CITY OF YACHATS
LINCOLN COUNTY, OREGON

Water Master Plan

JUNE, 2001
PROJECT NO. 0510.02

D

The Dyer Partnership
Engineers & Planners, Inc.

275 Market Avenue
Coos Bay, Oregon 97420
541/269-0732 ▫ Fax 541/269-2044

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(541) 269-0732 Fax (541) 269-2044
dyerpart@harborside.com

REGISTERED PROFESSIONAL
ENGINEER
11,809
OREGON
JULY 16, 1982
STEVE B. MAJOR
EXPIRES 12/31/02

City of Yachats
441 Hwy 101 N.
P O Box 345
Yachats, OR 97498

June 18, 2001

JUN 20 2001

Mr. Bill Fujii
Water Resources Department
Commerce Building
148 12th Street Salem, OR 97301-4172

Dear Bill,

On June 14, 2001 our City Council received and accepted the Water Master Plan report by the Dyer Partnership. Our efforts have been to develop a 20-year planning document that also incorporates a Water Conservation and Management Plan that not only satisfies WRD's requirements but also provides a feasible timetable for accomplishment for Yachats. We anticipate implementing our Consultants recommendations within the timetables given. Some elements of the plan have either been put in place or are in process, well ahead of schedule. An example is that we have approved installation of the remaining electronic meters to be accomplished this year instead of over a 5 year time period.

I understand that you may have concerns regarding our intent to establish a monitoring station on the Yachats River. Since this is a costly process and since it is our intent to avoid taking water from the Yachats except under emergency conditions we will not be proceeding with the required Environmental Assessment at this time. Attached is a letter from Doris Tai, District Ranger, outlining the steps that would be necessary for us to consider added impoundment on Reedy Creek or to draw water from the Yachats River. It does not seem prudent for us to spend $15,000 to $30,000 for an environmental analysis without any assurance of developing additional water potential.

Should you desire further information please don't hesitate to contact me.

Very truly yours,

Lee D. Corbin
Mayor

PHONE (541)547-3565 RELAY OREGON (800)735-2900 (T.D.D.) FAX (541)547-3063
E-MAIL CITYOYA@PIONEER.NET WEB SITE WWW.CI.YACHATS.OR.US

nited States Department of Agriculture
Forest Service
Siuslaw National Forest
Waldport Ranger District
P.O. Box 400
Waldport, OR 97394
(541) 563-3211

File Code: 2700

Date: April 15, 2001

Mr. Lee Corbin, Mayor
City of Yachats
Box 345 City Hall
Yachats, OR 97498

Dear Lee:

This letter is to recap our meeting of March 27 and to highlight the process/work involved should the City wish to pursue further actions in Reedy Creek or in the Yachats River (across Federal land). First, I will say I was encouraged by our conversation and by the progress the City has made of late to address concerns which have been raised by the Forest Service, the Water Resources Board and other regulatory agencies. It sounds like the City has taken steps to improve water conservation and has also made inroads towards a long term regional strategy for addressing water supply issues along the central Oregon Coast.

There is no doubt that providing safe and clean drinking water is of critical importance. And I can certainly emphasize with the position the City is in. Please realize that the Forest Service must also be concerned with other factors associated with fish and wildlife habitat and overall watershed health. In addition, we are held accountable by other regulatory agencies and by the public. There is really no way in this day and age to shortcut the environmental analysis warranted by the actions the City is proposing. To the contrary, the analysis must be thorough and well documented and be open to public review and input.

From our conversation, my understanding is that the City wishes to build another impoundment on Reedy Creek. There is also the future possibility of drawing water from the Yachats River. Should the latter be a serious consideration, it would be in the City's interest to assess both scenarios concurrently through one environmental assessment or environmental impact statement. In either case, an environmental analysis of some sort would be needed. Prior to launching into the analysis. the following information would assist in determining the level of assessment needed:

The City must first establish and document the need for additional water and the conditions under which this additional water would be used. I had been under impression that the recent addition of the storage tank was more than adequate to meet the City's short term needs for water.

The City must be in compliance with the conditions placed by the State Water Resources Board, including the amended water conservation plan.

A geo-technical assessment would need to be done on Reedy Creek to see if an impoundment at the scale we have discussed would be feasible. In checking with our Forest Service geo-tech specialist, there are serious stability concerns regarding the Reedy Creek drainage.

The City would need to decide if the analysis would include the Yachats River.

Beyond that, an environmental assessment/environmental impact statement (EA/EIS) would need to be completed to address the above as well as the following:

- The purpose and need (as stated above) for the proposed action
- A description of the existing situation and future plans
- A clear description of the proposed action and how it meets the need/future plans
- A full range of alternatives to the proposed action
- How the action(s) is in line with the Northwest Forest Plan, most specifically the Aquatic Conservation Strategy (ACS). If the action(s) does not meet the ACS, a Siuslaw Forest plan amendment would be needed.
- Disclosure of the issues involved and the effects on the resources – (mostly hydrologic in the case of Reedy Creek) and how these would be resolved or mitigated.
- Consultation with other regulatory agencies (US Fish and Wildlife, National Marine Fisheries, State Water Resources Board)
- Connected actions – how does this tie in with the Yachats River (as well as other water sources in the area)

Full public scoping is needed as part of the EA/EIS. Additional issues may emerge through the scoping process.

The Forest Service would need to be closely involved in the process. We would review and approve the various stages of the process (purpose and need, issues, scoping, alternatives, effects, consultation documents) and give the final acceptance of the document. Depending upon the level of involvement, there would most likely need to be some reimbursement for Forest Service time, as well.

I need to also say that completing the EA/EIS still does not guarantee a green light for the project. The assessment may raise issues which are unresolvable and/or raise concerns which are unacceptable.

I have attached a list of consultants/contractors who have experience in writing environmental documents. They ought to be able to give you some rough estimates as to the costs and timeline for the work outlined above.

Please let me, Jan Robbins or Paul Thomas know if you have questions.

DORIS TAI
District Ranger

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Section 1

Introduction

Introduction

Section 1

1.1 Background and Need

Historically, domestic water in Yachats was obtained directly from surface water features, including various small streams and springs in the area. By the 1940's, the City had developed a community water system. In 1945 the City of Yachats constructed a 200,000 gallon reservoir and installed a raw water intake at Reedy Creek. A six-inch diameter asbestos cement pipeline also was constructed at that time extending from the intake to the new reservoir. Although the water system has continued to develop with the passage of time, Reedy Creek remains the primary raw water source for the City of Yachats.

Although still a small town by many standards, the population of the City of Yachats has grown at a steady rate. During the past 15 years, more or less, a growth rate of approximately 2.5 percent per year has been observed making Yachats home to approximately 700 persons today. In addition to permanent residents, Yachats is both a vacation destination and point of interest wayside for tourists traveling the Oregon coast. As Yachats' population continues to expand and tourism increases, the demand for quality water will continue to grow. Presently, the City may produce as much as 9.5 million gallons of water in its maximum month.

For many years water was supplied to the system with only rudimentary disinfection for treatment. In 1992, in accordance with the recommendations of a Water System Evaluation and Long Range Plan (HE, Inc., 1989), the City constructed a conventional water treatment plant that employs standard clarification and disinfection processes on the water. The existing treatment plant is capable of processing up to 0.5 million gallons per day.

Previous planning efforts include the following studies and evaluations of the water system:

- Cornell, Howland, Hayes & Merryfield, A Report on a Water System Inspection for the Yachats Water District, Yachats, Oregon, July 1964.
- Dorner, W.J., Consulting Engineer, Letter Report – Ref: 1966 Water Study, Source, Transmission and Clarification, Yachats Water District, Yachats, Oregon, December 1966.
- Clark & Groff Engineers, Inc., Letter Report – Water Supply Situation, Yachats Water District, Yachats, Oregon, March 1973.
- HGE Engineers & Planners, Water System Evaluation and Long Range Plan, City of Yachats, Lincoln County, Oregon, March 1989.
- City Staff (Carrasco, et. al.), City of Yachats Water Conservation/Management Plan, September 1999.

The City has considered and implemented many of the recommendations from each report. As water demand increases in conjunction with the growth of the area's population, concerns over source water availability are becoming a greater issue for Yachats. In response, the City wants to ensure that appropriate source water will be available to meet future water demands. This Master Plan has been prepared to evaluate the City's water needs through the 20-year planning period and identify current deficiencies in the performance of the water system.

1.2 Study Objective

Oregon Health Division (OHD)

The purpose of the Water Master Plan is to furnish the City of Yachats with a comprehensive planning document which provides engineering assessment and planning guidance for the successful management of its water system over the next 20 years. This document satisfies the Oregon Health Division (OHD) requirement for communities to have a current master plan when 300 or more service connections exist (OAR 333-061-0060). The principal objectives include:

- Evaluation of the existing water system components
- Prediction of future water demands
- Evaluation of the capability of the existing system to meet future needs
- Comparison of source water availability and projected water demand
- Recommendations for improvements needed to meet future needs and/or address deficiencies
- Development of a Water Management Plan per OAR 690-086-0010

The Plan outlines water recommended system improvements that are considered necessary to comply with State and Federal standards and to provide for anticipated growth. The capital improvements are presented as projects with estimated costs to allow the City to plan and budget as needed. Supporting technical documentation is included to aid in grant and loan funding applications and meet the requirements of the Oregon Economic and Community Development Department (OECDD), the Oregon Department of Water Resources (WRD), the Rural Development Administration (RDA), as well as Oregon Health Division (OHD).

Oregon Department of Water Resources (WRD)

While much of this study was prepared to fulfill the requirements of a water master plan as outlined by the OHD, the study will also serve as a planning document capable of fulfilling the requirements of the Oregon Department of Water Resources. The Oregon Administrative Rules (OAR) 690-86 outlines the requirements of a conservation and management plan as required by the WRD. The City is currently under a Stipulated Order to develop a water management and conservation plan and submit it to WRD for review and acceptance.

In order to facilitate and simplify the review of the OAR 690-86 requirements, a "study-within-a-study" approach was taken. While the majority of the study seeks to fulfill OHD requirements, Sections 7 and 8 were developed for the OAR 690-86 and WRD requirements. The intent of this format is to allow those reviewing the plan according to the OAR 690-86 requirements to be able to review only two sections of the report. These summary sections reference other portions of the study if more detailed information is required. Also, each section and subsection in Sections 7 and 8 includes a reference to the portion of the OAR that a particular section is seeking to address. Again, the purpose of this format is to make the review of the study more efficient for each agency and party involved.

1.3 Scope of Study

Planning Period

As suggested by OAR 690-086-0140 and typical of most water master plans, the planning period for this Plan is 20 years, ending in the year 2021. The period is short enough for current users to benefit from system improvements, yet long enough to provide reserve capacity for future growth and increased demand.

Planning Area

The City's Urban Growth Boundary (UGB) plus the additional limits of the system defined by raw water sources and transmission is considered the study area in this Plan. Figure 2.1.1 shows the location of the City of Yachats in Oregon, and Figure 2.1.2 shows the City limits and the UGB.

Work Tasks

In compliance with Oregon Health Division and Oregon Department of Water Resources plan elements and standards, this study provides descriptions, analysis, projections, and recommendations for the City's water system over the next 20 years. The following elements are included:

- Study area characteristics including land use and population trends and projections
- Description of the existing water system including supply, treatment, 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 treatment evaluation
- Improvement alternatives and recommendations with associated costs
- Recommendations for water management planning and water usage curtailment
- A summary of recommendations in the form of a Capital Improvement Plan
- Funding options
- Maps of the existing system and recommended improvements

1.4 Authorization

The City of Yachats contracted with The Dyer Partnership, Engineers & Planners, Inc. on December 14, 2000 to prepare this Water Master Plan. Included in the contract was a Scope of Engineering Services on which the scope of this Plan is based.

Study Area

Section

2

Study Area

Section 2

2.1 Location

The City of Yachats is a small retirement and resort community located on a relatively rugged and isolated portion of the Oregon Coast near the southwest corner of Lincoln County. The City is located within the area described by Township 14-South, Range 12-West, and Sections 22, 23, 26, 27 & 34. See Figure 2.1.1 for the location of the City within the State of Oregon.

The community is bounded to the south by the Cape Perpetua coastal landmark. Most of the community is situated on a gently sloping plain at the base of the coast range, although there are a number of residences present on the westerly slopes of the coastal range. The Yachats River roughly bisects the town north to south while Highway 101 bisects the community east to west.

The majority of the City's commercial sector is located on the northerly side of the river, and both residences and resorts are located to the north and south. Highway 101 serves as the community's primary traffic artery providing access to Newport (approximately 24 miles north) and Florence (approximately 26 miles south).

Yachats is a well-known tourist destination with a number of beaches, resorts, hotels, shops and other amenities. In the summer months especially, the City experiences an influx of tourist traffic and seasonal residents. This influx creates an increased demand on the City's water system and coincides with the drier months when source water is scarce. In addition to the resort traffic, Yachats serves as a weekend and holiday host for many part-time residents with second homes, condominiums, and rental properties. The resulting influx of visitors has the ability to swell the population to more than double that of the full-time residents.

The City Limits of Yachats encompass slightly less than 600 acres (0.92 square miles). The study area for this Master Plan includes the area within the City Limits and the urban growth boundary, as indicated in Figure 2.1.2.

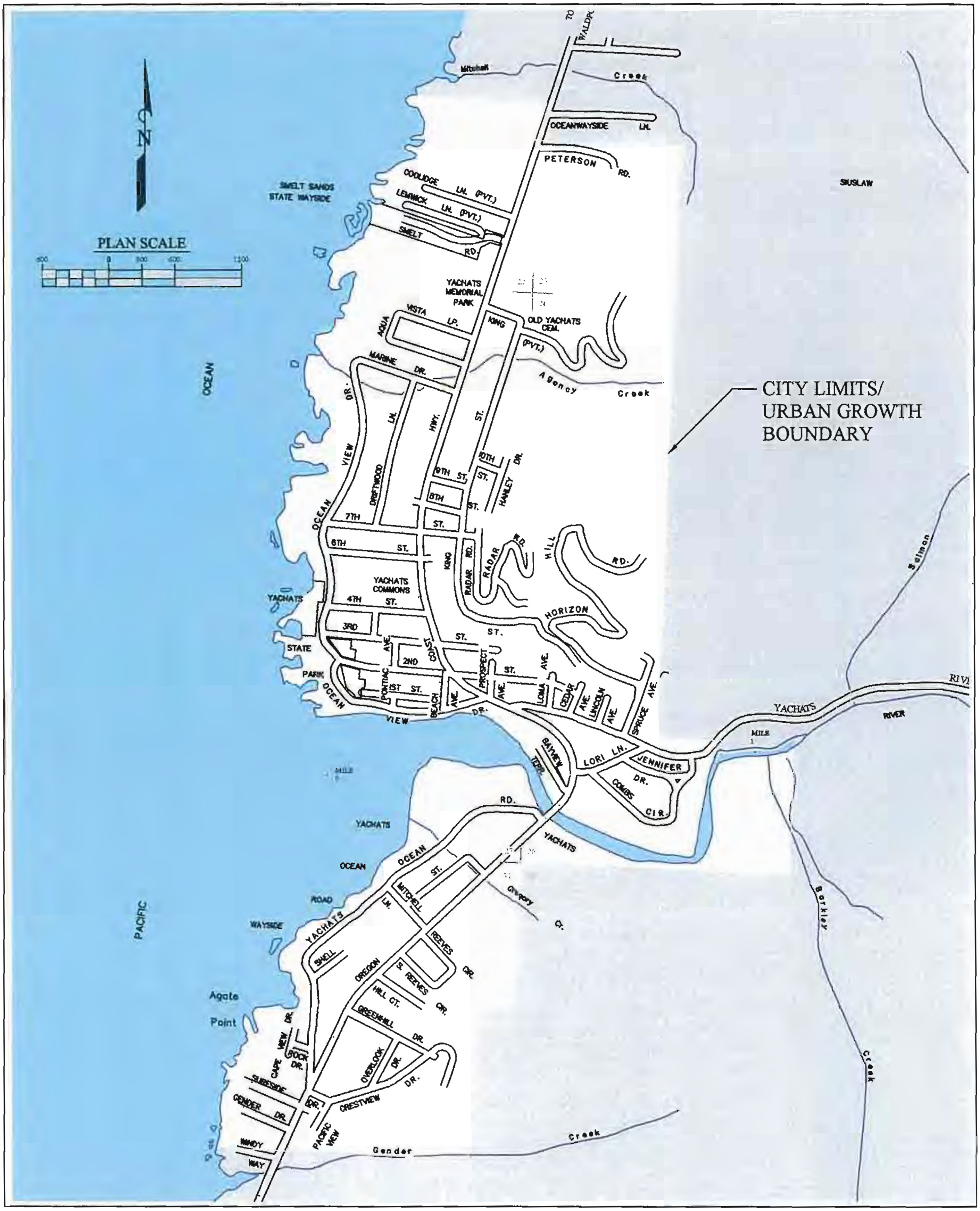
2.2 Water Resources

In this section, a brief description of the water resources available to the City will be presented. Subsequent sections of this Plan expand on the discussion.

Groundwater

Historically, the City of Yachats has relied upon surface water from tributary streams to the Yachats River to supply the municipal water system; the City does not own or operate any wells at this time. It is generally maintained that due to the area's underlying geology, which primarily consists of Tertiary age basalt, groundwater is not available in quantities sufficient to supply a municipal water system. The Oregon Department of Water Resources reports 19 wells within an approximate two-mile radius of the study area.

THE DYER PARTNERSHIP ENGINEERS & PLANNERS, INC.	*CITY OF YACHATS* *WATER MASTER PLAN*	FIGURE NO.
DATE: JUNE, 2001 PROJECT NO.: 0510.02	*LOCATION MAP*	*2.1.1*



THE DYER PARTNERSHIP ENGINEERS & PLANNERS, INC.	***CITY OF YACHATS*** ***WATER MASTER PLAN***	**FIGURE NO.**
DATE: JUNE, 2001 PROJECT NO.: 0510.02	***STUDY AREA MAP***	***2.1.2***

The maximum yield reported is 40 gallons per minute (gpm) from a well located about one and one-half miles southerly of Yachats and operated by the U.S. Forest Service. Of the wells located within the Yachats River watershed, yields range from two to ten gpm.

Surface Water

The natural drainage courses of the Yachats River, Reedy Creek and Salmon Creek, constitute the primary surface water in and near the study area. Presently, the City removes raw water from both Reedy and Salmon Creeks. A number of other minor creeks and water features are present within the Study Area.

The Yachats River originates approximately 16-river miles southeasterly of town near Klickitat Mountain within the Siuslaw National Forest. There are numerous tributary creeks along the Yachats that contribute to its flow.

The highest flows of the Yachats River, as well as local streams, occur in winter and early spring months in accordance with spring runoff and the rainy season. Higher river and stream flows during these months typically are attributed to runoff from heavy precipitation. During some colder winters, snow also can contribute to runoff. Periodic flooding of local streams and the Yachats River can occur during times of extended heavy precipitation and runoff.

Environmental Issues

The areas in and around the City of Yachats are known for their beauty and their coastal flavor. Numerous public viewpoints, walking trails, and other local treasures are favorites of residents and visitors alike.

Yachats, being a coastal community at the mouth of the Yachats River, is contained within an environmental region with two major water resources. These resources are the Pacific Ocean and the Yachats River and its estuary. The Yachats estuary serves as a habitat for a number of fish and wildlife species. The coastal headlands, tidal areas, and uplands, are all sensitive natural areas, each supporting its own ecosystem of diverse species of wildlife and vegetation. The impacts each resource has on the community are vast in both physical and socioeconomic terms.

Vegetation in the Yachats area is typical of coastal regions in Oregon. Forestlands lie north, south, and east of the City; the Pacific Ocean lies to the west. Forestlands consist of Douglas Fir, Western Hemlock, Sitka Spruce, Red Alder, and Western Red Cedar. Other plants common to the area include Pacific Rhododendron, Vine and Big Leaf Maple, Red Elderberry, Hairy Manzanita, Kinnikinnick, Salal, Salmonberry and Sword and Bracken Fern.

The tidal zone along the Pacific Coast and Yachats Estuary are the habitat of marine bass, rock fish, and ocean perch. Other types of marine life include clams, mussels, chitons, limpets, crab, shrimp, starfish, sea anemone, and urchins. Sea mammals living in the ocean off the coast of Yachats include harbor seals and sea lions. Other mammals native to the region include shrew, mole, raccoon, river otter, muskrat, beaver, skunk, squirrel, and blacktail deer.

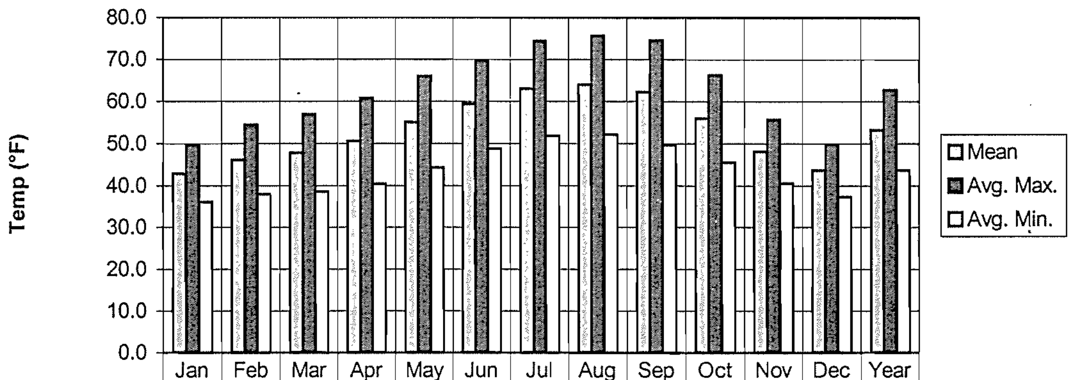
Of particular environmental interest in the area is the Steelhead Salmon, Coho Salmon and other anadromous fish that can be found at various time of year in the Yachats River. As with other coastal streams, impacts due to low water levels, over fishing, and numerous other environmental issues have resulted in dwindling steelhead population.

2.3 Climate

Yachats is located along the central portion of the Oregon coast and has a climate similar to much of the coast; moderate temperatures year-round with little precipitation during summer months and heavy precipitation between late fall and early spring.

Due to marine influence, few temperature extremes are observed in the Yachats area. The average daily temperatures in the months of December and January include highs in the upper 40's and lows in the upper 30's. The summer months typically have high temperatures averaging in the high 60's to middle 70's and lows from the high 40's to low 50's. Extreme temperatures range from 5 to 106°F. Figure 2.3.1 summarizes the average maximum and minimum temperatures in the City.

Figure 2.3.1
Monthly Temperature Data (1948-1999)



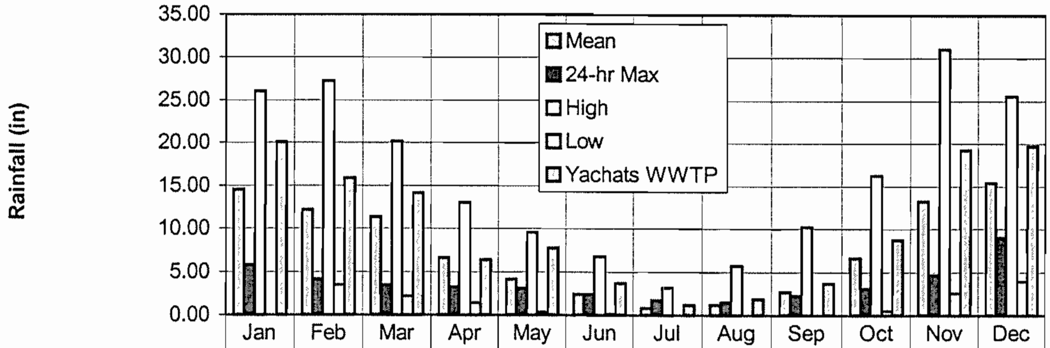
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Mean	42.8	46.1	47.8	50.6	55.1	59.4	63.1	63.9	62.2	55.9	48.1	43.6	53.2
Avg. Max.	49.6	54.4	56.9	60.8	65.9	69.8	74.4	75.7	74.6	66.3	55.6	49.8	62.8
Avg. Min.	36.0	37.9	38.6	40.4	44.3	48.7	51.8	52.1	49.7	45.5	40.6	37.3	43.6

Precipitation data indicates that Yachats receives an average of between 60 and 95 inches of precipitation per year. Nearly all precipitation occurs as rainfall, with the majority (approximately 69 percent) falling between the months of November and March. Rainfall amounts for November, December and January average approximately 14 inches per month. The wettest month is December with a historic average of approximately 15 inches of rainfall. The driest month is July with a historic average of less than one inch of rainfall. Records show that the average maximum 24-hour rainfall is 5.76-inches. A maximum mean 24-hour rainfall of 8.22-inches is recorded for the month of January. The largest average amount of rainfall experienced in a 24-hour period is the maximum mean 24-hour rainfall. Precipitation data is available from NOAA at *http://nimbo.wrh.noaa.gov*.

Figure 2.3.2 summarizes the average monthly precipitation for the Yachats area.

Though Yachats usually experiences high annual rainfalls, it should be pointed out that drought conditions are possible. The winter and spring of 2001 have proven to be just such a drought year. As of March 2001, the coastal region of Oregon was more than 70 percent below the normal precipitation levels. The resulting low streamflows in the creeks and rivers on the coast suggest an extremely dry

Figure 2.3.2
Monthly Precipitation



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	14.52	12.21	11.34	6.66	4.12	2.44	0.80	1.19	2.68	6.61	13.24	15.43
24-hr Max	5.76	4.16	3.43	3.20	3.08	2.40	1.72	1.50	2.27	3.10	4.65	9.00
High	26.02	27.25	20.20	13.00	9.57	6.75	3.16	5.73	10.24	16.26	31.09	25.57
Low	0.00	3.48	2.16	1.45	0.35	0.12	0.00	0.00	0.00	0.52	2.55	3.93
Yachats WWTP	20.11	15.87	14.12	6.38	7.75	3.68	1.17	1.90	3.67	8.70	19.26	19.74

upcoming summer with very low flows. For communities such as Yachats that rely on surface water, a drought season can have serious consequences.

2.4 Economic Conditions

A large portion of the demand for water depends upon local economic conditions. Regional economic conditions and trends can also affect population growth and future water consumption in the City of Yachats. For instance, increases in residential, commercial and/or industrial development create immediate additional water demand.

Some of the attributes that make the City an attractive place to live are location, environmental and air quality, City services, employment opportunities, affordable housing, small town atmosphere, and an abundance of recreational opportunities. For these reasons and others, Yachats is expected to exhibit healthy growth within the upcoming planning period.

While there are many positive attributes to the Yachats community, there are few of the common necessities for younger and growing families such as an abundance of family-wage jobs and local schools. As a result, Yachats serves more as a bedroom community for Newport, Waldport, and Florence.

Yachats is primarily a resort and retirement community; according to the 1990 Census, the median age of residents of the City of Yachats is 58.7 years. The local economy depends largely upon tourist and recreation money. Due to the scenic beauty, temperate climate and the recreation opportunities available within the City as well as the nearby Siuslaw National Forest, tourism and outdoor recreation are expected to remain stable sources of income for the community long into the future.

2.5 Population (Water Consuming Population)

Existing population and population projections play a significant role in infrastructure planning. Though a number of resources are available for determining population figures, none have been developed to account for the water consuming population. Therefore, other efforts had to be made to evaluate the water consuming population relying on the City of Yachats water system. All discussion of population hereafter refers to the water consuming population.

Since 1990 Yachats has experienced a growth rate higher than most other communities in Oregon. Economic conditions were difficult in the early 1980's due to the decline of the forest products industry. Yachats' livability characteristics, however, especially for retired persons and those enjoying outdoor recreation, have attracted a long term growing populace to the Oregon Coast regardless of the local economic climate.

However, estimating current and future population within the City of Yachats presents many special challenges. The vast majority of commercial water use is accounted for in the numerous motels, condominiums, transient-rental homes, second homes, and other part-time residential locations. Because the nature of these facilities is for part-time occupation only, they are not accounted for within the United States Census or included within the estimates developed by Portland State University. However, throughout the year, many part-time residents and visitors of Yachats are included within the water-consuming population.

In order to account for the entire service population, a separate analysis has to be performed for both peak and off-peak population levels. The following discussion outlines the methodology used to estimate the service population for the City of Yachats water system.

Full Time Residential Population

Based on Portland State University's (PSU) Center for Population and Research, the City of Yachats' population increased from 533 to 734 between 1990 and 2000. This equates to an average annual growth rate of 3.25 percent. During this same period, the County's average growth rate was 1.21 percent. From 1995 to 2000 the population increased from 645 to 734 giving an average growth rate of 2.61 percent per year over the last five years. The growth rate for the previous 20-year planning period (1978-1998) was approximately 1.8 percent.

The City is currently updating their City Comprehensive Plan. As part of the update, the City Planner has developed new population estimates and projections. According to the City Planner, growth in Yachats is expected to continue at a rate similar to that experienced in the community during the last decade. The updated Comprehensive Plan recommends a conservative growth rate of 2.25 percent per year over the next 20 years.

To support the recommended growth rate, the City Planning staff identified and quantified available building lots for residential development. Vacant and buildable lots were identified and visually inspected. Large lots were theoretically subdivided to determine the maximum amount of buildable property. Lots located in the upland areas were divided into larger lots to account for the increased slopes and the resulting decreased development density. Through this exhaustive analysis, it was determined that adequate buildable property exists within the UGB to support the recommended growth rate. A total of approximately 1200 R-1 to R-4 zone building lots are available within the City. This will allow for more than adequate space for the increased residential population to develop and construct residential dwellings.

For the purposes of this study, an existing full-time residential population of 734 persons shall be used with an average annual growth rate of 2.25 percent for the 20-year planning period.

Part Time Residential Population

Yachats serves as a second or part-time home for many residents. These residents include retirees that travel in the winter ("snow-birds"), full-time residents of Portland, Eugene, Salem, or other locations, and some condominium and transient-rental residents. While these part-time residents are not included as Yachats residents in census counts, they do use water and must be accounted for.

There are approximately 610 residential water connections in the City system. A detailed review of annual water records was performed in order to determine how many residential homes exhibit consistent water consumption throughout the year and how many have visibly inconsistent consumption patterns. The inconsistent patterns were interpreted to be part-time residences.

It was determined that approximately 410 homes exhibited consistent water consumption throughout the year. Dividing 734 persons into 410 homes results in a ratio of approximately 1.8 persons per home.

The remaining 200 homes (610 – 410 = 192) are assumed to be part-time residences due to their inconsistent water use patterns. Multiplying 200 homes by 1.8 persons/home (pph) results in a part-time residential population of approximately 360 persons.

For the purposes of this study, a peak total of 360 persons are estimated to be living part-time in the City of Yachats. It is also estimated that the part-time population will grow at the same rate as the full-time population or 2.25 percent.

While the months of consistent water use typically fell within the summer months, there were many accounts that exhibited inconsistent water use throughout different times of the year. Due to the general distribution of water consumption within this group, it is estimated that the off-peak part-time population is approximately 50 percent of the peak-time population or 180 persons in 2001.

Tourist / Transient Population

The vast majority of commercial water use within the City is related to the lodging industry. Since the water consumption practices of resort hotel clientele are similar to typical residential consumption, it is critical that the tourist population be approximated. For a discussion of the similarity of commercial versus residential per capita water consumption, see Section 7.3.

Visits were made to each lodging facility in the City to obtain data on numbers of rooms, the approximate occupancy rates throughout the year, toilet and fixture counts, and other pertinent data. It was determined that approximately 270 lodging units are located within the City with approximately 60 transient rental properties for a total of 330 lodging units. Transient rental properties include beach houses, bed & breakfasts, and other "rent-by-the-day" establishments.

The City Comprehensive Plan estimates that approximately 2.5 persons per lodging unit are typical of visitors to the Yachats lodging facilities. Based on a full or peak occupancy rate, a tourist population of approximately 825 persons should be expected on peak tourist days.

One of the most critical water-planning criterion is the average day demand (ADD). The ADD is defined as the water required on any given day of the year or simply the average daily demand. For the purposes of the analysis, the average occupancy rate is considered to be analogous to the off-peak occupancy rate.

Or in other words, the off-peak occupancy rate is considered to be equal to the average, year-round occupancy rate. For further discussion of the ADD , see Section 5.2.

According to information received from various lodging facilities, the estimated off-peak or yearly average occupancy rate is approximately 50 percent based on revenue streams throughout the year. Therefore, during off-peak times, approximately 413 persons will make up the tourist population sector for the City of Yachats.

The Comprehensive Plan also suggests that the growth of commercial facilities will be at approximately 3.0 percent over the 20-year planning period. This slightly higher growth rate will serve to provide capacity for the increasing popularity of Yachats as a tourist destination.

Total Water Service Population

The sum of each population sector described above is the total equivalent population for the City of Yachats. Figure 2.5.1 summarizes both peak and off-peak population estimates for the City of Yachats current population and projections for the planning period.

Figure 2.5.1 – Current Population Estimate and Population Projections

Year	2001	2006	2011	2016	2021	2026
Residential Population (1)	734	820	917	1,025	1,145	1,280
Peak Part-Time Residential (2)	360	402	450	503	562	628
Off-Peak Part-Time Residential (3)	180	201	225	251	281	314
Peak Tourist Population (4)	825	956	1,109	1,285	1,490	1,727
Off-Peak Tourist Population (5)	413	478	554	643	745	864
Total Peak Population	1,919	2,179	2,475	2,813	3,197	3,635
Total Off-Peak Population	1,327	1,500	1,696	1,919	2,171	2,458

(1) Beginning with 734 persons with moderate 2.25% (+ -) growth per year.

(2) Beginning with 360 persons with moderate 2.25% (+ -) growth per year.

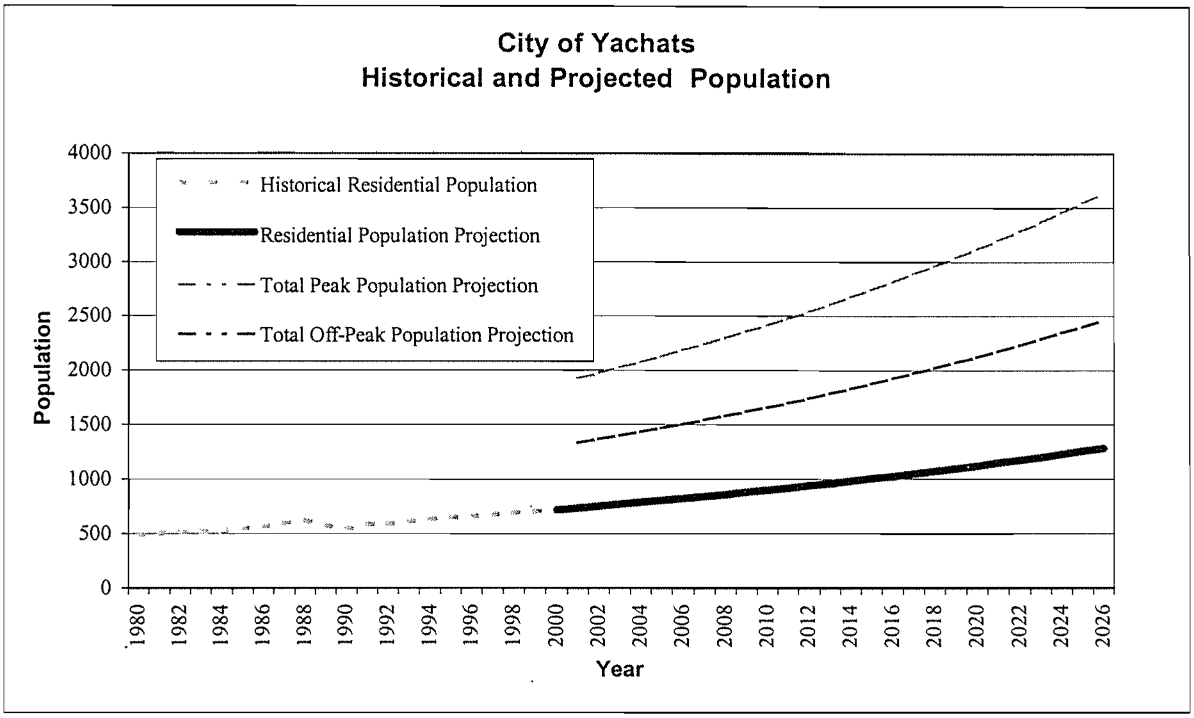
(3) 50% occupancy.

(4) Beginning with 268 motel rooms and 61 transient rentals w/ 2.5 ppr @ 3% (+ -) growth per year.

(5) 50% occupancy.

In Figure 2.5.2, the historical full-time residential population estimates from Portland State University are plotted with the projections for each population sector described above. The peak and off-peak population estimates will be used later in the Plan to project water demands and consumption throughout the planning period.

Figure 2.5.2 - Historic and Projected Growth, City Limits and Current UGB



2.6 Land Use

Land use within Yachats is categorized into five general uses: residential, commercial, public facilities, state parks, and estuary natural. There is an estimated 600 acres within the current UGB. The Yachats zoning map is shown as Figure 2.6.1. The five land use classifications are briefly discussed below:

- **Residential Lands.** Yachats' residential lands are distributed throughout the community and on each side of Highway 101. Residential lands also occupy the elevated marine terrace directly south of town and new subdivisions are being constructed in the hilly areas surrounding town. Residential land use ranges from single family dwellings, to multi-family dwellings, to bed and breakfast and motel land uses.

- **Commercial Lands.** The commercial properties are clustered around Highway 101. The center of the commercial land use areas is located around Third Street and extends outward. Commercial activities generally include retail and tourist related services. Small shops and restaurants catering to the seasonal tourist market make up the majority of the commercial properties in the City.

- **Public Facilities Lands.** Public lands consist of those required for government offices, schools, hospital, transportation facilities, parks, and recreation areas. The wastewater treatment plant and City shops are included within the public facilities lands.

- **State Parks Lands.** A number of state park land use areas are located within the City's UGB. Smelt Sands State Wayside, Yachats State Park, and Yachats Ocean Road Wayside are all located within the UGB and provide access to the ocean beaches and scenic areas which for tourists and residents alike.

Estuary Natural Lands. The estuary natural land use areas are located near the mouth of the Yachats River and extend into the Yachats Estuary. The ocean beaches and areas immediately adjacent to the coast are also included within the estuary natural land use sector.

Please see Figure 2.6.1 for a graphical depiction of the various land use zones within the City of Yachats.

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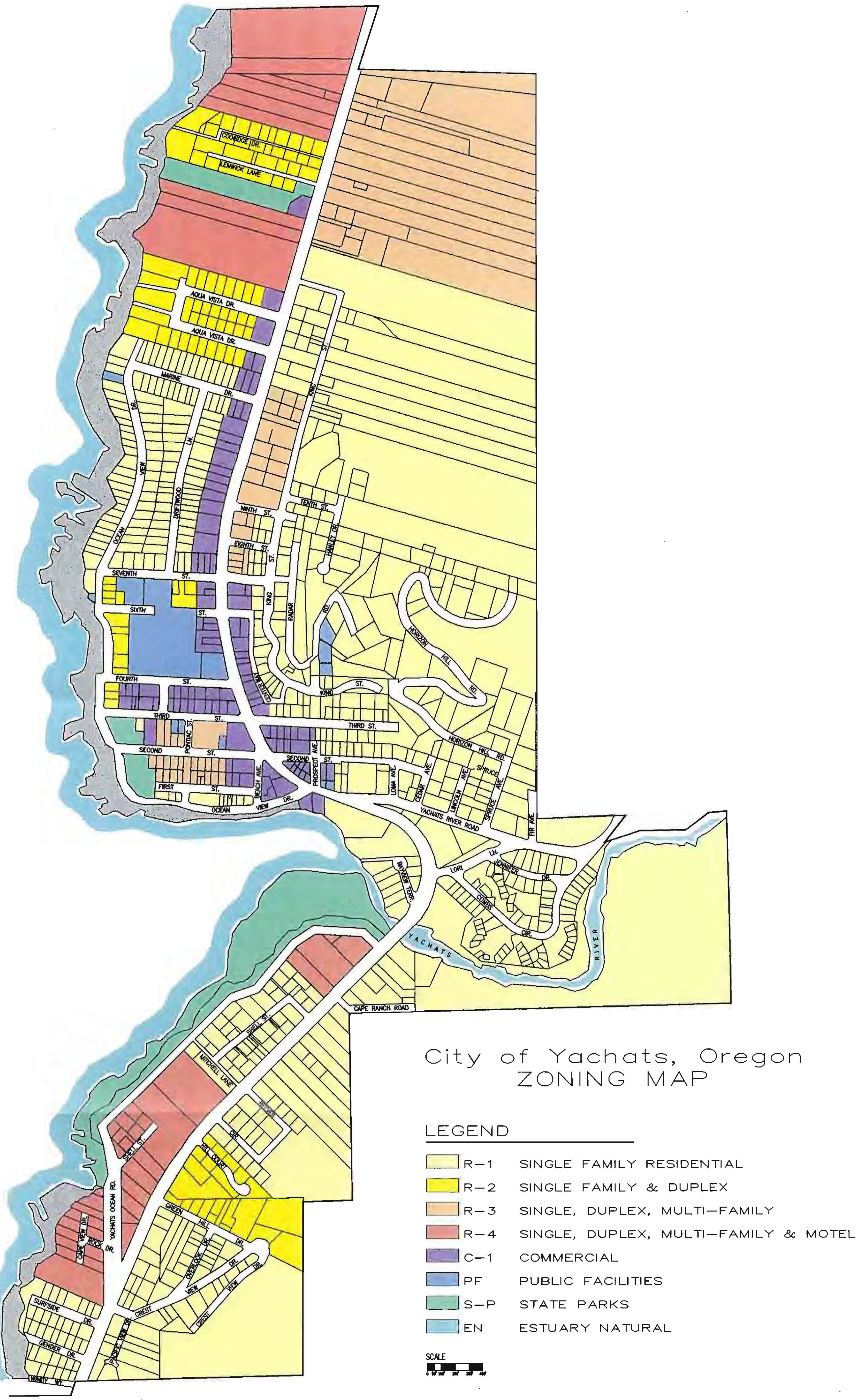

THE DYER PARTNERSHIP ENGINEERS & PLANNERS		CITY OF YACHATS, WATER MASTER PLAN	FIGURE NO.
DATE:	JUNE, 2001	ZONING MAP	2.6.1
PROJECT NO.:	0510.02		

Regulatory Environment

Section

3

Regulatory Environment

Section 3

3.1 Municipal Water Management Plans

The Oregon Water Resources Department has developed rules which govern water management planning (Water Management and Conservation Plans; OAR Chapter 690, Division 86). Included in the rules are groundwater management, hydroelectric power development, instream flow protection, interstate cooperation, water resources protection on public riparian lands, conservation and efficient water use, water allocation, and water storage. The Water Resources Commission has adopted a statewide policy on Conservation and Efficient Water Use (Statewide Water Resource Management; OAR 690-410). The policy requires major water users and suppliers to prepare water management plans. Municipal water suppliers are encouraged to prepare water management plans, and are required to do so if a plan is prescribed by a condition of a water use permit. The following elements are to be included in the plan:

- Description of the Water System
- A Water Conservation Element
- A Water Curtailment Element
- A Long-Range Water Supply Element

A Water Master Plan prepared under the requirements of the Department of Human Resources Health Division (OHD) which substantially meets the requirements of OAR 690-086-0140 may be submitted to meet the requirements of this rule. It is the intent of this City of Yachats Water Master Plan to meet all of the requirements of this rule.

The elements required in a Water Management and Conservation Plan are briefly described below. Sections 7 and 8 of this Master Plan include a more detailed discussion of the elements required in a Water Management Plan, a Conservation Plan, and Curtailment Plan.

Description of the Water System

The water system description shall include sources of water, storage and regulation facilities, transfer and exchange agreements, and intergovernmental cooperation agreements. System capacity, limitations and opportunities for expansion under existing water rights are to be included. Water use shall be discussed including current average annual water use, peak seasonal demand, average and peak day demands, and quantities of water used from a source. Customer information is required such as estimated numbers and general water use characteristics of residences, commercial, industrial, and other users. Also required is a schematic of the system which shows the sources of water, storage facilities, treatment facilities, major transmission and distribution lines, pump stations, interconnections with other municipal supply systems, and the service area. All of the applicable information required for a description of Yachats' water system is included in this Master Plan.

Water Conservation Plan

A water conservation plan is a long-term program intended to reduce average water use and the resulting demand on the water system. Conservation means eliminating waste or otherwise improving the efficiency of water use while satisfying beneficial uses. Conservation can be achieved by modifying the technology or method for diverting, transporting, applying or recovering water, by changing the management of water use, or by implementing other measures. The plan shall include a description of the water supplier's water use measurement and reporting program and a description of conservation measures, if any, that are currently being implemented.

For each of the following conservation measures not currently implemented, an evaluation of whether implementation is feasible and appropriate shall also be included:

- A system-wide leak repair program or line replacement to reduce system leakage to 15 percent, and if the reduction to 15 percent is found to be feasible and appropriate, to reduce system leakage to 10 percent;
- programs to encourage low water use landscaping;
- incentive programs that encourage conservation;
- retrofitting or replacement of existing inefficient water using fixtures;
- adoption of rate structures that support and encourage water conservation;
- water reuse opportunities; and
- any other conservation measures identified by the water supplier that would improve water use efficiency.

A description and estimated schedule for implementation of each of the following conservation measures shall be included:

- If the system is not fully metered, a program to install meters on all unmetered water service connections. The program shall start immediately after the plan is approved and shall identify the number of meters installed each year with full metering completed within five years of plan approval.
- a regularly scheduled program for leak detection for the transmission and distribution system;
- a meter testing and maintenance program;
- a public education program on efficient water use; and
- any other measures described above that are identified as feasible and appropriate.

Water Curtailment Plan

A water curtailment plan is defined as a short-term mandatory conservation plan usually brought on by an emergency or extreme water shortage. The goal of a water curtailment plan is to drastically reduce water consumption in order to protect existing resources and system components. Once the water shortage or emergency has passed, the curtailment activities can be discontinued.

The water curtailment element shall include at least the following:

- A description of the frequency and magnitude of supply deficiencies within the past ten years and current capacity limitation. The description shall include an assessment of the ability of the water supplier to maintain delivery during long-term drought or other source shortages;
- A list of three or more stages of alert for potential shortage or water service difficulties. The stages shall range from a potential or mild alert, increasing through a serious situation to a critical emergency;
- A description of predetermined levels of severity of shortage or water service difficulties which will trigger the curtailment actions under each stage of alert to provide the greatest assurance of maintaining potable supplies for human consumption; and
- A list of specific standby water use curtailment actions for each stage of alert ranging from notice to the public of a potential alert, increasing through limiting nonessential water use, to rationing and/or loss of service at the critical alert stage.

Long-Range Water Supply Plan

The long-range water supply plan shall include a description of the water supplier's expected future service area and an estimate of the long-range water demand projections for ten and 20 years, which are consistent with acknowledged comprehensive land use plans of the affected local government. The plan shall also include a comparison of the projected water needs compared to the system capacity and the reliability of water rights held by the water supplier.

If future demand projections indicate that additional water will be required within the next 20 years, the plan shall include a comparison between potential sources of additional water, including conservation and reuse, based on cost, availability, reliability and likely environmental impacts. A schedule is to be planned for development of any new sources with a description of criteria used in the selection of the sources.

3.2 Public Water System Regulations

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. Since its inception, the SDWA and associated regulations have been amended a number of times, with the most recent amendments in August 1996.

One of the main elements of these drinking water regulations is the establishment of maximum contaminant levels (MCLs) for inorganic, organic, microbiological and radio nuclide contaminants and turbidity. An MCL is the maximum allowable level of a contaminant in water delivered to the users of a public water system. Concentrations above the MCL for a contaminant are considered violations and require the water supplier to perform immediate corrective action and notify the public of such violations.

One amendment to the SDWA is the Surface Water Treatment Rule (SWTR). This rule affects all public water systems using surface water sources and established, among other requirements, that water must be treated through filtration and disinfection. This rule is required for all water providers using a surface water source unless certain water quality criteria and site-specific requirements are met. Treatment requirements, performance standards and MCLs are generally summarized as follows (excluding MCLs for inorganic materials, radioactive substances, and secondary contaminants) for a water system:

- The turbidity level of representative samples of filtered water must at no time exceed 5 NTU, measured as specified in OAR 333-061-0036(4)(b). That is to say, 0 percent of the turbidity measurements can exceed 5 NTU. Turbidity monitored continuously with results reported every four hours.

- The turbidity level of representative samples of filtered water must be less than or equal to 0.5 NTU in at least 95 percent of the measurement taken each month, measured as specified in OAR 333-061-0036(4)(b). That is to say, the turbidity levels can rise above 0.5 NTU no more than 5 percent of the time.

- Total coliform-positive (coliform present) samples shall not exceed more than one sample collected during a month. Two monthly samples are required. A set of at least three repeat samples is required for each positive sample. Repeat sampling continues until the MCL is exceeded or a set of repeat samples with negative results (coliform absent) is obtained. Confirmed presence of fecal coliform or *E. coli* requires immediate notification of the public.

- At least 99.9 percent (3-log) inactivation and/or removal of *Giardia lamblia* cysts at a point downstream at or before the first customer.

- At least 99.99 percent (4-log) inactivation and/or removal of viruses at a point downstream at or before the first customer.

- A free chlorine residual of 0.2 mg/L after 30 minutes of contact time shall be achieved under all flow conditions before the first customer.

- The residual disinfectant concentration in the distribution system, measured as total chlorine, combined chlorine, or chlorine dioxide, as specified in OAR 333-061-0036(4)(b)(C) cannot be undetectable in more than 5 percent of the samples each month, for any two consecutive months.

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 www.ohd.hr.state.or.us/cehs/dwp/pwsrules.htm. A summary of Oregon drinking water quality standards published in "*Pipeline*" (Volume 13, Issue 5, Special Edition Fall 1998) by the State Health Division is included in the Appendix. This document includes schedules and compliance deadlines for implementation of the SDWA.

3.3 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 make certain that water system facilities are free of public health hazards, and to verify 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 prescribed by OAR 333-061-0036.
- 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.
- Continue to report as prescribed by OAR 333-061-0040, the results of analyses or measurements which indicate that maximum contaminant levels 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.
- 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 Division, 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 relating to certification of water system operators.
- Verify that Non-Community water systems utilizing surface water sources or sources under the influence of surface water are in compliance with OAR 333-061-0065(2)(c) relating to required special training.

3.4 Future Water System Regulations

The adoption of the 1989 Surface Water Treatment Rule (SWTR) has improved the quality of drinking water and greatly reduced the number of infections caused by water borne pathogens. The SWTR set standards to reduce water concentration of *Giardia* and viruses, with a goal to reduce the risk of infection to less than one in 10,000 people per year. However, some water sources have a high concentration of pathogens that, even when treated to the levels required by the rule, do not meet the health goal. Specifically, the rule does not specifically control the protozoan *Cryptosporidium*, which has been linked to at least 50 deaths of *Cryptosporidium*-caused illness outbreaks in Milwaukee, Nevada, Oregon, and Georgia. Although the public health benefits of disinfection are significant and well recognized, it has been found that the disinfection byproducts also pose health risks at certain levels. The Safe Drinking Water Act (SDWA) Amendments, signed by President Clinton in August 1996, mandated the establishment of a series of new drinking water regulations in response to these and other concerns. Since the enactment of the amendments the US Environmental Protection Agency (EPA) has been busy developing, proposing, and finalizing regulatory actions. Some of the recent and proposed regulatory actions are summarized below.

Enhanced Surface Water Treatment Rules, Enacted & Proposed

One of the first rules developed by EPA under the SDWA amendments was the Interim Enhanced Surface Water Treatment Rule (IESWTR). The IESWTR was promulgated to address health risks from microbial contaminants without significantly increasing the potential risks from chemical contaminants. This rule applies to public water systems that use surface water or ground water under the direct influence of surface water (GWUDI) and serve at least 10,000 people. In addition, States are required to conduct the sanitary surveys for all surface water and GWUDI systems, including those that serve fewer than 10,000 people.

For water systems with a population of less than 10,000, the Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) was proposed. The final proposed rule provisions are anticipated for early 2001 and will generally parallel the IESWTR enacted in 1998. These provisions include:

- Turbidity less than 0.3 NTU 95 percent of the time, and at no time higher than 1 NTU.
- A treatment technique requiring a 2-log (99%) *Cryptosporidium* removal requirement.
- Strengthened combined filter effluent turbidity performance standards and new individual filter provisions.
- Disinfection benchmarking provisions to ensure continued microbial protection.
- Requirements for covers on new finished water reservoirs.

Additional information concerning LT1ESWTR may be found at http://www.epa.gov/safewater/mdbp/lt1fbr.html.

Stage 1 Disinfectants/Disinfection Byproducts Rule (Stage 1 DBPR)

Stage 1 DBPR was published along with the IESWTR to control disinfectants and formation of their harmful byproducts. This rule establishes maximum residual disinfecant level goals (MRDLGs) and maximum residual disinfectant levels (MRDLs) for three disinfectants: chlorine (4.0 mg/l), chloramines

(4.0 mg/l), and chlorine dioxide (0.8 mg/l). The rule also establishes maximum contaminant level goals (MCLGs) and maximum contaminant levels (MCLs) for specific disinfection byproducts as given in Table 3.4.1. Water system providers must monitor and control the use of disinfectants and meet the requirements for total trihaolmethanes (TTHM) and the sum of five haloacetic acids (HAA5)

Table 3.4.1 - MCLGs and MCLs for Stage 1 Disinfectants

Disinfection By-Product	MCLG (mg/l)	MCL (mg/l)	Time Period
Total trihalomethanes (TTHM)	-	0.080	Annual Average
Bromodichloromethane	0	-	-
Dibromochloromethane	0.06	-	-
Bromoform	0	-	-
Haloacectic acids (HAA5)	-	0.06	Annual Average
Dichloroacetic acid	0	-	-
Trichloroacetic acid	0.3	-	-
Chlorite	0.8	1.0	Monthly Average
Bromate	0	0.010	Annual Average

In addition, water systems that use surface water or GWUDI and use conventional filtration treatment are required to also remove a specified percentage of organic materials, measured as total organic carbon (TOC), that may react with disinfectants to form disinfection byproducts. Additional information concerning Stage 1 DBPR may be found at http://www.epa.gov/OGWDW/mdbp/dbp1.html.

Stage 2 Disinfection Byproducts Rule (Stage 2 DBPR), Proposed

In September 2000, a Stage 2 M-DBP Federal Advisory Committee compiled recommendations that the EPA should base the applicable sections of its anticipated Stage 2 Disinfection Byproducts Rule (DBPR) proposal. The following is a summary of the major rule provisions based on the recommendations of the Federal Advisory Committee as they pertain to small systems (<10,000 people). Additional information may be found at http://www.awwa.org.dbp/faca.htm.

The Stage 2 DBPR is designed to reduce disinfection byproducts occurrence peaks in the distribution system based on changes to compliance monitoring provisions. The requirements of this rule will apply to all community water systems and non-transient non-community water systems that add a disinfectant other than UV or deliver water that has been disinfected. The Stage 2 rules would be implemented in two phases.

- **Phase 1.** All systems must comply with a 120 mg/l TTHM/ 100 mg/l HAA locational running annual average based on Stage 1 monitoring sites and also continue to comply with the Stage 1 annual average requirements. The end of Phase 1 is three years after rule promulgation with an additional two year extension for available for systems requiring capital improvements.

- **Phase 2.** For small systems required to do *Cryptosporidium* monitoring, compliance with a 80 mg/l TTHM / 60 mg/l HAA locational running annual average will begin 8.5 years after rule promulgation with an additional two-year extension for systems requiring capital improvements. For all other small systems, compliance with the 80/60 locational running annual average would begin 7.5 years after rule promulgation with potential two-year capital improvement extension.

An initial distribution system evaluation (IDSE) would be conducted by the water provider and is intended to select new compliance monitoring sites that reflect locations with system high TTHM and HAA5 concentrations. Water providers would recommend new or revised monitoring sites based on their IDSE study. The results from the IDSE study would not be used for compliance purposes. For surface water systems with less than 10,000 people, water providers must monitor either quarterly (population from 500-9,999) or semi-annually (population <500) for one year at two distribution system sites per plant. These sites must be in addition to the Stage 1 DBPR compliance monitoring sites. Water providers that certify to the State that all samples taken in the last two years were below 40 mg/l TTHM / 30 mg/l HAA5 are not required to conduct the IDSE.

For long term compliance monitoring, the principles of reduced compliance monitoring strategy (for very low DBP levels) utilized in Stage 1 DBPR would continue in the Stage 2 DBPR. Water providers would collect paired samples (TTHM and HAA5) at the site representing the highest TTHM and the highest HAA5 locations in the distribution system as identified under the IDSE. If the highest levels of TTHM and HAA5 are observed at the same location, then only one samples would be needed. Monitoring would be either quarterly (population from 500 – 9,999) or annually (population <500). The Federal Advisory Committee also recommended that EPA propose that all wholesale and consecutive systems comply with the provisions of the Stage 2 DBPR on the same schedule of the system serving the largest population in the combined distribution system.

The proposed rule is anticipated in Spring 2001 and the final rule is expected in May 2002.

Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), Proposed

The Long Term 2 Enhances Surface Water Treatment Rule (LT2ESWTR) was proposed and reviewed by a Federal Advisory Committee at the same time as the Stage 2 DBPR rules. The requirements of this rule would pertain to all public water systems that use surface waters or GWUDI. The rule would incorporate system specific treatment requirements for one of four categories or "bins" depending upon the results of source water *Cryptosporidium* monitoring. Treatment requirements for each system would depend on system's existing treatment equipment and removal capabilities. To comply with additional treatment requirements, water providers would choose technologies from a "toolbox" of options. Additional information may be found at http://www.awwa.org/govtaff/finalagreement.doc. Proposed treatment requirements for average *Cryptosporidium* are presented in Table 3.4.2.

Table 3.4.2 - Proposed Treatment Requirements For Average *Cryptosporidium* Concentrations

Bin No.	Ave. *Cryptosporidium* Concentration	Additional Treatment Requirements(1)
1	< 0.075/ liter	No action
2	0.075/ liter < x < 1.0/ liter	1-log treatment (any technology or technologies)
3	1.0/ liter < x < 3.0/ liter	2.0 log treatment (must achieve at least 1-log of treatment using specific technology (2)
4	> 3.0/ liter	2.5 log treatment (must achieve at least 1-log treatment using specific technology (2)

(1) – For systems with conventional treatment that are in full compliance with IESWTR.
(2) - Acceptable technologies include ozone, chlorine dioxide, ultraviolet (UV), membranes, bag/cartridge filters, or in-bank filtration.

For small systems monitoring requirements, it is anticipated that source water *E. coli* concentrations would be utilized for *Cryptosporidium* monitoring. Observed *E. coli* concentrations above certain levels would trigger *Cryptosporidium* monitoring. The recommended *E. coli* monitoring for small systems would begin 2.5 years after rule promulgation and would include 24 samples over one year. After six years, of the system characterization, a second round of monitoring is proposed.

Filter Backwash Recycle Rule, Proposed

EPA is required to regulate the recycling of filter backwash within the treatment process of a public water system. The proposed rule has been under development for a number of years and was proposed in April 2000. A final rule is expected early in 2001. The proposed provisions would impact all conventional and direct filtration systems, which recycle filter backwash and use of surface water or GWUDI. Proposed provisions include the following requirements.

- Recycle flows be introduced prior to the point of primary coagulant addition.
- Certain systems meeting specific criteria (i.e. direct recycle, 20 or fewer filters, & recycle within the system) to perform a one-time self-assessment of their recycling practices and consult with the State on the findings.
- Direct filtration systems provide recycle treatment information to State, which may require that modifications to recycle practice be made.

The Filter Backwash Recycle Rule would apply to all systems, which recycle regardless of population served.

Other Proposed Regulations

EPA is either currently working on or has already promulgated a number of water system regulations. A number of the MCLs for existing regulated substances are anticipated to change including arsenic, aldicarb, aldicarb sulfone, aldicarb sulfoxide, radium, gross alpha radioactivity, beta particle, and photon radioactivity and radon. New MCLs are expected in the future for such substances as nickel, sulfate, methyl tertiary butyl ether (MTDE) and uranium. EPA is also deciding on whether to regulate other contaminants identified in the Drinking Water Contaminant Candidate List, which was finalized in March 1998. The 1996 SDWA required EPA to also conduct continuing studies on sensitive subpopulations and endocrine disruptor screening program. Information from these studies and programs may identify additional contaminants that may require regulation.

New rules for groundwater and the disinfection of groundwater will be imposed on "high risk wells" identified by EPA. It is expected that only "high risk wells" will be required to disinfect. The Groundwater Rule (GWR) is anticipated in November 2000 with compliance by November 2003.

In summary, the rules are getting tougher with increased treatment standards, lower MCLs, and more regulated substances. Water suppliers must stay informed of upcoming standards and requirements to ensure that their system will stay in compliance. Proper preparation is critical. When upcoming MCLs are established, a supplier should begin to test for these materials to determine if compliance will be a problem. Advanced planning will allow a utility more time to make necessary modifications to treatment techniques. Additional information on recent and pending regulations can be found at www.epa.gov/safewater/standards.html.

Existing Water System

Section

4

Section 4

Existing Water System

4.1 Raw Water Source and Water Rights

Raw Water Sources

The major drainage system in the vicinity of the City is the Yachats River Basin. The Yachats River watershed encompasses roughly 40 square miles. It is generally bounded to the south by Cape and Klickitat Ridges, which extend southeasterly approximately ten miles from Cape Perpetua, to the east by Yachats Mountain and associated ridges, and to the north by Green Mountain, Kerby Ridge, Burnt Timber Mountain and their associated ridges. The United States Forest Service manages approximately three quarters of the total Yachats watershed. However, the slopes adjacent to the City's primary and secondary water sources are under private ownership.

Yachats River. Flow in the Yachats River varies seasonally and is directly affected by precipitation. River levels are considerably higher during winter months than during the summer. In most years, river flow levels are at a minimum in the months of August and September, coinciding with the time when water demand in the City of Yachats is at its peak and other area streams are nearly dried up. Although the City holds water rights on the Yachats River itself, no water is removed from the river at this time for use in the municipal water system.

Cape Creek. A historical water source for the City was Cape Creek. Prior to constructing the treatment plant and diverting water from Reedy and Salmon Creeks, the City diverted water, untreated, from Cape Creek. Cape Creek has not been used to provide raw water for the City for many years.

Reedy and Salmon Creek. Presently, the City of Yachats has two main raw water sources. The primary source is Reedy Creek, located approximately two miles easterly of downtown and on the southerly slopes of Green Mountain. Salmon Creek, the City's secondary source, is located on the westerly slopes of Green Mountain; its confluence with the Yachats River is approximately 250 feet easterly of the City Limits. Although Reedy and Salmon Creeks have comparable flows, water is only taken from Salmon Creek on a backup or secondary basis when flows in Reedy Creek are not sufficient to supply the City's needs. According to City staff, water quality in Reedy Creek is considered superior to that of Salmon Creek. This is, in part, due to the infiltration-type intake system that provides a significant amount of pretreatment on the raw water. Due to the nature of the intake, a significant amount of prefiltration is accomplished with the infiltration system thus resulting in high quality raw water.

Both Reedy and Salmon Creeks are perennial features, however, flows vary significantly based upon rainfall and season. Both streams typically run high during the winter and very low during the drier summer months. High winter flows bring with them turbidity, which results in more difficult water treatment conditions. The low summer flows require careful monitoring of water availability from the creeks and conservative use within the treatment plant as well as by the community.

Water Rights

All water in Oregon is publicly owned. Because of this public ownership, a water right is generally required for anyone to use water regardless of whether the water originates from surface or underground sources.

Oregon's water laws are based on the principal of prior application. That is, if a person obtains a water right on a particular source before someone else, that person would then posses a "senior" water right that would permit them first use of the water during times of lower flows or droughts. A "junior" water right is one that is obtained after other water rights for a particular source have been assigned. A water right may be both "senior" to some and "junior" to others.

During periods of low water availability, a water right holder may use as much water as their water right allows as long as the use is truly beneficial and all senior water rights are satisfied. This method of resource appropriation governs all water used until the water is exhausted.

The City holds rights to obtain a total of 2.0 cfs of surface water from Reedy Creek. Additionally, permits to remove water from Salmon Creek and the Yachats River have been obtained. The permits grant the City a maximum of 2.0 cfs of surface water from Salmon Creek and a maximum of 2.0 cfs, but not less than 1.0 cfs, from the Yachats River. The City also holds a water right for Cape Creek totaling 0.49 cfs. Table 4.1.1 summarizes all water rights held by the City for surface water sources.

Table 4.1.1 – Surface Water Rights Documentation Summary

Location	Identification	Right Type	Magnitude	Priority Date
Reedy Creek	22933	Certificate	2.0 cfs	July 9, 1945
Salmon Creek	29018	Permit	1.0 cfs	June 26, 1963
Salmon Creek	29018	Permit	1.0 cfs	August 22, 1963
Yachats River	53471	Permit	2.0 cfs	March 20, 1989
Cape Creek	14104	Certificate	0.49 cfs	July 21, 1934

No additional water rights, for either surface or groundwater sources, are currently held by the City of Yachats.

Instream Water Rights

Instream rights are protective water rights established to preserve minimum perennial streamflows in our waterways. Like regular water rights, instream rights are issued with a priority date, a flow magnitude, and a certificate number. Instream rights differ from normal water rights in that they commonly vary from month to month and sometimes week to week throughout the year. For instance, the instream rights for a stream in January may be 50 cfs, while in September the instream right requires 15 cfs in the same stretch of water. The primary reason for the establishment of instream water rights has been for the protection and preservation of salmon and other anadromous fish species.

An individual or community may hold water rights on bodies of water where instream rights have been established. However, if the instream right priority date is senior to the individual or community right, the instream right flow magnitude must be satisfied before the individual or community is able to remove water from that source.

Instream rights have been established for the Yachats River in the vicinity of the City's water right and diversion points. The instream rights are senior to the City's rights on the Yachats River and therefore must by satisfied before the City may remove water from their diversion points. However, special conditions outlined in the City's water right state that the City may, for municipal use, remove up to 1 cfs from the Yachats River even though the instream rights have not been satisfied.

Table 4.1.2 summarizes the instream rights that impact the City's rights on the Yachats River. It should be noted that the City's rights are junior to two of the rights but senior to the third.

Table 4.1.2 – Instream Water Rights Documentation Summary – Yachats River (cfs)

Location of Instream Right	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Certificate Number	Priority Date
Beamer Creek to Mouth of River	15/ 50	70	70	65	65	65	65	40	30	20/ 15	15	15	59739	7-12-66
Beamer Creek to Mouth of River	25/ 50	70	70	65	65	65	65	40	30	20	15	15	59608	3-26-74
North Fork to Mouth of River	49.1	132	132	132	132	132	132	63	63/ 42	40.2	25.6	29.4	73160	3-25-91

Note: Where two flow levels are shown, the first is for the first 2 weeks of the month, the second is for the second 2 weeks of the month.

Interconnections With Other Systems

The City of Yachats is in the process of developing a physical interconnection with the Southwest Lincoln County Water District in the northernmost portion of the City distribution system. On a day-to-day basis, a closed valve will keep the two water systems separate and distinct from one another. However, if the need were to arise that one system was in need of treated water, and the other system had a surplus, the valve can be opened and treated water could be provided.

The City of Yachats has entered into agreements with the Southwest Lincoln Water District, the City of Waldport, the Seal Rock Water District, the City of Newport, and the City of Toledo to investigate the viability of developing a regional water system. For additional discussions of the potential for regional water systems in the area see Section 7.5.

4.2 Groundwater Sources - Wells

No groundwater sources are presently utilized by the Yachats water system. Although a hydrologic study of the area has not been performed, information regarding the yield of existing wells within several miles of the City indicates that groundwater is not a viable source for meeting the City's water needs. Also, WRD has stated that few if any additional groundwater is available for appropriation. This is especially true when considering the volume of water required for a municipal water supply.

Geology in the area is dominated by Tertiary age basalt, which is relatively impervious to water. Most of the area's precipitation is accounted for in surface runoff and no significant aquifers have been identified.

4.3 Raw Water Intakes and Transmission Line

Intakes

The City has a raw water intake situated within the streambed of Reedy Creek approximately one-half mile upstream from the Yachats River. The original intake and impoundment structure was constructed in the 1940's. In 1998, a landslide caused, at least in part, by intense rainfall destroyed the original intake, diversion, and impoundment structure. A new intake was constructed at the site though the impoundment itself was not restored.

The new intake, which can be referred to as an infiltration header, consists of an interconnected network of perforated eight-inch galvanized pipe. The header lies beneath several layers of gravel and geotextile fabric, which serve as a pre-filter for the water. The capacity of the infiltration header is not precisely known, although it is estimated to be in excess of 700 gpm (1.56 cfs).

The City's secondary source intake is located on Salmon Creek behind an impoundment structure approximately 100 yards north of the water treatment plant. The intake at this location consists of a single Johnson-type screen with a six-inch diameter outlet line; water entering the intake flows by gravity into the treatment plant and a pump located within the water treatment plant lifts water into the clarifier. Based upon flow records and design capacity data, this intake is capable of approximately 420 gpm (0.94 cfs).

Raw Water Transmission

The raw water transmission line from the Reedy Creek intake consists of six-inch diameter asbestos cement (AC) pipe from the point of diversion, along the access road to a prechlorination station adjacent to the Yachats River County Road. An eight-inch HDPE pipeline connects the prechlorination station to the water treatment plant. Total length of the transmission line is on the order of 8,400 feet.

The HDPE transmission line, installed in September 1997 in an effort to reduce raw water losses, is expected to be in good condition based on its age and material properties; a six-inch diameter AC raw water pipeline was replaced during the installation. Approximately 1500 lineal feet of six-inch AC raw waterline still are in use today on the Reedy Creek transmission line.

The raw water transmission line from the Salmon Creek intake consists of approximately 400 feet of six-inch diameter pipe. The water flows by gravity to the water treatment plant where pumps lift the raw water into the clarifier.

The City maintains and monitors a meter near the diversion on Reedy Creek. Additional meters are used to measure diverted water near the plant for flows from Reedy Creek and Salmon Creek separately.

Raw Water Storage

In 2000, the City constructed a 500,000 gallon, steel raw water reservoir adjacent to the water treatment plant. The storage tank was constructed in an effort to provide the City with increased operational flexibility. Previously, low summertime flow required the plant to run at lower operating rates due to the low raw water flows. Today, the plant can draw water from the raw water tank, operate at consistent rates, and fill the treated water reservoirs more efficiently. During off-hours, the raw water tank fills with flows from Reedy Creek.

The inclusion of this new system component has given the City valuable "breathing room" in terms of raw water availability. With the loss of the Reedy Creek impoundment, the tank provides valuable flow attenuation especially during the low summertime streamflow season.

If the City is able to solve their water supply problems, the raw water storage tank could be converted into a treated water storage tank by installing a cover and some simple piping changes.

4.4 Water Treatment Facility

The City of Yachats completed construction of its water treatment and filtration plant in 1992 and has a total treatment capacity of 0.5 MGD (350 gpm). The water treatment plant is a custom plant and includes a multi-media filtration system and makes use of the following processes:

- Prechlorination
- Chemical Coagulation and Polymer Addition
- Up-Flow Contact Clarification
- Multi-Media Filtration
- Disinfection (Post Chlorination)
- Serpentine Contact Basin Clearwell

The use of rapid sand filtration, such as the plant employs, is considered desirable for treating highly turbid water, as occurs in the source streams during the rainy season. More frequent backwashing of filters may be required when turbidity levels are elevated. Because of decreased water demand during the winter rainy season and the abundance of source water, more frequent backwashing of filters does not have a noticeably negative impact on the raw water supplies and the environment in general.

The Salmon Creek water treatment plant incorporates state of the art flow control and monitoring systems. Flow records are automatically graphed and reduced to daily consumption; monthly reports are forwarded to the Oregon Health Division in compliance with OAR Chapter 333. In addition, daily rainfall records at the plant are kept. All customers connected to the municipal water system are metered and monthly billing is based upon usage.

The water treatment plant has been relatively free from malfunction thus far in its service life and has been adequately maintained. It continues to produce quality potable water for the water service population of Yachats.

The treatment plant can be upgraded to a 1.0 MGD plant with relative ease by upsizing the treated water pumps and increasing the run-time of the plant as a whole. The clarifier and filters were sized to operate at a maximum capacity of 1.0 MGD.

The location of the water treatment facility is shown in Figure 4.4.1.

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THE DYER PARTNERSHIP ENGINEERS & PLANNERS, INC.	***CITY OF YACHATS*** ***WATER MASTER PLAN***	**FIGURE NO.**
DATE: JUNE, 2001 PROJECT NO.: 0510.02	***TREATMENT PLANT LOCATION***	***4.4.1***

The City of Yachats Water Treatment Plant

Disinfection Equipment

Originally, the City of Yachats disinfected unfiltered water by injecting gaseous chlorine (Cl_2) at one of its two chlorinating facilities, located adjacent to Salmon and Reedy Creeks. By carefully monitoring water turbidities and, when necessary, allowing sediment to settle out in their sedimentation basin prior to chlorinating, the City was able to meet water quality standards by these processes alone.

In 1992, spurred by stricter water quality requirements and difficulties in meeting the previous requirements, the City constructed its present water treatment plant. Disinfection of the water is now accomplished in a two-step process within the water treatment plant by injecting chlorine gas both before flocculation and within the clear well.

Recently, issues concerning safety and risk management have arisen concerning gas chlorine systems. Many communities are choosing to replace their gas chlorine systems with alternative disinfection systems. See Section 9 for a discussion of alternative disinfection systems.

In addition to the water treatment plant, the City still maintains its Reedy Creek chlorinating facility. When high winter flows cause increased levels of contaminants in the source water, pre-chlorination is performed at the Reedy Creek facility.

The City of Yachats Treatment Plant Equipment

The OAR rules governing water treatment requires that treatment be sufficient to achieve at least 99.9 percent (3-log) inactivation and/or removal of *Giardia lamblia* cysts and at least 99.99 percent (4-log) inactivation and/or removal of viruses as determined by OHD. The filtration plant process is assumed to provide a portion of the removal and disinfection must provide the remainder. The residual concentration in the water entering the distribution system also cannot be less than 0.2 mg/L for more than four hours. Inactivation ratio is determined based on "CT" which is the residual concentration (C) in mg/L times the contact time (T) in minutes. Required CT values are published in OAR and are dependent on the water temperature, pH, and chlorine residual.

In a Comprehensive Performance Analysis conducted in September 1999, the OHD rated Yachats' water treatment plant with a 2.5-log removal due to the filtration process and a 0.9-log inactivation from disinfection. The treatment process includes both prechlorination and post-chlorination. Baffle walls and a serpentine path in the clearwell create a long chlorine contact time (CT) for the treated water.

Oregon Health Division guidelines require a CT time of 30 minutes for the treatment plant. No CT analysis has been performed, although in its September 1999 Comprehensive Performance Analysis OHD estimated the plant's CT time to be approximately 74 minutes. Prechlorination likely provides about 15 minutes of the total contact time as water passes through the treatment units themselves.

The above estimates indicate that prechlorination probably is not required for the purposes of obtaining longer CT times. However, it is generally acknowledged that prechlorination improves the overall treatment process. This is in all probability due to the fact that the addition of an oxidant before the treatment process effectively lowers the pH of the raw water into a range where coagulants are more effective. The results include faster flocculation rates and larger floc formation.

It should be noted that prechlorination has been shown to increase total trihalomethanes (TTHM's) due to the chlorination of organic matter. TTHMs can cause liver, kidney and central nervous system problems and are known to be carcinogenic. The current MCL for total TTHM's is 0.1 mg/L for communities of over 10,000 people. Prechlorination also results in chlorinated water running through the metal treatment units, which causes increased corrosion of the metal parts. These concerns have caused many water treatment plant operators to think twice about prechlorinating in the past though it is often required at some plants to obtain adequate disinfection.

The City should be aware that the new Disinfectant Byproducts Rule (DBPR) will lower the MCL for TTHMs and require small communities (less than 10,000 population) to be in compliance by December of 2003. Prechlorination in many communities may cause the water system to be in noncompliance with regard to TTHMs. The City should begin monitoring the TTHM levels within the system to determine if it will be in compliance with the upcoming requirements. For additional discussion of future regulatory requirements, see Section 3.4.

Treated Water Pump Equipment

Two vertical turbine pumps move treated water from the clear well at the treatment plant to the 1.0 million gallon reservoir. The two effluent pumps send water from the plant into the system through a ten inch treated water transmission line. Each pump has a 350-gpm (0.5 MGD) capacity. In addition to providing treated water to the system, water is removed from a treated water header to provide backwash water for the filters.

In February 1997 a meter capable of measuring the volume of water being sent to the distribution system was installed on the treatment plant's effluent line. The additional meter has allowed the City to further account for water used in the treatment process.

Backwash Lagoon

Backwash and process water flows into the backwash lagoon located approximately 200 feet north of the water treatment plant. The backwash lagoon is a square concrete basin formerly used as a sedimentation pond. An intake and pumping system allows the liquid to be removed from the backwash lagoon and recycled for treatment. The solids that accumulate in the lagoon are removed periodically.

The City currently endeavors to recycle all backwash water during the summer months when raw water is so precious. However, during the winter months when streamflows are up and turbidity presents treatment difficulties, increased backwash frequencies require the City to pump water from the backwash lagoon to a nearby irrigation disposal system. All water pumped to the disposal system is metered and accounted for. Once the operational difficulties related to turbidity subside, the City returns to full recycling of all backwash, instrument, and process waters.

4.5 Treated Water Storage

Four tanks provide treated water storage totaling 1,211,000 gallons. All tanks are located in the northerly half of the City at elevations ranging from 210 to 545 feet. A brief description of each tank is provided below.

"Primary Tank"

The "Primary Tank" is a 1.0 million gallon reservoir located on the easterly side of Radar Road about 400 feet southerly of its dead end. The tank is an enclosed rectangular structure of pre-cast concrete. The tank was constructed in 1992 in conjunction with several other major improvements made to the system to correct deficiencies identified in the 1989 Water System Evaluation and Long Range Plan by HGE, Inc. The tank is enclosed in a cyclone-fenced yard to prevent public access.

Signs of wear and staining are apparent on the westerly exterior wall of the tank. The walls should be cleaned, repaired as necessary, sealed and painted to extend the useful life of the reservoir. Based on observations of the exterior of the tank, the City should have a qualified coating and repair contractor visit the site and make specific recommendations for repair and maintenance of the tank surface. This maintenance should take place in the early part of the 20-year planning period.

1,000,000 Gal. Concrete Reservoir – Primary Tank

"Round Tank"

The "Round Tank" is located approximately 200 feet south of the "Primary Tank" on the easterly side of Radar Road. The "Round Tank" is a 200,000 gallon closed circular below-ground reservoir of reinforced concrete construction. This tank was built in 1945 along with a number of other water system components. The water surface elevation in the "Round Tank" when full is 210.9 feet. This tank also is enclosed in a cyclone-fenced yard.

Because the "Round Tank" primarily is below grade, signs of leakage are not evident. The tank is emptied and cleaned and inspected on a regular maintenance schedule. According to staff, the tank remains in good condition.

The exposed portions of the tank should continue to be maintained and repaired to extend the service life of the reservoir.

200,000 Gal. Concrete Reservoir – Round Tank

"Upper Tank"

The "Upper Tank" is a 10,000-gallon reservoir located approximately one-half mile up Horizon Hill Road from Spruce Street. It has a maximum water surface elevation of 545 feet. The "Upper Tank," built in 1964, consists of an enclosed rectangular structure of cast-in-place concrete. There is a CMU block lean-to attached to the tank structure which houses a booster pump station and a 1,000-gallon pressure tank. The pressure tank and pump station are necessary for providing service to customers located above an elevation of about 500 feet.

A pump station located between the two larger tanks along Radar Road pumps water from the "Round Tank" to the "Upper Tank." Water is subsequently pumped from the "Upper Tank" into the adjacent 1,000-gallon pressure tank and pressurized in the process. The pressure tank provides water services to a few water customers located just above the upper tank.

The "Upper Tank" shows signs of staining on the exterior tank walls and may require minor maintenance to seal them. The pressure system has proven to be a maintenance problem for the City and requires regular attention from staff.

The exposed portions of the tank surface should continue to be maintained and repaired to extend the service life of the reservoir.

10,000 Gal. Concrete Reservoir and 1,000 Gal. Pressure Tank – Upper Tank

Water Level Controls

Water level sensors in the "Primary Tank" and the "Upper Tank" automatically control the respective pump stations in order to maintain the desired water levels in the tanks. The elevation of the reservoirs provides adequate service pressure to the majority of the system and pressures exceeding 80 psi to many of the properties east of Highway 101. With the existing level controls, pumping arrangements, and treatment systems, the Yachats water system functions essentially as an automatic system.

4.6 Distribution and Transmission System

Treated Water Transmission

Treated water is delivered to the distribution system via a transmission pipeline approximately 4,700 feet in length. The transmission line extends westerly from the water treatment plant along Yachats River Road until reaching Prospect Avenue. It then turns to the north following Prospect Avenue and the continuing alignment of same until reaching Radar Road. The line connects to the 1.0 million gallon tank located on the easterly side of Radar Road. The location of the treated water transmission line is indicated in Figures 4.4.1 and 4.6.1.

The transmission pipeline was installed in 1992 and is constructed of 12-inch diameter PVC pipe. Based upon the age of the pipeline and the qualities of the material, it is expected to be in good condition at this time.

Distribution System

For the purposes of this study, distribution piping is generally considered piping that is four inches in diameter and larger. Some two-inch piping that serves more than one customer may be considered distribution piping and is included in this study. Smaller diameter piping is generally considered service piping. Yachats' distribution system is composed of a combination of pipe sizes; there are about 62,000 feet (12 miles) of piping, excluding individual services; approximately 75 percent of the system is composed of six inch and larger pipe. A pipe size inventory is shown in Table 4.6.1. A map of the water distribution system is shown in Figure 4.6.1.

Table 4.6.1 - Piping System Size Inventory

Pipe Diameter (inches)	Length (feet)	% of Total
2	4,587	7.4%
4	10,333	16.8%
6	24,941	40.5%
8	13,402	21.8%
10	5,388	8.8%
12	2,901	4.7%
Total	**61,547**	**100%**

In addition to varying by diameter, the water distribution system is also composed of a variety of pipeline materials. The materials used to construct water lines over the years depended primarily on the accepted and available materials of the time. In the earlier part of the century, cast and galvanized iron piping was commonly used. Later, asbestos cement (AC) piping became popular. Today ductile iron, polyethylene (PE), and polyvinyl chloride (PVC) piping is used almost exclusively in the construction of new water lines.

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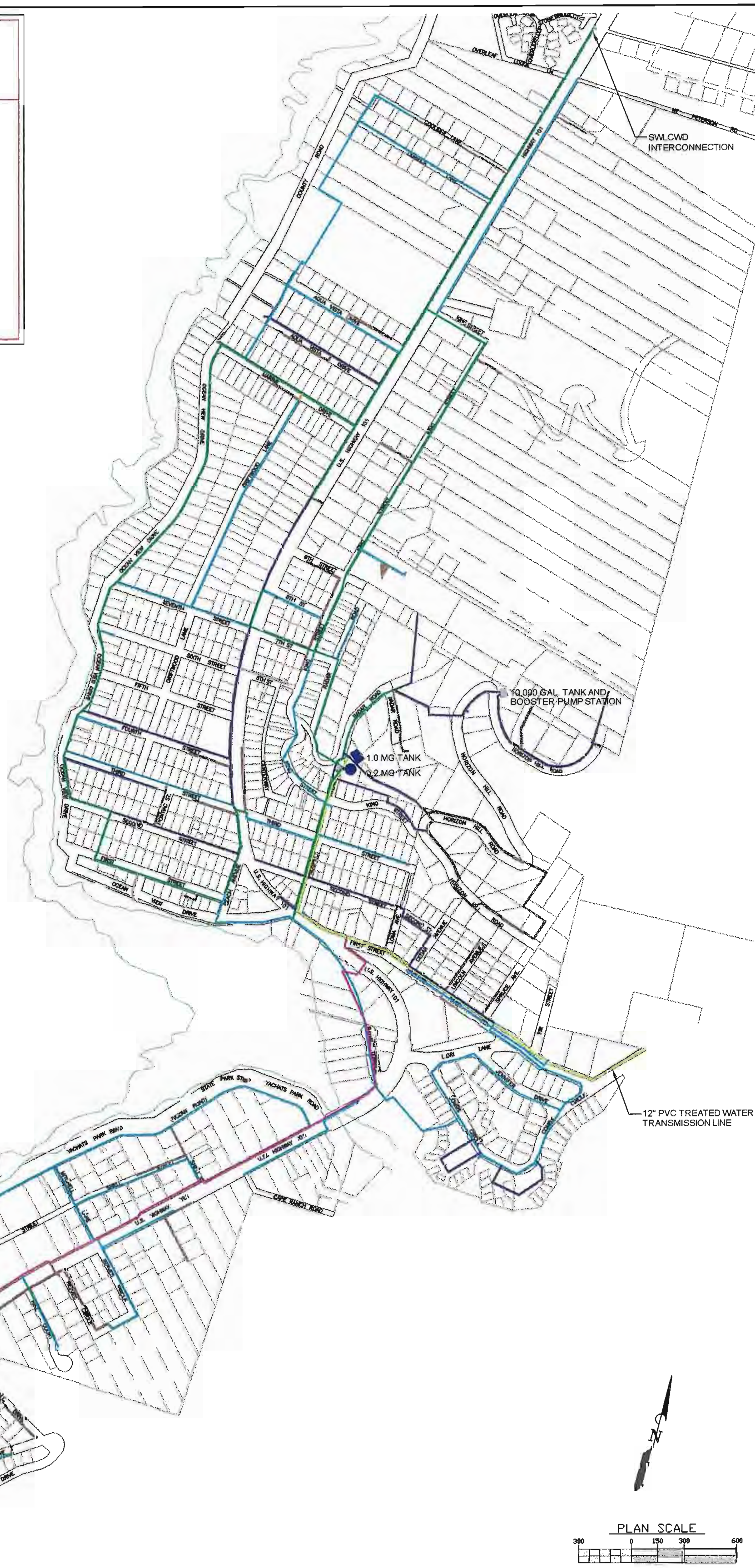
WATER SYSTEM KEY

- 3/4" Ø WATER LINES
- 2" Ø WATER LINES
- 3" Ø WATER LINES
- 4" Ø WATER LINES
- 6" Ø WATER LINES
- 8" Ø WATER LINES
- 10" Ø WATER LINES
- 12" Ø WATER LINES



THE DYER PARTNERSHIP ENGINEERS & PLANNERS	CITY OF YACHATS	FIGURE NO.
DATE: JUNE, 2001	EXISTING WATER DISTRIBUTION SYSTEM	4.6.1
PROJECT NO.: 0510.02		

The existing condition of the distribution system depends greatly on the materials that were used to construct the system as well as the level of workmanship at the time of construction. Today, many older piping materials show signs of leakage, corrosion, and loss of capacity. Older iron, steel, and cement piping sections frequently are replaced due to their poor condition.

Yachats' water distribution system utilizes AC, ductile iron, cast iron, PVC and polyethylene pipe. Complete data is not available regarding the accurate distribution of the various pipe materials presently in use in the system. In recent years, the City has began efforts to replace old, leaky pipe sections with new, more reliable piping materials; many of the pipes replaced also have been undersized for the City's present and future needs. Hydraulic problems in the system are being corrected concurrent with the new pipe installation.

Computer modeling was conducted to analyze the performance of the existing City of Yachats' water system. Hydraulic analysis software called WaterCad® by Haestad Methods was used to perform the complex calculations necessary to analyze the water system. The diameter and materials (if known) of each pipeline section was input to the computer model. A discussion of the computer modeling of the distribution system is presented in Section 9.

Maximum Service Elevation

Pressures at connections in a distribution system must never drop below 20 psi, which is equivalent to a 46-foot tall column of water. Customers must be located more than 46 feet below the minimum water level in a storage tank (or effective elevation of a pressure reducing valve) to have sufficient pressure without a booster pump. Storage tanks and pressure reducing valves are generally located to provide a pressure of less than 100 psi at the lowest service elevations in a pressure zone.

4.7 Water Districts

Southwest Lincoln County Water District (SLCWD)

Southwest Lincoln County Water District provides water to the unincorporated area north of the City of Yachats, continuing to the City of Waldport. A mutual aid agreement is in the works between the Cities of Yachats and Waldport and SLCWD to provide emergency water to the City or district needing help. Interconnection of the systems will enable reciprocal support should a local emergency or system failure occur. According to City personnel, plans are in place to install a valve and pipe to connect the Yachats water system to SLCWD system.

Although emergency aid is the goal of interconnecting the systems, it is not anticipated that either the SLCWD or the City of Waldport systems would have excess water during drought conditions in Yachats. Raw water for both systems is obtained from coastal streams, which are subject to the same seasonal climatic patterns as the streams along the Yachats River watershed. Also, since much of the water rights held by Waldport have not yet been developed, it is anticipated that they will experience the same kinds of challenges that Yachats has experienced when trying to develop their water right.

The Cities of Yachats and Waldport and the SLCWD also are discussing the feasibility of sharing resources with the City of Toledo and South Beach (Seal Rock Water District). The goal of the discussions is to create a regional water system which would provide treated water to members when source streams do not have sufficient flows to support the communities that depend on them. No agreement including the City of Yachats has been reached at this time, although the City is expected to continue participating in discussions regarding resource sharing.

In addition to the mutual aid agreement, the City of Yachats has endorsed a feasibility study of the potential for constructing a reservoir on Rocky Creek, which could serve coastal communities and their long-term water needs beyond the year 2050.

Water Use and Projected Demands

Section

5

Water Use and Projected Demands

Section 5

5.1 Description and Definitions

Water demand can be defined as the quantity of water delivered to the system over a period of time to meet the needs of consumers, provide filter backwashing water, and to supply the needs of fire fighting and system flushing. In addition, virtually all systems have an amount of leakage or loss that cannot be feasibly or economically reduced or eliminated. Total demand, therefore, includes all consumption and lost 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) with higher usage occurring during the morning and early evening periods and lowest usage 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 Monthly 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 seven day average demand that occurs in a year. Expressed in gallons per day.

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, treatment plant and transmission lines 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. Distribution systems should be designed to adequately handle the peak hourly demand. During this peak usage, 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 served to come up with a demand per person or a per capita demand which is expressed in gallons per capita per day (gpcd). Per capita demands can be multiplied by future population projections to determine future water demands.

5.2 Current Water Consumption Demands

For the purposes of this study, water consumption demand is based on the City's monthly records for the four-year period, January 1997 to December 2000. Demand levels were developed based on the entire data set and not skewed for any one years data. Production data is based on records for water production at the water treatment plant. Total water diversion data is based on the meters that measure the water diverted from both Reedy Creek and Salmon Creek.

Water sales records allow calculation of an Equivalent Dwelling Unit (EDU) and provide measurement of unaccounted water (lost water) when compared with plant production records. Water sold is typically less than the amount of water produced at the plant due to system leaks, unmetered use at a water treatment plant (backwash water, turbidimeter water, wash down, etc.), inaccuracies in customer meters, and other unmetered use such as fire flows and system flushing. In the case of Yachats, water produced at the plant, in many cases, was less than the amount of water diverted due to losses in the raw water transmission line prior to its replacement in 1998.

Diverted Water

As part of the auditing process, the City must account for all water diverted from each source. This is typically accomplished through a metering device at or near the point of diversion. OAR 690-085-0015 requires that, "Where practical, water use shall be measured at each point of diversion." However, the rule also states that:

> "...measurements may be taken at a reasonable distance from the point of diversion if the following conditions are met:
>
> a) The measured flow shall be corrected to reflect the flow at the point of diversion. The correction will be based on periodic flow measurements at the point of diversion taken in conjunction with flow measurements at the usual measuring point;
>
> b) If the measured flow includes flow contributions from more than one point of diversion, the measured flow shall be proportioned to reflect the flow at each point of diversion using the method prescribed subsection (a) of this section;
>
> c) A description of the correction method shall be submitted with the annual report the first time it is used and any time it is changed, or once every five years, whichever is shorter."

If the point of diversion is relatively close to the water treatment plant, it is common for many communities to use a single influent meter at the water plant to measure the amount of water that is diverted.

For the entire four years of data used for this report, daily monitoring of the Salmon Creek diversion allowed the City to account for the water removed from Salmon Creek and piped to the plant for treatment.

At the end of 1997, as the result of high rains causing an upstream landslide, the Reedy Creek impoundment, diversion structure, metering device, and other key elements were destroyed. The only data in this Plan utilizing the Reedy Creek diversion meter is for the months prior to January 1998. When the diversion meter was destroyed, the City used the influent meter at the water treatment plant to record the amount of water diverted from Reedy Creek. Approximately 8,200 lineal feet of raw waterline separates the treatment plant from the diversion at Reedy Creek.

In November of 2000, the City installed a new meter on the raw waterline near the Reedy Creek diversion. Once again the City will be capable of monitoring the amount of water diverted from Reedy Creek, though only two months worth of data are available within the data set for this study.

Table 5.2.1 summarizes the water diverted from the City's two active sources based on records provided by the City of Yachats.

Table 5.2.1 - Summary Annual Water Diversion From Each Source (1997 – 2000)

Year	Reedy Creek Annual Diversion (Gal. X 1000)	Salmon Creek Annual Diversion (Gal. X 1000)	Total Raw Water Diverted (Gal. x 1000)
1997	79,286	7,550	86,836
1998	62,147	10,997	73,144
1999	42,986	29,532	72,518
2000	46,686	12,424	59,110
Averages	57,776	15,126	72,902

Unaccounted Water ("Lost" Water)

The difference between the quantity of water diverted from the raw water source to the treatment plant and the quantity of water delivered through the distribution system and measured at customer meters is referred to as unaccounted water. The difference can be attributed to system leaks, inaccuracies in customer meters, unmetered services, and other unmetered use such as fire flows and system flushing.

The Oregon Administrative Rules (OAR) Section 690-86, states that all water systems should work to reduce unaccounted water levels to 15 percent. If the reduction of "lost" water to 15 percent is found to be feasible, the water provider should work to reduce unaccounted water levels to ten percent.

Previous planning efforts have alluded to a relatively high rate of unaccounted water in the City of Yachats. The analysis used in this study sought to identify and classify the various sources of unaccounted water in the Yachats' system in addition to the overall system losses.

Raw Water Losses – Reedy Creek. Approximately 8,200 lineal feet of raw water piping separates the treatment plant from the raw water diversion on Reedy Creek. According to City records, in 1997, approximately 23 percent, or 23 million gallons of the raw water diverted from Reedy Creek did not arrive at the water treatment plant. It is assumed that much of this loss could be attributed to the aged, 6-inch, AC raw water piping. In 1998, approximately 75 percent of the raw waterline was replaced with a new 8-inch HDPE raw waterline. The new HDPE line extends from the water treatment plant to the intersection of the Reedy Creek access road and the Yachats River County Road. The piping from the county road to the diversion remains as the original six-inch AC piping.

As previously described, at the end of 1997, the diversion and metering equipment at the Reedy Creek diversion was destroyed. Since this time, the City replaced the majority of the original raw waterline.

However, without metering equipment at the diversion, it has not been possible to monitor the amount of water diverted at the Reedy Creek diversion. In the interim, the City has used the influent meter at the treatment plant as the diversion meter.

In November of 2000, the City installed a new meter at the diversion of Reedy Creek. Once again, the City will have the ability to monitor the water diverted from their source and provide more accurate accounting.

Raw Water Losses – Salmon Creek. Because of the short distance (~250 feet) from the diversion to the plant, it is assumed that losses in the Salmon Creek raw water system are negligible.

Treatment Plant Losses. Treatment plant losses are defined as the difference between the water entering the plant and water leaving the plant plus all accountable uses within the treatment process. Prior to 1999, losses through the treatment plant averaged approximately 15 percent of the total water diverted from the raw water sources. However, the City has taken steps to meter water used in the treatment process and can therefore account for more of the diverted raw water. Since the installation of the additional meters, lost water through the plant has been reduced to one percent of the water diverted from the raw water sources. This small difference could be easily accounted for with standard meter inaccuracies.

Distribution System Losses. Distribution system losses include all losses due to leakage, unmetered use, inaccurate consumption meters, and other sources of unaccountable water use. Over the period of analysis, the City has experienced consistent water losses in the distribution system averaging 26 percent of the total water diverted from the raw water sources. It is expected that as the City replaces old waterline sections and installs new consumption meters, the distribution system losses will subside.

Overall System Losses. Overall systems losses are defined as the difference between the water diverted at the raw water source and the sum of all accounted water uses. The overall system losses should also be equal to the sum of the raw, treatment, and distribution system losses. Table 5.2.2 summarizes the overall system losses in the City of Yachats water system.

Table 5.2.2 - Summary Of Unaccounted Water – Losses (1997 – 2000)

Year	Raw Water Losses	Treatment Plant Losses	Distribution System Losses	Total Water System Losses
1997	23%	12%	20%	55%
1998	5% (1)	10%	26%	41%
1999	0% (1)	4%	32%	36%
2000	3% (1)	0%	25%	28%
Averages	**8% (1)**	**6%**	**26%**	**40%**

(1) Loss percentages based on assumed diversion data due to the loss of the Reedy Creek diversion system. Actual losses may vary if complete diversion data were available during period. New meter was installed in November of 2000.

Total raw water diverted for the City averages approximately 73 million gallons per year. Unaccounted water in the City's system averages around 30 million gallons per year or 80,000 gallons per day; losses on this order are significant. It is imperative that the City make efforts to reduce lost water and increase system efficiency. Reductions in lost water can result in increased revenues, reduced expenses, and improved water system performance. For guidelines on "lost" water reduction, see Section 7.

Equivalent Dwelling Unit Calculations

Projections for population growth are often utilized to estimate the future demand for public utility services, such as water and sewer. Typically, the future demand is based on an estimated number of residential homes, called average dwelling units, projected for the planning horizon. However, residential units are only a portion of the future demand. Commercial, vacation rental, and institutional customers will also demand services. Accounting for these customer types requires comparing the demand for services from the respective customer with the demand from the average dwelling unit. The relationship is defined as the equivalent dwelling unit (EDU) methodology. An example of the EDU methodology follows:

If a typical residential family requires, on the average, 200 gallons of water per day while a restaurant requires 1000 gallons of water per day, the demand for water from the restaurant is numerically equal to five residential units. In this case, the restaurant is said to be equal to five EDUs. By totaling all of the commercial and industrial users in terms of residential units with the total number of residential units in a community, the demand for public services can be established in terms of EDUs. The total number of EDUs can be used to estimate future demands based on the average household size and the future population. In the example provided above, if the average household consisted of three persons and in 20 years there are 100 households and one restaurant in the community, the equivalent population of the community would be 315 (300 people for the 100 houses + 15 equivalent people for the restaurant).

Within the City, there are approximately 600 residential accounts. Based on the number of full-time versus part-time residents as developed in Section 2.5 of this Plan, the average per capita household consists of approximately 1.8 persons per household (pph).

The City has approximately 75 non-residential accounts. Although the non-residential accounts make up only 17 percent of the customer base, they account for approximately 50 percent of the water consumed within the system. By evaluating the demand for residential customers, the commercial demand can be converted from connections or accounts to EDUs.

The combination of residential and non-residential EDUs can then be used to evaluate water consumption based on equivalent population values. For example, if there are ten commercial accounts that equate to 100 commercial EDUs in a water system, and the same water system has a residential population equal to two persons per household (EDU), the commercial water consumption could be expressed in terms of an equivalent population of 200 equivalent persons (100 commercial EDU's x 2 persons per EDU = 200 equivalent persons). By expressing non-residential consumption in terms of population, future demand can be evaluated based on simple population growth.

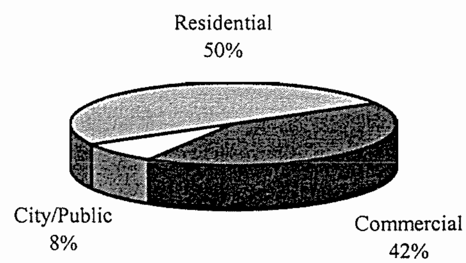
Table 5.2.3 summarizes the 1997-2000 City EDU totals along with the average water consumption for each sector. It should be reiterated that Table 5.2.3 shows the average consumption levels within the system. All losses, unaccounted water, and other water uses are not accounted for within the consumption data. Water system planning requires that all water diverted from the source be analyzed and considered as total water system consumption.

Table 5.2.3 - Summary Of Yachats EDU Totals And Water Consumption – 1997 To 2000

Account Sector	No. Svc's	No. EDU's	Total Water Consumption (gal/yr.)	Average Day Consumption Demand (gpd)
Residential	600	600	21,230,000	58,100
Commercial	57	517	18,202,000	49,900
City/Public	16	46	3,466,000	9,500
TOTAL	**673**	**1163**	**42,898,000**	**117,500**

Water use has been recorded for various customer sectors within the City of Yachats. These sectors include residential (both single and multi-family combined and transient rental homes), commercial, and City/public water use. The distribution of water use by land use sector is summarized in Figure 5.2.1.

Figure 5.2.1
Water Used by Sector



For planning purposes, demand projections and unit design factors for water consumption should be based on the City's yearly water production data rather than historical customer water consumption records (meter readings). Since the City has a history of water losses in the raw water system, the calculations in this study will utilize the best available raw water diversion data. This methodology incorporates all system losses and unmetered usage in the projected water requirements developed later in this Master Plan. Further reference to consumption within this report implies total water diverted including raw water losses, treatment plant losses, distribution system losses and City and fire department deductions.

Average Day Demand (ADD)

The average annual demand can be defined as the average water demand for any day in a given year. ADD is most commonly used to size facilities based on average water demand. When water diversion data is used to determine the ADD, it also becomes the basic unit that other water system demand quantities are built upon.

Incorporation of the average household size in the EDU methodology allows determination of the per-capita ADD based on the equivalent population of the City. That is, an EDU is assumed to have the same demand as the average household.

The ADD based on total water production and the off-peak equivalent population for the system data is summarized below in Table 5.2.4.

Table 5.2.4 - Annual Average Day Demand

Year	Annual Demand (Gal x 1000)	ADD (Gal x 1000)	Residential Population	Off-Peak Equivalent Population	ADD (gpcd)
1997	86,836	238	665	1,195	199
1998	73,144	200	685	1,228	163
1999	72,518	199	695	1,261	158
2000	59,110	162	715	1,294	125
1997-2000 Average	72,902	200	n/a	n/a	161
Plan Basis Values	74,600	205	730	1,327	154

Based on water production data and the equivalent service population as presented in the table above and the downward trend in water consumption, an ADD per-capita consumption value of 154 gpcd has been chosen to conservatively represent water usage in the City of Yachats. This unit design value will form the basis for projecting future ADD based on off-peak population growth.

Maximum Monthly Demand (MMD)

Water demand in the City of Yachats fluctuates monthly with the highest demands generally between the months of June and September. The higher summertime flows can most likely be attributed to a combination of increased outdoor water use (i.e. landscaping) and the increase in population due to tourism and vacationers. A summary of the City's maximum month water demand and calculated peaking factors from 1997 to 2000 are provided in Table 5.2.5.

Table 5.2.5 - Maximum Month Water Demand – 1997 To 2000

Year	Max Month (Days)	Monthly Demand (Gal x 1000)	MMD (gpd x 1000)	Peaking Factor (MMD/ADD)
1997	September (30)	12,407	414	2.03
1998	August (31)	8,950	289	1.88
1999	September (30)	6,163	199	1.32
2000	August (31)	6,263	202	1.70
1997-2000 Average	NA	8,446	276	1.73
Plan Basis Values	NA	9,120	308	1.50

Peaking factors are commonly used to develop relationships between the ADD and the other planning criteria. As developed in Table 5.2.5, a MMD peaking factor of 1.50 is appropriate for the City's demand data. Peaking factors tend to be consistent from one water system to another. It is common for water systems have a MMD peaking factor on the order of 1.5 times the ADD.

Maximum Day Demand and Peak Hour Demand (MDD & PHD)

To determine the maximum day demand and peak hour demand, a number of techniques are available. The demand values can be based upon actual production data over recent years, common peaking factors, statistical analysis, or a combination of these techniques. A brief description of how the MDD and PHD demand values were determined follows:

The MDD can be approximated based on the maximum water demand within the system. Maximum water diversion days over recent years with available data are presented in Table 5.2.6.

Table 5.2.6 - Summary Of Maximum Water Production Days

Year	Month When MDD Occurred	Water Demand
1997	September	684,000
1997	September	609,000
1998	August	645,000
1999	September	626,000
	Average	641,000

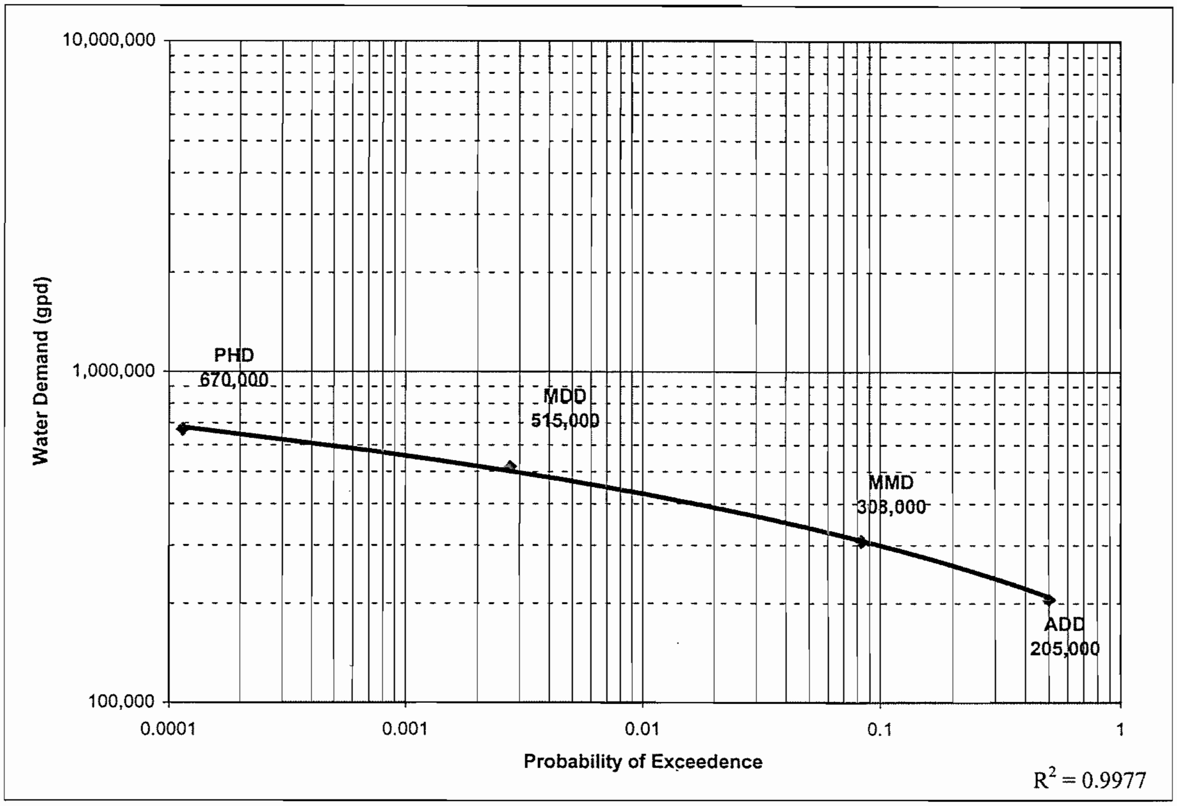
Common peaking factors are often used to approximate water demand values. Peaking factors between 2 and 2.5 are common for approximating the MDD. A peaking factor of 2 results in a MDD of 410,000 gpd while a peaking factor of 2.5 results in a MDD of 512,500 gpd.

Another method that can be incorporated to approximate the MDD is a statistical method. One can plot the probability of exceedence of demand versus the various water demand values. A logarithmic trendline across known quantities can be used to predict unknown quantities. Figure 5.2.2 shows the probability of exceedance plot and the resulting demand values.

Due to fixed surface water availability and increasing water demand, a conservative MDD peaking factor of 2.5 was chosen for this Master Plan. The resulting MDD was rounded to 515,000 gpd.

Though the PHD value is not as critical for reserve and treatment planning, the PHD will be used in the computer modeling process to ensure that the storage and distribution system will continue to function during short, peak demand situations. The PHD peaking factor chosen was 3.25 for the purposes of this study resulting in a PHD flow rate of approximately 670,000 gpd.

Figure 5.2.7 - Probability Plot For Determining Demand Values



A summary of the remaining planning criteria along with their associated peaking factors is provided in Table 5.2.7.

Table 5.2.7 - Summary Of Existing Water Demands - Basis For Master Plan

Demand Parameter	Total (gpd)	Peaking Factor	Per Capita Demand (GPCD)
Average Day (ADD)	205,000	1.00	154 (1)
Maximum Month (MMD)	308,000	1.50	232 (1)
Maximum Day (MDD)	515,000	2.50	268 (2)
Peak Hour Demand (PHD)	670,000	3.25	349 (2)

(1) Based on off-peak population estimates.
(2) Based on peak population estimates.

The MDD is the demand that is experienced on the highest demand day of the year. The MDD is commonly used to size facilities to provide capacity for periods of high demand. The MDD may be experienced on a holiday such as the Fourth of July or during a festival such as a County Fair. The MDD is usually associated with the warmest part of the year when agriculture, irrigation, and recreational uses of potable water are at their greatest. Peaking factors between 2 and 2.5 are commonly used for MDD. PHD is associated with the highest demand experienced during a single hour. Peak hour demand is commonly experienced during the early morning hours when many water users are bathing, cooking, and engaging in other activities that require widespread water use. PHD is used to size facilities for short periods of extreme demand. Peaking factors between 3 to 5 are commonly used for PHD.

5.3 Projected Water Demands

Water demands are projected into the future using the past records of water produced and water sold along with projected population estimates. The goal of projecting future water demand is not to build larger facilities to accommodate excessive water consumption, but rather to evaluate the capability of existing components and to size new facilities for reasonable demand rates. Large amounts of leakage and excessive water consumption should not be projected into the future estimates. Rather, efforts should be made to reduce leakage and lost water to a reasonable level and utilize lower, more acceptable demand rates for planning efforts. Water demand projections should be based on acceptable water loss quantities, reasonable conservation measures, and the community's expected water use characteristics.

There is a degree of uncertainty associated with future water demand projections for any community. Uncertainties in projections exist because of the estimates used to define the community's current water use and the built-in assumptions made with respect to anticipated growth in a community. The impact of water conservation measures on a community's future water consumption also is difficult to predict.

The U.S. Department of the Interior documented the per capita water use for Oregon in the 1995 U.S. Geological Survey - Circular 1200. According to the study, the average per capita water use for Oregon is 235 gallons per capita day (gpcd) including domestic, commercial, industrial, and public use and loss. Of the total 235 gpcd, 53 percent is domestic use, 14 percent is commercial, 17 percent is industrial, and 16 percent is public use and loss. An interagency team made up of personnel from the DEQ, Oregon Economic and Community Development Department (OECDD), Oregon Health Division (OHD), the Oregon Department of Water Resources (WRD), the USDA-Rural Utilities Service, Rural Community Assistance Corporation, and the Department of Land Conservation and Development has developed target design numbers based on the USGS study and their experience with Oregon communities. The team has adopted a maximum ADD of 235 gpcd, a MDD of 588 gpcd (2.5 times the ADD), and a PHD of 1,175 gpcd (5 times the ADD).

According to OAR 690-86-140, a water system should endeavor to reduce unaccounted water levels to 15 percent or less of the total water diverted from their raw water sources. As developed previously in this section, the City experiences unaccounted water levels on the order of 40 percent. In order to be in compliance with the OAR, the City must work to reduce their level of unaccounted water to 15 percent. Responsible water planning should not include the propagation of high-unaccounted water levels into water demand projections.

In order to project the water demand values into the future with reasonable levels of unaccounted water, the total diverted water was reduced by 25 percent. The resulting demands were recalculated at this lower demand level and projected into the planning period. The resulting projected demands assume an unaccounted water level of approximately 15 percent of the total raw water diverted to the system. A summary of the adjust current and project demands is provided in Table 5.3.1.

Table 5.3.1 - Future Water Demand For The City Of Yachats
Basis For Master Plan Demand-Present And Projected
(Adjusted for compliance with 15 percent unaccounted water levels.)

Parameter	2001	2011	2021	2051
Residential Population	734	917	1,145	2,233
# of EDU's op=off peak p=peak	810 (op) 1,196 (p)	1,018 (op) 1,508 (p)	1,272 (op) 1,896 (p)	2,225 (op) 4,014 (p)
Equivalent Population op=off peak p=peak	1,327 (op) 1,919 (p)	1,696 (op) 2,475 (p)	2,171 (op) 3,197 (p)	4,589 (op) 6,945 (p)
Water Demand (gpd) – Basis For Long Range Supply Plan **(gpcd)**				
ADD (154)	153,300	195,900	250,800	530,000
MMD (232)	230,900	295,100	377,800	798,500
MDD (268)	385,700	497,500	642,600	1,396,000
PHD (349)	502,300	647,800	836,800	1,817,900

The demand projections presented in Table 5.3.1 will be used in Section 9 of this Master Plan to analyze available capacity in existing systems throughout the planning period as well as to size new facilities for future demand.

It should be reiterated, that the water demands summarized above in Table 5.3.1 have been adjusted to represent approximate consumption rates if unaccounted water levels are reduced to 15-percent. If the City is not capable of reducing lost water levels, future demands will likely be greater than those developed within this section.

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Design Criteria and Level Of Service

Section

6

Design Criteria and Level of Service

Section 6

6.1 Design Life of Improvements

The design life of a water system component is sometimes referred to as its useful life or service life. The selection of a design life is a matter of judgment based on such factors 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.

As discussed in Section 1, the planning period for this Master Plan is 20 years, ending in the year 2021. The planning period is the time frame during which the recommended water system is expected to provide sufficient capacity to meet the needs of all anticipated users. The required system capacity is based on population, water demand projections, and land use considerations. The planning period for a water system and the design life for its components may not be identical. 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 determines 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 various system components are discussed below.

Raw Water Intakes and Transmission

Intake structures including concrete impoundments should have design lives of 50 to 100 years when properly constructed and maintained. Water transmission piping should easily have a design life of 40 to 60 years if quality materials and workmanship are incorporated into the construction. Modern PVC and cement mortar-lined ductile iron piping can last up to 100 years when properly designed and installed.

The lives of wells and well heads vary widely depending on the magnitude of the well, the draw-down of the aquifer by other consumers, the recharging of the well by main sources, the type and quality of the well water, and many other quantities. Though it is not uncommon to obtain more than 50 years of service from a single high production well, a well life of 20 years is often used due to the uncertainties associated with these groundwater sources.

Water Treatment Facility

Major structures and buildings should have a design life of approximately 50 years. Pumps and equipment usually have a useful life of about 20 years. The useful life of treatment equipment can be extended when properly maintained if additional treatment capacity is not required. Filter media normally has a design life of ten to 15 years. Flowmeters typically have a design life of ten to 15 years. Valves usually need to be replaced after 15 to 20 years of use.

Treated Water Transmission and Distribution Piping

Water transmission and distribution piping should easily have a design life of 40 to 60 years if quality materials and workmanship are incorporated into the construction. Modern PVC and cement mortar lined ductile iron piping can last up to 100 years when properly designed and installed.

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 design 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.

6.2 Sizing and Capacity Criteria

Demand projections presented in Section 5.3 are based on population projections offered in Section 2.5. The projections assume an average 2.25 percent annual growth rate until the year 2021. For the purposes of longer-term projections such as 50-year and 100-year, this same 2.25 percent growth rate has been used. Accurately predicting growth is difficult, especially beyond 20 years into the future. As time progresses, all of the projections should be updated to reflect actual population and demand. The analysis and presentation of recommended improvement alternatives can be found in Section 9.

Raw Water Source

The water sources must be capable of meeting maximum daily demand of the system over a period of many years. The selection of a source is a long-term commitment that cannot be easily changed. Water rights are becoming more critical as the State's population and water demand increases and the number of viable water sources remains constant. The water sources should be evaluated to ensure enough water to meet the MDD 50 years into the future.

Intake and Pumping Facilities

Intake piping and wetwells are not easily expanded and should be sized to meet the anticipated maximum day demand well into the future. A design life of 50 years is common for such facilities.

Pumps and other mechanical equipment can be expected to last no more than 20 years under normal conditions before extensive maintenance or replacement is necessary. Commonly, two pumps are installed in a pumping station, each having capacity equal to the capacity of a water treatment plant or the MDD predicted within a planning period. Duplex pumping systems can be designed to alternate after each cycle to extend the life of the equipment. If future demands increase beyond the ability of a single pump, the second pump can serve as a lag pump in parallel to sustain higher flow rates during peak demand times.

Transmission Piping

The long distances and high replacement cost of the transmission lines warrant an analysis for demand beyond the normal 20-year period. The existing transmission lines must have the ability to handle at least the 20-year MDD. The capacity of the raw water and treated water transmission piping will be evaluated against the 20-year MDD and the 50-year MDD.

Water Treatment Facility

Water treatment plants are not normally designed to handle flows above 20-year MDD since these facilities can be expanded and typically have an overall design life of around 20 years. The existing treatment plant components will be evaluated against the 20-year MDD.

Treated Water Storage

Total storage capacity must include reserve storage for fire suppression, equalization storage, and emergency storage. The interagency team (see Section 5.3) of various Oregon agencies has adopted a target storage capacity of 2.5 times the ADD plus 180,000 gallons for residential fire flow. An alternative method to analyzing the treated water storage requirements suggests itemizing the potential requirements for treated water within the system. A discussion of these various needs follows:

Equalization storage is typically set at 25 percent of the MDD to balance out the difference between peak demand and supply capacity from the treatment plant.

Emergency storage is required to protect against a total loss of water supply as would occur with a broken transmission line, an electrical outage, a treatment plant breakdown, or source contamination. At a minimum, emergency storage should be equal to one maximum day of demand.

Fire reserve storage is needed to supply fire flow throughout the water system to fight a major fire. The fire reserve storage is based on the maximum flow and duration of flow required to confine a major fire. The guidelines published in "Fire Suppression Rating Schedule" by the Insurance Services Office (ISO) are typically used to determine the required fire flow and fire reserve storage. Generally, fire flows of 1,000 gpm are sufficient for one or two family dwellings not exceeding two stories in height. Commercial, industrial and institutional buildings require higher flows. Determination of these flows are unique to each building under consideration and involve detailed surveys of construction (type and area), occupancy (combustibility), exposure (construction type, distance, length/height of wall) and communications (openings).

The ISO also classifies a city's fire protection capabilities on a numerical basis, called the Public Protection Classification. This classification is used within the insurance industry for various purposes. The Public Protection Classification is determined from a complex analysis of the City's capabilities to receive and handle fire calls, the strength of the fire department, and the adequacy of the water supply system. Analysis of the water supply system is further divided into equal parts of: 1) supply capabilities, 2) hydrant size, type, and installation, and 3) inspection and condition of hydrants.

Ideal storage capacity should be the sum of equalizing, emergency storage, and fire flow. It is unlikely a major fire would occur simultaneously with a disruption to water production and, therefore, it is sometimes considered that storage capacity should be equal to three days of ADD, 1.5 days of MDD, or a combination of fire reserve, equalizing storage, and emergency reserve.

Industrial customers often are required by the ISO to have available fire flows on the order of 3,000 gpm. It is also common for the ISO to require a public building such as schools to have available fire flows of 3,000 gpm or more. Storage capacity should be adequate to provide these flows for a three-hour duration.

Another important design parameter for reservoirs is elevation. Efforts should be made to locate all reservoirs at the same elevation when possible. As a consistent water surface is maintained in all reservoirs, the need for altitude valves, check valves, PRVs, booster pumps, pumper trucks for extracting fire flows, and other control devices is limited. 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 pressure range in the system should stay within the range of 25 to 100 psi.

All of the above criteria will be used to evaluate the adequacy of existing storage and the need, if any, for future additional storage in Section 9.5.

Distribution System

Distribution mains are typically sized for fire flow and 20-year population demand, or fire flow and saturation development demand. The mains should be at least six inches in diameter to provide minimum fire flow capacity. All pipelines should be large enough to sustain a minimum line pressure of approximately 25 psi. 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 all times. The distribution system must be sized to handle the peak hourly flows and to provide fire flows while maintaining minimum pressures.

In addition to the above design criteria, the following guidelines are recommended for the design of water distribution systems:

- Six-inch (6") diameter lines - minimum sized lateral water main for gridiron (looped) system and dead-end mains.
- Eight-inch (8") diameter lines - minimum size for permanently dead-ended mains supplying fire hydrants and for minor trunk mains.
- Ten-inch and larger (10" & up) diameter - as required for trunk (feeder) mains.

The distribution system lateral mains should be looped whenever possible. A lateral main is defined as a main not exceeding eight inches in diameter, which is installed to provide water service and fire protection for a local area including the immediately adjacent property. The normal size of lateral mains for single family residential areas is six inches in diameter. However, eight-inch lateral mains may be required to meet both the domestic and fire protection needs of an area.

The installation of permanent dead-end mains and dependence of relatively large areas on a single main should be avoided. For the placement of a fire hydrant on a permanently dead-ended main, the minimum size of such laterals should be eight inches in diameter. However, six-inch diameter mains may be used for a stub out not exceeding 500 feet in length supplying a single fire hydrant not on a public street and for internal fire protection. On new construction, the minimum size lateral main for supplying fire hydrants within public ways should be six inches provided six-inch mains are looped.

A computer model of the distribution system was developed as part of this Master Plan. The model utilized actual pipe sizes, system configuration, and materials as well as system pipe junction elevations and storage tank elevations. The system was checked for ability to provide fire flows simultaneously with the 20-year MDD. The model was developed using a software program called WaterCAD® (version 3.1) by Haestad Methods.

Discussion of the fire flow results and distribution system analysis is provided in Section 9.6.

Fire Flows

The requirements for fire fighting at any point will vary between 500 gpm (a minimum) to 12,000 gpm for a single fire. Multiple fires will place a greater demand on the distribution system. A municipality must continue to serve its domestic, commercial, and industrial customers during a fire, however. The Insurance Services Office (ISO) recommends that a public fire fighting system be able to operate with the remainder of the potable water system operating at the MDD.

Recommended fire flows in a neighborhood will depend on construction type, occupancy, and floor area. Fire flow recommended for a particular building can be calculated with the following formula:

$$Q = (18)C\sqrt{A}$$

Q is the fire flow in gpm. C is a constant that depends on construction: 1.5 for wood frame, 1.0 for ordinary construction, 0.8 for noncombustible construction, and 0.6 for fire resistant construction. A is the area in ft^2 (square feet) of all stories in the building, except for basements. Special rules are used to find A for multi-story fire-resistant structures, buildings with various fire loadings, or buildings with sprinkler systems. Q is rounded to the nearest 250 gpm, but it should not be less than 500 gpm or more than 8,000 gpm for a single building. For example, a 2000 ft^2, wood frame house requires a fire flow of 1,250 gpm.

An ISO inspection was performed in the City of Yachats in 1992 following construction of the water treatment plant and the 1.0 million gallon water tank. The purpose for the inspections is to rate a city's ability to fight fires and prevent significant loss of property and life. The ratings are used to set insurance levels for people living within the community. The inspection included a detailed analysis and evaluation of the City water system and the ability of the fire department to fight a major fire. It also included an evaluation of the types of properties, buildings, industries, and the associated fire risks for the community.

Most insurance requirements will be met if the flow rate can be maintained for T hours, where T is the flow rate in 1000's of gpm, with a maximum of ten hours.

Fire hydrants should be spaced so as to provide fire protection to an area of approximately 160,000 ft^2. This equates to overlapping radiuses of between 200 to 250 feet or a maximum spacing of approximately 500 feet. They are ordinarily located at street corners where use from four directions is possible. The actual separation of hydrants can be calculated from standards presented by the ISO. These standards determine the minimum area (square feet) covered per hydrant based on flow. The standards for 1000 to 3500 gpm are: 160,000 ft^2 for 1000 gpm or less; 150,000 ft^2 for 1500 gpm, 140,000 ft^2 for 2000 gpm; 130,000 ft^2 for 2500 gpm; 120,000 ft^2 for 3000 gpm; and 110,000 ft^2 for 3500 gpm.

The computer model analysis included providing residential fire flow of 1,000 gpm with higher fire flows in the areas such as schools and public buildings. The fire flows were modeled simultaneously with the current and 20-year MDD.

For a detailed discussion of the distribution system performance and fire flow analysis, see Section 9.

Water Management and Conservation Plan

Section 7

Water Management and Conservation Plan

Section 7

(OAR 690-86-140)

7.1 Water Management and Conservation Plan

Water conservation consists of any beneficial reduction in water losses, waste, or consumption. As water providers face growing demands of them and their limited resources, conservation planning is playing an increasingly important role in their management practices. Water that is conserved, in effect, becomes a new and relatively inexpensive source of water for the utility.

Conservation can have the effect of helping water providers avoid, downsize, or postpone water and wastewater expansion projects. Capital costs, maintenance costs, financing costs, and many other expenses may be reduced by effectively practicing conservation within the water system. Additional benefits for the environment include restoring stream flows to support aquatic life, providing recreational opportunities, and maintaining water quality. The investment that water system managers make in conservation planning will yield savings that can be measured in terms of reclaimed water, resources and related operating dollars.

A water conservation plan is defined as a voluntary, long-term program intended to reduce average per capita water consumption, thus diminishing the overall demand placed on a water system and its resources. The Oregon Department of Water Resources reviews water management and conservation plans based on the requirements found in the Oregon Administrative Rules (OAR) Division 86 (OAR 690-86-140). Much of what is required in a conservation plan is provided in a standard water master plan. However, the conservation and curtailment elements of a conservation plan are typically not part of a water system master plan. Sections 7 and 8 of this Master Plan have been specifically prepared to satisfy the requirements outlined in OAR 690-86-140. The entire Master Plan should be submitted to the Oregon Department of Water Resources as well as the Oregon Health Division for review and acceptance.

As outlined in OAR 690-86-140, a water management and conservation plan shall include the following elements:

- Description of the Existing System
- Water Conservation Element
- Water Curtailment Element
- Long-Range Water Supply Plan

Section 7 summarizes much of the information in this Master Plan and includes information for the existing system, the conservation element, and the long-range water supply plan. Section 8 discusses the water curtailment element.

Throughout Sections 7 and 8, previous sections from the Master Plan are referenced for more detailed coverage of specific topics. If additional information is required beyond the summary presented in this section, please refer to the referenced section for each topic.

7.2 Existing Water System (OAR 690-86-140.1)

The City of Yachats is located in Lincoln County about 24 miles south of Newport and 26 miles north of Florence on U.S. Highway 101. The water service population includes approximately 700 full-time residents. In addition to the full-time population, the City is host to a significant and fluctuating part-time and tourist population. For detailed coverage of the service population, see Section 2.

City services include treated drinking water, sewage treatment, and other common public works and maintenance services. See Section 2 for a detailed description of the City of Yachats. A location map and study area description are provided in Figures 2.1.1, 2.1.2, and 2.6.1.

The City's existing water system includes intake and transmission, treatment, distribution, and storage systems. A brief description of each is provided below. For a detailed description of these system components, see Section 4. Figure 4.6.1 provides a schematic of the City's distribution system.

Raw Water Sources (OAR 690-86-140.1.a)

The City of Yachats' primary water source is Reedy Creek. The City relies on Salmon Creek as a secondary or backup raw water source. In general, Salmon Creek is utilized only when flows in Reedy Creek are not sufficient to provide the City with the necessary water.

The City of Yachats holds a water right permit allowing diversion of raw water from the Yachats River though the diversion has not yet been developed. The water right includes stipulations for the removal of water from two separate diversion points. A portion of the water right is exempted from regulation by senior and instream water rights by a "municipal reserve" or an allocation for use established by administrative rule.

The City has entered into a stipulated agreement with various parties having interests in the environmental balance of Yachats River Basin. This stipulated agreement requires the City to fulfill a number of requirements and tasks prior to full development of the Yachats River water right. One of the required tasks includes the development of this Plan. A copy of the stipulated order and agreement is provided in Appendix G.

A historical water right is still held on Cape Creek though it is no longer considered a viable water source for the City.

Sections 4.1 and 4.2 include a detailed description of the City's various water sources

Surface Water Rights (OAR 690-86-140.1.a)

The City of Yachats currently holds surface water rights on a number of area streams as well as the Yachats River. The City's existing water rights are summarized below:

Table 7.2.1 – Surface Water Rights Documentation Summary – City of Yachats

Location	ID No.	Right Type	Maximum Rate Allowed	Currently In use? Yes - No	Min Quantity Available at the Source	Priority Date	Water Quality
Reedy Creek	22933	Cert.	2.0 cfs	Yes	~0.28 cfs	July 9, 1945	Good
Salmon Creek	29018	Permit	1.0 cfs	Yes	~0.28 cfs	June 26, 1963	Fair
Salmon Creek	29018	Permit	1.0 cfs	Yes	~0.28 cfs	August 22, 1963	Fair
Yachats River	53471	Permit	2.0 cfs	No	~15 cfs	March 20, 1989	Poor
Cape Creek	14104	Cert.	0.49 cfs	No	unknown	July 21, 1934	Fair

A copy of each of the City's water rights is included in Appendix A. Section 4.1 includes additional details on the City's surface water rights.

Groundwater Rights (OAR 690-86-140.1.a)

The City does not hold any groundwater rights. Although a hydrologic study of the area has not been performed, information regarding the yield of existing wells within several miles of the City indicates that groundwater is not a viable source for meeting the City's water needs. Geology in the area is dominated by Tertiary age basalt, which is relatively impervious to water. Most of the area's precipitation is accounted for in surface runoff and no significant aquifers have been identified.

Raw Water Storage (OAR 690-86-140.1.a)

In 1998, the City constructed a 500,000-gallon, open-air, steel reservoir adjacent to the water treatment plant. The reservoir was initially constructed to serve as a raw water storage tank to provide backup raw water during low streamflow periods. The tank is designed to fill during the evening hours when the plant may not be in production and attenuate the need for flows during the day. The tank has proven to be valuable in providing the City with increased operational flexibility and, since its installation, has eliminated major water supply deficiencies on a day-to-day basis.

If the City is successful in improving their raw water supply deficiencies, they may choose to convert the raw water storage tank into a treated water storage tank.

System Capacity vs. Existing Water Rights (OAR 690-86-140.1.b)

The City currently holds surface water rights of 2.0 cfs (1.3 MGD) on Reedy Creek and secondary water rights of 2.0 cfs on Salmon Creek. The City is also currently seeking to develop water rights for an additional 2.0 cfs from the Yachats River.

Information from the City's previous Water Master Plan (H.G.E., Inc. 1989) states that flows in Reedy and Salmon Creek were measured to fall below 0.18 MGD in each stream during a low flow period in October of 1987. The readings were made using the original impoundment structures and overflow weirs and gauging systems on Reedy and Salmon Creeks. Since the readings were taken, a landslide has destroyed the impoundment on Reedy Creek. Because no additional flow information was available for Reedy Creek, the data from the 1989 study will be used to characterize low flows within that water shed.

The dilemma facing the City of Yachats is that the source streams presently supplying the system do not have sufficient flows in the late summer months to supply the City's raw water needs; during this period combined flows of Reedy and Salmon Creeks can fall below 0.56 cfs (0.36 MGD). The maximum day productions recorded at the water treatment plant for three recent years have been in excess of 0.70 cfs (0.45 MGD), well above of the available stream flows during drought conditions.

Currently, the City's water system capacity is "source-limited" rather than "water-right-limited." The City needs to develop another raw water source in order to supplement the existing raw water streams during times of drought or regular low summertime flows.

Opportunities for expansion within the existing sources do not exist, as additional source water is not available. The only practical opportunity for development of a raw water source under existing water rights is that of the Yachats River. The City holds a water right permit for 2.0 cfs on the Yachats River. (See Section 4.1 for details.) However, environmental concerns, in-stream water rights, endangered anadromous fish species, and interventions by environmental groups have thus far prevented the City from developing the Yachats River as a backup or emergency water source to augment seasonal low flows in their primary and secondary sources.

See Section 5 for a detailed development of the supply and demand relationships within the water system. Section 9.1 analyzes the relationship between system capacity and the available raw water sources in the City system.

Water Treatment Facility

The City of Yachats water treatment facility was constructed in 1992 and has a total treatment capacity of approximately 350 gallons per minute (0.5 MGD). The plant capacity can be increased to a 700 gpm (1.0 MGD) plant with some minor modifications. See Section 4 for additional information on the City's water treatment facility and related systems.

The water treatment plant is a custom plant that includes a conventional multi-media filtration system. The plant makes use of the following processes:

- Prechlorination
- Chemical Coagulation and Polymer Addition
- Up-Flow Contact Clarification
- Multi-Media Filtration
- Disinfection (Post Chlorination)
- Serpentine Contact Basin Clearwell

The plant is in good general operating condition and the filters are well suited for treating raw water in a relatively wide range of turbidities.

Treated Water Storage

Treated water storage is accomplished in three reservoirs and a steel pressure tank. The City's total treated water storage volume is 1,211,000 gallons, with reservoirs located in the east-central portion of the City. The primary reservoir, a 1,000,000-gallon concrete tank, was constructed in 1992 and is in good condition today. The system's original 200,000-gallon below grade concrete reservoir was constructed in 1945 and also is in use today. A 10,000-gallon concrete reservoir constructed in 1964, as well as an adjacent 1,000-gallon pressure tank, are in good condition and continue to provide water service to a small high-level system. Not included in the above totals is a 43,000-gallon clearwell at the water treatment plant.

All reservoirs receive regular internal inspections and are well maintained. The two larger reservoirs are enclosed in cyclone-fenced yards to prevent public access. The pressure tank and associated booster pumps are enclosed in a CMU block building attached to the 10,000-gallon reservoir.

The City currently has adequate treated water storage reserves. However, the City is interested in adding a new 0.25 MG treated water reservoir in the southern portion of the system to provide adequate reserves to the population south of the Yachats River. See Section 9.5 for a discussion of the City's storage needs.

See Section 4.5 for a more detailed description of the City's existing treated water storage facilities.

Interconnections with Other Systems (OAR 690-86-140.1.a & e)

SLCWD. Southwest Lincoln County Water District (SLCWD) provides water to the unincorporated area to the north of the City between Yachats and the City of Waldport. The City has received a grant to develop a physical interconnection on the northern edge of the City distribution system linking the two water providers together. The City has entered into a Mutual Aid Agreement with SLCWD to provide and receive water in times of emergency or drought, providing that the donor provider has surplus water available.

At this time, the agreement between the City and SLCWD is intended to provide water under emergency conditions only. The agreement is not intended to serve as a regional water supply or water supply partnership.

Although emergency aid is the goal of system interconnection, it is not anticipated that either SLCWD or the City of Waldport systems would have excess water during a regional drought. Raw water for both systems is obtained from coastal streams, which are subject to the same seasonal climatic patterns and fluctuating flows as the streams within the Yachats River watershed. While they may be able to provide additional waters for fire fighting or short-term emergency needs, neither water provider has approached the agreement as a solution to their water supply needs.

Regional Interconnection. The City has given their endorsement to the investigation into the viability of a regional water supply between the City of Yachats, SLCWD, the City of Waldport, Seal Rock Water District, and the City of Toledo. Though still in the development stage, the City is very interested in the establishment of a regional water supply as it may provide them with much needed water supplies during times of drought and low streamflow.

Except for a short section of piping crossing the Alsea Bay Bridge in Waldport, the aforementioned water providers are already currently connected through various points of system interconnection. It is expected that a regional water study will be conducted sometime during the next year (2001-2002) to determine the viability of a regional water supply and to establish costs for the development of such a system.

The Mutual Aid Agreement between the City and SLCWD and a draft of the regional water supply (intergovernmental) agreement can be seen in Appendix B.

System Schematic (OAR 690-86-140.1.f)

Refer to Figure 4.6.1 for a detailed schematic of the City of Yachats' existing water system. The schematic shows locations of storage facilities, distribution and transmission systems, and the service area supplied by the water system. Figure 4.4.1 shows the locations of raw water diversion points, the water treatment plant, interconnection with Southwest Lincoln County Water District and both raw water and treated water transmission lines.

7.3 Existing Service Population (OAR 690-86-140.1.d)

The City of Yachats provides drinking water to residential, commercial and municipal customers within the City limits. Additionally, a significant portion of the City's water serves dedicated vacation rental facilities. The 2001 water service population of the City of Yachats is approximately 734 persons. The City has approximately 674 water service accounts distributed between various land use sectors. The service profile for the City is summarized below in Table 7.3.1:

Table 7.3.1 – Existing Service Profile

Year	Residential Accounts	Commercial Accounts	Transient Rental Accounts	City/Public Accounts
2000	540	57	61	16

A brief description of each land use sector is provided below:

Residential Accounts. Residential water customers in Yachats make up approximately 80 percent of the users in terms of total accounts. Yachats is a popular retirement community; the average number of persons per household is approximately 1.8 persons. The per capita income in Yachats is one of the highest in Oregon. As such, many upscale homes are located along the seafront and on the upland hills. In addition to the high end homes, Yachats also has a number of manufactured homes, mid-priced homes, and few multi-family dwellings.

Residential water use in the City of Yachats is not unlike that seen in many coastal communities. Due to the typically wet climate and cool temperatures, water use for outdoor recreation and landscape irrigation is generally less than that of communities in more arid regions.

Commercial Accounts. Commercial accounts within the City are comprised primarily of hotels, motels, and other establishments catering to the significant summertime and holiday tourist market. There are approximately 270 hotel rooms currently available within the City limits. Other commercial accounts include small shops, restaurants, grocers, and other common commercial establishments.

Transient Rental. Yachats is a popular vacation destination. As a result, a number of water use accounts are described as transient rental properties. These properties include condominiums, time-share properties, rental houses, and other short-term rental properties.

City/Public Water Use Accounts. City/public water accounts include City Hall, the City shops, parks, churches, the fire department and other typical city and public entities.

Estimating existing population and making population projections is extremely difficult in the City of Yachats. Due to the significant part-time residential population and the peak summer tourist season, obtaining accurate and verifiable information is very difficult. For the purposes of this Study, a system was developed for the analysis of residential population, off-peak equivalent population, and peak equivalent population. See Section 2.5 for a detailed description of the existing population and projections for future population figures for the City of Yachats. A more detailed discussion on the number of residents and their water use characteristics is provided below.

Water Use Characteristics

Previous planning efforts have made the assertion that, in Yachats, residential water consumption and commercial water consumption are very similar. Upon reviewing data for the years of 1997 to 2000, it was shown that residential consumption accounted for approximately 50 percent of all water sold while commercial consumption accounted for approximately 42 percent of all water sold.

As presented in Section 5, the commercial sector accounts for nearly as much water use as the entire residential sector within the City of Yachats. While the total amount of water *sold* to each sector is similar, it was not clear that water *consumption* within each sector was comparable. The vast majority of all water used in the commercial sector supports the tourist industry in the form of lodging and meals. As a result, it was expected that per capita water consumption in the commercial sector would be similar to that in the residential sector.

Utilizing monthly consumption data for each sector and the population estimates developed in Section 2.5, per capita consumption was estimated for each sector. Tables 7.3.2 and 7.3.3 summarize the per capita consumption within the commercial and residential sectors.

Table 7.3.2 – Residential Consumption Profile (1997-2000)

Year	High/Low	Month	Days	MG Consumption	Population Estimate	gpcd
1997	Low	Feb	28	1.228	665	66
	High	Aug	31	3.167	993	102
1998	Low	Feb	28	1.262	685	66
	High	Aug	31	2.740	1021	87
1999	Low	Feb	28	1.264	695	65
	High	Aug	31	2.535	1039	79
2000	Low	Mar	31	1.239	715	56
	High	Aug	31	2.482	1067	75
Average	Low	-	29	1.248	690	**62**
	High	-	31	2.731	1030	**86**

Note: Low consumption residential population was calculated as the full-time residential population alone. High consumption population was calculated as the full-time residential plus the peak part-time residential figures. See Section 2.5 for detailed coverage of population estimates.

Table 7.3.3 – Commercial Consumption Profile (1997-2000)

Year	High/Low	Month	Days	MG Consumption	Population Estimate	gpcd
1997	Low	Dec	31	1.047	530	64
	High	Aug	31	2.321	726	103
1998	Low	Feb	28	1.112	543	73
	High	Aug	31	2.564	748	111
1999	Low	Dec	31	0.932	566	53
	High	Aug	31	2.281	780	94
2000	Low	Nov	30	0.848	579	49
	High	Aug	31	2.213	802	89
Average	Low	-	30	0.985	555	**59**
	High	-	31	2.345	764	**99**

Note: Low consumption commercial population was calculated as the total equivalent off-peak population minus the full-time residential population. High consumption population was calculated as the equivalent peak population minus the full time residential population minus the peak part-time residential population. See Section 2.5 for detailed coverage of population estimates.

Based on the analysis summarized above, it could be said that per capita consumption within the commercial sector is indeed similar to that within the residential sector.

Based on the above profiles, the peaking factor between low winter and peak summer consumption ranges between 1.3 and 1.5 for residential and commercial consumption, respectively. It is assumed that minor increases in landscape irrigation, increases in summertime recreational water use, and tourist population surges can account for much of the increased seasonal water consumption.

7.4 Existing System Demand (OAR 690-86-140.1.c)

Water demand is commonly defined in terms of average, maximum, and peak use periods. A brief description of some of the common demand categories is provided below:

Average Annual Demand (AAD) - The total volume of water delivered to the system in a full year expressed in gallons. When demand fluctuates 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 Monthly 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.

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, treatment plant and transmission lines 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. Distribution systems should be designed to adequately handle the peak hourly demand. During this peak usage, storage reservoirs supply the demand in excess of the maximum day demand.

The demands described above, expressed in gallons per day (gpd), can be divided by the population served to come up with a demand per person or a per capita demand which is expressed in gallons per capita per day (gpcd).

Water Diverted

The total demand the City places on their raw water sources is equal to the total water diverted from all sources. The City has the ability to meter the water diverted from each source and keeps records of the total amount. The City diverts water from Reedy Creek for its primary raw water consumption. In addition to Reedy Creek, the City diverts water from their secondary source, Salmon Creek. For a detailed analysis of diverted water, see Section 5.2. A summary of the water diverted from each source is provided below in Table 7.4.1.

Table 7.4.1 - Summary Annual Water Diversion From Each Source (1997 – 2000)

Year	Reedy Creek Annual Diversion (Gal. X 1000)	Salmon Creek Annual Diversion (Gal. X 1000)	Total Raw Water Diverted (Gal. x 1000)
1997	79,286	7,550	86,836
1998	62,147	10,997	73,144
1999	42,986	29,532	72,518
2000	46,686	12,424	59,110
Averages	57,776	15,126	72,902

Unaccounted Water ("Lost Water")

The difference between the quantity of water diverted from the raw water source to the treatment plant and the quantity of water delivered through the distribution system and measured at customer meters is referred to as total unaccounted water. The difference can be attributed to system leaks, inaccuracies in customer meters, unmetered services, and other unmetered use such as fire flows and system flushing.

The Oregon Administrative Rules (OAR) section 690-86, states that all water systems should work to reduce unaccounted water levels to 15 percent. If the reduction of "lost" water to 15 percent is found to be feasible, the water provider should work to reduce unaccounted water levels to ten percent.

The City of Yachats' system experiences losses in excess of the 15 percent allowed by the OAR. In order to more accurately characterize system losses, an analysis was performed on available records, and an effort was made to identify the sources of losses within the system. Losses were separated into three distinct categories: raw water, treatment, and distribution system losses. For a detailed analysis of system losses, see Section 5.2. A summary of system losses for the period under study is provided in Table 7.4.2.

Table 7.4.2 - Summary Of Unaccounted Water – Losses (1997 – 2000)

Year	Raw Water Losses	Treatment Plant Losses	Distribution System Losses	Total Water System Losses
1997	23%	12%	20%	55%
1998	5% (1)	10%	26%	41%
1999	0% (1)	4%	32%	36%
2000	3% (1)	0%	25%	28%
Averages	**8% (1)**	**6%**	**26%**	**40%**

(1) Loss percentages based on assumed diversion data due to the loss of the Reedy Creek diversion system. Actual losses may vary if complete diversion data were available during period. New metering equipment was installed in November of 2000.

Based on the above analysis, average system losses total approximately 40 percent of the total water diverted from the City's water sources. It should, however, be pointed out that losses within the City system are on a steady decline over the years investigated and summarized in the above table. In order to be in compliance, the City should endeavor to reduce this value to 15 percent.

It should be noted, recently, the City randomly removed and tested a number of existing water meters. The results of the accuracy testing suggest that the existing meters may be reading low by more than 20 percent. If existing losses are around 28% as was shown in 2000, and the inaccurate meters were replaced with precise meters, losses may be reduced to below 10-percent. For additional discussion about water meter replacement, see Section 7.9.

The following subsections will summarize the existing water demand criteria for the City of Yachats. For detailed coverage on the following topics, see Section 5.2.

Average Day Demand (ADD)

The average annual demand can be defined as the average water demand for any day in a given year. ADD is most commonly used to size facilities based on average water demand. When water diversion data is used to determine the ADD, it also becomes the basic unit that other demand quantities are built upon.

The ADD for the City of Yachats is summarized below in Table 7.4.3. It should be pointed out that the per capita ADD includes all commercial and residential consumption along with all losses, leakage, meter inaccuracies, unmetered use, and all other lost water levels.

Table 7.4.3 Annual Average Day Demand

Year	Annual Demand (Gal x 1000)	ADD (Gal x 1000)	Residential Population	Off-Peak Equivalent Population	ADD (gpcd)
1997	86,836	238	665	1,195	199
1998	73,144	200	685	1,228	163
1999	72,518	199	695	1,261	158
2000	59,110	162	715	1,294	125
1997-2000 Average	72,902	200	n/a	n/a	161
Plan Basis Values	74,600	205	730	1,327	154

Maximum Monthly Demand (MMD)

Water demand in the City of Yachats fluctuates monthly with the highest demands generally between the months of June and September. The higher seasonal demands can likely be attributed to a combination of increased outdoor water use (i.e. landscaping) and the increase in population due to tourism and vacationers. A summary of the City's maximum month water demand and calculated peaking factors from 1997 to 2000 are provided in Table 7.4.4.

Table 7.4.4 - Maximum Month Water Demand – 1997 to 2000

Year	Max Month (Days)	Monthly Demand (Gal x 1000)	MMD (gpd x 1000)	Peaking Factor (MMD/ADD)
1997	September (30)	12,407	414	2.03
1998	August (31)	8,950	289	1.88
1999	September (30)	6,163	199	1.32
2000	August (31)	6,263	202	1.70
1997-2000 Average	NA	8,446	276	1.73
Plan Basis Values	NA	9,120	308	1.50

Maximum Day Demand (MDD) and Peak Hour Demand (PHD)

The MDD is the demand that is experienced on the highest demand day of the year. The MDD is commonly used in sizing facilities to provide capacity for periods of high demand. The MDD may be experienced on a holiday such as the Fourth of July or during a festival such as a County Fair. The MDD is usually associated with the warmest part of the year when agriculture, irrigation, and recreational uses of potable water are at their greatest. Peaking factors between 2 and 2.5 are commonly used for MDD.

For more information on the development of the MDD, see Section 5.2. A summary of the City's water demand criteria including PHD and MDD and associated peaking factors from 1997 to 2000 is provided in Table 7.4.5.

Table 7.4.5 - Summary Of Existing Water Demands - Basis For Master Plan

Demand Parameter	Total (gpd)	Peaking Factor	Per Capita Demand (GPCD)
Average Day (ADD)	205,000	1.00	154 (1)
Maximum Month (MMD)	308,000	1.50	232 (1)
Maximum Day (MDD)	515,000	2.50	268 (2)
Peak Hour Demand (PHD)	670,000	3.25	349 (2)

(1) Based on off-peak population estimates.
(2) Based on peak population estimates.

It should be reiterated; the water demand figures developed above are based on total water diverted and include all unaccounted water. With unaccounted water levels averaging 40 percent of total, the existing demand levels are inflated above levels acceptable by OAR guidelines. This will be taken into account when making water demand projections for the long range water supply plan in the following section.

7.5 Long Range Water Supply Plan (OAR 690-86-140.4)

Expected Future Service Area (OAR 690-86-140.4.a)

The current service area for the City of Yachats' system is essentially the current urban growth boundary (UGB). While a small number of homes are served outside of this boundary (12 connections), the City does not expect to annex additional areas into the UGB or expand it within the planning period. The main reason for not expanding the UGB would be the City's current difficulties in obtaining a consistent and reliable water source for the existing service population. Therefore, the future water service area for the City of Yachats is expected to remain the current UGB.

Long-Range Water Demand (OAR 690-86-140.4.a)

The capacity and sizing of a water system is based on the amount of anticipated water demand. Water system demand is the amount of water delivered from the source of supply to the distribution system over a given period. In most systems, the rate of demand varies considerably throughout the year and during each day. The demand rate is typically lower in the winter months and increases significantly in the summer months. Per capita demand is commonly used to evaluate and compare system demands.

Projections of future water demand are used to determine the adequacy of existing facilities and the capacity of proposed improvements. The projections are also used to evaluate existing water rights and source capacities.

The goal of responsibly projecting future water demands is not to build larger facilities to accommodate excessive water consumption, but rather to evaluate the capability of existing components and to size new facilities for reasonable demand rates. Large amounts of leakage and excessive water consumption should not be projected into the future estimates. Rather, efforts should be made to reduce leakage and lost water to a reasonable level and utilize lower, more acceptable demand rates for planning efforts. Water demand projections should be based on acceptable water loss quantities, reasonable conservation measures, and the community's expected water use characteristics.

Water demands are projected into the future using historical water demand levels and projected population and system growth characteristics. However, according to OAR 690-86-140, a water system should endeavor to reduce unaccounted water levels to 15 percent or less of the total water diverted from their raw water sources. As developed previously in this section, the City experiences average unaccounted water levels on the order of 40 percent. In order to be in compliance with the OAR, the City must work to reduce their level of unaccounted water to 15 percent. Responsible water planning should not include the propagation of high-unaccounted water levels into water demand projections.

In order to project the water demand values into the future with reasonable and responsible levels of unaccounted water, the total diverted water was reduced by 25 percent to simulate the results of the City reducing unaccounted water levels to 15 percent. The resulting demands were recalculated at this lower demand level and projected throughout the planning period.

Table 7.5.1 summarizes the population and water demand projections for the various planning criteria developed above.

Table 7.5.1 - Future Water Demand For The City Of Yachats
Basis For Master Plan Demand-Present and Projected
(Adjusted for compliance with OAR maximum 15 percent unaccounted water levels.)

Parameter	**2001**	**2011**	**2021**	**2051**
Residential Population	734	917	1,145	2,233
# of EDU's op=off peak p=peak	810 (op) 1,196 (p)	1,018 (op) 1,508 (p)	1,272 (op) 1,896 (p)	2,225 (op) 4,014 (p)
Equivalent Population op=off peak p=peak	1,327 (op) 1,919 (p)	1,696 (op) 2,475 (p)	2,171 (op) 3,197 (p)	4,589 (op) 6,945 (p)
(gpcd)	**Water Demand (gpd) – Basis For Long Range Supply Plan**			
ADD (154)	153,300	195,900	250,800	530,000
MMD (232)	230,900	295,100	377,800	798,500
MDD (268)	385,700	497,500	642,600	1,396,000
PHD (349)	502,300	647,800	836,800	1,817,900

Ten, 20 and 50-year projections have been provided in Table 7.5.1 for the purposes of long term planning. However, the growth rates and demand estimates should be reviewed at the beginning of each planning cycle.

It should be reiterated that the above projections are based on reduced demand levels and assume the City will be successful in reducing overall unaccounted water levels to 15 percent or less. If the City is unsuccessful in this effort, future demands are likely to be higher.

See Section 5.3 for a detailed accounting of the projected demands and methodologies used in population and water demand projections.

Projected Demand vs. System Capacity (OAR 690-86-140.4.b)

The maximum day demand (MDD) for the 20-year planning period is 642,600 gpd. This MDD equates to 1.0 cfs (446 gpm). The City has primary water rights on Reedy Creek totaling 2.0 cfs, as well as secondary rights totaling 2.0 cfs from Salmon Creek. In addition to the rights on its primary and secondary sources, the City holds 2.0 cfs on the Yachats River that have not yet been developed.

At face value, it appears that the City has ample water supplies to provide raw water for the planning period. However, combined flows in Reedy and Salmon Creeks have been known to fall below 0.56 cfs during periods of seasonal low flow. This low raw water yield does not satisfy the existing MDD, not to mention projected MDD's. The available flow will most likely be adequate for the 20-year ADD of 0.39 cfs assuming the City is capable of reducing unaccounted water levels.

The City's water system capacity is source-limited by availability rather than by water right. The City must develop additional raw water sources to provide for its raw water needs when the primary and secondary raw water sources have been depleted.

See Section 9.1 for detailed coverage of projected demand vs. system capacity. A summary of the 20-year projected demands and the minimum water available in Reedy and Salmon Creeks is provided below in Table 7.5.2.

Table 7.5.2 – Projected Water Requirements Vs Available Water

Criteria	2021 Demand Level* (cfs)	Minimum Combined Flows: Reedy and Salmon Creeks (cfs) Approx.
ADD	0.39	0.56
MMD	0.59	0.56
MDD	1.00	0.56
PHD	1.30	0.56

* It should be reiterated that the above demand figures assume 15-percent unaccounted water levels.

Development of New Sources (OAR 690-86-140.4.c.A)

Though the City's water rights are adequate for the 20 and 50-year MDD, water is not available in the source streams at the necessary volumes throughout the year. The City will need to develop additional raw water sources during the current planning period. The new source(s) should have the capacity to provide needed water during dry summer months when the existing source streams cannot meet the City's needs.

See Section 9.1 for detailed coverage of various source options available to the City,. The most promising raw water source options for the City's long-term needs are summarized below:

Unaccounted Water Reduction and Conservation Measures. The best source of additional water available to the City is the reduction of unaccounted water and conservation of existing water supplies. These source options are positive because they draw from existing resources, seeking to more efficiently utilize each unit removed. Also, the environmental impact, if anything, is positive. Each gallon of water that is recovered from leakage, meter loss, unmetered use, or other unaccounted use, is a gallon of water that is available for the beneficial use of the Yachats water consuming population. Furthermore, each gallon of water that is saved or conserved through conservation measures becomes one less gallon of water required at the point of diversion.

If the City is able to reduce unaccounted water levels to 15-percent or less, the raw water required at the point of diversion could be reduced by 25 percent or more. To put this into perspective, Table 7.5.3 summarizes the potential effects of unaccounted water reduction.

Table 7.5.3 – Potential Effects Of Unaccounted Water Reduction

Parameter	2001	2021
MDD, Existing Demand Levels Incl. Loss	515,000	856,900
MDD, Reduced to 15% Unaccounted Water	385,700	642,600
Net Available Water	129,300 (0.20 cfs)	214,200 (0.33 cfs)

The analysis summarized above suggests that the City can recover at least 0.20 cfs today and up to 0.33 cfs within the planning period. While this reclaimed water will not be adequate to provide enough water for the 20-year MDD, reductions on this order are significant and would aid the City during periods of low flow within their raw water sources and would provide more than enough water for the 20-year ADD.

In addition to developing new source water through unaccounted water reduction, the City may realize additional waters through the development of conservation measures. If, for instance, the City were able, through conservation measures, to reduce overall water consumption by only 10 percent of the total water diverted, the total additional water available for beneficial uses would be near 35 percent of what is currently being diverted. Table 7.5.4 summarizes the impact of both unaccounted water reduction and conservation measures on raw water requirements.

Table 7.5.4 – Potential Effects of Unaccounted Water Reduction and Conservation Measures On Raw Water Requirements – gpm (cfs)

Parameter	2001	2021	Minimum Combined Flows: Reedy and Salmon Creeks Approx. (cfs)
MDD, Existing Demand Levels Incl. Loss	515,000 (0.80 cfs)	856,900 (1.33 cfs)	0.56
MDD, Reduced to 15% Unaccounted Water	385,700 (0.60 cfs)	642,600 (1.00 cfs)	0.56
MDD, w/ 10% Conservation	463,500 (0.72 cfs)	771,200 (1.20 cfs)	0.56
MDD, w/ 10% Conservation & 15% Unaccounted Water (35% Total Reduction)	334,750 (0.52 cfs)	556,985 (0.86 cfs)	0.56
Net Available Water	180,250 (0.28 cfs)	299,915 (0.46 cfs)	na

Based on the analysis summarized in Table 7.5.4, the City may be able to reclaim as much as 0.46 cfs by the end of the planning period. While the total reduction does not provide enough additional water to fulfill the requirements of the 20-year MDD, the water savings is nearly as much as the current MMD and does provide significant additional water for the City.

As presented in Section 9.1, existing combined flows in Reedy and Salmon Creeks have been measured as low as 0.36 MGD (0.56 cfs). If the City were successful in meeting the proposed reductions, it would be able to provide for the current MDD with its existing source water, assuming flows in the two creeks do not drop below historical lows. However, even with these significant demand reductions, the current raw water sources will not be able to provide the required raw water for the MDD more than a few years into the planning period. MDD levels would need to be reduced by 58 percent before the existing raw water supply is sufficient for the finished water demand.

The cost and effectiveness of reducing unaccounted water is difficult to quantify. It will no doubt require expensive piping replacements, meter replacements, and other infrastructure improvements. See Section 10 for a list of proposed projects and improvements and associated project costs. While not all of the projects developed in Section 10 are necessarily for the purposes of water conservation, any project that will improve the efficiency of the system or replace older and failing infrastructure will result in some level of lost water reduction.

The cost and effectiveness of reducing water requirements through conservation is also difficult to quantify. Conservation measures vary widely in effectiveness, cost to implement, and applicability. For a discussion on various conservation measures and estimates of the cost of various measures, see Section 7.8.

While unaccounted water reduction and conservation are considered to be good potential sources that may assist the City in stretching their source water further, they are not the solution to the City's raw water needs: the reliability and effectiveness of such measures is difficult to predict, most water providers have the intention of being responsible water stewards. The provider may develop plans and projects to reduce unaccounted water and they may implement conservation measures with the intent of reducing per capita consumption; however, the result of such efforts may fall short of the intended goal, leaving them incapable of supplying adequate water to their customers.

The City should endeavor to reduce unaccounted water levels to 15 percent and seek to reduce overall consumption by 10 percent through conservation efforts. While these efforts will not solve the source water problems, they will reduce the burden placed on the City's sources and on the water system infrastructure.

The Yachats River. The City currently holds a water right permit for 2.0 cfs on the Yachats River. The City has, for the past decade, been attempting to develop a portion of this water right. However, due to various environmental concerns, it has been unable to develop the Yachats River as a backup water source for periods of seasonal low flow in its primary and secondary sources.

Environmental concerns on the Yachats River generally center on instream water rights, minimum streamflow levels, and the anadromous fish species these programs are intended to protect. The City's water rights are "junior" to two instream rights in the vicinity of the City's permitted points of diversion. This requires the instream rights to be satisfied before the City can exercise its water right. Historical streamflow readings suggest that satisfaction of the instream rights is regularly not achieved during seasonal low flow periods. (See Section 4.1 for detailed coverage of instream water rights on the Yachats River.) Because these rights are regularly not satisfied during low flows, the City will not be able to exercise its water rights during those same low flow periods. Unfortunately, the times of year that the City may require water from the Yachats coincide with the lowest flows in the river and the restrictive instream water rights. It is highly unlikely that the City will be able to utilize the full 2.0 cfs of the water right when the greatest need for the water arises.

However, 1.0 cfs of the total 2.0 cfs water right is described in the City's permit as a "municipal reserve." This "municipal reserve" is an allocation established by administrative rule intended to exempt up to 1.0 cfs of the City's water right from regulation resulting from senior instream water rights. That is to say, under the City's water right, the City is allowed to remove up to 1.0 cfs regardless of instream flows. While this point does not allow full development of the water right, it does allow development of up to half of the right.

It should be pointed out that the City's Yachats River water right is divided between two diversion points. If the City chooses to exercise their full 1.0 cfs municipal reserve, they will be required to construct two separate intakes, each to remove a maximum of 0.5 cfs during periods of low instream flow.

Table 7.5.4 summarizes the analysis of existing water availability and the impact that the addition of Yachats River water will have on maximum day demands during the planning period. The analysis assumes that the City will require only Yachats River water during periods of low seasonal streamflow in their primary source. Therefore, it is understood that only 1.0 cfs will be available from two 0.5 cfs diversions.

Table 7.5.5 – Potential Yachats River Impact On MDD

Parameter	2001	2021
MDD w/out Reductions	515,000 gpd (0.80 cfs)	856,900 gpd (1.32 cfs)
MDD w/ Reductions (85% Eff, 10%Conservation)	334,750 gpd (0.52 cfs)	556,985 gpd (0.86 cfs)
Minimum Flows in Primary & Secondary Sources	0.56 cfs	0.56 cfs
Water Available Under Municipal Reserve on Yachats River	1.0 cfs	1.0 cfs
Total Raw water Available	1.56 cfs	1.56 cfs

The analysis in Table 7.5.5 indicates that the addition of the 1.0 cfs municipal reserve on the Yachats River will provide the City with adequate raw water beyond the 20-year planning period. The projected use of the new source is obviously dependent on the City's ability to reach the reduced flow ranges discussed earlier in this section.

State and Federal agencies have worked to develop minimum streamflow standards for the fish-bearing streams on the Oregon Coast. On many of these streams, instream water rights have been established in an effort to ensure that minimum streamflows are protected. It is generally considered to be environmentally adverse when flows fall below the established minimum streamflow levels. Therefore, by the definition and criteria established by State and Federal agencies, if water is removed from the Yachats River during periods of low streamflow, a negative environmental impact should be expected. While the environmental impact of removing water in the amounts described by the City's water right is difficult to quantify, it is likely that by these definitions, the impact may be considered adverse.

It is worth noting that numerous private water rights exist on the Yachats River above the City's points of diversion. These private water rights are harvested throughout the year regardless of streamflows. Taken collectively, small private water rights may also result in an adverse environmental impact to the river.

It is understood that environmental concerns surrounding the Yachats River are in large part driving the efforts to prevent the City from developing their water right. While the City clearly has interests in protecting the river, they also have an obligation to provide water and fire protection to the consumers within the City system. The City must seek a balance of responsible, beneficial water use, and conservation of the natural resources in the Yachats River basin.

For water quality reasons, the City would choose to develop the upper point of diversion in order to divert the first 0.5 cfs of the municipal reserve. In order to remove the second 0.5 cfs, the lower diversion point must be developed. Costs to develop the upper diversion can be found in Section 10.3.

Regional Water Supplies. The City is currently involved in the development or investigation of the feasibility of three separate regional water supplies. The City considers the formation of a regional water supply as an important step toward solving their water demand problems.

The first regional supply option is that of **Rocky Creek** near Newport. The Rocky Creek project consists of the construction of a new dam and impoundment on Rocky Creek located north of the City of Newport. Early estimates suggest that the storage volume of the new reservoir will be approximately 9,000 ac-ft (over 2.9 billion gallons). This large storage volume would be capable of providing water for a significant population on the Oregon coast. Costs for the project are expected to be between $50-$100 million dollars.

The Rocky Creek project is in the early planning stages with significant challenges and obstacles to overcome before such a reserve will become a reality. The City of Yachats has expressed interest in the project and has pledged their support of the investigation and the feasibility study for the project. The financial impacts to the City are not known at this time and will be clearer once the studies and analysis of the project reach completion, as will be the case with the environmental impacts of such an endeavor.

The second regional supply the City has been pursuing centers around the **City of Toledo**. The City of Toledo has significant water rights and supplies available to them. Currently, in addition to providing for their own customers, Toledo provides for all the water needs of the Seal Rock Water District. The City of Yachats is in the process of developing an intergovernmental agreement with Toledo, Seal Rock Water District, City of Waldport, and Southwest Lincoln County Water District (SLCWD). The intergovernmental agreement essentially involves the governance of an interconnection of all the named water providers. The interconnection would enable the group to operate as a regional water supply with each entity being capable of providing or receiving backup or emergency water from the others as it is required.

A physical interconnection already exists between Toledo and the Seal Rock Water District. Separate physical interconnections will soon exist between Waldport, SLCWD, and the City of Yachats. In addition to the construction of a link between Seal Rock and Waldport across Alsea Bay to interconnect the entire system, it is expected that treatment process, transmission, and disinfection systems would require upsizing.

The Toledo option, as with the Rocky Creek project, is in the early stages of discussion and development. It is expected that within the next year or so that a regional water supply master plan and feasibility study will be developed. Estimates on costs, environmental impacts, and other project specifics should be deferred to the completion of the regional master plan so that all issues can be studied in more detail.

The third and final regional supply the City has been pursuing is a limited-supply agreement with the **City of Waldport and SLCWD**. The City is currently operating under a draft agreement with SLCWD to provide or receive water during a drought or emergency, as surplus water is available. SLCWD and the City of Yachats have sought to include the City of Waldport within this agreement to increase the base of water supplies available to each participant.

While none of the participants in the agreement would consider the mutual aid agreement as a long-term or reliable solution to water supply difficulties, the agreement does provide increased security for fire protection, system malfunction, or severe drought protection, though it is not likely one participant will have surplus water when the others are experiencing a significant drought.

The cost of the mutual aid agreement is relatively small, as is the impact to the environment. However, the increase in reliable and available water supply is also quite small. The agreement is an effective tool for short-term fire or emergency water provisions.

New Impoundments. While an impoundment on an existing source would not be considered a new source or new water right, an impoundment could serve as a significant source of raw water during periods of low streamflow in the existing sources. A number of opportunities exist for the City to construct an impoundment on an existing source. A brief description of each is provided below:

A small impoundment near the **Salmon Creek** diversion provides some raw water storage for that source; however, in terms of daily demands, the impoundment is small. An additional impoundment located higher in the basin of Salmon Creek once stored water for one home. Even though this old impoundment is silted in, it is too small to provide significant raw water storage. There has been some discussion and investigation into the construction of a significant dam and impoundment on the Salmon Creek drainage basin. Though the cost may be substantial, the City holds water rights on the stream and could store valuable water during the winter to be used throughout the summer months.
In 1998, a landslide above the **Reedy Creek** dam destroyed the dam and the Reedy Creek impoundment. The original impoundment served as a reliable water source for the City providing consistent flows throughout the year. There has been significant interest in restoring the dam and the impoundment in the Reedy Creek drainage basin. As with Salmon Creek, the cost of such a project may be significant. However, the reconstruction of an existing impoundment may be more feasible than the construction of a completely new facility. Also, the existing raw water transmission line is capable of providing raw water to the treatment facility through gravity flow.

The City owns a piece of property **south of the Yachats River** across from the water treatment plant. Preliminary investigations have been underway for the construction of a lined, earthen impoundment intended to store between 3 and 5-million gallons of raw water diverted from Reedy Creek. The impoundment would also serve as a settling pond to reduce turbidity and suspended solids in the raw water. In conjunction with the 0.5-MG raw water tank adjacent to treatment plant, the new south Yachats impoundment could be a significant step toward water supply independence. Approximate costs for the development of this impoundment are included in Section 10.3.

The purpose of the impoundments described above will not be to provide enough water to satisfy the demands of a summer season, but rather, provide a significant volume to attenuate high flow periods. In other words, during periods of low streamflows, the City may choose to divert water from the impoundments rather than directly from the source stream. Low streamflows in the source streams will be diverted into the impoundments throughout the day and night in order to fill the impoundments. During low and average flows, the streams will be capable of filling the impoundments, while during periods of high demand, the City will rely on the volume available in the impoundment to satisfy water demands.

Schedule for the Implementation of New Sources (OAR 690-86-140.4.c.B)

When putting together a schedule for the development of new sources, a number of criteria should be taken into consideration. The cost of the new source water including development and maintenance should be considered to determine the most cost-effective option. In addition to cost, availability, reliability, and environmental impacts should be considered. Table 7.5.6 illustrates a potential decision matrix that could be used by the City to determine which source or sources to pursue for development.

Table 7.5.6 – Source Decision Matrix

Ratings / Filter						
1= Discourages Source				4 = Favors Source		
Potential Source	**Estimated Cost Effectiveness**	**Water Availability**	**Water Reliability**	**Environmental Impacts**	**Total**	**Comments**
Unaccounted Water Reduction	3	2	1	4	10	Good source of water already in system. May be difficult to obtain significant volume.
Water Conservation	4	2	1	4	11	Good source of water. Results of conservation difficult to predict.
Yachats River	3	2	2	1	8	Only realistic source of surface water available to the City.
Regional : Rocky Creek	1	4	4	2	11	Good, but expensive alternative. Reservoir planning stages only.
Regional : Toledo	2	3	3	3	11	Good alternative. Many issues yet to overcome.
Regional : Waldport / SLCWD	4	1	1	3	9	Good emergency alternative. Not a long-term supply solution.
Impoundment: Salmon Creek	2	3	3	2	10	Environment impacts may be an issue
Impoundment: Reedy Creek	2	3	3	3	11	Good option. Reconstruction of existing facility. USFS Property.
Impoundment: South of Yachats River	3	3	3	3	12	Good impoundment alternative.

A decision matrix, such as the one developed in Table 7.5.6, depends upon subjective input for much of the criteria. Dependant upon one's outlook, ratings may change impacting the point total for each source. Due to the fact that only true potential sources were investigated, it is not surprising that the total scores are relatively close. Sources that were obviously not feasible were not included within the analysis (i.e., obtaining additional water from Salmon Creek).

The City is currently in need of additional source water under maximum-day conditions. Based on the above decision matrix, the following development schedule has been developed.

- **Unaccounted Water Reduction:** Efforts should begin immediately to reduce unaccounted water. The City has a goal of 85 percent efficiency by the year 2011.

- **Water Conservation:** Appropriate conservation measures should be developed in an effort to reduce overall water consumption an additional ten percent. See Section 7.8 for more specific information on water conservation programs.

- **Impoundment south of Yachats River:** The City has a goal to have an impoundment constructed and functional by 2003.

- **Yachats River:** The City has a goal of developing their upper diversion on the Yachats River in 2011. At this time, and during low seasonal streamflows, the City will be able to remove up to 0.5 cfs from the Yachats River under the municipal reserve within their water right permit. If the City is unable to develop alternative water supplies or other supply options, the timeline for the Yachats River may have to be accelerated.

- **Regional Supplies:** The City is currently involved in investigations and feasibility studies of the various regional supplies. Results of the various studies should be obtained prior to making final decisions about the best regional course for the City to follow.

- **Additional Impoundments:** The City has no immediate plans for the development of additional impoundments though investigations and discussions about impoundment alternatives, particularly Reedy Creek, will be ongoing throughout the planning period.

In addition to the requirements of the OAR, the City is required to satisfy a number of requirements specified in a Mutual Agreement and Order (MAO). One of the elements in the Order is a timeline of projects and goals leading the City's system to improved efficiency. The timeline and a number of other critical elements are presented in a technical memorandum in Appendix H.

7.6 Water Conservation (OAR 690-86-140.2)

Water providers are in the business of making and selling water. The sale of that water allows the utility to pay expenses, retire debts for system development loans, and plan for future water production facilities. Some providers may view conservation as an activity that is contrary to the financial survival of their water system. However, practically every water system is capable of making changes in their operation that will result in reducing "lost water" and lower production costs. The result of conservation is often an increase in operating revenues and a decrease in unnecessary and wasteful expenses. Responsible water management also includes educating the public about wasteful water usage practices.

> *"In order to meet the needs of existing and future populations and ensure the habitats and ecosystems are protected, the nation's water must be sustainable and renewable. Sound water resource management, which emphasizes careful efficient use of water, is essential in order to achieve these objectives.*
>
> *Efficient water use can have major environmental, public health, and economic benefits by helping to improve water quality, maintain aquatic ecosystems, and protect drinking water resources."* ~ EPA Office of Water, Statement on Principles on Efficient Water Use (December 1992)

The following sections are intended to provide the City with sufficient information to develop an active and efficient conservation program that will result in lower water use and reduced demand on the water system and the environment.

Water Conservation Progress Report (OAR 690-86-140.2.a)

As the City does not have a previously approved plan, they are not required to provide a progress report for previously implemented conservation measures. However, existing conservation measures are described later in this section.

Water Use Measurement and Reporting Program (OAR 690-86-140.2.b)

The City currently has meters in position to measure the flow from each point of diversion, the total flow entering the water treatment plant, the flow leaving the water treatment plant to the distribution system, and all end users in the service population. Also, a number of meters are used to measure the water used in the treatment plant for process water and the amount of water that is "wasted" from the backwash lagoon.

Daily records are kept at each measurement point and entered into logs at the water treatment plant. The City reads consumption water meters on a monthly basis and issues monthly bills indicating the volume of water consumed the previous month. It then utilizes a simple spreadsheet to perform an overall system audit on a monthly basis. This monthly audit has proven helpful in calling out irregular water use patterns that have turned out to be attributable to leaks, malfunctions, and other system problems. The City submits all annual reports as required.

The majority of the large meters used to measure the diverted water and treatment plant quantities are new and believed to be in good condition and measuring accurately. While the exact accuracy is not known, it is expected that the majority of the existing consumption meters are not in good condition and may not be reading within the required accuracy value of 15 percent. The City is currently undertaking a project to replace all existing consumption meters with an accurate and standardized meter make and model; the meter change-out program should be completed by June of 2003.

The City believes it is currently in compliance with the measuring and reporting guidelines as explained in OAR-690-85.

Current Conservation Practices (OAR 690-86-140.2.c)

The City of Yachats utilizes a number of conservation measures within its regular operating strategy. A summary of the current conservation practices is provided below:

- **Source water metering.** The City currently meters the amount of water removed from each source.
- **System wide metering.** The existing water system is fully metered enabling the City to compare the amount of water that is produced to the amount of water that is sold to its customers. The data can be used for audits and accounting practices. Meters are read on fixed intervals.
- **Public use water metering.** The City meters all water use including public facilities.

- **Public education.** The City includes conservation-minded water bill inserts on a semi-annual basis. The brochures remind consumers to be conservative and provide water conservation information to the public. The City also maintains a website with a conservation link describing various conservation measures and giving people tips about how they could conserve water in their own homes.

- **Retrofit Program.** The City currently has a retrofit program to replace inefficient and outdated water consumption fixtures. This has included providing, free of charge, fixture retrofit kits for showerheads, faucets, and other minor fixtures. The City is in the process of developing a toilet retrofit program that will provide rebates toward the installation of new ultra-low-flow toilets.

- **Water Reuse.** The City currently makes use of reuse water at both the wastewater treatment plant and the water treatment plant.

7.7 Conservation Planning Strategy

Water systems have a wide selection of specific conservation measures at their disposal. Some of the measures deal directly with the water provider while others are aimed at reducing the consumption levels of the water users. Appropriate conservation measures should be selected on the basis of how well they can help the system achieve water savings, program costs, and other implementation factors.

When evaluating potential conservation measures for a conservation program, water system managers should consider the following criteria:

- Program Costs
- Ease of Implementation
- Staff Resources
- Ratepayer Impacts
- Water Rights Issues
- Cost Effectiveness
- Budgetary Considerations
- Environmental Impacts
- Environmental and Social Justice
- Legal Issues or Constraints
- Permit Requirements
- Regulatory Approvals
- Timeliness of Savings
- Public Acceptance
- Consistency with Other Programs

Not all conservation measures are effective or appropriate for every water system. In order to assist water system managers in choosing appropriate conservation measures, the Environmental Protection Agency (EPA) has put together a number of guidelines and categories in order to facilitate choices.

The EPA suggests that water providers develop conservation programs that vary in their level of activity based on the size of the individual water system. In other words, the larger the water system, the more activities the water provider should undertake to conserve water. The recommended system size divisions and conservation levels are summarized in Table 7.7.1.

Table 7.7.1 – System Size Categories and Guideline Classifications

System Size Category (SDWA)	Applicable Guidelines
Serves fewer than 3,300 people	Basic Guidelines
Serves between 3,300 and 10,000 people	Basic Guidelines (up to 10,000 people)
Serves more than 10,000 people	Intermediate Guidelines (up to 100,000 people) Advanced Guidelines (more than 100,000 people)

The basic guidelines provide a simple planning approach for smaller systems to develop conservation strategies and programs; the intermediate and advanced guidelines lead to a comprehensive conservation plan appropriate for the resources and personnel found in larger water systems. The conservation measures recommended by the EPA for the associated guideline classifications are summarized in Table 7.7.2.

For a description and evaluation of various individual conservation measures, see Section 7.8. Section 7.9 outlines the measures that are currently required of all systems by the OAR rules and the Oregon Department of Water Resources. The City should, at a minimum, implement the conservation measures outlined in Section 7.9.

The EPA guidelines are divided into three levels of activity. All water systems, regardless of size, should consider the fundamental conservation principles outlined under Level 1. The measures in Levels 2 and 3 are appropriate for systems with greater conservation needs and the resources to develop a more robust conservation program. However, a water system manager should feel free to adopt any conservation measure that would provide a substantial benefit to the system.

It should be pointed out that conservation measures do not necessarily include activities to reduce unaccounted water. Though some measures will result in this end, conservation measures are generally intended to make long-term changes in consumption and management practices. The City has been active in developing conservation measures in their community and is committed to increasing their efforts and making even more efficient use of their water resources in the future.

As illustrated in Table 7.7.2, a wide variety of conservation measures are available to managers of water systems. Which measure(s) a water system chooses to adopt depends on a number of issues. In most water systems, water conservation begins on the supply side. Many of the following measures are to be carried out by the water supplier; others rely on involvement from the consumer. Typically, a combination of both types of measures will result in a successful conservation program.

Table 7.7.2 – Guidelines and Associated Water Conservation Measures

Measures	← Advanced Guidelines →		
	← Intermediate Guidelines →		
	← Basic Guidelines →		
Level 1 Measures			
Universal Metering	• Source Water Metering • Service-Connection Metering and Reading • Meter Public Use Water	• Fixed Interval Meter Reading • Meter Accuracy Analysis	• Test, Calibrate, Repair, and Replace Meters
Water Accounting and Loss Control	• Account for Water • Repair Known Leaks	• Analyze Nonaccount Water • Water System Audit • Leak Detection and Repair Strategy • Automated Sensors/Telemetry	• Loss-Prevention Program
Costing and Pricing	• Cost of Service Accounting • User Charges • Metered Rates	• Informative Water Bill • Water Bill Inserts • School Program • Public-Education Program	• Workshops • Advisory Committee
Level 2 Measures			
Water-Use Audits		• Audits of Large Volume Users • Large-Landscape and Irrigation Audits	• Selective End-Use Audits
Retrofits		• Make General Retrofit Kits Available	• Distribution of Retrofit Kits • Targeted Programs
Pressure Management		• System-wide Pressure Management	• Selective use of Pressure Reducing Valves
Landscape Efficiency		• Promotion of Landscape Efficiency • Selective Irrigation Submetering	• Landscape Planning and Renovation • Irrigation Management
Level 3 Measures			
Replacements and Promotions			• Rebates and Incentives • Promotion of New Technologies
Reuse and Recycling			• Industrial Application • Large Volume Irrigation Application • Selective Residential Applications
Water Use Regulation			• Water Use Standards and Regulations • Requirements for new Developments
Integrated Resource Management			• Supply-Side Technologies • Demand Side Technologies

7.8 Feasibility of Conservation Measures (OAR 690-86-140.2.d)

The OAR requires that a water provider perform an evaluation of various conservation measures to determine if they are "feasible and appropriate" for the provider to implement. The provider must consider economic feasibility, environmental impacts, availability of proven technology, time requirements to implement modifications, local variations, expected effectiveness of measure, and other pertinent criteria.

The following section seeks to provide analyses for various measures as required by the OAR guidelines.

System Wide Leak Repair Program (OAR 690-86-140.2.d.A)

General. A leak detection and repair program may include regular on-site testing using computer-assisted leak detection equipment, sonic leak detection surveys, or another acceptable method for detecting leaks along water distribution mains, valves, services, and meters. The inspections should include the internal inspection of water tanks and reservoirs.

Water leakage can be measured in terms of water volumes as well as the associated costs required to treat, store, and distribute water to the consumers—"lost" water produces no revenue for the utility. Repairing leaks can result in significant savings and additional revenues for the water system.

The goal of a system-wide leak detection program should be to reduce leakage to 15 percent of the total water produced. If the reduction to 15 percent is found to be feasible and appropriate, the water system management should strive to reduce leakage to 10 percent or less. It should be pointed out that system leakage differs from unaccounted water in that, system leakage does not include unmetered, unauthorized, or water lost through other ways. The goal of a leakage program is to reduce the water that leaves the conduits, tanks, or other system components and enters the environment.

Leak Detection. On a number of occasions in recent years, the City has hired leak-detection firms to perform isolated leak detection surveys of the City system. On nearly every occasion, the leak-detection contractor found minor leaks that the City was able to repair. However, using sonic leak-detection equipment in Yachats presents a number of challenges. The constant "white noise" created by the waves crashing on the rocks and the traffic on Highway 101 creates interference that can "mask" the sound created by many leaks.

The City should continue to bring in leak-detection consultants to scan the distribution system for leakage; any leak found and repaired will reduce lost water and add up to significant savings. The City should develop a map that will allow them to graphically keep track of the areas it has swept with the leak detection equipment. Over five years or so, the City should seek to scan the entire system and leaks should be repaired as discovered. Development of a planned strategy will benefit the City and allow it to demonstrate its leak detection plan to interested parties.

Repair. The City has made significant progress over the years to locate leaks and repair piping, valves, and other infrastructure elements; monthly water audits have been helpful in indicating abnormal losses in the system. Recently, monthly audits prompted City personnel to search for a leak in the southern portion of the system. A 2-inch diameter service line under a creek was broken and leaking into the creek. This particular leak was difficult to locate because the leakage was flowing directly into the creek and not into the ground.

In 1998, the City replaced 1.5 miles of AC raw water piping known to be in poor condition. The old piping was replaced with fusion-welded HPDE piping known for being essentially 100-percent leak-free. The City intends to replace an additional 1,200 lineal feet of raw water piping during the upcoming planning period.

Meters. While the City has been active in locating leaks, repairing leaks, and repairing or replacing aged infrastructure, it may not be said that the City has an official "plan" for leak detection and repair. As was developed in Section 5.2, consumption records indicate that the City has had consistent losses in the distribution system averaging 26 percent over the past four years. Preliminary testing of existing water meters suggests that they may be reading 20-percent low. If the existing meters are replaced, losses in the distribution system may be reduced significantly.

Section 10.7 includes project development information and estimated costs for the complete change out of all meters.

Distribution System Piping. Much of the distribution system consists of aged, small diameter AC piping. In other water systems, piping of this era and material class have been shown to be very leaky and inefficient water conduits. It is anticipated that many of the small diameter AC piping in the City of Yachts distribution system is in similarly poor condition.

The City wishes to undertake capital improvement projects during the planning period to replace all suspect piping in order to reduce leakage and system losses. The City has a ten-year goal (2011) for completion of the replacement of all piping sections identified for replacement. See Section 10.3 for project development and costs for each section of pipe replacement. Section 11 includes phasing and implementation plans for the improvements.

Feasible and Appropriate. The City experiences consistently high losses in its distribution system. Overall system losses average approximately 40-percent of the total water diverted from the City's sources. While it is not possible to quantify, it is likely that the City experiences more than 15 percent leakage in its system. It is therefore considered to be *appropriate* that the City adopt a formal leak detection and repair program. The program is to consist of an organized leak-detection sweep of the City over a five year period, replacement of all existing consumption meters over a 5-year period, replacement of suspect distribution system piping over a ten year period, and the immediate repair of all leaks upon discovery.

Undertaking an aggressive leak-detection and repair program is *feasible* for the City. It must reduce overall system losses to be able to develop additional water supplies for future growth. It has little choice but to take the necessary steps to reduce system losses. With over 40 percent overall losses, financial benefits, natural resource benefits, environmental benefits, and many other benefits await the City if it is successful in reducing leakage and water losses. Also, the City is under a stipulated order with the Oregon Department of Water Resources and has committed to reduce leakage and losses within its system.

Schedule and Budgeting. The City has a goal to complete the replacement of all existing consumption meters by July 2003. Work toward this goal has already begun and is expected to accelerate in the coming years. See Section 10.7 for budget and project information as the project is included in the CIP.

The City also has a goal of making a full leak-detection sweep of the system by July, 2006. This will incorporate sonic or other leak detection technology in conjunction with immediate repairs of located leaks. Pipes found to be in poor condition will be identified and slated for replacement; approximately $2500 per year will be budgeted for leak detection and repair activities.

The City has a goal to construct and/or replace all waterlines identified in Section 10. Many of these lines are undersized AC lines and are suspects for leakage and losses. Additional piping replacement may be added to this list as leaky and failed sections are identified.

Programs to Encourage Low Water Use Landscaping (OAR 690-86-140.2.d.B)

As was developed in Section 7.3, residential water consumption records indicate a 39 percent increase in per capita water consumption between February and August. Estimates of commercial per capita consumption increase 68 percent between the low and high monthly demands. It is reasonable to assume that the majority of the water consumption increase can be related to increases in outdoor water use brought on by mild or warm summer weather. This increase in outdoor activities may include outdoor recreation, gardening and landscaping water, increased water use by the tourist population, increases in visitors to Yachats not staying in lodging facilities but stopping to visit and using water from various sources, and other seasonal water uses.

Of particular interest is the practice of landscape irrigation. Because of its location on the southern Oregon coast, Yachats is not known for extravagant landscape water usage. In fact, the four major hotels in Yachats have adopted low water use landscaping and use very little water for landscaping during the summer months. However, nearly all residential and most commercial facilities can attribute a portion of their water consumption toward landscape irrigation. In this section, the issue of efficient landscaping practices will be discussed.

General. The efficiency of typical landscape-irrigation techniques has been estimated at 50 to 80 percent. (Water Conservation in California, California Department of Water Resources, 1984) This indicates that between one-fifth and one-half of the water applied to irrigation is not utilized by vegetation. Instead, the water evaporates as it is applied, percolates into groundwater, or runs onto streets or into storm drainage systems.

Outdoor water usage, including landscape watering, drives maximum-day demand, which in turn drives system capacity requirements for water system components. Reduction of landscape water demand can play a positive role in a water conservation program. In arid climates where landscape irrigation is very common, this type of conservation is very important. In western Oregon, landscape irrigation plays a relatively smaller role, however, it does impact the maximum day demand levels and some water providers may find appropriate applications for landscape conservation.

Utilities can promote the development of conservation through low water use landscaping practices. These practices can begin on City projects and then extend into planning and design activities including development and management of new landscape projects, development of public parks, and golf courses. Existing landscapes and irrigation systems can be renovated to incorporate water-conserving practices.

Xeriscaping™. This low water use irrigation program encompasses the following principles:

- Planning and Design
- Limited Turf Areas
- Efficient Irrigation
- Soil Improvement
- Mulching
- Use of Lower Water Demand Plants
- Appropriate Maintenance

Water savings from low-water-use landscaping can be significant with some estimates as high as 63 percent compared to traditional landscaping. Significant information on xeriscaping is available from the National Xeriscape Council. Lists of appropriate plants, guidelines for design, example regulations, and other support is available. The following incentives may be utilized to encourage homeowners to convert to low-water-use landscaping:

- Offer water connection fee discounts for new homes with approved low-water-use landscaping incorporated into home site.
- Create a demonstration garden (See Landscape Efficiency Education discussion below)
- Develop an approved low-water-use plant list for the area
- Develop landscape guidelines and distribute to community
- Develop promotions with local nurseries
- Prepare public information materials addressing low-water-use landscaping

For more information on xeriscaping, see the xeriscape website at *www.xeriscape.org*.

Landscape Policies, Planning and Renovation. New construction, commercial or residential, can be directed to incorporate low-water-use plantings and develop efficient watering methods and systems. Public parks, City buildings, and other common areas can be renovated, incorporating efficient landscaping practices, and setting the standard for others in the community to follow.

Utilities can coordinate with local nurseries to ensure low-water-use plantings are available and efforts are made to educate the public as to the benefits of landscape efficiency.

Landscape Efficiency Education. Significant resources are available to assist the provider in educating the consuming public on the merits of landscape efficiency. Some communities have developed "demonstration gardens" in public parks or common areas to showcase low-water-use landscaping and irrigation practices. These gardens include low water consumption plants and groundcover as well as the latest technology in efficient irrigation. Signs and reader boards describe each plant and component of the garden and urge community members to use similar landscaping at their homes.

Also, pamphlets, videos, CD-ROM's, and other media are readily available from various agencies for the purposes of public education concerning landscape irrigation.

Feasible and Appropriate. As was shown earlier in this section, per capita water consumption in Yachats does increase significantly between winter and summer months, though many of the existing lodging facilities in Yachats have already adopted low water use landscaping. While the exact amount of landscape water usage is not known, it is common for residential and some commercial water users to irrigate their properties in the summer months to maintain turf and plantings.

Yachats is located on the Oregon coast, and as such, is known for significant precipitation levels. However, evidence does suggest that at least a small portion of the summer water consumption may be attributed to landscape irrigation. Increasing the efficiency with which that landscaping water is used will reduce maximum water demand levels and decrease the demands placed on the City's raw water sources during the drier summer months. The inclusion of a low-water-use landscaping program for the City is, therefore, considered to be *appropriate.*

The costs associated with implementing a low-water-use landscaping program may vary widely. Costs may be as low as a few dollars for education materials and as high as many thousands of dollars per year for renovation and new construction incentives. A mid-range program to provide educational information, policies for new construction, and some simple incentives would be appropriate for the City of Yachats. The relatively low cost and the potential for water savings makes this measure a *feasible* conservation option for the City.

Schedule and Budgeting. By July of 2003, the City intends to adopt an official low-water-use landscaping program complete with guidelines, regulations, incentives, and educational information. The estimated budget for this item will depend on the level of detail and involvement the City wishes to undertake with its landscape conservation plan. The budget for this item will be set at a later date as the details for the program develop.

Incentive Programs that Encourage Conservation (OAR 690-86-140.2.d. C)

The greatest incentive a water provider can offer to its customers is to save money. Some savings are direct and from the provider while others are indirect and originate from such sources as reduced electrical costs for low-flow showerheads and reduced maintenance costs from low-water-use landscaping. Other savings may come from rebates or retrofit programs sponsored by the provider or other agencies. When used properly, water conservation incentive programs can play a significant role in putting ideas into action and making conservation measures a reality. This section will discuss various incentive programs available to the City.

Rebates. In order to accelerate the replacement of older, less efficient fixtures and appliances, utilities can offer rebates and other incentives to customers that upgrade. Customers should be encouraged to replace their old inefficient plumbing fixtures or to use retrofit kits. The City should also stock kits for supplying new residences as part of the basic hook-up fee.

Retrofit kits usually consist of toilet tank inserts, low-flow showerheads, faucet flow restriction devices, toilet leak detection dye tablets, and an informational guide. The cost of these retrofit kits varies between \$1.50 to \$7.00 each, depending upon the number and specific items included. Only showerheads and faucet restrictions should be needed for new residences.

Many water and electrical utility providers offer rebates to customers who purchase approved, efficient appliances. This may include front-loading washing machines and highly efficient dishwashers. The City may wish to offer incentives to customers who purchase these appliances for use in their homes or provide forms and information to facilitate the reception of rebates available from such sources as the Department of Energy. For more information on rebates available from the Oregon Department of Energy, see their website at *http://www.energy.state.or.us/res/tax/taxcdt.htm* . To assist the City in providing the necessary forms to its customers, a copy of the basic forms necessary to apply for a energy and water conservation rebate is provided in Appendix D.

Connection-Fee Discounts. As mentioned previously in the landscaping efficiency section, incentives in the form of connection fee discounts can be offered to developers or builders who incorporate low-water-use landscaping into their development. Specific guidelines and standards should be prepared in order to describe what is required to receive the discount.

The City may wish to extend a similar discount to water customers who renovate or remodel and incorporate new technology or new landscaping with the intention of reducing water consumption levels.

Feasible and Appropriate. The City currently has a number of incentive programs in place. In 1999-2000 the City distributed approximately 1,000 retrofit kits at a cost of approximately $5 each. The kits were distributed to all water customers and were to be installed by the customers themselves. The total number of kits installed in homes is not known. It may be appropriate for the City to perform a sampling poll to determine how many households installed the free kits. Additional kits are available today for new customers or upon request.

Also, the City is currently developing a program for the retrofitting or replacement of older, high-flow toilet systems. The City estimates that approximately 460 houses in Yachats were built prior to 1995 when local plumbing codes began to enforce low-flow toilet fixtures. It is estimated that as many 1,000 toilets in Yachats could be retrofitted with low-flow fixtures.

Under the proposed program, a customer may apply to receive a $100 rebate toward the replacement of each and every high-flow toilet at each household. The City will perform a brief pre-installation inspection to determine if the existing toilets meet the replacement requirements and a post-installation inspection to confirm that the new ultra-low-flow toilets have been installed. At the time of the pre-installation inspection, the City intends to inspect showerheads, nozzles, and other fixtures, and provide a new retrofit kit if low-flow fixtures are not in place. Upon return for the post-installation inspection, it will be determined if the new fixtures were installed. See Appendix E for information on the City's toilet retrofit incentive program.

If the City is capable of encouraging conservation through simple incentive programs, all benefits realized will enhance efforts to reduce the demands on its raw water sources. According to the AWWA, average per capita water consumption (inside water use) can be reduced by up to 57 percent for homes that adopt comprehensive conservation practices. Due to the potential benefits for the water system and the programs already in place, incentive programs are *appropriate* for the City of Yachats.

Since incentive programs often require the consumer saving or receiving monies, the costs of such programs can often be great. For instance, if all 1,000 of the estimated high-flow toilets in Yachats are replaced and a $100 rebate issued for each toilet, the City must be prepared to pay up to $100,000 in toilet retrofitting rebate costs. However, up to 20,000 gpd (7.2 million gallons per year) could be conserved by using the new ultra-low-flow toilets. The cost of retrofitting the old toilets would be approximately $0.01 per gallon conserved in the first year. If water reductions resulting from showerheads, faucets, front-loading washers, and other efficient fixtures are included, the positive impact to the water system could be great.

Due to the above issues and many others, the continued inclusion of incentive programs in the City's system in considered to be *feasible* as well as appropriate.

Schedule and Budgeting.

The City's toilet retrofit program is not scheduled to begin until October of 2003. Plans are being made to budget $5,000 per year to fund the program. In addition to this funding, the City plans to budget $1,500 per year for the purchase of additional retrofit kits to be distributed during the required home inspections.

The City will continue to make retrofit kits available upon request, and free of charge. Information on DOE rebates and other conservation incentives is currently available at City Hall.

Retrofitting or Replacement of Existing Inefficient Fixtures (OAR 690-86-140.2.d.D)

As was discussed in the previous section, the City has an existing retrofit program and has made significant strides toward retrofitting inefficient fixtures in the City of Yachats. In the past few years, the City has distributed over 1,000 retrofit kits to their water customers. The City is also developing a toilet rebate and retrofit program to retrofit all older and inefficient toilets.

It is estimated that a non-conserving residential dwelling will use, on average, more than 50 percent more water than a residential dwelling that adopts and follows conservation practices. Figures 7.8.1 and 7.8.2 demonstrate the different water use patterns between conserving and non-conserving homes.

FIGURE 7.8.1
AVERAGE INSIDE WATER USE
NONCONSERVING HOME

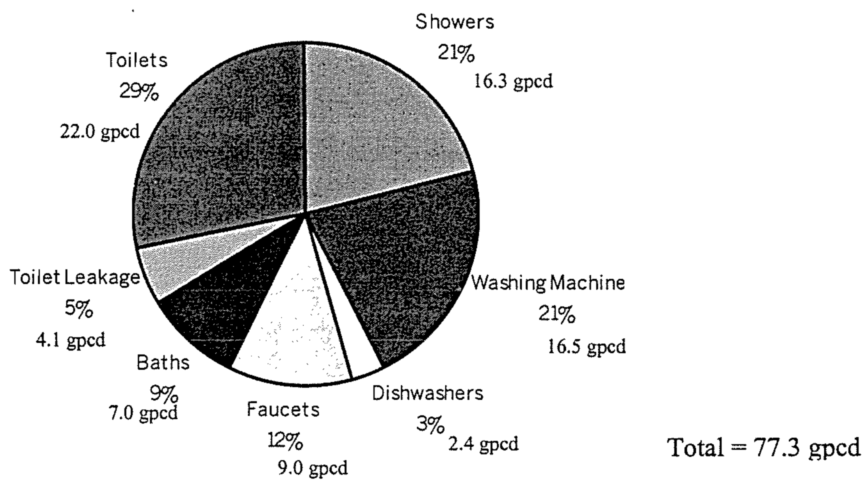
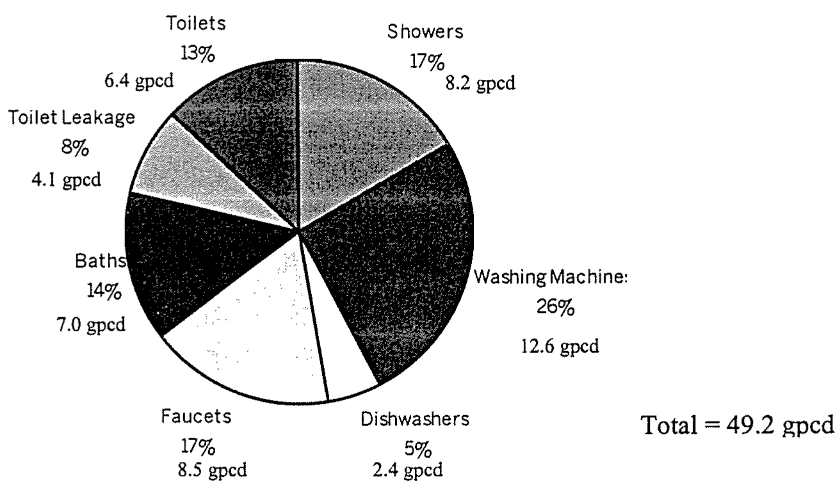


FIGURE 7.8.2
AVERAGE INSIDE WATER USE
CONSERVING HOME



If the City is successful in obtaining comprehensive participation in its retrofit programs, water savings such as those outlined in the above figures should be expected. For a description of these programs and the City's plans to incorporate them, see the previous section on incentive programs to encourage conservation.

Adoption of Rate Structures that Support and Encourage Water Conservation (OAR 690-86-140.2.d.E)

General. The City of Yachats charges customers for their water based upon a standard base rate plus a consumption rate. The existing water rates for the City are summarized below in Table 7.8.1.

Table 7.8.1 – Existing Rate Structure – City of Yachats

Fiscal Year	Base Rate $/Month	Consumption Rate $ / 100 cu. Ft.
2000-2001	$23.00	$2.60

Based on the current ADD for the residential sector, the average consumption per residential household is approximately 400 cubic feet. Based on this consumption estimate, the average residential water bill in the City of Yachats is approximately $33.40. During the summer months, and based on maximum month characteristics, the average residential water bill rises to approximately $38.60 (~600 cu. ft.).

For a community to receive grants, low-interest loans, or other funding, a number of requirements must be met. One requirement is that a water provider must set rates resulting in an average water bill that meets or exceeds the state average water bill. While the figure for the state average changes rapidly, when this study was prepared, estimates of the average state water bill were running between $38 and $40 per month. Based on these estimates, the City's existing rates are not in excess of the state average.

The City of Yachats issues a sewer bill in conjunction with their water bill that, generally, is dependent upon the volume of water measured at the water meter. The rational behind this common system is, that, the majority of water that passes through the meter will, sooner or later, end up in the sewer system.

The City of Yachats uses water consumption data to calculate the appropriate sewer charges for the entire year and charges a sanitary sewer base and volumetric rate. The sanitary sewer volumetric rate is constant with the exception of the months of May to September. During these months, the consumption, or volumetric sanitary sewer charge changes from $2.00 per 100 cu. ft. to $1.50 per 100 cu. ft. The reasoning for this discount is that the City recognizes a portion of the summertime water consumption is used for landscape irrigation and other outdoor or recreational use and does not find its way to the sanitary sewer system. While this policy is not intended to encourage excess water use, and is directed at the sewer system charges, the result may be interpreted as a reduced summertime water rate that, in fact, encourages water consumption.

While the purpose of this study is not to change sanitary sewer rates, the overall picture of the City's utility charges must be considered. If the lower summertime sewer rate is perceived as a summertime water consumption discount, steps should be taken with the water billing rates to offset the sanitary sewer discount, or provide a conservation incentive to encourage lower summertime water usage.

Conservation Rate Structures. Water providers should develop a water rate structure that supports and encourages water conservation. The conservation rate structure may include inverted block pricing (i.e., the price per gallon increases with elevated water use) and may include seasonal price differentials (i.e.; cost of water is higher during periods of high consumption, such as the summer months). The rates should depend on metered volumes to determine the charge to each customer. Major commercial customers and residential customers with larger meters (two inch or greater) may be charged a higher rate than normal residential users.

An effective conservation rate structure should be developed so as to encourage maximum participation in the conservation efforts. The most effective means of encouraging this participation is to develop a multi-step rate structure. Each step in the rate structure should be carefully established so as to accomplish the most in terms of conservation with the most customers.

If the average, monthly, household water consumption in Yachats is approximately 400 cubic feet per month and the maximum monthly household consumption is approximately 600 cubic feet, (as developed previously), an appropriate multi-step rate structure is summarized below in Table 7.8.2.

Table 7.8.2 – Potential Multi-Step Water Conservation Rate Structure – Residential Sector (1 EDU)

Criteria	Rate
Base Rate	$23.00 /month
Consumption Rate:	
0 – 300 cu. ft.	$1.75 / 100 cu. ft.
300-500 cu. ft.	$2.50 / 100 cu. ft.
500 –up cu. ft.	$3.00 cu. ft.

The City may choose to use a conservation rate structure only in the summer months or throughout the year. The effectiveness of such a structure will depend greatly upon the City's ability to educate the consumer on the new rate structure and the benefits available to the consumer when practicing water conservation.

Commercial consumption in the City of Yachats accounts for almost one-half of the total water used in the City system. The vast majority of commercial consumption is attributed to the numerous motel and lodging facilities located within the City. Special consideration should be given to these establishments so as not to penalize the motels for typical water consumption. EDU methodology, weighted limits, or some other method must be considered when developing a conservation rate structure for the commercial sector.

If for instance, EDU methodology was used, a certain motel may be considered to be equivalent to 20 EDU's. In this hypothetical case, each consumption rate level in Table 7.8.2 would be multiplied by 20 to determine the levels for the hypothetical motel. The conservation rate for the motel would then be from 0 to 6000 cu. ft., and so on.

Prior to the establishment of a conservation rate structure, the City may wish to perform a detailed rate analysis to determine the most appropriate conservation rate structure for the City's needs. The rate analysis should make concessions for the improvement projects described in Section 10 and the recommended phasing described in Section 11. A rate analysis of this magnitude was beyond the scope of this study. If EDU methodology is required, each non-residential account must be assigned an EDU rating based on existing consumption levels. This rating may be subject to review on a regular basis.

Feasible and Appropriate. The City is in need of additional raw water during the high-demand, summer months. Conservation rate structures have the potential of reducing the overall consumptive demand on the system. If correctly administered, the City will not experience a drop in revenue, while the availability of existing raw water supplies will be extended. Due to the City's need to protect their raw water supplies, a conservation rate structure is considered to be *appropriate.*

Because a conservation rate structure can provide benefits without sacrificing system revenues, it is also considered to be *feasible*. It should be reiterated, that, a detailed rate analysis should be performed to assist the City in development of an appropriate conservation rate structure. The new rate structure should include a detailed analysis of residential water use and develop a rate or multi-rate system that will encourage the maximum participation in the conservation effort. The new system should also include an equitable method to allow participation by the significant commercial water consumption sector.

Budget and Schedule. The City intends to investigate a new conservation rate structure that will encourage conservation in both the commercial and residential sectors. Development of the new structure is scheduled to be completed by July of 2003. No budget estimates are required for this measure.

Water Reuse Opportunities (OAR 690-86-140.2.d.F)

General. Supply-side water reuse generally includes reuse of process water from community treatment plants. Non-potable water reuse at a wastewater treatment plant can significantly reduce treated water consumption at the facility. Reuse of filter backwash at a conventional water treatment plant can also reduce the amount of treated water required at a water plant.

On the demand-side, gray-water reuse has gained favor in more arid communities. Though not currently allowed on residential systems in Oregon by DEQ, gray-water includes all household wastewater not containing human waste. This would include sink drains, shower and bath drains, roof drains, and other sources of non-potable water. Often, separate plumbing systems are developed with holding tanks that can be utilized as storage for landscape irrigation systems, non-potable outdoor washing, and other non-potable water uses. Another benefit of such systems is that less water enters the sanitary sewer system, thus extending the life and capacity of sanitary facilities.

While the benefits of residential and commercial gray-water systems are obvious, the additional costs for redundant plumbing and storage systems are often more than the property owners are willing to develop.

Larger commercial and industrial facilities can often benefit from water reuse programs. Depending on the types of facilities and the processes involved, significant savings in both money and water supplies can be achieved. One such area where significant savings has been realized is in facilities with cooling towers. In the past, evaporated water removed in cooling towers was drained to the sanitary sewer. Today, many of these facilities are finding effective ways to reuse this water within their own process.

Treatment Plant Reuse. The City of Yachats currently has a water reuse program at its wastewater facility. During the calendar year of 1996, the City used approximately 1.72 million gallons of treated water at their wastewater plant for wash down and other process water needs. Changes were made to the treatment plant operations including the addition of a non-potable water system. Where treated water was once used, today non-potable water is used to wash the treatment basins, foam removal, and other process water uses. In 1998, the treatment plant treated water consumption totaled just 649,000 gallons. The inclusion of non-potable water to the wastewater plant reduced treated water consumption at the plant by more than 62 percent. The City continues to look for ways to increase its water conservation efforts at the wastewater treatment plant.

The City water treatment plant utilizes flocculation, clarification, filtration, and disinfection processes. Filter backwash water, instrumentation sampling water, and other process water is drained from the plant and into a concrete backwash lagoon. Until the last few years, water from the backwash lagoon was wasted and disposed of through a land application system.

The reuse of backwash water is a controversial topic. According to the Oregon Health Division, current guidelines and standards do allow a water provider to reuse backwash water by sending it back through the treatment process. The main reason for concern is that materials and organisms removed during the filtering process are washed into the backwash lagoon during a backwash cycle. If that water, (and the materials and organisms), are then recycled back into the treatment process and trapped in the filters again with additional materials and organisms, the potential for a buildup or concentration of these materials and organisms exists.

The Environmental Protection Agency is currently reviewing filter backwash regulations and backwash reuse rules. Until these rules are developed or changed, there are no current regulations or guidelines suggesting the City should not reuse their backwash water.

Today, the City reuses nearly all backwash waters from the backwash lagoon. With the exception of the wettest winter months when turbidity in the lagoon exceeds reasonable levels, all lagoon water is reintroduced to the influent raw water stream and reused. During the summer months this has proven to be a valuable conservation measure reducing lost water at the plant from approximately 12 percent in 1996 to nearly 0 percent today. While some water is still land-applied in the wettest months, all water is reused during the critical summer months.

Feasible and Appropriate. The City currently reuses water at both its water and wastewater plants. As described above, the City is able to save significant amounts of water through reuse efforts resulting in less water required from raw water sources. Due to the success and minimal costs to reuse water at each plant, the measure is both *feasible* and *appropriate.*

Budget and Schedule. Since the City already practices water reuse, additional scheduling is not required. Because the systems to facilitate these reuse programs are already in place, no additional budgeting is required.

Other Conservation Measures Identified by the Water Supplier to Improve Water Use Efficiency (OAR 690-86-140.2.d.G)

Pressure Management. The City experiences high flows in the southern portion of its distribution system. The area west of Highway 101 can experience pressures between 80 and 100 psi. Mainline pressure reducing valves (PRV's) are notorious for being maintenance problems and commonly do not function properly, as is the case in the westernmost portion of the City's system. Also, mainline PRV's tend to cause low-pressure problems for residences downstream from the PRV that are located in the upper elevations.

The City is currently developing a program to install service line PRV's on many residences within the high-pressure zone. Demand-side pressure reduction studies have shown that a 30 to 40 psi decrease in water pressure can result in water savings between three and eight percent. (HUD water conservation study, Atlanta, Denver, Boston.) While the exact savings expected within the City of Yachats is not known, it is believed that pressure reduction in the high pressure zone is an appropriate measure that fits nicely with the retrofit efforts and leak detection program. It is anticipated that approximately 400 water service accounts could benefit from pressure reduction measures.

Budget and Schedule. The City intends to make PRV's and meter boxes available to interested parties located within the high pressure zone. The PRV's are to be installed on the customer-side of the meter by the customer and be maintained by the customer. The City plans to budget $2,500 per year for pressure management with installations beginning in July of 2003.

EPA WAVE Program. The Water Alliance for Voluntary Efficiency (WAVE) is a program intended to assist the lodging (motel, hotel, etc.) industry and other commercial industries to reduce water consumption and be more water-conservation minded. Sponsored by the Environmental Protection Agency (EPA), hotels and motels become members of the WAVE program by voluntarily developing conservation programs within their own establishments. Facilities that choose to take part in the WAVE program must sign a Memorandum of Understanding (MOU) with EPA. Wave participants agree to:

- Appoint a WAVE Implementation Manager
- Survey water use devices in all facilities
- Consider options for achieving greater water use efficiency and implement those options that maximize efficiency provided that they are profitable and do not compromise business operations
- Upgrade water use devices so that 90 percent of the projected reductions in water use are realized within five years
- Incorporate water-efficient devices in new facility design
- Provide annual information to EPA on efficiency measures implemented and the related savings in water, energy, and costs, and
- Inform customers and employees about the benefits of water use efficiency

The City of Yachats has a number of motels that, together with a few other commercial accounts, consume approximately 50 percent of the treated water within the system. Due to the significant water use in this sector, it only makes sense that the City would be interested in involving the lodging facilities in the conservation effort.

Benefits for the lodging facilities include:

- **Options Analysis System.** A computer software package that allows WAVE partners to survey water use in facilities, evaluate water efficiency options, and choose the most cost-effective water efficiency upgrade.
- **Training Workshops.** Regular meetings are held that will inform hotel management of the benefits of water efficiency and provide technical information to facility engineers.
- **Supporter Program.** WAVE supporters are equipment manufacturers, water management companies, and utilities that have agreed to educate customers about water efficiency.
- **Endorser Program.** These groups include membership associations and other organizations that support WAVE.
- **Public Recognition.** WAVE will place public service advertisements in major publications and EPA will distribute ready-to-use promotional materials to promote WAVE activities.

- **Financial Benefits.** By changing to water efficient equipment and procedures, a hotel or motel can cut its water use by up to 30-percent. Costs for investments in new equipment can often be recovered in three to five years.

- **Avoidance of Mandatory Audits.** Until the City of Yachats realizes its goal of 85-percent water efficiency, they are under order to perform mandatory annual audits of their major water consumers. For the City of Yachats, this will require an annual audit of each hotel within the community. The audits will require the hotels to account for all water consumption from the meter to each point of end use. In an effort to encourage participation in the WAVE program, the City may wish to develop an audit charge for facilities that do not participate in WAVE and are required to have the annual audit performed by the City.

Due to the significant commercial sector in the City of Yachats, it is critical that water conservation is practiced within these facilities. If the commercial sector (including lodging facilities) were able to reduce their total water consumption by 30 percent, the savings to the entire system would be 15 percent of the total water consumed. This reduction in water consumption would result in less water being diverted from the raw water sources and the extension of the viability of existing sources.

The City is developing a program intended to encourage water conservation within the lodging community. The intent is to encourage each lodging facility to join the WAVE program. It is believed that active participation in the WAVE program will yield immediate and long-term water conservation reductions. Additional information on the EPA WAVE program is available on the internet at *http://es.epa.gov/partners/wave/wave.html*.

Budget and Schedule. The City has made inquiries into setting up meetings with Federal WAVE personnel and various lodging facilities on the Oregon coast. The Oregon State University facility in Newport has been approached as a possible host for the meeting; OSU has been involved in earlier studies and investigations concerning WAVE and other organized conservation programs. The City's goal is to involve all lodging facilities in the WAVE program by July 2003. There are currently no plans to budget City funds for the development of the WAVE program in Yachats.

7.9 Mandatory Conservation Measures (OAR 690-86-140.2.e)

As was summarized in Section 7.7, many different types of conservation measures are available to water providers. Measures vary in complexity, cost, effectiveness, appropriateness, and a multitude of other ways. Which measures a provider chooses to incorporate into his or her own conservation plan also depends upon a number of issues.

While the water provider is free to choose from many conservation measures, OAR 690-86 does require that the provider undertake some mandatory conservation activities. The following section provides a description of each measure, how it is currently being implemented, a description of the schedule and budget for each measure, and other recommendations as appropriate.

Annual Water Audit (OAR 690-86-140.2.e. A)

General. The purpose for an annual water audit is to track the efficiency of the system, monitor water consumption levels, determine effectiveness of conservation measures, and gather system performance data. The OAR requires determination of the level of unaccounted-for water as communities seek to reach efficiency goals of 85 percent or greater.

Program. The City currently performs a monthly water audit of its entire system. City staff have developed a spreadsheet that allows them to enter in monthly meter readings from their raw water diversions, raw water meter, treated water meter, consumption totals for each section and any other accounted-for water use. A resulting graph and table are output summarizing the current and running condition of the City water system. At the end of each year, the December spreadsheet provides the totals for the year and concludes the annual audit.

The City auditing spreadsheet has gone through a number of changes and refinements resulting in the spreadsheet currently being used. Performing monthly audits has provided the City with relatively "fast" feedback on the performance of its system and the response of specific repairs or improvements that have been developed.

Recently, during the performance of a monthly audit, City personnel noticed a sudden and sharp increase in unaccounted-water levels. The entire staff was put on alert and began searching for a leak or other explanation to the rise in lost water. A large leak was found in a pipe crossing under a small creek. Water leaking from the pipe was entering the creek, thus making it difficult to notice such a large amount of water leaking from the distribution system. The pipe was repaired, resulting in the reduction in lost water levels the following month.

The annual water audit program has proven to be a valuable tool to the City in tracking its raw water requirements and consumption patterns. Also, as described in Section 7.4, raw water losses have dropped from the mid 50-percentile range in 1996 to the mid 20th-percentile range in the year 2000. Annual water audits have provided the City with regular feedback and reinforcement to support efforts at water conservation and improving the efficiency of the water system.

Implementation. Since the City currently has a monthly, as well as an annual water audit program in place; additional information concerning implementation, budgeting, or scheduling is not required.

System Metering Program (OAR 690-86-140.2.e.B)

General. The City of Yachats' water system is fully metered. However, the majority of the City's consumption meters generally consist of older, inefficient, rebuilt, and otherwise outdated metering equipment. As was stated previously, preliminary testing of the meters suggests that the existing meters may be reading more than 20-percent low. That is to say, approximately 20-percent of the total water in the system is "slipping" through the meters undetected. This unaccounted water could be accounted for with the installation of an accurate metering system.

A number of meter companies today offer metering equipment capable of near perfect accuracy over a long service life. In addition to accuracy, new metering systems can be equipped with automated meter reading (AMR) technology designed to increase the efficiency and accuracy in the meter reading and water billing process.

Numerous small communities have undertaken complete meter change-out programs, installing new AMR meters, and updating their billing procedures. Considering the revenue lost due to old meter inaccuracies, many meter change-out programs see a payback of just a few to up to ten years depending on the amount of new revenue captured by the new, more accurate meters.

Program. While the City is fully metered, it is expected that significant losses occur through the existing meters. As a result, the City has undertaken a meter replacement program. Initially, the City began installing meters utilizing City staff. It is estimated that the installation of a new meter assembly costs approximately $100. Within the first year, the City planned for and replaced approximately 50 meters.

However, at this pace, it will take the City in excess of ten years to change-out all standard consumption meters, so it is currently developing a plan to finance and change-out all remaining meters within a one to two-year period. Once this is accomplished, monthly and annual audits will begin to show the results and benefits of the meter change-out program. Also, new revenues resulting from newly captured water volumes will be available for the repayment of the change-out program costs.

Implementation. It is anticipated that the City will undertake an aggressive meter change-out program by the end of the 2001 calendar year. See Section 10.7 for a description of the budget and schedule of the project as it fits into the CIP program.

Leak Detection Program (OAR 690-86-140.2.e.C)

General. A leak detection and repair program makes use of various technologies to locate leaks in the system and identify pipelines requiring repair or replacement. The goal of a system-wide leak detection program should be to reduce leakage to 15 percent of the total water produced. If the reduction to 15 percent is found to be *feasible* and *appropriate*, the water system management should strive to reduce leakage to 10 percent or less.

As was developed in Section 7.8, the City's losses are on a level that suggests leak detection and repair is prudent. Over the past ten years, the City has repeatedly secured the services of a leak-detection contractor to scan the distribution system; on each occasion, leaks were detected and repaired.

It should be noted that leak detection efforts in areas like Yachats presents special challenges. "White noise" generated from the constant wave action and traffic noise from US Highway 101 tends to inhibit many forms of leak detection. However, any leak that is detected and repaired will result in reduced lost water and is considered to be *feasible*.

Program. The City has developed a program to perform a comprehensive leak detection survey of the entire system over the next five years (completion in July 2006). The distribution system has been divided into five sections to facilitate an organized methodology. Leaks will be identified and immediately repaired. Lines that are determined to be beyond repair will be temporarily repaired and the line slated for replacement in the CIP program.

Another method the City intends to employ to detect leaks is the isolation method. This method includes the isolation of short piping sections utilizing existing and newly installed mainline valves. The mainline is isolated under full pressure and all services are turned off at the meters. A pressure gauge is attached to one service and the pressure is monitored over a period of time. If the pressure falls off relatively quickly, it is likely that a major leak is located within that section of piping. This method can be used to pinpoint areas for the sonic leak-detection program.

In addition to leak detection, the City is developing a CIP program for the replacement of many undersized and suspect waterline sections. In Section 10 of this Plan, a number of piping replacement projects have been developed with the intention of not only improving distribution characteristics but to decrease losses through failing pipe networks.

Implementation. The City has a goal to complete the scheduled piping replacements within the first ten years of the planning period or by July of 2010; it will budget approximately $2,500 per year for the next five years for leak detection services. Financing of the CIP program will vary depending on many issues. Recommended financing for the CIP program as well as potential phasing options is discussed in Section 11.

Meter Testing and Maintenance Program (OAR 690-86-140.2.e.D)

General. Old or poor quality water meters are often found to be inaccurate. These inaccuracies are commonly on the order of ten to more than 50 percent of the actual water flowing through the meters. The water that is able to "slip" through the meter undetected becomes unaccounted-for water. In some communities, inaccurate meters result in millions of dollars in lost revenue.

Many meter companies offer programs for the testing and calibration of existing meters. Various communities have shown significant benefits by changing out entire systems to one style of meter. As the old, inaccurate meters are replaced, the additional revenue often pays for the change out program.

Program. Since the City is developing a program to replace all existing meters with new meters, a testing and maintenance program is not required at this time. New meters should be tested approximately ten years after their installation to confirm operating standards.

Implementation. Once the new meters are installed and in operation, it should be expected that they will be functioning at or near 100 percent accuracy. As the planning period progresses, the City may wish to develop a simple testing program to confirm that the new meters continue to function at optimum levels. This simple program could consist of "pulling" ten meters at random and testing their accuracy levels. Such a program may begin ten years (2011) into the program. This issue should be addressed during the first Plan update in 2006 or soon thereafter.

Public Education Program (OAR 690-86-140.2.e.E)

General. Most consumers have no knowledge of their water source, supply capacity or availability, and necessary treatment and distribution costs. The tremendous effort that takes place behind the scenes to provide reliable and safe drinking water goes, for the most part, unnoticed each time someone turns on their tap for a glass of water. Public information programs can change this.

The goal of a public information program on water use efficiency is to develop a conservation ethic among water users. A public information and education program on water conservation is recommended as a means of influencing water consumptive practices and patterns within the system. An informed public will also be more likely to support changes in the rate structure and management practices if they feel they are part of the conservation effort. Public education may take on the form of mailers, workshops, school programs, and individual conservation reviews.

Public information programs can educate consumers regarding:

- Toilet flushing and fixture efficiency,
- Running water unnecessarily while washing or brushing teeth,
- Efficient use of water when washing cars or other outdoor use,
- Landscape efficiency and irrigation practices,
- Rebates and other incentives promoting conservation practices,
- Potential curtailment activities, and

- General conservation awareness.

A significant amount of education materials have been developed at little or no cost to the water provider. Pamphlets, videos, CD-ROM computer programs, and other materials are available to assist the water provider in their public education efforts. Information is available on a variety of topics and materials can be obtained for practically any age group, demographic, or purpose.

The effectiveness of public education programs, in terms of conservation, is difficult to predict. During periods of drought, public awareness is high and public education may result in significant water consumption reductions. During other periods, the effectiveness will depend greatly on the program itself. Studies have suggested that a four to five percent reduction in water consumption could be expected from a comprehensive public education program.

Program. The City currently has a public education program that includes making pamphlets and other educational material available to water customers at City Hall. Also, the City includes monthly segments and stories in its newsletter dealing with conservation suggestions and tips about household conservation.

The City operates and maintains a website for the community. The website includes information about town meetings, news events, public works, issues, and many other topics. In an effort to increase public awareness of water conservation, the City has developed a conservation link on their website that details numerous conservation measures and activities. Tips on water conservation as well as general information about the City's water system is resulting in a relatively comprehensive resource for conservation in the City of Yachats. For more information on the Yachts conservation website, go to http://www.pioneer.net/~cityoya/ and click on the water conservation link.

Other Conservation Measures Identified by the Water Supplier to Improve Water Use Efficiency (OAR 690-86-140.2.e.F)

WAVE. The WAVE program is an appropriate and feasible conservation measure for the City of Yachats. See the description of the WAVE program provided earlier in Section 7.8 for more information.

Pressure Management. Pressure management is an *appropriate* and *feasible* conservation measure for the City of Yachats. See the description of the pressure management program provided earlier in Section 7.8 for more information.

7.10 Recommendation for Plan Update (OAR 690-86-140.5.a)

It is common for a water system to develop a water conservation plan, submit it to the Oregon Department of Water Resources for approval, develop a conservation program, and then resubmit an updated plan to WRD for review of the results of the conservation program. Typically the period of time between the first submittal of a conservation plan and the resubmittal of an updated plan is at least five years.

The City has a number of issues to correct and overcome during this planning period. Expansion of water rights, development of new raw water sources, and implementation of a water conservation plan, to name a few. The City should enter into a "partnership" with the Oregon Department of Water Resources in order to overcome these obstacles. This may include the development of a work plan and regular progress review milestones.

The City should work to overcome water right and raw water source obstacles with the assistance of the WRD. Every five to seven years, the City should plan to evaluate its progress and factor in any change to the system or other planning parameter that differs from the *Water Master Plan*. The City could then update Section 7 of this Plan with any new information and report their progress to the WRD.

Based on the elements contained in the Mutual Agreement and Order entered into by the City, they will be required to update their Management and Conservation Plan in 5 years or by July 1, 2006.

The *Water Master Plan*, in which this conservation plan is included, is developed for a 20-year planning cycle. It should be anticipated that the Water Management and Conservation Plan would need to be updated at the end of the planning cycle along with the Master Plan.

Section

8

Water Curtailment Plan

Water Curtailment Plan

(OAR 690-86-140)

Section

8

8.1 Water Curtailment Plan

A water curtailment plan is defined as a short term, mandatory program intended to drastically reduce water consumption, usually due to an emergency, catastrophic event, or serious water shortage. According to OAR 690-86-140, a water provider is to develop a water curtailment plan with planning criteria, specific operating guidelines, and the enforcement measures that may be required in the event of a serious emergency or water shortage.

Most water systems have critical components, which if damaged or destroyed, could cripple or prevent delivery of potable water to its consumers. Such a crisis could last from a few hours to many days. As part of a comprehensive water management and conservation plan, a curtailment plan would provide the City with the planning and information necessary for managing a "short term" supply deficiency crisis.

Due to occasional drought conditions, equipment failure, or other water system problems, the City's water supply may become significantly and seriously depleted. The deficiency, which could last from weeks to months, could be serious enough that there is not enough water to provide for the needs of the community. Being prepared for curtailment situations will allow a water provider to survive serious "long-term" supply-deficiencies.

In August of 1998, the City adopted a resolution describing a Water Emergency Plan. While the plan provided the City with the beginnings of a curtailment plan, the resolution did not contain all of the elements required by OAR 690-86-140.

The following sections provide information required by OAR 690-86-140 for water curtailment plans. The City may wish to develop a comprehensive emergency plan for all City operations. A curtailment plan can be used as the water supply element of such a comprehensive emergency plan.

8.2 Water Supply Deficiencies (OAR 690-86-140.3.a)

A history of supply deficiencies or emergency water conditions would suggest the need to prepare for future water supply deficiencies. If drought, contamination, system breakdown, or some other event has interrupted or hampered water supply efforts in the past, it is likely to hamper water supply efforts in the future. The severity of historical events can also suggest the relative importance of planning for future events.

A water provider should be prepared for periods of supply deficiency. The development of policy, ordinances, and other measures should not wait until the provider is in the midst of a water shortage. Knowledge of past deficiencies and information about the causes and indicators of future water supply emergencies will aide water suppliers in providing a consistent and reliable product to consumers.

Historical Deficiencies

The City of Yachats' water system has a history of water supply deficiencies. During these deficiencies, the City has struggled to remove enough water from Reedy and Salmon Creeks to satisfy the daily water demands. Generally these deficiencies occur during dry summer months when flows in the source creeks are extremely low. Over the past ten years, the City Council has declared a water emergency on four separate occasions. Due to the history of water supply emergencies, it is expected that the City will continue to experience water supply emergencies in the future. A summary of each water emergency is provided in Table 8.2.1.

Table 8.2.1 - Summary Of Historical Water Supply Emergencies

Date of Water Supply Emergency	Reason for Emergency
June, 1991	Water supply shortage – source deficiency
July, 1992	Water supply shortage – source deficiency
August, 1994	Water supply shortage – source deficiency
September, 1998	Water supply shortage – source deficiency

Existing Capacity Limitations

As described in Section 4, the City removes raw water from Salmon Creek and Reedy Creek. Summertime flows in the two creeks can be extremely low. Historical records indicate that flows in the two creeks have been measured as low as 125 gpm each. If the City is withdrawing all of the water from each creek, the total flow to the plant in 24 hours would only be 360,000 gpd. Since low flows in the creeks typically occur during the summer months, the likelihood of the flows coinciding with maximum month (MMD) or maximum day (MDD) demands is very high.

As was developed in Section 5, the MDD for the City of Yachats at this time is approximately 515,000 gpd; the MMD is approximately 308,000. Therefore, if streamflows in the creeks fall to their historical lows, the City will continue to face water supply emergencies. The City does not currently have the ability to continue delivering high water demand levels during a prolonged drought or during low streamflows conditions.

The City is endeavoring to develop new water sources to offset their raw water needs when streamflows in the primary sources are not adequate. They are also taking serious steps to reduce lost water and develop water conservation within the community. Discussion of alternate water sources can be found in Section 9 and a description of the City's conservation efforts is contained in Section 7.

8.3 Stages of Alert (OAR 690-86-140.3.b)

A water curtailment plan should contain at least three levels or stages of alertness. The levels should range from an *initial level of concern* to a *severe level-of-alertness* to a *final critical level*. Each level should include predetermined indicators that will invoke a specific level of alertness requiring predetermined actions and an associated list of recommended curtailment measures.

The following are provided as potential stages of alert for the City of Yachats' Water Curtailment Plan:

Alert Stage No 1: Water Alert Status

This level-of-alert serves primarily as a tool to inform the public that a potential problem exists. The problem may not yet warrant mandatory water conservation, but does suggest voluntary conservation. If the public is aware of the potential for problems, they will be more likely to accept and abide by more serious requirements should the alert status be increased.

Alert Stage No 2: Water Warning Status

This level-of-alert serves as the first level of action for the City to enact mandatory water use requirements within the system. This level would include all planned activities requiring temporary conservation including construction and maintenance activities as well as preparing for expected drought conditions.

Alert Stage No 3: Water Emergency Status

This level-of-alert serves to raise the alert status from a warning to an emergency status. A wider range of water use activities is affected. This is the most restrictive level of mandatory water conservation activities carrying the highest penalties to enforce the curtailment status.

Alert Stage No 4: Critical Water Supply Status

This level-of-alert serves to assist the water system in supplying the minimum amount of water to the consumers to sustain life. This level differs from level three in that the decision of how much water to use may be taken away from the consumer and would probably include rationing of drinking water. This extreme level-of-alert is reserved for extreme water supply problems.

See Section 8.5 for a discussion of the various actions required of both the City and the water consumer for each level of Alert.

8.4 Indicators of Water Shortage Severity (OAR 690-86-140.3.c)

A water curtailment plan should include a list of predetermined levels of severity or descriptions of specific scenarios that will invoke a predefined level of water curtailment alert. The City should develop a water curtailment plan with specific "triggers" that will initiate a specific alert stage in the plan. This Plan describes potential triggers and general curtailment planning guidelines. The City should review these guidelines and develop specific "triggers" that can be used to quantify the severity of water supply issues.

In many cases it is appropriate to have a number of issues that could serve as potential triggers for a phase of a curtailment plan. The City may wish to organize their plan so that one, two, or combinations of many triggers will initiate specific actions from the community. This approach to curtailment triggers allows more evidence to be gathered to suggest an appropriate response and provides the City with more flexibility to manage the water system during difficult water shortages and crisis. The following includes potential indicators for each level-of-alert.

Alert Stage No. 1: Water Alert Status

General. This level-of-alert could be declared if a water shortage or equipment failure poses a potential threat to the ability of the water system to meet the demands of its customers. Indicators may include a moderate decrease of flows in the Yachats River along with regional forecasts that predict drought or low streamflows in the watershed. Other indicators may include moderate decreases in reservoir levels (below one-half total capacity) at an earlier than normal date and an inability for the system to restore reserves in a timely manner. National indices may be referenced to provide further support for requiring specific curtailment actions.

It may be appropriate to declare this alert stage at the beginning or during major construction or maintenance of existing water system components. A possible scenario would include taking one reservoir temporary off-line to paint or clean it or perform some minor maintenance.

Streamflows. The City of Yachats is under order to develop a water curtailment plan that utilizes streamflows to trigger the various stages of alert. Since the City has the potential of removing water from three separate sources, the triggers should reference each source.

Senior instream water rights have been established in the vicinity of the City's point of diversion on the Yachats River. The lowest minimum streamflow required by the senior instream rights is 30 cfs occurring in the month of September. (See Section 4.1.) Available flow data for the Yachats River suggests that flows in the river often fall below the 30 cfs threshold during the months between July and October. If the City begins to use water from the Yachats River, a gauging station must be constructed near the point of diversion to monitor streamflows. The City may wish to establish a Level 1 curtailment trigger of 35 cfs to raise awareness of the low seasonal flows in the Yachats River.

Currently the City relies on its two primary water sources – Reedy and Salmon Creeks – for all their water needs. Low seasonal streamflows have resulted in the City Council declaring water supply emergencies in the past. The watersheds are nearly the same size and consist of similar hydrologic qualities; historical flow records indicate the flows in each stream are nearly identical throughout the year. As was discussed in Section 5, records indicate that streamflows in Reedy and Salmon Creeks have been recorded as low as 125 gpm in each stream; the City may wish to establish a Level 1 curtailment trigger of 275 gpm combined flow. (125+125=250 gpm, 275 would be in excess of the low streamflows but serve as a warning of impending deficiency)

Palmer Index (PI). The Palmer index is a widely used scale for measuring drought conditions. The PI is based on long-term records of temperature and precipitation and is tabulated by the US National Weather Service on a weekly basis. PI calculations are made for 350 climate divisions in the United States and posted on the NOAA and National Weather Service websites.

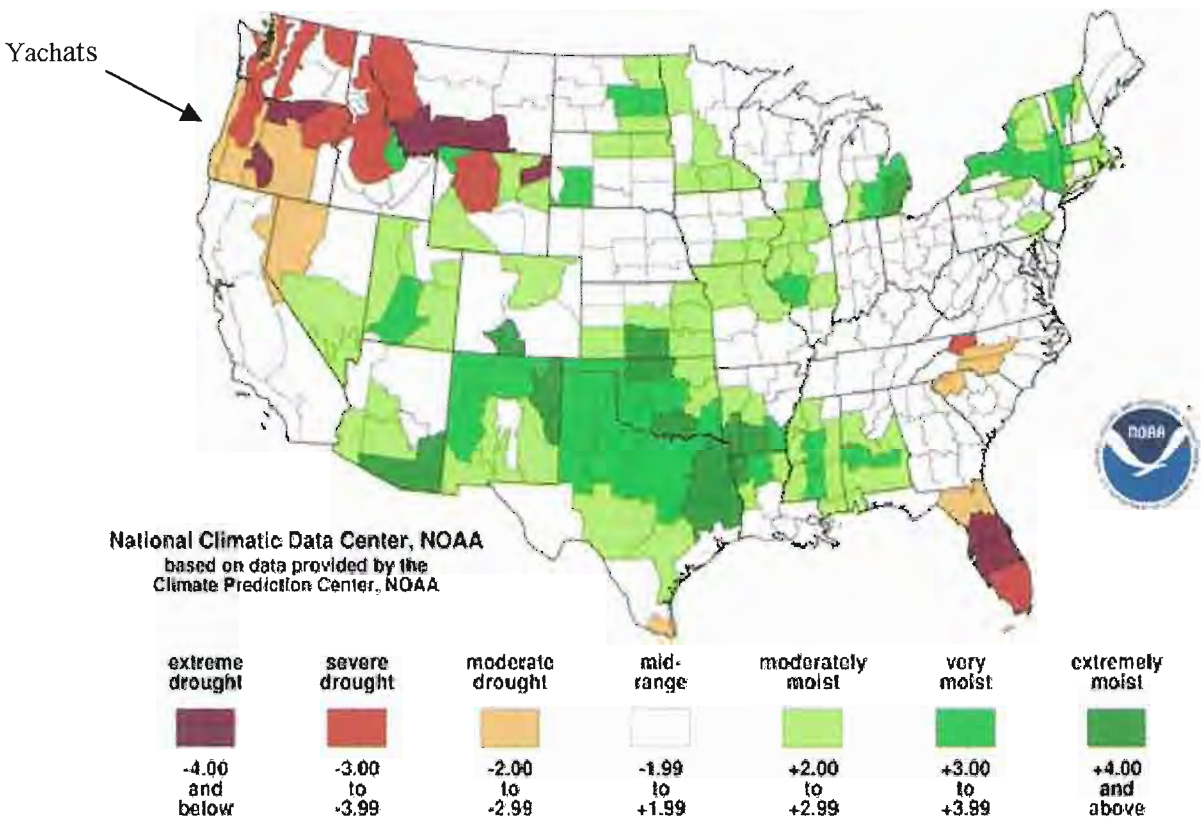
Normal weather has an index of zero in all seasons in any climactic region; droughts have negative index values while wet periods have positive values. Consecutive negative values from week to week can provide initial warning of an impending drought. Long-term negative values can assist the City in determining the severity of the drought condition.

In terms of a water curtailment plan, the City would be interested in the negative or drought index regime. Conveniently, the negative PI regime is divided into three drought levels; moderate drought (-2 to –3), severe drought (-3 to –4), and extreme drought (-4 and lower). The City could easily use the three tiers of the negative PI as triggers for the first three levels of the curtailment plan.

For Level 1 alert status, the City may wish to use the PI of –2 to –3. Figure 8.4.1 shows the PI for the week of March 11 to March 17, 2001. As can be seen in Figure 8.4.1, the City of Yachats is in the orange band along the Oregon coast. The PI for this area, during this week, indicates a moderate drought and, if adopted as a trigger, would invoke Level 1 curtailment actions.

FIGURE 8.4.1
Palmer Drought Index
Long-Term (Meteorological) Conditions

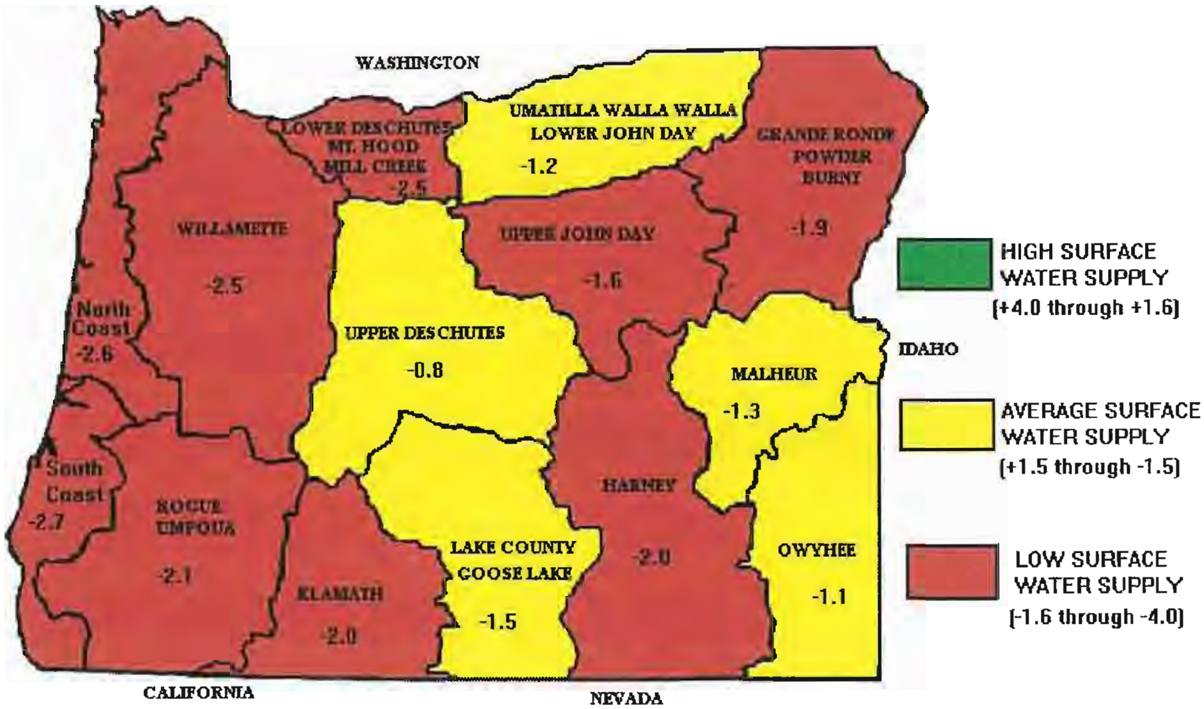
March 11, 2001 - March 17, 2001



Using an and/or or multiple trigger curtailment plan, the PI can provide valuable information for the determination of the severity of a water supply crisis even though the PI is not necessarily supply specific. The PI is updated weekly and is easily accessible at the following website: http://www.ncdc.noaa.gov/ol/climate/research/2001/Weekly/US_weekly.html.

Surface Water Supply Index (SWSI). The SWSI is similar to the Palmer Index in that it is an index that describes the current state of water resources in a given area. Calculated monthly by the National Resource Conservation Service (NRCS) for the major river basins within the state of Oregon, the SWSI can be used to identify which river basins are above, below, or at the normal surface water supplies. Figure 8.4.2 shows the SWSI for the various basins in the state of Oregon for the month of March, 2001.

Figure 8.4.2
SURFACE WATER SUPPLY INDEX
(SWSI)
March 1, 2001



For the purposes of curtailment triggers, the ranges of interest are between –1.5 and –4. An appropriate division may be as follows:

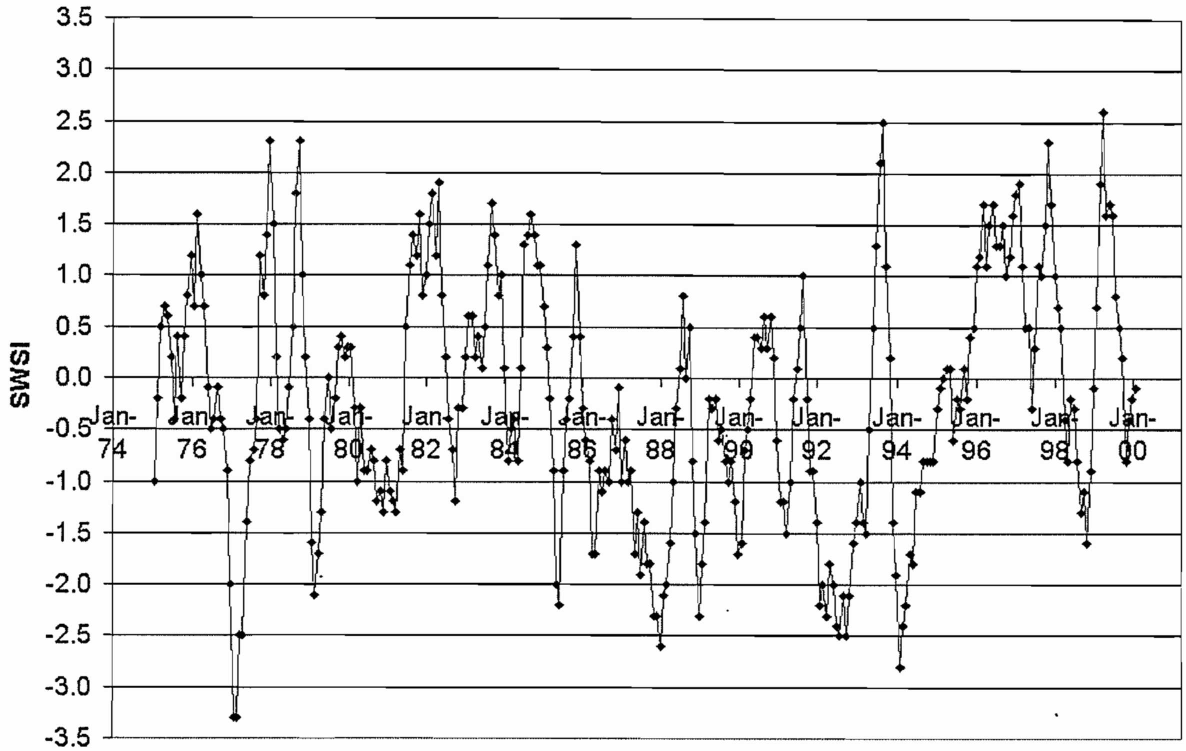
-1.5 to –2.5 = Level 1 Curtailment
-2.5 to –3.25 = Level 2 Curtailment
-3.25 to –4.0 = Level 3 Curtailment

The SWSI for Oregon is updated monthly and can be viewed and downloaded at the following website: *http://crystal.or.nrcs.usda.gov/snowsurveys/swsi.html*.

In addition to monthly SWSI data, significant historical data is available on the website to indicate the frequency and reoccurrence intervals expected for the various levels of curtailment. Figure 8.4.3 summarizes the history of the SWSI in the North Coast basin since 1974. The history of the SWSI suggests the sensitivity the area has to annual rainfall and the impact it has on surface water availability. In other words, the SWSI "bounces around" in relation to varying precipitation levels.

The figure suggests that, based on the above-recommended criteria, the City would have experienced Level 3 curtailment conditions only once over the past 25 years while Level 1 and Level 2 curtailment may have been experienced on a number of occasions.

Figure 8.4.3
NORTH COAST BASIN #1 - HISTORICAL SWSI - 5 MONTH AVERAGES



Combining information from the Palmer Index and the SWSI will provide valuable insight to both the "big picture" and the local conditions based on readily available and accepted information.

System Manager Assessment. Few will know more about the viability and condition of a water supply than the operators and managers of the water system. If the operators and/or system managers consider it necessary to invoke Level 1 curtailment actions, the ordinance should provide them with that ability. This "trigger" is important for such items as maintenance or construction on a critical system component, knowledge of raw water deficiencies other than volume, or other situations requiring specific curtailment actions.

Alert Stage No 2: Water Warning Status

General. This level-of-alert could be declared if a water shortage or equipment failure poses a serious threat to the ability of the water system to meet the demands of its customers. Indicators may include a significant decrease in the Yachats River flow along with regional forecasts that low streamflows are expected to drop further. Other indicators may include a significant decrease in reservoir levels (below three-quarter total capacity) at an earlier than normal date and an inability for the system to restore reserves in a timely manner.

It may be appropriate to declare this alert stage if a component within the water system breaks down or is taken off-line for an extended period of time. This would include major repairs or renovations within the water treatment plant, major renovation of a reservoir, or another major improvement project.

Scenarios that would require this level-of-alert would typically be those that could be planned and prepared for. This alert stage could be instituted as a follow up status to Level 1 after the public has been informed of potential problems and given an opportunity to carry out voluntary conservation activities.

Streamflows. Based on the streamflows discussed in Alert Stage 1, the City may wish to establish a stage 2, low flow criteria in the Yachats River of 20 cfs. Records indicate that flows in the Yachats River have been known to fall below 20 cfs in the months from August to October. As mentioned previously, the minimum streamflow or instream rights for September require 30 cfs of water in the vicinity of the City's point of diversion. By using a trigger of 20 cfs, the City would be mandating an increased level of curtailment with increased restrictions of water use.

The City may also wish to lower the minimum combined flows within Reedy and Salmon Creeks to 200 gpm for a Level 2 trigger.

Palmer Index (PI). As described earlier in this section, utilizing the PI for drought prediction and determination of drought severity can be a very useful tool. Based on Figure 8.4.1, a PI of –3.0 to –4.0 could be used to describe Level 2 alert status. For example, Figure 8.4.1 shows the Willamette Valley under what could be considered as a Level 2 alert status.

Surface Water Supply Index. As described earlier in this section, the SWSI can be utilized similarly to the PI for drought prediction or to describe the current status of the water supply. Based on Figure 8.4.2, a SWSI of –2.5 to –3.25 could be used to describe a Level 2 alert status. For example, Figure 8.4.2 shows the north coast area with a SWSI of –2.6. This could be interpreted as an being on the threshold of a Level 2 curtailment condition and is compatible with information provided from the Palmer Index.

System Manager Assessment. System management should continue to have the ability to invoke a Level 2 water curtailment status. If more serious conditions warrant increased activity and restrictions, the system manager needs the autonomy to require this level of curtailment.

Alert Stage No 3: Water Emergency Status

General. This level-of-alert could be declared if a water shortage or equipment failure poses a severe and immediate threat to the ability of the water system to meet the demands of its customers. Indicators may include an eminent loss of a portion or total source of supply. Other indicators could include a chemical spill in a water supply, severe equipment failure, and other severe water supply issues.

Scenarios that would result in a declaration of a water emergency would be of an unplanned nature. This may include natural disasters such as earthquakes or landslides, acts of terrorism or sabotage, complete failure of water system components, and other emergency conditions. A few specific scenarios are listed below:

- Landslide that destroys, intakes, and/or raw water supply piping,
- Collapse or failure of a storage reservoir,
- Severe source contamination by pesticide, chemical spill, sabotage, etc.,
- Landslide that destroys treated water line from water plant to City system or the raw water intake system, and

- Extreme drought conditions resulting in the near inability to obtain raw water for basic service.

While many of the scenarios listed above are not likely to occur, it is not unreasonable for the City to develop plans and strategies to prepare for emergency conditions within its water system.

Streamflows. Based on the streamflows discussed in Alert Stage 1, the City may wish to establish a Stage 3, low flow criteria in the Yachats River of 15 cfs. Records indicate that flows in the Yachats River have been known to fall below 20 cfs in the months from August to October. As mentioned previously, the minimum streamflow or instream rights for September require 30 cfs of water in the vicinity of the City's point of diversion. By using a trigger of 15 cfs, the City would be mandating an increased level of curtailment with increased restrictions of water use.

The City may also wish to lower the minimum combined flows within Reedy and Salmon Creeks to 175 gpm. At 175 gpm, the plant would be running at or below half of its normal operational capacity.

Palmer Index (PI). As described earlier in this section, utilizing the PI for drought prediction and determination of drought severity can be a very useful tool. Based on Figure 8.4.1, a PI of –4 or less could be used to describe level 3 alert status. For example, Figure 8.4.1 shows portions of Oregon, Montana, and Florida under experiencing conditions that could warrant Level 3 curtailment activity.

Surface Water Supply Index. As described earlier in this section, the SWSI can be utilized similarly to the PI for drought prediction or to describe the current status of the water supply. Based on Figure 8.4.2, a SWSI of –3.25 to –4.0 could be used to describe a Level 3 alert status.

System Manager Assessment. System management should continue to have the ability to invoke a Level 3 water curtailment status. If more serious conditions warrant increased activity and restrictions, the system manager needs the autonomy to require this level of curtailment.

Alert Stage No 4: Critical Water Supply Status

This final level-of-alert is necessary if scenarios from Level 3 result in disaster conditions that make it impossible for the water system to continue functioning under normal parameters. Indicators of this level include the inability of the water plant to produce additional water or the distribution system to deliver potable water to the consumers. This status is only for the most extreme cases where resources must by managed carefully and water rationed to consumers for the purpose of sustaining life.

The City should develop an ordinance that provides the water system manager with the necessary authority to govern all facets of the water system under the most difficult of circumstances.

8.5 Recommended Curtailment Actions (OAR 690-86-140.3.d)

Each level-of-alert should include a description of conservation measures appropriate to that level. These measures should provide guidelines, define acceptable and prohibited water usage, and describe the penalties for not abiding by the declaration of water curtailment.

The following describes certain stand-by water use curtailment actions for each level-of-alert:

Alert Stage No 1: Water Alert Status

General. This level-of-alert is intended to inform the public, begin water restrictions, or ask for voluntary reductions in water use practices. Actions for this level include advertising on radio, television, newspaper, and other media to announce the curtailment situation. Leaflets may be distributed or included within the monthly water bill. Each form of media contact should include suggestions, tips, and information for the consumers to reduce water consumption within their homes.

Consumers may wish to install retrofit kits supplied by the City. The kits may be supplied free of charge or for a small fee. See Section 7.8 for a discussion on retrofit kits and other water conservation measures. All water conservation at this level is on a voluntary basis. The City should be prepared to provide information and support for this voluntary effort.

Water Provider. The water provider should develop specific actions and tasks that it will undertake when faced with a water alert stage. For water curtailment Level 1, the City should develop a water system "reporting sign" to indicate the general condition of the City's water supply. Often used to warn of varying levels of fire danger, a properly located reporting sign can send a regular reminder to consumers that the water supply is tenuous. Under Level 1 curtailment, the reporting sign should raise the alert that the water supply is low and remind consumers to use water wisely.

Other efforts should be made by the City to educate the consumers about the general condition of the water system and warn them about how the situation could worsen. If restrictions are to begin with Level 1, efforts should be made to "get the word out" that water curtailment restrictions are being enforced.

The water provider should also discontinue sales of water to parties outside of the water provider boundary. This would include any and all intergovernmental agreements such as the current agreement with the Southwest Lincoln County Water District. Consumers within the provider boundary should be given priority during times of supply shortages.

Water Consumers. The water curtailment ordinance should outline some specific restrictions and requirements of water consumers. The City may wish to restrict lawn and landscape irrigating to every other day or require watering take place only during the nighttime hours.

The City may also request that consumers make efforts to voluntarily reduce water consumption up to 10 percent of normal through personal conservation efforts. This may include the repair of household leaks, installation of low flow fixtures, reduction or elimination of landscape watering, and other conservation efforts. See Section 7 for comprehensive coverage of water conservation elements.

Alert Stage No 2: Water Warning Status

General. This level-of-alert includes mandatory water conservation requirements and would likely be declared in the form of an ordinance. Conservation actions should restrict the irrigation of lawns, gardens, and landscaping to odd/even watering days and require irrigation to be performed during the night hours.

The ordinance should also prohibit some optional outside water uses including car washing, sidewalk and street washing, filling of swimming pools, water use for dust control, fire training, and other non-essential water uses.

Water Provider. The water provider should increase efforts to educate the public about the seriousness of the water supply shortage and the upgrading of the severity to a Level 2-curtailment condition. The City reporting sign should indicate the upgrade of severity and further caution consumers about wise and prudent water use.

The water provider may wish to make low flow retrofit kits available to all water consumers upon request. The provider may also begin a campaign to retrofit older, inefficient toilets, and even offer rebates for the installation of newer, more efficient fixtures.

The water provider may consider a rate change or drought surcharge to provide financial encouragement for water conservation. A rigorous public education program should follow any rate change to explain the purpose for the change and how the consumer can best avoid higher prices for water service.

The water provider may wish to enact changes in operations that will reduce water consumption. This may include fire department use, line flushing, street cleaning, park and landscape watering, and other nonessential water usage.

Water Consumers. Level 2 curtailment should include mandatory restrictions and no longer rely on voluntary water conservation. Watering of lawns and landscaping with overhead sprinklers may be banned under Level 2 curtailment. Irrigation should only be allowed by hand held (watering can) or drip system methods. Washing of vehicles, boats, buildings, equipment, or other outdoor washing may be prohibited.

To save water as well as provide valuable public information, restaurants may be required to post drought notices and offer drinking water only upon request. Other high volume water consumers (hotels, recreation centers, etc.) may be required to post drought notices apprising their clientele of the drought conditions.

Alert Stage No 3: Water Emergency Status

General. Alert Stage No. 3 includes additional mandatory conservation requirements brought on by severe or emergency conditions and would likely be declared in the form of an ordinance.

This level-of-alert would include all the curtailment actions and restriction described in Levels 1 and 2 along with provisions to prohibit all watering of lawns, landscaping, gardens and any other outside water use. Severe penalties should be enforced for those not abiding by these strict water curtailment actions.

Water Provider. The City should continue a public information campaign to educate their consumers about the dire condition of the water system. The water system reporting sign should indicate the existing emergency conditions. Handouts, leaflets, and press releases should be distributed with water bills or provided at various public locations within the community.

The City may wish to set limits on all consumers based on the water consumption records for the lowest consumption month of the year. If, for instance, February is the lowest consumption month within the system, consumers may be allowed to use the amount of water consumed the previous February. If the consumer uses more, they will be charged at a rate double or triple the normal consumption rate. If non-compliance continues, the consumer could be disconnected from the water system.

The City may also choose to allow no new connections or special water use until the integrity of the water system is restored. It may wish to take further steps to change operation and maintenance of City facilities to utilize gray water for landscaping and street cleaning and search for increased water reuse opportunities.

Water Consumers. A complete ban on outside watering except with gray water may be enforced. Strict penalties may be levied against consumers known to be using water inappropriately for Level 3 curtailment. Water consumers, including commercial consumers, should make all efforts possible to eliminate all nonessential water consumption.

Alert Stage No 4: Critical Water Supply Status

This level-of-alert applies to an extreme water curtailment condition. The goal of Level 4 curtailment should be to provide enough water to sustain human life. Conservation actions within this stage may include closing the distribution system or disconnecting all water users from the system. The City may choose to ration all water use from a central location, reservoir, or directly from the water treatment plant.

In the event that the reservoirs, treatment plant, or some other component is damaged or destroyed, the City would be responsible to locate a safe, emergency water source and make efforts to provide rations to the community.

The likelihood of this scenario occurring is extremely small, however, the City may wish to develop general plans for emergency preparedness including operating procedures and guidelines for the water system.

8.6 Water Curtailment Ordinance

Existing City Water Curtailment Ordinance

The City currently had a water emergency plan that was adopted in 1998. The previous ordinance did not contain many of the required components of a curtailment ordinance as outlined in OAR 690-86-140. Though it provided the rudiments of emergency curtailment, the previous ordinance did not adequately provide all the needed planning criteria and legal authority required by a modern water curtailment ordinance.

Update Water Curtailment Ordinance

A summary of the recommended curtailment plan is provided in Table 8.6.1.

While this Plan was in development, the City drafted and adopted a new water curtailment ordinance. The recommendations and organization developed in this section were incorporated into the final ordinance; the new water curtailment ordinance was adopted by the City Council on May 10, 2001. A copy of the adopted curtailment ordinance is provided in Appendix F.

TABLE 8.6.1
SUMMARY OF RECOMMENDED WATER CURTAILMENT PLAN

Alert Stage	Stage Activation	Action Measures
No. 1 Water Alert	1. PI (-2 to –3) and/or 2. SWSI (-1.5 to –2.5) and/or 3. Yachats River flows fall below 35 cfs and/or 4. Reedy/Salmon Creek flows fall below 275 gpm combined flow, and/or 5. Staff assessment.	1. Water status sign will indicate Alert Stage No. 1. 2. Call for voluntary reduction in all water use; mandatory for watering. 3. Prohibit outside watering only between 9 p.m. to 7 a.m. 4. Restrict outside watering for even addresses on even numbered days & odd addresses on odd numbered days. No outside watering on Sundays. 5. Prohibit water wasted down gutters or streets & wash down of paved surfaces, streets, & structures. 6. Water use for wash down of paved surfaces & structures only for health & safety purposes. 7. Public outreach promoting conservation. 8. Implement curtailment water rates & enforce penalties. 9. Cease sale of water to users not currently on the system. 10. Prohibit new hook-ups to the City's water system. 11. Prohibit water to be used by Fire Department for drills or truck washing.
No. 2 Water Warning	1. PI (-3 to –4) and/or 2. SWSI (-2.5 to –3.25) and/or 3. Yachats River flows fall below 20 cfs and/or 4. Reedy/Salmon Creek flows fall below 200 gpm combined flow, and/or 5. Staff assessment.	1. Water status sign will indicate Alert Stage No. 2. 2. All Stage No. 1 prohibited activities are also forbidden under Stage No. 2. 3. Curtailment water rates & penalties remain in-place. 4. Continue public outreach to community. 5. Watering of any lawn, landscaping bushes, shrubs & trees is prohibited. 6. Watering of any vegetable or flower garden or fruit tree is restricted to watering by hand using either a hose with self-closing nozzle, a container (e.g. bucket), or a drip irrigation system. 7. Prohibit washing of any vehicle, except a commercial fixed washing facility. 8. Prohibit water for the use of scenic/ recreational fountains, ponds & lakes except required to support fish. 9. Restaurants discontinue routinely offering water to customers unless specifically requested. 10. Prohibit use of water in any air conditioner or air-cooling mechanism, except at a commercial business. 11. Prohibit adding water to any swimming pool.
No. 3 Water Emergency	1. PI (-4 and lower) and/or 2. SWSI (-3.25 to –4.0) and/or 3. Yachats River flows fall below 15 cfs and/or 4. Reedy/Salmon Creek flows fall below 175 gpm combined flow, and/or 5. Staff assessment.	1. Water status sign will indicate Alert Stage No. 3. 2. All Stage No. 2 prohibited activities are also forbidden under Stage No. 3. 3. Water curtailment rates & penalties remain in place. 4. Continue public outreach to community. 5. Water to residential customers will be allotted based on the number of persons living at each household (e.g. 50 gallons/capita). 6. Commercial & industrial users will be restricted to the same volume of water used in prior February. 7. Implement a surcharge pricing structure for water use over the allotted use.
No. 4 Critical Water Supply	1. Delivery disruption > 24 hrs., forecasted storage < 1 day, and/or 2. Delivery disruption > 3 days, forecasted storage < 3 days, and/or 3. Staff assessment.	1. Water status sign will indicate Alert Stage No. 4. 2. City will discontinue water service through its normal distribution system. 3. Of water remains in the City's finished water tanks, water may be provided in small quantities to residents in their containers either directly from a designated tank or location within the City. 4. If water is not available in the City's finished water tanks, the City would locate a source of potable water & have it delivered to the City. Small quantities of potable water would be provided to residents, at no cost, in their containers.

PI – Palmer Index, SWSI – Surface Water Supply Index

The existing condition of the distribution system depends greatly on the materials that were used to construct the system as well as the level of workmanship at the time of construction. Today, many older piping materials show signs of leakage, corrosion, and loss of capacity. Older iron, steel, and cement piping sections frequently are replaced due to their poor condition.

Yachats' water distribution system utilizes AC, ductile iron, cast iron, PVC and polyethylene pipe. Complete data is not available regarding the accurate distribution of the various pipe materials presently in use in the system. In recent years, the City has began efforts to replace old, leaky pipe sections with new, more reliable piping materials; many of the pipes replaced also have been undersized for the City's present and future needs. Hydraulic problems in the system are being corrected concurrent with the new pipe installation.

Computer modeling was conducted to analyze the performance of the existing City of Yachats' water system. Hydraulic analysis software called WaterCad® by Haestad Methods was used to perform the complex calculations necessary to analyze the water system. The diameter and materials (if known) of each pipeline section was input to the computer model. A discussion of the computer modeling of the distribution system is presented in Section 9.

Maximum Service Elevation

Pressures at connections in a distribution system must never drop below 20 psi, which is equivalent to a 46-foot tall column of water. Customers must be located more than 46 feet below the minimum water level in a storage tank (or effective elevation of a pressure reducing valve) to have sufficient pressure without a booster pump. Storage tanks and pressure reducing valves are generally located to provide a pressure of less than 100 psi at the lowest service elevations in a pressure zone.

4.7 Water Districts

Southwest Lincoln County Water District (SLCWD)

Southwest Lincoln County Water District provides water to the unincorporated area north of the City of Yachats, continuing to the City of Waldport. A mutual aid agreement is in the works between the Cities of Yachats and Waldport and SLCWD to provide emergency water to the City or district needing help. Interconnection of the systems will enable reciprocal support should a local emergency or system failure occur. According to City personnel, plans are in place to install a valve and pipe to connect the Yachats water system to SLCWD system.

Although emergency aid is the goal of interconnecting the systems, it is not anticipated that either the SLCWD or the City of Waldport systems would have excess water during drought conditions in Yachats. Raw water for both systems is obtained from coastal streams, which are subject to the same seasonal climatic patterns as the streams along the Yachats River watershed. Also, since much of the water rights held by Waldport have not yet been developed, it is anticipated that they will experience the same kinds of challenges that Yachats has experienced when trying to develop their water right.

The Cities of Yachats and Waldport and the SLCWD also are discussing the feasibility of sharing resources with the City of Toledo and South Beach (Seal Rock Water District). The goal of the discussions is to create a regional water system which would provide treated water to members when source streams do not have sufficient flows to support the communities that depend on them. No agreement including the City of Yachats has been reached at this time, although the City is expected to continue participating in discussions regarding resource sharing.

In addition to the mutual aid agreement, the City of Yachats has endorsed a feasibility study of the potential for constructing a reservoir on Rocky Creek, which could serve coastal communities and their long-term water needs beyond the year 2050.

Water Use and Projected Demands

Section

5

Water Use and Projected Demands

Section 5

5.1 Description and Definitions

Water demand can be defined as the quantity of water delivered to the system over a period of time to meet the needs of consumers, provide filter backwashing water, and to supply the needs of fire fighting and system flushing. In addition, virtually all systems have an amount of leakage or loss that cannot be feasibly or economically reduced or eliminated. Total demand, therefore, includes all consumption and lost 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) with higher usage occurring during the morning and early evening periods and lowest usage 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 Monthly 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 seven day average demand that occurs in a year. Expressed in gallons per day.

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, treatment plant and transmission lines 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. Distribution systems should be designed to adequately handle the peak hourly demand. During this peak usage, 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 served to come up with a demand per person or a per capita demand which is expressed in gallons per capita per day (gpcd). Per capita demands can be multiplied by future population projections to determine future water demands.

5.2 Current Water Consumption Demands

For the purposes of this study, water consumption demand is based on the City's monthly records for the four-year period, January 1997 to December 2000. Demand levels were developed based on the entire data set and not skewed for any one years data. Production data is based on records for water production at the water treatment plant. Total water diversion data is based on the meters that measure the water diverted from both Reedy Creek and Salmon Creek.

Water sales records allow calculation of an Equivalent Dwelling Unit (EDU) and provide measurement of unaccounted water (lost water) when compared with plant production records. Water sold is typically less than the amount of water produced at the plant due to system leaks, unmetered use at a water treatment plant (backwash water, turbidimeter water, wash down, etc.), inaccuracies in customer meters, and other unmetered use such as fire flows and system flushing. In the case of Yachats, water produced at the plant, in many cases, was less than the amount of water diverted due to losses in the raw water transmission line prior to its replacement in 1998.

Diverted Water

As part of the auditing process, the City must account for all water diverted from each source. This is typically accomplished through a metering device at or near the point of diversion. OAR 690-085-0015 requires that, "Where practical, water use shall be measured at each point of diversion." However, the rule also states that:

> "...measurements may be taken at a reasonable distance from the point of diversion if the following conditions are met:
>
> a) The measured flow shall be corrected to reflect the flow at the point of diversion. The correction will be based on periodic flow measurements at the point of diversion taken in conjunction with flow measurements at the usual measuring point;
>
> b) If the measured flow includes flow contributions from more than one point of diversion, the measured flow shall be proportioned to reflect the flow at each point of diversion using the method prescribed subsection (a) of this section;
>
> c) A description of the correction method shall be submitted with the annual report the first time it is used and any time it is changed, or once every five years, whichever is shorter."

If the point of diversion is relatively close to the water treatment plant, it is common for many communities to use a single influent meter at the water plant to measure the amount of water that is diverted.

For the entire four years of data used for this report, daily monitoring of the Salmon Creek diversion allowed the City to account for the water removed from Salmon Creek and piped to the plant for treatment.

At the end of 1997, as the result of high rains causing an upstream landslide, the Reedy Creek impoundment, diversion structure, metering device, and other key elements were destroyed. The only data in this Plan utilizing the Reedy Creek diversion meter is for the months prior to January 1998. When the diversion meter was destroyed, the City used the influent meter at the water treatment plant to record the amount of water diverted from Reedy Creek. Approximately 8,200 lineal feet of raw waterline separates the treatment plant from the diversion at Reedy Creek.

In November of 2000, the City installed a new meter on the raw waterline near the Reedy Creek diversion. Once again the City will be capable of monitoring the amount of water diverted from Reedy Creek, though only two months worth of data are available within the data set for this study.

Table 5.2.1 summarizes the water diverted from the City's two active sources based on records provided by the City of Yachats.

Table 5.2.1 - Summary Annual Water Diversion From Each Source (1997 – 2000)

Year	Reedy Creek Annual Diversion (Gal. X 1000)	Salmon Creek Annual Diversion (Gal. X 1000)	Total Raw Water Diverted (Gal. x 1000)
1997	79,286	7,550	86,836
1998	62,147	10,997	73,144
1999	42,986	29,532	72,518
2000	46,686	12,424	59,110
Averages	57,776	15,126	72,902

Unaccounted Water ("Lost" Water)

The difference between the quantity of water diverted from the raw water source to the treatment plant and the quantity of water delivered through the distribution system and measured at customer meters is referred to as unaccounted water. The difference can be attributed to system leaks, inaccuracies in customer meters, unmetered services, and other unmetered use such as fire flows and system flushing.

The Oregon Administrative Rules (OAR) Section 690-86, states that all water systems should work to reduce unaccounted water levels to 15 percent. If the reduction of "lost" water to 15 percent is found to be feasible, the water provider should work to reduce unaccounted water levels to ten percent.

Previous planning efforts have alluded to a relatively high rate of unaccounted water in the City of Yachats. The analysis used in this study sought to identify and classify the various sources of unaccounted water in the Yachats' system in addition to the overall system losses.

Raw Water Losses – Reedy Creek. Approximately 8,200 lineal feet of raw water piping separates the treatment plant from the raw water diversion on Reedy Creek. According to City records, in 1997, approximately 23 percent, or 23 million gallons of the raw water diverted from Reedy Creek did not arrive at the water treatment plant. It is assumed that much of this loss could be attributed to the aged, 6-inch, AC raw water piping. In 1998, approximately 75 percent of the raw waterline was replaced with a new 8-inch HDPE raw waterline. The new HDPE line extends from the water treatment plant to the intersection of the Reedy Creek access road and the Yachats River County Road. The piping from the county road to the diversion remains as the original six-inch AC piping.

As previously described, at the end of 1997, the diversion and metering equipment at the Reedy Creek diversion was destroyed. Since this time, the City replaced the majority of the original raw waterline.

However, without metering equipment at the diversion, it has not been possible to monitor the amount of water diverted at the Reedy Creek diversion. In the interim, the City has used the influent meter at the treatment plant as the diversion meter.

In November of 2000, the City installed a new meter at the diversion of Reedy Creek. Once again, the City will have the ability to monitor the water diverted from their source and provide more accurate accounting.

Raw Water Losses – Salmon Creek. Because of the short distance (~250 feet) from the diversion to the plant, it is assumed that losses in the Salmon Creek raw water system are negligible.

Treatment Plant Losses. Treatment plant losses are defined as the difference between the water entering the plant and water leaving the plant plus all accountable uses within the treatment process. Prior to 1999, losses through the treatment plant averaged approximately 15 percent of the total water diverted from the raw water sources. However, the City has taken steps to meter water used in the treatment process and can therefore account for more of the diverted raw water. Since the installation of the additional meters, lost water through the plant has been reduced to one percent of the water diverted from the raw water sources. This small difference could be easily accounted for with standard meter inaccuracies.

Distribution System Losses. Distribution system losses include all losses due to leakage, unmetered use, inaccurate consumption meters, and other sources of unaccountable water use. Over the period of analysis, the City has experienced consistent water losses in the distribution system averaging 26 percent of the total water diverted from the raw water sources. It is expected that as the City replaces old waterline sections and installs new consumption meters, the distribution system losses will subside.

Overall System Losses. Overall systems losses are defined as the difference between the water diverted at the raw water source and the sum of all accounted water uses. The overall system losses should also be equal to the sum of the raw, treatment, and distribution system losses. Table 5.2.2 summarizes the overall system losses in the City of Yachats water system.

Table 5.2.2 - Summary Of Unaccounted Water – Losses (1997 – 2000)

Year	Raw Water Losses	Treatment Plant Losses	Distribution System Losses	Total Water System Losses
1997	23%	12%	20%	55%
1998	5% (1)	10%	26%	41%
1999	0% (1)	4%	32%	36%
2000	3% (1)	0%	25%	28%
Averages	**8%** (1)	**6%**	**26%**	**40%**

(1) Loss percentages based on assumed diversion data due to the loss of the Reedy Creek diversion system. Actual losses may vary if complete diversion data were available during period. New meter was installed in November of 2000.

Total raw water diverted for the City averages approximately 73 million gallons per year. Unaccounted water in the City's system averages around 30 million gallons per year or 80,000 gallons per day; losses on this order are significant. It is imperative that the City make efforts to reduce lost water and increase system efficiency. Reductions in lost water can result in increased revenues, reduced expenses, and improved water system performance. For guidelines on "lost" water reduction, see Section 7.

Equivalent Dwelling Unit Calculations

Projections for population growth are often utilized to estimate the future demand for public utility services, such as water and sewer. Typically, the future demand is based on an estimated number of residential homes, called average dwelling units, projected for the planning horizon. However, residential units are only a portion of the future demand. Commercial, vacation rental, and institutional customers will also demand services. Accounting for these customer types requires comparing the demand for services from the respective customer with the demand from the average dwelling unit. The relationship is defined as the equivalent dwelling unit (EDU) methodology. An example of the EDU methodology follows:

If a typical residential family requires, on the average, 200 gallons of water per day while a restaurant requires 1000 gallons of water per day, the demand for water from the restaurant is numerically equal to five residential units. In this case, the restaurant is said to be equal to five EDUs. By totaling all of the commercial and industrial users in terms of residential units with the total number of residential units in a community, the demand for public services can be established in terms of EDUs. The total number of EDUs can be used to estimate future demands based on the average household size and the future population. In the example provided above, if the average household consisted of three persons and in 20 years there are 100 households and one restaurant in the community, the equivalent population of the community would be 315 (300 people for the 100 houses + 15 equivalent people for the restaurant).

Within the City, there are approximately 600 residential accounts. Based on the number of full-time versus part-time residents as developed in Section 2.5 of this Plan, the average per capita household consists of approximately 1.8 persons per household (pph).

The City has approximately 75 non-residential accounts. Although the non-residential accounts make up only 17 percent of the customer base, they account for approximately 50 percent of the water consumed within the system. By evaluating the demand for residential customers, the commercial demand can be converted from connections or accounts to EDUs.

The combination of residential and non-residential EDUs can then be used to evaluate water consumption based on equivalent population values. For example, if there are ten commercial accounts that equate to 100 commercial EDUs in a water system, and the same water system has a residential population equal to two persons per household (EDU), the commercial water consumption could be expressed in terms of an equivalent population of 200 equivalent persons (100 commercial EDU's x 2 persons per EDU = 200 equivalent persons). By expressing non-residential consumption in terms of population, future demand can be evaluated based on simple population growth.

Table 5.2.3 summarizes the 1997-2000 City EDU totals along with the average water consumption for each sector. It should be reiterated that Table 5.2.3 shows the average consumption levels within the system. All losses, unaccounted water, and other water uses are not accounted for within the consumption data. Water system planning requires that all water diverted from the source be analyzed and considered as total water system consumption.

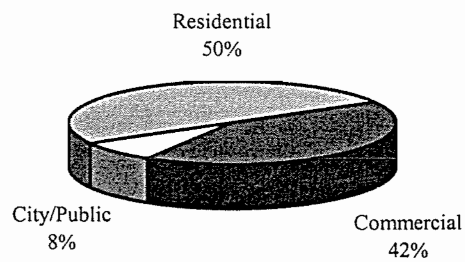
Table 5.2.3 - Summary Of Yachats EDU Totals And Water Consumption – 1997 To 2000

Account Sector	No. Svc's	No. EDU's	Total Water Consumption (gal/yr.)	Average Day Consumption Demand (gpd)
Residential	600	600	21,230,000	58,100
Commercial	57	517	18,202,000	49,900
City/Public	16	46	3,466,000	9,500
TOTAL	**673**	**1163**	**42,898,000**	**117,500**

Water use has been recorded for various customer sectors within the City of Yachats. These sectors include residential (both single and multi-family combined and transient rental homes), commercial, and City/public water use. The distribution of water use by land use sector is summarized in Figure 5.2.1.

For planning purposes, demand projections and unit design factors for water consumption should be based on the City's yearly water production data rather than historical customer water consumption records (meter readings). Since the City has a history of water losses in the raw water system, the calculations in this study will utilize the best available raw water diversion data. This methodology incorporates all system losses and unmetered usage in the projected water requirements developed later in this Master Plan. Further reference to consumption within this report implies total water diverted including raw water losses, treatment plant losses, distribution system losses and City and fire department deductions.

Figure 5.2.1
Water Used by Sector



Average Day Demand (ADD)

The average annual demand can be defined as the average water demand for any day in a given year. ADD is most commonly used to size facilities based on average water demand. When water diversion data is used to determine the ADD, it also becomes the basic unit that other water system demand quantities are built upon.

Incorporation of the average household size in the EDU methodology allows determination of the per-capita ADD based on the equivalent population of the City. That is, an EDU is assumed to have the same demand as the average household.

The ADD based on total water production and the off-peak equivalent population for the system data is summarized below in Table 5.2.4.

Table 5.2.4 - Annual Average Day Demand

Year	Annual Demand (Gal x 1000)	ADD (Gal x 1000)	Residential Population	Off-Peak Equivalent Population	ADD (gpcd)
1997	86,836	238	665	1,195	199
1998	73,144	200	685	1,228	163
1999	72,518	199	695	1,261	158
2000	59,110	162	715	1,294	125
1997-2000 Average	72,902	200	n/a	n/a	161
Plan Basis Values	74,600	205	730	1,327	154

Based on water production data and the equivalent service population as presented in the table above and the downward trend in water consumption, an ADD per-capita consumption value of 154 gpcd has been chosen to conservatively represent water usage in the City of Yachats. This unit design value will form the basis for projecting future ADD based on off-peak population growth.

Maximum Monthly Demand (MMD)

Water demand in the City of Yachats fluctuates monthly with the highest demands generally between the months of June and September. The higher summertime flows can most likely be attributed to a combination of increased outdoor water use (i.e. landscaping) and the increase in population due to tourism and vacationers. A summary of the City's maximum month water demand and calculated peaking factors from 1997 to 2000 are provided in Table 5.2.5.

Table 5.2.5 - Maximum Month Water Demand – 1997 To 2000

Year	Max Month (Days)	Monthly Demand (Gal x 1000)	MMD (gpd x 1000)	Peaking Factor (MMD/ADD)
1997	September (30)	12,407	414	2.03
1998	August (31)	8,950	289	1.88
1999	September (30)	6,163	199	1.32
2000	August (31)	6,263	202	1.70
1997-2000 Average	NA	8,446	276	1.73
Plan Basis Values	NA	9,120	308	1.50

Peaking factors are commonly used to develop relationships between the ADD and the other planning criteria. As developed in Table 5.2.5, a MMD peaking factor of 1.50 is appropriate for the City's demand data. Peaking factors tend to be consistent from one water system to another. It is common for water systems have a MMD peaking factor on the order of 1.5 times the ADD.

Maximum Day Demand and Peak Hour Demand (MDD & PHD)

To determine the maximum day demand and peak hour demand, a number of techniques are available. The demand values can be based upon actual production data over recent years, common peaking factors, statistical analysis, or a combination of these techniques. A brief description of how the MDD and PHD demand values were determined follows:

The MDD can be approximated based on the maximum water demand within the system. Maximum water diversion days over recent years with available data are presented in Table 5.2.6.

Table 5.2.6 - Summary Of Maximum Water Production Days

Year	Month When MDD Occurred	Water Demand
1997	September	684,000
1997	September	609,000
1998	August	645,000
1999	September	626,000
	Average	641,000

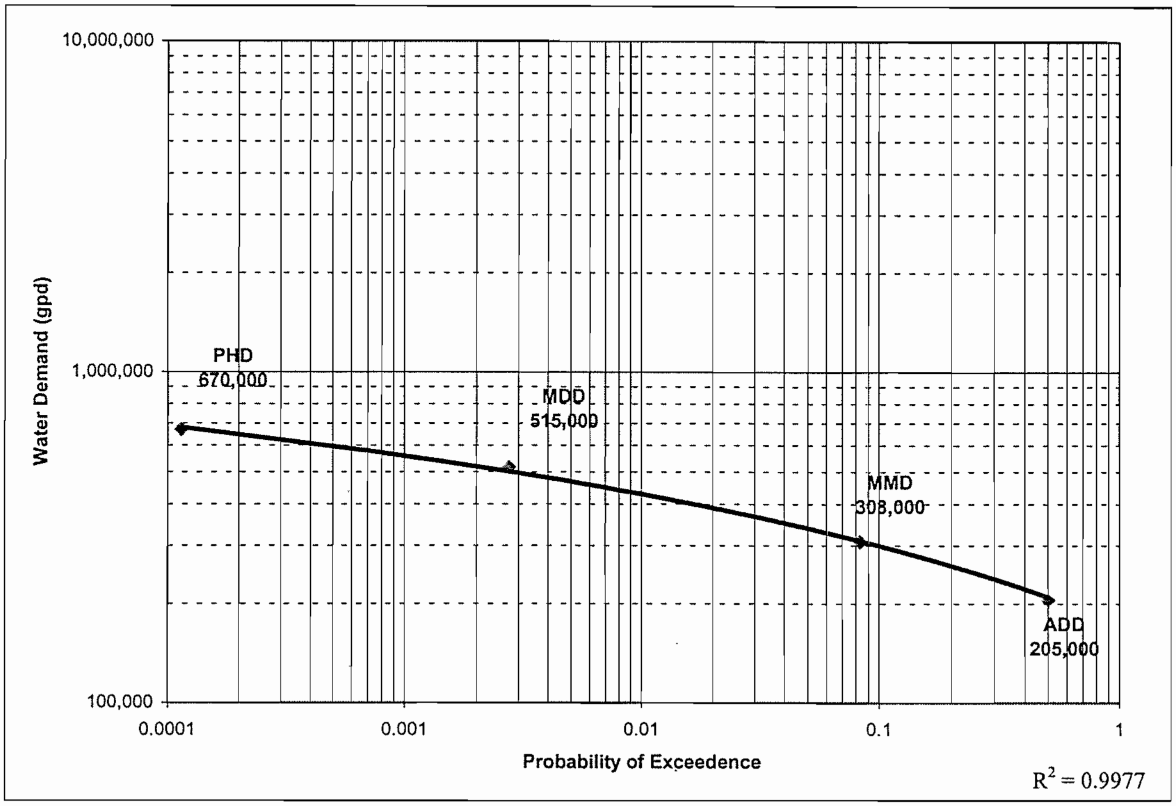
Common peaking factors are often used to approximate water demand values. Peaking factors between 2 and 2.5 are common for approximating the MDD. A peaking factor of 2 results in a MDD of 410,000 gpd while a peaking factor of 2.5 results in a MDD of 512,500 gpd.

Another method that can be incorporated to approximate the MDD is a statistical method. One can plot the probability of exceedence of demand versus the various water demand values. A logarithmic trendline across known quantities can be used to predict unknown quantities. Figure 5.2.2 shows the probability of exceedance plot and the resulting demand values.

Due to fixed surface water availability and increasing water demand, a conservative MDD peaking factor of 2.5 was chosen for this Master Plan. The resulting MDD was rounded to 515,000 gpd.

Though the PHD value is not as critical for reserve and treatment planning, the PHD will be used in the computer modeling process to ensure that the storage and distribution system will continue to function during short, peak demand situations. The PHD peaking factor chosen was 3.25 for the purposes of this study resulting in a PHD flow rate of approximately 670,000 gpd.

Figure 5.2.7 - Probability Plot For Determining Demand Values



A summary of the remaining planning criteria along with their associated peaking factors is provided in Table 5.2.7.

Table 5.2.7 - Summary Of Existing Water Demands - Basis For Master Plan

Demand Parameter	Total (gpd)	Peaking Factor	Per Capita Demand (GPCD)
Average Day (ADD)	205,000	1.00	154 (1)
Maximum Month (MMD)	308,000	1.50	232 (1)
Maximum Day (MDD)	515,000	2.50	268 (2)
Peak Hour Demand (PHD)	670,000	3.25	349 (2)

(1) Based on off-peak population estimates.
(2) Based on peak population estimates.

The MDD is the demand that is experienced on the highest demand day of the year. The MDD is commonly used to size facilities to provide capacity for periods of high demand. The MDD may be experienced on a holiday such as the Fourth of July or during a festival such as a County Fair. The MDD is usually associated with the warmest part of the year when agriculture, irrigation, and recreational uses of potable water are at their greatest. Peaking factors between 2 and 2.5 are commonly used for MDD. PHD is associated with the highest demand experienced during a single hour. Peak hour demand is commonly experienced during the early morning hours when many water users are bathing, cooking, and engaging in other activities that require widespread water use. PHD is used to size facilities for short periods of extreme demand. Peaking factors between 3 to 5 are commonly used for PHD.

5.3 Projected Water Demands

Water demands are projected into the future using the past records of water produced and water sold along with projected population estimates. The goal of projecting future water demand is not to build larger facilities to accommodate excessive water consumption, but rather to evaluate the capability of existing components and to size new facilities for reasonable demand rates. Large amounts of leakage and excessive water consumption should not be projected into the future estimates. Rather, efforts should be made to reduce leakage and lost water to a reasonable level and utilize lower, more acceptable demand rates for planning efforts. Water demand projections should be based on acceptable water loss quantities, reasonable conservation measures, and the community's expected water use characteristics.

There is a degree of uncertainty associated with future water demand projections for any community. Uncertainties in projections exist because of the estimates used to define the community's current water use and the built-in assumptions made with respect to anticipated growth in a community. The impact of water conservation measures on a community's future water consumption also is difficult to predict.

The U.S. Department of the Interior documented the per capita water use for Oregon in the 1995 U.S. Geological Survey - Circular 1200. According to the study, the average per capita water use for Oregon is 235 gallons per capita day (gpcd) including domestic, commercial, industrial, and public use and loss. Of the total 235 gpcd, 53 percent is domestic use, 14 percent is commercial, 17 percent is industrial, and 16 percent is public use and loss. An interagency team made up of personnel from the DEQ, Oregon Economic and Community Development Department (OECDD), Oregon Health Division (OHD), the Oregon Department of Water Resources (WRD), the USDA-Rural Utilities Service, Rural Community Assistance Corporation, and the Department of Land Conservation and Development has developed target design numbers based on the USGS study and their experience with Oregon communities. The team has adopted a maximum ADD of 235 gpcd, a MDD of 588 gpcd (2.5 times the ADD), and a PHD of 1,175 gpcd (5 times the ADD).

According to OAR 690-86-140, a water system should endeavor to reduce unaccounted water levels to 15 percent or less of the total water diverted from their raw water sources. As developed previously in this section, the City experiences unaccounted water levels on the order of 40 percent. In order to be in compliance with the OAR, the City must work to reduce their level of unaccounted water to 15 percent. Responsible water planning should not include the propagation of high-unaccounted water levels into water demand projections.

In order to project the water demand values into the future with reasonable levels of unaccounted water, the total diverted water was reduced by 25 percent. The resulting demands were recalculated at this lower demand level and projected into the planning period. The resulting projected demands assume an unaccounted water level of approximately 15 percent of the total raw water diverted to the system. A summary of the adjust current and project demands is provided in Table 5.3.1.

Table 5.3.1 - Future Water Demand For The City Of Yachats
Basis For Master Plan Demand-Present And Projected
(Adjusted for compliance with 15 percent unaccounted water levels.)

Parameter	2001	2011	2021	2051
Residential Population	734	917	1,145	2,233
# of EDU's op=off peak p=peak	810 (op) 1,196 (p)	1,018 (op) 1,508 (p)	1,272 (op) 1,896 (p)	2,225 (op) 4,014 (p)
Equivalent Population op=off peak p=peak	1,327 (op) 1,919 (p)	1,696 (op) 2,475 (p)	2,171 (op) 3,197 (p)	4,589 (op) 6,945 (p)
Water Demand (gpd) – Basis For Long Range Supply Plan **(gpcd)**				
ADD (154)	153,300	195,900	250,800	530,000
MMD (232)	230,900	295,100	377,800	798,500
MDD (268)	385,700	497,500	642,600	1,396,000
PHD (349)	502,300	647,800	836,800	1,817,900

The demand projections presented in Table 5.3.1 will be used in Section 9 of this Master Plan to analyze available capacity in existing systems throughout the planning period as well as to size new facilities for future demand.

It should be reiterated, that the water demands summarized above in Table 5.3.1 have been adjusted to represent approximate consumption rates if unaccounted water levels are reduced to 15-percent. If the City is not capable of reducing lost water levels, future demands will likely be greater than those developed within this section.

Design Criteria and Level Of Service

Section 6

Design Criteria and Level of Service

Section 6

6.1 Design Life of Improvements

The design life of a water system component is sometimes referred to as its useful life or service life. The selection of a design life is a matter of judgment based on such factors 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.

As discussed in Section 1, the planning period for this Master Plan is 20 years, ending in the year 2021. The planning period is the time frame during which the recommended water system is expected to provide sufficient capacity to meet the needs of all anticipated users. The required system capacity is based on population, water demand projections, and land use considerations. The planning period for a water system and the design life for its components may not be identical. 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 determines 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 various system components are discussed below.

Raw Water Intakes and Transmission

Intake structures including concrete impoundments should have design lives of 50 to 100 years when properly constructed and maintained. Water transmission piping should easily have a design life of 40 to 60 years if quality materials and workmanship are incorporated into the construction. Modern PVC and cement mortar-lined ductile iron piping can last up to 100 years when properly designed and installed.

The lives of wells and well heads vary widely depending on the magnitude of the well, the draw-down of the aquifer by other consumers, the recharging of the well by main sources, the type and quality of the well water, and many other quantities. Though it is not uncommon to obtain more than 50 years of service from a single high production well, a well life of 20 years is often used due to the uncertainties associated with these groundwater sources.

Water Treatment Facility

Major structures and buildings should have a design life of approximately 50 years. Pumps and equipment usually have a useful life of about 20 years. The useful life of treatment equipment can be extended when properly maintained if additional treatment capacity is not required. Filter media normally has a design life of ten to 15 years. Flowmeters typically have a design life of ten to 15 years. Valves usually need to be replaced after 15 to 20 years of use.

Treated Water Transmission and Distribution Piping

Water transmission and distribution piping should easily have a design life of 40 to 60 years if quality materials and workmanship are incorporated into the construction. Modern PVC and cement mortar lined ductile iron piping can last up to 100 years when properly designed and installed.

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 design 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.

6.2 Sizing and Capacity Criteria

Demand projections presented in Section 5.3 are based on population projections offered in Section 2.5. The projections assume an average 2.25 percent annual growth rate until the year 2021. For the purposes of longer-term projections such as 50-year and 100-year, this same 2.25 percent growth rate has been used. Accurately predicting growth is difficult, especially beyond 20 years into the future. As time progresses, all of the projections should be updated to reflect actual population and demand. The analysis and presentation of recommended improvement alternatives can be found in Section 9.

Raw Water Source

The water sources must be capable of meeting maximum daily demand of the system over a period of many years. The selection of a source is a long-term commitment that cannot be easily changed. Water rights are becoming more critical as the State's population and water demand increases and the number of viable water sources remains constant. The water sources should be evaluated to ensure enough water to meet the MDD 50 years into the future.

Intake and Pumping Facilities

Intake piping and wetwells are not easily expanded and should be sized to meet the anticipated maximum day demand well into the future. A design life of 50 years is common for such facilities.

Pumps and other mechanical equipment can be expected to last no more than 20 years under normal conditions before extensive maintenance or replacement is necessary. Commonly, two pumps are installed in a pumping station, each having capacity equal to the capacity of a water treatment plant or the MDD predicted within a planning period. Duplex pumping systems can be designed to alternate after each cycle to extend the life of the equipment. If future demands increase beyond the ability of a single pump, the second pump can serve as a lag pump in parallel to sustain higher flow rates during peak demand times.

Transmission Piping

The long distances and high replacement cost of the transmission lines warrant an analysis for demand beyond the normal 20-year period. The existing transmission lines must have the ability to handle at least the 20-year MDD. The capacity of the raw water and treated water transmission piping will be evaluated against the 20-year MDD and the 50-year MDD.

Water Treatment Facility

Water treatment plants are not normally designed to handle flows above 20-year MDD since these facilities can be expanded and typically have an overall design life of around 20 years. The existing treatment plant components will be evaluated against the 20-year MDD.

Treated Water Storage

Total storage capacity must include reserve storage for fire suppression, equalization storage, and emergency storage. The interagency team (see Section 5.3) of various Oregon agencies has adopted a target storage capacity of 2.5 times the ADD plus 180,000 gallons for residential fire flow. An alternative method to analyzing the treated water storage requirements suggests itemizing the potential requirements for treated water within the system. A discussion of these various needs follows:

Equalization storage is typically set at 25 percent of the MDD to balance out the difference between peak demand and supply capacity from the treatment plant.

Emergency storage is required to protect against a total loss of water supply as would occur with a broken transmission line, an electrical outage, a treatment plant breakdown, or source contamination. At a minimum, emergency storage should be equal to one maximum day of demand.

Fire reserve storage is needed to supply fire flow throughout the water system to fight a major fire. The fire reserve storage is based on the maximum flow and duration of flow required to confine a major fire. The guidelines published in "Fire Suppression Rating Schedule" by the Insurance Services Office (ISO) are typically used to determine the required fire flow and fire reserve storage. Generally, fire flows of 1,000 gpm are sufficient for one or two family dwellings not exceeding two stories in height. Commercial, industrial and institutional buildings require higher flows. Determination of these flows are unique to each building under consideration and involve detailed surveys of construction (type and area), occupancy (combustibility), exposure (construction type, distance, length/height of wall) and communications (openings).

The ISO also classifies a city's fire protection capabilities on a numerical basis, called the Public Protection Classification. This classification is used within the insurance industry for various purposes. The Public Protection Classification is determined from a complex analysis of the City's capabilities to receive and handle fire calls, the strength of the fire department, and the adequacy of the water supply system. Analysis of the water supply system is further divided into equal parts of: 1) supply capabilities, 2) hydrant size, type, and installation, and 3) inspection and condition of hydrants.

Ideal storage capacity should be the sum of equalizing, emergency storage, and fire flow. It is unlikely a major fire would occur simultaneously with a disruption to water production and, therefore, it is sometimes considered that storage capacity should be equal to three days of ADD, 1.5 days of MDD, or a combination of fire reserve, equalizing storage, and emergency reserve.

Industrial customers often are required by the ISO to have available fire flows on the order of 3,000 gpm. It is also common for the ISO to require a public building such as schools to have available fire flows of 3,000 gpm or more. Storage capacity should be adequate to provide these flows for a three-hour duration.

Another important design parameter for reservoirs is elevation. Efforts should be made to locate all reservoirs at the same elevation when possible. As a consistent water surface is maintained in all reservoirs, the need for altitude valves, check valves, PRVs, booster pumps, pumper trucks for extracting fire flows, and other control devices is limited. 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 pressure range in the system should stay within the range of 25 to 100 psi.

All of the above criteria will be used to evaluate the adequacy of existing storage and the need, if any, for future additional storage in Section 9.5.

Distribution System

Distribution mains are typically sized for fire flow and 20-year population demand, or fire flow and saturation development demand. The mains should be at least six inches in diameter to provide minimum fire flow capacity. All pipelines should be large enough to sustain a minimum line pressure of approximately 25 psi. 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 all times. The distribution system must be sized to handle the peak hourly flows and to provide fire flows while maintaining minimum pressures.

In addition to the above design criteria, the following guidelines are recommended for the design of water distribution systems:

- Six-inch (6") diameter lines - minimum sized lateral water main for gridiron (looped) system and dead-end mains.
- Eight-inch (8") diameter lines - minimum size for permanently dead-ended mains supplying fire hydrants and for minor trunk mains.
- Ten-inch and larger (10" & up) diameter - as required for trunk (feeder) mains.

The distribution system lateral mains should be looped whenever possible. A lateral main is defined as a main not exceeding eight inches in diameter, which is installed to provide water service and fire protection for a local area including the immediately adjacent property. The normal size of lateral mains for single family residential areas is six inches in diameter. However, eight-inch lateral mains may be required to meet both the domestic and fire protection needs of an area.

The installation of permanent dead-end mains and dependence of relatively large areas on a single main should be avoided. For the placement of a fire hydrant on a permanently dead-ended main, the minimum size of such laterals should be eight inches in diameter. However, six-inch diameter mains may be used for a stub out not exceeding 500 feet in length supplying a single fire hydrant not on a public street and for internal fire protection. On new construction, the minimum size lateral main for supplying fire hydrants within public ways should be six inches provided six-inch mains are looped.

A computer model of the distribution system was developed as part of this Master Plan. The model utilized actual pipe sizes, system configuration, and materials as well as system pipe junction elevations and storage tank elevations. The system was checked for ability to provide fire flows simultaneously with the 20-year MDD. The model was developed using a software program called WaterCAD® (version 3.1) by Haestad Methods.

Discussion of the fire flow results and distribution system analysis is provided in Section 9.6.

Fire Flows

The requirements for fire fighting at any point will vary between 500 gpm (a minimum) to 12,000 gpm for a single fire. Multiple fires will place a greater demand on the distribution system. A municipality must continue to serve its domestic, commercial, and industrial customers during a fire, however. The Insurance Services Office (ISO) recommends that a public fire fighting system be able to operate with the remainder of the potable water system operating at the MDD.

Recommended fire flows in a neighborhood will depend on construction type, occupancy, and floor area. Fire flow recommended for a particular building can be calculated with the following formula:

$$Q = (18)C\sqrt{A}$$

Q is the fire flow in gpm. C is a constant that depends on construction: 1.5 for wood frame, 1.0 for ordinary construction, 0.8 for noncombustible construction, and 0.6 for fire resistant construction. A is the area in ft^2 (square feet) of all stories in the building, except for basements. Special rules are used to find A for multi-story fire-resistant structures, buildings with various fire loadings, or buildings with sprinkler systems. Q is rounded to the nearest 250 gpm, but it should not be less than 500 gpm or more than 8,000 gpm for a single building. For example, a 2000 ft^2, wood frame house requires a fire flow of 1,250 gpm.

An ISO inspection was performed in the City of Yachats in 1992 following construction of the water treatment plant and the 1.0 million gallon water tank. The purpose for the inspections is to rate a city's ability to fight fires and prevent significant loss of property and life. The ratings are used to set insurance levels for people living within the community. The inspection included a detailed analysis and evaluation of the City water system and the ability of the fire department to fight a major fire. It also included an evaluation of the types of properties, buildings, industries, and the associated fire risks for the community.

Most insurance requirements will be met if the flow rate can be maintained for T hours, where T is the flow rate in 1000's of gpm, with a maximum of ten hours.

Fire hydrants should be spaced so as to provide fire protection to an area of approximately 160,000 ft^2. This equates to overlapping radiuses of between 200 to 250 feet or a maximum spacing of approximately 500 feet. They are ordinarily located at street corners where use from four directions is possible. The actual separation of hydrants can be calculated from standards presented by the ISO. These standards determine the minimum area (square feet) covered per hydrant based on flow. The standards for 1000 to 3500 gpm are: 160,000 ft^2 for 1000 gpm or less; 150,000 ft^2 for 1500 gpm, 140,000 ft^2 for 2000 gpm; 130,000 ft^2 for 2500 gpm; 120,000 ft^2 for 3000 gpm; and 110,000 ft^2 for 3500 gpm.

The computer model analysis included providing residential fire flow of 1,000 gpm with higher fire flows in the areas such as schools and public buildings. The fire flows were modeled simultaneously with the current and 20-year MDD.

For a detailed discussion of the distribution system performance and fire flow analysis, see Section 9.

Section 7

Water Management and Conservation Plan

Water Management and Conservation Plan

Section 7

(OAR 690-86-140)

7.1 Water Management and Conservation Plan

Water conservation consists of any beneficial reduction in water losses, waste, or consumption. As water providers face growing demands of them and their limited resources, conservation planning is playing an increasingly important role in their management practices. Water that is conserved, in effect, becomes a new and relatively inexpensive source of water for the utility.

Conservation can have the effect of helping water providers avoid, downsize, or postpone water and wastewater expansion projects. Capital costs, maintenance costs, financing costs, and many other expenses may be reduced by effectively practicing conservation within the water system. Additional benefits for the environment include restoring stream flows to support aquatic life, providing recreational opportunities, and maintaining water quality. The investment that water system managers make in conservation planning will yield savings that can be measured in terms of reclaimed water, resources and related operating dollars.

A water conservation plan is defined as a voluntary, long-term program intended to reduce average per capita water consumption, thus diminishing the overall demand placed on a water system and its resources. The Oregon Department of Water Resources reviews water management and conservation plans based on the requirements found in the Oregon Administrative Rules (OAR) Division 86 (OAR 690-86-140). Much of what is required in a conservation plan is provided in a standard water master plan. However, the conservation and curtailment elements of a conservation plan are typically not part of a water system master plan. Sections 7 and 8 of this Master Plan have been specifically prepared to satisfy the requirements outlined in OAR 690-86-140. The entire Master Plan should be submitted to the Oregon Department of Water Resources as well as the Oregon Health Division for review and acceptance.

As outlined in OAR 690-86-140, a water management and conservation plan shall include the following elements:

- Description of the Existing System
- Water Conservation Element
- Water Curtailment Element
- Long-Range Water Supply Plan

Section 7 summarizes much of the information in this Master Plan and includes information for the existing system, the conservation element, and the long-range water supply plan. Section 8 discusses the water curtailment element.

Throughout Sections 7 and 8, previous sections from the Master Plan are referenced for more detailed coverage of specific topics. If additional information is required beyond the summary presented in this section, please refer to the referenced section for each topic.

7.2 Existing Water System (OAR 690-86-140.1)

The City of Yachats is located in Lincoln County about 24 miles south of Newport and 26 miles north of Florence on U.S. Highway 101. The water service population includes approximately 700 full-time residents. In addition to the full-time population, the City is host to a significant and fluctuating part-time and tourist population. For detailed coverage of the service population, see Section 2.

City services include treated drinking water, sewage treatment, and other common public works and maintenance services. See Section 2 for a detailed description of the City of Yachats. A location map and study area description are provided in Figures 2.1.1, 2.1.2, and 2.6.1.

The City's existing water system includes intake and transmission, treatment, distribution, and storage systems. A brief description of each is provided below. For a detailed description of these system components, see Section 4. Figure 4.6.1 provides a schematic of the City's distribution system.

Raw Water Sources (OAR 690-86-140.1.a)

The City of Yachats' primary water source is Reedy Creek. The City relies on Salmon Creek as a secondary or backup raw water source. In general, Salmon Creek is utilized only when flows in Reedy Creek are not sufficient to provide the City with the necessary water.

The City of Yachats holds a water right permit allowing diversion of raw water from the Yachats River though the diversion has not yet been developed. The water right includes stipulations for the removal of water from two separate diversion points. A portion of the water right is exempted from regulation by senior and instream water rights by a "municipal reserve" or an allocation for use established by administrative rule.

The City has entered into a stipulated agreement with various parties having interests in the environmental balance of Yachats River Basin. This stipulated agreement requires the City to fulfill a number of requirements and tasks prior to full development of the Yachats River water right. One of the required tasks includes the development of this Plan. A copy of the stipulated order and agreement is provided in Appendix G.

A historical water right is still held on Cape Creek though it is no longer considered a viable water source for the City.

Sections 4.1 and 4.2 include a detailed description of the City's various water sources

Surface Water Rights (OAR 690-86-140.1.a)

The City of Yachats currently holds surface water rights on a number of area streams as well as the Yachats River. The City's existing water rights are summarized below:

Table 7.2.1 – Surface Water Rights Documentation Summary – City of Yachats

Location	ID No.	Right Type	Maximum Rate Allowed	Currently In use? Yes - No	Min Quantity Available at the Source	Priority Date	Water Quality
Reedy Creek	22933	Cert.	2.0 cfs	Yes	~0.28 cfs	July 9, 1945	Good
Salmon Creek	29018	Permit	1.0 cfs	Yes	~0.28 cfs	June 26, 1963	Fair
Salmon Creek	29018	Permit	1.0 cfs	Yes	~0.28 cfs	August 22, 1963	Fair
Yachats River	53471	Permit	2.0 cfs	No	~15 cfs	March 20, 1989	Poor
Cape Creek	14104	Cert.	0.49 cfs	No	unknown	July 21, 1934	Fair

A copy of each of the City's water rights is included in Appendix A. Section 4.1 includes additional details on the City's surface water rights.

Groundwater Rights (OAR 690-86-140.1.a)

The City does not hold any groundwater rights. Although a hydrologic study of the area has not been performed, information regarding the yield of existing wells within several miles of the City indicates that groundwater is not a viable source for meeting the City's water needs. Geology in the area is dominated by Tertiary age basalt, which is relatively impervious to water. Most of the area's precipitation is accounted for in surface runoff and no significant aquifers have been identified.

Raw Water Storage (OAR 690-86-140.1.a)

In 1998, the City constructed a 500,000-gallon, open-air, steel reservoir adjacent to the water treatment plant. The reservoir was initially constructed to serve as a raw water storage tank to provide backup raw water during low streamflow periods. The tank is designed to fill during the evening hours when the plant may not be in production and attenuate the need for flows during the day. The tank has proven to be valuable in providing the City with increased operational flexibility and, since its installation, has eliminated major water supply deficiencies on a day-to-day basis.

If the City is successful in improving their raw water supply deficiencies, they may choose to convert the raw water storage tank into a treated water storage tank.

System Capacity vs. Existing Water Rights (OAR 690-86-140.1.b)

The City currently holds surface water rights of 2.0 cfs (1.3 MGD) on Reedy Creek and secondary water rights of 2.0 cfs on Salmon Creek. The City is also currently seeking to develop water rights for an additional 2.0 cfs from the Yachats River.

Information from the City's previous Water Master Plan (H.G.E., Inc. 1989) states that flows in Reedy and Salmon Creek were measured to fall below 0.18 MGD in each stream during a low flow period in October of 1987. The readings were made using the original impoundment structures and overflow weirs and gauging systems on Reedy and Salmon Creeks. Since the readings were taken, a landslide has destroyed the impoundment on Reedy Creek. Because no additional flow information was available for Reedy Creek, the data from the 1989 study will be used to characterize low flows within that water shed.

The dilemma facing the City of Yachats is that the source streams presently supplying the system do not have sufficient flows in the late summer months to supply the City's raw water needs; during this period combined flows of Reedy and Salmon Creeks can fall below 0.56 cfs (0.36 MGD). The maximum day productions recorded at the water treatment plant for three recent years have been in excess of 0.70 cfs (0.45 MGD), well above of the available stream flows during drought conditions.

Currently, the City's water system capacity is "source-limited" rather than "water-right-limited." The City needs to develop another raw water source in order to supplement the existing raw water streams during times of drought or regular low summertime flows.

Opportunities for expansion within the existing sources do not exist, as additional source water is not available. The only practical opportunity for development of a raw water source under existing water rights is that of the Yachats River. The City holds a water right permit for 2.0 cfs on the Yachats River. (See Section 4.1 for details.) However, environmental concerns, in-stream water rights, endangered anadromous fish species, and interventions by environmental groups have thus far prevented the City from developing the Yachats River as a backup or emergency water source to augment seasonal low flows in their primary and secondary sources.

See Section 5 for a detailed development of the supply and demand relationships within the water system. Section 9.1 analyzes the relationship between system capacity and the available raw water sources in the City system.

Water Treatment Facility

The City of Yachats water treatment facility was constructed in 1992 and has a total treatment capacity of approximately 350 gallons per minute (0.5 MGD). The plant capacity can be increased to a 700 gpm (1.0 MGD) plant with some minor modifications. See Section 4 for additional information on the City's water treatment facility and related systems.

The water treatment plant is a custom plant that includes a conventional multi-media filtration system. The plant makes use of the following processes:

- Prechlorination
- Chemical Coagulation and Polymer Addition
- Up-Flow Contact Clarification
- Multi-Media Filtration
- Disinfection (Post Chlorination)
- Serpentine Contact Basin Clearwell

The plant is in good general operating condition and the filters are well suited for treating raw water in a relatively wide range of turbidities.

Treated Water Storage

Treated water storage is accomplished in three reservoirs and a steel pressure tank. The City's total treated water storage volume is 1,211,000 gallons, with reservoirs located in the east-central portion of the City. The primary reservoir, a 1,000,000-gallon concrete tank, was constructed in 1992 and is in good condition today. The system's original 200,000-gallon below grade concrete reservoir was constructed in 1945 and also is in use today. A 10,000-gallon concrete reservoir constructed in 1964, as well as an adjacent 1,000-gallon pressure tank, are in good condition and continue to provide water service to a small high-level system. Not included in the above totals is a 43,000-gallon clearwell at the water treatment plant.

All reservoirs receive regular internal inspections and are well maintained. The two larger reservoirs are enclosed in cyclone-fenced yards to prevent public access. The pressure tank and associated booster pumps are enclosed in a CMU block building attached to the 10,000-gallon reservoir.

The City currently has adequate treated water storage reserves. However, the City is interested in adding a new 0.25 MG treated water reservoir in the southern portion of the system to provide adequate reserves to the population south of the Yachats River. See Section 9.5 for a discussion of the City's storage needs.

See Section 4.5 for a more detailed description of the City's existing treated water storage facilities.

Interconnections with Other Systems (OAR 690-86-140.1.a & e)

SLCWD. Southwest Lincoln County Water District (SLCWD) provides water to the unincorporated area to the north of the City between Yachats and the City of Waldport. The City has received a grant to develop a physical interconnection on the northern edge of the City distribution system linking the two water providers together. The City has entered into a Mutual Aid Agreement with SLCWD to provide and receive water in times of emergency or drought, providing that the donor provider has surplus water available.

At this time, the agreement between the City and SLCWD is intended to provide water under emergency conditions only. The agreement is not intended to serve as a regional water supply or water supply partnership.

Although emergency aid is the goal of system interconnection, it is not anticipated that either SLCWD or the City of Waldport systems would have excess water during a regional drought. Raw water for both systems is obtained from coastal streams, which are subject to the same seasonal climatic patterns and fluctuating flows as the streams within the Yachats River watershed. While they may be able to provide additional waters for fire fighting or short-term emergency needs, neither water provider has approached the agreement as a solution to their water supply needs.

Regional Interconnection. The City has given their endorsement to the investigation into the viability of a regional water supply between the City of Yachats, SLCWD, the City of Waldport, Seal Rock Water District, and the City of Toledo. Though still in the development stage, the City is very interested in the establishment of a regional water supply as it may provide them with much needed water supplies during times of drought and low streamflow.

Except for a short section of piping crossing the Alsea Bay Bridge in Waldport, the aforementioned water providers are already currently connected through various points of system interconnection. It is expected that a regional water study will be conducted sometime during the next year (2001-2002) to determine the viability of a regional water supply and to establish costs for the development of such a system.

The Mutual Aid Agreement between the City and SLCWD and a draft of the regional water supply (intergovernmental) agreement can be seen in Appendix B.

System Schematic (OAR 690-86-140.1.f)

Refer to Figure 4.6.1 for a detailed schematic of the City of Yachats' existing water system. The schematic shows locations of storage facilities, distribution and transmission systems, and the service area supplied by the water system. Figure 4.4.1 shows the locations of raw water diversion points, the water treatment plant, interconnection with Southwest Lincoln County Water District and both raw water and treated water transmission lines.

7.3 Existing Service Population (OAR 690-86-140.1.d)

The City of Yachats provides drinking water to residential, commercial and municipal customers within the City limits. Additionally, a significant portion of the City's water serves dedicated vacation rental facilities. The 2001 water service population of the City of Yachats is approximately 734 persons. The City has approximately 674 water service accounts distributed between various land use sectors. The service profile for the City is summarized below in Table 7.3.1:

Table 7.3.1 – Existing Service Profile

Year	Residential Accounts	Commercial Accounts	Transient Rental Accounts	City/Public Accounts
2000	540	57	61	16

A brief description of each land use sector is provided below:

Residential Accounts. Residential water customers in Yachats make up approximately 80 percent of the users in terms of total accounts. Yachats is a popular retirement community; the average number of persons per household is approximately 1.8 persons. The per capita income in Yachats is one of the highest in Oregon. As such, many upscale homes are located along the seafront and on the upland hills. In addition to the high end homes, Yachats also has a number of manufactured homes, mid-priced homes, and few multi-family dwellings.

Residential water use in the City of Yachats is not unlike that seen in many coastal communities. Due to the typically wet climate and cool temperatures, water use for outdoor recreation and landscape irrigation is generally less than that of communities in more arid regions.

Commercial Accounts. Commercial accounts within the City are comprised primarily of hotels, motels, and other establishments catering to the significant summertime and holiday tourist market. There are approximately 270 hotel rooms currently available within the City limits. Other commercial accounts include small shops, restaurants, grocers, and other common commercial establishments.

Transient Rental. Yachats is a popular vacation destination. As a result, a number of water use accounts are described as transient rental properties. These properties include condominiums, time-share properties, rental houses, and other short-term rental properties.

City/Public Water Use Accounts. City/public water accounts include City Hall, the City shops, parks, churches, the fire department and other typical city and public entities.

Estimating existing population and making population projections is extremely difficult in the City of Yachats. Due to the significant part-time residential population and the peak summer tourist season, obtaining accurate and verifiable information is very difficult. For the purposes of this Study, a system was developed for the analysis of residential population, off-peak equivalent population, and peak equivalent population. See Section 2.5 for a detailed description of the existing population and projections for future population figures for the City of Yachats. A more detailed discussion on the number of residents and their water use characteristics is provided below.

Water Use Characteristics

Previous planning efforts have made the assertion that, in Yachats, residential water consumption and commercial water consumption are very similar. Upon reviewing data for the years of 1997 to 2000, it was shown that residential consumption accounted for approximately 50 percent of all water sold while commercial consumption accounted for approximately 42 percent of all water sold.

As presented in Section 5, the commercial sector accounts for nearly as much water use as the entire residential sector within the City of Yachats. While the total amount of water *sold* to each sector is similar, it was not clear that water *consumption* within each sector was comparable. The vast majority of all water used in the commercial sector supports the tourist industry in the form of lodging and meals. As a result, it was expected that per capita water consumption in the commercial sector would be similar to that in the residential sector.

Utilizing monthly consumption data for each sector and the population estimates developed in Section 2.5, per capita consumption was estimated for each sector. Tables 7.3.2 and 7.3.3 summarize the per capita consumption within the commercial and residential sectors.

Table 7.3.2 – Residential Consumption Profile (1997-2000)

Year	High/Low	Month	Days	MG Consumption	Population Estimate	gpcd
1997	Low	Feb	28	1.228	665	66
	High	Aug	31	3.167	993	102
1998	Low	Feb	28	1.262	685	66
	High	Aug	31	2.740	1021	87
1999	Low	Feb	28	1.264	695	65
	High	Aug	31	2.535	1039	79
2000	Low	Mar	31	1.239	715	56
	High	Aug	31	2.482	1067	75
Average	Low	-	29	1.248	690	**62**
	High	-	31	2.731	1030	**86**

Note: Low consumption residential population was calculated as the full-time residential population alone. High consumption population was calculated as the full-time residential plus the peak part-time residential figures. See Section 2.5 for detailed coverage of population estimates.

Table 7.3.3 – Commercial Consumption Profile (1997-2000)

Year	High/Low	Month	Days	MG Consumption	Population Estimate	gpcd
1997	Low	Dec	31	1.047	530	64
	High	Aug	31	2.321	726	103
1998	Low	Feb	28	1.112	543	73
	High	Aug	31	2.564	748	111
1999	Low	Dec	31	0.932	566	53
	High	Aug	31	2.281	780	94
2000	Low	Nov	30	0.848	579	49
	High	Aug	31	2.213	802	89
Average	Low	-	30	0.985	555	**59**
	High	-	31	2.345	764	**99**

Note: Low consumption commercial population was calculated as the total equivalent off-peak population minus the full-time residential population. High consumption population was calculated as the equivalent peak population minus the full time residential population minus the peak part-time residential population. See Section 2.5 for detailed coverage of population estimates.

Based on the analysis summarized above, it could be said that per capita consumption within the commercial sector is indeed similar to that within the residential sector.

Based on the above profiles, the peaking factor between low winter and peak summer consumption ranges between 1.3 and 1.5 for residential and commercial consumption, respectively. It is assumed that minor increases in landscape irrigation, increases in summertime recreational water use, and tourist population surges can account for much of the increased seasonal water consumption.

7.4 Existing System Demand (OAR 690-86-140.1.c)

Water demand is commonly defined in terms of average, maximum, and peak use periods. A brief description of some of the common demand categories is provided below:

Average Annual Demand (AAD) - The total volume of water delivered to the system in a full year expressed in gallons. When demand fluctuates 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 Monthly 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.

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, treatment plant and transmission lines 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. Distribution systems should be designed to adequately handle the peak hourly demand. During this peak usage, storage reservoirs supply the demand in excess of the maximum day demand.

The demands described above, expressed in gallons per day (gpd), can be divided by the population served to come up with a demand per person or a per capita demand which is expressed in gallons per capita per day (gpcd).

Water Diverted

The total demand the City places on their raw water sources is equal to the total water diverted from all sources. The City has the ability to meter the water diverted from each source and keeps records of the total amount. The City diverts water from Reedy Creek for its primary raw water consumption. In addition to Reedy Creek, the City diverts water from their secondary source, Salmon Creek. For a detailed analysis of diverted water, see Section 5.2. A summary of the water diverted from each source is provided below in Table 7.4.1.

Table 7.4.1 - Summary Annual Water Diversion From Each Source (1997 – 2000)

Year	Reedy Creek Annual Diversion (Gal. X 1000)	Salmon Creek Annual Diversion (Gal. X 1000)	Total Raw Water Diverted (Gal. x 1000)
1997	79,286	7,550	86,836
1998	62,147	10,997	73,144
1999	42,986	29,532	72,518
2000	46,686	12,424	59,110
Averages	57,776	15,126	72,902

Unaccounted Water ("Lost Water")

The difference between the quantity of water diverted from the raw water source to the treatment plant and the quantity of water delivered through the distribution system and measured at customer meters is referred to as total unaccounted water. The difference can be attributed to system leaks, inaccuracies in customer meters, unmetered services, and other unmetered use such as fire flows and system flushing.

The Oregon Administrative Rules (OAR) section 690-86, states that all water systems should work to reduce unaccounted water levels to 15 percent. If the reduction of "lost" water to 15 percent is found to be feasible, the water provider should work to reduce unaccounted water levels to ten percent.

The City of Yachats' system experiences losses in excess of the 15 percent allowed by the OAR. In order to more accurately characterize system losses, an analysis was performed on available records, and an effort was made to identify the sources of losses within the system. Losses were separated into three distinct categories: raw water, treatment, and distribution system losses. For a detailed analysis of system losses, see Section 5.2. A summary of system losses for the period under study is provided in Table 7.4.2.

Table 7.4.2 - Summary Of Unaccounted Water – Losses (1997 – 2000)

Year	Raw Water Losses	Treatment Plant Losses	Distribution System Losses	Total Water System Losses
1997	23%	12%	20%	55%
1998	5% (1)	10%	26%	41%
1999	0% (1)	4%	32%	36%
2000	3% (1)	0%	25%	28%
Averages	**8% (1)**	**6%**	**26%**	**40%**

(1) Loss percentages based on assumed diversion data due to the loss of the Reedy Creek diversion system. Actual losses may vary if complete diversion data were available during period. New metering equipment was installed in November of 2000.

Based on the above analysis, average system losses total approximately 40 percent of the total water diverted from the City's water sources. It should, however, be pointed out that losses within the City system are on a steady decline over the years investigated and summarized in the above table. In order to be in compliance, the City should endeavor to reduce this value to 15 percent.

It should be noted, recently, the City randomly removed and tested a number of existing water meters. The results of the accuracy testing suggest that the existing meters may be reading low by more than 20 percent. If existing losses are around 28% as was shown in 2000, and the inaccurate meters were replaced with precise meters, losses may be reduced to below 10-percent. For additional discussion about water meter replacement, see Section 7.9.

The following subsections will summarize the existing water demand criteria for the City of Yachats. For detailed coverage on the following topics, see Section 5.2.

Average Day Demand (ADD)

The average annual demand can be defined as the average water demand for any day in a given year. ADD is most commonly used to size facilities based on average water demand. When water diversion data is used to determine the ADD, it also becomes the basic unit that other demand quantities are built upon.

The ADD for the City of Yachats is summarized below in Table 7.4.3. It should be pointed out that the per capita ADD includes all commercial and residential consumption along with all losses, leakage, meter inaccuracies, unmetered use, and all other lost water levels.

Table 7.4.3 Annual Average Day Demand

Year	Annual Demand (Gal x 1000)	ADD (Gal x 1000)	Residential Population	Off-Peak Equivalent Population	ADD (gpcd)
1997	86,836	238	665	1,195	199
1998	73,144	200	685	1,228	163
1999	72,518	199	695	1,261	158
2000	59,110	162	715	1,294	125
1997-2000 Average	72,902	200	n/a	n/a	161
Plan Basis Values	74,600	205	730	1,327	154

Maximum Monthly Demand (MMD)

Water demand in the City of Yachats fluctuates monthly with the highest demands generally between the months of June and September. The higher seasonal demands can likely be attributed to a combination of increased outdoor water use (i.e. landscaping) and the increase in population due to tourism and vacationers. A summary of the City's maximum month water demand and calculated peaking factors from 1997 to 2000 are provided in Table 7.4.4.

Table 7.4.4 - Maximum Month Water Demand – 1997 to 2000

Year	Max Month (Days)	Monthly Demand (Gal x 1000)	MMD (gpd x 1000)	Peaking Factor (MMD/ADD)
1997	September (30)	12,407	414	2.03
1998	August (31)	8,950	289	1.88
1999	September (30)	6,163	199	1.32
2000	August (31)	6,263	202	1.70
1997-2000 Average	NA	8,446	276	1.73
Plan Basis Values	NA	9,120	308	1.50

Maximum Day Demand (MDD) and Peak Hour Demand (PHD)

The MDD is the demand that is experienced on the highest demand day of the year. The MDD is commonly used in sizing facilities to provide capacity for periods of high demand. The MDD may be experienced on a holiday such as the Fourth of July or during a festival such as a County Fair. The MDD is usually associated with the warmest part of the year when agriculture, irrigation, and recreational uses of potable water are at their greatest. Peaking factors between 2 and 2.5 are commonly used for MDD.

For more information on the development of the MDD, see Section 5.2. A summary of the City's water demand criteria including PHD and MDD and associated peaking factors from 1997 to 2000 is provided in Table 7.4.5.

Table 7.4.5 - Summary Of Existing Water Demands - Basis For Master Plan

Demand Parameter	Total (gpd)	Peaking Factor	Per Capita Demand (GPCD)
Average Day (ADD)	205,000	1.00	154 (1)
Maximum Month (MMD)	308,000	1.50	232 (1)
Maximum Day (MDD)	515,000	2.50	268 (2)
Peak Hour Demand (PHD)	670,000	3.25	349 (2)

(1) Based on off-peak population estimates.
(2) Based on peak population estimates.

It should be reiterated; the water demand figures developed above are based on total water diverted and include all unaccounted water. With unaccounted water levels averaging 40 percent of total, the existing demand levels are inflated above levels acceptable by OAR guidelines. This will be taken into account when making water demand projections for the long range water supply plan in the following section.

7.5 Long Range Water Supply Plan (OAR 690-86-140.4)

Expected Future Service Area (OAR 690-86-140.4.a)

The current service area for the City of Yachats' system is essentially the current urban growth boundary (UGB). While a small number of homes are served outside of this boundary (12 connections), the City does not expect to annex additional areas into the UGB or expand it within the planning period. The main reason for not expanding the UGB would be the City's current difficulties in obtaining a consistent and reliable water source for the existing service population. Therefore, the future water service area for the City of Yachats is expected to remain the current UGB.

Long-Range Water Demand (OAR 690-86-140.4.a)

The capacity and sizing of a water system is based on the amount of anticipated water demand. Water system demand is the amount of water delivered from the source of supply to the distribution system over a given period. In most systems, the rate of demand varies considerably throughout the year and during each day. The demand rate is typically lower in the winter months and increases significantly in the summer months. Per capita demand is commonly used to evaluate and compare system demands.

Projections of future water demand are used to determine the adequacy of existing facilities and the capacity of proposed improvements. The projections are also used to evaluate existing water rights and source capacities.

The goal of responsibly projecting future water demands is not to build larger facilities to accommodate excessive water consumption, but rather to evaluate the capability of existing components and to size new facilities for reasonable demand rates. Large amounts of leakage and excessive water consumption should not be projected into the future estimates. Rather, efforts should be made to reduce leakage and lost water to a reasonable level and utilize lower, more acceptable demand rates for planning efforts. Water demand projections should be based on acceptable water loss quantities, reasonable conservation measures, and the community's expected water use characteristics.

Water demands are projected into the future using historical water demand levels and projected population and system growth characteristics. However, according to OAR 690-86-140, a water system should endeavor to reduce unaccounted water levels to 15 percent or less of the total water diverted from their raw water sources. As developed previously in this section, the City experiences average unaccounted water levels on the order of 40 percent. In order to be in compliance with the OAR, the City must work to reduce their level of unaccounted water to 15 percent. Responsible water planning should not include the propagation of high-unaccounted water levels into water demand projections.

In order to project the water demand values into the future with reasonable and responsible levels of unaccounted water, the total diverted water was reduced by 25 percent to simulate the results of the City reducing unaccounted water levels to 15 percent. The resulting demands were recalculated at this lower demand level and projected throughout the planning period.

Table 7.5.1 summarizes the population and water demand projections for the various planning criteria developed above.

Table 7.5.1 - Future Water Demand For The City Of Yachats
Basis For Master Plan Demand-Present and Projected
(Adjusted for compliance with OAR maximum 15 percent unaccounted water levels.)

Parameter	2001	2011	2021	2051
Residential Population	734	917	1,145	2,233
# of EDU's op=off peak p=peak	810 (op) 1,196 (p)	1,018 (op) 1,508 (p)	1,272 (op) 1,896 (p)	2,225 (op) 4,014 (p)
Equivalent Population op=off peak p=peak	1,327 (op) 1,919 (p)	1,696 (op) 2,475 (p)	2,171 (op) 3,197 (p)	4,589 (op) 6,945 (p)
(gpcd)	**Water Demand (gpd) – Basis For Long Range Supply Plan**			
ADD (154)	153,300	195,900	250,800	530,000
MMD (232)	230,900	295,100	377,800	798,500
MDD (268)	385,700	497,500	642,600	1,396,000
PHD (349)	502,300	647,800	836,800	1,817,900

Ten, 20 and 50-year projections have been provided in Table 7.5.1 for the purposes of long term planning. However, the growth rates and demand estimates should be reviewed at the beginning of each planning cycle.

It should be reiterated that the above projections are based on reduced demand levels and assume the City will be successful in reducing overall unaccounted water levels to 15 percent or less. If the City is unsuccessful in this effort, future demands are likely to be higher.

See Section 5.3 for a detailed accounting of the projected demands and methodologies used in population and water demand projections.

Projected Demand vs. System Capacity (OAR 690-86-140.4.b)

The maximum day demand (MDD) for the 20-year planning period is 642,600 gpd. This MDD equates to 1.0 cfs (446 gpm). The City has primary water rights on Reedy Creek totaling 2.0 cfs, as well as secondary rights totaling 2.0 cfs from Salmon Creek. In addition to the rights on its primary and secondary sources, the City holds 2.0 cfs on the Yachats River that have not yet been developed.

At face value, it appears that the City has ample water supplies to provide raw water for the planning period. However, combined flows in Reedy and Salmon Creeks have been known to fall below 0.56 cfs during periods of seasonal low flow. This low raw water yield does not satisfy the existing MDD, not to mention projected MDD's. The available flow will most likely be adequate for the 20-year ADD of 0.39 cfs assuming the City is capable of reducing unaccounted water levels.

The City's water system capacity is source-limited by availability rather than by water right. The City must develop additional raw water sources to provide for its raw water needs when the primary and secondary raw water sources have been depleted.

See Section 9.1 for detailed coverage of projected demand vs. system capacity. A summary of the 20-year projected demands and the minimum water available in Reedy and Salmon Creeks is provided below in Table 7.5.2.

Table 7.5.2 – Projected Water Requirements Vs Available Water

Criteria	2021 Demand Level* (cfs)	Minimum Combined Flows: Reedy and Salmon Creeks (cfs) Approx.
ADD	0.39	0.56
MMD	0.59	0.56
MDD	1.00	0.56
PHD	1.30	0.56

* It should be reiterated that the above demand figures assume 15-percent unaccounted water levels.

Development of New Sources (OAR 690-86-140.4.c.A)

Though the City's water rights are adequate for the 20 and 50-year MDD, water is not available in the source streams at the necessary volumes throughout the year. The City will need to develop additional raw water sources during the current planning period. The new source(s) should have the capacity to provide needed water during dry summer months when the existing source streams cannot meet the City's needs.

See Section 9.1 for detailed coverage of various source options available to the City,. The most promising raw water source options for the City's long-term needs are summarized below:

Unaccounted Water Reduction and Conservation Measures. The best source of additional water available to the City is the reduction of unaccounted water and conservation of existing water supplies. These source options are positive because they draw from existing resources, seeking to more efficiently utilize each unit removed. Also, the environmental impact, if anything, is positive. Each gallon of water that is recovered from leakage, meter loss, unmetered use, or other unaccounted use, is a gallon of water that is available for the beneficial use of the Yachats water consuming population. Furthermore, each gallon of water that is saved or conserved through conservation measures becomes one less gallon of water required at the point of diversion.

If the City is able to reduce unaccounted water levels to 15-percent or less, the raw water required at the point of diversion could be reduced by 25 percent or more. To put this into perspective, Table 7.5.3 summarizes the potential effects of unaccounted water reduction.

Table 7.5.3 – Potential Effects Of Unaccounted Water Reduction

Parameter	2001	2021
MDD, Existing Demand Levels Incl. Loss	515,000	856,900
MDD, Reduced to 15% Unaccounted Water	385,700	642,600
Net Available Water	129,300 (0.20 cfs)	214,200 (0.33 cfs)

The analysis summarized above suggests that the City can recover at least 0.20 cfs today and up to 0.33 cfs within the planning period. While this reclaimed water will not be adequate to provide enough water for the 20-year MDD, reductions on this order are significant and would aid the City during periods of low flow within their raw water sources and would provide more than enough water for the 20-year ADD.

In addition to developing new source water through unaccounted water reduction, the City may realize additional waters through the development of conservation measures. If, for instance, the City were able, through conservation measures, to reduce overall water consumption by only 10 percent of the total water diverted, the total additional water available for beneficial uses would be near 35 percent of what is currently being diverted. Table 7.5.4 summarizes the impact of both unaccounted water reduction and conservation measures on raw water requirements.

Table 7.5.4 – Potential Effects of Unaccounted Water Reduction and Conservation Measures On Raw Water Requirements – gpm (cfs)

Parameter	2001	2021	Minimum Combined Flows: Reedy and Salmon Creeks Approx. (cfs)
MDD, Existing Demand Levels Incl. Loss	515,000 (0.80 cfs)	856,900 (1.33 cfs)	0.56
MDD, Reduced to 15% Unaccounted Water	385,700 (0.60 cfs)	642,600 (1.00 cfs)	0.56
MDD, w/ 10% Conservation	463,500 (0.72 cfs)	771,200 (1.20 cfs)	0.56
MDD, w/ 10% Conservation & 15% Unaccounted Water (35% Total Reduction)	334,750 (0.52 cfs)	556,985 (0.86 cfs)	0.56
Net Available Water	180,250 (0.28 cfs)	299,915 (0.46 cfs)	na

Based on the analysis summarized in Table 7.5.4, the City may be able to reclaim as much as 0.46 cfs by the end of the planning period. While the total reduction does not provide enough additional water to fulfill the requirements of the 20-year MDD, the water savings is nearly as much as the current MMD and does provide significant additional water for the City.

As presented in Section 9.1, existing combined flows in Reedy and Salmon Creeks have been measured as low as 0.36 MGD (0.56 cfs). If the City were successful in meeting the proposed reductions, it would be able to provide for the current MDD with its existing source water, assuming flows in the two creeks do not drop below historical lows. However, even with these significant demand reductions, the current raw water sources will not be able to provide the required raw water for the MDD more than a few years into the planning period. MDD levels would need to be reduced by 58 percent before the existing raw water supply is sufficient for the finished water demand.

The cost and effectiveness of reducing unaccounted water is difficult to quantify. It will no doubt require expensive piping replacements, meter replacements, and other infrastructure improvements. See Section 10 for a list of proposed projects and improvements and associated project costs. While not all of the projects developed in Section 10 are necessarily for the purposes of water conservation, any project that will improve the efficiency of the system or replace older and failing infrastructure will result in some level of lost water reduction.

The cost and effectiveness of reducing water requirements through conservation is also difficult to quantify. Conservation measures vary widely in effectiveness, cost to implement, and applicability. For a discussion on various conservation measures and estimates of the cost of various measures, see Section 7.8.

While unaccounted water reduction and conservation are considered to be good potential sources that may assist the City in stretching their source water further, they are not the solution to the City's raw water needs: the reliability and effectiveness of such measures is difficult to predict, most water providers have the intention of being responsible water stewards. The provider may develop plans and projects to reduce unaccounted water and they may implement conservation measures with the intent of reducing per capita consumption; however, the result of such efforts may fall short of the intended goal, leaving them incapable of supplying adequate water to their customers.

The City should endeavor to reduce unaccounted water levels to 15 percent and seek to reduce overall consumption by 10 percent through conservation efforts. While these efforts will not solve the source water problems, they will reduce the burden placed on the City's sources and on the water system infrastructure.

The Yachats River. The City currently holds a water right permit for 2.0 cfs on the Yachats River. The City has, for the past decade, been attempting to develop a portion of this water right. However, due to various environmental concerns, it has been unable to develop the Yachats River as a backup water source for periods of seasonal low flow in its primary and secondary sources.

Environmental concerns on the Yachats River generally center on instream water rights, minimum streamflow levels, and the anadromous fish species these programs are intended to protect. The City's water rights are "junior" to two instream rights in the vicinity of the City's permitted points of diversion. This requires the instream rights to be satisfied before the City can exercise its water right. Historical streamflow readings suggest that satisfaction of the instream rights is regularly not achieved during seasonal low flow periods. (See Section 4.1 for detailed coverage of instream water rights on the Yachats River.) Because these rights are regularly not satisfied during low flows, the City will not be able to exercise its water rights during those same low flow periods. Unfortunately, the times of year that the City may require water from the Yachats coincide with the lowest flows in the river and the restrictive instream water rights. It is highly unlikely that the City will be able to utilize the full 2.0 cfs of the water right when the greatest need for the water arises.

However, 1.0 cfs of the total 2.0 cfs water right is described in the City's permit as a "municipal reserve." This "municipal reserve" is an allocation established by administrative rule intended to exempt up to 1.0 cfs of the City's water right from regulation resulting from senior instream water rights. That is to say, under the City's water right, the City is allowed to remove up to 1.0 cfs regardless of instream flows. While this point does not allow full development of the water right, it does allow development of up to half of the right.

It should be pointed out that the City's Yachats River water right is divided between two diversion points. If the City chooses to exercise their full 1.0 cfs municipal reserve, they will be required to construct two separate intakes, each to remove a maximum of 0.5 cfs during periods of low instream flow.

Table 7.5.4 summarizes the analysis of existing water availability and the impact that the addition of Yachats River water will have on maximum day demands during the planning period. The analysis assumes that the City will require only Yachats River water during periods of low seasonal streamflow in their primary source. Therefore, it is understood that only 1.0 cfs will be available from two 0.5 cfs diversions.

Table 7.5.5 – Potential Yachats River Impact On MDD

Parameter	2001	2021
MDD w/out Reductions	515,000 gpd (0.80 cfs)	856,900 gpd (1.32 cfs)
MDD w/ Reductions (85% Eff, 10%Conservation)	334,750 gpd (0.52 cfs)	556,985 gpd (0.86 cfs)
Minimum Flows in Primary & Secondary Sources	0.56 cfs	0.56 cfs
Water Available Under Municipal Reserve on Yachats River	1.0 cfs	1.0 cfs
Total Raw water Available	1.56 cfs	1.56 cfs

The analysis in Table 7.5.5 indicates that the addition of the 1.0 cfs municipal reserve on the Yachats River will provide the City with adequate raw water beyond the 20-year planning period. The projected use of the new source is obviously dependent on the City's ability to reach the reduced flow ranges discussed earlier in this section.

State and Federal agencies have worked to develop minimum streamflow standards for the fish-bearing streams on the Oregon Coast. On many of these streams, instream water rights have been established in an effort to ensure that minimum streamflows are protected. It is generally considered to be environmentally adverse when flows fall below the established minimum streamflow levels. Therefore, by the definition and criteria established by State and Federal agencies, if water is removed from the Yachats River during periods of low streamflow, a negative environmental impact should be expected. While the environmental impact of removing water in the amounts described by the City's water right is difficult to quantify, it is likely that by these definitions, the impact may be considered adverse.

It is worth noting that numerous private water rights exist on the Yachats River above the City's points of diversion. These private water rights are harvested throughout the year regardless of streamflows. Taken collectively, small private water rights may also result in an adverse environmental impact to the river.

It is understood that environmental concerns surrounding the Yachats River are in large part driving the efforts to prevent the City from developing their water right. While the City clearly has interests in protecting the river, they also have an obligation to provide water and fire protection to the consumers within the City system. The City must seek a balance of responsible, beneficial water use, and conservation of the natural resources in the Yachats River basin.

For water quality reasons, the City would choose to develop the upper point of diversion in order to divert the first 0.5 cfs of the municipal reserve. In order to remove the second 0.5 cfs, the lower diversion point must be developed. Costs to develop the upper diversion can be found in Section 10.3.

Regional Water Supplies. The City is currently involved in the development or investigation of the feasibility of three separate regional water supplies. The City considers the formation of a regional water supply as an important step toward solving their water demand problems.

The first regional supply option is that of **Rocky Creek** near Newport. The Rocky Creek project consists of the construction of a new dam and impoundment on Rocky Creek located north of the City of Newport. Early estimates suggest that the storage volume of the new reservoir will be approximately 9,000 ac-ft (over 2.9 billion gallons). This large storage volume would be capable of providing water for a significant population on the Oregon coast. Costs for the project are expected to be between $50-$100 million dollars.

The Rocky Creek project is in the early planning stages with significant challenges and obstacles to overcome before such a reserve will become a reality. The City of Yachats has expressed interest in the project and has pledged their support of the investigation and the feasibility study for the project. The financial impacts to the City are not known at this time and will be clearer once the studies and analysis of the project reach completion, as will be the case with the environmental impacts of such an endeavor.

The second regional supply the City has been pursuing centers around the **City of Toledo**. The City of Toledo has significant water rights and supplies available to them. Currently, in addition to providing for their own customers, Toledo provides for all the water needs of the Seal Rock Water District. The City of Yachats is in the process of developing an intergovernmental agreement with Toledo, Seal Rock Water District, City of Waldport, and Southwest Lincoln County Water District (SLCWD). The intergovernmental agreement essentially involves the governance of an interconnection of all the named water providers. The interconnection would enable the group to operate as a regional water supply with each entity being capable of providing or receiving backup or emergency water from the others as it is required.

A physical interconnection already exists between Toledo and the Seal Rock Water District. Separate physical interconnections will soon exist between Waldport, SLCWD, and the City of Yachats. In addition to the construction of a link between Seal Rock and Waldport across Alsea Bay to interconnect the entire system, it is expected that treatment process, transmission, and disinfection systems would require upsizing.

The Toledo option, as with the Rocky Creek project, is in the early stages of discussion and development. It is expected that within the next year or so that a regional water supply master plan and feasibility study will be developed. Estimates on costs, environmental impacts, and other project specifics should be deferred to the completion of the regional master plan so that all issues can be studied in more detail.

The third and final regional supply the City has been pursuing is a limited-supply agreement with the **City of Waldport and SLCWD**. The City is currently operating under a draft agreement with SLCWD to provide or receive water during a drought or emergency, as surplus water is available. SLCWD and the City of Yachats have sought to include the City of Waldport within this agreement to increase the base of water supplies available to each participant.

While none of the participants in the agreement would consider the mutual aid agreement as a long-term or reliable solution to water supply difficulties, the agreement does provide increased security for fire protection, system malfunction, or severe drought protection, though it is not likely one participant will have surplus water when the others are experiencing a significant drought.

The cost of the mutual aid agreement is relatively small, as is the impact to the environment. However, the increase in reliable and available water supply is also quite small. The agreement is an effective tool for short-term fire or emergency water provisions.

New Impoundments. While an impoundment on an existing source would not be considered a new source or new water right, an impoundment could serve as a significant source of raw water during periods of low streamflow in the existing sources. A number of opportunities exist for the City to construct an impoundment on an existing source. A brief description of each is provided below:

A small impoundment near the **Salmon Creek** diversion provides some raw water storage for that source; however, in terms of daily demands, the impoundment is small. An additional impoundment located higher in the basin of Salmon Creek once stored water for one home. Even though this old impoundment is silted in, it is too small to provide significant raw water storage. There has been some discussion and investigation into the construction of a significant dam and impoundment on the Salmon Creek drainage basin. Though the cost may be substantial, the City holds water rights on the stream and could store valuable water during the winter to be used throughout the summer months.
In 1998, a landslide above the **Reedy Creek** dam destroyed the dam and the Reedy Creek impoundment. The original impoundment served as a reliable water source for the City providing consistent flows throughout the year. There has been significant interest in restoring the dam and the impoundment in the Reedy Creek drainage basin. As with Salmon Creek, the cost of such a project may be significant. However, the reconstruction of an existing impoundment may be more feasible than the construction of a completely new facility. Also, the existing raw water transmission line is capable of providing raw water to the treatment facility through gravity flow.

The City owns a piece of property **south of the Yachats River** across from the water treatment plant. Preliminary investigations have been underway for the construction of a lined, earthen impoundment intended to store between 3 and 5-million gallons of raw water diverted from Reedy Creek. The impoundment would also serve as a settling pond to reduce turbidity and suspended solids in the raw water. In conjunction with the 0.5-MG raw water tank adjacent to treatment plant, the new south Yachats impoundment could be a significant step toward water supply independence. Approximate costs for the development of this impoundment are included in Section 10.3.

The purpose of the impoundments described above will not be to provide enough water to satisfy the demands of a summer season, but rather, provide a significant volume to attenuate high flow periods. In other words, during periods of low streamflows, the City may choose to divert water from the impoundments rather than directly from the source stream. Low streamflows in the source streams will be diverted into the impoundments throughout the day and night in order to fill the impoundments. During low and average flows, the streams will be capable of filling the impoundments, while during periods of high demand, the City will rely on the volume available in the impoundment to satisfy water demands.

Schedule for the Implementation of New Sources (OAR 690-86-140.4.c.B)

When putting together a schedule for the development of new sources, a number of criteria should be taken into consideration. The cost of the new source water including development and maintenance should be considered to determine the most cost-effective option. In addition to cost, availability, reliability, and environmental impacts should be considered. Table 7.5.6 illustrates a potential decision matrix that could be used by the City to determine which source or sources to pursue for development.

Table 7.5.6 – Source Decision Matrix

Ratings / Filter						
1= Discourages Source				4 = Favors Source		
Potential Source	**Estimated Cost Effectiveness**	**Water Availability**	**Water Reliability**	**Environmental Impacts**	**Total**	**Comments**
Unaccounted Water Reduction	3	2	1	4	10	Good source of water already in system. May be difficult to obtain significant volume.
Water Conservation	4	2	1	4	11	Good source of water. Results of conservation difficult to predict.
Yachats River	3	2	2	1	8	Only realistic source of surface water available to the City.
Regional : Rocky Creek	1	4	4	2	11	Good, but expensive alternative. Reservoir planning stages only.
Regional : Toledo	2	3	3	3	11	Good alternative. Many issues yet to overcome.
Regional : Waldport / SLCWD	4	1	1	3	9	Good emergency alternative. Not a long-term supply solution.
Impoundment: Salmon Creek	2	3	3	2	10	Environment impacts may be an issue
Impoundment: Reedy Creek	2	3	3	3	11	Good option. Reconstruction of existing facility. USFS Property.
Impoundment: South of Yachats River	3	3	3	3	12	Good impoundment alternative.

A decision matrix, such as the one developed in Table 7.5.6, depends upon subjective input for much of the criteria. Dependant upon one's outlook, ratings may change impacting the point total for each source. Due to the fact that only true potential sources were investigated, it is not surprising that the total scores are relatively close. Sources that were obviously not feasible were not included within the analysis (i.e., obtaining additional water from Salmon Creek).

The City is currently in need of additional source water under maximum-day conditions. Based on the above decision matrix, the following development schedule has been developed.

- **Unaccounted Water Reduction:** Efforts should begin immediately to reduce unaccounted water. The City has a goal of 85 percent efficiency by the year 2011.

- **Water Conservation:** Appropriate conservation measures should be developed in an effort to reduce overall water consumption an additional ten percent. See Section 7.8 for more specific information on water conservation programs.

- **Impoundment south of Yachats River:** The City has a goal to have an impoundment constructed and functional by 2003.

- **Yachats River:** The City has a goal of developing their upper diversion on the Yachats River in 2011. At this time, and during low seasonal streamflows, the City will be able to remove up to 0.5 cfs from the Yachats River under the municipal reserve within their water right permit. If the City is unable to develop alternative water supplies or other supply options, the timeline for the Yachats River may have to be accelerated.

- **Regional Supplies:** The City is currently involved in investigations and feasibility studies of the various regional supplies. Results of the various studies should be obtained prior to making final decisions about the best regional course for the City to follow.

- **Additional Impoundments:** The City has no immediate plans for the development of additional impoundments though investigations and discussions about impoundment alternatives, particularly Reedy Creek, will be ongoing throughout the planning period.

In addition to the requirements of the OAR, the City is required to satisfy a number of requirements specified in a Mutual Agreement and Order (MAO). One of the elements in the Order is a timeline of projects and goals leading the City's system to improved efficiency. The timeline and a number of other critical elements are presented in a technical memorandum in Appendix H.

7.6 Water Conservation (OAR 690-86-140.2)

Water providers are in the business of making and selling water. The sale of that water allows the utility to pay expenses, retire debts for system development loans, and plan for future water production facilities. Some providers may view conservation as an activity that is contrary to the financial survival of their water system. However, practically every water system is capable of making changes in their operation that will result in reducing "lost water" and lower production costs. The result of conservation is often an increase in operating revenues and a decrease in unnecessary and wasteful expenses. Responsible water management also includes educating the public about wasteful water usage practices.

> *"In order to meet the needs of existing and future populations and ensure the habitats and ecosystems are protected, the nation's water must be sustainable and renewable. Sound water resource management, which emphasizes careful efficient use of water, is essential in order to achieve these objectives.*
>
> *Efficient water use can have major environmental, public health, and economic benefits by helping to improve water quality, maintain aquatic ecosystems, and protect drinking water resources."* ~ EPA Office of Water, Statement on Principles on Efficient Water Use (December 1992)

The following sections are intended to provide the City with sufficient information to develop an active and efficient conservation program that will result in lower water use and reduced demand on the water system and the environment.

Water Conservation Progress Report (OAR 690-86-140.2.a)

As the City does not have a previously approved plan, they are not required to provide a progress report for previously implemented conservation measures. However, existing conservation measures are described later in this section.

Water Use Measurement and Reporting Program (OAR 690-86-140.2.b)

The City currently has meters in position to measure the flow from each point of diversion, the total flow entering the water treatment plant, the flow leaving the water treatment plant to the distribution system, and all end users in the service population. Also, a number of meters are used to measure the water used in the treatment plant for process water and the amount of water that is "wasted" from the backwash lagoon.

Daily records are kept at each measurement point and entered into logs at the water treatment plant. The City reads consumption water meters on a monthly basis and issues monthly bills indicating the volume of water consumed the previous month. It then utilizes a simple spreadsheet to perform an overall system audit on a monthly basis. This monthly audit has proven helpful in calling out irregular water use patterns that have turned out to be attributable to leaks, malfunctions, and other system problems. The City submits all annual reports as required.

The majority of the large meters used to measure the diverted water and treatment plant quantities are new and believed to be in good condition and measuring accurately. While the exact accuracy is not known, it is expected that the majority of the existing consumption meters are not in good condition and may not be reading within the required accuracy value of 15 percent. The City is currently undertaking a project to replace all existing consumption meters with an accurate and standardized meter make and model; the meter change-out program should be completed by June of 2003.

The City believes it is currently in compliance with the measuring and reporting guidelines as explained in OAR-690-85.

Current Conservation Practices (OAR 690-86-140.2.c)

The City of Yachats utilizes a number of conservation measures within its regular operating strategy. A summary of the current conservation practices is provided below:

- **Source water metering.** The City currently meters the amount of water removed from each source.
- **System wide metering.** The existing water system is fully metered enabling the City to compare the amount of water that is produced to the amount of water that is sold to its customers. The data can be used for audits and accounting practices. Meters are read on fixed intervals.
- **Public use water metering.** The City meters all water use including public facilities.

- **Public education.** The City includes conservation-minded water bill inserts on a semi-annual basis. The brochures remind consumers to be conservative and provide water conservation information to the public. The City also maintains a website with a conservation link describing various conservation measures and giving people tips about how they could conserve water in their own homes.

- **Retrofit Program.** The City currently has a retrofit program to replace inefficient and outdated water consumption fixtures. This has included providing, free of charge, fixture retrofit kits for showerheads, faucets, and other minor fixtures. The City is in the process of developing a toilet retrofit program that will provide rebates toward the installation of new ultra-low-flow toilets.

- **Water Reuse.** The City currently makes use of reuse water at both the wastewater treatment plant and the water treatment plant.

7.7 Conservation Planning Strategy

Water systems have a wide selection of specific conservation measures at their disposal. Some of the measures deal directly with the water provider while others are aimed at reducing the consumption levels of the water users. Appropriate conservation measures should be selected on the basis of how well they can help the system achieve water savings, program costs, and other implementation factors.

When evaluating potential conservation measures for a conservation program, water system managers should consider the following criteria:

- Program Costs
- Ease of Implementation
- Staff Resources
- Ratepayer Impacts
- Water Rights Issues
- Cost Effectiveness
- Budgetary Considerations
- Environmental Impacts
- Environmental and Social Justice
- Legal Issues or Constraints
- Permit Requirements
- Regulatory Approvals
- Timeliness of Savings
- Public Acceptance
- Consistency with Other Programs

Not all conservation measures are effective or appropriate for every water system. In order to assist water system managers in choosing appropriate conservation measures, the Environmental Protection Agency (EPA) has put together a number of guidelines and categories in order to facilitate choices.

The EPA suggests that water providers develop conservation programs that vary in their level of activity based on the size of the individual water system. In other words, the larger the water system, the more activities the water provider should undertake to conserve water. The recommended system size divisions and conservation levels are summarized in Table 7.7.1.

Table 7.7.1 – System Size Categories and Guideline Classifications

System Size Category (SDWA)	Applicable Guidelines
Serves fewer than 3,300 people	Basic Guidelines
Serves between 3,300 and 10,000 people	Basic Guidelines (up to 10,000 people)
Serves more than 10,000 people	Intermediate Guidelines (up to 100,000 people) Advanced Guidelines (more than 100,000 people)

The basic guidelines provide a simple planning approach for smaller systems to develop conservation strategies and programs; the intermediate and advanced guidelines lead to a comprehensive conservation plan appropriate for the resources and personnel found in larger water systems. The conservation measures recommended by the EPA for the associated guideline classifications are summarized in Table 7.7.2.

For a description and evaluation of various individual conservation measures, see Section 7.8. Section 7.9 outlines the measures that are currently required of all systems by the OAR rules and the Oregon Department of Water Resources. The City should, at a minimum, implement the conservation measures outlined in Section 7.9.

The EPA guidelines are divided into three levels of activity. All water systems, regardless of size, should consider the fundamental conservation principles outlined under Level 1. The measures in Levels 2 and 3 are appropriate for systems with greater conservation needs and the resources to develop a more robust conservation program. However, a water system manager should feel free to adopt any conservation measure that would provide a substantial benefit to the system.

It should be pointed out that conservation measures do not necessarily include activities to reduce unaccounted water. Though some measures will result in this end, conservation measures are generally intended to make long-term changes in consumption and management practices. The City has been active in developing conservation measures in their community and is committed to increasing their efforts and making even more efficient use of their water resources in the future.

As illustrated in Table 7.7.2, a wide variety of conservation measures are available to managers of water systems. Which measure(s) a water system chooses to adopt depends on a number of issues. In most water systems, water conservation begins on the supply side. Many of the following measures are to be carried out by the water supplier; others rely on involvement from the consumer. Typically, a combination of both types of measures will result in a successful conservation program.

Table 7.7.2 – Guidelines and Associated Water Conservation Measures

Measures	← Advanced Guidelines →		
	← Intermediate Guidelines →		
	← Basic Guidelines →		
Level 1 Measures			
Universal Metering	• Source Water Metering • Service-Connection Metering and Reading • Meter Public Use Water	• Fixed Interval Meter Reading • Meter Accuracy Analysis	• Test, Calibrate, Repair, and Replace Meters
Water Accounting and Loss Control	• Account for Water • Repair Known Leaks	• Analyze Nonaccount Water • Water System Audit • Leak Detection and Repair Strategy • Automated Sensors/Telemetry	• Loss-Prevention Program
Costing and Pricing	• Cost of Service Accounting • User Charges • Metered Rates	• Informative Water Bill • Water Bill Inserts • School Program • Public-Education Program	• Workshops • Advisory Committee
Level 2 Measures			
Water-Use Audits		• Audits of Large Volume Users • Large-Landscape and Irrigation Audits	• Selective End-Use Audits
Retrofits		• Make General Retrofit Kits Available	• Distribution of Retrofit Kits • Targeted Programs
Pressure Management		• System-wide Pressure Management	• Selective use of Pressure Reducing Valves
Landscape Efficiency		• Promotion of Landscape Efficiency • Selective Irrigation Submetering	• Landscape Planning and Renovation • Irrigation Management
Level 3 Measures			
Replacements and Promotions			• Rebates and Incentives • Promotion of New Technologies
Reuse and Recycling			• Industrial Application • Large Volume Irrigation Application • Selective Residential Applications
Water Use Regulation			• Water Use Standards and Regulations • Requirements for new Developments
Integrated Resource Management			• Supply-Side Technologies • Demand Side Technologies

7.8 Feasibility of Conservation Measures (OAR 690-86-140.2.d)

The OAR requires that a water provider perform an evaluation of various conservation measures to determine if they are "feasible and appropriate" for the provider to implement. The provider must consider economic feasibility, environmental impacts, availability of proven technology, time requirements to implement modifications, local variations, expected effectiveness of measure, and other pertinent criteria.

The following section seeks to provide analyses for various measures as required by the OAR guidelines.

System Wide Leak Repair Program (OAR 690-86-140.2.d.A)

General. A leak detection and repair program may include regular on-site testing using computer-assisted leak detection equipment, sonic leak detection surveys, or another acceptable method for detecting leaks along water distribution mains, valves, services, and meters. The inspections should include the internal inspection of water tanks and reservoirs.

Water leakage can be measured in terms of water volumes as well as the associated costs required to treat, store, and distribute water to the consumers—"lost" water produces no revenue for the utility. Repairing leaks can result in significant savings and additional revenues for the water system.

The goal of a system-wide leak detection program should be to reduce leakage to 15 percent of the total water produced. If the reduction to 15 percent is found to be feasible and appropriate, the water system management should strive to reduce leakage to 10 percent or less. It should be pointed out that system leakage differs from unaccounted water in that, system leakage does not include unmetered, unauthorized, or water lost through other ways. The goal of a leakage program is to reduce the water that leaves the conduits, tanks, or other system components and enters the environment.

Leak Detection. On a number of occasions in recent years, the City has hired leak-detection firms to perform isolated leak detection surveys of the City system. On nearly every occasion, the leak-detection contractor found minor leaks that the City was able to repair. However, using sonic leak-detection equipment in Yachats presents a number of challenges. The constant "white noise" created by the waves crashing on the rocks and the traffic on Highway 101 creates interference that can "mask" the sound created by many leaks.

The City should continue to bring in leak-detection consultants to scan the distribution system for leakage; any leak found and repaired will reduce lost water and add up to significant savings. The City should develop a map that will allow them to graphically keep track of the areas it has swept with the leak detection equipment. Over five years or so, the City should seek to scan the entire system and leaks should be repaired as discovered. Development of a planned strategy will benefit the City and allow it to demonstrate its leak detection plan to interested parties.

Repair. The City has made significant progress over the years to locate leaks and repair piping, valves, and other infrastructure elements; monthly water audits have been helpful in indicating abnormal losses in the system. Recently, monthly audits prompted City personnel to search for a leak in the southern portion of the system. A 2-inch diameter service line under a creek was broken and leaking into the creek. This particular leak was difficult to locate because the leakage was flowing directly into the creek and not into the ground.

In 1998, the City replaced 1.5 miles of AC raw water piping known to be in poor condition. The old piping was replaced with fusion-welded HPDE piping known for being essentially 100-percent leak-free. The City intends to replace an additional 1,200 lineal feet of raw water piping during the upcoming planning period.

Meters. While the City has been active in locating leaks, repairing leaks, and repairing or replacing aged infrastructure, it may not be said that the City has an official "plan" for leak detection and repair. As was developed in Section 5.2, consumption records indicate that the City has had consistent losses in the distribution system averaging 26 percent over the past four years. Preliminary testing of existing water meters suggests that they may be reading 20-percent low. If the existing meters are replaced, losses in the distribution system may be reduced significantly.

Section 10.7 includes project development information and estimated costs for the complete change out of all meters.

Distribution System Piping. Much of the distribution system consists of aged, small diameter AC piping. In other water systems, piping of this era and material class have been shown to be very leaky and inefficient water conduits. It is anticipated that many of the small diameter AC piping in the City of Yachts distribution system is in similarly poor condition.

The City wishes to undertake capital improvement projects during the planning period to replace all suspect piping in order to reduce leakage and system losses. The City has a ten-year goal (2011) for completion of the replacement of all piping sections identified for replacement. See Section 10.3 for project development and costs for each section of pipe replacement. Section 11 includes phasing and implementation plans for the improvements.

Feasible and Appropriate. The City experiences consistently high losses in its distribution system. Overall system losses average approximately 40-percent of the total water diverted from the City's sources. While it is not possible to quantify, it is likely that the City experiences more than 15 percent leakage in its system. It is therefore considered to be *appropriate* that the City adopt a formal leak detection and repair program. The program is to consist of an organized leak-detection sweep of the City over a five year period, replacement of all existing consumption meters over a 5-year period, replacement of suspect distribution system piping over a ten year period, and the immediate repair of all leaks upon discovery.

Undertaking an aggressive leak-detection and repair program is *feasible* for the City. It must reduce overall system losses to be able to develop additional water supplies for future growth. It has little choice but to take the necessary steps to reduce system losses. With over 40 percent overall losses, financial benefits, natural resource benefits, environmental benefits, and many other benefits await the City if it is successful in reducing leakage and water losses. Also, the City is under a stipulated order with the Oregon Department of Water Resources and has committed to reduce leakage and losses within its system.

Schedule and Budgeting. The City has a goal to complete the replacement of all existing consumption meters by July 2003. Work toward this goal has already begun and is expected to accelerate in the coming years. See Section 10.7 for budget and project information as the project is included in the CIP.

The City also has a goal of making a full leak-detection sweep of the system by July, 2006. This will incorporate sonic or other leak detection technology in conjunction with immediate repairs of located leaks. Pipes found to be in poor condition will be identified and slated for replacement; approximately $2500 per year will be budgeted for leak detection and repair activities.

The City has a goal to construct and/or replace all waterlines identified in Section 10. Many of these lines are undersized AC lines and are suspects for leakage and losses. Additional piping replacement may be added to this list as leaky and failed sections are identified.

Programs to Encourage Low Water Use Landscaping (OAR 690-86-140.2.d.B)

As was developed in Section 7.3, residential water consumption records indicate a 39 percent increase in per capita water consumption between February and August. Estimates of commercial per capita consumption increase 68 percent between the low and high monthly demands. It is reasonable to assume that the majority of the water consumption increase can be related to increases in outdoor water use brought on by mild or warm summer weather. This increase in outdoor activities may include outdoor recreation, gardening and landscaping water, increased water use by the tourist population, increases in visitors to Yachats not staying in lodging facilities but stopping to visit and using water from various sources, and other seasonal water uses.

Of particular interest is the practice of landscape irrigation. Because of its location on the southern Oregon coast, Yachats is not known for extravagant landscape water usage. In fact, the four major hotels in Yachats have adopted low water use landscaping and use very little water for landscaping during the summer months. However, nearly all residential and most commercial facilities can attribute a portion of their water consumption toward landscape irrigation. In this section, the issue of efficient landscaping practices will be discussed.

General. The efficiency of typical landscape-irrigation techniques has been estimated at 50 to 80 percent. (Water Conservation in California, California Department of Water Resources, 1984) This indicates that between one-fifth and one-half of the water applied to irrigation is not utilized by vegetation. Instead, the water evaporates as it is applied, percolates into groundwater, or runs onto streets or into storm drainage systems.

Outdoor water usage, including landscape watering, drives maximum-day demand, which in turn drives system capacity requirements for water system components. Reduction of landscape water demand can play a positive role in a water conservation program. In arid climates where landscape irrigation is very common, this type of conservation is very important. In western Oregon, landscape irrigation plays a relatively smaller role, however, it does impact the maximum day demand levels and some water providers may find appropriate applications for landscape conservation.

Utilities can promote the development of conservation through low water use landscaping practices. These practices can begin on City projects and then extend into planning and design activities including development and management of new landscape projects, development of public parks, and golf courses. Existing landscapes and irrigation systems can be renovated to incorporate water-conserving practices.

Xeriscaping™. This low water use irrigation program encompasses the following principles:

- Planning and Design
- Limited Turf Areas
- Efficient Irrigation
- Soil Improvement
- Mulching
- Use of Lower Water Demand Plants
- Appropriate Maintenance

Water savings from low-water-use landscaping can be significant with some estimates as high as 63 percent compared to traditional landscaping. Significant information on xeriscaping is available from the National Xeriscape Council. Lists of appropriate plants, guidelines for design, example regulations, and other support is available. The following incentives may be utilized to encourage homeowners to convert to low-water-use landscaping:

- Offer water connection fee discounts for new homes with approved low-water-use landscaping incorporated into home site.
- Create a demonstration garden (See Landscape Efficiency Education discussion below)
- Develop an approved low-water-use plant list for the area
- Develop landscape guidelines and distribute to community
- Develop promotions with local nurseries
- Prepare public information materials addressing low-water-use landscaping

For more information on xeriscaping, see the xeriscape website at www.xeriscape.org.

Landscape Policies, Planning and Renovation. New construction, commercial or residential, can be directed to incorporate low-water-use plantings and develop efficient watering methods and systems. Public parks, City buildings, and other common areas can be renovated, incorporating efficient landscaping practices, and setting the standard for others in the community to follow.

Utilities can coordinate with local nurseries to ensure low-water-use plantings are available and efforts are made to educate the public as to the benefits of landscape efficiency.

Landscape Efficiency Education. Significant resources are available to assist the provider in educating the consuming public on the merits of landscape efficiency. Some communities have developed "demonstration gardens" in public parks or common areas to showcase low-water-use landscaping and irrigation practices. These gardens include low water consumption plants and groundcover as well as the latest technology in efficient irrigation. Signs and reader boards describe each plant and component of the garden and urge community members to use similar landscaping at their homes.

Also, pamphlets, videos, CD-ROM's, and other media are readily available from various agencies for the purposes of public education concerning landscape irrigation.

Feasible and Appropriate. As was shown earlier in this section, per capita water consumption in Yachats does increase significantly between winter and summer months, though many of the existing lodging facilities in Yachats have already adopted low water use landscaping. While the exact amount of landscape water usage is not known, it is common for residential and some commercial water users to irrigate their properties in the summer months to maintain turf and plantings.

Yachats is located on the Oregon coast, and as such, is known for significant precipitation levels. However, evidence does suggest that at least a small portion of the summer water consumption may be attributed to landscape irrigation. Increasing the efficiency with which that landscaping water is used will reduce maximum water demand levels and decrease the demands placed on the City's raw water sources during the drier summer months. The inclusion of a low-water-use landscaping program for the City is, therefore, considered to be *appropriate.*

The costs associated with implementing a low-water-use landscaping program may vary widely. Costs may be as low as a few dollars for education materials and as high as many thousands of dollars per year for renovation and new construction incentives. A mid-range program to provide educational information, policies for new construction, and some simple incentives would be appropriate for the City of Yachats. The relatively low cost and the potential for water savings makes this measure a *feasible* conservation option for the City.

Schedule and Budgeting. By July of 2003, the City intends to adopt an official low-water-use landscaping program complete with guidelines, regulations, incentives, and educational information. The estimated budget for this item will depend on the level of detail and involvement the City wishes to undertake with its landscape conservation plan. The budget for this item will be set at a later date as the details for the program develop.

Incentive Programs that Encourage Conservation (OAR 690-86-140.2.d. C)

The greatest incentive a water provider can offer to its customers is to save money. Some savings are direct and from the provider while others are indirect and originate from such sources as reduced electrical costs for low-flow showerheads and reduced maintenance costs from low-water-use landscaping. Other savings may come from rebates or retrofit programs sponsored by the provider or other agencies. When used properly, water conservation incentive programs can play a significant role in putting ideas into action and making conservation measures a reality. This section will discuss various incentive programs available to the City.

Rebates. In order to accelerate the replacement of older, less efficient fixtures and appliances, utilities can offer rebates and other incentives to customers that upgrade. Customers should be encouraged to replace their old inefficient plumbing fixtures or to use retrofit kits. The City should also stock kits for supplying new residences as part of the basic hook-up fee.

Retrofit kits usually consist of toilet tank inserts, low-flow showerheads, faucet flow restriction devices, toilet leak detection dye tablets, and an informational guide. The cost of these retrofit kits varies between $1.50 to $7.00 each, depending upon the number and specific items included. Only showerheads and faucet restrictions should be needed for new residences.

Many water and electrical utility providers offer rebates to customers who purchase approved, efficient appliances. This may include front-loading washing machines and highly efficient dishwashers. The City may wish to offer incentives to customers who purchase these appliances for use in their homes or provide forms and information to facilitate the reception of rebates available from such sources as the Department of Energy. For more information on rebates available from the Oregon Department of Energy, see their website at *http://www.energy.state.or.us/res/tax/taxcdt.htm* . To assist the City in providing the necessary forms to its customers, a copy of the basic forms necessary to apply for a energy and water conservation rebate is provided in Appendix D.

Connection-Fee Discounts. As mentioned previously in the landscaping efficiency section, incentives in the form of connection fee discounts can be offered to developers or builders who incorporate low-water-use landscaping into their development. Specific guidelines and standards should be prepared in order to describe what is required to receive the discount.

The City may wish to extend a similar discount to water customers who renovate or remodel and incorporate new technology or new landscaping with the intention of reducing water consumption levels.

Feasible and Appropriate. The City currently has a number of incentive programs in place. In 1999-2000 the City distributed approximately 1,000 retrofit kits at a cost of approximately $5 each. The kits were distributed to all water customers and were to be installed by the customers themselves. The total number of kits installed in homes is not known. It may be appropriate for the City to perform a sampling poll to determine how many households installed the free kits. Additional kits are available today for new customers or upon request.

Also, the City is currently developing a program for the retrofitting or replacement of older, high-flow toilet systems. The City estimates that approximately 460 houses in Yachats were built prior to 1995 when local plumbing codes began to enforce low-flow toilet fixtures. It is estimated that as many 1,000 toilets in Yachats could be retrofitted with low-flow fixtures.

Under the proposed program, a customer may apply to receive a $100 rebate toward the replacement of each and every high-flow toilet at each household. The City will perform a brief pre-installation inspection to determine if the existing toilets meet the replacement requirements and a post-installation inspection to confirm that the new ultra-low-flow toilets have been installed. At the time of the pre-installation inspection, the City intends to inspect showerheads, nozzles, and other fixtures, and provide a new retrofit kit if low-flow fixtures are not in place. Upon return for the post-installation inspection, it will be determined if the new fixtures were installed. See Appendix E for information on the City's toilet retrofit incentive program.

If the City is capable of encouraging conservation through simple incentive programs, all benefits realized will enhance efforts to reduce the demands on its raw water sources. According to the AWWA, average per capita water consumption (inside water use) can be reduced by up to 57 percent for homes that adopt comprehensive conservation practices. Due to the potential benefits for the water system and the programs already in place, incentive programs are *appropriate* for the City of Yachats.

Since incentive programs often require the consumer saving or receiving monies, the costs of such programs can often be great. For instance, if all 1,000 of the estimated high-flow toilets in Yachats are replaced and a $100 rebate issued for each toilet, the City must be prepared to pay up to $100,000 in toilet retrofitting rebate costs. However, up to 20,000 gpd (7.2 million gallons per year) could be conserved by using the new ultra-low-flow toilets. The cost of retrofitting the old toilets would be approximately $0.01 per gallon conserved in the first year. If water reductions resulting from showerheads, faucets, front-loading washers, and other efficient fixtures are included, the positive impact to the water system could be great.

Due to the above issues and many others, the continued inclusion of incentive programs in the City's system in considered to be *feasible* as well as appropriate.

Schedule and Budgeting.

The City's toilet retrofit program is not scheduled to begin until October of 2003. Plans are being made to budget $5,000 per year to fund the program. In addition to this funding, the City plans to budget $1,500 per year for the purchase of additional retrofit kits to be distributed during the required home inspections.

The City will continue to make retrofit kits available upon request, and free of charge. Information on DOE rebates and other conservation incentives is currently available at City Hall.

Retrofitting or Replacement of Existing Inefficient Fixtures (OAR 690-86-140.2.d.D)

As was discussed in the previous section, the City has an existing retrofit program and has made significant strides toward retrofitting inefficient fixtures in the City of Yachats. In the past few years, the City has distributed over 1,000 retrofit kits to their water customers. The City is also developing a toilet rebate and retrofit program to retrofit all older and inefficient toilets.

It is estimated that a non-conserving residential dwelling will use, on average, more than 50 percent more water than a residential dwelling that adopts and follows conservation practices. Figures 7.8.1 and 7.8.2 demonstrate the different water use patterns between conserving and non-conserving homes.

FIGURE 7.8.1
AVERAGE INSIDE WATER USE
NONCONSERVING HOME

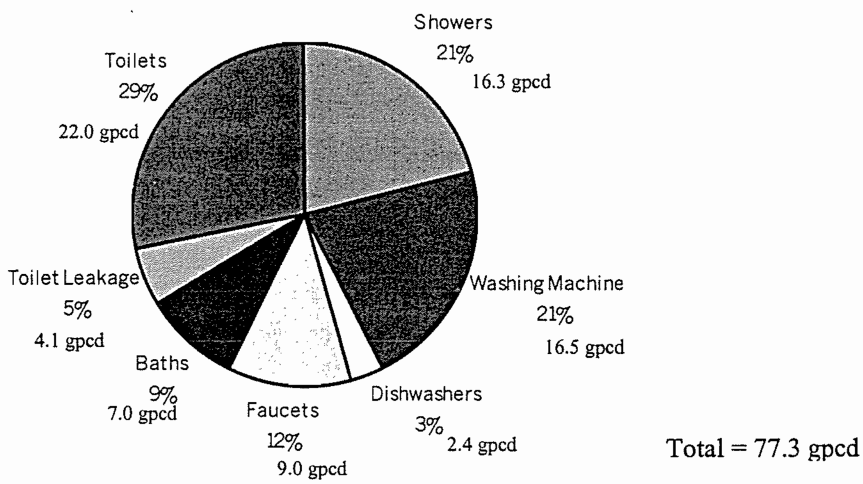
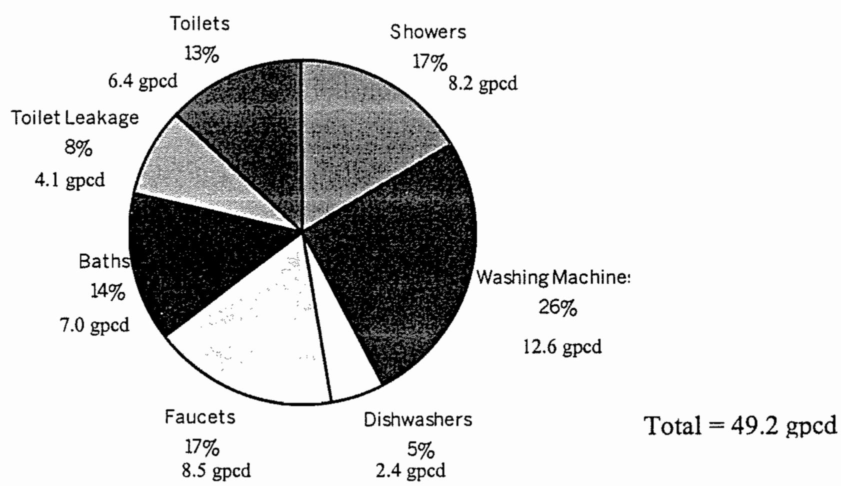


FIGURE 7.8.2
AVERAGE INSIDE WATER USE
CONSERVING HOME



If the City is successful in obtaining comprehensive participation in its retrofit programs, water savings such as those outlined in the above figures should be expected. For a description of these programs and the City's plans to incorporate them, see the previous section on incentive programs to encourage conservation.

Adoption of Rate Structures that Support and Encourage Water Conservation (OAR 690-86-140.2.d.E)

General. The City of Yachats charges customers for their water based upon a standard base rate plus a consumption rate. The existing water rates for the City are summarized below in Table 7.8.1.

Table 7.8.1 – Existing Rate Structure – City of Yachats

Fiscal Year	Base Rate $/Month	Consumption Rate $ / 100 cu. Ft.
2000-2001	$23.00	$2.60

Based on the current ADD for the residential sector, the average consumption per residential household is approximately 400 cubic feet. Based on this consumption estimate, the average residential water bill in the City of Yachats is approximately $33.40. During the summer months, and based on maximum month characteristics, the average residential water bill rises to approximately $38.60 (~600 cu. ft.).

For a community to receive grants, low-interest loans, or other funding, a number of requirements must be met. One requirement is that a water provider must set rates resulting in an average water bill that meets or exceeds the state average water bill. While the figure for the state average changes rapidly, when this study was prepared, estimates of the average state water bill were running between $38 and $40 per month. Based on these estimates, the City's existing rates are not in excess of the state average.

The City of Yachats issues a sewer bill in conjunction with their water bill that, generally, is dependent upon the volume of water measured at the water meter. The rational behind this common system is, that, the majority of water that passes through the meter will, sooner or later, end up in the sewer system.

The City of Yachats uses water consumption data to calculate the appropriate sewer charges for the entire year and charges a sanitary sewer base and volumetric rate. The sanitary sewer volumetric rate is constant with the exception of the months of May to September. During these months, the consumption, or volumetric sanitary sewer charge changes from $2.00 per 100 cu. ft. to $1.50 per 100 cu. ft. The reasoning for this discount is that the City recognizes a portion of the summertime water consumption is used for landscape irrigation and other outdoor or recreational use and does not find its way to the sanitary sewer system. While this policy is not intended to encourage excess water use, and is directed at the sewer system charges, the result may be interpreted as a reduced summertime water rate that, in fact, encourages water consumption.

While the purpose of this study is not to change sanitary sewer rates, the overall picture of the City's utility charges must be considered. If the lower summertime sewer rate is perceived as a summertime water consumption discount, steps should be taken with the water billing rates to offset the sanitary sewer discount, or provide a conservation incentive to encourage lower summertime water usage.

Conservation Rate Structures. Water providers should develop a water rate structure that supports and encourages water conservation. The conservation rate structure may include inverted block pricing (i.e., the price per gallon increases with elevated water use) and may include seasonal price differentials (i.e.; cost of water is higher during periods of high consumption, such as the summer months). The rates should depend on metered volumes to determine the charge to each customer. Major commercial customers and residential customers with larger meters (two inch or greater) may be charged a higher rate than normal residential users.

An effective conservation rate structure should be developed so as to encourage maximum participation in the conservation efforts. The most effective means of encouraging this participation is to develop a multi-step rate structure. Each step in the rate structure should be carefully established so as to accomplish the most in terms of conservation with the most customers.

If the average, monthly, household water consumption in Yachats is approximately 400 cubic feet per month and the maximum monthly household consumption is approximately 600 cubic feet, (as developed previously), an appropriate multi-step rate structure is summarized below in Table 7.8.2.

Table 7.8.2 – Potential Multi-Step Water Conservation Rate Structure – Residential Sector (1 EDU)

Criteria	Rate
Base Rate	$23.00 /month
Consumption Rate:	
0 – 300 cu. ft.	$1.75 / 100 cu. ft.
300-500 cu. ft.	$2.50 / 100 cu. ft.
500 –up cu. ft.	$3.00 cu. ft.

The City may choose to use a conservation rate structure only in the summer months or throughout the year. The effectiveness of such a structure will depend greatly upon the City's ability to educate the consumer on the new rate structure and the benefits available to the consumer when practicing water conservation.

Commercial consumption in the City of Yachats accounts for almost one-half of the total water used in the City system. The vast majority of commercial consumption is attributed to the numerous motel and lodging facilities located within the City. Special consideration should be given to these establishments so as not to penalize the motels for typical water consumption. EDU methodology, weighted limits, or some other method must be considered when developing a conservation rate structure for the commercial sector.

If for instance, EDU methodology was used, a certain motel may be considered to be equivalent to 20 EDU's. In this hypothetical case, each consumption rate level in Table 7.8.2 would be multiplied by 20 to determine the levels for the hypothetical motel. The conservation rate for the motel would then be from 0 to 6000 cu. ft., and so on.

Prior to the establishment of a conservation rate structure, the City may wish to perform a detailed rate analysis to determine the most appropriate conservation rate structure for the City's needs. The rate analysis should make concessions for the improvement projects described in Section 10 and the recommended phasing described in Section 11. A rate analysis of this magnitude was beyond the scope of this study. If EDU methodology is required, each non-residential account must be assigned an EDU rating based on existing consumption levels. This rating may be subject to review on a regular basis.

Feasible and Appropriate. The City is in need of additional raw water during the high-demand, summer months. Conservation rate structures have the potential of reducing the overall consumptive demand on the system. If correctly administered, the City will not experience a drop in revenue, while the availability of existing raw water supplies will be extended. Due to the City's need to protect their raw water supplies, a conservation rate structure is considered to be *appropriate.*

Because a conservation rate structure can provide benefits without sacrificing system revenues, it is also considered to be *feasible*. It should be reiterated, that, a detailed rate analysis should be performed to assist the City in development of an appropriate conservation rate structure. The new rate structure should include a detailed analysis of residential water use and develop a rate or multi-rate system that will encourage the maximum participation in the conservation effort. The new system should also include an equitable method to allow participation by the significant commercial water consumption sector.

Budget and Schedule. The City intends to investigate a new conservation rate structure that will encourage conservation in both the commercial and residential sectors. Development of the new structure is scheduled to be completed by July of 2003. No budget estimates are required for this measure.

Water Reuse Opportunities (OAR 690-86-140.2.d.F)

General. Supply-side water reuse generally includes reuse of process water from community treatment plants. Non-potable water reuse at a wastewater treatment plant can significantly reduce treated water consumption at the facility. Reuse of filter backwash at a conventional water treatment plant can also reduce the amount of treated water required at a water plant.

On the demand-side, gray-water reuse has gained favor in more arid communities. Though not currently allowed on residential systems in Oregon by DEQ, gray-water includes all household wastewater not containing human waste. This would include sink drains, shower and bath drains, roof drains, and other sources of non-potable water. Often, separate plumbing systems are developed with holding tanks that can be utilized as storage for landscape irrigation systems, non-potable outdoor washing, and other non-potable water uses. Another benefit of such systems is that less water enters the sanitary sewer system, thus extending the life and capacity of sanitary facilities.

While the benefits of residential and commercial gray-water systems are obvious, the additional costs for redundant plumbing and storage systems are often more than the property owners are willing to develop.

Larger commercial and industrial facilities can often benefit from water reuse programs. Depending on the types of facilities and the processes involved, significant savings in both money and water supplies can be achieved. One such area where significant savings has been realized is in facilities with cooling towers. In the past, evaporated water removed in cooling towers was drained to the sanitary sewer. Today, many of these facilities are finding effective ways to reuse this water within their own process.

Treatment Plant Reuse. The City of Yachats currently has a water reuse program at its wastewater facility. During the calendar year of 1996, the City used approximately 1.72 million gallons of treated water at their wastewater plant for wash down and other process water needs. Changes were made to the treatment plant operations including the addition of a non-potable water system. Where treated water was once used, today non-potable water is used to wash the treatment basins, foam removal, and other process water uses. In 1998, the treatment plant treated water consumption totaled just 649,000 gallons. The inclusion of non-potable water to the wastewater plant reduced treated water consumption at the plant by more than 62 percent. The City continues to look for ways to increase its water conservation efforts at the wastewater treatment plant.

The City water treatment plant utilizes flocculation, clarification, filtration, and disinfection processes. Filter backwash water, instrumentation sampling water, and other process water is drained from the plant and into a concrete backwash lagoon. Until the last few years, water from the backwash lagoon was wasted and disposed of through a land application system.

The reuse of backwash water is a controversial topic. According to the Oregon Health Division, current guidelines and standards do allow a water provider to reuse backwash water by sending it back through the treatment process. The main reason for concern is that materials and organisms removed during the filtering process are washed into the backwash lagoon during a backwash cycle. If that water, (and the materials and organisms), are then recycled back into the treatment process and trapped in the filters again with additional materials and organisms, the potential for a buildup or concentration of these materials and organisms exists.

The Environmental Protection Agency is currently reviewing filter backwash regulations and backwash reuse rules. Until these rules are developed or changed, there are no current regulations or guidelines suggesting the City should not reuse their backwash water.

Today, the City reuses nearly all backwash waters from the backwash lagoon. With the exception of the wettest winter months when turbidity in the lagoon exceeds reasonable levels, all lagoon water is reintroduced to the influent raw water stream and reused. During the summer months this has proven to be a valuable conservation measure reducing lost water at the plant from approximately 12 percent in 1996 to nearly 0 percent today. While some water is still land-applied in the wettest months, all water is reused during the critical summer months.

Feasible and Appropriate. The City currently reuses water at both its water and wastewater plants. As described above, the City is able to save significant amounts of water through reuse efforts resulting in less water required from raw water sources. Due to the success and minimal costs to reuse water at each plant, the measure is both *feasible* and *appropriate*.

Budget and Schedule. Since the City already practices water reuse, additional scheduling is not required. Because the systems to facilitate these reuse programs are already in place, no additional budgeting is required.

Other Conservation Measures Identified by the Water Supplier to Improve Water Use Efficiency (OAR 690-86-140.2.d.G)

Pressure Management. The City experiences high flows in the southern portion of its distribution system. The area west of Highway 101 can experience pressures between 80 and 100 psi. Mainline pressure reducing valves (PRV's) are notorious for being maintenance problems and commonly do not function properly, as is the case in the westernmost portion of the City's system. Also, mainline PRV's tend to cause low-pressure problems for residences downstream from the PRV that are located in the upper elevations.

The City is currently developing a program to install service line PRV's on many residences within the high-pressure zone. Demand-side pressure reduction studies have shown that a 30 to 40 psi decrease in water pressure can result in water savings between three and eight percent. (HUD water conservation study, Atlanta, Denver, Boston.) While the exact savings expected within the City of Yachats is not known, it is believed that pressure reduction in the high pressure zone is an appropriate measure that fits nicely with the retrofit efforts and leak detection program. It is anticipated that approximately 400 water service accounts could benefit from pressure reduction measures.

Budget and Schedule. The City intends to make PRV's and meter boxes available to interested parties located within the high pressure zone. The PRV's are to be installed on the customer-side of the meter by the customer and be maintained by the customer. The City plans to budget $2,500 per year for pressure management with installations beginning in July of 2003.

EPA WAVE Program. The Water Alliance for Voluntary Efficiency (WAVE) is a program intended to assist the lodging (motel, hotel, etc.) industry and other commercial industries to reduce water consumption and be more water-conservation minded. Sponsored by the Environmental Protection Agency (EPA), hotels and motels become members of the WAVE program by voluntarily developing conservation programs within their own establishments. Facilities that choose to take part in the WAVE program must sign a Memorandum of Understanding (MOU) with EPA. Wave participants agree to:

- Appoint a WAVE Implementation Manager
- Survey water use devices in all facilities
- Consider options for achieving greater water use efficiency and implement those options that maximize efficiency provided that they are profitable and do not compromise business operations
- Upgrade water use devices so that 90 percent of the projected reductions in water use are realized within five years
- Incorporate water-efficient devices in new facility design
- Provide annual information to EPA on efficiency measures implemented and the related savings in water, energy, and costs, and
- Inform customers and employees about the benefits of water use efficiency

The City of Yachats has a number of motels that, together with a few other commercial accounts, consume approximately 50 percent of the treated water within the system. Due to the significant water use in this sector, it only makes sense that the City would be interested in involving the lodging facilities in the conservation effort.

Benefits for the lodging facilities include:

- **Options Analysis System.** A computer software package that allows WAVE partners to survey water use in facilities, evaluate water efficiency options, and choose the most cost-effective water efficiency upgrade.
- **Training Workshops.** Regular meetings are held that will inform hotel management of the benefits of water efficiency and provide technical information to facility engineers.
- **Supporter Program.** WAVE supporters are equipment manufacturers, water management companies, and utilities that have agreed to educate customers about water efficiency.
- **Endorser Program.** These groups include membership associations and other organizations that support WAVE.
- **Public Recognition.** WAVE will place public service advertisements in major publications and EPA will distribute ready-to-use promotional materials to promote WAVE activities.

- **Financial Benefits.** By changing to water efficient equipment and procedures, a hotel or motel can cut its water use by up to 30-percent. Costs for investments in new equipment can often be recovered in three to five years.

- **Avoidance of Mandatory Audits.** Until the City of Yachats realizes its goal of 85-percent water efficiency, they are under order to perform mandatory annual audits of their major water consumers. For the City of Yachats, this will require an annual audit of each hotel within the community. The audits will require the hotels to account for all water consumption from the meter to each point of end use. In an effort to encourage participation in the WAVE program, the City may wish to develop an audit charge for facilities that do not participate in WAVE and are required to have the annual audit performed by the City.

Due to the significant commercial sector in the City of Yachats, it is critical that water conservation is practiced within these facilities. If the commercial sector (including lodging facilities) were able to reduce their total water consumption by 30 percent, the savings to the entire system would be 15 percent of the total water consumed. This reduction in water consumption would result in less water being diverted from the raw water sources and the extension of the viability of existing sources.

The City is developing a program intended to encourage water conservation within the lodging community. The intent is to encourage each lodging facility to join the WAVE program. It is believed that active participation in the WAVE program will yield immediate and long-term water conservation reductions. Additional information on the EPA WAVE program is available on the internet at *http://es.epa.gov/partners/wave/wave.html.*

Budget and Schedule. The City has made inquiries into setting up meetings with Federal WAVE personnel and various lodging facilities on the Oregon coast. The Oregon State University facility in Newport has been approached as a possible host for the meeting; OSU has been involved in earlier studies and investigations concerning WAVE and other organized conservation programs. The City's goal is to involve all lodging facilities in the WAVE program by July 2003. There are currently no plans to budget City funds for the development of the WAVE program in Yachats.

7.9 Mandatory Conservation Measures (OAR 690-86-140.2.e)

As was summarized in Section 7.7, many different types of conservation measures are available to water providers. Measures vary in complexity, cost, effectiveness, appropriateness, and a multitude of other ways. Which measures a provider chooses to incorporate into his or her own conservation plan also depends upon a number of issues.

While the water provider is free to choose from many conservation measures, OAR 690-86 does require that the provider undertake some mandatory conservation activities. The following section provides a description of each measure, how it is currently being implemented, a description of the schedule and budget for each measure, and other recommendations as appropriate.

Annual Water Audit (OAR 690-86-140.2.e. A)

General. The purpose for an annual water audit is to track the efficiency of the system, monitor water consumption levels, determine effectiveness of conservation measures, and gather system performance data. The OAR requires determination of the level of unaccounted-for water as communities seek to reach efficiency goals of 85 percent or greater.

Program. The City currently performs a monthly water audit of its entire system. City staff have developed a spreadsheet that allows them to enter in monthly meter readings from their raw water diversions, raw water meter, treated water meter, consumption totals for each section and any other accounted-for water use. A resulting graph and table are output summarizing the current and running condition of the City water system. At the end of each year, the December spreadsheet provides the totals for the year and concludes the annual audit.

The City auditing spreadsheet has gone through a number of changes and refinements resulting in the spreadsheet currently being used. Performing monthly audits has provided the City with relatively "fast" feedback on the performance of its system and the response of specific repairs or improvements that have been developed.

Recently, during the performance of a monthly audit, City personnel noticed a sudden and sharp increase in unaccounted-water levels. The entire staff was put on alert and began searching for a leak or other explanation to the rise in lost water. A large leak was found in a pipe crossing under a small creek. Water leaking from the pipe was entering the creek, thus making it difficult to notice such a large amount of water leaking from the distribution system. The pipe was repaired, resulting in the reduction in lost water levels the following month.

The annual water audit program has proven to be a valuable tool to the City in tracking its raw water requirements and consumption patterns. Also, as described in Section 7.4, raw water losses have dropped from the mid 50-percentile range in 1996 to the mid 20th-percentile range in the year 2000. Annual water audits have provided the City with regular feedback and reinforcement to support efforts at water conservation and improving the efficiency of the water system.

Implementation. Since the City currently has a monthly, as well as an annual water audit program in place; additional information concerning implementation, budgeting, or scheduling is not required.

System Metering Program (OAR 690-86-140.2.e.B)

General. The City of Yachats' water system is fully metered. However, the majority of the City's consumption meters generally consist of older, inefficient, rebuilt, and otherwise outdated metering equipment. As was stated previously, preliminary testing of the meters suggests that the existing meters may be reading more than 20-percent low. That is to say, approximately 20-percent of the total water in the system is "slipping" through the meters undetected. This unaccounted water could be accounted for with the installation of an accurate metering system.

A number of meter companies today offer metering equipment capable of near perfect accuracy over a long service life. In addition to accuracy, new metering systems can be equipped with automated meter reading (AMR) technology designed to increase the efficiency and accuracy in the meter reading and water billing process.

Numerous small communities have undertaken complete meter change-out programs, installing new AMR meters, and updating their billing procedures. Considering the revenue lost due to old meter inaccuracies, many meter change-out programs see a payback of just a few to up to ten years depending on the amount of new revenue captured by the new, more accurate meters.

Program. While the City is fully metered, it is expected that significant losses occur through the existing meters. As a result, the City has undertaken a meter replacement program. Initially, the City began installing meters utilizing City staff. It is estimated that the installation of a new meter assembly costs approximately $100. Within the first year, the City planned for and replaced approximately 50 meters.

However, at this pace, it will take the City in excess of ten years to change-out all standard consumption meters, so it is currently developing a plan to finance and change-out all remaining meters within a one to two-year period. Once this is accomplished, monthly and annual audits will begin to show the results and benefits of the meter change-out program. Also, new revenues resulting from newly captured water volumes will be available for the repayment of the change-out program costs.

Implementation. It is anticipated that the City will undertake an aggressive meter change-out program by the end of the 2001 calendar year. See Section 10.7 for a description of the budget and schedule of the project as it fits into the CIP program.

Leak Detection Program (OAR 690-86-140.2.e.C)

General. A leak detection and repair program makes use of various technologies to locate leaks in the system and identify pipelines requiring repair or replacement. The goal of a system-wide leak detection program should be to reduce leakage to 15 percent of the total water produced. If the reduction to 15 percent is found to be *feasible* and *appropriate*, the water system management should strive to reduce leakage to 10 percent or less.

As was developed in Section 7.8, the City's losses are on a level that suggests leak detection and repair is prudent. Over the past ten years, the City has repeatedly secured the services of a leak-detection contractor to scan the distribution system; on each occasion, leaks were detected and repaired.

It should be noted that leak detection efforts in areas like Yachats presents special challenges. "White noise" generated from the constant wave action and traffic noise from US Highway 101 tends to inhibit many forms of leak detection. However, any leak that is detected and repaired will result in reduced lost water and is considered to be *feasible*.

Program. The City has developed a program to perform a comprehensive leak detection survey of the entire system over the next five years (completion in July 2006). The distribution system has been divided into five sections to facilitate an organized methodology. Leaks will be identified and immediately repaired. Lines that are determined to be beyond repair will be temporarily repaired and the line slated for replacement in the CIP program.

Another method the City intends to employ to detect leaks is the isolation method. This method includes the isolation of short piping sections utilizing existing and newly installed mainline valves. The mainline is isolated under full pressure and all services are turned off at the meters. A pressure gauge is attached to one service and the pressure is monitored over a period of time. If the pressure falls off relatively quickly, it is likely that a major leak is located within that section of piping. This method can be used to pinpoint areas for the sonic leak-detection program.

In addition to leak detection, the City is developing a CIP program for the replacement of many undersized and suspect waterline sections. In Section 10 of this Plan, a number of piping replacement projects have been developed with the intention of not only improving distribution characteristics but to decrease losses through failing pipe networks.

Implementation. The City has a goal to complete the scheduled piping replacements within the first ten years of the planning period or by July of 2010; it will budget approximately $2,500 per year for the next five years for leak detection services. Financing of the CIP program will vary depending on many issues. Recommended financing for the CIP program as well as potential phasing options is discussed in Section 11.

Meter Testing and Maintenance Program (OAR 690-86-140.2.e.D)

General. Old or poor quality water meters are often found to be inaccurate. These inaccuracies are commonly on the order of ten to more than 50 percent of the actual water flowing through the meters. The water that is able to "slip" through the meter undetected becomes unaccounted-for water. In some communities, inaccurate meters result in millions of dollars in lost revenue.

Many meter companies offer programs for the testing and calibration of existing meters. Various communities have shown significant benefits by changing out entire systems to one style of meter. As the old, inaccurate meters are replaced, the additional revenue often pays for the change out program.

Program. Since the City is developing a program to replace all existing meters with new meters, a testing and maintenance program is not required at this time. New meters should be tested approximately ten years after their installation to confirm operating standards.

Implementation. Once the new meters are installed and in operation, it should be expected that they will be functioning at or near 100 percent accuracy. As the planning period progresses, the City may wish to develop a simple testing program to confirm that the new meters continue to function at optimum levels. This simple program could consist of "pulling" ten meters at random and testing their accuracy levels. Such a program may begin ten years (2011) into the program. This issue should be addressed during the first Plan update in 2006 or soon thereafter.

Public Education Program (OAR 690-86-140.2.e.E)

General. Most consumers have no knowledge of their water source, supply capacity or availability, and necessary treatment and distribution costs. The tremendous effort that takes place behind the scenes to provide reliable and safe drinking water goes, for the most part, unnoticed each time someone turns on their tap for a glass of water. Public information programs can change this.

The goal of a public information program on water use efficiency is to develop a conservation ethic among water users. A public information and education program on water conservation is recommended as a means of influencing water consumptive practices and patterns within the system. An informed public will also be more likely to support changes in the rate structure and management practices if they feel they are part of the conservation effort. Public education may take on the form of mailers, workshops, school programs, and individual conservation reviews.

Public information programs can educate consumers regarding:

- Toilet flushing and fixture efficiency,
- Running water unnecessarily while washing or brushing teeth,
- Efficient use of water when washing cars or other outdoor use,
- Landscape efficiency and irrigation practices,
- Rebates and other incentives promoting conservation practices,
- Potential curtailment activities, and

- General conservation awareness.

A significant amount of education materials have been developed at little or no cost to the water provider. Pamphlets, videos, CD-ROM computer programs, and other materials are available to assist the water provider in their public education efforts. Information is available on a variety of topics and materials can be obtained for practically any age group, demographic, or purpose.

The effectiveness of public education programs, in terms of conservation, is difficult to predict. During periods of drought, public awareness is high and public education may result in significant water consumption reductions. During other periods, the effectiveness will depend greatly on the program itself. Studies have suggested that a four to five percent reduction in water consumption could be expected from a comprehensive public education program.

Program. The City currently has a public education program that includes making pamphlets and other educational material available to water customers at City Hall. Also, the City includes monthly segments and stories in its newsletter dealing with conservation suggestions and tips about household conservation.

The City operates and maintains a website for the community. The website includes information about town meetings, news events, public works, issues, and many other topics. In an effort to increase public awareness of water conservation, the City has developed a conservation link on their website that details numerous conservation measures and activities. Tips on water conservation as well as general information about the City's water system is resulting in a relatively comprehensive resource for conservation in the City of Yachats. For more information on the Yachts conservation website, go to http://www.pioneer.net/~cityoya/ and click on the water conservation link.

Other Conservation Measures Identified by the Water Supplier to Improve Water Use Efficiency (OAR 690-86-140.2.e.F)

WAVE. The WAVE program is an appropriate and feasible conservation measure for the City of Yachats. See the description of the WAVE program provided earlier in Section 7.8 for more information.

Pressure Management. Pressure management is an *appropriate* and *feasible* conservation measure for the City of Yachats. See the description of the pressure management program provided earlier in Section 7.8 for more information.

7.10 Recommendation for Plan Update (OAR 690-86-140.5.a)

It is common for a water system to develop a water conservation plan, submit it to the Oregon Department of Water Resources for approval, develop a conservation program, and then resubmit an updated plan to WRD for review of the results of the conservation program. Typically the period of time between the first submittal of a conservation plan and the resubmittal of an updated plan is at least five years.

The City has a number of issues to correct and overcome during this planning period. Expansion of water rights, development of new raw water sources, and implementation of a water conservation plan, to name a few. The City should enter into a "partnership" with the Oregon Department of Water Resources in order to overcome these obstacles. This may include the development of a work plan and regular progress review milestones.

The City should work to overcome water right and raw water source obstacles with the assistance of the WRD. Every five to seven years, the City should plan to evaluate its progress and factor in any change to the system or other planning parameter that differs from the *Water Master Plan*. The City could then update Section 7 of this Plan with any new information and report their progress to the WRD.

Based on the elements contained in the Mutual Agreement and Order entered into by the City, they will be required to update their Management and Conservation Plan in 5 years or by July 1, 2006.

The *Water Master Plan*, in which this conservation plan is included, is developed for a 20-year planning cycle. It should be anticipated that the Water Management and Conservation Plan would need to be updated at the end of the planning cycle along with the Master Plan.

Water Curtailment Plan

Section

8

Water Curtailment Plan

(OAR 690-86-140)

Section 8

8.1 Water Curtailment Plan

A water curtailment plan is defined as a short term, mandatory program intended to drastically reduce water consumption, usually due to an emergency, catastrophic event, or serious water shortage. According to OAR 690-86-140, a water provider is to develop a water curtailment plan with planning criteria, specific operating guidelines, and the enforcement measures that may be required in the event of a serious emergency or water shortage.

Most water systems have critical components, which if damaged or destroyed, could cripple or prevent delivery of potable water to its consumers. Such a crisis could last from a few hours to many days. As part of a comprehensive water management and conservation plan, a curtailment plan would provide the City with the planning and information necessary for managing a "short term" supply deficiency crisis.

Due to occasional drought conditions, equipment failure, or other water system problems, the City's water supply may become significantly and seriously depleted. The deficiency, which could last from weeks to months, could be serious enough that there is not enough water to provide for the needs of the community. Being prepared for curtailment situations will allow a water provider to survive serious "long-term" supply-deficiencies.

In August of 1998, the City adopted a resolution describing a Water Emergency Plan. While the plan provided the City with the beginnings of a curtailment plan, the resolution did not contain all of the elements required by OAR 690-86-140.

The following sections provide information required by OAR 690-86-140 for water curtailment plans. The City may wish to develop a comprehensive emergency plan for all City operations. A curtailment plan can be used as the water supply element of such a comprehensive emergency plan.

8.2 Water Supply Deficiencies (OAR 690-86-140.3.a)

A history of supply deficiencies or emergency water conditions would suggest the need to prepare for future water supply deficiencies. If drought, contamination, system breakdown, or some other event has interrupted or hampered water supply efforts in the past, it is likely to hamper water supply efforts in the future. The severity of historical events can also suggest the relative importance of planning for future events.

A water provider should be prepared for periods of supply deficiency. The development of policy, ordinances, and other measures should not wait until the provider is in the midst of a water shortage. Knowledge of past deficiencies and information about the causes and indicators of future water supply emergencies will aide water suppliers in providing a consistent and reliable product to consumers.

Historical Deficiencies

The City of Yachats' water system has a history of water supply deficiencies. During these deficiencies, the City has struggled to remove enough water from Reedy and Salmon Creeks to satisfy the daily water demands. Generally these deficiencies occur during dry summer months when flows in the source creeks are extremely low. Over the past ten years, the City Council has declared a water emergency on four separate occasions. Due to the history of water supply emergencies, it is expected that the City will continue to experience water supply emergencies in the future. A summary of each water emergency is provided in Table 8.2.1.

Table 8.2.1 - Summary Of Historical Water Supply Emergencies

Date of Water Supply Emergency	Reason for Emergency
June, 1991	Water supply shortage – source deficiency
July, 1992	Water supply shortage – source deficiency
August, 1994	Water supply shortage – source deficiency
September, 1998	Water supply shortage – source deficiency

Existing Capacity Limitations

As described in Section 4, the City removes raw water from Salmon Creek and Reedy Creek. Summertime flows in the two creeks can be extremely low. Historical records indicate that flows in the two creeks have been measured as low as 125 gpm each. If the City is withdrawing all of the water from each creek, the total flow to the plant in 24 hours would only be 360,000 gpd. Since low flows in the creeks typically occur during the summer months, the likelihood of the flows coinciding with maximum month (MMD) or maximum day (MDD) demands is very high.

As was developed in Section 5, the MDD for the City of Yachats at this time is approximately 515,000 gpd; the MMD is approximately 308,000. Therefore, if streamflows in the creeks fall to their historical lows, the City will continue to face water supply emergencies. The City does not currently have the ability to continue delivering high water demand levels during a prolonged drought or during low streamflows conditions.

The City is endeavoring to develop new water sources to offset their raw water needs when streamflows in the primary sources are not adequate. They are also taking serious steps to reduce lost water and develop water conservation within the community. Discussion of alternate water sources can be found in Section 9 and a description of the City's conservation efforts is contained in Section 7.

8.3 Stages of Alert (OAR 690-86-140.3.b)

A water curtailment plan should contain at least three levels or stages of alertness. The levels should range from an *initial level of concern* to a *severe level-of-alertness* to a *final critical level*. Each level should include predetermined indicators that will invoke a specific level of alertness requiring predetermined actions and an associated list of recommended curtailment measures.

The following are provided as potential stages of alert for the City of Yachats' Water Curtailment Plan:

Alert Stage No 1: Water Alert Status

This level-of-alert serves primarily as a tool to inform the public that a potential problem exists. The problem may not yet warrant mandatory water conservation, but does suggest voluntary conservation. If the public is aware of the potential for problems, they will be more likely to accept and abide by more serious requirements should the alert status be increased.

Alert Stage No 2: Water Warning Status

This level-of-alert serves as the first level of action for the City to enact mandatory water use requirements within the system. This level would include all planned activities requiring temporary conservation including construction and maintenance activities as well as preparing for expected drought conditions.

Alert Stage No 3: Water Emergency Status

This level-of-alert serves to raise the alert status from a warning to an emergency status. A wider range of water use activities is affected. This is the most restrictive level of mandatory water conservation activities carrying the highest penalties to enforce the curtailment status.

Alert Stage No 4: Critical Water Supply Status

This level-of-alert serves to assist the water system in supplying the minimum amount of water to the consumers to sustain life. This level differs from level three in that the decision of how much water to use may be taken away from the consumer and would probably include rationing of drinking water. This extreme level-of-alert is reserved for extreme water supply problems.

See Section 8.5 for a discussion of the various actions required of both the City and the water consumer for each level of Alert.

8.4 Indicators of Water Shortage Severity (OAR 690-86-140.3.c)

A water curtailment plan should include a list of predetermined levels of severity or descriptions of specific scenarios that will invoke a predefined level of water curtailment alert. The City should develop a water curtailment plan with specific "triggers" that will initiate a specific alert stage in the plan. This Plan describes potential triggers and general curtailment planning guidelines. The City should review these guidelines and develop specific "triggers" that can be used to quantify the severity of water supply issues.

In many cases it is appropriate to have a number of issues that could serve as potential triggers for a phase of a curtailment plan. The City may wish to organize their plan so that one, two, or combinations of many triggers will initiate specific actions from the community. This approach to curtailment triggers allows more evidence to be gathered to suggest an appropriate response and provides the City with more flexibility to manage the water system during difficult water shortages and crisis. The following includes potential indicators for each level-of-alert.

Alert Stage No. 1: Water Alert Status

General. This level-of-alert could be declared if a water shortage or equipment failure poses a potential threat to the ability of the water system to meet the demands of its customers. Indicators may include a moderate decrease of flows in the Yachats River along with regional forecasts that predict drought or low streamflows in the watershed. Other indicators may include moderate decreases in reservoir levels (below one-half total capacity) at an earlier than normal date and an inability for the system to restore reserves in a timely manner. National indices may be referenced to provide further support for requiring specific curtailment actions.

It may be appropriate to declare this alert stage at the beginning or during major construction or maintenance of existing water system components. A possible scenario would include taking one reservoir temporary off-line to paint or clean it or perform some minor maintenance.

Streamflows. The City of Yachats is under order to develop a water curtailment plan that utilizes streamflows to trigger the various stages of alert. Since the City has the potential of removing water from three separate sources, the triggers should reference each source.

Senior instream water rights have been established in the vicinity of the City's point of diversion on the Yachats River. The lowest minimum streamflow required by the senior instream rights is 30 cfs occurring in the month of September. (See Section 4.1.) Available flow data for the Yachats River suggests that flows in the river often fall below the 30 cfs threshold during the months between July and October. If the City begins to use water from the Yachats River, a gauging station must be constructed near the point of diversion to monitor streamflows. The City may wish to establish a Level 1 curtailment trigger of 35 cfs to raise awareness of the low seasonal flows in the Yachats River.

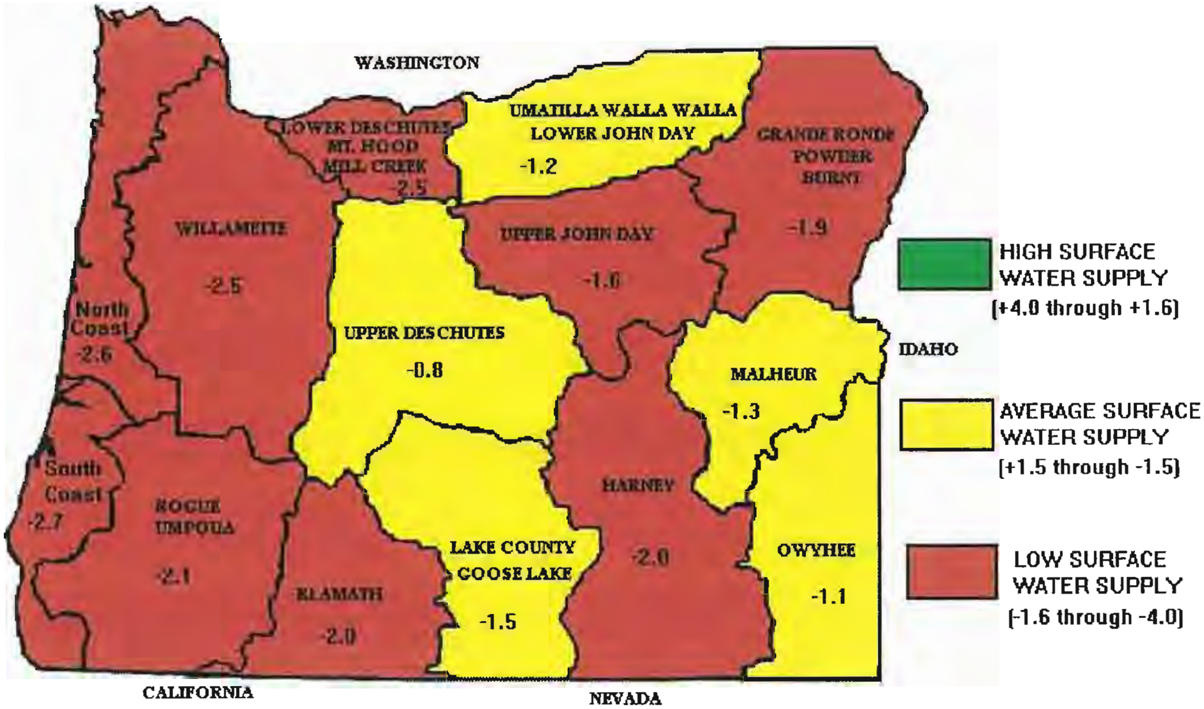
Currently the City relies on its two primary water sources – Reedy and Salmon Creeks – for all their water needs. Low seasonal streamflows have resulted in the City Council declaring water supply emergencies in the past. The watersheds are nearly the same size and consist of similar hydrologic qualities; historical flow records indicate the flows in each stream are nearly identical throughout the year. As was discussed in Section 5, records indicate that streamflows in Reedy and Salmon Creeks have been recorded as low as 125 gpm in each stream; the City may wish to establish a Level 1 curtailment trigger of 275 gpm combined flow. (125+125=250 gpm, 275 would be in excess of the low streamflows but serve as a warning of impending deficiency)

Palmer Index (PI). The Palmer index is a widely used scale for measuring drought conditions. The PI is based on long-term records of temperature and precipitation and is tabulated by the US National Weather Service on a weekly basis. PI calculations are made for 350 climate divisions in the United States and posted on the NOAA and National Weather Service websites.

Normal weather has an index of zero in all seasons in any climactic region; droughts have negative index values while wet periods have positive values. Consecutive negative values from week to week can provide initial warning of an impending drought. Long-term negative values can assist the City in determining the severity of the drought condition.

In terms of a water curtailment plan, the City would be interested in the negative or drought index regime. Conveniently, the negative PI regime is divided into three drought levels; moderate drought (-2 to –3), severe drought (-3 to –4), and extreme drought (-4 and lower). The City could easily use the three tiers of the negative PI as triggers for the first three levels of the curtailment plan.

Figure 8.4.2
SURFACE WATER SUPPLY INDEX
(SWSI)
March 1, 2001



For the purposes of curtailment triggers, the ranges of interest are between –1.5 and –4. An appropriate division may be as follows:

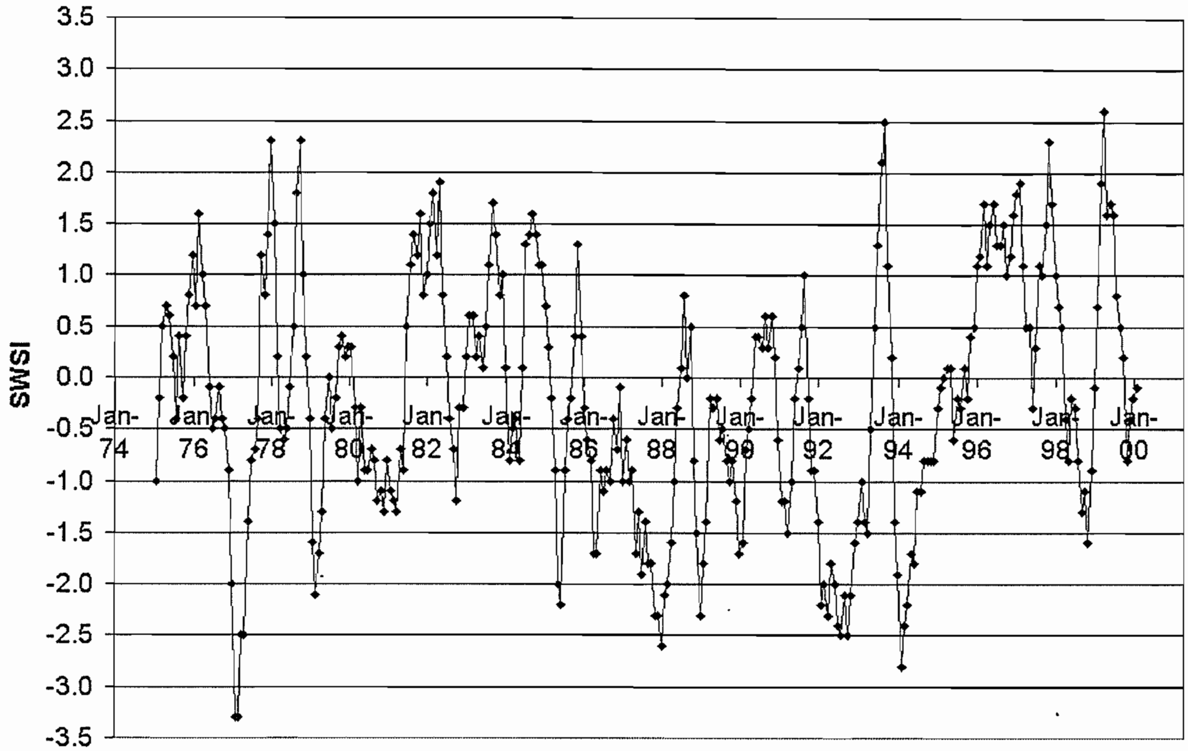
-1.5 to –2.5 = Level 1 Curtailment
-2.5 to –3.25 = Level 2 Curtailment
-3.25 to –4.0 = Level 3 Curtailment

The SWSI for Oregon is updated monthly and can be viewed and downloaded at the following website: *http://crystal.or.nrcs.usda.gov/snowsurveys/swsi.html*.

In addition to monthly SWSI data, significant historical data is available on the website to indicate the frequency and reoccurrence intervals expected for the various levels of curtailment. Figure 8.4.3 summarizes the history of the SWSI in the North Coast basin since 1974. The history of the SWSI suggests the sensitivity the area has to annual rainfall and the impact it has on surface water availability. In other words, the SWSI "bounces around" in relation to varying precipitation levels.

The figure suggests that, based on the above-recommended criteria, the City would have experienced Level 3 curtailment conditions only once over the past 25 years while Level 1 and Level 2 curtailment may have been experienced on a number of occasions.

Figure 8.4.3
NORTH COAST BASIN #1 - HISTORICAL SWSI - 5 MONTH AVERAGES



Combining information from the Palmer Index and the SWSI will provide valuable insight to both the "big picture" and the local conditions based on readily available and accepted information.

System Manager Assessment. Few will know more about the viability and condition of a water supply than the operators and managers of the water system. If the operators and/or system managers consider it necessary to invoke Level 1 curtailment actions, the ordinance should provide them with that ability. This "trigger" is important for such items as maintenance or construction on a critical system component, knowledge of raw water deficiencies other than volume, or other situations requiring specific curtailment actions.

Alert Stage No 2: Water Warning Status

General. This level-of-alert could be declared if a water shortage or equipment failure poses a serious threat to the ability of the water system to meet the demands of its customers. Indicators may include a significant decrease in the Yachats River flow along with regional forecasts that low streamflows are expected to drop further. Other indicators may include a significant decrease in reservoir levels (below three-quarter total capacity) at an earlier than normal date and an inability for the system to restore reserves in a timely manner.

It may be appropriate to declare this alert stage if a component within the water system breaks down or is taken off-line for an extended period of time. This would include major repairs or renovations within the water treatment plant, major renovation of a reservoir, or another major improvement project.

Scenarios that would require this level-of-alert would typically be those that could be planned and prepared for. This alert stage could be instituted as a follow up status to Level 1 after the public has been informed of potential problems and given an opportunity to carry out voluntary conservation activities.

Streamflows. Based on the streamflows discussed in Alert Stage 1, the City may wish to establish a stage 2, low flow criteria in the Yachats River of 20 cfs. Records indicate that flows in the Yachats River have been known to fall below 20 cfs in the months from August to October. As mentioned previously, the minimum streamflow or instream rights for September require 30 cfs of water in the vicinity of the City's point of diversion. By using a trigger of 20 cfs, the City would be mandating an increased level of curtailment with increased restrictions of water use.

The City may also wish to lower the minimum combined flows within Reedy and Salmon Creeks to 200 gpm for a Level 2 trigger.

Palmer Index (PI). As described earlier in this section, utilizing the PI for drought prediction and determination of drought severity can be a very useful tool. Based on Figure 8.4.1, a PI of –3.0 to –4.0 could be used to describe Level 2 alert status. For example, Figure 8.4.1 shows the Willamette Valley under what could be considered as a Level 2 alert status.

Surface Water Supply Index. As described earlier in this section, the SWSI can be utilized similarly to the PI for drought prediction or to describe the current status of the water supply. Based on Figure 8.4.2, a SWSI of –2.5 to –3.25 could be used to describe a Level 2 alert status. For example, Figure 8.4.2 shows the north coast area with a SWSI of –2.6. This could be interpreted as an being on the threshold of a Level 2 curtailment condition and is compatible with information provided from the Palmer Index.

System Manager Assessment. System management should continue to have the ability to invoke a Level 2 water curtailment status. If more serious conditions warrant increased activity and restrictions, the system manager needs the autonomy to require this level of curtailment.

Alert Stage No 3: Water Emergency Status

General. This level-of-alert could be declared if a water shortage or equipment failure poses a severe and immediate threat to the ability of the water system to meet the demands of its customers. Indicators may include an eminent loss of a portion or total source of supply. Other indicators could include a chemical spill in a water supply, severe equipment failure, and other severe water supply issues.

Scenarios that would result in a declaration of a water emergency would be of an unplanned nature. This may include natural disasters such as earthquakes or landslides, acts of terrorism or sabotage, complete failure of water system components, and other emergency conditions. A few specific scenarios are listed below:

- Landslide that destroys, intakes, and/or raw water supply piping,
- Collapse or failure of a storage reservoir,
- Severe source contamination by pesticide, chemical spill, sabotage, etc.,
- Landslide that destroys treated water line from water plant to City system or the raw water intake system, and

- Extreme drought conditions resulting in the near inability to obtain raw water for basic service.

While many of the scenarios listed above are not likely to occur, it is not unreasonable for the City to develop plans and strategies to prepare for emergency conditions within its water system.

Streamflows. Based on the streamflows discussed in Alert Stage 1, the City may wish to establish a Stage 3, low flow criteria in the Yachats River of 15 cfs. Records indicate that flows in the Yachats River have been known to fall below 20 cfs in the months from August to October. As mentioned previously, the minimum streamflow or instream rights for September require 30 cfs of water in the vicinity of the City's point of diversion. By using a trigger of 15 cfs, the City would be mandating an increased level of curtailment with increased restrictions of water use.

The City may also wish to lower the minimum combined flows within Reedy and Salmon Creeks to 175 gpm. At 175 gpm, the plant would be running at or below half of its normal operational capacity.

Palmer Index (PI). As described earlier in this section, utilizing the PI for drought prediction and determination of drought severity can be a very useful tool. Based on Figure 8.4.1, a PI of –4 or less could be used to describe level 3 alert status. For example, Figure 8.4.1 shows portions of Oregon, Montana, and Florida under experiencing conditions that could warrant Level 3 curtailment activity.

Surface Water Supply Index. As described earlier in this section, the SWSI can be utilized similarly to the PI for drought prediction or to describe the current status of the water supply. Based on Figure 8.4.2, a SWSI of –3.25 to –4.0 could be used to describe a Level 3 alert status.

System Manager Assessment. System management should continue to have the ability to invoke a Level 3 water curtailment status. If more serious conditions warrant increased activity and restrictions, the system manager needs the autonomy to require this level of curtailment.

Alert Stage No 4: Critical Water Supply Status

This final level-of-alert is necessary if scenarios from Level 3 result in disaster conditions that make it impossible for the water system to continue functioning under normal parameters. Indicators of this level include the inability of the water plant to produce additional water or the distribution system to deliver potable water to the consumers. This status is only for the most extreme cases where resources must by managed carefully and water rationed to consumers for the purpose of sustaining life.

The City should develop an ordinance that provides the water system manager with the necessary authority to govern all facets of the water system under the most difficult of circumstances.

8.5 Recommended Curtailment Actions (OAR 690-86-140.3.d)

Each level-of-alert should include a description of conservation measures appropriate to that level. These measures should provide guidelines, define acceptable and prohibited water usage, and describe the penalties for not abiding by the declaration of water curtailment.

The following describes certain stand-by water use curtailment actions for each level-of-alert:

Alert Stage No 1: Water Alert Status

General. This level-of-alert is intended to inform the public, begin water restrictions, or ask for voluntary reductions in water use practices. Actions for this level include advertising on radio, television, newspaper, and other media to announce the curtailment situation. Leaflets may be distributed or included within the monthly water bill. Each form of media contact should include suggestions, tips, and information for the consumers to reduce water consumption within their homes.

Consumers may wish to install retrofit kits supplied by the City. The kits may be supplied free of charge or for a small fee. See Section 7.8 for a discussion on retrofit kits and other water conservation measures. All water conservation at this level is on a voluntary basis. The City should be prepared to provide information and support for this voluntary effort.

Water Provider. The water provider should develop specific actions and tasks that it will undertake when faced with a water alert stage. For water curtailment Level 1, the City should develop a water system "reporting sign" to indicate the general condition of the City's water supply. Often used to warn of varying levels of fire danger, a properly located reporting sign can send a regular reminder to consumers that the water supply is tenuous. Under Level 1 curtailment, the reporting sign should raise the alert that the water supply is low and remind consumers to use water wisely.

Other efforts should be made by the City to educate the consumers about the general condition of the water system and warn them about how the situation could worsen. If restrictions are to begin with Level 1, efforts should be made to "get the word out" that water curtailment restrictions are being enforced.

The water provider should also discontinue sales of water to parties outside of the water provider boundary. This would include any and all intergovernmental agreements such as the current agreement with the Southwest Lincoln County Water District. Consumers within the provider boundary should be given priority during times of supply shortages.

Water Consumers. The water curtailment ordinance should outline some specific restrictions and requirements of water consumers. The City may wish to restrict lawn and landscape irrigating to every other day or require watering take place only during the nighttime hours.

The City may also request that consumers make efforts to voluntarily reduce water consumption up to 10 percent of normal through personal conservation efforts. This may include the repair of household leaks, installation of low flow fixtures, reduction or elimination of landscape watering, and other conservation efforts. See Section 7 for comprehensive coverage of water conservation elements.

Alert Stage No 2: Water Warning Status

General. This level-of-alert includes mandatory water conservation requirements and would likely be declared in the form of an ordinance. Conservation actions should restrict the irrigation of lawns, gardens, and landscaping to odd/even watering days and require irrigation to be performed during the night hours.

The ordinance should also prohibit some optional outside water uses including car washing, sidewalk and street washing, filling of swimming pools, water use for dust control, fire training, and other non-essential water uses.

Water Provider. The water provider should increase efforts to educate the public about the seriousness of the water supply shortage and the upgrading of the severity to a Level 2-curtailment condition. The City reporting sign should indicate the upgrade of severity and further caution consumers about wise and prudent water use.

The water provider may wish to make low flow retrofit kits available to all water consumers upon request. The provider may also begin a campaign to retrofit older, inefficient toilets, and even offer rebates for the installation of newer, more efficient fixtures.

The water provider may consider a rate change or drought surcharge to provide financial encouragement for water conservation. A rigorous public education program should follow any rate change to explain the purpose for the change and how the consumer can best avoid higher prices for water service.

The water provider may wish to enact changes in operations that will reduce water consumption. This may include fire department use, line flushing, street cleaning, park and landscape watering, and other nonessential water usage.

Water Consumers. Level 2 curtailment should include mandatory restrictions and no longer rely on voluntary water conservation. Watering of lawns and landscaping with overhead sprinklers may be banned under Level 2 curtailment. Irrigation should only be allowed by hand held (watering can) or drip system methods. Washing of vehicles, boats, buildings, equipment, or other outdoor washing may be prohibited.

To save water as well as provide valuable public information, restaurants may be required to post drought notices and offer drinking water only upon request. Other high volume water consumers (hotels, recreation centers, etc.) may be required to post drought notices apprising their clientele of the drought conditions.

Alert Stage No 3: Water Emergency Status

General. Alert Stage No. 3 includes additional mandatory conservation requirements brought on by severe or emergency conditions and would likely be declared in the form of an ordinance.

This level-of-alert would include all the curtailment actions and restriction described in Levels 1 and 2 along with provisions to prohibit all watering of lawns, landscaping, gardens and any other outside water use. Severe penalties should be enforced for those not abiding by these strict water curtailment actions.

Water Provider. The City should continue a public information campaign to educate their consumers about the dire condition of the water system. The water system reporting sign should indicate the existing emergency conditions. Handouts, leaflets, and press releases should be distributed with water bills or provided at various public locations within the community.

The City may wish to set limits on all consumers based on the water consumption records for the lowest consumption month of the year. If, for instance, February is the lowest consumption month within the system, consumers may be allowed to use the amount of water consumed the previous February. If the consumer uses more, they will be charged at a rate double or triple the normal consumption rate. If non-compliance continues, the consumer could be disconnected from the water system.

The City may also choose to allow no new connections or special water use until the integrity of the water system is restored. It may wish to take further steps to change operation and maintenance of City facilities to utilize gray water for landscaping and street cleaning and search for increased water reuse opportunities.

Water Consumers. A complete ban on outside watering except with gray water may be enforced. Strict penalties may be levied against consumers known to be using water inappropriately for Level 3 curtailment. Water consumers, including commercial consumers, should make all efforts possible to eliminate all nonessential water consumption.

Alert Stage No 4: Critical Water Supply Status

This level-of-alert applies to an extreme water curtailment condition. The goal of Level 4 curtailment should be to provide enough water to sustain human life. Conservation actions within this stage may include closing the distribution system or disconnecting all water users from the system. The City may choose to ration all water use from a central location, reservoir, or directly from the water treatment plant.

In the event that the reservoirs, treatment plant, or some other component is damaged or destroyed, the City would be responsible to locate a safe, emergency water source and make efforts to provide rations to the community.

The likelihood of this scenario occurring is extremely small, however, the City may wish to develop general plans for emergency preparedness including operating procedures and guidelines for the water system.

8.6 Water Curtailment Ordinance

Existing City Water Curtailment Ordinance

The City currently had a water emergency plan that was adopted in 1998. The previous ordinance did not contain many of the required components of a curtailment ordinance as outlined in OAR 690-86-140. Though it provided the rudiments of emergency curtailment, the previous ordinance did not adequately provide all the needed planning criteria and legal authority required by a modern water curtailment ordinance.

Update Water Curtailment Ordinance

A summary of the recommended curtailment plan is provided in Table 8.6.1.

While this Plan was in development, the City drafted and adopted a new water curtailment ordinance. The recommendations and organization developed in this section were incorporated into the final ordinance; the new water curtailment ordinance was adopted by the City Council on May 10, 2001. A copy of the adopted curtailment ordinance is provided in Appendix F.

TABLE 8.6.1
SUMMARY OF RECOMMENDED WATER CURTAILMENT PLAN

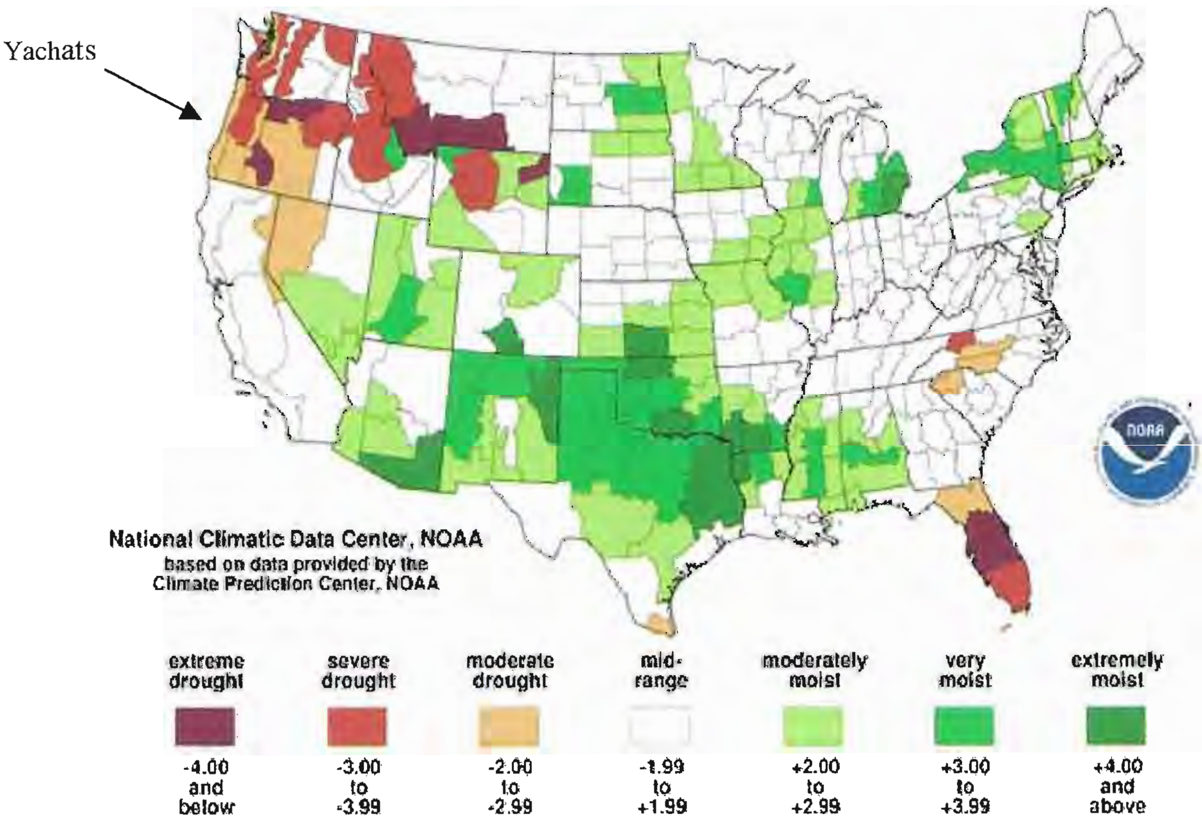
Alert Stage	Stage Activation	Action Measures
No. 1 Water Alert	1. PI (-2 to –3) and/or 2. SWSI (-1.5 to –2.5) and/or 3. Yachats River flows fall below 35 cfs and/or 4. Reedy/Salmon Creek flows fall below 275 gpm combined flow, and/or 5. Staff assessment.	1. Water status sign will indicate Alert Stage No. 1. 2. Call for voluntary reduction in all water use; mandatory for watering. 3. Prohibit outside watering only between 9 p.m. to 7 a.m. 4. Restrict outside watering for even addresses on even numbered days & odd addresses on odd numbered days. No outside watering on Sundays. 5. Prohibit water wasted down gutters or streets & wash down of paved surfaces, streets, & structures. 6. Water use for wash down of paved surfaces & structures only for health & safety purposes. 7. Public outreach promoting conservation. 8. Implement curtailment water rates & enforce penalties. 9. Cease sale of water to users not currently on the system. 10. Prohibit new hook-ups to the City's water system. 11. Prohibit water to be used by Fire Department for drills or truck washing.
No. 2 Water Warning	1. PI (-3 to –4) and/or 2. SWSI (-2.5 to –3.25) and/or 3. Yachats River flows fall below 20 cfs and/or 4. Reedy/Salmon Creek flows fall below 200 gpm combined flow, and/or 5. Staff assessment.	1. Water status sign will indicate Alert Stage No. 2. 2. All Stage No. 1 prohibited activities are also forbidden under Stage No. 2. 3. Curtailment water rates & penalties remain in-place. 4. Continue public outreach to community. 5. Watering of any lawn, landscaping bushes, shrubs & trees is prohibited. 6. Watering of any vegetable or flower garden or fruit tree is restricted to watering by hand using either a hose with self-closing nozzle, a container (e.g. bucket), or a drip irrigation system. 7. Prohibit washing of any vehicle, except a commercial fixed washing facility. 8. Prohibit water for the use of scenic/ recreational fountains, ponds & lakes except required to support fish. 9. Restaurants discontinue routinely offering water to customers unless specifically requested. 10. Prohibit use of water in any air conditioner or air-cooling mechanism, except at a commercial business. 11. Prohibit adding water to any swimming pool.
No. 3 Water Emergency	1. PI (-4 and lower) and/or 2. SWSI (-3.25 to –4.0) and/or 3. Yachats River flows fall below 15 cfs and/or 4. Reedy/Salmon Creek flows fall below 175 gpm combined flow, and/or 5. Staff assessment.	1. Water status sign will indicate Alert Stage No. 3. 2. All Stage No. 2 prohibited activities are also forbidden under Stage No. 3. 3. Water curtailment rates & penalties remain in place. 4. Continue public outreach to community. 5. Water to residential customers will be allotted based on the number of persons living at each household (e.g. 50 gallons/capita). 6. Commercial & industrial users will be restricted to the same volume of water used in prior February. 7. Implement a surcharge pricing structure for water use over the allotted use.
No. 4 Critical Water Supply	1. Delivery disruption > 24 hrs., forecasted storage < 1 day, and/or 2. Delivery disruption > 3 days, forecasted storage < 3 days, and/or 3. Staff assessment.	1. Water status sign will indicate Alert Stage No. 4. 2. City will discontinue water service through its normal distribution system. 3. Of water remains in the City's finished water tanks, water may be provided in small quantities to residents in their containers either directly from a designated tank or location within the City. 4. If water is not available in the City's finished water tanks, the City would locate a source of potable water & have it delivered to the City. Small quantities of potable water would be provided to residents, at no cost, in their containers.

PI – Palmer Index, SWSI – Surface Water Supply Index

For Level 1 alert status, the City may wish to use the PI of –2 to –3. Figure 8.4.1 shows the PI for the week of March 11 to March 17, 2001. As can be seen in Figure 8.4.1, the City of Yachats is in the orange band along the Oregon coast. The PI for this area, during this week, indicates a moderate drought and, if adopted as a trigger, would invoke Level 1 curtailment actions.

FIGURE 8.4.1
Palmer Drought Index
Long-Term (Meteorological) Conditions

March 11, 2001 - March 17, 2001



Using an and/or or multiple trigger curtailment plan, the PI can provide valuable information for the determination of the severity of a water supply crisis even though the PI is not necessarily supply specific. The PI is updated weekly and is easily accessible at the following website: *http://www.ncdc.noaa.gov/ol/climate/research/2001/Weekly/US_weekly.html*.

Surface Water Supply Index (SWSI). The SWSI is similar to the Palmer Index in that it is an index that describes the current state of water resources in a given area. Calculated monthly by the National Resource Conservation Service (NRCS) for the major river basins within the state of Oregon, the SWSI can be used to identify which river basins are above, below, or at the normal surface water supplies. Figure 8.4.2 shows the SWSI for the various basins in the state of Oregon for the month of March, 2001.

Analysis and Improvement Alternatives

Section 9

Analysis and Improvement Alternatives

Section 9

This section of the Master Plan presents detailed analyses of each component within the system and, where appropriate, provides recommended improvement options for each project. Section 10 provides cost estimates for the projects developed in Section 9. Projects are grouped together and prioritized in Section 11.3. Section 11.4 provides an analysis of the potential impacts to rate payers and makes recommendations for obtaining funding for the recommended projects.

9.1 Raw Water Sources and Water Rights

As presented in Section 6.2, the City should develop raw water sources and the appropriate water rights capable of providing the 50-year MDD of 1.40 MGD (2.16 cfs). At a minimum, the City must make plans to provide for the 20-year MDD of 0.64 MGD (1.0 cfs). See Section 5.3 for the analyses and development of water demand planning values. While the City currently holds water rights in excess of 2 cfs, the primary and secondary streams are regularly incapable of delivering the required volume for the City's raw water needs. In fact, during periods of low summertime flow, the combined flow from Reedy and Salmon Creeks has been known to be below 0.36 MGD (.56 cfs). Therefore, while the City has an abundance of water rights, it does lack a source, or combination of sources, capable of providing a consistent and reliable volume of raw water.

Source water in the state is becoming increasingly scarce and developing viable water supplies is becoming more difficult as environmental issues take precedence over communities' needs. Many communities are finding it necessary to develop and even purchase source water now that will not be needed for more than 20 years.

A number of potential raw water sources are discussed below:

Surface Water

Reedy Creek. Reedy Creek serves as the primary water source for the City of Yachats. The City holds a water right certificate for 2.0 cfs (1.3 MGD) on Reedy Creek. However, low summertime flows have been known to fall as low as 0.28 cfs. During these periods of extreme low flow, the City relies on other water sources to augment its raw water needs. Due to the lack of additional waters in Reedy Creek, it cannot be considered for development of additional source waters.

Salmon Creek. Salmon Creek is the City's secondary raw water source. The City holds a water right permit totaling 2.0 cfs (1.3 MGD) on Salmon Creek. The permit states that the amount of water taken from Salmon Creek "shall be limited to any deficiency in the available supply under the prior existing right from Reedy Creek." Water rights permits need to be renewed periodically and are subject to review by the Oregon Department of Water Resources at the time of renewal. Because of this process, water rights permits generally are not considered as secure as water rights certificates in terms of guaranteeing long-term water sources for communities.

Flow magnitudes on Salmon Creek are practically identical to those on Reedy Creek. As a result, Salmon Creek cannot be considered as a source of additional raw water.

The City should proceed with steps to "perfect" or certificate their raw water right on Salmon Creek. The City can show a current need for the water right they hold and can fully appropriate the water that is available to them. The information provided in this Plan will assist the City in obtaining a certificate for Salmon Creek.

Yachats River. The City holds water rights on the Yachats River totaling 2.0 cfs (1.3 MGD); the water rights are divided into two separate points of diversion. The permit currently allows the City to remove only 0.5 cfs from each point of diversion when streamflows in the Yachats do not satisfy the instream water rights. Two "senior" instream water rights exist on the Yachats River, which limit the City to only 1.0 cfs (0.6 MGD) during low flow periods.

For the past ten years, the City has made efforts to develop its water rights on the Yachats River. Despite demonstrating need based on shortages in the primary and secondary sources, the City has met with resistance from environmental groups interested in protecting natural resources within the Yachats watershed.

The surface water rights on the Yachats River, if developed, in combination with surface water sources presently in use, will provide the City with a minimum low flow of about 1.56 cfs (1.01 MGD) even during years when streamflow levels are equivalent to some of the lowest on record. The combination of the three sources discussed above will be adequate to provide the City with source water through the 20-year planning period. Even if the City were able to develop the Yachats River source, it would remain an emergency backup source due to poor water quality, and be used only when the primary and secondary sources are not providing adequate water volumes.

Marks Creek. Marks Creek is a tributary of the Yachats River with the confluence located just upstream from the confluence of Reedy Creek and the Yachats River. Until recently, the City held water rights on Marks Creek totaling 3.0 cfs; under an agreement with the Oregon Department of Water Resources, the City filed for a cancellation of this water right. Due to the cancellation of this right, Marks Creek is not considered a viable option for the City to pursue as a raw water source.

Cape Creek. Cape Creek flows into the Pacific Ocean approximately two miles south of the City of Yachats. The City holds a water right certificate on Cape Creek for 0.49 cfs. The original Yachats Water District used the source as an untreated source of water for the district's water supply needs. However, the source has not been used in many years and the piping and diversion infrastructure is no longer functional.

Summertime flows in Cape Creek are extremely low and new diversion infrastructure and piping to the water treatment plant would have to be constructed in order to develop Cape Creek as a raw water source. Due to the low summer flows and the significant cost to develop infrastructure, surplus water is not available to provide for the maximum demand needs of the City of Yachats.

Groundwater

As discussed in Section 4.2 groundwater is not considered to be a viable source of raw water in the Yachats area. There are no plans to explore or develop any groundwater sources.

Water Rights Purchases

Another option for obtaining water rights is to purchase them from water rights holders in the vicinity. The City could research surface water rights held on Beamer Creek, the Yachats River, and other nearby tributaries to determine the location of existing diversions and holders of existing water rights. It could then identify appropriate and available water rights, and approach the holders of those rights to discuss the potential purchase.

Once the City reaches an agreement to purchase water rights, the appropriate paperwork should be prepared to transfer the water right to the City and change the point of diversion (POD) to the City's intake. It will be easier to obtain water rights upstream from the City's intake so that downstream-water-users cannot claim the additional removal of water "causes damage" to their water right.

Some communities have chosen to purchase entire pieces of property for the sole purpose of obtaining a water right allotted to the property. Once the water provider owns the property, they are able to transfer the water right to the City, change the POD to the City intake, and resell the property.

The City should consult with the Watermaster for assistance in obtaining any new water source. Lost time and unnecessary expenses can be avoided by including the Watermaster in all water acquisition plans.

Regional Water Supply

The City has been diligently involved in the development of various regional water supply investigations. Having already entered into a mutual aid agreement with Southwest Lincoln County Water District (SLCWD), the City has also endorsed feasibility studies with the City of Waldport, City of Toledo, Seal Rock Water District, and the City of Newport for the development of a regional water supply.

While the infrastructure investment would be significant and the administration and management of a regional supply would be complicated, a regional supply remains one of the best options for the City's long-term water supply needs.

9.2 Raw Water Intake, Transmission, and Storage

Intake

Reedy Creek. The raw water intake on Reedy Creek was installed in February 1999 after an upstream landslide destroyed the previous intake and diversion structure. The intake consists of an infiltration header constructed of a perforated, eight-inch diameter, galvanized pipe network positioned within the streambed. The intake header was backfilled with layers of aggregate and geotextile fabric that serve as pretreatment gravel filter; the resulting raw water quality is very good throughout the year. The capacity of the intake header is not specifically known, though it is estimated to be in excess of 700 gpm (1.0 MGD).

Salmon Creek. The raw water intake on Salmon Creek consists of a Johnson type screen positioned above the streambed behind a diversion structure which is located near the water treatment plant. The intake screen is connected to a six-inch transmission line extending to the treatment plant. The Salmon Creek intake is generally used as a secondary use raw water intake and is in good operating condition.

Based upon flow records and design capacity information for Johnson screens, the intake is estimated to be capable of about 420 gpm (0.6 MGD).

Yachats River. The City presently does not have a raw water intake on the Yachats River. The existing water rights allow the City to remove water from two separate diversion points. The upper diversion point will provide superior water quality and is the first diversion on the Yachats that should be developed. The diversion should be sized to be capable of removing the full 1.0 cfs when running at full capacity and 0.5 cfs when removing the municipal reserve amount. This may be best accomplished with a duplex pumping station capable of running with one pump alone or with both pumps simultaneously. The City may also wish to construct a pump station capable of allowing it to stage the development of the diversion in increments of 0.5 cfs.

Normally, intakes should be sized for the 50-year MDD. The combination of the estimated 1.0 MGD Reedy Creek intake and the 0.6 MGD Salmon Creek intake exceeds the City's 50-year MDD of 1.3 MGD, provided source water is actually available when MDD flows are required.

The existing intakes appear to be sized appropriately though adequate water is rarely available during maximum demand conditions. The existing intakes should continue to be inspected and maintained. No additional improvements are foreseen for the raw water intakes during the planning period.

Raw Water Transmission Line

Reedy Creek. The AC portion of the raw water transmission line from Reedy Creek was installed in 1945 and extends from the intake to the chlorinating building just off the county road. The remaining portions of the transmission line between the chlorinating building and the water treatment plant adjacent to Salmon Creek were replaced with an eight-inch HDPE pipe in September 1997 in an effort to reduce raw water losses; the nature of the HDPE piping construction virtually ensures the elimination of leakage. The City should develop a project for the replacement of the remaining six-inch AC piping from the Reedy Creek diversion with eight-inch HPDE piping. It is estimated that approximately 1,000 feet of six-inch piping remains on the Reedy Creek transmission line.

Salmon Creek. Water from Salmon Creek is delivered to the treatment plant via a six-inch transmission line connected to the Johnson type screen intake. Due to the close proximity to the treatment plant and the short length of piping, the existing transmission line is adequate.

Yachats River. If the Yachats River water right is developed, additional raw water transmission piping will be required to connect the new point of diversion to the existing Reedy Creek raw waterline. All new raw water piping should be a minimum of eight inches in diameter. The recommended material for this application is fusion-welded HDPE piping.

No additional improvements are foreseen for the raw water transmission line during the planning period.

Raw Water Storage

Steel Tank. In 1999, the City constructed a 500,000-gallon raw water holding tank adjacent to the water treatment plant. The treatment plant is capable of providing water in excess of the current maximum-day demand (MDD) to offset low summertime flows from the City's primary and secondary water sources. During water production, water is drawn from the tank into the treatment plant. When production ends, the tank is refilled. A float and automatic valve control the flow into and out of the raw water tank. The tank has provided the City with increased flexibility and consistency in its ability to provide water to consumers during maximum demand periods.

No additional improvements are required at the steel raw water tank at this time.

If the City is not successful in the development of new raw water sources, one option would be to impound a significant volume of raw water during the high-flow winter months and rely on that impoundment to provide water to the treatment plant during the low streamflow season. As with large storage reservoirs, the more water that can be stored, the better the water system will be prepared for periods of drought. However, cost, space limitations, environmental impacts, and other factors will limit the size of the impoundment available to the City.

Reedy Creek. The Reedy Creek impoundment provided significant storage volume for the City prior to its destruction by a landslide in 1998; while the original storage volume is not known, it did provide valuable raw water storage for the City.

Reconstruction of the Reedy Creek impoundment may pose some significant challenges for the City and environmental and regulatory issues will introduce a number of hurdles to the process. Uncertainties concerning the physical features of the site in terms of stability of the existing geology, potential capacity of the impoundment, and the potential of exfiltration from the impoundment tend to detract from the Reedy Creek option. A survey of the existing site should be performed to determine the potential volume available in an impoundment on Reedy Creek as well as preliminary geotechnical evaluations of the site to determine if a dam could be constructed.

Salmon Creek. Similar interest exists for the construction of a larger impoundment above the existing diversion on Salmon Creek. As is the case with Reedy Creek, the City would have to overcome numerous obstacles to construct a large raw water impoundment on Salmon Creek.

Yachats River. The most favorable location for a raw water impoundment exists on a ten acre, City-owned parcel located on the opposite side of the Yachats River from the water treatment plant. The City is currently investigating the development of a smaller raw water impoundment on this site. It is expected that, given space and topography limitations, an impoundment could be constructed to hold between three and five million gallons of raw water. The impoundment would be of earthen construction with bermed walls of sufficient height to prevent a 100-year flood from inundating the impoundment. The impoundment would be lined with clay, rubber, or other type of waterproof liner to prevent exfiltration from the impoundment.

Flows from Reedy Creek could be diverted during high-flow and off production periods to fill the impoundment: A pumping station would be required to transmit water from the impoundment to the water treatment plant. Two separate "bores" would be required to cross the river for the piping to fill and empty the impoundment.

The combination of a 3.0-MG impoundment: with the 0.5-MG steel raw water tank would provide the City with more than one week of raw water flows under maximum-day conditions. Low summertime flows in Reedy Creek could be diverted to the impoundment to fill it during off-production hours.

While raw water impoundments are not necessarily new sources of water, they can provide the City with increased operational flexibility and the ability to augment high and low-flow periods.

9.3 Water Treatment Facilities

Pretreatment

Because the City relies entirely on surface water for its raw water source, having the ability to treat surface water year-round is of significance. A pretreatment system capable of removing suspended solids and reducing turbidity levels is important for efficient operation of the water treatment plant.

Sedimentation. Providing facilities to "settle out" the particles in the water can reduce high turbidity and suspended solids. Sedimentation basins provide a place for raw water flows to slow down and particles to settle. The process can be accelerated through the addition of coagulants such as alum. Baffles and other components can assist the process by lengthening the path of travel for water through the basins.

The impoundments and raw water storage discussed in Section 9.2 can provide valuable sedimentation to the raw water system. The drawback of sedimentation basins is the removal of the settleable solids from the bottom of the basins. The silt and solids on the bottom of the basins should be removed regularly, usually on an annual basis. This can result is significant maintenance activities and potential damage to liners or other equipment during the process.

Clarifier. The existing clarifier has a history of operational difficulties and occasional failures. The design of the clarifier, described as an upflow, contact clarifier, requires regular and complex operator adjustments. Due to the relative automatic operation of the Yachats plant, changes in flow, turbidity, or other sudden change can easily upset the clarifier and cause the clarification portion of the treatment process to fail, resulting in essentially direct filtration treatment.

Improved flow control into the clarifier may reduce the "upsets" experienced by flow surges to the plant. The valves should be adjusted or replaced as necessary to allow the slow opening and closure of the flow control valves to prevent bursts of raw water from entering the clarifier and upsetting the sediment layer near the bottom of the clarifier.

An alternative to the existing clarifier arrangement would be to convert it to a standard sedimentation or clarification basin. The settlement of suspended solids could be enhanced through the installation of tube settlers and launders to "skim" the clarified water off the top of the tank and direct the clarified flows to the filtration system.

Treatment Plant

General. The water treatment plant was constructed in 1992 and is in good condition today. The plant utilizes standard multi-media filtration and has a capacity of 350 gpm (0.5 MGD) and generally operates well given the area's raw water conditions.

As presented in Section 6, the water treatment plant should be sized to provide water for the 20-year MDD of 0.64 MGD. It should be noted that the treatment plant is only capable of producing 0.5 MGD of water when running at full capacity for 24 hours. Based upon population projections and projected water use demands (adjusted to allow 15 percent unaccounted water), the existing plant should be capable of providing the City's MDD flows beyond the year 2011.

Since the filtration system and process piping was sized for 1.0 MGD, the only improvement required at the plant to produce 1.0 MGD would be to replace the 350 gpm treated water pumps with two 700 gpm pumps.

Controls. Rapid changes in turbidity require changes in the feed rates of the coagulant. A system incorporated by many water providers is that of a streaming current monitor (SCM). The SCM is capable of sensing these rapid changes in turbidity and can send signals to metering pumps to increase or decrease the feed rates of alum, PAX, or another coagulant. While the SCM does not eliminate the need for regular operator involvement, it can reduce many of the problems caused by over or under feeding the chemical coagulant.

In addition to SCM's, some communities have found increased operational efficiency by introducing particle counters to their treatment process. Particle counters may be used on the raw water to qualify readings obtained from turbidimeters or SCM's. While turbidimeters and SCM' indicate levels of turbidity and changes in turbidity, particle counters can provide information about what particle sizes are creating the turbidity, particle distribution, and particle concentration. Particle counters can also be used on the finished-water side to further qualify finished water quality.

Disinfection. The existing water plant was originally designed with a gaseous chlorine disinfection system. While chlorine gas is known for effective disinfection, it has recently fallen out of favor due to safety concerns and increased regulatory requirements.

An alternative to chlorine gas that has recently found favor among large and small water suppliers is that of onsite chlorine generation. On site generation involves the passing of an electric current through a brine solution. The resulting chemicals generally include sodium hypochlorite and other oxidizing chemicals. The required raw materials are rock salt, water, and electricity.

A number of manufacturers offer onsite generation equipment capable of producing oxidizing materials that will result in an effective disinfection product and a strong chlorine residual. Taking into consideration safety concerns, performance, and operating cost, the City may wish to replace its existing disinfection system with an onsite chlorine generator. The onsite system can be installed in the location of the existing disinfection equipment and utilize all existing process piping.

9.4 Treated Water Transmission

The treated water transmission line consists of about 4,700 feet of 12-inch diameter PVC waterline extending to the 1.0 MG tank located on Radar Road. The treated water transmission line was installed in 1992 along with the treatment plant and the 1.0 MG tank and is in good condition today. An effluent meter installed in February 1997 is capable of measuring the volume of treated water delivered to the distribution system.

No additional improvements are foreseen for the treated water transmission line during the planning period.

9.5 Treated Water Storage

Existing Reserves

The City has a total treated water storage capacity of 1,211,000 gallons not counting 43,000 gallons stored in the treatment plant clearwell. Treated water storage is comprised of a 1.0 million gallon rectangular concrete tank, a 200,000 gallon circular concrete tank, a 10,000 gallon rectangular concrete tank, and a 1000 gallon steel pressure tank; the existing tanks are believed to be in fair condition, although both above-ground concrete tanks (1.0 MG and 10,000 gal. tanks) have staining on the exterior walls, indicating minor leakage.

Regular inspection and maintenance of each tank is required to extend the useful life of the infrastructure. The interior of each tank should be inspected every three to five years and deficiencies repaired as required. Sealing of leaks and coating of surfaces should be performed when conditions indicate such action be taken.

No additional improvements to the existing reservoirs are required at this time.

New Reserves

As discussed in Section 6, there are a number of ways to determine the treated water storage requirements of a given water system. Two different methods were utilized to determine the treated water reserve requirements for the City of Yachats. Each method is briefly summarized below:

State Agency Recommended Method – Method 1

An interagency team made up of personnel from the DEQ, OECDD, OHD, WRD, USDA, DLCD, and others have been working to develop recommended sizing strategies based on state and community consumption averages and their experiences with Oregon communities. Part of these recommendations included sizing parameters for treated water reserve components.

The interagency team suggests that reserves in the system be sized for a volume that is equal to 2.5 times the ADD plus fire flow reserves. Based on this methodology, the required reserve for the City of Yachats is summarized in Table 9.5.1. It should be noted that the sizing analysis was performed using demand figures that have been adjusted to allow 15 percent unaccounted water. Current average demands are actually higher and would result in increased reserve requirements. If the City is unsuccessful in reducing unaccounted water levels, additional storage may be required in the future.

Table 9.5.1 -Treated Water Reserve Requirements-Method 1

Storage Requirement Description	Planning Year	
	2001	2021
Equalizing	0	0
Emergency*	385,700	642,600
Fire Reserve**	540,000	540,000
Total (Gallons)	925,700	1,182,600
Total (MG)	.93	1.18
Existing Reserves	1.21	1.21
Reserve Shortfall (MG)	--	--

* Equal to 2.5 x ADD, ** Equal to 3000 gpm for 3 hours

Standard Methodology – Method 2

The second method used to analyze the reserve requirements for the City of Yachats is based on methodology commonly used within the industry. The methodology operates under the planning scenario of a major fire occurring during maximum-day conditions. The scenario could be interpreted as the City experiencing a fire on the Fourth of July or other major water demand day.

Method 2 suggests having one MDD storage volume to make it through the maximum-day demand without further production capabilities for emergency storage. In addition to emergency storage, one-quarter of a MDD should be stored for equalizing flow in order to balance demand and production offsets. Appropriate fire reserves are also included in Method 2. Based on this second methodology, the required reserve for the City of Yachats is summarized in Table 9.5.2.

Table 9.5.2 - Treated Water Reserve Requirements-Method 2

Storage Requirement Description	Planning Year	
	2001	2021
Equalizing	96,425	160,650
Emergency*	385,700	642,600
Fire Reserve**	540,000	540,000
Total (Gallons)	1,022,125	1,343,250
Total (MG)	1.02	1.34
Existing Reserves	1.21	1.21
Reserve Shortfall (MG)	--	0.13

* Equal to 1 x MDD, ** Equal to 3000 gpm for 3 hours

Recommended Treated Water Storage Plan

A number of issues should be considered when sizing new treated water reserve components. The above analyses can be used to develop the requirements for a treated water reserve system both now and at the end of the planning period based on current and predicted system demands. The above methodologies do not, however, take into consideration the remaining life of the existing reserve facilities or the expected life of new components.

Depending on the methodology used, slightly different reserve requirements are developed for the Yachats water system. While Method 1 results in no reserve shortfall for the entire planning period, Method 2 results in a slight shortfall at the end of the planning period. Each method differs slightly in its philosophy of storage planning. Though each method is valid, Method 2 results in a slightly higher storage volume. The main reason for this greater volume is that in Method 2 the emergency storage volume is based on the projected MDD rather than the ADD. It should be reiterated that the demands used in the calculations assume that the City will reduce losses and therefore reduce reserve requirements for the system.

Our calculations indicate that the City of Yachats is slightly deficient in the treated water storage for the 20-year planning period. Additional storage may provide the City with increased operational flexibility as well as provide it with additional infrastructure to bridge the useful life spans of the existing reservoirs constructed in 1945 and 1992. Construction of a treated water reservoir in the southern portion of the water system will provide improved flows and pressure distribution to this area where future growth is expected to take place. A 250,000-gallon steel reservoir with an aluminum dome can be economically constructed and provide the City with significant additional storage.

Therefore, the City may consider developing plans and financing for the construction of a new 0.25 MG treated water storage reservoir. We further recommend that the site of the new reservoir be moved to a location within the southern half of the City and at an elevation of approximately 220 feet. Before a reservoir is sited, a survey of the existing system and potential new reservoir locations should be conducted.

Common materials for the construction of treated water reservoirs include reinforced concrete and steel. A reinforced concrete tank typically has a longer useful life than a steel tank, however, the initial cost of a concrete tank is usually 30 to 50 percent higher than a steel tank. Steel tanks usually require more maintenance and have a shorter useful life. Over the life of each type of tank, a concrete tank is usually considered to be a better long-term investment.

It should be noted that the City has the potential to convert the existing 500,000-gallon raw water storage tank to a treated water storage tank. However, conversion of the raw water tank would require the tank to be covered. Also, due to the elevation of the existing tank, additional pumping would be required to lift water from the tank into the reservoirs on system's main pressure level. Because of these changes, and the value of the tank as a raw water reservoir, it is not likely that it will be converted to a treated water tank within this planning period.

See Section 10 for a development of the costs for the recommended reservoir options.

9.6 Distribution System

Hydraulic Modeling

The distribution system in the City of Yachats is comprised of a variety of pipe materials and sizes. Approximately 76 percent of the system is made up of piping that is six inches in diameter or larger. Older portions of the system are constructed of asbestos-cement (AC) piping. Portions replaced or constructed within the past 12 years consist of PVC piping. Additional pipe materials used within the system include ductile iron, cast iron, and possibly other materials. Leakage and lost water in the treated water storage and distribution system has ranged from 20 to 32 percent in the years of 1997 to 2000.

The existing water system was modeled using hydraulic modeling software called WaterCAD® by Haestad Methods. The existing reservoirs and piping were analyzed for system performance. The hydraulic performance of the distribution system was modeled under fire flow conditions combined with maximum-day demand. The modeling scenario could be interpreted as the City fighting a fire on the Fourth of July. Higher fire flow demands were modeled in locations such as City Hall, schools, hotels, and other larger facilities.

Hydraulic Performance

Due to adequate system pressures and a relatively well looped distribution network, hydraulic performance of the system is adequate in most areas. A number of existing pipe sections, however, were identified as deficient.

Through discussions with City staff as well as reviewing the distribution system layout, a hierarchy of repair priorities has been established. The system repair hierarchy is as follows:

1) troublesome areas,
2) all four inch waterlines,
3) six and eight inch AC piping, and
4) all undersized lines.

A summary of each distribution project is provided in Section 10 along with a cost estimate for each project. Section 11 provides recommendations for project prioritization.

Capital Improvement Plan

Section 10

Section 10

Capital Improvement Plan

10.1 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 are discussed in this section. The estimates presented herein are preliminary and are based on the level and detail of planning presented in this Study. As projects proceed and as site-specific information becomes available, the estimates may require updating. System improvements that are recommended in the City of Yachats, are detailed in this section along with associated costs.

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. Reference was made to the as-built drawings, and system maps of the existing facilities to determine construction quantities, elevations of the reservoirs and major components, and locations of distribution lines. Where required, estimates will be based on preliminary layouts of the proposed improvements.

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 is most commonly used. This index is based on the value of 100 for the year 1913. Average yearly values for the past ten years are summarized in Table 10.1.1.

Table 10.1.1 - ENR Index 1990 to 2000

YEAR	INDEX	% CHANGE/YR
1990	4732	2.53
1991	4835	2.18
1992	4983	3.06
1993	5208	4.52
1994	5336	2.46
1995	5443	2.01
1996	5521	1.43
1998	5852	2.95
1999	5992	2.39
2000	6222	3.84
	Average Annual Change =	2.74

It is anticipated that construction of any necessary projects will start by the summer of 2002. Cost estimates presented in this Plan for construction performed in later years should be projected with an increase of three percent per year. Future yearly ENR indices can be used to calculate the cost of projects for their construction year based on the annual growth in the ENR index.

The cost estimates provided within this Master Plan assume that all projects are constructed under public contract. City construction projects or "in-house" projects can often be performed at a lower cost than the contracted rates represented herein. This would allow the City to do more with the funding that is available. City construction projects also provide the opportunity for the public works staff to gain exposure and improve public relations with the residents of Yachats. City personnel are experienced with waterline replacement projects; however, the City should be cautious in undertaking too large of a project because other services may suffer or construction may be too complex for staff skill levels and available City equipment. Regardless of the project size, it is recommended that, should the City implement "in-house" improvements, the project be supported with quality control inspections, field staking and surveying.

It is also recommended that in the event other public works projects are being performed in the same location, (i.e., sewer, street, storm, etc.), planning priority be given to combining these water projects with the projects at hand. In doing this, the City will save money by eliminating repetitive mobilization, demolition, and road patching in the same locations.

Contingencies

A planning level contingency factor equal to approximately 15 percent (15%) of the estimated construction cost has been added. 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.

Engineering

The cost of engineering services for major projects typically includes special investigations, a predesign report, 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 15 to 25 percent 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, complicated projects.

Additional engineering services may be required for specialized projects. This could include geotechnical evaluations, structural evaluations, and other specialized consulting activities.

Legal and Administrative

An allowance of three percent (3%) of construction cost has been added for legal and administrative services. This allowance is intended to include internal project planning and budgeting, grant administration, liaison, interest on interim loan financing, legal services, review fees, legal advertising, and other related expenses associated with the project.

Land Acquisition

Some projects may require the acquisition of additional right-of-way or property 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.

10.2 Recommended Projects

A number of project alternatives were developed in Section 9. For each major component of the system, projects have been developed and preliminary cost estimates prepared for the purposes of budgeting for improvements.

A written description for each recommended project is provided along with a cost estimate. The location and scope of each project is shown on Figure 10.2.1.

Section 11 groups projects into priorities and analyzes the financial impact to the City's water system and the potential impact to ratepayers.

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THE DYER PARTNERSHIP ENGINEERS & PLANNERS	CITY OF YACHATS	FIGURE NO.
DATE: JUNE, 2001	PROPOSED WATER SYSTEM IMPROVEMENTS	10.2.1
PROJECT NO.: 0510.02		

10.3 Water Source and Water Rights Projects

Project Number 1 – Development of a New Raw Water Source

A number of new raw water source options were developed in Section 9.1. While it is difficult to prepare cost estimates for these types of projects, discussion about the cost of various options is appropriate.

Available water resources are becoming increasingly scarce. Developing additional water sources will be a difficult and potentially expensive task, however, the City should not wait for its water supply to become deficient before it acts to develop additional water sources. As was presented in Section 6.2, raw water sources should be developed to supply enough water for the 50-year demand projections. The City should, at a minimum, develop systems now to provide adequate raw water for the 20-year MDD of 1.0-cfs.

Conservation. As was discussed in Section 7, water reclaimed through lost water reduction and conservation measures can be considered a new water source. However, the effectiveness and reliability of such programs is not guaranteed. While the City should undertake all measures and activities recommended in Section 7, additional plans should be made to improve the reliability of the City's raw water supply. Costs related specifically to conservation measures are provided in Section 7. Costs related to piping improvements and other major infrastructure improvements will be included within the CIP in this Section.

Yachats River. The Yachats River is the only true source of new raw water available to the City. The City holds water rights totaling 2.0 cfs on the Yachats River though the permit is junior to a number of instream water rights. The instream water rights will prevent the City from removing its full water right during low seasonal streamflows. However, it will be able to harvest up to 1.0-cfs from the municipal reserve; the municipal reserve must be removed from two separate diversion points.

Project No. 1 includes the development of the "upper" diversion point on the Yachats River. A new intake with fish screen and pumping station must be constructed. The intake will be connected to the Reedy Creek transmission main.

Table 10.3.1 – Yachats River "Upper Diversion" Raw Water Pump Station
Project No. 1

Item	Description	Units	No. Units	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	1	$12,000	$12,000
2	Excavation & Backfill	LS	1	$15,000	$15,000
3	Duplex Pumps	LS	1	$20,000	$20,000
4	Wet Well	LS	1	$25,000	$25,000
5	Intake & Fish Screen	LS	1	$20,000	$20,000
6	Piping & Appurtenances	LS	1	$15,000	$15,000
7	Electrical Service & Facilities	LS	1	$15,000	$15,000
8	Transmission Piping	LS	1	$20,000	$20,000

Project Subtotal	***$122,000***
Contingency	***$18,500***
Engineering	***$30,500***
Legal & Admin.	***$3,700***
Land Acquisition	***$50,000***
Project Total	***$224,700***

10.4 Raw Water Transmission

Project Number 2 – Raw Water Transmission

Approximately 1,000 lineal feet of the six inch AC Reedy Creek transmission line should be replaced with eight inch HDPE piping. Project No. 2 includes provisions for the replacement of this section of raw waterline.

A cost estimate for this project is provided below:

Table 10.4.1 – Reedy Creek Raw Water Transmission Improvement
Project No. 2

Item	Description	Units	No. Units	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	1	$5,000	$5,000
2	Demolition and Site Prep	LS	1	$2,500	$2,500
3	8-inch HDPE Transmission Piping	LF	1000	$35	$35,000
4	8-inch Gate Valve	EA	4	$650	$2,600
5	Misc. Fittings and Appurtenances	LS	1	$10,000	$10,000

Project Subtotal	***$55,100***
Contingency	***$8,500***
Engineering	***$11,000***
Legal & Admin.	***$1,700***
Project Total	***$76,300***

10.5 Raw Water Storage

Project Number 3– Raw Water Storage

The City would like to construct a raw water storage pond on a City-owned parcel located on the south side of the Yachats River directly across from the water treatment plant. Though a preliminary survey or geotechnical analysis has not been performed, it is assumed that a pond capable of storing a minimum of 3.0-MG of raw water could be constructed. Preliminary planning assumes the pond would be an earthen, lined, impoundment with bermed-walls raised above the flood plain. The water to fill the pond would come from the Reedy Creek diversion and a pump station would transmit the raw water from the pond across the river and into the water treatment plant.

A cost estimate for this project is provided below:

Table 10.5.1 – Yachats River Raw Water Impoundment
Project No. 3

Item	Description	Units	No. Units	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	1	$52,000	$52,000
2	Demolition and Site Prep	LS	1	$26,000	$26,000
3	Excavation and Embankment	CY	18000	$5	$90,000
4	10-inch HDPE Direction Drill	LF	1000	$300	$300,000
5	1.0 MGD Pumping Station	LS	1	$90,000	$90,000
6	Pond Lining	SY	7500	$7	$52,500
7	Misc. Fittings and Appurtenances	LS	1	$78,000	$78,000

Project Subtotal	***$688,500***
Contingency	***$103,300***
Engineering	***$124,000***
Legal & Admin.	***$20,700***
Project Total	***$936,500***

10.6 Treated Water Storage

Project Number 4 – 0.25 Million Gallon Reservoir

The City has adequate treated water storage capacity for existing demand levels. However, additional treated water storage reserves will be required before the end of the planning period. It is recommended that a 0.25 MG treated water reservoir be constructed in the southern portion of the City. Constructing the new reservoir south of the Yachats River will distribute reserves and provide more uniform flow and pressure distribution in the southern half of the water system.

A bolted steel tank is suited for a reservoir of this volume. Various paints, coatings, or bonded surfaces are available to protect the steel tank from the elements. While a specific reservoir site has not been established at this time, a reservoir is shown at the top of Green Hill Drive on Figure 10.2.1 for planning purposes. The City will need to perform a reservoir siting study to confirm the best location and elevation for a new treated water reservoir.

A cost estimate for the project is provided below:

Table 10.6.1 – 0.25 Million-Gallon Reservoir
Project No. 4

Item	Description	Units	No. Units	Unit Cost	Subtotal
1	Const. Fac. & Temp. Controls	LS	1	$42,500	$42,500
2	Demolition and Site Prep	LS	1	$25,500	$25,500
3	10-inch Waterline	LF	210	$35	$7,350
4	8-inch Waterline	LF	750	$30	$22,500
5	6-inch Waterline	LF	395	$25	$9,875
6	4-inch Waterline	LF	380	$22	$8,360
7	10-inch Gate Valve	EA	2	$900	$1,800
8	8-inch Gate Valve	EA	5	$750	$3,750
9	6-inch Gate Valve	EA	5	$475	$2,375
10	4-inch Gate Valve	EA	2	$425	$850
11	0.25 MG Bolted Steel Tank	LS	1	$165,000	$165,000
12	Fire hydrant Assembly	Ea	4	$2,200	$8,800
13	Connections to Exist 10-inch	Ea	3	$2,000	$6,000
14	Connections to Exist 8-inch	Ea	1	$1,800	$1,800
15	Connections to Exist 6-inch	Ea	2	$1,500	$3,000
16	Site Work, Fencing, and Access	LS	1	$50,000	$50,000
17	Misc. Fittings and Appurtenances	LS	1	$48,000	$48,000

Project Subtotal	***$407,460***
Contingency	***$61,000***
Engineering	***$73,000***
Land Acquisition	***$50,000***
Legal & Admin.	***$12,000***
Project Total	***$603,460***

10.7 Distribution System Improvements

A number of distribution system improvement projects have been developed for the Master Plan. A project and cost estimate has been prepared and is presented below and on the following pages. For recommendations on project prioritization, see Section 11.

For the location of each distribution system improvement project, see Figure 10.2.1.

Project Number 5 – Second Street Waterline Replacement

An existing four inch waterline within Second Street between Prospect and Cedar Avenues and extending southerly along Cedar Avenue to Yachats River Road is due for replacement. A new six inch waterline has been placed within Yachats River Road between Cedar Avenue and Fir Street, but is not currently connected to the system. A new six inch waterline should be installed to replace the above described four inch line and connected to the existing unused six inch waterline.

This project includes provisions to replace approximately 1,100 feet of existing waterline.

A cost estimate for this project is provided below:

Table 10.7.1 – Second Street Waterline Replacement.
Project No. 5

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Construction Facilities & Temp. Controls	LS	1	$9,500	$9,500
2	Demolition	LS	1	$5,600	$5,600
3	6-inch Waterline	LF	1100	$25	$27,500
4	6-inch Gate Valve	Ea	6	$475	$2,850
5	Service Connections	Ea	20	$300	$6,000
6	Connections to Exist 8-inch	Ea	1	$1,800	$1,800
7	Connections to Exist 6-inch	Ea	1	$1,500	$1,500
8	Connections to Exist 4-inch & Smaller Line	Ea	1	$1,200	$1,200
5	Fire hydrant Assembly	Ea	2	$2,200	$4,400
9	AC Patch	LF	1100	$18	$19,800
10	Service Lines, Fittings & Appurtenances	LS	1	$9,000	$9,000

Construction Total	***$89,150***
Contingency	***$13,400***
Engineering	***$16,000***
Administration	***$2,700***
Project Total	***$121,250***

Project Number 6 – U. S. Highway 101 Waterline

To improve distribution performance and increase fire flows in the vicinity, the existing four inch waterline on U. S. Highway 101 between Third and Seventh Streets should be replaced with a new eight inch waterline.

This project will improve the entire system performance and provide improved fire flows in the vicinity of the improvements.

A cost estimate for this project is provided below:

Table 10.7.2 – Highway 101 Waterline
Project No. 6

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Construction Facilities & Temp Controls	LS	1	$10,500	$10,500
2	Demolition	LS	1	$6,500	$6,500
3	8-inch Waterline	LF	1050	$28	$29,400
4	8-inch Gate Valve	Ea	6	$700	$4,200
5	Fire hydrant Assembly	Ea	3	$2,200	$6,600
6	Service Connections	Ea	22	$300	$6,600
7	Connections to Exist 8-inch	Ea	2	$1,800	$3,600
8	Connections to Exist 6-inch	Ea	2	$1,500	$3,000
9	AC Patch	LF	1050	$18	$18,900
10	Service Lines, Fittings & Appurtenances	LS	1	$11,000	$11,000

Construction Total	***$100,300***
Contingency	***$15,000***
Engineering	***$18,000***
Administration	***$3,000***
Project Total	***$136,300***

Project Number 7 – Reeves Circle Waterline

Reeves Circle is a residential street with an existing six inch waterline serving the northerly half and a two inch waterline serving the southerly half. To eliminate problems and increase available fire flows in the area, it is proposed the existing two inch waterline be replaced with a new six inch line.

A cost estimate for this project is provided below:

Table 10.7.3 – Reeves Circle Waterline
Project No. 7

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Construction Facilities & Temp. Controls	LS	1	$5,500	$5,500
2	Demolition	LS	1	$3,500	$3,500
3	6-inch Waterline	LF	625	$25	$15,625
4	6-inch Gate Valve	Ea	3	$650	$1,950
5	Service Connections	Ea	11	$300	$3,300
6	Connections to Exist 10-inch	Ea	1	$2,000	$2,000
7	Connections to Exist 6-inch	Ea	1	$1,200	$1,200
8	Fire hydrant Assembly	Ea	1	$2,200	$2,200
9	AC Patch	LF	625	$18	$11,250
10	Service Lines, Fittings & Appurtenances	LS	1	$5,500	$5,500

Construction Total	***$52,025***
Contingency	***$7,800***
Engineering	***$9,400***
Administration	***$1,600***
Project Total	***$70,825***

Project Number 8 – Fourth Street and Driftwood Lane Waterlines

This project includes provisions for the replacement of the existing two inch waterline on the southerly side of Fourth Street with a six inch waterline. The new line would connect between the distribution line on U.S. Highway 101 and an existing dead-end six inch line that extends easterly from Ocean View Drive. Additionally, a new six inch line would be installed on Driftwood Lane to connect the line to an existing six inch line in Third Street.

This project will increase fire flows in the vicinity and improve hydraulic performance.

A cost estimate for this project is provided below:

Table 10.7.4 – Fourth Street and Driftwood Lane Waterlines
Project No. 8

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Construction Facilities & Temp. Controls	LS	1	$8,000	$8,000
2	Demolition	LS	1	$5,000	$5,000
3	6-inch Waterline	LF	900	$25	$22,500
4	6-inch Gate Valve	Ea	6	$475	$2,850
5	Service Connections	Ea	12	$300	$3,600
6	Connections to Exist 8-inch	Ea	1	$1,800	$1,800
7	Connections to Exist 6-inch	Ea	2	$1,500	$3,000
8	Fire hydrant Assembly	Ea	3	$2,200	$6,600
9	AC Patch	LF	900	$18	$16,200
10	Service Lines, Fittings & Appurtenances	LS	1	$8,000	$8,000

Construction Total	***$77,550***
Contingency	***$11,600***
Engineering	***$14,000***
Administration	***$2,300***
Project Total	***$105,450***

Project Number 9 – Second and Pontiac Streets Waterlines

This project includes provisions for the replacement of the existing four inch waterline on Second Street and the existing two inch line on Pontiac Street with new six inch waterlines. The project will complete an additional water main loop in the center of the City.

This project will increase fire flows in the vicinity and improve hydraulic performance.

A cost estimate for this project is provided below:

Table 10.7.5 – Second and Pontiac Streets Waterlines
Project No. 9

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Construction Facilities & Temp. Controls	LS	1	$9,300	$9,300
2	Demolition	LS	1	$5,600	$5,600
3	6-inch Waterline	LF	1020	$25	$25,500
4	6-inch Gate Valve	Ea	4	$475	$1,900
5	Service Connections	Ea	25	$300	$7,500
6	Connections to Exist 8-inch	Ea	2	$1,800	$3,600
7	Connections to Exist 6-inch	Ea	1	$1,500	$1,500
8	Fire hydrant Assembly	Ea	3	$2,200	$6,600
9	AC Patch	LF	1020	$18	$18,360
10	Service Lines, Fittings & Appurtenances	LS	1	$9,300	$9,300

Construction Total	***$89,160***
Contingency	***$13,400***
Engineering	***$16,000***
Administration	***$2,700***
Project Total	***$121,260***

Project Number 10 – Lincoln and Spruce Avenues Waterlines

This project includes provisions for the replacement of the existing two inch waterlines on Lincoln and Spruce Avenues with new six inch waterlines. The new lines will connect to the existing six inch waterline on the Yachats River Road. Additionally, a two inch waterline will be installed to connect the northerly ends of the new six inch waterlines to provide a "looped" line.

This project will improve overall system performance and increase fire flows in the area of the new waterlines.

A cost estimate for this project is provided below:

Table 10.7.6 – Lincoln and Spruce Avenues Waterlines
Project No. 10

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Construction Facilities & Temp. Controls	LS	1	$7,700	$7,700
2	Demolition	LS	1	$4,600	$4,600
3	6-inch Waterline	LF	775	$25	$19,375
4	6-inch Gate Valve	Ea	4	$475	$1,900
5	2-inch Waterline	LF	250	$18	$4,500
6	Service Connections	Ea	15	$300	$4,500
7	Connections to Exist 6-inch	Ea	2	$1,500	$3,000
8	Fire hydrant Assembly	Ea	3	$2,200	$6,600
9	AC Patch	LF	775	$18	$13,950
10	Service Lines, Fittings & Appurtenances	LS	1	$8,000	$8,000

Construction Total	***$74,125***
Contingency	***$11,100***
Engineering	***$13,300***
Administration	***$2,225***
Project Total	***$100,750***

Project Number 11 – Coolidge Lane Waterline

This project includes provisions for the replacement of the existing two inch waterline on Coolidge Lane with a new six inch waterline. The new line will connect to the existing eight inch waterline on the westerly side of U.S. Highway 101 and the existing six inch line that enters Coolidge Lane from the west.

This project will improve overall system performance and increase fire flows in the area of the new waterline.

A cost estimate for this project is provided below:

Table 10.7.7 – Coolidge Lane Waterline
Project No. 11

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Construction Facilities & Temp. Controls	LS	1	$5,600	$5,600
2	Demolition	LS	1	$34,000	$34,000
3	6-inch Waterline	LF	620	$24	$14,880
4	6-inch Gate Valve	Ea	2	$475	$950
5	Fire hydrant Assembly	Ea	1	$2,200	$2,200
6	Service Connections	Ea	12	$300	$3,600
7	Connections to Exist 8-inch	Ea	1	$1,500	$1,500
8	Connections to Exist 6-inch	Ea	1	$1,200	$1,200
9	Fire hydrant Assembly	Ea	2	$2,200	$4,400
10	AC Patch	LF	620	$18	$11,160
11	Service Lines, Fittings & Appurtenances	LS	1	$5,800	$5,800

Construction Total	***$85,290***
Contingency	***$12,800***
Engineering	***$15,400***
Administration	***$2,600***
Project Total	***$116,090***

Project Number 12 – Shell Street Waterline

This project includes provisions for the replacement of the existing two inch waterline that connects the existing six inch waterlines within Shell Street and Yachats Park Road with a new six inch waterline. This project will provide an additional "looped" connection and will improve fire flows in the vicinity of the new line.

A cost estimate for this project is provided below:

Table 10.7.8 – Shell Street Waterline
Project No. 12

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Construction Facilities & Temp. Controls	LS	1	$2,500	$2,500
2	Demolition	LS	1	$1,250	$1,250
3	6-inch Waterline	LF	210	$25	$5,250
4	6-inch Gate Valve	Ea	2	$475	$950
5	Service Connections	Ea	2	$300	$600
6	Connections to Exist 6-inch	Ea	2	$1,500	$3,000
7	Connections to Exist 4-inch & Smaller	Ea	1	$1,200	$1,200
8	Fire hydrant Assembly	Ea	1	$2,200	$2,200
9	Service Lines, Fittings & Appurtenances	LS	1	$2,700	$2,700

Construction Total	***$19,650***
Contingency	***$3,000***
Engineering	***$4,000***
Administration	***$600***
Project Total	***$27,250***

Project Number 13 – Surfside, Gender and Windy Way Waterlines

This project includes provisions for the replacement of the existing two inch waterlines on Surfside and Gender Drives and Windy Way with new four inch waterlines.

This project will provide improved hydraulic performance and higher fire flows to the distribution system in the vicinity of the improvements.

A cost estimate for this project is provided below:

Table 10.7.9 – Surfside, Gender and Windy Way Waterlines
Project No. 13

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Construction Facilities & Temp. Controls	LS	1	$9,500	$9,500
2	Demolition	LS	1	$5,700	$5,700
3	4-inch Waterline	LF	1025	$22	$22,550
4	4-inch Gate Valve	Ea	3	$475	$1,425
5	Fire hydrant Assembly	Ea	3	$2,200	$6,600
6	Service Connections	Ea	38	$300	$11,400
7	Connections to Exist 10-inch	Ea	3	$2,000	$6,000
8	AC Patch	LF	1025	$18	$18,450
9	Service Lines, Fittings & Appurtenances	LS	1	$9,600	$9,600

Construction Total	***$91,225***
Contingency	***$13,700***
Engineering	***$16,400***
Administration	***$2,700***
Project Total	***$124,025***

Project Number 14 – Miscellaneous Loop Closures

This project includes provisions for the closure of various loops within the distribution grid. One Loop closure is located on the north end of Driftwood Lane. The second closure is located near Northeast Peterson Road and will close a loop across Highway 101.

This project will provide improved hydraulic performance and higher fire flows to the distribution system in the vicinity of the improvements.

A cost estimate for this project is provided below:

Table 10.7.10 – Misc. Loop Closures
Project No 14

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Construction Facilities & Temp. Controls	LS	1	$2,700	$2,700
2	Demolition	LS	1	$1,600	$1,600
3	8-inch Waterline	LF	100	$28	$2,800
4	6-inch Waterline	LF	100	$25	$2,500
5	8-inch Gate Valve	Ea	2	$700	$1,400
6	6-inch Gate Valve	Ea	2	$650	$1,300
7	Connections to Exist 8-inch	Ea	2	$1,800	$3,600
8	Connections to Exist 6-inch	Ea	2	$1,500	$3,000
9	AC Patch	LF	200	$18	$3,600
10	Service Lines, Fittings & Appurtenances	LS	1	$3,000	$3,000

Construction Total	***$25,500***
Contingency	***$3,800***
Engineering	***$5,100***
Administration	***$800***
Project Total	***$35,200***

Project Number 15 – King Street Waterline

This project includes provisions for the replacement of an existing eight inch AC waterline on King Street from 7th Street north to Highway 101. The replacement of the line is necessary due to the poor condition of the existing waterline and the long history of leak repairs.

This project will provide improved hydraulic performance and higher fire flows to the distribution system in the vicinity of the improvements.

A cost estimate for this project is provided below:

Table 10.7.11 – King Street Waterline
Project No 15

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Construction Facilities & Temp. Controls	LS	1	$21,100	$21,100
2	Demolition	LS	1	$12,700	$12,700
3	8-inch Waterline	LF	2400	$28	$67,200
4	8-inch Gate Valve	Ea	6	$700	$4,200
5	6-inch Gate Valve	Ea	2	$650	$1,300
6	Connections to Exist 10-inch	Ea	1	$2,000	$2,000
7	Connections to Exist 8-inch	Ea	1	$1,800	$1,800
8	Connections to Exist 6-inch	Ea	2	$1,500	$3,000
9	Fire hydrant Assembly	Ea	6	$2,200	$13,200
10	Service Connections	Ea	40	$300	$12,000
11	AC Patch	LF	2400	$18	$43,200
12	Service Lines, Fittings & Appurtenances	LS	1	$21,000	$21,000

Construction Total	***$202,700***
Contingency	***$30,400***
Engineering	***$36,500***
Administration	***$6,100***
Project Total	***$275,700***

Project Number 16 – Radar and 7th Street Waterline

This project includes provisions for the replacement of an existing eight inch AC waterline on Radar and 7th Street from the existing reservoir site to Highway 101. The replacement of the line is necessitated due to the poor condition of the existing waterline and the long history of leak repairs. In order to provide increased capacity to the center of the system, the eight inch waterline should be upsized to a ten inch waterline.

This project will provide improved hydraulic performance and higher fire flows to the distribution system in the vicinity of the improvements.

A cost estimate for this project is provided below:

Table 10.7.12 – Radar and 7th Street Waterline
Project No 16

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Construction Facilities & Temp. Controls	LS	1	$14,000	$14,000
2	Demolition	LS	1	$8,400	$8,400
3	10-inch Waterline	LF	1300	$35	$45,500
4	10-inch Gate Valve	EA	5	$900	$4,500
5	6-inch Gate Valve	Ea	1	$650	$650
6	Connections to Exist 8-inch	Ea	2	$1,800	$3,600
7	Connections to Exist 6-inch	Ea	2	$1,500	$3,000
8	Fire hydrant Assembly	Ea	4	$2,200	$8,800
9	Service Connections	Ea	25	$300	$7,500
10	AC Patch	LF	1300	$18	$23,400
11	Service Lines, Fittings & Appurtenances	LS	1	$14,700	$14,700

Construction Total	***$134,050***
Contingency	***$20,100***
Engineering	***$24,100***
Administration	***$4,000***
Project Total	***$182,250***

Project Number 17 – 3rd Street Waterline

This project includes provisions for the replacement of an existing four inch AC waterline on 3rd Street from Highway 101 to Ocean View Drive with a new six inch waterline. The replacement of the line is necessitated due to the poor condition of the existing waterline and the long history of leak repairs. The construction of the 3rd Street waterline will tie into the new grid of waterlines in the "downtown" area between 2nd and 4th Streets.

This project will provide improved hydraulic performance and higher fire flows to the distribution system in the vicinity of the improvements.

A cost estimate for this project is provided below:

Table 10.7.13 – 3rd Street Waterline
Project No 17

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Construction Facilities & Temp. Controls	LS	1	$10,500	$10,500
2	Demolition	LS	1	$6,300	$6,300
3	6-inch Waterline	LF	1000	$25	$25,000
4	6-inch Gate Valve	Ea	6	$475	$2,850
5	Service Connections	Ea	25	$300	$7,500
6	Connections to Exist 8-inch	Ea	2	$1,800	$3,600
7	Connections to Exist 6-inch	Ea	1	$1,500	$1,500
8	Fire hydrant Assembly	Ea	3	$2,200	$6,600
9	Service Connections	Ea	25	$300	$7,500
10	AC Patch	LF	1000	$18	$18,000
11	Service Lines, Fittings & Appurtenances	LS	1	$11,000	$11,000

Construction Total	***$100,350***
Contingency	***$15,000***
Engineering	***$18,000***
Administration	***$3,000***
Project Total	***$136,350***

Project Number 18 – System-Wide Water Meter Replacement

This project includes provisions for the replacement of all existing meters with new, accurate, and consistent water meters. Based on initial testing results, it appears that a significant amount of loss in the system could be attributed to aged and inaccurate water meters. Preliminary estimates suggest that existing meters may account for at least 20 percent of the existing system losses. With losses totaling approximately 28 percent in 2000, a reduction of 20 percent would bring the City within compliance with the efficiency requirements of OAR 690-86.

Modern meters are capable of nearly 100 percent accuracy. Many meters offer automated-meter-reading (AMR) systems capable of significantly increasing the efficiency of the reading and billing process. The replacement of water meters with new meters should be considered of the highest priority so that the City may gather accurate data for the calculation of actual system losses.

A cost estimate for this project is provided below:

Table 10.7.14 – System-Wide Water Meter Replacement
Project No 18

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Construction Facilities & Temp. Controls	LS	1	$2,500	$2,500
2	Demolition	LS	1	$2,500	$2,500
3	Install New Water Meters	Ea	500	$130	$65,000
4	New AMR Equipment	LS	1	$5,000	$5,000

Construction Total	***$75,000***
Contingency	***$11,250***
Engineering	***$2,500***
Administration	***$2,500***
Project Total	***$91,250***

10.8 Treatment Plant Improvements

A number of improvements are recommended for the water treatment plant. While the treatment plant is relatively new and in good condition, some minor improvements are recommended to improve the operation and effectiveness of the treatment process.

Project Number 19 – Controls and Instrumentation Improvements

This project includes provisions to improve control and instrumentation systems at the water treatment plant. New systems included in the process will be a streaming current monitor and chemical feed pumps, a raw and finished water particle counter, a pH probe, and other miscellaneous instrumentation improvements.

A cost estimate for this project is provided below:

Table 10.8.1 – Control and Instrumentation Improvements
Project No 19

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Construction Facilities & Temp. Controls	LS	1	$3,900	$3,900
2	Demolition	LS	1	$2,300	$2,300
3	Streaming Current Monitor	Ea	1	$16,000	$16,000
4	pH Probe	Ea	1	$2,700	$2,700
5	Particle Counter	Ea	1	$7,000	$7,000
6	Misc Fittings & Appurtenances	LS	1	$5,200	$5,200

Construction Total	***$37,100***
Contingency	***$5,600***
Engineering	***$7,400***
Administration	***$1,100***
Project Total	***$51,200***

Project Number 20 – Clarifier Improvements

This project includes provisions to improve the operation and efficiency of the existing upflow, contact clarifier. Improvements recommended for the clarifier include the installation of tube settlers, improved flow control equipment, and other miscellaneous improvements.

A cost estimate for this project is provided below:

Table 10.8.2 – Clarifier Improvements
Project No 20

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Construction Facilities & Temp. Controls	LS	1	$5,600	$5,600
2	Demolition	LS	1	$4,000	$4,000
3	Tube Settlers	SF	450	$40	$18,000
4	Support System & Launderers	LS	1	$15,000	$15,000
5	Flow Control System	Ea	1	$7,000	$7,000
6	Misc Fittings & Appurtenances	LS	1	$8,000	$8,000

Construction Total	***$57,600***
Contingency	***$8,600***
Engineering	***$11,500***
Administration	***$1,700***
Project Total	***$79,400***

Project Number 21 – Disinfection Improvements

This project includes provisions to improve the operation, efficiency, and safety of the existing disinfection system. The existing gaseous chlorine disinfection system should be replaced with an on-site chlorine generator capable of manufacturing chlorine products from salt, water, and an electrical current. The on-site system can be installed in the footprint of the existing equipment and use all existing piping and ancillary components to feed the on-site solutions.

A cost estimate for this project is provided below:

Table 10.8.3 – Disinfection Improvements
Project No 21

Item	Description	Unit	Quantity	Unit Cost	Subtotal
1	Construction Facilities & Temp. Controls	LS	1	$4,000	$4,000
2	Packaged On-Site Disinfection System	LS	1	$30,000	$30,000
3	Misc Fittings & Appurtenances	LS	1	$5,000	$5,000

Construction Total	*$39,000*
Contingency	*$5,900*
Engineering	*$7,800*
Administration	*$1,200*
Project Total	*$53,900*

10.9 Recommended Project Summary

Seventeen separate projects were developed in the previous sections. A description of each project was provided along with a cost estimate for each. The location and scope of each project is summarized on Figure 10.2.1.

A summary of all recommended projects is provided below in Table 10.9.1. For project prioritization and an analysis of the potential impact to ratepayers, see Section 11.

Table 10.9.1 – Recommended Project Summary

Project No.	Project Description	Total Project Cost (2001 Dollars)
1	Yachats River Diversion Project	$224,700
2	Reedy Creek Transmission Improvement	$76,300
3	Yachats River Impoundment	$936,500
4	0.25 MG Storage Tank	$603,460
5	2nd Street Waterline Improvements	$121,250
6	Highway 101 Waterline	$136,300
7	Reeves Circle Waterline	$70,825
8	Fourth and Driftwood Waterline	$105,450
9	2nd Street and Pontiac Waterline	$121,260
10	Spruce and Lincoln Ave Waterline	$100,750
11	Coolidge Lane Waterline	$116,090
12	Shell Street Waterline	$27,250
13	Surfside, Gender, & Windy Way Waterlines	$124,025
14	Misc Loop Closures	$35,200
15	King Street Waterline	$275,700
16	Radar and 7th Street Waterline	$182,250
17	3rd Street Waterline	$136,350
18	System-Wide Water Meter Replacement	$91,250
19	Controls and Instrumentation	$51,200
20	Clarifier Improvements	$79,400
21	Disinfection Improvements	$53,900

Total Recommended Projects **$3,669,410**

Financing and Prioritization

Section 11

Financing and Prioritization

Section 11

Most communities are unable to finance major infrastructure improvements without some form of governmental funding assistance, such as low interest loans or grants. In this section, a number of major federal, state, and local funding programs appropriate for the recommended improvements are discussed.

The projects developed in Section 10 vary in their level of prioritization. Section 11.3 separates the projects into four priority levels to assist the City in its planning efforts. A recommended financing strategy for each priority rating is also presented along with a discussion of the potential impact to ratepayers.

11.1 Grant and Loan Programs

Some level of outside funding assistance in the form of grants or low interest loans will be necessary to make the proposed improvement projects affordable for the City of Yachats. The amount and types of outside funding will dictate the amount of local funding that the City must secure. In evaluating grant and local programs, the major objective is to select a program, or a combination of programs, which are best suited and available for the intended project.

A brief description of the major Federal and State funding programs that are typically utilized to assist qualifying communities in the financing of infrastructure improvement programs is given below. Each of the government assistance programs has certain prerequisites and requirements. These assistance programs promote such goals as aiding economic development, benefiting areas of low to moderate-income families, and providing for specific community improvement projects. With each program having specific requirements, not all communities or projects may qualify for every program. Former President Clinton's Timber Initiative identifies certain timber-dependent counties that receive priority in the award of funding under some programs.

Economic Development Administration (EDA) Public Works Grant Program

The EDA Public Works Grant Program, administered by the U.S. Department of Commerce, is aimed at projects which directly create permanent jobs or remove impediments to job creation in the project area. Thus, to be eligible for this grant, a community must be able to demonstrate the potential to create jobs from the project. Potential job creation is assessed with a survey of businesses to demonstrate the prospective number of jobs that might be created if the proposed project was completed.

Proposed projects must be located within an EDA-designated Economic Development District. Priority consideration is given to projects that improve opportunities for the establishment or expansion of industry and that create or retain private sector jobs in both the near-term and long-term. Communities, which can demonstrate that their existing system is at capacity (i.e., moratorium on new connections), have a greater chance of being awarded this type of grant. EDA grants are usually in the range of the 50 to 80 percent of the project cost; therefore some type of local funding is also required. Grants typically do not exceed 1 million dollars.

Water and Waste Disposal Loans and Grants (RDA)

Until October 1, 1992, the U.S. Department of Agriculture, Farmers Home Administration (FmHA), administered these programs. These loans and grants are now administered by the newly formed Rural Development Administration (RDA). While these programs are administered by a new agency, the program requirements are essentially the same as under FmHA.

The Rural Utilities Service (RUS) is one of three entities that comprise the USDA's Rural Development mission area. Administered by the USDA Rural Development office, the RUS supports various programs that provide financial and technical assistance for development and operation of safe and affordable water supply systems and sewer and other forms of waste disposal facilities.

The RDA has the authority to make loans to public bodies and non-profit corporations to construct or improve essential community facilities. Grants are also available to applicants who meet the median household income (MHI) requirements. Eligible applicants must have a population less than 10,000. Priority is given to public entities in areas smaller than 5,500 people to restore a deteriorating water supply, or to improve, enlarge, or modify a water facility and/or inadequate waste facility. Preference is given to requests that involve the merging of small facilities and those serving low-income communities.

In addition, borrowers must meet the following stipulations:

- Be unable to obtain needed funds from other sources at reasonable rates and terms.
- Have legal capacity to borrow and repay loans, to pledge security for loans, and to operate and maintain the facilities or services.
- Be financially sound and able to manage the facility effectively.
- Have a financially sound facility based on taxes, assessments, revenues, fees, or other satisfactory sources of income to pay all facility costs including operation and maintenance, and to retire the indebtedness and maintain a reserve.
- Water and waste disposal systems must be consistent with any development plans of State, multi-jurisdictional area, counties, or municipalities in which the proposed project is located. All facilities must comply with Federal, State, and local laws including those concerned with zoning regulations, health and sanitation standards, and the control of water pollution.

Loan and grant funds may be used for the following types of improvements:

- Construct, repair, improve, expand, or otherwise modify rural water supply and distribution facilities including reservoirs, pipelines, wells, pumping stations, water supplies, or water rights.
- Construct, repair, improve, expand, or otherwise modify waste collection, pumping, treatment, or other disposal facilities. Facilities to be financed may include such items as sewer lines, treatment plants, including stabilization ponds, storm sewer facilities, sanitary landfills, incinerators, and necessary equipment.
- Acquire a water supply or a water right.
- Legal and engineering costs connected with the development of facilities.

- Other costs related to the development of the facility including the acquisition of right-of-way and easements, and the relocation of roads and utilities.

- Finance facilities in conjunction with funds from other agencies or those provided by the applicant.

Interim commercial financing will normally be used during construction and Rural Development funds will be available when the project is completed. If interim financing is not available or if the project cost is less than $50,000, multiple advances of Rural Development funds may be made as construction progresses.

The maximum term on all loans is 40 years. However, no repayment period will exceed any statutory limitation on the organization's borrowing authority nor the useful life of the improvement of the facility to be financed. Interest rates are set quarterly and are based on current market yields for municipal obligations. Current interest rates may be obtained from any Rural Development office.

The following rates currently apply for the Rural Development program: (Quarter ending June, 2001)

> ***Market rate.*** Those applicants pay the market rate whose median household income (MHI) of the service area is more than the $27,756 (Oregon non-metropolitan MHI). The market rate is currently 5.125 percent.
>
> ***Intermediate rate.*** The intermediate rate is paid by those applicants whose MHI of the service area is less than $27,756 but greater than $22,205. The intermediate rate is currently 4.75 percent.
>
> ***Poverty line rate.*** Those applicants whose MHI of the service area is below $22,205 (80 percent of the non-metropolitan MHI) pay the lowest rate. Improvements must also be to correct a regulatory violation or health risk issue to qualify for this lowest rate. The current poverty line rate is 4.5 percent.

Maximum grant amounts, based on MHI, are provided in Table 11.1.1. The grants are calculated on the basis of eligible costs that do not include the costs attributable to reserve capacity or interim financing. In addition, grant funds cannot be used to reduce total user costs below that of comparable communities funded by RUS.

Table 11.1.1 - Maximum RDA Grant Funds Based On Median Household Income

Median Household Income (MHI)	Maximum Grant
<$22,205, and a regulatory violation or documented health issue	75%
$22,205 to $27,756	45%
>$27,756	0%

Eligibility for the Rural Water and Waste Disposal grants and loans are currently based on 1990 census data. The MHI in the City of Yachats, based on 1990 census data, is $23,667. At this MHI, the City could be eligible for a maximum grant of up to 45 percent of the total project cost. The City may also eligible for a RDA loan at the intermediate rate of 5.0 percent.

There are other restrictions and requirements associated with these loans and grants. If the City becomes eligible for grant assistance, the grant will apply only to eligible project costs. Additionally, grant funds are only available after the City has incurred long-term debt resulting in an annual debt service obligation equal to one-half percent of the MHI. In addition, an annual funding allocation limits the RDA funds. To receive an RDA loan, the City must secure bonding authority, usually in the form of general obligation or revenue bonds.

RDA will advise the applicant as to how to assemble information to determine engineering feasibility, economic soundness, cost estimates, organization, financing, and management matters in connection with the proposed improvements. If financing is provided, the RDA will also make periodic inspections to monitor project construction.

Applications for financial assistance are made at area offices of the RDA. For additional information on RDA loans and grant programs call 1-541-673-0136 or visit the RUS website at http://www.usda.gov/rus/water/.

The Oregon Rural Development website is http://www.rurdev.usda.gov/or/.

Emergency Community Water Assistance Grants (ECWAC)

Available through the USDA Rural Utilities Service (RUS) as part of the Water and Waste Disposal programs, ECWAC is available to communities when disaster strikes. Congress may appropriate funds for the program after a flood, earthquake, or other disaster if Federal assistance is warranted.

In order to receive assistance through an ECWAC grant, an applicant must fulfill the following requirements:

- Demonstrate that a significant decline in quantity or quality of water occurred within two years of the date the application was filed with RUS.
- Public bodies and nonprofit corporations serving rural areas, including cities or towns whose population does not exceed 10,000 people may be eligible.

Projects that are eligible for assistance include the following:

- Extend, repair or perform significant maintenance on existing water systems.
- Construct new water lines, wells, or other sources of water, reservoirs, and treatment plants.
- Replace equipment and pay costs associated with connection or tap fees.
- Pay related expenses such as legal and engineering fees and environmental impact analyses, or acquire rights associated with developing sources of treating, storing, or distributing water.
- Achieve compliance with the requirements of the Federal Water Pollution Control Act (33 U.S.C et seq.) or with the Safe Drinking Water Act when noncompliance is directly related to a recent decline in potable water quality.

The maximum grant available through ECWAC is $500,000. Grants for repairs, partial replacement, or significant maintenance on an established system cannot exceed $75,000. Otherwise, grants may be made for 100 percent of eligible project costs.

Applications are filed with any USDA Rural Development office. For additional information on RDA loans and grant programs call 1-541-673-0136 or visit the RUS website at http://www.usda.gov/rus/water/.

Technical Assistance and Training Grants (TAT)

Available through the USDA Rural Utilities Service (RUS) as part of the Water and Waste Disposal programs, TAT grants are intended to provide technical assistance and training to associations on a wide range of issues relating to the delivery of water and waste disposal services.

Rural communities with populations of less than 10,000 persons are eligible along with private, nonprofit organizations that have been granted tax-exempt status by the IRS.

TAT funds may be used for the following activities:

- Identify and evaluate solutions to water and/or waste related problems of associations in rural areas.
- Assist entities with preparation of applications for Water and Waste Disposal loans and grants.
- Provide training to association personnel in order to improve the management, operation and maintenance of water and/or waste disposal facilities.
- Pay expenses related to providing the technical assistance and/or training. This may include the preparation of a Water Master Plan.

Grants may be made for up to 100 percent of the eligible project costs. Applications are filed with any USDA Rural Development office. For additional information on RDA loans and grant programs call 1-541-673-0136 or visit the RUS website at http://www.usda.gov/rus/water/.

Oregon Community Development Block Grant (OCDBG) Program

The Community Development Program section of the Oregon Economic and Community Development Department (OECDD) administers the OCDBG Program. Funds for the program come from the U.S. Department of Housing and Urban Development. OCDBG funds under the Public Works category are targeted to water and wastewater systems.

The national objective of the program is the development of viable urban communities, by providing decent housing and a suitable living environment and expanding economic opportunities, principally for persons of low and moderate income. The State of Oregon has the following objectives for the funds it administers:

- Improving the availability and adequacy of public facilities and infrastructure;
- conserving the existing housing supply and improving housing conditions;

- increasing the supply of housing affordable to low and moderate income persons – particularly those with the lowest incomes; and

- increasing business and employment opportunities.

Only non-metropolitan cities and counties in rural Oregon can apply for and receive grants. Eligible activities include the following:

- Community Facilities

- Housing Rehabilitation

- Public Works Water and Sewer Improvements

- Public Works Infrastructure for New Housing

- Emergency Projects

- Section 108 Loan Guarantees

In 1999, Oregon was allotted approximately $15 million dollars in federal funds to provide improvement grants to qualified applicants. OCDBG grants are available for each of three phases necessary to complete water and/or wastewater system improvements.

- Phase 1: Technical assistance grants for planning and grant applications. Maximum grant $30,000.

- Phase 2: Grants for engineering, financial analysis, and environmental assessment.

- Phase 3: Grants for construction.

Total public works project grants are limited to $750,000 for the combined total of all phases. Grants awarded may be used for the following public works applications:

- Projects which are necessary to bring municipal water and sewer systems into compliance with:

  ⇒ The requirements of the Safe Drinking Water Act or the Clean Water Act administered by the Oregon Health Division (OHD)

  ⇒ The requirements of water quality statutes, rules or permits administered by the Oregon Department of Environmental Quality (DEQ) or the Environmental Quality Commission (EQC)

- Projects where the municipal system has not been issued a notice of non-compliance from the Oregon Health Division or the Department of Environmental Quality. The department may determine that a project is eligible for assistance if there is a high probability that within two years the system will be notified of non-compliance and it is reasonable and prudent to use program funds to bring the water or sewer system into compliance with current regulations or requirements proposed to take effect within the next two years.

Applications may now be submitted year-round for Public Works grants under the OCDBG Program. Only cities and counties may apply. To be eligible, a city must have at least 51 percent residents with low or moderate incomes, based on 1990 census data or a local survey. Based on the 1990 census data, 32 percent of residents in Yachats are Low/Moderate Income.

For additional information on the OCDBG programs, call 1-800-233-3306 or visit the OECDD website at http://www.econ.state.or.us/cdbg.htm.

Oregon Special Public Works Fund

The Special Public Works Fund (SPWF) program provides financing to local governments to construct, improve, and repair infrastructure in order to support local economic development and create new jobs locally, especially family wage jobs. In order to be eligible, the following conditions must be satisfied.

- The existing infrastructure must be insufficient to support current or future industrial or eligible commercial development; and
- there must be a high probability that family wage jobs will be created or retained within:
  - ⇒ the boundary to be served by the proposed infrastructure project; or .
  - ⇒ industrial or eligible commercial development of the properties served by the proposed infrastructure project.

The SPWF program is capitalized through biennial appropriations from the Oregon Lottery Economic Development Fund by the Oregon State Legislature, through bond sales for dedicated project funds, through loan repayments and other interest earnings. The Oregon Economic and Community Development Department (OECDD) administers the fund. Cities are eligible applicants and the following criteria is used to determine project eligibility.

Firm Business Commitment. In addition to creating or retaining permanent jobs as a result of the project, there must be private and/or public investment in the project equal to at least twice the SPWF funding. Firm business commitment can be characterized by the following:

- Specific industrial/manufacturing and eligible commercial businesses committing to create permanent full-time-equivalent jobs.
- Up to $10,000 in grant funds may be awarded for each full-time-equivalent job created (based on demonstrated financial need).
- Of jobs created, 30 percent must be "family wage" jobs.
- Public and/or private investment equal to at least 2x infrastructure cost.

Capacity Building. Capacity building efforts can be characterized by the following:

- Infrastructure capacity to support industrial/manufacturing development.
- Document recent interest by eligible business(s) in locating within the municipality.

- Demonstrate ongoing marketing efforts of industrial lands.

- Demonstrate distressed community status. Grant funds of up to $250,000 per project may be awarded to distressed communities without a firm business commitment.

All projects must principally benefit industrial or eligible commercial users.

The SPWF is primarily a loan program. Grant funds are available based upon economic need of the municipality. The maximum loan term is 25 years, though loans are generally made for 20-year terms. The grant/loan amounts are determined by a financial analysis based on a demonstrated need and the applicant's ability or inability to afford additional loans (debt capacity, repayment sources and other factors). Borrowers that are "credit worthy" may be funded through the sale of state revenue bonds. Loans are generally repaid with utility revenues, local improvement districts (LIDs), general funds, or voter approved bond issues.

Determination of the final amount of financing and the loan/grant/bond mix will be based on the financial feasibility of the project, the individual credit strength of an applicant, the ability to assess specially benefited property owners, the ability of the applicant to afford annual payments on loans from enterprise funds or other sources, future beneficiaries of the project, and six other applicable issues.

The maximum SPWF loan per project is $10 million, if funded from SPWF revenue bond proceeds. Projects financed directly from the SPWF may receive up to $1 million. The maximum SPWF grant is $500,000 for a construction project and cannot exceed 85 percent of the total project cost. Grants are made only when loans are not feasible.

Technical Assistance grants and loans may finance preliminary planning and engineering studies and economic investigations to determine infrastructure feasibility. Up to $10,000 in grant funds and $20,000 in additional loan funds may be awarded to eligible applicants with under 5,000 persons living within the City.

For additional information on the OCDBG and other OECDD programs, call 1-800-233-3306 or visit the OECDD website at http://www.econ.state.or.us/spwf.htm.

Water/Wastewater Financing Program

The 1993 Legislature created the Water/Wastewater Financing Program for communities that must meet Federal and State mandates to provide safe drinking water and adequate treatment and disposal of wastewater. The legislation was intended to assist local governments in meeting the Safe Drinking Water Act and the Clean Water Act.

Funding for the program is capitalized through a biennial appropriation from the Oregon Lottery Economic Development Fund by the Oregon State Legislature. The Oregon Economic and Community Development Department (OECDD) administers the program.

Program eligibility is limited to projects necessary to ensure compliance with the applicable State regulatory agency standards or rules. Cities, counties, districts and other public entities are eligible for the program. Eligible activities include the following:

- Water source, treatment, storage, and distribution improvements.

- Wastewater collection and capacity.
- Storm system.
- Purchase of rights-of-way and easements necessary for infrastructure development.
- Design and construction engineering.

While loans and grants may be awarded, grant funding must be accompanied by loans from the Community Development Program. Loans are based on a municipality's ability to repay. Grant funding is available only if a loan is not feasible. OECDD will structure a financing package that may include direct loans, bond loans, and/or grants and may include funds from other Community Development programs for which the project is eligible. The mix of loan/grant/bond financing will depend on the financial feasibility of the project and will consider utility rates, per capita income, existing debt, and other factors.

The limitations on the eligible projects and related funding assistance is summarized below:

- Projects financed with bond funds
  Loan - max. $10 million
  Grant - max. $500,000
- Projects financed with SPWF funds (lottery funds)
  Loan - max. $500,000
  Grant - max. $500,000
- Technical Assistance (for eligible applicants under 5,000 population)
  Loan - max. $20,000
  Grant - max. $10,000

Interested applicants should contact OECDD prior to submitting an application. Applications are accepted year-round. For additional information on this and other OECDD programs, call 1-800-233-3306 or visit the OECDD website at http://www.econ.state.or.us/wtrww.htm.

Department of Environmental Quality, State Revolving Fund (CW SRF)

The Clean Water State Revolving Fund (CW SRF) Program is administered by the Department of Environmental Quality (DEQ) and was developed to replace the EPA Construction Grants Program. The SRF is a loan program that provides low interest rate loans, instead of grants, for the planning, design, and construction of water pollution control facilities.

Interest rates on all design and/or construction loans are two-thirds of the current municipal bond rate during the quarter that the loan agreement is signed. In addition, an initiation fee (1.5 percent of the loan amount) and a servicing fee (0.5 percent of the outstanding balance) are also assessed to cover program administration by DEQ. As an example, the interest rate for design or construction loans signed in April of 2001 was 3.43 percent. The interest rate for facility planning was 2.57 percent. The interest rates change quarterly based on the national average municipal bond rate. Loans can be in the form of general obligation bonds or other rated debt obligations, revenue secured loan, or a discretionary loan.

An applicant must follow three steps in applying for an SRF Loan:

- Submit a preliminary application within 30 days of receipt from DEQ.
- Secure placement on the Intended Use Plan Priority List. Prospective projects are ranked, and only those on the Priority List are eligible for loans.
- Submit a final application.

SRF funds are allocated based on a prioritization process. Based on the preliminary applications, projects are assigned points and ranked in priority order based on:

- severity of water quality/health hazard problem;
- receiving water body sensitivity; and
- population served by the project.

The Intended Use Plan is one part of Oregon's annual SRF capitalization grant application. This Plan includes lists of eligible projects ranked in priority order. When projects have been allocated funds, they are placed on the Funded List. Projects that are not funded remain on the Planning List to receive funds if any of the funded list projects do not complete the loan process. Projects identified on the funded list from prior years, which have not been initiated, are placed on a Supplemental List.

For additional information on this and other DEQ programs, call 1-800-452-4011 or visit the DEQ website at http://waterquality.deq.state.or.us.

Drinking Water State Revolving Fund (DWSRF)

Each year the state of Oregon Health Division receives an allotment from the Federal Government for the Safe Drinking Water Revolving Loan Fund. In 1999, $11 million dollars was allotted to the State of Oregon to assist water providers with their system needs. The funds along with a 20 percent state match are used to make low interest loans to finance needed drinking water system improvements. As of May 2000, a change in the DWSRF policy allows disadvantaged communities to receive up to $250,000 or 25 percent of the loan amount (whichever is less) in the form of principal forgiveness for water safety improvement projects. Funds may be used for the following types of activities:

- **Planning**: Master Plans, pilot studies, and feasibility studies that are part of a compliance related construction project.
- **Preliminary and Final Engineering and Design**: Surveying, legal review, preparation of engineering drawings, and specifications for construction. Also, costs necessary for recipients to contract environmental review services.
- **Construction Costs**: All aspects of a public water system from source of supply, filtration, treatment, storage, transmission, and metering.
- **Source Water Protection**: As part of a source water management plan for a watershed or a delineated source water protection area for a well.

- **Property Acquisition**: The acquisition of real property directly related to or necessary for the proposed project including rights-of-way, easements, and facility sites.

While many activities are eligible for DWSRF financing, the following activities are considered ineligible activities:

- Dams or rehabilitation of dams.
- Purchase of water rights, except if the water rights are owned on a system that is being purchased through a consolidation project.
- Reservoirs, except for finished water reservoirs and those reservoirs that are part of the treatment process.
- Administrative costs.
- Operation and maintenance expenses.
- Projects primarily intended to supply or attract future growth.

The program's financing is available to all sizes of water systems. Municipal, nonprofit and privately owned community water systems are eligible, as well as nonprofit non-community systems. Terms of the loan are 20 years at 80 percent of the state/local bond rate. Financially disadvantaged applicants can get up to a 30-year loan at an interest rate of 1 percent, as well as the possibility of some principal forgiveness. The loan limit per project has been increased from $2 million to $4 million as of May 2000.

The Oregon Health Division and the Oregon Economic and Community Development Department (OECDD) rate proposed projects. Highest ratings are given to projects that present the following:

- Project addresses the most serious risk to human health.
- Project is necessary to ensure Safe Drinking Water Act compliance.
- Applicant has the greatest financial need, on a per household basis, according to affordability criteria.

Special consideration is given to projects at small water systems that serve 10,000 or fewer people, consolidating or merging with another system as a solution to a compliance problem, and which have an innovative solution to the stated problem.

Additional consideration will be given to disadvantaged communities. As of May 2000, the definition of a disadvantaged community has changed to one in which the ratio of average annual water rate to the local median household income exceeds 1.75 percent. Determination of the median household income is based upon the 1990 Census, with the possibility of special surveys where incomes might have fallen. The above ratio is subject to adjustment with the availability of 2000 Census figures and inflation indexing thereafter.

Applicants with 300 or more service connections are eligible for assistance with final design and construction projects only if they maintain a current, approved master plan that evaluates the needs of the water system for at least a twenty-year period and includes the major elements outlined in OAR 333-061-

0060(5). Systems with less than 300 service connections may receive funding for an engineering feasibility analysis instead of a master plan.

Interested parties should contact the OECDD for details. For additional information on the DWSRF programs, call 1-800-233-3306 or visit the OECDD website at http://www.econ.state.or.us/safe_wtr.htm.

State Water Resources Department: Water Development Loan Fund

The Water Development Loan Fund (WDLF) may grant loans to individuals, cities, local governments, and other public and private entities. The goal of the fund is to provide low-cost, long-term, fixed-rate financing incentives that promote projects that achieve the state's long-term water management goals.

Eligible projects include:

- **Drainage projects:** facilities installed to provide for the removal of excess water to increase soil versatility and productivity.
- **Irrigation projects:** facilities designed to provide water to land for the purpose of irrigation.
- **Community water supply project:** an undertaking, in whole or in part, in Oregon for the purpose of providing water for municipal use. A community is an incorporated or unincorporated town or locality with more than three service connections and a population of less than 30,000 people.
- **Fish protection project:** an undertaking, in whole or in part, in Oregon for the purpose of watershed protecting fish or fish habitat.
- **Watershed project:** a water development project in Oregon that provides more than one use. The primary use of the project must be one of the uses listed above. Secondary uses may include other water uses that are compatible with the primary use.

Funds to finance a water development project are obtained through the issuance and sale of self-liquidating bonds. The bonds are repaid by participants in the program and at no cost to the state or the Oregon taxpayer. The amount and type of loan security required depends on the borrower and the type of project. A first lien on real estate is required security for all loans. Other security may also be required.

Interested parties should contact the Water Resources Department for details. For additional information on the WDLF programs, call 1-800-624-3199 or visit the WRD website at http//www.wrd.state.or.us.

Oregon Department of Energy, Small Scale Energy Loan Program (SELP)

The SELP program was created by voters in 1980 and offers loans to projects whose purpose is to promote energy conservation and renewable energy resource development. Eligible applicants include cities, counties, special districts, individuals, and non-profit groups. Loans will cover up to 100 percent of construction costs, including engineering, fees, and studies. The finished project must at least break even in power costs.

The program offers low-interest loans for projects that:

- conserve natural gas, electricity, oil, or other source of energy;

- produce energy from renewable resources such as water, wind, geothermal, solar, biomass, waste materials or waste heat; and
- use recycled materials to create products.

Interested parties should contact the Oregon Office of Energy for details. For additional information on the Office of Energy programs, call 1-503-378-4040 or visit the Office of Energy website at http://www.energy.state.or.us.

11.2 Local Funding Sources

The amount and type of local funding obligations for infrastructure improvements will depend, in part, on the amount of grant funding anticipated and the requirements of potential loan funding. Local revenue sources for capital expenditures include ad valorem taxes, various types of bonds, service charges, connection fees, and system development charges. The following sections identify those local funding sources and financing mechanisms that are most common and appropriate for the improvements identified in this study.

General Obligation Bonds

A general obligation (G.O.) bond is backed by the full faith and credit of the issuer. For payment of the principal and interest on the bond, the issuer may levy ad valorem general property taxes. Such taxes are not needed if revenue from assessments, user charges or some other source are sufficient to cover debt service.

Oregon Revised Statutes limit the maximum term to 40 years for cities. Except in the event that Rural Development Administration will purchase the bonds, the realistic term for which general obligation bonds should be issued is 15 to 20 years. Under the present economic climate, the lower interest rates will be associated with the shorter terms.

Financing of water system improvements by general obligation bonds is usually accomplished by the following procedure:

- Determination of the capital costs required for the improvement.
- An election authorizing the sale of general obligation bonds.
- Following voter approval, the bonds are offered for sale.
- The revenue from the bond sale is used to pay the capital costs associated with the projects.

From a fund raising viewpoint, general obligation bonds are preferable to revenue bonds in matters of simplicity and cost of issuance. Since the bonds are secured by the power to tax, these bonds usually command a lower interest rate than other types of bonds. General obligation bonds lend themselves readily to competitive public sale at a reasonable interest rate because of their high degree of security, their tax-exempt status, and their general acceptance.

These bonds can be revenue-supported wherein a portion of the user fee is pledged toward payment of the debt service. Using this method, the need to collect additional property taxes to retire the obligated bonds is eliminated. Such revenue-supported general obligation bonds have most of the advantages of revenue bonds, but also maintain the lower interest rate and ready marketability of general obligation bonds. Because the users of the water system pay their share of the debt load based on their water usage rates, the share of that debt is distributed in a fare and equitable manner.

Advantages of general obligation bonds over other types of bonds include:

- The laws authorizing general obligation bonds are less restrictive than those governing other types of bonds.
- By the levying of taxes, the debt is repaid by all property benefited and not just the system users.
- Taxes paid in the retirement of these bonds are IRS-deductible.
- General obligation bonds offer flexibility to retire the bonds by tax levy and/or user charge revenue.

The disadvantage of general obligation bond debt is that it is often added to the debt ratios of the underlying municipality, thereby restricting the flexibility of the municipality to issue debt for other purposes. Furthermore, general obligation bonds are normally associated with the financing of facilities that benefit an entire community and must be approved by a majority vote and often necessitate extensive public information programs. A majority vote often requires waiting for a general election in order to obtain an adequate voter turnout. Waiting for a general election may take years, and too often a project needs to be undertaken in a much shorter period of time.

Revenue Bonds

The general shift away from ad valorem property taxes and toward a greater reliance on user fees makes revenue bonds a frequently used option of long-term debt. These bonds are an acceptable alternative and offer some advantages to general obligation bonds. Revenue bonds are payable solely from charges made for the services provided. These bonds cannot be paid from tax levies or special assessments; their only security is the borrower's promise to operate the system in a way that will provide sufficient net revenue to meet the debt service and other obligations of the bond issue.

Many communities prefer revenue bonding, as opposed to general obligation bonding because it insures that no tax will be levied. In addition, debt obligation will be limited to system users since repayment is derived from user fees. Another advantage of revenue bonds is that they do not count against a municipality's direct debt, but instead are considered "overlapping debt." This feature can be a crucial advantage for a municipality near its debt limit or for the rating agencies, which consider very closely the amount of direct debt when assigning credit ratings. Revenue bonds also may be used in financing projects extending beyond normal municipal boundaries. These bonds may be supported by a pledge of revenues received in any legitimate and ongoing area of operation, within or outside the geographical boundaries of the issuer.

Successful issuance of revenue bonds depends on the bond market evaluation of the revenue pledged. Revenue bonds are most commonly retired with revenue from user fees. Recent legislation has eliminated the requirement that the revenues pledged to bond payment have a direct relationship to the services financed by revenue bonds. Revenue bonds may be paid with all or any portion of revenues derived by a public body or any other legally available monies. In addition, if further security to finance revenue bonds is needed, a public body may mortgage grant security and interests in facilities, projects, utilities or systems owned or operated by a public body.

Normally, there are no legal limitations on the amount of revenue bonds to be issued, but excessive issue amounts are generally unattractive to bond buyers because they represent high investment risks. In rating revenue bonds, buyers consider the economic justification for the project, reputation of the borrower, methods and effectiveness for billing and collecting, rate structures, provision for rate increases as needed to meet debt service requirements, track record in obtaining rate increases historically, adequacy of reserve funds provided in the bond documents, supporting covenants to protect projected revenues, and the degree to which forecasts of net revenues are considered sound and economical.

Municipalities may elect to issue revenue bonds for revenue producing facilities without a vote of the electorate (ORS 288.805-288.945). In this case, certain notice and posting requirements must be met and a 60-day waiting period is mandatory. A petition signed by five percent of the municipality's registered voters may cause the issue to be referred to an election.

Improvement Bonds

Improvement (Bancroft) bonds can be issued under an Oregon law called the Bancroft Act. These bonds are an intermediate form of financing that is less than full-fledged general obligation or revenue bonds, but is quite useful especially for smaller issuers or for limited purposes.

An improvement bond is payable only from the receipts of special benefit assessments, not from general tax revenues. Such bonds are issued only where certain properties are recipients of special benefits not accruing to other properties. For a specific improvement, all property within the improvement area is assessed on an equal basis, regardless of whether it is developed or undeveloped. The assessment is designed to apportion the cost of improvements, approximately in proportion to the afforded direct or indirect benefits, among the benefited property owners. This assessment becomes a direct lien against the property, and owners have the option of either paying the assessment in cash or applying for improvement bonds. If the improvement bond option is taken, the City sells Bancroft improvement bonds to finance the construction, and the assessment is paid over 20 years in 40 semi-annual installments with interest. Cities and special districts are limited to improvement bonds not exceeding three percent of true cash value.

With improvement bond financing, an improvement district is formed, the boundaries are established, and the benefited properties and property owners are determined. The engineer usually determines an approximate assessment, either on a square foot or a front-foot basis. Property owners are then given an opportunity to object to the project assessments. The assessments against the properties are usually not levied until the actual cost of the project is determined. Since this determination is normally not possible until the project is completed, funds are not available from assessments for the purpose of making monthly payments to the contractor. Therefore, some method of interim financing must be arranged, or a preassessment program, based on the estimated total costs, must be adopted. Commonly, warrants are issued to cover debts, with the warrants to be paid when the project is complete.

The primary disadvantage to this source of revenue is that the property to be assessed must have a true cash value of at least 50 percent of the total assessments to be levied. As a result, a substantial cash payment is usually required by owners of undeveloped property. In addition, the development of an assessment district is very cumbersome and expensive when facilities for an entire community are contemplated. In comparison, general obligation bonds can be issued in lieu of improvement bonds, and are usually more favorable.

Capital Construction (Sinking) Fund

Sinking funds are often established by budgeting for a particular construction purpose. Budgeted amounts from each annual budget are carried in a sinking fund until sufficient revenues are available for the needed project. Such funds can also be developed with revenue derived from system development charges or serial levies.

A city may wish to develop sinking funds for each sector of the public services. The fund can be used to rehabilitate or maintain existing infrastructure, construct new infrastructure elements, or to obtain grant and loan funding for larger projects.

The disadvantage of a sinking fund is that it is usually too small to undertake any significant projects. Also, setting aside money generated from user fees without a designated and specified need is not generally accepted in the municipal budgeting process.

Connection Fees

Most cities charge connection fees to cover the cost of connecting new users to water and wastewater systems. Based on recent legislation, connection fees can no longer be programmed to cover a portion of capital improvement costs.

The City of Yachats has established a charge of $20 for permits to connect new services to the municipal water system for the 2000-2001 fiscal year. Additionally, the monthly base rate for water service is $23, and the volumetric rate is $2.60 per hundred cubic feet of water used.

System Development Charges

A system development charge (SDC) is essentially a fee collected as each piece of property is developed, and which is used to finance the necessary capital improvements and municipal services required by development. Such a fee can only be used to recover the capital costs of infrastructure. Operating, maintenance, and replacement costs cannot be financed through system development charges.

The Oregon Systems Development Charges Act was passed by the 1989 Legislature (HB 3224) and governs the requirements for systems development charges effective July 1, 1991. Two types of charges are permitted under this act: 1)-improvement fees, and 2) reimbursement fees. SDCs charged before construction are considered improvement fees and are used to finance capital improvements to be constructed. After construction, SDCs are considered reimbursement fees and are collected to recapture the costs associated with capital improvements already constructed or under construction. A reimbursement fee represents a charge for utilizing excess capacity in an existing facility paid for by others. The revenue generated by this fee is typically used to pay back existing loans for improvements.

Under the Oregon Systems Development Charges Act, methodologies for deriving improvement and reimbursement fees must be documented and available for review by the public. A capital improvement plan must also be prepared which lists the capital improvements that may be funded with improvement fee revenues, and the estimated cost and timing of each improvement. However, revenue from the collection of SDCs can only be used to finance specific items listed in a capital improvement plan. The projects and costs developed in this *Water Master Plan* may be used for this purpose. In addition, SDCs cannot be assessed on portions of the project paid for with grant funding.

The City of Yachats does have an active SDC program for the water system. The water system SDC varies depending on the size of the service being developed. For example, according to the fee schedule effective through January 1, 2001, a three-quarter inch service has a charge of $3,534.19 while a two inch service has a charge of $18,850.07.

Local Improvement District (LID)

A local improvement district (LID) or multiple LIDs can be formed by the City to be responsible for securing and repaying debt. A LID incorporates property owners within a defined boundary who agree to fund all or a portion of an improvement project. LID projects are best suited for improvements that benefit a limited number of users rather than the entire system.

The City may be required to assist in the LID process through facilitation and administration of the project. Agreements should be prepared detailing who will pay for engineering and planning costs, administration costs, interim financing, and other costs related to a public works project.

The LID formation process requires public hearings, at which, a remonstrance (no vote) of two thirds of the influenced area can halt the process. A successful LID project can result in liens against the LID properties at the end of the project or a full payment from all or some of the property owners.

Disadvantages to a LID include the requirement of a significant amount of time and interest from the City if they choose to administer the LID. It is not uncommon to have some or many residents within the LID boundary that are opposed to the project. Those in opposition to the LID must either rally enough support to derail the project or work for some other compromise. The political and administrative fallout is often borne by the City and its representatives.

Ad Valorem Taxes

Ad valorem property taxes are often used as revenue source for utility improvements. Property taxes may be levied on real estate, personal property, or both. Historically, ad valorem taxes were the traditional means of obtaining revenue to support all local governmental functions.

A marked advantage of these taxes is the simplicity of the system; it requires no monitoring program for developing charges, additional accounting and billing work is minimal, and default on payments is rare. In addition, ad valorem taxation provides a means of financing that reaches all property owners that benefit from a water system, whether a property is developed or not. The construction costs for the project are shared proportionally among all property owners based on the assessed value of each property.

Ad valorem taxation, however, is less likely to result in individual users paying their proportionate share of the costs as compared to their benefits. In addition, the ability of communities to levy property taxes has been limited with the passage of Ballot Measure 5 and other subsequent legislation. While the impacts of the various legislative efforts are still unclear, capital improvement projects are exempt from property tax limitations if new public hearing requirements are met and an election is held.

User Fee

User fees can be utilized to retire general obligation bonds, and are commonly the sole source of revenue to retire revenue bonds and to finance operation and maintenance. User fees represent monthly charges of all residences, businesses, and other users that are connected to the applicable system. These fees are established by resolution and can be modified, as needed, to account for increased or decreased operating and maintenance costs.

User fees should be based on a metered volume of water consumption. Through metered charges, an equitable and fair system of recovering water system costs is used. Flat fees and unmetered connections should be avoided. Large water users should pay a larger portion of the water system costs; through higher rates and metered billing, this can be accomplished.

Assessments

Under special circumstances, the beneficiary of a public works improvement may be assessed for the cost of a project. For example, the City may provide some improvements or services that directly benefit a particular development. The City may choose to assess the industrial or commercial developer to provide up-front capital to pay for the administered improvements.

11.3 Project Prioritization

Twenty recommended water system improvement projects have been developed in Section 10 of this Master Plan. Some projects are critical and should be undertaken as soon as possible. Others should be undertaken as funding becomes available. Still others have been developed for long-term planning purposes and will not be constructed unless development trends or other circumstances require it.

To assist the City in its planning efforts, the projects have been assigned a Priority Rating from 1 to 4 with 1 being the most critical projects and 4 being long-term planning projects. A brief description of each priority rating and the projects assigned that rating is provided below.

Priority 1 Projects

Priority 1 projects should be considered the most critical and should be undertaken as soon as funding can be made available. These projects include improvements that are considered necessary to maintain the quality of the system, maintain health guidelines, and bring the system into compliance with the various regulatory agencies.

Projects falling within this category include the complete change out of existing water meters, the construction of a raw water impoundment to assist the City in its water supply problems, and a number of distribution projects intended to reduce leakage and improve hydraulic performance in the "downtown" area.

It should be noted that the Yachats River Impoundment project is intended to provide raw water storage to attenuate differences in high and low flows to the City system. The City is currently investigating the viability of such a project and only intended to undertake the project if it is determined to be feasible and provide the raw water supply levels needed for maximum day demand levels. If the project is not undertaken, other options must be explored to provide the needed raw water to the system. See Section 9 for a discussion of the various raw water supply options.

The projects that have been assigned a Priority 1 rating are summarized below in Table 11.3.1.

Table 11.3.1 – Priority 1 Projects

Project No.	Project Description	Total Project Cost
18	System-Wide Water Meter Replacement	$ 91,250
3	Yachats River Impoundment	$ 936,500
8	Fourth and Driftwood Waterline	$ 105,450
9	2nd Street and Pontiac Waterline	$ 121,260
14	Misc Loop Closures	$ 35,200
17	3rd Street Waterline	$ 136,350

Total Priority 1 Projects **$ 1,426,010**

Priority 2 Projects

Priority 2 projects are typically important projects that should be undertaken as funding becomes available. Often these projects include important distribution system improvements and other important improvements. While these projects are not included in the "critical" list, they should be considered as important and necessary for good water system performance.

The projects that have been assigned a Priority 2 rating are summarized below in Table 11.3.2.

Table 11.3.2 – Priority 2 Projects

Project No.	Project Description	Total Project Cost
5	2nd Street Waterline Improvements	$ 121,250
6	Highway 101 Waterline	$ 136,300
15	King Street Waterline	$ 275,700
16	Radar and 7th Street Waterline	$ 182,250
20	Disinfection Improvements	$ 53,900

Total Priority 2 Projects **$ 715,500**
Total Priority 1 & 2 Projects **$ 2,141,510**

Priority 3 Projects

Priority 3 projects typically include distribution projects that are not considered as critical. The projects should, however, be undertaken as funding becomes available or as conditions change, placing the project in a higher priority bracket. Projects within this category may be considered optional based on need, development levels, availability of funding, and system performance. As other public works projects arise in the vicinity of Priority 3 projects, the City should consider including the water system improvement projects in the planning process.

If the City is able to secure appropriate funding, Priority 3 projects should be developed. The City may wish to prioritize projects within the Priority 3 set to determine which projects shall be undertaken first.

The projects that have been assigned a Priority 3 rating are summarized below in Table 11.3.3.

Table 11.3.3 – Priority 3 Projects

Project No.	Project Description	Total Project Cost
2	Reedy Creek Transmission Improvement	$ 76,300
4	0.25 MG Storage Tank	$ 603,460
10	Spruce and Lincoln Ave Waterline	$ 100,750
13	Surfside, Gender, & Windy Way Waterlines	$ 124,025
19	Clarifier Improvements	$ 79,400

Total Priority 3 Projects	***$***	***983,935***
Total Priority 1,2 & 3 Projects	***$***	***3,125,445***

Priority 4 Projects

Priority 4 projects include projects that depend on long-term conditions such as development, population growth, annexation issues, or new regulatory requirements. Priority 4 projects include improvements that may not be considered critical but would improve system efficiency and operation.

The projects that have been assigned a Priority 4 rating are summarized below in Table 11.3.4.

Table 11.3.4 – Priority 4 Projects

Project No.	Project Description	Total Project Cost
1	Yachats River Diversion Project	$ 224,700
7	Reeves Circle Waterline	$ 70,825
11	Coolidge Lane Waterline	$ 116,090
12	Shell Street Waterline	$ 27,250
18	Controls and Instrumentation	$ 51,200

Total Priority 4 Projects	***$***	***490,065***
Total Priority 1,2,3 & 4 Projects	***$***	***3,615,510***

11.4 Recommended Funding

The City should begin investigating, applying for and developing funding as soon as possible for the Priority 1 and Priority 2 improvements. Letters of interest should be submitted to place the City on the Project Priority Lists. Funding may come from a variety of sources and funds from several programs can be combined.

Several factors in Yachats will help the City in terms of obtaining funds to design and construct the recommended improvements. Those factors are:

- Median Household Income (MHI) of $23,667 (based on 1990 Census)
- Population of approximately 700 (small community)

- Existing outstanding water system debt of $1.1 M ($1,570 per capita)
- Average water bill of approximately $33.40 per EDU.

Because of the economic conditions in Yachats, the City is potentially eligible for 45 percent grant funding along with low interest loans to cover the remainder of a project's cost. Typically, before funding agencies will award grant monies, a city's water fee rates must be close to the State average rate. The State average water rate is now around $35 per month per EDU according to RUS and OECDD. If a city has low water rates, and does not have the funds available to construct needed projects, loans must be obtained to fund the projects. Generally, water rates must be increased somewhat for a city to accrue the funds required to make the annual loan payments. Once the debt service on loans results in a water rate near the State average, additional eligible improvements may be funded with grant monies when a city is eligible for grants. With the average water bill already near the $35 state average, a major rate increase will not be required to qualify for funding.

Once the Health Division approves this Master Plan, it is recommended that a "One-Stop" meeting be conducted with the various funding agencies to determine the most suitable and economically feasible financing package for Yachats.

Priority 1 Improvements

For Priority 1 Improvements the City should consider applying for:

- loan from the Safe Drinking Water Revolving Loan Fund
- grant or loan from Rural Development Water and Waste Program
- grant or loan from the OECDD Water/Wastewater Financing Program

Since a loan to pay for Priority 1 Improvements would result in an average residential water bill that is not above the State average, grant funding is unlikely. The Safe Drinking Water Revolving Loan Fund, administered by OECDD, could provide a 20-year loan at a rate equal to 80 percent of the "State and Local Bonds Rate." If the average water cost for a residential customer was at least the State average, a 30-year loan at one percent could be a possibility. Rural Development's Water and Waste Disposal Loan Program could potentially provide a 20 or 40-year loan at a rate of 4.5 percent.

Priority 2 Improvements

For Priority 2 Improvements the City should consider applying for:

- grant from EDA Public Works Grant Program
- Special Public Works Fund
- grant from the Oregon Community Development Block Grant (OCDBG) Program
- grant and/or loan from the Rural Development Water and Waste Program

Due to the City's higher median household income, they may only be qualified for grants not to exceed 45 percent of the project total. However the City should pursue funding in any form and discuss funding options with the various agencies. If the City is required to raise rates to the state average in order to receive specific funding assistance, it will likely be less costly to rate payers to obtain loans and raise rates to meet the loan payments.

Priority 3 Improvements

Priority 3 improvements are not considered critical at this time. However, the City may consider constructing some or all of the projects in this priority at a later date. Funding for the projects can also be developed at a later date using public funding sources or by funding the projects in-house with capital improvement funds and SDC revenue.

Priority 4 Improvements

Priority 4 improvements are provided for long-term planning. LIDs, SDCs, and developer participation will be the likely sources of funding for these projects. If development pressures do not require the construction of Priority 4 infrastructure, these projects may not be undertaken.

11.5 Impact to Ratepayers

Construction of the proposed projects will likely require ratepayers in the City to pay higher rates for water service. As such, ratepayers will want to know what options are available to reduce the cost for water service within the City. In anticipation of this request, Section 7 of this study has identified water conservation measures that will assist users in reducing consumption.

Approval of a project that creates a rate increase will not be an easy decision for the Council. However, the City's water system does need improvement, funding assistance is available to the City, and failure to construct the projects now may increase the cost and possibly the scope of the projects if constructed later. Therefore, it is recommended that the City contact funding agencies and notify them of the intended project(s) as soon as possible. Once the availability of funding is identified, the City can begin a public relations campaign to explain the need for the project to ratepayers. Feedback from public hearings can be anticipated and should be addressed to educate the ratepayers on the importance of the project. A well-informed public will enhance the acceptance of the project and improve the City's opportunity to pass a bond issue.

Based on water sales records, the average residential consumption is around 400 ft^3 (3,000 gallons) per month per household. For the normal residential water user, the existing rate structure charges an $23.00 base rate plus $2.60 per 100 ft^3. The result is an estimated average residential water bill of $33.40 per month.

Existing revenue only covers expenses and allows for a small emergency fund but does not allow the accumulation of funds for improvements. Therefore, any planned improvements must be funded with new funding sources. New funding sources include loans, internal funding, and grants. Loans and increased internal funding will require a rate increase to cover the loan payment and the capital improvement fund transfers.

As previously mentioned, one of the typical requirements for obtaining grants is that the community's average residential water bill is at least equal to the state average. According to various funding agencies, the statewide average water bill is approximately $35.00 per month. Generally, communities that do not charge at least the state average water rate will not likely qualify for grant programs. Typically, funding agencies state that they do not subsidize water system improvements so that communities can maintain low water rates.

The potential impact to ratepayers was estimated for each set of priority projects. The analysis assumed the City would obtain a 20-year loan at an interest rate of 4.50 percent. The burden of the loan payments is spread out over the existing 1,163 EDU's within the City system. Based on the 2000-2001 budget, it was assumed the City has approximately $130,000 in funds available between the capital improvement and SDC funds to "seed" the Priority 1 projects. It should be noted that if the City is successful in obtaining any grant funding, the impact to rate payers could be significantly less, or the City would be able to take on more projects.

Impact to Ratepayers – Priority 1 ($7.29 Rate Increase)

Priority 1 projects include the system-wide installation of new water meters, the construction of a number of critical distribution improvement projects, and the construction of a 3.0-MG raw water impoundment system. If the City were to undertake all Priority 1 projects, the potential impact to rate payers is equal to a rate increase of approximately $6.81 per EDU.

Impact to Ratepayers – Priority 1 w/o Raw Water Impoundment ($2.02 Rate Increase)

The largest project in the Priority 1 group is the raw water impoundment project. If the City chooses not to proceed with this project as a solution to its water supply problem, it would significantly reduce the cost of the Priority 1 projects. Without the raw water impoundment project, the impact to ratepayers for the Priority 1 projects would be approximately $2.02 per EDU. Coincidentally, a rate increase of approximately $2 per EDU would raise the City's average water rate to over the state average and improve the City's eligibility for grant funding.

Impact to Ratepayers – Priority 2 ($4.03 Rate Increase)

Priority 2 projects include a number of distribution system improvements and the installation of an on-site chlorine generating disinfection system at the water treatment plant. Priority 2 projects will generally improve hydraulic performance and replace lines that are suspect for leakage and loss.

The potential required rate increase for Priority 2 projects is $4.03. The cumulative impact to ratepayers for Priorities 1 and 2 ranges between $6.05 and $11.32 depending on whether or not the raw water impoundment project is undertaken.

Impact to Ratepayers – Priority 3 ($5.54 Rate Increase)

Priority 3 projects include the replacement of the remaining AC piping on the Reedy Creek raw waterline, the construction of a 250,000 gallon treated water reservoir, improvements to the existing clarifier at the water treatment plant, and a number of distribution system improvements.

The cumulative impact to rate payers for Priorities 1, 2 and 3 ranges from $11.59 to $16.86 depending on whether or not the raw water impoundment project is undertaken.

Impact to Ratepayers – Priority 4 ($2.76 Rate Increase)

The Priority 4 projects are not considered critical at this time to the health and operation of the water system. As funding becomes available, or as situations change, the projects should be undertaken. The Priority 4 projects include the Yachats River diversion project, improvements to the controls and instrumentation at the water treatment plant, and a number of distribution improvement projects.

The cumulative impact to rate payers for Priorities 1, 2, 3 and 4 ranges from $14.35 to $19.62 depending on whether or not the raw water impoundment project is undertaken.

Affordability

One major consideration in deciding on any proposed capital improvements is the users' ability to support the full cost, (including debt repayment) of utility service. Several measures of household affordability or ability-to-pay have been proposed or are currently being utilized. The majority of affordability indicators are largely a function of income and employment. A summary of affordability measures and thresholds from selected studies is provided in Table 11.5.1. The Environmental Protection Agency (EPA no date) compiled this information for assessing affordability issues with the Safe Drinking Water Act.

Table 11.5.1 Summary of Affordability Measures and Thresholds

Source	Indicator(s)	Threshold
Water Utility Financing Study (1980)	Ratio of annual user charge & median household income	1.5 – 2.5% - Questionable >2.5% - Unaffordable
Rural Utilities Service Water & Waste Disposal Loans & Grants	Debt service portion of annual user charge & median household income (MHI)	>0.5% & MHI below poverty line or >1.0% & MHI between 80 & 100% of statewide non-metropolitan MHI
Department of Housing & Urban Development	Ratio of water & sewer bills, & household income	1.3 to 1.4%
National Consumer Law Center "The Poor and the Elderly – Drowning in the High Cost of Water", circa 1991	Ratio of sum of water & sewer bills & household income	>2.00 %
EPA Economic Guidance for Water Quality Standards Workbook	Ratio of annual user charge & median household income	<0.8% - no hardship expected 0.8 – 1.5% - mid-range >1.5% may be unreasonable burden
EPA's Municipality's Ability-to-Pay (MABEL) 1990	1. Ratio of annual user charge & median household income. 2. Increase in average user charge	1. >1.0% must provide additional security. 2. >25% - system probably cannot issue debt
EPA Affordability of the 1986 SDWA Amendments (1993)	Ratio of Pre & post SDWA costs & median household income	>2.0% - not affordable
State of New York's Affordability Criteria for Drinking Water Projects	$0 to $24,725 MHI $24,725 to $39,557 MHI $39,557 and above MHI	1% MHI $247 + (MHI-24,725)*0.0235 1.5% MHI
State of Idaho Assessment Tools for SRF Loans	Ratio of annual user charge & median household income	1.5% MHI

Abbreviations: AUC – annual user charge
MHI – median household income

One of the most common affordability indicators is the ratio of annual user charges to the median household income. The threshold of affordability for this ratio varies from 1.5 to 2.5 percent of median household income. OECDD utilizes 1.75 percent of the median household income as a threshold for qualifying for grant monies (Halferty 2001).

One limitation of using the ratio of annual user charges to the median household income is determination of a representative median household income for a community. Currently, most funding agencies still utilize the 1990 Census data for making this determination, as the 2000 Census data is not available. Due to the lack of new data, the ratio of annual user charges to the median household income will be calculated using the 1990 Census income data and an estimate of the 2000 median household income. As the 2000 Census data becomes available, the affordability ratio should be recalculated. A summary of the affordability calculation is given in Table 11.5.2.

Table 11.5.2 Affordability of Projected Water User Costs

Description	1990	2000 (Est.)*
City of Yachats		
Median Household Income (MHI), $	23,667	31,806
Annual User Charge/MHI, % (Priority 1)	2.04	1.52
Annual User Charge/MHI, % (Prior. 1 minus impoundment)	1.80	1.34
Annual User Charge/MHI, % (Priority 1& 2)	2.24	1.67
Annual User Charge/MHI, % (Prior. 1&2 minus impoundment)	2.00	1.49
Annual User Charge/MHI, % (Priority 1,2 & 3)	2.52	1.88
Annual User Charge/MHI, % (Prior. 1,2 & 3 minus impoundment)	2.28	1.70
Annual User Charge/MHI, % (Priority 1,2,3 & 4)	2.66	1.98
Annual User Charge/MHI, % (Prior. 1,2,3 & 4 minus impoundment)	2.42	1.80

*Based on a 3% per year estimated increase in the MHI.

As illustrated in Table 11.5.2, the affordability analysis in Yachats is affected significantly by the MHI used. Based on the 1990 MHI, all affordability indices exceed the 1.75 percent threshold. Using the 2000 estimated MHI, all Priority 1 and 2 projects fit under the 1.75 percent threshold. If the impoundment project is not undertaken, nearly all recommended projects fit underneath the 1.75 percent affordability index threshold.

Summary

Based on the recommended projects and the analysis in this section, the City should make arrangements to undertake the Priority 1 and Priority 2 projects. This will likely require the City to secure a loan and raise rates to make the loan payments. Grants and other funding options should be pursued in an effort to reduce the amount of money that may be required in the form of a loan.

It should be noted that the above analysis describes potential impacts to ratepayers. The priority ratings are provided to assist the City in developing a capital improvement program to maintain and improve the City's drinking water and fire protection system. It will be easier to develop these programs if the City is aware of the potential impact to ratepayers. The actual impact to ratepayers will depend on many factors including the interest rate and loan package obtained by the City, the population growth rate over the planning period, the projects that the City will choose to undertake, the bidding and construction climate at the time the projects commence, and other important factors.

Approval of a project that creates a rate increase will not be an easy decision. However, the City's water system needs improvement and funding assistance may be available to the City. Failure to construct the project now may increase the cost and possibly the scope of the project if constructed later. Therefore, it is recommended that the City contact funding agencies and notify them of the intended project as soon as possible. Once the source of funding is identified, the City can begin informing the ratepayers about the need for the project. A well-informed public will increase acceptance of the project and improve the City's opportunity to pass a bond issue.

Section

12

Summary

Summary

Section 12

This section provides a summary to the findings and recommendations of this Master Plan. A 20-year planning period (to the year 2021) has been used for projections and system evaluations. The study goal is to develop recommendations for system improvements needed within the planning period, which will allow the City of Yachats to provide safe and adequate water service within the existing Urban Growth Boundary.

The City of Yachats is a small community located approximately midway between Florence and Newport along the Oregon coast. City services include providing water to about 700 full time residents and a significant part-time tourist and transient population.

Currently the City withdraws water from the Reedy Creek to supply its system and the water is conveyed to a treatment facility that was constructed in 1992. When water quality in Reedy Creek is poor, or when demand requires it, the City withdraws water from Salmon Creek. Treated water is stored in three reservoirs and a pressure tank totaling 1,211,000 gallons in storage capacity and then distributed throughout the distribution system within two pressure service levels.

In 1989 the City of Yachats had a *Water System Evaluation and Long Range Plan* prepared by HGE Engineers and Planners. Based upon the study's planning period, it is still considered current. However, due to questions raised regarding the City's present water system operating efficiency and its desire to develop additional raw water sources, the Oregon Department of Water Resources (WRD) has required that another Water Master Plan be performed to address these issues. The City authorized The Dyer Partnership to prepare a Water Management and Conservation Plan to satisfy the WRD requirements. This Plan is prepared in accordance with the guidelines in the Oregon Administrative Rules (OAR) 690-86-140 for Water Management and Conservation Plans.

For a description of the Conservation and Curtailment Plans, see Section 7 and 8. The following sections summarize the Master Plan components contained in the other sections of this Plan.

12.1 Existing Water Use

Over the past four years, the City has sold approximately 43 million gallons of water per year. Roughly 50 percent of this water is used by residential customers, 42 percent by commercial customers, and eight percent by the City and community facilities.

Though the City has experienced losses on the average of 40 percent of the water diverted, losses have been reduced from a high of 55 percent in 1997 to a low of 28 percent in 2000. A number of improvement projects and operational recommendations in this Plan are expected to reduce the high losses to acceptable (15 percent) levels.

Average water demand over the past four years has been on the order of 205,000 gallons per day (gpd) or about 154 gallons per person per day (gpcd) including all commercial and public water use. Residential consumption averaged between 62 gpcd in the winter and 86 gpcd in the summer months based on available data. The estimated current maximum daily demand (MDD) is 515,000 gpd.

The existing demand values are based on the total amount of water diverted from the sources and, therefore, include all system losses. OAR 690-86 requires all water systems to work towards reducing losses to 15 percent. If this reduction is found to be feasible, the system is required to reduce losses to ten percent. It is anticipated that the City will be successful in reducing their system losses to at least 15 percent. Therefore, all projected water demands have been reduced to account for the decreased loss levels.

12.2 Projected Population and Water Demand

The recently updated City Comprehensive Plan adopted a population growth rate of 2.25 percent per year over the next 20 years. The population at the end of the 20-year planning period is projected to be on the order of 1145 persons. For detailed information on existing and future population trends, see Section 2.

For the purposes of this study, an existing full-time residential population of 734 persons has been used with an average annual growth rate of 2.25 percent for the 20-year planning period.

As discussed in Section 5 and according to OAR 690-86-140, a water system should endeavor to reduce unaccounted water levels to 15 percent or less of the total water diverted from raw water sources. The City experiences average unaccounted water levels of approximately 40 percent. In order to be in compliance with the OAR, the City must work to reduce its level of unaccounted water to 15 percent. Responsible water planning should not include the propagation of high-unaccounted water levels into water demand projections.

A summary of population, equivalent dwelling units (EDUs), and the water system demand quantities is provided below in Table 12.2.1. Separate EDU and equivalent population projections are included for peak and off-peak population periods. Projections of population and water demand were made for both the 20-year planning period and the 50-year planning period. For detailed coverage of the water demand projections for the City of Yachats, see Section 5.

Table 12.2.1 - Projected Design Water Demand and Population Values
Basis For Master Plan Demand-Present And Projected
(Adjusted for compliance with 15 percent unaccounted water levels.)

Parameter	2001	2011	2021	2051
Residential Population	734	917	1,145	2,233
# of EDU's op=off peak p=peak	810 (op) 1,196 (p)	1,018 (op) 1,508 (p)	1,272 (op) 1,896 (p)	2,225 (op) 4,014 (p)
Equivalent Population op=off peak p=peak	1,327 (op) 1,919 (p)	1,696 (op) 2,475 (p)	2,171 (op) 3,197 (p)	4,589 (op) 6,945 (p)
Water Demand (gpd) – Basis For Long Range Supply Plan **(gpcd)**				
ADD (154)	153,300	195,900	250,800	530,000
MMD (232)	230,900	295,100	377,800	798,500
MDD (268)	385,700	497,500	642,600	1,396,000
PHD (349)	502,300	647,800	836,800	1,817,900

12.3 Water System Deficiencies and Recommended Improvements

This section will provide a brief description of system deficiencies and the recommendations made in this Master Plan to overcome the deficiencies. For detailed coverage of each topic, see Section 9.

Raw Water Sources and Water Rights

The City of Yachats holds water rights on Reedy Creek equal to 2.0 cfs. The City holds additional water rights for 2.0 cfs each on Salmon Creek and the Yachats River. The City's primary water source is Reedy Creek; Salmon Creek is used as an emergency source when needed to supplement flows taken from Reedy Creek or when turbidity levels make Salmon Creek preferable as a source. To date, the Yachats River has not been developed as a municipal water source.

Responsible long-term planning requires the City develop adequate water sources to supply its projected 50-year water needs. Based on the 50-year planning horizon the City will require total flows on the order of 2.16 cfs. At a minimum, the City must make provisions to provide water for the 20-year projected maximum day raw water requirement of 1.0 cfs. Existing water rights are adequate to satisfy both 20- and 50-year projected water demands though adequate source water is rarely available during peak demand periods; combined flows in Reedy and Salmon Creeks have been measured as low as 0.56 cfs.

Few options are available to the City in terms of the development of new raw water sources. While the Yachats River remains the only viable source of water that the City currently holds water rights for, it may not be the best source in terms of water quality, availability, and environmental sensitivity. Various regional water systems may be the answer for the City's long-term water needs, though the cost and development of the systems is not currently known. A summary of the raw water supply options available to the City is provided below:

- Development of water rights on Yachats River

- Transfer or purchase water rights from a water right holder in the area
- Purchase treated water from regional water supply
- Increased conservation and loss reduction efforts

Acquiring a new source of raw water will not be an easy task for the City. As water resources become more scarce in Oregon, communities must compete with each other and with the protected, instream water rights for valuable raw water supplies. While the City does have some options, each must be explored during the planning period to determine the most viable option available to them. For a detailed description of each water supply option, see Section 9.1.

Raw Water Storage

The addition of a 0.5 MG, steel, raw water storage tank to the system in 1999 has provided the City with increased operational flexibility and a valuable raw water "cushion" to attenuate raw water demands during periods of peak demand.

The City owns a ten acre parcel directly across the Yachats River from the water treatment plant and it is currently investigating the potential to construct a 3-MG, lined, raw water storage pond on this parcel. Water from Reedy Creek would be diverted to the pond. When raw water is required, water would be pumped from the pond to the treatment plant. In combination with the 0.5-MG tank, the City would have a significant raw water supply to draw on when low seasonal flows in the source streams are not adequate to provide for the water demands.

Water Treatment Facility

The City's water treatment facility was constructed in 1992. The facility generally operates well given the raw water conditions at the site. With a capacity of 0.5 MGD, the plant has sufficient capacity to meet the City's MDD through the 10-year planning period. In order to increase output, the City should be prepared to construct an expansion on the water treatment plant within ten years. Since the filters, clarifier, and other major components were sized for 1.0 MGD, the only major expansion required will be the treated water pumps and some minor improvements.

Other improvements recommended at the plant include the installation of tube settlers in the clarifier, updating of the coagulant system, retrofitting of the disinfection system, and other minor treatment improvements. For detailed coverage of improvements related to the water treatment plant, see Section 9.3.

Treated Water Storage

The City now has a total water storage capacity of 1,211,000 gallons, not counting the 43,000-gallon capacity of the clearwell at the water treatment plant. The existing storage reserves are considered sufficient for the current system demand level. Calculations of the City's reserve storage requirements indicate that there will be a slight reserve shortfall by the end of the 20-year planning period.

The age of the existing reservoirs vary from ten to more than 50 years. Due to the need for additional reserves later in the planning period and the age of some of the existing reserves, the City should construct a 0.25 MG treated water reservoir midway through the planning period. The new reservoir will provide additional storage as well as "span" the useful life of the older reserve components.

For a detailed description of the recommended storage reservoir, see Section 9.5.

Distribution System Improvements

In general, the fire flows and hydraulic characteristics of the distribution system are adequate. Lower flows in several locations are related to unlooped or dead-end piping or small diameter piping sections in the system. Because the bulk of the distribution system is in a single pressure zone, some high residual pressures occur at low elevations.

Recent, random testing of the existing meters suggests that they may be reading an average of 20 percent low. With system losses of approximately 28 percent in 2000, the City may be capable of lowering its losses to a compliant ten percent or less. A project to replace all existing meters with new, accurate meters is a high priority for the City.

A number of distribution system projects were developed and presented in Section 10. Some of the projects are critical and should be undertaken as soon as possible, while others can be placed on the planning schedule and developed as funding becomes available. For the location of each project see Figure 10.2.1.

12.4 Capital Improvement Plan

A total of twenty-one projects were developed in this Master Plan. To assist the City in the planning process, the projects were separated into four priority categories. A brief description of each priority is provided below along with a table showing the projects included in each priority. For detailed coverage of the recommended projects, see Section 10. For the location and approximate scope of each project, see Figure 1 in Appendix A.

Priority 1 Projects

Priority 1 projects should be considered the most critical and should be undertaken as soon as funding can be made available. These projects are necessary to maintain the quality of the system, maintain health guidelines, and bring the system into compliance with the various regulatory agencies.

Projects falling within this category include the system-wide change out of existing water meters, the possible construction of a raw water impoundment, and the development of various distribution system improvements to reduce leakage and improve hydraulic performance.

The projects that have been assigned a Priority 1 rating are summarized below in Table 12.4.1.

Table 12.4.1 – Priority 1 Projects

Project No.	Project Description	Total Project Cost
18	System-Wide Water Meter Replacement	$ 91,250
3	Yachats River Impoundment	$ 936,500
8	Fourth and Driftwood Waterline	$ 105,450
9	2nd Street and Pontiac Waterline	$ 121,260
14	Misc Loop Closures	$ 35,200
17	3rd Street Waterline	$ 136,350
	Total Priority 1 Projects	***$ 1,426,010***

Priority 2 Projects

While Priority 2 projects are not as critical as Priority 1 projects, they are nevertheless important and necessary for good water system performance and should be undertaken as funding becomes available.

Projects falling within this priority include the retrofitting of the existing disinfection system at the water treatment plant and a number of distribution system improvements. The distribution system improvements, for the most part, are replacing old and potentially leaky piping systems in an effort to reduce lost water levels.

The projects that have been assigned a Priority 2 rating are summarized below in Table 12.4.2

Table 12.4.2 – Priority 2 Projects

Project No.	Project Description	Total Project Cost
5	2nd Street Waterline Improvements	$ 121,250
6	Highway 101 Waterline	$ 136,300
15	King Street Waterline	$ 275,700
16	Radar and 7th Street Waterline	$ 182,250
20	Disinfection Improvements	$ 53,900
	Total Priority 2 Projects	***$ 715,500***
	Total Priority 1 & 2 Projects	***$ 2,141,510***

Priority 3 Projects

Priority 3 projects typically include distribution improvements that are not considered as critical for a system as those in the previous priorities. The projects should, however, be undertaken as funding becomes available or as conditions change. Projects within this category may be considered optional based on need, development levels, availability of funding, and system performance. As other public work projects arise in the vicinity of Priority 3 projects, the City should consider including the water system improvement projects in the planning process.

Projects included within this priority set include the construction of the 0.25 MG treated water reservoir, the replacement of a portion of the Reedy Creek raw waterline, retrofitting of the existing clarifier, and various distribution system improvements.

If the City is able to secure appropriate funding, Priority 3 projects should be developed. The City may wish to prioritize projects within the Priority 3 set to determine which projects shall be undertaken first.

The projects that have been assigned a Priority 3 rating are summarized below in Table 12.4.3.

Table 12.4.3 – Priority 3 Projects

Project No.	Project Description	Total Project Cost
2	Reedy Creek Transmission Improvement	$ 76,300
4	0.25 MG Storage Tank	$ 603,460
10	Spruce and Lincoln Ave Waterline	$ 100,750
13	Surfside, Gender, & Windy Way Waterlines	$ 124,025
19	Clarifier Improvements	$ 79,400

Total Priority 3 Projects	***$***	***983,935***
Total Priority 1,2 & 3 Projects	***$***	***3,125,445***

Priority 4 Projects

Priority 4 projects include improvements that depend on long-term conditions such as development, population growth, annexation issues, or new regulatory requirements.

Projects included in this priority set include improvements to the controls and instrumentation at the water treatment plant, the development of the Yachats River raw water diversion, and various distribution system improvements.

The projects that have been assigned a Priority 4 rating are summarized below in Table 12.4.4

Table 12.4.4 – Priority 4 Projects

Project No.	Project Description	Total Project Cost
1	Yachats River Diversion Project	$ 224,700
7	Reeves Circle Waterline	$ 70,825
11	Coolidge Lane Waterline	$ 116,090
12	Shell Street Waterline	$ 27,250
18	Controls and Instrumentation	$ 51,200

Total Priority 4 Projects	***$***	***490,065***
Total Priority 1,2,3 & 4 Projects	***$***	***3,615,510***

12.5 Potential Impacts to Ratepayers

Construction of the recommended projects will likely require ratepayers in the City to pay more for water service. As such, ratepayers will want to know what options are available to reduce the cost of water service. In anticipation of this request, Section 7 of this study identifies water conservation measures that will assist users in reducing consumption.

Based on water sales records, the existing average monthly residential water rate for the City of Yachats is approximately $33.40. According to various funding agencies, the statewide average residential monthly water bill is about $35.00. Generally, communities that do not charge at least the state average water rate may not qualify for grant programs.

Regardless of the funding source, water facility improvements will likely cause the City to raise water rates. In order to provide some insight into the potential impact on the average residential account (EDU), the following impact to ratepayer analysis was performed:

The potential impact to ratepayers was estimated for each set of priority projects. The analysis assumed the City would obtain a 20-year loan at an interest rate of 4.75 percent. The burden of the loan payments is spread out over the existing 1,163 EDUs within the City system. Based on the 2000-2001 budget, it was assumed the City has approximately $130,000 in funds available between the capital improvement and SDC funds to "seed" the Priority 1 projects.

Impact to Ratepayers – Priority 1 ($7.29 Rate Increase)

Priority 1 projects include the system-wide installation of new water meters, the construction of a number of critical distribution improvement projects, and the construction of a 3.0-MG raw water impoundment system. If the City were to undertake all Priority 1 projects, the potential impact to ratepayers is equal to a rate increase of approximately $6.81per EDU.

Impact to Ratepayers – Priority 1 w/o Raw Water Impoundment ($2.02 Rate Increase)

The largest project in the Priority 1 group is the raw water impoundment project. If the City chooses not to proceed with this project as a solution to their water supply problem, it would significantly reduce the cost of the Priority 1 projects. Without the raw water impoundment project, the impact to ratepayers for the Priority 1 projects would be approximately $2.02 per EDU. Coincidentally, a rate increase of approximately $2 per EDU would raise the City's average water rate to over the state average and improve City's eligibility for grant funding.

Impact to Ratepayers – Priority 2 ($4.03 Rate Increase)

Priority 2 projects include a number of distribution system improvements and the installation of an on-site chlorine generating disinfection system at the water treatment plant. Priority 2 projects will generally improve hydraulic performance and replace lines that are suspect for leakage and loss.

The potential required rate increase for Priority 2 projects is $4.03. The cumulative impact to ratepayers for priorities 1 and 2 ranges between $6.05 and $11.32 depending on whether or not the raw water impoundment project is undertaken.

Impact to Ratepayers – Priority 3 ($5.54 Rate Increase)

Priority 3 projects include the replacement of the remaining AC piping on the Reedy Creek raw waterline, the construction of a 250,000 gallon treated water reservoir, improvements to the existing clarifier at the water treatment plant, and a number of distribution system improvements.

The cumulative impact to ratepayers for Priorities 1, 2 and 3 ranges from $11.59 to $16.86 depending on whether or not the raw water impoundment project is undertaken.

Impact to Ratepayers – Priority 4 ($2.76 Rate Increase)

The Priority 4 projects are not considered critical at this time to the health and operation of the water system. As funding becomes available, or as situations change, the projects should be undertaken. The Priority 4 projects include the Yachats River diversion project, improvements to the controls and instrumentation at the water treatment plant, and a number of distribution improvement projects.

The cumulative impact to ratepayers for Priorities 1, 2, 3 and 4 ranges from $14.35 to $19.62 depending on whether or not the raw water impoundment project is undertaken.

Approval of a project that creates a rate increase will not be an easy decision. However, the City's water system needs improvement and funding assistance may be available to the City. Failure to construct the project now may increase the cost and possibly the scope of the project later. Therefore, it is recommended that the City contact funding agencies and notify them of the intended project as soon as possible. Once the source of funding is identified, the City can begin informing the ratepayers of the need for the project. An informed public will increase acceptance of the project and improve the City's opportunity to pass a bond issue.

It should be noted that the above analysis describes potential impacts to ratepayers. The priority ratings are provided to assist the City in developing a capital improvement program to maintain and improve the water and fire protection system. It will be easier to develop these programs if the City is aware of the potential impact to ratepayers. The actual impact will depend on many factors including the interest rate and loan package obtained by the City, the population growth rate over the planning period, the projects that the City will choose to undertake, the bidding and construction climate at the time the projects commence, and other important factors.

Water Rights

Appendix

A

STATE OF OREGON

COUNTY OF LINCOLN

PERMIT TO APPROPRIATE THE PUBLIC WATERS

THIS PERMIT IS HEREBY ISSUED TO

CITY OF YACHATS (541)547-3565
PO BOX 345
YACHATS OREGON 97498

to use the waters of YACHATS RIVER, a tributary of PACIFIC OCEAN, for MUNICIPAL USE.

This permit is issued approving Application 69856. The date of priority is March 20, 1989. The use is limited to not more than 2.0 CUBIC FOOT PER SECOND (CFS), OF WHICH 1.0 CFS IS NOT SUBJECT TO INSTREAM WATER RIGHT Certificate 59608 OR MINIMUM STREAM FLOWS WITH A DATE OF PRIORITY OF MARCH 26, 1974, or its equivalent in case of rotation, measured at the point of diversion from the source. The use of water under this permit is further limited as described below.

The points of diversion are located as follows:

POD 1 - NE¼ SW¼, SECTION 31, T14S, R11W, WM; 1740 FEET SOUTH AND 2550 FEET EAST FROM THE NW CORNER OF THE SW¼ NW¼, SECTION 31. POD 2 - NW¼ SE¼, SECTION 26, T14S, R12W, WM; 295 FEET NORTH AND 420 FEET EAST FROM THE NW CORNER OF THE SW¼ SE¼, SECTION 26.

Within 1 year from the date this permit is issued, the permittee shall submit a revised water management and conservation plan consistent with the Agreement and Stipulated Final Order on Reconsideration issued on September 3, 1998, and OAR Chapter 690, Division 86.

The use shall conform to such reasonable rotation system as may be ordered by the proper state officer.

A description of the proposed place of use under this permit is as follows:

NE ¼ SE ¼
S ½ SE ¼
SECTION 22

SW ¼ SW ¼
SECTION 23

W ½ W ½
SE ¼ SW ¼
SECTION 26

NE ¼
N ½ SE ¼
SE ¼ SE ¼
SECTION 27

NE ¼
SECTION 34
TOWNSHIP 14 SOUTH, RANGE 12 WEST, W.M.

The City shall install and maintain a permanent recording measuring device on the Yachats River, the design and location of which will be specified in consultation with the Water Resources Department (WRD) and the Department of Fish and Wildlife (ODFW). The device shall be installed prior to any diversions or use of water under this permit, placed so as to accurately measure stream flows needed to meet instream water rights Cert. 59739, Cert 59608 and Cert. 73161, and be accessible to WRD and ODFW staff at all times. Maintenance of the measuring device and associated rating curve shall substantially comply with the applicable provisions of OAR 690-085-015(4) (methods for measuring open channels) so an estimate of flow can be made at any time. Flow shall be determined prior to and during diversions under this permit, and the City shall maintain a record of flow measurements and observations.

Measurement, recording and reporting conditions:

A. Before water use may begin under this permit, the permittee shall install a meter or other suitable measuring device as approved by the Director at each point of diversion. The permittee shall maintain the meter or measuring device in good working order, shall keep a complete record of the volume and instantaneous rate of water used each month and shall submit a report which includes the recorded water use measurements to the Department annually or more frequently as may be required by the Director. Further, the Director may require the permittee to report general water use information, including the place and nature of use of water under the permit.

B. The permittee shall allow the watermaster access to the meter or measuring device; provided however, where the meter or measuring device is located within a private structure, the watermaster shall request access upon reasonable notice.

When streamflow on the Yachats River, measured at the device described above, exceeds senior and junior instream rights (Cert. 59739, Cert. 59608 and Cert. 73161) the City may exercise this permit (both points of diversion and the full 2.0 cfs) without restriction beyond the existing terms of the permit.

When streamflows measured at the device described above drop below the flows identified in the junior instream water right (Cert. 73161) or senior instream water rights (Cert. 59739 or Cert. 69608), use of the

Yachats River under this permit may be made only in emergencies or when population growth exceeds other sources of supply. Future use due to population growth exceeding supply shall be limited by the City's compliance with its approved water management and conservation plan.

"Emergencies" are limited to: sustained drought, accompanied by the institution of curtailment measures described in the City's water management plan that include curtailment triggers linked to streamflows; supply line breakage; firefighting; outdoor events within the City's service area which place an abnormally high demand on water supply (e.g. Cycle Oregon, outdoor festivals); catastrophic loss of use of primary water supply sources; and threats to public health, not attributable to inefficiency or chronic conditions, as may be approved jointly by ODFW and WRD.

Population growth will be deemed to have "exceeded other sources of supply" only if the City: (1) is in compliance with its approved water management plan which includes the elements specified in The Stipulated Final Order and Agreement on Reconsideration (T-7589), and (2)(a) prior to 15 years from the date of this agreement or 10 years from the date of approval of the management plan, whichever comes first, is either meeting the plan schedule or has reached the goal of 85% water use efficiency, yet remains unable to meet the requirements of the City's resident population using other developed sources; or (b) after 15 years from the date of this agreement or 10 years from the date of approval of the management plan, whichever comes first has reached or exceeded 85% water use efficiency, yet remains unable to meet the requirements of the City's resident population using other developed sources.

In the event streamflows measured at the device described above are insufficient to satisfy the junior instream water right (Cert. 73161) or the senior instream water rights (Cert. 59739 and Cert. 69608), and the Yachats River is utilized under this permit, diversions shall not exceed 1 cfs, and those diversions shall be made at a rate not to exceed 0.50 cfs at the upper point of diversion (POD 1) and 0.50 cfs at the lower point of diversion (POD 2).

Addition of the lower diversion point (POD 2) shall be a permanent change.

Water may not be diverted at any point of diversion authorized under this permit until all applicable conditions of the permit have been met, including compliance with state-wide land-use goals and any local acknowledged land-use plans.

Actual construction work shall begin on or before November 19, 1991, and shall be completed on or before October 1, 1998. Complete application of the water to the use shall be made on or before October 1, 1998 (See Special Order Volume 46, page 534 and Special Order Volume 49, page 208).

This permit is for the beneficial use of water without waste. The water user is advised that new regulations may require the use of best practical technologies or conservation practices to achieve this end.

The use of water allowed herein my be made only at times when sufficient water is available to satisfy all prior rights, including rights for maintaining instream flows.

This permit is issued to supercede permit 51190. Permit 51190 is superceded in order to incorporate the relevant portions of the Stipulated Final Order and Agreement on Reconsideration issued on September 3, 1998, by Administrative Law Judge Weisha Mize and to incorporate the conditions contained in the Order Approving An Additional Point of Diversion recorded in Special Order Volume 52, pages 767-771. Permit 51190 is superceded by this instrument and is of no further force or effect.

Issued September 15, 1998

for

Martha O. Pagel, Director
Water Resources Department

STATE OF OREGON

COUNTY OF LINCOLN

CERTIFICATE OF WATER RIGHT

FEB 05 2001

This Is to Certify, That YACHATS WATER DISTRICT

of Yachats, State of Oregon, has made proof to the satisfaction of the STATE ENGINEER of Oregon, of a right to the use of the waters of Reedy Creek a tributary of Yachats River for the purpose of municipal (all of the purposes for which water could be used in a city under a right initiated for municipal use) under Permit No. 17333 of the State Engineer, and that said right to the use of said waters has been perfected in accordance with the laws of Oregon; that the priority of the right hereby confirmed dates from July 9, 1945;

that the amount of water to which such right is entitled and hereby confirmed, for the purposes aforesaid, is limited to an amount actually beneficially used for said purposes, and shall not exceed 2.0 cubic foot per second

or its equivalent in case of rotation, measured at the point of diversion from the stream. The point of diversion is located in the NE¼ NW¼, Section 31, Township 14 South, Range 11 West, W. M.

The amount of water used for irrigation, together with the amount secured under any other right existing for the same lands, shall be limited to - - - - - - - of one cubic foot per second per acre,

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

A description of the place of use under the right hereby confirmed, and to which such right is appurtenant, is as follows:

S½SE¼
Section 22
SW¼
Section 26
all
Section 27
all
Section 34
Township 14 South, Range 12 West, W. M.

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

WITNESS the signature of the State Engineer, affixed this 12th day of July, 1957.

LEWIS A. STANLEY
State Engineer

Recorded in State Record of Water Right Certificates, Volume 16, page 22933.

FEB 05 2001

STATE OF OREGON
STATE ENGINEER
516 PUBLIC SERVICE BUILDING
SALEM 10

Refer to File No 38383

January 16, 1964

Yachats Water District
Yachats
Oregon

Gentlemen:

Enclosed find application No. 38383, permit No. 29018 with blueprint.

PLEASE READ CAREFULLY THE FOLLOWING INSTRUCTIONS

Your permit has been recorded in this office but you should hold the original permit as evidence of your water right. If the land is sold, an assignment to the new owner should be recorded in this office. Assignment blanks will be furnished upon request.

The permit which appears on the last page of the application fixes time limits for beginning of construction, completion of construction and complete application of water to beneficial use. The law requires that you begin actual construction work within one year from the date of issuance of the permit or your right will be lost. The State Engineer is authorized to extend the time for completion of construction and for complete application of water upon proper showing, but has no authority to extend the time limit for beginning of construction.

Forms A, B, and C may be attached for your convenience in submitting (A) Notice of beginning of construction, (B) Notice of completion of construction, and (C) Notice of complete application of water. If your application has stated that construction has already started, or that construction work is completed, or that complete application of water has been made, only the required forms will be attached.

If the proposed appropriation of water will require only a portable pumping plant and portable pipelines and no permanent construction is contemplated, acquisition by the permittee of pumping or distribution machinery or equipment will be considered as beginning of construction. Acquisition and installation of all the machinery or equipment necessary for the project will be considered as completion of construction.

When complete application of water has been accomplished, Form C should be submitted. Thereafter, an inspection or survey will be made by the State Engineer and the permittee will be given opportunity to submit final proof of appropriation. When proof satisfactory to the State Engineer has been made, the right will be confirmed by issuance of a certificate. The certificate will limit the right to the extent that water has been applied to beneficial use in accordance with the terms of the permit.

The late summer flow in many streams is required to satisfy existing rights and your permit, as provided by law, grants a right to use water only when there is a surplus in the source involved over and above that required to satisfy prior rights.

Very truly yours,

Chris L. Wheeler

CHRIS L. WHEELER
State Engineer

Form 110

Enclosures

Permit No. [illegible]

AUG 2 2 1963
STATE ENGINEER
SALEM, OREGON

*APPLICATION FOR PERMIT

To Appropriate the Public Waters of the State of Oregon

I, Yachats Water District (Name of applicant)

of Yachats, Lincoln County, Oregon (Mailing address),

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

If the applicant is a corporation, give date and place of incorporation unincorporated

1. The source of the proposed appropriation is Salmon Creek (Name of stream), a tributary of the Yachats River

2. The amount of water which the applicant intends to apply to beneficial use is ~~4~~ 2 cfs or Stream Flow — see Ltr. 10-9-63 cubic feet per second. Supplemental to 2 cfs from Reedy Creek Appropriation (If water is to be used from more than one source, give quantity from each)

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

4. The point of diversion is located App. 750 ft. North (N. or S.) and App. 275 East (E. or W.) from the SW corner of NW¼ of SE¼ of Sec 26 (Ref. Vol 11 Page 11966 State Record of W.R. Certificates) (Section or subdivision)

(By survey of J.W.Hanna Reg. Surveyor) Same point is located 3053.27 feet East and 436.4 feet South of 1/4 Section common to Sec. 27 and 26. Date of survey June 27, 1963)

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

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

being within the NW ¼ of NW ¼ of SE ¼ (Give smallest legal subdivision) of Sec. 26, Tp. 14 South (N. or S.), R. 12 West (E. or W.), W. M., in the county of Lincoln

5. The App. 600 feet (Main ditch, canal or pipe line) to be Feet (Miles or feet) in length, terminating in the SW¼ of NW¼ of SE¼ (Smallest legal subdivision) of Sec. 26, Tp. 14 South (N. or S.), R. 12 West (E. or W.), W. M., the proposed location being shown throughout on the accompanying map.

DESCRIPTION OF WORKS

Diversion Works—

6. (a) Height of dam App. 5 feet, length on top 20 feet, length at bottom 20 feet; material to be used and character of construction Concrete (Loose rock, concrete, masonry, rock and brush, timber crib, etc., wasteway over or around dam)

(b) Description of headgate Not determined (Timber, concrete, etc., number and size of openings)

(c) If water is to be pumped give general description 200 gpm Centrifugal (Size and type of pump)

20 HP Head Est. 220 ft. (Size and type of engine or motor to be used, total head water is to be lifted, etc.)

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

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

29018

Canal System or Pipe Line—

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

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

(c) Length of pipe, ... *ft.; size at intake,* .... *in.; size at* .... *ft. from intake* .... *in.; size at place of use* .... *in.; difference in elevation between intake and place of use,* .... *ft. Is grade uniform?* .... *Estimated capacity,* .... *sec. ft.*

8. *Location of area to be irrigated, or place of use* Yachats Water District, Yachats, Ore

Township North or South	Range E. or W. of Willamette Meridian	Section	Forty-acre Tract	Number Acres To Be Irrigated
14 South	12 West	22	SE¼ of SE¼	
		23	SW¼ SW¼	
		26	West ½ of SW¼	
		"	~~[illegible]~~ & W½ NW¼	
		"	SE¼ SW¼	
		27	All land	
		34	All NW¼ NE¼	

(If more space required, attach separate sheet)

(a) Character of soil ....

(b) Kind of crops raised ....

Power or Mining Purposes—

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

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

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

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

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

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

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

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

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

29015

Municipal or Domestic Supply—

10. (a) To supply the city of Yachats, Oregon (Unincorporated)

Lincoln (Name of) County, having a present population of 300

and an estimated population of 1000 in 1970

(b) If for domestic use state number of families to be supplied App 300 services 1963

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

11. Estimated cost of proposed works, $ 4,000

12. Construction work will begin on or before June 1964

13. Construction work will be completed on or before June 1965

14. The water will be completely applied to the proposed use on or before 1980

F. C. Schwartz Secretary
(Signature of applicant)
Yachats Water District

Remarks:

Rights of way and required land under process of acquisition.

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

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

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

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

STATE ENGINEER

By ...
ASSISTANT

PERMIT

STATE OF ORDEGON, } ss.
County of Marion,

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

The right herein granted is limited to the amount of water which can be applied to beneficial use and shall not exceed 2.0 *cubic feet per second measured at the point of diversion from the stream, or its equivalent in case of rotation with other water users, from* Salmon Creek and the right allowed herein shall be limited to any deficiency in the available supply under the prior existing right from Ready Creek.

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

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

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

The priority date of this permit is August 22, 1963 for 1.0 c.f.s.
June 26, 1963 for 1.0 c.f.s.

Actual construction work shall begin on or before December 20, 1964 *and shall thereafter be prosecuted with reasonable diligence and be completed on or before October 1, 19*65.

*Complete application of the water to the proposed use shall be made on or before October 1, 19*66.

WITNESS my hand this 20th *day of* December, 19 63

Chris L. Wheeler
STATE ENGINEER

Application No. 38383
Permit No. 29018

PERMIT

TO APPROPRIATE THE PUBLIC WATERS OF THE STATE OF OREGON

This instrument was first received in the office of the State Engineer at Salem, Oregon, on the 25th *day of* January, 1963, *at* 8:00 *o'clock* A. *M.*

Returned to applicant:

Approved:
December 20, 1963

Recorded in book No. 80 *of Permits on page* 29018

CHRIS L. WHEELER
STATE ENGINEER

Drainage Basin No. 18 *page* 64

Fees

State Printing 98137

Southwest Lincoln Co. W.D. Agreement

Appendix

B

DRAFT

MUTUAL AID AGREEMENT

OFFER TO AID

Whereas the undersigned water district, fire districts, and municipalities find that a mutual aid agreement should exist between them for the purpose of fire protection and other water emergencies; now, therefore, it is agreed for the purposes stated above among the following parties:

Water District: Southwest Lincoln County Water District (hereafter "water district")
7740 Highway 101 North
Waldport, Oregon 97394;

Municipalities: City of Waldport (hereafter "city")
Post Office Box 1120
Waldport, Oregon 97394;

City of Yachats (hereafter "city")
Post Office Box 345
Yachats, Oregon 97498;

Fire Districts: Yachats Rural Fire Protection District (hereafter "fire district")
Post Office Box 1
Yachats, Oregon 97498;

Central Oregon Coast Fire and Rescue District ("fire district")
Post Office Box 1120
Waldport, Oregon 97394;

Section I. Fire Emergencies

A. Definition.
For the purposes of this agreement, a "fire emergency" means a condition, as determined solely by the Fire Chief (hereafter "Chief") or designate of a fire district, in which it is determined that additional water to fight a fire is needed, over and above the available water supply of either a city or water district.

B. Use of Available Water.
The Chiefs or designates agree and understand that the available water in a city or water district will be utilized for any fire, before declaring the fire emergency need. Available water means that amount of water within a city or the district which may be used without jeopardizing the water supply for domestic use, as may be determined by the public works director/superintendent (hereafter "PWD") of the city or the district manager of water district or their designate, in which the fire emergency exists.

C. Permission to Use Water.
Once a Chief has determined that a fire emergency exists in which additional water is needed, the Chief shall notify the PWD or district manager or designate of both the entity where the fire emergency exists and the entity from which additional water is sought. The PWD or district manager or designate which has been requested, in their discretion, may agree to supply additional water to the city or water district in which

the fire emergency exists. Only the PWD of a city or district manager of a water district or their designate, from which additional water is requested, shall have authority to take the steps necessary to provide water for any water emergency. The Chief shall also contact and coordinate with the PWD, district manager, or designate, of the entity where the fire emergency exists, before any additional water is supplied. The PWD, district manager, or designate, of the city or water district providing the additional water shall have the sole discretion to determine if any condition exists which would require termination of the supply of additional water.

D. Call List.

The PWD and district manager of each city or water district shall provide a call list for the Chiefs of the districts, which shall be used by the Chiefs to give notice to both the city or water district in which the fire emergency exists and the city or water district requested to supply additional water that a fire emergency has been called and permission is sought for needed additional water. A Chief shall not take any step necessary, such as opening a valve or utilizing a fire hydrant in a city or water district which may be called upon to provide additional water, unless the Chief has received actual permission from the PWD or district manager or designate of both entities to use water from a supplying city or water district and both entity's authorized representatives have agreed upon the method and means to utilize the water.

Section II. Other Water Emergencies.

A. Definition.

For the purposes of this agreement, an "Other Water Emergency" means a condition that exists, other than a fire emergency, in which a city or a water district requests that another city or water district provide water to it on an emergency basis.

B. Discretion to Provide Water.

Upon receipt of a request to provide water due to an other water emergency, the mayor of a city or district manager of a water district, or their expressed designates, shall determine on a case-by-case analysis whether or not to provide water on an emergency basis. The city or water district supplying such emergency water shall determine the means, manner, amount and other terms and conditions under which it will supply such emergency water.

C. Charges for Water.

For water supplied for any other water emergency, the supplying city or water district is entitled to charge the requesting city or water district for the water supplied at the lowest rate per unit of water as is charged to residential users within the boundaries of the city or water district. The city or water district providing the water shall reasonably determine the amount of water to be supplied to the requesting city or water district.

Section III. Other Terms and Conditions.

A. Indemnification and Hold Harmless.

It is agreed among the parties that each fire district, city or water district shall indemnify and hold harmless any city or water district which agrees to supply emergency water to the fire district, city or water district pursuant to this agreement, from any damages, costs or other charges, which may result from the acts or omissions, negligent, intentional, or otherwise incurred under this agreement, including reasonable attorneys fees incurred in any suit, action or arbitration, including those incurred on appeal. The indemnification and hold harmless provisions contained in this section are subject to and limited by the relevant provisions of the Oregon Tort Claims Act, ORS Chapter 30.

B. Land Use or Other Laws.

This agreement does not allow any use of property within the jurisdiction of a city, Lincoln County or a water district in violation of any applicable land use or other laws and regulations of the State or a unit of local government.

C. Notices.

Except as otherwise provided or required in this agreement, any written notices to any party herein shall be directed to the mayor of a city, the district manager of a water district or the Chief of a fire district at the addresses set forth above.

In witness whereof, the parties have hereunto entered into this agreement on the date so indicated below.

____________________________ ____________

Kim Lehmann, Mayor Date

City of Waldport

____________________________ ____________

Arthur O. Roberts, Mayor Date

City of Yachats

____________________________ ____________

Connie Field, Chairperson Date

Southwest Lincoln County Water District

Chair | Date
Yachats Rural Fire Protection District

Chair | Date
Central Oregon Coast Fire and Rescue District

PIPELINE Water Quality Article

Appendix

C

Oregon Drinking Water News
PIPELINE
Drinking Water Program, Oregon Health Division

Vol. 13, Issue 5 • Special Edition, Fall 1998

OREGON DRINKING WATER QUALITY STANDARDS

(Including the 1996 Safe Drinking Water Act Amendments)

Fall, 1998

YOU GOT OUR NUMBER!

Contract counties are responsible for all community water systems with groundwater sources serving less than 3,300 people as well as all nontransient noncommunity and transient noncomunnity water systems. Operators and managers of these systems should call their county health department first for assistance with drinking water issues.
State staff are responsible for all community water systems using surface water sources and those community systems serving 3,300 or more people. In those counties without a local health department contact please call the state program at (503) 731-4317.

Contract Counties
The Drinking Water Program contracts with the following counties to perform much of the program work at the local level.

Baker/Malheur	Ray Huff/Susan Fuller	(541) 473-5186
		Email: envhealth@malheurco.org
Benton	Bob Wilson/Ron Smith	(541) 757-6841
		Email: ronald.e.smith@co.benton.or.us
Clackamas	Jim Buckley/Steve Dahl	(503) 655-8384
		Email: jamesb@co.clackamas.or.us
		Email: steved@co.clackamas.or.us
Columbia	Mark Edington	(503) 366-3828
Coos	Frances Smith	(541) 756-2020
		Email: frances_h._smith@class.orednet.org
Crook	Russell Hanson/Ann McSheery	(541) 447-8155
		Email: DIRRUS@mailexcite.com
Curry	Mike Meszaros	(541) 247-5501
Douglas	Dave Bussen/Gerry Meyer	(541) 440-3571
		Email: gvmeyer@co.douglas.or.us
Hood River	Scott Fitch	(541) 386-1115
		Email: healthdept@gorge.net
Jackson	John Manwaring	(541) 776-7316
		Email: manwarjs@hhs.co.jackson.or.us
Jefferson	Lee Cloninger	(541) 475-4456
		Email: lcloninger@fc.orednet.org
Josephine	Bruce Cunningham	(541) 474-5325
		Email: johlth@magick.net
Klamath	Leisa Cook/Susan Burch	(541) 883-1122
Lincoln	Elizabeth Fox	(503) 265-4179
		Email: lfox@co.lincoln.or.us
Linn	John McEvoy	(541) 967-3821
		Email: envhlth@co.linn.or.us
Malheur/Baker	Ray Huff/Susan Fuller	(541) 473-5186
		Email: envhealth@malheurco.org
Marion	Rick Sherman	(503) 588-5346
		Email: rsherman@cyberis.net
Multnomah	Darryl Flasphaler	(503) 248-3400
		Email: ervin.kauffman@co.multnomah.or.us
Polk	John Callicrate	(503) 623-9237
		Email: John.Callicrate@bbs.chemek.cc.or.us
Sherman/Wasco	Glenn Pierce	(541) 296-4636
		Email: wascophd@gorge.net
Tillamook	Annette Pampush	(503) 842-3902
		Email: apampush@co.tillamook.or.us
Wasco/Sherman	Glenn Pierce	(541) 296-4636
		Email: wascophd@gorge.net
Washington	Toby Harris/Mark Hanson	(503) 648-8722
		Email: tobyharris@washington.co.or.us

State Program
Technical staff members are frequently in the field assisting water systems. Each day, however, one staff member serves as *phone duty person* in the Portland office and is available to answer questions at (503) 731-4317. Please make use of this person unless you feel you must speak with a specific staff member.

Another option is to contact a staff person's voice mail directly. To do this, call our auto-attendant number (503) 731-4821 and when directed by the recording, dial the person's extension listed below.

Web site	www.ohd.hr.state.or.us/cehs/dwp
General Inquiries	(503) 731-4317
Portland office fax	(503) 731-4077
Voice mail	(503) 731-4821 + ext.

Drinking Water Administration: (503) 731-4010	
Dave Leland, Program Manager	ext. 757
Diane Weis	ext. 751
Technical Services: (503) 731-4317	
Western Region	
Tom Charbonneau, Manager	ext. 749
Scott Curry	ext. 739
Carrie Gentry	ext. 742
Bonnie Waybright	ext. 752
Eastern Region	
Pendleton office fax	(541) 276-4778
Gary Burnett, Manager (Pendleton)	(541) 276-8006
Leslie Bensching (Pendleton)	(541) 276-8006
John Potts (Corvallis)	(541) 757-4281
Kari Salis (Portland)	ext. 764
Bart Stepp (Pendleton)	(541) 276-8006
Monitoring and Compliance: (503) 731-4381	
Mary Alvey, Manager	ext. 748
Cheri Law	ext. 747
Roberta Lindgren	ext. 741
Patrick Meyer	ext. 753
Mike Patterson	ext. 746
Georgine Proctor	ext. 761
Brian Rigwood	ext. 743
Nancy Stellmach	ext. 760
George Waun	ext. 758
Protection and Development: (503) 731-4317	
Chris Hughes, Manager	ext. 750
Jeff Frederick (Springfield)	(541) 726-2594
Mike Grimm	ext. 765
Dennis Nelson (Springfield)	(541) 726-2587
Springfield office fax	(541) 726-2596
Tom Pattee (Springfield)	(541) 726-2588
Dave Phelps	ext. 759
Kurt Putnam	ext. 740

Lab certification, Public Health Laboratory, Portland:
Dr. Irene Ronning, Coordinator **(503) 229-5505**

OREGON DRINKING WATER QUALITY STANDARDS

(Including the 1996 Safe Drinking Water Act Amendments)

This summary provides a broad overview of current and future drinking water quality standards which public water systems in Oregon must meet through the year 2005. It is organized in two major sections - Section I: Current Standards, and Section II. Future Standards. This summary is for reference only, and is not a substitute for the actual statutes and regulations that govern public water supply in Oregon. Future standards described here are still under development at the national level, and are subject to change.

Types of Drinking Water Contaminants

The sources of drinking water, both tap and bottled water, include rivers, lakes, ponds, reservoirs, springs,and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals, and in some cases radioactive materials, and can pick up substances resulting from the presence of animals or from human activities.

Drinking water contaminants are any substances present in drinking water that could adversely affect human health. Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. They can be grouped into the following general categories:

- Microbial Contaminants - such as viruses and bacteria which can come from sewage treatment plants, septic systems, agricultural and livestock operations, and wildlife.
- Inorganic Chemicals - such as salts or metals, which can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming. Includes lead and copper leached into the water from household plumbing and fixtures.
- Organic Chemicals - Pesticides and herbicides which may come from a variety of sources, such as agriculture, urban stormwater runoff, and residential uses. Also includes synthetic and volatile chemicals which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, and septic system.
- Radiologic Contaminants - which can be naturally-occurring or result from oil and gas production and mining operations.

Every drinking water system is vulnerable to microbial or chemical contaminants of one type or another from a variety of sources. Disease-causing microorganisms (bacteria, viruses, protozoans) can be present in surface water (lakes and streams) or from groundwater (wells or springs) from human or animal feces. Microorganisms can also enter the water system through pipe breaks or cross connections. Organic chemicals (industrial solvents, pesticides) are mainly man-made and can enter drinking water supplies as a consequence of chemical production, storage, use, or disposal in the water source area. Inorganic chemicals can be introduced by human activities (nitrate from fertilizer) but more often result from natural occurrence in rocks, soils, and mineral deposits (radon, arsenic). Drinking water treatment which is essential to remove microbes and chemicals can also add or form contaminants in drinking water, such as disinfectant chemicals themselves, byproducts of disinfectants with other materials in the water, and treatment chemicals used in filtering water. Finally, water storage tanks, pipes, and household plumbing that are in direct contact with water can contribute contaminants from either the material used in the tanks and pipes or from internal coatings used to protect the materials from contact with the water (lead and copper, organics).

Drinking Water Standards and Health Protection

In order to ensure that tap water is safe to drink, national regulations set by the US Environmental Protection Agency limit the amount of certain contaminants in water provided by public water systems. Other national regulations set by the Food and Drug Administration, establish limits for contaminants in bottled water which must provide the same level of protection of public health. Drinking water quality standards are established to protect human health by limiting the exposure of people to drinking water contaminants. There are now national drinking water quality standards for 79 different contaminants. These standards may be in several forms:

- Maximum Contaminant Level Goal (MCLG) - The level of a contaminant in drinking water below which there is no known or expected risk to health, allowing for a margin of safety. All regulated contaminants have an MCLG.
- Maximum Contaminant Level (MCL) - The highest level of a contaminant that is allowed in drinking water, set a close to the MCLG as feasible using the best available treatment technology. Most MCLs are expressed in concentration units called "milligrams per liter" (mg/L), which for drinking water is the

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same as "parts per million", or ppm. MCLs can be expressed in a variety of other measurement units.

- Treatment Technique (TT) - A required process intended to reduce the level of a contaminant in drinking water. For any contaminant that can not be detected or measured effectively in water, the standard may be a treatment technique requirement, which means that all water systems at risk of the contaminant are required to provide continuous water treatment to remove the contaminant at all times.
- Action Level (AL) - The concentration of a contaminant, which when exceeded, triggers treatment or other requirement which a water system must follow.

Public water systems and bottled water producers must sample water for contaminants routinely to ensure that standards are met, and report the results of that sampling to the regulatory agency. Sampling frequencies vary by the type of drinking water contaminant. Contaminants that are associated with immediate health impacts, like bacteria and nitrates, must be sampled often, such as every month, quarter, or year. Contaminants associated with health effects that could develop from very long-term exposures, like arsenic, are tested less frequently, such as every 3 or 4 years.

Some people may be more vulnerable to contaminants than the general population. Immune-compromised persons, such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice from their health care providers. USEPA and Centers for Disease Control and Prevention (CDC) guidelines on appropriate measures to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the national Safe Drinking Water Hotline (800-426-4791).

Drinking Water Regulatory Program

A brief overview of the public drinking water regulatory program is useful. The first national drinking water standards, called the National Interim Primary Drinking Water Regulations (NIPDWR), were adopted on December 24, 1975, by the US Environmental Protection Agency (USEPA) under the 1974 Safe Drinking Water Act. By 1986, drinking water quality standards were in place for 23 different contaminants. The 1986 Safe Drinking Water Act mandated USEPA to set standards for 83 contaminants within 3 years, and 25 more contaminants every three years thereafter. Today, there are national standards for 79 contaminants.

In Oregon, public drinking water systems are subject to the Oregon Drinking Water Quality Act (ORS 448 - Water Systems). The primary purpose of the 1981Oregon Act is to "assure all Oregonians safe drinking water." According to the Oregon Act, safe drinking water means water which is sufficiently free from biological, chemical, radiological, or physical impurities such that individuals will not be exposed to disease or harmful physiological effects." Under the Oregon Act,the Health Division has broad authority to set water quality standards necessary to protect public health through insuring safe drinking water within a public water system. To accomplish this, the Division is directed under the Act to require regular water sampling by water suppliers. These samples must be analyzed in laboratories approved by the Division, and the results of laboratory tests on those samples must be reported by the water supplier to the Division. The Division must investigate water systems that fail to submit samples,or whose sample results indicate levels of contaminants that are above maximum allowable levels. Water suppliers who fail to sample the water or report the results, or whose water contains contaminants in excess of allowable levels must take corrective action and notify water users.

Since 1986, the Division has exercised primary responsibility for administering the federal Safe Drinking Water Act in Oregon, an arrangement called Primacy. The Health Division adopts and enforces standards that are no less stringent than the federal standards, and in return, the USEPA gives the Division the regulatory responsibility for public drinking water systems and partial financial support for the Oregon program operation.

In practice, the Oregon drinking water standards match the national standards established under the Safe Drinking Water Act by the USEPA. This is because setting maximum levels for drinking water contaminants to protect human health involves considerable development of health effects information and other scientific research that is best carried out at the national level. The Health Division concentrates its efforts on implementing the national standards at Oregon public water systems.

Oregon Public Water Systems

Today, there are 2,719 public water systems in Oregon subject to regulation under the federal Safe Drinking Water Act. They serve 25 or more people at least 60 days per year. Of these, 889 are community water systems, which means the systems serve at least 15 connections used by year-round residents. These systems perform the most frequent water sampling for the greatest number of contaminants, because the people served have the most ongoing exposure to the drinking water. **Community water systems** in Oregon serve a total of about 2.7 million people and range in size from 15-home subdivisions and mobile home parks up to and including the City of Portland. **Nontransient noncommunity water systems** serve nonresidential populations consisting of the same people every day, such as a school or workplace with its own independent water supply system. There are 340 of these in Oregon. **Transient noncommunity water systems** serve transient populations. Examples are campgrounds, parks, or restaurants with their own independent water supply systems, and there are 1,490 of these in Oregon.

Oregon public water systems get their water either from wells or springs (called groundwater) or from rivers, lakes, or streams (called surface water). Of the 2,719 public water systems in Oregon, 2,472 get their water exclusively from groundwater. 247 water systems get their water in whole or in part from surface water supplies. Generally speaking, surface water requires much more treatment and processing to ensure safety for drinking than does groundwater.

There are many small water systems in Oregon. Almost 87% of the public water systems in Oregon serve 500 or fewer people each.

An additional 900 very small systems, serving 10-24 people each, are subject only to the Oregon Act. About 500,000 Oregonians get their drinking water from individual home wells, which are not subject to either state or federal public water system standards.

Measuring Progress

The Oregon Safe Drinking Water Benchmark, stated below, is intended to measure progress of public water suppliers toward meeting safe drinking water standards in Oregon:

"The percentage of Oregonians served by public drinking water systems that meet all health-based standards continuously during the year"

Meeting all health-based standards at all times during the year is an important indicator of drinking water safety. The benchmark includes the following health-based standards, listed from highest to lowest health risk:

- *E. Coli* (or fecal coliform) bacteria maximum level
- Surface water treatment technique performance levels (filtration and disinfection)
- Nitrate/Nitrite maximum levels
- Chemical/Radiological maximum levels
- Lead action level
- Total coliform bacteria maximum level
- Copper action level

Included in the benchmark are about 1,300 public water systems that serve the majority of the state's population, including all community systems, all nontransient noncommunity systems, and the larger transient noncommunity systems (serving over 500 people per day).

The Oregon benchmark goal is to reach 95% by 2005. Results for the last four years are 1994-49%, 1995-50%, 1996-56%, 1997-89%. Note that progress toward the benchmark goal is likely to be affected by revisions to existing standards and establishment of standards for additional contaminants that are scheduled for the coming years, described in Section II.

For More Information

The chart on page 1 lists both state and county drinking water staff members, along with their telephone numbers. County staffs are responsible for community water systems serving fewer than 3,300 people and using groundwater sources as well as all nontransient noncommunity and transient noncommunity systems. Operators of those systems should contact their county health department directly for assistance on drinking water issues.

State staff are responsible for all community water systems serving more than 3,300 people and all smaller community systems that use surface water sources. In counties without drinking water programs, state staff are responsible for all public water systems. State staff also serve as a technical resource for county drinking water programs as needed.

Also, visit the Oregon Drinking Water Web Page (http://www.ohd.hr.state.or.us/cehs/dwp) for drinking water information and publications. In addition, you can contact the national Safe Drinking Water Hotline at 800-426-4791.

I. Current Standards

There are now drinking water quality standards in Oregon for 84 contaminants. These standards are summarized in this Section.

Microbial Contaminants - Coliform Bacteria

Purpose: Coliform bacteria is the primary measure of the microbial quality of drinking water. They are used as indicators of the possible presence of pathogenic, or disease-causing, microorganisms. Routine samples collected by Oregon public water suppliers are analyzed for total coliform bacteria. Samples that show the presence of total coliforms are further examined for fecal coliforms or *E. coli.*, which are more specific indicators of fecal contamination.

Health effects: Coliforms are bacteria that are naturally present in the environment and are used as an indicator that other, potentially harmful, bacteria may be present. Coliforms present in more samples than allowed is a warning of potential problems. Fecal coliforms and *E. Coli* are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause short-term health effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, and people with severely compromised immune systems.

Application: All public water systems must regularly test for coliform bacteria from locations in the distribution system, identified in a coliform sampling plan.

Monitoring: All community systems, and noncommunity systems using surface water sources or serving over 1,000 people, must sample monthly:

Population	Number of Monthly Samples
up to 1,000	1
1,001-2,500	2
2,501-3,300	3
3,301-4,100	4
4,101-4,900	5
>4,900	see rules

All other systems must test for coliform bacteria once per calendar quarter.

Compliance: All coliform sample results are reported as "coliform absent" (negative) or "coliform present" (positive). A set of 3-4 repeat samples is required for each positive coliform sample (so that a total of at least five samples is collected during the month). Repeat sampling continues until the maximum contaminant level is exceeded or a set of repeat samples with negative results is obtained. Small systems (fewer than 40 samples/month) are allowed no more than one positive sample per month, larger systems are allowed no more than 5% positive samples in any month. Confirmed presence of fecal coliform or *E. coli* is considered an acute health risk and requires immediate notification of the public.

Water Treatment/control measures: Disinfection processes for source waters, such as chlorination, ozonation, and ultraviolet light. Other control measures include maintaining a disinfectant residual in the distribution system, protection of the source water area, proper well construction, maintaining distribution system pressure, and cross connection control.

Rule history:
Federal rule - 6/29/89
Oregon rule - 1/1/91

Microbial Contaminants - Surface Water Treatment

Purpose: Control pathogenic microorganisms and indicators in surface water sources, including *Giardia lamblia,* enteric viruses, heterotrophic plate count bacteria (HPC) and *Legionella.* Control level of particulate matter from soil runoff (turbidity).

Health effects: Inadequately treated water from surface water supplies may contain sufficient numbers of disease-producing organisms to cause illness. These organisms include bacteria, viruses, and parasites that can cause symptoms such as nausea, cramps, diarrhea, and associated headaches. Turbidity has no health effects. However, turbidity can interfere with disinfection and provide a medium for microbial growth. Turbidity may indicate the presence of disease-causing organisms.

Application: All public water systems using surface water sources, and all public water systems using groundwater sources determined by the Division to be under the direct influence of surface water.

Compliance: Water systems must provide a total level of treatment to remove/inactivate 99.9% (3-log) of *Giardia lamblia,* and to remove/inactivate 99.99% (4-log) of viruses, as follows:
Filtration plus disinfection treatment meeting performance standards, or
Disinfection treatment plus meet criteria to remain unfiltered, or
Disinfection plus natural filtration plus wellhead/ source water protection.

Filtration performance standards:
Continuous turbidity recording, report results every four hours
95% of turbidity readings less than 0.5 ntu (1 ntu for alternative technologies)
All turbidity readings less than 5 ntu
Minimum 2-log removal/inactivation, based on comprehensive performance evaluation

Disinfection performance standards:
Daily calculation of CxT (disinfectant concentration x time) at highest flow
CxT sufficient to meet needed removal/inactivation levels
Continuous 0.2 mg/L disinfectant residual at entry point
Minimum detectable disinfectant residual in 95% of distribution system samples

Implementation dates:

12/91 Unfiltered systems meet requirements to remain unfiltered
6/93 Filtration or alternate water source in place. Filtered systems meet performance requirements
6/94 State determines which community groundwater systems are under direct influence of surface water
12/95 Surface-influenced community systems meet treatment performance requirements
6/99 State determines which noncommunity groundwater systems are under direct influence of surface water
12/01 Surface-influenced noncommunity systems meet treatment performance requirements

Rule history:
Federal rule - 6/29/89
Oregon rule - 1/1/91

Microbial Contaminants - Disinfection By-products

Purpose: Trihalomethanes are organic contaminants that are called disinfection byproducts, because they result from disinfectants (chlorine used to kill harmful microbes in the drinking water) reacting with natural organic matter in the source water. Total Trihalomethanes (TTHMs) represents the sum of four by-products; chloroform, bromoform, dichlorobromomethane, and dibromochloromethane. The challenge is to maintain adequate levels of disinfection to kill microorganisms while at the same time minimizing the levels of TTHMs produced.

Table 1 - Microbial Contaminants

Contaminant	MCL, mg/L	Health Effects	Source of Drinking Water Contamination
Giardia lamblia	TT[1]	Gastrointestinal disease	Human and animal fecal wastes
Legionella	TT	Legionnaire's disease	Natural waters, can grow in water heating systems
Heterotrophic plate count (HPC)	TT	Indicates water quality, effectiveness of disinfection treatment	Naturally occurring bacteria
Total coliforms	<5% positive[2]	General indicator of pathogens	Environmental bacteria
Fecal coliforms and E. Coli	Confirmed presence	More specific indicator of pathogens	Human and animal fecal wastes
Turbidity	TT	Interferes with disinfection, indicator of filtration treatment efficiency	Particulate matter from soil runoff
Viruses	TT	Gastrointestinal disease	Human and animal fecal wastes
Trihalomethanes (total)	0.10	Liver, kidney, central nervous system effects, possible cancer	Drinking water chlorination by-product

[1] Treatment technique, filtration plus disinfection, or equivalent
[2] No more than 1 positive sample per month for systems collecting <40 samples per month

Health Effects: Some people who drink water containing TTHMs in excess of the MCL over many years could experience problems with their liver, kidneys, or central nervous systems, and may have an increased risk of getting cancer.

Application: TTHM requirements apply to community systems serving over 10,000 people and applying a disinfectant to the drinking water.

Monitoring: TTHMs must be monitored throughout the distribution system at frequencies varying from quarterly to once per year.

Compliance: Compliance is determined on meeting the maximum level for TTHMs over a running 12-month average of the sample results.

Water treatment/control measures: TTHMs can be reduced by moving the point of chlorine application from prior to filtration to after filtration, where many of the natural organic compounds in the water have been reduced. Alternative disinfectants such as chlorine combined with ammonia or ozone disinfection are available.

Rule history:
Federal rule - 11/29/79
Oregon rule - 9/24/82

Lead and Copper

Purpose: Set treatment technique requirements to control lead and copper in drinking water at the customer tap. Although lead and copper are naturally present in geologic deposits, they are rarely present in Oregon at significant levels in surface water or groundwater sources. They are primarily from corrosion of plumbing and plumbing fixtures in homes and buildings. Lead comes from lead solder and brass fixtures, and copper comes from copper tubing and brass fixtures.

Health effects:

Lead: Infants and young children are typically more vulnerable to lead in drinking water than the general population. Infants and children who drink water containing lead in excess of the action level could experience delays in their physical or mental development. Children could show slight deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.

Copper: Copper is an essential nutrient, but some people who drink water containing copper in excess of the action level over a relatively short period of time could experience gastrointestinal distress. Some people who drink water containing copper in excess of the action level over many years could suffer liver or kidney damage. People with Wilson's Disease should consult their personal doctor.

Application: All community and nontransient noncommunity systems

Monitoring: Samples are collected from "high-risk" homes; those with lead-soldered plumbing built prior to the July 1985 prohibition of lead solder in Oregon. One-liter samples of standing water (first draw after 6 hours of non-use) are collected at homes identified in the water system sampling plan. The number of samples required for initial and subsequent monitoring is summarized below:

Water System Population	Initial Sample Sites	Reduced Sample Sites
>100,000	100	50
10,001-100,000	60	30
3,301-10,000	40	20
501-3,300	20	10
101-500	10	5
<101	5	5

Two rounds of initial sampling were required during 1992-94, collected at six-month intervals. Subsequent annual sampling from the 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 three years. Water systems practicing corrosion control treatment must also monitor for water quality parameters (such as pH, temperature, alkalinity) and comply with target levels as specified by the Division.

Compliance: In each sampling round, 90% of samples from homes must have lead levels less than or equal to 0.015 mg/L, and copper levels less than or equal to 1.3 mg/L.

Water Treatment/Control Measures: Water systems that can not meet these levels must either implement a corrosion control program or develop alternate sources of water by January, 1998. If levels are not met even after treatment installation and optimization, then continuing public education efforts are required. It is possible that lead levels in a particular home may be higher than at other homes in the community as a result of the materials used in that home's plumbing. People who are concerned about elevated lead levels can arrange to test their water and if the results are high, can flush taps for 30 seconds to 2 minutes before using tap water, especially after periods of non-use.

Rule History:
Federal rule - 6/7/91
State rule - 12/7/92
Technical corrections to federal rule - 6/30/94

Inorganic Contaminants

Purpose: Control levels of fifteen metals and minerals in drinking water, both naturally-occurring and resulting from agricultural or industrial use. 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. See Table 2.

Health effects: For most inorganic contaminants, health concerns are related to long-term or even lifetime exposures (see Table 2). Nitrate and nitrite, however,can seriously affect infants in short-term exposures by interfering with the transfer of oxygen from the lungs to the bloodstream. Infants below the age of six months who drink water containing nitrate or nitrite in excess of the MCLs could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome. USEPA is reviewing the drinking water standard for arsenic because of special concerns that it may not be stringent enough. Arsenic is a naturally-occurring mineral known to cause cancer in humans at high concentrations.

Application: All public water systems. The exception is the asbestos standard which applies to community and nontransient noncommunity systems.

Monitoring: Nitrate - community and nontransient noncommunity systems must sample quarterly for surface water sources and annually for groundwater sources. All noncommunity and state-regulated water systems must sample annually. Asbestos - community and nontransient noncommunity systems with asbestos-cement water pipes or with water sources in geologic asbestos deposit areas must sample every nine years. All other inorganics - community and nontransient noncommunity systems must sample surface water sources annually and groundwater sources every three years. All transient noncommunity and state-regulated water systems must sample once.

Compliance: Water systems must meet the established maximum contaminant levels (Table 2). Systems that can not meet one or more MCLs must either install water treatment systems or develop alternate sources of water.

Water Treatment: A variety of water treatment processes are available for reducing levels of specific inorganic contaminants in drinking water, including ion exchange and reverse osmosis.

Rule history:

Federal rules - 12/24/75 (NIPDWR), 1/30/91 and 7/1/91 (Phase II), and 7/19/92 (Phase V)

State rule - 9/24/82 (arsenic), 12/7/92 (Phase II), and 1/14/92 (Phase V)

Table 2 - Inorganic Contaminants

Contaminant	MCL, mg/L (or as noted)	Potential Health Effects	Sources of Drinking Water Contamination
Antimony	0.006	Blood cholesterol increases, blood sugar decreases	Discharge from petroleum refineries, fire retardants, ceramics, electronics, solder
Arsenic	0.05	Skin damage, circulatory system effects, increased cancer risk	Erosion of natural deposits of volcanic rocks, runoff from orchards, runoff from glass and electronics production wastes
Asbestos	7 million fibers per liter (>10 um fiber size)	Benign intestinal polyps	Erosion of natural geologic deposits, decay of asbestos-cement water pipes
Barium	2	Increase in blood pressure	Discharge of drilling wastes, discharge from metal refineries, erosion of natural deposits
Beryllium	0.004	Intestinal lesions	Discharge from metal refineries and coal-burning factories, discharge from electrical, aerospace, and defense industries
Cadmium	0.005	Kidney damage	Corrosion of galvanized pipes, erosion of natural deposits, discharge from metal refineries, runoff from waste batteries and paints
Chromium (total)	0.1	Allergic dermatitis	Discharge from steel and pulp mills, erosion of natural deposits
Cyanide	0.2	Thyroid, nervous system damage	Discharge from steel/metal factories, discharge from plastic and fertilizer factories
Fluoride	4.0[1]	Bone disease, mottled teeth	Erosion of natural deposits, discharge from fertilizer and aluminum industries, drinking water additive promoting strong teeth
Mercury (total inorganic)	0.002	Kidney damage	Erosion of natural deposits, discharges from refineries and factories, runoff from landfills, runoff from cropland
Nickel	None[2]	Heart and liver damage	Electroplating, stainless steel, alloys
Nitrate (as N)	10	Methemoglobinemia ("blue baby syndrome") in infants below the age of six months	Runoff from fertilizer use, leaching from septic tank/ drain fields, erosion of natural deposits
Nitrite	1	Methemoglobinemia ("blue baby syndrome") in infants below the age of six months	Runoff from fertilizer use, leaching from septic tank/ drain fields, erosion of natural deposits (rapidly converted to nitrate)
Selenium	0.05	An essential nutrient, excessive levels associated with hair and nail loss, numbness in fingers and toes, circulatory problems	Discharge from petroleum and metal refineries, erosion of natural deposits, discharge from mines
Thallium	0.002	Hair loss, blood changes, and kidney, liver, intestinal effects	Leaching from ore processing sites, discharge from electronics, drugs, and glass factories

[1]Note: a secondary standard for fluoride is set a 2.0 mg/L to control tooth discoloration

[2]Federal standard withdrawn 2/23/95 Monitoring is required

Organic Chemicals

Purpose: Control levels of 53 different organic contaminants (see Table 3). Organic contaminants are most often associated with industrial or agricultural activities that affect sources of drinking water supply. Major types of organic contaminants include industrial and commercial solvents and chemicals, and pesticides used in agriculture and landscaping. Organic contaminants can also enter drinking water from materials in contact with the water such as pipes and internal paints and coatings.

Health effects: For organic contaminants, health concerns are related to long-term or even lifetime exposures to low levels of contaminant (see Table 3).

Table 3 - Organic Contaminants

Contaminant	MCL, mg/L	Potential Health Effects	Sources of Drinking Water Contamination
Acrylamide	TT[1]	Central nervous system effects, increased risk of cancer	Polymers used in water and sewage treatment
Alachlor	0.002	Eye, liver, kidney, spleen effects, increased risk of cancer	Runoff from herbicides used on row crops
Atrazine	0.003	Cardiovascular and reproductive effects	Runoff from herbicides used on row crops
Benzene	0.005	Decreased blood platelets, increased risk of cancer	Discharge from factories, leaching from landfills and gas storage tanks
Benzo(a)-pyrene (Polyaromatic hydrocarbons)	0.0002	Reproductive difficulties and increased risk of cancer	Leaching from linings of water storage tanks and water pipes
Carbofuran	0.04	Blood, nervous system and reproductive system effects	Leaching of soil fumigant used on rice and alfalfa
Carbon tetrachloride	0.005	Liver effects and increased risk of cancer	Discharge from chemical plants and other industrial activities
Chlordane	0.002	Blood and nervous system effects, increased risk of cancer	Residue of banned termiticide
Chloro-benzene	0.1	Kidney and liver effects	Discharge from chemical and agricultural chemical factories
2,4-D	0.07	Liver, adrenal gland, and kidney damage	Runoff from herbicides used on row crops
Dalapon	0.2	Kidney effects	Runoff from herbicides used on rights of way
1,2 Dibromo-3-chloropropane (DBCP)	0.0002	Reproductive difficulties and increased risk of cancer	Runoff from soil fumigant used on soybeans, cotton, pineapples, orchards
o-Dichloro-benzene	0.6	Liver, kidney, circulatory system damage	Discharge from industrial chemical factories
p-Dichloro-benzene	0.075	Liver, kidney, spleen damage, blood effects	Discharge from industrial chemical factories
1,2-Di-chloroethane	0.005	Increased risk of cancer	Discharge from industrial chemical factories
1,1-Di-chloro-ethylene	0.007	Liver damage	Discharge from industrial chemical factories
cis 1,2-Dichloro-ethylene	0.07	Immune system problems	Discharge from industrial chemical factories
trans 1,2-Dichloro-ethylene	0.1	Liver damage and immune system problems	Discharge from industrial chemical factories
Dichloro-methane	0.005	Liver damage and increased risk of cancer	Discharge from pharmaceutical and chemical factories
1,2-Di-chloropro-pane	0.005	Increased risk of cancer	Discharge from industrial chemical factories
Di(2-ethyl-hexyl) adipate	0.4	General toxic and reproductive effects	Discharge from chemical factories
Di(2-ethyl-hexyl) phathalate	0.006	Liver effects, reproductive difficulties, increased risk of cancer	Discharge from chemical and rubber factories
Dinoseb	0.007	Reproductive difficulties	Runoff from herbicide used on soybeans and vegetables
Dioxin (2,3,7,8-TCDD)	3×10^{-8}	Reproductive difficulties and increased risk of cancer	Emissions from waste incineration and other combustion, discharge from chemical factories
Diquat	0.02	Cataracts	Runoff from herbicide use
Endothall	0.1	Stomach, intestine effects	Runoff from herbicide use
Endrin	0.002	Nervous system effects	Residue of banned insecticide
Epichloro-hydrin	TT[1]	Stomach effects and increased risk of cancer	Discharge from industrial chemical factories, impurity in some water treatment chemicals
Ethyl-benzene	0.7	Liver, kidney damage	Discharge from petroleum refineries
Ethylene dibromide	0.00005	Stomach, kidney, reproductive system effects, and increased risk of cancer	Discharge from petroleum refineries
Glyphosate	0.7	Kidney, reproductive system effects	Runoff from herbicide use
Heptachlor	0.0004	Liver damage, increased risk of cancer	Residue of banned termiticide
Heptachlor epoxide	0.0002	Liver damage, increased risk of cancer	Breakdown of heptachlor
Hexachloro-benzene	0.001	Liver, kidney, reproductive system effects, and increased risk of cancer	Discharge from metal refineries and agricultural chemical factories
Hexachloro-cyclopenta-diene	0.05	Kidney damage	Discharge from chemical factories
Lindane	0.0002	Liver, kidney effects, increased risk of cancer	Runoff/leaching from insecticide used on lumber, gardens, cattle; restricted in 1983
Methoxy-chlor	0.04	Reproductive difficulties	Runoff/leaching from insecticide used on fruits, vegetable, alfalfa, livestock

Contaminant	MCL, mg/L	Potential Health Effects	Sources of Drinking Water Contamination
Oxamyl (Vydate)	0.2	Nervous system effects	Runoff/leaching from insecticide used on apples, potatoes, tomatoes
Pentachlorophenol	0.001	Liver and kidney effects, increased risk of cancer	Discharge from wood preserving operations
Picloram	0.5	Liver damage	Herbicide runoff
Polychlorinated biphenyls (PCBs)	0.0005	Skin, thymus gland, reproductive system nervous system effects, immune deficiencies, increased risk of cancer	Runoff from landfills, discharge of waste chemicals
Simazene	0.004	Blood effects	Herbicide runoff
Styrene	0.1	Liver, kidney, blood effects	Discharge from rubber and plastic factories, leaching from landfills
Tetrachloroethylene	0.005	Liver damage and increased risk of cancer	Leaching from PVC pipes, discharge from factories and dry cleaning
Toluene	1	Liver, kidney, nervous system effects	Discharge from petroleum refineries
Toxaphene	0.003	Kidney, liver, nervous system effects, increased cancer risk	Runoff/leaching from insecticide used on cattle, cotton, canceled in 1982
2,4,5-TP (Silvex)	0.05	Liver damage	Residue of banned herbicide, canceled in 1983
1,2,4-Trichlorobenzene	0.07	Adrenal gland changes	Discharge from textile finishing factories
1,1,1-Trichloroethane	0.2	Liver, nervous system, circulatory system effects	Discharge from metal degreasing sites and other factories
1,1,2-Trichloroethane	0.005	Kidney, liver, immune system damage	Discharge from industrial chemical factories
Trichloroethylene	0.005	Liver damage and increased risk of cancer	Discharge from metal degreasing sites and other factories
Vinyl chloride	0.002	Increased risk of cancer	Leaching from PVC pipe, discharge from plastics factories
Xylenes (total)	10	Nervous system damage	Discharge from petroleum factories, discharge from chemical factories

[1]Treatment technique requirement (limit dosage of polymer treatment chemicals)

Application: Community and nontransient noncommunity water systems.

Monitoring: One test for each contaminant from each water source is required during every 3-year compliance period, beginning in the 1993-95 period. The exceptions are dioxin and acrylamide/ epichlorohydrin. Only those systems determined by the Division to be at risk of contamination must monitor for dioxin. Water systems using polymers containing acrylamide or epichlorohydrin in their water treatment processes must keep their dosages below specified levels.

Compliance: Water systems must meet the established maximum contaminant levels (Table 3). Systems that can not meet one or more MCLs must either install or modify water treatment systems or develop alternate sources of water.

Water Treatment: A variety of water treatment processes are available for reducing levels of specific organic contaminants in drinking water, including activated carbon and aeration.

Rule history:
Federal rules - 1/30/91 and 7/1/91(Phase II); and 7/19/92 (Phase V)
State rule - 12/7/92 (Phase II) and 1/14/92 (Phase V)

Radiologic Contaminants

Purpose: Limit exposure to six radioactive contaminants in drinking water (see Table 4). These contaminants are both natural and man-made.

Health effects: Primarily increased cancer risk from long-term exposure.

Application: All community water systems.

Monitoring: One sample from each source for gross alpha every four years. Only communities serving over 100,000 people or with sources potentially impacted by man-made radiation sources designated by the Division must sample for other radiologic contaminants.

Compliance: Community water systems that can not meet MCLs must install treatment or develop alternate water sources.

Water treatment: Variety of treatment processes will reduce radiologic contaminants, including ion exchange and reverse osmosis.

Rule history:
Federal rule - 7/9/76
State rule - 9/24/82

Table 4 - Radiologic Contaminants

Contaminant	MCL, pCi/L (picocuries per liter), unless otherwise noted	Potential health effects	Sources of Drinking Water Contamination
Gross alpha	15	Cancer	Erosion of natural deposits
Gross beta[1]	50	Cancer	Decay of natural and man-made deposits
Iodine-131[2]	3	Cancer	Power production
Radium 226+228[3]	5	Cancer	Erosion of natural deposits
Strontium 90[2]	8	Cancer	Power and weapons production
Tritium[2]	20,000	Cancer	Power and weapons production

[1]Sampling required only if designated by the Division - Gross beta + photon emitters not to exceed 4 millirems per year
[2]Sampling required only if designated by the Division
[3]Sampling only if gross alpha result exceeds 5 pCi/L

Review and Update of Current Standards

USEPA is required to review existing drinking water standards by the year 2000. It is likely that 5-6 standards will undergo detailed review and possible revision.

II. Future Standards

New and revised drinking water quality standards are mandated under the federal 1996 Safe Drinking Water Act. These include:

- Disinfectants/Disinfection by-products
- Enhanced surface water treatment
- Radon/Radionuclides
- Arsenic
- Groundwater
- Next five contaminants

The Health Division, under the Primacy Agreement with USEPA, will have up to two years to adopt each federal rule after it is finalized. This Section is intended to summarize and preview these standards, currently under development by USEPA and not yet final.

Microbial Standards - Disinfectants/Disinfection By-products, Enhanced Surface Water Treatment, Groundwater Disinfection

Purpose: Increase protection of people from disease-producing (pathogenic) organisms in water supplies while at the same time limiting the exposure of people to chemical disinfectants and various chemical by-products of disinfection treatment present as a result of disinfection treatment practices.

The primary additional organism of concern in surface water supplies is *Cryptosporidium*. 100% of surface water supplies are considered at some risk of containing microorganisms at any given time.

Human enteric viruses from human fecal matter is of concern in groundwater supplies. Available data suggests that 8-10% of public wells may be at risk of virus contamination, so requirements will focus on identification of at-risk wells and either reducing the risk or providing adequate levels of disinfection treatment to kill viruses.

Finally, disinfection treatment used to kill microorganisms in drinking water can react with naturally occurring organic and inorganic matter in water to form disinfection by-products. The challenge is to apply levels of disinfection treatment needed to kill microorganisms while limiting the levels of disinfection by-products produced.

Occurrence data in US public water systems is currently lacking, therefore, larger utilities are now collecting microbiological and disinfection by-product data under the Information Collection Rule (ICR). ICR data will be complete, validated, and available by January, 2000, and will be used to design future microbial drinking water standards. Therefore, the new microbial standards will be introduced in stages, with early stages focusing on improvements in health protection that can be achieved by optimizing existing water system facilities without major capital costs, and final stages requiring major capital investments if public health needs are demonstrated by the ICR data. The regulatory stages are summarized below:

Stage 1 Disinfectants/Disinfection By-products
(Stage 1 D/DBP) - Reduced MCLs and new MCLs

Interim Enhanced Surface Water Treatment (IESWTR) -
Increased filtration and disinfection performance standards for large systems (serving over 10,000 people)

Filter Backwash Recycling Rule (FBR) - Regulation of filter backwash recycling to limit accumulation of microorganisms

Groundwater Rule (GWR) - New disinfection treatment performance standards or alternative practices for all systems with groundwater at risk of virus contamination

Long-term Stage 1 Enhanced Surface Water Treatment (LT1ESWTR)- Increased filtration and disinfection performance standards for smaller systems

Stage 2 Disinfectants/Disinfection By-products (Stage 2 D/DBP)- Further reduced MCLs and new MCLs

Long-term Stage 2 Enhanced Surface Water Treatment (LT2ESWTR) - Further increased filtration and disinfection performance standards for all systems

Revisions to current coliform bacteria standards - If needed

Health effects: See Table 5.

Table 5 - Future Microbial Contaminants, Disinfectant Residuals, and Disinfection By-products

Contaminant	MCL, mg/L	Potential Health Effects	Source of Drinking Water Contamination
Bromate	0.010	Cancer	Drinking water ozonation by-product
Bromodichloromethane	(see total trihalomethanes (TTHMs)	Cancer; liver, kidney, and reproductive effects	Drinking water chlorination by-product
Bromoform	(see TTHMs)	Cancer; nervous system, liver and kidney effects	Drinking water chlorination by-product
Chloral hydrate	TT	Liver effects	Drinking water chlorination by-product
Chloramines (residual total chlorine)	4 (as CL_2)		Drinking water chlorination residual
Chlorine (residual free chlorine)	4 (as CL_2)		Drinking water chlorination residual
Chlorine dioxide	0.8 (as CLO_2)		Drinking water residual from disinfection using chlorine dioxide
Chlorite	1.0	Oxidative effects to red blood cells	By-product of disinfection using chlorine dioxide
Chloroform	(see TTHMs)	Cancer; liver, kidney, reproductive effects	Drinking water chlorination by-product
Cryptosporidium	TT (filtration)	Severe gastro-intestinal illness, especially for people with compromised immune systems	Fecal matter from humans and animals, especially cattle
Dichlorobromomethane	(see TTHMs)	Nervous system, liver, kidney, reproductive effects	Drinking water chlorination by-product
Dichloroacetic acid	(see HAA5)	Cancer; reproductive, developmental effects	Drinking water chlorination by-products
Haloacetic acids (HAA5)[1]	0.060 (Stage 1) 0.030 (Stage 2)	Cancer and other effects	Drinking water chlorination by-products
Trichloroacetic acid	(see HAA5)	Liver, kidney, spleen developmental effects	Drinking water chlorination by-product

Contaminant	MCL, ms/L	Potential Health Effects	Source of Drinking Water Contamination
Total Trihalo-methanes (TTHMs)	0.10 (current) 0.080 (Stage 1) 0.040 (Stage 2)	Cancer and other effects	Drinking water chlorination by-products
Viruses	TT (disinfection)	Severe gastro-intestinal illness	Human fecal matter

[1] Sum of the concentrations of mono-, di-, and trichloroacetic acids and mono- and dibromoacetic acids

Application: Microbial standards apply to all public water systems using groundwater or surface water sources of supply. D/DBP standards apply to community and nontransient noncommunity systems that apply disinfectants.

Monitoring: Monitoring is likely to be required both for pathogenic organisms and for disinfectants and disinfection by-products. Monitoring of treatment processes is also likely.

Compliance: Compliance is demonstrated by either meeting the MCLs or meeting treatment technique requirements or best management practices for applicable contaminants. See Table 5.

Federal regulation dates:
- Information collection rule - 5/14/96
- Notice of data availability - 11/3/97
- Final Stage 1 D/DBP and IESWTR - 11/98
- Final Filter Backwash Recycling Rule - 8/00
- Final LT1ESWTR and GWR - 11/00
- Final Stage 2 D/DBP, LT2ESWTR - 5/02
- Coliform bacteria rule revision - 2002 or later

Arsenic

Purpose: Revise existing standard for arsenic based on health effects research suggesting that arsenic may present an internal organ cancer risk at low levels of exposure. EPA has finalized a comprehensive arsenic health research plan to reduce uncertainties in assessing health risks of arsenic, but the results are not expected to be available before the scheduled adoption of the new standard.

Health effects: Current standard of 0.050 mg/L is based on health effects including skin thickening and possible skin cancer. Revised standard to take into account risk of internal organ cancer.

Application: Community and nontransient noncommunity systems, surface water and groundwater sources.

Monitoring: To be determined in rule.

Compliance: Based on meeting revised Maximum Contaminant Level. EPA suggests a health target level of 0.002 mg/L for discussion of the revised MCL. National annual costs of meeting a range of possible MCLs are: 0.0005 mg/L, $120B; 0.002 mg/L, $4.2B; 0.010 mg/L, $710M; 0.020 mg/L, $330M; 0.050 mg/L, $120M. Many utilities provide water with arsenic levels greater than 0.002 mg/L.

Federal regulation dates:
- EPA proposed rule - January, 2000
- EPA final rule - January, 2001

Radionuclides

Purpose: Set new standards for radon and uranium. The radon MCL is to be based on a revised risk assessment by the National Academy of Sciences. Finalize standards for currently regulated contaminants, including radium-226, radium-228, alpha emitters, and beta and photon emitters.

Health effects: Primarily cancer for all contaminants. Radon is a radioactive gas which is naturally-occurring in some groundwater. It poses a health risk when the gas is released from water into air, as occurs during showering, bathing, or washing clothes or dishes. Radon in drinking water is a relatively small part of the total radon in air. Other sources are radon gas from soil which enters homes through foundations, and radon inhaled directly while smoking cigarettes. Radon which is inhaled has been linked to lung cancer, however, it is not clear what level of radon in drinking water contributes to this effect. People concerned about radon in their homes can have their homes tested to determine total exposure level. For information on how to conduct home tests, contact Radiation Protection Services at (503) 731-4272.

Application: Community and nontransient noncommunity systems, surface water and groundwater sources.

Monitoring: To be determined in rule.

Compliance: Based primarily on meeting MCLs. Existing MCLs for radium-226 and 228 are unlikely to be raised, as was earlier expected, from 5 pCi/L to 20 pCi/L. Uranium MCL proposed in 1991 at 0.02 mg/L. Radon MCL proposed in 1991 at 300 pCi/L. A multi-media approach to radon regulation is under discussion, in which an Alternative MCL could be set by states with effective indoor air radon reduction programs in place and operating. The Alternative MCL would be in the range of 3,000-4,000 pCi/L. Oregon radon data from 65 deep community wells collected in 1983 showed 23 with radon greater than 300 pCi/L. Cost data from 1990 suggests the following national annual costs of various alternate radon MCLs: 200 pCi/l, $3.3B; 300 pCi/L, $2.5B; 1,000 pCi/L,$816M; 4,000 pCi/L, $178M.

Regulation dates (Contaminants other than radon):
- EPA proposed rule - 7/18/91
- EPA final rule - November, 2000

Regulation dates (Radon):
- NAS studies complete - June, 1998
- EPA draft rule - December, 1998
- Guidelines for multi-media programs - August, 1999
- EPA final rule - August, 2000

Drinking Water Contaminant Candidate List (DWCCL)

Purpose. Identify chemical and microbiological contaminants known or anticipated to occur in public water systems, for possible future regulation. The first DWCCL was published in February, 1998. In Tables 6 and 7, the list is broken into two groups. The first group includes twenty contaminants that are priorities for regulation, and will be the source for regulatory decisions in 2001. The second group includes forty additional contaminants which require further research on health, treatment, and/or analytical methods, or need further occurrence data collection. For each contaminant, its classification is shown along with the Chemical Abstract System Number (CASN), if applicable, for use in locating additional information on the contaminant. The list must be updated every five years.

In addition, the tables indicate the contaminants on the DWCCL for which EPA Health Advisories have been published. These advisories contain known information on health risks, and specify ranges of concentrations that are acceptable for drinking over different lengths of time. Advisories are generally used to evaluate specific contaminant exposures at specific sites, such as chemical spills.

Table 6 - Contaminant Candidate List - Regulatory Determination Priorities (20)

Contaminant	Classification	Chemical Abstract Number	Health Advisory Published
Acanthamoeba	microbiological	———	
1,1,2,2-tetrachloroethane	organic	630-20-6	
1,1-dichloroethane	organic	75-34-3	
1,2,4-trimethylbenzene	organic	95-63-6	
1,3-dichloropropene	pesticide	542-75-6	
2,2-dichloropropane	organic	594-20-7	
Aldrin	pesticide	309-00-2	X
Boron	inorganic	7440-42-8	
Bromobenzene	organic	108-86-1	
Dieldrin	pesticide	60-57-1	X
Hexachlorobutadiene	organic	87-68-3	
p-Isopropyltoluene	organic	99-87-6	
Manganese	inorganic	7439-96-5	
Metolachlor	pesticide	51218-45-2	
Metribuzin	pesticide	21087-64-9	
Naphthalene	organic	91-20-3	
Organotins	organic	———	
Triazines & degradation products (including Cyanazine, Atrazindesethyl)	pesticide	———	
Sulfate	inorganic	———	
Vanadium	inorganic	7440-62-2	

Table 7 - Contaminant Candidate List - Research and Occurrence Priorities (40)

Contaminant	Classification	Chemical Abstract Number	Health Advisory Published
Adenoviruses	microbiological	———	
Aeromonas hydrophilia	microbiological	———	
Cyanobacteria (Blue-green algae) and their toxins	microbiological	———	
Caliciviruses	microbiological	———	
Coxsackieviruses	microbiological	———	
Echoviruses	microbiological	———	
Helicobacter pylon	microbiological	———	
Microsporidia	microbiological	———	
1,1-dichloropropene	organic	563-58-6	
1,2-diphenylhydrazine	organic	122-66-7	
1,3-dichloropropane	organic	142-28-9	
2,4,6-trichlorophenol	organic	88-06-2	
2,4-dichlorophenol	organic	120-83-2	
2,4-dinitrophenol	organic	51-28-5	
2,4-dinitrotoluene	organic	121-14-2	
2,6-dinitrotoluene	organic	606-20-2	
2-methyl-phenol	organic	95-48-7	
Alachlor ESA	pesticide	———	
Aluminum	inorganic	7429-90-5	
Acetochlor	pesticide	34256-82-1	
DCPA (Dacthal) monoacid & degradates	pesticide	887-54-7	
DCPA (Dacthal) di-acid degradates	pesticide	2136-79-0	
DDE	pesticide	72-55-9	
Diazinon	pesticide	333-41-5	X
Disulfoton	pesticide	298-04-4	X
Diuron	pesticide	330-54-1	X
EPTC (s-Ethyl-dipropylthiocarbonate)	pesticide	759-94-4	
Fonofos	pesticide	944-22-9	X
Linuron	pesticide	330-55-2	
Methyl bromide	organic	74-83-9	
Molinate	pesticide	2212-67-1	
Mycobacterium avium intercellulare (MAC)	microbiological	———	
MTBE	organic	1634-04-4	X
Nitrobenzene	organic	98-95-3	
Perchlorate	inorganic	———	
Prometon	pesticide	1610-18-0	
RDX	organic	121-82-4	X
Sodium	inorganic	7440-23-5	
Terbacil	pesticide	5902-51-2	X
Terbufos	pesticide	13071-79-9	X

Monitoring: To support identification of contaminants, the EPA must establish the National Contaminant Occurrence Database (NCOD) by August, 1999. Monitoring and reporting may be required for public water systems for up to 30 unregulated contaminants for inclusion in the database.

Regulating contaminants: EPA must publish a decision on whether or not to regulate at least five contaminants (including sulfate) from the DWCCL by August, 2001, and from each updated DWCCL every five years. For any contaminants from the first DWCCL for which a decision is made to regulate, the final rule is due by February, 2005, with compliance required by water systems by February, 2008.

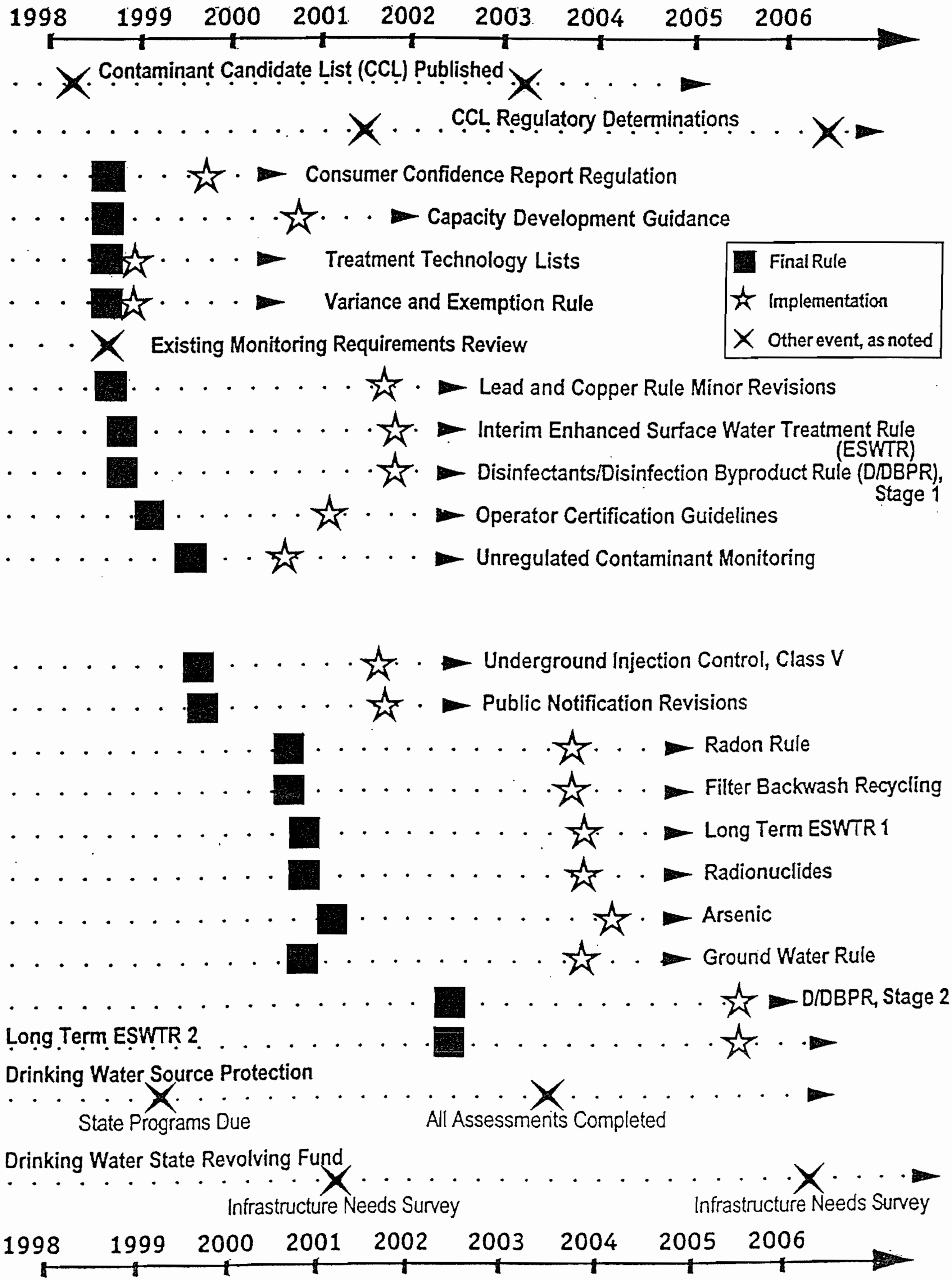
Safe Drinking Water Act Timeline

The chart on page 13 shows a simplified implementation timeline for major provisions of the 1996 Safe Drinking Water Act, prepared and published by the USEPA [1]. These will take effect from now until 2005 and beyond. These provisions include the new drinking water standards described above as well as many new program initiatives such as consumer confidence reports, technical/financial/managerial capacity development, operator certification, drinking water source protection, and the drinking water state revolving loan fund. Watch for information on these program initiatives in future regular editions of the PIPELINE.

Other useful sources of information include:
Journal American Water Works Association (and related publications)
Rural Water Magazine, National Rural Water Association (and related publications)
USEPA, AWWA, and other organization web pages (access through Oregon Drinking Water web page)

[1] "Safe Drinking Water Is In Our Hands - Existing Standards and Future Priorities" EPA 815-F-98-007 (June, 1998)

Timeline of SDWA Activities



Appendix D

Energy Rebate Forms

Application and Verification Form for Residential Energy Tax Credit Certification - Instructions: 2000-2001

Premium Efficiency Appliances

The Oregon Residential Energy Tax Credit Program provides a tax credit for clothes washers, dishwashers and other major household appliances certified energy-efficient by the Oregon Office of Energy. Lists of eligible appliances by manufacturer and model are updated monthly. Lists are available from your appliance dealer or from the Office of Energy. (Visit our Web site or call us at the number below.) To qualify for the tax credit, you must have an Oregon income tax liability, the appliance must be used in your primary or secondary residence, and the home must be in Oregon. Only homeowners and renters are eligible; landlords, builders and developers are not.

Don't wait to apply for the tax credit. It usually takes at least four to six weeks to get the Certification you need to claim the credit on your tax return. Take the following steps to receive your tax credit:

1. **Verify that the appliance you are buying is eligible for a tax credit and determine the tax credit amount.** Look up the appliance you intend to buy by manufacturer and model number in the Office of Energy list of qualifying appliances. The tax credit you may claim is the amount on the list of qualifying appliances or 25 percent of the net purchase price of the appliance, WHICHEVER IS LESS. Verify that energy use (in kWh or therms) listed on the appliance's yellow EnergyGuide label matches the energy use shown in the list of qualifying appliances. If it doesn't, the appliance may not be eligible for a tax credit. Contact the Office of Energy for clarification.

2. **Submit a completed Application and Verification Form for Tax Credit Certification for Premium Efficiency Appliances.** You may apply for a tax credit for more than one appliance on a single form. Include a copy of your receipt(s) for the purchased appliance(s). If the paperwork you submit demonstrates that the appliance qualifies for the tax credit, the Office of Energy will approve your application and send you a signed Certification specifying the qualifying tax credit amount. You can apply for and claim the credit for the tax year you purchase the appliance as long as you place it in service by April 1 of the following year and the Office of Energy has received your completed application by that date.

3. **Claim the tax credit on your state income tax return.** Keep your Certification, a copy of your application, proof of payment and any other supporting documentation with a copy of your tax return. (Do not attach these items to your tax return.) If your return is audited, the Department of Revenue will request copies of this information from you. You may carry forward any unused credit up to five years.

OREGON OFFICE OF ENERGY

1-800-221-8035 • 503-378-4040 (Salem) • www.energy.state.or.us

Detach these instructions before mailing completed application.

Q&A

Oregon Residential Energy Tax Credit for Premium-Efficiency Clothes Washers and Dishwashers

ELIGIBLE PURCHASES

Q. Which appliances qualify for the tax credit?

A. Only models on the Oregon Office of Energy's lists of qualifying products *at the time of purchase* are eligible. The lists are available from your appliance dealer or our Web site (www.energy.state.or.us). Or call the Office of Energy at 1-800-221-8035.

Q. Can I get a tax credit for appliances I bought before the program started?

A. No. The appliance tax credit program began on Jan. 1, 1998. Appliance purchases before this date do not qualify.

Q. Can I get the tax credit if I purchase a used premium-efficiency appliance?

A. No. Used appliances are not eligible.

CALCULATING THE TAX CREDIT

Q. How much is the tax credit?

A. The tax credit amount is the *lesser* of 1) the tax credit amount on the list of qualifying appliances or 2) 25 percent of the net purchase price of the appliance. The tax credit is up to $160 to $230 for qualifying clothes washers and $50 to $70 for qualifying dishwashers, based on estimated energy savings.

Q. What is the net purchase price of the appliance?

A. It's the price on your receipt *after* you deduct any in-store discounts. You do *not* need to deduct any mail-in rebates, including any rebate your utility offers.

Q. Can I include installation and delivery costs in the net purchase price eligible for a tax credit?

A. No. Installation and delivery are not qualifying costs.

WHO CAN GET A TAX CREDIT

Q. Who is eligible for the Residential Energy Tax Credit for appliances?

A. Homeowners and renters are eligible for the tax credit; *landlords, builders and developers are not.* You can get a tax credit only if the appliance is installed in the home you live in or in your secondary (vacation) home. The home must be in Oregon. (Landlords can get a *Business Energy Tax Credit* for premium-efficiency appliances in rental housing. Call the Office of Energy for more information.)

Q. Can I receive a tax credit if I don't pay Oregon income taxes?

A. No. You must pay Oregon income taxes to receive a tax credit. The tax credit cannot exceed your tax liability.

Q. Can I get a tax credit if I give the appliance as a gift?

A. No. But the people receiving the gift can apply for the tax credit if you give them the receipt and they qualify. (The tax credit doesn't exceed their Oregon income tax liability, they own or rent and occupy the home where the appliance is installed, and the home is in Oregon.)

Q. I'm a builder. Can I get a tax credit for installing qualifying appliances in the homes I'm building?

A. No. Builders cannot take the tax credit unless they are building the home for themselves. The home buyer can apply for the tax credit if you pass on the receipts for the appliances when the home is purchased.

HOW THE TAX CREDIT WORKS

Q. How do I apply for the tax credit?

A. Complete a Tax Credit Application and Verification Form for Premium-Efficiency Appliances. It's available from your dealer or the Oregon Office of Energy. (You can use one form to apply for a tax credit for all the qualifying appliances you purchased.) Fill out the form completely, sign it, and attach receipt(s). Send the application to the Office of Energy. You'll receive a Certification with the tax credit amount you qualify for.

Q. When do I apply for the tax credit?

A. Don't wait to apply. It usually takes at least four to six weeks to receive the Certification you'll need to claim the tax credit on your income tax return. You can apply for and claim the credit for the tax year in which the appliance is purchased as long as the appliance is placed in service by April 1 of the following year. For example, you can apply for and claim the tax credit in 2001 if you buy the appliance in 2001 but don't install it until March 2002.

Q. How do I claim the credit on my Oregon income tax return?

A. Enter the eligible tax credit amount from your Office of Energy Certification on line 41 if you file Oregon Form 40; enter the amount on line 21 if you file Oregon Form 40S.

Q. Can I carry over the tax credit to future years?

A. Yes. You may take the full tax credit in one year or over as many as five years.

Q. Can I get a cash payment instead of a tax credit?

A. No. You can only get a credit on your Oregon income tax.

Q. Can I get a tax credit if I don't have the receipt?

A. No. You must include with your tax credit application a receipt for your purchase indicating the model number of each qualifying appliance and the price paid for each item. Most appliance centers retain receipts. Call your dealer for a copy.

ENERGY AND WATER SAVINGS

Q. How much energy and water do premium-efficiency clothes washers save?

A. Clothes washers that qualify for the tax credit use 60 percent less *energy* per year on average than standard models. Qualifying washers use up to 40 percent less *water* (and detergent) than standard models on average, saving 5,000 to 7,000 gallons of water per year.

Q. How much energy and water do premium-efficiency dishwashers save?

A. Dishwashers that qualify for the tax credit use 20 percent to 25 percent less *energy* per year on average than standard models and save up to 1,000 gallons of water a year.

January 2001

Application and Verification Form
for Residential Energy Tax Credit Certification

Premium Efficiency Appliances

OREGON OFFICE OF ENERGY
625 Marion St. NE, Suite 1
Salem, OR 97301-3742
Toll-free: 1-800-221-8035
Salem: (503) 378-4040
Web site: www.energy.state.or.us

Please note
We cannot approve your application unless it is complete and signed and receipts are attached.

1. APPLICANT INFORMATION

Name:			Social Security No.*:
Mailing address:			Daytime phone:
City:	State:	ZIP:	County:
Street address where appliance(s) will be used (if different):			
City:	State:	ZIP:	County:
If different than mailing address, please explain:			
Are you a homeowner? ❑ Renter? ❑ (Landlords and builders are *not* eligible for the tax credit.)			
Number of people in household:			

2. UTILITY INFORMATION

Name of electric utility:		Name of natural gas utility:	
Fuel used for water heating:	❑ Electricity	❑ Natural gas	❑ Other (specify):

3. APPLIANCE INFORMATION

Provide the following information for all appliances for which you are claiming a tax credit, and **attach receipts for your purchase(s):**

Brand name	Model no.	Type of appliance	Energy use[1]	Tax credit[2]	Net price[3]	Date of purchase
Frigidaire EXAMPLE	FWT647GH	Clothes washer	259kWh	$175	$699	Oct. 10, 2000

[1] From yellow EnergyGuide label on appliance, in kWh or therms.
[2] From list of appliances qualifying for the Oregon Residential Energy Tax Credit or 25 percent of the net purchase price of the appliance, whichever is less.
[3] Purchase price less any manufacturer or retailer rebates shown on receipt (not including mail-in rebates).

FOR OFFICE USE ONLY
File no.:
Date received:
Tax credit amount: $
Tax year:

Continued on next page

*OAR 330-070-0025 authorizes the Oregon Office of Energy to request that you voluntarily provide your social security number for use as an identification number in maintaining records. If you provide your social security number and consent to its use, it will be used only for the purpose(s) stated above or as otherwise required by law.

4. DECLARATIONS AND INSTALLATION VERIFICATION

I understand that the Oregon Office of Energy does not make any warranty concerning the performance, operation, installation, or any other characteristic or feature of this appliance. Energy Office approval is only for purposes of obtaining the Oregon Residential Energy Tax Credit. By signing below, I (we) certify that the appliance(s) described in this application is (are) installed and that the information contained herein is accurate and true.

Initial each item below:

X ______ I give the Oregon Office of Energy permission to inspect this installation upon agency request. **Note:** Refusing access for inspection may result in denial of this application.

X ______ **I have attached proof of payment for the appliance(s)** (a copy of the receipt(s) for my purchase marked "paid" and dated by the appliance dealer or installer).

Have you received a tax credit through the Oregon Residential Energy Tax Credit Program for a prior year?
❑ Yes ❑ No If yes, what year? ________________ For what type of system? ________________

On occasion, the Oregon Office of Energy is requested to disclose information from your application. We are required by law to comply. Under most circumstances, names, addresses and other information will be released. The Oregon Office of Energy does not endorse any company to whom the information is released. If you would like more information about the release of personal information, please call the Office of Energy at 1-800-221-8035 or (503) 378-4040.

5. APPLICANT SIGNATURES

Each applicant must sign below.

X ____ Date: ________________
Signature of applicant

X ____ Date: ________________
Signature of joint applicant

Other co-applicants filing separate tax returns (If two or more persons are investing in this device and file separate tax returns, give names, addresses, and amounts invested.):

Name: ________________ Address: ________________________ Amount invested: $__________

Name: ________________ Address: ________________________ Amount invested: $__________

Name: ________________ Address: ________________________ Amount invested: $__________

6. MAILING INSTRUCTIONS

Photocopy *all* documents for your records. Attach a clear copy of proof of purchase to your *original* application and mail to:

Oregon Office of Energy, 625 Marion St. NE, Suite 1, Salem, OR 97301-3742

Note: The Oregon Office of Energy certifies the energy efficiency of appliances for the Oregon Residential Energy Tax Credit program. It is the applicant's responsibility to ensure compliance with all other eligibility requirements. See the Oregon Department of Revenue Information Circular 150-101-641, "Residential Energy Tax Credit."

Toilet Retrofit Program

Appendix

E

CITY OF YACHATS RESIDENTIAL TOILET REBATE

The City of Yachats is now offering a $100 per toilet rebate to homeowners who replace their old high water using toilets with ultra low flow toilets using 1.6 gallons per flush.

Eligibility Requirements

Applicants must:

- Own a single family home within the City of Yachats service area.
- Agree to a brief pre- and post- installation inspection.
- Replace all the toilets that use 3.5 or more gallons per flush toilets in the household.
- Recycle old toilets at a pre-determined site, seat removed.

You are ineligible for rebate if :

- Your dwelling was constructed after January 1995.
- You choose not to replace **all** toilets that use 3.5 gallons or more per flush.
- Your dwelling is a commercial building or owned by a commercial or government entity.
- The installation site is multifamily housing (apartment).

Free Water Conservation Kits are available for you during the pre-inspection, and consists of a handy bucket filled with the following high quality items:

- Shower Heads
- Garden Hose Nozzles
- Shower Timers
- Bathroom Fixture Rebates

How can I participate?

Step 1: Call the City of Yachats Water Department Office (547-3565) and schedule a brief pre-inspection. City staff must sign and date the application.
Step 2: After pre-inspection is completed, replace the qualifying toilets in your household and call to schedule a post inspection.
Step 3: Recycle your old toilet at a pre-determined City site with all metal, wood and plastic removed. You must have a City staff person initial and date the recycled by section on the application.
Step 4: Mail in your application along with original receipts for toilets and fixtures (make copies for your own files) dated no earlier than September 30th, 2003, and proof that the toilet was recycled (Staff initialed and dated).
Step 5: Rebate payment will be mailed to you in 4-6 weeks after original receipts are received and post-installation inspection is complete.

CITY OF YACHATS

RESIDENTIAL TOILET REBATE

APPLICATION FORM

Owner's Name ______________________________

Site Address ______________________________

Contact Phone ______________________________

Number of toilets to be replaced ______________

Total # of toilets in the home ______________

Total # of bathrooms in the house ______________

Total amount spent on custom fixtures $__________

Authorization from Owner.

______________________ Date: ______________
Signature of Owner

Pre-inspection completed by: ______________________ Date ________
City Staff Signature

Recycled by: ______________________ Date ____________
Staff Signature

Water Curtailment Ordinance

Appendix

F

CITY OF YACHATS
ORDINANCE NO. 222

AN ORDINANCE AMENDING THE YACHATS CODE TO PROVIDE THE MANNER AND METHOD OF DECLARING A POTENTIAL WATER SHORTAGE EMERGENCY CONDITION, PROVIDING FOR THE PROHIBITION OR RESTRICTION OF THE USE OF WATER FOR CERTAIN PURPOSE, AND DECLARING AN EMERGENCY

WHEREAS, The City of Yachats depends on rainfall filled streams for virtually 100% of its water; and

WHEREAS, The City of Yachats may from time to time experience a severe water shortage due to below average rainfall or other condition; and

WHEREAS, the major streams which are the City's primary water sources, Reedy Creek, Salmon Creek and the Yachats River, may experience low flows or other adverse condition; and

WHEREAS, the city is a distributor of a public water supply within the meaning of the State Water Resources Department; and

WHEREAS, other conditions, natural or unnatural may prevail that result in a severe shortage of water; and

WHEREAS, the State Department of Water Resources provides that a distributor of a public water supply may declare that a water shortage emergency condition prevails within the service area served by the distributor whenever it finds and determines that ordinary demands and requirements of water consumers may not be satisfied without depleting the water supply of the distributor to the extent that there may be insufficient water for human consumption, sanitation or fire protection;

NOW THEREFORE, the City of Yachats ordains as follows:
The following sections will be added to the Yachats Municipal Code.

<u>Section 1. A new Section 8.22.010 is hereby added to read as follows</u>

8.22.010 Definitions

As used in this title:

"Grey water" means water used in the home for domestic means that is collected after primary use and reused for landscape watering.

"Commercial Large Meter" means those users of meters 1-1/2" or larger and billed under the City's water system as "Commercial Large Meter."

"Residential Water" means those users of residential sized meters and billed under the City's water system as "Residential Water."

"Outside City Water" means those users of residential sized meters and billed under the City's water system as "Outside City Water."

"Commercial Water" means those commercial users of meters smaller than 1-1/4" and billed under the City's water system as "Commercial Water."

"Transient Rental Residential" means those users of residential sized meters and billed under the City's water system as "Transient Residential Water."

"Flow control nozzle" means any hand held nozzle type device, in proper working condition, affixed directly to the hose that must be triggered by hand to allow flow.

"Hot tubs, whirlpools and spas" means large bath tub type vessels, jetted or non-jetted, with a capacity greater than 40-gallons.

"Drought" means a status determined by the combined flow of Reedy and Salmon Creeks as specified in Section 8.22.020.

"Potential Drought" means an assessment of future drought conditions based on the Palmer Drought Severity Index for the Pacific Northwest Region or other appropriate measurements or conditions.

"Approved City Agents" means persons trained by City personnel to read meters and report the readings back to the City for the purpose of reading meters on a more frequent basis to enforce the provisions of this ordinance.

Section 2. A new Section 8.22.020 is hereby added to read as follows

8.22.020 Purposes and Determinations

A. As the result of a drought and the threat of a continued drought or other condition, the ordinary demands and requirements of water consumers may not be satisfied without depleting the water supply of the City of Yachats to the extent that there may be insufficient water for human consumption, sanitation or fire protection.

B. The City Council finds and determines that a water shortage emergency may exist within the City's water service area and will be likely to continue to exist for an unknown period, but that from time to time there may be sufficient water in the reservoirs from rainfall for temporary suspension of the water conservation measures provided in this Ordinance.

C. The City Council finds, determines and anticipates that a situation, or situations, may occur, or exist, from causes beyond the control of the City, and that are not related to weather, that will result in limited quantities of water being available and is likely to exist for a prolonged period that requires extreme measures to maintain the absolute minimum of treated water for human consumption, sanitation or fire protection.

D. The City Council, to protect the health, safety and general welfare of its citizens in the public interest, finds it necessary to adopt regulations necessary to mitigate any water shortage emergency.

E. During such time that the City Council of the City of Yachats determines that there is a water shortage, as declared by the City Council, no person or entity shall use water supplied by or through the City's water system for the reasons stated under each phase.

Section 3. A new Section 8.22.030 is hereby added to read as follows

8.22.030 Water Conservation Actions - Phase 1

A. Phase 1 shall be in effect when:

1. The flow in the Yachats River is recorded to be 35 cubic feet per second (hereafter CFS) or,

2. The combined flow of Reedy and Salmon Creek is less than 0.64 CFS (275 Gallons Per Minute (hereafter GPM)) or,

3. According to the Palmer Drought Severity Index, the Coastal Region is in a Moderate to Extreme Drought and the Public Works Superintendent determines that conditions exist to warrant Phase 1 restrictions.

B. All City water users shall receive written notice of the water shortage situation, that the Phase 1 water restrictions are in force and the penalties for non-compliance.

C. Water Alert Status - Phase 1 calls for moderate curtailment. The following non-essential uses are restricted or prohibited under Phase 1:

1. The watering of lawns, gardens and landscaping is restricted to alternative days. Specifically, houses with an address number ending in even numbers (0-2-4-6-8) shall water lawns only on even numbered calendar days. Houses with an address number ending in odd numbers (1-3-5-7-9), or fractional addresses, shall water only on odd numbered calendar days. All watering of lawns, gardens and landscaping shall be prohibited between the hours of 10:00 A.M. and 7:00 P.M of each day..

2. All sales of water to persons who are not customers of the water system are prohibited.

3. No water shall be used by the Yachats Rural Fire District for drills, fire hose testing, hydrant flushing or truck washing.

4. The operation of an ornamental fountain, unless it is are equipped with a recirculation system, is prohibited.

Section 4. A new Section 8.22.040 is hereby added to read as follows

8.22.040 Water Conservation Actions - Phase 2

A. Phase 2 shall be in effect when:

1. The flow of the Yachats River is measured to be 20 CFS or

2. The combined flow of Reedy and Salmon Creek is less than 0.50 CFS (200 GPM) or

3. According to the Palmer Drought Severity Index, the Coastal Region is in a Severe or Extreme Drought and the Public Works Superintendent determines that conditions exist to warrant Phase 2 restrictions.

B. All City water users shall receive written notice of the water shortage situation, that the Phase 2 water restrictions are in force and the penalties for non-compliance.

C. Water Warning Status - Phase 2 calls for extensive restrictions on water usage. In addition to the restrictions and prohibitions for Phase 1 above, the following non-essential uses are prohibited:

1. The watering of any vegetation, except that trees and shrubs may be watered with a hand held watering device, bucket or hose with flow control nozzle, or drip irrigation system only (No airborne sprinkler systems);

2. The use of water for washing, hosing and the like of buildings and pavement or other pedestrian surfaces;

3. Drinking water served at restaurants, motels and other businesses which serve food or drink to the public, unless users post "drought notices" in a clearly conspicuous manner so that members of the public will be apprised of the water shortage. If so posted, water for drinking purposes may be served upon request;

4. Washing of vehicles, equipment, watercraft and the like;

5. The operation of all exterior ornamental fountains, even with a recirculating system; and

6. Use of City water for dust control.

D. All Commercial Large Meter users, Commercial Water, and Transient Water users shall post the written notice, provided by the City, pursuant to Subsection B of this Section in a conspicuous location within twenty four (24) hours of receiving said notice.

Section 5. A new Section 8.22.050 Is hereby added to read as follows

8.22.050 Water Conservation Actions - Phase 3

A. Phase 3 shall be in effect when:

1. The flow of the Yachats River is measured to be 15 CFS, or

2. The combined flow of Reedy and Salmon Creek is less than 0.40 CFS (175 GPM), or

3. According to the Palmer Drought Severity Index, the Coastal Region is in an Extreme Drought and the Public Works Superintendent determines that conditions exist to warrant Phase 3 restrictions.

B. All City water users shall receive written notice of the water shortage situation, that the Phase 3 water restrictions are in force and the penalties for non-compliance.

C. Water Emergency Status - Phase 3 is the most restrictive level of water conservation measures. In addition to the restrictions and prohibitions for Phase 1 and 2, above, the following non-essential uses of water are prohibited:

1. All landscape watering is prohibited, except for use of grey water or water from other than the City's water supply;

2. Use of water from a fire hydrant for any use other than for fire fighting;

3. Use of non-recirculating hot tubs, whirlpools or spas;

4. All "Commercial Large Meter" users are required to send linens for laundering outside the City except that Commercial Laundromats are exempt from this regulation;

D. All small meter users, including Residential water, Outside City Water, Commercial Water, and Transient Rental Residential water users shall be charged the base volumetric rate for the first 400 Cubic Feet per month usage. Usage over 400 Cubic feet per month usage shall be charged the base volumetric rate plus $2 per 100 Cubic Feet over the 400 Cubic feet. Fractions of months under Phase 3 water conservation restrictions shall be billed extra based on daily usage over 13.33 Cubic Feet per day. Meters may be read more frequently by City personnel or Approved City Agents to enforce these restrictions. Small meter users using more than 27 cubic feet per day on average shall be given a written warning to reduce usage and thereafter cited under 8.22.070 C.1. (Phase 3 - First offense).

E. All users may be required to reduce their normal usage by a certain percentage when compared to their average normal usage over the same calendar time period from the previous two years.

F. No water connections to new residences, business or industry shall be permitted during Phase 3 water conservation restrictions and prohibitions.

G. All Commercial Large Meter, Commercial, and Transient Water users shall post a written notice, approved by the City in a conspicuous location in each rental unit within two days of receiving notice of a Phase 3 status.

Section 6. A new Section 8.22.060 is hereby added to read as follows

8.22.060 Water Conservation Actions - Phase 4

A. Critical Water Supply Status - Water conservation shall be implemented in case of disaster conditions and may be put into effect without further action of the City Council upon determination by the Public Works Superintendent that the water system has been damaged beyond immediate repair.

1. The City shall discontinue service through its normal distribution system;

2. Providing adequate water remains in the City reservoirs, water may be provided directly from the reservoir only to single, duplex and multiple family dwellings, other residential uses, health clinics and assisted living facilities. If this water can be dispersed through the distribution system without substantial losses, such water may be provided through the system during set hours (for example, from 6-7 a.m. and 7-8 p.m. daily) so as to extend the treated water supply for sustaining life.

3. In the event reservoirs are destroyed or damaged, the City shall purchase available water from the nearest city or water district. If the nearest city or water district is unable to supply water to the City, the City may contract for or commandeer private vehicles to transport water to the City. If the City is unable to obtain water from other sources, the City will pump raw water

from the Yachats River with a boil water order until the critical water supply status has ended and the City's water system is functioning on a normal basis.

Section 7. A new Section 8.22.070 is hereby added to read as follows

8.22.070 Penalties

Any person or entity violating a provision of this code shall be subject to citation as a civil infraction as set forth below pursuant to Section 1.12 of the Code. Each day a violation of this ordinance is committed or permitted to continue shall constitute a separate infraction.

A. Phase 1

1. Conviction for a first infraction (no prior conviction) pursuant to this Code shall result in a written warning.

2. Conviction of a second infraction (one prior conviction) shall constitute a Class D infraction.

3. Conviction of three or more infractions shall constitute a Class C infraction. In addition, water service to the meter from which the water for the third conviction was obtained may be terminated by the City for 5 consecutive days as provided in Section 8.22.080, below.

B. Phase 2

1. First infraction (no prior conviction) shall result in a written warning.

2. Conviction of a second infraction (one prior conviction) shall constitute a Class C infraction.

3. Conviction of three or more infactions shall Constitute a Class B infraction. In addition, water service to the meter from which the water for the third infraction was obtained may be terminated by the City for 10 consecutive days as provided in Section 8.22.080, below.

C. Phase 3

1. First infraction (no prior conviction) shall constitute a Class B infraction.

2. Conviction of a two or more infractions shall constitute a Class A infraction. In addition, water service to the meter from which the water for the third infraction was obtained shall be terminated by the City for 15 consecutive days as provided in Section 8.22.080, below.

Section 8. A new Section 8.22.080 is hereby added to read as follows

8.22.080 Suspension of Water Service

A. As stated above in Section 8.22.070 Penalties, Subsections A, B, and C above, upon conviction of three or more infractions, water service to the water meter from which the water for the third offense was obtained may or shall be terminated by the City for a period of 5 to 15 days, depending on the Phase of the infraction. Notice of termination of water service shall be given in the manner required for termination of water service pursuant to Section 8.04.040. In addition to any fine or forfeiture, there shall be imposed connect-disconnect fees in the same amount as for disconnection-connection for non-payment of water charges.

B. In the event that three or more infractions occur on Transient Rental properties, the City Council may suspend temporarily or, upon a finding of gross indifference to this code, terminate the Transient Rental license on a permanent basis.

Section 9. A new Section 8.22.090 is hereby added to read as follows

8.22.090 Resolution Declaring Necessity for Water Conservation

The City Council may, from time to time, declare the necessity for water conservation, and upon such declaration by resolution, the provisions in Sections 8.22.020 and 8.22.030 shall be in full force and effect and shall be enforced until such time as the Council declares a suspension or termination of the need for such water conservation measures.

Section 10. A new Section 8.22.100 is hereby added to read as follows

8.22.100 Public Works Superintendent Declaring Necessity for Water Conservation

In an Emergency, as determined in the discretion of the Public Works Superintendent, the Public Works Superintendent may declare the necessity for water conservation and upon such declaration, the provisions of Sections 8.22.020 and 8.22.030 shall be in full force and effect and shall be enforced until such time as the Public Works Superintendent declares a suspension or termination of the need for such water conservation measures. The Public Works Superintendent shall notify the Council immediately upon such declaration and Council shall meet as soon as practical to accept, reject or modify such determination.

Section 11. A new Section 8.22.110 is hereby added to read as follows

8.22.110 Method of Measurement

The method to determine the severity of a drought shall be by measuring the flow of water at sources with developed City rights.

1. If the City is using the Yachats River to supplement its raw water source, the water flows in the Yachats River will be determined by the use of a measuring device approved by the Oregon Water Resources Department.

2. For all phases of a water shortage, the combined flow of Reedy and Salmon Creek shall be measured using a staff gage installed in Salmon Creek.

Section 12. Declaring an emergency

WHEREAS, the adoption of this Ordinance is necessary to preserve peace, health, safety and welfare of the citizens of the City, an emergency is hereby declared to exist and this Ordinance shall be in full force and effect immediately upon its adoption by the City Council and signed by the Mayor.

PASSED AND ADOPTED by the City Council of the City of Yachats on this 12th day of April, 2001.

Ayes: ____ Nays: ____ Abstentions: ____ Absent: ____

APPROVED by the Mayor this ____ day of

______________________ ______________________

Lee Corbin, Mayor Nancy Otterson, City Recorder

Mutual Agreement & Stipulated Order

Appendix

G

• City of Yachats • City Council and Commission Minutes
City Council, Commission members, and City Hall: cityoya@pioneer.net

STIPULATED FINAL ORDER AND AGREEMENT ON RECONSIDERATION

STATE OF OREGON

WATER RESOURCES DEPARTMENT

Oregon Department of Water Resources Permit

In the matter of the Special Order, Volume 50, Page 578-579 Approving an Additional Point of Diversion for City of Yachats, Transfer 7589 Modification of Permit 51190

Background

On July 8, 1996, pursuant to ORS 537.211(4), the City of Yachats (City) submitted an application to add a point of diversion to the water right authorized by permit 51190 (T-7589). The additional point of diversion is proposed downstream from the original, in the Yachats River estuary. The Department received comments opposing the application to add a point of diversion from the Yachats Area Watershed Restoration Advisory Council, WaterWatch and others on or before September 12, 1996.

On September 12, 1996, the Department granted the City's request (Special Order Vol. 50, page 578). On November 8, 1996, WaterWatch of Oregon; T.B. Dame and Paul Engelmeyer; Yachats Area Watershed Restoration Advisory Council (Council); Dike Dame; Ron Taves; Hans Radtke; Andrea Scharf; Paul Engelmeyer; and James Adler (collectively, "the Petitioners") petitioned the Department to reconsider it's approval of the permit amendment, on several grounds.

On April 4, 1997, the Department issued an "Order of Reconsideration" and listed the two matters on which the Department sought additional evidence and argument before entering a final order. A second "Order on Reconsideration" reciting the basis for the grant of reconsideration and referring the matter to contested case hearing, was issued on October 10, 1997. An order setting contested case hearing was issued on January 28, 1998, by Administrative Law Judge Weisha Mize.

The Petitioners contest the City's proposed action, maintaining, inter alia, that the Water Resources Department has no authority to issue an order adding a point of diversion, that an additional point of diversion will result in injury to existing instream water rights, that approval of the City's proposed action allows violation of permit conditions which include compliance with land use laws and that the approval of the City's proposed action sets bad polity because it allows for expansion of a permit and perpetuates wasteful use of water. The City contends inter alia, that the proposed diversions are lawful and necessary to maintain a reliable water supply for the current and future residents of Yachats.

Agreed Terms and Conditions

The City, the Petitioners and the Department now agree that the issues in this case may be settled on the following terms and conditions and hereby stipulate as follows:

1. Entry of this stipulate final order by the Administrative Law Judge.

2. Issuance of an order approving the City's permit amendment application (T-7589), a draft of which is attached an incorporated herein by reference. The attached order shall supersede the Special Order at Volume 50, Page 578 – 579.

3. Issuance of a permit superceding permit 51190, a draft of which is attached and incorporated herein by reference.

4. The parties waive the right to file exceptions to this order and the right to judicial review of this order and agreement, and permit conditions arising from this order and agreement.

5. The City shall install and maintain a permanent recording measuring device on the Yachats River, the design and location of which will be specified in consultation with the Water Resources Department (WRD) and the Department of Fish and Wildlife (ODFW). The device shall be installed prior to any diversions or use of water under this permit, placed so as to accurately measure steam flows needed to meet instream water rights Cert. 59739, Cert 59608 and Cert. 73161, and be accessible to WRD and ODFW staff at all times. Maintenance of the measuring device and associated rating curve shall substantially comply with the applicable provisions of OAR 690-085-015(4) (methods for measuring open channels) so an estimate of flow can be made at any time. Flow shall be determined prior to and during diversions under this permit, and the City shall maintain a record of flow measurements and observations.

6. Before water use may begin under this permit, the permittee shall install a meter or other suitable measuring device as approved by the Director at each point of diversion. The permittee shall maintain the meter or measuring device in good working order, shall keep a complete record of the volume and instantaneous rate of water used each month and shall submit a report which includes the recorded water use measurements to the Department annually or more frequently as may be required by the Director. Further, the Director may require the permittee to report general water use information, including the place and nature of use of water under the permit.

The permittee shall allow the watermaster access to the meter or measuring device; provided however, where the meter or measuring device is located with a private structure, the watermaster shall request access upon reasonable notice.

7. When streamflow on the Yachats River, measured at the device described in #5 above, exceeds senior and junior instream rights (Cert. 59739, Cert. 59608, Cert. 73161) the City may exercise this permit (both points of diversion and the full 2.0 cfs) without restriction beyond the existing terms of the permit as amended. The minimum streamflows are set out in the following table:

MONTH	DAYS	59739	59608	73161
Jan		65.00	65.00	132.00
Feb		65.00	65.00	132.00
Mar		65.00	65.00	132.00
Apr		65.00	65.00	132.00
May		40.00	40.00	63.00

June	1 – 15	30.00	30.00	63.00
June	16 – 30	30.00	30.00	42.00
July	1 – 15	20.00	20.00	40.20
July	16 – 31	15.00	20.00	40.20
Aug		15.00	15.00	25.60
Sep		15.00	15.00	24.90
Oct	1 – 15	15.00	25.00	49.10
Oct	16 – 31	50.00	50.00	49.10
Nov		70.00	70.00	132.00
Dec		70.00	70.00	132.00

8. When streamflows measured at the device described in #5 above drop below the flows identified in the junior instream water rights (Cert. 59739 or Cert. 69608), use of the Yachats River under this permit may be made only in emergencies or when population growth exceeds other sources of supply. Future use due to population growth exceeding supply shall be limited by the City's compliance with it's approved water management and conservation plan.

a) For purposes of this settlement agreement, "emergencies" are limited to: sustained drought, accompanied by the institution of curtailment measures described in the City's water management plan that include curtailment triggers linked to steamflows; supply line breakage; firefighting; outdoor events within the City's service area which place an abnormally high demand on water supply (e.g. Cycle Oregon, outdoor festivals); catastrophic loss of use of primary water supply sources; and threats to public health, not attributable to inefficiency or chronic conditions, as may be approved jointly by ODFW and WRD.

b) For purposes of this settlement agreement, population growth will be deemed to have "exceeded other sources of supply" only if the City: (1) is in compliance with its approved water management plan which includes the elements specified in #9 of the Stipulated Final Order and Agreement on Reconsideration, and (2) (a) prior to 15 years from the date of this agreement or 10 years from the date of approval of the management plan, whichever comes first, is either meeting the plan schedule or has reached the goal of 85% water use efficiency, yet remains unable to meet the requirements of the city's resident population using other developed sources; or (b) after 15 years from the date of this agreement or 10 years from the date of approval of the management plan, whichever comes first has reached or exceeded 85% water use efficiency, yet remains unable to meet the requirements of the City's resident population using other developed sources.

9. The City will amend and resubmit it's draft water management plan, currently under department review. The parties agree that submission of the amended plan triggers the review and appeal provisions of OAR 690 Division 86. The amended plan shall include the following:

a) goal of 85% water use efficiency and a plan and time table for meeting that goal by fifteen years from the date of this agreement or ten years from plan approval, whichever comes first;

b) demand projections based on the 85% efficiency level and demand figures based upon the best practicable estimate of population and occupancy figures and seasonal average water use;

c) a schedule for water audits;

d) a commitment to continue to cooperate in efforts to develop a regional water supply;

e) an analysis of the land use approval processes which will be required to develop the two points of diversion on the Yachats River described herein, and a discussion of how and when the City intends to comply with those land use processes;

f) an analysis of the feasability of other water sources and a timeline for when the City will abandon nonviable sources or seek to transfer those sources to instream rights;

g) a curtailment plan which includes triggers for curtailment that are based upon streamflows; and

h) all elements necessary to meet the requirements of the WRD Division 86 rules.

WRD agrees to process the amended plan in a timely manner.

10. Addition of the lower diversion point shall be a permanent change.
11. In the event streamflows measured at the device described in #5 are insufficient to satisfy the junior instream water rights (Cert. 73161) or the senior instream water rights (Cert. 59739 and Cert. 69608), and the Yachats River is utilized under this permit, diversions shall not exceed 1 cfs, and those diversions shall be made at a rate not to exceed 0.50 cfs at the upper point of diversion and 0.50 cfs at the lower point of diversion.
12. The City agrees to relinquish its rights to divert 3 cfs from Marks Creek under permit 35219. The City agrees to file an affidavit of cancellation with the Department certifying that the City is the owner of the permit and that the permit has been abandoned by the owner and that the owner desires cancellation of the permit. The City shall not divert of use water under this permit until the Marks Creek Permit 35219 has been canceled.
13. The Protestants agree not to protest or appeal Department action on the City's new permit amendment to change the upper point of diversion from 14S 11W 31 1740'S 2550'E FRM NW COR (application T-7967), and agree not to protest or appeal Department action on the City's next request for an extension on this permit that is filed specifically to extend the October 1, 1998, expiration date.
14. The terms of this agreement will be incorporated into the City's water management plan and to the extent possible, into the attached draft order approving the July, 1996, permit amendment request (T-7589). Permit 51190 shall be superceded by the attached draft permit and shall include the conditions contained in the final order approving the City's July 8, 1996, permit amendment request.
15. The Department, the City, and the petitioners agree on all aspects of this agreement and the attached draft order.
16. This agreement may be executed in counterparts.

______________________________ ____________________

On Behalf of WaterWatch of Oregon Date

______________________________ ____________________

On Behalf of Yachats Area Date

Watershed Advisory Council

______________________________ ____________________

T. B. ("Dike") Dame Date

Ron Taves Date

Hans Radtke Date

Andrea Scharf Date

Paul Engelmeyer Date

James Adler Date

On Behalf of the City of Yachats Date

On Behalf of Oregon Water Resources Date

Department

Stipulated Final Order

Pursuant to the Agreement described above, the City's application to add a point of diversion under Permit 51190 is approved. An order, consistent with the attached draft order, shall be issued bearing the modifications to the order recorded in Special Order Volume 50, Page 578-579. The previous order approving this permit amendment is of no further force or effect.

Date Weisha Mize

Administrative Law Judge

Water Resources Department

STATE OF OREGON

COUNTY OF LINCOLN

ORDER APPROVING AN ADDITIONAL POINT OF DIVERSION

Pursuant to ORS 537.211, after notice given, reviewing objections, and resolving a petition for reconsideration, this order approves, as conditioned or limited herein, TRANSFER 7589 and modifies Permit 51190 in the name of CITY OF YACHATS P.O. BOX 345, YACHATS, OREGON 97498. This order is issued to modify the previous order approving T-7589 (Special Order Volume 50, Page 578- 579) and by reference incorporates the Stipulated Final Order and Agreement on Reconsideration issued August XX, 1998, by Administrative Law Judge Weisha Mize.

The permit to be modified, Permit 51190, has a priority date of March 20, 1989. The permit allows the use of the YACHATS RIVER, a tributary of the PACIFIC OCEAN, for MUNICIPAN USE. The amount of water to which this permit is entitled is limited to an amount actually beneficially used and shall not exceed 2.0 cubic feet per second, of which 1.0 cfs is not subject to instream water right Certificate 59708 minimum stream flows with a date of priority of March 26, 1974, if available at the authorized point of diversion: NE ¼ SW ¼, SECTION 31, T 14 S, R 11 W, WM; 1740 FEET SOUTH AND 2550 FEET EAST FROM THE NW CORNER OF THE SW ¼ NW ¼, SECTION 31, or its equivalent in case of rotation, measured at the point of diversion from the source.

The use shall conform to any reasonable rotation system ordered by the proper state officer.

The authorized place of use is as follows:

NE ¼ SE ¼ W ½ W ½

S ½ SE ¼ SE ¼ SW ¼

SECTION 22 SECTION 26

SW ¼ SW ¼ NE ¼

SECTION 23 N ½ SE ¼

SE ¼ SE ¼

SECTION 27

NE ¼

SECTION 34

TOWNSHIP 14 SOUTH, RANGE 12 WEST, W.M.

The right to use the water for the above purpose is restricted to beneficial use on the lands or place of use described.

The applicant proposes to add an additional point of diversion to:

NW ¼ SE ¼, SECTION 26, T 14 S r 12 W, MW; 295 FEET NORTH AND 420FEET EAST FROM THE NW CORNER OF THE SW ¼ SE ¼

SECTION 26

THIS CHANGE TO AN EXISTING WATER PERMIT MAY BE MADE PROVIDED THE FOLLOWING CONDITIONS ARE MET BY THE PERMIT HOLDER:

1. The quantity of water diverted at the new point of diversion, together with that diverted at the old point of diversion, shall not exceed the quantity of water lawfully available at the original point of diversion and is further limited as described below.
2. The City shall install and maintain a permanent recording measuring device on the Yachats River, the design and location of which will be specified in consultation with the Water Resources Department (WRD) and the Department of Fish and Wildlife (ODFW). The device shall be installed prior to any diversions or use of water under this permit, placed so as to accurately measure stream flows needed to meet instream water rights Cert. 59739, Cert 59608 and Cert. 73161, and be accessible to WRD and ODFW staff at all times. Maintenance of the measuring device and associated rating curve shall substantially comply with the applicable provisions of OAR 690-085-015 (4) (methods for measuring open channels) so an estimate of flow can be made at any time. Flow shall be determined prior to and during diversions under this permit, and the City shall maintain a record of flow measurements and observations.
3. Measurement, recording and reporting conditions:

A. Before water use may begin under this permit, the permittee shall install a meter or other suitable measuring device as approved by the Director at each point of diversion. The permittee shall maintain the meter or measuring device in good working order, shall keep a complete record of the volume and instantaneous rate of water used each month and shall submit a report which includes the recorded water use measurements to the Department annually or more frequently as may be required by the Director. Further, the Director may require the permittee to report general water use information, including the place and nature of use of water under the permit.
B. The permittee shall allow the watermaster access to the meter or measuring device; provided however, where the meter or measuring device is located within a private structure, the watermaster shall request access upon reasonable notice.

1. When streamflow on the Yachats River, measured at the device described in #2 above, exceeds senior and junior instream rights (Cert. 59739, Cert. 59608 and Cert. 73161) the City may exercise this permit (both [points of diversion and the full 2.0 cfs) without restriction beyond the existing terms of the permit as amended.
2. When streamflows measured at the device described above drop below the flows identified in the junior instream water right (Cert. 73161) or senior instream water rights (Cert. 59739 or Cert. 69608), use of the Yachats River under this permit may be made only in emergencies or when population growth exceeds other sources of supply. Future use due to population growth exceeding supply shall be limited by the City's compliance with its approved water management and conservation plan.
3. "Emergencies" are limited to sustained drought, accompanied by the institution of curtailment measures described in the City's water management plan that include curtailment triggers linked to streamflows; supply line breakage; firefighting; outdoor events within the City's service area which place an abnormally high demand on water supply (e.g. Cycle Oregon, outdoor festivals); catastrophic loss of use of primary water supply sources; and threats to public health, not attributable to inefficiency or chronic conditions as may be approved jointly by ODFW and WRD.

Population growth will be deemed to have "exceeded other sources of supply" only if the City : (1) is in compliance with its approved water management plan which includes the elements specified in the Stipulated Final Order and Agreement on Reconsideration (T-7589), and (2) (a) prior to 15 years from the date of approval of the management plan, whichever comes first, is either meeting the plan schedule or has reached the goal of 85% water use efficiency, yet remains unable to meet the requirements of the City's resident population using other developed sources; or (b) after 15 years from the date of this agreement or 10 years from the date of approval of the management plan, whichever comes first has reached or exceeded 85% water use efficiency, yet remains unable to meet the requirements of the City's resident population using other developed sources.

4. Addition of the lower diversion point shall be a permanent change.
5. In the event streamflows measured at the device described in #2 above are insufficient to satisfy the junior instream water right (Cert. 73161) or the senior instream water rights (Cert. 59739 and Cert. 69608), and the Yachats River is utilized under this permit, diversions shall not exceed 1cfs, and those diversions shall be made at a rate not to exceed 0.50 cfs at the upper point of diversion and 0.50 cfs at the lower point of diversion.
6. Water may not be diverted at any point of diversion authorized under this permit until all applicable conditions of the permit have been met, including compliance with state-wide land-use goals and any local acknowledged land-use plans.
7. Water shall be acquired from the same surface water source as the original point of diversion.
8.
9. All other terms and conditions of the permit shall remain the same.

Permit 51190, in the name of the City of Yachats, is amended as described herein and a superceding permit, consistent with the attached draft permit shall be issued. Permit 51190 is of no further force or effect.

WITNESS the signature of the Water Resources Director, affixed ______________.

Martha O. Pagel, Director

STATE OF OREGON

COUNTY OF LINCOLN

PERMIT TO APPROPRIATE THE PUBLIC WATERS

THIS PERMIT IS HEREBY ISSUED TO

CITY OF YACHATS

PO BOX 345

YACHATS, OREGON 97498

To use the waters of YACHATS RIVER, a tributary of PACIFIC OCEAN, for MUNICIPAL USE.

This permit is issued approving Application 69856. The date of priority is March 20, 1989. The use is limited to not more than 2.0 CUBIC FOOT PER SECOND (CFS), OF WHICH 1.0 CFS IS NOT SUBJECT TO INSTREAM WATER RIGHT Certificate 59608 OR MINIMUM STREAM FLOWS WITH A DATE OF PRIORITY OF MARCH 26, 1974, or its equivalent in cases of rotation, measured at the point of diversion from the source. The use of water under this permit is further limited as described below.

The points of diversion are located as follows:

POD 1 – NE ¼, SW ¼, SECTION 31, T14S, R11W, WM; 1740 FEET SOUTH AND 2550 FEET EAST FROM THE NW CORNER OF THE SW ¼ NW ¼, SECTION 31. POD 2 – NW ¼ SE ¼, SECTION 26, T14S, R12W, WM; 295 FEET NORTH AND 420 FEET EAST FROM THE NW CORNER OF THE SW ¼ SE ¼, SECTION 26.

Within 1 year from the date this permit is issued, the permittee shall submit a revised water management and conservation plan consistent with the Agreement and Stipulated Final Order on Reconsideration issued on September 3, 1998, and OAR Chapter 690, Division 86.

The use shall conform to such reasonable rotation system as may be ordered by the proper state officer.

A description of the proposed place of use under this permit is as follows:

- NE ¼ SE ¼
- S ½ SE ¼
- SECTION 22
- SW ¼ SW ¼
- SECTION 23
- W ½ W ½
- SE ¼ SW ¼
- SECTION 26
- NE ¼
- N ½ SE ¼
- SE ¼ SE ¼
- SECTION 27
- NE ¼
- SECTION 34
- TOWNSHIP 14 SOUTH, RANGE 12 WEST W.M.

The City shall install and maintain a permanent recording measuring device on the Yachats River, the design and location of which will be specified in consultation with the Water Resources Department (WRD) and the Department of Fish and Wildlife (ODFW). The device shall be installed prior to any diversions or use of water under this permit, placed so as to accurately measure stream flows needed to meet instream water rights Cert. 599739, Cert 59608 and Cert. 73161, and be accessible to WRD and ODFW staff at all times. Maintenance of the measuring device and associated rating curve shall substantially comply with the applicable provisions of OAR 690-085-015 (4) (methods for measuring open channels) so an estimate of flow can be made at any time. Flow shall be determined prior to and during diversions under this permit, and the City shall maintain a record of flow measurements and observations.

Measurement, recording and reporting conditions:

A. Before water use may begin under this permit, the permittee shall install a meter or other suitable measuring device as approved by the Director at each point of diversion. The permittee shall maintain the meter or measuring device in good working order, shall keep a complete record of the volume and instantaneous rate of water used each month and shall submit a report which includes the recorded water use measurements to the Department annually or more frequently as may be required by the Director. Further, the Director may require the permittee to report general water use information, including the place and nature of use of water under the permit.
B. The permittee shall allow the watermaster access to the meter or measuring device; provided however, where the meter or measuring device; provided however, where the meter or measuring device is located within a private structure, the watermaster shall request access upon reasonable notice.

When streamflow on the Yachats River, measured at the device described above, exceeds senior and junior instream rights (Cert. 59739, Cert. 59708, and Cert. 73161) the City may exercise this permit (both points of diversion and the full 2.0 cfs) without restriction beyond the existing terms of the permit.

When streamflows measured at the device described above drop below the flows identified in the junior instream water rights (Cert. 73161) or senior instream water rights (Cert. 59739 or Cert. 69608), use of the Yachats River under this permit may be made only in emergencies or when population growth exceeds other sources of supply. Future use due to population growth exceeding supply shall be limited by the city's compliance with its approved water management and conservation plan.

"Emergencies" are limited to: sustained drought, accompanied by the institution of curtailment measures described in the City's water management plan that include curtailment triggers linked to streamflows; supply line breakage; firefighting; outdoor events held within the City's service area which place an abnormally high demand on water supply (e.g. Cycle Oregon, outdoor festivals); catastrophic loss of use of primary water supply sources; and threats to public health, not attributable to inefficiency or chronic conditions, as may be approved jointly by ODFW and WRD.

Population growth will be deemed to have "exceeded other sources of supply" only if the City: (1) is in compliance with its approved water management plan which includes the elements specified in The Stipulated Final Order and Agreement on Reconsideration (T-7589), and (2) (a) prior to 15 years from the date of this agreement or 10 years from the date of approval of the management plan, whichever comes first, is either meeting theplan schedule or has reached the foal of 85% water use efficiency, yet remains unable to meet the requirements of the City's resident population using other developed sources; or (b) after 15 years from the date of this agreement or 10 years from the date of approval of the management plan, whichever comes first has reached or exceeded 85% water use efficiency, yet remains unable to meet the requirements of the City's resident population using other developed sources.

In the event streamflows measured at the device described above are insufficient to satisfy the junior instream water right (Cert. 73161) or the senior instream water rights (Cert. 59739 and Cert. 69608), and the Yachats River is utilized under this permit, diversions shall not exceed 1 cfs and those diversions shall be made at a rate not to exceed 0.50 cfs at the upper ponit of diversion (POD 1) and 0.50 cfs at the lower point of diversion (POD 2).

Addition of the lower diversion point (POD 2) shall be a permanent change.

Water may not be diverted at any point of diversion authorized under this permit until all applicable conditions of the permit have been met, including compliance with state-wide land-use goals and any local acknowledged land-use plans.

Actual construction shall begin on or before November 19, 1991, and shall be completed on or before October 1, 1998. Complete application of the water to the use shall be made on or before October 1, 1998 (See Special Order Volume 46, page 534 and Special Order Volume 49, page 208).

This permit is for the beneficial use of water without waste. The water user is advised that new regulations may require the use of best practical technologies or conservation practices to achieve this end.

The use of water allowed herein may be made only at times when sufficient water is available to satisfy all prior rights, including rights for maintaining instream flows.

This permit is issued to supercede permit 51190. Permit 51190 is superceded in order to incorporate the relevant portions of the Stipulated Final Order and Agreement on Reconsideration issued on September 3, 1998, by Administrative Law Judge Weisha Mize and to incorporate the conditions contained in the Order Approving An Additional Point of Diversion recorded in Special Order Volume 52, pages 767 – 771. Permit 51190 is superceded by this instrument and is of no further force or effect.

Issued September 15, 1998

Martha O. Pagel, Director

Water Resources Department

CITY OF YACHATS WATER MANAGEMENT AND CONSERVATION PLAN WATER RESOURCES DEPARTMENT REVIEW

We have reviewed the City of Yachats Water Management and Conservation Plan according to the requirements of OAR Chapter 690, Division 86. The Department reviewed the City's 1997 draft plan (Draft Plan) previously, and provided the comments to the City to assist with preparation of a final plan (Plan). Under OAR 690-86-910(7), the Department shall review the Plan to determine if it satisfies the relevant requirements of OAR 690-86-140. In addition, this evaluation of the Plan is limited to a review of modifications made in response to our comments on the Draft Plan. Our comments follow the structure and organization of the Division 86 administrative rules on water management and conservation plan elements and standards, and are as follows:

WATER SYSTEM DESCRIPTION ELEMENT

<u>140(1)(d)</u> Description of customers served including the estimated numbers and general water use characteristics of residences, commercial and industrial facilities and other uses.

Section 2 of the Plan characterizes population groups according to water use. Commercial and transient rental groups generally account for over 50 percent of water use; especially during the low-flow period when water use is greatest. Our previous comments focused on the need to further characterize water use patterns among the major population and water using groups. The purpose of our comments were aimed at helping the City to develop an understanding of how water was being used so it could evaluate the feasibility and appropriateness of implementing low water use landscaping conservation techniques to help meet conservation goals and reduce peak season demand. However, our review went beyond low water use landscaping and noted the generic characterization of commercial and residential water use. Our intent was to focus attention on characterizing use among the major water using sectors to aid the community to evaluate the feasibility and appropriateness of an array of conservation measures that would aid it to meet its water supply needs.

This plan carries forward from the previous plan unsupported assumptions and conclusions about water use characteristics. Statements indicating it is reasonable to assume temporary residents have the same water use requirements as full time residents because the City generates the majority of its revenue from tourism are unfounded. Similarly, concluding facilities (commercial) which cater to tourism require greater quantities of landscape water are unfounded without an analysis and characterization of water use. Figures 6.0 and 6.1 on page 21, which compare transient occupancy rates with water production, indicate peak water production during August and September is not attributable to occupancy. The unsupported assumptions about water use were then used to develop population estimates which in turn were used to project future water demand. When viewed in sequence, projections of future water demand based on unsupported assumptions and conclusions lead staff to question the methodology used to project future population and water demand (see comments on 140(4)(a)).

Figures 6.0 and 6.1 suggest the City has access to data to more accurately differentiate and characterize transient and tourism, commercial, and residential water use. A characterization and understanding of water use is fundamental to projecting demand, and formulating a plan to effectively implement water management and conservation measures consistent with Plan goals and objectives. The Plan must incorporate a methodology to project demand which more accurately characterizes water use by sector and according to season of use.

WATER CONSERVATION ELEMENT

140(2)(d)(A) For conservation measures not currently being implemented, an evaluation of whether implementation of the measure is feasible and appropriate: a system-wide leak repair program or line replacement to reduce system leakage to 15 percent, and if feasible... to reduce leakage to 10 percent

The Department's comments on the Draft Plan noted the City corrects and repairs leaks in the water system as they are identified. However, the comments on the Draft Plan also noted it was not clear what the program entailed and because of this it could only be inferred there was a program of leak repair or line replacement. The Final Plan discusses the City's 10 year plan for water main replacement to upgrade undersize, dead end and old lines (3.2.3 Distribution System, page 15). However, from the brief description, it is unclear if the program integrates the conservation goal aimed at reducing leakage. We understand this is an element of the City's Water System Master Plan developed to meet Health Division requirements. As such, it probably is not a program designed to implement the conservation goals of the OAR Chapter 690, Division 86 administrative rules aimed at achieving more efficient water use and preventing waste of water through reduced leakage. If the program accomplishes and implements conservation goals, the line replacement program should be integrated more fully into the plan. At a minimum the program should be included in the appendices and the discussion expanded to describe how it implements the conservation goal of reducing leakage.

In addition, a Priority I recommendation (page 38) identifies the need to provide adequate funds to correct leakage in the City distribution system. This appears to be inconsistent with the discussion of the line replacement program on page 15 which suggests funds to implement the 10 year program are a regular component of the City's annual budget.

The discussion of the leak detection program for the distribution system beginning on page 21 is an improvement over the Draft Plan. The discussion begins to link integration of meter maintenance and replacement, monthly water use monitoring, water accounting, and visual monitoring and leak testing to form a comprehensive leak detection program. The discussion highlights the issues the City faces in reducing its considerable amount of unaccounted water. Yet the plan does not develop an easy to follow strategy or methodology to detect and differentiate the potential cause of large quantities of unaccounted water. Similarly, given the methods and programs described, it is unclear how the City will isolate and identify pipeline leaks which evade visual detection and contribute to the large quantity of unaccounted water. The unaccounted water could be leakage or inaccurate meters, or some combination of a range of factors. Given the lack of success in identifying system leakage using standard testing methods, the City needs to review its methodology to determine whether the leak detection and line replacement programs in concert with its other water management and conservation programs will meet its obligations to operate an 85 percent efficient water system.

In conclusion, the Plan is not clear on whether the City currently implements a line replacement program to reduce leakage to 15 percent. However, the Plan describes a leak detection program which the City now implements. Whether or not the leak detection program in tandem with line replacement reduces leakage to 15 percent is open to interpretation. For the purposes of this review we find the leak detection program implemented by the City satisfies the rule requirement.

At the time the City updates its Water System Master Plan according to Health Department requirements, we recommend it use the opportunity that presents to integrate the elements of this Water Management and Conservation Plan with the Water System Master Plan. This would serve the City well by synthesizing infrastructure development with supply and demand management (see comments on 690-86-140(5)(a) and (b)).

140(2)(d)(B) Evaluate programs to encourage low water use landscaping

The Department's comments on the Draft Plan concluded the City was not currently implementing a program to encourage low water use landscaping even though it briefly discussed landscape irrigation under *Preventive Measures* and *Emergency Measures*. We concluded discussion of low water use landscaping in those sections was appropriate. However, without characterizing the irrigation component of water demand, a reliance on a reduction in landscape watering to address emergencies was inappropriate.

The Plan now identifies low water use landscaping as an element of the long-term water conservation plan. The Plan states the City *will* initiate a system of measures and controls to encourage participation in the program. Furthermore, the Plan incorporates information about low water use landscaping as a component of the public information program. The one programmatic low water use landscaping element contained in the Plan is an indication the City *will* develop regulations to require developers to plant low water using plants and grasses.

The City is not currently implementing a program to encourage low water use landscaping. Nor does the Plan identify a schedule for implementing its future plan element on low water use landscaping. As stated in the comments on the Draft Plan when discussing the leak detection program (page 8), a program implies a procedure and schedule for solving a problem. The Plan does not describe a program to encourage low water use landscaping, but identifies a single action (Section 5.8, *Water Conservation During Summer Irrigation*, page 32). Furthermore, the recommended action identified in the Plan is inconsistent with section 5.1.2 *Residential Conservation Goals* (page 29) recommending residential landscape irrigation audits.

According to the Plan, the City has concluded low water use landscaping is a part of its overall plan to meet its general water conservation goals. But, it also is apparent the City has not evaluated how best to implement a low water use landscaping program or assessed the contribution of the program to helping the City meet its conservation goals and reduce seasonal demand.

Given that the City is not currently implementing a program encouraging low water use landscaping, the rule requires the Plan to include an evaluation of whether a program is appropriate and feasible. We refer the City to the comments on the Draft Plan discussing the characterization of landscape irrigation water use, and evaluating what effect the program will have on the City meeting its conservation goals.

140 (2)(d)(C) Evaluate incentive programs that encourage conservation and 140(2)(d)(D) retrofit or replacement of inefficient water using fixtures.

The Plan describes potential water savings of about five to six percent of peak day demand based on its evaluation of the retrofit or replacement of inefficient fixtures (page 29). The Plan focuses its incentive and retrofit programs on residential and commercial inefficient plumbing fixtures (page 31). As such, the City will provide retrofit kits at no cost to the general population, and upgrade fixtures for those persons qualifying for public assistance. These are proactive actions.

The Plan initiates these programs in fiscal year 2000, yet it fails to identify quantifiable retrofit goals for both water savings and a target number of households for fiscal year 2000 and subsequent budget cycles. What is the City's goal for retrofit of targeted households, when does it anticipate meeting its goal, at what rate does the City anticipate retrofit to occur, and how will it account for the programs in its budget? While the Plan evaluates the potential water savings, and shows the City could meet a portion of its conservation goals through these programs, it fails to provide an implementation schedule as required by 690-86-140(2)(e)(F).

140(2)(d)(E) Evaluate the adoption of rate structures that support and encourage water conservation

The Plan describes the current rate structure (page 32) and according to the Priority 1 recommendations on page 38 will develop a rate structure tailored to the season and availability of water. As described, potential modification of the present rate structure is open-ended. The Plan would benefit from identification of a planned completion date for adoption of a new rate structure. Because the Plan concludes adoption of a rate structure tailored to the season and availability is appropriate, under OAR 690-86-140(2)(e)(F), the Plan needs to include an estimated schedule for implementation of a new rate structure.

140 (2)(d)(F) Evaluate Reuse Opportunities

Our Draft Plan comments focused on the failure to evaluate the feasibility and appropriateness of water reuse opportunities. In response to these comments, the Plan describes an annual reduction of over 50 percent since 1996 in the use of treated drinking water in the wastewater process (page 27) by reusing effluent water. The Plan also includes a discussion of raw water loss of about 17 percent on average at the Water Treatment Plant (page 19). About 12 percent of the loss is attributed to filter back washing and five percent to plant operations. In recognition of these losses the Plan establishes a utility conservation goal of five percent. Consistent with our previous comments under 690-86-140(2)(d)(G), the Plan should evaluate whether the five percent goal is achievable through staff training as proposed. Similarly, as noted in our previous comments under 609-86-140(2)(e)(F), the Plan must include an implementation schedule for the utility training conservation measure.

In many cases, water treatment processes do not recycle or reuse filter backwash water because of the risks associated with water borne organisms. If the City's water treatment plant is not designed to recycle or reuse filter backwash or process water, the Plan should clarify why the water is lost as part of the treatment process.

As part of the proposed training, we anticipate the City will review its Water Treatment Plant filter backwash schedule. Other Cities have reevaluated the schedule and increased their interval between backwash cycles. This reduces the amount of water "lost" in the process as well as costs to produce treated water. But in doing so the risk to public health was assessed and a more aggressive backwash schedule implemented only after determining it posed no undue risk.

WATER CURTAILMENT ELEMENT

<u>140(3)(d)</u> A Description of specific stand-by water use curtailment actions for each stage of alert

The emergency curtailment ordinance included in Appendix 3 (not Appendix 4 as cited) addresses outdoor water use. The outdoor water use described by the ordinance addresses Stage 1 and Stage 2 curtailment levels. The description of Stage 3 actions on page 35 discuss legal restrictions on all use of water other than what is required for public health and safety. This infers additional curtailment of domestic and commercial uses, and the rationing of water to about one-half of the three year average. The City should modify the emergency water curtailment ordinance to capture this element of its emergency planning and thus have all essential elements in place in advance of an emergency.

LONG-RANGE WATER SUPPLY ELEMENT

<u>140(4)(a)</u> A description of the water supplier's expected future service area and an estimate of long-range water demand projections for 10 and 20 years with supporting methodology demonstrating compatibility with local comprehensive land us plans

Comments on the Draft Plan, and those included here under 690-86-140(1)(d), address the assumptions used in the Plan to project long-range water demand. The Plan fails to substantively analyze the relationship between transient occupancy and tourism and water demand. This is a significant oversight. The general tenor of the Plan is that tourism is vitally important to the community both economically and for the purposes of water management. A major emphasis of the Plan is to accommodate projected seasonal and peak day demand resulting both from tourism and residential growth. Given that the tourism and commercial use sectors comprise over 50 percent of the water use during the season of lowest flow and peak demand, the demand estimates contained in the Plan must be supported by a sound methodology. A methodology incorporating a comparison of monthly and seasonal metered billing data with occupancy would provide both baseline data for examining commercial landscape irrigation and supportable data for estimating long range demand based on permanent and transient populations. The development and analysis of such data may provide additional information allowing the City to tailor elements of its conservation and water management programs to the transient population and commercial sector.

140(4)(b) A comparison of projected water needs and system capacity and size and reliability of water rights, permits or other current water supply contracts held

This Plan addresses most of our comments on the previous draft. However, inconsistencies and unsupported conclusions about projected water demand remain a part of the Plan. The Section 3.5 *Summary* on page 17 concludes the City requires an additional one cubic foot per second (cfs) in the near-term to meet the peak demand of the summer tourist season. This appears to be an unsupported conclusion given Plan content preceding the summary section on page 17. Based on the subsequent Section 4 analysis of supply and demand, the projected maximum daily demand shown in Table 8.0 (page 22) for the year 2023 equals 865,433 gallons per day. The section 4 Summary, page 26, concludes the long range forecast reveals a need to double the present quantity of two cfs (to four cfs) to meet the growth expected by 2023. The difference between "reliable supply" and the projected 2023 demand as depicted by the Plan is about 0.80 cfs. The conclusion is inaccurate and unsupported by the analysis. Unsupported conclusions such as this undermine confidence in the supply and demand analysis, and whether the Plan effectively evaluates the costs and benefits of implementing water management and conservation opportunities to reduce demand, inefficiency and waste.

140(4)(c)(A) If future projections indicate that additional water will be required within the next 20 years, include a comparison between the potential sources of additional water, including conservation, reuse, and interconnection with other systems which consider costs, availability, reliability and likely environmental costs

The purpose of our previous comments were aimed at having the revised Plan include an evaluation about whether environmental values would affect the likelihood of developing alternative sources identified by the Plan. Based on the projected long-range demand, the City's current water allocations meet its projected requirements. Environmental values need to be considered as the City examines storage or other source alternatives. However, the intent of this rule is to have the plan develop a decision making filter, taking into account environmental values, as it considers and plans for new sources of water to meet projected demands exceeding current allocations. At such time as the City updates the plan, and identifies a projected demand for water in excess of current allocations and reliable supply, it will be required to perform the comparison required by rule.

140(5)(a) and (b) Describe a proposed date for submittal of an updated Water Management and Conservation Plan based on the proposed schedule for implementation of conservation measures, other community planning activities, or expected changes in rate of growth, etc., or an explanation of why an update is unnecessary an should not be required

Consistent with our previous Draft Plan comments, the Plan must either describe a proposed date for submission of an updated Water Management Conservation Plan or actions that would trigger an update, or include an explanation of why an update should not be required. We recommend the City propose updating its Water Management and Conservation Plan when it conducts an update of its Water System Master Plan as identified in our comments on 690-86-140(2)(d)(A).

City of Yachats Water Management and Conservation Plan
Compliance with Permit Conditions
Stipulated Final Order and Agreement on Reconsideration of Permit 53471

Under the terms of Stipulated Final Order and Agreement the City of Yachats agreed the Water Management and Conservation Plan would include:

- A plan and timetable for meeting a goal of 85 percent water use efficiency (15 years from the date of the agreement or 10 years from Plan approval, whichever comes first);
- Demand projections based on 85 percent efficiency and the best practicable estimate of population and occupancy figures and seasonal average water use;
- A schedule for water audits;
- A commitment to continue to cooperate in efforts to develop a regional water supply;
- An analysis of the land use approval process which will be required to develop the two points of diversion on the Yachats River, and a discussion of how and when the City intends to comply with those land use processes;
- A curtailment plan which includes triggers for curtailment that are based upon streamflows; and
- All elements necessary to meet the requirements of the OAR Chapter 690, Division 86 rules.

The Department's evaluation of whether the City of Yachats Water Management and Conservation Plan (Plan) satisfies the conditions for permit 53471 is as follows:

Timetable for 85 Percent Water Use Efficiency
An explicit timetable for meeting a goal of 85 percent efficiency is not included in the Plan.

Demand Projections
The term *water use efficiency* was not defined by the agreement. The City's interpretation of 85 percent water use efficiency appears at odds with comments received from parties to the agreement The term is subject to interpretation. Demand projections described by Table 7.0, Table 8.0, and Table 12.0 appear to rely on 1997-98 water year data. When compared with 1998 water information contained in Appendix 1 showing unaccounted water averaging 21% (as high as 34 percent for one month), a conclusion could be reached that demand projections incorporate system inefficiencies into the demand projections. This issue could have been addressed in one section of the Plan simply and clearly by describing the methodology and referencing the data sets used to arrive at the projections. Instead, one has to compare tables (which are inconsistent) and make judgements about how to interpret the data and analysis.

As noted in the Department's review of the Plan, the best practicable estimate of population and occupancy was not used to project demand (see comments on 140(1)(d) and 140(4)(a)).

Demand projections were not based on seasonal average water use, such as the high-flow season and low-flow/peak demand season. Rather, the plan focused on peak day demand and average annual and daily water use. Projecting demand based on peak day use and the maximum demand on the water system is a traditional and accepted municipal water supply planning tool. However, the agreement specifically called for projecting demand based on seasonal average water use.

A Schedule for Water Audits
The Plan discusses a schedule for water audits in the context of an annual audit of the system. In addition, as part of the leak detection program, the City monitors meters and billing records on a monthly basis.

Commitment to Continue to Cooperate in Efforts to Develop a Regional Water Supply
The Plan identifies the City's commitment to continue to cooperate in efforts to develop regional water supply alternatives.

An Analysis of the Land Use Approval Process Which Will be Required to Develop the Two Points of Diversion on the Yachats River
The Plan does not contain an analysis of the land use approval process. The Plan indicates the City is bound to follow the rules and requirements to obtain land use approval. However, an analysis suggests the City would evaluate the issues associated with the process and develop conclusions and recommendations based on the analysis.

A Curtailment Plan Which Includes Triggers for Curtailment That are Based on Streamflows
The Plan identifies triggers for curtailment based on a percentage of water availability or raw water shortage. This satisfactorily meets the Division 86 requirements. The triggers are not,

however, based directly on streamflow levels from the City's sources. Correlating staff gauge measurements of streamflow (as shown in Table 6.0 for Reedy Creek, page 19) to raw water shortages would meet the intent of the agreement.

All Elements Necessary to Meet the Requirements of OAR Chapter 690, Division 86 Rules
The Plan, as submitted, does not satisfy all the requirements of the administrative rules on water management and conservation plans (see review comments pages 1 through 7). However, the administrative process provides an opportunity for the City to correct Plan deficiencies (OAR 690-86-910(8)).

May 2, 2000

Rod Carasco, Public Works Superintendent
City of Yachats
P. O. Box 345
Yachats, OR 97498

Re: Final Order and Determination on the City of Yachats Final Water Management and Conservation Plan

Dear Mr. Carasco:

The Department's review and approval of a final water management and conservation plan requires it to evaluate and make an affirmative determination that the final plan satisfies the relevant requirements of OAR 690-86-140. In doing so, the Department evaluates whether the plan implements conservation measures which are feasible and appropriate for ensuring the efficient use of water and prevention of waste. This evaluation considers the economic feasibility of conservation measures, any adverse environmental impacts of implementing the measures, whether the measures are available and proven, the time needed to implement the measures, the effects of the local physical setting on potential successful implementation of measures, and whether the measures are consistent with other relevant water management plans. Furthermore, the Department limits the scope of its evaluation to a review of modifications made to the final plan in response to the comments on the draft plan. The Department's review of the City of Yachats Final Water Management and Conservation Plan (Final Plan) is included as Attachment 1.

The Department received the City of Yachats Final Plan on December 30, 1999. On January 11, 2000, The Department provided public notice of receipt of the Final Plan and commenced a 30 day public comment period. Eight sets of comments were received prior to the close of the public comment period and are included as Attachment 2.

We have reviewed the Final Plan to see if.it satisfies the relevant requirements of the Department's Division 86 administrative rules on water management and conservation plans and the Stipulated Final Order and Agreement on Reconsideration of Permit 53471. Our review also considered the public comments on the plan.

NOTICE OF RIGHT TO PETITION FOR RECONSIDERATION OR JUDICIAL REVIEW

This is a final order in other than a contested case. This order is subject to judicial review under ORS 183.484. Any petition for judicial review must be filed within the 60 day time period specified by ORS 183.484(2).

Pursuant to ORS 536.075 and OAR 137-004-080 and OAR 690-01-005 you may either petition for judicial review or petition the Director for reconsideration of this order.

The Department finds the City of Yachats Final Plan does not satisfy the relevant requirements of OAR 690-86-140 and terms of the Stipulated Final Order and Agreement on reconsideration of Permit 53471. Pursuant to OAR 690-86-910(8), the Department shall consult with the City of Yachats to establish a time frame for correcting the deficiencies identified in Attachment 1.

Failure to satisfactorily correct the deficiencies by the deadline established as a result of consultation shall be sufficient cause for the Department to deny approval of the Final Plan.

Our staff will continue to assist you in developing a plan which satisfies the relevant requirements of our administrative rules on water management and conservation plans and the terms of the stipulated final order and agreement. Bill Fujii will be the point of contact for consultation on correcting the deficiencies in the Final Plan. I recommend you contact Bill to begin the consultation. Bill can be reached at (503) 378-8455, extension 254.

Sincerely,

Thomas J. Paul, Administrator
Field Services Division

c: Bill Ferber, Watermaster
File

TP:gln

BEFORE THE OREGON WATER RESOURCES DEPARTMENT

In The Matter of a Water Management and Conservation Plan, submitted by The City of Yachats	)))	Order Allowing Additional Time to Correct Discrepancies

BACKGROUND

The City of Yachats (City) submitted its Final Water Management and Conservation Plan (Plan) in accordance with OAR chapter 690, division 86 and with a stipulated agreement entered into in August 1998, by the City. OAR chapter 690, division 86 sets out the statewide policy on conservation and efficient water use and requires major water users and suppliers to prepare and submit water management plans. Management plans are reviewed according to the standards set out in OAR 690-86-140. The stipulated agreement sets out additional items that are required to be in the City's Plan.

The City submitted a Draft Plan in 1997, which the Department reviewed and provided comments on. The City submitted the current Plan on December 30, 1999. On January 11, 2000, the Water Resources Department (Department) noticed the Plan in its public notice. The Department received comments from the Yachats Area Watershed Advisory Council, WaterWatch of Oregon, Oregon Trout, Andrea Scharf, Southwest Lincoln County Water District, Oregon Department of Fish and Wildlife, United States Fish and Wildlife Service and United States Forest Service within the 30 day comment period.

The Department issued a "Final Order and Determination" of the City's Plan on May 2, 2000. Upon reviewing the "Final Order and Determination" pursuant to a timely request for reconsideration, the Department determined that the order was not a final order. The Department subsequently withdrew the May 2, 2000, order.

OAR 690-86-910(8), allows the Department to provide additional time to correct any discrepancies in a water management plan upon a determination that the final plan does not satisfy the plan requirements. The Department has determined that the final plan submitted by the City does not satisfy the plan requirements and hereby issues this interim order, setting out the discrepancies in the City's Plan and providing additional time (until July 1, 2001) to correct the identified discrepancies.

PLAN REVIEW

This review is limited to consideration of modifications made in response to Department comments on the Draft Plan and to consideration of compliance with the terms of the stipulated agreement. The comments below follow the organization of the division 86 rules and the stipulated agreement.

A. Water System Description Element

<u>140(1)(d)</u> Description of customers served including the estimated numbers and general water use characteristics of residences, commercial and industrial facilities and other uses.

Section 2 of the Plan characterizes population groups according to water use. Commercial and transient rental groups generally account for over 50 percent of water use; especially during the low-flow period when water use is greatest. This plan carries forward from the previous plan unsupported assumptions and conclusions about water use characteristics. Statements indicating it is reasonable to assume temporary residents have the same water use requirements as full time residents because the City generates the majority of its revenue from tourism are unfounded. Similarly, concluding facilities (commercial) that cater to tourism require greater quantities of landscape water are unfounded without an analysis and characterization of water use. Figures 6.0 and 6.1 on page 21, which compare transient occupancy rates with water production, indicate peak water production during August and September is not attributable to occupancy. The unsupported assumptions about water use were then used to develop population estimates which in turn were used to project future water demand. When viewed in sequence, projections of future water demand based on unsupported assumptions and conclusions lead staff to question the methodology used to project future population and water demand (see comments on 140(4)(a)).

A characterization and understanding of water use is fundamental to projecting demand, and formulating a plan to effectively implement water management and conservation measures consistent with Plan goals and objectives. ***The Plan must incorporate a methodology to project demand that more accurately characterizes water use by sector and according to season of use.***

B. Water Conservation Element

<u>140(2)(d)(A)</u> For conservation measures not currently being implemented, an evaluation of whether implementation of the measure is feasible and appropriate: a system-wide leak repair program or line replacement to reduce system leakage to 15 percent, and if feasible... to reduce leakage to 10 percent

The Department's comments on the Draft Plan noted the City corrects and repairs leaks in the water system as they are identified. However, the comments on the Draft Plan also noted it was not clear what the program entailed and because of this it could only be inferred there was a program of leak repair or line replacement. The Final Plan discusses the City's 10-year plan for water main replacement to upgrade undersize, dead end and old lines (3.2.3 Distribution System, page 15). However, from the brief description, it is unclear if the program integrates the conservation goal aimed at reducing leakage. We understand this is an element of the City's Water System Master Plan developed to meet Health Division requirements. As such, it probably is not a program designed to implement the conservation goals of the OAR Chapter 690, Division 86 administrative rules, which are aimed at achieving more efficient water use and preventing waste of water through reduced leakage. In addition, a Priority I recommendation (page 38) identifies the need to provide adequate funds to correct leakage in the City distribution system. This appears to be inconsistent with the discussion of the line replacement program on page 15 which suggests funds to implement the 10-year program are a regular component of the City's annual budget. ***If the program accomplishes and implements conservation goals, the line replacement program should be integrated more fully into the plan. At a minimum the program should be included in the appendices and the discussion expanded to describe how it implements the conservation goal of reducing leakage.***

<u>140(2)(d)(B)</u> Evaluate programs to encourage low water use landscaping

The Department's comments on the Draft Plan concluded the City was not currently implementing a program to encourage low water use landscaping even though it briefly discussed landscape irrigation under *Preventive Measures* and *Emergency Measures*. The Plan now identifies low water use landscaping as an element of the long-term water conservation plan. The Plan states the City *will* initiate a system of measures and controls to encourage participation in the program. The City is not currently implementing a program to encourage low water use landscaping. Nor does the Plan identify a schedule for implementing its future plan element on low water use landscaping. As stated in the comments on the Draft Plan when discussing the leak detection program (page 8), a program implies a procedure and schedule for solving a problem. The Plan does not describe a program to encourage low water use landscaping, but identifies a single action (Section 5.8, *Water Conservation During Summer Irrigation*, page 32). Furthermore, the recommended action identified in the Plan is inconsistent with section 5.1.2 *Residential Conservation Goals* (page 29) recommending residential landscape irrigation audits.

According to the Plan, the City has concluded low water use landscaping is a part of its overall plan to meet its general water conservation goals. But, it also is apparent the City has not evaluated how best to implement a low water use landscaping program or assessed the contribution of the program to helping the City meet its conservation goals and reduce seasonal demand. ***Given that the City is not currently implementing a program encouraging low water use landscaping, the rule requires the Plan to include an evaluation of whether a program is appropriate and feasible.***

<u>140 (2)(d)(C)</u> Evaluate incentive programs that encourage conservation and 140(2)(d)(D) retrofit or replacement of inefficient water using fixtures.

The Plan describes potential water savings of about five to six percent of peak day demand based on its evaluation of the retrofit or replacement of inefficient fixtures (page 29). The Plan focuses its incentive and retrofit programs on residential and commercial inefficient plumbing fixtures (page 31). The Plan initiates these programs in fiscal year 2000, yet it fails to identify quantifiable retrofit goals for both water savings and a target number of households for fiscal year 2000 and subsequent budget cycles. What is the City's goal for retrofit of targeted households, when does it anticipate meeting its goal, at what rate does the City anticipate retrofit to occur, and how will it account for the programs in its budget? ***While the Plan evaluates the potential water savings, and shows the City could meet a portion of its conservation goals through these programs, it fails to provide an implementation schedule as required by 690-86-140(2)(e)(F).***

<u>140(2)(d)(E)</u> Evaluate the adoption of rate structures that support and encourage water conservation

The Plan describes the current rate structure (page 32) and according to the Priority 1 recommendations on page 38 will develop a rate structure tailored to the season and availability of water. As described, potential modification of the present rate structure is open-ended. ***Because the Plan concludes adoption of a rate structure tailored to the season and availability is appropriate, under OAR 690-86-140(2)(e)(F), the Plan needs to include an estimated schedule for implementation of a new rate structure.***

<u>140 (2)(d)(F)</u> Evaluate Reuse Opportunities

The Department's Draft Plan comments focused on the failure to evaluate the feasibility and appropriateness of water reuse opportunities. The Plan now describes an annual reduction of over 50 percent since 1996 in the use of treated drinking water in the wastewater process (page 27) by reusing effluent water. The Plan also includes a discussion of raw water loss of about 17 percent on average at the Water Treatment Plant (page 19). About 12 percent of the loss is attributed to filter back washing and five percent to plant operations. In recognition of these losses the Plan establishes a utility conservation goal of five percent. ***Consistent with our previous comments under 690-86-140(2)(d)(G), the Plan should evaluate whether the five percent goal is achievable through staff training as proposed. Similarly, as noted in our previous comments under 609-86-140(2)(e)(F), the Plan must include an implementation schedule for the utility training conservation measure.***

D. Long-range Water Supply Element

<u>140(4)(a)</u> A description of the water supplier's expected future service area and an estimate of long-range water demand projections for 10 and 20 years with supporting methodology demonstrating compatibility with local comprehensive land us plans

Comments on the Draft Plan, and those included here under 690-86-140(1)(d), address the assumptions used in the Plan to project long-range water demand. The general tenor of the Plan is that tourism is vitally important to the community both economically and for the purposes of water management. A major emphasis of the Plan is to accommodate projected seasonal and peak day demand resulting both from tourism and residential growth. Given that the tourism and commercial use sectors comprise over 50 percent of the water use during the season of lowest flow and peak demand, the demand estimates contained in the Plan must be supported by a sound methodology. ***The Plan must substantively analyze the relationship between transient occupancy and tourism and water demand.***

140(4)(b) A comparison of projected water needs and system capacity and size and reliability of water rights, permits or other current water supply contracts held

This Plan addresses most of our comments on the previous Draft Plan. However, inconsistencies and unsupported conclusions about projected water demand remain a part of the Plan. The Section 3.5 *Summary* on page 17 concludes the City requires an additional one cubic foot per second (cfs) in the near-term to meet the peak demand of the summer tourist season. This appears to be an unsupported conclusion given Plan content preceding the summary section on page 17. Based on the subsequent Section 4 analysis of supply and demand, the projected maximum daily demand shown in Table 8.0 (page 22) for the year 2023 equals 865,433 gallons per day. The section 4 Summary, page 26, concludes the long-range forecast reveals a need to double the present quantity of two cfs (to four cfs) to meet the growth expected by 2023. The difference between "reliable supply" and the projected 2023 demand as depicted by the Plan is about 0.80 cfs. The conclusion is inaccurate and unsupported by the analysis. ***The conclusions need to be supported by the analysis.***

140(5)(a) and (b) Describe a proposed date for submittal of an updated Water Management and Conservation Plan based on the proposed schedule for implementation of conservation measures, other community planning activities, or expected changes in rate of growth, etc., or an explanation of why an update is unnecessary an should not be required

The Plan does not describe a proposed date as required by the rule. We recommend the City propose updating its Water Management and Conservation Plan when it conducts an update of its Water System Master Plan as identified in our comments on 690-86-140(2)(d)(A). ***The Plan must either describe a proposed date for submission of an updated Water Management Conservation Plan or actions that would trigger an update, or include an explanation of why an update should not be required.***

D. Stipulated Agreement Elements

1. Time table for 85% water use efficiency

Efficiency ratio in this case is defined as the amount of water sold (including contracts), used by the City in processing treated water and use by the City for municipal facilities divided by the amount diverted. Losses from leaks, unaccounted water loss, loss of water from unutilized reuse opportunities not analyzed under OAR 690-86-140 (2)(d)(F) are not considered use by the City for municipal facilities. ***A time table for meeting a water use efficiency of 85% by July 1, 2011 must be included in the Plan.***

2. Demand projections

The stipulated agreement requires a demand projection based on 85% efficiency and the best practicable estimate of population, occupancy figures and seasonal average use. The current demand projections do not satisfy this standard. The best practicable estimate of population and occupancy was not used to project demand. Nor were demand projections based on seasonal average water use. ***A determination of demand projections based on the 85% efficiency level and demand figures based upon the best practicable estimate of population and occupancy figures and seasonal average water use must be included in the Plan.***

3. Water audit schedule

The Plan only included an annual audit of the system. ***The Plan also must include an audit schedule that requires major users to perform on-site water audits annually if the previous year did not met the 85% efficiency goal or if the average annual per capita use is greater than 250 gallons user per day.*** Commercial users participating in the EPA WAVE program may be exempted from the audit schedule.

4. Commitment to cooperate

The stipulated agreement requires a commitment to cooperate in efforts to develop a regional water supply. ***The Plan should include a description of all of the actions that the City has undertaken in this regard including any City ordinances, or agreements entered into by the City.***

5. Analysis of the land use approval process

The Plan only states that the City is bound to follow the land use rules and regulations. The required analysis must list and analyze the known requirements that the City will need to comply with, including but not limited to any permit conditions by WRD; the Special Use Permit needed for use of the US Forest Service Lands; conditional land use approvals by Lincoln County; amendments to the City or County Comprehensive Plans; Removal Fill Permits from the Oregon Division of State Lands;

401 certificates and Coastal Zone Management Act Consistency from the Department of Land Conservation and Development; 404 Certification from the Army Corps of Engineers. ***The Plan must include an analysis of the land use approval process that is consistent with the above description.***

6. Time line for water sources

The Plan must include a time line for when the City will abandon non-viable sources or seek to transfer those sources to instream rights.

7. Curtailment plan

The current curtailment plan identifies triggers that are based on a percentage of water availability or raw water shortage. ***Under the stipulated agreement, the Plan must include a curtailment plan that includes triggers for curtailment based upon streamflows.***

8. Satisfaction of the requirements in division 86

The stipulated agreement specifically incorporates the water management plan requirements set out in the chapter 690, division 86 administrative rules. The missing elements required by the division 86 rules are set out in sections A-C above. ***Pursuant to the stipulated agreement, all Plan elements required by the division 86 rules must be met.***

IT IS HEREBY ORDERED that the City correct the above described discrepancies in its Plan, incorporate the corrections into a revised Plan, and submit a complete revised Plan to the Department by no later than July 1, 2001.

The Department understands that the City will give the original parties involved in the stipulated agreement (see attachment "A") and the public at large notice and an opportunity to comment on the action items set out in this order. *See* OAR 690-86-120(6) (encouraging public involvement in plan development).

Failure to meet the conditions of this order may result in the Department denying approval of the City's Plan. The status of the City's Plan will be taken into consideration for requests of extensions of Permit 53471. Non-compliance with an approved Plan may result in any of the enforcement actions set out in OAR 690-86-920, including assessment of civil penalties.

If the Department approves the City's revised Plan, the approval will include the following condition:

The City shall consult with the Department to establish if interim adjustments to the Plan will be required if (1) flow targets on the Yachats River are identified by the National Marine Fishery Service for Endangered Species Recovery after July 1, 2001, and/or (2) the City requests an extension of Permit 53471. Following consultation, the Department may set a schedule and requirements for interim Plan adjustments.

If approved, the Plan will be required to be updated by July 1, 2006. Any interim updates made to comply with conditions of Plan approval will not change the July 1, 2006 update requirement. A Water System Master Plan if required by the Health Division may be consolidated with a water management plan under OAR 690-086-0120(4) after consultation with the Department.

Dated: APR 05 2001

Thomas J. Paul, Administrator
Field Services Division

Attachment "A" Parties Involved in the Stipulated Agreement

Karren Russell, WaterWatch of Oregon, Inc.
213 S.W. Ash Street
Suite 208
Portland, OR 97204

Yachats Area Watershed Council
PO Box 28
Yachats, Oregon 97498

Dike Dame
5064 River Rd.
Yachats, OR 97498

James Adler
2917 River Rd.
Yachats, OR 97498

Andrea Scharf
9777 River Rd.
Yachats, OR 97498

Ron Taves
9384 River Rd.
Yachats, OR 97498

Paul Engelmeyer
P.O. Box 496
Yachats, OR 97498

Appendix H

Response to Order

THE DYER PARTNERSHIP
ENGINEERS & PLANNERS, INC.

MEMORANDUM

TO: Mr. Lee Corbin, Mayor
City of Yachats

FROM: Garrett Pallo

DATE: June 22, 2001

RE: Response to Stipulated Agreement Elements
Water Management and Conservation Plan
Project No. 0510.02

General

In accordance with OAR 690-86, the Oregon Water Resources Department (WRD) has required that the City of Yachats submit a Water Management and Conservation Plan. As you are aware, the City has also entered into a Stipulated Order and Agreement to take various steps towards improving the efficiency and operation of the City water system.

In addition to commentary provided by WRD on the City's previous submittal of a Water Management and Conservation Plan, the Stipulated Order contains a number of "Stipulated Agreement Elements" that require action or response by the City. The City has taken action on many of the Elements during this planning process. Other Elements have been discussed in this Plan.

The purpose of this memorandum is to provide a summary accounting of the Stipulated Agreement Elements. A brief description of each element will be provided along with a response or accounting of actions the City has taken or intends to undertake relative to specific Elements. A copy of the Mutual Agreement and Final Stipulated Order is provided in Appendix G of the Management and Conservation Plan.

Stipulated Agreement Element No. 1: Time Table for 85% Water Use Efficiency

Element: *Efficiency ratio in this case is defined as the amount of water sold (including contracts), used by the City in processing treated water and use by the City for municipal facilities divided by the amount diverted. Losses from leaks, unaccounted water loss, loss of water from utilized reuse opportunities not analyzed under OAR 690-86-140(2)(d)(F) are not considered use by the City for municipal facilities. A timetable for meeting a water use efficiency of 85% by July 1, 2011 must be included in the Plan.*

275 MARKET AVE.
COOS BAY, OREGON 97420
TELEPHONE: (541) 269-0732
FAX: (541) 269-2044

Response: The City has been striving to improve its water system efficiency for the past ten years. In 1997, system losses totaled 55 percent. By 2000, losses had dropped to 28 percent.

Recently, the City randomly chose a number of water meters to be replaced; the old meters were "bench tested" to determine their approximate accuracy. Preliminary results suggest that the existing metering system may be inaccurate by at least 20 percent. If the system, on a whole, is reading low by 20 percent, the existing efficiency of the system may very well be below ten percent (28% - 20% = 8%).

The City has adopted an aggressive schedule to replace all existing water meters. In addition to replacing meters, the City has plans to replace a number of aged and suspect waterline sections. The City also intends to initiate a number of programs meant to reduce water use and improve system efficiency. The Following list summarizes the City's goals and provides dates when each goal will be either completed or in effect. Some of the activities are at or near completion and have been identified in the list below:

PROPOSED TIMETABLE FOR 85 PERCENT WATER USE EFFICIENCY

1. **By July 1, 2001**: Submit final Water Management and Conservation Plan to WRD. (Completed by July 1, 2001)

2. **By July 1, 2001:** Submit Water Master Plan to the Oregon Health Department. (Completed by July 1, 2001)

3. **By July 1, 2002:** Complete upgrade of the Water Treatment Plant operation and maintenance system in order to maximize plant performance and increase plant efficiency. (Will be complete by end of year, 2001)

4. **By July 1, 2002:** Convert all chemical delivery systems at the Water Treatment Plant from systems that require treated water for delivery to systems that do not require treated water to deliver chemicals to their respective points of injection. (Completed)

5. **By July 1, 2003:** Complete the system-wide replacement of all existing water meters with a new, accurate, uniform, and automated metering system. (To be completed during the summer of 2001)

6. **By July 1, 2003:** The City will make efforts to have all lodging facilities and other appropriate commercial facilities in the City of Yachats committed to full participation in the WAVE program.

7. **By September 1, 2003:** If system efficiency is found to be less than 85 percent, the City will begin performing annual audits of all major water users in the system. Commercial users participating in the WAVE program will be exempted from the audit schedule.

8. **By July 1, 2006 (and every five years thereafter):** The City will test the efficiency of the meters recording the flow of raw water being removed from each source, the raw water entering the plant, the treated water leaving the plant, and the meters recording the backwash water pumped into the irrigation field.

9. **By July 1, 2006:** A leak detection survey of the entire system will be completed. Results from the survey shall be used to reprioritize or add new projects to the Capital Improvement Plan.

10. **By July 1, 2006:** An updated Water Management and Conservation Plan will be completed and submitted to the WRD.

11. **By July 1, 2006:** Begin installing isolation valves in strategic locations around the distribution system for the purpose of locating leaks without disrupting services to other residents in the system.

12. **By July 1, 2010:** Complete the replacement of all waterline sections identified in the Capital Improvement Plan. Many piping sections were identified for replacement due to historical leakage and maintenance problems.

13. **By July 1, 2011:** Water system will be operating with a maximum of 15 percent unaccounted water (85 percent efficiency). If the system is found to be operating with 15 percent or less of unaccounted water, begin actions to reduce system losses to 10 percent. The analysis for loss, efficiency, and recommendations for additional improvements will be developed in an update to the Water Management and Conservation Plan to be completed by July 1, 2011.

It is expected, that if the City fulfills each item outlined in the above time-line, system efficiency will be in compliance with OAR 690-86-140. For additional information about the various projects and goals described above, see Sections 7, 9, and 10 of the Plan.

Stipulated Agreement Element No. 2: Demand Projections

Element: *The Stipulated agreement requires a demand projection based on 85% efficiency and the best practicable estimate of population, occupancy figures and seasonal average use. The current demand projections do not satisfy this standard. The best practicable estimate of population and occupancy was not used to project demand. Nor were demand projections based on seasonal average water use. A determination of demand projections based on the 85% efficiency level and demand figures based upon the best practicable estimate of population and occupancy figures and seasonal average water use must be included in the Plan.*

Response: In addition to full-time residents, the City of Yachats experiences regular influxes of population due to significant part-time and tourist population sectors. While these sectors do not register on the U.S. Census or other official population estimates, they do consume water. As a result, efforts had to be made to account for their numbers, water use habits, and projections of future water use.

Working closely with the City Planner and reviewing efforts recently completed for an update to the City Comprehensive Plan, population estimates were made for peak and off-peak seasons. For a detailed description of the process and results of the population analysis, see Section 2.5 of the Plan.

By utilizing diversion, production, consumption, and other metered data, it was possible to establish existing water demand figures. In Section 5.2 of the Plan, average, maximum, and peak demand values were tabulated. However, it should be noted that over the four years of data analyzed, system losses averaged approximately 40 percent. It should also be noted that losses fell from 55 percent in 1997 to 28 percent in 2000.

The goal of projecting future water demand is not to build larger facilities or appropriate larger amounts of water to accommodate excessive or unnecessary water consumption, but rather, to evaluate the capability of existing components and resources and to size new facilities for reasonable demand rates. Therefore, prior to projecting existing demand rates into the future, they were adjusted to reflect expected reductions in lost water levels. In other words, demand projections developed in the *Water Master Plan* assume that the City will be successful in its efforts to reduce system losses to a maximum of 15 percent.

Demand values were tabulated for average day demand (ADD), maximum month demand (MMD), maximum day demand (MDD), and peak hour demand (PHD).

For a detailed description of the process and results of the demand analysis and projections adjusted for reasonable lost water levels, see Section 5.3 of the Plan.

Stipulated Agreement Element No. 3: Water Audit Schedule

Element: *The Plan only indicated an annual audit of the system. The Plan also must include an audit schedule that requires major users to perform on-site water audits annually if the previous year did not meet the 85% efficiency goal or if the average annual per capita use is greater than 250 gallons [per] user per day. Commercial users participating in the EPA WAVE program may be exempted from the audit schedule.*

Response: The City has developed a spreadsheet that provides it with a monthly system-wide audit. The spreadsheet will continue to be used on a monthly basis to give the City feedback on its efforts to reduce lost water and increase water conservation.

While the City does expect to reduce system losses to below 15 percent, it is developing a program to facilitate annual audits with its major users. As was stated above, the City plans to begin this audit process no later than September 1, 2003.

It should be noted that the City is very interested in promoting and encouraging involvement in the EPA WAVE program. As was mentioned previously, the City has a goal to have all lodging facilities in the City of Yachats committed to full participation in the WAVE program by July 1, 2003. The City has made inquiries into having representatives from the EPA WAVE program come to the Oregon Coast to promote the program and solicit participation from facilities within and outside the City Limits of Yachats. If the City is successful in persuading lodging facilities to commit to WAVE, the majority of the "major" water consumers will be exempted from the auditing process.

Stipulated Agreement Element No. 4: Commitment to Cooperate

Element: *The stipulated agreement requires a commitment to cooperate in efforts to develop a regional water supply. The Plan should include a description of all of the actions that the City has undertaken in this regard including any City ordinances, or agreements entered into by the City.*

Response: The City considers a regional water supply to be a viable long-term solution to its water supply needs. As such, the City has investigated and expressed interest and commitment to a number of regional supply options.

The City has entered into a mutual aid agreement with the Southwest Lincoln County Water District (SLCWD) to receive and provide water to each other in situations of drought, fire, or other emergency. A copy of the Mutual Aid Agreement is provided in Appendix B of the Plan. It should be noted that negotiations are currently under way to include the City of Waldport within the mutual aid agreement with SLCWD and the City of Yachats.

The City has committed to the study and investigation of establishing a regional water supply with SLCWD, Waldport, Seal Rock Water District, and the City of Toledo. A draft intergovernmental agreement has been prepared and negotiations are ongoing. It is expected that a regional water master plan will be developed within the next two years.

The City has also committed to the investigation of a regional plan that will include all of the previous parties mentioned and the City of Newport. The construction of a major reservoir at Rocky Creek would be intended to serve the region with a year-round water supply; the project is currently under study and development of the system is considered to be many years off.

As demonstrated by its involvement in the above-mentioned regional water supplies, the City truly is committed to the development of a regional water supply for its long-term water supply needs. For additional coverage on regional water supplies for the City's long-term water needs, see Section 7.5 of the Water Management and Conservation Plan.

Stipulated Agreement Element No. 5: Analysis of the Land Use Approval Process

Element: *The Plan only states that the City is bound to follow the land use rules and regulations. The required analysis must list and analyze the known requirements that the City will need to comply with, including but not limited to any permit conditions by WRD; the Special Use Permit needed for use of the US Forest Service Lands; conditional land use approvals by Lincoln County; amendments to the City or County Comprehensive Plans; Removal / Fill Permits from the Oregon Division of State Lands; 401 certificates and Costal Zone Management Act Consistency from the Department of Land Conservation and Development; 404 Certification from the Army Corps of Engineers. The Plan must include an analysis of the land use approval process that is consistent with the above description.*

Response: In order for the City to construct a new diversion on the Yachats River, land use approval must be obtained. While it is impossible to predict the actual result or path the process will eventually follow, it is possible to provide an overview of the process. The Final Order requires the City to provide an analysis of the land use approval process. As the City has been debating the issue of the Yachats diversion for the past decade, much of the process has been undertaken or investigated.

The following comments are provided as a summary of the process the City may face if it proceeds with plans to develop the diversion.

<u>US Army Corps of Engineers / DSL Removal & Fill Permit:</u> Previous experience with similar installations has shown that the best place to begin a land use approval process is with the Corps/DSL permit. The Corps/DSL permit requires a comprehensive explanation of the

proposed project as well as estimates of the impact to the waterway, riparian zone, and other natural resources. In addition to gathering all data together, the Corps/DSL permit process is automatically routed to other affected regulatory bodies and impacted parties. Each party is invited to comment or object to the project or portions of the project. The local Corps/DSL representatives also organize site visits so affected parties and agencies can see the potential areas of impact.

It should be noted that projects similar to the proposed Yachats diversion have been granted exempt status due to the fact that they typically do not fill or remove enough material to be considered as having an impact. While the City must still make application, the likely result will be that it will be granted an exemption.

While the City can complete the Corps/DSL permitting process independently, some engineering support may be required. Typical costs for navigating a Corps/DSL permit run between $2,000 to $5,000 depending on the complexity of the issues and interaction required. While the Corps/DSL permit is not the only requirement of the land use approval process, it is the best starting point.

<u>Special Use Permit needed for use by US Forest Service Lands:</u> The City has met with representatives of the US Forest Service to discuss the potential of constructing a diversion on US Forest Service property. Preliminary feedback indicates that an Environmental Assessment (EA) will be required for the project to be considered. EA's are becoming more common on state and federally funded or regulated projects. The typical cost for an EA is between $15,000 and $30,000 depending on the complexity of the issues and the requirements of the specific regulatory body.

The letter received from Ms. Doris Tai, District Ranger, describes the potential land-use approval process from the perspective of the United States Forest Service. Rather than repeat her comments, a copy of her letter is attached to the end of this memorandum. The letter describes in some detail the process that the City may face if they wish to develop a raw water diversion on the Yachats River.

<u>Conditional Land use Permit from Lincoln County:</u> The City has previously applied for and received a conditional land use permit from Lincoln County for this project. The permit has, however, expired and must be applied for again if the City moves forward with this project. The permit is expected to cost between $500 and $1,000.

<u>Amendments to City or County Comprehensive Plan:</u> The City's Comprehensive Plan is currently being updated and revised. Of particular interest in the Comprehensive Plan is specific language concerning the City's relationship with the Yachats River and the potential impacts the

City may have on the River. It is expected that the Comprehensive Plan update will be completed within the next year.

401 Certificates and Coastal Zone Management Act Consistency from the Department of Land Conservation and Development: CZM compliance through DLCD will be accomplished through the Corps/DSL permitting process as a portion of the Corps/DSL permit is dedicated to compliance with the CZM Act.

In summary, the exact path that the land use approval process will take is unknown. Requirements and steps may vary depending on the final format of the project and other key issues. Because each permit has an expiration period, the City does not plan to begin the land use approval process until it appears that it will have the ability to complete the process and develop a raw water diversion on the Yachats River. The time and expense of all the potential permit processes is too great for the City to undertake unless it has an indication that it will be allowed to complete the process.

Stipulated Agreement Element No. 6: Time Line for Water Sources

Element: *The Plan must include a time line for when the City will abandon non-viable sources or seek to transfer those sources to instream rights.*

Response: The only water source that the City currently holds a water right for, which it does not consider to be viable, is Cape Creek; the City holds a 0.49 cfs water right certificate on Cape Creek. There is no longer an intake or transmission piping to Cape Creek and flows in the creek are extremely low during the summer months.

When considering water supplies, viability is a relative term. While the City does not currently consider its Cape Creek water right to be viable, it may be more viable than trying to obtain new surface water rights in the vicinity. If the City is unable to solve its water supply problems or develop its water right on the Yachats River, a certificated water right on Cape Creek may become more valuable.

The City's current position on Cape Creek is to retain its water right certificate for a minimum of six months after the acceptance of the City's Water Management and Conservation Plan and the extension of its water right permit on the Yachats River. Once the City knows that it has alternatives available, the Cape Creek water right certificate will be officially abandoned.

Stipulated Agreement Element No. 7: Curtailment Plan

Element: *The current curtailment plan identifies triggers that are based on a percentage of water availability or raw water storage. Under the stipulated agreement, the Plan must include a curtailment plan that includes triggers for curtailment based upon streamflows.*

Response: While the *Water Master Plan* was being drafted, the City was diligently drafting a new Water Curtailment Plan. Input was provided to the City and a number of drafts were reviewed and commented upon. The end result is that a new curtailment plan was presented to the Council and adopted on May 10, 2001.

In addition to using streamflows in the Yachats River for triggers, flow levels in Salmon and Reedy Creek were identified to serve as trigger points in the new curtailment plan. Also, other information such as the Palmer Drought Index was identified as an auxiliary trigger for the new curtailment plan.

Section 8 of the Water Management and Conservation Plan was developed to assist the City in forming its new curtailment plan. Information, recommendations, and formatting was provided to the City while it was drafting the final ordinance. See Section 8 for detailed coverage of the information that was provided to the City.

A copy of the final curtailment ordinance and plan is provided in Appendix F of the Water Management and Conservation Plan.

Stipulated Agreement Element No. 8: Satisfaction of the requirements of Division 86.

Element: *The stipulated agreement specifically incorporates the water management plan requirements set out in the chapter 690, division 86 administration rules. The missing elements required by the division 86 rules are set out in section A-C above. Pursuant to the stipulated agreement, all Plan elements required by the division 86 rules must be met.*

Response: While the final Water Management and Conservation Plan was being developed, a number of WRD reviews of previous drafts of the Plan were made available to us. Many of the comments from the previous reviews were helpful in developing the format and content of the latest planning effort.

The Final Stipulated Order contained a number of review comments from the latest submittal that the City made to the WRD. The comments were carefully considered when developing specific sections within the new Plan.

It is our belief that the newest submittal of the Water Management and Conservation Plan complies with all the requirements of OAR 690-86.

Summary

The City wishes to fulfill all the requirements of the Final Stipulated Order and improve the efficiency and performance of its water system. As effective and responsible stewards of an important natural resource, the City wishes to provide water to the consumers within the City without negatively impacting the natural environment.

The Water Management and Conservation Plan provides the City of Yachats with the necessary technical and planning information to lead the water system within the next 20 years. Significant efforts have already been made to reduce water losses and improve conservation efforts. If the recommendations and projects contained with the *Water Master Plan* are developed, the City of Yachats' water system should be operating within all regulatory and administrative guidelines.

nited States Department of Agriculture | Forest Service | Siuslaw National Forest | Waldport Ranger District
P.O. Box 400
Waldport, OR 97394
(541) 563-3211

File Code: 2700

Date: April 15, 2001

Mr. Lee Corbin, Mayor
City of Yachats
Box 345 City Hall
Yachats, OR 97498

Dear Lee:

This letter is to recap our meeting of March 27 and to highlight the process/work involved should the City wish to pursue further actions in Reedy Creek or in the Yachats River (across Federal land). First, I will say I was encouraged by our conversation and by the progress the City has made of late to address concerns which have been raised by the Forest Service, the Water Resources Board and other regulatory agencies. It sounds like the City has taken steps to improve water conservation and has also made inroads towards a long term regional strategy for addressing water supply issues along the central Oregon Coast.

There is no doubt that providing safe and clean drinking water is of critical importance. And I can certainly emphasize with the position the City is in. Please realize that the Forest Service must also be concerned with other factors associated with fish and wildlife habitat and overall watershed health. In addition, we are held accountable by other regulatory agencies and by the public. There is really no way in this day and age to shortcut the environmental analysis warranted by the actions the City is proposing. To the contrary, the analysis must be thorough and well documented and be open to public review and input.

From our conversation, my understanding is that the City wishes to build another impoundment on Reedy Creek. There is also the future possibility of drawing water from the Yachats River. Should the latter be a serious consideration, it would be in the City's interest to assess both scenarios concurrently through one environmental assessment or environmental impact statement. In either case, an environmental analysis of some sort would be needed. Prior to launching into the analysis. the following information would assist in determining the level of assessment needed:

The City must first establish and document the need for additional water and the conditions under which this additional water would be used. I had been under impression that the recent addition of the storage tank was more than adequate to meet the City's short term needs for water.

The City must be in compliance with the conditions placed by the State Water Resources Board, including the amended water conservation plan.

A geo-technical assessment would need to be done on Reedy Creek to see if an impoundment at the scale we have discussed would be feasible. In checking with our Forest Service geo-tech specialist, there are serious stability concerns regarding the Reedy Creek drainage.

The City would need to decide if the analysis would include the Yachats River.

Beyond that, an environmental assessment/environmental impact statement (EA/EIS) would need to be completed to address the above as well as the following:

- The purpose and need (as stated above) for the proposed action
- A description of the existing situation and future plans
- A clear description of the proposed action and how it meets the need/future plans
- A full range of alternatives to the proposed action
- How the action(s) is in line with the Northwest Forest Plan, most specifically the Aquatic Conservation Strategy (ACS). If the action(s) does not meet the ACS, a Siuslaw Forest plan amendment would be needed.
- Disclosure of the issues involved and the effects on the resources – (mostly hydrologic in the case of Reedy Creek) and how these would be resolved or mitigated.
- Consultation with other regulatory agencies (US Fish and Wildlife, National Marine Fisheries, State Water Resources Board)
- Connected actions – how does this tie in with the Yachats River (as well as other water sources in the area)

Full public scoping is needed as part of the EA/EIS. Additional issues may emerge through the scoping process.

The Forest Service would need to be closely involved in the process. We would review and approve the various stages of the process (purpose and need, issues, scoping, alternatives, effects, consultation documents) and give the final acceptance of the document. Depending upon the level of involvement, there would most likely need to be some reimbursement for Forest Service time, as well.

I need to also say that completing the EA/EIS still does not guarantee a green light for the project. The assessment may raise issues which are unresolvable and/or raise concerns which are unacceptable.

I have attached a list of consultants/contractors who have experience in writing environmental documents. They ought to be able to give you some rough estimates as to the costs and timeline for the work outlined above.

Please let me, Jan Robbins or Paul Thomas know if you have questions.

DORIS TAI
District Ranger