Seal Rock Water District

Lincoln County, Oregon

WATER SYSTEM MASTER PLAN

November 2010

Civil West

Engineering Services, Inc.

Civil West Engineering Services, Inc. • 486 E Street • Coos Bay, Oregon 97420

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REGISTERED PROFESSIONAL ENGINEER
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OREGON
JULY 25, 1995
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ES.1 Introduction

The Seal Rock Water District (SRWD) is located in Lincoln County, Oregon and serves a relatively long and narrow band of coastal land between the cities of Waldport and Newport. The District serves residential and small commercial customers through approximately 2,400 water meters. The service boundary encompasses around 6,505 acres or 10.2 square miles. The current population is estimated at 4,050 persons. Based on a 1.5% average annual growth rate the population served is expected to grow to 5,620 persons by the year 2030.

The District obtains treated water from the city of Toledo. The District is the “purchasing water system” and the city is the “wholesale system” per OAR 333-061-0020.

Almost 20 years have elapsed since the last 1993 Master Plan. The District recently completed accurate system mapping (concurrent with this Master Plan) through aerial photogrammetric surveys. This new mapping is incorporated into this Master Plan and was used to conduct new hydraulic modeling of the Seal Rock distribution system.

The city of Toledo completed their Water Master Plan earlier this year. The city of Newport completed a Water Master Plan in 2008. It is considered beneficial to have all three interconnected communities utilizing current and updated water planning documents with coincident planning periods.

ES.2 Water Demand

ES.2.1 Current Water Demand

Based on records for the last several years; the District purchases an average of 120 to 130 million gallons of water per year from Toledo. This water amount represents approximately 50% of the total water sold by the city of Toledo. Peak demand occurs in July or August. Minimum demands occur in February or March. Current average day demand (ADD), maximum month demand (MMD), maximum day demand (MDD), and peak hourly demand are shown below.

Unit	ADD	MMD	MDD	PHD
gpd	360,000	590,000	785,000	1,450,000
P.F.	1.00	1.64	2.18	4.03
gpcd	89	146	194	358

Approximately 83% of all water sold in the District is to domestic customers and 17% is to commercial accounts. The average quantity of water sold per meter varies with higher use in the summer however the average is about 3,340 gallons per month. The average for a standard ¾-inch domestic meter inside the District is 2,873 gallons per month.

The amount of water sold is less than that demanded from Toledo with the difference being unaccounted water. Annual values show a 3-year average unaccounted water total of 31.3 million gallons per year or 23.8% of total water demand.

ES.2.2 Future Water Demand

Water demand projections over the planning period are estimated by multiplying the current per capita demand numbers by the future projected population estimates. An average annual growth rate of 1.5% is projected for the planning period commensurate with actual growth over the last decade. Even though unaccounted water is high, the per capita ADD of 89 gpcd is normal. Significant per capita demand reductions are not anticipated.

Year	Population Estimate	EDU Estimate	ADD (gpd)	MMD (gpd)	MDD (gpd)	PHD (gpd)
2008	4,050	2,950	360,000	590,000	785,000	1,450,000
2009	4,111	2,994	365,400	598,850	796,775	1,471,750
2010	4,172	3,039	370,881	607,833	808,727	1,493,826
2011	4,235	3,085	376,444	616,950	820,858	1,516,234
2012	4,299	3,131	382,091	626,204	833,170	1,538,977
2013	4,363	3,178	387,822	635,598	845,668	1,562,062
2014	4,428	3,226	393,640	645,132	858,353	1,585,493
2015	4,495	3,274	399,544	654,808	871,228	1,609,275
2016	4,562	3,323	405,537	664,631	884,297	1,633,414
2017	4,631	3,373	411,620	674,600	897,561	1,657,915
2018	4,700	3,424	417,795	684,719	911,025	1,682,784
2019	4,771	3,475	424,062	694,990	924,690	1,708,026
2020	4,842	3,527	430,423	705,415	938,560	1,733,646
2021	4,915	3,580	436,879	715,996	952,639	1,759,651
2022	4,989	3,634	443,432	726,736	966,928	1,786,046
2023	5,063	3,688	450,084	737,637	981,432	1,812,836
2024	5,139	3,743	456,835	748,701	996,154	1,840,029
2025	5,216	3,800	463,687	759,932	1,011,096	1,867,629
2026	5,295	3,857	470,643	771,331	1,026,262	1,895,644
2027	5,374	3,914	477,702	782,901	1,041,656	1,924,079
2028	5,455	3,973	484,868	794,644	1,057,281	1,952,940
2029	5,537	4,033	492,141	806,564	1,073,140	1,982,234
2030	5,620	4,093	499,523	818,663	1,089,238	2,011,967
2031	5,704	4,155	507,016	830,943	1,105,576	2,042,147
2032	5,789	4,217	514,621	843,407	1,122,160	2,072,779
2033	5,876	4,280	522,340	856,058	1,138,992	2,103,871
2034	5,964	4,344	530,175	868,899	1,156,077	2,135,429
2035	6,054	4,410	538,128	881,932	1,173,418	2,167,460
ADD	89 gpcd					
MMD	146 gpcd		Persons/EDU =		1.3729	
MDD	194 gpcd					
PHD	358 gpcd					

The planning period design flow is the 20-year MDD which equals 765 gpm or 1.1 MGD.

ES.3 <u>Existing Water System</u>

ES.3.1 Water Supply

The SRWD purchases water from the city of Toledo. Raw water to the Toledo Water Treatment Plant comes from the Siletz River in the summer and from Mill Creek in the winter. The District holds a 2.6 cfs water right on the Siletz River however the right is junior to the instream rights. The city of Toledo holds senior water rights on the Siletz of 5.75 cfs and a junior right of 4.0 cfs. The city of Toledo also holds 15.0 cfs senior water rights on Mill Creek plus 250 acre-feet of permitted storage behind the Mill Creek Dam.

Treated water travels through approximately 50,000 feet of 12-inch dedicated transmission piping to the Seal Rock Water District. Even though the Toledo system and the Seal Rock system are at the same hydraulic grade of approximately 300 feet above sea level, a pump station exists (called the Toledo Pump Station) nearer to the city to overcome pipe friction and deliver water to the District quickly. A master meter exists to measure flows entering the SRWD system from Toledo.

ES.3.2 Water Treatment

The SRWD has no treatment facility and finished water is purchased from Toledo. The Toledo plant was constructed in 1976 and received some upgrades in 2000. The plant is in good condition and is well maintained. The major plant components have adequate capacity to serve the city plus the District for the planning period although some minor capacity increases and maintenance improvements are needed.

A chlorine booster station exists near the District end of the 50,000 foot transmission piping to ensure proper free chlorine residuals in the District. This equipment boosts the free chlorine residual from around 0.6 mg/L up to 1.2 mg/L.

ES.3.3 Water Storage

The SRWD has two in-use finish water storage tanks; the 0.9 MG Driftwood Storage Tank and the 1.4 MG Lost Creek Storage Tank for a total of 2.3 million gallons of finished water storage.

The Driftwood Tank is a welded Cor-Ten steel tank constructed in 1981 with a water surface elevation of 265.5 feet. The Lost Creek Tank is a glass-fused-to-steel tank constructed in 2005 with a water surface elevation of 301 feet. A pressure reducing valve drops pressure from the Lost Creek Tank discharge to match the 265.5 foot hydraulic grade of the Driftwood Tank.

The District also has on older concrete tank, called the Makai Tank, constructed in 1971 which is off-line. The tank has a maximum design water surface of 242 feet and is too low in elevation to fit into the system today and thus cannot be used at this time.

ES.3.4 Distribution Pump Stations

The SRWD has 7 pump stations, including the 700 gpm Toledo Pump Station (PS) which is located close to the city of Toledo and pumps water through the long transmission pipe to the District. Two of the pump stations – the York Pump Station and the Beaver Creek Pump Station – do not lift water to higher pressure zones but merely exist to overcome pipe restrictions in the long piping system. Now that significant 12-inch piping has been installed along Highway 101, the Beaver Creek PS can be eliminated. The Toledo PS automatic start/stop is based on water level in the Lost Creek Storage Tank. The 40-year-old Beaver Creek and York Pump Stations turn on simultaneously based on water level in the Driftwood Storage Tank. The Toledo PS, York PS, and Beaver Creek PS are all overdue for pump replacement (Beaver Cr. only if not eliminated) and associated mechanical upgrades. The York PS is also undersized and at times cannot properly supply the Driftwood storage tank.

The Cross Street PS and East Bayshore PS are similar pumping stations which contain two normal duty pumps and one larger “fire” pump with start/stop based on pressure switches connected to a 500-gallon hydropneumatic tank inside the PS building. These pump stations boost pressure to higher elevation areas containing 70 to 90 homes each. The 500 gpm fire pumps are fairly small for typical fire duty but even so apparently cannot be started across-the-line when the pump station is on standby generator power due to excessive startup current exceeding the generator capacity. Other than needing new soft-start motor starters or VFDs for the larger pumps, the Cross Street and East Bayshore PSs are in good condition.

In addition, there are two smaller booster pump stations (BPS) – the Driftwood BPS and the Lost Creek BPS – which serve relatively small areas containing 8 or 9 homes each.

ES.3.5 Distribution Piping System

The SRWD has 60 miles of piping (315,150 feet) covering 6 pressure zones. There are approximately 150 fire hydrants. Four pressure zones are created through the various booster pump stations. The majority of the system is in a main pressure zone fed by gravity from the storage tanks. The west Bayshore area along the beach at the lowest elevations in the south end of the District is fed through pressure reducing valves from the main zone. Static pressures in the system range from about 23 psi to 110 psi. Significant portions along Highway 101 have pressures exceeding 100 psi which can exacerbate leakage problems.

System piping in the SRWD ranges from 2-inch to 12-inch in diameter with a small amount of 14-inch HDPE (with 12-inch inside diameter). Over 30% of the system is 4-inch in diameter or less with approximately 51,000 feet of piping being 2-inch diameter. The long and narrow system contains numerous ravines and other challenges, severely limiting the opportunities for creating pipe loops. The lack of looping results in many dead-end pipes increasing manpower required for flushing and blow-offs. A serious deficiency is that much of the 2-inch and 3-inch piping installed in the system is actually non-pressure-rated ABS pipe not designed for potable water use. This piping breaks frequently as would be expected.

The significant amount of undersized piping and limited looping creates hydraulic restrictions in many areas of the system. A majority of the fire hydrants, when operated, create unacceptable pressure conditions of less than 20 psi in areas of the system. In fact, by attempting to avoid the pressure violation (less than 20 psi), 65% of the fire hydrants cannot produce the minimum 1000 gpm fire flow recommended by the Oregon Fire Code. In effect, when most of the hydrants are operated either for an actual fire event or for periodic system flushing, pressure violations per OAR 333-061-0050 occur in the system

ES.4 Improvement Needs

The District is well operated and maintained however certain components in use are past their expected design life and there are numerous limitations in the piping system. Projects are needed in various areas of the system to make the improvements necessary to avoid violations, to properly maintain the older areas of piping, to reduce unaccounted water, to replace worn out and undersized components in some pump stations, and to ensure continued reliable and safe water to residents and businesses.

In accordance with Oregon Revised Statutes in ORS 448, failure to properly construct, operate, or maintain the water system can result in various penalties including civil penalties, forced improvements, moratoriums on new connections, and even orders to cease operations.

ES.4.1 Water Supply

This Master Plan evaluates several options to determine if the Seal Rock Water District could treat and supply their own potable water rather than the current wholesale purchase from Toledo. Options include various other streams, other municipal suppliers, raw water from the Siletz River with a treatment plant at Lost Creek, and a seawater desalination facility. Aside from the city of Toledo, the only other option with long-term sustainability for water supply is desalination. Other streams in the area have insufficient flows. Other municipalities including Newport, Waldport and Yachats have their own long-term water supply problems and the District's water right on the Siletz River is junior to the instream rights (and thus can be restricted in any summer for months at a time) and is only sufficient for the next 40 years. Seawater desalination would potentially satisfy the long-term needs of the area and future technological advances may reduce the cost of desalination, however at this time environmental hurdles and the extreme capital cost and annual operating expense make the option unfeasible.

The clear prudent option for this planning period is for the District is to continue the wholesale purchase of water from the city of Toledo. The Toledo supply is adequate to meet the needs of the city and the District combined for 100 years or more. A new intergovernmental agreement (IGA) is needed to allow the District and the City to move forward with assurances and guidelines as may be reasonable and fair.

Rebuilding the supply infrastructure on the Siletz River and Mill Creek are capital improvement projects in the Toledo Water Master Plan. Various relatively minor improvements are also needed at the Toledo Water Treatment Plant for maintenance and capacity building reasons. It is assumed that based on the historic trend of Seal Rock purchasing 50% of water sold in Toledo, the District will in some way be required to pay for half of these supply improvements, either through rates or capital contributions. The estimated cost to the District for supply is $7.25 million. With the Mill Creek supply infrastructure having an estimated cost of $9.6 million ($4.8 million for each community), the Mill Creek supply portion is the bulk of the $7.25 million cost attributed to the District. Past, current and recommended future practice for Toledo is to utilize the Siletz River in summer months when the water is clean and clear and to utilize the Mill Creek source in winter months when high turbidity affects the Siletz.

ES.4.2 Water Storage

The District currently has adequate water storage for the next 15 years based on industry standard guidelines. By the end of the planning period there will be a storage deficiency of 200,000 gallons. It is recommended that long-term planning and system development charges begin now for a future storage tank. Estimated costs are presented in this Plan to allow justifiable SDCs. A suitable location is upper Cross Street. Closer to the time additional storage is required; the District should reevaluate storage needs and size a tank for 20-year demands at that time.

ES.4.3 Water Distribution

Various distribution piping improvement projects are recommended to correct vulnerabilities, replace undersized and deteriorated piping, and to remedy hydraulic restrictions leading to pressure problems. A general rule that the District should follow is to create 6-inch+ diameter loops whenever the opportunity arises. Since so few opportunities exist for looping, every opportunity to create a loop must be taken. District standards for development now require 6-inch or greater pipe in all cases unless otherwise approved.

Significant quantities of 2- and 3-inch ABS pipe exist which is not designed for pressurized potable water piping. This ABS pipe is a source of leakage and requires frequent repairs. This pipe is scattered throughout many areas however a large portion is located in the Pacific Shores area. Other areas where this undersized piping should be replaced include Marsh Street, Art Street, NW Parkview Street, NW Quail Street, Old Coast Road, Huckleberry Lane, SW 100th Court, SE 145th Street, SW Brandt Street, SW Abalone Street, Powe Drive, and more.

A significant vulnerability in the District is the single exposed 10-inch pipe on the Beaver Creek Bridge on Highway 101. This section of pipe is a bottleneck for all flow feeding south and no alternate route exists. This pipe is aging and is vulnerable to wave and other damage. A horizontal directional drill project is recommended to install a new pipe under Beaver Creek. At the same time, a new service to Ona Beach State Park should be installed to allow the old 6-inch pipe which feeds the Park to be abandoned. This 6-inch pipe literally extends onto the beach sand and has pressure over 100 psi.

Another vulnerable and hydraulically restricted area is the entire north end of the District which is fed by a single 8-inch pipe along Highway 101 and crossing Thiel Creek, Moore Creek, and Grant Creek. This 8-inch pipe runs for over 7,600 feet with no looping to feed the Pacific Shores and Surfland areas. Significant development on Cedar Street, Birch Street, Abalone Street, SW Brandt Street is also served from this 8-inch pipe. The solution to the problems at the north end of the District is to create a new 12-inch loop from the existing 12-inch feeding the Lost Creek Tank following the existing gravel roadways and tying into Thiel Creek Road (SE 98th Street). The length of piping required to connect to SE 98th Street is approximately 7,950 feet. The existing 6-inch piping on SE 98th Street is undersized and deteriorated and must also be replaced with 12-inch to connect the loop to Highway 101.

Capital Improvement Plan

Phase 1 - Year 2012	
Distribution Piping - HDD at South Bayshore	$105,415
Distribution Piping - NW Lotus Lake Dr. / Parker Way	$95,555
Distribution Piping - NW Orcas Dr.	$70,108
Distribution Piping - Marsh Street	$53,215
Distribution Piping - Powe Drive (Silver Sands)	$139,925
Distribution Piping - HDD at Beaver Creek	$548,585
Distribution Piping - SW 100th Court	$36,903
Distribution Piping - SE 118th St.	$35,271
Distribution Piping - SW Brandt, SW Abalone St.	$190,603
Beaver Creek Pump Station Bypass/Abandonment	$15,696
Distribution Piping - SE 145th Street	$89,683
Toledo Pump Station Upgrade	$39,150
York Pump Station Upgrade	$48,285
	$1,468,392
Phase 2 - Year 2014	
Distribution Piping - Quail Street, Old Coast Rd, Seagull Way Loop	$482,053
Distribution Piping - Seagull Way, Bittern, Cross St. Loop	$192,125
Distribution Piping - Art Street, Park View Street, Line Street Loop	$396,575
Distribution Piping - Huckleberry and Blackberry Street	$141,919
Distribution Piping - Pacific Shores	$372,070
	$1,584,741
Phase 3 - Year 2016-2018	
Distribution Piping - East Piping to North End	$1,341,613
Distribution Piping - SE Cedar Street	$140,288
Distribution Piping - SE Birch Street	$160,588
Distribution Piping - SE Chittum Dr.	$107,699
Distribution Piping - NW Kona Street and Pali Street	$265,785
	$2,015,971
Phase 4 - Year 2018 - 2022	
Cross Street Storage Tank (Water Surface 305')	$736,350
Other 2-Inch Piping Replacements	$2,400,000
	$3,136,350
Total All Phases	**$8,205,455**
Total Portion of Toledo CIP attributed to SRWD	**$7,250,000**
	$15,455,455

ES.5 Funding Options

The Capital Improvement Plan (CIP) for the Seal Rock Water District contains $8.2 million in various piping improvements, pump station upgrades, and storage improvements needed over the planning period to serve those residents and businesses that exist now as well as those expected to be added to the system over the period. In addition, the SRWD is responsible for $7.3 million in water supply improvements in Toledo including half the cost of a new intake on the Siletz River, half the cost of new piping under the Olalla Reservoir, half the cost of improvements to the Mill Creek water supply infrastructure, and half the cost of minor capacity building improvements at the water treatment facility. The effective total capital need is therefore $15.5 million. Details on the needed improvements are included in Sections 7 and 8 of this Master Plan.

These two components of the improvement needs - namely the internal SRWD CIP improvements and the external water supply improvement part of the Toledo system – can be funded in different ways. Potential options are discussed below:

ES.5.1 Internal SRWD Capital Improvements Funding

The SRWD CIP totals $8.2 million. Basic options for funding include loans, grants, revenue bonds, and general obligation (GO) bonds. Assuming a 4 Phase approach over time, loans for each Phase at 3.5% for 20 years, zero grant and a 10% cushion, water rates would need to increase by about $25 per month for the average user (See Table 9.4.1-2). A GO Bond for $8.2 million would result in an assessment of approximately $0.82 per $1000 of property value resulting in an annual tax bill of $164 for a $200,000 property or approximately $13.70 per month.

ES.5.2 SRWD Share of External (Toledo) Water Supply Improvements Funding

The SRWD share of the Toledo CIP portions involving joint water supply for both communities totals $7.3 million. This portion can be funded one of two ways. One option is for the City of Toledo to fund this entirely with loans and grants and then impose a subsequent rate increase to the SRWD commensurate with the District's share of the cost. The other option is for the District to pass a bond measure and then to provide the City of Toledo with a bulk payment covering the entire cost of the District's share of the supply improvements.

Option A – If Toledo funded the entire $7.3 million, a rate increase to the SRWD would be required to cover the costs. Assuming a 3.5% loan for 20 years, the annual amount that Toledo would need from the SRWD to cover the new loan would be $514,000 or $42,800 per month. To cover this cost, the District would need to increase rates such that the average user rate increased by approximately $14 per month. Potentially an agreement between the City and the District could limit future rate increases (beyond that required for the $7.3 million capital improvements) to that required for system operation and maintenance only.

Option B – If the SRWD passed a GO Bond and made a lump sum payment to Toledo to cover the District's half of the water supply improvements, there would be no rate increase from the City to the District for the capital improvements. Future rate adjustments could be limited to as required for system operation and maintenance only. A GO Bond for $7.3 million would result in an assessment of approximately $0.73 per $1000 of property value resulting in an annual tax bill of $146 for a $200,000 property.

A GO Bond for the entire $15.5 million would result in an assessment of approximately $1.55 per $1000 and an annual tax bill of $310 for a $200,000 property ($26 per month).

Introduction

Section 1

1.1 Background and Need

1.1.1 Water System Background

The Seal Rock Water District (SRWD) is located in Lincoln County, Oregon and serves a relatively long and narrow band of coastal land between the cities of Waldport and Newport. The District serves residential and small commercial customers through approximately 2,400 water meters. Figure 1.1.1-1 shows the location of the SRWD on the Oregon coast. The study area is described in Section 2.

According to past planning documents, the SRWD was formed in 1959 and began serving water to 175 customers in the 1960s. Originally, water supply came from Henderson Creek and Hill Creek with chlorination as the only treatment. As the need for water increased the SRWD applied for water rights on Beaver Creek as recommended in a 1970 Lincoln County area-wide study and received a priority date of 9/16/1971. Additional water rights (also with a priority date of 9/16/1971) were obtained on Grant, Moore, and Collins Creeks. The quantity of water available on these small coastal streams was known to be inadequate to support community growth and low summer flows would be problematic quickly. Development and use of Beaver Creek and the other small coastal streams was not implemented and the District continued to search for long-term supply options.

In 1972 the SRWD and the city of Toledo coordinated to utilize the Siletz River as their mutual water source and to construct an intertie between the two communities with treatment occurring in Toledo. This long-range water supply plan was approved by the Lincoln County Board of Commissioners in 1974. The two communities then split the costs and constructed the Toledo Water Treatment Plant (WTP), the Siletz River raw water piping, and the Seal Rock intertie pipeline and pumping station. The SRWD forfeited water rights on the smaller coastal streams in order to obtain water rights on the Siletz River. Water Use Permit No S40277 with a priority date of February 28, 1973 was issued to the SRWD allowing for withdrawal of 2.6 cubic feet per second (cfs) from the Siletz River. The SRWD permit on the Siletz River is junior to the instream water rights and therefore could be restricted during low streamflow periods. The city of Toledo has water rights on the Siletz which are senior to the instream water rights.

In 1978 in a continuing effort to look for long-range water supply options the SRWD applied for water rights on Drift Creek. This option also was not realized, due to the conversion of minimum streamflows into instream water rights senior to the SRWD permit, and the permit was later cancelled. At this point the District has only the Permit S40277 for the Siletz River (deadline for showing full beneficial use currently extended to 10/1/2043), and the old Certificate No. 32199 allowing for 0.4 cfs from Hill Creek.

The Siletz River/Toledo WTP continues today to be the source of water for the SRWD. All customers in the SRWD are metered and several master meters exist to allow monitoring of use and to help detect leaks in distinct regions of the system. The District's water system contains several pump stations, two active storage tanks, and many miles of piping. Various piping and storage improvements have been completed in the District over the years, including significant telemetry upgrades to allow remote monitoring of various master meters and pump stations. In recent years the SRWD boundary was modified and water service to the northernmost portion of the District including the Idaho Point area was transferred to the city of Newport. A normally-closed piping intertie exists with the Newport system. The hydraulic grade of this intertie is such that under normal circumstances water will flow from the SRWD into Newport since the SRWD pressure is higher than Newport's at the connection.

1.1.2 Need for Plan

Almost 20 years have elapsed since the analysis work done for the 1993 Master Plan. Various addendums to the original Plan were prepared and various minor improvements completed. The most recent major plan amendment occurred in 2002 which updated recommendations for storage improvements and various piping replacements. As a result, the Lost Creek Storage Tank was constructed along with additional piping upgrades.

At this point, the SRWD considers it prudent to reevaluate overall system needs and to complete a new 20-year Water System Master Plan in accordance with OAR 333-061-0060(5). Aerial mapping and GPS data collection is being conducted which will allow the District to have an accurate system-wide map for the first time. This accurate mapping will allow for the creation of new computer pipe network modeling, updated with improvements constructed in the recent past, to provide for sound and economical improvement recommendations for the next 20-year period. In addition, the District's current System Development Charge (SDC) policy was adopted in 1994 and is due for updates. A more current Water System Master Plan is needed to support SDC updates.

The City of Toledo is currently conducting a Water Master Plan and there will be a benefit for both the SRWD and the city of Toledo to have concurrent up-to-date planning. The city of Newport completed a new Water System Master Plan in 2008.

1.1.3 Plan Authorization

The SRWD solicited engineering proposals for this Water System Master Plan in August of 2008. After a review of proposals and a formal selection process, the District contracted with Civil West Engineering Services, Inc. on October 22, 2008 to complete this Plan and to provide other engineering services. On January 14, 2010 Board approval was given to expand the scope of the Master Plan to include water supply sources and alternatives.

1.1.4 Past Studies

- *Water Study*, 1989 – Gary L. Dyer Consulting Engineers
- *Master Water System Plan*, 1993 – Gary L. Dyer Consulting Engineers
- Various Addendums to Master Water System Plan through 2002 by The Dyer Partnership
- *Interconnection and Regional Water System Study*, 2003 – The Dyer Partnership

1.2 Study Objective

The purpose of the Water System Master Plan is to furnish the SRWD with a comprehensive planning document that provides engineering assessment of system components and guidance for future planning and management of the water system over the next 20 years. An evaluation of long-range water supply options was added to the scope of work in early 2010.

Principal plan objectives include:

- Description and mapping of existing water system
- Prediction of future population and water demands
- Creation of digital hydraulic model based on updated mapping
- Evaluation of existing water system components
- Evaluation of the capability of the existing system to meet future needs and regulations

- Recommendations for improvements needed to meet future needs and/or address deficiencies
- Background provisions to support updated water system SDCs
- Evaluations of raw water supply options including desalination

This Plan details infrastructure improvements required to maintain compliance with State and Federal standards as well as provide for anticipated growth. Capital improvements are presented as projects with estimated costs to allow the District to plan and budget as needed.

System mapping and hydraulic modeling was dependent on a separate Aerial Mapping Project conducted concurrently with this Plan, with significant GPS ground location points of existing infrastructure being determined by District staff. Once the Aerial Mapping project was complete and base maps of the existing water system finalized, hydraulic modeling and subsequent mapping of potential improvement needs progressed.

1.3 Scope of Study

1.3.1 Planning Period

The planning period for this Water System Master Plan is 20 years, in accordance with OAR 333-061-0060(5)(b) and OAR 690-086-0170. The period must be short enough for current users to benefit from system improvements, yet long enough to provide reserve capacity for future growth and increased demand. Existing residents should not pay an unfair portion for improvements sized for future growth, yet it is not economical to build improvements that will be undersized in a relatively short period of time. The end of the planning period is the year 2030, based on the assumption that immediately needed infrastructure improvements would not be implemented until at least 2010.

1.3.2 Planning Area

The Master Plan planning area is that contained within the SRWD Boundary, as well as the immediate area surrounding water system components outside the boundary, such as the intertie piping with Toledo and the corresponding pump station. The area within the SRWD Boundary includes approximately 6500 acres. Additional information and maps for the planning area are presented in Section 2.

1.3.3 Work Tasks

In compliance with Drinking Water program standards, this plan provides descriptions, analyses, projections, and recommendations for the water system over the planning period. The following elements are included:

- Study area characteristics, including land use and population trends and projections
- Description of the existing water system including transmission, storage and distribution
- Existing regulatory environment including regulations, rules and plan requirements
- Current water usage quantities and allocations
- Projected water demands
- Existing system capacity analysis and evaluation
- Supply options
- Improvement alternatives and recommendations with associated costs
- A summary of recommendations with a Capital Improvement Plan
- Funding options
- Maps of the existing system and recommended improvements

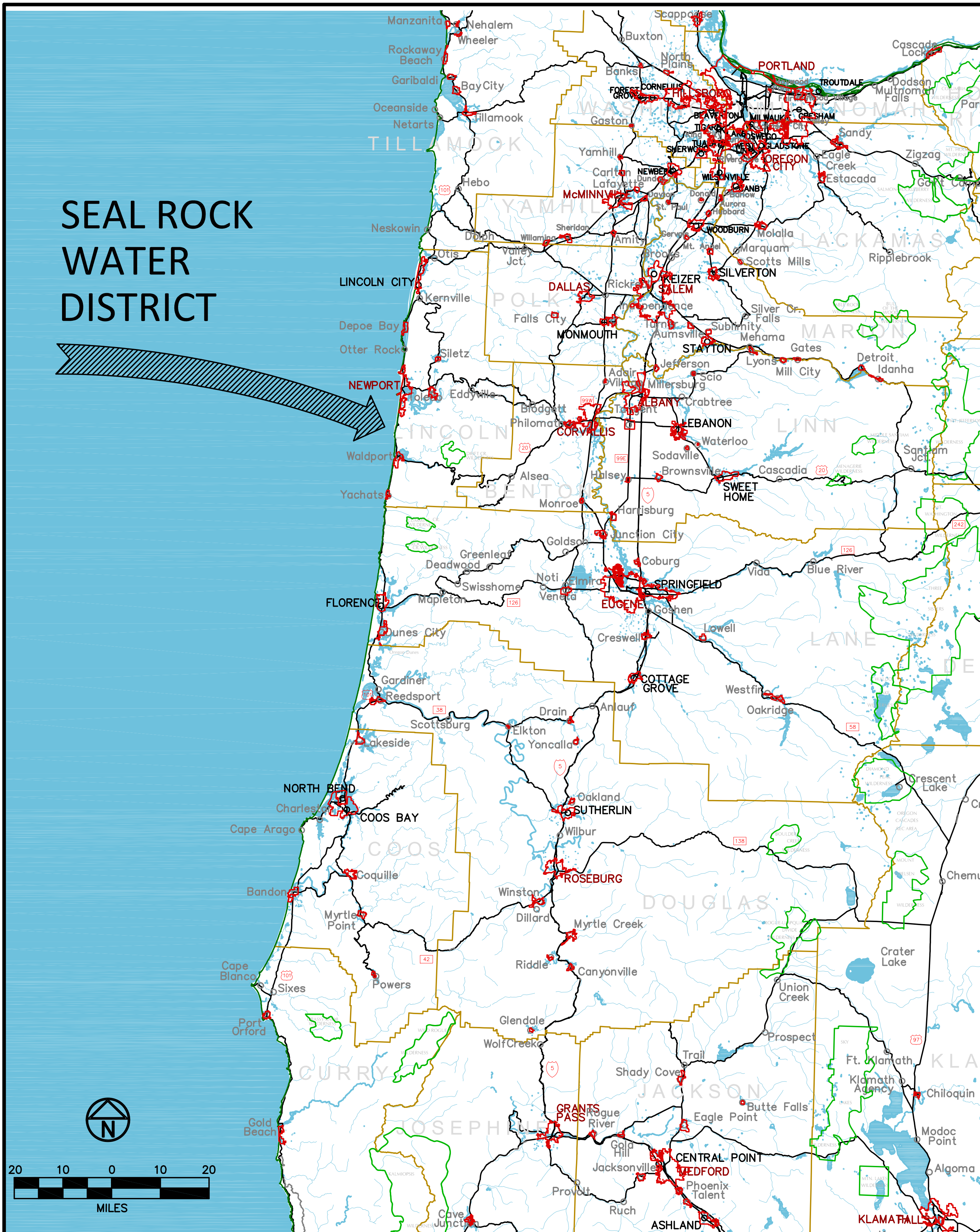
1.4 Acknowledgments

Members of the SRWD staff and Board of Commissioners have contributed efforts to ensure complete information and proper planning of the community's water system needs.

Board Members
President: John Garcia
Secretary: Saundra Mies-Grantham
Treasurer: Glen Morris
Member: Daryl Eldridge
Member: Rob Mills

Office Staff:
Gloria Butsch: Office Supervisor
Trish Karlsen: Bookkeeper
Tracie Swanson: Utility Billing Clerk

Field Staff:
Scott Dixon: Field Operations Supervisor
Brad Wynn
David Anderson
Justin Babcock
Rory Thayer
Jason Maxon



Civil West Engineering Services, Inc.	DWG BY: REB DATE: MAY 12, 2009	0 1"	LOCATION MAP	FIGURE
	WATER SYSTEM MASTER PLAN		SEAL ROCK WATER DISTRICT LINCOLN COUNTY, OREGON	1.1.1-1

2.1 Physical Environment

2.1.1 Planning Area Location

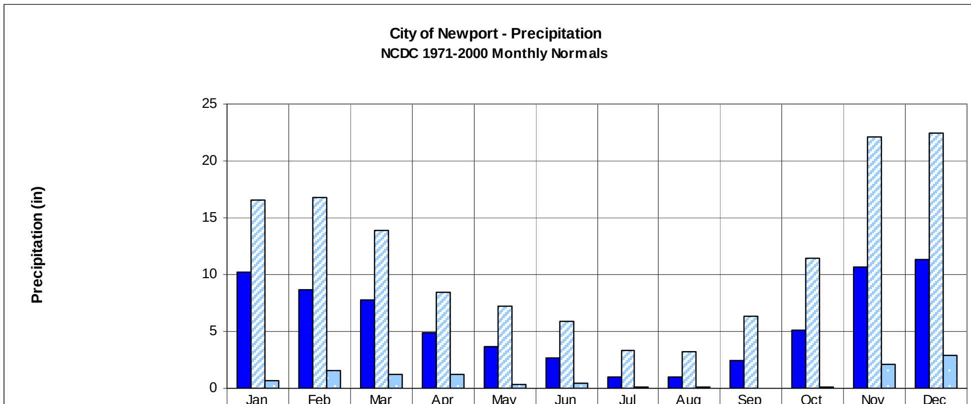
The Seal Rock Water District (SRWD) is located in Lincoln County Oregon approximately in the center of the County coastline (44°29'56"N, 124°04'55"W) in Townships 11S, 12S, and 13S in Range 12W and 11W. The District boundary extends from the north side of Alsea Bay at Waldport 11.5 miles northward to Henderson Creek near the Newport Municipal Airport. The District serves the coastline between the cities of Waldport and Newport and at no point extends more than 1.5 miles inland from the beach. The current SRWD Boundary encompasses 6,505 acres or 10.2 square miles.

This Master Plan planning area is that contained within the Seal Rock Water District boundary. Also considered is the water transmission pipe route from the city of Toledo to the SRWD. The area can be seen in Figure 2.1.1-1.

2.1.2 Climate

Climate data was obtained using long-term records collected at the Newport Station (Station 356032) as reported by the Western Regional Climate Center. The Newport Station is the closest weather recording station to the SRWD.

Average annual precipitation is approximately 70-inches in Newport. Record low and high precipitation years recorded were 43-inches in 1944 and 111-inches in 1968. The maximum recorded 24-hour rainfall was 4.99-inches on November 19, 1996. On average, 46% of the annual precipitation occurs in November, December, and January. Snowfall is rare with most years recording little or no snowfall; however, record snowfall of 11-inches was reported in 1942-43 and again in 1972-73. The mean annual snowfall during the period from 1930 to 2007 is 1.02-inches. No statistically significant increasing or decreasing trend in annual rainfall is evident. Based on the NOAA Atlas 2, Volume X Isopluvial maps, the 5-year storm 24-hour rainfall is 4.5 inches.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean Precipitation (in.)	10.25	8.69	7.74	4.87	3.68	2.72	1.04	1.02	2.39	5.12	10.67	11.38
Highest Precipitation (in.)	16.54	16.81	13.84	8.41	7.21	5.86	3.3	3.19	6.32	11.39	22.13	22.44
Lowest Precipitation (in.)	0.68	1.56	1.22	1.2	0.34	0.41	0.13	0.07	0.03	0.13	2.06	2.88

Month

Figure 2.1.2-1 – Precipitation Normals, NCDC 1971-2000

The average annual temperature in Newport ranges from 45 to 58°F with an annual mean of 51°F. A record high temperature of 100°F was recorded on July 11, 1961. A record low temperature of 1°F was recorded on December 8, 1972. August is statistically the warmest month with a mean of 58°F while December and January are the coldest with a mean of 45°F.

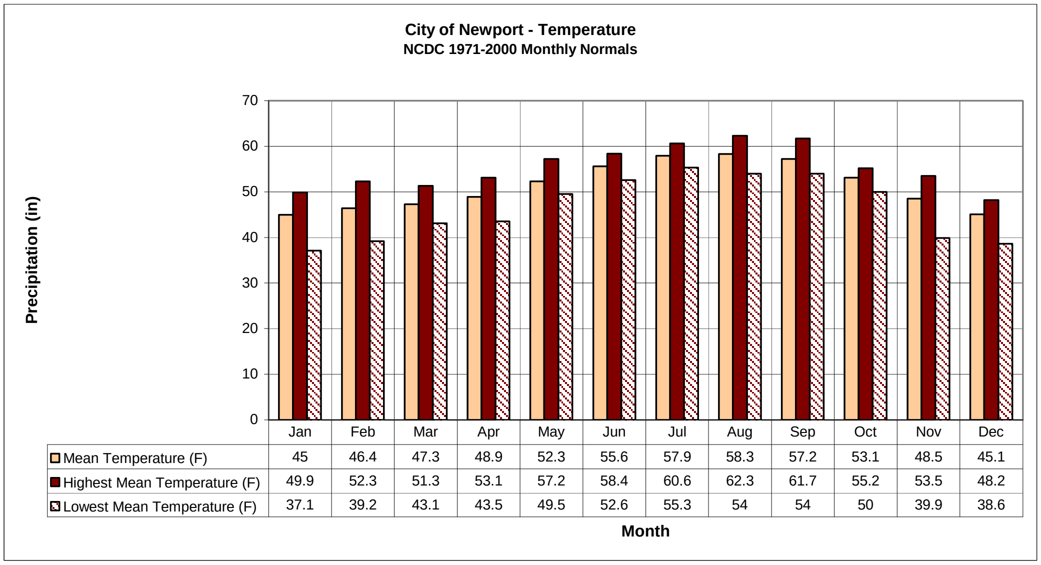


Figure 2.1.2-2 – Temperature Normals, NCDC 1971-2000

2.1.3 Land Use

Land use within the SRWD boundary is primarily zoned for residential use along the beach with a few small pockets of commercial land along Highway 101. There is also significant Public Facilities (P-F) land in Driftwood State Park, Seal Rock State Park, Ona Beach State Park, and Lost Creek State Park. The District is bounded on the west by the Pacific Ocean. Land to the east of the SRWD is primarily zoned Timber-Conservation (T-C) including land inside the boundary. No Wild and Scenic Rivers are located in the planning area. The area zoning can be seen in Figure 2.1.3-1.

2.1.4 Floodplains

Areas within the SRWD are within the 100-year floodplain. Floodplain areas occur along the beach and several creeks. FEMA FIRM maps for SRWD area are included at the end of this Section in Figure 2.1.4-1.

2.1.5 Wetlands

Several wetland designations occur in the SRWD according to the National Wetlands Inventory (NWI) database. Estuarian and Marine Wetland areas occur along the beach and tidal flats. Freshwater Forested-Shrub Wetlands and Freshwater Emergent Wetlands occur in low areas primarily along the various creeks and in small pockets near coastal ponds. A Wetlands Map produced from the digital NWI data is shown as Figure 2.1.5-1.

2.1.6 Cultural Resources

According to the National Register of Historic Places, the only listed archaeological site in the study area is Seal Rock itself listed as a historical village site (NR #97001007, 35-LNC-14) with significance dating back to the 1500s. No other historical sites or structures are listed.

Lincoln County is part of the Siletz Service Area of the Confederated Tribes of Siletz Indians. Areas around Yaquina Bay and River were once home to the Yaquina Tribe (now included in the Siletz Tribe). Areas around Alsea Bay and River were once home to the Alsea Tribe (also now included in the Siletz Tribe). Several remnants of tribal settlements in the area have been discovered including fishing-weirs at Yaquina Bay at the Ahnkuti site (near Toledo).

2.1.7 Biological Resources

Biological resources in the area include numerous fish, shellfish, birds and mammals. Fish species include white sturgeon, pacific herring, steelhead, flatfishes, perch, coho, chinook salmon, chum salmon, surf smelt, longfin smelt, lingcod, English sole, and starry flounder. Shellfish include Pacific oysters, blue mussels, various clams, bay shrimp, and dungeness crab. A variety of bird species are present including the threatened brown pelican and threatened western snowy plover. Marine mammals in the area include California sea lions, harbor seals, and the threatened northern sea lion. Biological habitat in the area includes tidal, marine, and forest habitat.

2.1.8 Coastal Resources

The Oregon Coastal Zone roughly includes all land west of the crest of the Coast Range. The entire planning area is therefore within the Coastal Zone. Coastal resources in the area include coastal and marine habitat, tidal wetlands, commercial and sport fisheries, the Yaquina Bay deep draft estuary, and tourism related to the beach and Oregon Coast Aquarium.

2.2 Population

2.2.1 Past Estimates

According to data in the District's 1989 Water Study, the Seal Rock Water District served approximately 175 connections in the early 1960s, 800 connections in 1972, and 1355 connections in 1988. The 1989 Study estimated a permanent service population of 3927 persons at that time based on assumptions of 2.5 persons per single-family dwelling, 2.0 persons per multi-family dwelling units, and 2.0 persons per mobile home unit. An average annual growth rate of 2.0% was selected to estimate future populations. The predicted 2010 population was 5950 persons.

In 1993 a Water System Master Plan was prepared for the District. This Master Plan estimated the 1993 population at 5192 persons by multiplying the number of residential (domestic) connections in the District by the estimated number of persons per household. A value of 2.34 persons per household was used in accordance with the value published in the 1990 US Census data for Lincoln County. The 1993 Master Plan projected a population in 2013 of 8952 persons based on an average growth rate of 2.8% (accounting for transfer of some customers to City of Newport). The 1993 Plan presumed a 1.5% average annual growth rate for years 2013 to 2043.

In 2002 an addendum to the 1993 Master Plan was prepared. The Addendum did not attempt to estimate population but modified growth to 1.14% for the proceeding 10-year period.

The US Census 2000 data for Lincoln County includes the following values:
1.65 persons per housing unit (total population / total housing units)
2.31 persons per occupied housing unit
71.8% of housing units occupied / 28.2% of housing units vacant
19.1% of housing units are for seasonal, recreational, or occasional use

Data for the City of Newport includes:
1.89 persons per housing unit (total population / total housing units)
2.32 persons per occupied housing unit
81.7% of housing units occupied / 18.3% of housing units vacant
8.7% of housing units are for seasonal, recreational, or occasional use

Data for the City of Waldport includes:
1.87 persons per housing unit (total population / total housing units)
2.26 persons per occupied housing unit
82.7% of housing units occupied / 17.3% of housing units vacant
8.0% of housing units are for seasonal, recreational, or occasional use

2.2.2 Historic and Existing Population

Since the Seal Rock Water District is an unincorporated community, detailed census data and other population figures are not available, making precise population estimates difficult to obtain. In such cases water meter installation records can prove valuable for population and growth projections when sufficient data is available. The SRWD has accurate records for the number of water meters in the system over time. Data for the number of ¾-inch residential (domestic) water meters and the total number of system water meters is shown in Table 2.2.2-1 for the last 14 years based on the numbers of meters counted in June of each year. This data shows an average of 43 new meters added to the system per year and an average percent change of 2.1% per year. This same data is shown graphically in Figure 2.2.2-1.

The number of total water meters in the system in June 2008 is 2443 with 2379 meters being ¾-inch residential water meters.

Table 2.2.2-1 – Water Meter Growth History

Year	Total Domestic 3/4" Water Meters	Total Water Meters	Percent Change
1994	1,774	1,847	
1995	1,832	1,902	2.98%
1996	2,118	2,193	15.30%
1997	2,141	2,214	0.96%
1998	2,169	2,245	1.40%
1999	2,191	2,274	1.29%
2000	2,218	2,302	1.23%
2001	2,231	2,317	0.65%
2002	2,248	2,335	0.78%
2003	2,271	2,356	0.90%
2004	2,320	2,408	2.21%
2005	2,356	2,444	1.50%
2006	2,397	2,490	1.88%
2007	2,434	2,525	1.41%
2008	2,379	2,443	-3.25%
		94-08 Average	2.1%
		97-07 Average	1.3%

Out of the 2379 domestic ¾-inch meters, 16 meters serve multiple dwellings totaling approximately 34 housing units. This results in an estimate of 2363 single-family housing units plus 34 multi-family housing units or 2397 housing units in the "domestic" billing category. In addition there are an estimated 50 housing units in the Driftwood Village Mobile Home Park served with a single 4-inch meter. There are also 6 housing units (Bed & Breakfasts, house with retail shop, etc.) listed as "commercial" customers. Accounting for all the above dwelling types results in an estimate of 2453 total housing units in June 2008.

Using the County average of 1.65 persons per housing unit and 2453 total housing units results in a current full-time population estimate of 4050 persons. At any given time, a number of housing units will be vacant. In the SRWD, the number of occupied homes increases dramatically during summer months as with other parts of the Oregon coast. If it is assumed that 100% of the total housing units are occupied during the summer peak and that there is an average of 2.31 persons per occupied unit, the summer peak population would be 5666 persons.

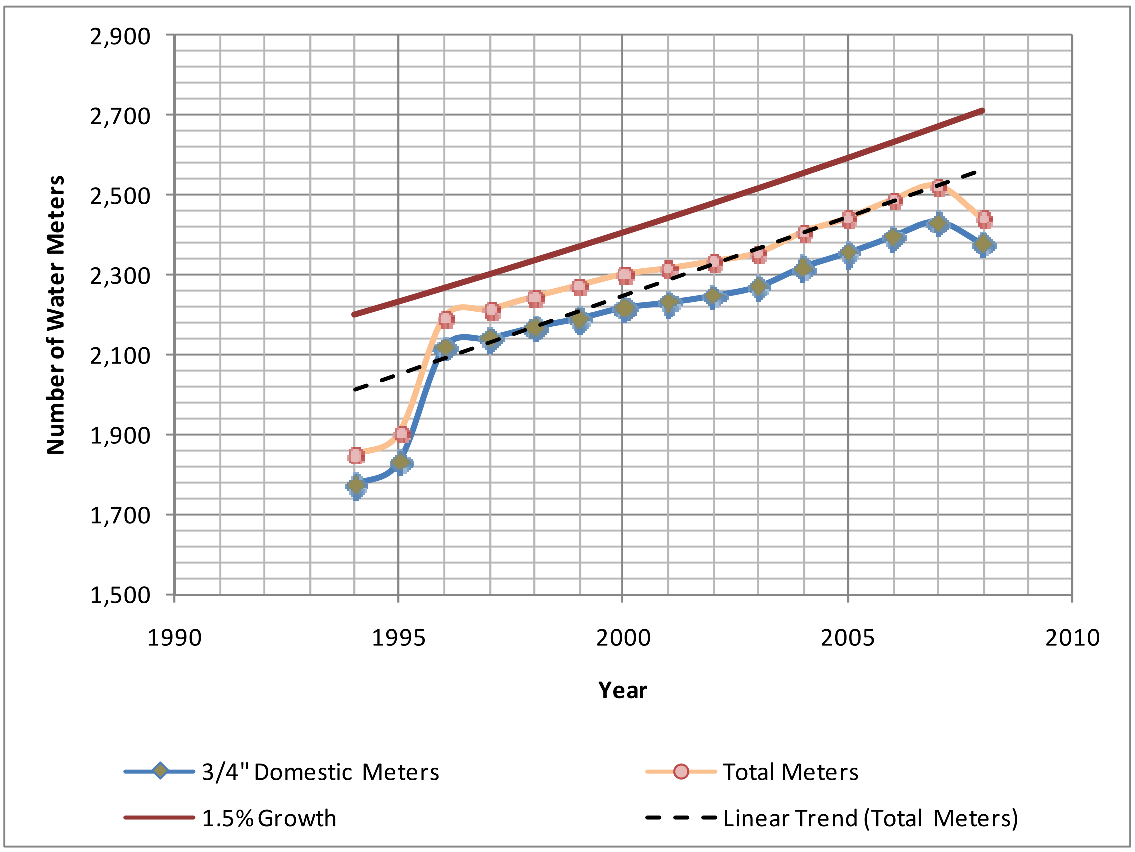


Figure 2.2.2-1 – Water Meter Growth History

According to water meter growth data for the District (Table 2.2.2-1) the average annual increase over the last 14 years is 2.1%. A graphical representation of this meter growth data (Figure 2.2.2-1) shows a steep increase from 1995 to 1996 followed by a steady modest increase of 1.3% per year for the next 11 years and then a small dip from 2007 to 2008. The steep incline in 1995/96 was the result of rapid meter purchasing activity due to a potential moratorium threat. The dip in 2007/08 was due to a transfer of the Idaho Point area customers to the City of Newport. A statistical best-fit linear trend through the 14 years of data results in an average of approximately 1.5% increase per year.

2.2.3 Projected Population

The Oregon Office of Economic Analysis long-term population forecast (last updated April 2004) indicates an average annual population increase of 0.7% for Lincoln County from 2010 to 2030. The Seal Rock Water District has historically grown at a greater rate than the County as a whole and is expected to continue to do so in the future. The City of Newport adopted a 1.25% average annual growth rate in its recent Water Master Plan based on the previous decade of actual growth and the Seal Rock area can be expected to grow more similarly to Newport rather than the average of the County as a whole. The SRWD is projected to grow at an average annual rate of 1.5% for the planning period based on the best statistical fit for actual data over the last 14 years.

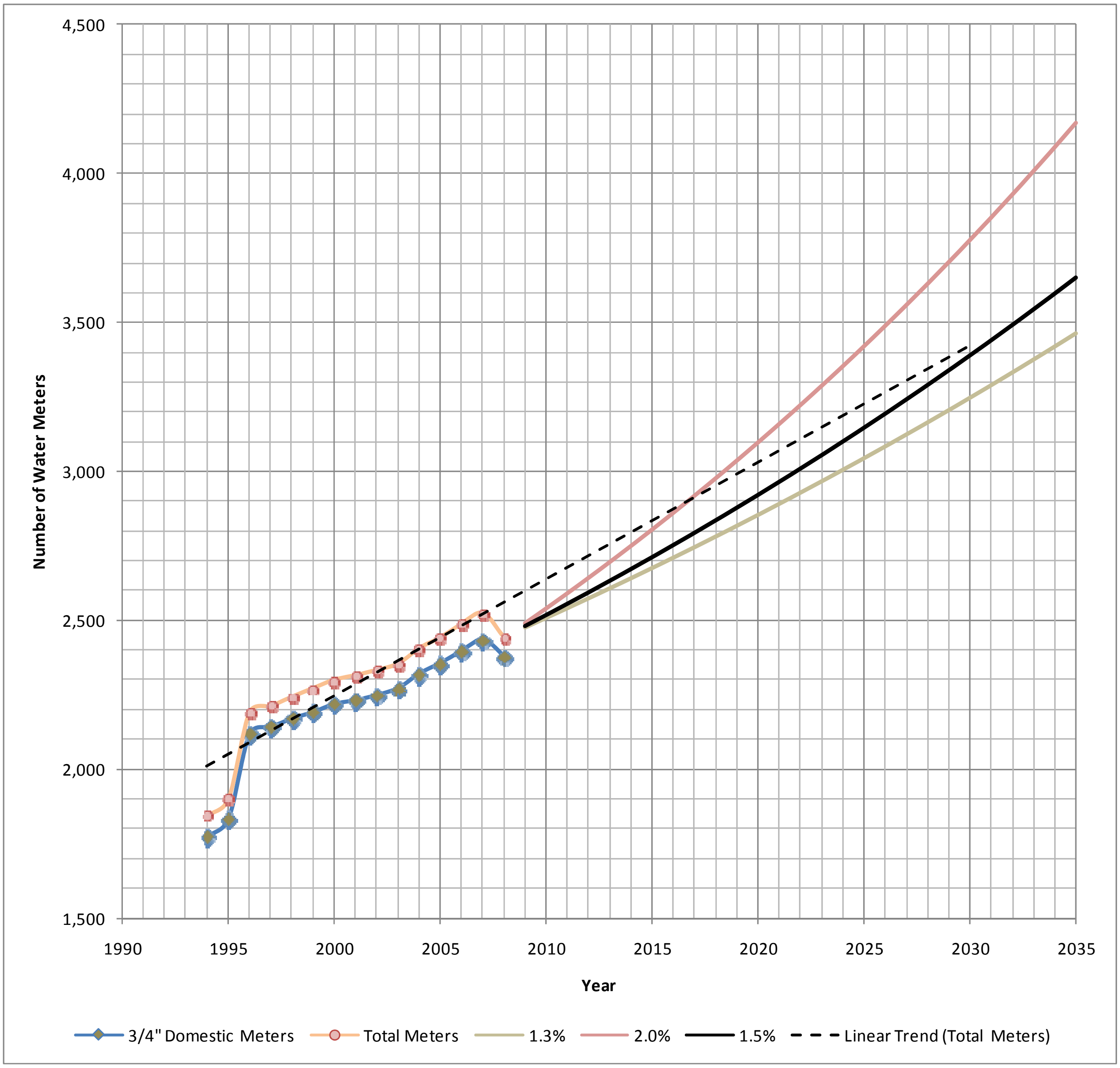


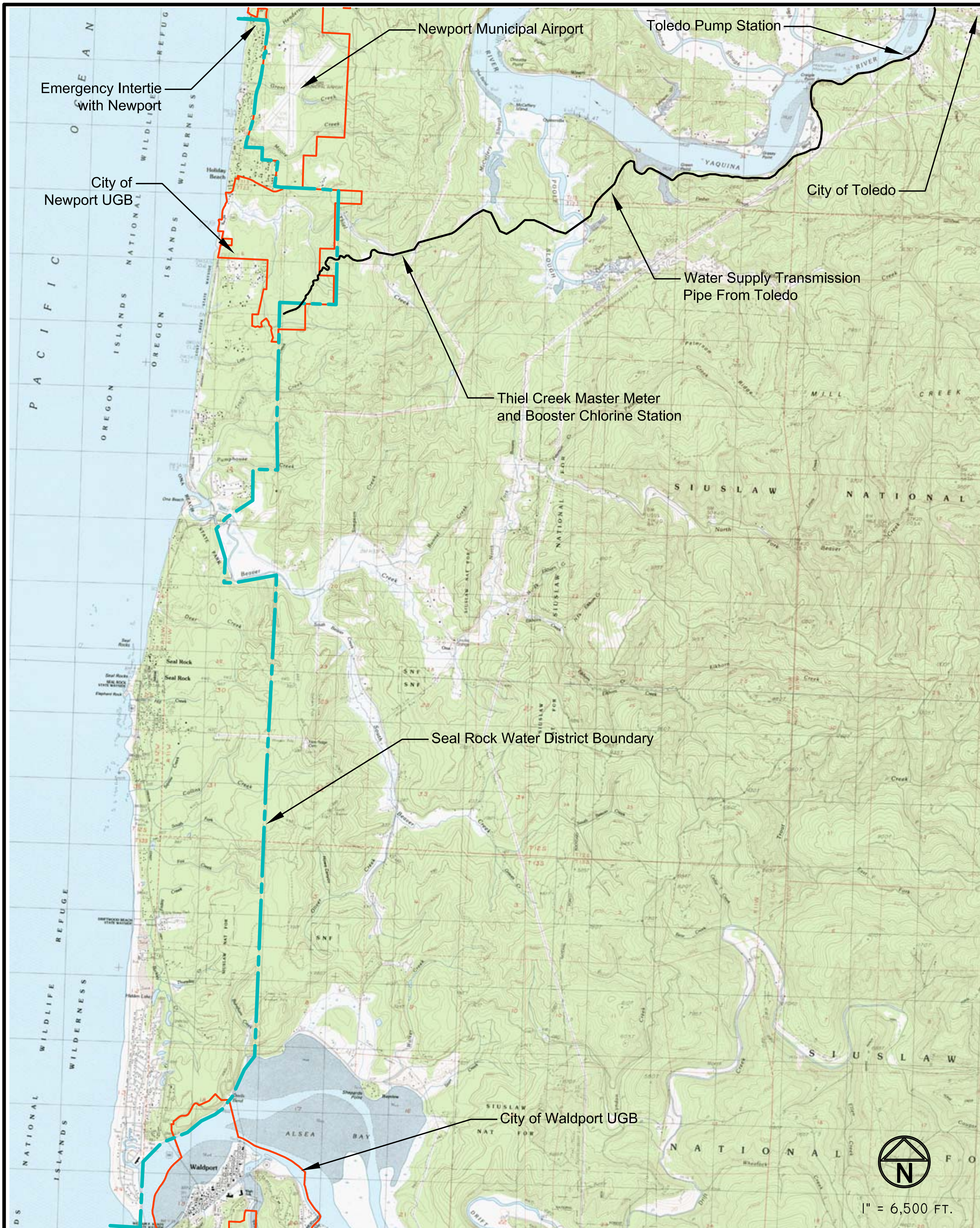
Figure 2.2.3-1 – Water Meter Growth Projections

Table 2.2.3-1 – Population and Service Connection Growth Projections

Year	Total Domestic 3/4" Water Meters	Total Housing Units	Estimated Population
2008	2,379	2,453	4,050
2009	2,415	2,490	4,111
2010	2,451	2,527	4,172
2011	2,488	2,565	4,235
2012	2,525	2,604	4,299
2013	2,563	2,643	4,363
2014	2,601	2,682	4,428
2015	2,640	2,722	4,495
2016	2,680	2,763	4,562
2017	2,720	2,805	4,631
2018	2,761	2,847	4,700
2019	2,802	2,890	4,771
2020	2,844	2,933	4,842
2021	2,887	2,977	4,915
2022	2,930	3,021	4,989
2023	2,974	3,067	5,063
2024	3,019	3,113	5,139
2025	3,064	3,160	5,216
2026	3,110	3,207	5,295
2027	3,157	3,255	5,374
2028	3,204	3,304	5,455
2029	3,252	3,353	5,537
2030	3,301	3,404	5,620
2031	3,351	3,455	5,704
2032	3,401	3,507	5,789
2033	3,452	3,559	5,876
2034	3,504	3,613	5,964
2035	3,556	3,667	6,054

For the 20-year planning period ending in the year 2030, the estimated full-time population is 5,620 persons. Based on the current estimate of 4,050 persons, this projection requires 1,570 new persons over the next 22 years, or an average of 71 people per year. Based on the 2000 US Census figure for the County of 2.31 persons per *occupied* housing unit and 1.65 persons per *total* housing units, it will take an average of 30.7 new occupied housing units per year or 43 new total housing units per year to accommodate this growth.

According to the 2000 Census data 28% of housing units in the County are vacant and 72% are occupied on average. Summer populations increase over winter and average populations due to the influx of tourists, vacationers, and other seasonal water users. If a summer occupancy rate of 90% is assumed to occur in the SRWD, the summer peak population in the year 2030 is projected to be 7075 persons.



Civil West Engineering Services, Inc.

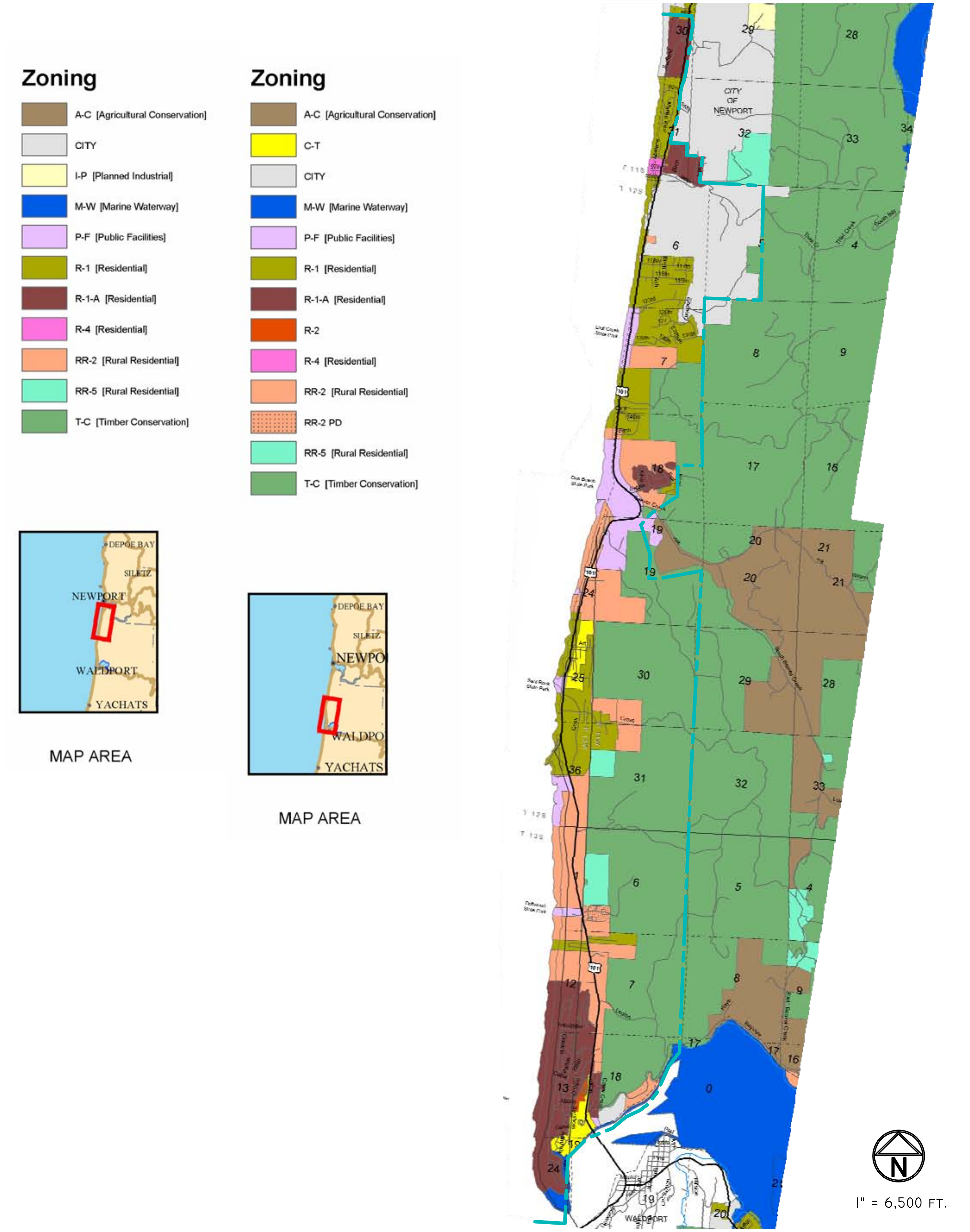
Dwg By: REB
Date: March 12, 2010

PLANNING AREA MAP

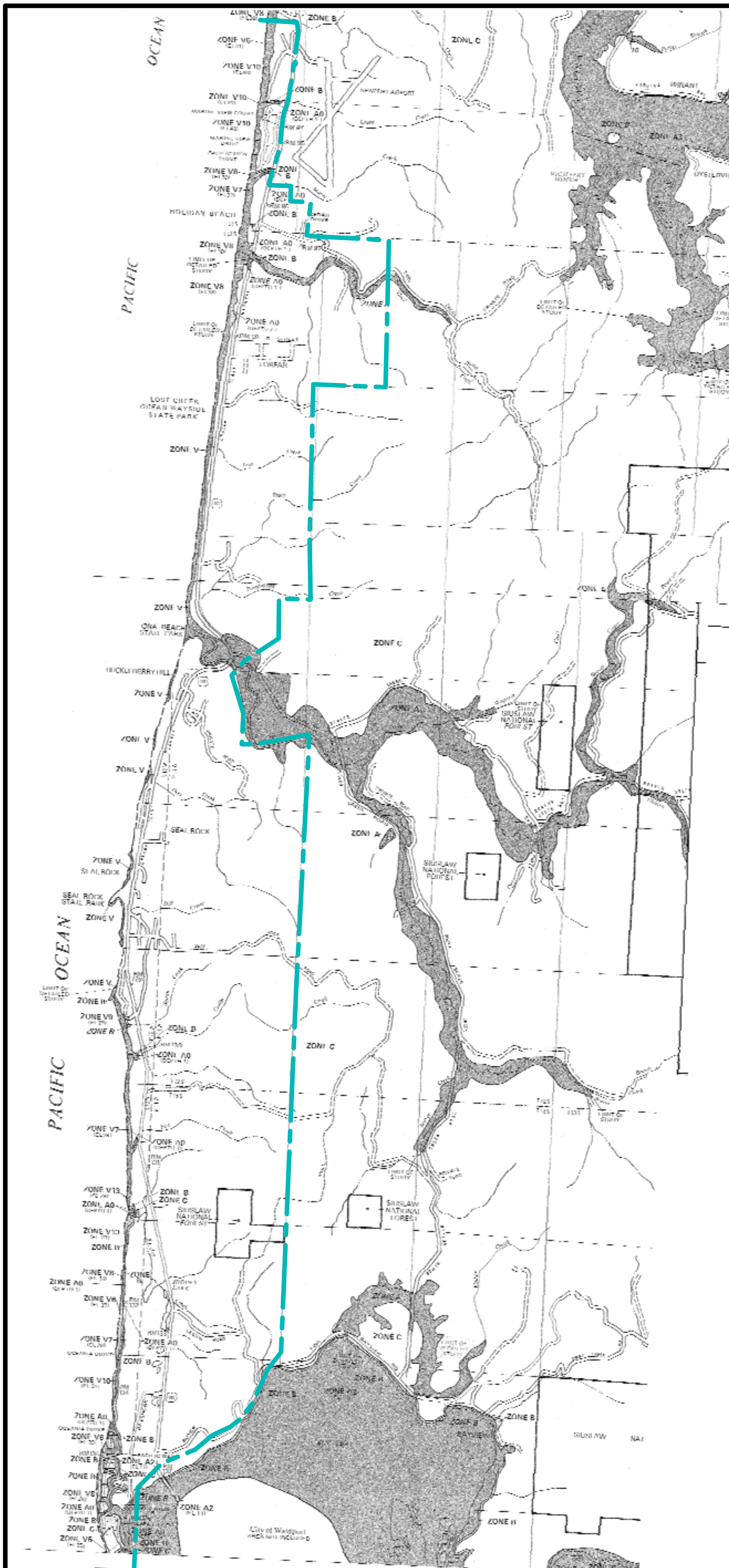
Water System Master Plan

Seal Rock Water District
Lincoln County, Oregon

FIGURE 2.1.1-1



Civil West Engineering Services, Inc.	Dwg By: REB Date: Feb 5, 2009	0 1"	ZONING MAP	FIGURE
	Water System Master Plan		Seal Rock Water District Lincoln County, Oregon	2.1.3-1



KEY TO MAP

500-Year Flood Boundary	ZONE B
100-Year Flood Boundary	
Zone Designations* With Date of Identification e.g., 12/2/74	ZONE A1 DATE / ZONE A5 DATE
100-Year Flood Boundary	
500-Year Flood Boundary	ZONE B
Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7×
River Mile	• M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

N

1" = 6,500 FT.

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DWG BY: REB
DATE: FEB 12, 2009

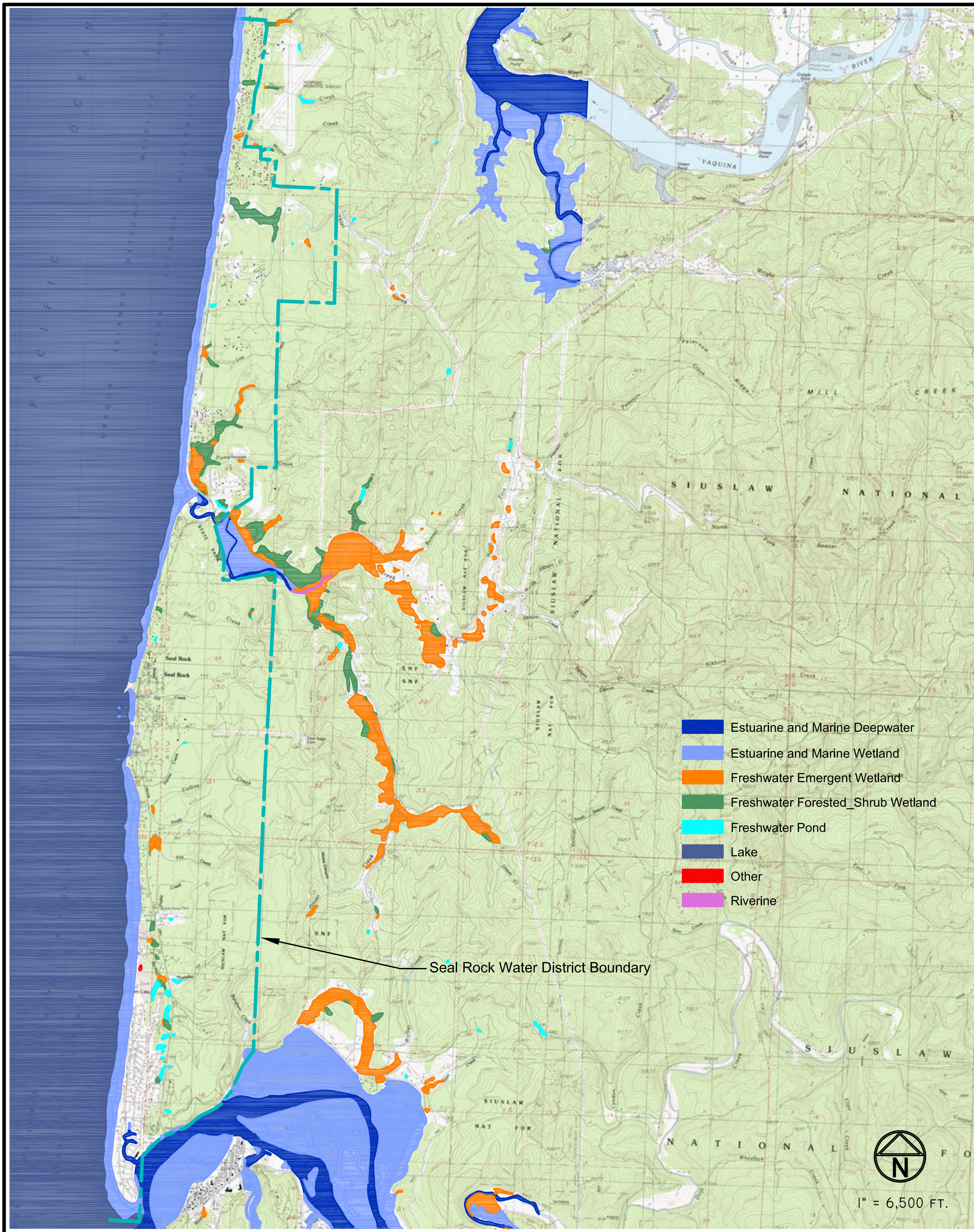
0 1"

FLOOD MAP

FIGURE 2.1.4-1

WATER SYSTEM MASTER PLAN

SEAL ROCK WATER DISTRICT
LINCOLN COUNTY, OREGON



Civil West Engineering Services, Inc.

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DATE: FEB 12, 2009

0 1"

WETLANDS MAP

FIGURE 2.1.5-1

WATER SYSTEM MASTER PLAN

SEAL ROCK WATER DISTRICT
LINCOLN COUNTY, OREGON

Water Demand Analysis

Section 3

3.1 Definitions

System water demand is the quantity of water that must enter the system in order to meet all water needs in the community. Water demand includes water delivered to the system to meet the needs of consumers as well as water used for fire fighting and system flushing, and other unaccounted water. Additionally, virtually all systems have a certain amount of leakage that cannot be economically removed and thus total demand typically includes some leakage. The difference between the amount of water metered and sold and the total amount delivered to the system is referred to as unaccounted water. Unaccounted water is discussed later in this Section. Water demand varies seasonally with the lowest usage in winter months and the highest usage during summer months. Variations in demand also occur with respect to time of day. Diurnal peaks typically occur during the morning and early evening periods, while the lowest usage occurs during nighttime hours.

The objective of this section is to determine the current water demand characteristics and to project future demand requirements that will establish system component adequacy and sizing needs. Water demand is described in the following terms:

Average Annual Demand (AAD) - The total volume of water delivered to the system in a full year expressed in gallons. When demand fluctuates up and down over several years, an average is used.

Average Daily Demand (ADD) - The total volume of water delivered to the system over a year divided by 365 days. The average use in a single day expressed in gallons per day.

Maximum Month Demand (MMD) - The gallons per day average during the month with the highest water demand. The highest monthly usage typically occurs during a summer month.

Peak Weekly Demand (PWD) - The greatest 7-day average demand that occurs in a year expressed in gallons per day. Not commonly determined.

Maximum Day Demand (MDD) - The largest volume of water delivered to the system in a single day expressed in gallons per day. The water supply and treatment facilities should be designed to handle the maximum day demand.

Peak Hourly Demand (PHD) - The maximum volume of water delivered to the system in a single hour expressed in gallons per day or gallons per minute. Distribution systems should be designed to adequately handle the peak hourly demand or maximum day demand plus fire flows, whichever is greater. During peak hourly flows, storage reservoirs supply the demand in excess of the maximum day demand.

Demands described above, expressed in gallons per day (gpd), can be divided by the population or Equivalent Dwelling Units (EDUs) served to come up with a demand per person or per capita which is expressed in gallons per capita per day (gpcd), or demand per EDU (gpd/EDU). These unit demands can be multiplied by future population or EDU projections to estimate future water demands for planning purposes.

3.2 Current Water Demand

3.2.1 Master Meter Records

The SRWD obtains all system water through a single pipeline conveying water from the City of Toledo. A master meter records the quantity of water sent to and purchased by the SRWD. Average annual demand (AAD) over the last 5 years is 131.1 million gallons.

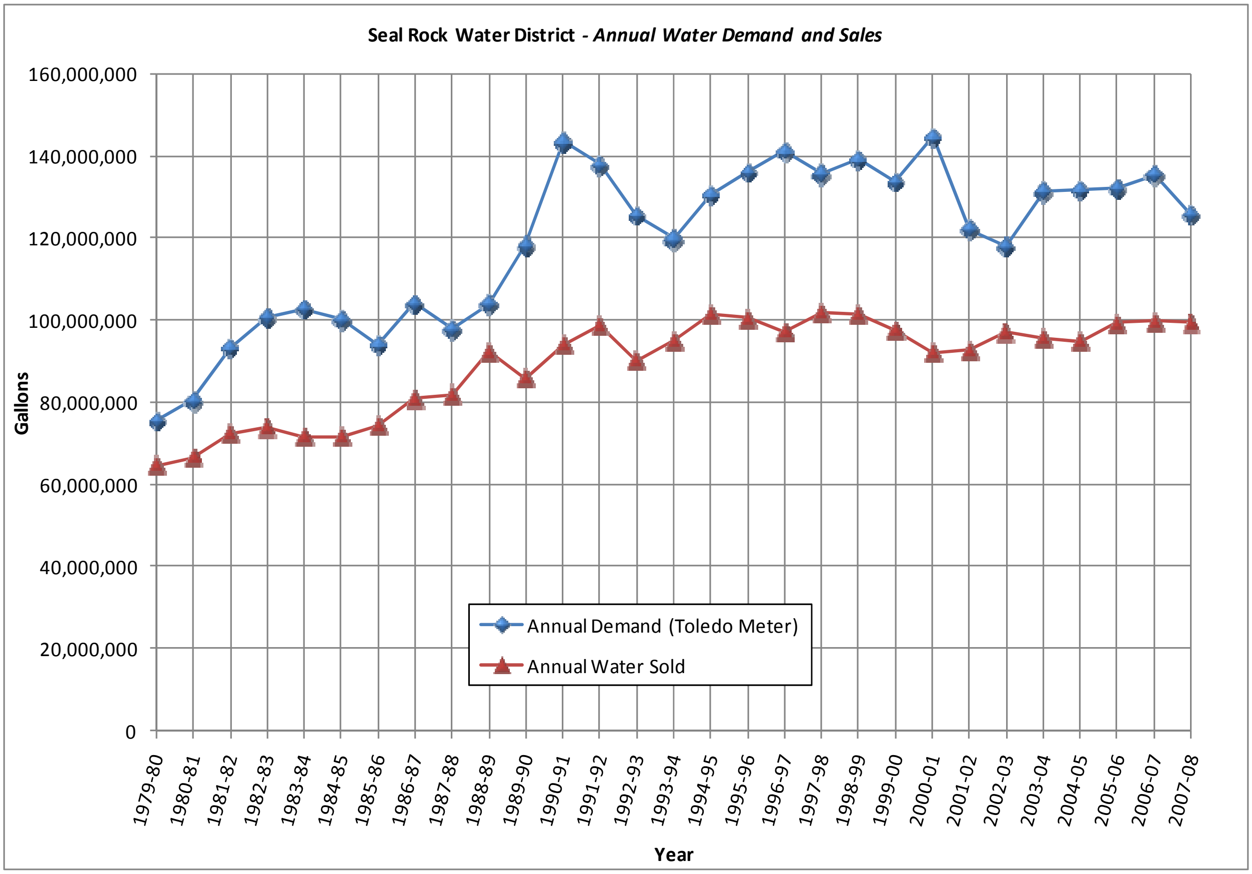


Figure 3.2.1-1 – Annual Water Demand and Use Records, 1979-2008

Table 3.2.1-1 – Monthly Water Demand

2005-2006 MONTH	Total Water Purchased (gallons)	2006-2007 MONTH	Total Water Purchased (gallons)	2007-2008 MONTH	Total Water Purchased (gallons)
JULY	12,124,000	JULY	13,539,000	JULY	13,511,050
AUG	16,798,000	AUG	18,259,000	AUG	13,319,700
SEP	12,272,000	SEP	12,994,000	SEP	15,740,110
OCT	9,173,000	OCT	10,149,000	OCT	9,480,650
NOV	9,115,000	NOV	8,732,000	NOV	9,126,690
DEC	9,942,000	DEC	10,351,000	DEC	8,840,660
JAN	10,872,000	JAN	12,215,000	JAN	8,494,430
FEB	8,439,000	FEB	8,674,000	FEB	8,088,059
MAR	10,978,000	MAR	7,977,000	MAR	10,385,401
APR	9,820,000	APR	10,929,000	APR	9,436,590
MAY	11,168,000	MAY	10,256,000	MAY	8,736,600
JUN	11,261,000	JUN	11,177,450	JUN	10,270,300
TOTAL	**131,962,000**	**TOTAL**	**135,252,450**	**TOTAL**	**125,430,240**

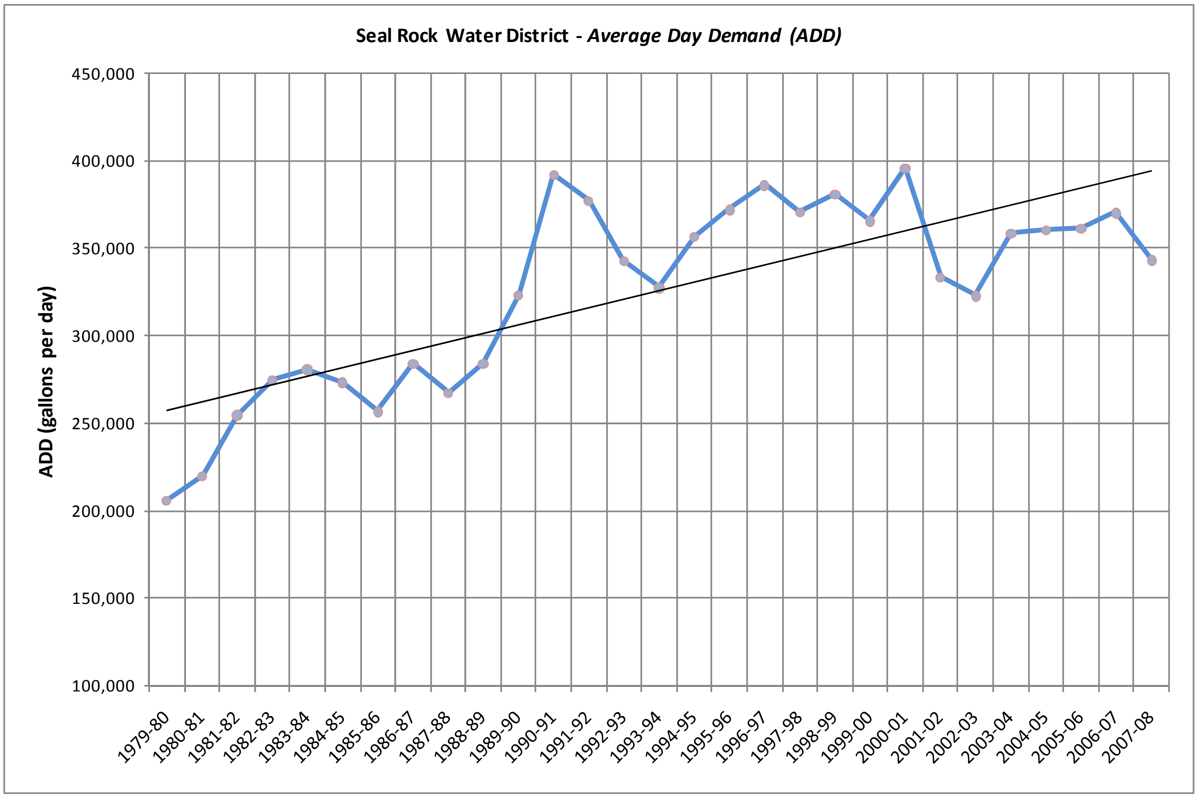
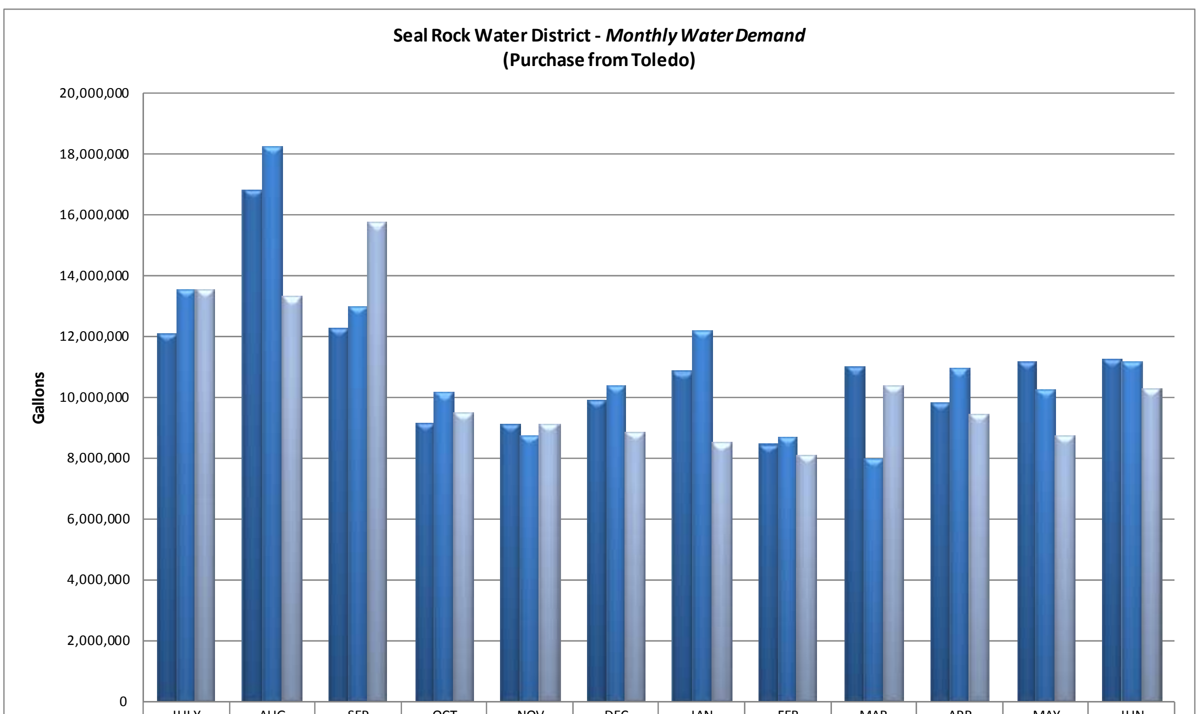


Figure 3.2.1-2 – Average Daily Water Demand, 1979-2008



	JULY	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
Demand 05/06	12,124,000	16,798,000	12,272,000	9,173,000	9,115,000	9,942,000	10,872,000	8,439,000	10,978,000	9,820,000	11,168,000	11,261,000
Demand 06/07	13,539,000	18,259,000	12,994,000	10,149,000	8,732,000	10,351,000	12,215,000	8,674,000	7,977,000	10,929,000	10,256,000	11,177,450
Demand 07/08	13,511,050	13,319,700	15,740,110	9,480,650	9,126,690	8,840,660	8,494,430	8,088,059	10,385,401	9,436,590	8,736,600	10,270,300

Figure 3.2.1-3 – Monthly Water Demand

The 122.6 million gallons purchased by the District from Toledo over the 2008 calendar year represented 49% of total water sales in Toledo over that period.

Over the last 20 years, average daily demands (ADD) have ranged from 206,000 gpd to 396,000 gpd with an average of 326,000 gpd. The average ADD for the last 5 years is 359,000 gpd.

Based on the last 3 years of records, monthly water demand has ranged from 8.0 million gallons to 18.3 million gallons. Lowest monthly demands occur in February or March while the highest monthly demands occur in August or September. Expressed as an average in gallons per day, the maximum monthly demand (MMD) is 589,000 gpd. The MMD has been 1.3 to 1.6 times the ADD.

Maximum daily demands must be estimated since past records are not available for every day. The master meter for the SRWD (all water from Toledo) has typically been read once every 3 to 7 days. Based on District records which average the reading over the number of days since the last reading, a maximum of 963,685 gallons was used in mid July 2008. This high demand was unusual and occurred because 2 days prior an unusually low amount of water was pumped from Toledo and efforts were being made to catch back up and fill the system storage tanks. Recently, telemetry improvements have been made which will allow better monitoring of tank levels, more even pumping from Toledo, and daily recording of flow values. When tank level fluctuations are accounted for, the 2008 maximum daily demand (MDD) becomes 785,100 gpd. The 2007 MDD was 728,800 gpd.

3.2.2 Current Demand Summary

Based on the water demand records discussed and shown graphically in previous parts of this Section and the population estimates discussed in Section 2, the following water demand summary applies to the SRWD for conditions occurring in late 2008/early 2009.

Table 3.2.2-1 – Current Water Demand Summary

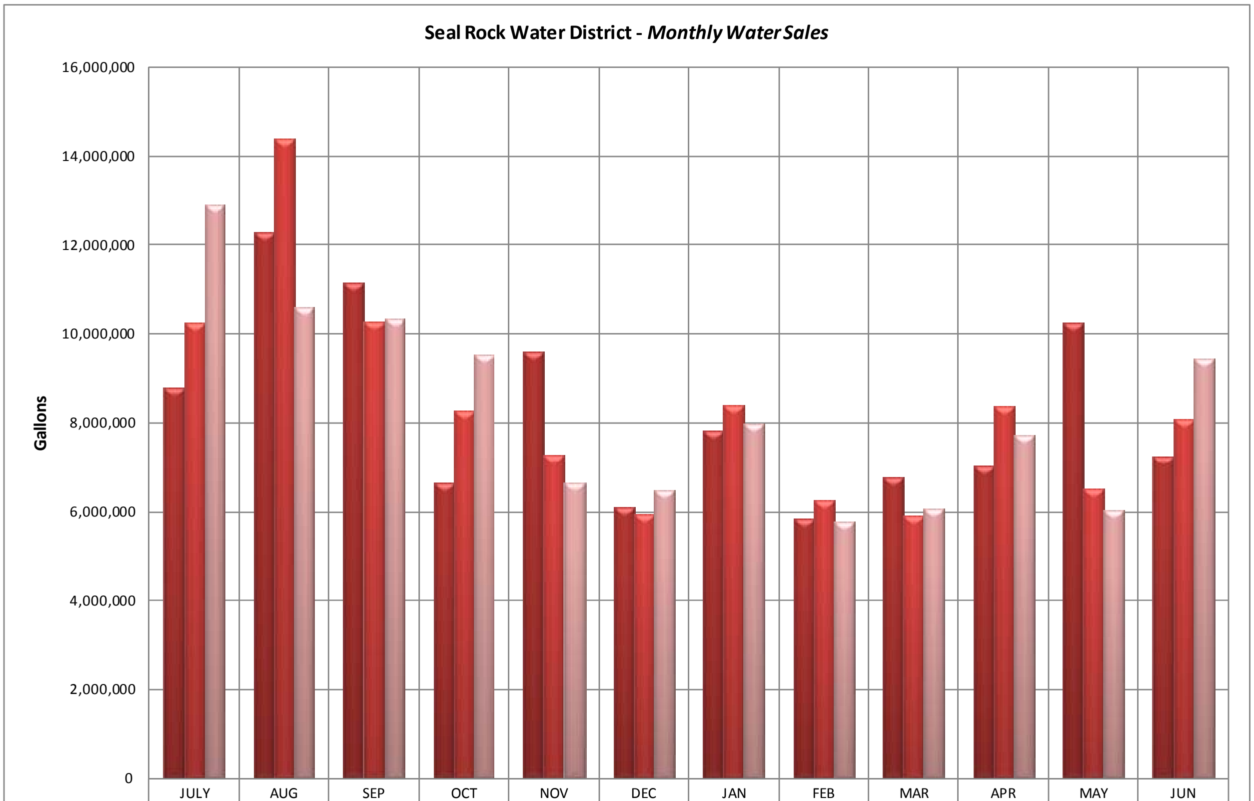
Unit	ADD	MMD	MDD	PHD
gpd	360,000	590,000	785,000	1,450,000
P.F.	1.00	1.64	2.18	4.03
gpcd	89	146	194	358

P.F. = Peaking Factor. Multiple of ADD. P.F. for PHD assumed at 4.0.

3.2.3 Water Sales Records

The quantity of water sold in the system is less than the quantity of water entering the system (water demand) due to leakage and other unaccounted water loss. Whereas 131 million gallons of water per year is demanded and purchased from Toledo, only about 100 million gallons of water per year is sold. Based on the last 3 years of records, water sold ranges from 5.8 to 14.4 million gallons per month. Peak use occurs in July or August and minimum use occurs in February or March.

Approximately 83% of total water sales is to customers listed as “domestic” accounts while 17% goes to customers listed as “commercial” accounts. The volume of water metered through a single water meter is 3,340 gallons per month when averaged over an entire year. During summer peak months, the average use per meter jumps to 5,000 to 5,800 gallons per month.



	JULY	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
2005/2006	8,765,070	12,272,820	11,150,100	6,633,450	9,604,730	6,086,790	7,824,690	5,831,550	6,772,290	7,036,280	10,240,450	7,245,100
2006/2007	10,254,740	14,399,420	10,270,110	8,254,120	7,267,300	5,924,160	8,398,290	6,247,560	5,890,480	8,349,700	6,517,570	8,080,620
2007/2008	12,883,110	10,584,260	10,338,070	9,547,570	6,631,010	6,490,210	7,991,920	5,762,880	6,049,480	7,739,660	6,033,360	9,454,270

Figure 3.2.3-1 – Monthly Water Sales

3.2.4 Unaccounted Water

The difference between the quantity of water measured entering the distribution system (water demand) and the quantity of water measured exiting the distribution system is unaccounted water. This comparison is typically called a "water balance". Measured water exiting the system is primarily that measured through individual customer water meters (water sold). Other sources of exiting water include authorized non-consumptive uses such as pipeline flushing and firefighting and unauthorized uses such as water theft, line breaks, and leakage.

In addition to "real" water loss resulting from leakage, unmetered flushing, etc., unaccounted water can also include "apparent" water loss due to meter inaccuracies or meter reading errors. In general, as water meters age they tend to read lower and lower resulting in higher and higher "apparent" water loss.

If there were no leakage in the system, all water meters were 100% accurate, and every drop of water used for fire fighting and system flushing was measured, there would be zero unaccounted water. In reality every water system has a certain amount of leakage, water meters are not 100% accurate, and it is rare for every drop of water used in town to be metered and measured. Therefore virtually every community water system has unaccounted water.

The volume of unaccounted water varies significantly month by month due to meter discrepancies, differences in dates of reading demand master meters versus individual customer meters, and the number of days in takes to read individual meters. These factors make monthly unaccounted water comparisons of little value and annual comparisons (annual water audits) are used to lessen the impact of these variables. Annual values for the SRWD indicate a 3-year average unaccounted water total of 31.3 million gallons per year or 23.8% of the total water demand. Records for the 30-year period since 1979 show average unaccounted water at 24.4%. Due to continued efforts to search for and corrects leaks, it appears the District has reduced unaccounted water to 20.7% for 2007/2008.

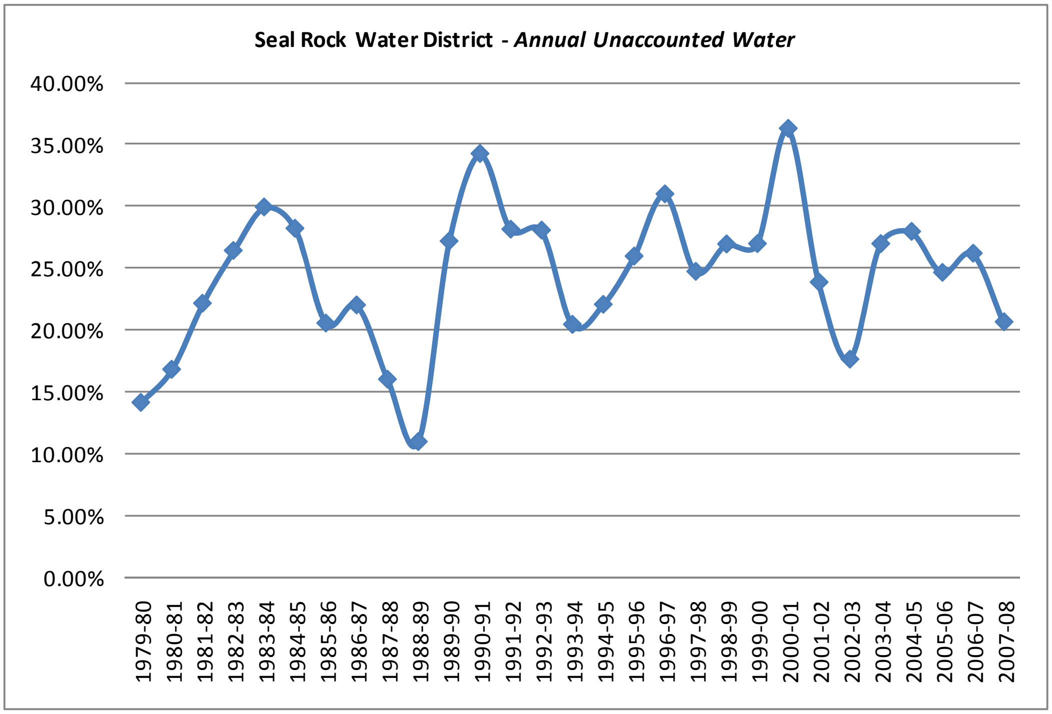


Figure 3.2.4-1 – Unaccounted Water Percentage, 1979-2008

Table 3.2.4-1 – Unaccounted Water

Water Year	Water Demand (gallons)	Water Sold (gallons	Unaccounted Water (gallons)	Percent Unaccounted
2005-2006	131,962,000	99,463,320	32,498,680	24.6%
2006-2007	135,252,450	99,854,070	35,398,380	26.2%
2007-2008	125,430,240	99,505,800	25,924,440	20.7%
Average	130,881,563	99,607,730	31,273,833	23.8%

According to OAR 690-086 (Water Resources Department – Water Management and Conservation Plans), if the annual water audit indicates leakage exceeding 10%, a regularly scheduled and systematic program should be in place to detect leaks in the transmission and distribution system using methods and technology appropriate to the size and capabilities of the municipal water supplier. Other provisions in OAR 690-086 can require system-wide leak repair or line replacement programs to reduce leakage to no more than 15% under certain circumstances such as water permit extension requests or water diversion expansions or initiations.

Records are not available to determine how much of the current 20.7% unaccounted water is actually leakage. Some of the unaccounted water can be attributed to system flushing through hydrants and meter inaccuracies however it is almost certain that the majority of the unaccounted water is from leakage and the amount of leakage in the SRWD is more than 10%. The SRWD should continue efforts to detect and repair leaks. Efforts should also be made to measure and record water used for flushing and other authorized non-metered uses.

3.2.5 EDU Analysis

Based on water sales records for the last 3 years, the average quantity of water sold to a typical single-family dwelling unit inside the District boundary (3/4" domestic meter inside District) is 2,873 gallons per month. This volume sold per month becomes the basis for Equivalent Dwelling Unit (EDU) calculations with 1 EDU = 2873 gallons per month in metered sales. Other users can then be described as an equivalent number of EDUs based on their relative water consumption. For example, a commercial business that had an average metered consumption of 5,746 gallons per month uses twice the amount of water as the typical single-family dwelling and can be considered 2 EDUs.

The following table shows sales data and EDU numbers for the last 3 years. The 2008 estimated number of EDUs in the system is 2,950. With a population estimate of 4,050 persons, the people per EDU is 1.37.

Table 3.2.5-1 – EDU Values

2005-2006 MONTH	1", 2", 3" Comm. Inside	4", .75", 1.5" Comm. Inside	.75" Res. Inside	1" Comm. Outside	2" Comm. Outside	4", .75", 1.5" Comm. Outside	.75" Res. Outside	6" LF Outside	Total
JULY	744,160	517,990	7,334,190	13,970	16,500	35,950	91,510	10,800	8,765,070
AUG	1,038,100	799,970	10,206,280	22,870	12,300	44,460	101,540	47,300	12,272,820
SEP	964,900	704,290	9,265,920	15,310	8,900	35,690	106,690	48,400	11,150,100
OCT	526,640	511,900	5,462,280	9,120	0	19,420	77,790	26,300	6,633,450
NOV	765,160	803,880	7,817,190	10,820	0	38,100	147,680	21,900	9,604,730
DEC	433,260	477,230	5,095,190	3,040	0	15,270	55,200	7,600	6,086,790
JAN	461,080	591,760	6,655,980	3,750	0	20,820	83,200	8,100	7,824,690
FEB	477,440	482,570	4,776,300	3,670	0	19,260	61,310	11,000	5,831,550
MAR	444,410	530,670	5,693,710	4,650	0	21,760	65,590	11,500	6,772,290
APR	596,560	594,560	5,711,540	7,870	22,100	20,000	73,350	10,300	7,036,280
MAY	702,310	744,890	8,586,620	9,230	44,200	40,150	100,550	12,500	10,240,450
JUN	560,850	575,310	5,898,020	9,860	23,300	100,650	66,110	11,000	7,245,100
TOTAL	7,714,870	7,335,020	82,503,220	114,160	127,300	411,530	1,030,520	226,700	99,463,320
EDU	220.10	209.26	2353.74	3.26	3.63	11.74	29.40	6.47	2837.59

1 EDU = Use per Meter, 3/4" Domestic Inside District = 2921 gallons per month

2006-2007 MONTH	1", 2", 3" Comm. Inside	4", .75", 1.5" Comm. Inside	.75" Res. Inside	1" Comm. Outside	2" Comm. Outside	4", .75", 1.5" Comm. Outside	.75" Res. Outside	6" LF Outside	Total
JULY	907350	705,510	8,446,520	16,580	13,400	59,450	75,930	30,000	10,254,740
AUG	1169420	916,690	11,967,140	24,010	25,500	74,400	123,560	98,700	14,399,420
SEP	838080	694,850	8,543,930	15,300	10,500	45,600	94,950	26,900	10,270,110
OCT	689670	632,670	6,784,990	12,640	6,600	34,900	77,950	14,700	8,254,120
NOV	571740	547,100	6,003,800	9,460	3,100	28,250	94,750	9,100	7,267,300
DEC	378210	485,100	4,952,260	6,590	3,300	16,700	71,100	10,900	5,924,160
JAN	520970	652,460	7,076,510	30,900	1,800	18,650	81,500	15,500	8,398,290
FEB	477360	547,420	5,080,200	5,580	3,100	41,450	79,250	13,200	6,247,560
MAR	410960	453,260	4,937,590	3,670	1,800	16,550	52,250	14,400	5,890,480
APR	691990	731,970	6,788,330	10,410	6,300	27,350	78,150	15,200	8,349,700
MAY	478380	535,920	5,377,920	14,800	5,000	25,750	71,500	8,300	6,517,570
JUN	700260	565,310	6,678,730	23,670	9,000	24,500	71,850	7,300	8,080,620
TOTAL	7,834,390	7,468,260	82,637,920	173,610	89,400	413,550	972,740	264,200	99,854,070
EDU	226.22	215.65	2386.17	5.01	2.58	11.94	28.09	7.63	2883.29

1 EDU = Use per Meter, 3/4" Domestic Inside District = 2886 gallons per month

2007-2008 MONTH	1", 2", 3" Comm. Inside	4", .75", 1.5" Comm. Inside	.75" Res. Inside	1" Comm. Outside	2" Comm. Outside	4", .75", 1.5" Comm. Outside	.75" Res. Outside	6" LF Outside	Total
JULY	1065020	993,710	10,582,580	31,650	15,900	63,700	115,750	14,800	12,883,110
AUG	1022350	720,510	8,654,500	29,150	13,100	34,200	84,650	25,800	10,584,260
SEP	953220	684,060	8,485,500	38,890	13,200	37,150	77,450	48,600	10,338,070
OCT	965300	779,280	7,603,940	36,650	5,500	40,800	105,300	10,800	9,547,570
NOV	556950	622,480	5,335,740	16,940	6,400	23,800	61,800	6,900	6,631,010
DEC	561470	668,080	4,978,260	3,000	4,300	208,500	59,500	7,100	6,490,210
JAN	687310	694,780	6,475,830	4,650	4,500	32,900	79,350	12,600	7,991,920
FEB	467990	430,810	4,770,530	3,200	3,200	18,550	56,800	11,800	5,762,880
MAR	585960	460,020	4,898,950	6,450	5,400	16,900	66,700	9,100	6,049,480
APR	768830	526,480	6,338,100	10,350	5,200	9,350	68,550	12,800	7,739,660
MAY	646200	431,600	4,861,760	8,950	3,800	11,400	60,150	9,500	6,033,360
JUN	1082190	627,590	7,578,490	33,000	10,100	20,800	92,400	9,700	9,454,270
TOTAL	9,362,790	7,639,400	80,564,180	222,880	90,600	518,050	928,400	179,500	99,505,800
EDU	277.56	226.47	2388.36	6.61	2.69	15.36	27.52	5.32	2949.89

1 EDU = Use per Meter, 3/4" Domestic Inside District = 2811 gallons per month

3.3 Future Water Demand

3.3.1 Basis for Projections

Water demand estimates for future years are determined by multiplying the current unit demand values (gallons per person or per EDU) by the projected number of future users in the water system. It is assumed new users added to the system will consume water at the same rate as current users. Population projections are presented in Section 2.2.3. The unit water demand values are presented in Section 3.2.2. The projections are based on an average annual growth rate of 1.5%.

3.3.2 Water Demand Projections

Table 3.3.2-1 – Water Demand Projections

Year	Population Estimate	EDU Estimate	ADD (gpd)	MMD (gpd)	MDD (gpd)	PHD (gpd)
2008	4,050	2,950	360,000	590,000	785,000	1,450,000
2009	4,111	2,994	365,400	598,850	796,775	1,471,750
2010	4,172	3,039	370,881	607,833	808,727	1,493,826
2011	4,235	3,085	376,444	616,950	820,858	1,516,234
2012	4,299	3,131	382,091	626,204	833,170	1,538,977
2013	4,363	3,178	387,822	635,598	845,668	1,562,062
2014	4,428	3,226	393,640	645,132	858,353	1,585,493
2015	4,495	3,274	399,544	654,808	871,228	1,609,275
2016	4,562	3,323	405,537	664,631	884,297	1,633,414
2017	4,631	3,373	411,620	674,600	897,561	1,657,915
2018	4,700	3,424	417,795	684,719	911,025	1,682,784
2019	4,771	3,475	424,062	694,990	924,690	1,708,026
2020	4,842	3,527	430,423	705,415	938,560	1,733,646
2021	4,915	3,580	436,879	715,996	952,639	1,759,651
2022	4,989	3,634	443,432	726,736	966,928	1,786,046
2023	5,063	3,688	450,084	737,637	981,432	1,812,836
2024	5,139	3,743	456,835	748,701	996,154	1,840,029
2025	5,216	3,800	463,687	759,932	1,011,096	1,867,629
2026	5,295	3,857	470,643	771,331	1,026,262	1,895,644
2027	5,374	3,914	477,702	782,901	1,041,656	1,924,079
2028	5,455	3,973	484,868	794,644	1,057,281	1,952,940
2029	5,537	4,033	492,141	806,564	1,073,140	1,982,234
2030	5,620	4,093	499,523	818,663	1,089,238	2,011,967
2031	5,704	4,155	507,016	830,943	1,105,576	2,042,147
2032	5,789	4,217	514,621	843,407	1,122,160	2,072,779
2033	5,876	4,280	522,340	856,058	1,138,992	2,103,871
2034	5,964	4,344	530,175	868,899	1,156,077	2,135,429
2035	6,054	4,410	538,128	881,932	1,173,418	2,167,460
ADD	89 gpcd					
MMD	146 gpcd		Persons/EDU =		1.3729	
MDD	194 gpcd					
PHD	358 gpcd					

3.3.3 Design Values

For the 20-year planning period ending in the year 2030, the following water demand design values result from the analysis:

Table 3.3.3-1 – 20-Year Water Demand Values

Unit	ADD	MMD	MDD	PHD
gpd	500,000	820,000	1,100,000	2,000,000
gpm	347	569	764	1,389
P.F.	1.00	1.64	2.20	4.00

4.1 Design Life of Improvements

The design life of a water system component is the time that the component is expected to be useful based on its intended use and required function. Design life is sometimes referred to as service life or life expectancy. Actual realized design life can depend on factors such as the type and intensity of use, type and quality of materials used in construction, and the quality of workmanship during installation. The estimated and actual design life for any particular component may vary depending on the above factors. The establishment of a design life provides a realistic projection of service upon which to base an economic analysis of new capital improvements.

The planning period for a water system and the design life for its components may not be identical. The typical 20-year planning period is limited due to the need to limit economic burdens on current generations and inaccuracies that result from attempts at projecting needs too far into the future. Design life can be greater to or less than the planning period. For example, a properly maintained steel storage tank may have a design life of 60 years, but the projected fire flow and consumptive water demand for a planning period of 20 years determine its size. At the end of the initial 20-year planning period, water demand may be such that an additional storage tank is required; however, the existing tank with a design life of 60 years would still be useful and remain in service for another 40 years. The typical design life for system components are discussed below.

4.1.1 Equipment and Structures

Equipment used in water systems such as pumps, valves, and other major treatment related equipment is sized for a 20-year demand and has a similar 20-year expected design life. Minor equipment such as less expensive chemical feed pumps, turbidimeters, and other instrumentation sometimes must be replaced or updated when less than 20-years old, typically at 10 to 15 years old. The useful life of some equipment can be extended with proper maintenance if sufficient capacity still exists. It is not uncommon to see larger pumps still in service after 30 years or more if properly maintained.

Filter media such as sand and anthracite should be replaced at 12 to 15 years. Membranes used in filtration plants typically have an expected life of 10 years.

Major structures used in water systems such as concrete basins and intake wetwells can last 50 years or more when properly constructed.

4.1.2 Treated Water Transmission and Distribution Piping

Water transmission and distribution piping should easily have a useful life of 50 to 60 years if quality materials and workmanship are incorporated into the construction and the pipes are adequately sized. Steel piping used in the 1950’s and 60’s that has been buried, commonly exhibits significant corrosion and leakage within 30 years. Cement mortar lined ductile iron piping can last up to 100 years when properly designed and installed. PVC and HDPE pipe manufacturers claim a 100-year service life for pipe as well.

4.1.3 Treated Water Storage

Distribution storage tanks should have a design life of 60 years (painted steel construction) to 80 years (concrete construction). Steel tanks with a glass-fused coating can have a design life similar to concrete construction. Actual service life will depend on the quality of materials, the workmanship during installation, and the timely administration of maintenance activities. Several practices, such as the use of cathodic protection, regular cleaning and frequent painting can extend or assure the service life of steel reservoirs. Painting intervals for steel tanks is 15 to 25 years. The life of steel tanks is greatly reduced if not repainted periodically as needed.

4.2 Sizing and Capacity Criteria and Goals

The 20-year projected water demands presented in Section 3 are used to size improvements. Various components of the system demand are used for sizing different improvements. Methods and demands used are discussed below.

4.2.1 Water Supply

The current water supply, including pumping capacity, should at minimum be sufficient to meet the projected 20-year maximum daily demand (MDD). Considering the difficulty in obtaining new water rights, raw water supply should meet a longer-term need and it is not unreasonable to plan today for 60-year demand water sources. Currently the MDD is 0.785 million gallons per day (mgd) or 1.21 cubic feet per second (cfs). At the end of the 20-year planning period, the projected MDD is 1.1 mgd or 1.70 cfs. In order to plan for long-term water supply options, projections beyond the planning period are shown assuming the same growth rate as the planning period.

Supply Capacity Goal – 20-year MDD of 1.1 mgd (1.7 cfs) – 1.22 mgd (1.89 cfs) with WTP (see 4.2.2)
Supply Capacity Goal – 40-year MDD of 1.5 mgd (2.32 cfs)
Supply Capacity Goal – 60-year MDD of 2.0 mgd (3.09 cfs)

4.2.2 Water Treatment

Water treatment plant equipment and components such as pumps, filters, flocculators, etc. are typically sized to provide for the 20-year MDD. Conventional filter basins are sized for 20 year flows and media may have to be replaced once during that 20-year period. Membrane filters are more modular and initial designs must have space for 20-year flow capacity but fewer modules may be installed initially

For the SRWD, any discussion of treatment sizing must include an additional 10% allowance for water use that would occur at a treatment plant itself (90% of water going to town). Difficult to construct items with a long design life such as buried piping and concrete wetwells for surface water intakes should be sized to accommodate at least a 40 to 50 year flow capacity need (or entire water right). Other components such as concrete clearwells and buildings may be oversized beyond the 20-year MDD depending on future expansion ease.

Treatment Capacity Goal – 1.22 mgd (850 gpm)

4.2.3 Fire Protection

According to the 2007 Oregon Fire Code, the minimum fire-flow requirements for one- and two-family dwellings not exceeding 3,600 s.f. shall be 1,000 gpm. When square footage exceeds 3,600 or for other types of buildings the minimum fire flow is 1,500 gpm. When flows of 1,750 gpm or less are required a single fire hydrant is required to be accessible within 250 feet (200 feet on dead-end streets) resulting in a maximum hydrant spacing of 500 feet (400 feet on dead-end streets).

For other types of structures, the requirements of the Oregon Fire Code require flows up to 8,000 gpm (2007 OFC Table B105.1). For fire flows less than 2,750 gpm a flow duration of 2 hours is required. For flows between 3,000 and 3,750 gpm a duration of 3 hours is required. For flows of 4,000 gpm and above a duration of 4 hours is required. The minimum number of hydrants available at a specific location, the average spacing between hydrants, and the maximum distance from any point on the street to a hydrant are dependent on the fire-flow requirement. For structures which require 4,000 gpm at least 4 hydrants must be available spaced not more than 350 feet apart.

Fire Flow Capacity Goals – Residential Only Outlying Areas; 1,000 gpm
Fire Flow Capacity Goals – General Commercial Areas; 1,500 gpm
Fire Flow Capacity Goals – Central Town Area and Along Hwy. 101; 3,000 gpm

4.2.4 Treated Water Storage

Total storage capacity must include reserve storage for fire suppression, equalization storage, and emergency storage. In larger communities it is common to provide storage capacity equal to the sum of equalization storage plus the larger of fire storage or emergency storage. In small communities it is recommended that total storage be the sum of fire plus equalization plus emergency storage. This is considered prudent since it is possible for fire danger to increase during water emergencies, such as power failures when alternative sources of heating and cooking might be used.

Equalization storage is typically set at 20-25% of the MDD to balance out the difference between peak demand and supply capacity. When peak hour flows are known, equalization storage is the difference between the MDD and PHD for a duration of 8 hours [PHD-MDD x 8 hrs.].

Emergency storage is required to protect against a total loss of water supply such as would occur with a broken transmission line, an electrical outage, equipment breakdown, or source contamination. Emergency storage should be an adequate volume to supply the system's average daily demand for the duration of a possible emergency. For most systems, emergency storage should be equal to one maximum day of demand or 2.5 to 3 times the average day demand.

Fire reserve storage is needed to supply fire flow throughout the water system to fight a major fire. OAR 333-061-0050(6)(a)(H) states that finished water storage capacity shall be increased to accommodate fire flows when fire hydrants are provided. The fire reserve storage is based on the maximum flow and duration of flow required to confine a major fire. Fire flows are discussed in Section 4.2.3.

Due to the unique situation of the SRWD with 10 miles of piping separating the system storage from the water supply, past studies have recommended 4.0 times the ADD for emergency storage. Much of the transmission pipe alignment cannot be accessed and repaired quickly and in January 2000, a pipe break resulted in a loss of virtually all system storage. In addition, storage locations and hydraulic distribution must be considered to assure each area of the system has sufficient flow and volume. Further analysis will follow in this Plan however the minimum overall storage need is:

Storage Capacity Goal – 4.0 x $ADD_{20\text{-}year}$ *+ 0.25 x MDD + 180,000 fire storage = 2.5 MG*

Another important design parameter for treated water storage reservoirs is elevation. Efforts should be made to locate all reservoirs at the same elevation when possible within a pressure zone. As a consistent water surface is maintained in all reservoirs, the need for altitude valves, pressure reducing valves (PRVs), booster pumps, and other control devices may be minimized. Distribution reservoirs should also be located at an elevation that maintains adequate water pressure throughout the system; sufficient water pressures at high elevations and reasonable pressures at lower elevations. The ideal pressure range for a distribution system is between 40 and 80 psi.

For subdivisions at higher elevations than allowed within the main pressure zone, storage tanks should be required when possible rather than hydropneumatic tank booster pump stations. Tank size needs to be determined on a case-by-case basis as part of the design review. Fire pumps with a capacity of at least 1,000 gpm together with standby generators should be provided when a storage tank is not possible. Minimum tank size should be 120,000 gallons fire storage (1,000 gpm for 2 hours) plus 1 times the MDD per EDU. For very small developments, individual sprinkler systems may be most appropriate.

4.2.5 Distribution System

Distribution mains are typically sized to convey projected maximum day flows plus simultaneous fire flows while maintaining at least 20 psi at all connections, or projected peak hourly flows while maintaining approximately 40 psi, whichever case is more stringent. Looped mains should be at least six inches in diameter to provide minimum fire flow capacity. The State of Oregon requires a water distribution system be designed and installed to maintain a pressure of at least 20 psi at all service connections (at the property line) at all times, even during fire flow conditions. OAR 333-061-0050 governs the construction standards for water systems including distribution piping. The size and layout of pipelines must be designed to deliver the flows indicated above.

The installation of permanent dead-end mains and dependence of relatively large areas on a single main should be avoided. In all cases, except for minor looping using 6-inch or larger pipe, a hydraulic analysis should be performed to ensure adequate sizing.

Distribution Capacity Goal – Worst Case of projected MDD + fire flow with at least 20 psi residual pressure or Projected PHD with 40 psi residual pressure

4.2.6 Transmission Piping

When un-looped transmission piping is designed, such as raw water supply mains or long runs of treated water transmission along rural routes, it is often prudent to size this piping to convey quantities beyond the 20-year demands. Since it is likely that the pipe itself will be in good condition in 20 years, and the cost increase to upsize slightly is small (approximate same labor cost with small increase in material cost), it may be desirable to ensure the piping can adequately convey 40 or 50 years flows.

4.3 Basis for Cost Estimates

The cost estimates presented in this Plan will typically include four components: construction cost, engineering cost, contingency, and legal and administrative costs. Each of the cost components is discussed in this section. The estimates presented herein are preliminary and are based on the level and detail of planning presented in this Study. Construction costs are based on competitive bidding as public works projects with State prevailing wage rates. As projects proceed and as site-specific information becomes available, the estimates may require updating.

4.3.1 Construction Costs

The estimated construction costs in this Plan are based on actual construction bidding results from similar work, published cost guides, and other construction cost experience. Construction costs are preliminary budget level estimates prepared without design plans and details.

Future changes in the cost of labor, equipment, and materials may justify comparable changes in the cost estimates presented herein. For this reason, common engineering practices usually tie the cost estimates to a particular index that varies in proportion to long-term changes in the national economy. The Engineering News Record (ENR) construction cost index (CCI) is most commonly used. This index is based on the value of 100 for the year 1913. Average yearly values for the past 10 years are summarized in Table 4.3.1-1.

Table 4.3.1-1 – ENR Index 2000-2010

YEAR	INDEX	% CHANGE/YR
2000	6221	2.67
2001	6343	1.96
2002	6538	3.07
2003	6694	2.39
2004	7115	6.29
2005	7446	4.65
2006	7751	4.10
2007	7967	2.78
2008	8310	4.31
2009	8570	3.13
2010 (June)	8805	
	Average since 2000	3.54%

Cost estimates presented in this Plan are based on June 2010 dollars with an ENR CCI of 8805. For construction performed in later years, costs should be projected based on the then current year ENR Index using the following method:

Updated Cost = Plan Cost Estimate x (current ENR CCI / 8805)

4.3.2 Contingencies

A contingency factor equal to approximately fifteen percent (15%) of the estimated construction cost has been added to the budgetary costs estimated in this Plan. In recognition that the cost estimates presented are based on conceptual planning, allowances must be made for variations in final quantities, bidding market conditions, adverse construction conditions, unanticipated specialized investigation and studies, and other difficulties which cannot be foreseen at this time but may tend to increase final costs. Upon final design completion of any project, the contingency can be reduced to 10%. A contingency of at least 10% should always be maintained going into a construction project to allow for variances in quantities of materials and unforeseen conditions.

4.3.3 Engineering

The cost of engineering services for major projects typically includes special investigations, predesign reports, surveying, foundation exploration, preparation of contract drawings and specifications, bidding services, construction management, inspection, construction staking, start-up services, and the preparation of operation and maintenance manuals. Depending on the size and type of project, engineering costs may range from 18 to 25% of the contract cost when all of the above services are provided. The lower percentage applies to large projects without complicated mechanical systems. The higher percentage applies to small or complicated projects.

Engineering costs for basic design and construction services presented in this Plan are estimated at 20% of the estimated total construction cost. Other engineering costs such as specialized geotechnical exploration, easement research and preparation, and/or specific pre-design reports will typically be in addition to the basic engineering fees charged by firms.

4.3.4 Legal and Management

An allowance of four percent (4%) of construction cost has been added for legal and other project management services. This allowance is intended to include internal project planning and budgeting, funding program management, interest on interim loan financing, legal review fees, advertising costs, wage rate monitoring, and other related expenses associated with the project that could be incurred.

4.3.5 Land Acquisition

Some projects may require the acquisition of additional right-of-way, property, or easements for construction of a specific improvement. The need and cost for such expenditures is difficult to predict and must be reviewed as a project is developed. Effort was made to include costs for land acquisition, where expected, within the cost estimates included in this Plan.

5.1 Responsibilities as a Water Supplier

Per OAR 333-061-0025, water suppliers are responsible for taking all reasonable precautions to assure that the water delivered to water users does not exceed maximum contaminant levels, to assure that water system facilities are free of public health hazards, and to assure that water system operation and maintenance are performed as required by these rules. This includes, but is not limited to, the following:

- Routinely collect and submit water samples for laboratory analyses at the frequencies and sampling points prescribed by OAR 333-061-0036 “Sampling and Analytical Requirements”;
- Take immediate corrective action when the results of analyses or measurements indicate that maximum contaminant levels have been exceeded and report the results of these analyses as prescribed by OAR 333-061-0040 “Reporting and Record Keeping”;
- Continue to report as prescribed by OAR 333-061-0040, the results of analyses or measurements which indicate that maximum contaminant levels (MCLs) have not been exceeded;
- Notify all customers of the system, as well as the general public in the service area, when the maximum contaminant levels have been exceeded;
- Notify all customers served by the system when the reporting requirements are not being met, or when public health hazards are found to exist in the system, or when the operation of the system is subject to a permit or a variance;
- Maintain monitoring and operating records and make these records available for review when the system is inspected;
- Maintain a pressure of at least 20 pounds per square inch (psi) at all service connections at all times (at the property line);
- Follow-up on complaints relating to water quality from users and maintain records and reports on actions undertaken;
- Conduct an active program for systematically identifying and controlling cross connections;
- Submit, to the DWP, plans prepared by a professional engineer registered in Oregon for review and approval before undertaking the construction of new water systems or major modifications to existing water systems, unless exempted from this requirement;
- Assure that the water system is in compliance with OAR 333-061-0205 “Water Personnel Certification Rules - Purpose” relating to certification of water system operators.
- Assure that Transient Non-Community water systems utilizing surface water sources or sources under the influence of surface water are in compliance with OAR 333-061-0065 “Operation and Maintenance” (2)(c) relating to required special training.

5.2 Public Water System Regulations

Water providers should always be informed of current standards, which can change over time, and should also be aware of pending future regulations. As of this writing, OAR Chapter 333, Division 61 covering Public Water Systems is over 300 pages in length and the latest effective version is dated 2-15-2008. This Section is not meant to be a comprehensive list of all requirements but a general overview of the requirements.

Specific information on the regulations concerning public water systems may be found in the Oregon Administrative Rules (OAR), Chapter 333, Division 61. The rules can be found on the Internet at http://egov.oregon.gov/DHS/ph/dwp/rules.shtml where copies of all the rules and regulations can be printed out or downloaded for reference. A summary of Oregon drinking water quality standards is published in "*Pipeline*" (Volume 21, Issue 4, Fall 2006) by the State Drinking Water Program.

Drinking water regulations were established in 1974 with the signing of the Safe Drinking Water Act (SDWA). This act and subsequent regulations were the first to apply to all public water systems in the United States. The Environmental Protection Agency (EPA) was authorized to set standards and implement the Act. With the enactment of the Oregon Drinking Water Quality Act in 1981, the State of Oregon accepted primary enforcement responsibility for all drinking water regulations within the State. Requirements are detailed in OAR Chapter 333, Division 61. The SDWA and associated regulations have been amended several times since inception with the goal of further protection of public health.

SDWA requires the EPA to regulate contaminants which present health risks and are known, or are likely, to occur in public drinking water supplies. For each contaminant requiring federal regulation, EPA sets a non-enforceable health goal, or maximum contaminant level goal (MCLG). This is the level of a contaminant in drinking water below which there is no known or expected health risk. The EPA is then required to establish an enforceable limit, or maximum contaminant level (MCL), which is as close to the MCLG as is technologically feasible, taking cost into consideration. Where analytical methods are not sufficiently developed to measure the concentrations of certain contaminants in drinking water, the EPA specifies a treatment technique instead of an MCL to protect against these contaminants.

Water systems are required to collect water samples at designated intervals and locations. The samples must be tested in State approved laboratories. The test results are then reported to the State, which determines whether the water system is in compliance or violation of the regulations. There are three main types of violations:

> (1) MCL violation — occurs when tests indicate that the level of a contaminant in treated water is above the EPA or State's legal limit (states may set standards equal to, or more protective than, EPA's). These violations indicate a potential health risk, which may be immediate or long-term.
>
> (2) Treatment technique (TT) violation — occurs when a water system fails to treat its water in the way prescribed by EPA (for example, by not disinfecting). Similar to MCL violations, treatment technique violations indicate a potential health risk to consumers.
>
> (3) Monitoring and reporting violation — occurs when a system fails to test its water for certain contaminants or fails to report test results in a timely fashion. If a water system does not monitor its water properly, no one can know whether or not its water poses a health risk to consumers.

If a water system violates EPA/State rules, it is required to notify the State and the public. States are primarily responsible for taking appropriate enforcement actions if systems with violations do not return to compliance. States are also responsible for reporting violation and enforcement information to the EPA quarterly.

To comply with the regulations, water systems must provide adequate treatment techniques, operate treatment processes to meet performance standards, and properly protect treated water to prevent subsequent contamination after treatment.

5.3 Current Standards

There are now EPA-established drinking water quality standards for 91 contaminants, including 7 microbials and turbidity, 7 disinfectants and disinfection byproducts, 16 inorganic chemicals (including lead and copper), 56 organic chemicals (including pesticides and herbicides), and 5 radiologic contaminants. These standards either have established MCLs or treatment techniques. In addition, there are secondary contaminant levels for 16 contaminants that represent desired goals, and in the case of fluoride, may require special public notice.

Total Coliform Rule

The total coliform rule was established by the EPA in 1989 to reduce the risk of waterborne illness resulting from disease-causing organisms associated with animal or human waste. Routine samples collected by Oregon public water suppliers are analyzed for total coliform bacteria. The number of monthly samples required varies based on population served. For Newport, a minimum of 10 samples per month is required.

Compliance is based on the presence or absence of total coliforms in any calendar month. Sample results are reported as “coliform-absent” or “coliform-present”. If any routine sample is coliform-present, a set of at least three repeat samples must be collected within 24 hours. If any repeat sample is total coliform-present, the system must analyze that culture for fecal coliforms or *E. coli*, and must then collect another set of repeat samples, unless the MCL has been violated and the system has notified the State. Following a positive routine or repeat total coliform result, the system must collect a minimum of five routine samples the following month.

Systems which collect fewer than 40 samples per month are allowed no more than one coliform-present sample per month including any repeat sample results. Larger systems (40 or more samples per month) are allowed no more than five percent coliform-present samples in any month including any repeat sample results. Confirmed presence of fecal coliform or *E. coli* presents a potential acute health risk and requires immediate notification of the public to take protective actions such as boiling or using bottled water. Any fecal coliform-positive repeat sample or *E. coli*-positive repeat sample, or any total coliform-positive repeat sample following a fecal or *E. coli*-positive routine sample is a violation of the MCL.

Surface Water Treatment Rules

All water systems using surface water must provide a total level of filtration and disinfection treatment to remove/inactivate 99.9 percent (3-log) of *Giardia lamblia*, and to remove/inactivate 99.99 percent (4-log) of viruses. In addition, filtered water systems must physically remove 99 percent (2-log) of *Cryptosporidium.* Systems with source water *Cryptosporidium* levels exceeding specified limits must install and operate additional treatment processes.

Filtered water systems must meet specified performance standards for combined filter effluent turbidity levels, and water systems using conventional and direct filtration must also record individual filter effluent turbidity and take action if specified action levels are exceeded. When more than 1 filter exists, each filter’s effluent turbidity must be monitored continuously and recorded at least every 15 minutes. The combined flow from all filters must have a turbidity measurement at least every four hours by grab sampling or continuous monitoring. Turbidity monitoring must occur prior to any storage such as a clearwell or contact tank. Turbidity monitoring equipment must be calibrated using an approved method at least once per quarter. General requirements for systems utilizing conventional or direct filtration are:

- Individual filter turbidity monitored continuously and recorded every 15 minutes or less
- Combined filter turbidity monitored continuously or grab sample taken at least every 4 hours
- Combined filter turbidity less than 1 NTU in 100% of measurements
- Combined filter turbidity less than or equal to 0.3 NTU in 95% of measurements in a month
- Specific follow-up actions if individual filter turbidity exceeds 1.0 NTU twice

General requirements for systems utilizing slow sand, and alternative filtration (membrane filtration and cartridge filtration) are:

- Combined filter turbidity monitored continuously or grab sample taken at least every 4 hours Department may reduce to once per day if determined to be sufficient
- Combined filter turbidity less than 5 NTU in 100% of measurements
- Combined filter turbidity less than or equal to 1 NTU in 95% of measurements in a month
- Department may require lower turbidity values if the above levels cannot provide the required level of treatment

All water systems must meet specified CxT [concentration x time] requirements for disinfection, and meet required removal/inactivation levels. In addition, a disinfectant residual must be maintained in the distribution system.

- Continuous recording of disinfectant residual at entry point to the distribution system. Small system may be allowed to substitute 1-4 daily grab samples.
- Daily calculation of CxT at highest flow (peak hourly flow)
- Provide adequate CxT to meet needed removal/inactivation levels
- Maintain a continuous minimum 0.2 mg/L disinfectant residual at entry point to the distribution system
- Maintain a minimum detectable disinfectant residual in 95% of the distribution system samples (collected at coliform bacteria monitoring points)

Filtered water systems that recycle spent filter backwash water or other waste flows must return those flows through all treatment processes in the filtration plant. Systems wishing to recycle filter backwash water must provide notice to the State including a plant schematic showing the origin, conveyance, and return location of recycled flows. Design flows, observed flows, and typical recycle flows are also required along with a state-approved plant operating capacity.

Disinfectants and Disinfection Byproducts

Disinfection treatment chemicals used to kill microorganisms in drinking water can react with naturally occurring organic and inorganic matter in source water, called DBP precursors, to form disinfection byproducts (DBPs). Some disinfection byproducts have been shown to cause cancer and reproductive effects in lab animals and suggested bladder cancer and reproductive effects in humans. The challenge is to apply levels of disinfection treatment needed to kill disease-causing microorganisms while limiting the levels of disinfection byproducts produced. The primary disinfection byproducts of concern in Oregon are the total trihalomethanes (TTHM) and the haloacetic acids (HAA5).

Disinfection byproducts must be monitored throughout the distribution system at frequencies of daily, monthly, quarterly, or annually, depending on the population served, type of water source, and the specific disinfectant applied, and in accordance with an approved monitoring plan. Disinfectant residuals must be monitored at the same locations and frequency as coliform bacteria.

Total organic carbon (TOC) is an indicator of the levels of DBP precursor compounds in the source water. Systems using surface water sources and conventional filtration treatment must monitor source water for TOC and alkalinity monthly and practice enhanced coagulation to remove TOC if it exceeds 2.0 mg/L as a running annual average.

Compliance is determined based on meeting maximum contaminant levels (MCLs) for disinfection byproducts and maximum levels for disinfectant residual (MRDLs) over a running annual average of the sample results, computed quarterly.

- TTHM/HAA5 monitoring required in distribution system. One sample per quarter for systems serving 500-9,999 persons. One sample per year in warmest month required for systems serving less than 500.
- MCL for TTHM is 0.080 mg/L. MCL for HAA5 is 0.060 mg/L.
- Any system having TTHM > 0.064 mg/L or HAA5 > 0.048 based on a running annual average must conduct disinfection profiling.
- TOC and alkalinity monitoring in source water monthly. Enhanced coagulation if TOC greater than 2.0 mg/L
- Comply with MRDLs. Limit for chlorine (free Cl_2 residual) is 4.0 mg/L. Limit for chloramines is 4.0 mg/L (as total Cl_2 residual). Limit for chlorine dioxide is 0.8 mg/L (as ClO_2)
- Bromate MCL of 0.010 mg/L
- Chlorite MCL of 1.0 mg/L

Long-Term 2 Enhanced Surface Water Treatment Rule

LT2ESWTR was published by the U.S. EPA on January 5, 2006. The Oregon rule is due by January 5, 2010. The rule requires source water monitoring for public water systems that use surface water or ground water under the influence of surface water. Based on the system size and filtration type, systems must monitor for *Cryptosporidium*, *E. coli*, and turbidity. Source water monitoring data will be used to categorize the source water *Crypto* concentration into four "bin" classifications that have associated treatment requirements. Systems serving 10,000 or more people are required to conduct 24 months of *Crypto* monitoring. Systems serving fewer than 10,000 people are required to conduct 12 months of *E. coli* monitoring and 12-24 months of *Crypto* monitoring if E. coli trigger levels are exceeded. The rule provides other options to comply with the initial source water monitoring that include either submitting previous *Crypto* data meeting (grandfathered data) the requirements or committing to provide a total of at least 5.5-log treatment for *Cryptosporidium*. A second round of source water monitoring will follow 6 years after the system makes its initial bin determination.

<u>Critical Deadlines for LT2ESWTR for systems serving less than 10,000 persons include:</u>

Submit sample schedule and sample location description:	July 1, 2008 July 1, 2010*
Begin first round of source water monitoring:	October 2008 April 2010*
Submit Grandfathered Data (if applicable):	December 1, 2008 June 1, 2010*
Submit Bin Classification:	September 2012
Comply with Rule:	October 1, 2014
Begin second round of source water monitoring:	October 1, 2017 April 1, 2019*

** Cryptosporidium monitoring - applies to filtered systems that exceed E. coli trigger*

Critical Deadlines for LT2ESWTR for systems serving 10,000 to 49,999 persons include:

Submit sample schedule and sample location description:_______January 1, 2008
Begin first round of source water monitoring:________________April 2008
Submit Grandfathered Data (if applicable):__________________June 1, 2008
Submit Bin Classification:________________________________September 2010
Comply with Rule:______________________________________October 1, 2013
Begin second round of source water monitoring: _____________October 2016

Stage 2 Disinfectants and Disinfection Byproducts Rule

The Stage 2 DBPR was published by the U.S. EPA on January 4, 2006. The Oregon rule is expected to be finalized on January 4, 2010. The rule builds on existing regulations by requiring water systems to meet disinfection byproduct (DBP) MCLs at each monitoring site in the distribution system. Whereas the Stage 1 Rule controls average DBP levels across distribution systems, the Stage 2 Rule controls the occurrence of peak DBP levels within distribution systems.

The rule requires all community water systems to conduct an Initial Distribution System Evaluation (IDSE). The goal of the IDSE is to characterize the distribution system and identify monitoring sites where customers may be exposed to high levels of TTHM and HAA5. There are four ways to comply with the IDSE requirements: Standard Monitoring, System Specific Study, 40/30 Certification, and Very Small System (VSS) Waiver.

Standard monitoring (SM) is one year of increased monitoring for TTHM and HAA5 in addition to the data being collected under Stage 1 DBPR. These data will be used with the Stage 1 data to select Stage 2 DBPR TTHM and HAA5 compliance monitoring locations. Any system may conduct standard monitoring to meet the Initial Distribution System Evaluation (IDSE) requirements of the Stage 2 DBPR. The number of monitoring sites, the monitoring periods, and monitoring frequency vary depending on population served.

Systems that have extensive TTHM and HAA5 data (including Stage 1 DBPR compliance data) or technical expertise to prepare a hydraulic model may choose to conduct a system specific study (SSS) to select the Stage 2 DBPR compliance monitoring locations.

The term "40/30" refers to a system that during a specific time period has all individual Stage 1 DBPR compliance samples less than or equal to 0.040 mg/L for TTHM and 0.030 mg/L for HAA5 and no monitoring violations during the same period. These systems have no IDSE monitoring requirements, but will still need to conduct Stage 2 DBPR compliance monitoring.

The Very Small System (VSS) Waiver applies to systems that serve fewer than 500 people and have eligible TTHM and HAA5 data. The VSS eligibility does not depend on the actual TTHM and HAA5 sample results. These systems also have no IDSE monitoring requirements, but will still need to conduct Stage 2 DBPR compliance monitoring. 40/30 certifications were previously due for systems larger than 10,000 persons. For systems less than 10,000 persons, the 40/30 due date is April 1, 2008.

Critical Deadlines for Stage 2 DBPR for systems serving less than 10,000 persons include:

Submit SM Plan or SSS Plan:______________________________April 1, 2008
Complete SM:____March 31, 2010
Submit IDSE Report:____________________________________July 1, 2010
Begin Compliance Monitoring:_____________________________October 1, 2013

Critical Deadlines for Stage 2 DBPR for systems serving 10,000 to 49,999 persons include:

Submit SM Plan or SSS Plan:______________________________October 1, 2007 (should be done)
Complete SM:____September 30, 2009
Submit IDSE Report:___________________________________January 1, 2010
Begin Compliance Monitoring:____________________________October 1, 2013

Lead and Copper

Excessive levels of lead and copper are harmful and rules exist to limit exposure through drinking water. Lead and copper enter drinking water mainly from corrosion of plumbing materials containing lead and copper. Lead comes from solder and brass fixtures. Copper comes from copper tubing and brass fixtures. Protection is provided by limiting the corrosivity of water sent to the distribution system. Treatment alternatives include pH adjustment, alkalinity adjustment, or both, or adding passivating agents such as orthophosphates.

Samples from community systems are collected from homes built prior to the 1985 prohibition of lead solder in Oregon. One-liter samples of standing water (first drawn after 6 hours of non-use) are collected at homes identified in the water system sampling plan. Two rounds of initial sampling are required, collected at 6-month intervals. Subsequent annual sampling from a reduced number of sites is required after demonstration that lead and copper action levels are met. After three rounds of annual sampling, samples are required every 3 years. The number of initial and reduced samples required is dependent on the population served by the water system.

In each sampling round, 90% of samples from homes must have lead levels less than or equal to the Action Level of 0.015 mg/L and copper levels less than or equal to 1.3 mg/L. Water systems with lead above the Action Level must conduct periodic public education, and either install corrosion control treatment, change water sources, or replace plumbing.

- Have Sampling Plan for applicable homes
- Collect required samples
- Meet Action Levels for Lead and Copper (0.015 mg/L for Lead and 1.3 mg/L for Copper)
- Rule out source water as a source of significant lead levels
- If Action Levels not met, provide corrosion control treatment and other steps

On October 10, 2007 EPA published the 2007 Final Revisions to the Lead and Copper Rule. The Oregon rule is projected for 2009 to 2011. The rule addresses confusion about sample collection by clarifying language that speaks to the number of samples required and the number of sites from which samples should be collected. The rule also modifies definitions for monitoring and compliance periods to make it clear that all samples must be taken within the same calendar year. Finally, the rule adds a new reduced monitoring requirement, which prevents water systems above the lead action level to remain on a reduced monitoring schedule.

Inorganic Contaminants

The level of many inorganic contaminants is regulated for public health protection. These contaminants are both naturally occurring and can result from agriculture or industrial operations. Inorganic contaminants most often come from the source of water supply, but can also enter water from contact with materials used for pipes and storage tanks. Regulated inorganic contaminants include arsenic, asbestos, fluoride, mercury, nitrate, nitrite, and others. A possible future MCL for Nickel is currently being evaluated by EPA.

Compliance is achieved by meeting the established MCLs for each contaminant. Systems that cannot meet one or more MCL must either install treatment systems (such as ion exchange or reverse osmosis) or develop alternate sources of water.

- Sample quarterly for Nitrate (reduction to annual may be available)
- Communities with Asbestos Cement (AC) pipe must sample every 9 years for Asbestos
- Sample annually for Arsenic. New MCL of 0.010 mg/L effective January 2006
- Sample annually for all other inorganics. Waivers are available based on monitoring records showing three samples below MCLs. MCLs vary based on contaminant

Organic Chemicals

Organic contaminants are regulated to reduce exposure to harmful chemicals through drinking water. Examples include acrylamide, benzene, 2,4-D, styrene, toluene, and vinyl chloride. Major types of organic contaminants are Volatile Organic Chemicals (VOCs) and Synthetic Organic Chemicals (SOCs). Organic contaminants are usually associated with industrial or agricultural activities that affect sources of drinking water supply, including industrial and commercial solvents and chemicals, and pesticides. These contaminants can also enter from materials in contact with the water such as pipes, valves and paints and coatings used inside water storage tanks.

At least one test for each contaminant from each water source is required during every 3-year compliance period. Public water systems serving more than 3,300 people must test twice during each 3-year compliance period for SOCs. Public water systems using surface water sources must test for VOCs annually.

Compliance is achieved by meeting the established MCL for each contaminant. Quarterly follow up testing is required for any contaminants that are detected above the specified MCL. Only those systems determined by the State to be at risk must monitor for dioxin. Water systems using polymers containing acrylamide or epichlorohydrin in their water treatment process must keep their dosages below specified levels. Systems that cannot meet one or more MCL must either install or modify water treatment systems (such as activated carbon and aeration) or develop alternate sources of water.

- At least one test for each contaminant (for each water source) every 3-year compliance period
- Sample twice each compliance period for each SOCs when system over 3,300 people
- Test VOCs annually
- Quarterly follow up testing required for any detects above MCL
- Maintain polymer dosages in treatment process below specified levels
- MCLs vary based on contaminant

Radiologic Contaminants

Radioactive contaminants, both natural and man-made, can result in an increased risk of cancer from long-term exposure and are regulated to reduce exposure through drinking water. Rules were recently revised to include a new MCL for uranium (30 μg/L), and to clarify and modify monitoring requirements. Initial monitoring tests, quarterly for one year at the entry point from each source, were to be completed by December 31, 2007 for gross alpha, radium-226, radium-228 and uranium. A single analysis for all four contaminants collected between June 2000 and December 2003 will substitute for the four initial samples. Gross alpha may substitute for radium-226 if the gross alpha result does not exceed 5 pCi/L and may substitute for uranium monitoring if the gross alpha result does not exceed 15 pCi/L. Subsequent monitoring is required every three, six, or nine years depending on the initial results, with a return to quarterly monitoring if the MCL is exceeded. Compliance with MCLs is based on the average of the four initial test results, or subsequent quarterly tests. Community water systems than cannot meet MCLs must install treatment (such as ion exchange or reverse osmosis) or develop alternate water sources.

5.4 Future Water System Regulations

The 1996 Safe Drinking Water Act (SDWA) requires EPA to review and revise as appropriate each current standard at least every six years. Data is continually collected on contaminants currently unregulated in order to support development of future drinking water standards. Drinking water contaminant candidate lists (CCL) are prepared and revised every five years. The first DWCCL was published on March 2, 1998 which included 51 chemicals and 9 microbials. In 2003, EPA decided not to regulate any of the 9 microbials from the initial list. In 2005 EPA published the second CCL consisting of the remaining 51 contaminants from the first list. The Agency published the preliminary regulatory determinations for 11 of the 51 contaminants listed on the second CCL in April of 2007. EPA has started the process to develop the third Contaminant Candidate List (CCL3) to help identify unregulated contaminants that may require a national drinking water regulation in the future. The EPA must publish a decision on whether to regulate at least five contaminants from the CCL every 5 years. As a result, additional contaminants can become regulated in the future.

In addition, rule revisions and new rules will occur to further address health risks from disinfection byproducts and pathogenic organisms. Rules such as the Long-Term Stage 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) and the Stage 2 Disinfectants/Disinfection Byproducts Rule (State 2 DBPR) have recently gone into effect at the federal level and require systems to begin planning for compliance. New and revised drinking water quality standards are mandated under the 1996 federal SDWA. Known future standards (and their likely EPA promulgation date) include:

- Radon Rule (2009)
- Distribution Rule, including revised coliform bacteria requirements (2010)

Water suppliers should be aware of and familiar with these mandates and deadlines, and plan strategically to meet them. DHS, under the Primacy Agreement with the EPA, has up to two years to adopt each federal rule after it is finalized. Water suppliers generally have at least three years to comply with each federal rule after it is finalized; however, some of these rules will likely establish a significant number of compliance dates for water suppliers that will occur prior to state adoption of the rules. These “early implementation” dates will likely have to be implemented in Oregon directly by the EPA, because the state program will not yet have the rules in place or the resources to carry them out.

These anticipated rules are described generally below. Additional details will be found in the final EPA rules once they are promulgated.

Radon Rule

All community water systems using groundwater sources will conduct quarterly initial sampling at distribution system entry points for one year. Subsequent sampling will occur once every 3 years. The Radon MCL is expected to be 300 pCi/L. An alternative MCL (AMCL) of 4,000 pCi/L is proposed if the State develops and adopts an EPA-approved statewide Multi-Media Mitigation (MMM) program. Local communities may have the option of developing an EPA-approved local MMM program in the absence of a statewide MMM program, and meeting the AMCL.

Distribution Rule

Under this rule, current requirements for coliform bacteria will be revised, emphasizing fecal coliforms and *E. coli*, and focusing on protection of water within the distribution system. The rule will apply to all public water systems and will involve identifying and correcting sanitary defects and hazards in water systems and using best management practices for disinfection to control coliform bacteria in the system.

5.5 Water Management and Conservation Plans

The Municipal Water Management and Conservation Planning (WMCP) program provides a process for municipal water suppliers to develop plans to meet future water needs. 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. These plans will be used to demonstrate the communities' needs for increased diversions of water under the permits as their demands grow. A master plan prepared under the requirements of the Department of Human Resources Drinking Water Program or the water supply element of a public facilities plan prepared under the requirements of the Department of Land Conservation and Development which substantially meets the requirements of OAR 690-086-0125 to 690-086-0170 may be submitted to meet the requirements for WMCPs. Rules for WMCPs are detailed in OAR 690, Division 86.

A WMCP provides a description of the water system, identifies the sources of water used by the community, and explains how the water supplier will manage and conserve supplies to meet future needs. Preparation of a plan is intended to represent a pro-active evaluation of the management and conservation measures that suppliers can undertake. The planning program requires municipal water suppliers to consider water that can be saved through conservation practices as a source of supply to meet growing demands if the saved water is less expensive that developing new supplies. As such, a plan represents an integrated resource management approach to securing a community's long-term water supply.

Many of the elements required in a plan are also required under similar plans by the Drinking Water Section of the state Department of Human Services (water system master plans) and Department of Land Conservation and Development (public facilities plans). Water providers can consolidate overlapping plan elements and create a single master plan that meets the requirements of all three programs.

Every municipal water supplier required to submit a WMCP shall exercise diligence in implementing the approved plan and shall update and resubmit a plan consistent with the requirements of the rules as prescribed during plan approval. Progress reports are required showing 5-year benchmarks, water use details, and a description of the progress made in implementing the associated conservation or other measures.

The WMCP shall include the following elements:

1) Water System Description including infrastructure details, supply sources, service area and population, details of water use permits and certificates, water use details, customer details, system schematic, and leakage information.

2) Water Conservation Element including description of conservation measures implemented and planned, water use and reporting program details, progress on conservation measures, and conservation benchmarks.

3) Water Curtailment Element including current capacity limitations and supply deficiencies, three or more stages of alert for potential water shortages or service difficulties, levels of water shortage severity and curtailment action triggers, and specific curtailment actions to be taken for each stage of alert.

4) Water Supply Element detailing current and future service areas, estimates of when water rights and permits will be fully exercised, demand projections for 10 and 20 years, evaluation of supply versus demand, and additional details should an expansion of water rights be anticipated.

Failure to comply with rules for WMCPs can result in enforcement actions by the Water Resources Department Director. Enforcement actions can include requirements for additional information and planning, water use regulation, cancellation of water use permits, or civil penalties under OAR 690-260-0005 to 690-260-0110.

5.6 Regulations Summary for Seal Rock

Since the District does not have a surface or groundwater treatment facility, the surface and groundwater treatment rules do not apply. The District is required to conduct distribution sampling as other communities do including samples for Disinfection By-Products (DBP), Lead and Copper, Coliform, and other regulated chemicals.

The District has only one violation reported by the State for the last decade. In 2007 the District received a minor violation for late reporting of volatile organic chemical tests (VOC). The results were merely received late by the State and the District was returned to compliance status in 2008. There have also been several routine samples which tested positive for total coliform (TC+) however repeat samples tested negative for TC and no violation occurred. The TC+ tests reinforce the importance of properly maintaining the booster chlorine equipment and maintaining satisfactory free chlorine residuals in the piping network.

Responsibilities of water suppliers (OAR 333-061-0025) that the District should particularly watch include the requirement to maintain 20 psi or higher at all times at all points in the system, the requirement to have stamped engineered plans approved prior to piping installations (except for minor repairs and replacing old pipe with new pipe of same size), and the need to maintain a formal cross-connection program to identify and eliminate cross connection hazards.

Failure to comply with rules can result in investigations by the Oregon Health Authority with potential penalties, forced improvements, moratoriums, or even orders to cease operation of a water system (see ORS 448.175, 448.250, 448.255).

6.1 Water Supply

6.1.1 Water Source

The Seal Rock Water District (SRWD) purchases treated water from the City of Toledo. The State considers the District to be the "purchasing water system" while the City of Toledo is the "wholesale water system". "Wholesale system" means a public water system that treats source water as necessary to produce finished water and then delivers some or all of that finished water to another public water system. Delivery is through a direct connection between the two systems consisting of a long 12-inch transmission pipe and a pump station.

Raw water for the Toledo Water Treatment Plant (WTP) comes from the Siletz River and Mill Creek. The SRWD is the largest "customer" for the City of Toledo with approximately half of all water sold by the City going to the SRWD. Treated water from the WTP flows into the Toledo distribution piping grid with a portion of the treated water eventually flowing into a dedicated 12-inch transmission pipe initially following the Yaquina River and heading towards Seal Rock (See Figure 2.1.1-1).

The 12-inch transmission piping exits the Toledo distribution piping grid at the corner of SE Fir Street and SE 10th Street in Toledo, crosses the Yaquina River, and then runs approximately 2,200 feet before exiting the Toledo Urban Growth Boundary. The 12-inch transmission piping then travels another 6,000 feet and enters the Toledo Pump Station which boosts pressure and pumps the water through another 43,000 feet before reaching the Lost Creek Master Meter and Pressure Reducing Station inside the Seal Rock Water District Boundary. The approximate 50,000 feet of 12-inch piping between the City of Toledo and the SRWD contains a volume of around 294,000 gallons. At 400 gallons per minute (gpm) there is approximately 20 feet of head loss due to friction in the pipe. At 800 gallons per minute (gpm) there is approximately 75 feet of head loss due to friction in the pipe.

6.1.2 Water Rights

The SRWD has a single water right on the Siletz River under Permit S40277 which has a priority date of 2/28/1973 and allows for withdrawal of up to 2.6 cfs (1166 gpm) for municipal uses. No Claim of Beneficial Use has been made for the permit thus it remains uncertificated at this time. The point of diversion (POD) for the Siletz permit is located at the Toledo Intake near river mile 40. The SRWD also has a water right on Hill Creek (Deer Creek) under certificate 32199 which has a priority date of 10/1/1959 and allows for withdrawal of up to 0.4 cfs for municipal uses. The Hill Creek water right is not used and no treatment provisions exist to allow use. The City of Toledo has water rights for 9.75 cfs at the same POD on the Siletz with 5.75 cfs being senior to the instream water rights.

The State established Instream Water Rights (ISWR) on the Siletz River in 1966, 1974, and 1991. The 1966 ISWR senior to the SRWD permit extend from river mile 42.6 to the mouth and reserve 100 to 200 cfs in the river for aquatic life and recreation depending on the month. At times streamflow in the Siletz drops below the ISWR thus the potential for restriction of the junior SRWD right exists. The lowest recorded streamflow in the area of the POD was 47 cfs in October of 1987. According to the Water Resource Department water availability analysis, no additional water is available from the Siletz in this area from July through October. A graph showing daily mean flows in the Siletz River for the last 25 years at USGS Gauging Station 14305500 just upstream from the POD is shown in Figure 6.1.2-1.

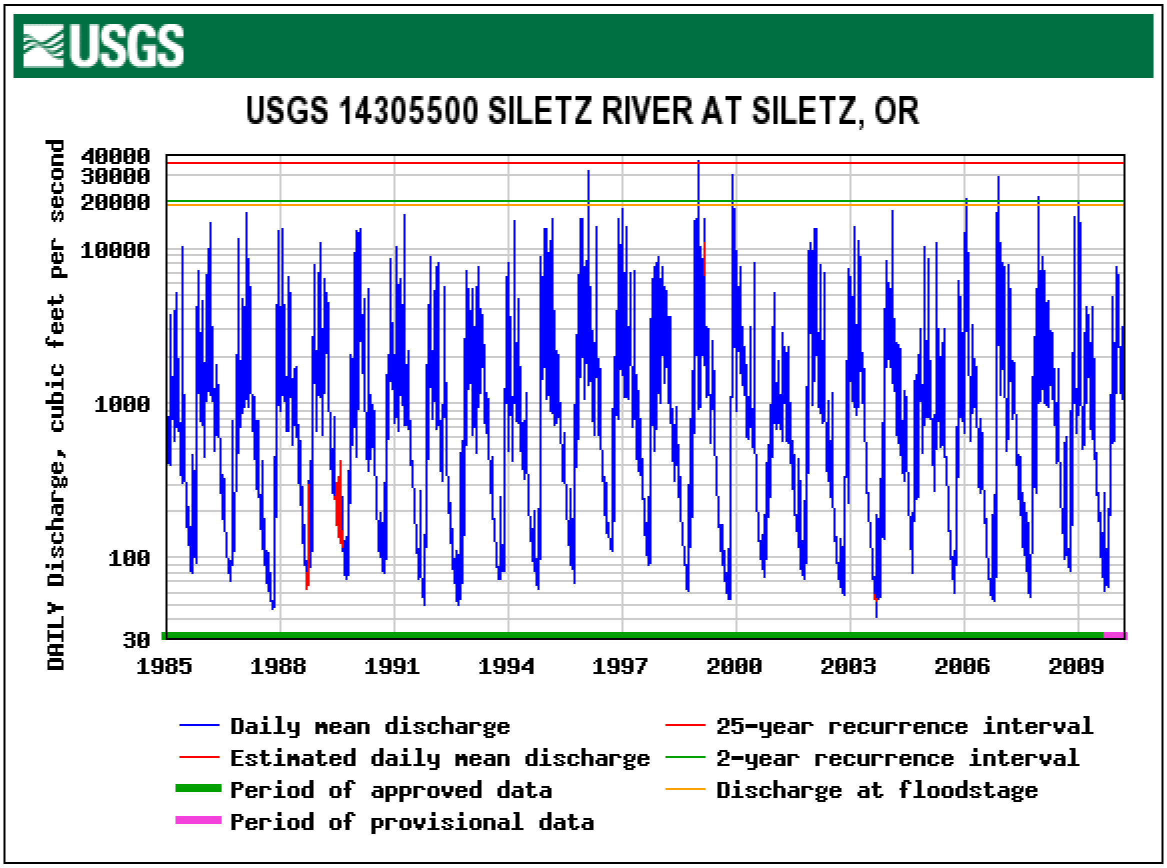


Figure 6.1.2-1 – Siletz River Daily Mean Flow

6.2 Water Treatment

6.2.1 Toledo Water Treatment Plant

The Toledo Water Treatment Plant is a conventional surface water treatment plant constructed in 1976 with costs covered jointly by the City of Toledo and the SRWD. The adjacent concrete clearwell at the plant was constructed in 1938. Upgrades to the instrumentation and controls system, individual filter effluent turbidimeters, new filter media, and other minor improvements were constructed in 1999. Original design capacity of the plant was 3.0 mgd or 2080 gpm however treatment standards today are much more stringent and it would be difficult to treat the original design flow while meeting today's standards. At this time flows required through the plant range from 850 to 1300 gpm.

With minor upgrades to the plant, a few maintenance repairs, and the addition of baffling to the clearwell, the WTP will reliably provide sufficient flows to satisfy the water demands for the City of Toledo as well as the SRWD over the next 20 years. An estimated 1,600 gpm would be required from the plant to meet these combined 20-year demands.

6.2.2 Thiel Creek Chlorine Booster Station

At the Toledo Pump Station free chlorine residual typically ranges from 0.55 to 0.65 mg/L. After traveling through approximately 34,600 feet of 12-inch piping water reaches the Thiel Creek Chlorine Booster Station and Master Meter where the free chlorine residual is boosted to around 1.2 mg/L. A pressure of approximately 99 psi exists at the station in the mainline. The station also contains a 6-inch Sensus flowmeter. The station equipment is housed in a concrete block (CMU) building which is in good condition.

Chlorine is introduced into the system by pumping a 0.8% solution of sodium hypochlorite into the main pipe. The sodium hypochlorite is generated on-site with salt and electricity using a Clor-Tec brand generator (Model 00T-6) capable of creating the equivalent of 6 pounds per day (ppd) of chlorine. The created solution is stored in a 170-gallon plastic solution tank. Two Milton-Roy chemical feed pumps are used alternately to pump the chlorine solution from the tank into the main piping. With an average free chlorine boost of 0.7 mg/L and an average flow of 360,000 gpd, an average of 2.1 ppd of chlorine is required. A solution strength of 0.8% contains the equivalent of one pound of chlorine in 15 gallons of solution. An average of 30 gallons per day of solution is therefore required.

The free chlorine residual is monitored continuously at the station with a Siemens/Wallace & Tiernan Depolox 3 plus analyzer. Radio telemetry equipment relays flow and chlorine residual information to SCADA equipment at the District Office.

The 6-ppd hypochlorite generator has adequate capacity for the planning period however it is likely that the equipment will require replacement during the planning period due to age. The sizing of any new equipment, when required, should be evaluated at the time however a 10-ppd unit would be recommended to provide a boost of up to 1.0 mg/L into the 20-year peak day flow of 1.1 MGD. The solution tank should be sized to store 3 to 7 average days of use.

6.3 Treated Water Storage

The District currently has a total storage capacity of 2.3 million gallons when both existing tanks are full.

6.3.1 Driftwood Storage Tank

The Driftwood Storage Tank is a 0.9 MG Cor-Ten welded steel tank constructed in 1981. The tank has a diameter of 85 feet and a wall height of 24 feet. Cor-Ten steel is a "weathering" steel designed to develop a stable rust veneer and not require painting. In potable water tank applications, the tank interior must be painted.

The tank base elevation is approximately 245 feet (mean sea level, NAVD 88) based on the recent aerial photogrammetry work in the District. The Driftwood tank is filled by the York Pump Station with pump "on/off" based on water depth signals sent via radio telemetry. Current water level settings are 20.5 feet depth at full (pump off), and 16 feet deep at the normal low level (pump on). At the full depth of 20.5 feet, the elevation of the water surface is approximately 265.5 feet. Based on these level settings the actual storage volume in the tank ranges from 679,000 gallons at the normal low level up to 870,000 gallons when full. Assuming the tank could be filled to a depth of 22 feet allowing for 24-inches of freeboard, the maximum possible volume would be 934,000 gallons.

The service elevation range for the Driftwood Tank resulting in the ideal pressure range of 40 to 80 psi is from 173 feet down to elevation 81 feet. To ensure the 20 psi minimum pressure required at service connections and allow normal tank water level fluctuations, connections above elevation 210 feet should not be allowed.

6.3.2 Lost Creek Storage Tank

The Lost Creek Storage Tank is a 1.4 MG glass-fused-to-steel bolted tank constructed in 2005. The tank is 106.3 feet in diameter with wall height of 23.84 feet. With design freeboard, the maximum storage volume is 1,483,000 gallons (22.34 feet water depth).

The tank base elevation is 280.1 feet and the overflow elevation is 302.6 feet (NAVD 88), resulting in a depth at overflow of 22.5 feet. The Lost Creek tank is filled by the Toledo Pump Station with "on/off" based on water depth signals sent via radio telemetry. Normal full water surface at current settings is 21 feet deep providing an elevation of approximately 301 feet. Normal low water setting is 16 feet deep with a water surface elevation of 296 feet. Based on these level settings the actual storage volume in the tank ranges from 1.06 million gallons at the normal low level up to 1.4 million gallons when full.

The service elevation range for the Lost Creek Tank resulting in the ideal pressure range of 40 to 80 psi is from 208 feet down to elevation 116 feet. To ensure the 20 psi minimum pressure required at service connections and allow normal tank water level fluctuations, connections above elevation 245 feet should not be allowed.

Just downstream from the Lost Creek Tank, a pressure reducing valve (approximate ground elevation of 165 feet) reduces pressure by 15 psi to create a hydraulic grade line (HGL) approximately matching the Driftwood Storage Tank water surface. Normal inlet pressure at the PRV when the Lost Creek Tank is full is 60 psi and the outlet pressure is 44 psi (outlet HGL = 266 feet).

6.3.3 Makai Storage Tank

The Makai Storage Tank is a 1 MG concrete tank constructed in 1971. The base of the tank is at an elevation of approximately 218 feet and the maximum water surface is at an elevation of about 242 feet. The Makai tank in no longer in service since it is located at an elevation too low to properly fit into the hydraulics of the water system. The tank concrete is also in poor condition.

6.4 Pump Stations

The District has 7 pump stations, including the Toledo Pump Station which is located closer to the City of Toledo and pumps water through the long transmission piping to the District. A schematic showing the pump station, storage tank, and master meter locations is shown as Figure 6.4-1.

6.4.1 Toledo Pump Station

The Toledo Pump Station is located on East Yaquina Bay Road about 2 miles outside of the City of Toledo near the confluence of the Yaquina River and Montgomery Creek. The station is a partially below-grade concrete and brick building housing two pumps, valves, chlorine monitoring equipment and generator controls. A new standby generator was recently added.

The Toledo Master Meter is located in a vault just upstream from the pump station with flow measuring provided with 2-inch and 6-inch Sensus water meters.

Pumping function is provided by two pumps by Pacific Pumping Co. (now PACO) each rated for 400 gpm at 110 feet of head driven by 20 Hp, 230/460V, three phase motors. The pumps have been observed to provide more flow than the nameplate suggests with approximately 700 gpm being produced by each pump (running individually).

Suction pressure (Toledo side of pumps) is approximately 114 psi resulting from a water surface elevation of around 300 feet in the City of Toledo's Ammon Road Storage Tank which would place the pump station at an elevation of approximately 37 feet above sea level. 12-inch discharge piping from the station runs 45,225 feet to the Lost Creek Storage Tank. The "full" water level at the Lost Creek tank is 301 feet resulting in a static discharge pressure at the station approximately equal to the static suction pressure.

Current maximum day demands (MDD) in Seal Rock would require a flow of at least 550 gpm from the station. With a current maximum capacity of 700 gpm the station is adequate for current needs however higher capacity pumps will be required to meet the planning period demand. To meet the 20-year projected MDD with 24 hours of pumping will require pumps with a capacity of 765 gpm. Based on the approximate length of discharge piping to the Lost Creek Tank, the friction loss in the discharge piping is about 45 feet at 550 gpm and 75 feet at 700 gpm.

In addition to being slightly undersized, the existing pumps are past their expected design life. The station also has an outdated electrical panel that should be upgraded with modern, more efficient equipment.

6.4.2 Beaver Creek Pump Station

The Beaver Creek Pump Station is located on the west side of Highway 101 just south of Beaver Creek and Ona Beach State Park. Ground elevation at the station is approximately 35 feet.

The Beaver Creek Master Meter is located in a vault just to the south of the pump station building. Flow measuring is provided with a single 6-inch Sensus flow meter. Radio telemetry relays flow data to the District Office SCADA system.

The station has a single vertical in-line centrifugal Paco pump rated for 150 gpm at 60 feet of head driven by a 5 Hp motor. A 6-inch bypass line allows flows to bypass the pump when required. The pump runs continuously and provides a boost in pressure of approximately 10 to 15 psi. On 6/11/2009 an inlet pressure of of 90.4 psi and an outlet pressure of 103.4 psi was observed while the pump was running.

12-inch main piping along Highway 101 feeds the station and exits the station. The 6-inch piping, which reduces to 3-inch at the pump, creates a significant piping restriction in the system.

The station does not have a standby generator but does have a connection for a portable generator. Radio telemetry equipment relays information about flow rate and pressures to the SCADA system at the District office.

The Beaver Creek PS operates simultaneously with the York Pump Station to alleviate low pressures at certain higher elevation areas on the suction side of the York PS that would occur if the York PS was operating alone. As discussed in the next section, the York PS starts and stops based on water levels in the Driftwood Storage Tank.

2008 Records show an average of 187,000 gpd through the Beaver Creek PS and a one day peak of 484,000 gpd.

6.4.3 York Pump Station

The York Pump Station (1972) is located on the east side of Highway 101 south of NW Fox Creek Drive. Ground elevation at the station is approximately 56 feet. A standby generator was recently added.

The York PS contains two close-coupled horizontal centrifugal pumps each driven by a 5 H, 480V motor. The pumps are each model 1J283681 by Pacific Pumping Company (later PACO). A single 4-inch Sensus flow meter measures discharge from the pump station. Static pressure at the station should be around 91 psi.

The free chlorine residual is monitored continuously at the station with a Siemens/Wallace & Tiernan Depolox 3 plus analyzer. Radio telemetry equipment relays flow and chlorine residual information to SCADA equipment at the District Office.

12-inch main piping along Highway 101 feeds the station and exits the station. Thesmall diameter piping in the station creates a significant piping restriction in the system however a manual 12-inch bypass does exist. The station operates based on water levels in the Driftwood Storage Tank with pump "on" at a tank depth of 16 feet and pump "off" at a tank depth of 20.5 feet. The Beaver Creek PS turns on simultaneously with the York PS.

2008 Records show an average of 120,000 gpd through the York PS and a one day peak of 400,000 gpd.

6.4.4 Cross Street Booster Pump Station

The Cross Street Booster Pump Station is located near the intersection of NW Cross Street and NW Seal Rock Street. Ground elevation at the station is approximately 119 feet resulting in a static pressure of 64 psi on the suction side of the pumps. A standby generator provides backup power.

The station includes a 500-gallon steel hydropneumatic tank with pressure switches to turn the pumps off and on as necessary to boost pressure (to around 80 psi at the station) for approximately 90 homes east of Seal Rock Street.

Pumping equipment includes two Weinman close-coupled horizontal centrifugal pumps rated for 50 gpm at 96 feet driven with 3 Hp motors and one rated for 500 gpm at 115 feet driven with a 20 Hp motor.

Flow measuring is provided with a single 4-inch Sensus flow meter. Radio telemetry relays flow and pressure data to the District Office SCADA system.

The Cross Street BPS is in good condition. District records for 2008 indicate an average use of around 12,000 gpd and a peak use of 31,000 gpd.

6.4.5 East Bayshore Booster Pump Station

The East Bayshore Booster Pump Station is located on the east side of Highway 101 at the south end of the District. Ground elevation at the station is approximately 110 feet resulting in a static pressure of 65 psi on the suction side of the pumps. A standby generator provides backup power.

The station includes a 500-gallon steel hydropneumatic tank with pressure switches to turn the pumps off and on as necessary to boost pressure for approximately 70 homes in East Bayshore and the Alsea Highlands. The pumps come on at 95 psi and turn off at 115 psi.

Pumping equipment includes two close-coupled horizontal centrifugal pumps driven with 5 Hp motors and one driven with a 15 Hp motor.

Flow measuring is provided with a single 4-inch Sensus flow meter. The free chlorine residual is monitored continuously at the station with a Siemens/Wallace & Tiernan Depolox 3 plus analyzer. Radio telemetry equipment relays flow and chlorine residual information to SCADA equipment at the District Office.

The East Bayshore BPS is in good condition. District records for 2008 indicate an average use of around 12,000 gpd and a peak of 24,000 gpd. Improvements should be considered to increase pump run times and avoid excessive cycles.

6.4.6 Driftwood Booster Pump Station

The Driftwood Booster Pump Station is located adjacent to the Driftwood Storage Tank at a ground elevation of around 245 feet. The station boosts pressure to about 8 homes in the area which are located too high to obtain adequate pressure from the Driftwood Tank by gravity. A standby generator provides backup power.

The station contains a hydropneumatic tank and three pumps. Two pumps are Cornell centrifugal model 1.25W-5-2 driven by 5 Hp motors and one is a Cornell model 2W-7.5-2 driven with a 7.5 Hp motor.

6.4.7 Lost Creek Booster Pump Station

The Lost Creek Booster Pump Station is located at the intersection of SE 130th Drive and Elderberry Drive at an elevation of approximately 190 feet. Suction pressure at the station is around 23 psi and pressure is boosted to 45 to 55 psi to serve a small area with around 9 homes. A standby generator provides backup power.

The station includes a small hydropneumatic tank and two Sta-Rite 1.5 Hp centrifugal pumps housed in a fiberglass enclosure. Radio telemetry equipment relays information to the SCADA equipment at the District Office.

6.5 Distribution Piping System

Maps of the entire distribution system are shown in Figures 6.5-1 through 6.5-5.

6.5.1 Pressure Zones

The District's water system is currently separated into 6 pressures zones. Pressure in the main pressure zone is created by the pressure reducing valve (PRV) just downstream from the Lost Creek Storage Tank which reduces incoming pressure by about 15 psi from that resulting by gravity from the tank. The hydraulic grade line (HGL) created downstream of the PRV is approximately 266 feet matching the water surface elevation in the Driftwood Storage Tank. Four additional pressure zones are created for isolated areas served by the booster pump stations (BPS). The remaining pressure zone is located at the lower elevations at the south end of the District in Bayshore. The west Bayshore area is fed through two PRVs which reducing pressure from 86 psi to 50 psi to create an HGL of 183 feet and prevent excessive pressures which would otherwise result in elevations below 80 feet.

Table 6.5.1 – SRWD Pressure Zones

Pressure Zone	Hydraulic Grade Control	Hydraulic Grade	Maximum Service Elevation (~25 psi static)	Ideal Service Elevations (80 to 40 psi)
Main Zone	PRV Downstream of Lost			
	Cr. Tank / Driftwood Tank	266 feet	208 feet	81 to 174 feet
Cross Street BPS	Cross Street BPS	*(63 psi to 80 psi)*		
	Hydropneumatic Tank	264 feet to 304 feet	206 feet	119 to 172 feet
Lost Creek BPS	Lost Creek BPS	*(45 psi to 55 psi)*		
	Hydropneumatic Tank	294 feet to 317 feet	236 feet	132 to 202 feet
Driftwood BPS	Driftwood BPS	*(50 to 80 psi)*		
	Hydropneumatic Tank	360 feet to 430 feet	302 feet	245 to 268 feet
E. Bayshore BPS	E. Bayshore	*(95 psi to 115 psi)*		
	Hydropneumatic Tank	329 feet to 375 feet	271 feet	190 to 237 feet
W. Bayshore	Bayshore and Sandpipe	*(50 psi downstream)*		
	PRVs	183 feet	125 feet	0 to 90 feet

The Cross Street BPS, with a maximum discharge pressure setting of 80 psi, does not technically create a separate pressure zone from the Main Pressure Zone but merely forces water into its service area to overcome hydraulic deficiencies (pipes too small) in the system. Similarly, both the Beaver Creek PS and the York PS function only to overcome piping size limitations.

6.5.2 Routes and Master Meters

The system contains several Master Meters (MM) which have been used to record gross flows to various large areas of the system. The areas are separated into twelve "routes". These meters include the initial meter at the Toledo Pump Station, the Thiel Creek MM at the chlorine booster station, the Lost Creek Reservoir MM just upstream from the Lost Creek PRV, the MM at the Lost Creek Booster Pump Station, the For Far MM measuring flows heading north of SE 116th Street, the Pacific Shores MM measuring flows north of the Newport Airport entrance, the Beaver Creek MM measuring flows heading south through the Beaver Creek Pump Station, the York MM measuring flows through the York Pump Station, the Cross Street MM measuring flows through the Cross Street Booster Pump Station, the MM at the East Bayshore Boos ter Pump Station, and the Sandpiper and Bayshore MMs measuring flows west of Highway 101 at the south end of the District. Flow information from the various MMs is relayed to the SCADA system via radio telemetry. To help identify areas with water leakage issues, comparisons are made between the MM readings and the individual service water meters. Occasionally nighttime flow checks are taken at the meters, presumably when domestic use is negligible, to locate and estimate leakage.

6.5.3 Piping System Inventory

The SRWD contains 60 miles of water piping (excluding services) including approximately 8 miles of transmission piping from the Toledo Pump Station to the junction of the Lost Creek Storage Tank. The distribution system contains 150 fire hydrants. A summary of the piping, excluding individual service laterals, is shown below.

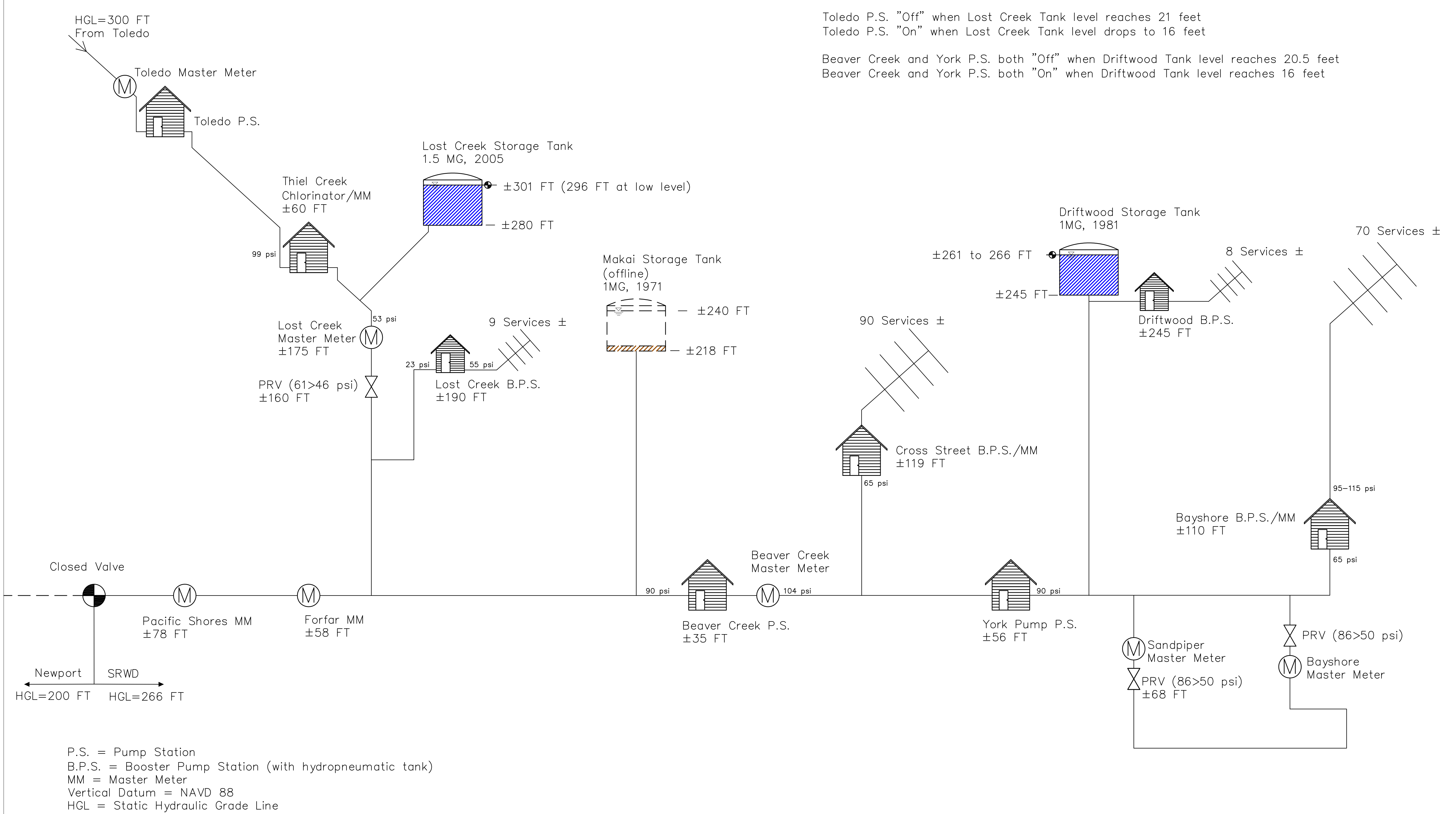
Table 6.5.3 – SRWD Pipe Inventory

Nominal Diameter (in)	Approximate Length (ft)	Percent of Total Pipe
2	51,000	16.2%
3	3,340	1.1%
4	44,790	14.2%
6	67,700	21.5%
8	44,700	14.2%
12	55,440	17.6%
14	5,680	1.8%
12*	39,570	12.6%
14*	2,930	0.9%
	315,150	100.0%
** Toledo PS to Lost Creek Tank Junction*		

Due to the layout of the largely rural area – including a long and narrow boundary (11+ miles long and 1 mile wide), numerous ravines and small creeks, and undeveloped platted streets – a large number of dead-end pipes exist and looping is often difficult. The primary backbone of the system from Ona Beach southward is a single 12-inch pipe along Highway 101. Mostly 8-inch pipe along Highway 101 runs northward from just north of Ona Beach to the north end of the District. Many developed areas are fed with 2- and 4-inch pipe off the main backbone piping which does not provide adequate fire protection flows. In other areas, excessive distances of single 6-inch pipe exists which also presents extreme limitations to fire flows.

Known problem areas (prior to computer modeling – See Section 7) with deteriorating piping requiring frequent repairs or significant restrictions due to inadequate pipe size include Art Street and Park View Street with too many homes serves off 2-inch piping, small diameter piping in Pacific Shores in bad condition, 2-inch pipe on 100th Court in bad condition, significant 2-inch piping on Quail Street and lower Seal Rock area in bad condition, and 3-inch on Marsh Street in bad condition.

Obvious vulnerabilities include the single pipe across the Beaver Creek bridge on Highway 101 separating the majority of the District from the water supply, the single 8-inch pipe along Highway 101 at Thiel Creek separating a large portion of the north end of the District from the supply, and a single section of 6-inch pipe on Oceania Drive separating the southern tip of Bayshore from the rest of the system.



Civil West Engineering Services, Inc.

SEAL ROCK WATER DISTRICT
LINCOLN COUNTY, OREGON

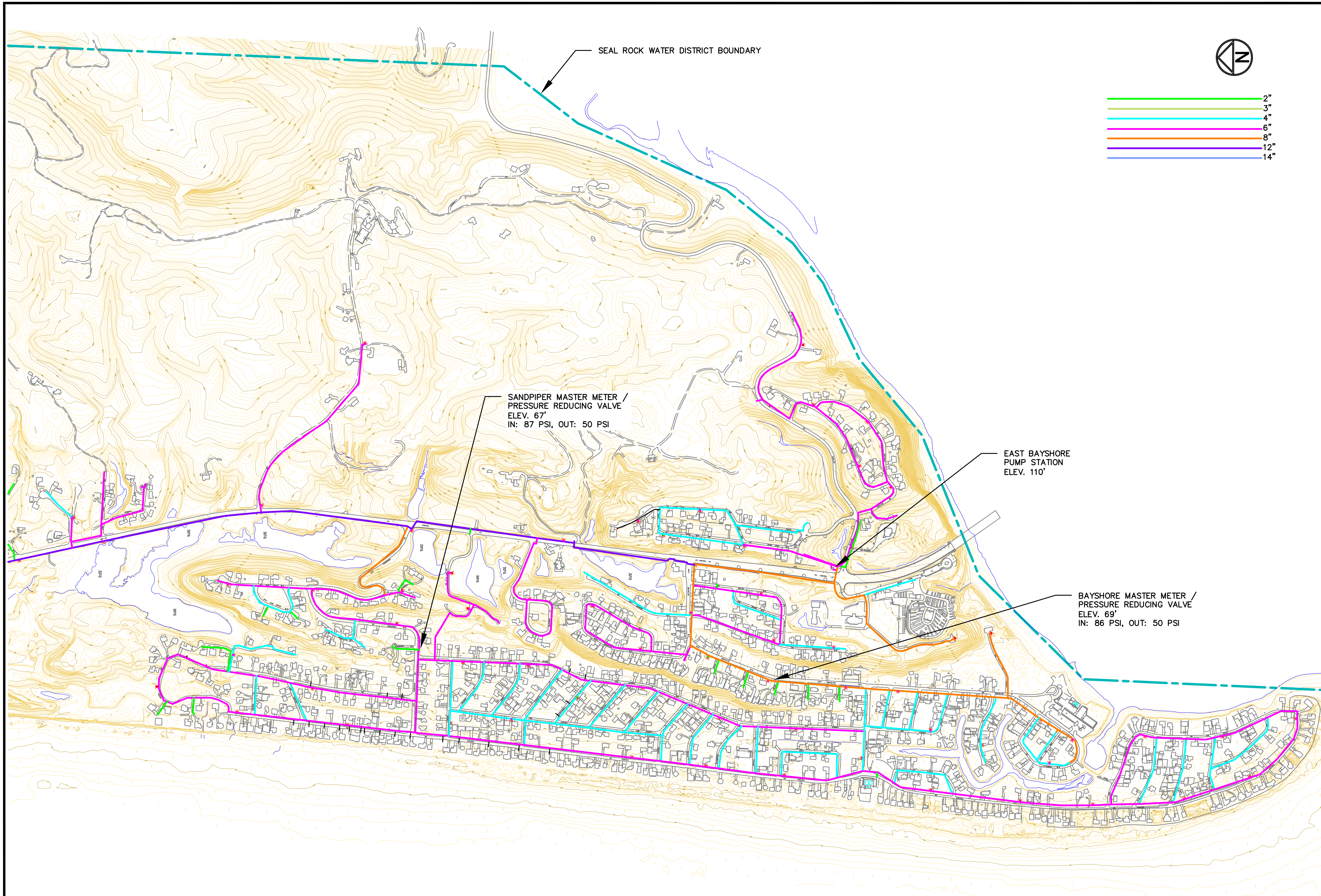
Water System Schematic

WATER SYSTEM MASTER PLAN

0 1"
NTS

DRAWN BY: JBH
DATE: JUNE 18, 2010

FIGURE
6.4-1



Civil West Engineering Services, Inc.

SEAL ROCK WATER DISTRICT
LINCOLN COUNTY, OREGON

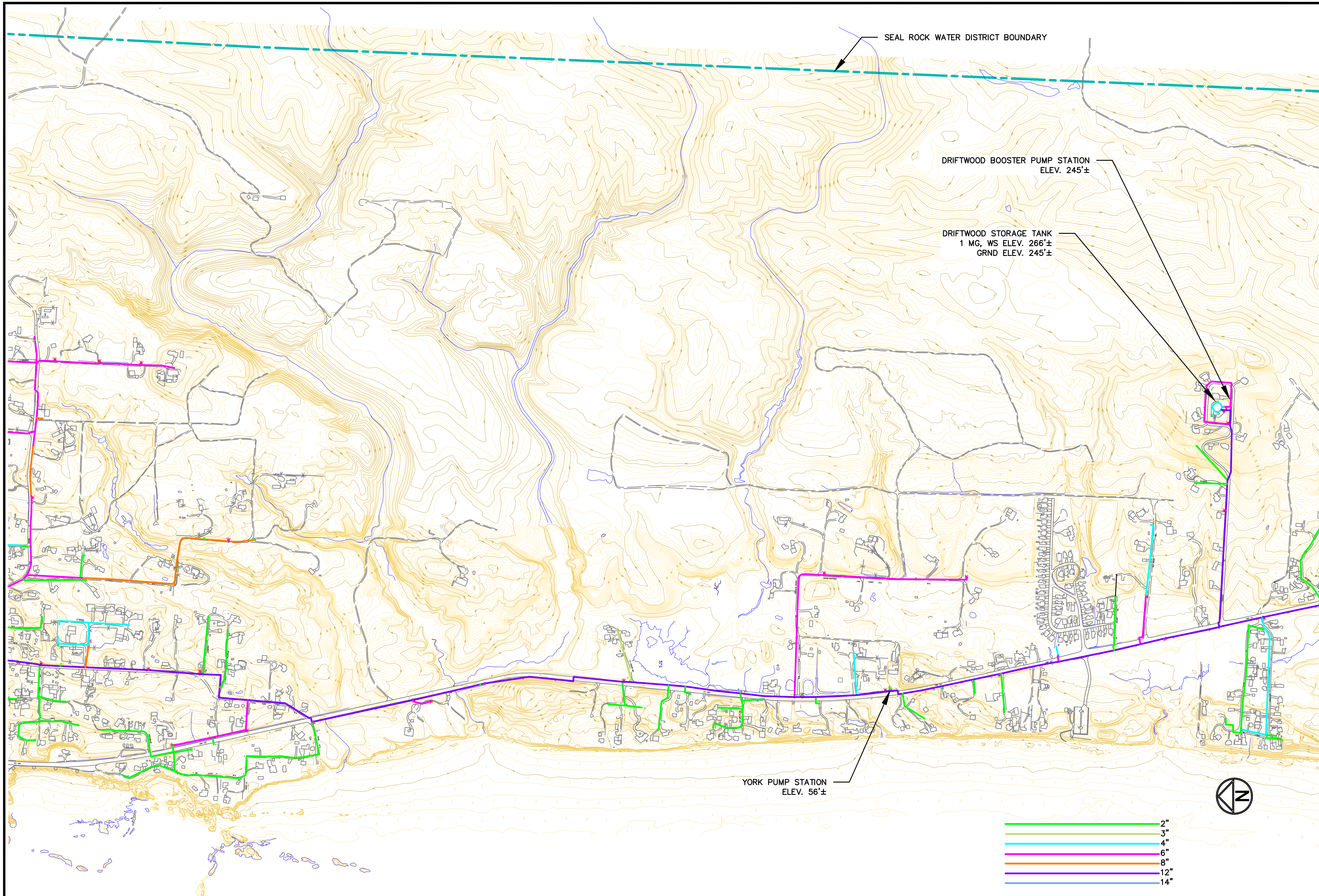
Existing Water System

WATER SYSTEM MASTER PLAN

0 1"
1" = 800'

DRAWN BY: CDA
DATE: JULY 27, 2010

FIGURE
6.5-1



Civil West Engineering Services, Inc.

SEAL ROCK WATER DISTRICT
LINCOLN COUNTY, OREGON

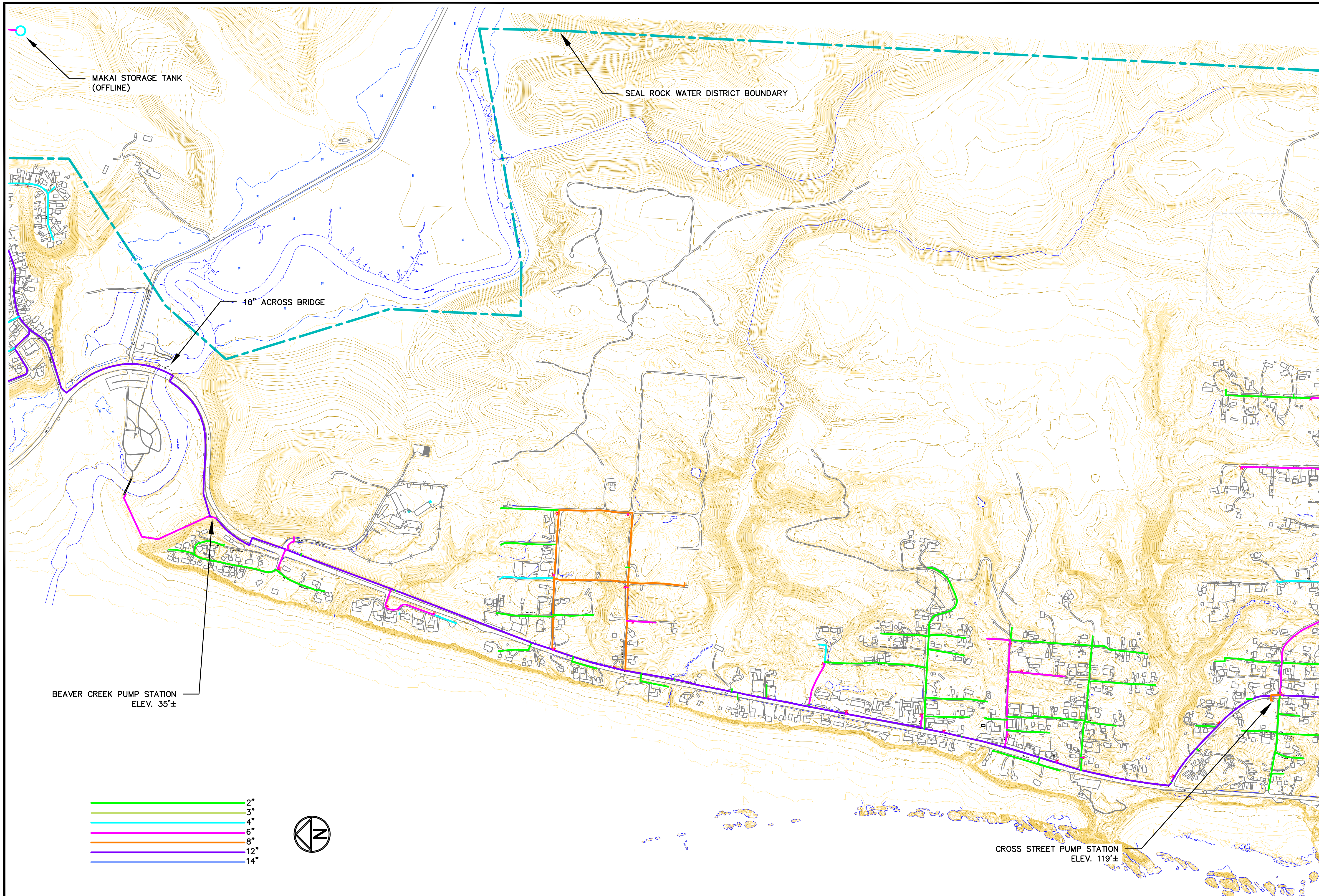
Existing Water System

WATER SYSTEM MASTER PLAN

0 1"
1" = 800'

DRAWN BY: CDA
DATE: JULY 27, 2010

FIGURE
6.5-2



Civil West Engineering Services, Inc.

Seal Rock Water District
Lincoln County, Oregon

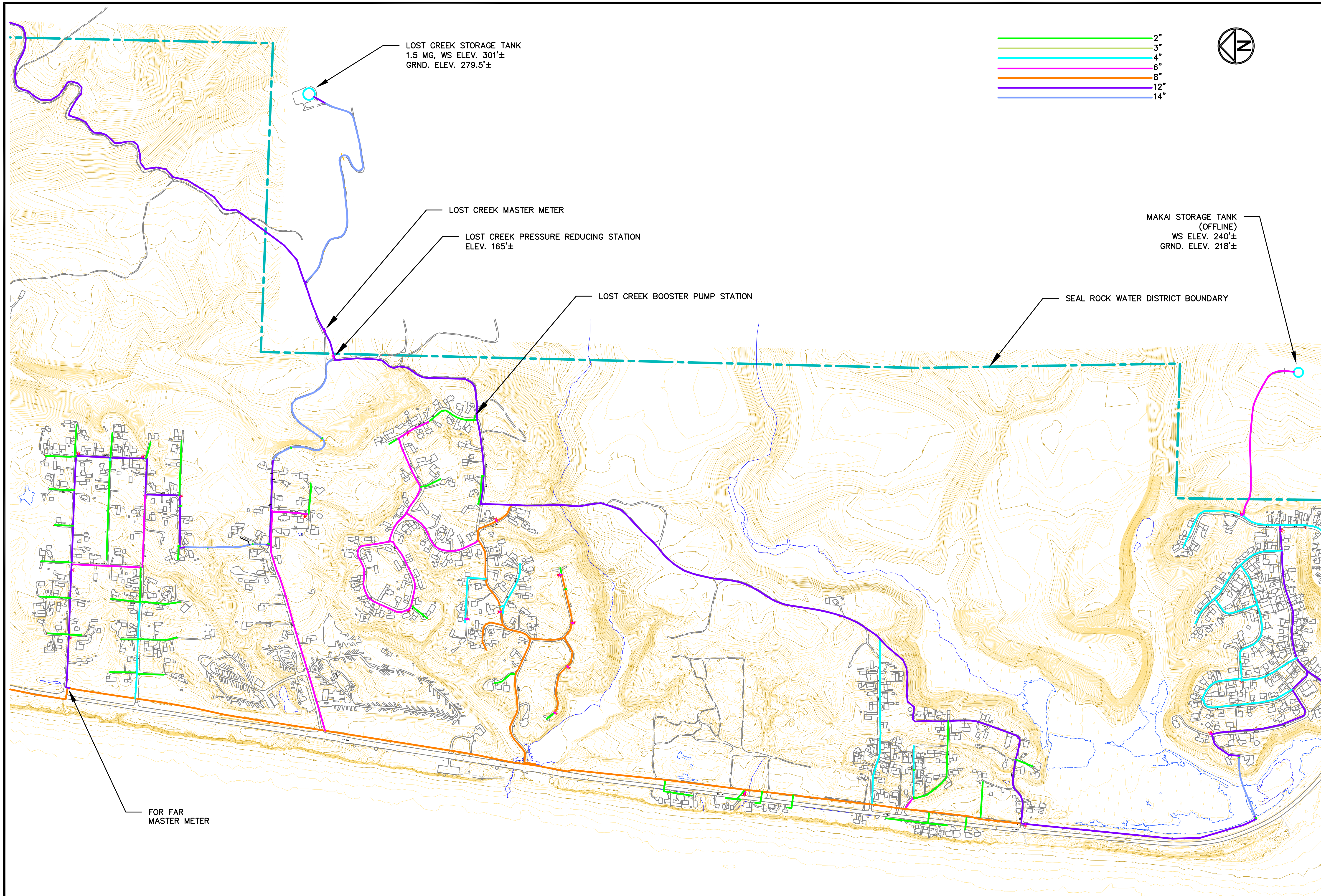
Existing Water System

Water System Master Plan

0 1"
1" = 800'

Drawn By: CDA
Date: July 27, 2010

FIGURE 6.5-3



Civil West
Engineering Services, Inc.

SEAL ROCK WATER DISTRICT
LINCOLN COUNTY, OREGON

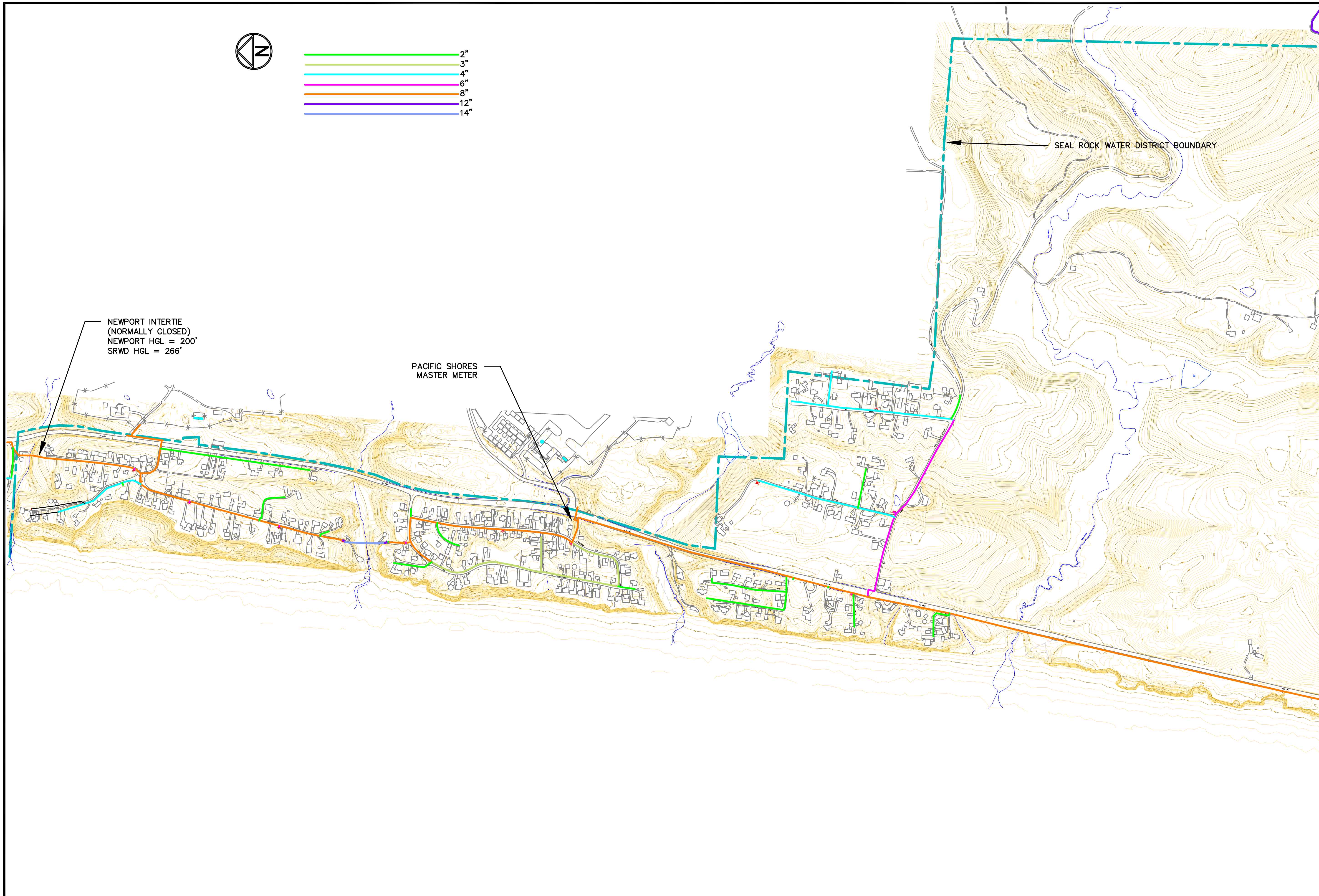
Existing Water System

WATER SYSTEM MASTER PLAN

0 1"
1" = 800'

DRAWN BY: CDA
DATE: JULY 27, 2010

FIGURE
6.5-4



Civil West Engineering Services, Inc.

Seal Rock Water District
Lincoln County, Oregon

Existing Water System

Water System Master Plan

0 1"
1" = 800'

Drawn By: CDA
Date: July 27, 2010

FIGURE
6.5-5

7.1 Water Supply Needs and Alternatives

7.1.1 Water Supply Needs

Currently, the SRWD purchases treated water from the city of Toledo in amounts averaging 0.37 mgd with peaks up to 0.8 mgd. To adequately serve the community for the next 20-year planning period, the District will require a reliable source of at least 1.1 mgd. If treatment is provided within the District in the future rather than purchasing finished water as done now, a source of at least 1.22 mgd would be required for the planning period to allow for some water to be used at a production facility for backwashing filters, etc. Due to the difficulty and expense of creating an alternative supply source, long-term supply needs would need to be considered. Looking 60-years into the future indicates a need for 2.0 mgd delivered to the community requiring a supply of at least 2.22 mgd (3.44 cfs) assuming 90% efficiency from a water treatment plant. With alternative technology such as desalination, significantly greater raw water supply quantities would be required as 90% efficiency is not possible using this method.

As with most of the central Oregon Coast, groundwater supplies are likely inadequate for the SRWD. No significant aquifers have been identified and no significant groundwater wells have been developed in any of the nearby communities. The basalt geology of the area is known to be relatively impervious and no further discussions of groundwater potential will ensue in this report.

7.1.2 Treated Water from Toledo (continue existing methods)

The city of Toledo has adequate water supply and treatment capacity to meet the needs of both the City and the District for the 20-year planning period and beyond. With capacity upgrades to various components over time, it appears that the city of Toledo's senior water rights on the Siletz River alone (1929 and 1937) are sufficient to provide for both the District and the City for over 60 years into the future. With the City's additional 19.0 cfs water rights (Mill Creek 15.0 cfs; Siletz 4.0 cfs), reliable water supply for over 100 years is possible. Components of the City current system however are in need of replacement and upgrades in order to continue reliable service for the next 20 years. Of primary concern to the District is the need for a new intake and pump station on the Siletz River, new piping section across the Olalla Reservoir, and replacement of the Mill Creek pump station and transmission piping. Various minor improvements are also needed at the Toledo water treatment facility. The recent *Toledo Water System Master Plan* (April 2010) identifies the Seal Rock Water District portion of these improvements at $7.2 million based on 50% cost split with the City. The 50% cost sharing has been used historically by the communities since approximately half of the water sold by the City goes to the District while the other half remains inside the City.

To complete the reconstruction of the Siletz River supply infrastructure and to provide the necessary maintenance and capacity improvements at the Toledo WTP (Phase 2 and 3 of Toledo Capital Improvement Plan) will require approximately $2.4 million from the District and $2.4 million from the City. If the city of Toledo were to obtain loans to complete the project, the SRWD would likely see a rate increase that would result in an additional charge of approximately $166,000 per year.

To complete the reconstruction of the Mill Creek supply infrastructure will require approximately $4.8 million from the City and $4.8 million from the District.

Total Cost - $7.2 million (plus monthly water bill from Toledo)

7.1.3 Raw Water from Siletz River

The District has a permit on the Siletz River (Permit S40277) which allows withdrawal of up to 2.6 cfs (1.68 mgd). This water right would be adequate for the District for approximately 40 years. The permitted point of diversion (POD) of the permit is at the Toledo intake on the river near river mile 40. The District's permit has a priority date of 1973 which is junior to the Instream Water Right (ISWR) established in 1966. The ISWR reserves 100 cfs in the river from July 1 to September 30 each year for aquatic life and recreational use. Streamflow records from USGS gauging station 143055 near the POD show that summer flows can often drop below the reserved ISWR (See Section 6.1.2). Since flows drop lower than the ISWR and the District's rights are junior (younger) to the ISWR, the potential exists for water restrictions to be imposed on the right whereby the District would not be allowed to withdraw the water. This restriction could occur for weeks or even months at a time. A water availability analysis using data from the Oregon Water Resources Department indicates a water deficit in July, August, September and October when expected stream flows are compared with all previously approved water use permits (including Seal Rock's).

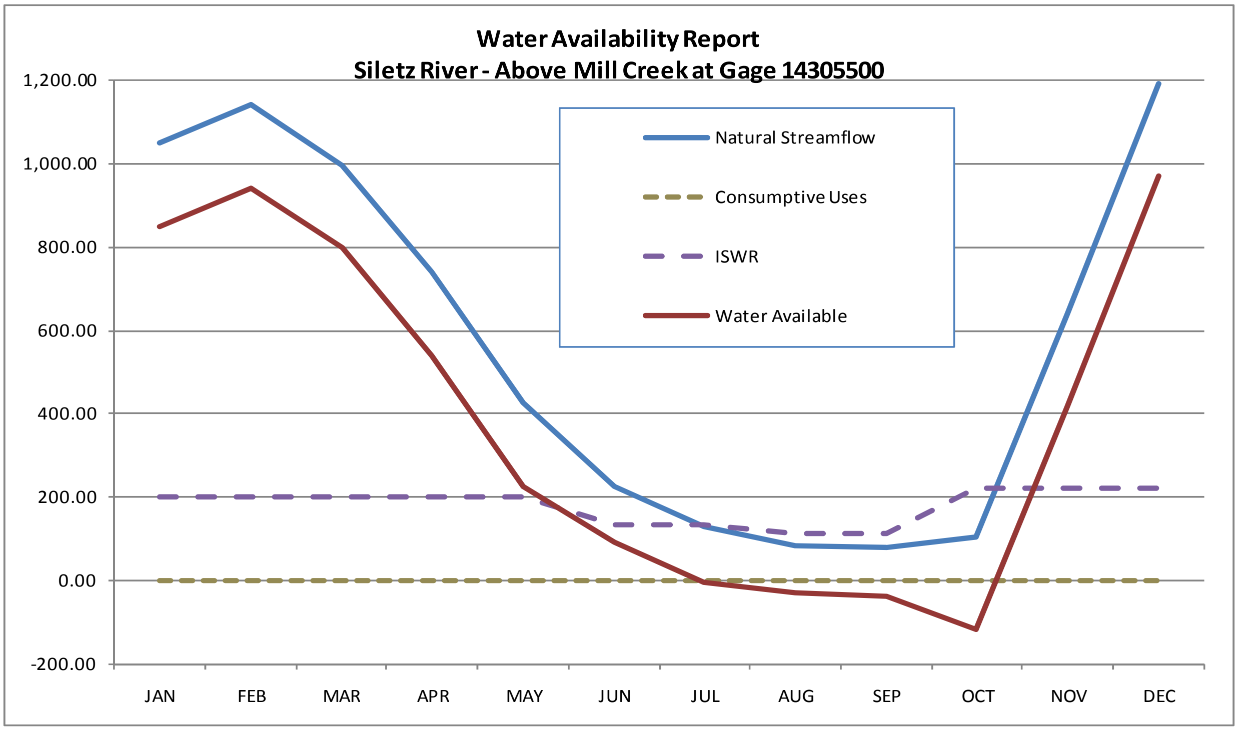


Figure 7.1.3-1 – Siletz River Water Availability

To supply raw water to the District would require continued sharing of the Toledo intake and raw water transmission piping (or new separate intake and transmission pipe to Toledo area at even greater expense), new raw water piping around and bypassing the city of Toledo (See Figure 7.1.3-2), upgrades to the Toledo Pump Station, and a new water treatment facility. The existing 12-inch transmission piping from Toledo to the District would continue to be used to convey or partially convey raw water depending on the location of the new treatment plant. A plant location near the existing Lost Creek Storage Tank is assumed at this point. The new water treatment plant would need provisions to handle the high winter turbidity of the Siletz and would need a 20-year capacity of 850 gpm.

A new 850 gpm treatment plant with high turbidity pre-treatment clarifier, membrane filtration, and backwash disposal facilities has a probable cost of approximately $4.1 million assuming no land acquisition cost. The raw water bypass piping around Toledo would have a probable cost of $3.8 million. The SRWD share of the Siletz Intake and Olalla piping is assumed to remain at $2.0 million.

Raw Water Transmission from the Siletz River (Toledo Bypass)				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$200,000
12" HDD Piping, River Crossings	lf	2,345	$180.00	$422,100
12" Conventional Trench Piping	lf	16,820	$85.00	$1,429,700
Valving and Control at Intertie	ls	1	$150,000.00	$150,000
Asphalt Patching, Road Restoration	lf	16,820	$20.00	$336,400
Construction Cost Total				$2,538,200
Contingency (20%)				$507,640
Engineering (20%)				$507,640
Permitting and Environmental Reviews				$75,000
Project Management and Legal (5%)				$126,910
Total Project Budget Estimate				**$3,755,390**

850 GPM Water Treatment Plant (Siletz River Surface Water)				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$280,000
Pretreatment Clarifier, 45' diam.	ls	1	$600,000	$600,000
Membrane Filtration Equipment	ls	1	$800,000	$800,000
Building, Electrical	sf	2,000	$250	$500,000
Clearwell, Disinfection Equipment	ls	1	$300,000	$300,000
Backwash Waste Storage Basin	ls	2	$80,000	$160,000
Mechanical, Pump Equipment	ls	All	$100,000	$100,000
Site Work, Gravel, Site Piping	ls	All	NA	$50,000
Construction Cost Total				$2,790,000
Contingency (20%)				$558,000
Engineering (20%)				$558,000
Permitting and Environmental Reviews				$50,000
Project Management and Legal (5%)				$139,500
Total Project Budget Estimate				**$4,095,500**

Since considerable expense would be required to allow raw water to be delivered from the Siletz River to the Seal Rock Water District; and the SRWD water right is junior to the instream rights and only sufficient for about a 40-year period; this option is not ideal and is not recommended.

Total Cost - $9.9 million (plus monthly operating expense)

7.1.4 Raw Water from Hill (Deer Creek) Creek

The SRWD has a certificated (certificate No. 32199) water right on Hill Creek, also known as Deer Creek, of 0.4 cfs (179.5 gpm) with a POD about 250 feet east of Highway 101. According to the Water Resources Department Water Availability Analysis, natural streamflows drop to less than half of the water right during the summer months and no additional water is available from June through October. This water right is not considered a viable option for the District.

7.1.5 Raw Water from Mill Creek

The city of Toledo has water rights totaling 15.0 cfs on Mill Creek combined with a 65 foot tall dam holding 250 acre-feet of stored water. Toledo treats water from both Mill Creek and the Siletz River as needed during different times of the year. Historically, raw water from Mill Creek is used in winter months when the Siletz River has high turbidities, and the Siletz River raw water is used in the summer when algae and low flows occur in Mill Creek. Actual streamflows in Mill Creek are very low in the summer months. Past reports have estimated only 1.1 to 1.3 mgd available (including storage attenuation) from Mill Creek in the summer. Although Mill Creek is a very important source of water with ample winter flows and high water quality when needed most (during high turbidity events in the Siletz), summer flows appear to be inadequate to meet the needs of Toledo and Seal Rock. In addition, the SRWD has no water rights on Mill Creek, the city of Toledo is unlikely to consider transfers of water rights, and no new water rights would be granted by Water Resources Department. This water source is not considered a viable option as a source of raw water for the District.

7.1.6 Raw Water from Georgia-Pacific Mill Effluent

The Georgia-Pacific, LLC (GP) paper mill in Toledo discharges approximately 10 mgd of water resulting from the paper manufacturing process. Water for the GP Mill comes from an intake on the Siletz River just upstream from the city of Newport's intake and about 600 feet upstream from the city of Toledo intake. From the Siletz River, the water is pumped through 26-inch AC piping installed in 1957 to the Olalla Reservoir. From the Reservoir, water flows by gravity down West Olalla Creek with a weir valve at near the bottom of the dam controlling flow. A second intake/pump station and tide gate in Toledo near the intersection of Sturdevant Street and 10th Street is utilized to then pump water to the mill site. Following process use and treatment at the mill, waste water then travels to an ocean outfall in Newport about 3800 feet off Nye Beach. Although the waste water from the mill process is high in BOD and would be challenging to treat to drinking water standards, it would be possible with a sophisticated treatment plant costing an estimated $4 million. Significant additional costs in piping water would also be necessary which would likely exceed the cost of a treatment facility. This is not a recommended alternative due to the difficulty, cost, uncertainty, and resulting dependence on a single private factory for the entire community water supply. If the mill was to close for some reason in the future the District would be faced with a significant water supply problem and unknown cost for lease or purchase of huge infrastructure components. It is also uncertain that this industrial water would continue to be available and converted to municipal water if the mill were to close. This option is not considered viable.

7.1.7 Regional Water Supply Options

Based on the *Intergovernmental Water Consortium Interconnection and Regional Water System Study* (Dyer Partnership, 2003), the city of Waldport, the city of Yachats, and the Southwest Lincoln County Water District, all do not have adequate water supplies for the next 50 years. The Study recommended improved interconnection for these three communities together with water conservation and curtailment efforts at cost of $14 million. Eventually, the development of the Yachats River water right held by the city of Yachats with shared supply with an estimated cost of $15 million will be needed according to the Study. Even with full development of all available water supplies for the communities to the south of Seal Rock, it does not appear feasible that excess water would be available in any quantity to send north to Seal Rock.

Based on the *City of Newport Water System Master Plan* (Civil West, 2008), the city of Newport only has sufficient water supply between Big Creek and the Siletz River to meet the City's needs for 20 to 30 years. At this time, regional supply from Newport is not an option. In the Newport Master Plan, an analysis at the time showed that desalination or a regional system using Rocky Creek were the viable future options and that the Rocky Creek option was $10 million less expensive than desalination at approximately $60 million. Rocky Creek has been discussed as a potential supply for many years. In 2000 the Central Coast Water Council was formed including Newport, Lincoln City, Siletz, Toledo, Waldport, Yachats, Kernville-Gleneden, SW Lincoln County Water District, and the Seal Rock Water District and a report titled *Rocky Creek Regional Water Supply Project – Preliminary Water Management Plan* was completed by CH2MHill, Fuller & Morris, and David Evans and Associates in 2002. Newport has an application (R 83810) in at the Oregon Water Resources Department with a date of 1998 to allow storage of 9000 acre-feet on Rocky Creek behind a future 140 foot tall dam along with withdrawal of 6.0 cfs (S 83809). The city of Depoe Bay already has a 1973 permit for 4.0 cfs on Rocky Creek with an intake and pump station which has been withdrawing water for many years. Considering the expense of developing Rocky Creek as a regional supply, several municipalities must be involved including Newport and Lincoln City. The city of Newport is continuing to pursue Rocky Creek as an option for some point in the future but will continue to use existing resources for at least the next 20-years.

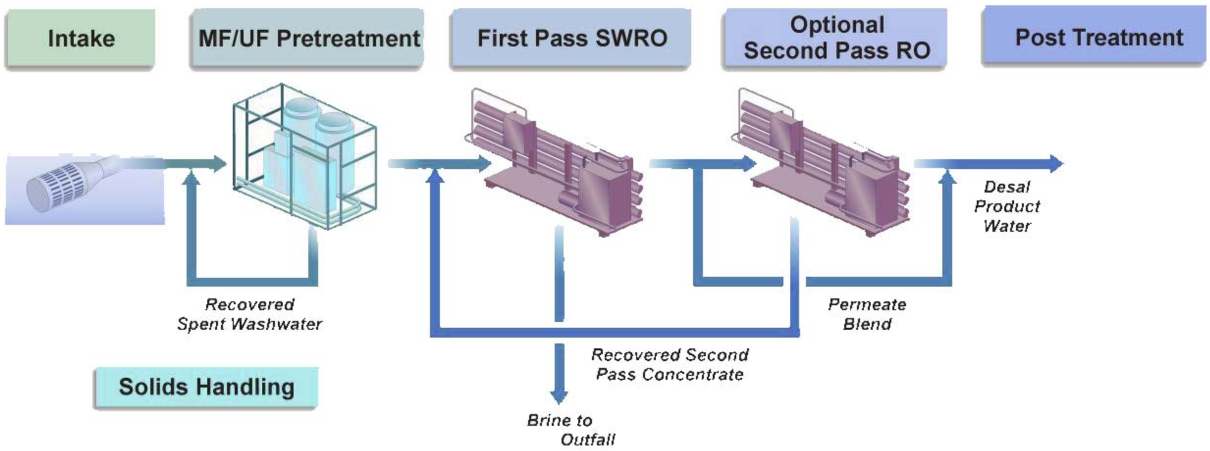
A regional water supply system with supply from communities to the south of Seal Rock or to the north of Seal Rock is not a viable option at this time. Other than supply from the city of Toledo, regional water supply sources are not available unless the Rocky Creek dam were to be constructed at some point in the future or a large seawater desalination plant were to be constructed at one of the communities.

7.1.8 Desalination Treatment Facility Options

For this discussion, desalination is the process of removing salt to convert seawater or brackish water to fresh water suitable for human consumption. Desalination is increasingly investigated as an option for meeting municipal water demands in areas close to a source with little other options available. Most of the world's desalination plants occur in the Middle East and North Africa however less than 1% of the world's water consumed comes from desalination. In the United States, most desalination facilities occur in Florida and southern California. Widespread adoption of desalination is slowed by financial, environmental and regulatory constraints. Large capital costs, high energy requirements and significant brine discharge environmental costs have been the largest hurdles. The obvious benefit of using desalinated ocean water is the near infinite supply of source water, especially for coastal communities.

When brackish water with lower salinity than seawater is available, the cost for treatment and disposal is less than that required to treat seawater. There are actually over 1000 "desalting" plants in the United States however all but a few are used to treat brackish groundwater or other non-seawater sources. The first large-scale seawater desalination plant in the U.S. is the 25 mgd plant in Tampa Bay Florida which went on-line in 2007 ($158M). The most recent serious investigations into municipal desalination include those for the Marin Municipal Water District in California (5 MGD @ $89M) and the Coquina Coast Seawater Desalination Project in Florida (10 MGD @ $180M).

The various components of a desalination treatment system include the intake, pretreatment, desalination equipment, post treatment and concentrate management. Discussion of these components and various options is in the following sections. A simplified flow diagram of a possible seawater reverse osmosis (SWRO) plant is shown on the following page.

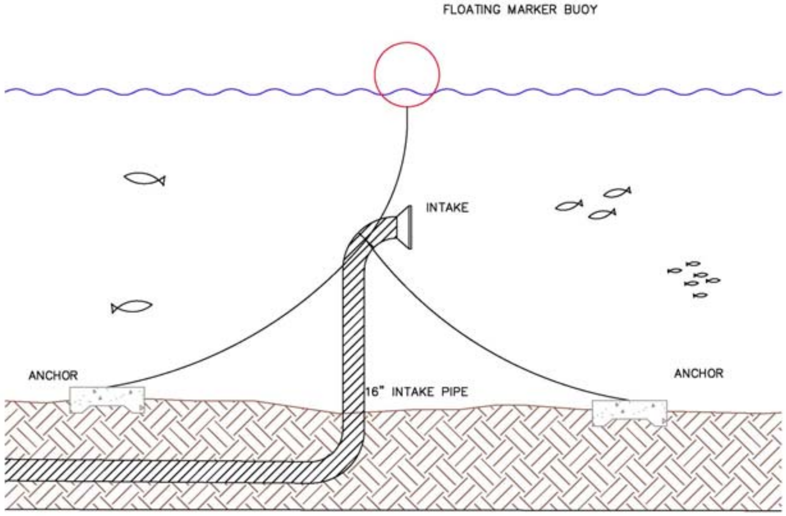


7.1.8.1 Intake

Drawing seawater into the system can be accomplished a number of different ways. Seawater desalination intakes generally fall into one of two major categories—surface intakes located above the seafloor and subsurface intakes located beneath the seafloor or sandy beach. Options therefore include a surface intake (direct draw from ocean) or a subsurface intake (vertical well on shore or a horizontal directional drilled well starting on shore and extending out, below the ocean floor). Each method has advantages and disadvantages as described below.

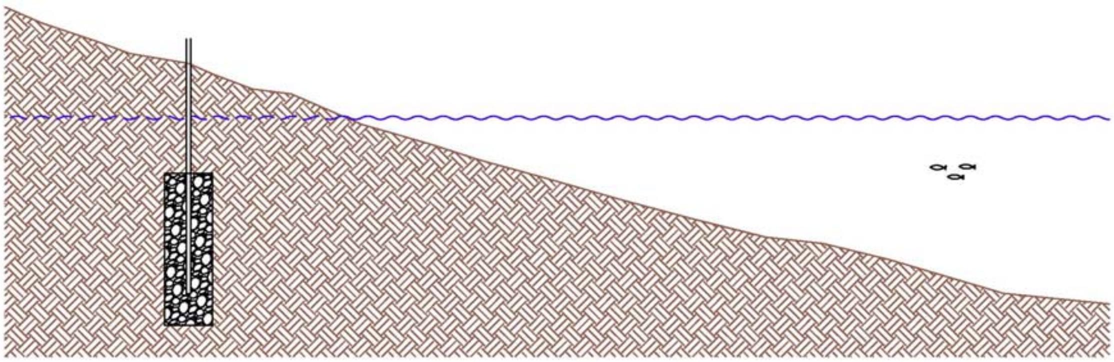
(Surface Intake):

Advantages:	Disadvantages:
• Does not depend on subsurface (below ocean floor) geology. • Easy access to intake structure for inspection and maintenance. • Generally warmer water temperature.	• Located offshore, requires additional piping. • Buffeted by waves, tides and currents; reduced lifespan. • Lower water quality. • Transmission pipe difficult (HDD, atop ocean floor, or direct bury in ocean floor)



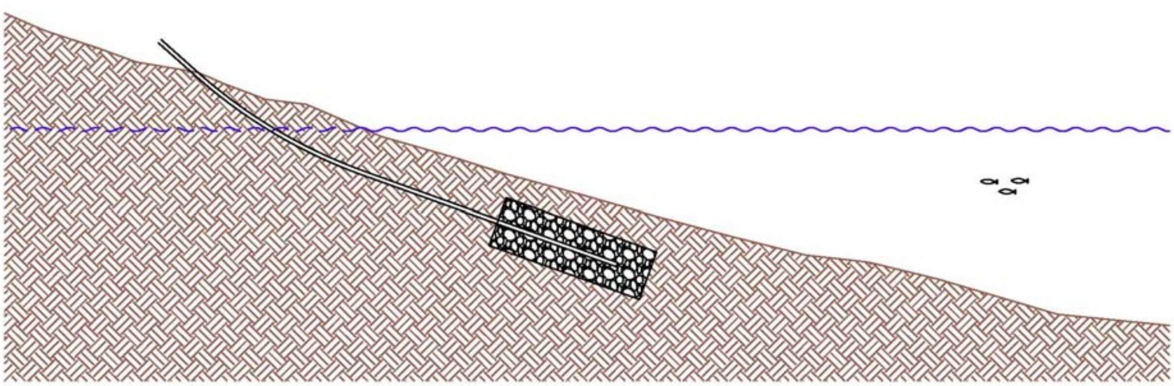
Vertical on-shore well (Subsurface Intake):

Advantages:	Disadvantages:
• Lowest cost. • High water quality (earth and sand act as filter).	• Requires real estate for well. • Unknown substrate geology; might be impermeable rock. • Generally lower water temperature.



Horizontal Directional Drill (Subsurface Intake):

Advantages:	Disadvantages:
• Less dependent on deep geology than vertical well. • High water quality (earth and sand act as filter).	• Unknown substrate geology; might be impermeable rock. • Generally lower water temperature. • More expensive



Based upon the limited information available at this time it is not known whether a subsurface intake would be feasible in the Seal Rock area and a surface intake is assumed for evaluation purposes. A surface intake, which is not dependent on substrate geology, will need to be located far enough offshore to obtain water which has fewer suspended solids as a result of wave turbulence. For the purposes of this investigation, we have assumed a surface intake 1500 feet offshore. As described in section 7.1.8.3, in order to produce the required 1.2 MGD of drinking water (see Section 4.2.2), at least twice as much seawater will need to be processed. In order to convey 2.4 MGD of seawater, a minimum of a 16-inch pipe will extend from the pump station to the offshore intake.

7.1.8.2 Pretreatment

As discussed in the following section, the likely method of desalination will be Reverse Osmosis. Because reverse osmosis utilizes a filter with very small openings, if raw seawater were to be used, the filters would clog very quickly. Typically reverse osmosis filters are used only after the larger contaminants have been removed from the water.

Pretreatment of seawater requires a process substantially similar to full treatment of fresh water. Options include chemical flocculation/clarification/media filtration or microfiltration/ultrafiltration with membranes technology. Since pretreatment methods are less costly than the desalination process, it is worthwhile to design pretreatment to reduce as many contaminants as possible so that the desalination process is not burdened with additional impurities. Sludge handling and backwash waste disposal facilities are also required as a result of the chemical coagulation and particle removal process. There would not likely be a significant cost difference between conventional processes and membrane pretreatment and both methods are employed at various existing facilities. Pilot studies would be required to determine the most suitable method for pretreatment in Seal Rock.

7.1.8.3 Desalination

Several technologies exist to remove salt from seawater or brackish water to drinking water standards and those can be classified into the following three categories:

- Thermal technologies – Technologies that rely on boiling or freezing water to isolate contaminates. Most of the world’s desalination plants use heat to evaporate the clean water.
- Alternative technologies – Technologies that take advantage of non-traditional methods. Although alternative technologies are continuously being investigated, none currently exist which are cost comparable to membrane and thermal technologies and reliable enough for municipal use.
- Membrane technologies – Technologies that desalinate and purify water by forcing the water to flow through a semi-permeable membrane that removes contaminates. Reverse and forward osmosis are two examples of membrane treatment. Most of the desalination plants within the United States use reverse osmosis (RO) and essentially all desalination plants being planned today will use RO.

Thermal technologies are feasible when treatment can be combined with a heat source; most commonly a power generation plant. Excess heat from the power plant can be used to “distill” the salt water into drinking water. In the absence of a “free” heat source, thermal technologies require much more energy than RO plants. Additionally, the cold water temperatures off the Oregon coast make brute force distillation even more energy intensive and impractical. For this reason, this analysis will primarily focus on RO treatment as the likely preferred desalination method.

Reverse Osmosis is the process of forcing water through a filter with very small openings (<0.1nm) which allow water molecules through but prevent the passing of larger molecules such as salt and other dissolved solids. In order to force the water through the membrane, the water must be pressurized to between 600 to 1000 psi. The pressure required is subject to change based on factors such as salinity, temperature, and other contaminants still in the water after pretreatment. Forward osmosis (FO) is a method which uses osmotic pressure created by a draw solution instead of applied hydraulic pressure for mass transport. FO has been studied for potential desalination of seawater for at least 30 years but as yet has not found to be suitable in municipal applications. Bench-scale and other small-scale tests have shown FO using a draw solution of ammonia-carbon dioxide to be a viable desalination method however not for large scale implementations. Limitations with FO still exist today, including lack of ideal high-performance membranes and lack of an easily separable draw solution.

Desalination of brackish water (lower salt content than sea water) requires less pressure than sea water and thus has a slightly lower capital cost and lower operating costs. The community of Seal Rock may not have feasible access to brackish water. No brackish groundwater is anticipated to be available. No water is available in Yaquina Bay or Alsea Bay per Water Resource Department. Beaver Creek may have water available but it is not known how far upstream an intake would be required in order to achieve consistent brackish water conditions with salinity low enough to realize meaningful cost reductions. Therefore, for the purposes of this study it is assumed that the source water will come from the Pacific Ocean. Because of the salinity in the ocean (35,000 ppm), the expected drinking water yield is approximately 50% using best available technology today. Since 1.2 MGD is required to meet the needs of the community, at least 2.4 MGD must be withdrawn from the ocean. 1.2 MGD will re-enter the ocean as concentrate as discussed in section 7.1.8.5.

Pressurizing the water is the main power draw in a RO desalination system. Technology exists which can "recycle" some of the power by using energy recovery devices, which transfer as much as 75% of the energy contained in the pressurized concentrate to the incoming source water. Since the concentrate represents roughly half of the volume of source water, a net energy reduction of 37% can be expected when energy recovery devices are included.

The power required to pressurize the source water typically represents approximately one third of the cost to operate the plant. The power efficiency of existing plants varies widely, but based on the latest technology, a power consumption rate of 20 KWh/1000 Gal is appropriate for preliminary estimates. Based on the average daily demand (ADD) of 0.36 MGD and electricity costs of $0.08/KWh, the resulting annual power cost is estimated to be $210,000/yr.

7.1.8.4 Post-treatment

Because the RO treatment method removes virtually all of the dissolved solids from the water, the resulting water has low hardness and low alkalinity. Without appropriate post-treatment, the water would be very corrosive and would introduce metals into the drinking water and reduce the life expectancy of the distribution system.

Current post-treatment options include the addition of chemicals such as calcium hydroxide to increase the hardness and alkalinity and sodium hydroxide to adjust the pH. Another option is to mix the treated water with another water source. While this is certainly a less expensive option and is available to users who are looking to supplement their existing water source, it is not practical when desalination is the only source.

7.1.8.5 Concentrate Management

Current RO treatment of sea water will yield 50% drinking water, leaving 50% of the water pumped from the ocean as "concentrate". The concentrate will have twice as many contaminants, including salt, as the source water and will require a NPDES permit to discharge. The Oregon Department of Environmental

Quality currently does not have any standards for concentrate discharge but has indicated that they will likely look to California for guidance. For the purposes of this investigation, it is assumed that no treatment of the concentrate will be required.

Concentrate discharge also represents the largest environmental hurdle. Organizations such as the Surfrider Foundation and Greenpeace have consistently opposed desalination plants on the grounds that the concentrate is harmful to the ocean environment. Their other concerns regarding desalination are the large energy requirements to operate and the possibility of capturing sea life in the intake. A very important consideration in planning is the likelihood of several years of environmental opposition, pilot studies, and permitting negotiations.

7.1.8.6 Desalination Facility Probable Cost

As calculated in the table below, the estimated planning level budget cost for a small 1.2 MGD seawater desalination facility is approximately $36.7 million including pilot studies, permitting, and land acquisition. The cost for construction (including estimated contractor markups, overhead, and profit) and basic engineering (engineering design, construction management, inspection) is approximately $21.45 per gallon. As a comparison for the same items, the recent study for the Marin Municipal Water District predicted a unit cost of approximately $17 per gallon for a 5 MGD facility utilizing an existing wastewater treatment plant outfall. Annual operating and maintenance costs for labor, chemicals, energy, etc. are estimated at $630,000 per year.

Seawater Desalination Plant, 850 GPM				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	$2,200,000	$2,200,000
Ocean Intake	lf	1,500	$1,800	$2,700,000
Supply Pump Station	ea	1	$350,000	$350,000
Intake Screening and Cleaning Equipment	ls	1	$250,000	$250,000
Ocean Outfall	lf	2,500	$1,800	$4,500,000
Pretreatment Equipment	ls	1	$2,000,000	$2,000,000
Solids Handling	ls	1	$500,000	$500,000
High Pressure Pumping Equipment	ea	2	$120,000	$240,000
Energy Recovery Equipment	ea	1	$100,000	$100,000
RO Membrane Equipment	ls	1	$4,000,000	$4,000,000
Post Treatment	ls	1	$300,000	$300,000
Building, Electrical	sf	4,000	$250	$1,000,000
Off-Site Electrical and Electrical Service	ls	All	$1,500,000	$1,500,000
Mechanical Piping, Valving, Metering	ls	All	$650,000	$650,000
Concentrate Holding, Pumping Equipment	ls	1	$500,000	$500,000
Site Work, Gravel, Site Piping	ls	All	$1,000,000	$1,000,000
Clearwell, Disinfection Equipment	ls	1	$300,000	$300,000
Connection Piping to System	lf	1,000	$85	$85,000
Construction Cost Total				$22,175,000
Contingency (20%)				$4,435,000
Engineering (18%)				$3,991,500
Pilot Studies, Water Testing				$2,000,000
Land Acquisition				$1,000,000
Permitting and Environmental Reviews				$2,000,000
Project Management and Legal (5%)				$1,108,750
Total Project Budget Estimate				**$36,710,250**

7.1.9 Other Surface Water Supply Options

A Water Study in 1989 concluded that the various small creeks in the area, including Henderson, Moore, Thiel, and Deer Creek have insufficient flow and inadequate impoundment potential to be considered viable water supply options. Drift Creek was determined to have adequate flow and the District once held permit 43196 with a priority date of 1978 allowing for 10.0 cfs withdrawal from Drift Creek. Due to expense of treatment and transmission of water from Drift Creek and the fact that the permit was junior to the then upcoming instream rights, the Drift Creek right was cancelled. Today there is no additional water available in Drift Creek. According to the 1989 Study, Beaver Creek flows were measured on October 17, 1972 and found to be only 0.77 cfs and a conclusion was made that Beaver Creek was not a viable source of supply. According to Water Resource Department (WRD) mathematical estimates today, Beaver Creek (at the mouth) does have sufficient available water to supply the District. It is assumed that even if water is available in sufficient quantities from Beaver Creek and new water rights could be issued, at least a brackish water desalination facility would be required. According the water availability reports from WRD, no additional water is available in year around from Yaquina Bay and from Alsea Bay.

7.1.10 Recommended Water Supply Option

The SRWD generally has two options for long-term water supply. The options include the continued wholesale purchase of water from Toledo or the construction and operation of a desalination plant in Seal Rock. The least cost option by far is to continue the wholesale purchase of water from the city of Toledo. The estimated budget cost for a 1.2 MGD desalination facility is $36.7 million. The recent Water Master Plan for Toledo estimates (for all 4 phases of the entire CIP) that approximately $7.2 million dollars from the SRWD (and $7.2 million from the city) would rebuild both the supply from Mill Creek and the supply from the Siletz River as well as upgrade the water treatment facility. As discussed in Section 7.1.2, the water rights held by the city of Toledo are sufficient to supply the city and the District for many years beyond the current planning period. Even though the $7.2 million represents improvements sized only for the next 20-years, the major infrastructure built with these funds would provide for service well beyond 20 years with relatively minor capacity increase projects such as new pumps.

Challenges exist for the two communities to adequately and equitably provide for future water supply needs. Seal Rock must have assurance that the city can and will provide water to the District for at least the next 20 years without significant limitations on quantities and at a justifiable price. Toledo must be assured that Seal Rock will remain a water customer before the city can justify the expense of making and maintaining improvements large enough to serve both communities. Both communities and their residents can benefit from spreading the financial burden of capital improvements over a larger customer base. Options for financial burden sharing may include loans to the city only or loans to both the city and the District. The District should coordinate with the city and pursue an agreement to ensure water supply and arrange for equitable financial burden sharing.

7.2 Treated Water Storage Needs and Alternatives

Based on typical cleaning cycles needed and reports of a few inches of sediment in the bottom, the Lost Creek storage tank should be vacuumed by divers in the near future. Cleaning every 5 years should be budgeted.

As discussed in Section 4, the goal for treated water storage is to have 4 average days of emergency water (4 x ADD), a modest amount of equalization storage to provide for diurnal fluctuations in tank water levels (25% of one MDD), plus fire storage sufficient to supply 1500 gpm for 2 hours. The recommended 20-year storage is therefore 2.5 MG (4 x 0.5 + 0.25 x 1.1 + 0.18). Existing storage is equal to 2.3 MG between the Lost Creek Tank and the Driftwood Tank assuming the tanks are 100% full.

Figure 7.2-1 – Finished Water Storage Needs

Year	ADD (gpd)	MDD (gpd)	Existing Storage (MG)	Emergency Storage Need (MG)	Fire Storage Need (MG)	Equalization Storage Need (MG)	Storage Deficit (MG)
2008	360,000	785,000	2.3	1.44	0.18	0.20	-0.48
2009	365,400	796,775	2.3	1.46	0.18	0.20	-0.46
2010	370,881	808,727	2.3	1.48	0.18	0.20	-0.43
2011	376,444	820,858	2.3	1.51	0.18	0.21	-0.41
2012	382,091	833,170	2.3	1.53	0.18	0.21	-0.38
2013	387,822	845,668	2.3	1.55	0.18	0.21	-0.36
2014	393,640	858,353	2.3	1.57	0.18	0.21	-0.33
2015	399,544	871,228	2.3	1.60	0.18	0.22	-0.30
2016	405,537	884,297	2.3	1.62	0.18	0.22	-0.28
2017	411,620	897,561	2.3	1.65	0.18	0.22	-0.25
2018	417,795	911,025	2.3	1.67	0.18	0.23	-0.22
2019	424,062	924,690	2.3	1.70	0.18	0.23	-0.19
2020	430,423	938,560	2.3	1.72	0.18	0.23	-0.16
2021	436,879	952,639	2.3	1.75	0.18	0.24	-0.13
2022	443,432	966,928	2.3	1.77	0.18	0.24	-0.10
2023	450,084	981,432	2.3	1.80	0.18	0.25	-0.07
2024	456,835	996,154	2.3	1.83	0.18	0.25	-0.04
2025	463,687	1,011,096	2.3	1.85	0.18	0.25	-0.01
2026	470,643	1,026,262	2.3	1.88	0.18	0.26	0.02
2027	477,702	1,041,656	2.3	1.91	0.18	0.26	0.05
2028	484,868	1,057,281	2.3	1.94	0.18	0.26	0.08
2029	492,141	1,073,140	2.3	1.97	0.18	0.27	0.12
2030	499,523	1,089,238	2.3	2.00	0.18	0.27	0.15
2031	507,016	1,105,576	2.3	2.03	0.18	0.28	0.18
2032	514,621	1,122,160	2.3	2.06	0.18	0.28	0.22
2033	522,340	1,138,992	2.3	2.09	0.18	0.28	0.25
2034	530,175	1,156,077	2.3	2.12	0.18	0.29	0.29
2035	538,128	1,173,418	2.3	2.15	0.18	0.29	0.33

As can be seen in Table 7.2 current storage facilities are adequate for the next 15 years; however, based on the storage goals, the District will be deficient by 200,000 gallons a couple of years after the end of the planning period. A suitable elevation and location for a tank within the District exists on Cross Street and current number of homes in this area and future development potential further justify a high level storage tank in lieu of a hydro-pneumatic booster pump station. A cost estimate follows for a 200,000-gallon storage tank on Cross Street for current planning purposes however storage needs should be reevaluated later in the planning period; potentially in 10 to 15 years (year 2020 to 2025). At that time a tank larger than 200,000 gallons will be justified and an updated 20-year demand-sized tank should be constructed in order to ensure a reasonable useful life.

Cross Street Storage Tank (Water Surface 305')				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$40,000
200,000 Gallon Steel Storage Tank	ls	1	$230,000	$230,000
Excavation and Site Work	ls	All	$35,000	$35,000
Connecting Piping to System, 8-inch	lf	1,500	$65	$97,500
Site Piping, Fencing, Vaults	ls	All	$50,000	$50,000
Fire Hydrant Assemblies	ea	3	$3,500	$10,500
Construction Cost Total				$463,000
Contingency (20%)				$92,600
Engineering (20%)				$92,600
Geotechnical Investigations				$15,000
Environmental Reviews				$50,000
Project Management and Legal (5%)				$23,150
Total Project Budget Estimate				**$736,350**

7.3 Distribution System Needs and Alternatives

7.3.1 Water Distribution System Hydraulic Analysis

As discussed in Section 6.5, the system contains undersized piping and numerous dead-ends which limit fire flow ability. In order to accurately investigate potential problems and determine the most economical solutions a computer model of the system is developed to mimic the actual physical system in spatial layout, elevation, storage tank locations, and pipe sizes. A program called Bentley WaterCAD V8i was used to model the system. The District recently completed a comprehensive aerial mapping project of the service area. Accurate layout of roadways, structures, and other surface improvements was obtained from the photogrammetric survey as was detailed elevation data. Subsequent GPS data was collected by the District for valve, hydrant, and other appurtenance locations. The spatial layout of the piping system was superimposed on the accurate aerial mapping and pipe sizes were obtained from previous records and staff knowledge.

The modeling is used to check that the goals outlined in Section 4 are met. In general those goals include:

1) During Peak Hourly Demands, the system maintains at least 40 psi
2) During Fire Flow Demands plus Maximum Day Demands, the system maintains at least 20 psi

Existing conditions and future conditions were modeled to determine deficiencies and solutions. As is typical, pipe size needs are almost entirely dictated by fire flow goals with normal domestic water demands having little impact. Fire flow availability is limited by the rule which requires at least 20 psi in the system at all times. The model predicts the maximum flow that can be withdrawn at any location before pressures either at that location or anywhere else in the system are pulled below 20 psi.

A visual summary of the fire hydrant coverage and flow deficiencies is presented in Figure 7.3-1 with hydrants flow availability color coded according to National Fire Protection Association (NFPA) recommendations in NFPA 291 modified to show those hydrants with less than 750 gpm available as well.

7.3.2 Water Distribution System Pipe Deficiencies

7.3.2.1 Low-Pressure Areas

Most areas of the system are able to maintain 40+ psi even during peak hourly demands. A few locations however, where piping has been allowed to extend into higher elevations, have less than 40 psi. These low pressure areas – most of which are near or south of the Driftwood Storage Tank - include NW Lotus Lake Drive (worst in the system at 25 psi), Legion Road, portions above NW Terrace Court not served by the Driftwood BPS, portions along the east side of NW Hidden Lake Loop, and the north end of NW Shore View Drive. Another problem area that has marginal static pressure and impacts fire flow to other areas is the high point on the existing 2-inch on Art Street. The high point on the 12-inch piping SE 130th Drive near the Lost Creek BPS inlet also has less than 40 psi. None of these areas appear to have violations of the 20 psi minimum rule under normal circumstances however they do limit fire flow potential in other areas since they tend to drop to 20 psi quickly under fire flow conditions, even for some fire hydrants far away from the actual 20 psi limiting location. For example, the high point on the 2-inch piping along Art Street is the first point in the system to drop to 20 psi when the fire hydrant near the York PS is opened. The District should use extreme caution and request engineering review prior to pipe extensions into higher elevations. In no case should piping be extended beyond the maximum service elevation of a pressure zone without new booster pump stations and/or high level storage tanks. These new improvements typically will be paid for by private developers rather than the public.

7.3.2.2 Deteriorated Piping Areas

Based on staff reports of pipe age, condition and repair frequency; deteriorated piping problem areas include the 3-inch piping on Marsh Street, the 6-inch piping near the beach along the south end of Bayshore, various 2-inch piping on Quail Street and other portions along Old Coast Road, 2-inch on 100th Court, and virtually all 2- and 3-inch piping in Pacific Shores. Other areas also exist where existing deteriorated ABS pipe requires frequent repairs.

7.3.2.3 Vulnerable Areas

Due to the nature of the District's long and narrow system with a single 12-inch trunk line along the Highway and many areas with no looping, the potential exists for a single pipe failure event to cause the loss of water supply to large areas. Each ravine or creek crossing along the Highway is a vulnerable location. Perhaps the most vulnerable piping section in the District occurs where the aging 10-inch exposed piping crosses the bridge at Beaver Creek. A pipe failure at the Beaver Creek bridge crossing would result in a complete separation from the main storage (Lost Creek Storage Tank) and the supply from Toledo for the majority of the District.

Additional vulnerabilities include the long run of 8-inch pipe along the Highway from SE 116th Street to SE 98th Street (crossing Thiel Creek), some 4-inch exposed piping at creek crossings in Silver Sands, the south end of Bayshore fed with a single 6-inch pipe which breaks frequently, and the 6-inch piping running from the Beaver Creek PS down to the beach and feeding the Ona Beach State Park.

7.3.2.4 Undersized Piping Areas

With over 50,000 feet of 2-inch piping, the District has numerous areas served with undersized piping. An excessive number of homes are served through excessive lengths of 2-inch piping on Art Street, NW Parkview Street, NW Quail Street, Old Coast Road and other areas west of Seal Rock Street, NW Huckleberry Lane, SW 100th Court, SE 145th Street, SW Brandt Street, SW Abalone Street, several streets in Pacific Shores, Silver Sands, and many other areas along the beach.

7.3.3 Fire Hydrant Deficiencies

The system has numerous areas where no fire hydrants exist to protect existing structures. These areas are mostly where undersized 2-inch, 3-inch or 4-inch piping exists and adequate hydrant flows are not possible at this time. There are some locations however where the existing piping is adequate but hydrant spacing is either too far or no hydrants are placed. The 2007 Oregon Fire Code indicates a maximum average spacing between hydrants of 500 feet (C105).

The goal of at least 1000 gpm in residential only areas is typical for most communities. The 2007 Oregon Fire Code also indicates (B105) that available fire flow be at least 1000 gpm at 20 psi for one- and two-family dwellings not exceeding 3600 square feet in area.

Of the 151 fire hydrants in the SRWD; 98 hydrants (65%) cannot produce 1000 gpm without causing some point in the system to drop to 20 psi or below (See Figure 7.3-1).

46 of the hydrants (30%) do not have the ability to provide 750 gpm. 52 hydrants (34%) can provide between 500 and 750 gpm. Only 5 hydrants (3%) produce less than 500 gpm. 46 hydrants (30%) are able to provide 1000 to 1499 gpm. 7 of the hydrants (5%) are able to provide in excess of 1500 gpm.

7.3.4 Pump Station Deficiencies and Recommendations

7.3.4.1 Toledo Pump Station

The pumps in the Toledo PS are due for replacement after over 35 years of service. The station has a newer 60 kW generator which is in good condition. The electrical system includes new soft-start motor starters installed recently during the writing of this Plan. New pumps for the Toledo Pump Station should be sized to provide roughly at least 765 gpm at 80 feet total dynamic head to match the projected 20 year maximum day demand. This pump sizing should be verified during design of the pump station upgrade to account for friction losses in the specific mechanical piping required to properly install the new equipment at the station.

Potential suitable pump choices, subject to verification in design, are a PACO 4012A LCV with a 10.31-inch impeller driven with an 1800 rpm 20 Hp motor or a PACO 5012A VLS with 10.34-inch impeller driven with an 1800 rpm 20 Hp motor. The hydraulic efficiency of these pumps is around 83% which is very good for a centrifugal pump.

It is likely that mechanical piping modifications will be required to fit the new pumps however these should be minor, especially with a pump like the PACO 5012A VLS which is very similar in configuration to the existing pumps. It also appears that the newly purchased soft-start motor starters and standby generator will work with new pump motors since both the potential new pumps and the existing pumps are 20 Hp.

Toledo Pump Station Upgrade				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$3,000
Pump and Motor, 765 gpm	ea	2	$7,000.00	$14,000
Mechanical Piping Modifications	ls	All	$4,000.00	$4,000
Electrical Work, conductors to motors	ls	1	$5,000.00	$5,000
Pump Base Modifications	ea	2	$500.00	$1,000
Construction Cost Total				$27,000
Contingency (20%)				$5,400
Engineering (20%)				$5,400
Project Management and Legal (5%)				$1,350
Total Project Budget Estimate				**$39,150**

7.3.4.2 Beaver Creek Pump Station

Based on the latest computer modeling of the District system, the Beaver Creek Pump Station merely exists to overcome excessive pipe friction due to the small diameter pipe and fittings at the pump station itself. With the old Makai storage tank offline and the newer 12-inch piping along the Highway, the pump station essentially becomes useless with identical pressure zones on both the suction and discharge side of the station. In fact, the pump is too small to be effective and the pump station actually restricts flow.

It is recommended that the pump be removed and a 12-inch minimum bypass pipe constructed around the building. Increased flows will then be possible through the 12-inch main piping near Beaver Creek with little pressure change in the system. The greatest pressure impact created by the elimination of the pump station will be a 4 psi drop in pressure at the top of Art Street (47 psi to 43 psi) when the York PS is on. If the Beaver Creek PS is removed and the York PS is then upgraded to produce 400 gpm, the pressure at the top of Art Street will drop to approximately 39 psi when the York PS is on and 45 psi when off.

Beaver Creek Pump Station Bypass/Abandonment				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$2,000
12-inch Piping	lf	45	$85.00	$3,825
Fittings and Gate Valves	ls	All	$2,500.00	$2,500
Demolition and Removal	ls	1	$2,000.00	$2,000
Interior Pipe Changes	ea	1	$500.00	$500
Construction Cost Total				$10,825
Contingency (20%)				$2,165
Engineering (20%)				$2,165
Project Management and Legal (5%)				$541
Total Project Budget Estimate				**$15,696**

7.3.4.3 York Pump Station

The 35+ year old York Pump Station currently contains undersized pumps and piping. The aging existing pumps are also past their expected design life. With flows of only 180 to 230 gpm produced by the pumping equipment, it is not possible to keep up with system demand and fill the Driftwood Storage Tank during peak summer periods and the pumps run continuously at times – sometimes for several days at a time. Like the Beaver Creek Pump Station, the York Pump Station has no function other than to overcome pipe hydraulic restrictions (same pressure zone on suction and discharge side). However, unlike the Beaver Creek station, the York station cannot be removed and economically replaced with larger pipe.

It is recommended that the York PS pumps be replaced with larger pumps rated for approximately 400 to 500 gpm. Two pumps should be installed with each operating independently and on automatic alternation to provide redundancy. The small diameter interior piping in the pump station should be replaced with as much 6-inch piping as possible.

New pumps can be sized roughly to provide 400 gpm at 35 feet total dynamic head depending on piping details inside the building. Potential suitable pump choices, subject to verification in design, are a PACO 4012A LC or LCV with a 9.89-inch impeller driven with a 1200 rpm 5 Hp motor or a PACO 5012A VLS with 9.97-inch impeller driven with a 1200 rpm 5 Hp motor. The hydraulic efficiency of these pumps is around 82-85% which is very good for a centrifugal pump.

Increasing the capacity of the York PS creates additional headloss in the main 12-inch trunk piping along the Highway and slightly reduces available fire flows on Grebe Street and the surrounding areas and in the Makai area due undersized piping in these areas.

York Pump Station Upgrade				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$3,300
Pump and Motor, 400 gpm	ea	2	$3,500.00	$7,000
Mechanical Piping Modifications	ls	All	$10,000.00	$10,000
Electrical Work, new control panel	ls	1	$12,000.00	$12,000
Pump Base Modifications	ea	2	$500.00	$1,000
Construction Cost Total				$33,300
Contingency (20%)				$6,660
Engineering (20%)				$6,660
Project Management and Legal (5%)				$1,665
Total Project Budget Estimate				**$48,285**

7.3.4.4 East Bayshore Booster Pump Station

Need soft-start motor starters for larger pumps to allow starting under standby generator power.

7.3.4.5 Cross Street Booster Pump Station

Need soft-start motor starters for larger pumps to allow starting under standby generator power.

7.3.4.6 Thiel Creek Chlorine Booster Station

Need ventilation system to reduce interior moisture and subsequent deterioration and corrosion.

7.3.5 Distribution System Improvement Recommendations and Costs

To correct marginal hydrant flows in South Bayshore and to address the vulnerability of the single 6-inch pipe along S. Oceania Drive it is recommended that an 8-inch pipe be installed by horizontal directional drill methods from Admiralty Circle to Marine View Drive.

Distribution Piping - HDD at South Bayshore				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$7,500
Pipe, Trenching, Gravel Backfill - 8"	lf	30	$65	$1,950
Horizontal Direction Drill (HDD) - 8"	lf	450	$135	$60,750
Asphalt Patching	lf	30	$20	$600
Fire Hydrant Assemblies	ea	1	$3,500	$3,500
Construction Cost Total				$74,300
Contingency (20%)				$14,860
Engineering (20%)				$14,860
Easement Acquisition, Legal				$5,000
Project Management and Legal (5%)				$3,715
Total Project Budget Estimate				**$112,735**

To correct the extreme low pressure area and very poor performing fire hydrants around NW Lotus Lake Drive the piping needs to be extended on the west end to connect upstream (high pressure side) of the Sandpiper Pressure Reducing Station and then extended on the east end to loop into the existing piping on Highway 101. This also benefits the entire Bayshore area by creating a third pipe feed in addition to the existing pipe on Bayshore Loop and the existing pipe on Sandpiper Drive.

Distribution Piping - NW Lotus Lake Dr. / Parker Way				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$6,500
Pipe, Trenching, Gravel Backfill - 8"	lf	630	$65	$40,950
Horizontal Direction Drill (HDD) - 8"	lf	70	$135	$9,450
Asphalt Patching	lf	100	$20	$2,000
Fire Hydrant Assemblies	ea	2	$3,500	$7,000
Construction Cost Total				$65,900
Contingency (20%)				$13,180
Engineering (20%)				$13,180
Project Management and Legal (5%)				$3,295
Total Project Budget Estimate				**$95,555**

Over 30 homes in the Silver Sands area on Powe Drive and Sarkisian Drive are served from existing 2- and 4- inch piping with no fire flow ability. Piping is also exposed in this area at the creek crossings. The 2-inch piping on Powe Drive should be replaced with 6-inch and the creek crossing on Sarkisian Drive should be reconstructed with 6-inch.

Distribution Piping - Powe Drive (Silver Sands)				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$9,500
Pipe, Trenching, Gravel Backfill - 6"	lf	1,000	$55	$55,000
Creek Crossings (two)	lf	200	$80	$16,000
Asphalt Patching	lf	100	$20	$2,000
Fire Hydrant Assemblies	ea	4	$3,500	$14,000
Construction Cost Total				$96,500
Contingency (20%)				$19,300
Engineering (20%)				$19,300
Project Management and Legal (5%)				$4,825
Total Project Budget Estimate				**$139,925**

The undersized 2-inch piping on Orcas Drive should be replaced with 6-inch piping and a fire hydrant installed at the end to function as a blow-off and provide fire protection.

Distribution Piping - NW Orcas Dr.				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$4,800
Pipe, Trenching, Gravel Backfill - 6"	lf	520	$55	$28,600
Horizontal Direction Drill (HDD) - 8"	lf	70	$135	$9,450
Asphalt Patching	lf	100	$20	$2,000
Fire Hydrant Assemblies	ea	1	$3,500	$3,500
Construction Cost Total				$48,350
Contingency (20%)				$9,670
Engineering (20%)				$9,670
Project Management and Legal (5%)				$2,418
Total Project Budget Estimate				**$70,108**

The undersized 2-inch piping on Marsh Street is also deteriorated and requires frequent repairs. This piping should be replaced with 6-inch and a fire hydrant should be installed near the end of the pipe run.

Distribution Piping - Marsh Street				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$3,700
Pipe, Trenching, Gravel Backfill - 6"	lf	500	$55	$27,500
Asphalt Patching	lf	100	$20	$2,000
Fire Hydrant Assemblies	ea	1	$3,500	$3,500
Construction Cost Total				$36,700
Contingency (20%)				$7,340
Engineering (20%)				$7,340
Project Management and Legal (5%)				$1,835
Total Project Budget Estimate				**$53,215**

To correct deteriorating and undersized piping and create a significant loop, the 2-inch piping on Quail Street, the Old Coast road, and Seagull Way should be replaced with 8-inch.

Distribution Piping - Quail Street, Old Coast Road, Seagull Way Loop				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$25,000
Pipe, Trenching, Gravel Backfill - 8"	lf	3,830	$65	$248,950
Pipe, Trenching, Native Backfill - 8"	lf	500	$60	$30,000
Asphalt Patching	lf	300	$20	$6,000
Fire Hydrant Assemblies	ea	5	$3,500	$17,500
Construction Cost Total				$327,450
Contingency (20%)				$65,490
Engineering (20%)				$65,490
Project Management and Legal (5%)				$16,373
Total Project Budget Estimate				**$474,803**

To complete an additional loop and replace more 2-inch piping a second loop from Seagull Way to Bittern Street to Cross Street should be installed.

Distribution Piping - Seagull Way, Bittern, Cross St. Loop				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$13,000
Pipe, Trenching, Gravel Backfill - 8"	lf	520	$65	$33,800
Pipe, Trenching, Gravel Backfill - 6"	lf	300	$55	$16,500
Pipe, Trenching, Native Backfill - 8"	lf	820	$60	$49,200
Asphalt Patching	lf	300	$20	$6,000
Fire Hydrant Assemblies	ea	4	$3,500	$14,000
Construction Cost Total				$132,500
Contingency (20%)				$26,500
Engineering (20%)				$26,500
Project Management and Legal (5%)				$6,625
Total Project Budget Estimate				**$192,125**

To correct deteriorating and undersized piping and create a significant loop, the 2-inch piping on Art Street, Parkview Street, and Line Street should be replaced with 8-inch.

Distribution Piping - Art Street, Park View Street, Line Street Loop				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$25,000
Pipe, Trenching, Gravel Backfill - 8"	lf	3,000	$65	$195,000
Pipe, Trenching, Native Backfill - 8"	lf	500	$60	$30,000
Asphalt Patching	lf	300	$20	$6,000
Fire Hydrant Assemblies	ea	5	$3,500	$17,500
Construction Cost Total				$273,500
Contingency (20%)				$54,700
Engineering (20%)				$54,700
Project Management and Legal (5%)				$13,675
Total Project Budget Estimate				**$396,575**

To correct deteriorating and undersized piping and create a loop, the 2-inch piping on Huckleberry Street and Blackberry Street should be replaced with 6-inch piping and connected to the existing 12-inch piping on the west side of Highway 101 just south of the Beaver Creek PS site. If not connected to the 12-inch, the new piping must be 8-inch to allow proper flows.

Distribution Piping - Huckleberry and Blackberry Street				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$9,500
Pipe, Trenching, Gravel Backfill - 6"	lf	1,425	$55	$78,375
Asphalt Patching	lf	150	$20	$3,000
Fire Hydrant Assemblies	ea	2	$3,500	$7,000
Construction Cost Total				$97,875
Contingency (20%)				$19,575
Engineering (20%)				$19,575
Project Management and Legal (5%)				$4,894
Total Project Budget Estimate				**$141,919**

The existing 10-inch pipe crossing the Highway 101 Bridge at Beaver Creek is vulnerable to wave damage and creates a hydraulic restriction separating the majority of District customers from the water supply. To correct the vulnerability of the exposed piping at the Beaver Creek crossing, to create a redundant pathway for water supply between the northern and southern parts of the District, and to eliminate the vulnerable 6-inch pipe on the beach feeding the State Park restrooms, a new pipe should be installed between NW Estate Drive and the Beaver Creek Pump Station location. The new pipe should be installed by horizontal directional drill (HDD) methods and should be at least 14-inches in diameter. The installation can be done in two parts with a bore pit and pipe surfacing location near the park restrooms so that a new service to the restrooms can be installed. The vulnerable 6-inch pipe on the beach coming from near the Beaver Creek PS can then be abandoned.

Distribution Piping - HDD at Beaver Creek				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$35,000
Pipe, Trenching, Gravel Backfill - 12"	lf	80	$85	$6,800
Horizontal Direction Drill (HDD) - 14"	lf	2,000	$150	$300,000
New Service to Park	lf	100	$20	$2,000
Fire Hydrant Assemblies	ea	1	$3,500	$3,500
Construction Cost Total				$347,300
Contingency (20%)				$69,460
Engineering (20%)				$69,460
Geotechnical Investigations				$15,000
Environmental Reviews				$30,000
Project Management and Legal (5%)				$17,365
Total Project Budget Estimate				**$548,585**

To replace undersized piping in Makai the existing 4-inch on NW Kona Street should be replaced with 8- and 6-inch piping. A section of 4-inch on NW Pali Street should also be replaced with 8-inch.

Distribution Piping - NW Kona Street and Pali Street				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$18,000
Pipe, Trenching, Gravel Backfill - 8" (Kona)	lf	1,190	$65	$77,350
Pipe, Trenching, Gravel Backfill - 8" (Pali)	lf	410	$65	$26,650
Pipe, Trenching, Gravel Backfill - 6"	lf	660	$55	$36,300
Asphalt Patching	lf	200	$20	$4,000
Fire Hydrant Assemblies	ea	6	$3,500	$21,000
Construction Cost Total				$183,300
Contingency (20%)				$36,660
Engineering (20%)				$36,660
Project Management and Legal (5%)				$9,165
Total Project Budget Estimate				**$265,785**

To create a loop and replace the undersized 2-inch piping, new 6-inch piping should be installed on SE 145th Street and connected to the existing 6-inch on SE 144th Street.

Distribution Piping - SE 145th Street				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$6,000
Pipe, Trenching, Gravel Backfill - 6"	lf	870	$55	$47,850
Asphalt Patching	lf	50	$20	$1,000
Fire Hydrant Assemblies	ea	2	$3,500	$7,000
Construction Cost Total				$61,850
Contingency (20%)				$12,370
Engineering (20%)				$12,370
Project Management and Legal (5%)				$3,093
Total Project Budget Estimate				**$89,683**

To correct the undersized single 6-inch pipe feeding SE 127th Drive and SE 126th Drive, new 8-inch should be installed on Chittum Drive.

Distribution Piping - SE Chittum Dr.				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$7,500
Pipe, Trenching, Gravel Backfill - 8"	lf	835	$65	$54,275
Asphalt Patching	lf	100	$20	$2,000
Fire Hydrant Assemblies	ea	3	$3,500	$10,500
Construction Cost Total				$74,275
Contingency (20%)				$14,855
Engineering (20%)				$14,855
Project Management and Legal (5%)				$3,714
Total Project Budget Estimate				**$107,699**

The undersized section of 2-inch on 118th Street from Birch Street to Buckthorn Street should be replaced with 6-inch to connect the existing 6-inch to the existing 4-inch.

Distribution Piping - SE 118th St.				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$2,500
Pipe, Trenching, Gravel Backfill - 6"	lf	315	$55	$17,325
Asphalt Patching	lf	50	$20	$1,000
Fire Hydrant Assemblies	ea	1	$3,500	$3,500
Construction Cost Total				$24,325
Contingency (20%)				$4,865
Engineering (20%)				$4,865
Project Management and Legal (5%)				$1,216
Total Project Budget Estimate				**$35,271**

The undersized and deteriorated 2-inch piping on SW 100th Court should be replaced with 6-inch.

Distribution Piping - SW 100th Court				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$3,000
Pipe, Trenching, Gravel Backfill - 6"	lf	330	$55	$18,150
Asphalt Patching	lf	40	$20	$800
Fire Hydrant Assemblies	ea	1	$3,500	$3,500
Construction Cost Total				$25,450
Contingency (20%)				$5,090
Engineering (20%)				$5,090
Project Management and Legal (5%)				$1,273
Total Project Budget Estimate				**$36,903**

The undersized 2-inch piping on SW Brandt Street and SW Abalone Street should be replaced with 6-inch and looped if possible.

Distribution Piping - SW Brandt, SW Abalone St.				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$13,000
Pipe, Trenching, Gravel Backfill - 6"	lf	1,790	$55	$98,450
Asphalt Patching	lf	300	$20	$6,000
Fire Hydrant Assemblies	ea	4	$3,500	$14,000
Construction Cost Total				$131,450
Contingency (20%)				$26,290
Engineering (20%)				$26,290
Project Management and Legal (5%)				$6,573
Total Project Budget Estimate				**$190,603**

The deteriorated and undersized 2- and 3-inch piping in Pacific Shores should be replaced.

Distribution Piping - Pacific Shores				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$26,000
Pipe, Trenching, Gravel Backfill - 8"	lf	2,450	$65	$159,250
Pipe, Trenching, Gravel Backfill - 6"	lf	670	$55	$36,850
Asphalt Patching	lf	500	$20	$10,000
Fire Hydrant Assemblies	ea	7	$3,500	$24,500
Construction Cost Total				$256,600
Contingency (20%)				$51,320
Engineering (20%)				$51,320
Project Management and Legal (5%)				$12,830
Total Project Budget Estimate				**$372,070**

Due to the extreme long run of non-looped, single 8-inch piping along Highway 101 feeding the north end of the District, the area is vulnerable to a complete service loss in the event of a pipe failure. In addition, fire flow in the Pacific Shores area is very poor with only about 570 gpm being available near the Newport intertie. Options include a new larger pipe along Highway 101 or a second feed from the east along existing gravel roads. Due to the nature of the system layout and lack of looping opportunities, even increasing the feed along the Highway to 24-inch from SE 118th Street does not increase fire flows to even 750 gpm. The only way to improve flows to this north end of the District is to create a loop feeding the area from the east. A new 12-inch pipe connecting to the existing 12-inch transmission line to the Lost Creek Storage Tank and then running along the existing gravel roads north and west to tie in to Theil Creek Road has been discussed in the past and is the best means to improve service to the area. The added benefit is another large loop in the system.

Distribution Piping - East Piping to North End				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$92,000
Pipe, Trenching, Gravel Backfill - 12"	lf	1,800	$85	$153,000
Pipe, Trenching, Native Backfill - 12"	lf	7,950	$75	$596,250
PRV Station	ea	1	$60,000	$60,000
Asphalt Patching	lf	500	$20	$10,000
Fire Hydrant Assemblies	ea	4	$3,500	$14,000
Construction Cost Total				$925,250
Contingency (20%)				$185,050
Engineering (20%)				$185,050
Project Management and Legal (5%)				$46,263
Total Project Budget Estimate				**$1,341,613**

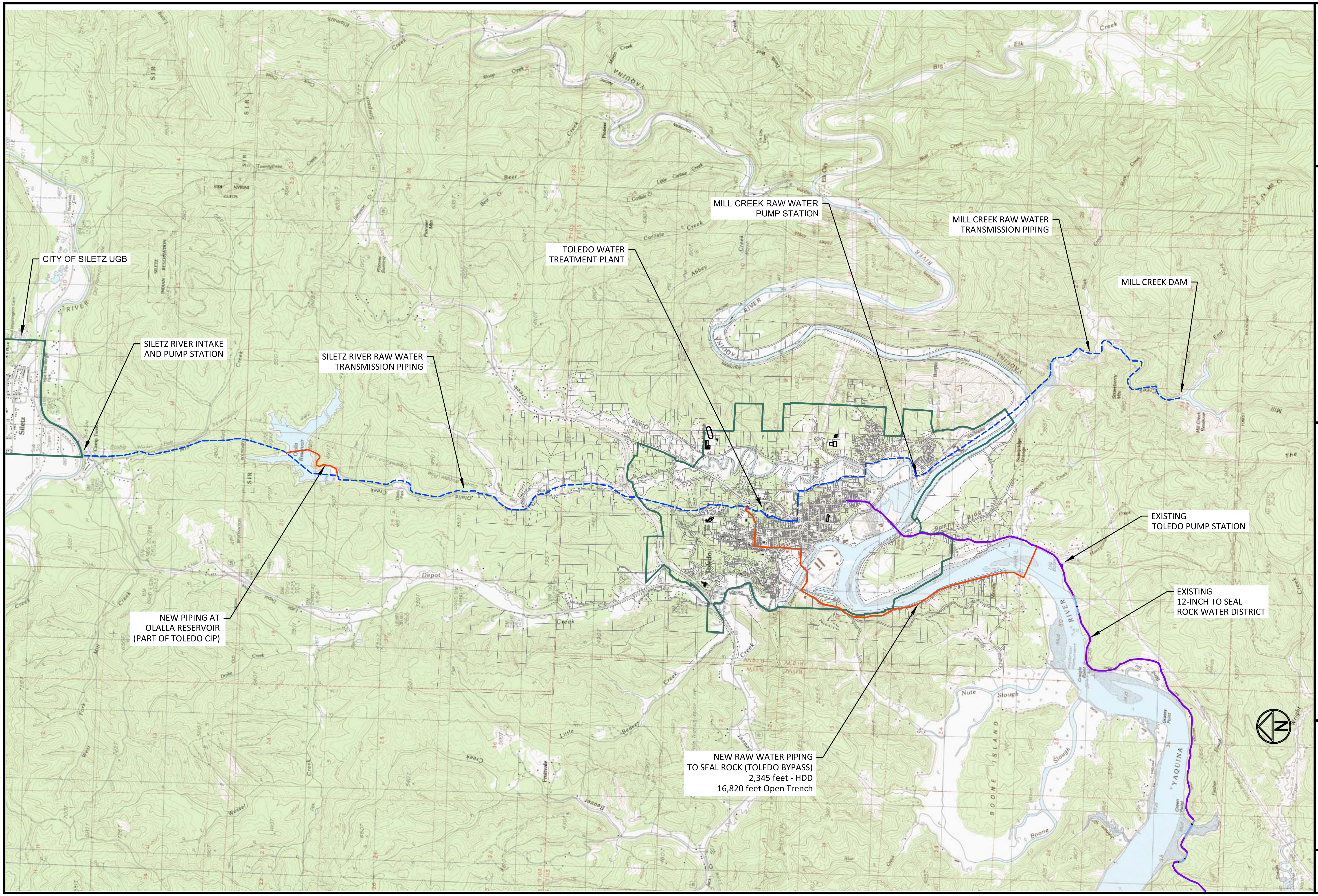
In addition to the new 12-inch east piping, larger piping is needed on Cedar and Birch Streets to correct deficiencies in this area. The long runs of 4-inch piping on these streets is inadequate and should be replaced with 8- and 6- as shown in Figure 7.3.5-5.

Distribution Piping - SE Cedar Street				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$9,500
Pipe, Trenching, Gravel Backfill - 8"	lf	1,150	$65	$74,750
Asphalt Patching	lf	100	$20	$2,000
Fire Hydrant Assemblies	ea	3	$3,500	$10,500
Construction Cost Total				$96,750
Contingency (20%)				$19,350
Engineering (20%)				$19,350
Project Management and Legal (5%)				$4,838
Total Project Budget Estimate				**$140,288**

Distribution Piping - SE Birch Street				
Item Description	***Unit***	***Quantity***	***Unit Cost***	***Item Cost***
Mobilization, Overhead, Profit	ls	All	NA	$26,000
Pipe, Trenching, Gravel Backfill - 8"	lf	340	$65	$22,100
Pipe, Trenching, Gravel Backfill - 6"	lf	930	$55	$51,150
Asphalt Patching	lf	50	$20	$1,000
Fire Hydrant Assemblies	ea	3	$3,500	$10,500
Construction Cost Total				$110,750
Contingency (20%)				$22,150
Engineering (20%)				$22,150
Project Management and Legal (5%)				$5,538
Total Project Budget Estimate				**$160,588**

A summary of the above piping projects is provided below:

Description	**Budget**	**Project #**
Distribution Piping - HDD at South Bayshore	$105,415	P1
Distribution Piping - NW Lotus Lake Dr. / Parker Way	$95,555	P2
Distribution Piping - Powe Drive (Silver Sands)	$139,925	P3
Distribution Piping - NW Orcas Dr.	$70,108	P4
Distribution Piping - Marsh Street	$53,215	P5
Distribution Piping - Quail Street, Old Coast Rd, Seagull Way Loop	$482,053	P6
Distribution Piping - Seagull Way, Bittern, Cross St. Loop	$192,125	P7
Distribution Piping - Art Street, Park View Street, Line Street Loop	$396,575	P8
Distribution Piping - Huckleberry and Blackberry Street	$141,919	P9
Distribution Piping - HDD at Beaver Creek	$548,585	P10
Distribution Piping - NW Kona Street and Pali Street	$265,785	P11
Distribution Piping - SE 145th Street	$89,683	P12
Distribution Piping - SE Chittum Dr.	$107,699	P13
Distribution Piping - SE 118th St.	$35,271	P14
Distribution Piping - SW 100th Court	$36,903	P15
Distribution Piping - SW Brandt, SW Abalone St.	$190,603	P16
Distribution Piping - Pacific Shores	$372,070	P17
Distribution Piping - East Piping to North End	$1,341,613	P18
Distribution Piping - SE Cedar Street	$140,288	P19
Distribution Piping - SE Birch Street	$160,588	P20
	$4,965,973	



Civil West Engineering Services, Inc.

SEAL ROCK WATER DISTRICT
LINCOLN COUNTY, OREGON

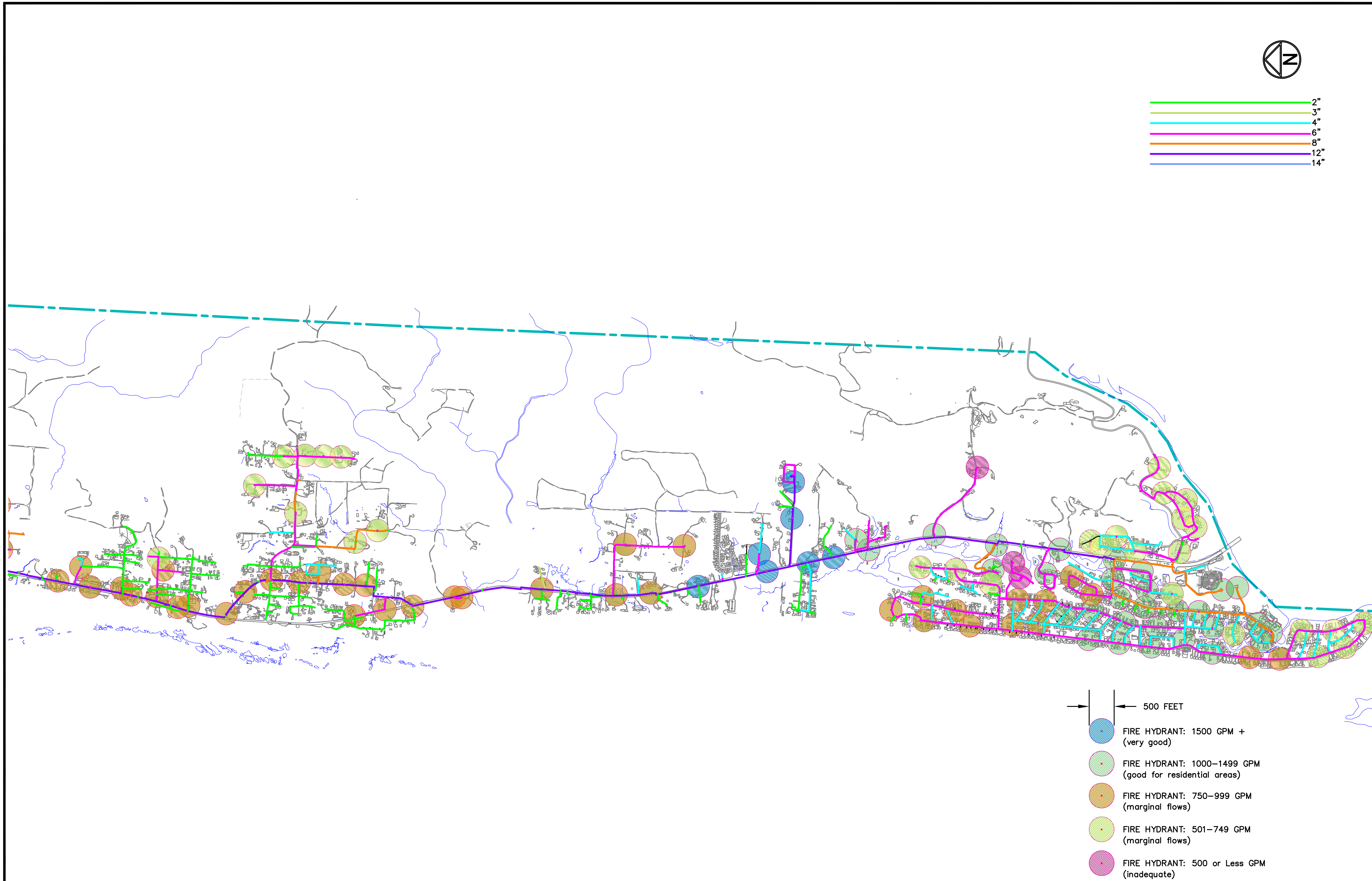
Raw Water Supply System At Toledo (Siletz Water Option)

WATER SYSTEM MASTER PLAN

0 1"
1" = 4000 ft

DRAWN BY: REB
DATE: JUNE 18, 2010

FIGURE
7.1.3-2



Civil West
Engineering Services, Inc.

SEAL ROCK WATER DISTRICT
LINCOLN COUNTY, OREGON

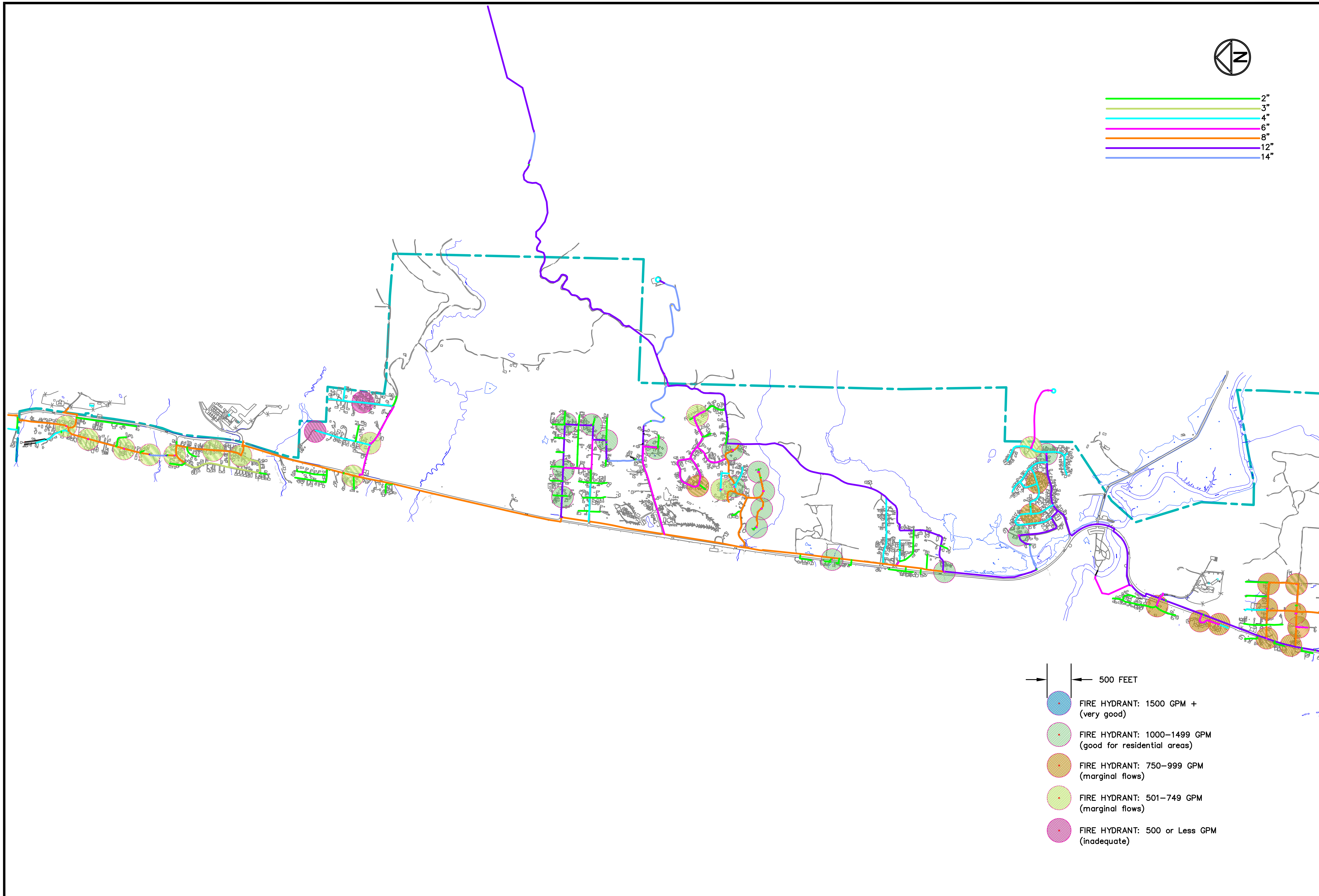
Existing Fire Hydrant Coverage

WATER SYSTEM MASTER PLAN

0
1"
1" = 2000'

DRAWN BY: REB
DATE: JULY 22, 2010

FIGURE
7.3-1a



Civil West
Engineering Services, Inc.

Seal Rock Water District
Lincoln County, Oregon

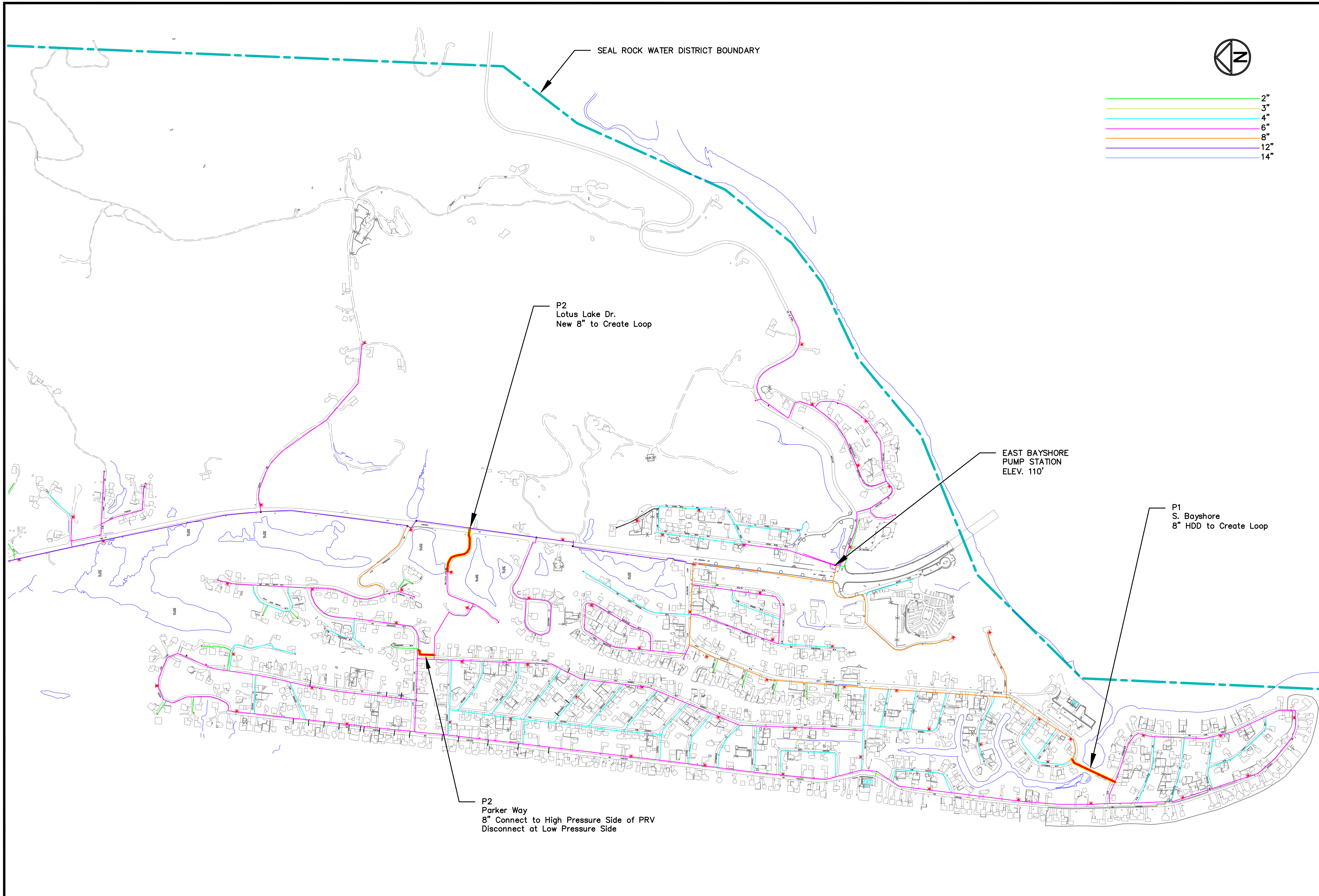
Existing Fire Hydrant Coverage

Water System Master Plan

0 1"
1" = 2000'

Drawn By: REB
Date: July 22, 2010

FIGURE
7.3-1b



Civil West Engineering Services, Inc.

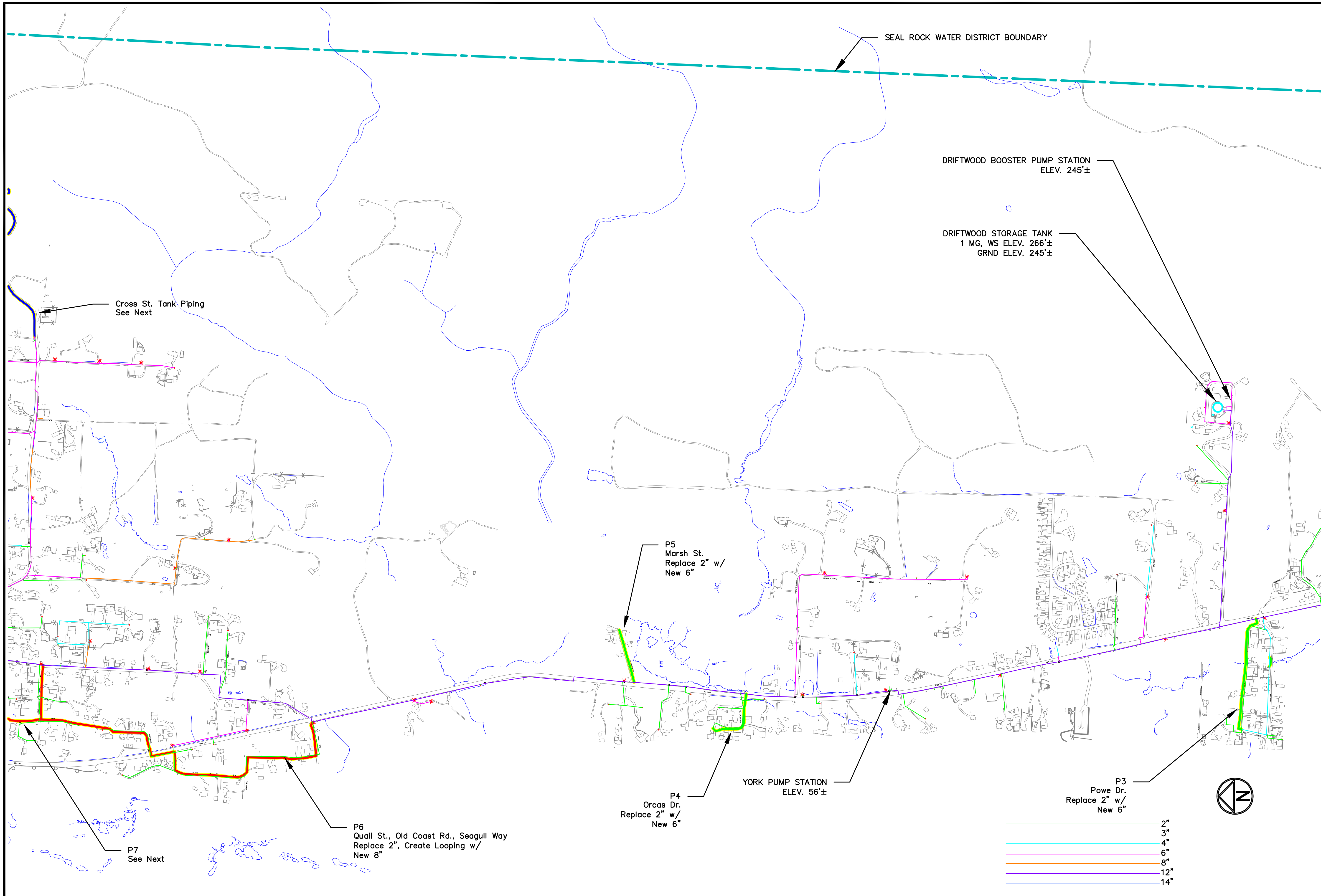
Seal Rock Water District
Lincoln County, Oregon

Proposed Water System

Water System Master Plan

0 1"
1" = 800'
Drawn By: REB
Date: Sept. 1, 2010

FIGURE 7.3.5-1



Civil West Engineering Services, Inc.

SEAL ROCK WATER DISTRICT
LINCOLN COUNTY, OREGON

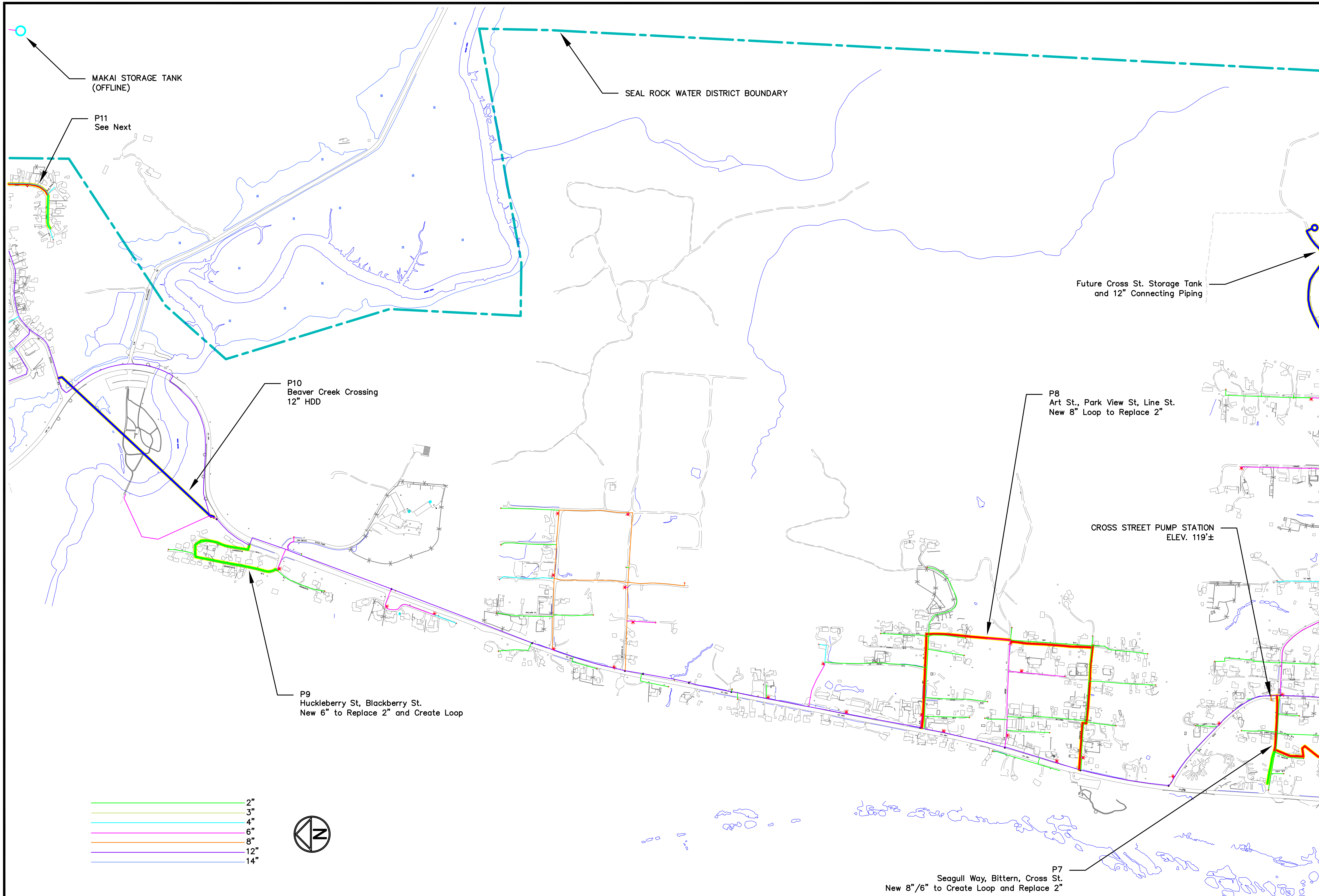
Proposed Water System

WATER SYSTEM MASTER PLAN

0 1" 1" = 800'

DRAWN BY: REB
DATE: SEPT. 1, 2010

FIGURE
7.3.5-2



Civil West Engineering Services, Inc.

Seal Rock Water District
Lincoln County, Oregon

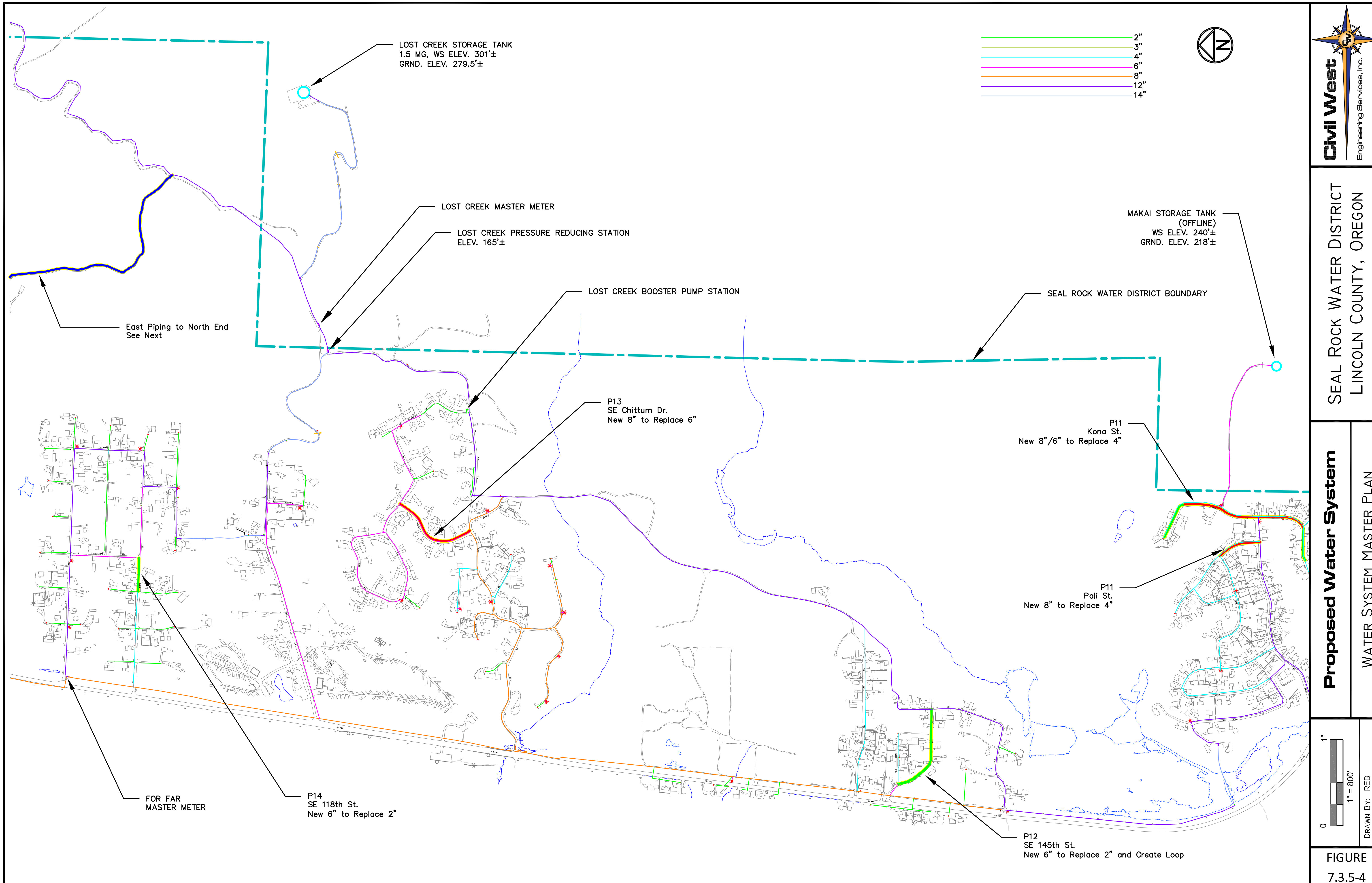
Proposed Water System

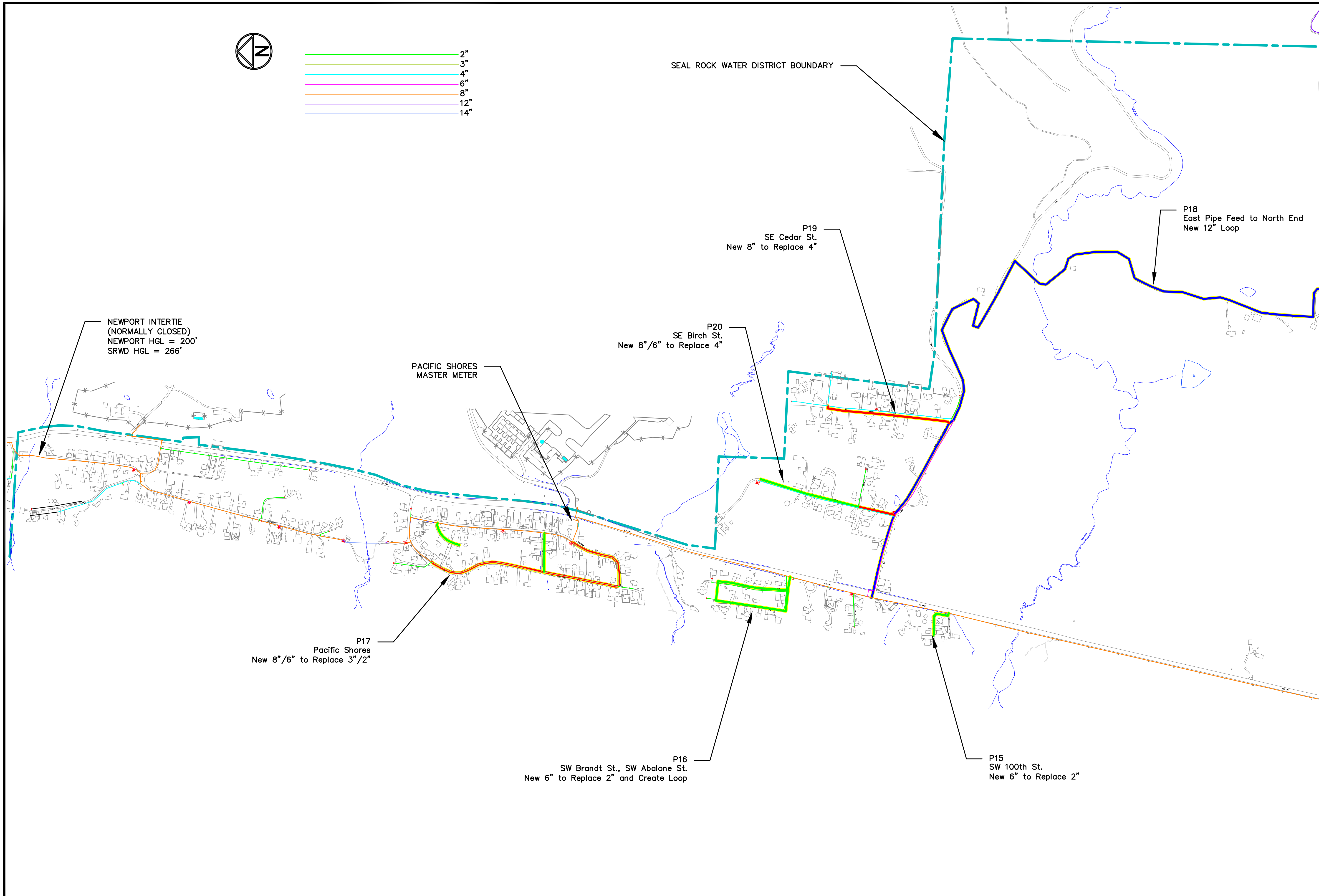
Water System Master Plan

0 1"
1" = 800'

Drawn By: REB
Date: Sept. 1, 2010

FIGURE
7.3.5-3


LOST CREEK STORAGE TANK
1.5 MG, WS ELEV. 301'±
GRND. ELEV. 279.5'±
LOST CREEK MASTER METER
LOST CREEK PRESSURE REDUCING STATION
ELEV. 165'±
LOST CREEK BOOSTER PUMP STATION
East Piping to North End
See Next
SEAL ROCK WATER DISTRICT BOUNDARY
MAKAI STORAGE TANK
(OFFLINE)
WS ELEV. 240'±
GRND. ELEV. 218'±
2"
3"
4"
6"
8"
12"
14"
N
P13
SE Chittum Dr.
New 8" to Replace 6"
P11
Kona St.
New 8"/6" to Replace 4"
P11
Pali St.
New 8" to Replace 4"
FOR FAR
MASTER METER
P14
SE 118th St.
New 6" to Replace 2"
P12
SE 145th St.
New 6" to Replace 2" and Create Loop
Civil West
Engineering Services, Inc.
SEAL ROCK WATER DISTRICT
LINCOLN COUNTY, OREGON
Proposed Water System
WATER SYSTEM MASTER PLAN
1"
0
1" = 800'
DRAWN BY: REB
DATE: SEPT. 1, 2010
FIGURE
7.3.5-4



Civil West Engineering Services, Inc.

SEAL ROCK WATER DISTRICT
LINCOLN COUNTY, OREGON

Proposed Water System

WATER SYSTEM MASTER PLAN

0 1" 1" = 800'

DRAWN BY: REB
DATE: SEPT. 1, 2010

FIGURE
7.3.5-5

8.1 Capital Improvement Plan Purpose and Need

This Section summarizes the water system capital improvements needed to properly serve the community's needs over the next 20 years as determined by the detailed analyses in this Water System Master Plan. The Capital Improvement Plan (CIP) consists of various projects to maintain and protect existing water system assets, projects to correct deficiencies, and projects necessary to increase water system capacity to serve the growing population.

The water system CIP is used to help establish funding needs, user rates, system development charges (SDCs), and to plan for and prioritize various project needs. The CIP can change over time as projects are completed and/or new unforeseen needs arise and an attempt should be made to annually update the CIP and keep the list of needs current.

8.2 Capital Improvement Plan Projects

8.2.1 CIP Summary

The various water supply, water storage, and water distribution system projects recommended in this Water System Master Plan for the 20-year planning period are summarized in this Section.

Description	Budget	Project #
Distribution Piping - HDD at South Bayshore	$105,415	P1
Distribution Piping - NW Lotus Lake Dr. / Parker Way	$95,555	P2
Distribution Piping - Powe Drive (Silver Sands)	$139,925	P3
Distribution Piping - NW Orcas Dr.	$70,108	P4
Distribution Piping - Marsh Street	$53,215	P5
Distribution Piping - Quail Street, Old Coast Rd, Seagull Way Loop	$482,053	P6
Distribution Piping - Seagull Way, Bittern, Cross St. Loop	$192,125	P7
Distribution Piping - Art Street, Park View Street, Line Street Loop	$396,575	P8
Distribution Piping - Huckleberry and Blackberry Street	$141,919	P9
Distribution Piping - HDD at Beaver Creek	$548,585	P10
Distribution Piping - NW Kona Street and Pali Street	$265,785	P11
Distribution Piping - SE 145th Street	$89,683	P12
Distribution Piping - SE Chittum Dr.	$107,699	P13
Distribution Piping - SE 118th St.	$35,271	P14
Distribution Piping - SW 100th Court	$36,903	P15
Distribution Piping - SW Brandt, SW Abalone St.	$190,603	P16
Distribution Piping - Pacific Shores	$372,070	P17
Distribution Piping - East Piping to North End	$1,341,613	P18
Distribution Piping - SE Cedar Street	$140,288	P19
Distribution Piping - SE Birch Street	$160,588	P20
	$4,965,973	

In addition to the piping projects shown on the previous page, it is recommended that all 2-inch piping in the District which extends for 250 feet or more, or serves more than 3 homes be replaced over time as budgets and maintenance needs arise. Also, all the 2-inch piping which is constructed of black ABS must be replaced as this material is unsuitable for pressurized water piping and results in frequent breaks and leaks. It is estimated that this additional 2-inch piping replacement, approximately 30,000 feet, will average $80 per foot including engineering, contingencies, new 6-inch piping, fire hydrants, etc.

Description	Budget	Project #
Cross Street Storage Tank (Water Surface 305')	$736,350	T1
Toledo Pump Station Upgrade	$39,150	PS1
York Pump Station Upgrade	$48,285	PS2
Beaver Creek Pump Station Bypass/Abandonment	$15,696	PS3
Other 2-Inch Piping Replacements	$2,400,000	P21
	$3,239,481	

The total estimated project cost for all 20-year improvements within the District is $8.2 million.

8.2.2 CIP Phases

The various improvements recommended for the 20-year planning period have significant cost and a phased approach is required to accomplish the projects over time in a prioritized fashion. If significant problems develop with a certain section of piping, it should be replaced with the recommended pipe size as soon as possible regardless of the phase it may be listed in. If favorable funding options arise, it may be prudent to undertake multiple phases, or portions of several phases at one time.

One project which can be delayed significantly is the new storage tank. This Plan recommends a new storage tank at the higher elevations on Cross Street. The storage deficiency will not actually begin to occur until approximately 2026. It is recommended that storage needs be reevaluated in 10 years (year 2020) and then plans for new storage begin.

Phase 1 - Year 2012	
Distribution Piping - HDD at South Bayshore	$105,415
Distribution Piping - NW Lotus Lake Dr. / Parker Way	$95,555
Distribution Piping - NW Orcas Dr.	$70,108
Distribution Piping - Marsh Street	$53,215
Distribution Piping - Powe Drive (Silver Sands)	$139,925
Distribution Piping - HDD at Beaver Creek	$548,585
Distribution Piping - SW 100th Court	$36,903
Distribution Piping - SE 118th St.	$35,271
Distribution Piping - SW Brandt, SW Abalone St.	$190,603
Beaver Creek Pump Station Bypass/Abandonment	$15,696
Distribution Piping - SE 145th Street	$89,683
Toledo Pump Station Upgrade	$39,150
York Pump Station Upgrade	$48,285
	$1,468,392
Phase 2 - Year 2014	
Distribution Piping - Quail Street, Old Coast Rd, Seagull Way Loop	$482,053
Distribution Piping - Seagull Way, Bittern, Cross St. Loop	$192,125
Distribution Piping - Art Street, Park View Street, Line Street Loop	$396,575
Distribution Piping - Huckleberry and Blackberry Street	$141,919
Distribution Piping - Pacific Shores	$372,070
	$1,584,741
Phase 3 - Year 2016-2018	
Distribution Piping - East Piping to North End	$1,341,613
Distribution Piping - SE Cedar Street	$140,288
Distribution Piping - SE Birch Street	$160,588
Distribution Piping - SE Chittum Dr.	$107,699
Distribution Piping - NW Kona Street and Pali Street	$265,785
	$2,015,971
Phase 4 - Year 2018 - 2022	
Cross Street Storage Tank (Water Surface 305')	$736,350
Other 2-Inch Piping Replacements	$2,400,000
	$3,136,350
Total All Phases	**$8,205,455**
Total Portion of Toledo CIP attributed to SRWD	**$7,250,000**
	$15,455,455

In addition to the above $8.2 million in projects within the District, the SRWD will have, as a partner with the city of Toledo, financial responsibility for certain improvements in the Toledo CIP which are necessary to provide water to the SRWD. The Toledo improvements necessary to provide water to Seal Rock total $7.25 million. Specifically, the Toledo Phase 2 Improvements involving rebuilding the Siletz River Intake and transmission piping and including some improvements at the water treatment plant have costs that can be 50% attributed to the SRWD since 50% of the water goes to the District. Similarly, the Toledo Phase 4 Improvements involving rebuilding the Mill Creek supply pump station and transmission piping can be 50% attributed to the SRWD. The Toledo Phase 3 Improvements also have a small cost for water treatment capacity increases that can be 50% attributed to the SRWD.

8.2.3 Toledo CIP Phases

As previously discussed, the city of Toledo 2010 Water System Master Plan identifies various needs and those projects which are required and sized to allow continued service to Seal Rock. Only certain portions of the Toledo CIP related to raw water supply and treatment relate to Seal Rock. How the costs are shared will depend on a proper intergovernmental agreement (IGA) between the City and the District.

Water CIP - Phase 1			***Potential Cost Share Distribution***	
Item	***Description***	***Opinion of Probable Project Cost***	***Toledo Share***	***Seal Rock Share***
S1	Skyline Drive 1.6 MG Storage Tank	$1,596,437	$1,596,437	$0
P1	Skyline Drive Booster Pump Station	$82,650	$82,650	$0
P2	Wagon Road Pump Station	$192,850	$192,850	$0
D1	Phase 1 Distribution Improvements	$1,053,418	$1,053,418	$0
		$2,925,355	**$2,925,355**	**$0**

Water CIP - Phase 2			***Potential Cost Share Distribution***	
Item	***Description***	***Opinion of Probable Project Cost***	***Toledo Share***	***Seal Rock Share***
T1	Water Treatment Maintenance Improvements	$478,935	$239,468	$239,468
WS1	Siletz River Intake and Pump Station	$2,380,000	$1,190,000	$1,190,000
WS2	Olalla Reservoir Pipeline Crossing	$1,572,500	$786,250	$786,250
		$4,431,435	**$2,215,718**	**$2,215,718**

Water CIP - Phase 3			***Potential Cost Share Distribution***	
Item	***Description***	***Opinion of Probable Project Cost***	***Toledo Share***	***Seal Rock Share***
D2	Phase 2 Distribution Improvements	$1,057,703	$1,057,703	$0
S2	Ammon Rd. Storage Tank Refurbishment	$269,150	$269,150	$0
S3	Graham St. Storage Tank Refurbishment	$149,100	$149,100	$0
T2	Water Treatment Capacity Improvements	$297,250	$148,625	$148,625
		$1,773,203	**$1,624,578**	**$148,625**

Water CIP - Phase 4			***Potential Cost Share Distribution***	
Item	***Description***	***Opinion of Probable Project Cost***	***Toledo Share***	***Seal Rock Share***
WS3	Mill Creek Pump Station and Transmission Piping	$9,600,000	$4,800,000	$4,800,000
		$9,600,000	**$4,800,000**	**$4,800,000**

Toledo CIP Costs are in 2009 dollars (ENR CCI = 8570)

8.2.4 CIP Updates

Periodically the Capital Improvement Plan should be updated. It is suggested that every 3 to 5 years the CIP be evaluated and modified as necessary to reflect current development trends, system needs, and prior accomplishments. The District may modify the CIP at any time under ORS 223.309(2).

Seal Rock Water District
2010 Water System Master Plan
CIP Schedule

Water Rate (2900 gal)	$41.14		$44.35	$48.30	$51.50		$54.25		$63.00		$64.90		$66.50						$68.00			
Project	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Adopt Master Plan																						
Phase 1			$1,468,392																			
*Toledo Phase 2**					$2,300,000																	
Phase 2					$1,584,741																	
*Toledo Phase 3***							$150,000															
*Toledo Phase 4****									$4,800,000													
Phase 3							$1,341,613		$674,358													
Phase 4									$500,000		$1,000,000		$900,000						$736,350			
			$1,468,392		$3,884,741		$1,491,613		$5,974,358		$1,000,000		$900,000		$0		$0		$736,350		$0	
																					$15,455,454	

* Siletz River Intake, Siletz Transmission (Olalla Crossing), WTP Upgrades - $2.3 million attributed to City and $2.3 million attributed to District

** WTP Capacity Upgrades - $150,000 attributed to City and $150,000 attributed to District

*** Mill Creek Pump Station and Transmission - $4.8 million attributed to City and $4.8 million attributed to District

Rate calculations are approximate and assume 20-year loans at 3.5% interest.

Toledo Phase 2: If $2.3 million is attributed to the SRWD, an additional $162,000 per year is required. Assuming 120 million gallons purchased, the cost increase from the city would need to be $1.35 per 1000 gallons.
For the average Seal Rock customer using 2900 gallons of water per month, this results in an additional charge of $3.92 per month.

Toledo Phase 3: If $0.15 million is attributed to the SRWD, an additional $10,500 per year is required. Assuming 120 million gallons purchased, the cost increase from the city would need to be $0.09 per 1000 gallons.
For the average Seal Rock customer using 2900 gallons of water per month, this results in an additional charge of $0.25 per month.

Toledo Phase 4: If $4.8 million is attributed to the SRWD, an additional $340,000 per year is required. Assuming 145 million gallons purchased, the cost increase from the city would need to be $2.35 per 1000 gallons.
For the average Seal Rock customer using 2900 gallons of water per month, this results in an additional charge of $6.75 per month.

9.1 Existing Water Rates and Charges

9.1.1 Existing Water Rate Structure

The following water rate structure was enacted by the Board effective July 1, 2010. The structure results in a monthly bill of $73.68 for a residential customer inside the District with a standard ¾-inch meter using 7500 gallons of water in one month. The rate structure is an increasing block type which tends to encourage water conservation. Customers outside the District boundary are charged a base rate $14.65 higher than customers inside the boundary but pay the same rate per 1000 gallons of use. For the average year-around use of 2873 gallons per month per EDU (based on 3-year average of all ¾" meters inside District – See Section 3.2.3), the charge for a domestic customer inside the District would be $41.14 per month.

Domestic Rate Schedule - Inside District		
Meter Size	***3/4"***	***1"***
Base Fee	**$24.60**	**$44.25**
First 1000 gal.	$4.61	per 1000 gal.
Next 3000 gal.	$6.37	per 1000 gal.
Next 3000 gal.	$7.04	per 1000 gal.
Next 6000 gal.	$8.28	per 1000 gal.
Next 4000 gal.	$10.25	per 1000 gal.
Next 3000 gal.	$15.37	per 1000 gal.
Balance	$16.46	per 1000 gal.

Commercial customers have a different rate schedule than domestic customers. In addition to that shown below there are increasing base rates for meters up to 6-inches.

Commercial Rate Schedule - Inside District				
Meter Size	***3/4"***	***1"***	**1.5"**	**2"**
Base Fee	**$41.35**	**$76.75**	**$98.00**	**$150.95**
First 1000 gal.	$3.67	same	same	per 1000 gal.
Next 6000 gal.	$5.23			per 1000 gal.
Next 5000 gal.	$6.00			per 1000 gal.
Next 4000 gal.	$7.30			per 1000 gal.
Balance	$8.69			per 1000 gal.

9.1.2 Connection and System Development Charges

The connection fee for a new standard domestic water meter is $1500 meant to cover the actual cost of labor and materials to provide a new service line, meter, and meter box.

A System Development Charge (SDC) was established in the District in 1994 at $876 per EDU. The current SDC is $1200 per EDU.

9.1.3 Budget

Information from the June 30, 2009 Audit Report is shown below. Annual revenue from water sales was $1,348,652. Revenue from service connections was $18,916.

Change in Net Assets

Water Service	$1,348,652	$1,358,293	($9,641)	-0.7%
Other Services	18,916	27,955	(9,039)	-32.3%
Total Operating Revenues	1,367,568	1,386,248	(18,680)	-1.3%
OPERATING EXPENSES				
Payroll and benefits	469,594	413,865	55,729	13.5%
Water purchase	252,793	240,004	12,789	5.3%
Maintenance & repairs	209,021	174,256	34,765	20.0%
General and admin	80,915	84,517	(3,602)	-4.3%
Professional services	17,987	20,548	(2,561)	-12.5%
Supplies	24,505	23,305	1,200	5.1%
Depreciation	274,833	255,189	19,644	7.7%
Total operating expenses	1,329,648	1,211,684	117,964	9.7%
OPERATING INCOME	37,920	174,564	(136,644)	-78.3%
NON OPERATING REVENUES(EXPENSES)				
Miscellaneous income	7,898	8,828	(930)	-10.5%
Interest income	46,340	104,226	(57,886)	-55.5%
Property taxes	207,875	190,516	17,359	9.1%
Grants	271,209	208,860	62,349	29.9%
Disposal of F/A	0	(114,203)	114,203	-100.0%
Interest expense	(145,457)	(246,524)	101,067	-41.0%
Total nonoperating Revenue	387,864	151,703	236,162	155.7%
Income (Loss) Before Contrib.	425,784	326,267	99,517	30.5%
CONTRIBUTED CAPITAL	9,600	28,535	(18,935)	-66.4%
CHANGES IN NET ASSETS	435,386	354,800	80,586	22.7%
Beginning Net Assets	5,932,826	5,578,026	354,800	6.4%
Prior Year Adjustment				
Ending Net Assets	$6,368,212	$5,932,826	$435,386	7.3%

SEAL ROCK WATER DISTRICT , OREGON

RECONCILIATION OF REVENUES AND EXPENDITURES (BUDGETARY BASIS) TO THE STATEMENT OF REVENUES, EXPENSES AND CHANGES IN NET ASSETS for the Year Ended June 30, 2009

	Total Revenues	Total Expenditures	Net
Budgetary Basis			
General Fund	$ 1,440,524	$ 1,503,959	$ (63,435)
Capital Projects Fund	1,893,333	712,229	1,181,104
Debt Service Fund	144,676	136,701	7,975
R. D. Requirement Reserve Fund	3,187	0	3,187
Revenue Bond Fund	156,710	156,825	(115)
2000 Loan Agreement Payment & Reserve Fund	73,032	81,645	(8,613)
System Development Charges Reserve Fund	76,497	139,773	(63,276)
Water Source Improvement Reserve Fund	300,519	139,448	161,071
Depreciation Reserve Fund	26,292	15,140	11,152
Special Projects/ODOT Reserve Fund	2,424	12,562	(10,138)
SRWD Land & Building Reserve Fund	82,389	243,031	(160,642)
Total budgetary basis	$ 4,199,582	$ 3,141,313	1,058,269
Add (Deduct) Items to Reconcile to Net Income on a Financial Reporting Basis			
Payment of long-term debt			
Revenue bonds			61,994
General obligation bonds			42,348
Loans			30,000
Accrued interest			(39,575)
Loan proceeds			(1,534,000)
Assets acquired			1,091,184
Depreciation			(274,833)
Change in net assets			435,387
NET ASSETS - Beginning of year			5,932,826
NET ASSETS - End of year			$ 6,368,212

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9.1.4 Outstanding Debts

A water Revenue Bond for $2.48 million was issued in 1998. The bond requires annual payments of $156,825 and matures in 2028. The balance in the 2009 audit was $1.93 million.

A 2004 General Obligation (G.O.) Bond of $2.328 million exists. The balance in the 2009 audit was $2.24 million.

In 2000 the District obtained a loan for $975,000 for equipment, repairs and improvements. The loan requires payments of around $75,000 per year and matures in 2025. The balance in the 2009 audit was $770,000.

9.2 Revenue Increase Needed

9.2.1 CIP Summary

The various piping, pump station, and storage improvements needed within the District as listed in the CIP total $8.2 million. In addition, the city of Toledo must undertake raw water supply and treatment improvements for which 50% of the capacity may be attributed the Seal Rock Water District. The 50% Seal Rock share of the Toledo water supply and treatment projects totals $7.2 million per the Toledo Water Master Plan CIP.

9.2.2 Additional Annual Revenue Required

The following table shows potential revenue increases needed to fund the CIP based on average standard funding terms including a 3.5% interest rate and a 20-year payback. For the entire $8.2 million in capital improvements within the District, annual revenue of $0.58 million would be needed for a loan payment. Current annual revenue is approximately $1.4 million.

Table 9.2.2-1 – Potential Revenue Increases Required

Cost per EDU	Full CIP	Phase 1	Phase 2	Phase 3	Phase 4
Capital Cost	$8,205,455	$1,468,392	$1,584,741	$2,015,971	$3,136,350
Loan Needed	$8,205,455	$1,468,392	$1,584,741	$2,015,971	$3,136,350
Interest rate	3.50%	3.50%	3.50%	3.50%	3.50%
Loan Period (yrs)	20	20	20	20	20
Annual Annuity	$577,344.61	$103,317.64	$111,504.10	$141,845.91	$220,676.96
Monthly Income Required	$48,112.05	$8,609.80	$9,292.01	$11,820.49	$18,389.75

9.3 Potential Grant and Loan Sources

9.3.1 Background Data for Funding

Funding for municipal water system capital improvements occurs with loans, grants, principal forgiveness, bonds, or a combination thereof. Parameters such as the local and State median household income (MHI), existing debt service, water use rates, low/moderate income level percentages, financial stability, and project need are used by funding agencies to evaluate the types and levels of funding assistance that can be received by a community.

Census data is not available since the District is a combination of incorporated and unincorporated areas. According to the 2000 US Census, the MHI in Waldport and Newport is $33,301 and $31,996 respectively. Assuming that the Seal Rock MHI is the average of Waldport and Newport; the area MHI would be $32,650. The State MHI is $40,916 and the area average MHI is 79.8% of the State MHI.

The average residential water bill in Seal Rock is currently $73.68 per month or $884.16 annually (based on 7,500 gallons use per month) which equals 2.7% of the assumed local MHI. Many funding sources require user rates to be high enough to meet a certain "threshold rate" or "affordability rate" which is expressed at a percentage of the local MHI. For example in 2009 for the Community Development Block Grant (CDBG) program, water rates had to be at least 1.48% of the local MHI to qualify for grant assistance. In Seal Rock, this threshold rate would be $40.27 per month. For USDA Rural Development, a state-wide "similar systems rate" is used which is currently around $56 per month. After the threshold rate is met, grants and principal forgiveness may be available and/or lower interest rates and longer terms.

The calculation for the water user rate can incorporate, when applicable, fee-equivalents derived from other local funding sources that are or will be used to pay for the water system, including any special levy on taxable property within the system's territory.

9.3.2 Infrastructure Finance Authority (IFA)

Recent restructuring in the State has resulted in the creation of the Oregon Business Development Department (OBDD) / Infrastructure Finance Authority (IFA) from what previously was the Oregon Economic and Community Development Department.

IFA administers resources aimed at community development activities primarily in the water and wastewater infrastructure areas. The IFA Regional Coordinator for Lincoln County is Louise Birk (503-986-0130) and any application process should begin by contacting her. The funding programs through IFA include:

- Community Development Block Grants (CDBG)
- Safe Drinking Water Revolving Loan Fund (SDWRLF)
- Special Public Works Funds
- Water/Wastewater Financing

Block Grant assistance for Toledo is highly unlikely due to the existing low water rates and inability to meet the national objectives for low- and moderate income persons.

The SDWRLF generally must be used to address a health or compliance issue and could potentially provide a loan up to $6 million per project. To receive a loan the project must be ranked high enough on the Project Priority List in the Intended Use Plan developed by the State. A Letter of Interest (LOI) must be submitted before a project can be listed in the Intended Use Plan. The LOIs are accepted annually. The 2010 LOI was due in October of 2009 so it is likely that the 2011 LOI will be due sometime in the fall of 2010. The 2011 LOI is still being revised at this time. Loan terms are typically 3-4% interest for 20 years however "Disadvantaged Communities" can potentially qualify for 1% loans for 30 years as well as some principal forgiveness. To be considered a Disadvantaged Community the average residential water rate must be at or above the threshold rate and the area MHI must be less that the State MHI.

All recipients of SDWRLF awards need to complete an environmental review on every project in accordance with the State Environmental Review Process (SERP), pursuant to federal and state environmental laws. The Environmental Report typically required can cost $25,000 to $75,000 depending on the specific biological, cultural, waterway, and wetland issues that arise.

Loans and grants are available through the Special Public Works Funds and Water/Wastewater Financing depending on need and financial reviews by IFA.

9.3.3 Rural Development / Rural Utilities Service (RUS)

The United States Department of Agriculture (USDA) Rural Utilities Service (RUS) has a Water Programs Division which provides loans, guaranteed loans, and grants for water infrastructure projects for towns of less than 10,000 persons. Grants are only available when necessary to keep user costs to reasonable levels (very similar to IFA threshold rate). Loans can be made with repayment periods up to 40 years. Current interest rates are around 3.25% for design/construction loans. Environmental reporting is required similar to that for the SDWRLF but with slightly different criteria.

9.4 Potential Water Rate Increases

9.4.1 Seal Rock CIP Rate Impacts

Because of the various options in funding programs and requirements for contact and communication with the Regional Coordinators prior to applications, the recommended first step in exploring funding options is to attend a "One-Stop" financing meeting. The One-Stop meeting is held in Salem once a month with the goal of gathering the State and federal funding agencies together at one time and one place to discuss all potential funding possibilities and issues. No funding commitments are made at the meeting, but probable funding sources and details are provided to enable the District to choose the best alternatives possible at that time and to initiate funding application steps.

Since the current user rates are high enough to exceed current threshold amounts, it is possible that lower than standard interest rates, 30+ year terms, or even grant assistance might be available. Based on the average 100 million gallons per year sold (See Section 3.2.5) and the funding agency average of 7,500 gallons per month per EDU, there are 1,111 total EDUs. The following Table shows a possible scenario with the needed increase in revenue spread evenly over all 1111 EDUs. It can be seen that even at the end of Phase 4, the potential user rate for 7,500 gallons would be $139 per month.

Table 9.4.1-1 – Potential System-Wide Rate Increases, 7500 Gallons

Cost per EDU	**Phase 1**	**Phase 2**	**Phase 3**	**Phase 4**
Capital Cost	$1,468,392	$1,584,741	$2,015,971	$3,136,350
Loan Needed	$1,468,392	$1,584,741	$2,015,971	$3,136,350
interest rate	3.50%	3.50%	3.50%	3.50%
Loan Period (yrs)	20	20	20	20
Annual Annuity	$103,317.64	$111,504.10	$141,845.91	$220,676.96
Monthly Income Required	$8,609.80	$9,292.01	$11,820.49	$18,389.75
Monthly Income Reqd' w / 10% reserve	$9,470.78	$10,221.21	$13,002.54	$20,228.72
Increased Charge from Toledo per month	$0.00	$13,000.00	$0.00	$16,000.00
Year	2011	2014	2016	2020
Number of EDUs *(7500 gallon EDUs)*	1111	1215	1252	1328
Monthly Cost per EDU	**$8.52**	**$19.11**	**$10.39**	**$15.23**
Previous Average Residential Water Bill	$73.68	$82.20	$101.32	$111.70
New Average Residential Water Bill	**$82.20**	**$101.32**	**$111.70**	**$138.98**

It is important to note that the above rates are for 7,500 gallons of use which is much higher than normal in Seal Rock. In Seal Rock, the average domestic user actually uses closer to 2,873 gallons per month and there are approximately 2,950 EDUs. The potential rate increases for the average user are shown below in Table 9.4.1-2.

Table 9.4.1-2 – Potential System-Wide Rate Increases, 2873 Gallons

Cost per EDU	Phase 1	Phase 2	Phase 3	Phase 4
Capital Cost	$1,468,392	$1,584,741	$2,015,971	$3,136,350
Loan Needed	$1,468,392	$1,584,741	$2,015,971	$3,136,350
interest rate	3.50%	3.50%	3.50%	3.50%
Loan Period (yrs)	20	20	20	20
Annual Annuity	$103,317.64	$111,504.10	$141,845.91	$220,676.96
Monthly Income Required	$8,609.80	$9,292.01	$11,820.49	$18,389.75
Monthly Income Reqd' w/ 10% reserve	$9,470.78	$10,221.21	$13,002.54	$20,228.72
Increased Charge from Toledo per month	$0.00	$13,000.00	$0.00	$16,000.00
Year	2011	2014	2016	2020
Number of EDUs *(2873 gallon EDUs)*	2950	3226	3323	3527
Monthly Cost per EDU	**$3.21**	**$7.20**	**$3.91**	**$10.27**
Previous Average Residential Water Bill	$41.14	$44.35	$51.55	$55.46
New Average Residential Water Bill	**$44.35**	**$51.55**	**$55.46**	**$65.73**

9.4.2 Toledo CIP Rate Impacts

The Seal Rock Water District currently pays Toledo around $250,000 per year for approximately 120 million gallons of treated water at a cost of $2.13 per 1000 gallons. The table below shows the additional annual revenue needed by Toledo from Seal Rock to accomplish the project portions of the Toledo CIP attributable to Seal Rock (50% of raw water supply and treatment only) based on typical loan scenarios.

Table 9.4.2-1 – Potential Seal Rock Revenue Increase Needed by Toledo

Cost per EDU - Seal Rock	Phase 1	Phase 2	Phase 3	Phase 4
Capital Cost (Seal Rock Share Only)	$0	$2,215,718	$148,625	$4,800,000
Loan Needed	$0	$2,215,718	$148,625	$4,800,000
Interest rate	3.50%	3.50%	3.50%	1.00%
Loan Period (yrs)	20	20	20	30
Annual Annuity	$0.00	$155,900.27	$10,457.42	$185,990.94
Monthly Income Required	$0.00	$12,991.69	$871.45	$15,499.25
Monthly Income Reqd' w/ 10% reserve	$0.00	$14,290.86	$958.60	$17,049.17

- *Phases above are from Toledo CIP*

Based on this scenario, if Phase 1 through Phase 3 projects in the Toledo CIP were undertaken within the next few years, an additional $166,300 in annual revenue would be needed from Seal Rock to cover half the cost of the applicable projects. These projects include the reconstruction of the Siletz River Intake and Pump Station, the rebuilding of the Olalla Reservoir transmission pipe crossing, and various upgrades at the water treatment plant. When the Phase 4 Mill Creek supply improvements are undertaken at some point in the future, additional revenue from Seal Rock of $185,990 per year would be needed to cover half the costs.

The inter-governmental agreement (IGA) between Seal Rock and Toledo is due for an update and an equitable long-term plan needs to be established. As an example of potential impacts based on the current rate scenario; to generate the additional Seal Rock revenue for Toledo CIP Phase 1-3 would require an adjustment in the wholesale rate for 1000 gallons from $2.13 to approximately $3.50 based on current average volumes of water sold. For each of the approximate 2,950 EDUs in the Seal Rock Water District, this increase would equal an additional $4.70 per month.

9.5 Rate Impact Summary

The current rate structure in Seal Rock generates approximately $1.35 million per year ($112,500 per month) in water sales revenue metered through around 2400 meters with approximately 100 million gallons per year sold. This means that water is sold for roughly $13.50 per 1000 gallons on average system-wide, or 1.35 cents per gallon.

9.5.1 Phase 1 Improvements

To complete $1.5 million Phase 1 Improvements, a loan is assumed with a 20-year payback at 3.5%. An additional $9,470 per month is needed to pay back the potential loan (with 10% additional fund cushion). To generate the increased revenue, an effective rate increase of $3.21 per EDU is required based on 1 EDU=2,873 gallons per month and 2,950 EDUs. This would mean that the average domestic user in Seal Rock would see their rates go from $41.14 per month to $44.35 per month.

Using a 7,500 gallon per month per EDU basis; the number of EDUs drops to 1,111 and the cost for 7,500 gallons would need to increase from $73.68 per month to $82.20 per month. If 25% grant could be obtained, the rate for 7500 gallons would be approximately $80.07.

9.5.2 Phase 2 Improvements

To complete the $1.6 million Phase 2 Improvements, a loan is assumed with a 20-year payback at 3.5%. Phase 2 is assumed to occur in the year 2014. An additional $10,220 per month is needed to pay back the potential loan (with 10% additional fund cushion). To generate the increased revenue, an effective rate increase of $3.17 per EDU is required based on 1 EDU=2,873 gallons per month and 3,226 EDUs. This would mean that the average domestic user in Seal Rock would see their rates go from $44.35 per month (if increased for Phase 1) to $47.52 per month.

Using a 7,500 gallon per month per EDU basis; the number of EDUs drops to 1,215 and the cost for 7,500 gallons would need to increase from $82.20 per month to $90.62 per month. If 25% grant could be obtained for Phase 2 and Phase 1, the rate for 7500 gallons would be $86.38.

In addition, the District should plan for increased charges from the city of Toledo in anticipation of the city's need to undertake the necessary improvements to the Siletz River Intake and Pump Station and associated transmission piping under the Olalla Reservoir (Toledo CIP Phase 2 - total of $4.43 million with an assumed 50% or $2.22 million attributed to Seal Rock needs). Assuming Toledo obtains a loan for their Phase 2, approximately $156,000 per year ($13,000 per month) in additional revenue from Seal Rock may be needed. Currently Seal Rock purchases approximately 120 million gallons per year for $250,000 from the city. Using a simple analysis shows that the city would need to then charge $406,000 for that same 120 million gallons of water or $0.00338 per gallon. For the District to pass that same $156,000 per year along to customers would result in a cost of $4.03 per EDU (based on 3226 EDUs using 2,873 gallons per month each).

By the end of Phase 2, the water rate for 2,873 gallons could be $51.55 [$47.52 + $4.03] including an assumed rate increase from Toledo. The rate for 7,500 gallons could be $101.32. Assuming 25% grants, the rate for 7500 gallons would be $97.08.

9.5.3 Phase 3 Improvements

To complete the $2.0 million Phase 3 Improvements, a loan is assumed with a 20-year payback at 3.5%. Phase 3 is assumed to occur in the year 2016. An additional $13,000 per month is needed to pay back the potential loan (with 10% additional fund cushion). Again, an additional $156,000 per year in charges from Toledo is also assumed. To generate the increased revenue, an effective rate increase of $3.91 per EDU is required (based on 1 EDU=2,873 gallons per month and 3,323 EDUs) for the District's Phase 3 and the previous $4.03 per EDU due to increased charges from Toledo. This would mean that the average domestic user in Seal Rock would see their rates go from $51.55 per month (if increased for Phase 1and 2 and Toledo) to $55.46 per month.

Using a 7,500 gallon per month per EDU basis; the cost for 7,500 gallons would need to increase from $101.32 per month to $111.70 per month. If 25% grants were available to the District for Phase 1 through 3, the rate for 7,500 gallons would be $104.87.

9.5.4 Phase 4 Improvements

Phase 4 is assumed to occur in the year 2020. To complete the $3.1 million Phase 4 Improvements, a loan is assumed with a 20-year payback at 3.5%. An additional $20,000 per month is needed to pay back the potential loan (with 10% additional fund cushion). To generate the increased revenue, an effective rate increase of $5.74 per EDU is required based on 1 EDU=2,873 gallons per month and 3,527 EDUs. This would mean that the average domestic user in Seal Rock would see their rates go from $55.46 per month (if increased for Phase 1, 2, and 3 and Toledo) to $61.20 per month.

Using a 7,500 gallon per month per EDU basis; the cost for 7,500 gallons would need to increase from $111.70 per month to $126.93 per month.

In addition, the District should plan for increased charges from the city of Toledo in anticipation of the city's need to undertake the necessary improvements to the Mill Creek Pump Station and associated transmission piping (Toledo CIP Phase 4 - total of $9.6 million with an assumed 50% or $4.8 million attributed to Seal Rock needs). Assuming Toledo obtains a loan for their Phase 3/4, approximately $196,000 per year in additional revenue from Seal Rock may be needed. For the District to pass that same $196,000 per year along to customers would result in a cost of $4.63 per EDU (based on 3,527 EDUs using 2,873 gallons per month each).

By the end of Phase 4, the water rate for 2,873 gallons could be $65.82 including assumed rate increases from Toledo. The rate for 7,500 gallons could be $139.21. Assuming 25% grants, the rate for 7500 gallons would be $128.57.