CITY OF ILWACO

PACIFIC COUNTY, WASHINGTON

2011 WATER SYSTEM PLAN

G&O #10565
JUNE 2011

Gray & Osborne, Inc.
CONSULTING ENGINEERS

CITY OF ILWACO

PACIFIC COUNTY WASHINGTON

WATER SYSTEM PLAN

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CHAPTER 1

WATER SYSTEM DESCRIPTION

INTRODUCTION

In accordance with Washington Administrative Code (WAC) 246-290-100 and the Washington State Department of Health (DOH), water system plans need to be updated every 6 years, or more frequently if necessary, to reflect the current conditions of the water system. This Water System Plan (Plan) has been prepared to update the 2003 City of Ilwaco Water System Plan, using the *DOH Water System Design Manual* (December 2010) and the *DOH Water System Planning Handbook* (April 1997). Copies of the Washington State DOH Project Approval Application and Submittal Forms are included in Appendix A.

SYSTEM OWNERSHIP AND MANAGEMENT

The City of Ilwaco (City) owns and operates its own water system. The City's DOH water system identification number is 35500. A copy of the 2010 Water Facilities Inventory Report (WFI) is included in Appendix A. The source of supply, water treatment facilities, storage reservoirs, and distribution lines are all owned and maintained by the City's public works staff.

SYSTEM BACKGROUND

WATER SYSTEM HISTORY

Until 1989, the primary water supply for the City was Black Lake. A water rights claim was filed in 1911 for use of Black Lake as a municipal supply. At that time, neither the claim nor the actual amount of water continuously used by the appropriator was recorded. This situation was rectified in 1917 by a law that established a permit and certification process. Unfortunately, claims made prior to the 1917 law were not addressed. Legislation passed in 1967 and 1969 attempted to correct this deficiency, and a surface water right certificate to Black Lake was issued to the Town of Ilwaco in November 1966 for domestic and municipal supplies. Cranberry growers in the area had claimed prior water rights to Black Lake, and in 1973 an adjudication process led to the quantification of water rights for Black Lake and its natural outlet, Tarlatt Slough. The result of this adjudication was that Ilwaco was placed 36th in priority to withdraw water from the lake, and furthermore was limited to a withdrawal rate of 0.78 cfs (350 gpm) and a total yearly withdrawal of 222 acre-feet (72.3 million gallons).

The adjudicated water right was not sufficient to meet the City's needs. Ilwaco exceeded its permitted withdrawal rates from Black Lake. During summer periods of low inflow,

the level of Black Lake was lowered to the point that flows in Tarlatt Slough were affected. The Washington State Department of Ecology ordered Ilwaco to pump water from Black Lake into the Slough to satisfy prior water rights without regard to Ilwaco's rate of withdrawal. The only way for the City to be relieved of this pumping obligation was to stop all withdrawals from Black Lake.

The Town of Long Beach agreed in 1977 to make 0.25 mgd (175 gpm) of treated water available to the City to supplement their supply and in 1979 an intertie was completed between these water systems. Studies at that time indicated that Long Beach would have sufficient treatment capacity at least through the year 1990 to provide for its own peak use as well as continue to supply 0.25 mgd to the City. However, it was not certain whether Long Beach's surface water supply sources would be capable of delivering this amount of water during periods of drought. The availability of water remained a major concern for the City.

Water quality problems emerged as a second major concern in the 1970s. Total Trihalomethane (TTHM) data collected in 1974 showed that the City's treated water from the Black Lake source contained 250 ppb of TTHMs. Because of TTHM formation of the Black Lake supply and the inadequacy of the available quantity, the City applied for water rights on Indian Creek located approximately 6 miles east of the City. In 1988, a dam and a treatment facility were completed on Indian Creek. The Black Lake source has been abandoned for drinking water use but is available for emergency purposes.

Table 1-1 provides a summary of the water system facilities and their ages.

TABLE 1-1

City of Ilwaco Water History

Water System Facility	First Service Date
160,000 gal. concrete Reservoir(1)	1940s
260,000 gal. wooden Reservoir (City Center)	1970s
50,000 gal. wooden Reservoir (Sahalee)	1970s
Water Treatment Plant	1988
Impoundment Dam	1988
159,000 gal. concrete Reservoir (Indian Creek)	1988
500,000 gal. steel Reservoir (City Center)	1996
New Treatment Plant Filter	1998
400,000 gal. fused Glass Steel Reservoir (Discovery Heights)	2003
Discovery Heights Booster Station	2003
Lakeview Estates Booster Station	2004

(1) Abandoned.

LOCATION

The City of Ilwaco is located in Pacific County on the southern end of the Long Beach Peninsula. The City is near the mouth of the Columbia River, adjacent to Baker Bay. A vicinity map is shown in Figure 1-1. Ilwaco is approximately 60 miles from the county seat of South Bend, and is approximately 200 and 120 miles from the urban centers of Seattle and Portland, respectively.

EXISTING SERVICE AREA

The City provides water service to all residents within the City limits and to some customers outside of the city limits. Figure 1-8 presents the City's service area. The Long Beach Peninsula Coordinated Water System Plan (Economic and Engineering Services, 1985) set the Water Service Area Boundary for the future service area limits for the City of Ilwaco. This plan was never adopted by the County. The current water service area closely approximates the area shown in the Coordinated Water service area, with additional area east of the City. This area is along the City's transmission main to the Indian Creek Treatment Plant, both of which were built after the assignment of service areas in the proposed Coordinated Water System Plan.

The City also provides water to the water systems operated by the Washington State Parks and Recreation Commission (Cape Disappointment State Park) and the U.S. Coast Guard (Cape Disappointment Coast Guard Station).

ADJACENT PURVEYORS

The Ilwaco water system service area is bordered by Cape Disappointment State Park Water System, the Long Beach Water System and the Chinook Water District. The following paragraphs are brief descriptions of each purveyor. The current service area boundaries are shown in Figure 1-2**.**

CITY OF LONG BEACH

The Long Beach water system borders the Ilwaco service area to the north. The City of Long Beach provides water service to the City of Long Beach and Seaview area of unincorporated Pacific County, serving a permanent population of approximately 3,000. The Long Beach Water System is supplied by three surface water sources, Baker Creek, Dohman Creek and Maddicks Creek. Long Beach has water rights to an additional source, Rikkola Creek, which Long Beach may develop as a future source of supply. The City of Ilwaco owns an intertie between the Ilwaco and Long Beach water systems. The intertie includes a 6-inch meters measuring flow in both directions between the two systems. The intertie is currently being used for an interruptible supply between the two Cities, and an interruptible supply agreement has been negotiated. A copy of the agreement is in Appendix C.

CAPE DISAPPOINTMENT STATE PARK

The City of Ilwaco provides water to Cape Disappointment State Park. The supply serves park visitors and staff throughout the year. Cape Disappointment State Park purchases approximately 3 million gallons of water per year from the City. The Cape Disappointment Coast Guard Station is also served from the City's water system and purchases approximately 3 million gallons per year.

The Park and the U.S. Coast Guard station are served by an 8-inch HDPE water main from the Discovery Heights reservoir. Areas of the Park with potable water service, such as the North Head area and Main Gate area have separate meters off of the 8-inch water main. The Coast Guard station is metered on a separate 6-inch meter and has a 50,000-gallon reservoir on site.

CHINOOK WATER DISTRICT

The Chinook Water District serves customers east of the Ilwaco service area on the north shore of Baker Bay, serving a permanent population of approximately 560. The District obtains water from Freshwater Creek and two small, unnamed creeks. There is a 12" x 12" x 12" tee along the transmission line from the Ilwaco Indian Creek Facility to the City of Ilwaco for possible future service to the Chinook Water District. An intertie is not currently provided.

PHYSICAL CHARACTERISTICS OF THE WATER SERVICE AREA

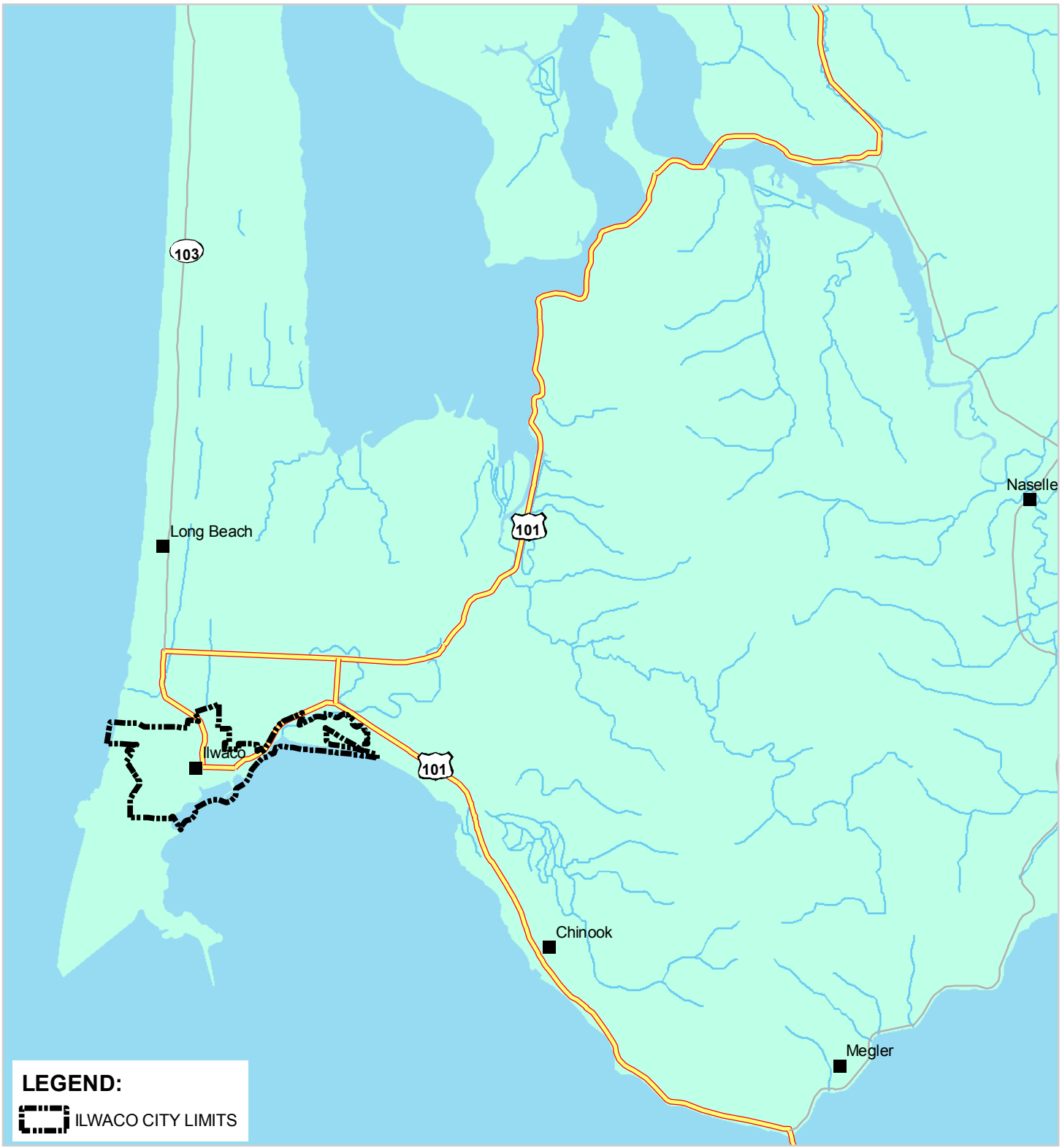
Planning and design of water system facilities can be influenced by physical characteristics such as geography, topography, geology and soils, climate, ground and surface water availability, water quality, and terrestrial/aquatic environmental characteristics. The following sections provide an overview of the physical characteristics of the City of Ilwaco water service area.

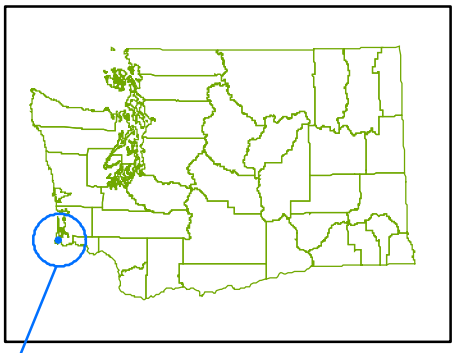
TOPOGRAPHY

The topography of the central portion of the City of Ilwaco is generally flat with a mean elevation of 11 feet above sea level. The outlying area of the City encompasses some very hilly terrain with elevations ranging up to 125 feet in the eastern portion of the City and above 300 feet in the western portion. A topographical map of the Ilwaco area is shown in Figure 1-3.

SOILS

A soil map of the Ilwaco area is shown in Figure 1-4. Specific soils found in the area are described further in the following section.





N

0 10,000 Feet

CITY OF ILWACO

WATER SYSTEM PLAN UPDATE
FIGURE 1-1
LOCATION MAP

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PACIFIC OCEAN

WILLAPA BAY

BAKER BAY

BEAR RIVER

INDIAN CREEK

CITY OF ILWACO
WATER TREATMENT PLANT

WTP

101

101

101

LEGEND:

- ILWACO CITY LIMITS
- RIVERS
- PARCELS

ADJACENT PURVEYORS:

- CAPE DISAPPOINTMENT STATE PARK
- CHINOOK WATER SERVICE AREA
- ILWACO WATER SERVICE AREA
- LONG BEACH WATER SERVICE AREA

N

0 2,500 5,000 10,000 Feet

CITY OF ILWACO

WATER SYSTEM PLAN
FIGURE 1-2
ADJACENT PURVEYORS

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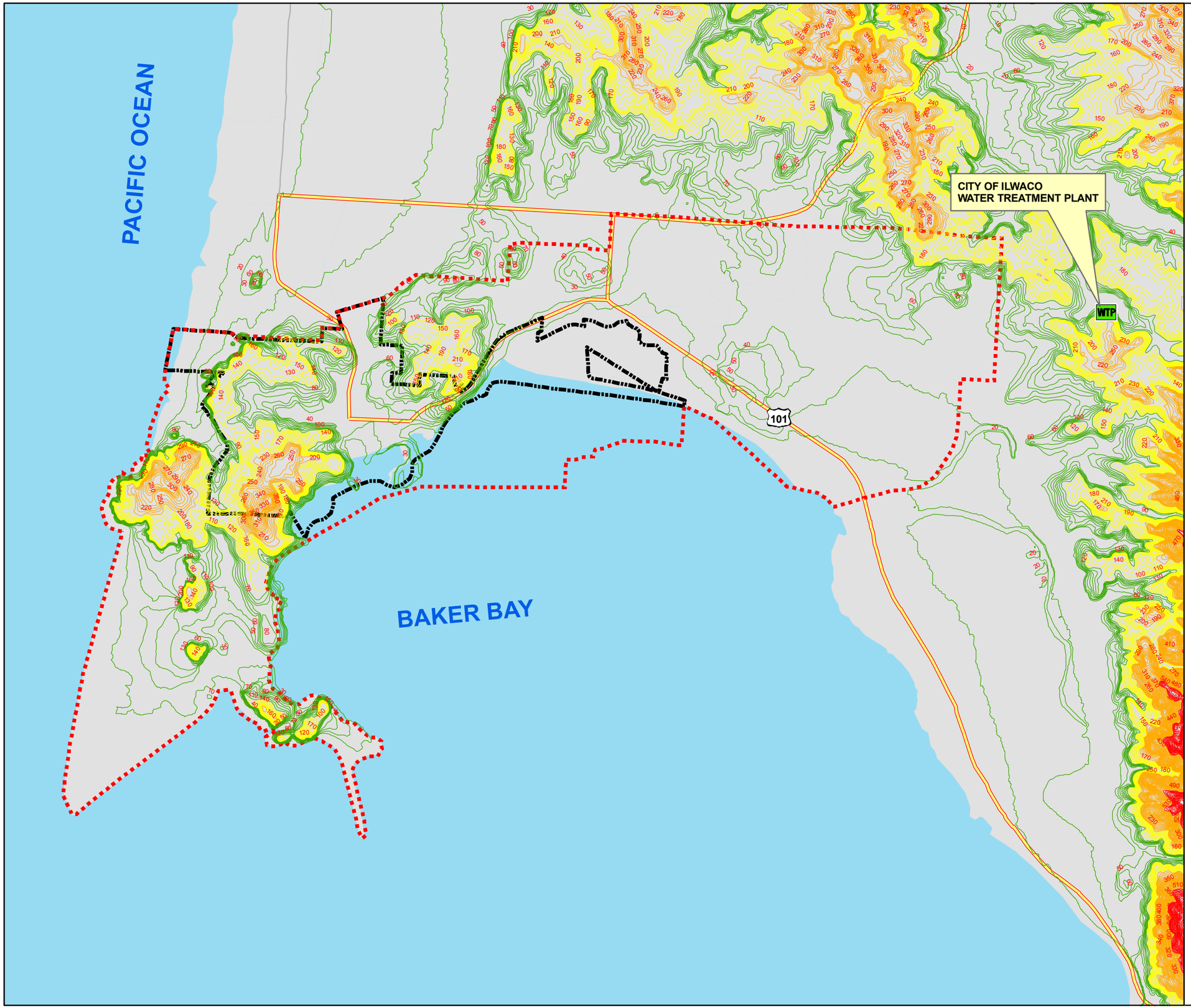

N

0 1,750 3,500 7,000 Feet

LEGEND:

10 FOOT CONTOURS (USGS INTERPOLATED)

ELEVATION:

- 0 - 100 FEET
- 100 - 200 FEET
- 200 - 500 FEET
- > 500 FEET
- WATER SERVICE AREA
- ILWACO CITY LIMITS

CITY OF ILWACO

WATER SYSTEM PLAN
FIGURE 1-3
TOPOGRAPHY

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PACIFIC OCEAN

BAKER BAY

CITY OF ILWACO
WATER TREATMENT PLANT

WTP

LOOP 100

FIRST AVE N

SPRUCE ST E

STATE RT 101 ALT

ROBERT GRAY DR

STRINGTOWN RD

STATE RT 101

CHINOOK VALLEY RD

WALLBURG RD

CHINOOK DIKE RD

101

N

0 1,750 3,500 7,000 Feet

LEGEND:

- ILWACO CITY LIMITS
- WATER SERVICE AREA
- PARCELS

USDA SOILS:

- Astoria silt loam, 3 to 8 percent slopes
- Beaches
- Dune land
- Fluvaquents, tidal
- Ilwaco silt loam, 1 to 8 percent slopes
- Ilwaco silt loam, cool, 1 to 8 percent slopes
- Ilwaco silt loam, cool, 30 to 65 percent slopes
- Ilwaco silt loam, cool, 8 to 30 percent slopes
- Knappton silt loam, 30 to 65 percent slopes
- Knappton silt loam, 65 to 90 percent slopes
- Knappton silt loam, 8 to 30 percent slopes
- Lebam silt loam, 1 to 8 percent slopes
- Lebam silt loam, 8 to 30 percent slopes
- Lebam silt loam, cool, 5 to 30 percent slopes
- Montesa silt loam, 1 to 8 percent slopes
- Netarts fine sand, 3 to 12 percent slopes
- Nuby silt loam
- Ocosta silty clay loam
- Orcas peat
- Palix silt loam, 30 to 65 percent slopes
- Palix silt loam, 65 to 90 percent slopes
- Palix silt loam, 8 to 30 percent slopes
- Palix silt loam, cool, 30 to 65 percent slopes
- Palix silt loam, cool, 65 to 90 percent slopes
- Palix silt loam, cool, 8 to 30 percent slopes
- Pits, quarries
- Rennie silty clay loam
- Salzer silty clay
- Seastrand mucky peat
- Seastrand variant muck
- Sylvia silt loam
- Traham very gravelly loam, 5 to 30 percent slopes
- Udorthents, level
- Umbric Dystrochrepts, very steep
- Vesta silt loam, 1 to 8 percent slopes
- Vesta silt loam, 8 to 30 percent slopes
- Water
- Westport fine sand, 3 to 10 percent slopes
- Willapa silt loam, 1 to 8 percent slopes
- Willapa silt loam, 30 to 70 percent slopes
- Willapa silt loam, 8 to 30 percent slopes
- Willapa silt loam, cool, 1 to 8 percent slopes
- Willapa silt loam, cool, 8 to 30 percent slopes
- Yaquina loamy fine sand

CITY OF ILWACO

WATER SYSTEM PLAN
FIGURE 1-4
SOILS MAP

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PACIFIC OCEAN

BAKER BAY

CITY OF ILWACO
WATER TREATMENT PLANT

WTP

STATE RT 101

STATE RT 101/ALT

CHINOOK VALLEY RD

WALLBURG RD

ROBERT GRAY DR

STRINGTOWN RD

LOOP 100

FIRST AVE N

SPRUCE ST E

CHINOOK DIKE RD

101

N

0 1,750 3,500 7,000 Feet

LEGEND:

- WATER SERVICE AREA
- ILWACO CITY LIMITS
- PARCELS
- WETLANDS

FEMA FLOOD ZONE:

- 100-YEAR FLOODPLAIN

CITY OF ILWACO

WATER SYSTEM PLAN
FIGURE 1-5
CRITICAL AREAS

Gray & Osborne, Inc.
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PACIFIC OCEAN

WOOD RESERVOIR
260,000 GAL

INTERTIE
BOOSTER PUMP STATION

LAKEVIEW
BOOSTER PUMP STATION

STEEL RESERVOIR
500,000 GAL

SPRING STREET
BOOSTER PUMP STATION

SAHALEE
BOOSTER PUMP STATION

SAHALEE RESERVOIR
50,000 GAL

COASTAL RIDGE
BOOSTER PUMP STATION

DISCOVERY HEIGHTS RESERVOIR
400,000 GAL

BAKER BAY

BAKER BAY
BOOSTER PUMP STATION

CITY OF ILWACO
WATER TREATMENT PLANT

INDIAN CREEK RESERVOIR
159,000 GAL

INDIAN CREEK
IMPOUNDMENT

WTP

STATE RT 101

CHINOOK VALLEY RD

WALLBURG RD

CHINOOK DIKE RD

101

N

0 1,750 3,500 7,000 Feet

LEGEND:

- FIRE HYDRANT
- BPS
- PRV
- RESERVOIR

ILWACO WATER LINES:

- UNKNOWN
- 4-INCH
- 6-INCH
- 8-INCH
- 10-INCH
- 12-INCH
- WASHINGTON STATE PARKS WATER LINES
- USCG WATER LINES
- WATER SERVICE AREA
- ILWACO CITY LIMITS
- WATER BODY
- PARCELS

CITY OF ILWACO

WATER SYSTEM PLAN
FIGURE 1-6
WATER SYSTEM BASEMAP

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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To the southwest and west of the downtown core of Ilwaco, the soils are Palix silt loam and Ilwaco silt loam. Both are well drained and are more prone to slipping than eroding. Palix soils are formed in colluvium derived from siltstone, on slopes of 8 to 30 percent, and Ilwaco soils are formed in colluvium derived from sandstone, and sit on slopes of 1 to 8 percent. A small pocket of Salzer soils exist near the City park area. Salzer soils form a silty clay that is very deep and very poorly drained. It is often found in old swales and riverbeds formed from fine textured alluvium. It has very slow permeability with very slow or ponded runoff associated with it.

The area northeast of Ilwaco contains Palix, Lebam, and Ocosta soils. Lebam soils are deep, well drained, derived from siltstone, and found on the uplands on slopes of 5 to 30 percent. Ocosta soils are deep and they drain poorly. They form when clayey alluvium is deposited in quiet waters, and therefore are found on flood plains and deltas protected from tidal overflow.

To the north of Ilwaco, the soils are Palix and Lebam. To the northeast of the City, tracing up the Columbia River coastline, there is Willapa, Palix, and Ocosta soils. Willapa soils are deep, well drained and found on wave-cut marine terraces. It is formed in medium to fine-textured marine sediment.

All the soils found in the Ilwaco area are usually covered with a mat of needles, leaves, and twigs and have a high available water capacity. Although the soils have good drainage characteristics, there is a high water table in the areas along the River, which significantly reduces infiltration.

SURFACE WATER

The surface water resources of the Ilwaco area consist of the Columbia River, specifically Baker Bay, Black Lake, the Wallacut River, and the Pacific Ocean. The western portion of the City borders the Pacific Ocean and Baker Bay lies to the south, at the mouth of the Columbia River. The main channel of the river is approximately three miles south of the City. Another water body within the vicinity is Black Lake, which is situated north of the downtown core and is approximately 32 acres. This lake is categorized as a bog lake, a body of water overlying a layer of peat, and it once served as Ilwaco's primary source of water. Holman Lake, an open water wetland, is found on the west side of downtown and collects drainage from the steeper terrain found within the city limits. The Wallacut River is located in the vicinity of the airport and originates east of the City. This river is sometimes known to flood homes located directly on the river's edge in the Vandalia neighborhood.

Indian Creek provides the surface water source for the impoundment. Indian Creek is a tributary of Bear River. The Bear River discharges into the southern end of Willapa Bay.

GROUNDWATER AND AQUIFER RECHARGE

There are three groundwater aquifers in the Peninsula area. These aquifers are located in the Terrace Deposits and the Upper and Lower Marine Sand Deposits.

The Terrace deposits have been identified in the Ilwaco-Seaview area. This aquifer is composed of alluvium materials ranging from silt to coarse sand with occasional gravel and could form suitable groundwater aquifers if found unweathered below the water table.

Weathering in the upper Terrace Deposits forms an aquitard between the overlying unweathered marine beach deposits and the less weathered, deeper portions of the Terrace Sediments.

The upper marine sand aquifer overlies an intermediate silt and clay aquitard along the Peninsula. It provides water to numerous small, shallow wells throughout the area. This aquifer has a thickness of 80-90 feet at the south end of the Peninsula and thickens to about 120 feet near Ocean Park.

Throughout the Peninsula, there is a sedimentary sequence of sand-clay-sand. These layers were deposited over basalt bedrock, which appears to overlie the older Terrace Deposits. These deposits increase in thickness from the hills east of Long Beach toward the ocean. These deposits also appear to thicken from basalt outcroppings near Ilwaco to Ocean Park where basalt bedrock lies at a depth of 730 feet.

Investigations of groundwater supplies in the Ilwaco/Seaview area established limited groundwater supplies from the three aquifers. The City of Ilwaco conducted a test well drilling program in 1984 to further evaluate the capacity of these deposits. A test well was installed about 2 miles north of Ilwaco, and one mile east of Seaview. The aquifer was found to underlie peat and weathered marine beach deposits at a depth of 53 feet. Water quality in the upper marine sand aquifer is subject to contamination from domestic and agricultural surface activities. These activities include on-site sewage disposal practices in unsewered areas, application of fertilizer and agricultural chemicals, and other activities. Organic material discharged to the aquifer from these land activities and other natural sources are capable of trihalomethane (TTHM) formation when chlorinated. Test wells drilled into the lower marine deposit aquifer indicated a high yield potential but poor water quality due to stagnation and possible saltwater intrusion.

CLIMATE

The Ilwaco area has a mild, maritime climate, which is typical of Washington's Pacific coast. The area's climate is classified as the Marine West Coast type, which is characterized by cool, dry summer and moderate winters with considerable rainfall. Table 1-2 lists climatological data, such as temperature, and precipitation for a 41-year

average. Data from the Long Beach Experimental Station was utilized as the City of Ilwaco lies within the same climate zone as Long Beach.

TABLE 1-2

City of Ilwaco Climatological Data, 1967 – 2008
(Long Beach Experimental Station)

Month	Average Temperature (F°)	Average Precipitation (Inches)
January	42	11.68
February	44	8.59
March	46	8.80
April	48	6.04
May	52	3.79
June	56	2.90
July	56	1.54
August	59	1.85
September	57	3.38
October	51	7.14
November	46	11.21
December	42	12.53
Average	50	
Total (annual average)		79.43

The average annual rainfall within the region for a 41-year period is 79.43 inches.

GEOLOGIC HAZARD AREAS

Geologically hazardous areas are areas that because of their susceptibility to erosion, sliding, earthquakes, or other geological events are not suited to commercial, residential, or industrial development consistent with public health or safety concerns. Typically, landslide hazards in Pacific County are associated with acts of road construction. Landslides are frequent during times of heavy inundation when steep slopes are undercut for roadways. Landslides have been documented along Robert Gray Drive. The hilly portions of the City of Ilwaco contain steep slopes, which may be prone to erosion and landslides.

FLOOD HAZARD AREAS

The 100-year flood plain is shown in Figure 1-5. These boundaries are in accordance with the Federal Emergency Management Agency (FEMA). The boundaries of the 100-year flood plain exist at an elevation of approximately 13 feet (NAVD 1988 datum). Areas within the 100-year flood plain include the entire Port region, much of the southern

portion of the City, as well as areas directly adjacent to Baker Bay. Although FEMA highly recommends against the placement of any structure in the 100-year flood plain, any structure built within the flood plain's boundaries must provide for adequate protection against the 100-year flood (i.e., structures within the floodplain are constructed at a minimum of 1 foot above the flood plain elevation).

WETLANDS

Wetlands are defined as those areas that are inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

The National Wetlands Inventory documents numerous wetlands areas in and around the Ilwaco area. Figure 1-5 illustrates the wetlands identified by the National Wetlands Inventory. Baker Bay is characterized by large tracts of tidal-salt marsh wetlands. The area directly north of Ilwaco is predominantly cranberry wetlands. Areas of forested and scrub-shrub wetlands are found both east of the City and in the west part of the City.

Pacific County has adopted a rating system, which attempts to rate each wetland type by specific function. Specific functions may include wildlife habitat, hydrologic features, commercial value, and aesthetic qualities. Local wetland functions are associated with their relative value to both human and natural land-use activities. Wetland value reflects the worth, utility, or importance of the wetland to provide a public or private service. The suitability rating determines the value of each wetland type to support a particular function. Wetlands are prioritized from Rating No. 1 to Rating No. 4, with Rating No. 1 wetlands considered the most suited for a particular function.

Rating No. 1 – Extremely suited to the specific function or wetland characteristic. Contains high quality, native plant, and animal communities, which are generally only found in these wetland areas. Considered to be of exceptional local significance and may contain kelp, eelgrass beds, shellfish beds, sole source aquifer recharge areas. Possesses the most significant and locally outstanding function for this type of wetland. Existing environmental conditions may be considered rare.

Rating No. 2 – Well-suited for most wetland functions. Contains an important number of wetland characteristics and functions based on diversity and size. Contains fewer functions than in Rating No. 1.

Rating No. 3 – Contains a limited number of functions. Wetland functions may occur on a temporary or seasonal nature. Plant types are considered common with fair to marginal habitat value. These wetlands may have been altered or been previously disturbed. Functions can be reproduced by other means.

Rating No. 4 – Wetlands with little value or function. Plant species are common with minimal wildlife habitat. Not within jurisdiction of the Shoreline Management Act or other federal agencies. May not be of use to passive or active land-use and environmental activities. Includes wetlands that are considered isolated and are less than one acre in size.

Pacific County has developed a wetlands mitigation policy to offset losses of wetland areas. Wetland mitigation should consider the function and value of the wetland in addition to overall area of disturbance. Specific acre-for-acre mitigation measures were not developed by the County. Rather, innovative mitigation techniques should be used to provide both public and private benefit. Mitigation techniques may include providing shoreline access through easements or establishing educational trust accounts for school field trips to educate children about the value and function of local wetlands.

UTILITY SERVICES

The Pacific County Public Utility District No. 2 (PUD) is the electrical power provider that serves the City of Ilwaco. The PUD's goals and future objectives include providing sufficient electrical capacity to meet existing demand for both the incorporated city limits as well as the urban growth area.

CenturyLink provides telecommunication services to the City of Ilwaco. Charter Communications provides cable services. Solid waste collection is provided by Peninsula Sanitation Service.

Water, sanitary sewer, and storm drain systems are provided by the City of Ilwaco.

EXISTING WATER SYSTEM

The following sections provide a description of the water system facilities currently owned and operated by the City of Ilwaco. Figure 1-6 shows the existing facilities within the water system.

WATER SUPPLY SOURCES AND CHARACTERISTICS

The City collects its water from Indian Creek, a tributary of the Bear River. Water is impounded by a dam and treated at an on-site water treatment facility. The dam is designed to impound approximately 847 acre-feet over a 35-acre reservoir at normal pool, 1,022 acre-feet at maximum pool, and 29.48 acre-feet at low pool. The pumping and transmission facilities are designed to handle the maximum projected flow rate of 1.5 mgd. The treatment plant was built with an initial capacity of 1.0 mgd provided by two 0.5 mgd filters. An additional 1.0 mgd filter was commissioned in 1998. This expansion allows the City to supply approximately 1.5 mgd with one 500,000-gpd filter unit out of service.

The water diverted for the City of Ilwaco would otherwise flow into Indian Creek, which is a tributary of the Bear River. The Bear River empties into the southern end of Willapa Bay. Water diverted to the City, however, is treated and discharged into Baker Bay. The Bear River is a minor source of water for Willapa Bay, which is supplied primarily by the North River, Nasselle River, and Willapa River. Willapa Bay is an estuary significant for its fishing, oyster farming, wildlife refuge, and recreational opportunities. The City is required by its water right to bypass a minimum flow into Indian Creek.

WATER RIGHTS

The City's water right certificates and permits are shown in Table 1-3. Copies of the water rights are included in Appendix B.

The water rights summary describes the maximum instantaneous withdrawal and the maximum annual withdrawal. An instantaneous water right represents the maximum pumping capacity of a well or maximum diversion rate for a spring or surface water source. The total instantaneous withdrawal from Indian Creek allowed under these water rights certificates is 2.33 cubic feet per second, which is equal to 1,505,814 gallons per day (gpd). Therefore, the City's production is limited to 1.5 mgd. An annual water right certificate represents the total quantity of water that may be withdrawn or diverted during the entire year. The total annual withdrawal allowed by these water rights is 732 acre-ft/year, which is equal to 653,443 gallons per day.

TABLE 1-3

Indian Creek Water Rights and Reservoir Permit Summary

Date	Type	Number	Maximum Permitted Instantaneous Withdrawal (cfs)	Maximum Permitted Annual Withdrawal (acre-ft/year)	Maximum Permitted Storage (acre-ft/year)
4/24/1995	Permit	S2-29218	0.77	22	N/A
3/4/1991	Water Right Certificate	S2-25880	1.56	710	N/A
6/23/1986	Reservoir Permit	R2-26649	N/A	N/A	1,022

The City's Reservoir Permit provisions require summer and fall stream flows below the dam to be maintained at no less than 2.0 cfs (1,292,544 gpd) and limits reservoir filling to the months of December, January, and February.

TREATMENT

Untreated water is stored in the Indian Creek Impoundment. The 60-foot-high earth dam is 750 feet long at the crest and 400 feet long at the base. The reservoir impounds 29.5 acre-feet (9.6 million gallons) of water at low pool (Elev. 45 feet), 847 acre-feet (276 million gallons) at normal pool (Elev. 90 feet) and 1,022 acre-feet (333 million gallons) at maximum pool (Elev. 94.7 feet). The reservoir covers 5.07 acres at low pool, 35.19 acres at normal pool and 48.39 acres at maximum pool.

In order to mitigate any adverse effects to aquatic spawning and rearing habitat, reservoir filling is limited to December, January, and February, with filling evenly distributed over these months. Stream water is not allowed to be diverted to the reservoir for filling during the salmon migration periods of October/November and March/April/May.

The reservoir has been designed so that 97 percent of the storage capacity can be released by gravity. An 18-inch steel pipe, encased in 10 inches of reinforced concrete, is located at an invert elevation of 22 feet (approximately 15 feet below the dam base). This pipe can remove 97 percent of the storage in a 10 to 20 day time period depending on inflow to the dam. The intake has two inlets that are screened and gated with inclined, hydraulically operated sluice gates. The pipe inlets are located at elevations of 43 and 38 feet.

A 24-inch-diameter flexible pipe and aluminum cover was added to the upper intake structure to allow the operator to selectively withdraw water from a higher water elevation. This “floating” intake is designed to remain 10 feet below the water surface elevation. The intake is held in place by a buoy and is anchored to the upstream embankment in two places by cables attached to concrete blocks. The floating intake is currently inactive and in need of repair. See Chapter 9 for a discussion of proposed water system improvements.

Water is conveyed to the Ilwaco Water Treatment Plant by approximately 1,000 feet of 18-inch and 12-inch raw water transmission line.

When the raw water enters the treatment facility, a flow-through turbidimeter measures the raw water turbidity. The City adds alum, soda ash, polymer, and potassium permanganate to ensure the removal of turbidity, iron, and manganese required to provide a high quality finished water and meet regulatory standards. The amounts of water treatment chemicals vary, depending on the varying raw water quality.

After chemical addition, the water flows to the treatment units, Filter Nos. 1, 2, and 3 for flocculation, coagulation, and filtration. Filter Nos. 1 and 2 are 350-gpm Mircofloc flocculation, sedimentation, and mixed media filter units. Filter No. 3 is a 700-gpm US Filter/Microfloc upflow clarifier and filter unit. Currently, water can be directed to either Filter Nos. 1 and 2 or Filter No. 3. The City has been using Filter No. 3 exclusively for

several years. The City is in the process of repairing Filter Nos. 1 and 2 into operational condition.

The upflow clarifier for Filter No. 3 provides in-bed coagulation, flocculation, and initial solids removal. The adsorption clarifier is an upflow process, with four feet of buoyant clarification media held by a retaining screen. Chemicals added to the raw water create floc that adsorbs to the chemically inert clarifier media. The water enters the tank through an influent flow control valve. The valve is throttled to maintain a constant flow into the clarifier section. The chemically treated water flows upward through the adsorption media and the media retainer. The water is distributed by the influent header and by the headloss through the media. It then flows over the trough weir and onto a mixed media filter.

In Filter Nos. 1 and 2, chemically treated water enters the flocculation basin. Flocculation is accomplished by two slowly rotating paddle wheels. The flocculated water flows into the sedimentation chamber containing tube settlers. The water flows up through the tube settler modules and then into the mixed media filters.

In all of the City's treatment units, the filtration system in the mixed media beds is comprised of a mixed media filter bed. This filter bed is made up of anthracite coal, silica sand, and special high density sand. The layers in the filter bed have different densities so that the low density media remains on the top, and the high density media remains on the bottom of the filter. The headloss across the media is low, about 1-1.2 feet at design flow.

The filter bed is supported by gravel of several sizes, which covers the header-lateral underdrain system. The filtered water is uniformly collected by the underdrain and flows to the clearwell.

The operation and maintenance of the treatment system are discussed in detail in Chapter 7.

INTERTIES

The City has one intertie with the City of Long Beach. The intertie, which is owned by the City, is located west of Black Lake where a 6-inch PVC waterline owned by the City connects to a 10-inch PVC waterline owned by the City of Long Beach. The Cities of Long Beach and Ilwaco have entered into an agreement dated August 15, 2000, regarding the use of this intertie. The hydraulic gradeline of the Long Beach and Ilwaco water systems at the intertie are 143 and 157 feet, respectively. Water transferred from Long Beach into the City's system must therefore be pumped through the Intertie Booster Station, which is owned by the City.

The Chinook Water District has proposed to construct a future intertie with the City's system in its 1995 Water System Plan. This intertie would be used to supplement

Chinook Water District's source capacity. There is currently no agreement or timeline for this future intertie.

STORAGE

The City owns five active storage reservoirs that are used to meet peak demands, provide fire flow storage, and create adequate system pressures. The 160,000-gallon concrete reservoir in the City Center zone has been permanently abandoned since the time of the last water system plan update in 2003. A new 400,000-gallon reservoir was brought online in 2003. This reservoir serves the development at Discovery Heights and provides storage capacity for the Cape Disappointment State Park and the U.S. Coast Guard Station. This reservoir will also be connected to the Sahalee subdivision to provide greater pressure and fire protection. The 400,000-gallon reservoir is connected to the existing lower pressure zone with a pressure sustaining/reducing valve to allow this reservoir to supply water to the lower pressure zone in event of a fire or large water demand. A summary of the storage facilities is shown in Table 1-4.

TABLE 1-4

Storage Facilities

Name	Type	Zone	Capacity (gallons)	Year Constructed	Height (ft.)	Diameter (ft)	Overflow Elevation (ft)
Sahalee	Wood	275[(1)]	50,000	1970s	14	25	275
City Center	Steel	157	500,000	1996	28	60	157
City Center	Wood	157	260,000	1970s	20	48	157
Indian Creek	Concrete	160	159,000	1988	32	30	160.5
Discovery Heights	Glass-fused Steel	339	400,000	2003	28	50	339

(1) Zone will increase to 339 when the connection to the Discovery Heights Reservoir is complete.

PRESSURE ZONES

The City's service area is composed of six pressure zones. These zones are shown in Figure 1-7.

The Indian Creek Zone (HGL = 160 ft) serves customers in the Water Service Area east of the Baker Bay Booster Pump Station. Storage in this zone is provided by the Indian Creek Concrete Reservoir, which is fed directly by the City's water treatment plant.

The City Center Zone (HGL = 157 ft) serves the City's core. Storage for this zone is provided by all of the City Center reservoirs. Supply for this zone is provided by the

Baker Bay Booster Pump Station, which is an in-line booster station on the transmission line from the City's water treatment plant in the Indian Creek zone.

The Lakeview Estates Zone (HGL = 317 ft) is a small closed zone that is fed by the City Center Zone via the Lakeview Estates Booster Pump Station.

The Sahalee Zone (HGL = 275 ft) serves the Sahalee subdivision. Storage for the zone is currently provided by the Sahalee Reservoir. Supply for the zone is currently provided by the Sahalee Booster Pump Station. The City plans to connect this zone to the Discovery Heights zone and abandon the Sahalee Booster Pump Station and Reservoir.

The Discovery Heights Zone (HGL = 339 ft) serves the Discovery Heights development, as well as the Cape Disappointment State Park and U.S. Coast Guard Station. Storage for the zone is provided by the Discovery Heights Reservoir. Supply for the zone is provided by the Spring Street Booster Station.

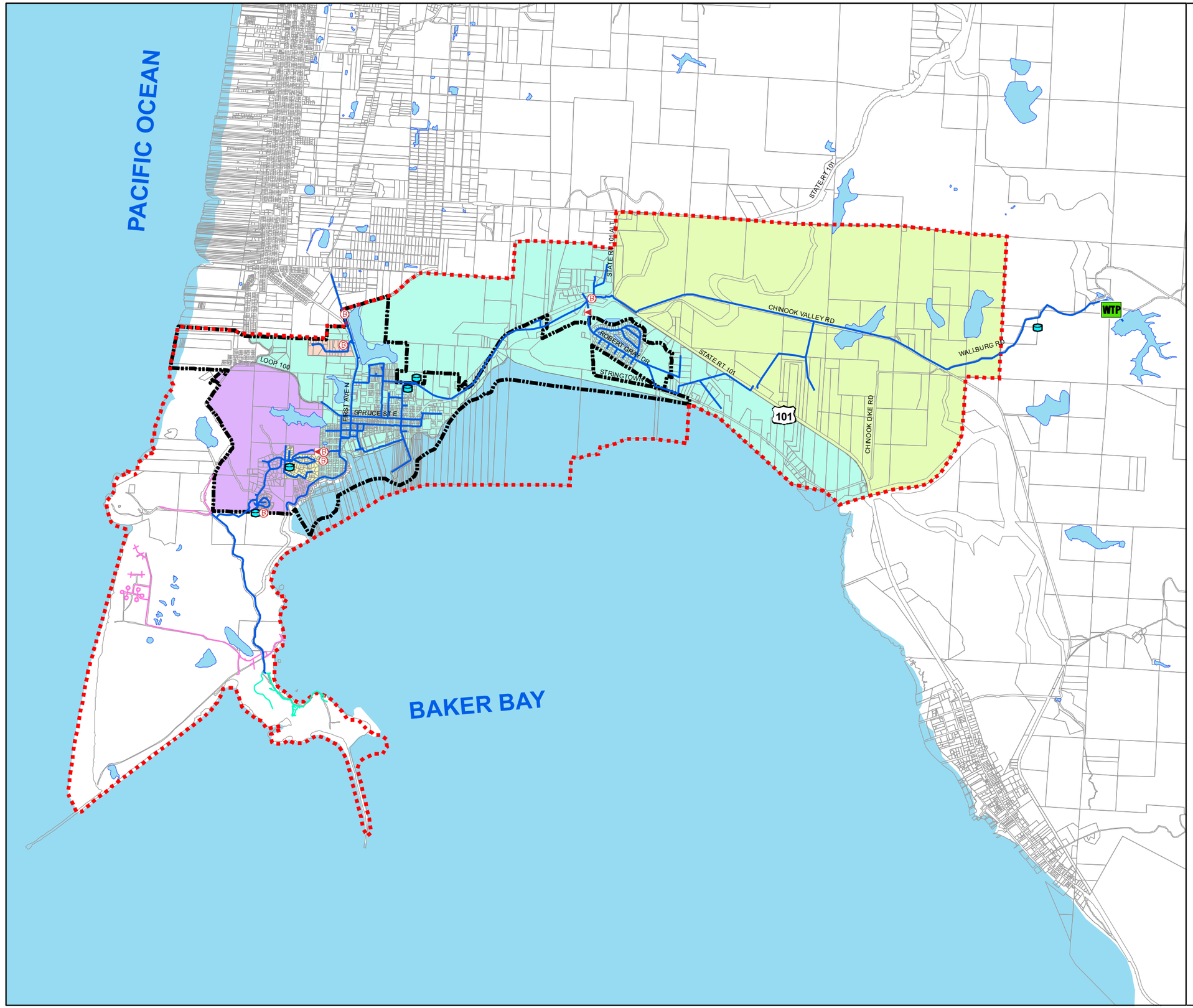
The Coastal Ridge Zone (HGL = 547 ft) serves the Coastal Ridge Townhouse Village near the discovery Heights Reservoir. This zone is a small closed zone that is fed by the Discovery Heights Zone via the Coastal Ridge Booster Pump Station.

The area in the northwest portion of the City's Water Service Area is currently undeveloped. Because of the elevations throughout this area, a new pressure zone or extension of the Discovery Heights zone would be needed to serve the area.

BOOSTER STATIONS

The City's system contains five booster pump stations: the Baker Bay Booster Pump Station, the Spring Street Booster Pump Station, the Sahalee Booster Pump Station, the Lakeview Estates Booster Pump Station, and the Intertie Booster Pump Station. A summary of the City's booster pumps is shown in Table 1-5.

The Baker Bay Booster Pump Station is located along Highway 101 at Stringtown Road. The station contains three centrifugal pumps providing a total capacity of 950 gpm. Pump No. 1 is a 10-hp pump with a capacity of 190 gpm. Pump Nos. 2 and 3 are 20-hp pumps, each with a capacity of 380 gpm. The booster pumps are controlled by a pressure transducer in either the 260,000-gallon wood reservoir or 500,000-gallon steel reservoir in the City Center. The choice of which reservoir to use to control the booster pump station is selected by the operator. The signal is sent to a PLC at the booster pump station that activates the pumps when certain water levels are reached. Currently, emergency power to operate these pumps in case of a power outage can be provided by the City's portable generator. The City can gravity feed from the clearwell pumps at the water treatment plant and supply between 275 and 300 gpm to the distribution system in the event that the booster station is not operable.



N

0 1,750 3,500 7,000 Feet

LEGEND:

- BPS
- PRV
- RESERVOIR
- ILWACO WATER LINES
- WASHINGTON STATE PARKS WATER LINES
- USCG WATER LINES
- WATER SERVICE AREA
- ILWACO CITY LIMITS

PRESSURE ZONES:

- CITY CENTER (157 FT)
- COASTAL RIDGE (574 FT)
- DISCOVERY HEIGHTS (339 FT)
- INDIAN CREEK (160 FT)
- LAKEVIEW ESTATES (317 FT)
- SAHALEE (275 FT)
- WATER BODY
- PARCELS

CITY OF ILWACO

WATER SYSTEM PLAN
FIGURE 1-7
PRESSURE ZONES

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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The Sahalee subdivision is currently served by the Sahalee Booster Pump Station and Reservoir. Several residences require individual booster pumps to assure adequate pressure. The Sahalee subdivision will be connected to the Discovery Heights Reservoir. When this occurs the individual booster pumps will not be necessary and the Sahalee Booster Pump Station and Reservoir will be abandoned.

The Spring Street Booster Pump Station provides water from the City Center zone to the Discovery Heights zone. This booster station pumps into an open zone and provides domestic flows only. The station is equipped with two 500-gpm booster pumps and a chlorination system, which provides additional chlorination as needed to maintain the desired chlorine residual in the Discovery Heights zone.

The Coastal Ridge Booster Pump Station provides water from the Discovery Heights zone to the Coastal Ridge Townhouse Village. This booster station pumps into a closed zone and provides domestic and fire flows. The station is equipped with two 60-gpm domestic booster pumps that pump to a hydraulic gradeline of 510 feet and one 1,000-gpm fire flow pump. The station capacity with both domestic pumps running is 108 gpm.

The Lakeview Estates Booster Pump Station serves the Lakeview Estates zone, which is a closed zone with no storage. This station is equipped with a 500-gpm fire pump and a 45-gpm domestic pump. These pumps are controlled by the station discharge pressure.

The Intertie Booster Pump Station pumps water, when required, from the Long Beach water system into the City's water system and vice versa. This station is equipped with two pumps with a capacity of 400 gpm each. This station is operated manually by the operator when needed.

TABLE 1-5

Booster Station Inventory

Booster Station	Date of Construction	Number of Pumps	Total Capacity	Motor Power
Baker Bay	1988	3	1,150 gpm	1 @ 10 hp 2 @ 20 hp
Sahalee	1960s	1	150 gpm	1 @ 10 hp
Spring Street	2003	2	500 gpm	2 @ 60 hp
Coastal Ridge	2005	1 Fire 2 Domestic	1,000 gpm 108 gpm	1 @ 40 hp 2 @ 5 hp
Lakeview Estates	2003	1 Fire 1 Domestic	500 gpm 45 gpm	1 @ 40 hp 1 @ 3 hp
Intertie	1980s	2	800 gpm	2 @ 15 hp

DISTRIBUTION SYSTEM

The City's current distribution system is composed of 86,520 lineal feet of water lines, over 16 miles of pipe. Table 1-6 shows the distribution system inventory by pipe diameter. The majority of water lines were installed in the 1970s. Distribution lines in the port area, along Lake and Spruce Streets, from the main reservoirs and from the Baker Bay Booster Station to the main part of the City have been replaced since 1995. The waterlines serving the Discovery Heights development, Cape Disappointment State Park, and the Coast Guard were installed in 2003.

TABLE 1-6

Pipe Lengths by Diameter

Pipe Diameter	Length of Pipe in System (lineal feet)	Percent of System
4	1,158	1.3%
6	25,549	29.5%
8	15,698	18.1%
10	16,473	19.0%
12	27,642	31.9%
16	1,158	1.3%
Total	**86,520**	**100.0%**

Currently, the City has 76 hydrants located within the water system.

RELATED PLANNING DOCUMENTS

2010 PACIFIC COUNTY FINAL DRAFT COMPREHENSIVE PLAN

Pacific County's Final Draft Comprehensive Plan was approved by the County in August 2010. This plan is the guiding document for how the County plans to develop future growth and development over the next 20 years. The County's Comprehensive Plan applies to areas within the Water Service Area that are outside the City's corporate boundaries.

1985 LONG BEACH PENINSULA COORDINATED WATER SYSTEM PLAN

This plan, completed in 1985, recommended that the City apply for water rights from Indian Creek, construct a treatment facility and reservoir at Indian Creek, and abandon the Black Lake Source. All of these recommendations were implemented. The Coordinated Water System Plan was not adopted by Pacific County.

1997 CITY OF ILWACO COMPREHENSIVE PLAN

The City of Ilwaco adopted its Comprehensive Land Use Plan in 1994 and updated it in 1997. The Comprehensive Plan is a planning document with goals and objectives enforced by City codes. One of the goals of the Comprehensive Plan was "To upgrade and improve public facilities such as the sewer treatment plant, water system, and roads."

The policies of the Comprehensive Plan that pertain to the water system include the following:

- New development will be allowed only when and where all public facilities are adequate, and only when and where such development can be adequately served by public facilities without reducing the level of service elsewhere.

- If probable funding falls short of meeting existing needs, the City should reassess the capital facilities plan to ensure that all elements are coordinated and consistent.

- The six-year financing plan to finance identified capital facilities would be updated annually.

- The City will maintain financial policies, which will ensure future population pays its fair share of the cost of capital improvements by assessing new development for the cost of extending services.

- The City will actively pursue state/federal financial assistance for capital projects, which will allow for the leveraging of local funds.

- The City will implement the recommendations of the Water System Plan to address existing deficiencies and future needs.

- The City will establish ratemaking policies that encourage water conservation.

The Comprehensive Plan recommended that conservation objectives be made a part of the ratemaking process, and also indicated that the City would look for ways to encourage conservation, such as highly visible education programs.

The Comprehensive Plan addressed assessment of new development. The Comprehensive Plan indicates that new development will pay the greater share of the incremental cost of extending water and sewer services, improving and developing infrastructure. The Comprehensive Plan indicates that this can be accomplished through a number of mechanisms including:

- Establishing a capital facilities charge, to assess new customers for their fair share of the current system.

- Extracting the necessary income from new customers to pay for their share of incremental capital costs system expansions and infrastructure improvements and development through the assessment of impact fees or connection charges.

- Requiring developers to contribute to the cost of water and sewer extensions or road improvement or construction, either through a cash settlement, or by building the improvements as part of the development plan.

- Considering the formation of an LID to fund the necessary improvements where a particular improvement will benefit only a portion of the population. This is especially relevant in the case where a new development is proposed and seeking to be served, the City could require that an LID be in place to fund the appropriate capital improvements. This way the value of the land can support the infrastructure development while reducing the impact on rate payers without affecting the City's ability to use general obligation debt or special levies supported by property tax revenues.

The goals of the Capital Facilities Element of the Comprehensive Plan are:

1. Ensure that the City has the necessary financial capacity to fund current and future capital improvements, while maintaining an equitable balance between the burden of providing new facilities and the beneficiaries of those facilities.

2. Provide the capital facilities needed to adequately serve future growth within projected funding capabilities.

3. Coordinate timing, expansion and location of public facilities to meet present demand and allow for future growth in a cost-effective manner.

2003 CITY OF ILWACO WATER SYSTEM PLAN

This document is a complete description of the City's water system in 2003. All components of the system are described and analyzed and a recommended list of capital improvements was created. Department of Health approved the plan and it was adopted by the City.

2006 REGIONAL JOINT OPERATIONS FEASIBILITY STUDY

This document was prepared by Gray & Osborne for the City of Long Beach at the request of the Department of Health to evaluate the potential for joint management, governance, and/or operations of water treatment facilities by the City of Long Beach, City of Ilwaco, and Chinook Water District. The recommended alternative of the analysis was for the three purveyors to continue to operate their own treatment plants and enter into an Interagency Cooperative Agreement to share resources and services. The analysis notes that future conditions, such as a decrease in available supplies, may increase the benefits of a regional solution to water supply.

AGREEMENTS

Agreements pertaining to the City's water system are given in Appendix C and summarized below.

LONG BEACH

The City has an interruptible supply agreement with the City of Long Beach. This agreement outlines the terms of water supply between the two purveyors. The intertie between the two systems allows water supply to be provided from either system to the other as needed.

WASHINGTON STATE PARKS

The City has an agreement with the Washington State Parks and Recreation Commission (Parks) to provide water supply to Cape Disappointment State Park. The City also has an agreement with Parks providing easements along the City's waterlines inside the park for maintenance.

LONGVIEW TIMBER

A portion of the land near the City's watershed was purchased by Longview Timber, LLC, from the Weyerhauser Company. The City's real estate contract with Weyerhauser to purchase land for the watershed included Timber Reservations and Timber Management Covenants that reserve the right to harvest timber from a portion of the watershed through 2027. This agreement is further discussed in the Watershed Control Program given in Chapter 6.

DISCOVERY HEIGHTS DEVELOPMENT AGREEMENT

The City entered into a development agreement with MSW Venture, LLC, regarding development of the Discovery Heights area. The agreement outlined the City's and developer's responsibilities for the water system utilities within the development.

SERVICE AREA CHARACTERISTICS

The City of Ilwaco water service area encompasses approximately 7,307 acres. The service area includes the City's entire Urban Growth Area, which is all incorporated into the City, as well as outlying rural areas along the City's existing distribution system.

RETAIL SERVICE AREA

The City's retail water service area, as described in the Municipal Water Law, is shown in Figure 1-8.

The City acknowledges that it has a duty to serve all new connections within its retail service area if:

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

WHOLESALE SERVICE AREA

The City's wholesale service area includes Cape Disappointment State Park, which is served by an intertie with the City.

The City also has an agreement with the City of Long Beach for the two purveyors to provide wholesale water to each other on an interruptible, as-needed basis. The City's intertie with the City of Long Beach is typically only used during emergencies.

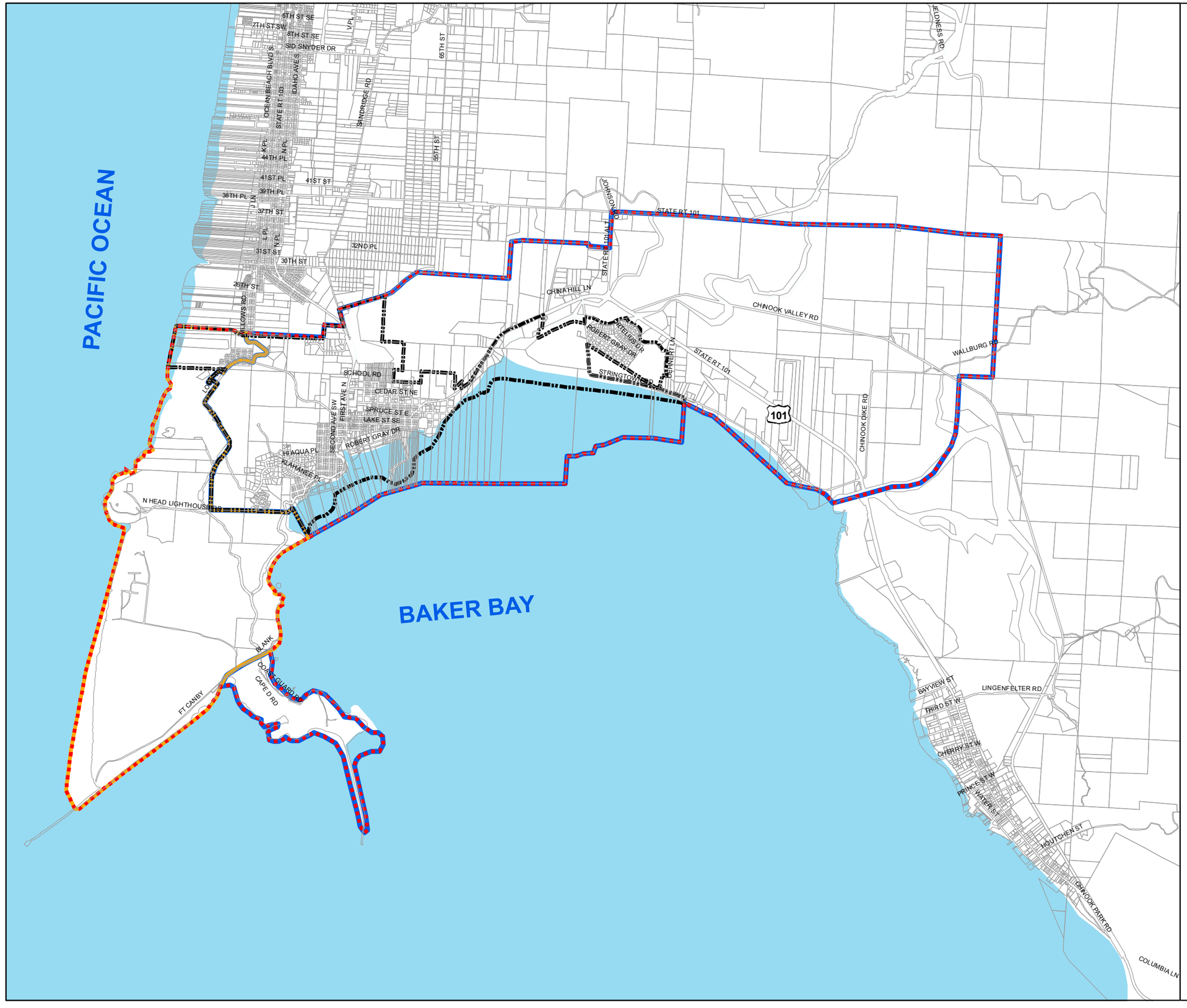
FUTURE SERVICE AREA

The City does not anticipate expanding its water service area beyond the water service area boundaries identified above.

EXISTING LAND USE

The City of Ilwaco has a relatively compact, older downtown core surrounded by a larger low-density residential and mixed-use area. Directly south of the downtown area is the Port of Ilwaco and Ilwaco harbor. The City limits extend east to Vandalia area and west to Cape Disappointment State Park and north to Black Lake.

The primary document for growth and land use decisions in Ilwaco is the July 1997 *City of Ilwaco Comprehensive Plan*. The 1997 Plan addresses the problems associated with


PACIFIC OCEAN
BAKER BAY
5TH ST SE
7TH ST SW
6TH ST SE
SID SNYDER DR
V PL
OCEAN BEACH BLVD
IDAHO AVE S
STATE RT 100
SANDRIDGE RD
65TH ST
55TH ST
K PL
N PL
44TH PL
41ST PL
41ST ST
39TH PL
38TH PL
37TH ST
L PL
32ND PL
31ST ST
30TH ST
28TH ST
WILLOWS RD
JOHNSON RD
STATE RT 101/ALT
STATE RT 101
CHINA HILL LN
CHINOOK VALLEY RD
ROBERT GRAY DR
RIEFLIN DR
STRINGTOWN RD
BENNETT LN
WALLBURG RD
101
CHINOOK DIKE RD
SCHOOL RD
CEDAR ST NE
SPRUCE ST E
LAKE ST SE
FIRST AVE N
SECOND AVE SW
HAQUA PL
KLAHANEE PL
N HEAD LIGHTHOUSE RD
BLANK
COAST GUARD RD
CAPE D RD
FT CANBY
BAYVIEW ST
THIRD ST W
CHERRY ST W
PRINCE ST W
WATER ST
HOUTCHEN ST
CHINOOK PARK RD
COLUMBIA LN
N
0
1,750
3,500
7,000
Feet
LEGEND:
ILWACO CITY LIMITS
WATER SERVICE AREA
WHOLESALE SERVICE AREA
RETAIL WATER SERVICE AREA
PARCELS
CITY OF ILWACO
WATER SYSTEM PLAN
FIGURE 1-8
WATER SERVICE AREA BOUNDARY
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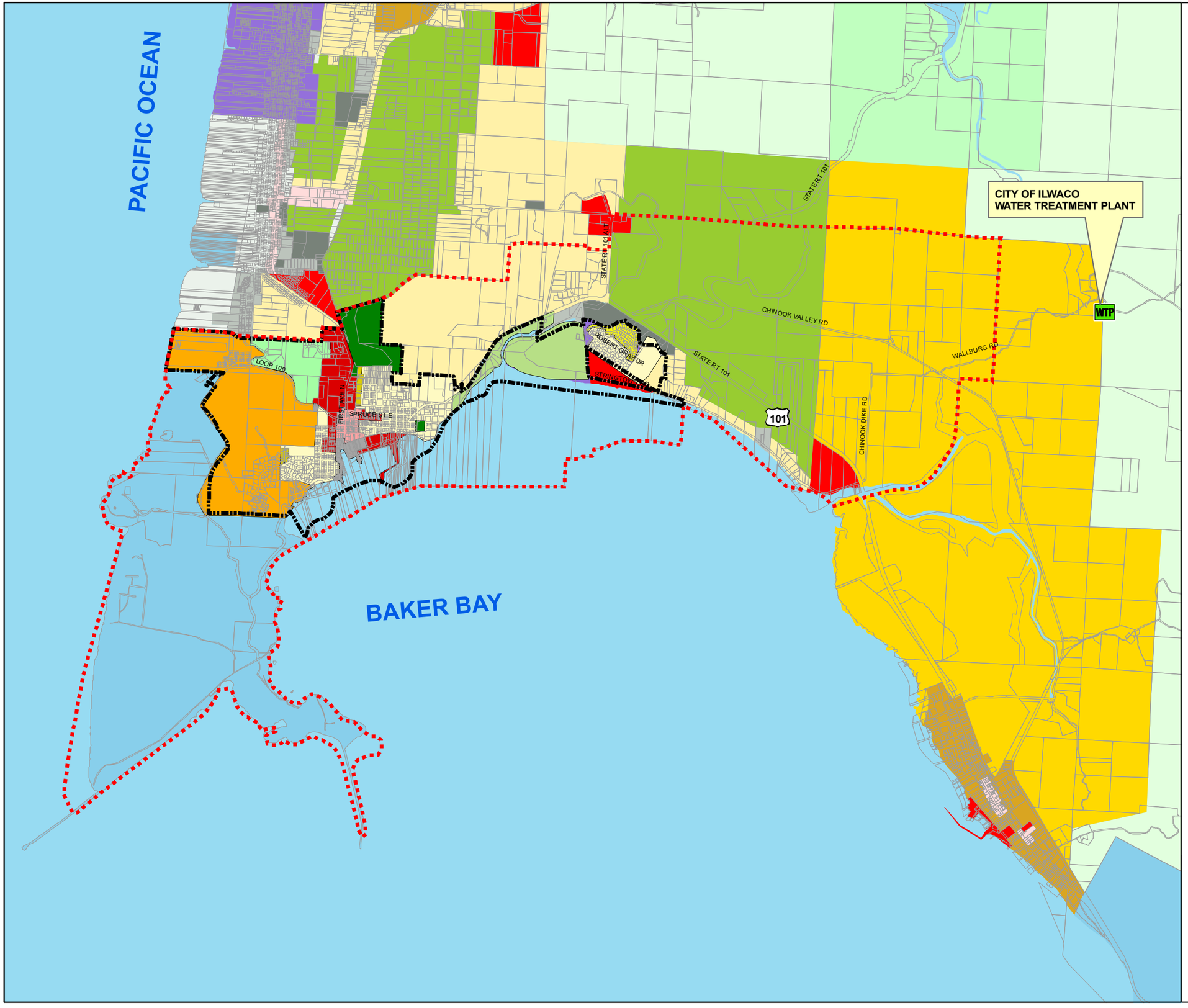

N

0 1,750 3,500 7,000 Feet

LEGEND:

- WATER SERVICE AREA
- ILWACO CITY LIMITS
- PARCELS

CITY OF ILWACO ZONING:

- Core Commercial
- Low Density Commercial
- Light Industrial
- Park
- Single Family Residential
- SFR - Manufactured Home
- Multi-Family
- Resort Residential
- Recreation Residential
- Recreation

PACIFIC COUNTY ZONING:

- Agricultural (AG)
- Community Commercial (CC)
- Conservation (CD)
- Commercial Forest (F-C)
- FT
- Industrial
- Mixed Use (MU)
- MU
- Rural Lands (RL)
- Restricted Residential (R-1)
- General Residential (R-2)
- Resort (R-3)
- RL
- Rural Residential (RR)
- Remote Rural (RR-1)
- Shoalwater Tribe
- TMIX
- Transitional Forest (F-T)
- Incorporated

CITY OF ILWACO

WATER SYSTEM PLAN
FIGURE 1-9
ZONING

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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residential and recreational subdivisions and the ability to maintain a rural lifestyle that is valued by Ilwaco residents. A rural lifestyle is characterized by a variety of low-density neighborhoods and developments, concentrations of residential buildings surrounded by open space, as in planned unit developments, and commercial development, which is generally, limited to growth areas and convenience centers. With this objective in mind, zoning for the City of Ilwaco is implemented through the City's Zoning Ordinance, which was originally adopted in 1972 and later revised in 1999 and 2003. The zoning for the City of Ilwaco (see Figure 1-9) is separated into the classifications shown in Table 1-7.

TABLE 1-7

City of Ilwaco Land Use Classifications

Land Use Category	Acres
Single-Family Residential, R-1	291
Single-Family Residential, Manufactured Home R-1S	25
Multi-Family Residential, R-2	11
Resort Residential, R-3	406
Recreation Residential, R-4	158
Recreation, R-5	91
Core Commercial, C-1	23
Low-Density Commercial, C-2	120
Light Industrial, M-1	8
Park, P	92
TOTALS	**1,225**

SERVICE AREA POLICIES AND CONDITIONS OF SERVICE

DESIGN STANDARDS

The City of Ilwaco has adopted developer standards that cover improvements to the City's water system. These design standards are given in Appendix D.

APPLICATIONS FOR NEW SERVICE

Applications for new service by the City's water system must be made in writing.

The applicant will incur connection charges for the new service as outlined in Chapter 9. The costs of water main extensions or upsizing to accommodate the new service will also be borne by the applicant.

The City is a municipal water supplier as defined in RCW 90.03.015, and therefore has a duty to provide retail water service within its retail service area if:

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

Applicants may dispute decisions regarding water service connections or extensions by filing an appeal with the City Council.

ADDITIONAL SERVICE AREA POLICIES

DOH has established a list of service area policies that will be addressed in a water system plan. These policies guide the development of the water system and provides direction as to how a utility will respond to requests for water service within its service area. Table 1-8 provides a list of these DOH policies and descriptions and the City's policies.

TABLE 1-8

Service Area Policies

DOH Policy Name	Policy Description	City of Ilwaco Policy	Source
Wholesaling Water	Will the City provide water to other utilities on a wholesale basis?	The City provides water to the City of Long Beach and Washington State Parks on a wholesale basis. Agreements concerning these wholesale supplies are given in Appendix C.	City of Ilwaco Agreements
Annexation Policy	How annexation relates to the provision of water service.	a) Only properties within the UGA can annex to the City. b) New development allowed only when and where public facilities are adequate. c) The City will maintain financial policies which ensure future population pays its fair share of the cost of capital improvements by assessing new development for the cost of extending services	a) Ilwaco Municipal Code (IMC) 15.90 b) 1997 City Comprehensive Plan c) 1997 City Comprehensive Plan
Direct Connection and Remote System Policy	New developments directly connect to existing water system, or whether satellite systems will be allowed.	Satellite systems are not allowed. The ownership and all necessary easements of all developer constructed water systems must be transferred to the City to enable the City to operate and maintain the system	IMC 15.76.010
Design and Performance Standards Policy	Minimum design and performance standards for development	All proposed developments must comply with standards and specification of the City. The City's design standards include the APWA Standard Specifications and DOH Design Manual.	IMC 15.76.170 and City of Ilwaco Development Standards

TABLE 1-8 – (continued)

Service Area Policies

DOH Policy Name	Policy Description	City of Ilwaco Policy	Source
Surcharge for Outside Customers	A surcharge for customers outside of its corporate boundaries.	The City of Ilwaco imposes a 50 percent surcharge on monthly utility rates for service outside of the corporate boundaries.	Ilwaco Resolution No. 2010-09
UGA	Responsibility for service provided in UGA, how provided, and how financed.	a) New development allowed only when and where public facilities are adequate. b) The City will maintain financial policies which ensure future population pays its fair share of the cost of capital improvements by assessing new development for the cost of extending services	a) 1997 City Comprehensive Plan b) 1997 City Comprehensive Plan
Late-Comer Agreements	Allows late-comer agreements for those who propose to extend the water system and provides provisions for pay back.	Decided on a case by case basis.	--
Oversizing Policy	Provides funds to install larger than needed facilities to allow for future development, if needed.	The City does not currently have an established oversizing policy for water.	--
Cross-Connection Control Program	Regulates cross-connections and includes steps taken if a cross-connection is discovered.	All residential and commercial customers are surveyed as to the existence of cross connections. The City will determine the type of protection required. Annual testing of devices required.	Cross-Connection Control Program, Appendix K

TABLE 1-8 – (continued)

Service Area Policies

DOH Policy Name	Policy Description	City of Ilwaco Policy	Source
Extension Policy	Regulates extension of the system, including identity of responsible party. Design standards and payment included in conditions of service.	a) New development allowed only when and where public facilities are adequate. b) The City will maintain financial policies which ensure future population pays its fair share of the cost of capital improvements by assessing new development for the cost of extending services c) The ownership and all necessary easements of all developer constructed water systems must be transferred to the City to enable the City to operate and maintain the system d) All proposed developments must comply with standards and specification of the City. The City's design standards include the APWA Standard Specifications and DOH Design Manual	a) 1997 City Comprehensive Plan b) 1997 City Comprehensive Plan c) IMC 15.76.010 d) IMC 15.76.170 and City of Ilwaco Development Standards
Satellite Management Agencies	Is purveyor approved as a Satellite Management Agency?	The City does not intend to become a Satellite Management Agency	--

CHAPTER 2

BASIC PLANNING DATA

INTRODUCTION

Basic planning data essential for assessment of the City's water system demands are presented in this chapter. The information includes historical water demands, anticipated growth, water demand projections, and production quantities. This data is used to project future population, customer growth, and associated water demands over the planning period. This information is used in future chapters to evaluate the condition of the existing water system and determine future needs based on anticipated growth.

EXISTING POPULATION, SERVICES, AND WATER DEMAND

POPULATION

The City's water service area is comprised of the City's entire Urban Growth Area, as well as adjacent areas in unincorporated Pacific County. While it is not inclusive of the entire water service area, the City's population contains the majority of the customers and provides the best indication of population growth within the water service area. Table 2-1 presents the Washington State Office of Financial Management's (OFM) historical population estimates for the City of Ilwaco.

TABLE 2-1

Historical Population for the City of Ilwaco

Year Range	Population	Annual Growth Rate
2000	950	-
2001	950	0.0%
2002	945	-0.5%
2003	940	-0.5%
2004	955	1.6%
2005	975	2.1%
2006	1,015	4.1%
2007	1,040	2.5%
2008	1,070	2.9%
2009	1,070	0.0%
2010	1,115	4.2%

SERVICE CONNECTIONS

The City provides water to customers located both inside and outside of the City limits. The number of service connections to the City's water system is shown by customer class in Table 2-2.

In addition to the City's full-time population, a significant number of people visit the City in the summer months for recreational activities. These visitors are often temporary water users at the City's hotels, motels, and RV Parks, as well as at Cape Disappointment State Park.

TABLE 2-2

Service Connections

Customer Classification	Number of Service Connections
Single-Family Residential – Inside City	508
Single-Family Residential – Outside City	48
Commercial – Inside City	140
Commercial – Outside City	2
Transient Units (Hotels, Motels, RVs)	280
Total	**978**

WATER USE DATA COLLECTION

Production History

The City records the discharge of treated water from its water treatment plant on a daily basis. A summary of the City's annual gross water production, average day production, and maximum day production is shown in Table 2-3.

As shown in Table 2-3, the City's production peaked in 2004, after which it returned to historical average levels.

TABLE 2-3

Metered Water Production

Year	Total Annual Production (MG)	Average Daily Production (mgd)	Maximum Day Production (mgd)	Ratio
2003	167.6	0.46	0.93	2.03
2004	203.2	0.56	0.94	1.68
2005	161.0	0.44	0.86	1.96
2006	99.6	0.27	0.82	2.99
2007	102.3	0.28	0.76	2.71
2008	111.0	0.30	0.63	2.07
2009	103.6	0.28	0.72	2.54
2010	128.9	0.35	0.70	1.98

Maximum Day Production

The City's maximum day production for the years 2003 through 2010 is shown in Table 2-3. The peaking factor, also known as maximum day to average day ratio, identifies the relation between the maximum day production and average day production. The peaking factor was calculated for years 2003 to 2010. Table 2-3 shows the peaking factor ratio for each year. During the period from 2003 to 2010, the City's overall peaking factor has ranged from a low of 1.68 to a high of 2.99, with an average value of 2.24.

Consumption History

Meter data for the City is collected monthly for commercial customers and bi-monthly for residential customers. Historical annual water consumption, in million gallons, for the period 2003 to 2010 is shown in Table 2-4. Figure 2-1 shows the proportions of water consumption by customers/classes for 2010. Table 2-5 shows the water consumption for bi-monthly periods in 2010.

Consumption totals by customer class is only available for 2008 through 2010. For missing monthly billing reports, consumption is estimated based on the same months from another year with similar production for the month.

As shown in Table 2-4 and Figure 2-1, residential usage accounts for only about a third of the City's water use, with commercial usage accounting for the other two thirds. The City's largest water user is the Ilwaco Fish Company, uses about a quarter of the City's annual water production. Water use by the Ilwaco Fish Company varies from month to month and year to year by the production rates and types of products processed.

TABLE 2-4

Historical Metered Water Consumption

Customer/Class	Consumption (MG)							
	2003[(1)]	**2004**	**2005**	**2006**	**2007[(2)]**	**2008**	**2009**	**2010**
Ilwaco Fish Company	20.8	35.5	25.1	25.6	17.7	17.3	16.9	21.0
State Park	5.4	3.4	4.4	3.5	4.6	4.7	3.3	3.3
USCG	2.4	2.2	1.9	2.4	2.7	2.9	2.8	3.5
Ocean Beach Hospital & Medical Clinic	1.8	1.6	1.9	2.8	2.9	3.5	3.1	3.1
Eagle's Nest Resort	2.1	3.2	1.6	0.9	1.8	0.2[(3)]	5.2	7.1
Port of Ilwaco	2.3	3.5	3.2	2.5	1.7	2.7	4.3	1.2
Other Commercial	-	-	-	-	-	17.1	16.1	12.9
Total Commercial	-	-	-	-	-	**48.5**	**51.7**	**52.1**
Total Residential	-	-	-	-	-	**23.5**	**26.4**	**23.9**
Total	**94.1**	**90.5**	**87.6**	**83.4**	**78.0**	**72.0**	**78.1**	**76.1**

(1) Billing data is not available for September and October of 2003. Data for this period is estimated based on billing data from these months in 2005.

(2) Billing data is not available for January and February of 2007. Data for this period is estimated based on billing data from these months in 2008, with the exception of the data for Eagle's Nest Resort, which is based on data from 2006.

(3) Zero consumption is registered for Eagle's Nest Resort in the billing reports for several months in 2008.

FIGURE 2-1

2010 Water Consumption by Customer/Class

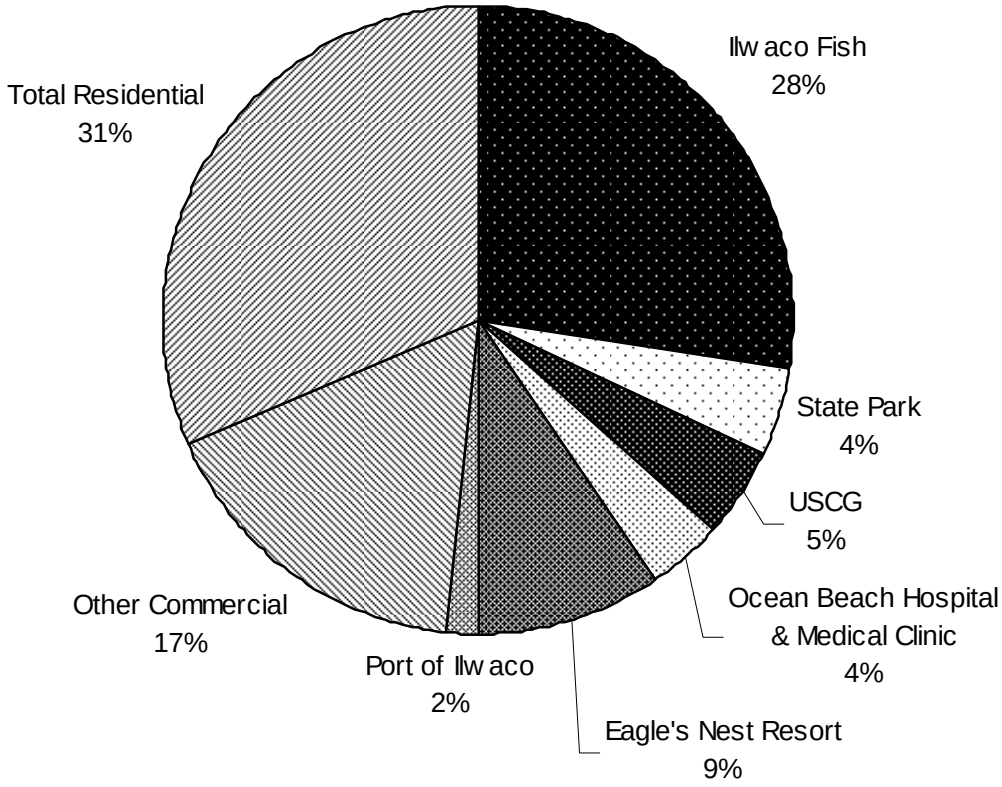


TABLE 2-5

2010 Metered Water Consumption by Month

Customer/Class	Consumption (MG)					
	Jan-Feb	**Mar-Apr**	**May-Jun**	**Jul-Aug**	**Sep-Oct**	**Nov-Dec**
Ilwaco Fish	1.81	0.75	4.89	4.85	3.71	5.00
State Park	0.30	0.32	0.75	1.17	0.53	0.24
USCG	0.45	0.41	0.67	0.69	0.69	0.61
Ocean Beach Hospital and Medical Clinic	0.44	0.43	0.38	0.39	0.45	0.45
Eagle's Nest Resort	0.88	1.01	0.93	1.46	1.78	1.07
Port of Ilwaco	0.08	0.24	0.20	0.36	0.29	0.03
Other Commercial	1.21	2.13	2.88	2.77	2.87	1.66
Total Commercial	**5.17**	**5.28**	**10.71**	**11.69**	**10.33**	**9.06**
Total Residential	**3.56**	**3.71**	**3.39**	**5.58**	**4.15**	**3.67**
Total	**13.9**	**14.3**	**24.8**	**29.0**	**24.8**	**21.8**

TABLE 2-6

Historical Distribution System Leakage

Customer/Class	2003	2004	2005	2006	2007	2008	2009	2010
Total Production (MG)	167.6	203.2	161.0	99.6	102.3	111.0	103.6	128.9
Filter Backwash[(1)] (MG)	2.7	3.9	4.4	1.6	2.3	4.1	3.8	3.4
Total Metered Consumption[(2)] (MG)	94.1	90.5	87.6	83.4	78.0	72.0	78.1	76.1
Distrubition System Leakage (MG)	70.8	108.9	69.0	14.5	22.0	35.0	21.7	49.5
Distrubition System Leakage (%)	42%	54%	43%	15%	22%	31%	21%	38%
3-year Rolling Average (%)	-	-	46%	37%	26%	23%	25%	30%

(1) Approximately half of the filter backwash is estimated to come from the Indian Creek Reservoir after it is metered as production.

(2) Consumption is estimated for two months in both 2003 and 2007.

As shown in Table 2-5, the peak usage by most of the City's customers is in July and August. This is a period of high fish production and the peak use of the region's recreational facilities, such as campgrounds at Cape Disappointment State Park. The peak in residential usage may be attributed both to lawn irrigation as well as high occupancy rates among vacation homes.

Distribution System Leakage

Distribution system leakage (DSL) is defined as the difference between total water produced or purchased and all authorized water consumption. Authorized consumption (AC) includes both metered customer consumption and unmetered authorized consumption for activities such as construction, firefighting, and flushing.

Distribution system leakage for the City equals the difference between the supply measured at the water treatment plant and the volume measured at customers' meters along with all credibly estimated unmetered use. Table 2-6 provides annual data of distribution system leakage from 2003 to 2010. As shown in Table 2-6, based on the best available data for customer consumption, the City's annual distribution system leakage has ranged from 15 percent to 54 percent, with a 3-year rolling average ranging from 23 to 46 percent. Some of the variability in annual distribution system leakage is attributable to the bimonthly reading of residential meter readings, which have been in odd months in recent years, resulting in consumption being accounted for in a different year than the corresponding production. The 3-year rolling average, which has been relatively constant in the past few years, is therefore a better measure of actual distribution system leakage for the City.

EQUIVALENT RESIDENTIAL UNITS

An Equivalent Residential Unit (ERU) is the amount of water, in gallons per day, equivalent to water usage by one single-family residential customer. The amount of water attributed to an ERU is calculated by dividing the total volume of water utilized in the residential customer class by the total number of residential connections. This number defines the average residential water use. Residential customer billing data for 2008 through 2010 have been used to determine the ERU value for those years. These ERU values are shown in Table 2-7. The average residential water use per ERU for the City in 2008 through 2010 was 122 gallons per day. This value will be used throughout the Plan to predict future water demands on the City's system.

TABLE 2-7

Equivalent Residential Units (ERUs) 2008-2010

Year	SF Residential Consumption (gpd)	SF Residential Connections	ERU Value
2008	64,464	548	118
2009	72,261	558	130
2010	65,532	556	118
Average			**122**

Table 2-8 presents the numbers of ERUs for large users and customer classes for 2010, based on the ERU value for 2010.

TABLE 2-8

Year 2010 Equivalent Residential Units

Customer	Average Daily Consumption (gpd)	ERUs
Ilwaco Fish	57,576	488
State Park	9,092	77
USCG	9,632	82
Ocean Beach Hospital and Medical Clinic	8,402	71
Eagle's Nest Resort	19,531	166
Port of Ilwaco	3,321	28
Other Commercial	35,272	299
Total Commercial	**142,825**	**1,212**
Total Residential	**65,532**	**556**
Total System	**208,357**	**1,768**

Per Capita Water Production

Assuming an average of 2.27 people per household, as presented in the Pacific County Comprehensive Plan, the estimated population of the water service area for 2010 is 1,262. The residential consumption for 2010 was 0.066 mgd. Therefore, the residential consumption per capita for 2010 is estimated to be 52 gallons per capita per day (gpcd). The residential production per capita was estimated by assuming the residential production for 2010 was 31 percent of the total production for 2010, which is the same proportion as residential consumption to total consumption. The estimated production per capita for 2010 is 88 gpcd. Table 2-9 presents a summary of water production per capita.

TABLE 2-9

Year 2010 Per Capita Residential Production

Year	Population	Residential Consumption (mgd)	Per Capita Consumption (gpcd)	Residential Production[(1)] (mgd)	Per Capita Production (gpcd)
2010	1,262	0.066	52	0.111	88

(1) Residential production is estimated to be 31 percent of the total 2010 production.

FUTURE ERUS, POPULATION AND WATER DEMANDS

PROJECTED POPULATION

The 2010 Pacific County Comprehensive Plan projects a county-wide annual growth rate of 1.4 percent. In addition to this base growth rate, the City anticipates that a few larger developments may also be constructed in the 20-year planning period. These developments would add a larger number of connections in a short amount of time. The City anticipates that the Discovery Heights development may reach buildout at 350 residential units within the 20-year planning period. The City also anticipates that within the next 10 to 20 years, properties northeast and east of the City center may also be developed, adding an additional 100 residential units in the City Center Zone and 50 residential units in the Indian Creek Zone. Table 2-10 presents the projected service area population for the 20-year planning period.

TABLE 2-10

Projected Service Area Population

Year	City Center Zone Population[(1)]	Discovery Heights Zone Population[(2,3)]	Indian Creek Zone Population[(4)]	Total
2011	1,081	187	12	1,280
2012	1,096	187	12	1,295
2013	1,111	226	14	1,351
2014	1,127	265	14	1,406
2015	1,143	304	16	1,463
2016	1,159	343	16	1,518
2020	1,452	497	20	1,969
2025	1,540	689	134	2,363
2030	1,635	877	134	2,646

(1) City Center Zone population projections are based on a growth rate of 1.4 percent with an additional 100 residential units by 2020.

(2) Discovery Heights Zone population projections are based on a growth rate of approximately 17 residential units per year through 2030, for a total of 350 residential units in this development by 2030 (approximate growth rate of 20 percent). Discovery Heights Zone population projections include the population in the existing Sahalee Zone, which is projected to grow at the general City growth rate of 1.4 percent.

(3) The City reserves 450 ERUs of water storage capacity for Discovery Heights to be used for either residential or commercial development. For planning purposes only, this Plan uses 100 commercial ERUs and 350 residential ERUs for Discovery Heights.

(4) Indian Creek Zone population projections are based on a growth rate of 1 residential unit every 2 years with an additional 50 residential units by 2025.

WATER DEMAND PROJECTIONS

Projected Average Day Consumption

Projected average day consumption for the next 20 years is shown in Table 2-11. The initial projections are based on metered consumption over the last 3 years. From there, projected usage is anticipated to grow for the residential and commercial classes proportional to the projected growth in ERUs for these customer classes. The commercial usage in the City Center Zone is anticipated to grow at a rate of 1.4 percent. The City anticipates that commercial development in the Discovery Heights Zone may reach buildout in the 6-year planning period at a total of 100 ERUs.

The Ilwaco Fish Company, Cape Disappointment State Park, and the Coast Guard are not expected to expand significantly, so projected usage by these customers is based on the highest anticipated usage by their existing facilities. The ERUs are calculated based on the total demand based on an ERU value of 122 gpd/ERU.

TABLE 2-11

Projected Average Day Consumption

Year	Pop.[1]	ERUs[2]	Average Day Consumption[3] (gpd)					
			Res.[4]	Comm.[5,6]	Ilwaco Fish[7]	Coast Guard[8]	State Parks[9]	Total
2011	1,280	2,166	72,300	70,000	100,000	10,000	12,000	264,300
2012	1,295	2,182	73,200	71,000	100,000	10,000	12,000	266,200
2013	1,351	2,241	76,300	75,100	100,000	10,000	12,000	273,400
2014	1,406	2,299	79,400	79,100	100,000	10,000	12,000	280,500
2015	1,463	2,359	82,600	83,200	100,000	10,000	12,000	287,800
2016	1,518	2,417	85,700	87,200	100,000	10,000	12,000	294,900
2020	1,969	2,661	111,200	91,500	100,000	10,000	12,000	324,700
2025	2,363	2,891	133,500	97,200	100,000	10,000	12,000	352,700
2030	2,646	3,073	149,500	103,400	100,000	10,000	12,000	374,900

(1) Population as presented in Table 2-10.
(2) ERUs are calculated for the total demand based on a value of 122 gpd/ERU.
(3) Demands are rounded to the nearest 100 gallons per day.
(4) Residential consumption is based on historical usage and projected to be proportional to population.
(5) Commercial consumption is based on historical usage and projected to grow at a rate of 1.4 percent plus 25 ERUs of commercial development per year in the Discovery Heights Zone for 2013-2016.
(6) The City reserves 450 ERUs of water storage capacity for Discovery Heights to be used for either residential or commercial development. For planning purposes only, this Plan uses 100 commercial ERUs and 350 residential ERUs for Discovery Heights.
(7) Ilwaco Fish Company consumption is based on the highest historical usage and is not anticipated to grow significantly.
(8) Cape Disappointment State Park consumption is based on the highest historical usage and is not anticipated to grow significantly.
(9) Coast Guard consumption is based on the highest historical usage and is not anticipated to grow significantly.

Projected Maximum Day and Peak Hour Consumption

Maximum day factors, the ratio of maximum day consumption to average day consumption, have been calculated for the following individual users: Ilwaco Fish, Cape Disappointment State Park, United States Coast Guard, and Residential and Commercial customers. The information can be found in Table 2-12.

The individual maximum day factors are used to better estimate future consumption given the unique nature of the City's customer base. The State Park and Coast Guard station peak hour factors are calculated in the Fort Canby State Park Water and Sewer Feasibility Study published in 2001. The maximum day factors for Ilwaco Fish and Residential and Commercial customers are estimated by assuming that the maximum day

factor is at least 1.5 times the ratio of peak month average day consumption to average annual day consumption based on historical water sales records.

Peak hour factors, the ratio of peak hour consumption to maximum day consumption, for Ilwaco Fish, Cape Disappointment State Park, and United States Coast Guard are calculated separately because they have unique water use characteristics. The State Park and Coast Guard station peak hour factors are calculated based on the guidelines set forth in the DOH Water System Design Manual Equation 5.3 in the Fort Canby State Park Water and Sewer Feasibility Study. Ilwaco Fish peak hour is assumed to occur during their peak month of production water use. The estimated maximum month average day was divided by 16 hours, assuming two 8 hour shifts, to estimate the peak hour use. Peak hour factors are shown in Table 2-12.

The peak hour factor for the City residential and commercial consumption was determined using the guidelines set forth in DOH Water System Design Manual Equation 5.3. The projected maximum day consumption for 2011 for residential and commercial customers is used in the equation.

Equation 5.3

Peak Hour Demand (PHD) = (MDD/1440){(C) * (N) + F} + 18

PHD	= Peak Hour Demand (gpm)	
MDD	= Maximum Day Demand (gpd/ERU)	(MDD = 243)
C	= Coefficient associated with ranges of ERUs	(C = 1.6)
N	= Number of ERUs	(N =1,170)
F	= Factor associated with ranges of ERUs	(F = 225)

(The C and F coefficients can be found in the DOH, Water System Design Manual)

The City's peak hour consumption for residential and commercial use is calculated to be 372 gallons per minute based on projected 2011 data. Maximum day consumption in gallons per minute is 198 for residential and commercial use. The peak hour to maximum day ratio is then calculated as 372/198 = 1.88 for residential and commercial use. This peak hour factor is used to calculate the peak hour consumption by residential and commercial users.

TABLE 2-12

Maximum Day and Peak Hour Factors

Customer Classification	Maximum Day Factor	Peak Hour Factor
Residential and Commercial	2.00	1.88
Ilwaco Fish	5.71	1.50
Coast Guard	3.20	3.51
State Parks	4.40	3.20

Each group has a different maximum day factor as shown in Table 2-12. Table 2-13 provides the breakdown of maximum day consumption for each group. The projected maximum day consumption numbers are calculated by taking the average day consumption and multiplying them by the maximum day factor shown in Table 2-12.

TABLE 2-13

Projected Maximum Day Consumption

Year	Pop.	ERUs	Maximum Day Consumption[(1)] (gpd)					
			Res.	Comm.	Ilwaco Fish	Coast Guard	State Parks	Total
2011	1,280	2,166	144,600	140,000	400,000	32,000	52,800	769,400
2012	1,295	2,182	146,400	142,000	400,000	32,000	52,800	773,200
2013	1,351	2,241	152,600	150,200	400,000	32,000	52,800	787,600
2014	1,406	2,299	158,800	158,200	400,000	32,000	52,800	801,800
2015	1,463	2,359	165,200	166,400	400,000	32,000	52,800	816,400
2016	1,518	2,417	171,400	174,400	400,000	32,000	52,800	830,600
2020	1,969	2,661	222,400	183,000	400,000	32,000	52,800	890,200
2025	2,363	2,891	267,000	194,400	400,000	32,000	52,800	946,200
2030	2,646	3,073	299,000	206,800	400,000	32,000	52,800	990,600

(1) Projected Maximum Day Consumption is based on Average Day Consumption multiplied by the peaking factors given in Table 2-12 and rounded to the nearest 100 gallons per day.

Each group has a different peak hour factor as shown in Table 2-12. Table 2-14 provides the breakdown of peak hour consumption for each group. Peak hour consumption is stated in gallons per minute. The projected consumption is calculated by multiplying the maximum day consumption in gallons per minute by the peak hour factor as shown in Table 2-12.

TABLE 2-14

Projected Peak Hour Consumption

Year	Pop.	ERUs	Peak Hour Consumption[(1)] (gpm)					
			Res.	Comm.	Ilwaco Fish	Coast Guard	State Parks	Total
2011	1,280	2,166	189	183	417	78	117	984
2012	1,295	2,182	192	186	417	78	117	989
2013	1,351	2,241	200	197	417	78	117	1,008
2014	1,406	2,299	208	207	417	78	117	1,027
2015	1,463	2,359	216	218	417	78	117	1,046
2016	1,518	2,417	224	228	417	78	117	1,064
2020	1,969	2,661	291	239	417	78	117	1,142
2025	2,363	2,891	349	254	417	78	117	1,216
2030	2,646	3,073	391	271	417	78	117	1,274

(1) Peak hour consumption is calculated based on maximum day consumption multiplied by the peak hour factor given in Table 2-12, rounded to the nearest gallon per minute.

Projected Average Day, Maximum Day and Peak Hour Demands

The total average day, maximum day, and peak hour demands for the system are calculated as the consumption plus all distribution system leakage for the system. A summary of projected total system water demands for average day, maximum day, and peak hour is shown in Table 2-15. The distribution system leakage is assumed to be a constant volume and is based on historical rates. The projected demands are consistent with historical production and anticipated future growth.

TABLE 2-15

Projected Water System Demands

Year	Pop.[1]	ERUs[2]	Average Day Consumption[3] (gpd)	Maximum Day Consumption[4] (gpd)	Peak Hour Consumption[5] (gpm)	DSL Volume[6] (gpd)	DSL %	Average Day Demand[7] (gpd)	Maximum Day Demand[8] (gpd)	Peak Hour Demand (gpm)
2011	1,280	2,166	264,300	769,400	984	125,000	32%	389,300	894,400	1,071
2012	1,295	2,182	266,200	773,200	989	125,000	32%	391,200	898,200	1,076
2013	1,351	2,241	273,400	787,600	1,008	125,000	31%	398,400	912,600	1,095
2014	1,406	2,299	280,500	801,800	1,027	125,000	31%	405,500	926,800	1,114
2015	1,463	2,359	287,800	816,400	1,046	125,000	30%	412,800	941,400	1,133
2016	1,518	2,417	294,900	830,600	1,064	125,000	30%	419,900	955,600	1,151
2020	1,969	2,661	324,700	890,200	1,142	125,000	28%	449,700	1,015,200	1,229
2025	2,363	2,891	352,700	946,200	1,216	125,000	26%	477,700	1,071,200	1,302
2030	2,646	3,073	374,900	990,600	1,274	125,000	25%	499,900	1,115,600	1,361

(1) Population as presented in Table 2-10.
(2) ERUs are calculated based on a value of 122 gpd/ERU.
(3) Average day consumption as shown in Table 2-11.
(4) Maximum day consumption as shown in Table 2-13.
(5) Peak hour consumption as shown in Table 2-14.
(6) DSL is assumed to be a constant volume and is estimated based on historical rates.
(7) Average Day Demand includes Average Day Consumption and DSL.
(8) Maximum Day Demand includes Maximum Day Consumption and DSL

CHAPTER 3

SYSTEM ANALYSIS

The purpose of this chapter is to determine if the existing system facilities are able to supply sufficient quality and quantity of water to meet existing and projected demands. In this section, three major planning components will be analyzed in detail:

- System design and construction standards
- System Component Analyses that compare the City's existing facilities to the City's established design standards
- Identification of system deficiencies

Proposed improvement projects to mitigate the identified system deficiencies are described in Chapter 8, along with estimated project costs and a prioritized schedule.

SYSTEM DESIGN AND CONSTRUCTION STANDARDS

The City has adopted system design, water quality, and construction standards. These standards are summarized in the following sections.

DESIGN STANDARDS

Performance and design criteria typically address the sizing and reliability requirements for source, storage, distribution, and fire flow. The City has established design standards that meet or exceed the minimum standards requires by the Washington State Department of Health (DOH). The DOH standards are established in the following:

- **WAC 246-290, Group A Public Water Systems, Washington State Board of Health (September 2010).**
  This is the primary drinking water regulation utilized by the Washington State Department of Health to assess capacity, water quality, and overall compliance with drinking water standards.

- **Water System Design Manual (WSDM), Washington State Department of Health (December 2009).**
  The WSDM serves as guidance for the preparation of plans and specifications for Group A public water systems in compliance with WAC 246-290.

Table 3-1 lists the suggested DOH Water System Design Manual guidance and the City policies with regard to each standard for general facility requirements.

TABLE 3-1

General Facility Requirements

Standard	DOH Water System Design Manual	City of Ilwaco Standard
Average Day and Maximum Day Demand	Average Day Demand (ADD) should be determined from metered water use data. Maximum Day Demand (MDD) is estimated at approximately 2.0 times the average day demand if metered data is not available.	ADD = metered production data MDD = metered production maximum day data
Peak Hour Demand	Peak hour demand is determined using the following equation from DOH Water System Design Manual: PHD = (MDD/1440)[(C)(N) + F] + 18 C = Coefficient from DOH Table 5-1 N = Number of connections, ERUs F = Factor of range from Table 5-1	Peak hour demand is calculated based on the DOH formula.
Source	Capacity must be sufficient to meet MDD and replenish fire suppression storage in 72 hours.	Same as DOH Water System Design Manual, Chapter 7.
Storage	The sum of: Operational Storage Volume sufficient to prevent pump recycling. Equalizing Storage $V_{ES} = (Q_{PH} - Q_S) * 150$ Standby Storage $V_{SB} = (2 * ADD * N) - t_m * (Q_S - Q_L)$ Fire Suppression Storage $V_{FSS} = NFF * T$ ADD = average day demand, gpd/ERU N = number of ERU's Q_{PH} = peak hour demand, gpm Q_S = capacity of all sources, excluding emergency sources, gpm Q_L = capacity of largest source, gpm t_m = daily pump source run time, min (1440) NFF = needed fire flow, gpm T = fire flow duration, min	Same as DOH Water System Design Manual, using the formulas provided in the manual, Chapter 9.
Minimum System Pressure	The system should be designed to maintain a minimum of 30 psi in the distribution system under peak hour demand and 20 psi under fire flow conditions during MDD.	Same as DOH Water System Design Manual, Chapter 8.
Fire Flow Standard	The minimum fire flow shall be determined by the local fire authority or WAC 246-293 for systems within a critical water supply service area (CWSSA).	Ilwaco Municipal Code 15.86.090.C sets flow requirements of 500 gpm for single family residential and Multi-Family/Commercial/ Industrial flows per Uniform Fire Code.

TABLE 3-1 – (continued)

General Facility Requirements

Standard	DOH Water System Design Manual (June 1999)	City of Ilwaco Standard
Minimum Pipe Sizes	The diameter of a transmission line shall be determined by hydraulic analysis. The minimum distribution system line size shall not be less than 6-inches in diameter.	Same as DOH Water System Design Manual, Chapter 8.
Reliability Recom-mendations	• Sources capable of supplying MDD within an 18-hour period • Sources meet ADD with largest source out of service • Back-up power equipment for pump stations unless there are two independent public power sources • Provision of multiple storage tanks • Standby storage equivalent to ADD x 2, with a minimum of 200 gpd/ERU • Low and high level storage alarms • Looping of distribution mains when feasible • Pipeline velocities not > 8 fps at PHD • Flushing velocities of 2.5 fps for all pipelines	Same as DOH Water System Design Manual, Chapter 5.
Valve and Hydrant Spacing	Sufficient valving should be placed to keep a minimum of customers out of service when water is turned off for maintenance or repair. Fire hydrants on lateral should be provided with their own auxiliary gate valve.	Valve and hydrant standards are outlined in the City of Ilwaco Developer Standards

WATER QUALITY STANDARDS

A summary of the existing and proposed drinking water quality standards applicable to the City is presented in Chapter 5. Any water quality deficiencies are summarized at the end of this chapter.

CONSTRUCTION STANDARDS

Construction standards set forth the actual materials and construction standards that contractors, developers, and the City must follow when constructing water system facility improvements. Construction standards for the City of Ilwaco are included in Appendix D.

FIRE FLOW STANDARDS

The City's typical fire flow requirements are summarized in Table 3-2. Minimum fire flows are given in Ilwaco Municipal Code 15.86.060.C, which states that the flow required to all buildings other than single dwellings shall be determined by the Universal Fire Code and that no hydrant shall provide less than 500 gpm at 20 psi. The maximum fire flow required in the City Center commercial/industrial area is 3,000 gpm for 3 hours. The buildings in the proposed commercial development in Discovery Heights are anticipated to have automatic sprinkler systems and require a fire flow of 1,500 gpm for 3 hours. The City has a goal to provide 1,000 gpm in residential areas.

TABLE 3-2

Typical Fire Flow Requirements

Zoning	Fire Flow Required (gpm)	Duration (hours)
Single-Family Residential	1,000(1)	1
Discovery Heights – Multi-Family/ Commercial - with sprinkler systems	1,500	3
City Center – Multi-Family/Institutional/ Commercial/Industrial	3,000	3

(1) The fire flow required per Ilwaco Municipal Code 15.86.060.C is 500 gpm. The City has a goal to provide 1,000 gpm of fire flow to residential areas.

SYSTEM COMPONENT ANALYSIS

SOURCE OF SUPPLY ANALYSIS

A description of the City's source of supply was presented in Chapter 1. According to Department of Health Design Standards, source production capacity must be sufficient to supply maximum day demands. Maximum day and average day demands must also comply with the maximum instantaneous and maximum annual withdrawal limitations of associated water rights.

Water Rights Analysis

The City's water rights are discussed in Chapter 1 and are summarized in Table 3-3.

TABLE 3-3

Indian Creek Water Rights Summary

Date	Type	Number	Maximum Permitted Instantaneous Withdrawal (cfs)	Maximum Permitted Annual Withdrawal (acre-ft / year)	Maximum Permitted Storage (acre-ft / year)
4/24/1995	Permit	S2-29218	0.77	22	N/A
3/4/1991	Water Right Certificate	S2-25880	1.56	710	N/A
6/23/1986	Reservoir Permit	R2-26649	N/A	N/A	1022

Table 3-4 compares the Water Treatment Plant (WTP) capacity to the maximum instantaneous withdrawal allowed under the City's existing water rights. The City currently has 1,050 gpm of treatment plant capacity with one 700-gpm filter and one 350-gpm filter and one 350-gpm filter as a back-up.

TABLE 3-4

Instantaneous Production Water Rights Analysis

Current WTP Maximum Capacity	Maximum Instantaneous Withdrawal Permitted by Existing Water Rights		Water Right Surplus/(Deficit)
(gpm)	(cfs)	(gpm)	(gpm)
1,050	2.33	1,046	(4)

Table 3-5 shows a comparison of the annual production for the WTP over the last 8 years as compared to the average annual withdrawal permitted by existing water rights. As shown in Table 3-5, the annual production for the WTP over the last 8 years is within the maximum annual withdrawal water right.

Table 3-6 compares the projected average annual withdrawal requirement (projected average day demand) with existing water rights. Table 3-7 compares the projected maximum day demand with existing water rights. As shown in Tables 3-6 and 3-7, the City has sufficient water rights to provide service during the 20-year planning period.

WATER TREATMENT PLANT ANALYSIS

The City of Ilwaco draws water from the Indian Creek Impoundment, a surface water source. The City is required to meet the treatment water requirements outlined in Part 6 of Chapter 246-290 WAC, Surface Water Treatment. The City must provide continuous

disinfection to ensure that filtration and disinfection together achieve at least the following: (i) 99.9 percent (3 log) inactivation and removal of *Giardia lamblia* cysts; and (ii) 99.99 percent (4 log) inactivation and/or removal of viruses. In addition, to comply with Chapter 246-290-678 WAC, Reliability for Filter Systems, the City must ensure that the following reliability features are include in the water treatment facilities:

(a) Alarm devices to provide warning of treatment process failures including coagulation, filtration, and disinfection. Alarm devices shall warn individuals responsible for taking corrective action and/or provide for automatic plant shutdown until corrective action can be taken;

(b) Standby replacement equipment available to assure continuous operation and control of coagulation, clarification, filtration and disinfection processes;

(c) Multiple filter units that provide redundant capacity when filters are out of service for backwash or maintenance, except where waived based on engineering justification acceptable to the department.

The analysis provided in Table 3-8 indicates the ability of the City's treatment facility to provide the City's maximum day production demand. Current treatment capacity is 700 gpm, which is equal to 1,000,000 gpd. The City has two additional 350-gpm filters, Filter Nos. 1 and 2, that were recently repaired and serve as redundant filters but cannot be run in parallel with Filter No. 3. The backwash water represents approximately 5 percent of the plant's capacity.

With only Filter No. 3 operational, the City can meet projected maximum day demands through 2012. With the existing Filter Nos. 1 and 2 or a new filter running in parallel with Filter No. 3, the City could meet projected maximum day demands for the 20-year planning period. Currently, Filter Nos. 1 and 2 can only be run simultaneously with Filter No. 3 manually.

TABLE 3-5

Historical Annual Production Water Rights Analysis

Year	WTP Annual Production[1]		Total Withdrawal[2]		Maximum Annual Withdrawal Permitted by Existing Water Rights		Surplus/(Deficit)	
	(MG)	(acre-ft)	(MG)	(acre-ft)	(MG)	(acre-ft)	(MG)	(ACRE-
2003	167.6	514	179	548	238.5	732	59.9	184
2004	203.2	624	217	667	38.5	732	21.2	65
2005	161.0	494	174	532	238.5	732	65.0	200
2006	99.6	306	106	326	238.5	732	132.3	406
2007	102.3	314	110	337	238.5	732	128.8	395
2008	111.0	341	121	370	238.5	732	117.8	362
2009	103.6	318	113	346	238.5	732	125.9	386
2010	128.9	396	139	426	238.5	732	99.7	306

(1) WTP Annual Production includes all production metered leaving the Water Treatment Plant, including approximately half of the metered backwash volume that flows back into the plant from the Indian Creek Reservoir.

(2) Total withdrawal includes WTP production plus half of the metered backwash and an additional estimated 5 percent of production for raw water clarifier flushing.

TABLE 3-6

Projected Average Annual Withdrawal Water Rights Analysis

Year	Projected Annual Demand		Projected Total Annual Withdrawal[(1)]		Maximum Annual Withdrawal Permitted by Existing Water Rights		Surplus/(Deficit)	
	(MG)	(acre-ft)	(MG)	(acre-ft)	(MG)	(acre-ft)	(MG)	(acre-ft)
2011	145.6	447	159.9	491	238.5	732	78.6	241
2012	146.4	449	160.6	493	238.5	732	77.9	239
2013	149.1	457	163.6	502	238.5	732	74.9	230
2014	151.7	466	166.5	511	238.5	732	72.0	221
2015	154.4	474	169.5	520	238.5	732	69.0	212
2016	157.1	482	172.4	529	238.5	732	66.1	203
2020	168.2	516	184.7	567	238.5	732	53.8	165
2025	178.7	548	196.2	602	238.5	732	42.3	130
2030	187.0	574	205.3	630	238.5	732	33.2	102

(1) Total withdrawal includes demands plus 10 percent of the projected demands for backwash and raw water clarifier flushing.

TABLE 3-7

Projected Maximum Day Demand Water Rights Analysis

Year	Projected Maximum Day Demand (MG)	Projected Maximum Day Withdrawal[(1)] (MG)	Maximum Permitted Instantaneous Withdrawal (MG)	Projected Water Rights Surplus/(Deficit) (MG)
2011	894,400	983,840	1,500,000	516,160
2012	898,200	988,020	1,500,000	511,980
2013	912,600	1,003,860	1,500,000	496,140
2014	926,800	1,019,480	1,500,000	480,520
2015	941,400	1,035,540	1,500,000	464,460
2016	955,600	1,051,160	1,500,000	448,840
2020	1,015,200	1,116,720	1,500,000	383,280
2025	1,071,200	1,178,320	1,500,000	321,680
2030	1,115,600	1,227,160	1,500,000	272,840

(1) Total withdrawal includes demands plus 10 percent of the projected demands for backwash and raw water clarifier flushing.

TABLE 3-8

Projected Maximum Day Production Analysis

Year	Projected Maximum Day Demand (gpd)	WTP Net Capacity[1,2] (gpd)	Surplus/(Deficit) (gpd)
2011	894,400	1,350,000	455,600
2012	898,200	1,350,000	451,800
2013	912,600	1,350,000	437,400
2014	926,800	1,350,000	423,200
2015	941,400	1,350,000	408,600
2016	955,600	1,350,000	394,400
2020	1,015,200	1,350,000	334,800
2025	1,071,200	1,350,000	278,800
2030	1,115,600	1,350,000	234,400

(1) The City's existing Filters No. 1 and No. 2 cannot be run in parallel with Filter No. 3 in an automatic mode. All three filters can only be run simultaneously when attended by the operator.

(2) WTP Net Capacity is 1.5 mgd less 150,000 gpd for backwash and clarifier flushing.

RELIABILITY REQUIREMENTS

Per Chapter 246-290-678 WAC DOH requires filtered systems to provide reliability features in all water treatment facilities used to treat surface water sources.

The DOH Water System Design Manual contains a definition of reliability that was published by the National Research Council (NRC). Reliability was defined as "a recognition of the various uncertainties inherent in infrastructure services and, more formally, as the likelihood that infrastructure effectiveness will be maintained over an extended period of time, or as the probability that service will be available at least at specified levels throughout the design life of the infrastructure system".

Section 12.5.4 Treatment System Reliability, DOH Water System Design Manual, states that water treatment required for removal and/or disinfection of primary microbiological contaminants in surface water must operate reliably at all times. Per Chapter 246-290-678 WAC, the purveyor shall ensure that reliability features are included in all water treatment facilities used to treat surface water. These features shall include but not be limited to:

1. Alarm devices to provide warning of treatment process failures including coagulation, filtration, and disinfection. Alarm devices shall warn individuals responsible for taking corrective action and/or provide for automatic plant shutdown until corrective action can be taken.

2. Standby replacement equipment available to assure continuous operation and control of coagulation, clarification, filtration and disinfection processes;

3. Multiple filter units that provide redundant capacity when filters are out of service for backwash or maintenance, except where waived based on engineering justification acceptable to the department.

In addition, Chapter 246-290-222 WAC, Water System Physical Capacity, states that the treatment capacity, in conjunction with any storage that is designed to accommodate peak use periods on a daily or longer basis, shall be sufficient to provide a reliable supply of water equal to or exceeding the maximum day demand (MDD) while meeting the water quality parameters set forth in Part 4 and Part 6 of Chapter 246-290 WAC.

DOH recommends that the system be designed such that the source alone be able to meet, and preferably exceed, the widely used and accepted standard of MDD. The DOH Water System Design Manual states the following reasons why it is recommended that the source supply be able to meet MDD at all times:

- When a system relies on storage to meet MDD, the impact on system users will be significantly greater if the volume of storage constructed is underestimated.

- The more storage is relied on rather than source to meet MDD, the longer it takes to replenish storage once it is depleted. Fire protection authorities generally recommend the ability to replenish fire suppression storage with a 24-hour period after it is depleted. This may not be possible during periods of high demand if the source cannot provide flow rates equal to or exceeding the MDD.

At this time the City of Ilwaco does not comply with all of the reliability criteria. The City does not have standby equipment sufficient to assure continuous operation and control of coagulation, clarification, filtration and disinfection.

In order to provide clarification and filtration reliability the City must be able to demonstrate that a sufficient quantity of water will be produced or provided by other sources to meet the maximum day demand. The other sources available include the intertie with the City of Long Beach and storage capacity in excess of the fire suppression storage in the City's reservoirs.

The treatment capacity of the City of Long Beach Water Treatment Plant is 1.5 mgd. The City of Long Beach 2005 Water System Plan states that historical maximum day demands for that system have been approximately 1.0 mgd and are likely to increase with additional growth. The City of Long Beach would likely only be able to provide 500,000 gallons/day to the City of Ilwaco during periods of high water use. A letter from the City of Long Beach in 2003 regarding provisions of water is included in Appendix C.

The available storage capacity, not counting the required fire suppression storage, in the City Center (157) zone is approximately 220,000 gallons. The available storage capacity, not counting the required fire suppression storage in the Discovery Heights (339) zone is 130,000 gallons. Therefore, approximately 350,000 gallons of water is available in the event of limited or no production at the Water Treatment Plant. However, assuming this water is used because the Water Treatment Plant is not producing water it will not be replenished and therefore only provides a redundant supply for a limited time.

Table 3-9 illustrates the redundancy analysis. If Filter No. 3 goes out of service, either the repaired existing filters or a new filter would be able to supply approximately 1,000,000 gallons per day, with 100,000 gallons per day required for backwash and raw water flushing. The balance of the maximum day demand would have to be provided by the City of Long Beach intertie or available storage. Enough storage would be available to allow Filter No. 3 to be out of service for several days while maintaining an acceptable level of service to the water system.

TABLE 3-9

Redundancy Analysis

Year	Maximum Day Demand (gpd)	WTP Net Capacity[(1)] (gpd)	Surplus/(Deficit) (gpd)
2011	894,400	520,000	-374,400
2012	898,200	520,000	-378,200
2013	912,600	520,000	-392,600
2014	926,800	520,000	-406,800
2015	941,400	520,000	-421,400
2016	955,600	520,000	-435,600
2020	1,015,200	520,000	-495,200
2025	1,071,200	520,000	-551,200
2030	1,115,600	520,000	-595,600

(1) If the largest capacity filter, Filter No. 3, was out-of-service, the remaining filters, Filter No. 1 and No. 2, or a new filter could produce 1,000,000 gallons/day less 100,000 gallons/day for backwash and raw water clarifier flushing.

BOOSTER STATION ANALYSIS

The City has four booster stations to transfer supply between pressure zones. The DOH Water System Design Manual establishes certain criteria for booster pumps that pump to open systems (pumping into a zone in which the HGL is governed by a storage tank open to the atmosphere) and closed systems (pumping into a zone with a closed distribution system or a pressure tank). The City's Baker Bay and Springs Street Booster Stations pump into open systems, while the Lakeview Estates and Coastal Ridge Booster Stations pump into closed systems. During normal operating conditions, an open system booster pump station is required to meet average day demands with the largest pump out of service and to meet maximum day demands with all pumps in service. Fire-flow capacities for booster pump stations in open systems need to be analyzed in conjunction with the fire suppression storage for the system.

The City's Baker Bay Booster Station has two pumps capable of supplying 350 gpm each and one pump capable of supplying 150 gpm. This booster station supplies water to the City Center Zone, some of which is then supplied to the Discovery Heights Zone. Table 3-10 compares the Baker Bay Booster Station capacity with the largest pump out of service to projected average day demands in the City Center and Discovery Heights Zones in 2030. Table 3-11 compares the Baker Bay Booster Station capacity with all pumps in service to projected maximum day demands in the City Center and Discovery Heights Zones in 2030. The station has sufficient capacity to meet projected demands throughout the 20-year planning period. The Baker Bay Booster Station does not have provisions for auxiliary power. During prolonged power outages, a normally closed valve could be opened to supply the City Center Zone with a low flow rate gravity feed from the Indian Creek Zone.

The Spring Street Booster Station has two pumps capable of supplying 250 gpm each. This booster station supplies water to the Discovery Heights Zone. Table 3-10 compares the Spring Street Booster Station capacity with the largest pump out of service to projected average day demands in the Discovery Heights Zone in 2030. Table 3-11 compares the Spring Street Booster Station capacity with all pumps in service to projected maximum day demands in the Discovery Heights Zone in 2030. The station has sufficient capacity to meet projected demands throughout the 20-year planning period. Fire suppression for the Discovery Heights Zone is supplied by the Discovery Heights Reservoir. Therefore, no fire flow pumping by the booster station is required. The Spring Street Booster Station does not have provisions for auxiliary power. During prolonged power outages, the standby storage in the Discovery Heights Reservoir would be the only source of water available.

TABLE 3-10

2030 Average Day Demand Booster Station Analysis

Booster Station	Projected Average Day Demand[(1)] (gpm)	Booster Station Capacity with Largest Pump Out of Service (gpm)	Capacity Surplus/(Deficit) (MG)
Baker Bay[(2)]	342	600	258
Spring Street[(3)]	65	250	185

(1) Average day demand by pressure zone is given in Table 3-12 in the following section.
(2) Baker Bay Booster Station pumps water to the City Center zone, as well as the Discovery Heights zone via the Spring Street Booster Station.
(3) The Spring Street Booster Station pumps water to the Discovery Heights zone.

TABLE 3-11

2030 Maximum Day Demand Booster Station Analysis

Booster Station	Projected Maximum Day Demand[(1)] (gpm)	Booster Station Capacity (gpm)	Projected Water Rights Surplus/(Deficit) (MG)
Baker Bay[(2)]	765	950	185
Spring Street[(3)]	150	500	350

(1) Maximum day demand by pressure zone is given in Table 3-12 in the following section.
(2) Baker Bay Booster Station pumps water to the City Center zone, as well as the Discovery Heights zone via the Spring Street Booster Station.
(3) The Spring Street Booster Station pumps water to the Discovery Heights zone.

A closed system booster pump station must provide the entire flow and pressure required by the closed zone. Thus, a closed system booster pump station must be capable of meeting peak hour demands at no less than 30 psi. DOH recommends that closed system booster pump stations meet this requirement with the largest pump out of service. A closed system must also be capable of meeting fire suppression requirements, if required.

The Lakeview Estates Booster Station has one domestic pump capable of supplying 45 gpm and one fire pump capable of supply 500 gpm. This station was designed to provide peak hour demand for the Lakeview Estates development, which is not anticipated to be expanded beyond its current state. This station does not have a redundant domestic pump. The station has a manual transfer switch and portable generator connection for auxiliary power. A generator is not normally located on-site.

The Coastal Ridge Booster Station has two domestic pumps capable of supplying 108 gpm total and one fire pump capable of supply 1,000 gpm. This station was

designed to provide peak hour demand for the Coastal Ridge townhouse village in the Discovery Heights development, which is not anticipated to be expanded beyond its current state. The station has limited domestic pump redundancy and no provisions for auxiliary power. A normally closed valve can be opened during fire flow emergencies to bypass the pump station and supply the Coastal Ridge area with flow from the Discovery Heights Reservoir at 10-17 psi when the reservoir is full.

STORAGE ANALYSIS

Storage requirements for the City will be determined by applying the Department of Health Group A Water System Design Manual, December 2009, Chapter 9. The storage recommended according to this guidance document is based on the sum of the following:

- Operational Storage (OS)
- Equalizing Storage (ES)
- Standby Storage (SB)
- Fire Suppression Storage (FSS)
- Dead Storage (DS)

Operational Storage (OS)

Operational storage is the volume of the reservoir devoted to supplying the water system while, under normal operation conditions, the source(s) of supply are in "off" status. This volume is dependent upon the sensitivity of the reservoir water level sensors and the tank configuration necessary to prevent excessive cycling of source pump motors. Operational storage is in addition to other storage components, thus providing a factor of safety for equalizing, standby, and fire suppression components.

Equalizing Storage (ES)

Equalizing storage is typically used to meet diurnal demands that exceed the average day and maximum day demands. The volume of equalizing storage required depends on peak system demands, the magnitude of diurnal water system demand variations, the source production rate, and the mode of system operation. Sufficient equalizing storage must be provided in combination with available water sources and pumping facilities such that peak system demands can be satisfied.

Equalizing storage is calculated using the following equation:

$$V_{ES} = (Q_{PH} - Q_S) \times 150 \text{ minutes}$$

V_{ES} = Equalizing storage component (gallons)
Q_{PH} = Peak hourly demand (gpm)
Q_s = Total source of supply capacity, excluding emergency sources (gpm)

Standby Storage (SB)

Standby storage is provided in order to meet demands in the event of a system failure such as a power outage, an interruption of supply, or break in a major transmission line. The amount of emergency storage will be based on the reliability of supply and pumping equipment, standby power sources, and the anticipated length of time the system could be out of service.

Standby storage is calculated using the following equation:

SB_{TSS} = (2 days) x (ADD) x (N)

SB_{TSS} = Standby storage component for a single source system (gallons)
ADD = Average day demand for the system (gpd/ERU)
N = Number of ERUs

DOH Note: Although standby storage volumes are intended to satisfy the requirements imposed by system customers for unusual situations and are addressed by WAC 246-290-420, it is recommended that a standby storage volume be not less than 200 gallons/ERU.

Fire Suppression Storage (FSS)

The minimum standby fire suppression storage volume is calculated using the following equation.

V_{FSS} = (NFF) x (T)

Where

V_{FSS} = Fire suppression storage volume, gallons
NFF = Minimum fire flow requirement
T = Duration of fire flow needed, minutes

Dead Storage (DS)

Dead storage is the component of capacity, which is below the minimum level to provide adequate pressure to some customers. Water pressure must remain above 20 psi at all times, which means that dead storage is the volume of water below the 20-psi level.

Storage Analysis by Zone

An independent storage analysis for each pressure zone is shown in the following sections. These numbers were broken out from the projected water system demands calculated in Chapter 2. The 157 Zone, City Center, consists of the existing City

residential, commercial, and the Ilwaco Fish Company. The 339 Zone, Discovery Heights, consists of the Discovery Heights development, State Park, and the Coast Guard. The 160 Zone, Indian Creek, consists of a small number of residential customers east of the City along the water treatment plant transmission line.

The Indian Creek Reservoir provides operational storage for the water treatment plant by calling on the clear well pumps and providing backwash water for the filters. This reservoir also provides treatment storage necessary for the contact time needed to meet CT requirements for the finished water.

Table 3-12 shows the demand breakdown used in the storage analysis for each of the three pressure zones. Table 3-12 provides the breakdown of Average Day Production Demand, Maximum Day Production Demand, and Peak Hour Production Demand as determined by pressure zone. The Maximum Day Production Demand and Peak Hour Production Demand were calculated by multiplying the Average Day Production Demand by the respective peaking factors found in Chapter 2.

Table 3-13 shows the individual components of the storage analysis for the City Center zone. The storage analysis for the City Center Zone (157 Zone) is shown in Table 3-14. There is sufficient storage capacity to meet demands for the next twenty years. Growth within this zone is expected to remain minimal during future years, indicating that additional storage will not be needed. Dead storage is absent from all four reservoirs because they are high enough above the service area. Operational storage was assumed to be 2 percent of the total reservoir volume. Standby storage is nested within the fire suppression storage because it is a lesser volume. Fire flow requirements within the City are 3,000 gpm for 3 hours. The City's booster stations that supply these reservoirs exceed the peak hour demand of the system. Therefore, no equalizing storage is required for the reservoirs. As shown in Table 3-14, the City Center Zone has sufficient storage to meet the projected demands for the 20-year planning period.

Table 3-15 shows the individual components of the storage analysis for the Discovery Heights Zone (339 Zone). Table 3-16 shows the results of the storage analysis for the Discovery Heights Zone (339 Zone). This zone is served by the new 400,000-gallon reservoir exclusively. Fire suppression requirements in the Discovery Heights Zone (339 Zone) are 1,500 gpm for three hours because the new commercial construction will require sprinkler systems. As shown in Table 3-16, the Discovery Heights Zone has sufficient storage to meet the projected demands for the 20-year planning period.

Table 3-17 presents the individual storage components for the Indian Creek Zone (160 Zone). The storage analysis for the Indian Creek Zone is shown in Table 3-18. There is currently not sufficient storage in this zone to meet the distribution system needs (i.e., fire suppression storage and equalizing storage) as well as the treatment plant storage (i.e., backwash storage and treatment storage) currently needed within the zone.

TABLE 3-12

Projected Demands by Pressure Zone for the Storage Analysis

Year	City Center Zone[1] (157 ft HGL)			Discovery Heights Zone[2] (339 ft HGL)			Indian Creek Zone[3] (160 ft HGL)		
	ADD (gpd)	MDD (gpd)	PHD (gpm)	ADD (gpd)	MDD (gpd)	PHD (gpm)	ADD (gpd)	MDD (gpd)	PHD (gpm)
2011	344,140	775,780	839	44,550	117,400	230	610	1,220	2
2012	346,040	779,580	844	44,550	117,400	230	610	1,220	2
2013	347,972	783,443	849	49,696	127,693	244	732	1,464	2
2014	349,926	787,351	854	54,842	137,985	257	732	1,464	2
2015	351,958	791,415	860	59,988	148,277	271	854	1,708	2
2016	353,912	795,323	865	65,134	158,569	284	854	1,708	2
2020	375,191	837,882	920	73,411	175,122	306	1,098	2,196	3
2025	386,772	861,044	951	83,730	195,760	333	7,198	14,396	19
2030	398,868	885,236	982	93,834	215,968	359	7,198	14,396	19

(1) City Center demands include all system demands not included in either the Discovery Heights or Indian Creek Zones

(2) The Discovery Heights Zone demands are based on projected usage by the Discovery Heights and Sahalee developments, State Parks, and the Coast Guard. See Chapter 2 for information on demand projections.

(3) The Indian Creek Zone demands are based on the estimated use for the existing residents and projected growth east of the Baker Bay Booster Station. See Chapter 2 for information on demand projections. The projected demands shown do not include backwash water, which is accounted for separately in the storage analysis.

TABLE 3-13

City Center Zone (157 Zone) Storage Components

Year	Operating Range (ft)	Operating Storage (gallons)	PHD (gpm)	ES Qs (gpm)	ES Storage (gallons)	SB ADD (gpd)	SB Storage (gallons)	Fire Flow (gpm)	FF Duration (min)	FF Storage (gallons)
2011	2	69,374	839	950	0	344,140	688,280	3,000	180	540,000
2012	2	69,374	844	950	0	346,040	692,080	3,000	180	540,000
2013	2	69,374	849	950	0	347,972	695,943	3,000	180	540,000
2014	2	69,374	854	950	0	349,926	699,851	3,000	180	540,000
2015	2	69,374	860	950	0	351,958	703,915	3,000	180	540,000
2016	2	69,374	865	950	0	353,912	707,823	3,000	180	540,000
2020	2	69,374	920	950	0	375,191	750,382	3,000	180	540,000
2025	2	69,374	951	950	120	386,772	773,544	3,000	180	540,000
2030	2	69,374	982	950	4,867	398,868	797,736	3,000	180	540,000

TABLE 3-14

City Center Zone (157 Zone) Storage Analysis

Year	DS[(1)] (gal)	OS (gal)	ES (gal)	SB (gal)	FSS (gal)	Total Required Storage[(2)] (gal)	Storage Volume (gal)	Storage Surplus/ (Deficit) (gal)
2011	0	69,374	0	344,140	540,000	609,374	760,000	150,626
2012	0	69,374	0	346,040	540,000	609,374	760,000	150,626
2013	0	69,374	0	347,972	540,000	609,374	760,000	150,626
2014	0	69,374	0	349,926	540,000	609,374	760,000	150,626
2015	0	69,374	0	351,958	540,000	609,374	760,000	150,626
2016	0	69,374	0	353,912	540,000	609,374	760,000	150,626
2020	0	69,374	0	375,191	540,000	609,374	760,000	150,626
2025	0	69,374	120	386,772	540,000	609,494	760,000	150,506
2030	0	69,374	4,867	398,868	540,000	614,241	760,000	145,759

(1) With the exception of approximately eight customers near the City Center Reservoirs, all other customers in this zone can be served at 20 psi by the full volume of the reservoirs. The eight customers near the reservoirs cannot be served at 20 psi with the reservoirs full. The pressure deficiency for these customers is discussed in Chapter 4.

(2) Total Required Storage assumes nesting of standby and fire suppression storage.

TABLE 3-15

Discovery Heights Zone (339 Zone) Storage Components

Year	Operating Range (ft)	Operating Storage (gallons)	PHD [(1)] (gpm)	ES Qs (gpm)	ES Storage (gallons)	SB [(1)] ADD (gpd)	SB Storage (gallons)	Fire Flow (gpm)	FF Duration (min)	FF Storage (gallons)
2011	2	29,374	230	500	0	44,550	89,100	1,500	180	270,000
2012	2	29,374	230	500	0	44,550	89,100	1,500	180	270,000
2013	2	29,374	244	500	0	49,696	99,393	1,500	180	270,000
2014	2	29,374	257	500	0	54,842	109,685	1,500	180	270,000
2015	2	29,374	271	500	0	59,988	119,977	1,500	180	270,000
2016	2	29,374	284	500	0	65,134	130,269	1,500	180	270,000
2020	2	29,374	306	500	0	73,411	146,822	1,500	180	270,000
2025	2	29,374	333	500	0	83,730	167,460	1,500	180	270,000
2030	2	29,374	359	500	0	93,834	187,668	1,500	180	270,000

(1) The City reserves 450 ERUs of water storage capacity for Discovery Heights to be used for either residential or commercial development. For planning purposes only, this Plan uses 100 commercial ERUs and 350 residential ERUs for Discovery Heights.

TABLE 3-16

Discovery Heights (339 Zone) Storage Analysis

Year	DS[(1)] (gal)	OS (gal)	ES [(2)] (gal)	SB [(2)] (gal)	FSS (gal)	Total Required Storage[(3)] (gal)	Storage Volume (gal)	Storage Surplus/ (Deficit) (gal)
2011	0	29,374	0	89,100	270,000	299,374	400,000	100,626
2012	0	29,374	0	89,100	270,000	299,374	400,000	100,626
2013	0	29,374	0	99,393	270,000	299,374	400,000	100,626
2014	0	29,374	0	109,685	270,000	299,374	400,000	100,626
2015	0	29,374	0	119,977	270,000	299,374	400,000	100,626
2016	0	29,374	0	130,269	270,000	299,374	400,000	100,626
2020	0	29,374	0	146,822	270,000	299,374	400,000	100,626
2025	0	29,374	0	167,460	270,000	299,374	400,000	100,626
2030	0	29,374	0	187,668	270,000	299,374	400,000	100,626

(1) The highest service in the Discovery Heights Zone is at approximately 265 feet.

(2) The City reserves 450 ERUs of water storage capacity for Discovery Heights to be used for either residential or commercial development. For planning purposes only, this Plan uses 100 commercial ERUs and 350 residential ERUs for Discovery Heights.

(3) Total Required Storage assumes nesting of standby and fire suppression storage.

TABLE 3-17

Indian Creek (160 Zone) Storage Components

Year	Operating Range (ft)	Operating Storage[(1)] (gallons)	ES[(2)] (gpm)	Treatment Storage[(3)] (gal)	SB ADD (gpd)	SB Storage (gal)	Fire Flow (gpm)	FF Duration (min)	FF Storage (gallons)
2011	3	35,862	69,374	0	610	1,220	1,000	60	60,000
2012	3	35,862	69,374	0	610	1,220	1,000	60	60,000
2013	3	35,862	69,374	100,000	732	1,464	1,000	60	60,000
2014	3	35,862	69,374	100,000	732	1,464	1,000	60	60,000
2015	3	35,862	69,374	100,000	854	1,708	1,000	60	60,000
2016	3	35,862	69,374	100,000	854	1,708	1,000	60	60,000
2020	3	35,862	69,374	100,000	1,098	2,196	1,000	60	60,000
2025	3	35,862	69,374	100,000	7,198	14,396	1,000	60	60,000
2030	3	35,862	69,374	100,000	7,198	14,396	1,000	60	60,000

(1) Operating Storage for the Indian Creek Zone includes the fill cycle for the water treatment plant clear well pumps, plus 5 percent of maximum day production for backwash water required for filter operation.

(2) Equalizing Storage for the Indian Creek Zone is estimated at a fill cycle (operating storage) for the City Center tanks, as the Baker Bay Booster Pump Station may pump out of the Indian Creek Reservoir while the water treatment plan is inactive.

(3) Treatment Storage for the Indian Creek Zone includes the volume counted toward the contact time for CT. The City anticipates that development may occur in the area near the Indian Creek Reservoir, which would require contact time within the reservoir due to the reduction in pipe length before the first customer service.

TABLE 3-18

Indian Creek (160 Zone) Storage Analysis

Year	DS[(1)] (gal)	OS (gal)	ES (gal)	Treatment Storage[(2)] (gal)	SB (gal)	FSS (gal)	Total Required Storage[(3)] (gal)	Storage Volume (gal)	Storage Surplus/ (Deficit) (gal)
2011	5,287	35,862	69,374	0	1,220	60,000	170,523	159,000	(11,523)
2012	5,287	35,862	69,374	0	1,220	60,000	170,523	159,000	(11,523)
2013	5,287	35,862	69,374	100,000	1,464	60,000	270,523	159,000	(111,523)
2014	5,287	35,862	69,374	100,000	1,464	60,000	270,523	159,000	(111,523)
2015	5,287	35,862	69,374	100,000	1,708	60,000	270,523	159,000	(111,523)
2016	5,287	35,862	69,374	100,000	1,708	60,000	270,523	159,000	(111,523)
2020	5,287	35,862	69,374	100,000	2,196	60,000	270,523	159,000	(111,523)
2025	5,287	35,862	69,374	100,000	14,396	60,000	270,523	159,000	(111,523)
2030	5,287	35,862	69,374	100,000	14,396	60,000	270,523	159,000	(111,523)

(1) The highest potential service in the Indian Creek Zone is below the elevation that can be served at 20 psi by the full volume of the reservoir. The reservoir's silt stop causes the bottom foot of the reservoir to be dead storage

(2) Treatment Storage for the Indian Creek Zone includes the volume counted toward the contact time for CT.

(3) Total Required Storage assumes nesting of standby and fire suppression storage.

ILWACO SYSTEM DEFICIENCIES

Existing and future system deficiencies are summarized below. Chapter 9 presents the capital improvement projects necessary to correct existing deficiencies.

WATER RIGHTS

The City has adequate instantaneous and annual withdrawal water rights to meet projected demands through 2030 as shown in Tables 3-6 and 3-7.

SOURCE OF SUPPLY

The City's existing source of supply is capable of supplying maximum day demands through 2012 as shown in Table 3-8. A new treatment unit is needed to supply maximum day demands beyond 2012.

The City's source of supply will not have enough redundancy to supply maximum day demands during a treatment unit outage after 2012, as shown in Table 3-9. The City's system has sufficient storage and backup supply from the City of Long Beach to allow an outage of several days for treatment unit repair.

BOOSTER STATIONS

The City has adequate booster station capacity to meet projected demands through 2030, as shown in Tables 3-10 and 3-11.

STORAGE

The City has adequate storage capacity through 2030 in the City Center and Discovery Heights Zones as shown in Tables 3-14 and 3-16. The Indian Creek Zone has an existing storage deficiency as shown in Table 3-18.

WATER QUALITY

The City's water quality currently meets all requirements. A complete analysis of water quality can be found in Chapter 8 of this plan.

DISTRIBUTION SYSTEM

The City's water system has isolated areas with peak hour pressure and fire flow availability deficiencies. Deficiencies in the City's distribution system are presented in Chapter 4.

OPERATION AND MAINTENANCE

The City has not fully implemented its Cross-Connection Control Program. The City's Operations and Maintenance Program is discussed in Chapter 7.

SYSTEM CAPACITY SUMMARY

Table 3-19 summarizes the City's water system capacity in terms of ERUs and indicates the year in which the capacity is projected to be exceeded.

TABLE 3-19

System Capacity Summary

Capacity Parameter	Capacity (ERUs)	Year Capacity is Exceeded
Distribution System - Peak Hour	>3,000	>2030
Distribution System - Fire Flow	>3,000	>2030
Booster Station Capacity(1)	4,193	>2030
Storage Capacity(2)	3,989	>2030
Source Capacity(3)	4,034	>2030
Water Rights - Annual	4,129	>2030
Water Rights - Instantaneous	4,168	>2030

(1) Booster station capacity is limited only by the capacity of the Baker Bay Booster Station. The Discovery Heights, Lakeview Estates, and Coastal Ridge Booster Stations have sufficient capacity to serve the associated developments at buildout.

(2) Storage capacity excluding deficiencies for existing customers near the City Center Reservoirs and the existing storage deficiency for the Indian Creek Reservoir. These deficiencies will not be affected by new customers in these zones.

(3) Source capacity for existing operations with a net treatment plant capacity of 1.35 mgd.

CHAPTER 4

HYDRAULIC ANALYSIS

INTRODUCTION

This Chapter presents information on the computer hydraulic model of the City's water system and the results of hydraulic analyses conducted to evaluate the existing and future capabilities of the water system.

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

The development of a hydraulic model, which can accurately simulate the response of a water system under a variety of conditions, has become an increasingly important element in the planning, design, and analysis of water systems, and is required by WAC 246-290.

HYDRAULIC MODELING PROGRAM

The City's existing water system was analyzed using the MWHSoft's H_2ONet hydraulic modeling software, which operates in an AutoCAD computer-aided design and drafting environment. The H_2ONet hydraulic model was created from an existing KYPIPE hydraulic model developed during the completion of the City's 1997 Water System Plan. The model was modified and calibrated during the completion of the City's 2003 Water System Plan to include facilities added after 1997. The current model has been further updated to include the facilities that have been added since 2003, which include primarily the Lakeview Estates and Discovery Heights developments.

The H_2ONet model is configured with a graphical user interface. Each model element, including pipes, valves, pumps, and reservoirs, is assigned a unique graphical representation within the program. Each element is connected together within the model in a network of nodes, or pipe intersections, and links, the pipes themselves. Each element is also assigned a number of attributes specific to its function and representation. Element attributes include spatial coordinates, elevation, water demand, pipe length, and

diameter, as well as pump and reservoir characteristics. Model input is accomplished through the creation and manipulation of these objects and their attributes.

MODEL ASSUMPTIONS

In order to create a realistic representation of the City's water system, the model was created using a water system base map, the previous hydraulic model, and information obtained through conversations with the City. The following sections present the assumptions regarding the City's water sources, system demands, storage, booster station settings, and PRV settings.

Source

Because the Water Treatment Plant is not in continuous operation, the Water Treatment Plant is assumed to be idle for the modeling for more conservative pressures within the Indian Creek Zone.

Demands

Current and projected system demands were developed in Chapter 2 of this Plan from past production and consumption data. Chapter 3 presents estimates of projected usage by pressure zone. Individual demands are assigned to the Ilwaco Fish Company, Ocean Beach Hospital, Eagle's Nest Resort, Cape Disappointment State Park, and the Coast Guard based on historical and projected usage. The remaining demands were divided equally among the nodes for each pressure zone.

Storage

The levels within the City's reservoirs are modeled with operating and equalizing storage depleted for peak hour modeling and with operating, equalizing, and fire suppression storage depleted for fire flow modeling. The Sahalee Reservoir is modeled with operating storage only depleted for 2011 peak hour and fire flow modeling because the reservoir cannot provide sufficient pressures within the Sahalee zone. For future modeling, the Sahalee Reservoir is modeled as abandoned with the Sahalee Zone connected to the Discovery Heights Zone.

For fire flow modeling in the City Center Zone, extended period simulations are used to determine the levels of the Discovery Heights and City Center Reservoirs after a fire in the commercial/industrial zone. The PRV at the Spring Street Booster Station would open during a commercial fire and provide flows from the Discovery Heights Reservoir. This reduces the fire flow storage depleted from the City Center Reservoirs.

Booster Stations

Because the Baker Bay and Spring Street booster stations do not have auxiliary power supplies and therefore may not be available during a power outage, these booster stations were not operated in peak hour or fire flow modeling. The Lakeview Estates and Coastal Ridge booster stations also do not have auxiliary power supplies; however, because these booster stations are the only sources of supply for the closed zones they feed, these booster stations are modeled with the domestic pumps operating for peak hour modeling and the fire pumps operating for fire flow modeling. During a power outage, the modeled pressures would not be available within these zones, and special accommodations, such as powering the booster stations with a portable generator, would need to be made to supply these zones with pressure.

Pressure Reducing Valves

The City's system currently includes pressure reducing valves (PRVs) at the Spring Street and Baker Bay booster stations. However, the Baker Bay PRV to the Vandalia area is currently set at fully open. The model is set to reflect current conditions. In an emergency, the PRV at the Spring Street booster station would open to provide flows from the Discovery Heights tank to the City Center Zone.

MODEL CALIBRATION

For the purposes of model calibration, hydrant flow tests were conducted in November 2002 at three locations throughout the City's water system. The field results from these flow tests were used to calibrate the hydraulic model through adjustment of system elevations, friction coefficient factors, and verification of pipe sizes and system connectivity. Table 4-1 describes the locations of the hydrants used for the tests and the model nodes associated with those hydrants. The nodes for these hydrants are shown on Figure 4-1.

TABLE 4-1

Calibration Node Numbers and Locations

Node Numbers	Hydrant Locations
28	Cooks Road and Rose Street
74	Outer Harbor Way
20	Main Street and Second Avenue

The conditions of the hydrant tests were simulated as closely as possible in the model. The calibration was conducted under average daily demand conditions with the levels in the tanks as shown in Table 4-2. Table 4-3 presents actual field hydrant flow test data along with the corresponding results from the calibrated model.

TABLE 4-2

Tank Levels

Tank	Level (ft)
500,000 Steel	22.1
260,000 Wooden	15.9
159,000 Concrete	28.0

TABLE 4-3

Field Hydrant Flow Test Results

Test	Pressure/ Flow Node	Field Observations			Model Calibration Results		
		Static Pressure (psi)	Flow (gpm)	Residual Pressure (psi)	Static Pressure (psi)	Flow (gpm)	Residual Pressure (psi)
1	28	33	557	16	32.6	557	16.9
2	74	60	1,186	48	60.6	1,186	50.5
3	20	60	1,222	53	56.2	1,222	51.5

The results of the calibration of the hydraulic model fell within the allowable limits. The model is an accurate representation of the conditions in the field.

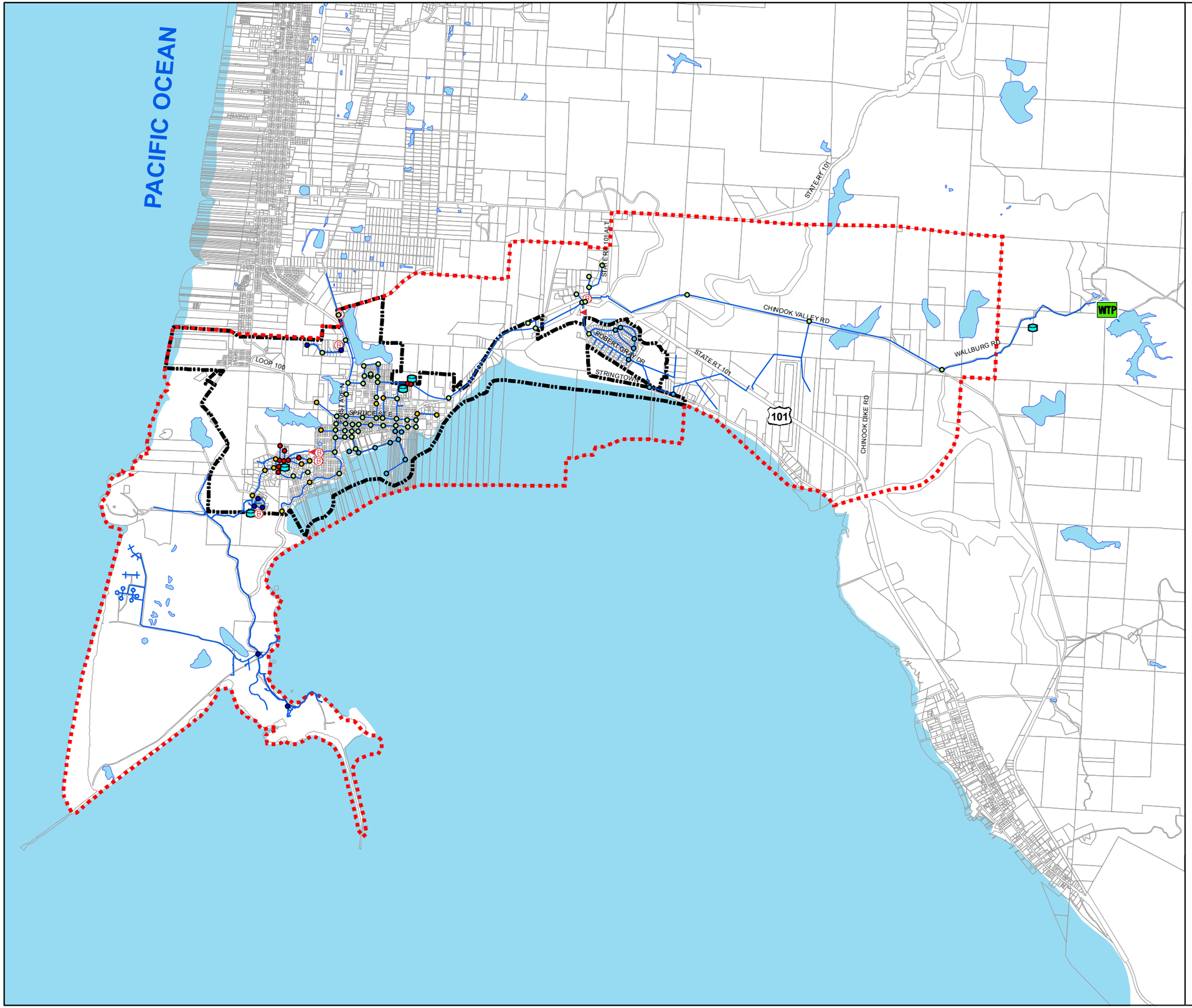
MODEL SIMULATION AND RESULTS

The results of the hydraulic modeling and a node map are included in Appendix E.

Peak Hour Demand

In order to evaluate the water system's ability to meet future demands, the existing system has been modeled under the projected peak hour demand conditions for 2011, 2016, and 2030. WAC 246-290-230 (5) requires that public water systems be designed to deliver peak hour demand while maintaining minimum system-wide pressures of 30 psi, with equalizing storage depleted from any reservoirs. The storage analysis, which provides a breakdown of the storage components, is presented in Chapter 3 of this Plan.

Figure 4-1 shows the 2011 peak hour pressures generated by the model. The modeling results indicate the City's water system currently has two main areas of peak hour pressure deficiency. Table 4-4 presents the peak hour pressures for the deficient areas. These areas are the Sahalee Zone and the area in the vicinity of the City Center reservoirs. Both of these areas are at higher elevations than can be served by the adjacent reservoirs. For the 2016 and 2030 peak hour modeling, the Sahalee Zone is modeled



LEGEND:

- BPS
- PRV
- RESERVOIR
- WATER LINES
- WATER SERVICE AREA
- ILWACO CITY LIMITS
- WATER BODY
- PARCELS

2011 PEAK HOUR PRESSURES (PSI)

- 0 - 30
- 30 - 40
- 40 - 60
- 60 - 80
- OVER 80

CITY OF ILWACO

WATER SYSTEM PLAN
FIGURE 4-1
2011 PEAK HOUR PRESSURES

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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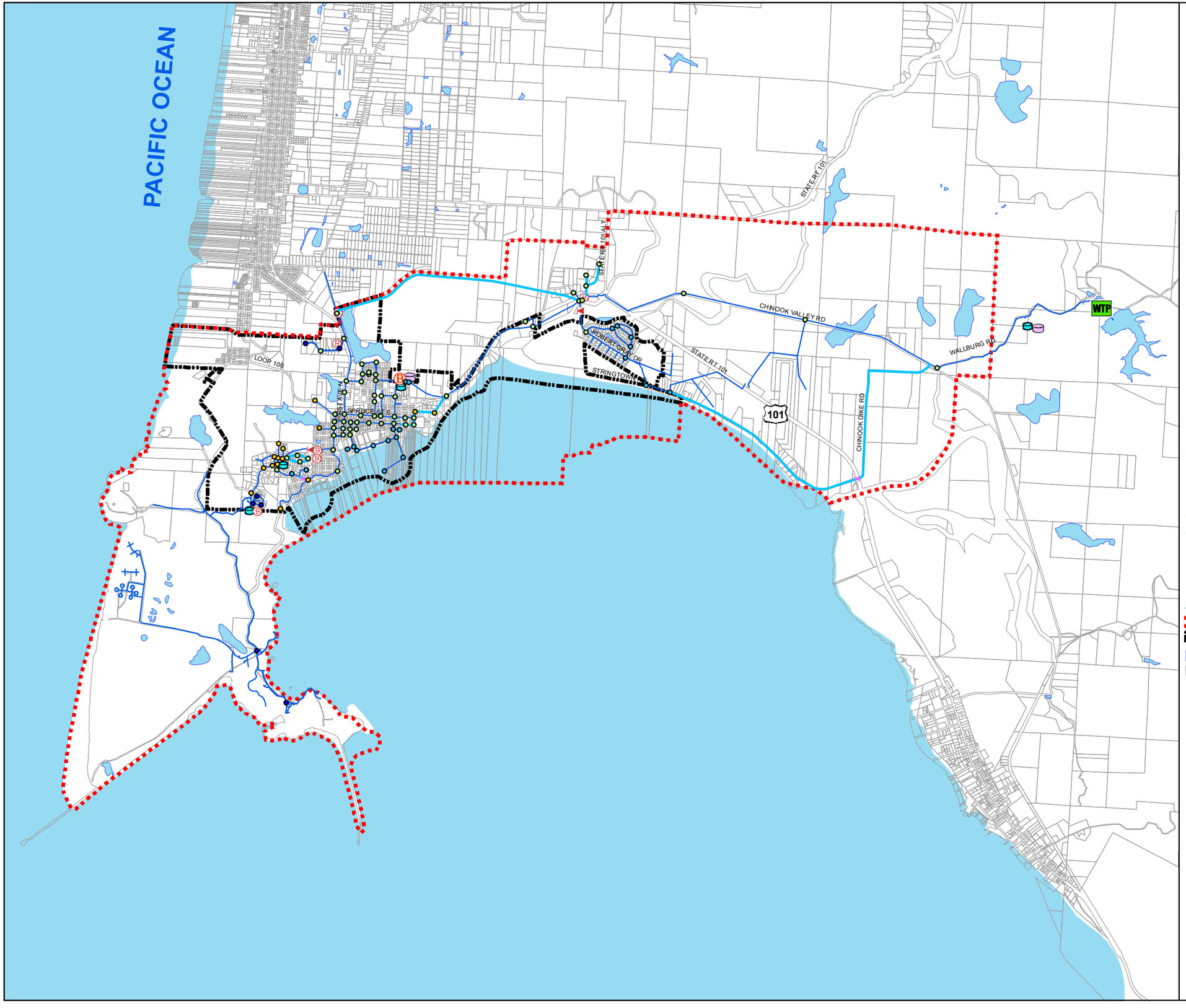

N

0 1,750 3,500 7,000 Feet

LEGEND:

CAPITAL IMPROVEMENT PROJECTS:

- PROPOSED RESERVOIR
- PROPOSED PRV
- PROPOSED BPS
- PROPOSED DISTRIBUTION MAINS

EXISTING FACILITIES:

- BPS
- PRV
- RESERVOIR
- WATER LINES
- WATER SERVICE AREA
- ILWACO CITY LIMITS
- WATER BODY
- PARCELS

2030 PEAK HOUR PRESSURES WITH IMPROVEMENTS (PSI)

- 0 - 30
- 30 - 40
- 40 - 60
- 60 - 80
- OVER 80

CITY OF ILWACO

WATER SYSTEM PLAN
FIGURE 4-2
2030 PEAK HOUR PRESSURES
WITH IMPROVEMENTS

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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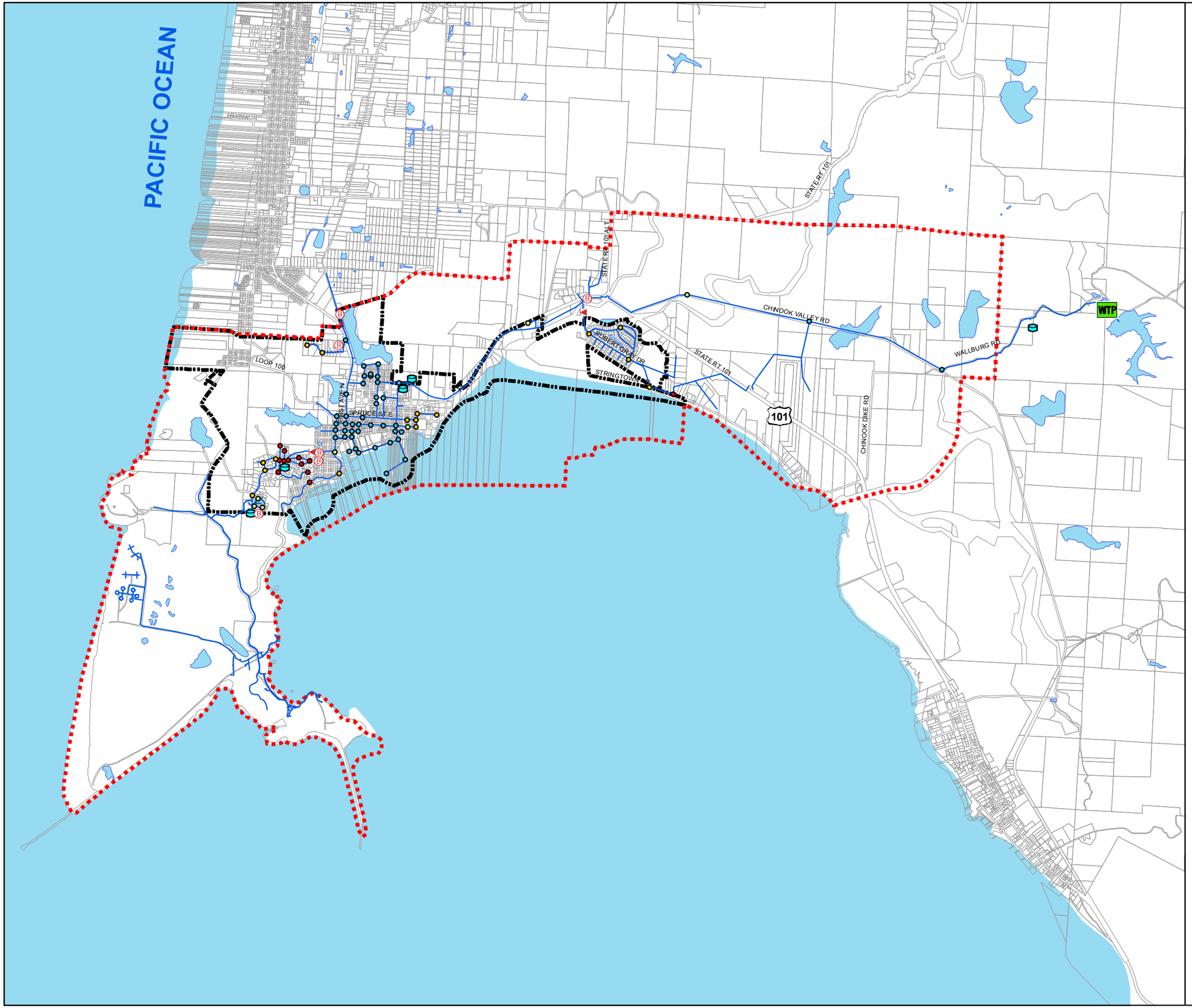

N

0 1,750 3,500 7,000 Feet

LEGEND:

- BPS
- PRV
- RESERVOIR
- WATER LINES
- WATER SERVICE AREA
- ILWACO CITY LIMITS
- WATER BODY
- PARCELS

2011 AVAILABLE FIRE FLOW (GPM)

- 0 - 500
- 500-1,000
- 1,000-1,500
- 1,500-3,000
- OVER 3,000

CITY OF ILWACO

WATER SYSTEM PLAN
FIGURE 4-3
2011 AVAILABLE FIRE FLOW

Gray & Osborne, Inc.
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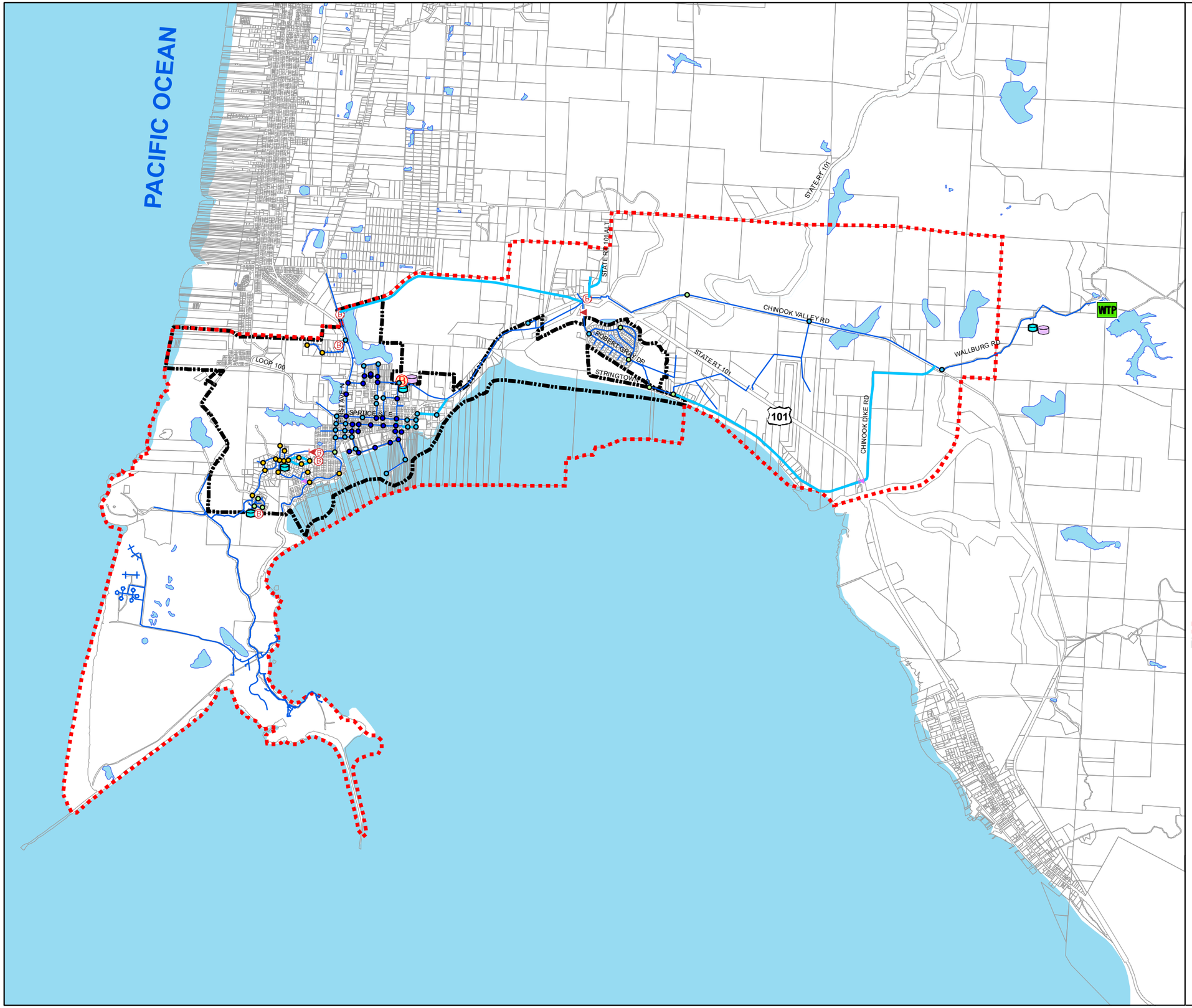

N

0 1,750 3,500 7,000 Feet

LEGEND:

CAPITAL IMPROVEMENT PROJECTS:
- PROPOSED RESERVOIR
- PROPOSED PRV
- PROPOSED BPS
- PROPOSED DISTRIBUTION MAINS

EXISTING FACILITIES:
- BPS
- PRV
- RESERVOIR
- WATER LINES
- WATER SERVICE AREA
- ILWACO CITY LIMITS
- WATER BODY
- PARCELS

2030 AVAILABLE FIRE FLOW WITH IMPROVEMENTS (GPM)
- 0 - 500
- 500 - 1,000
- 1,000 - 1,500
- 1,500 - 3,000
- OVER 3,000

CITY OF ILWACO

WATER SYSTEM PLAN
FIGURE 4-4
2030 AVAILABLE FIRE FLOW WITH IMPROVEMENTS

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with a connection to the Discovery Heights Zone. The higher hydraulic gradeline of the Discovery Heights Zone is sufficient to correct the pressure deficiency in the Sahalee Zone. The area near the City Center reservoirs will need to be served by a new domestic booster station or a developer improvement to correct the deficient pressures. Figure 4-2 shows the 2030 peak hour pressures generated by the model with all of the improvements included in the City's 20-year Capital Improvement Program. Table 4-5 presents the improved peak hour pressures for the deficient locations in 2030. See Chapter 9 for a discussion of the City's Capital Improvement Program.

TABLE 4-4

2011 Peak Hour Pressures for Deficient Locations

Location	Node	Pressure Zone	2011 Peak Hour Pressure (psi)	Reason for Deficiency
Whealdon Street	120	City Center	11.1	Elevation Relative to Reservoir
Sahalee	146	Sahalee	5.2	Elevation Relative to Reservoir

TABLE 4-5

2030 Improved Peak Hour Pressures for Deficient Locations

Location	Node	Pressure Zone	2030 Peak Hour Pressure (psi)	Project Resolving Deficiency
Whealdon Street	120	City Center	61.3	BS-1 – Whealdon BPS
Sahalee	146	Sahalee	33.17	D-1 – Sahalee Connection to Discovery Heights

Available Fire Flows

For design of water systems, WAC 246-290-230 states, "If fire flow is to be provided, the distribution system shall also provide maximum day demand (MDD) plus the required fire flow at a pressure of at least 20 psi at all points throughout the distribution system, and under the condition where the designed volume of fire suppression and equalizing storage has been depleted."

The fire flow requirements for the City are discussed in Chapter 3. In general, residential areas require a fire flow of at least 500 gpm, and the City Center commercial/industrial area requires a fire flow of 3,000 gpm. Figure 4-3 shows the 2011 available fire flows

generated by the model. Table 4-6 provides representative results for areas where the available fire flow does not meet requirements.

TABLE 4-6

2011 Available Fire Flow for Deficient Locations

Location	Node	Pressure Zone	Fire Flow Required (gpm)	Fire Flow Available (gpm)	Reason for Deficiency
City Center Commercial	12, 40, 56, 58, 60, 64, 66, 68, 70, 88	City Center	3,000	2,484-2,879	Insufficient Looping
Sahalee	134-152	Sahalee	500	0	Low Static Pressures
Robert Gray Drive near Klahanee Drive	156	City Center	500	376	Dead-end main
East end of Stringtown Road	220	City Center	500	489	Dead-end main

The fire flow availability in the City Center commercial/industrial area is limited by low pressures at high elevations in the City Center Zone caused by high head losses between the reservoirs and the commercial/industrial area. These head losses will be reduced by a new connection from Cooks Hill Road to the transmission main along Highway 101. This connection will provide an additional loop for high flows from the City Center Reservoirs to the commercial/industrial area.

Static pressures at several locations in the Sahalee Zone are below 20 psi under existing conditions, which means that no fire flow is available in this zone while maintaining pressures within the zone above 20 psi. This deficiency will be resolved by the connection of the Sahalee Zone to the Discovery Heights Zone.

The existing dead end on Robert Gray Drive near Klahanee Drive limits fire flow availability to this area. This deficiency will be resolved by a connection on Klahanee Drive between the Sahalee area and Robert Gray Drive. This connection will include a PRV and will be constructed after the Sahalee Zone is connected to the Discovery Heights Zone, which will allow flows from the Discovery Heights Reservoir.

The existing dead end on Stringtown Road limits fire flow availability to this area. This deficiency will be resolved by completing the Stringtown loop from the dead end east and north to the Indian Creek transmission main.

Figure 4-4 shows the 2030 available fire flows generated by the model with improvements. Table 4-7 provides the improved fire flow results for deficient locations in 2030. See Chapter 9 for the City's Capital Improvement Program.

TABLE 4-7

2030 Improved Available Fire Flow for Deficient Locations

Location	Node	Pressure Zone	Fire Flow Required (gpm)	Fire Flow Available (gpm)	Reason for Deficiency
City Center Commercial	12, 40, 56, 58, 60, 64, 66, 68, 70, 88	City Center	3,000	2,845-3,582	D-4 – Cooks Hill Road, ST-2 – City Center Reservoir
Sahalee	134-152	Sahalee	500	587-830	D-1 – Sahalee Connection to Discovery Heights
Robert Gray Drive near Klahanee Drive	156	City Center	500	861	D-5 – Klahanee Drive
East end of Stringtown Road	220	City Center	500	1,116	D-7 – Stringtown Loop

CHAPTER 5

WATER USE EFFICIENCY PROGRAM

A viable water use efficiency plan is a requirement of water system planning. Public awareness and participation are necessary for the City to develop an active and beneficial water use efficiency plan. The following chapter presents the City's Water Use Efficiency Program.

WATER USE EFFICIENCY PLANNING REQUIREMENTS

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

Conservation can be used effectively to help meet the increased demand for water, to protect the environment, to delay the development of costly infrastructure and to ensure that water is available to meet economic and population growth consistent with the Growth Management Act by using existing supplies more efficiently. Public awareness and participation are necessary for the City to develop an active and beneficial conservation plan.

As an extension to the *Conservation Planning Requirements*, the WUE Rule sets more stringent requirements for public water purveyors. The WUE Rule is comprised of three fundamental elements:

1. Planning requirements;
2. Distribution leakage standards; and
3. Goal setting and performance reporting.

This Chapter provides a discussion of the requirements, and the impact the WUE Rule has on the City.

PAST CONSERVATION PROGRAMS

The City adopted a conservation program in 2003 as part of its last Water System Plan. The key objectives of the revised plan were to reduce consumption to delay or eliminate capital improvements and additional regulations as the system continues to grow, and to reduce distribution system leakage to 15 percent by 2006.

To meet these goals, the City implemented a variety of both supply and demand side measures, which are listed below:

- Program Promotion
- Source and Service Meter Testing
- Service Meter Replacement
- Leak Detection Program
- Customer Assistance

Many of these measures will continue to be implemented as part of the City's new WUE program, and are described in more detail further on in this Chapter.

EFFECTS OF PAST PROGRAMS

The City saw record high production in 2004, using 560,000 gallons per day. Since then, production and ERU consumption has fluctuated, making it difficult to pinpoint effects of the conservation program. At the time of the last Plan, the City had a rate of DSL upwards of 40 percent. While still high, the City has managed to reduce DSL to a 3-year rolling average of 30 percent currently.

PLANNING REQUIREMENTS

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

- Data collection
- Demand forecasts
- Selection and evaluation of WUE measures

DATA COLLECTION AND REPORTING

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

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

Table 5-1 summarizes the water use data collection requirements.

A summary of the water use data collection requirements for the City of Ilwaco is presented in Table 5-1. These specific requirements apply to the City are based on the total number of direct residential service connections being less than 1,000.

TABLE 5-1

Summary of Water Use Data Collection

Data Type	Includes
Source of Supply Meter Readings	Monthly and annual totals of water produced, purchased from another water system, and/or supplied to other water systems through interties
Service Meter Readings	Total annual water consumed, annual water consumed by each customer class.

This data is needed to meet the planning and performance reporting requirement and to check compliance with the distribution system leakage standard of the WUE Rule.

DEMAND FORECAST

Demand forecasting is an essential element of planning. It provides a basis for comparison for growth and usage, and also helps in scheduling system improvements. For the purposes of the WUE Rule, forecasting is used in goal setting and measuring the success of the WUE program.

Complete demand forecasts are provided in Chapter 2 of this plan.

Source Evaluation

As discussed in Chapters 1 and 3 of this Plan, the City's sources are capable of supplying maximum day demands through 2012; however, the source of supply does not currently meet redundancy requirements. An additional filter is needed to supply maximum day demands beyond 2012. Reduction in production with efficient water use will prolong the ability of the existing Water Treatment Plant to meet future demands.

WUE MEASURES

The WUE Rule requires the evaluation or implementation of water use efficiency measure to help meet the WUE goals. The WUE Guidebook states several measures that must be implemented or evaluated and provides a list of measures that can be counted as additional measures in the WUE Program. WAC 246-290-810 identifies the minimum number of water use efficiency measures that must be evaluated based on system size. The City serves between 500 and 999 service connections and therefore must evaluate or implement four water use efficiency measures.

Additional discussion of the City's measures is included later in this chapter.

DISTRIBUTION SYSTEM LEAKAGE

The *Conservation Planning Requirements* set the maximum allowable amount of lost and unaccounted for water at 20 percent of total source production. The WUE Rule now requires that water distribution systems have a leakage rate less than 10 percent of finished water production based on a three-year rolling average. The City was required to meet the 3-year rolling average requirement by July 1, 2010.

Distribution system leakage (DSL) for the City equals the difference between the treated supply volume and water purchased through the Long Beach intertie and volume measured at the customers' meters plus any other credibly estimated usage. Table 2-6 provides annual data of distribution system leakage from 2003 to 2010. As shown in Table 2-6, based on the best available data for customer consumption, the City's annual distribution system leakage has ranged from 15 percent to 54 percent, with a 3-year rolling average ranging from 23 to 46 percent. The current 3-year rolling average is 30 percent, which exceeds the DOH requirement. As a result, the City will implement a Water Loss Control Action Plan, which is described later in this Chapter.

GOAL SETTING AND WUE MEASURES

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

GOALS

The City plans to reduce its total water use in several ways. First, the City will reduce DSL to 10 percent or less by 2016. Second, the City will promote efficient water use to its largest water users to reduce overall and peak demands.

Goal No. 1 of the water use efficiency program is to significantly reduce distribution system leakage. The City would like to have a DSL rate of 10 percent or less by 2016. The City's current 3-year rolling average for DSL is 30 percent, with a rate of 38 percent in 2010. Table 5-2 summarizes the annual reductions in DSL needed to meet this goal.

TABLE 5-2

Supply Side Goal Summary

Year	DSL %
2011	30%
2012	26%
2013	22%
2014	18%
2015	14%
2016	10%

Goal No. 2 of the WUE program is to reduce consumption by general commercial and residential users by 3 MG by 2016. The Ilwaco Fish Company's production will be excluded from the consumption measured for this goal because it is highly variable and based on market factors beyond the City's control. Table 5-3 gives a summary of the reductions in consumption needed to meet Goal No. 2. Because the City's residential water consumption per customer is already low, the City will primarily target reductions in the consumption of high water usage customers. For example, as shown in Chapter 2, water usage by the Eagle's Nest Resort has increased from historical levels of 1 to 3 MG to 7 MG in 2010. It is unclear whether this increase is due to a leak on the customer side of the meter or to an increase in usage on the property. The City plans to investigate cases like these and assist customers in identifying leaks and reducing unnecessary water usage.

TABLE 5-3

Demand Side Goal Summary

Year	Reduction in Consumption (MG)
2011	0.5
2012	0.5
2013	0.5
2014	0.5
2015	0.5
2016	0.5

EVALUATION OR IMPLEMENTATION OF WUE MEASURES

The City has between 500 and 999 connections and, therefore, must evaluate or implement four supplementary water use efficiency measures. The following sections describe both the mandatory and supplementary water use efficiency measures evaluated and indicate which have been or will be implemented by the City.

Mandatory Measures

Implement Source and Service Metering and Meter Calibration

The installation of flow meters on each source of supply is required to measure the amount of water entering the distribution system. A source meter is installed at the water treatment plant and read on a daily basis. The treatment plant was built in 1988. The City tests its source meter on an annual basis to determine if the source meter is functioning properly.

The City has service meters installed on all service connections. The City is continuing to replace all old meters with new One Touch meters, which will be able to be read automatically by City staff. The City has replaced approximately 50 percent of meters, leaving approximately 175 meters that still need to be replaced. Service meters are calibrated upon request of the customer.

Implement Water Loss Control Action Plan

The City's current 3-year rolling average DSL rate is approximately 30 percent, well exceeding the requirement 10 percent or less. As a result, the City must implement a Water Loss Control Action Plan (WLCAP). The Water Loss Control Action Plan is described later in this Chapter.

Implement Customer Education

Water conservation materials published by DOH and Ecology are made available to the public at City Hall. These materials include lawn watering schedules, water conservation tips, and information on water saving devices for the home.

Evaluate Conservation Rate Structure

The City currently has a uniform rate structure. The monthly base rate includes up to 500 cubic feet of water. Usage above 500 cubic feet is billed per 100 cubic feet at a fixed rate. Customers such as hotels, motels, trailer and RV parks also pay a monthly fee per transient space, and mobile/manufactured home parks pay an additional fee per home present for the entire month. The City's current rates are further described in Chapter 10.

The City is currently in the process of completing a rate study and setting new rates. A conservation rate structure is being evaluated as part of this process.

Supplementary Measures

Customer Leak Detection

The City's billing department monitors customers' water bills for abnormally high water reads. When a read occurs that is outside the range of normal use, the customer is notified of a potential leak on their side of the water meter. In order to encourage leak repairs, the City credits 50 percent of the difference between normal consumption and the high consumption read once the leak is repaired.

Hydrant Metering

As a new measure beginning in 2011, the City will implement a metering policy for hydrant flushing, construction uses, and any other hydrant uses. This effort will assist the City with tracking DSL.

Summary of Supplemental Measures

Based on their number of connections, the City must implement or evaluate four measures. The City has chosen to implement all measures listed above. Table 5-4 provides a summary of measures.

TABLE 5-4

Water Use Efficiency Measures

Measure for Implementation	Customer Classes Affected
Customer Leak Detection	4
Hydrant Metering	1
Total Measures Counted	**5**

Evaluation of Measures

All of the measures selected for implementation require little funding aside from any time required by staff to develop and execute each measure. Nonetheless, the City will track any costs associated with the supplemental measures and compare it to water saved to evaluate effectiveness of each measure.

TARGET WATER SAVINGS PROJECTIONS

Table 5-5 presents the projected system demands with water use efficiency savings. The water use efficiency savings projections include the City's WUE Goals No. 1 and 2 to reduce leakage and consumption as discussed previously. At the end of the 6-year planning period (2016), these water use efficiency measures will account for a total WUE savings of 132 MG.

The primary savings projected for the City's system are attributable to reductions in DSL. These DSL reductions could delay the maximum day production and redundancy deficiencies discussed in Chapter 3.

TABLE 5-5

Projected Water System Demands with WUE Savings

Year	Average Day Consumption[(1)] (gpd)	Maximum Day Consumption[(2)] (gpd)	Peak Hour Consumption[(3)] (gpm)	DSL Volume[(4)] (gpd)	DSL %	Average Day Demand[(5)] (gpd)	Maximum Day Demand[(6)] (gpd)	Peak Hour Demand (gpm)	Annual WUE Savings (MG)
2011	262,930	768,030	983	114,126	30%	377,056	882,156	1,063	4
2012	263,560	770,660	988	93,636	26%	357,196	864,296	1,053	12
2013	264,190	773,290	992	75,214	22%	339,404	848,504	1,044	20
2014	264,921	776,121	996	58,576	18%	323,496	834,696	1,037	26
2015	278,451	804,551	1,034	45,531	14%	323,982	850,082	1,066	32
2016	279,281	807,581	1,039	31,031	10%	310,312	838,612	1,061	37
2020	301,581	852,181	1,098	33,509	10%	335,090	885,690	1,121	36
2025	321,481	891,981	1,150	35,720	10%	357,201	927,701	1,174	36
2030	336,481	921,981	1,189	37,387	10%	373,868	959,368	1,215	35

(1) Projected Average Day Consumption less 0.5 MG/year per the City's WUE Goal No. 2.
(2) Projected Maximum Day Consumption less 0.5 MG/year per the City's WUE Goal No. 2.
(3) Projected Peak Hour Consumption less 0.5 MG/year per the City's WUE Goal No. 2.
(4) DSL Volume to meet the City's WUE Goal No. 1.
(5) DSL percentage to meet the City's WUE Goal No. 1.
(6) Average Day Demand includes Average Day Consumption and DSL.
(7) Maximum Day Demand includes Maximum Day Consumption and DSL

PERFORMANCE REPORTING

The City must report water use efficiency goals progress annually. The annual report must include:

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

The latest annual report is included in Appendix F.

WATER LOSS CONTROL ACTION PLAN

The following elements are included in the City's Water Loss Control Action Plan (WLCAP):

- An International Water Association Water Audit
- Assessing data accuracy, collection methods and errors
- Field activities to reduce leakage
- Additional water loss control methods to reduce leakage
- Schedule for completion of elements

INTERNATIONAL WATER ASSOCIATION WATER AUDIT

The City has completed an International Water Association (IWA) Water Audit form, which is provided in Appendix F. This water audit further refines the types of water loss and provides priority areas for improving the City's water use efficiency practices.

For 2010, the IWA water audit indicated Current Annual Real Losses (CARL) of 43.35 MG. The City's system is too small to fit within the IWA methodology for calculating Unavoidable Real Losses (UARL); however, using the IWA formula the City's UARL would be approximately 12,000 gpd, or 4.5 MG. Using these CARL and UARL values, the City's Infrastructure Leakage Index (ILI) would be almost 10.0, which is still well outside the range of acceptable limits.

The priority areas suggested by the IWA audit include improving the accuracy of the following:

1. Volume from own sources
2. Unbilled metered water
3. Customer metering inaccuracies

These priority areas are consistent with the City's plans for addressing DSL, as discussed in the following sections.

ASSESSING DATA ACCURACY AND COLLECTION METHODS

The City has taken several steps to ensure the accuracy of its water production and consumption data. Over the several years the City has replaced approximately 50 percent of service meters with radio read meters. The radio read meters minimize error by automatically uploading data and alerting operators when a meter has a reading error. The City eventually plans to use an automatic meter reading (AMR) system to read all of its water meters.

The City will also begin reading and recording several of the system meters that are not currently recorded. These include the influent meter at the water treatment plant and the booster station flow meters at the Baker Bay and Spring Street Booster Stations. The influent flow meter readings will allow the City to accurately account for the portion of backwash coming from the Indian Creek Reservoir rather than the clear well pumps, which is currently estimated based on design documents. The booster station flow meter readings will further sectionalize water usage throughout the City. All usage by the City Center and Discovery Heights Zones is pumped by the Baker Bay Booster Station, and all usage by the Discovery Heights Zone is pumped through the Spring Street Booster Station. With the sectionalized data, the City will be able to perform zone analyses to determine if DSL is primarily attributable to any particular pressure zone.

FIELD ACTIVITIES TO REDUCE LEAKAGE

The City plans to increase its leak detection efforts within the next 12 months to reduce its DSL. The City will repair leaks as identified and prioritize the replacement of mains with frequent leaks or breaks.

The City also plans to reduce or eliminate known points of leakage within its water system. The wooden reservoir in the City Center Zone is known to be currently leaking. The City estimates that this reservoir is leaking at a rate of 15,000 gallons per day, or 5.5 MG annually. Replacement of this reservoir may reduce the City's DSL on a percentage basis by 3 to 4 percent. The City has allocated maintenance funds to reline the reservoir in 2011 and plans to replace the reservoir in the 6-year planning period. The wooden reservoir at Sahalee is another known source of leakage. The reservoir itself is leaking, and the booster station that fills the reservoir is run on a timer and frequently overflows the reservoir. These facilities will be decommissioned upon completion of the connection between the Discovery Heights and Sahalee Zones (Capital Improvement Plan Project D-1), which is scheduled for 2012. See Chapter 9 for the City's Capital Improvement Plan.

WATER LOSS CONTROL METHODS

The City plans to employ several aggressive water loss control methods to reduce leakage and eliminate water accounting inaccuracies, including leak detection, large

meter calibration, meter replacements, leaky storage tank repair/replacement, pipe replacements, and water audits.

As previously mentioned, the City will also move forward with its service meter replacement program, with the intention of replacing the remaining approximately 25 percent of service meters over the 6-year planning period. The City billing staff also will continue to monitor customer usage for potential leaks and keep detailed records of identified leaks and whether or not the leak is fixed. Once the City's customer meters are all replaced with radio read meters, the City will consider reading meters more frequently and synchronizing meter reads with production meter reading to improve the City's ability to track DSL.

The City's Capital Improvement Plan projects ST-2, D-1, and D-3 involve replacements of leaking infrastructure that is anticipated to reduce DSL. See Chapter 9 for a description of the City's Capital Improvement Plan.

CHAPTER 6

WATERSHED CONTROL PROGRAM

INTRODUCTION

Water supply systems using a surface water source must develop and implement a watershed control program in order to protect the water supply and the health of water system customers. Protection of the City's source can be accomplished through monitoring and limiting and controlling, to the best extent possible, all activities that may adversely affect the watershed. This chapter has been prepared to fulfill the watershed control program requirements for filtered systems. Specific criteria against which the adequacy of source water protection is evaluated is presented in the following regulations:

WAC 246-290-135 (4) Source Protection
WAC 246-290-668, Watershed Control
WAC 246-290-678, Reliability for Filtered Systems

REGULATORY REQUIREMENTS

SOURCE PROTECTION REQUIREMENTS

In accordance with WAC 246-290-135, subpart (5), the City's Watershed Control Program includes a description of the watershed location, hydrology, land ownership, and activities that may adversely affect source water quality. The WAC also requires a description of relevant written agreements, monitoring activities, and water quality.

WATERSHED CONTROL REQUIREMENTS

In concert with Source Protection, WAC 246-290-668 requires an evaluation of the Watershed Control Program at least every 6 years. All changes in the watershed over the previous 6 years that could adversely affect source water quality must be described.

FILTERED SYSTEM RELIABILITY REQUIREMENTS

WAC 246-290-678 requires all water systems with filtration technology to provide reliability features. The WAC requires such features as alarm devices to warn of treatment process failures, standby replacement equipment to ensure continuous operation, and redundant filter units. The reliability features of the Ilwaco WTP are described in Chapter 3.

WATERSHED DESCRIPTION

The City of Ilwaco obtains its water from the impoundment of Indian Creek, a tributary of the Bear River. Indian Creek was formed by the construction of an earthen dam built in 1988. The dam is located approximately 5,500 feet upstream from the confluence of Indian Creek and Bear River and approximately six miles northeast of the City of Ilwaco. The remote location of the watershed and land management practices implemented by the City have helped preserve the quality of this resource.

The City's drinking water intake is located behind the dam. Raw water from the impoundment flows by gravity to the water treatment plant. The water is filtered, disinfected using hypochlorite, and routed to a storage tank before flowing to the City's distribution system. The Indian Creek treatment facility currently has a production capacity of 1.0 mgd and water rights for 1.5 mgd.

LOCATION AND SIZE

Figure 6-1 shows the location and size of the Indian Creek drainage basin and watershed. The drainage basin located in Sections 27, 28, 29, 33, and 34 of Township 10N, Range 10W and Section 3 Township 9N, Range 10W in Pacific County consists of approximately 808 acres. The terrain of the drainage basin consists of wooded slopes. The adjacent drainage basins to the north and east discharge to small creeks tributary to the Bear River and the drainage basins to the west discharge to small creeks tributary to the Chinook River.

ROADS AND TRAILS

Walberg Road, a County road, provides limited access to the Indian Creek Watershed. The gravel road begins at Chinook Valley Road and continues east to the Water Treatment Plant. A private road continues southeast along the ridge that delineates the watershed. Logging activities and recreational users of properties located outside of the watershed use this road for access. Several old logging roads located within the watershed have been abandoned and use by non-City staff is prohibited. All former logging roads within the City owned watershed are gated and have been allowed return to a vegetated state. City staff plant to walk the abandoned roads around the perimeter of the impoundment to patrol the area once a week.

HYDROLOGY

Mean annual precipitation to the drainage basin is approximately 79.43 inches per year, as measured at the Long Beach Experimental Station, the official rain gauge closest to the watershed. The 808 acre drainage basin receives approximately 5,350 acre-feet, or 1,740 million gallons of rainfall per year. Approximately 232 acre-feet, or 75.5 million gallons of precipitation falls directly onto the 35 acres of impoundment water surface.

N

0 1,900 3,800 7,600
Feet

LEGEND:

INDIAN CREEK WATERSHED
ILWACO CITY LIMITS

CITY OF ILWACO

WATER SYSTEM PLAN
FIGURE 6-1
INDIAN CREEK WATERSHED

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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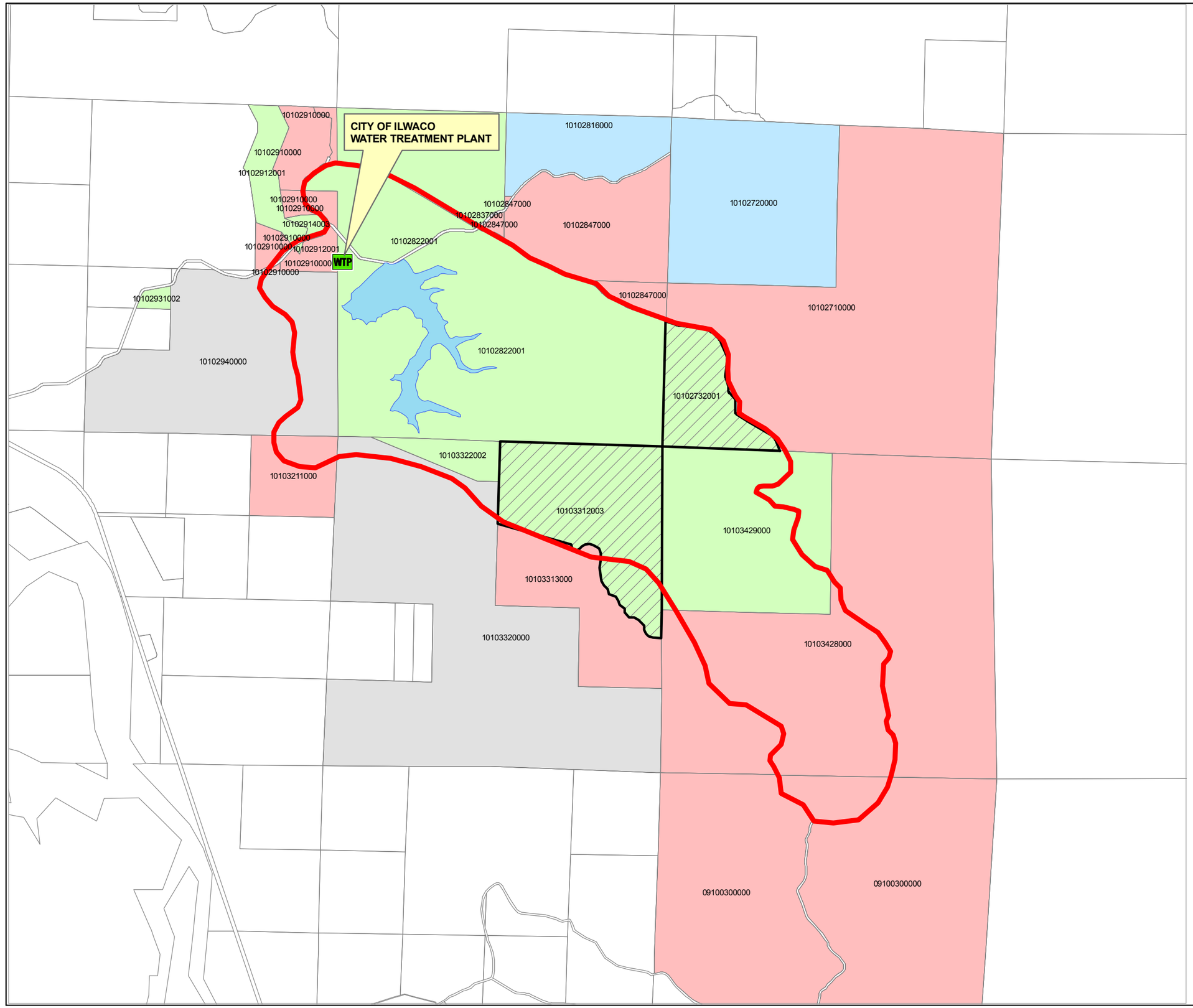

LEGEND:

- INDIAN CREEK WATERSHED
- ILWACO CITY LIMITS
- TIMBER RESERVATION AREAS (THROUGH 2028)
- WATER
- PARCELS
- CITY OF ILWACO
- LONGVIEW TIMBERLANDS LLC
- TC&I-CHINOOK LLC
- HAWAII ERS TIMBERLAND LLC

CITY OF ILWACO

WATER SYSTEM PLAN
FIGURE 6-2
WATERSHED OWNERSHIP

Gray & Osborne, Inc.
CONSULTING ENGINEERS

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The hydrology report prepared during the planning stages for the Indian Creek provided a water balance for the impoundment. The Reservoir Permit (No. R 2-26649P) requires that the reservoir can only be filled during the months of December, January and February, and a minimum of 2.0 cfs must be maintained in Indian Creek downstream of the dam during the spring and summer. The following Water Balance, Table 6-1, indicates that the impoundment is able to be filled by creek flow in December, January and February and the remainder of the demands are met by available storage and Indian Creek flow during the remainder of the year.

The City measured the water surface elevation in the impoundment and the flow released to Indian Creek downstream of the dam approximately twice a month from 1990 through 1994 (Appendix G). The normal pool elevation of 90 feet shown in the records indicates that the water surface elevation is just below the spillway. An elevation of 90+ feet indicates that water is exiting the impoundment over the spillway. The information presented in the water surface elevation records indicate that the minimum impoundment surface elevation experienced in the 5 years of record was 80 feet, equivalent to available storage of approximately 450 acre-ft.

The City plans to resume collection of weekly water surface elevation readings to track trends in the water level.

TABLE 6-1

Water Balance[1]

Month	Indian Creek Inflow[2]	Downstream Release[3] (cfs)	City Demand[4] (cfs)	Evaporation and Seepage Loss[5] (cfs)	Total Demand (cfs)	Surplus/ (Deficit) (cfs)	Available Storage (acre-ft)
January	21.43	2.00	2.33	0.02	4.35	17.08	1022
February	14.82	2.00	2.33	0.03	4.36	10.46	1022
March	11.17	2.00	2.33	0.04	4.37	6.80	1022
April	6.86	2.00	2.33	0.07	4.40	2.46	1022
May	3.89	2.00	2.33	0.10	4.43	(0.54)	989
June	2.65	2.00	2.33	0.13	4.46	(1.81)	878
July	1.70	2.00	2.33	0.14	4.47	(2.77)	707
August	1.13	2.00	2.33	0.13	4.46	(3.33)	502
September	0.89	2.00	2.33	0.11	4.44	(3.55)	284
October	0.89	2.00	2.33	0.07	4.40	(3.51)	68
November	12.56	2.00	2.33	0.04	4.37	8.19	572
December	21.22	2.00	2.33	0.02	4.35	16.87	1022

(1) Water Balance, Table 4-2, City of Ilwaco, Water System Plan, 1997.
(2) From Table II-1, Town of Ilwaco Design Report for Water System Improvements, 1986. Evaluation of Indian Creek yield based on measured flow in Bear River and percentage of total acres in Bear River watershed attributable to the Indian Creek Watershed.
(3) Minimum downstream release of 2.0 cfs during spring and summer applied to all months.
(4) City demand assumed to be 1.5 mgd.
(5) From Table II-4, town of Ilwaco Design Report for Water System Improvements, 1986.

SOILS

Soils in the drainage basin are primarily deep, well drained, silty loam with some poorly drained, silty, clay loam along the shores of Indian Creek. The soils are moderately permeable allowing rainfall to infiltrate into the soil and provide recharge to the Indian Creek reservoir throughout the year. Slopes vary from random areas of flat terrain to steep slopes of 70 percent. The bulk of the area is in the upland category with slopes ranging from 30 to 60 percent.

VEGETATION

The vegetation within the drainage basin consists primarily of woodland areas. The principal trees include western hemlock, Douglas fir, red alder, and sitka spruce. Understory species include salmonberry, sallal, red huckleberry, and western swordfern. A wetland has developed near the clearing at the base of the Indian Creek dam. Wetland plants include sedges, alders, cattails, and small fruited bullrush.

LAND USE AND OWNERSHIP

The drainage basin for the Indian Creek impoundment is approximately 808 acres (Town of Ilwaco Design Report for Water System Improvements, AEA, Inc., 1986). Approximately 605 acres within the watershed and an additional 102 acres adjacent to the watershed is owned by the City of Ilwaco. The drainage basin and property ownership is shown on Figure 6-2. The remainder of the watershed and adjacent properties are owned by Longview Timberlands, LLC, Longview, WA, Hawaii Timberland LLC, Vancouver, WA and TC&I-Chinook LLC, Portland, OR. The ownership of these properties has changed since the previous Water System Plan was prepared in 2003. Land use within the drainage basin is limited to operations relating to the Indian Creek watershed, with occasional logging activities.

City of Ilwaco

The 605 acres of the drainage basin owned by the City of Ilwaco are wooded areas and are managed by the City as protective areas for the City's watershed. The area was previously logged in 1988. The area is not due to be logged again until 2018. The City owns 2.4 acres west of the WTP which contains the Indian Creek Reservoir and approximately 100 acres immediately north of the treatment plant site.

Longview Timberlands, LLC

Longview Timberland, LLC, (Longview Timberlands) owns approximately 100 acres of timberland in the southern tip of the City's watershed. The majority of the property to the east and south of the watershed boundaries in Sections 27, 28, 32, 33 and 34 Township 10N Range 10W and Section 3 Township 9N, Range 10W is owned by Longview Timberlands. Details of their current activity are not available and recent

aerial photographs do not indicate that logging activities have been conducted in the watershed. The Longview Timberlands property is managed as a timber resource.

Longview Timberlands retains the rights to timber reservations for a portion of the watershed per the City's original agreement to purchase these lands from the Weyerhaeuser Company. The agreement is provided in Appendix C. The timber reservation areas are shown on Figure 6-2. Longview Timberlands reserves the right to harvest merchantable timber in the reservation areas through 2028 or upon completion of harvest. Longview Timberlands is required to give the City notice of the intent to harvest these areas at least three years in advance. While the timber reservations are in place, Longview Timberlands may manage the areas according to generally accepted silvicultural practices (thinning, fire control, pest control, fertilization, etc.), provided that all actions comply with applicable laws governing operations in municipal watersheds. Longview Timberlands may not apply pesticides without approval by the City. Longview Timberlands will give the City notice at least 90 days before commencing any silvicultural practices, except in emergencies.

TC&I-Chinook LLC

Portions of Sections 27 and 28 Township 10N Range 10W outside of the north drainage basin boundary belong to TC&I-Chinook, Inc. Details of their current activity are not available and recent aerial photographs do not indicate that logging activities have been conducted. The TC&I – Chinook property is managed as a timber resource.

Hawaii Timberland LLC

Portions of Sections 29 and 33 Township 10N Range 10W to the west and south of the watershed basin belong to Hawaii Timberland LLC. Small portions of these parcels lie within the watershed. Recent aerial photographs indicate that the parcel located in Section 29 Township 10N Range 10W has been recently logged. A heavily vegetated buffer of City owned property is located between the logging activity and the impoundment. The Hawaii Timberland LLC property is managed as a timber resource.

Mineral Rights

The previous owners of the watershed retained the mineral rights to the property when land ownership transferred to the City of Ilwaco. These rights include the right to explore and mine for minerals. Any damage to the watershed land surface will require the mineral rights owner or developer to compensate for any losses to the City. Previous owners include Boise Cascade Corporation, Cavenham Forest Industries, and Weyerhaeuser Corporation.

WATER RIGHTS

The City of Ilwaco has water rights for Indian Creek for 732 acre-ft per year. These water rights are through a permit (S2-29218) for 22 acre-ft per year and a certificate (S2-25880) for 710 acre-ft per year.

Prior to 1989, the City's primary water supply was Black Lake. The use of Black Lake as the primary water source for the City was abandoned because of limitations on the amount of water the City could withdraw due to senior water rights holders and because trihalomethane precursors were identified in the source water.

In 1989, the City of Ilwaco brought the Indian Creek surface water source online. Initial water rights for Indian Creek were 1.0 mgd per day. The certificate was issued on March 4, 1991. The City performed initial water demand forecasts and determined this amount was not sufficient to provide for future demand and fire flow conditions. The City requested an additional 0.5 mgd from the Department of Ecology. The Department of Ecology issued a permit for the additional amount requested on April 24, 1995.

WATER QUALITY RISK ASSESSMENT

The water quality within the watershed control area has shown significant quantities of iron and organics in the source water. A detailed analysis of the City's source water quality can be found in Chapter 8 of the Water System Plan.

CURRENT WATERSHED CONTROL PLAN

Currently, the City of Ilwaco has policies and informal procedures in place to provide protection of the watershed. The remote location of the watershed has its benefits and disadvantages. The remote location of the watershed provides a buffer against potential detrimental activities to the watershed. In the same vein, the remote location also makes it more difficult to monitor and manage the watershed.

The City has obtained satisfactory water supply from Indian Creek since 1989. There has been no degradation of the water supply since the City of Ilwaco has started using it as a source of supply. Previous logging practices within the watershed do not appear to have caused any damage to the area. Land use practices in the watershed set forth by the City and the State have done an adequate job of protection.

There are no major activities besides logging that take place within the watershed. The City does not allow recreational activities, road building, transportation or sanitation within the watershed. However, certain activities may occur within the watershed of which the City is not aware. These activities may include hunting, fire fighting and wildlife management.

Timber land owners within the watershed must follow the best management practices for timber harvesting contained in Title 222 WAC. City staff will contact the new property owners that own timber rights or property in or adjacent to the watershed to determine their plans for management of the individual properties and to request that the City be notified prior to any activity that may affect the City's watershed.

WATERSHED CONTROL ACTIONS

The City is committed to protecting the watershed from potential harmful activities. City water system operators will patrol the perimeter of the impoundment on a weekly basis to look for signs of intrusion or damage to the area surrounding the impoundment. The main access to the watershed off of the private road that forms the east and south boundary of the watershed is gated to prevent access to the watershed. "No Trespassing" signs are posted around the perimeter of the watershed.

The City will continue the current actions it takes to protect the watershed and look to find ways to increase its watershed protection. The following is a list of actions the City will take in order to ensure the future protection of the Indian Creek watershed:

- **Increase Knowledge of Watershed Activities**

  Over the past 6 years, the ownership of the land surrounding the watershed has changed hands. The City will keep up to date on who owns the small portions of the watershed in Sections 29 and 34, Township 10N Range 10W and Section 3 Township 9N, Range 10W that are within the watershed and the areas on the perimeter of the watershed. Each time the land ownership is changed the City will notify the land owner to discuss their plans for the property and the possible impacts they may have on the watershed.

  The City will annually notify the County that the City is interested in any planning activities or building permits that are occurring within Sections 27, 28, 29, 32, 33 and 34 Township 10N, Range 10W and Section 3, Township 9N, Range 10W.

- **Secure Access to Drainage Basin**

  Access to the City's treatment facility and the Indian Creek Dam is currently secured and locked at the entrance. "No Trespassing" signs are posted throughout the perimeter of the City's watershed perimeter.

  The City and adjacent property owners have discussed erecting additional gates to limit access to the private road that follows the east and south ridge of the watershed if funds are available. One gate would be placed at the end of Walberg Road at the Water Treatment Plant. A second gate

would be placed along the road south of the southern end of the watershed. The gates would limit access to the area to the City and the property owners and eliminate a majority of the recreational use by motorcycles and quads.

- **Remove Deteriorating Culverts**

  The City has identified three metal culverts along the main abandoned road within the watershed that have deteriorated and caused partial collapse of the old road bed. Continued deterioration of the culvert and undermining of the road bed may contribute to sediment deposition into the impoundment. As funds permit the City will remove the deteriorated culverts and remove the old road bed in the area to provide open channel conveyance of surface runoff through the abandoned road.

- **Wildlife Program**

  In the past, beaver activity has been identified at the headwaters of Indian Creek and just below the Indian Creek Dam. Pacific County actively traps and removes beavers from the watershed.

- **Monitor Drainage Basin**

  A member of the City staff travels to the treatment plant once a day. City staff will patrol the watershed perimeter and access roads once per week. The City will continue to monitor the watershed. All City staff that are responsible for monitoring activities in the watershed will be knowledgeable about the watershed boundaries, access, and the potential impacts that various activities can have on the watershed.

- **Erosion Prevention**

  Entities that perform logging or road building within or near the watershed area must use Best Management Practices contained in the Forest Practices regulations, Title 222 WAC, to prevent erosion and sediment transport when performing these activities. The City will reseed or replant any area within the watershed, which are damaged by forest fires.

EMERGENCY RESPONSE

If an emergency concerning the watershed should occur, such as a spill or forest fire within the watershed, the following individuals or agencies will be contacted immediately.

Pacific County Sheriff Dispatch ..... 911 or (360) 642-9403

City of Ilwaco Fire Department ..... 911 or (360) 642-2316

Washington State Department of Health

Division of Drinking Water (SW Office) .....(360) 236-3030
24 Hour Drinking Water Emergency Hotline.....(877) 481-4901

Water Quality Superintendent

City Hall.....(360) 642-3145
Water Treatment Plant.....(360) 777-8330

Long Beach City Hall .....(360) 642-4421

Department of Natural Resources

Report A Forest Fire Hotline .....(800) 562-6010

CHAPTER 7

OPERATION AND MAINTENANCE

ORGANIZATION

The City of Ilwaco (City) water system is operated by the Water Department, which is under the direction of the City's Mayor. The Water Department has two employees. Other City staff assist with water system maintenance and operation as needed.

CERTIFICATION REQUIREMENTS

Waterworks Operator Certification, specified in WAC 248-55, requires larger public water systems in Washington State to retain in their employ individuals who are certified, by examinations, as competent in water supply operations and/or management. The Washington State Department of Health (DOH) determines the required level and number of certified positions based on the population and complexity of the water system.

Under the current certification requirements of the DOH, the City must provide three mandatory certification positions for its water system, a Water Distribution Manager Level 1 (WDM 1), a Water Treatment Plant Operator Level 3 (WTPO 3), and a Cross Connection Control Specialist Level 1 (CCS 1). The DOH also requires that personnel with supporting certifications be available for each of the three mandatory certification positions. The current level of operator certification for each certified City employee is presented below.

TABLE 7-1

City Staff Certification Levels

Name	Position	WDM	WTPO	CCS
Daryl Gardner	Supervisor	2	3	—
Dennis Schweizer	Operator	2	2	—
David Gustafson	Operator	1	2 (Temp.)	—

PROFESSIONAL GROWTH REQUIREMENTS

In order to promote and maintain expertise for various grades of operator certification, Washington State requires that all certified operators complete at least three Continuing Education Units (CEUs) within each 3-year period. Programs sponsored by both the Washington Environmental Training Center (WETRC) and the American Waterworks Association's (AWWA) Pacific Northwest Subsection are two frequently used CEU

sources utilized by City employees. The City regularly budgets for operator training in the annual budget.

JOB RETENTION PLAN

The City of Ilwaco is committed to hiring and retaining water treatment plant operators who are professional, dedicated and ethical. The City informally follows a job retention program with the goal of hiring and retaining top-quality operators.

The City recognizes that employee retention is important to ensure continuity at the water treatment plant and that a job must be appealing to the employees they want to retain.

In order to ensure job retention, the City surveys current employees to discover issues that employees perceive with their job. By conducting employee surveys, the City gathers information that is helpful in developing the job retention plan and also lets employees know that the City is interested and concerned about their welfare. The survey can be anonymous or verbally conducted at the discretion of the mayor

The City will conduct exit interviews for departing key employees. The exit interviews will be conducted promptly after an employee has turned in their notice to sever employment.
The strategies the City employs to ensure retention of key employees include:

> Retention Strategy #1: Provide work that is meaningful, challenging, and offers training and development opportunities.
> Retention Strategy #2: Provide management that assists and supports staff.
> Retention Strategy #3: Demonstrate awareness of life beyond the workplace and life in the workplace.
> Retention Strategy #4: Provide an array of core benefits, including a pay grade/step program.

RETENTION STRATEGY #1

The City recognizes that for most employees, the most compelling reason to take a job and stick with it is that they value the job itself. Employees must feel that the job they perform is important to the operation of the city, the job will help the employee to develop professionally, and the job offers a challenge. The City will develop the following programs to implement this retention strategy.

- The City will clearly define and understand the roles for each position by writing specific, comprehensive job descriptions for each employee. The descriptions will be kept up-to-date and include how the duties of the position fit into the overall organization of the City.

- Each employee's role will be clearly communicated to the employee, and each employee will understand how the role fits into the organization and enhances its mission and purpose.

- The City will clearly discuss the job description and lay out all of the tasks involved in performing the job well during orientation. The negative consequences to the City if the employee's work is substandard or incomplete will be discussed. The employee will understand his or her mission and the importance to the overall operation of the water system.

- The City recognizes that each employee must feel challenged. The mayor will monitor when an employee's performance falters or absences or late arrivals increase and respond accordingly. If the mayor concludes that an employee's interest in the job is beginning to wane, the supervisor will be asked to look for ways to revitalize the employee. Most importantly, the supervisor will talk with the employee to let him or her know that there is concern about their recent falters.

- The City encourages employees to learn new skills and to develop existing skills. When an employee requests to attend a particular seminar or take a course, the supervisor will meet with the employee and talk about what he expects from the course and how he anticipates it will be beneficial on the job. If the City has specific goals for the employee to achieve in the course, they will be shared and discussed. The employee will meet with the supervisor again after the seminar or course and talk about what was learned and can be incorporated in the current work environment.

RETENTION STRATEGY #2

The City recognizes that a potential problem may arise where management becomes or is perceived as unsupportive. The City deploys the following steps to implement this retention strategy

- The City management welcomes new ideas and, if the idea has merit, will make sure the employee has the proper tools and training to allow the idea to be implemented. Regular meetings with the mayor and/or council committee are encouraged. These meetings allow staff to solicit support and guidance on specific projects.

- The supervisor will respond to employee requests, inquiries or ideas promptly. The City recognizes that the worst message could be imparted is that autonomy means employees have all the responsibility for accomplishing a task – without the support and tools they need to succeed.

- The City recognizes that employee autonomy goes hand-in-hand with responsibility. Employees are more likely to accept responsibility for their performance when given the freedom to accomplish tasks independently.

- The City will promptly acknowledge an employee's outstanding performance or cost-saving suggestion.

RETENTION STRATEGY # 3

The City recognizes that employees have commitments outside of the workplace. When feasible, the City will entertain an individual employee's need for flexible schedules to keep employees more content allowing them to be more productive at work.

RETENTION STRATEGY #4

The City recognizes that employees consider salary and employee benefits as very important in their decision to accept or reject a job and in deciding to continue in the job or look elsewhere. The City has developed the following programs to implement this strategy.

- The City will attempt to offer salary and benefit packages – to water system professionals that are comparable to similarly sized communities within the realities of city budgetary constraints.

The City investigates alternative benefit packages that could be offered to employees.

NORMAL SYSTEM OPERATION

The City's water system consists of a water treatment plant, five storage reservoirs, five booster stations, and 16 miles of transmission and distribution piping. Figure 1-6 provides a map of the City's water system components. The City collects its water from Indian Creek and treats it at the water treatment plant (WTP).

Treated water is supplied from the WTP to the 159,000-gallon reservoir through a 12-inch transmission main. The 1,150-gpm Baker Bay booster station discharges water from this reservoir west through 12-inch and 10-inch water mains to supply the City's distribution system. The transmission main directly feeds the three In-City reservoirs, which set the hydraulic grade for the lower pressure zone. The distribution system consists mainly of PVC and AC water main, ranging in size from 2 to 12 inches.

Currently, the City serves six pressure zones, the Indian Creek, City Center, Lakeview Estates, Sahalee, Coastal Ridge, and Discovery Heights Zones. The Indian Creek Zone is

supplied directly by the Water Treatment Plant. Water is pumped from the Indian Creek Zone to the City Center Zone. From the City Center Zone, water is pumped up to the Lakeview Estates and Discovery Heights Zones. From the discovery Heights Zone, water is pumped up to the Coastal Ridge Zone.

SYSTEM MONITORING AND CONTROL

The City's water treatment plant is controlled by a Supervisory Control and Data Acquisition (SCADA) program. The SCADA system continuously monitors the treated water turbidity and, chlorine residual. The WTP will automatically shut-off in the event of high turbidity or low chlorine residual. The SCADA system also monitors the permanganate concentration in the treated water and will alarm the operator in the event of high levels of permanganate. The SCADA system also monitors reservoir levels in Indian Creek Reservoir and the City Center Reservoirs and the status of the Baker Bay Booster Station.

The City is planning upgrades to its SCADA and telemetry system that will provide additional control and monitoring of the water system facilities.

STANDARD OPERATING PROCEDURES

The City is in the process of preparing Standard Operating Procedures (SOPs) for use in water system operations. The City plans to have the SOPs completed and implemented by the end of 2011. These SOPs will cover normal filter operations, emergency responses, emergency contacts, treatment technique violations, public notifications, PLC settings, and water quality sampling procedures.

ROUTINE AND PREVENTATIVE MAINTENANCE

The planning and performance of routine and preventative maintenance for the components of the City's water system represent important tasks in the reliable delivery of water to the service area. The most cost-effective method for maintaining a water system is to develop a planned Preventative Maintenance (PM) program. A planned PM program allows the City to determine the schedule for maintenance activities, so as to minimize the total maintenance cost.

Developing a PM program involves defining the tasks to be performed, determining the frequency of each task, and assigning City personnel for the completion of the tasks. The program allows the City to preserve the value of the physical infrastructure of the water system and provide a save, reliable water supply to the service area.

MAINTENANCE OF MAJOR SYSTEM COMPONENTS

Routine maintenance tasks for the City's major system components are presented in Table 7-2. For each pump station and reservoir, the table also provides a description, previously performed maintenance, and planned maintenance.

TABLE 7-2

Preventative Maintenance Schedule

Name	Activity	Frequency
Reservoirs	Interior Cleaning and Painting	Every 5 years
	Exterior Cleaning and Paining	As necessary
	Clean site of debris	Monthly
Booster Stations	Inspect pump house	Monthly
	Flush pump	Semi-annually
Distribution Mains	Flush	Annually
Isolation Valves	Close and Open	Annually
Control Valves	Calibrate	Every 5 years
Generator	Start generator	Monthly
Hydrants	Exercise hydrants	Annually

MATERIALS INVENTORY

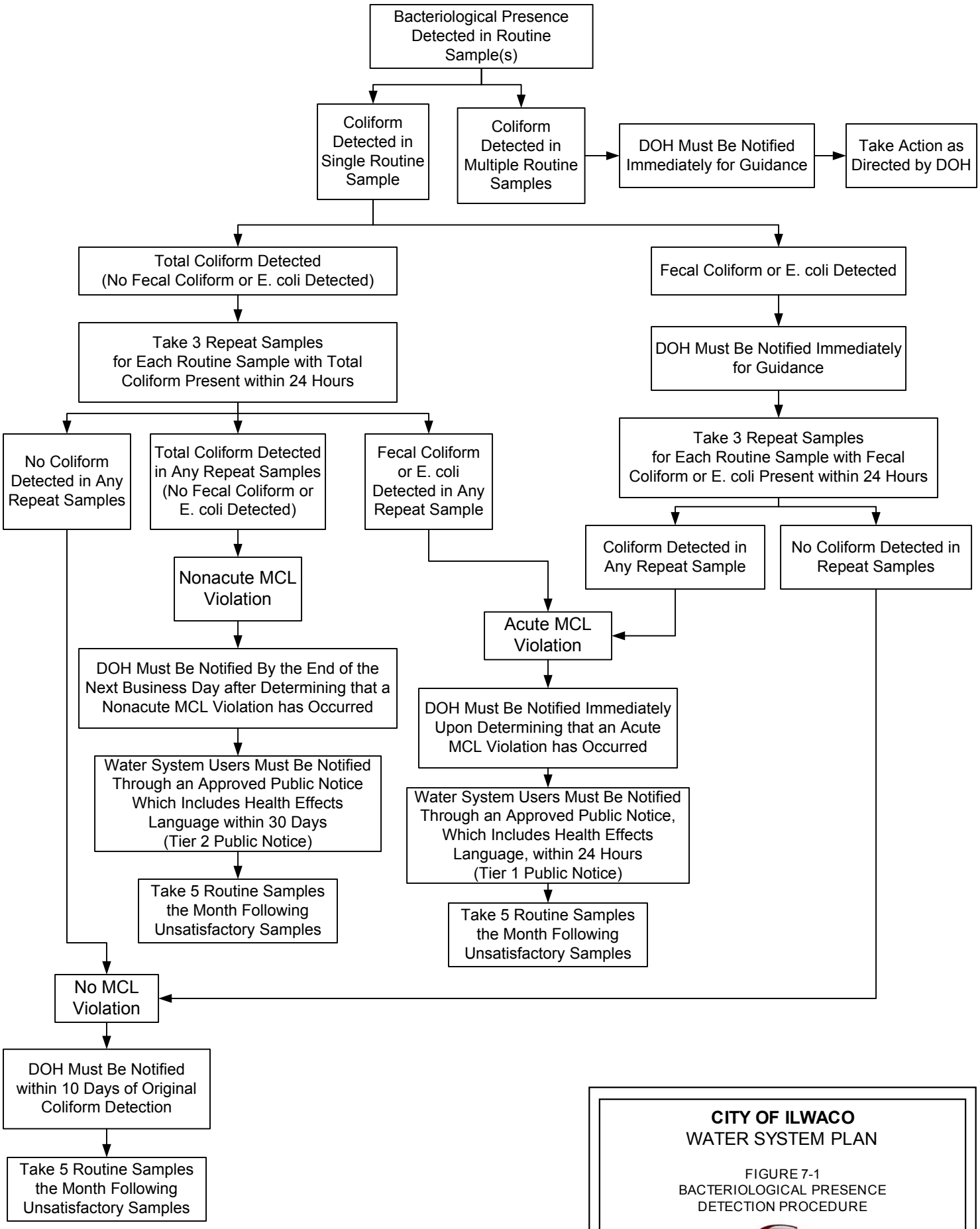
A key element of any effective PM program is an accurate inventory of parts, materials, and tools, including the location of each. The City has the Familian Northwest Office in Longview at their full disposal for the acquisition of parts and supplies for the operation and maintenance of the water system. A full complement of parts and accessories is available within 4 hours. The City can also get additional supplies from the City of Long Beach and Astoria.

EMERGENCY RESPONSE

The operation of the water system under emergency conditions is an important responsibility of the City staff. Emergency response procedures will be rehearsed and reviewed by all personnel. Staff members will be aware of emergency procedure changes and the location of emergency contact information. Detailed emergency response procedures are also being included in the City's new Standard Operating Procedures, which is anticipated to be completed by the end of the year.

STAFF NOTIFICATION

A procedure for quickly notifying all City staff, customers, other utilities, and if necessary, the local health department and DOH, of a water system related emergency is

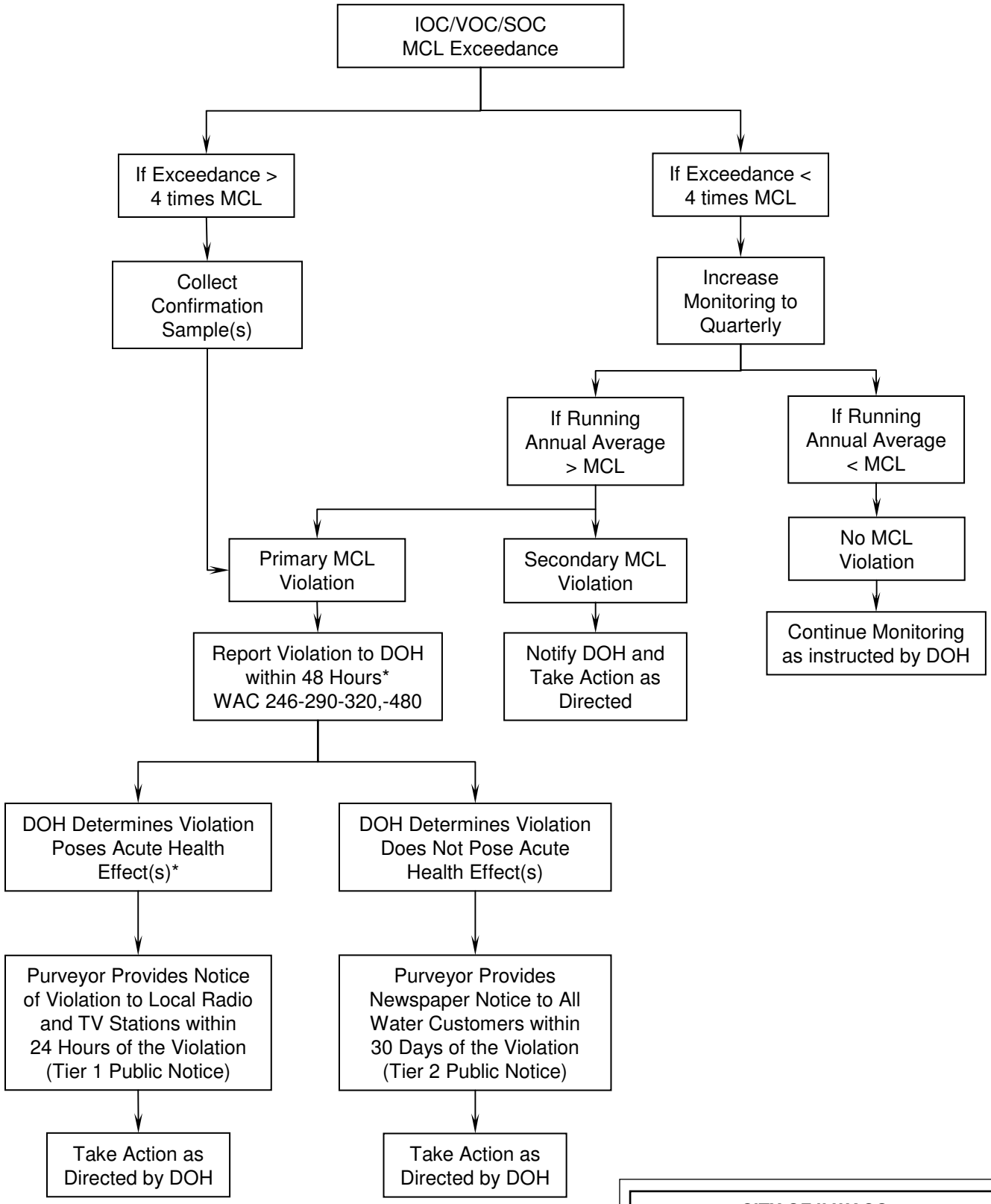


DOH: Washington State Department of Health

CITY OF ILWACO
WATER SYSTEM PLAN

FIGURE 7-1
BACTERIOLOGICAL PRESENCE
DETECTION PROCEDURE

Gray & Osborne, Inc.
CONSULTING ENGINEERS



* A violation of the 10.0 mg/L nitrate MCL constitutes an acute health effect concern. DOH must be notified immediately upon violation of the nitrate MCL.

DOH: Washington State Department of Health

WAC: Washington Administrative Code

CITY OF ILWACO
WATER SYSTEM PLAN

FIGURE 7-2
IOC/VOC/SOC
DETECTION PROCEDURE

Gray & Osborne, Inc.
CONSULTING ENGINEERS

a necessary component of an Emergency Response Program. The City keeps a list of staff contact information.

PUBLIC NOTIFICATION

In response to certain water system emergencies, it may be necessary to notify the public of drinking water quality concerns. WAC 246-290-320 indicates the follow-up actions that must be taken in the event of water quality emergencies. The public notification requirements of WAC 246-290-320 refer to the Environmental Protection Agency's (EPA's) Public Notification (PN) Rule, which is codified in the Code of Federal Regulations (CFR) beginning at section 40 CFR 141.201. In addition to notifying its own customers, the City must notify any wholesale customers of water quality emergencies. The public notifications must provide specific health effects language provided by EPA.

The EPA PN Rule categorizes drinking water situations and violations into three tiers, Tier 1, Tier 2, and Tier 3. The categories are summarized in the following paragraphs.

Tier 1 includes situations or violations that pose an acute health risk, such as a fecal coliform detection or a nitrate MCL violation. Waterborne pathogens and any other water system situation determined by DOH to pose an acute health risk are also included in Tier 1. Tier 1 situations and violations require public notification and DOH consultation as soon as practical but within 24 hours of learning of the violation.

Tier 2 includes situations or violations that do not pose an immediate health risk but still require prompt public notification. Tier 2 includes most MCL violations, other than acute bacteriological and nitrate MCL violations. Tier 2 situations and violations require DOH consultation within 48 hours and public notification as soon as practical but within 30 days of learning of the violation.

Tier 3 includes situations or violations that have the lowest health risk. Tier 3 includes most monitoring violations, exceedance of the fluoride MCL, and the detection of unregulated contaminants. Tier 3 situations and violations require DOH consultation within 48 hours and public notification as soon as practical but within 1 year of learning of the violation. These notifications can be combined with the purveyor's annual water quality report. In the event that public notification is required during an emergency, the City maintains a list of both television and radio resources that can be provided with news releases regarding the situation.

Sample public notification forms that will be used by the City if needed are included in Appendix N.

EMERGENCY RESPONSE PROCEDURES

The City provides guidelines for the general assessment of an emergency situation. The first order of business is to assess whether or not an Emergency Operations Center (EOC) will be established. An EOC is probably not necessary under the following conditions:

- A single event has occurred
- A small number of similar events have occurred
- The event has already peaked or ended

Establishing an EOC will be considered under the following conditions:

- Multiple events have occurred
- Several system outages
- Severity or length of event is increasing
- Communications are down or failing
- Event is regional

Once a general assessment of the situation has been completed, the Plan provides "decision trees" outlining procedures for emergency situations such as severe weather events, earthquakes, power failure, and water contamination.

VULNERABILITY ANALYSIS

It is important to estimate the degree in which system facilities may be vulnerable to various types of emergency situations in order to identify system weaknesses. The following sections provide information regarding which facilities would be vulnerable to various types of emergency events and recommended actions that City staff could take to help mitigate the problem.

Water Shortage

A water shortage for the City's system could occur if adequate supply is not available from either the City's WTP or from the intertie with the City of Long Beach. In the event of a water shortage, the City will rely on standby storage to serve the system until supply can be provided. The public will be notified and asked to conserve water to maximize the period of standby storage availability. If needed, Ilwaco Municipal Code 13.04.090 gives the City the authority to restrict water use as necessary.

Bacteriological Presence Detection Procedure

Notification procedures for notifying system customers, the local health department, and DOH of water quality emergencies are an important component of an emergency response program. Many public water systems will occasionally detect positive coliform

samples, mainly as a result of minor contamination in distribution mains or sample taps, or improper bacteriological sampling procedures. However, the persistent detection of coliforms in the water supply, particularly E. coli or fecal bacteria, may require issuing a public boil water notice to ensure the health and safety of the water customers. Emergencies such as floods, earthquakes, and other disasters can affect water quality as a result of damage to water system facilities, thereby warranting a boil water order in advance of supply. WAC 246-290-320 requires water utilities to follow specific procedures in the event coliform bacteria are detected in the water system. These procedures are outlined in Figure 7-1.

IOC/VOC/SOC Detection Procedures

A procedure to comply with DOH requirements in the event of an inorganic chemical/physical characteristic, volatile organic chemical, or synthetic organic chemical detection is presented in Figure 7-2.

Treatment Technique Violations

A water system has a treatment technique violation, as identified in WAC 246-290-632, when a waterborne disease outbreak occurs or, for a purveyor providing filtration of a surface water source, when the filtration or disinfection performance requirements are not met. For the City's system, the failure to meet filtration or disinfection performance requirements would be shown by high turbidity or low chlorine residuals. As previously mentioned, turbidity and chlorine residual are continuously monitored by the City's SCADA system, and the WTP shuts down when these parameters are not within the appropriate range. Treatment technique violations require DOH consultation as soon as practical but within 24 hours of learning of the violation and require Tier 2 public notification unless elevated to Tier 1 by DOH.

Power Failure

Various types of weather can cause loss of power. In order to alleviate the effects of a power outage, the City has several auxiliary generators at its disposal. Table 7-3 presents the potential effects of a lengthy power failure on the water system components.

TABLE 7-3

Emergency Response Procedures for a Power Failure

Water System Component	Potential Effects	Recommended Actions
Transmission and Distribution System	No effect.	None.
Storage Facilities	Telemetry system may be inoperable	Manually check reservoir levels.
Booster Stations	Booster stations will be inoperable without auxiliary power	Operate auxiliary generators at booster stations.

Earthquake

A severe earthquake may have a substantial impact on the City's water system. In order to help mitigate the effects of an earthquake, the City will take seismic events into consideration when designing future reservoirs. Table 7-4 presents potential effects of a severe earthquake on the water system components.

TABLE 7-4

Emergency Response Procedures for an Earthquake

Water System Component	Potential Effects	Recommended Actions
Transmission and Distribution System	Transmission and distribution system mains may be broken and City staff transportation for monitoring systems and making repairs may be limited.	Isolate broken sections as they are located and repair.
Storage Facilities	Reservoirs may be leaking or structurally damaged	Check each reservoir for structural damage or cracks and leaks. Seal and drain as required.
Booster Stations	Booster stations may be structurally damaged or mechanical damage to pumps may have occurred.	Check booster stations and shut down pumps as required.

Severe Snowstorm

A severe snowstorm will limit motor vehicle traffic, including the transportation of City personnel. Table 7-5 provides the emergency response procedures for a severe snowstorm.

TABLE 7-5

Emergency Response Procedures for a Severe Snowstorm

Water System Component	Potential Effects	Recommended Actions
Transmission and Distribution System	City staff transportation for monitoring system and making repairs may be limited.	Contact county or state highway department to expedite plowing of problem areas. Keep chains or other snow gear for maintenance equipment on hand. Keep valve locations current and available to maintenance personnel.
Storage Facilities	No immediate effect, snow may prevent access.	Clear snow from access roads.
Booster Stations	No immediate effect, snow may prevent access.	Clear snow from access roads.

Fire

An extensive fire may result in low distribution system pressures and drawing down of the City's reservoirs. Table 7-6 presents the emergency response procedures for a fire.

TABLE 7-6

Emergency Response Procedures for a Fire

Water System Component	Potential Effects	Recommended Actions
Transmission and Distribution System	Low pressure may result in the extremities of the distribution system depending on the extent of the fire demand.	No action.
Storage Facilities	Drawdown will occur with increased demand.	Monitor reservoir levels.
Booster Stations	Additional pumps will be called on.	No action.

Flooding

Heavy snowmelt and/or rains have the potential to cause flooding and landslides in the City. Table 7-7 presents the emergency response procedures for flooding.

TABLE 7-7

Emergency Response Procedures for Flooding

Water System Component	Potential Effects	Recommended Actions
Transmission and Distribution System	Transmission and distribution mains may be affected by landslides or high water levels. City staff transportation for monitoring system and making repairs may be limited.	Take more frequent bacteriological tests to assure water quality. Observe conditions at bridges and prepare to close off washed out pipes if necessary.
Storage Facilities	None.	None.
Booster Stations	None.	None.

Contamination of the Water Supply

Contamination of the water supply may occur due to such occurrences as main breaks or pollution from an isolated source. Table 7-8 presents the emergency response procedures for contamination of the water supply.

TABLE 7-8

Emergency Response Procedures for Contamination of the Water Supply

Water System Component	Recommended Actions
Transmission and Distribution System	Close valves as required to isolate the source of contamination. Repair and/or otherwise remove source of contamination. Flush previously contaminated section and test until free of contamination prior to resumption of use.
Storage Facilities	Isolate contaminated reservoir from the distribution system and decide on method of disinfection. Consider draining, cleaning, and disinfecting reservoir if water is determined to be unsuitable for consumption. Disinfect reservoir with chlorine in accordance with AWWA standards. Take bacteriological samples and return to service when results are satisfactory.
Booster Stations	Close valves as required to isolate the source of contamination. Repair and/or otherwise remove source of pollution. Flush previously contaminated section and test until free of contamination prior to resumption of use.

CONTINGENCY OPERATIONAL PLAN

A contingency operational plan is necessary for operation of the system when normal operating procedures are not available. The following sections provide information regarding alternate modes of operation for system facilities.

Source of Supply

The City provides all of its own water supply. In the event that the City cannot provide its own supply, it has an emergency intertie with the City of Long Beach. The intertie is located on Sand Ridge Road at the City limits. The intertie is normally closed and does have a meter to track usage.

Transmission Facilities

In the event of a transmission main failure, it is possible to close off the main without a serious interruption of water service. However, some residents along the segment may be without water service until repairs could be completed. In the event that repairs will take more than 8 to 12 hours, temporary emergency service lines could be placed above ground and directly connected to each customer's service meter.

Booster Stations

The City's booster stations do not have auxiliary generators on site. The City Center, Indian Creek, and Discovery Heights Zones can be served by reservoir storage during power outages. However, the Lakeview Estates and Coastal Ridge Zones are closed zones and will therefore lose pressure during power outages if the booster stations are not operated with portable generators. The City will monitor the situations in these zones during prolonged power outages and respond accordingly.

Storage Facilities

Since the City's reservoirs primarily provide supply for peak demand periods, if one were removed from service during average demand conditions, it would not cause significant problems within the water system.

CHAIN OF COMMAND

During emergency responses, the water system chain of command will follow that of normal operation, with the Mayor services as the immediately responsible person. If the Mayor is unavailable, the Mayor Pro Tempore will be responsible for emergency response.

EMERGENCY CONTACT LIST

Pacific County Sherriff Dispatch	911 or (360) 642-9403
City of Ilwaco Fire Department	911 or (360) 642-2316
Washington State Department of Health	
Division of Drinking Water (SW Office)	(360) 236-3030
24 Hour Drinking Water Emergency Hotline	(877) 481-4901
Water Quality Superintendent	
City Hall	(360) 642-3145
Water Treatment Plant	(360) 777-8330
Long Beach City Hall	(360) 642-4421
Pacific County Emergency Management	(360) 642-9340

CROSS-CONNECTION CONTROL

Water utility purveyors have the responsibility to protect customers from water contamination due to cross-connections, as required by WAC 246-290-490. A cross-connection is any physical arrangement where the potable water supply is connected, directly or indirectly, to any liquid, gas, or solid of unknown or unsafe quality that may contaminate the public water supply through backflow. The regulation also requires utilities to develop and implement a comprehensive program to control cross-connections within the system. The City's Cross-Connection Control Program is provided in Appendix K. The City currently contracts cross-connection control specialist services on a project-by-project basis. The City does not currently maintain an inventory of cross-connection devices.

RECORDKEEPING AND REPORTING

Recordkeeping and reporting requirements for public water systems are given in WAC 246-290-480. The records concerning water system operation are retained at the City's Water Treatment Plant. Billing records and other official City records are retained at City Hall.

OPERATION AND MAINTENANCE DEFICIENCIES

The City is currently deficient in the execution of its Cross-Connection Control Program as required by WAC 246-290-490. Per WAC 246-290-490(3)(e), the City is required to provide a Cross-Connection Control Specialist to implement the Cross-Connection Control Program. The City will retain the services of an outside cross-connection specialist to fully execute the City's adopted program. Per WAC 246-290-490(3)(j), the City is required to maintain an inventory of backflow devices. The City plans to work with the newly retained CCS to compile an inventory of backflow devices and to ensure that these backflow devices are tested as required.

CHAPTER 8

WATER QUALITY MONITORING

The water quality monitoring program of the City is administered to comply with the regulations established to enforce the Safe Drinking Water Act (SDWA). The regulations include the sampling requirements of a monitoring program, as well as compliance conditions for specified contaminants.

The State of Washington has adopted as state law, all of the SDWA regulations promulgated by the EPA as of July 1, 1993. The state has delegated authority to oversee drinking water regulations to the State Department of Health (DOH). State Drinking Water Regulations are published in WAC 246-290 and establish monitoring requirements, maximum contaminant levels, and follow-up actions.

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

This chapter describes each of the applicable water quality regulations and the impact of each regulation on the City. The results of prior monitoring efforts and the continuing requirements of the City are also presented in this chapter.

OVERALL MONITORING REQUIREMENTS

Table 8-1 lists existing and future drinking water regulations, the current status of each regulation, and whether or not the regulation will require the City to conduct monitoring or take other action.

TABLE 8-1

Existing Drinking Water Regulations

Rule[1]	Contaminants Affected[2]	Action Required?
Total Coliform Rule	Coliforms	Yes
Residual Disinfectant	Total Free Chlorine	Yes
Lead and Copper Rule	Lead, Copper	Yes
Arsenic Rule	Arsenic	Yes
Inorganic Chemicals, and Physical Parameters	IOCs	Yes
Volatile and Synthetic Organic Compounds	VOCs, SOCs	Yes
Surface Water Treatment Rule (SWTR)	Microbial Contaminants	Yes
Interim Enhanced Surface Water Treatment Rule	Microbial Contaminants	No
Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR)	Microbial Contaminants	Yes
Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR)	Microbial Contaminants	Yes
Filter Backwash Recycling Rule	Microbial Contaminants	No
Stage 1 Disinfectants/Disinfection Byproducts Rule (DBPR)	TTHMs, HAA5, Chlorite, Bromate	Yes
Stage 2 Disinfectants/Disinfection Byproducts Rule (DBPR)	TTHMs, HAA5, Chlorite, Bromate	Yes
Consumer Confidence Report	Reporting Only	Yes
Radionuclides Rule	Radionuclides	Yes
Ground Water Rule	Bacteriological	No

(1) Drinking water regulations as of February 2011.
(2) TTHM = Total Trihalomethanes, IOCs = Inorganic Chemical and Physical Characteristics
VOCs = Volatile Organic Chemicals, SOCs = Synthetic Organic Compounds,
HAA5 = Five Halo-Acetic Acids

MONITORING OF SPECIFIC PARAMETERS

BACTERIOLOGICAL

Many serious diseases are caused by bacteria, which are a classification of single-celled organisms. Indicator organisms are often used to test for bacterial contamination in drinking water. Total coliform, fecal coliform, and *E. Coli* are typical indicator organisms. The absence of coliform bacteria generally assures the water purveyor that pathogenic bacteria are not present. WAC 246-290 establishes bacteriological requirements for public water systems. Compliance with this rule is based on the presence/absence of total coliforms.

Monitoring requirements and schedules for the City are found in the City's Coliform Monitoring Plan. A copy of the Coliform Monitoring Plan is attached in Appendix H of this Plan. The number of routine samples required depends on system size, or the population served by the system. The State bacteriological standards require a minimum of two monthly samples for a population of 1,001 to 2,500. The figure in Appendix H provides the locations the City uses for monitoring. If a samples tests positive for coliform, the City must collect 3 repeat samples to assess the extent of the problem. The repeat samples must come from the original site as well as one upstream and one downstream sample. In a month following a detected coliform sample, the City is required to collect five samples.

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

A violation of bacteriological MCLs occurs during routine sampling when:

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

The City is in compliance with monitoring requirements for coliform. The City has not had a sample test positive for coliform since 1999.

DISINFECTANTS/DISINFECTION BYPRODUCTS RULE

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

compounds (mono-, di- and trichloroacetic acids and mono- and dibromoacetic acids) known as HAA5.

Stage 1

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

Stage 2

Stage 2 of the D/DBP Rule was published in January 2006 and compliance with the new regulations begins in 2012. Under Stage 2 of the D/DBP Rule, the MCLs for TTHM and HAA5 remain 80 µg/L and 60 µg/L, respectively; however, compliance with the MCL is based on the locational running annual average (LRAA) of each individual sample site instead of the running annual average of all sample sites combined. This means that the annual average at each site must be below the MCL. The number of samples taken is dependant on the population served. The City has completed the Initial Distribution system Evaluation (IDSE) with standard monitoring to identify locations with high DBP levels for Stage 2 sampling. The City will be required to sample two sites per quarter under Stage 2.

Monitoring Results

The City's DBP monitoring has indicated that the extremities of the City's system have moderate amounts of both TTHM's and HAA5's. The City monitors for DBP's at Lakeview Estates and the State Park. The TTHM levels in the City's system typically range from 20-40 µg/L at Lakeview Estates and from 40-60 µg/L at the State Park. The HAA5 levels in the City's system typically range from 5-10 µg/L at Lakeview Estates and 10-30 µg/L at the State Park. The City has had individual samples that have exceeded the MCL for both TTHM's (117.8 µg/L in September of 2004 and 83.2 µg/L in September of 2006 at the State Park) and HAA5's (60.1 µg/L in September of 2004 at the State Park); however, the running annual average for the City's system has remained below the MCL's. DBP levels have decreased in recent years. The City will continue to monitor DBP levels and optimize the system to maintain DBP levels below the MCL.

RESIDUAL DISINFECTANT

The City treats and chlorinates its own water at the water treatment plant (WTP). The City has a chlorine analyzer at the outlet of the WTP that it uses to ensure the correct amount of chlorine has been added. The chlorine analyzer continually monitors the chlorine in the treated water.

ASBESTOS

Since the City's system contains asbestos-cement (AC) water lines, it must monitor for asbestos in accordance with 40 CFR 141.23 (b). One sample in an area with AC pipe is required every 9 years. The City conducted asbestos sampling in 1999 and 2009 and found that the asbestos levels in the samples were below the detection limits.

LEAD AND COPPER

In 1991, the EPA promulgated the Federal Lead and Copper Rule (LCR). The State of Washington adopted this rule in 1995 with minimal changes. The LCR is intended to reduce the tap water concentrations of lead and copper than can occur when corrosive source water causes lead and copper to leach from water lines and other plumbing fixtures. Possible treatment techniques to reduce lead and copper leaching include pH adjustment through the addition of caustic soda or soda ash to the source water prior to distribution.

The City is currently required to test 10 samples for lead and copper every 3 years, and 90 percent of these samples must be below the action levels of 0.015 mg/L for lead and 1.3 mg/L for copper. The City completed lead and copper testing in 2005 and 2011, and all samples were below the action levels.

IOCS, VOCS AND SOCS

The State of Washington has adopted Federal MCLs and monitoring regulations for inorganic chemicals and physical parameters (IOCs), volatile organic compounds (VOCs), and synthetic organic compounds (SOCs). The Federal standards were originally promulgated in the Phase I Rule and updated in the Phase II and Phase V Rules.

The City is required to monitor for IOCs, VOCs, and SOCs. The City has had samples that have exceeded the MCLs for color and manganese in the pas t6 years. In July 2004, the City detected a level of manganese of 0.096 mg/L, which is above the MCL for manganese of 0.05 mg/L. In the same sample, the color level was 25 color units, which is above the MCL for color of 15 color units. However, the most recent IOC/VOC/SOC samples have had results below the MCLs for all contaminants.

SURFACE WATER TREATMENT RULE (SWTR)

The Surface Water Treatment Rule (SWTR) was incorporated into the WAC in April 1993. This Rule established water quality requirements for surface water sources and groundwater sources that are under the direct influence of surface water (i.e., GWI sources). This rule is now under the Long Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR). The City's responsibilities will be described below.

RADIONUCLIDES RULE

Existing state law requires monitoring of existing drinking water sources for radionuclides. Radionuclides include radioactive substances occurring naturally in ground waters. Regulated substances include radium-226, radium-228, uranium, and gross alpha and beta particles.

Table 8-2 summarizes radionuclide MCLs as defined by Washington State Department of Health's WAC 246-290 and EPA's Radionuclide Rule. WAC 246-290 requires radionuclide samples once every four years.

TABLE 8-2

Radionuclide MCLs

Radionuclide	MCL
Radium – 226	3 pCi/L
Radium – 228	20 pCi/L
Combined Radium - 226 and 228	5 Ci/L
Uranium	20 µg/L
Gross Alpha (excluding Uranium)	15 pCi/L
Gross Beta	4 millirem

INTERIM ENHANCED SURFACE WATER TREATMENT RULE (IESWTR)

The purpose of the IESWTR is to improve control of microbial pathogens, specifically the protozoan Cryptosporidium, in drinking water and address risk trade-offs with disinfection byproducts. The rule requires systems to meet strengthened filtration requirements as well as to calculate levels of microbial inactivation to ensure that microbial protection is not jeopardized if systems make changes to comply with disinfection requirements of the Stage 1 Disinfection and Disinfection Byproducts Rule (DBPR). The IESWTR applies to public water systems that use surface water or ground water under the direct influence of surface water and serve more than 10,000 people.

LONG TERM 1 ENHANCED SURFACE WATER TREATMENT RULE (LT1ESWTR)

The LT1ESWTR applies to public water systems that use surface water or ground water under the direct influence of surface water and serve fewer than 10,000 persons. The LT1ESWTR builds upon the framework established for systems serving a population of 10,000 or more in the IESWTR.

The City must take turbidity monitoring results every four hours. The turbidity reading must be below 0.3 NTU in at least 95 percent of the measurements taken each month. The maximum turbidity level is 1 NTU.

LONG TERM 2 ENHANCED SURFACE WATER TREATMENT RULE (LT2ESWTR)

The LT2ESWTR applies to all public water systems that use surface water or groundwater under the direct influence of surface water. The LT2ESWTR supplements previous regulations to target additional treatment for disease-causing microorganisms for high-risk systems. The City was not deemed to be a high-risk system and was therefore not required to provide additional treatment.

The second round of LT2ESWTR sampling will begin in 2016, when the City will be required to collect fecal coliform samples twice per month for 12 months.

CONSUMER CONFIDENCE REPORT

This rule was finalized on August 19, 1998. The Consumer Confidence Report Rule requires community water system purveyors to prepare and distribute an annual report of water quality analyses to their customers. The City's 2009 Consumer Confidence Report is included in Appendix J.

CHAPTER 9

CAPITAL IMPROVEMENT PLAN

This chapter presents a Capital Improvement Plan in accordance with the requirements of WAC 246-290. Recommended water system improvements and associated cost and scheduling information are presented in the following sections according to the analyses, deficiencies, and recommendations identified in earlier chapters of the plan. Figure 9-1 provides a map of the proposed project locations. Scheduling and financing of these improvements is included in Chapter 10. All costs shown in this chapter are planning level costs and are based upon similar projects constructed in Western Washington under public works bidding. The project costs assume engineering and administration cost of 25 percent of construction cost, 20 percent construction cost contingency, and sales tax. Detailed cost estimates for the capital improvement projects are included in Appendix L.

Since the adoption of the City's 2003 Water System Plan, the following projects identified in that plan have been completed:

- SO-1 – In-Plant Electrical System Reliability
- SO-3 – Electrical Service Improvements
- D-1 – Connect Transmission Main on Highway 101
- D-4 – Replace Baker Bay Subdivison Waterline
- G-1 – Replace Service Meters
- G-2 – Calibrate Large Service Meters
- G-4 – Unidirectional Flushing Program

The remaining projects from the previous capital improvement program that are still considered necessary have been added to the current capital improvement program.

In the future other projects may arise that are not identified as part of the City's CIP. Such projects may be deemed necessary for ensuring water quality, preserving emergency water supply, accommodating transportation improvements proposed by other agencies, or addressing unforeseen problems with the City's water system. Due to budgetary constraints, the completion of these projects may require that the proposed completion date for the projects in the CIP be rescheduled. The City retains the flexibility to reschedule proposed projects and to expand or reduce the scope of the proposed projects as best determined by the City when new information becomes available for evaluation.

GENERAL SYSTEM IMPROVEMENTS

G-1: CONTROL IMPROVEMENTS

The City plans to install an antenna at the Indian Creek Reservoir to improve water system SCADA communications. With this antenna, all water system data could be accessed at the water treatment plant rather than only at the wastewater treatment plant. The City also plans to make the necessary control improvements to monitor and record reservoir levels and booster station flow rates at the water treatment plant.

Year to be Completed: 2013
Estimated Project Cost: $85,000

PROPOSED SOURCE IMPROVEMENTS

SO-1: NEW 1.0 MGD TREATMENT UNIT

The City plans to replace Filter Nos. 1 and 2 with a new 700-gpm upflow clarifier and filter unit identical to Filter No. 3. As part of this project, the City will make the improvements necessary to operate Filter No. 3 and the new unit simultaneously, increasing the treatment plant capacity from 1.0 mgd to 1.5 mgd.

Year to be Completed: 2013
Estimated Project Costs: $763,000

SO-2: BACKWASH BASIN IMPROVEMENTS

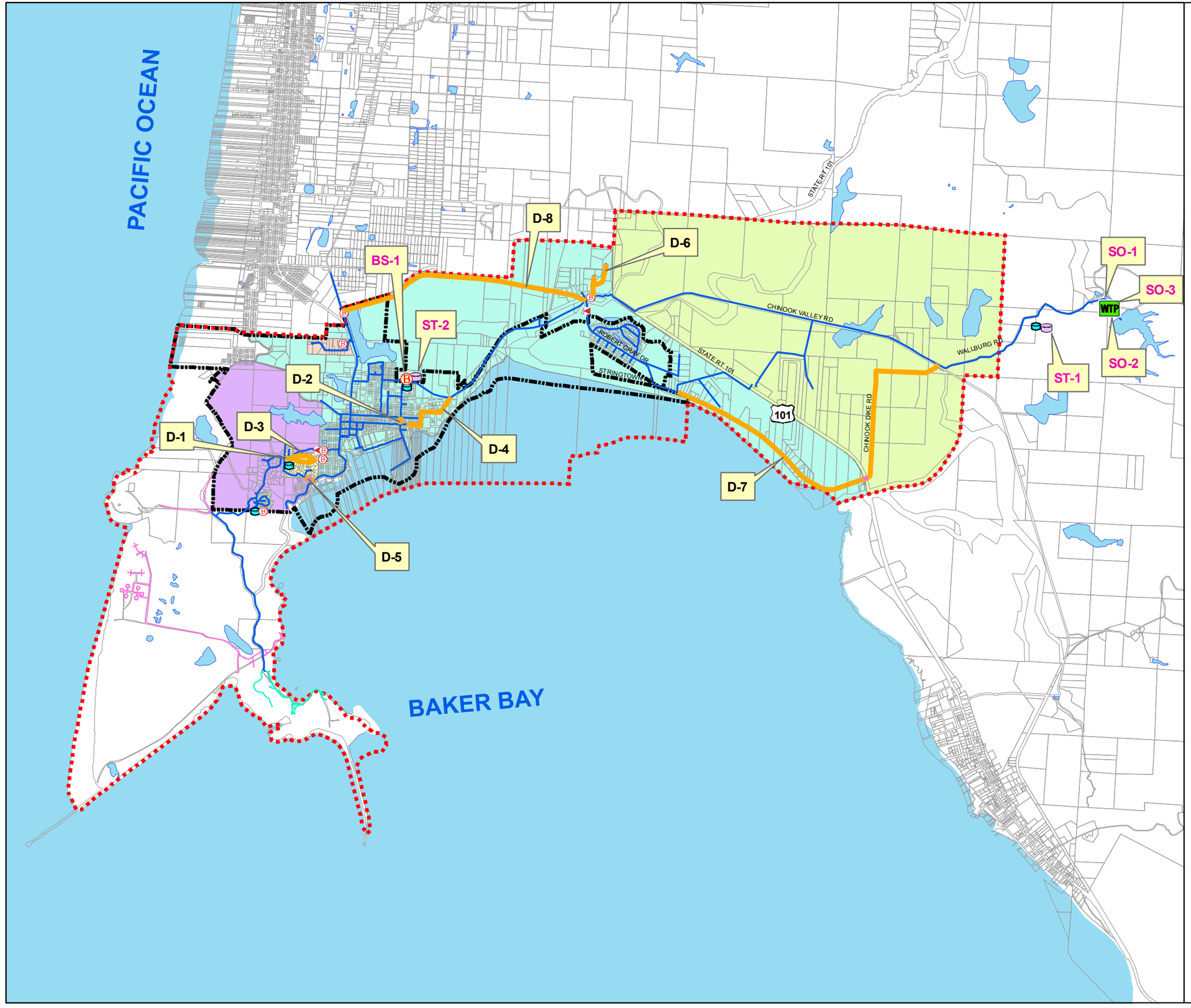
The City's existing backwash basin does not provide adequate settling time for the plant's existing capacity. The basin also does not have a ramp for easy cleaning access, making cleaning more infrequent and further reducing the effective volume of the basin. The City plans to expand the backwash basin to provide adequate settling times for treatment plant production up to the water right of approximately 1.5 mgd and to add a ramp to the basin to improve access for cleaning.

Year to be Completed: 2012
Estimated Project Cost: $99,000

SO-3: INTAKE REPAIR

The City's floating intake in the Indian Creek impoundment has failed and needs to be replaced. The City will install a new intake.

Year to be Completed: 2011
Estimated Project Cost: $25,000



N

0 1,750 3,500 7,000 Feet

LEGEND:

CAPITAL IMPROVEMENT PROJECTS:
- PROPOSED RESERVOIR
- PROPOSED PRV
- PROPOSED BPS
- PROPOSED DISTRIBUTION MAINS

EXISTING FACILITIES:
- BPS
- PRV
- RESERVOIR
- ILWACO WATER LINES
- WASHINGTON STATE PARKS WATER LINES
- USCG WATER LINES
- WATER SERVICE AREA
- ILWACO CITY LIMITS
- WATER BODY
- PARCELS

PRESSURE ZONES:
- CITY CENTER (157 FT)
- COASTAL RIDGE (574 FT)
- DISCOVERY HEIGHTS (339 FT)
- INDIAN CREEK (160 FT)
- LAKEVIEW ESTATES (317 FT)
- SAHALEE (275 FT)

CITY OF ILWACO

WATER SYSTEM PLAN
FIGURE 9-1
CAPITAL IMPROVEMENT PLAN

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\Ilwaco\10565 Water System Plan Update\GIS\CIP.mxd

PROPOSED STORAGE IMPROVEMENTS

ST-1: NEW INDIAN CREEK RESERVOIR

The City's existing Indian Creek Reservoir does not provide sufficient storage to meet both distribution requirements, such as fire suppression storage and equalizing storage, and treatment requirements, such as contact time storage and backwash storage. The City plans to construct an additional 160,000-gallon storage reservoir similar to the existing reservoir at the same site. The reservoirs will operate in series with a pressure sustaining valve in between them that will keep the first reservoir full for contact time and backwash water while allowing the second reservoir to float on the system and provide equalizing and fire suppression storage.

Year to be Completed: 2012
Estimated Project Cost: $585,000

ST-2: NEW CITY CENTER RESERVOIR

The City's existing wood reservoir in the City Center pressure zone has extensive leaks and is nearing the end of its useful life. The City plans to construct a new 500,000-gallon steel reservoir similar to the existing steel reservoir in the City Center Zone. This new reservoir is anticipated to be constructed on the site of the existing wood reservoir. The new reservoir will provide additional storage to improve redundancy and reliability and overcome hydraulic limitations within the City's system. After the completion of the new reservoir, the existing wood reservoir will be abandoned and demolished.

Year to be Completed: 2012
Estimated Project Cost: $1,130,000

PROPOSED BOOSTER STATION IMPROVEMENTS

BS-1: WHEALDON STREET BOOSTER STATION

Existing customers near the City Center reservoirs on Whealdon Street are not served at adequate pressures by the reservoirs. The City plans to construct a booster station to serve domestic flows in this area, which includes approximately eight customers.

Year to be Completed: 2020
Estimated Project Cost: $133,000

PROPOSED DISTRIBUTION SYSTEM IMPROVEMENTS

The distribution projects will provide the system with increased reliability, system pressures, and fire flows. As indicated in Chapter 4, the City is currently deficient in its capability to provide fire flow and in its ability to maintain 30 psi throughout the distribution system under peak hour flows.

D-1: SAHALEE CONNECTION TO DISCOVERY HEIGHTS

The existing Sahalee Reservoir is not capable of providing sufficient pressures within the Sahalee Zone. The Sahalee Zone can, however, be adequately served at the hydraulic gradeline of the Discovery Heights Zone, which contains adequate storage to serve the Sahalee Zone. The City plans to construct approximately 420 lf of water main to connect the Sahalee Zone to the Discovery Heights Zone. Upon completion of this project, the Sahalee Booster Station and Reservoir will be abandoned. This project will improve peak hour pressures and fire flow availability in the Sahalee area.

Year to be Completed: 2011
Estimated Project Cost: $17,000

D-2: ELIZABETH AVENUE WATERLINE REPLACEMENT

The existing 6-inch water main from Spruce Street to Lake Street needs to be replaced to maximize the water system improvements that were completed by the Port of Ilwaco. The project involves the replacement of approximately 200 lf of existing water main with 12-inch pipe. This project will improve fire flow availability to the Port of Ilwaco area.

Year to be Completed: 2016
Estimated Project Cost: $81,000

D-3: SAHALEE WATERLINE REPLACEMENT

The City plans to replace approximately 3,000 lf of 6-inch asbestos cement pipe with new 8-inch water main. These waterlines are nearing the end of their useful life and have a history of leaks. This project is anticipated to reduce leakage and will improve fire flows to the Sahalee area.

Year to be Completed: 2019
Estimated Project Cost: $720,000

D-4: COOKS HILL ROAD WATERLINE EXTENSION

The existing dead-end waterline serving Cooks Hill Road provides marginal fire flows to this area and contributes to substandard fire flows in the commercial/industrial area in the

City Center Zone. The City plans to install 2,700 lf of 8-inch waterline from the water line on Highway 101 to Cooks Hill, including replacement of the existing line from Cooks Hill Road down to Lake Street to connect to the larger diameter lines near the Port of Ilwaco. This project will increase available fire flow to Cook's Hill Road and improve fire flow to the commercial/industrial area in the City Center Zone.

Year to be Completed: 2017
Estimated Project Cost: $603,000

D-5: KLAHANEE DRIVE WATERLINE EXTENSION

This project will construct approximately 400 lineal feet of 8-inch waterline along Klahanee Drive to Robert Gray Drive. The connection will include a pressure reducing valve (PRV) that will separate the Discovery Heights and City Center Zones and will open during low pressures on Robert Gray Drive. This project will assure that sufficient flow and pressure are available to meet fire flow requirements along Robert Gray Drive, which is currently served by a dead-end waterline.

Year to be Completed: 2015
Estimated Project Cost: $166,000

D-6: CHINA HILL IMPROVEMENTS

The China Hill subdivision is currently served by 3-inch and 1-1/2-inch-diameter waterlines. This pipe diameter is smaller than existing minimum standards. The City plans to replace 1,900 lf of these waterlines with 8-inch-diameter waterlines.

Year to be Completed: 2015
Estimated Project Cost: $446,000 (Local Improvement District)

D-7: STRINGTOWN LOOP

The City plans to install 15,000 lf of 12-inch water main to complete a loop along Stringtown Road and Chinook Dike Road connecting the existing piping in the Vandalia area to the transmission main from the Indian Creek Water Treatment Plant. A tee for this connection was installed on the transmission main at Chinook Dike Road during the original construction. This loop will allow the City to serve properties farther east along Stringtown Road and will resolve the existing fire flow deficiency at the end of the dead-end main east of the Vandalia area. A PRV station along this line will separate the Indian Creek and City Center Zones and keep the Baker Bay Booster Station discharge from flowing back into the transmission main.

Year to be Completed: 2024
Estimated Project Cost: $4,449,000 (Developer Extension)

D-8: OLD RAILROAD LOOP

The City plans to install 10,000 lf of 12-inch water main to complete a loop around Black Lake along the old railroad grade that ran north of the lake. This loop will increase the redundancy and reliability of the City's transmission system and will allow the City to serve properties northeast of the City. This project will significantly increase the capacity of the Intertie Booster Station by decreasing head losses between the booster stations and the reservoirs. The project will also slightly increase the capacity of the Baker Bay Booster Station by decreasing head losses. The loop will also provide a redundant transmission main to the Highway 101 transmission main should it need to be taken out of service for maintenance.

Year to be Completed: 2026
Estimated Project Cost: $2,969,000 (Developer Extension)

DEVELOPER EXTENSIONS AND LOCAL IMPROVEMENT DISTRICTS

Some of the City's proposed capital improvement projects involve areas that may be further developed within the next 20 years. Where possible, the City will coordinate with developers to meet the goals of the capital improvement plan, for example, by paying for line upsizing.

In particular, the City anticipates that there may be development northeast of the City, along Stringtown Road, and in the Indian Creek Zone within the 20-year planning period.

Development northeast of the City may affect the Old Railroad Loop (D-8) project. A portion of the Old Railroad Loop may be completed as part of a developer extension to serve the area.

A portion of the Stringtown Loop (D-7) project may be completed as part of a developer extension to serve development along Stringtown Road.

The China Hill Improvements (D-6) project may be funded as part of a local improvement district (LID) formed for properties in this area.

CAPITAL IMPROVEMENT PLAN SCHEDULE

Table 9-1 provides a summary of the capital improvements and a timetable for their completion. Figure 9-1 shows the locations of the capital improvement projects.

TABLE 9-1

Capital Improvement Project Costs and Schedule

No.	Project	Estimated Construction Date	Anticipated Funding Source	Estimated Cost[(1)]
G-1	Control Improvements	2013	City Funds	$ 85,000
SO-1	New 1.0 mgd Treatment Unit	2013	Loan	$ 763,000
SO-2	Backwash Basin Improvements	2012	Loan	$ 99,000
SO-3	Intake Repair	2011	City Funds	$ 25,000
ST-1	New Indian Creek Reservoir	2012	Loan	$ 585,000
ST-2	New City Center Reservoir	2012	Loan	$ 1,130,000
BS-1	Whealdon Street Booster Station	2020	City Funds	$ 133,000
D-1	Sahalee Connection to Discovery Heights	2011	City Funds	$ 17,000
D-2	Elizabeth Avenue Waterline Replacement	2016	City Funds	$ 81,000
D-3	Sahalee Waterline Replacements	2019	Loan	$ 720,000
D-4	Cooks Hill Road Waterline Extension	2017	Loan	$ 603,000
D-5	Klahanee Drive Waterline Extension	2015	City Funds	$ 166,000
D-6	China Hill Improvements	2015	LID	-[(2)]
D-7	Stringtown Loop	2024	Developer Extension	-[(2)]
D-8	Old Railroad Loop	2026	Developer Extension	-[(2)]
Total 6-Year CIP				**$2,951,000**
Total 7 to 20-Year CIP				**$1,456,000**
Total 20-Year CIP				**$4,407,000**

(1) All costs in 2011 dollars.
(2) Developer or LID funded.

CHAPTER 10

FINANCIAL ANALYSIS

This chapter describes how the City of Ilwaco can operate the existing system and finance the water improvements outlined in the previous chapters. Included in this chapter is a review of historical revenues and expenses, a 6-year budget forecast, and a review of rates over the next 6 years to finance operation of the existing system and for constructing recommended capital improvements. Also included is a summary of potential funding sources available for providing grant and loans for funding planning documents and the design and construction of capital projects.

FINANCIAL STATUS OF EXISTING WATER UTILITY

CURRENT WATER RATES

The City's monthly water rates were last approved by the City Council in Resolution #2011-03 on March 28, 2011, which is included in Appendix M. Table 10-1 shows base water rates specified under Resolution #2011-03 effective April 1, 2011.

TABLE 10-1

Monthly Base Rates

Meter Size	2011 Monthly Base Rate[(1)]
5/8" or 3/4"	$22.00
1"	$36.74
1-1/4"	$55.00
1-1/2"	$73.26
2"	$117.26
3"	$220.00
4"	$366.74
6"	$733.26
Hotels, Motels and RV Parks: For each non-residential transient space	$2.11/space
Fire Sprinkler Connection	$17.50

(1) Customers outside of the Ilwaco city limits pay an additional 50 percent surcharge on base and volume charges.

Each customer is also billed by volume for water usage. Table 10-2 details the monthly volume rates specified in Resolution #2011-03 effective April 1, 2011.

TABLE 10-2

Monthly Volume Rates

Volume Charge	2011 Monthly Volume Rate[(1)]
Per 100 cu. ft.	$3.22

(1) Customers outside of the Ilwaco city limits pay an additional 50 percent surcharge on base and volume charges.

CURRENT CONNECTION FEES

All new connections pay the same fee of $2,400 per meter equivalent. Meter equivalents are based on factors determined by the American Water Works Association for comparing the flow of larger meters to the flow through a 3/4-inch meter. Connection charges are summarized in Table 10-3.

TABLE 10-3

Current Connection Charges

Meter Size	AWWA Meter Equivalency Factor	2011 Connection Charge
5/8 to 3/4 inch	1.00	$ 2,400
1 inch	1.67	$ 4,008
1.5 inch	2.33	$ 5,592
2 inch	5.33	$ 12,792
3 inch	10.00	$ 24,000
4 inch	16.66	$ 39,984
6 inch	33.33	$ 79,992
8 inch	53.33	$127,992
Fire Sprinkler Connection		$ 1,750

HISTORICAL REVENUES & EXPENSES

The City's historical revenues and expenses for 2004 through 2010 are summarized in Table 10-4.

BUDGET PROJECTION

A budget forecast has been prepared to assess the City's ability to fund continued operation of the existing system without funding any new capital projects. Table 10-5 shows a budget forecast for the City's water system. This budget forecast was developed as part of the City's rate study. The City raised rates in 2011 to adequately fund operations and maintenance, cash reserves, and capital improvements. The City plans to continue to increase rates annually after 2011 to compensate for inflation.

TABLE 10-4

Historical Revenues and Expenses

Description	2004	2005	2006	2007	2008	2009	2010
Start of Year Reserves	**$ 83,670**	**$ 44,934**	**$ 44,624**	**$ 47,570**	**$ 38,382**	**($ 19,435)**	**$ 43,111**
Water Sales	$410,618	$416,497	$429,645	$430,158	$450,300	$446,951	$539,388
Investment Interest	$ 4,934	$ 2,833	$ 2,480	$ 4,709	$ 1,141	$ 131	$ 124
Water Connections	$ 24,192	$ 52,463	$ 74,840	$ 18,035	$ 6,010	$ 11,667	$ 9,229
Other Revenue Sources	$ 7,629	$ 3,363	$ 18,260	$ 15,671	$ 27,015	$ 2,611	$ 4,433
Total Revenue	**$447,373**	**$475,156**	**$525,225**	**$468,573**	**$484,466**	**$461,360**	**$553,174**
Wages & Benefits	($211,961)	($213,870)	($217,939)	($184,665)	($215,093)	($232,384)	($195,030)
General O&M	($ 74,044)	($ 84,899)	($115,728)	($103,222)	($102,510)	($ 48,306)	($ 58,298)
Electricity	($ 28,250)	($ 25,752)	($ 25,362)	($ 25,500)	($ 26,635)	($ 25,399)	($ 27,376)
Chemicals	($ 2,731)	($ 46,957)	($ 27,293)	($ 18,633)	($ 39,335)	($ 13,583)	($ 36,250)
Professional Services	($ 13,986)	($ 2,996)	($ 16,798)	$ -	($ 1,484)	($ 1,791)	($ 17,769)
Communications	($ 10,563)	($ 9,153)	($ 8,876)	($ 5,637)	($ 5,644)	($ 4,183)	($ 3,147)
Insurance	($ 3,654)	($ 3,273)	($ 2,940)	($ 3,502)	($ 4,205)	($ 5,338)	($ 12,781)
Excise Taxes	($ 20,388)	($ 20,927)	($ 27,284)	($ 21,633)	($ 22,646)	($ 19,583)	($ 26,925)
Miscellaneous	($ 20,768)	($ 17,505)	($ 22,835)	($ 20,199)	($ 42,359)	($ 14,589)	($ 27,518)
Other Financing Uses	($ 14,355)	($ 9,355)	($ 9,355)	($ 42,829)	($ 12,927)	($ 9,355)	($ 11,854)
Debt Service	($ 41,208)	($ 40,779)	($ 41,728)	($ 51,941)	($ 27,563)	($ 24,303)	($ 24,054)
Capital Outlay	($ 980)	$ -	($ 6,141)	$ -	($ 41,882)	$ -	($ 53,731)
Total Expenses	**($482,888)**	**($475,466)**	**($522,279)**	**($477,761)**	**($542,283)**	**($398,814)**	**($494,733)**
Net Revenues	**($ 35,515)**	**($ 310)**	**$ 2,946**	**($ 9,188)**	**($ 57,817)**	**$ 62,546**	**$ 58,441**
Non-Revenues	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Non-Expenditures	**($ 3,221)**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
End of Year Reserves	**$ 44,934**	**$ 44,624**	**$ 47,570**	**$ 38,382**	**($ 19,435)**	**$ 43,111**	**$101,552**

TABLE 10-5

Budget Forecast

Water Utility Fund	2011	2012	2013	2014	2015	2016
Start of Year Reserves	**$101,550**	**$ 93,051**	**$ 178,199**	**$ 161,014**	**$ 236,262**	**$ 93,140**
Operating Revenues						
Water Sales[1]	$593,359	$617,517	$ 625,133	$ 632,900	$ 640,823	$ 648,905
Investment Interest	$ 1,500	$ 1,500	$ 1,500	$ 1,500	$ 1,500	$ 1,500
Water Connections[2]	$ 7,200	$ 7,200	$ 7,200	$ 7,200	$ 7,200	$ 7,200
Total Revenues	**$602,059**	**$626,217**	**$ 633,833**	**$ 641,600**	**$ 649,523**	**$ 657,605**
Operating Expenses						
Wages & Benefits	($197,289)	($ 201,235)	($205,259)	($209,365)	($213,552)	($217,823)
General O&M	($ 36,000)	($ 36,720)	($ 37,454)	($ 38,203)	($ 38,968)	($ 39,747)
Chemicals	($ 25,000)	($ 25,500)	($ 26,010)	($ 26,530)	($ 27,061)	($ 27,602)
Electricity	($ 29,880)	($ 30,478)	($ 31,087)	($ 31,709)	($ 32,343)	($ 32,990)
Insurance	($ 20,355)	($ 20,762)	($ 21,177)	($ 21,601)	($ 22,033)	($ 22,474)
Excise Taxes[3]	($ 26,701)	($ 27,788)	($ 28,131)	($ 28,481)	($ 28,837)	($ 29,201)
Miscellaneous	($ 38,074)	($ 38,282)	($ 39,261)	($ 40,259)	($ 41,278)	($ 42,316)
Debt Service[4]	($ 35,659)	($ 31,304)	($106,404)	($150,904)	($146,590)	($146,590)
Total Operating Expenses[5]	**($408,958)**	**($ 412,069)**	**($494,784)**	**($547,052)**	**($550,661)**	**($558,742)**
Net Operating Revenues	**$193,101**	**$ 214,148**	**$139,049**	**$ 94,548**	**$ 98,862**	**$ 98,863**
Capital Project Revenues and Expenses						
Loan Proceeds	$ -	$1,814,000	$793,825	$ -	$ -	$ -
Capital Projects[6]	($ 42,000)	($1,814,000)	($882,259)	$ -	($179,684)	($ 89,431)
Short-lived Asset Replacement	($159,600)	($ 129,000)	($ 67,800)	($ 19,300)	($ 62,300)	($ 15,300)
Net Capital Project Expenses	**($201,600)**	**($ 129,000)**	**($156,234)**	**($ 19,300)**	**($241,984)**	**($104,731)**
End of Year Reserves	**$ 93,051**	**$ 178,199**	**$161,014**	**$236,262**	**$ 93,140**	**$ 87,272**

(1) Water sales based on rates effective in April 2011 and 1.25 percent annual rate increase thereafter.
(2) Connection charges based on three new services, or 0.4 percent growth, per year.
(3) Excise taxes based on projected water sales.
(4) Debt service based on existing loans plus a new loan in 2012 of approximately $1.8 million at an interest rate of 1 percent.
(5) General expenses projected with annual inflation of 2 percent.
(6) Capital projects after 2012 are inflated at a rate of 2 percent annually from 2011.

The City has also developed a plan to replace short-lived assets nearing the end of their useful lives from reserves, which is included in Appendix O.

CAPITAL IMPROVEMENT EXPENSES

The City plans to pursue low interest public loans for some of the proposed capital improvement projects. Public loans are increasingly competitive and therefore cannot be relied upon for consistent funding. The projects that are most likely to receive public loan funding are the Indian Creek Reservoir project (ST-1), the Backwash Basin Improvements project (SO-2), and the City Center Reservoir (ST-2). These projects will ensure that the City maintains proper treatment levels, reduce leakage, and improve fire flow availability. If loan funding is not received, these projects may be deferred until a later date when a loan is received or when sufficient funds have been raised to pay for the projects. See Table 9-1 for anticipated funding sources for other projects.

APPENDIX A

WASHINGTON STATE DEPARTMENT OF HEALTH FORMS

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Water System Plan Submittal Form

This form is required to be submitted along with the Water System Plan (WSP). It will serve to expedite review and approval of your WSP. WSPs will not be reviewed until submittal form and checklist are completed.

City of Ilwaco	35500	City of Ilwaco
1. Water System Name	2. PWS ID# or Owner ID#	3. System Owner Name
Mike Cassinelli	360-642-3357	Mayor
4. Contact Name for Utility	Phone Number	Title
P.O. Box 548	Ilwaco	WA 98624
Contact Address	City	State Zip
Nancy Lockett, P.E.	206-284-0860	Principal
5. Project Engineer	Phone Number	Title
701 Dexter Ave. N., Suite 200	Seattle	WA 98109
Project Engineer Address	City	State Zip
6. Billing Contact Name (required if not the same as #4)	Billing Phone Number	Billing Fax Number
Billing Address	City	State Zip

6. How many services are presently connected to the system? 698
7. Is the system expanding? (seeking to extend service area or increase number of approved connections) ☒ Yes ☐ No
8. If number of services is expected to increase, how many new connections are proposed in the next six years? 190
9. If the system is private-for-profit, is it regulated by the State Utilities and Transportation Commission? ☐ Yes ☐ No
10. Is the system located in a Critical Water Supply Service Area (i.e., have a Coordinated Water System Plan)? ☒ Yes ☐ No
11. Is the system a customer of a wholesale water purveyor? ☒ Yes ☐ No
12. Will the system be pursuing additional water rights from the State Department of Ecology in the next twenty years? ☐ Yes ☒ No
13. Is the system proposing a new intertie? ☒ Yes ☐ No
14. Do you have projects currently under review by the Department of Health? ☐ Yes ☒ No
15. Are you requesting distribution main project report and construction document submittal exception, and if so, does the WSP contain standard construction specifications for distribution mains? ☒ Yes ☐ No
16. Are you requesting distribution related project report and construction document submittal exception, and if so, does the WSP contain distribution facilities design and construction standards, including internal engineering review procedures? ☒ Yes ☐ No
17. Have you sent copies of the draft WSP or notice to adjacent purveyors for their review? ☒ Yes ☐ No
18. Have you sent copies of the draft WSP to local governments with jurisdiction within your service area for their review? ☒ Yes ☐ No
19. Are you proposing a change in the place of use of your water right? ☒ Yes ☐ No

If answer to questions 17 and 18 is yes, list adjacent utilities/entities that have received a copy of the draft WSP: City of Long Beach, Chinook Water District, Washington State Parks, Pacific County

Is this plan: ☒ an Initial Submittal ☐ a Revised Submittal

Please enclose the following number of copies of the WSP:

2 copies for Department of Health
1 copy for Department of Ecology
1 additional copy if you answered "yes" to question 9

3 Total copies attached

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

☐ **Northwest Drinking Water Office**
Department of Health
20435 72nd Ave S, Suite 200
Kent, WA 98032-2358
Phone: (253) 395-6750
Fax: (253) 395-6760

☒ **Southwest Drinking Water Office**
Department of Health
PO Box 47823
Olympia, WA 98504-7823
Phone: (360) 236-3030
Fax: (360) 664-8058

☐ **Eastern Drinking Water Office**
Department of Health
16201 E Indiana Ave, Suite 1500
Spokane Valley, WA 99216
Phone: (509) 329-2100
Fax: (509) 329-2104

If you need this publication in an alternate format, call (800) 525-0127. For TTY/TDD call (800) 833-6388.

Water System Plan (WSP) Checklist for Municipal Systems

	√ Required	Content Description	WSP Page #
	(√)	**Water System Plan Submittal Form**	
Chapter 1		**Description of Water System**	
	(√)	Ownership and management (updated/current WFI)	1-1
	( )	System history and background	1-1
	(√)	Brief inventory of existing facilities (update as needed)	1-9
	(√)	Description of and discussion about related plans: CWSP, ground water management, basin and City/County land use plans & zoning. Include land use maps for 6 & 20-years	1-16
	(√)	Service area characteristics, agreements, & policies including conditions of service and how new service will be provided in the retail service area. Include maps for water rights service area & for existing, future & retail service areas	1-19
	(√)	Duty to serve statement for the retail service area	1-19
	( )	Satellite Management Agency information	N/A
	(√)	Local Government Consistency from planning agencies (City & County)	App. P
	(√)	ODW will obtain a "not-inconsistent" statement from Ecology for Water Resource Inventory Area #____.	App. P
Chapter 2		**Basic Planning Data**	
	(√)	**Current data:** population, service connections & ERUs	2-1
	(√)	**Data Collection:** Monthly and annual production totals per source including purchased water Annual usage by customer class Annual usage for water supplied to other systems ≥ 1000 connections – description of seasonal variations in use by customer class	2-3
	(√)	**6 & 20 year service area projections for:** Land use Zoning Population, service connections & ERUs Water demand - use WAC 246-290-221 and include demands with and without expected efficiency savings	2-9
	(√)	DSL percentage and volume (provide discussion in Chapter 4)	2-6
	( )	≥ 1000 connections - include demand forecast if all measures deemed cost-effective were implemented	N/A
Chapter 3		**System Analysis**	
	(√)	System design standards (fire flow, system pressures, etc.)	3-1
	(√)	System inventory, description and analysis	Ch. 3
	(√)	Source	3-5
	(√)	Storage	3-16
	(√)	Distribution system/hydraulics (with equalization & FFS depleted)	Ch. 4
	(√)	Add pressure zones	Ch. 4

(√)	Treatment	3-5
(√)	Written legal & physical system capacity analysis & DOH Capacity & ERU Determinations (WSDM 6-1) forms	3-27
(√)	Water quality analysis	Ch. 8
(√)	Summary of system deficiencies	3-26
(√)	Analysis of possible improvement projects	Ch. 9

Chapter 4 Water Resource Analysis & Water Use Efficiency (WUE)

(√) **Metering Program** — 5-6

- Description of all source meters (existing and new sources)
- Description of service meter program included how all meters are operated and maintained, if not fully metered submit installation schedule & include in the budget
- Description of permanent & seasonal intertie meter program, if not fully metered submit meter installation schedule & include in the budget
- Describe activities to minimize leakage if not fully service & intertie metered

(√) **Water Use Efficiency Program (WUE)** — Ch. 5

A WUE program should be designed to achieve the WUE goal by implementing cost effective measures per WAC 246-290-810

- Describe the current conservation (WUE) program
- Describe WUE goal & document public adoption process
- Describe measures that will be implemented to achieve the goal & include schedule & costs in the budget
- Describe process used to evaluate the WUE measures you did not implement
- Describe yearly consumer education
- Estimate projected water savings from selected measures
- Describe process that will be used to determine effectiveness of the program

( ) ≥ 1000 Connections — N/A

- Estimate water saved from efficiency measures over the past 6 years
- Quantitative evaluation of measures to determine if they are cost-effective, include marginal costs of water production
- Evaluate measures for cost-effectiveness if shared with other systems
- Quantitative or qualitative evaluation of measures to determine if they are cost-effective from the societal perspective

(√) **Distribution System Leakage (DSL)-** — 5-4

Evaluate and report DSL - WAC 246-290-820(2)

(√) **Water loss control action plan (WLCAP)** — 5-10

Submit the WLCAP as required by WAC 246-290-820(4)

(√) **Source of supply analysis:** — 1-9

- Evaluate water supply alternatives if additional water rights will be pursued within 20 years
- Describe water supply characteristics & discuss any foreseeable impact (quantity & quality) to the resource (WAC 246-290-100 (4)(f) (ii) (B))

	(√)	**Water rights self-assessment: Consult with Ecology regarding water rights prior to plan submittal.** Put all water right information together in Chapter 4. 1) Water right self-assessment forms: existing, 6 & 20 year 2) Description of water right status 3) Legal description from water right 4) Copies of water right certificate(s) 5) Well log & USGS map with point of withdrawal/diversion & place of use	App. B
	(√)	Water supply reliability analysis	6-4
	(√)	Interties – descriptions and agreements	1-12
	( )	≥ 1000 connections - explore reclaimed water opportunities	N/A
Chapter 5		**Source Water Protection (Check One or Both)**	
	( )	Wellhead protection program or 2 year update (updated inventory, letters, and map) per WAC 246-290-135	N/A
	(√)	Watershed control program (surface water systems)	Ch. 6
Chapter 6		**Operation and Maintenance Program**	
	(√)	Water system management and personnel	7-1
	(√)	Operator certification	7-1
	(√)	Routine operating procedures and preventive maintenance	7-3
	(√)	Water quality sampling procedures & program	Ch. 8
	(√)	Coliform monitoring plan and map	App. H
	(√)	Emergency program, service reliability requirements & water shortage plan per WAC 246-290-420	App. N
	(√)	Address sanitary survey findings	N/A
	(√)	Cross-connection control program (> 1000 connections provide copies of annual summary report form)	App. K
	(√)	Recordkeeping, reporting, and customer complaint program	7-4
	(√)	Summary of O&M deficiencies, include cost in budget	3-27
Chapter 7		**Distribution Facilities Design and Construction Standards**	
	(√)	Standard construction specifications for distribution mains	App. D
	(√)	Design and construction standards for distribution-related projects	App. D
Chapter 8		**Improvement Program**	
	(√)	Capital improvement program including 6-year CIP schedule	Ch. 9
Chapter 9		**Financial Program (See Financial Viability Manual)**	
		A financial program to demonstrate financial viability:	
	(√)	Summary of past income and expenses	10-4
	( )	≥ 1000 connections – Balanced 1-year operational budget	
	(√)	< 1000 connections – Balanced 6-year operational budget including a financial viability test	10-5
	(√)	Plan for collecting the revenue necessary to maintain cash flow stability and to fund capital and emergency improvements	10-7

	(√)	Rate structure evaluation that considers: • Affordability of water rates • Feasibility of implementing rate structure that encourages water demand efficiency	10-7
Chapter 10		**Miscellaneous Documents**	
	(√)	Informational meeting for the consumers, include notification and minutes	App. P
	(√)	WUE goals public meeting (this may be combined with other meetings)	App. P
	(√)	Attach notice to adjacent utilities that WSP is available for review & comment. Attach comments received.	App. P
	( )	>1000 connections - completed SEPA process with signed Determination	N/A
	(√)	Agreements: franchise, wheeling, mutual aid, inter-local and other agreements	App. C
	( )	Satellite Management Contract and Water User Agreement	N/A
	(√)	When DOH is ready to approve the final WSP, the plan must be adopted by the governing body; include meeting minutes	App. P

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

WATER FACILITIES INVENTORY (WFI) FORM

ONE FORM PER SYSTEM

Quarter: 1
Updated: 10/28/2010
Printed: 07/12/2011
WFI Printed For: Annual
Submission Reason: Contact Update

RETURN TO: Southwest Regional Office, PO Box 47823, Olympia, WA, 98504

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
35500 2	ILWACO WATER DEPARTMENT, CITY OF	PACIFIC	A	Comm

6. PRIMARY CONTACT NAME & MAILING ADDRESS

DARYL W. GARDNER [MANAGER]
PO BOX 548
ILWACO, WA 98624

7. OWNER NAME & MAILING ADDRESS — **8. Owner Number** 002727

ILWACO WATER DEPARTMENT
MIKE CASSINELLI — TITLE: MAYOR
PO BOX 548
ILWACO, WA 98624

STREET ADDRESS IF DIFFERENT FROM ABOVE

ATTN
ADDRESS
CITY STATE ZIP

STREET ADDRESS IF DIFFERENT FROM ABOVE

ATTN
ADDRESS
CITY STATE ZIP

9. 24 HOUR PRIMARY CONTACT INFORMATION		10. OWNER CONTACT INFORMATION	
Primary Contact Daytime Phone:	(360) 777-8330	Owner Daytime Phone:	(360) 642-3145
Primary Contact Mobile/Cell Phone:	(503) 440-2850	Owner Mobile/Cell Phone:	(503) 970-1284
Primary Contact Evening Phone:	(503) 440-2850	Owner Evening Phone:	(360) 642-3357
Fax: (360) ~~642-3145~~ 642-3155	E-mail: waterdaryl@centurytel.net	Fax: (360) 642-3155	E-mail: ~~ilwacopw@willapabay.org~~ mayor@ilwaco-wa.gov

WAC 246-290-420(9) requires that water systems provide 24-hour contact information for emergencies.

11. SATELLITE MANAGEMENT AGENCY - SMA (check only one)

- [x] Not applicable (Skip to #12)
- [ ] Owned and Managed
- [ ] Managed Only
- [ ] Owned Only

SMA NAME: _____ SMA Number: _____

12. WATER SYSTEM CHARACTERISTICS (mark ALL that apply)

- [ ] Agricultural
- [x] Commercial / Business
- [ ] Day Care
- [x] Food Service/Food Permit
- [ ] 1,000 or more person event for 2 or more days per year
- [x] Hospital/Clinic
- [ ] Industrial
- [ ] Licensed Residential Facility
- [ ] Lodging
- [x] Recreational / RV Park
- [x] Residential
- [x] School
- [ ] Temporary Farm Worker
- [ ] Other (church, fire station, etc.): _____

13. WATER SYSTEM OWNERSHIP (mark only one)

- [ ] Association
- [ ] County
- [ ] Investor
- [ ] Special District
- [x] City / Town
- [ ] Federal
- [ ] Private
- [ ] State

14. STORAGE CAPACITY (gallons)

1,369,000

15	16	17	18 SOURCE CATEGORY										19 USE			20	21 TREATMENT						22	23	24 SOURCE LOCATION			
Source Number	SOURCE NAME LIST UTILITY'S NAME FOR SOURCE AND WELL TAG ID NUMBER. Example: WELL #1 XYZ456 IF SOURCE IS PURCHASED OR INTERTIED, LIST SELLER'S NAME Example: SEATTLE	INTERTIE INTERTIE SYSTEM ID NUMBER	WELL	WELL FIELD	WELL IN A WELL FIELD	SPRING	SPRING FIELD	SPRING IN SPRINGFIELD	SEA WATER	SURFACE WATER	RANNEY / INF. GALLERY	OTHER	PERMANENT	SEASONAL	EMERGENCY	SOURCE METERED	NONE	CHLORINATION	FILTRATION	FLUORIDATION	IRRADIATION (UV)	OTHER	DEPTH TO FIRST OPEN INTERVAL IN FEET	CAPACITY (GALLONS PER MINUTE)	1/4, 1/4 SECTION	SECTION NUMBER	TOWNSHIP	RANGE
S01	InAct 03/19/1995 BLACK LAKE									X					X			X	X			X		660	NE NE	33	10N	11W
S02	48000M/LONG BEACH (emergency)	48000 M													X	Y			X	X					600		14	10N	11W
S03	INDIAN CREEK (primary)									X			X			Y			X	X			X		700	NE NE	28	10N	10W

WATER FACILITIES INVENTORY (WFI) FORM - Continued

1. SYSTEM ID NO.	2. SYSTEM NAME	3. COUNTY	4. GROUP	5. TYPE
35500 2	ILWACO WATER DEPARTMENT, CITY OF	PACIFIC	A	Comm

	ACTIVE SERVICE CONNECTIONS	DOH USE ONLY! CALCULATED ACTIVE CONNECTIONS	DOH USE ONLY! APPROVED CONNECTIONS
25. SINGLE FAMILY RESIDENCES (How many of the following do you have?)	0	615	Unspecified
A. Full Time Single Family Residences (Occupied 180 days or *more* per year)	~~599~~ 556		
B. Part Time Single Family Residences (Occupied *less than* 180 days per year)	0		
26. MULTI-FAMILY RESIDENTIAL BUILDINGS (How many of the following do you have?)			
A. Apartment Buildings, condos, duplexes, barracks, dorms	2		
B. Full Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied *more than* 180 days/year	16		
C. Part Time Residential Units in the Apartments, Condos, Duplexes, Dorms that are occupied *less than* 180 days/year	0		
27. NON-RESIDENTIAL CONNECTIONS (How many of the following do you have?)			
A. Recreational Services and/or Transient Accommodations (Campsites, RV sites, hotel/motel/overnight units)	~~4~~ 280	4	
B. Institutional, Commercial/Business, School, Day Care, Industrial Services, etc.	~~85~~ 140	85	
28. TOTAL SERVICE CONNECTIONS		704	

29. FULL-TIME RESIDENTIAL POPULATION

A. How many residents are served by this system 180 or *more* days per year? ~~819~~ 1262

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

31. TEMPORARY & TRANSIENT USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. How many total visitors, attendees, travelers, campers, patients or customers have access to the water system each month?	600	600	1500	1800	2700	4500	9000	10500	6000	3000	1500	600
B. How many days per month is water accessible to the public?	30	28	30	30	30	30	30	30	30	30	30	30

32. REGULAR NON-RESIDENTIAL USERS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
A. If you have schools, daycares, or businesses connected to your water system, how many students daycare children and/or employees are present each month?	1125	1125	1125	1125	1125	325	325	325	1125	1125	1125	1125
B. How many days per month are they present?	31	30	31	30	31	30	31	31	30	31	30	31

33. ROUTINE COLIFORM SCHEDULE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	~~2~~ 1262	~~2~~ 1262	~~2~~ 1262	~~2~~ 1262	~~2~~ 1262	~~2~~ 1262	~~2~~ 1262	~~2~~ 1262	~~2~~ 1262	~~2~~ 1262	~~2~~ 1262	~~2~~ 1262

35. Reason for Submitting WFI:

☒ Update - Change ☐ Update - No Change ☐ Inactivate ☐ Re-Activate ☐ Name Change ☐ New System ☐ Other _____

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

SIGNATURE: Daryl W Gardner DATE: 7/12/11

PRINT NAME: Daryl Gardner TITLE: _____

Water Quality Monitoring Report for the Year 2011

/stem: ILWACO WATER DEPARTMENT, CITY OF PWSID: 35500 2 Report Date: 03/02/2011
Contact: DARYL W. GARDNER Group: A - Comm County: PACIFIC Region: SOUTHWEST

Part 1: List of Active Sources with Water Quality Monitoring Requirements

DOH Source#	Name	Type	Use	Susceptibility Rating
S03	INDIAN CREEK	Surface	Permanent	High

Part 2: Sampling Schedule for the Year 2011

Coliform Sampling (Routine)	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
	2	2	2	2	2	2	2	2	2	2	2	2

* Indicates the requirement is an exception from WAC 246-290.

- If the coliform (bacteriological) sampling schedule listed at the bottom of the current Water Facilities Inventory (WFI) form for your system is different from the schedule listed above, follow the schedule on the current WFI.
- Samples must be collected from representative points throughout the distribution system.
- Repeat samples are required following an unsatisfactory sample. In addition, collect a sample from each operating groundwater source
- A minimum of 5 routine samples are required the month following one or more unsatisfactory samples in accordance with your system's Coliform Monitoring Plan.

Lead and Copper Distribution Sampling

- Lead and copper samples must be collected from indoor faucets within the distribution system after the water has sat unused in the pipes for at least 6 hours but no more than 12 hours.
- Sample faucets should be flushed with cold water the evening prior to collecting the sample.
- Part 2 indicates the month in which samples should be collected. Part 4 indicates the total number of sample required.
- If you are required to sample annually or once every 3 years, samples must be collected between June and September.

Chlorine Residual Sampling

- Systems that use continuous chlorination must take chlorine residual measurements daily (or at a reduced frequency approved by the department), and at the same time and location as routine and repeat coliform samples.

Disinfection Byproducts Sampling

- Systems that use continuous chlorination treatment must collect samples for total trihalomethanes (TTHM) and for haloacetic acids (HAA5) for each chlorination treatment facility identified in your individual disinfection byproducts (DBP) monitoring plan. Collect the samples from the distribution system at the frequency and locations identified in your DBP monitoring plan.

Chemical Sampling Requirements

- Source water chemical samples must be taken from a location as near to the source as possible, but after all treatment, and before entering the distribution system.
- Nitrate, nitrite and arsenic are included as part of a complete IOC.

Month	Source	Monitoring Requirement	Test Panel
January		*No source chemical sampling required this month*	

Water Quality Monitoring Report for the Year 2011

Month	Source	Monitoring Requirement	Test Panel
ruary		*No source chemical sampling required this month*	
rch		HALO-ACETIC ACIDS	HAA5
rch		TRIHALOMETHANES	THM
rch	S03	IOC	IOC
rch	S03	VOLATILE ORGANIC CONTAMINANTS	VOC1
ril		*No source chemical sampling required this month*	
y		HALO-ACETIC ACIDS	HAA5
y		TRIHALOMETHANES	THM
ıe		*No source chemical sampling required this month*	
y		*No source chemical sampling required this month*	
gust		HALO-ACETIC ACIDS	HAA5
gust		TRIHALOMETHANES	THM
otember		*No source chemical sampling required this month*	
tober		*No source chemical sampling required this month*	
vember		HALO-ACETIC ACIDS	HAA5
vember		TRIHALOMETHANES	THM
cember		*No source chemical sampling required this month*	

rt 3: State Waivers

- Automatically granted to all sources based on DOH assessment of conditions within the state.
- No waiver application, or fee required.
- State waivers granted for the 2011 - 2013 compliance period are listed in Part 4.

rt 4: Water Quality Monitoring Frequency

- Although waivers may be granted for your system, there may be some monitoring required as a condition of the waiver your system was granted.

Monitoring Group	Test Panel	Sample Location	Schedule/Status
sbestos	ASB	Distribution	Collect 1 Asbestos sample in 2018
acteriological	Coli	Distribution	See routine sample schedule in part 2
ioxin	Dioxin	All sources	State Waiver Thru Dec 2013
ndothall	Endo	All sources	State Waiver Thru Dec 2013
DB and other soil fumigants	Fumigant	S03	State Waiver Thru Dec 2013
lyphosphate	Glyphs	All sources	State Waiver Thru Dec 2013

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Water Quality Monitoring Report for the Year 2011

Monitoring Group	Test Panel	Sample Location	Schedule/Status
Halo-Acetic Acids	HAA5	Distribution	1 sample per treatment plant every 3 months
Herbicides	Herbs	S03	1 sample between Jan 2011 - Dec 2013
Insecticides	Insect	S03	1 sample between Jan 2011 - Dec 2013
Inorganic Contaminants	IOC	S03	1 sample(s) every 1 year
Lead/Copper *	LCR	Distribution	LCR 1 Set of 10 samples between Jan 2010 - Dec 2012
Nitrate *	NIT	S03	Collect 1 sample(s) every 1 year
General Pesticides	Pest1	S03	1 sample between Jan 2011 - Dec 2013
Diquat	Diquat	All sources	State Waiver Thru Dec 2013
Total Trihalomethane	THM	Distribution	1 sample per treatment plant every 3 months
Volatile Organic Contaminants	VOC	S03	1 sample(s) every 1 year

** These contaminant monitoring groups do not have waiver options under the SDWA.*

Water Quality Monitoring Report for the Year 2011

rt 5: Regional Water Quality Monitoring Contact

Southwest Regional Office

r Further information call the Southwest Regional Office Sophia Petro Phone: (360) 236-3046

r questions regarding Disinfection ByProducts (DBP) monitoring, contact: Regina Grimm, p.e. (360) 236-3035

ɔecial Note

r Group A Community Systems Only: Your Consumer Confidence Report, summarizing the results of your 2010 ter quality monitoring requirements is due before July 1, 2011 . For further information visit ɔw.doh.wa.gov/ehp/dw/Our_Main_Pages/consumer.htm or contact the CCR Coordinator at your Regional Office.

DARYL W. GARDNER
ILWACO WATER DEPARTMENT, CITY OF
PO BOX 548
ILWACO WA 98624

APPENDIX B

WATER RIGHTS

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Table 1

WATER SYSTEM PLAN
WATER RIGHTS SELF ASSESSMENT – EXISTING STATUS

PERMIT CERTIFICATE OR CLAIM #	NAME ON DOCUMENT	PRIORITY DATE (List oldest first)	SOURCE NAME/ NUMBER	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	EXISTING WATER RIGHTS		EXISTING CONSUMPTION		CURRENT WATER RIGHT STATUS (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
Permits/ Certificates 1. S2-25880	City of Ilwaco	3/4/1991	Indian Creek /SO3	No	1.56 cfs	710 afy				
2. S2-29218	City of Ilwaco	4/24/1995	Indian Creek /SO3	No	0.77 cfs	22 afy				
3.										
4.										
Claims 1.										
2.										
3.										
4.										
TOTAL	**********	*********	*********	**********	2.33 cfs	732 afy	1.56 cfs	396 afy	+0.77 cfs	+336 afy

INTERTIE NAME/ IDENTIFIER	NAME OF PURVEYOR PROVIDING WATER	EXISTING LIMITS ON INTERTIE USE		EXISTING CONSUMPTION THROUGH INTERTIE		CURRENT INTERTIE SUPPLY STATUS (Excess/Deficiency)	
		Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
1.							
2.							
3.							
4.							
TOTAL	**********						

PENDING WATER RIGHT APPLICATION (New/Change)	NAME ON APPLICATION	DATE SUBMITTED	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	PENDING WATER RIGHTS	
				Maximum Instantaneous Flow Rate (Qi) Requested	Maximum Annual Volume (Qa) Requested
1.					
2.					
3.					
4.					

If you need this publication in an alternate format, call (800) 525-0127. For TTY/TDD call (800) 833-6388.

DOH Form 331-371 (Updated 08/10)

To return form, please see reverse side.

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Table 2

WATER SYSTEM PLAN
WATER RIGHTS SELF ASSESSMENT – 6 YEAR FORECAST

PERMIT CERTIFICATE OR CLAIM #	NAME ON DOCUMENT	PRIORITY DATE (List oldest first)	SOURCE NAME/ NUMBER	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	EXISTING WATER RIGHTS		FORECASTED WATER USE FROM SOURCES (6-year Demand)		FORECASTED WATER RIGHT STATUS (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
Permits/ Certificates 1. S2-25880	City of Ilwaco	3/4/1991	Indian Creek /SO3	No	1.56 cfs	710 afy				
2. S2-29218	City of Ilwaco	4/24/1995	Indian Creek /SO3	No	0.77 cfs	22 afy				
3.										
4.										
Claims 1.										
2.										
3.										
4.										
TOTAL	**********	*********	*********	**********	2.33 cfs	732 afy	1.56 cfs	451 afy	+0.77 cfs	+281 afy

INTERTIE NAME/ IDENTIFIER	NAME OF PURVEYOR PROVIDING WATER	EXISTING LIMITS ON INTERTIE USE		FORECASTED CONSUMPTION THROUGH INTERTIE		FORECASTED INTERTIE SUPPLY STATUS (Excess/Deficiency)	
		Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
1.							
2.							
3.							
4.							
TOTAL	**********						

PENDING WATER RIGHT APPLICATION (New/Change)	NAME ON APPLICATION	DATE SUBMITTED	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	PENDING WATER RIGHTS	
				Maximum Instantaneous Flow Rate (Qi) Requested	Maximum Annual Volume (Qa) Requested
1.					
2.					
3.					
4.					

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DOH Form 331-372 (Updated 08/10)

To return form, please see reverse side.

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Table 3

WATER SYSTEM PLAN
WATER RIGHTS SELF ASSESSMENT – 20 YEAR FORECAST

PERMIT CERTIFICATE OR CLAIM #	NAME ON DOCUMENT	PRIORITY DATE (List oldest first)	SOURCE NAME/ NUMBER	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	EXISTING WATER RIGHTS		FORECASTED WATER USE FROM SOURCES (20-year Demand)		FORECASTED WATER RIGHT STATUS (Excess/Deficiency)	
					Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
Permits/ Certificates 1. S2-25880	City of Ilwaco	3/4/1991	Indian Creek /SO3	No	1.56 cfs	710 afy				
2. S2-29218	City of Ilwaco	4/24/1995	Indian Creek /SO3	No	0.77 cfs	22 afy				
3.										
4.										
Claims 1.										
2.										
3.										
4.										
TOTAL	**********	********	********	**********	2.33 cfs	732 afy	2.33 cfs	510 afy	0 cfs	+222 afy

INTERTIE NAME/ IDENTIFIER	NAME OF PURVEYOR PROVIDING WATER	EXISTING LIMITS ON INTERTIE USE		FORECASTED CONSUMPTION THROUGH INTERTIE		FORECASTED INTERTIE SUPPLY STATUS (Excess/Deficiency)	
		Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)	Maximum Instantaneous Flow Rate (Qi)	Maximum Annual Volume (Qa)
1.							
2.							
3.							
4.							
TOTAL	**********						

PENDING WATER RIGHT APPLICATION (New/Change)	NAME ON APPLICATION	DATE SUBMITTED	ANY PORTION SUPPLEMENTAL? (If yes, explain in footnote)	PENDING WATER RIGHTS	
				Maximum Instantaneous Flow Rate (Qi) Requested	Maximum Annual Volume (Qa) Requested
1.					
2.					
3.					
4.					

If you need this publication in an alternate format, call (800) 525-0127. For TTY/TDD call (800) 833-6388.

DOH Form 331-373 (Updated 08/10)

To return form, please see reverse side.

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

PERMIT

TO APPROPRIATE PUBLIC WATERS OF THE STATE OF WASHINGTON

[X] Surface Water (issued in accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the Department of Ecology.)

[ ] Ground Water (issued in accordance with the provisions of Chapter 263, Laws of Washington for 1945, and amendments thereto, and the rules and regulations of the Department of Ecology.)

PRIORITY DATE	APPLICATION NUMBER	PERMIT NUMBER	CERTIFICATE NUMBER
April 24, 1995	S2-29218	S2-29218	

NAME
City of Ilwaco

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CODE)
PO Box 548	Ilwaco	Washington	98624-0548

The applicant is, pursuant to the Report of Examination which has been accepted by the applicant, hereby granted a permit to appropriate the following described public waters of the State of Washington, subject to existing rights and to the limitations and provisions set out herein.

PUBLIC WATERS TO BE APPROPRIATED

SOURCE
Indian Creek - Reservoir

TRIBUTARY OF (IF SURFACE WATERS)
Bear River

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
.77		22

QUANTITY, TYPE OF USE, PERIOD OF USE		
22 Acre-feet per year	Municipal Supply	Year-round as needed

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION/WITHDRAWAL
500 feet North and 350 feet East of the East quarter corner of Section 29.

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE E. OR W. W.M.	W.R.I.A.	COUNTY
SW¼ NW¼	28	10	10W	24	Pacific

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Area served by City of Ilwaco

DESCRIPTION OF PROPOSED WORKS

City of Ilwaco treatment plant.

DEVELOPMENT SCHEDULE

BEGIN PROJECT BY THIS DATE:	COMPLETE PROJECT BY THIS DATE:	WATER PUT TO FULL USE BY THIS DATE
January 1, 1996	January 1, 1997	January 1, 2015

PROVISIONS

The permittee is advised that notice of Proof of Appropriation of water (under which the final certificate of water right is issued) should not be filed until the permanent distribution system has been constructed and tha quantity of water allocated by the permit has been put to full beneficial use."

An approved metering device shall be installed and maintained in accordance with RCW 90.03.360, WAC 508-64-020 through -040 (installation, operation, and maintenance requirements are attached). Meter readings shal be recorded at least monthly.

Issuance of this water right is subject to the implementation of the minimum requirements established in the Conservation Planning Requirements, Guideline and Requirements for Public Water Systems Regarding Wate Use Reporting, Demand Forecasting Methodology, and Conservation Programs, July 1994, and as revised.

Under RCW 90.03.005 and 90.54.020(6), conservation and improved water use efficiency must be emphasized in the management of the states water resources, and must be considered as a potential new source of water. Accordingly, as part of the terms of this water right, the applicant shall prepare and implement a wate conservation plan approved by Department of Health. The standards for such a plan may be obtained from either the Department of Health or the Department of Ecology.

This permit shall be subject to cancellation should the permittee fail to comply with the above development schedule and/or fail to give notice to the Department of Ecology on forms provided by that Department documenting such compliance.

Given under my hand and the seal of this office at Olympia, Washington,

this 11th *day of* September, *19* 95.

Mary Riveland, Director

Department of Ecology

ENGINEERING DATA
OK JOH

by Gale Bloomstrom

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

CERTIFICATE OF WATER RIGHT

APPLICATION NO.	PERMIT NO.	CERTIFICATE NO.
April 21, 1961	S2-25880	S2-25880 P

NAME
Town of Ilwaco

MAILING ADDRESS
Post Office Box 548 | CITY: Ilwaco | STATE: Washington | ZIP CODE: 98624

This is to certify that the herein named applicant has made proof to the satisfaction of the Department of Ecology of a right to the use of the public waters of the State of Washington as herein defined, and under and specifically subject to the provisions contained in the Permit issued by the Department of Ecology, and that said right to the use of said waters has been perfected in accordance with the laws of the State of Washington, and is hereby confirmed by the Department of Ecology and entered of record as shown, but is limited to an amount actually beneficially used.

PUBLIC WATERS TO BE APPROPRIATED

SOURCE
Indian Creek

TRIBUTARY OF (IF SURFACE WATERS)
Bear River

MAXIMUM CUBIC FEET PER SECOND	MAXIMUM GALLONS PER MINUTE	MAXIMUM ACRE-FEET PER YEAR
1.56		710

QUANTITY, TYPE OF USE	PERIOD OF USE	
710 acre-feet per year	Municipal supply	Continuously

LOCATION OF DIVERSION/WITHDRAWAL

APPROXIMATE LOCATION OF DIVERSION/WITHDRAWAL
500 feet North and 350 feet East of the East Quarter Corner of Section 29.

LOCATED WITHIN SMALLEST LEGAL SUBDIVISION	SECTION	TOWNSHIP N.	RANGE, E. OR W.W.M.	W.R.I.A.	COUNTY
SW¼NW¼	28	10	10 W	24	Pacific

RECORDED PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)

LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

Area served by the Town of Ilwaco.

PROVISIONS

The Town of Ilwaco will be required to apply for additional flow rights from Indian Creek at such time as the treatment plant capacity is increased above 1 million gallons per day.

The Town of Ilwaco's Certificate of Adjudicated Water Right, as recorded in Volume IX-C of Adjudicated Water Right Certificates, at page 7, for diversion of water from Black Lake will be maintained as an Emergency Backup Source Only, as requested by the Town of Ilwaco and the Department of Health. This mitigation measure has been approved by the Department of Wildlife.

The Water Resources Act of 1971 specifies certain criteria regarding utilization and management of the waters of the state in the best public interest. Use of water may be subject to regulation at certain times, based on the necessity to maintain water quantities sufficient for preservation of the natural environment.

The intake shall be screened at all times in accordance with the Department of Fisheries and the Department of Wildlife screening criteria.

An approved measuring device shall be installed and maintained in accordance with RCW 90.03.360, WAC 508.64.020 through 508-64-040.

On-going studies may reflect needed modifications to these provisions. Any modifications will be in written agreement between The City of Ilwaco, Department of Fisheries Department of Wildlife, and the Department of Ecology.

The right to the use of the water aforesaid hereby confirmed is restricted to the lands or place of use herein described, except as provided in RCW 90.03.380, 90.03.390, and 90.44.020.

This certificate of water right is specifically subject to relinquishment for nonuse of water as provided in RCW 90.14.180.

Given under my hand and the seal of this office at Olympia, Washington,

this 4th *day of* March, 1991.

Christine O. Gregoire, Director
Department of Ecology

ENGINEERING DATA
OK BB

by Julie Bowerman

FOR COUNTY USE ONLY

☒ SURFACE WATER ☐ GROUND WATER

$10.00 MINIMUM STATUTORY EXAMINATION FEE REQUIRED WITH APPLICATION

(GRAY BOXES FOR OFFICE USE ONLY)

APPLICATION NO. S227606 | W.R.I.A. 24 | COUNTY Pacific | PRIORITY DATE 8/18/89 | TIME 1:14

APPLICANT'S NAME — PLEASE PRINT

Town of Ilwaco

Bus. Tel. 642 - 3 | Home Tel. | Other Tel.

ADDRESS (STREET) P.O. Box 548 | (CITY) Ilwaco | (STATE) WA | (ZIP) 98624

DATE & PLACE OF INCORPORATION IF APPLICANT IS A CORPORATION

1. SOURCE OF SUPPLY

IF SURFACE WATER

SOURCE (NAME OF STREAM, LAKE, SPRING, ETC.) (IF UNNAMED, SO STATE)

Bear River

TRIBUTARY

Bear ~~Branch~~ River per letter dated 10-6-89 SF

IF GROUND WATER

SOURCE (WELL, TUNNEL, INFILTRATION TRENCH, ETC.)

SIZE AND DEPTH

~~I have examined this application as required by SEPA and find that it is: ☐ not an "action". ☐ categorically exempt.~~

DATE SIGNATURE

2. USE

USE TO WHICH WATER IS TO BE APPLIED (DOMESTIC SUPPLY, IRRIGATION, MINING, MANUFACTURING, ETC.)

Community Municipal

Multi-family, commercial, and industrial

ENTER QUANTITY OF WATER REQUESTED USING UNITS OF: CUBIC FEET PER SECOND (CFS) 3 OR GALLONS PER MINUTE (GPM) | ACRE FEET PER YEAR 2172

TIMES DURING YEAR WATER WILL BE REQUIRED

All year as needed

IF IRRIGATION, NUMBER OF ACRES | IF DOMESTIC USE, NUMBER OF UNITS BY TYPE, E.G. 1-HOME, 1-MOBILE HOME, 2-CAMPSITES, ETC. | IF MUNICIPAL USE, ESTIMATED POPULATION 20 YEARS FROM TODAY 108

DATE PROJECT WAS OR WILL BE STARTED: unknown at present stage

DATE PROJECT WAS OR WILL BE COMPLETED: unknown at present stage

3. LOCATION OF POINT OF DIVERSION/WITHDRAWAL

3A. IF IN PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)	SECTION	TOWN	RANGE

ALSO, PLEASE ENCLOSE A COPY OF THE PL... MARK THE POINT(S) OF WITHDRAWAL OR ...

3B. IF NOT IN PLATTED PROPERTY

ON ACCOMPANYING SECTION MAPS, ACCURATELY MARK AND IDENTIFY EACH POINT OF DIVERSION. SHOW NORTH-SOUTH AND EAST-WEST DISTANCES FROM NEAREST SECTION CORNER OR PROPERTY CORNER.

ALSO, ENTER BELOW THE DISTANCES FROM THE NEAREST SECTION OR PROPERTY CORNER TO THE DIVERSION OR WITHDRAWAL

1000 feet SW of NE corner of section 28

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE (E OR W) W.M.	COUNTY
N 1/2 NE 1/4 ~~NE 1/4 of the NE 1/4~~	28	10	10W	Pacific

Approx. 300 feet south & 1900 feet west of the Northeast Section cor. of Section

4. DO YOU OWN THE LAND ON WHICH THIS SOURCE IS LOCATED. IF NOT, INSERT NAME & ADDRESS OF OWNER

Crown Zellerbach Corp./Cavenham Forest Industries (503) 795-3221

5. LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

ATTACH A COPY OF THE LEGAL DESCRIPTION OF THE PROPERTY (ON WHICH THE WATER WILL BE USED) TAKEN FROM A REAL ESTATE CONTRACT, PROPERTY DEED OR TITLE INSURANCE POLICY, OR, COPY CAREFULLY IN THE SPACE BELOW

~~See attached map #1,2,3,&4~~

Area served by Town of Ilwaco.

APPLIC.

SEPA - Town of Ilwaco
F&W, HQ Field. Dst.

of Ecology

■ SURFACE WATER ☐ GROUND WATER

$10.00 MINIMUM STATUTORY EXAMINATION FEE REQUIRED WITH APPLICATION

(GRAY BOXES FOR OFFICE USE ONLY)

APPLICATION NO.	W.R.I.A.	COUNTY	PRIORITY DATE	TIME
S227232	24	Pacific	2-1-88	11:06

APPLICANT'S NAME — PLEASE PRINT

City of Ilwaco

Paulene → Bus. Tel. 206-642-31

Home Tel.

Other Tel.

ADDRESS (STREET)	(CITY)	(STATE)	(ZIP CO
P.O. Box 548	Ilwaco	Washington	9862

DATE & PLACE OF INCORPORATION IF APPLICANT IS A CORPORATION

1. SOURCE OF SUPPLY

IF SURFACE WATER	IF GROUND WATER
SOURCE (NAME OF STREAM, LAKE, SPRING, ETC.) (IF UNNAMED, SO STATE)	SOURCE (WELL, TUNNEL, INFILTRATION TRENCH, ETC.)
Kallstrom Creek	
TRIBUTARY	SIZE AND DEPTH
Chinook River	

2. USE

USE TO WHICH WATER IS TO BE APPLIED (DOMESTIC SUPPLY, IRRIGATION, MINING, MANUFACTURING, ETC.)

Domestic Supply - Municipal

ENTER QUANTITY OF WATER REQUESTED USING UNITS OF:	CUBIC FEET PER SECOND (CFS)	OR	GALLONS PER MINUTE (GPM)	ACRE FEET PER YEAR
	4.0		1800	

Year Round As needed

TIMES DURING YEAR WATER WILL BE REQUIRED

All seasons

IF IRRIGATION, NUMBER OF ACRES	IF DOMESTIC USE, NUMBER OF UNITS BY TYPE, E.G. 1-HOME, 1-MOBILE HOME, 2-CAMPSITES, ETC.	IF MUNICIPAL USE, ESTIMATED POPULATION 20 YEARS FROM TODAY
		1,0

DATE PROJECT WAS OR WILL BE STARTED	DATE PROJECT WAS OR WILL BE COMPLETED
1990	2000

3. LOCATION OF POINT OF DIVERSION/WITHDRAWAL

3A. IF IN PLATTED PROPERTY

LOT	BLOCK	OF (GIVE NAME OF PLAT OR ADDITION)	SECTION	TOWN	RANGE

ALSO, PLEASE ENCLOSE A COPY OF THE PLA
MARK THE POINT(S) OF WITHDRAWAL OR DI

3B. IF NOT IN PLATTED PROPERTY

ON ACCOMPANYING SECTION MAPS, ACCURATELY MARK AND IDENTIFY EACH POINT OF DIVERSION. SHOW NORTH-SOUTH AND EAST-WEST DISTANCES FROM NEAREST SECTION CORNER OR PROPERTY CORNER.

ALSO, ENTER BELOW THE DISTANCES FROM THE NEAREST SECTION OR PROPERTY CORNER TO THE DIVERSION OR WITHDRAWAL.

1000 Ft. East of Center of Section 32 T 10N. R.10 W.W.M.

LOCATED WITHIN (SMALLEST LEGAL SUBDIVISION)	SECTION	TOWNSHIP N.	RANGE (E OR W.) W.M.	COUNTY
N ½ of SE ¼	32	10 N	10 W	Pacific

4. DO YOU OWN THE LAND ON WHICH THIS SOURCE IS LOCATED. IF NOT, INSERT NAME & ADDRESS OF OWNER

Weyerhaeuser Corporation

5. LEGAL DESCRIPTION OF PROPERTY ON WHICH WATER IS TO BE USED

ATTACH A COPY OF THE LEGAL DESCRIPTION OF THE PROPERTY (ON WHICH THE WATER WILL BE USED) TAKEN FROM A REAL ESTATE CONTRACT, PROPERTY DEED OR TITLE INSURANCE POLICY, OR COPY CAREFULLY IN THE SPACE BELOW

City of Ilwaco - Municipal water system - all within T 10 N; R. 11 W.W.M.

and T 9 N.; R 11 W.W.M.

HQ

F&W

DOHS

RECEIVED

88 FEB -1 AM 9:06

APPLIC

ECY 040-1-14
Rev. 1/85

SEPA: City of Ilwaco

APPENDIX C

AGREEMENTS

INTERRUPTABLE WATER SUPPLY AGREEMENT
CITIES OF ILWACO AND LONG BEACH

WHEREAS, the Cities of Ilwaco and Long Beach entered into a Water Service Contract in 1978 providing for the sale of water between the two cities.

WHEREAS, there occasionally exists the ability for the City of Ilwaco to produce a greater volume of water than is necessary to meet the City of Ilwaco's demands, and there occasionally exists the ability for the City of Long Beach to produce a greater volume of water than is necessary to meet the City of long Beach's demands.

WHEREAS, under these circumstances, surplus water from one City could be sold to the other City if the need arises, on an interruptible basis, and the sale cost would be based on water treatment plant operator wages and benefits, water treatment plant chemicals, and electrical costs, plus 15% for administration.

IT IS AGREED BETWEEN LONG BEACH AND ILWACO AS FOLLOWS:

1. Ilwaco agrees to supply water, with prior notification, to Long Beach, on an interruptible basis, at a rate of $.70 per hundred cubic feet, through the existing water intertie located on Highway 101. The City of Ilwaco has sole discretion regarding the ability to supply water, on an interruptible basis, to the City of Long Beach.

2. Long Beach agrees to supply water, with prior notification, to Ilwaco on an interruptible basis, at a rate of $.70 per hundred cubic feet, through the existing water intertie located on Highway 101. The City of Long Beach has sole discretion regarding the ability to supply water, on an interruptible basis, to the City of Ilwaco.

3. Basis of interruptible supply water charge. This interruptible supply water charge is based on the actual costs for water treatment plant operator wages and benefits, electricity, and treatment chemicals. Because the supply is interruptible, other costs which may be associated with a guaranteed water supply have not been included, including water treatment plant maintenance, equipment, phone, depreciation, water treatment plant debt service, and water transmission system debt service.

4. Revisions to Agreement. Revisions to this Agreement may be periodically required. Commencing on March 1 of each year, either party may request a review for the purpose of negotiating amendments to this agreement. Both parties shall honor such requests and enter into bargaining in good faith.

5. Revision of Interruptible Supply Water Rate. On March 1 of each year, the interruptible supply water rate may be amended at the request of either party. The basis of the charge for sale from Ilwaco to Long Beach shall be the previous year costs of Ilwaco Water Treatment Plant operator wages and benefits, Ilwaco Water Treatment Plant and booster station electricity, and Water Treatment Plant chemical costs, divided by the total volume of water produced at the Ilwaco Water Treatment Plant plus an additional 15% for administration. The basis of the charge for sale from Long Beach to Ilwaco shall be the previous year costs of Long Beach Water Treatment Plant operator wages and benefits, Long Beach Water Treatment Plant electricity, and Long Beach Water Treatment Plant, plus an additional 15% for administration.

6. Billing. Billing shall e made on an annual basis.

7. Duration. This agreement shall be perpetual unless terminated as provided for below.

8. Termination. This agreement shall be terminated upon thirty (30) days written notice by either party.

9. Effective Date. This agreement shall become effective immediately.

Dated this 15th day of August, 2000

Mayor, City of Ilwaco

Mayor, City of Long Beach

Attest:

Clerk, City of Ilwaco

Clerk, City of Long Beach

September 5, 2003

Mr. Mark Toy
Washington State Department of Health
1112 SE Quince Street, P.O. Box 47890
Olympia, Washington, 98504-7890

RE: City of Long Beach Water Availability for City of Ilwaco

Dear Mr. Toy:

First, I enjoyed meeting with you last month regarding the performance of the City's water plant. We discussed the opportunity to obtain funding for a feasibility study for the analysis of merging the Long Beach and Ilwaco water treatment plant operation and administration. Mayor Jacobson and Councilman Unruh (charged with utility division oversight) both agree this is a worthwhile endeavor. Therefore it is my intent to send you a project proposal next week.

However, to assist our neighboring city, the City of Long Beach presently has the ability to provide approximately 500,000 gallons of supplemental water daily. Please understand that this statement is not a commitment to do so, as that requires the concurrence of the Mayor and City Council.

We look forward to working with you and your department to improve both the quality and quantity of municipal water services on the Long Beach Peninsula. Should you have any questions or comments please contact me at (360) 642-4421 or e-mail at nabiel@centurytel.net.

Best regards,

Nabiel Shawa
City Administrator

3-7-2002

INTERLOCAL AGREEMENT
between
Washington State Parks and Recreation Commission
and
City of Ilwaco, Washington

THIS AGREEMENT is made and entered into by and between the Washington State Parks and Recreation Commission, hereinafter referred to as "Parks", and the City of Ilwaco, hereinafter referred to as the "City".

IT IS THE PURPOSE OF THIS AGREEMENT to set forth the terms and conditions to be followed by Parks and the City for the completion of Fort Canby State Park Sewer and Water System Improvement Project, the long-term operation and maintenance of these improvements and the provision of water and sewer services to Parks by the City.

RECITALS

The City currently provides water service to Fort Canby State Park, which is owned and operated by Parks, per the City Water System Plan, 1997. Parks now desires increased pressure and adequate fire flow to Fort Canby State Park as required by Washington State regulatory standards.

Parks currently treats wastewater generated by Fort Canby State Park and the Coast Guard Station at Cape Disappointment at a wastewater treatment plant located within Fort Canby State Park.

Parks has completed the *"Fort Canby State Park Water and Sewer Feasibility Study, June 2001"* which makes recommendations for improvements to the water and sewer systems for Fort Canby State Park.

Parks has a long-standing practice of seeking municipal water and sewer services where available and practical. Parks has previously entered into an agreement with the City to pay a proportionate share of costs for the City to update its Comprehensive Plan.

The City of Ilwaco Wastewater Facility Plan, 1994, identified potential service to Fort Canby State Park. The City and Parks have received verbal notice from the Washington State Department of Ecology that a revised compliance order is being prepared that will release

COPY

see also L-10 easement

capacity in the City's wastewater treatment plant adequate to meet Parks' and the Coast Guard's needs. Formal written notice from the Department of Ecology is expected prior to formal allocation of Equivalent Residential Units (ERU) to Parks and prior to construction of the sewer system improvements by Parks.

Parks has received funding, subject to the conditions of Section 324, Washington State Substitute Senate Bill 6155, enacted on June 26, 2001 and attached hereto as Exhibit "A", adequate to construct improvements as agreed to by the City and Parks.

Timely performance and completion of the project is essential to Parks and the City. Parks and the City may incur serious and substantial damages if the project is delayed or not completed.

The Southwest Washington Coastal Erosion Project, conducted jointly by the Coast Guard and the Department of Ecology, in its February 16, 1999, report to Parks entitled "*Shoreline Change at Fort Canby State Park*" concluded that the ongoing progression of coastal erosion in the area of Fort Canby State Park will result in bridging of the primary dune by the year 2009, which in turn will likely result in the flooding of lowland areas, including the existing wastewater treatment plant of Fort Canby State Park.

STATEMENT OF OBLIGATIONS

Parks and the City mutually agree that each party will have the following obligations as to design, construction, operation and maintenance of water and sewer improvements.

Parks and the City mutually agree:

1. That the charge for connection to the City wastewater treatment plant will be the rate in effect at the time of purchase of ERU capacity; the connection charge shall be based on the annual average wastewater flow, estimated not to exceed 19,200 gallons per day (80 ERU's) and the number of ERU's shall be determined by dividing the annual average wastewater flow by 100 gallons per day per capita, the Department of Ecology recommended wastewater flow for planning purposes (*Criteria for Sewage Works Design, 1998*) and the average household size in Ilwaco of 2.4 people per residence (*OFM, 1991*), therefore, the number of

ERU's is equal to the average annual flow divided by 240 gallons; additional connection charges shall be assessed if Parks exceeds 80 ERU's, the additional connection charges shall be based on a biannual evaluation of Park's actual ERU's and will be at the rate in effect during the evaluation period;

2. That sewer service usage and monthly sewer service charges, in terms of ERU's, will be determined not less than biannually, beginning June 30, 2003, based upon average annual actual meter readings of wastewater flow from Fort Canby State Park and an ERU equal to 240 gallons per day; that Parks shall be required to pay for and install flow meter(s) as necessary to measure wastewater flow for the purposes of determining ERU's; and that Parks shall also install Biological Oxygen Demand (BOD) and Total Suspended Solids (TSS) monitoring equipment as needed to determine waste strength of effluent delivered to the City's wastewater treatment plant for treatment; a BOD surcharge shall be assessed if such a surcharge is established for all commercial customers by City of Ilwaco ordinance or as may be otherwise agreed to by the City and Parks, as long as sanitary sewer service, consistent with all applicable state and local regulations for said service, are provided;

June 30 05 is next evaluation

3. To encourage joint use of facilities, where practical, by the several properties in the water and sewer service area on such terms and conditions as are acceptable to the involved parties so long as MSW Ventures, LLC, or its successors, (hereinafter "MSW"), submits all plans, permit applications and other applicable documentation to the City for approval within sixty (60) days of the Department of Ecology's revised compliance order releasing ERU capacity to serve Parks and Coast Guard requirements, or May 15, 2002, whichever is later, and to the Washington State Department of Health and the Department of Ecology within thirty (30) days of approval by the City; and that off-site fabrication of the water reservoir to be constructed and installed by MSW begins by November 30, 2002;
4. That if portions of the system improvements needed to serve Fort Canby State Park are constructed by MSW and turned over to and accepted by the City for ownership, operation and maintenance, and all other conditions of paragraph 4, Park's Obligations, are satisfied,

? did we do this?

Parks will, within thirty (30) days of the City's written notice to Parks of receipt and acceptance of such water and sewer system improvements, pay to the City $923,000 to reserve to Parks the future right to access and utilize these improvements; and if such payment is made by Parks, no connection or "latecomers" fee shall be due from Parks upon connection to and utilization of these improvements by Parks.

Parks' Obligations:

1. To design and construct all water and sewer system improvements on Parks' property and on all public properties and/or all public rights-of-way up to a point of connection at MSW's south property line necessary to provide the services addressed by this Agreement;
2. To coordinate construction with the City's Utility Department and the City's Engineer at the point of connection with MSW's south property line over whose property water and sewer system improvements may be built by MSW to ensure proper alignment, connection, fittings, pipe and specifications;
3. That water and sewer system improvements will be designed and constructed in accordance with the alternatives outlined in Chapter 6 "*Recommended Alternative And Financing*" of the *Fort Canby Water And Sewer Feasibility Study*, attached hereto as Exhibit "B", and the "*City of Ilwaco Conditions and Standards – Utility and Roadway Construction*," portions of which are attached hereto as Exhibit "C"[1];
4. That Parks will pay the City $923,000 to reserve to Parks the future right to access and utilize improvements constructed by MSW, or within the boundaries of MSW property, if and only if (1) the City holds legally sufficient, suitable rights-of-way or easements, that are beneficial and acceptable to Parks, and which allow Parks to access and utilize improvements constructed by MSW; (2) the improvements will provide adequate services to Parks and are built to City standards; (3) the improvements are available for connection by Parks no later than June 30, 2003; and (4) the ownership of the improvements have been transferred to the

[1] Note: Recommended and alternative routes for the water and sewer facilities are as shown graphically on Figures 6,7,10, and 11, attached as Exhibit D to this Agreement.

City ; and if such payment is made by Parks, no connection or "latecomers" fee shall be due from Parks upon connection to and utilization of these improvements by Parks;

5. That Parks will not be required to design, construct and/or pay for a water storage reservoir or system improvements larger than that needed to specifically serve the needs of Fort Canby State Park, as identified in the *Fort Canby Water And Sewer Feasibility Study*;
6. That construction of the improvements shall be done to the City's standards, specifications, and requirements, and that during construction of the improvements the City shall have inspection and construction approval for all portions of the water and sewer systems within the bounds of properties or rights-of-way owned or managed by the City, or within Parks' property where the water and sewer improvements may eventually be turned over to the City for operation and maintenance;
7. That Parks shall be responsible for all funding, design, bidding, permitting, and construction of the water and sewer system improvements to City standards and specifications, except that Parks shall have no responsibility whatsoever for funding, design, bidding, permitting or construction of those portions designed or constructed by third parties (including private parties such as MSW), including all bidding and management of professional, design and construction contracts, as well as overall management of the project;
8. That Parks shall be solely responsible for performance of environmental studies and environmental permit acquisition as required to gain regulatory agency approvals for construction of the improvements except those portions designed or constructed by third parties (including private parties such as MSW);
9. That upon completion of the sewer and water system improvements, Parks will retain ownership, maintenance, and operational responsibilities for all water and sewer system components within the boundaries of Fort Canby State Park on Parks' side of the water meter and main entrance sewer pump and North Head sewer pump station that serve only Parks facilities (main campground, Beards Hollow, North Head area, and any relocated or newly constructed park facilities);

10. To transfer to the City ownership of the water and sewer system improvements, including the main pump stations, force mains, water lines, and appurtenant facilities which are off-site of Park's property or that serve parties other than Parks, including all applicable and transferable warranties, guarantees, training obligations, and related items; transfer of ownership to the City under this paragraph shall include all improvements up to and including connection point of the Coast Guard water and/or sewer facilities;
11. To provide to the City the necessary easements and permits for operation and maintenance of the water and sewer system improvements within Parks' property which are transferred to City ownership; ? Have we pd this ?
12. To pay to the City the amount of $280,000 ($3,500 per ERU times 80 ERU's), based upon currently applicable connection charge rate, as established by City of Ilwaco Ordinance 612, attached hereto as Exhibit "E"; payment or presentation of a purchase order for said connection charge shall be made by Parks within ten (10) business days following receipt by Parks of written notice by the City of availability of the required eighty (80) ERU's, but in no event shall payment be made later than sixty (60) days after receipt of written notice;
13. To pay to the City a monthly sewer service fee for the average annual ERU's, as determined in Paragraph 2, Page 3, in an amount equal to the current service charge per ERU levied against all commercial customers as established by City of Ilwaco Ordinance 648, attached hereto as Exhibit "F", or as may be adjusted by the City Council for all commercial customers from time to time or as may be otherwise mutually agreed to by the City and Parks, as long as sanitary sewer service, consistent with all applicable state and local regulations for said service, are provided;

ERU = 240 gal/day

14. To pay to the City a monthly water service fee equal to the current service charge, based upon usage meter readings and water rates, as established by City of Ilwaco Ordinance 647, attached hereto as Exhibit "G", or as may be adjusted by the City Council for all commercial customers from time to time, as long as water service, consistent with all applicable state and local regulations for said service, are provided;

15. To reimburse the City the actual and reasonable costs incurred by the City for staff time, engineering time and other expenses relating to the design revision and construction inspection of improvements designed and constructed by Parks.

The City's Obligations:

1. To review all plans and specifications prior to construction in a timely manner but no later than 30 days after receipt provided that such plans and specifications are acceptable to the City and to inspect, and approve or reject, all construction within 24 hours of notification by Parks or Parks' contractors;
2. That the routing and location for water and sewer improvements identified as "recommended alternatives" in Chapter 6 "*Recommended Alternative And Financing*" of the *Fort Canby Water And Sewer Feasibility Study*, attached hereto as Exhibit "B", are acceptable to the City;
3. To accept full ownership and liability for the operation and maintenance of all improvements upon transfer by Parks and acceptance by the City, with the understanding that all applicable and transferable warranties, guarantees, training obligations, and related items will also be transferred to the City, however, Parks and the City shall remain liable for their own acts and omissions occurring prior to the date of transfer by Parks and acceptance by the City;
4. To complete all facility and operational improvements to the City's wastewater treatment plant, as required by the Department of Ecology as a regulatory approval condition to extend wastewater treatment service to Parks, no later than September 30, 2002;
5. To approve, by the City Council, all comprehensive plan updates as required for extension and/or expansion of water and sewer services to Parks no later than July 30, 2002;
6. To allocate to Parks eighty (80) ERU's or an annual average of 19,200 gallons per day reserved capacity from the City's existing two-cell wastewater treatment plant and to notify Parks in writing, immediately upon written release of capacity by the Department of Ecology, of the City's intent to allocate and sell to Parks a total of eighty (80) ERU's or an

annual average of 19,200 gallons per day reserved capacity within the City's existing two-cell wastewater treatment plant;

7. That the ERU allocation to Parks and the Coast Guard is valid until December 31, 2005, or December 31 of the year the City completes construction of the third cell to the City's wastewater treatment plant, whichever is later; should Parks not make final connection to the City's wastewater treatment plant by that date, the City shall have the right of first refusal to buy back from Parks any or all of the eighty (80) ERU's allocated to Parks at the per ERU price previously paid to the City by Parks, and should the City choose not to purchase all the ERU's, Parks shall have the right to negotiate a price and sell any remaining ERU's to a third party approved by the City, which such approval shall not be unreasonably withheld by the City;
8. To allocate to the United States Coast Guard an additional estimated thirty-five (35) ERU's (above the eighty (80) ERU's to be allocated to Parks) or an annual average of 8,400 gallons per day reserved capacity within the City's existing two-cell wastewater treatment plant and to notify the Coast Guard and Parks in writing of the release of said capacity by the Department of Ecology and availability for purchase by the Coast Guard; the per ERU fee to be paid by the Coast Guard, the actual number of ERU's to be utilized by the Coast Guard and any other terms and conditions of the Coast Guard's use of the City's services shall be negotiated directly between the City and the Coast Guard;
9. Except in the case of emergency, routine maintenance, and act of God, to provide regular and uninterrupted water, sewer, and wastewater treatment services to Parks in an amount no less than agreed upon herein for as long as Parks has a requirement for such services;
10. That connection of other parties or properties to be served by portions of the water and sewer improvements on Parks' property or property under Parks' control transferred to the City by Parks shall require the advance written concurrence of Parks and compliance by the City with the provisions of RCW 35.91 and the terms outlined under Section 324 of Washington State Substitute Senate Bill 6155, enacted June 26, 2001 and attached hereto as Exhibit "A";

11. That, in no case, shall the connection of other parties to these improvements result in a reduction of pressure, flow capacity, or other quality of service measures to Parks or Fort Canby State Park;
12. To make all reasonable efforts within the limit of its authority to collect fees from third parties (including private parties) for use of water and/or sewer systems improvements constructed by Parks, in addition to the normal connection fees currently charged by City ordinance from such parties to be served by portions of the City water and/or sewer systems transferred to the City by Parks, and to reimburse to the State of Washington, Public Works Assistance Account, at rates proportional to third party use; and to otherwise comply with the provisions of RCW 35.91 and Section 324 of Washington State Substitute Senate Bill 6155, enacted June 26, 2001, regarding the use by third parties of improvements constructed by Parks;
13. To enforce the standards and conditions of the "*City of Ilwaco Conditions and Standards – Utility and Roadway Construction*" in administering any extensions of City water and sewer system by MSW which will affect service to Parks and to require security acceptable to the City by May 15, 2002, from MSW, in the amount of (1) the full cost of the fabrication, construction and installation of the water reservoir to be installed by MSW; and (2) $200,000, which amount represents (a) the full cost of the water pipe between the reservoir and MSW's south property line connection to Parks' constructed improvements; and (b) the full increased cost of enhanced water system improvements, in excess of those required by Parks, to be constructed MSW; provided that in the case that the performance of MSW shall not be completed by June 30, 2003, the City will use the posted security to ensure the required improvements are completed; provided that as to subpart (1), the City may release the security under the following schedule: one-third (1/3) when the reservoir is ordered, one-third (1/3) when the reservoir is delivered to the site, and one-third (1/3) when the reservoir is installed; and as to subpart (2), the City may release the security according to the following schedule: upon completion of twenty (20) percent of the construction (excluding the

reservoir) the City may release ten (10) percent of the security, thereafter the security may be released as follows:

Completion	Release
30%	20%
40%	30%
50%	40%
60%	50%
70%	60%
80%	70%
90%	80%
100%	remaining security released upon acceptance and receipt by the City

14. To require MSW or its successors to place all easements over property owned or controlled by MSW and for the construction, maintenance, operation, repair and reconstruction of the improvements, including sewer pipe, mains, and pump stations, if any, and water pipe, mains, pump stations, if any, and reservoir, into an escrow to be held pending completion of the improvements by MSW; the easements shall be delivered to the City when the improvements are transferred to and accepted by the City, or sooner upon the occurrence of the enumerated events outlined in the Joint Escrow Instructions between MSW and the City.

PERIOD OF PERFORMANCE

This Agreement shall commence immediately upon execution by both parties, and may be terminated as provided herein.

INDEPENDENT CAPACITY

The employees or agents of each party who are engaged in the performance of this Agreement shall continue to be employees or agents of that party and shall not be considered for any purpose to be employees or agents of the other party.

AGREEMENT ALTERATIONS AND AMENDMENTS

This Agreement may be amended by mutual agreement of the parties. Such amendments shall not be binding unless they are in writing and signed by personnel authorized to bind each of the parties.

TERMINATION

Either party may give a Notice of Intent to terminate this Agreement or portions thereof by providing thirty (30) days written notification upon the occurrence of one or more of the following events:

1. Failure of the City to allocate to Parks 80 ERU's and to the Coast Guard 35 ERU's in the City's existing two-cell wastewater treatment plant by July 1, 2002;
2. Failure of MSW to complete construction and transfer to the City of water and sewer improvements which will affect service to Parks or are necessary for Parks' water and sewer system by June 30, 2003;
3. Failure of MSW to submit all required plans, permit applications and other applicable documentation for the construction of sewer and water improvements from MSW's south property line to the City's connection to the City for approval within sixty (60) days of the Department of Ecology's revised compliance order releasing ERU capacity to serve Parks' and the Coast Guard's requirements, or May 15, 2002, whichever is later, and/or to the Department of Health and/or the Department of Ecology within thirty (30) days of approval by the City; or failure to begin off-site fabrication of the water reservoir by November 30, 2002; or failure to begin onsite construction of the water and sewer improvements by March 30, 2003;
4. Failure of the City to enter into a Water and Sewer Reimbursement Agreement with MSW by March 1, 2002, or failure of delivery of the required security and easements into escrow for MSW constructed improvements by May 15, 2002;
5. Failure of the City to complete all facility and operational improvements to the City's wastewater treatment plant required by this Agreement by September 30, 2002;

6. Failure of the City Council to approve all comprehensive plan updates as required for extension and/or expansion of water and sewer services to Parks by July 30, 2002;
7. Any other failures, deficiencies or breaches of this Agreement that materially affects the party's benefits contained in this Agreement.

The written notice shall state specifically the basis on which the party seeks termination. Upon receipt of written Notice of Termination, the receiving party shall have thirty (30) days to cure the reason for termination. The Notice of Termination shall be effective only if the occurrence giving rise to the Notice is not cured within thirty (30) days.

SAVINGS

In the event funding from state, federal or other sources is withdrawn, reduced or limited by fifty (50) percent or more of the original 2001 appropriation after the effective date of this Agreement and prior to completion of improvements by Parks, Parks may terminate this Agreement, without notice, subject to renegotiation under any new funding limitations or conditions. In the event state, local or federal approvals for any work to be performed by Parks is not received in a timely manner, including if any such approval is challenged in an administrative, legislative or judicial forum, Parks may terminate this Agreement without notice, provided that such termination may not occur earlier than March 30, 2003, subject to renegotiation to accommodate state, local or federal approval requirements. If termination occurs pursuant to this clause, the City is not obligated to refund any payment made by Parks for ERU's, but at its option may buy back from Parks any or all ERU's previously purchased by Parks as provided in paragraph 7, City's Obligations.

DAMAGES

Any delay or failure in performance by either party shall not constitute a default hereunder if and to the extent the cause for such delay or failure of performance was unforeseeable and beyond control of the party. The aggrieved party shall be entitled to damages from the other party if the cost or time of the aggrieved party's performance is changed due to the fault or negligence of the other party and the aggrieved party incurs additional expenses or suffers a loss as a result thereof.

Both parties shall make all reasonable efforts to prevent and mitigate the effects of any delay regardless of cause.

DISPUTES

In the event that a dispute arises under this Agreement, it shall be determined by a Dispute Board in the following manner: Each party to this Agreement shall appoint one member to the Dispute Board. The members so appointed shall jointly appoint an additional member to the Dispute Board. The Dispute Board shall review the facts, contract terms and applicable statutes and rules and make a determination of the dispute. The determination of the Dispute Board may be appealed to the Cowlitz County Superior Court.

GOVERNANCE

This contract is entered into pursuant to and under the authority granted by the laws of the state of Washington and any applicable federal laws. The provisions of this Agreement shall be construed to conform to those laws. In the event of an inconsistency in the terms of this Agreement, or between its terms and any applicable statute or rule, the inconsistency shall be resolved by giving precedence in the following order:

a. applicable state and federal statutes and rules;

b. statement of work; and

c. any other provisions of the Agreement, including Exhibits incorporated by reference.

ASSIGNMENT

The work to be provided under this Agreement, and any claim arising thereunder, is not assignable or delegable by either party in whole or in part, without the express prior written consent of the other party, which consent shall not be unreasonably withheld.

WAIVER

A failure by either party to exercise its rights under this Agreement shall not preclude that party from subsequent exercise of such rights and shall not constitute a waiver of any other rights

under this Agreement unless stated to be such in a writing signed by an authorized representative of the party and attached to the original Agreement.

SEVERABILITY

If any provision of this Agreement or any provision of any document incorporated by reference shall be held invalid, such invalidity shall not affect the other provisions of this Agreement which can be given effect without the invalid provision, if such remainder conforms to the requirements of applicable law and the fundamental purpose of this Agreement, and to this end the provisions of this Agreement are declared to be severable.

ALL WRITINGS CONTAINED HEREIN

This Agreement, including all Exhibits which by this reference are incorporated herein, contains all the terms and conditions agreed upon by the parties. No other understandings, oral or otherwise, regarding the subject matter of this Agreement shall be deemed to exist or to bind any of the parties hereto.

CONTRACT MANAGEMENT

The program manager for each of the parties shall be responsible for and shall be the contact person for all communications and billings regarding the performance of this Agreement.

The Program Manager for Parks responsible for items regarding this Agreement is:

Andrew E Gerst, Jr. PE,
Facilities Engineering Manager
P.O.Box 42650
7150 Cleanwater Lane
Olympia, WA 98504-2650
(360) 902-8624

The Program Manager(s) for the City responsible for items regarding this Agreement is:

Edward W. Leonard
Mayor
City of Ilwaco
120 First Avenue North
P.O. Box 548
Ilwaco, WA 98624
(360) 642-3145

and

Dave Nelson
City Attorney
1516 Hudson Street, Suite 205
Longview, WA 98632
(360) 425-9400

IN WITNESS WHEREOF, the parties have executed this Agreement:

Washington Parks and
Recreation Commission

By: _____

Title: ASSISTANT DIR.

Date: 3/7/02

City of Ilwaco

By: _____

Title: MAYOR

Date: 03/01/2002

Approved as to form only
this 1st day of March, 2002

_____
Assistant Attorney General
Attorney for the State Parks and Recreation Commission

Approved as to form only
this 5th day of March, 2002

_____
David A. Nelson
Nelson Law Firm, PLLC
Attorney for the City of Ilwaco

AFTER RECORDING MAIL TO:
Lands Program
Washington State Parks & Recreation Commission
P.O. Box 42650
Olympia, WA 98504-2650

Document Titles (s)

1. WATER AND SEWER EASEMENT

Reference numbers of related documents:

None.

Grantor(s):

1. STATE OF WASHINGTON, WASHINGTON STATE PARKS AND RECREATION COMMISSION

Grantee(s):

1. CITY OF ILWACO

Legal Description:

A right-of-way that is ten (10) feet in width, being five (5) feet on either side of the water and sewer lines as constructed, located entirely within Cape Disappointment State Park, in Sections 5 and 9, Township 9 North, Range 11 West, W.M., Pacific county, WA, as shown in Exhibit A of easement document.

Assessor's Property Tax Parcel Account Number(s):

None. Portion of 09110550001
09110550002

M:\Projects\Cape Disappointment\RPA\Easements\2004-04-693 City of Ilwaco-Water&Sewer\recording cover page.doc

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STATE OF WASHINGTON
PARKS AND RECREATION COMMISSION
Rex Derr, Director

Cape Disappointment State Park
Water & Sewer Easement and Agreement #2004-04-693

THIS AGREEMENT is made between the State of Washington, acting through the WASHINGTON STATE PARKS AND RECREATION COMMISSION, as grantor (hereafter "State") and the City of Ilwaco, (hereafter "Grantee").

AUTHORITY

State is acting under those authorities granted to State and described under RCW 79A.05.070, and Washington State Parks and Recreation Commission action of May 3, 2001. The easement granted hereunder is granted subject to and conditioned upon the following terms, conditions and covenants which Grantee hereby promises to observe and perform faithfully and fully (collectively, the "Agreement").

1.0 EASEMENT

1.1 Conveyance. State, for the consideration described in Section 1.3 below, hereby conveys and quit claims to Grantee a non-exclusive, non-divisible easement over a parcel of land in Pacific County legally described and shown as set forth in Exhibit A (hereafter "Easement Area"), together with the right of ingress and egress over and across existing roads. This Easement is being conveyed pursuant to that Interlocal Agreement between State and Grantee, dated March 7, 2002.

1.2 Term. The easement shall be perpetual unless terminated as set forth hereafter.

1.3 Consideration. State and Grantee recognize the mutual benefits of the Facilities as consideration for the easement granted herein.

1.4 Appurtenant Easement. The easement granted herein shall be deemed appurtenant to Grantee's water and sewer systems.

1.5 Title/Disclaimer. The rights granted herein are subject to permits, leases, licenses and easements, if any, heretofore granted by State affecting the property subject to this Agreement

2.0 PURPOSE AND SCOPE OF EASEMENT

2.1 Permitted Use. The easement granted pursuant to this Agreement is for the purpose of and is limited to operating, maintaining, repairing, replacing, and using the water and sewer system improvements as described in the March 7, 2002

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Interlocal Agreement between State and Grantee, including the main pump stations (main entrance and North Head), force mains, water lines, meters, and appurtenant facilities and improvements ("Facilities" herein) subject to Grantee obtaining and at all times possessing all applicable federal, state and local permits. Grantee may not expand, change or modify the purpose or scope of the easement granted herein without State's prior written consent, which shall be at its sole discretion and shall be subject to applicable fees according to State's fee schedule. Any unauthorized use of the Easement Area shall be considered a material breach of this Agreement and may be the basis for termination pursuant to paragraph 6.10 Material Breach or Default. No use will be deemed authorized unless approved in advance in writing by State.

2.2 Tree Removal. Any trees or timber to be cut or removed by Grantee from the Easement Area shall be disclosed in advance to State and shall not be cut or removed until State grants its prior written consent. If Grantee cuts or removes trees or timber, timber subsequently grown shall belong to State.

2.3 Grantee's Use and Activities. Grantee shall exercise its rights under this Agreement so as to minimize, and avoid if reasonably possible, interference with State's use of the Easement Area and adjoining park property for park purposes. Grantee shall at all times conduct its activities on the Easement Area so as not to interfere with, obstruct or endanger the public or State's operations or facilities.

3.0 RESERVATIONS

3.1 Reservations to State. State reserves all ownership of the Easement Area and resources thereon (including timber) and the right of use for any purpose including, but not limited to, the right to remove resources within the Easement Area; the right at all times to cross and re-cross the Easement Area at any place on grade or otherwise; and the right to use, maintain, patrol, reconstruct or repair the Easement Area so long as any such action by State does not unreasonably interfere with Grantee's rights. Control of park gates, roads and lands shall remain with State at all times. State may grant to third parties any and all rights reserved, including easements and leases, so long as any such right granted to any third party, or the exercise thereof, does not unreasonably interfere with the Grantee's rights. In the event State elects to exercise rights provided by this reservation, including future grants to third parties, State shall give written notice to Grantee of such election.

3.2 Use of Area by State. Grantee has been advised and is aware that (a) State is using or intends to use the Easement Area and adjoining park property for recreational park purposes; (b) new park facilities may be constructed in addition to or in replacement of such facilities already existing; and (c) construction of such new facilities may require the installation of roads and other fixtures or improvements over, upon, across and under the Easement Area, and, in addition,

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may require the location of structures with permanent foundations within the Easement Area.

Nothing herein prevents or precludes State from undertaking construction, installation and use of the Easement Area and adjoining park property. The State shall only be liable to Grantee for any damage to or destruction of Grantee's Facilities directly caused by State's use of the Easement Area, adjoining park property, or State's facilities on the Easement Area or adjoining park property to the extent that the damage or destruction results solely from State's failure to exercise reasonable care not to damage or destroy Grantee's Facilities.

4.0 INSURANCE, WASTE AND ENVIRONMENTAL LIABILITY

4.1 Insurance. Grantee's liability coverage is provided through its membership in the Associated Washington Cities Risk Management Service Agency. The current policy period is January 1, 2004 to December 31, 2004, and the policy is automatically renewed annually. The Risk Management Service Agency provides a $250,000,000 per occurrence limit of insurance, with the Grantee carrying a deductible of $1000 per occurrence. Coverages include bodily injury, personal injury, property damage, errors and omissions and advertising injury.

4.2 Waste. Grantee shall not cause or permit any filling activity to occur in or on the Easement Area, except as approved in advance in writing by State. Grantee shall not deposit refuse, garbage, or other waste matter in or on the Easement Area.

4.3 Hazardous Substances. Grantee shall not, without State's prior written consent, use, store, generate, process, transport, handle, treat, release, or dispose of any hazardous substance or other pollutants in or on the Easement Area. The term hazardous substance means any substance or material as those terms are now or are hereafter defined or regulated under any federal, state, or local law including but not limited to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, 42 U.S.C. 9601 et. seq.), or the Washington Model Toxic Control Act (MTCA, RCW 70.105D). Grantee shall immediately notify State if Grantee becomes aware of any release or threatened release of a hazardous substance or other pollutant on the Easement Area or adjoining property. If a release of hazardous substance or other pollutant occurs in, on, under, adjacent to or above the Easement Area or adjacent property arising out of any action of Grantee, its contractors, subcontractors, invitees, agents, employees, licensees, or permitees, Grantee shall, at Grantee's sole expense, promptly take all actions necessary or advisable to clean up, contain, and remove the hazardous substance or other pollutant in accordance with applicable laws. Any cleanup shall be performed in a manner approved in advance in writing by State, except in emergency situations Grantee may take reasonable and appropriate actions without advance approval.

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5.0 CONSTRUCTION, OPERATION AND MAINTENANCE

5.1 Plan of Development. At least thirty (30) days prior to any new development or the reconstruction of any and all Facilities, Grantee shall submit a completed Plan of Development (PoD) to State for its written approval and verification. State's approval will be contingent upon acceptance of the PoD by the Capital Development Program, Parks Development Service Center. The PoD shall include, without limitation, the following:

a. Map showing areas to be developed, location of Facilities and location of utility and other easements;
b. Land clearing, leveling and erosion control plans;
c. Specific physical characteristics, technical specifications and components of Facilities;
d. Schedule of completion dates for Facilities components; and
e. Detailed description of activities to be conducted in the Easement Area.

No construction, reconstruction or development of any kind may take place within the Easement Area prior to State's written approval of the PoD and verification that Grantee has obtained all applicable permits. State will notify Grantee in writing of its verification of permits and approval of the PoD. Nothing in this Agreement shall be deemed to impose any duty or obligation on State to determine the adequacy or sufficiency of Grantee's PoD or to ascertain whether Grantee's construction is in conformance with the PoD and Facilities Specifications approved by State.

During construction and maintenance, Grantee shall minimize soil erosion and damage to soil. Grantee's equipment shall not be operated when ground conditions are such that excessive soil damage or erosion will occur.

In case of incomplete improvements or development, Grantee shall restore the Easement Area to its original condition, if State determines it to be in the best interest for managing the Easement Area.

5.2 Unauthorized Improvements. All improvements not included in the Permitted Use of the Easement Area, or as otherwise approved in advance in writing by State, are prohibited and may be cause for termination under paragraph 6.10 Breach or Default. Improvements placed within the Easement Area without State's prior written consent shall immediately become the property of State or at State's option, may be required to be removed by Grantee at Grantee's sole cost.

5.3 Facilities Specifications. Grantee shall so place, protect, and bury the Facilities as to allow the unobstructed movement of any equipment or materials across the surface of the Easement Area and shall install the Facilities at such depth as to not interfere with State's normal and usual use of the Easement Area. Grantee shall

mark the location of the buried Facilities as required by the applicable regulatory and permitting authorities or as directed by State.

If Grantee fails to place or bury the Facilities according to the Facilities Specifications or as otherwise approved in writing by State, Grantee shall hold State harmless from any and all damage to the Facilities. Further, Grantee shall indemnify, defend and hold harmless State against all claims or liabilities resulting directly or indirectly from Grantee's failure to properly place or bury the Facilities per the Facilities Specifications and other requirements contained in this Agreement. State may require Grantee to relocate the Facilities in the event that they interfere with State's pre-existing use of the park.

State reserves the right to inspect the "open trench" during construction to ensure compliance with the Plan of Development, permits and Facilities Specifications. Grantee shall take precautionary measures necessary to ensure the safety of park visitors during construction.

5.4 Damage. Grantee, when exercising the rights granted herein, shall repair or cause to be repaired, at its sole cost and expense, all damage to improvements on State lands occasioned by it, which is in excess of that which it would cause through normal and prudent exercise of such rights.

5.5 Restoration. Upon completion of the work authorized herein, Grantee shall immediately restore the surface of the Easement Area as required by State.

5.6 Survey Markers. Grantee shall not destroy or disturb any survey markers (including but not limited to corner markers, witness objects, or line markers) without State's prior written approval. Markers that must necessarily be disturbed or destroyed during construction shall be adequately referenced and replaced in accordance with all applicable laws of the state of Washington, including but not limited to RCW 58.24, and all State regulations pertaining to preservation of such markers. Grantee shall re-establish such markers using a licensed land surveyor or public official as prescribed by law according to U.S. General Land Office standards at Grantee's sole cost.

5.7 Response to an Emergency. Nothing contained herein shall prevent Grantee from responding to an emergency relating to the Facilities on the Easement Area, provided Grantee immediately provide written notice to State of said action.

5.8 Aerial Application. The aerial application of pesticides, insecticides and herbicides is prohibited.

5.9 Wetlands. Grantee shall not cause damage to or conduct any filling of any wetlands without the proper written authorization from the appropriate government agency and without receiving prior written approval from State.

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5.10 Survey. It is understood that at the time of this easement, Grantee is taking ownership and control of the Facilities as constructed by State. If Grantee relocates any Facilities pursuant to this Agreement, Grantee shall provide State with a survey showing the location of each of the Facilities on the Easement Area as they are installed.

5.11 Work Standards. All work performed by Grantee shall be in accordance with the Plan of Development submitted to and approved by State and shall be completed in a careful and workmanlike manner to State's satisfaction, free of claims or liens. Upon completion of construction, and upon completion of any subsequent work performed by Grantee, Grantee shall remove all debris and restore the surface of the Easement Area as nearly as possible to the condition in which it was at the commencement of work.

5.12 Removal of Improvements and Equipment. All Facilities which remain upon the Easement Area sixty (60) days from the termination or forfeiture of this Agreement, shall become the property of State and be considered a part of the land upon which they are located; provided, however, that any time within sixty (60) days after the termination or forfeiture of this Agreement, Grantee shall be entitled to remove the Facilities; or, State may require Grantee to remove the Facilities, at Grantee's cost. All tools, equipment and other property not permanently affixed upon the land by Grantee shall remain Grantee's property but shall be removed within sixty (60) days after the termination or forfeiture of this Agreement.

5.13 Inspectors. State may appoint one or more representatives to serve as inspectors to oversee work performed by Grantee in the Easement Area. Grantee shall not carry on any work unless it has given such notice thereof as State has requested so as to allow for the presence of State's inspectors. Grantee and its contractors and subcontractors shall promptly and fully comply with all orders and directions of State's inspectors, including without limitation, cessation of work, and Grantee's construction contracts shall so provide. Grantee shall promptly pay State's charge for such inspectors, including salary, lodging and travel expenses.

5.14 Archaeology. In the event archaeological, cultural or historic resources are found or unearthed during any work or construction, Grantee shall comply with the provisions of RCW 27.44 and RCW 27.53 and the rules of the Office of Archaeological and Historic Preservation. Upon discovery of any such resources, Grantee shall stop work and notify State.

5.15 Appearance of the Property. Grantee shall keep all above-ground Facilities within the Easement Area in a neat, clean, sanitary and safe condition, and shall keep the Facilities in good condition, except only for reasonable wear and tear. The above-ground Facilities shall be maintained by Grantee to a standard consistent with the

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facilities and structures owned by the State within Cape Disappointment State Park, including the color and quality of the paint thereon.

5.16 Monitoring. Grantee shall test and monitor the Facilities required by the appropriate regulatory authority. Test results shall be submitted to State at State's request. State reserves the right to perform testing at any time on any portion of the Facilities system.

6.0 GENERAL TERMS AND CONDITIONS

6.1 Compliance with Laws and Regulations. Grantee shall comply with all applicable laws, including all federal, state, county and municipal laws, ordinances, and regulations in effect, both current and future, for the design, construction, maintenance, operation or improvement of the Facilities and use of the Easement Area. Grantee shall so comply in a timely manner and at its sole expense.

6.2 Ownership and Maintenance of Facilities. The Facilities authorized herein shall be continuously owned and maintained by Grantee at Grantee's sole expense.

6.3 Assignment. This Agreement, or any of the rights granted herein, shall not be assigned without the State's prior written consent, except that the rights granted herein may be used by any employee, contractor, or representative of Grantee while engaged in Grantee's operations. In processing a request for assignment, State shall charge Grantee its administrative costs and require additional compensation for any additional use or user. In the event the State consents to the assignment of Grantee's interest in this Agreement, the State reserves the right to unilaterally amend, or terminate and replace, this Agreement to accommodate any change in circumstances, conditions or parties. These rights are in addition to and not a limitation upon State's discretionary authority under this Section.

6.4 Successors. The rights and obligations of the parties shall inure to the benefit of and be binding upon their respective successors and assigns.

6.5 Forfeiture. In the event that any portion of the Easement Area is not used by Grantee for the purpose for which it was granted within a period of two (2) years from the day and year first above written, Grantee's rights within the Easement Area shall revert to State, and the Easement Area shall be freed from the easement as fully and completely as if this Agreement had not been entered into; provided, however, an extension of time may be granted upon written request prior to the expiration date of said two (2) year period and upon such additional terms and conditions as may be specified by State; such terms and conditions shall include State's right to modify the consideration due State which shall include, but not be limited to, additional charges for administrative costs and appreciation of land and valuable material.

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Should Grantee cease to use the Easement Area for the purposes specified herein for a period of two (2) years, it shall notify State of such nonuse; and the rights granted herein shall revert to State.

6.6 Termination. In the event that this Agreement is terminated for any reason, Grantee's rights within the Easement Area shall immediately revert to State, and the Easement Area shall be freed from the easement as fully and completely as if this Agreement had not been entered into.

6.7 Indemnity. Grantee shall indemnify, defend with counsel acceptable to State, and hold harmless State, its employees, officers, and agents from any and all liability, damages, expenses, causes of action, suits, claims, costs, fees (including reasonable attorney's fees), penalties, or judgments, of any nature whatsoever, arising out of the use, occupation, or control of the Easement Area by Grantee, its contractors, subcontractors, agents, employees, or franchisees, including but not limited to the use, storage, generation, processing, transportation, handling, disposal, release, or threatened release of any hazardous substance or materials. To the extent that RCW 4.24.115 applies, Grantee shall not be required to indemnify State from State's sole or concurrent negligence. This indemnification shall survive the forfeiture or termination of this Agreement.

6.8 Advance By State. If State advances or pays any cost or expense for or on behalf of Grantee, Grantee shall reimburse State the amount paid and shall pay interest on such amount at the rate of one percent (1%) per month, or fraction thereof, until paid.

6.9 Attorney Fees and Venue. In the event either party is required to incur attorney fees and costs to enforce any obligations under the terms of this agreement, in addition to any other relief to which either party may be entitled, the prevailing party shall be entitled to an award of costs and reasonable attorney fees. Venue for any action shall be in Pacific County Superior Court. The laws of the state of Washington shall govern any dispute and the interpretation of this Agreement.

6.10 Notices and Submittals. All notices, demands, and requests required under this Agreement shall be in writing sent by United States registered or certified mail, postage prepaid, and shall be addressed as follows:

If to State:
Washington State Parks and Recreation Commission
Lands Program
P.O. Box 42650
Olympia, WA 98504-2650
Ph: (360) 902-8500
Fax: (360) 902-8840

If to Grantee:
City of Ilwaco
120 First Avenue North
PO Box 548
Ilwaco, WA 98624
Ph: (360) 642-3145
Fax: (360) 642-3155

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Or at such other place as either party may from time to time designate by written notice to the other.

Notices, demands, and requests served upon State or Grantee as provided in this Section in the manner aforesaid shall be deemed sufficiently served or given for all purposes hereunder three (3) days after such notice, demand, or request shall be so mailed in any post office in the state of Washington.

6.11 Material Breach or Default. If Grantee breaches or defaults on any undertaking, promise or performance called for herein, State may terminate this Agreement after Grantee has been given thirty (30) days' written notice of the breach or default and (1) such breach or default has not been corrected within such time; or (2) if such breach or default cannot be reasonably corrected within such thirty (30) day period, Grantee has not commenced such correction and thereafter continued same with reasonable diligence. Upon such termination, all Facilities on the Easement Area shall be forfeited and become the property of State subject only to any previously approved waiver of interest or security interest. In addition to the right of termination, State shall have any other remedy available in law or equity. Any Grantee obligations not fully performed upon termination will continue until fully performed. The failure of State to exercise any right at any time will not waive State's right to terminate for any future breach or default. The failure by State to provide notice to Grantee shall not relieve Grantee of its obligations under this Agreement.

6.12 Force Majeure. Grantee's failure to comply with any of the obligations under this Agreement shall be excused only if due to causes beyond Grantee's control and without the fault or negligence of Grantee, including acts of God, acts of the public enemy, acts of any government, fires, floods, epidemics and strikes.

6.13 Amendments. Any amendments, revisions, supplements, or additions to this Agreement or the attached exhibits shall be made in writing, executed by the parties hereto, and neither State nor Grantee shall be bound by verbal or implied agreements.

6.14 Discrimination. Grantee shall not conduct or suffer any business upon the Easement Area which unlawfully discriminates against any person on the basis of race, color, creed, religion, sex, age, or physical or mental handicap.

6.15 Emergency Action. State may take such emergency action as is necessary to protect the public health, safety and welfare, including, but not limited to, temporary closing or otherwise restricting Grantee's use of the Easement Area. Grantee understands that it shall have no recourse against State for any losses incurred as a result of State's taking such action.

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EAS 33.00 Pacific Co, WA

6.16 Interpretation. This Agreement has been submitted to the scrutiny of all parties hereto and their counsel if desired, and shall be given a fair and reasonable interpretation in accordance with the words hereof, without consideration or weight being given to its having drafted by any party hereto or its counsel.

6.17 Non-Waiver. No failure of State to insist upon the strict performance of any provision of this Agreement shall be construed as depriving State of the right to insist on strict performance of such provision or any other provision in the future. No waiver by State of any provision of this Agreement shall be deemed to have been made unless expressed in writing and signed by State.

6.18 Remedies Cumulative. The specified remedies to which State may resort under this Agreement are cumulative and are not intended to be exclusive of any other remedies or means of redress to which State may lawfully be entitled in case of any breach or threatened breach by Grantee.. In addition to the remedies provided in this Agreement, State shall be entitled to the restraint by injunction of the violation, or attempted or threatened violation, of any of the terms and conditions of this Agreement.

6.19 Severability. If any term of this Agreement or the application thereof to any person or circumstance is found to be to any extent invalid or unenforceable, the remainder of this Agreement, or the application of such term or provision to persons or circumstances other than those as to which it is invalid or unenforceable, shall not be affected thereby, and each term of this Agreement shall be valid and be enforced as written to the fullest extent permitted by law.

6.20 State's Consent. Except in the case of assignment and purpose of the easement, State shall not unreasonably withhold its consent where such consent is expressly provided for in this Agreement.

6.21 Temporary Closure for Cause. If Grantee damages the Easement Area such that it interferes with the normal operation of the park (determined at State's discretion), State may close the park and/or restrict Grantee's access to the Easement Area until Grantee remedies the situation to State's satisfaction. Grantee understands it shall have no recourse against State for any losses incurred during such the shutdown or restriction.

6.22 Recording. Upon full execution, Grantee shall promptly record this Agreement in Pacific County and provide a copy of the recorded Agreement to State.

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IN WITNESS WHEREOF, the parties hereto have executed this instrument as of this 11th day of March, 2005,

GRANTEE: CITY OF ILWACO

By _____

Name EDWARD W. LEONARD

Title MAYOR, CITY OF ILWACO

STATE OF WASHINGTON STATE PARKS AND RECREATION COMMISSION

By _____

Larry Fairleigh, Assistant Director
Parks Development Service Center
By Delegation 2004-43, Section 7 (10-11-04)

Approved as to form only:

CHRISTINE GREGOIRE
Attorney General

By _____
MARK SCHUMOCK
Assistant Attorney General
Dated 2/7/05 MFS.

3-11-05 AL

This transaction is not Taxable under Chapter 11 of the Extraordinary Session Laws of 1951.
See Affidavit No. Exempt
PACIFIC COUNTY TREASURER

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GRANTEE'S ACKNOWLEDGMENT

STATE OF WASHINGTON)
) ss.
County of)

THIS IS TO CERTIFY that on this day, before me the undersigned Notary Public in and for the State of Washington, duly commissioned and sworn, personally appeared Edward W. Leonard to me known to be the Mayor of **the City of Ilwaco** that executed the foregoing instrument and acknowledged the said instrument to be the free and voluntary act and deed of said City, for the uses and purposes therein mentioned, and on oath stated that he was authorized to execute the said instrument.

WITNESS my hand and official seal this 22 day of February, 2005

DEBRA E. GORE
NOTARY PUBLIC
STATE OF WASHINGTON
COMMISSION EXPIRES
JUNE

Debra E Gore
Notary Public in and for the State of Washington
residing at Ocean Park, WA
My commission expires 6-01-2007

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WASHINGTON STATE PARKS & RECREATION COMMISSION
ACKNOWLEDGMENT

STATE OF WASHINGTON)
) ss.
County of THURSTON)

THIS IS TO CERTIFY that on this day, before me the undersigned Notary Public in and for the State of Washington, duly commissioned and sworn, personally appeared Larry Fairleigh to me known to be the Asst. Director of the **Washington State Parks and Recreation Commission** that executed the foregoing instrument and acknowledged the said instrument to be the free and voluntary act and deed of said Commission, for the uses and purposes therein mentioned, and on oath stated that he was authorized to execute the said instrument.

WITNESS my hand and official seal this 10th day of March, 2005.

SREYTOUCH RYSER
COMMISSION EXPIRES
NOTARY
PUBLIC
6-4-07
STATE OF WASHINGTON

Sreytouch Ryser
Notary Public in and for the State of Washington
residing at Tumwater, WA
My commission expires 6-4-07

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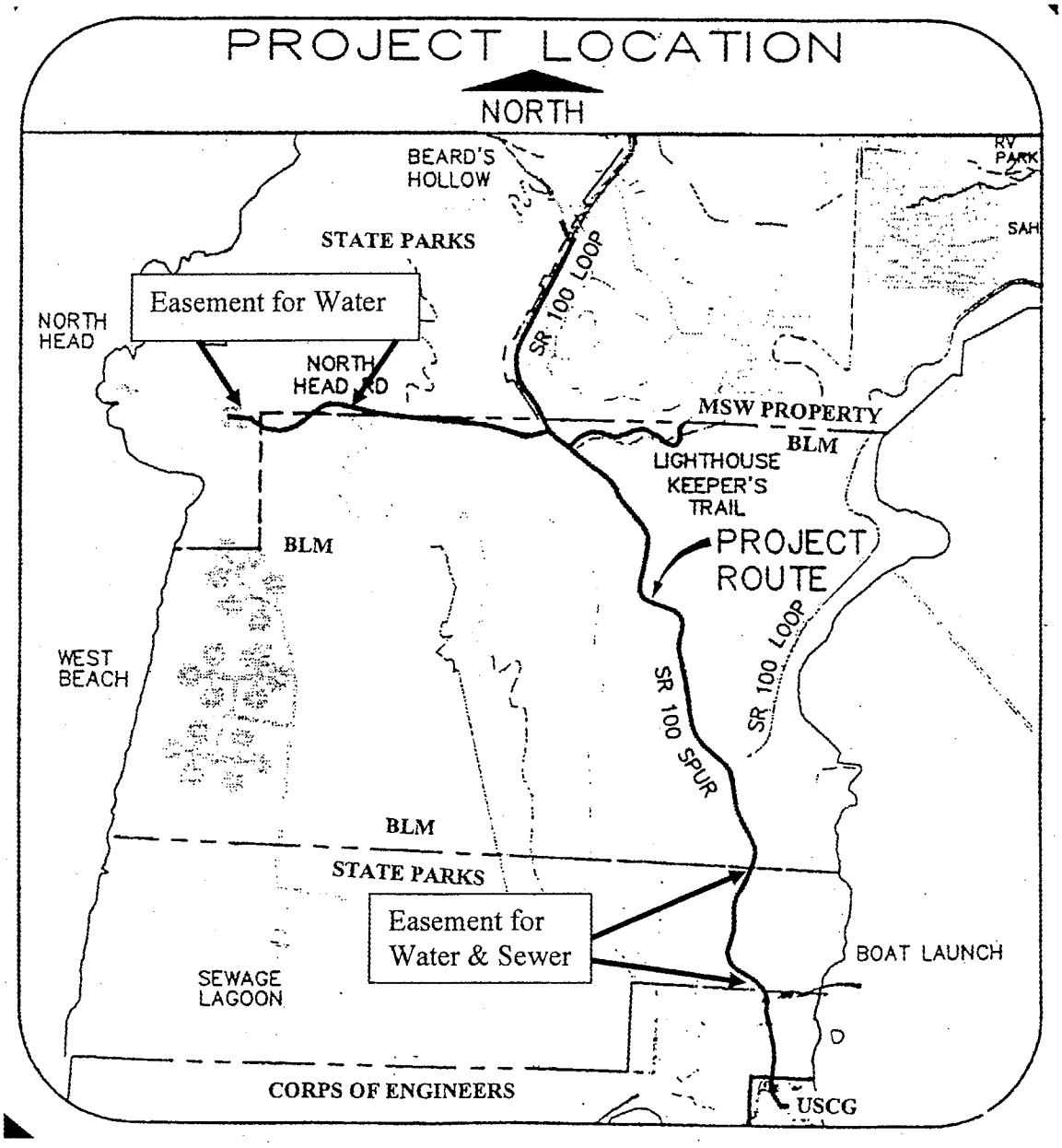
EAS 33.00 Pacific Co, WA

EXHIBIT A
LEGAL DESCRIPTION OF EASEMENT AREA

A right-of-way that is ten (10) feet in width, being five (5) feet on either side of the water and sewer lines as constructed, located entirely within Cape Disappointment State Park, in Sections 5 and 9, Township 9 North, Range 11 West, W.M., Pacific County, WA, as shown below:



M:\Projects\Cape Disappointment\RPA\Easements\2004-04-693 City of Ilwaco-Water&Sewer\EASEMENT to City of Ilwaco-water&sewer.doc

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EAS 33.00 Pacific Co, WA

THREE-PARTY AGREEMENT
BETWEEN
UNITED STATES COAST GUARD,
WASHINGTON STATE PARKS AND RECREATION COMMISSION
AND
CITY OF ILWACO, WASHINGTON

THIS AGREEMENT is made and entered into by and between the United States Coast Guard, hereinafter referred to as "CG," the Washington State Parks and Recreation Commission, hereinafter referred to as "Parks", and the City of Ilwaco, hereinafter referred to as the "City" (collectively referred to as the "Parties").

IT IS THE PURPOSE OF THIS AGREEMENT to set forth the roles and responsibilities of the parties regarding the Fort Canby State Park Sewer and Water System Improvement Project (the "Project"), the long-term operation and maintenance of these improvements, and the provision of water and sewer services by the City to Parks and CG.

RECITALS

WHEREAS there is a recognized need for enhanced water and sewer utility services at Fort Canby State Park and CG Station Cape Disappointment, and both Parks and CG now desire increased pressure and adequate fire flow as required by Washington State regulatory standards.

WHEREAS, The Southwest Washington Coastal Erosion Project, conducted jointly by the Coast Guard and the Department of Ecology, in its February 16, 1999, report to Parks entitled "*Shoreline Change at Fort Canby State Park*" concluded that the ongoing progression of coastal erosion in the area of Fort Canby State Park will result in bridging of the primary dune by the year 2009, which in turn will likely result in the flooding of lowland areas, including the existing wastewater treatment plant of Fort Canby State Park. Accordingly, the city of Ilwaco has determined that an emergency exists under RCW 36.70A.110(4) in Resolution No. 2002-07.

WHEREAS Parks received funding from the State legislature, subject to the conditions of Section 324, Washington State Substitute Senate Bill 6155 (June 26, 2001), to complete the Project; and thereafter Parks and City entered into an Interlocal Agreement on March 7, 2002 setting forth the terms and conditions by which Parks will build new water and sewer lines, Parks will transfer ownership of these new lines to City, and City will be responsible for ongoing operations and maintenance of these lines and provision of utility services to Parks and CG (the "Interlocal Agreement," attached hereto as [redacted] by reference);

WHEREAS, MSW Ventures LLC, a private developer ("MSW"), and the City entered into a Sewer and Water Reimbursement Agreement (the "Reimbursement Agreement") setting forth the terms and conditions by which MSW shall build approximately one mile of water and sewer lines, from City's municipal utility plant

L-10 Back-up

across property that MSW owns and intends to develop, and up to a connection point at Park's property line. Pursuant to the Reimbursement Agreement, once constructed satisfactorily, MSW shall transfer ownership of these lines to City, and City shall be responsible for ongoing operation and maintenance of these lines. As set forth in the Interlocal Agreement, after the City obtains these lines, Parks shall pay a fixed fee of $923,000 to City in consideration of the future right to access and utilize these lines.

WHEREAS, in accordance with the Interlocal Agreement, Parks will contract to design and construct approximately 1.5 miles of water and sewer lines from the MSW property line, across Fort Canby State Park, and up to the connection point at or near CG's property line. CG's proportional usage of these lines is 30%, or approximately $1,068,222 of construction costs.

WHEREAS, in accordance with the utility contract between CG and City (the "Utility Contract," attached hereto as [redacted] and incorporated herein by reference), CG shall pay to City: (a) connection fees for 35 Equivalent Residential Units, or approximately $122,500, to reserve sewage treatment capacity in the City's plant; (b) a non-recurring, non-refundable service charge of approximately $1,068,222 as contribution in aid of construction for the new water and sewer lines to be constructed by Parks; (c) a latecomer's fee of $289,831 in consideration of the future right to access and utilize the lines owned by City and previously obtained from MSW; and (d) recurring monthly charges for water and sewer services in accordance with City's ordinance rates.

WHEREAS, the city has completed all facility and operational improvements to the city's existing wastewater treatment plant required by the Interlocal Agreement.

WHEREAS, the city has entered into a Water and Sewer Reimbursement Agreement with MSW and the required security and easements have been delivered into escrow for MSW constructed improvements.

WHEREAS the CG is entering this Agreement pursuant to the authority granted to it by 14 U.S.C. §93(b) authorizing the CG to maintain, operate and repair CG shore establishments, and 14 U.S.C. §93(b) authorizing the CG to enter into cooperative agreement with other Government agencies.

STATEMENT OF OBLIGATIONS

CG, Parks and the City agree as follows:

1. The CG shall pay the non-recurring, non-refundable service charge described above in four increments, as follows: (a) completion of design, (b) 50% completion of construction of Parks' portion of the lines, (c) 75% completion of construction of Parks' portion of the lines, and (d) 100% completion of construction of Parks' portion of the lines.

2. [redacted]

[redacted]

3. In accordance with the Utility Contract, CG shall pay a latecomer's fee of $289,831 in consideration of the future right to access and utilize the lines owned by City and previously obtained from MSW. The amount of $289,831 is a fixed fee and not subject to change. The City shall transfer the entire $289,831 CG latecomer's fee to Parks as CG's proportional contribution to the $923,000 fee paid by Parks to City in consideration of the future right to access and utilize these same lines.

4. When Parks determines that payment of (a) the latecomer's fee of $289,831; or (b) any incremental payment towards the non-recurring, non-refundable service charge of approximately $1,068,222 is due, Parks shall submit an invoice directly to CG at the address specified in Section G.3 of the Utility Contract. The invoice shall state that payment should be made to City. After CG review and concurrence, CG shall pay City the invoice amount.

5. The payments described in Paragraph 4 above shall be transferred in their entirety, plus all accrued interest, to Parks. City shall initiate and maintain a trust account with a federally insured financial institution. CG payments shall be deposited directly into this trust account and not co-mingled with other City funds. City shall take all necessary action to assist in the completion of this transfer of funds to Parks. The city will request the bank where the trust account is established to give both the city and Parks notice upon the deposit of any funds. In accordance with the Utility Contract, CG shall pay City an administrative processing fee of $200 for each transfer of funds as described above.

6. This Three-Party Agreement is limited to the definition of the roles and responsibilities of the respective parties in completing the Fort Canby State Park Sewer and Water System Improvement Project. There shall be no obligation of funds under this agreement. CG obligation of funds shall be accomplished in the Utility Contract.

EFFECTIVE DATE

This Agreement shall commence immediately upon execution by all three parties.

AGREEMENT ALTERATIONS AND AMENDMENTS

This Agreement may be amended by mutual agreement of the Parties. No amendment shall be binding unless it is in writing and signed by persons authorized to bind each of the Parties.

TERMINATION

This Agreement shall terminate upon the accomplishment of its purpose, the completion of the Fort Canby State Park Sewer and Water System Improvement Project, or otherwise upon the mutual written agreement of all three Parties. In addition, CG or Parks may give a Notice of Intent to terminate this Agreement or portions thereof by providing thirty (30) days written notification upon the occurrence of one or more of the following events:

1. Failure of MSW to complete construction and transfer to the City those water and sewer improvements which will affect service to Parks and CG or are necessary for Parks' and CG's water and sewer system by June 30, 2003.

2. Failure of MSW to submit all required plans, permit applications and other applicable documentation for the construction of sewer and water improvements from MSW's South property line to the City's connection to the City for approval within sixty (60) days of the Department of Ecology's revised compliance order releasing ERU capacity to serve Parks' and CG's requirements, and/or to the Department of Health and/or the Department of Ecology within thirty (30) days of approval by the City; or failure to begin off-site fabrication of the water reservoir by November 30, 2002; or failure to begin onsite construction of the water and sewer improvements by March 30, 2003;

3. Failure of the City Council to approve all comprehensive plan updates as required for extension and/or expansion of water and sewer services to Parks or failure of City Council to obtain acknowledgement or approval by October 31, 2002 from applicable governmental authorities that an emergency exists under RCW 36.70A.110(4) relating to the destruction of Parks' sewer ponds at Ft Canby State Park;

4. Any other failures, deficiencies or breaches of this Agreement, the Interlocal Agreement or the Utility Contract that materially affect the Parties' benefits as contained in each of these three documents.

The written notice shall state specifically the basis on which the party seeks termination. Upon receipt of written Notice of Termination, the recipient party shall have thirty (30) days to cure the reason for termination. The Notice of Termination shall be effective only if the occurrence giving rise to the Notice is not cured within thirty (30) days.

GOVERNING LAW

This agreement is entered into pursuant to laws of the State of Washington and any applicable Federal laws.

CONTRACT MANAGEMENT POINTS OF CONTACT

The program manager for each of the Parties shall be responsible for and shall be the contact person for all communications and billings regarding the performance of this Agreement.

The Program Manager for Parks is:

Andrew E. Gerst, Jr. P.E.
Facilities Engineering Manager
P.O. Box 42650
7150 Cleanwater Lane
Olympia, WA 98504-2650
(360) 902-8624

The Program Managers for City are:

Edward W. Leonard
Mayor, City of Ilwaco
120 First Avenue North
P.O. Box 548
Ilwaco, WA 98624
(360) 642-3145

and

Dave Nelson
City Attorney
1516 Hudson Street, Suite 204
Longview, WA 98632
(360) 425-9400

The Program Manager for CG is:

Robert Townsend
Contracting Officer
U.S. Coast Guard MLCPAC(fcp)
Coast Guard Island
Alameda, California 94501
(510) 437-3009

IN WITNESS WHEREOF, the Parties have executed this Agreement:

Washington Parks and Recreation Commission

By: _____

Print Name: LAWRENCE D FAIRLEIGH

Title: ASSISTANT DIRECTOR

Date: 9/5/02

City of Ilwaco

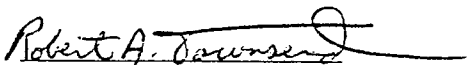
By: 

Print Name: Edward W. Leonard

Title: Mayor

Date: August 27, 2002

United States Coast Guard

By: 

Print Name: ROBERT A. TOWNSEND

Title: Contracting Officer

Date: SEP 17 2002

Exhibit A Interlocal Agreement between Parks and City, March 7, 2002
Exhibit B Utility Services Contract, No. DTCG89-02-C-64T001, between CG and City

REAL ESTATE CONTRACT

Between the Town of Ilwaco, a Washington muncipal corporation ("Ilwaco"), and Weyerhaeuser Company, a Washington corporation ("Weyerhaeuser"), dated March 20, 1987. jw

BACKGROUND:

Based on recommendations of its consultant, American Engineering Associates, and other information, Ilwaco has determined that it needs to acquire certain timberlands in the Indian Creek drainage for municipal watershed purposes. Ilwaco is authorized and prepared to acquire the needed property by condemnation if necessary. Weyerhaeuser owns portions of the property. Wishing to avoid the expense and delays of condemnation, Ilwaco and Weyerhaeuser agree to the following transaction.

AGREEMENTS:

1. Weyerhaeuser will convey to Ilwaco the following real property lying approximately as shown on the map attached as Exhibit A:

(a) "Parcel 1," containing approximately 133 acres, and consisting of the following portions of Section 28, Township 10 North, Range 10 West (W.M.), Pacific County, Washington:

(1) the North one half of the Southwest one quarter; and

(2) that portion of the Northwest one quarter lying South of the North boundary of a new county road right of way, to be sixty feet in width and located as close as practicable to the ridge line extending Northwesterly from the existing county road, and South of the South side of Weyerhaeuser logging road No. 1620 extending Southeasterly from the existing county road.

(b) "Parcel 2," containing approximately 327 acres, and consisting of the following portions of Township 10 North, Range 10 West (W.M.):

(1) In Section 28, that portion of the East one half lying South of the South side of Weyerhaeuser's existing logging road No. 1620;

(2) In Section 27, that portion of the Southeast one quarter lying South and West of the Southwest side of Weyerhaeuser's existing logging road No. 1620;

be based on the survey. The survey will be completed as soon as practicable after Ilwaco's review of the title report and Weyerhaeuser's approval of the staking of those boundaries requiring a survey.

6. In the deed Weyerhaeuser will quitclaim a non-exclusive easement to use any roads it may now or hereafter own or control that provide access from the nearest public road to the property conveyed, authorizing Ilwaco to use such roads to manage the lands for watershed and commercial timber management purposes. However, Weyerhaeuser does not guarantee that any such roads will remain usable, and Ilwaco will be responsible for any additional maintenance attributable to its use.

7. In the deed Ilwaco will covenant that the proposed replacement county road segment will be dedicated and open for public use before Ilwaco authorizes the existing segment within the subject property to be taken out of service.

8. Weyerhaeuser will pay any real estate excise tax under Ch. 82.45 RCW. Ilwaco will pay any "rollback taxes" attributable to the conveyances, and will reimburse Weyerhaeuser for property taxes pro rated as of the date of this agreement. If it elects to close through escrow, Ilwaco will pay all escrow fees. If it elects to purchase title insurance, Ilwaco pay any title insurance premiums and sales taxes on the title policy.

9. During the time this agreement is in effect, Weyerhaeuser may continue harvesting timber being reserved, and otherwise continue managing the property for commercial timber production.

10. This agreement may be terminated by Ilwaco if it decides not to proceed with its proposed watershed project, or by Weyerhaeuser if the transaction has not closed by _____, 1987.

* * * End of Agreement * * *

TOWN OF ILWACO

By _____
Mayor

WEYERHAEUSER COMPANY

By _____
Manager, Acquisition, Sale & Exchange

jw2/1124/a8
11/11/86

STATE OF WASHINGTON
) ss.
COUNTY OF KING)

* Manager, Acquisition, Sale & Exchange

On this 23rd day of March, 1987, before me personally appeared J. Whittig, to me known to be a ~~Vice President~~ * of WEYERHAEUSER COMPANY, the corporation that executed the within and foregoing instrument, and acknowledged said instrument to be the free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and on oath stated that he was authorized to execute said instrument on behalf of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal the day and year first above written.

Notary Public in and for the State of Washington, residing at Seattle.

My appointment expires March 20, 1988

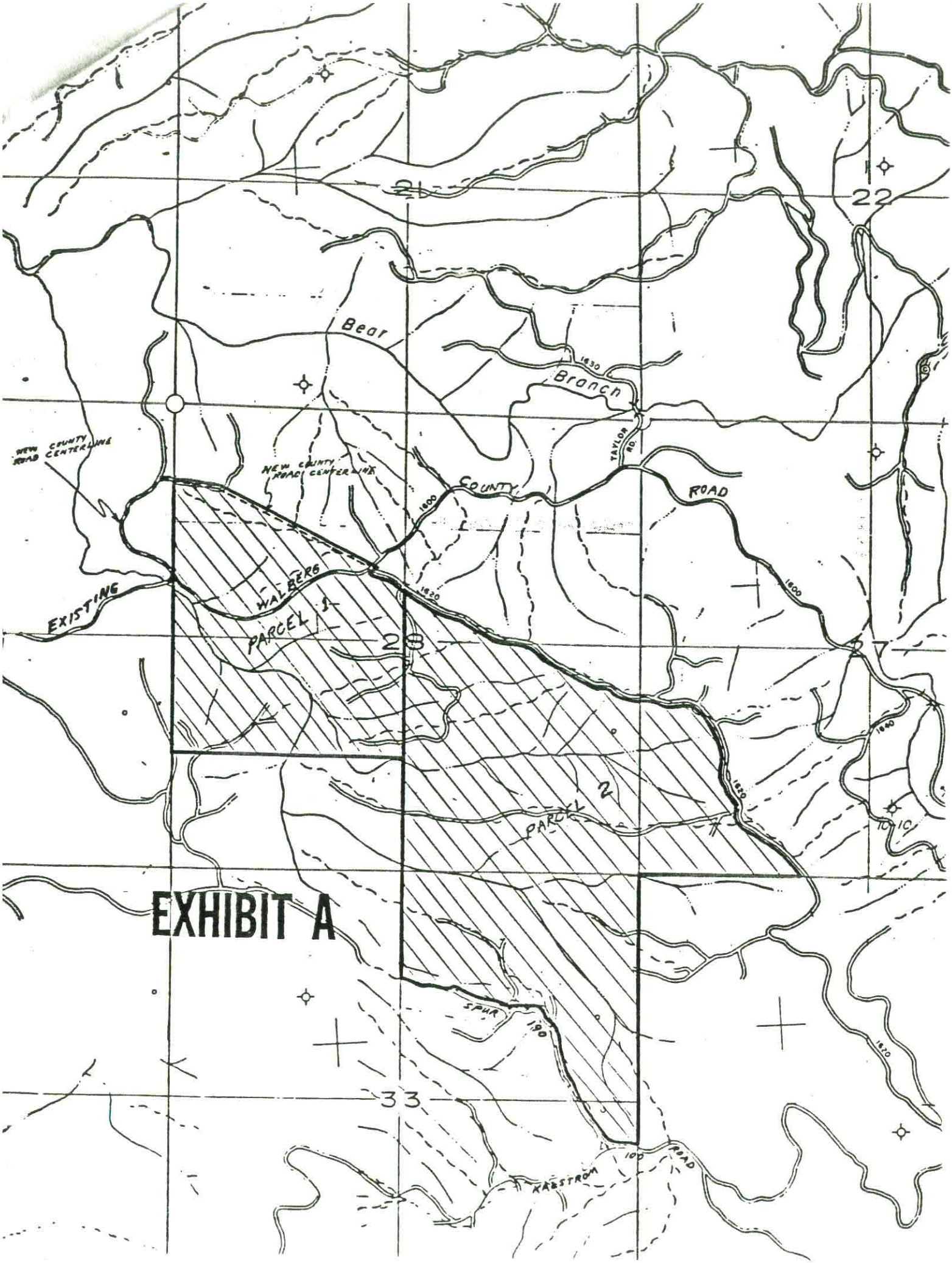

21
22
Bear
Branch
1830
NEW COUNTY ROAD CENTERLINE
NEW ROAD COUNTY CENTERLINE
TAYLOR RD.
COUNTY
ROAD
1800
EXISTING
WALBERG
PARCEL 1
1820
28
27
1840
PARCEL 2
1830
1810
EXHIBIT A
SPUR
180
33
1820
KARSTROM
100
ROAD

EXHIBIT B

Mineral Reservation

Grantor hereby expressly saves, excepts and reserves out of the grant hereby made, unto itself, its successors and assigns, forever, all geothermal steam and heat and all metals, ores and minerals of any nature whatsoever, not previously reserved, in or upon said land including but not limited to, coal, lignite, peat, oil and gas, including coal seam gas, together with the right to enter upon said lands for the purpose of exploring the same for such geothermal resources, metals, ores and minerals, and drilling, opening, developing and working mines and wells thereon and taking out and removing therefrom, including by surface mining methods, all such geothermal resources, metals, ores and minerals, and to occupy and make use of so much of the surface of said land as may be reasonably necessary for said purpose; provided, that Grantee and Grantee's heirs, representatives, successors and assigns, shall be paid just and reasonable compensation for any injury or damage to the surface of said land, to the crops or to the improvements thereon caused by the exercise of any rights herein reserved, provided, further, that the exercise of such rights by Grantor shall not be postponed or delayed pending reasonable efforts to agree upon or have determined such just and reasonable compensation.

EXHIBIT C

Reservation of Rights to Use Roads

The following reservation is to be included in the deed from Weyerhaeuser Company to the town of Ilwaco:

"The Grantor reserves, for itself and any successor owners of any tributary lands, the right to use and maintain all haul roads now existing on the lands hereby conveyed, and any replacement roads that may be constructed with consent of Grantee or its successors, for purposes of commercial timber management on lands now or hereafter owned or controlled by the Grantor or its successors that are tributary to such roads. For this purpose lands shall be considered "tributary" to a road segment if the road segment could be reasonably used in the ordinary course of business for access to the lands for commercial timber management purposes, and "commercial timber management" includes timber harvesting and hauling, site preparation for reforestation, protection of timber crops from fire, disease, pests and competing vegetation, and hauling of rock or other road building materials and equipment in preparation for or in connection with any such activities."

EXHIBIT D

Timber Reservations and Timber Management Covenants

The following reservations and covenants are to be included in the deed from Weyerhaeuser Company to the town of Ilwaco, with respect to "Parcel 2":

"1. Weyerhaeuser to itself, successors and assigns reserves the right to harvest the currently merchantable stand of timber designated on the attached map as Unit 644, containing approximately 120 acres, in the Northwest quarter of Section 28, until five years from recording of this conveyance. A portion of this timber is covered by the Indian Creek No. 1 timber cutting contract between Weyerhaeuser and M. Nygaard Logging Company, currently scheduled to expire March 31, 1987. Weyerhaeuser agrees to release the portion of Unit 644 covered by that contract promptly on its completion, if the timber has then been removed.

"2. Weyerhaeuser for itself, successors and assigns reserves the right to harvest the existing stands of timber designated on the attached map as Unit 626, containing approximately 59 acres, in the Southwest quarter of Section 27, and Units 579 and 761, containing approximately 102 acres and 14 acres respectively, in the East one half of Section 33, until 40 years from recording of this conveyance.

"3. Weyerhaeuser will give Ilwaco three years notice before exercising any of the rights hereby reserved, except Unit 644 currently scheduled for harvest in 1986 and 1987. If Weyerhaeuser gives notice of intent to harvest but is unable to obtain necessary regulatory permits to do so, it may elect either to extend the timber reservation until it is able to remove the reserved timber or to sell such timber to Ilwaco at its then current market value, disregarding any adverse effects on market value attributable to its location within a municipal watershed or unavailability of harvest permits.

"4. Weyerhaeuser will release its rights under these timber reservations and timber management covenants as to each unit or portion of a unit on completion of harvest.

"5. Weyerhaeuser will be responsible for any post-harvest slash disposal and reforestation to the extent necessary to meet normal regulatory requirements for comparable timberlands outside municipal watersheds. Weyerhaeuser will indemnify Ilwaco against any penalties and other costs imposed by regulatory

agencies for failure to meet normal regulatory requirements relating to slash disposal and reforestation, but Ilwaco will reimburse Weyerhaeuser for any additional slash disposal or reforestation costs attributable to the fact that the lands are used for domestic water supply purposes.

"6. Weyerhaeuser reserves the right to manage and protect the reserved timber by thinning, fire control, pest control, fertilization, and other generally accepted silvicultural practices, provided that Weyerhaeuser:

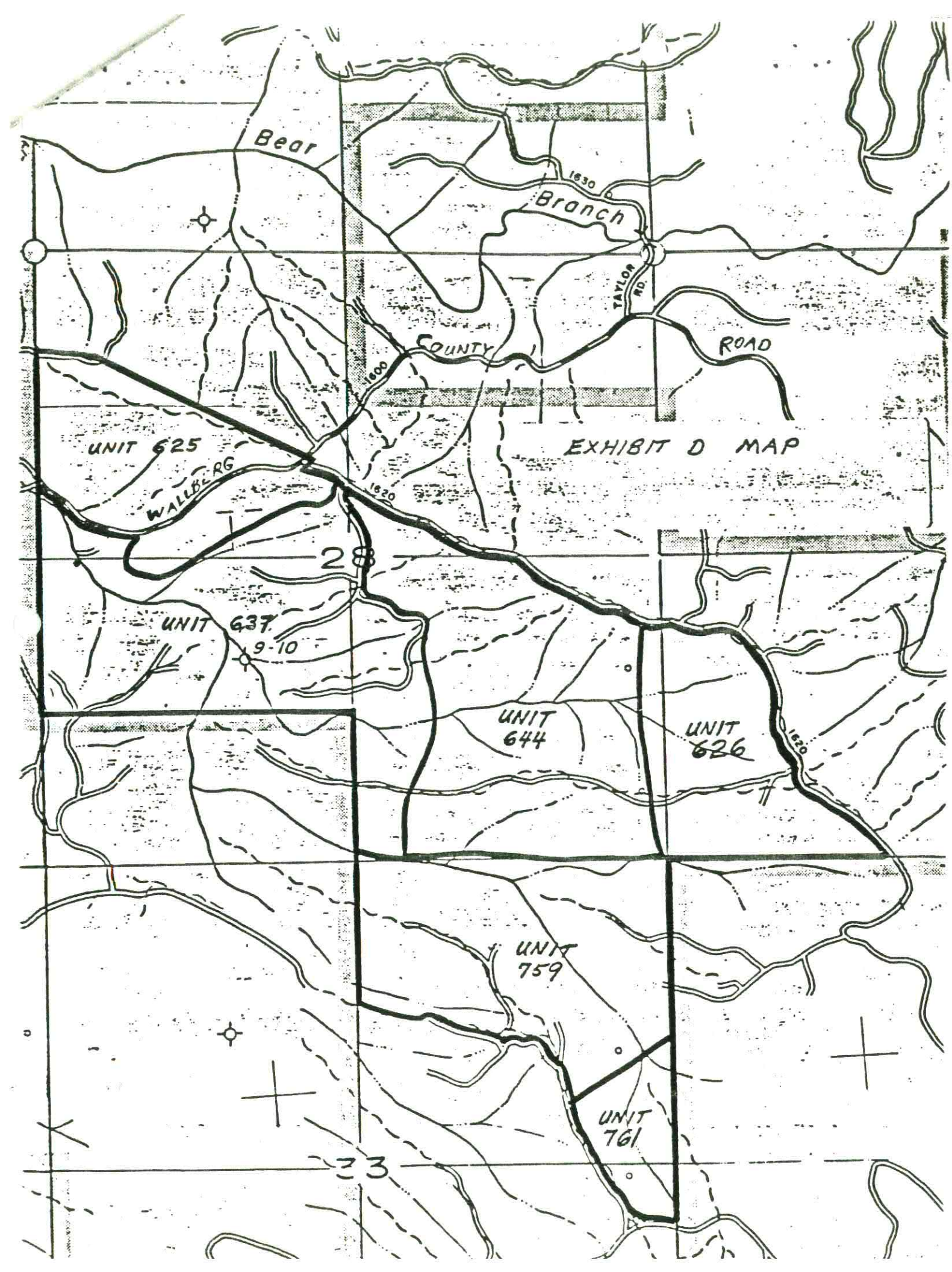
(a) will comply with all applicable state laws and regulations generally applicable to similar operations in municipal watersheds;

(b) will not apply pesticides within the watershed without approval of Ilwaco, which approval will not be unreasonably withheld;

(c) will give Ilwaco 90 days notice before commencing any forest practice, except in emergencies where Weyerhaeuser will give notice as soon as practicable;

(d) does not guarantee that the area will be adequately protected from fire, pests or other damage, and will have no responsibility to Ilwaco for any damage occurring to the timber from natural or other causes.

"7. The town of Ilwaco agrees not to unreasonably interfere with Weyerhaeuser's harvest of the reserved timber or with Weyerhaeuser's management of the reserved timber stands. Ilwaco will cooperate with Weyerhaeuser to manage the water supply system in a manner which minimizes the possibility of adverse effects being caused by Weyerhaeuser's timber harvest and silvicultural operations."


Bear
Branch
1630
TAYLOR RD.
COUNTY
ROAD
1600
EXHIBIT D MAP
UNIT 625
WALLBERG
1620
28
UNIT 637
9-10
UNIT 644
UNIT 626
1620
UNIT 759
UNIT 761
33

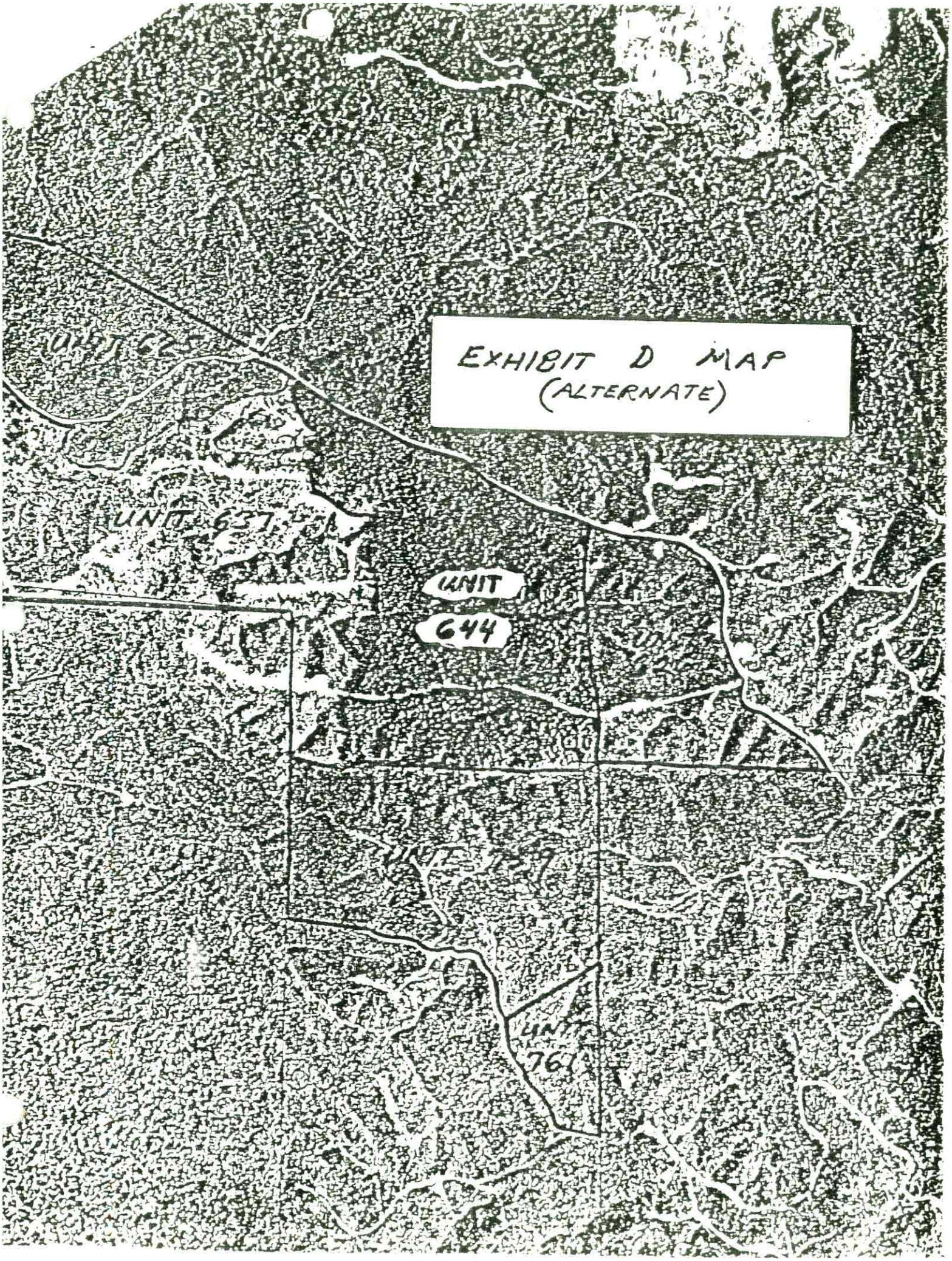


EXHIBIT D MAP
(ALTERNATE)
UNIT 637
UNIT
644
UNIT
761

"EXHIBIT- P"

When Recorded. Return to:

Randall B. Printz
Landerholm, Memovich, Lansverk
& Whitesides. P.S.
P.O. Box 1086
Vancouver, WA 98666-1086

ABOVE SPACE RESERVED FOR RECORDING INFORMATION

DEVELOPMENT AGREEMENT

PARTIES: MSW VENTURE, LLC, hereinafter referred to as "MSW"

and

City of Ilwaco, hereinafter referred to as "City"

EFFECTIVE DATE: May 27, 2003.

RECITALS:

WHEREAS, MSW owns approximately 350 acres of contiguous real property located in the City of Ilwaco, Washington, adjacent to and immediately East and South of State Loop 100, and lying generally North and West of the Sa-Ha-Lee Subdivision, and which is more particularly described in Exhibit A and incorporated by reference herein; and

WHEREAS, the property is zoned R-3 under the City's zoning regulations; and

WHEREAS, MSW wishes to develop residential and commercial uses on the site, including a golf course; and

WHEREAS, such development will provide the City with additional tax revenues, transportation and utility improvements, creation of jobs, and unique housing alternatives for area residents; and

WHEREAS, MSW and the City wish to have the site developed in a manner that provides long-term predictability, efficiency and integration; and

WHEREAS, the City and MSW desire to maximize the ability to efficiently plan for and provide for urban services and capital facilities in furtherance of the City's Comprehensive Plan Goals and Policies; and the City's Capital Facilities Plan; and

WHEREAS, as part of its Preliminary Plat and Master Plan Application, MSW has prepared and submitted to the City a Narrative describing the proposed future uses of the property; and

WHEREAS, this Narrative also describes the projected intensity of the uses as well as the Master Plan's projected utilization of urban services, i.e., water, sewer, transportation at full buildout. This Narrative is attached hereto as Exhibit "B" and is incorporated by reference herein; and

WHEREAS, it is the City's and MSW's desire to establish, on a long-term basis, the standards under which the MSW property shall develop; and

WHEREAS, such integrated planning is consistent with and encouraged by the Growth Management Act; and

WHEREAS, RCW 36.70B.170 provides authority for a city to enter into a development agreement; and,

WHEREAS, RCW 36.70B.170 provides:

> The Legislature finds that the lack of certainty of the approval of development projects can result in a waste of public and private resources, escalate housing costs for consumers and discourage the commitment to comprehensive planning which would make maximum efficient use of resources at the least economic cost to the public. Assurance to a development project applicant that upon government approval the project may proceed in accordance with existing policies and regulations, and subject to conditions of approval, all is set forth in a development agreement, will strengthen the public planning process, encourage private participation and comprehensive planning, and reduce the economic cost of development;

AND whereas, the City of Ilwaco has held a public hearing, received evidence and determined that entering into this Agreement is in the public's best interest;

In consideration of the above recitals, the Parties agree that the following standards shall apply to development of the site:

1. Absent amendment of this Development Agreement by mutual agreement between the City and MSW, the standards provided for herein shall apply to and govern the development of the property.

2. So long as the future development of the property and implementation of the Master Plan is substantially consistent with the Master Plan Narrative, attached hereto as Exhibit

"A"; said future development shall be governed and regulated under the Land Use, Development and Environmental Regulations in effect on the 14th day of April, 2003. Substantially consistent "shall mean that impacts from future development shall not exceed those proposed and analyzed in the Master Plan Narrative by more than fifteen percent.

3. In conjunction with its Preliminary Plat and Master Plan Applications, the Applicant has provided a Transportation Analysis, which has been reviewed by the Washington State Department of Transportation and the City. Based upon that analysis, review, and comment from WSDOT and others, the City has imposed upon the Applicant as a condition of their requested approvals, measures to mitigate the transportation impacts of their development. The Applicant shall provide that mitigation in the time and manner provided for in its Preliminary Plat Approval (obtained commensurate with this Development Agreement). No further transportation analysis, mitigation or transportation related fees will be required for individual pad, or parcel development or further platting upon the site, so long as the development of the site is substantially consistent with Exhibit "A". Any proposed development upon the site which is not substantially consistent with Exhibit "A" shall be required to go through additional transportation review and approval by the City.

4. The City acknowledges that MSW has constructed water facilities, including a large water reservoir on its site that has a capacity in excess of that needed by the full build out of MSW's property as contemplated in Exhibit "A". MSW has constructed these improvements in advance of, and in anticipation of its future full build out. It is recognized by the parties that it may take ten to fifteen years, or longer, to achieve such future build out. Because of MSW's willingness to comprehensively plan its utility needs, construct facilities in advance of its need, and to create capacity in excess of its own need, the City shall reserve for a period of fifteen (15) years, four hundred fifty Equivalent Residential Units (450 ERU's) of water storage capacity in the water reservoir on MSW's property.

5. In the event any controversy or claim arises under this Agreement, the prevailing party shall be entitled to its reasonable costs, disbursements and attorney fees, together with all expenses, which it may reasonably incur in taking such action.

6. Failure by either Party at any time to require performance by the other Party of any of the provisions hereof shall in no way affect the Parties' rights hereunder to enforce the same, nor shall any waiver by the Party of the breach hereof be held to be a waiver of any succeeding breach or a waiver of this nonwaiver clause.

7. This Agreement shall be construed with and governed by the laws of the State of Washington. The Parties agree to venue in Pacific County, State of Washington.

8. If any portion of this Agreement shall be invalid or unenforceable to any extent, the validity of the remaining provisions shall not be affected thereby.

9. This Agreement and its covenants, conditions and terms shall be assignable by the Parties and shall extend to, and be binding upon, and inure to the benefit of all of the Parties' successors and assigns.

10. Each of the recitals contained herein are intended to be, and are incorporated a covenants between the Parties and shall be so construed.

11. This Agreement may only be amended by mutual agreement of the Parties.

CITY OF ILWACO, WASHINGTON

By _____
Title MAYOR

MSW VENTURE, LLC

By _____
Title Member

STATE OF WASHINGTON)
) ss.
County of Pacific)

I certify that I know or have satisfactory evidence that Ed Leonard is the person who appeared before me, and said person acknowledged that he signed this instrument, on oath stated that he was authorized to execute the instrument and acknowledged it as the Mayor of the City of Ilwaco, Washington, to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated: September 15, 2004

LORNA J. BATT
NOTARY PUBLIC
STATE OF WASHINGTON
COMMISSION EXP. JUNE 1, 2005

Lorna J. Batt
Notary Public in and for the State of Washington, residing at Ilwaco, WA.
My appointment expires: 6-1-2005

STATE OF WASHINGTON)
) ss.
County of Clark)

I certify that I know or have satisfactory evidence that Richard Marshall is the person who appeared before me, and said person acknowledged that he signed this instrument, on oath stated that he was authorized to execute the instrument and acknowledged it as the member of MSW Venture, LLC, to be the free and voluntary act of such party for the uses and purposes mentioned in the instrument.

Dated: September 15, 2004

LORNA J. BATT
NOTARY PUBLIC
STATE OF WASHINGTON
COMMISSION EXP. JUNE 1, 2005

Lorna J. Batt
Notary Public in and for the State of Washington, residing at Ilwaco, WA.
My appointment expires: 6-1-2005

APPENDIX D

DESIGN STANDARDS

CITY OF ILWACO
WATER SYSTEM STANDARDS

GENERAL

A. The standards established by this chapter are intended to represent the minimum standards for the design and construction of water system facilities. Greater or lesser requirements may be mandated by the City due to localized conditions. Extensions, connections or modifications to the existing system shall be in compliance with the requirements of the State Department of Health and the Department of Ecology as applicable.

B. Off-site improvements to the existing system may be warranted based on (1) the condition and capacity of the existing water system and (2) impacts caused by the proposed development. These off-site improvements (in addition to "on-site improvements) shall be completed as determined by the Public Works Superintendent to mitigate impacts caused by the development.

C. All water mains shall have a capacity at least 150% of the expected maximum size required for the development.

D. All water systems shall have telemetry satisfactory to the Public Works Superintendent on all associated lines, tanks, reservoirs, pumps, valves, and associated vaults and buildings for sampling and monitoring those items such as chlorination, turbidity, pressure, levels, flow, and status, which may be required by the Public Works Superintendent.

E. All water booster pump stations shall be equipped with on-site auxiliary power capability sufficient to ensure the station is operable during a power outage.

DESIGN STANDARDS

A. The design of water system improvements shall depend on their type and local site conditions. The design elements of water system improvements shall conform to the standards as set forth in this Chapter.

B. Detailed plans which provide the locations, size, and type of the proposed water system and points of connection shall be submitted for the City's review. These plans shall be separate from sewer plans.

C. Project plans shall have a horizontal scale of not more than 50 feet to the inch. Plans shall show:

1. Locations of streets, right-of-ways, existing utilities, and water system facilities;

2. Ground surface, pipe type and size, water valves, and hydrants stationing;

3. All known existing structures, both above and below ground, which might interfere with the proposed construction, particularly sewer lines, gas mains, storm drains, telephone lines, television cables, and overhead and underground power lines; and

4. All utility easements, and applicable County recording number(s).

5. Computations and other data used for design of the water system shall be submitted to the City for approval.

D. The water system facilities shall be constructed in conformance with the current version of the Standard Specifications for Road, Bridge, & Municipal Construction and current amendments thereto, State of Washington, revised as to form to make reference to Local Governments and as modified by the City's requirements and standards.

E. Material and installation specifications shall contain appropriate requirements that have been established by the industry in its technical publications, such as ASTM, AWWA, WPCF, and APWA standards. Requirements shall be set forth in the specifications for the pipe and methods of bedding and backfilling so as not to damage the pipe or its joints.

F. Except as otherwise noted herein, all work shall be accomplished as recommended in applicable American Water Works Association (AWWA) Standards, and according to the recommendations of the manufacturer of the material or equipment concerned.

G. The location of the water mains, valves, hydrants, and principal fittings including modifications shall be staked by the Developer. No deviation shall be made from the required line or grade. The Contractor shall verify and protect all underground and surface utilities encountered during the progress of this work.

H. Prior to final inspection, all pipelines shall be tested and disinfected.

I. Before acceptance of the water system by the City, all pipes, assemblies, and other appurtenances shall be cleaned of all debris and foreign material. After all other work is completed and before final acceptance, the entire roadway, including the roadbed, planting, sidewalk areas, shoulders, driveways, alley and side street approaches, slopes, ditches, utility trenches, and construction areas shall be neatly finished to the lines, grades and cross sections for a new roadway consistent with the original section.

J. The Developer shall be required, upon completion of the work and prior to acceptance by the City, to furnish the City with a written guarantee covering all material and workmanship for a period of three years after the date of final acceptance and he shall make all necessary repairs during that period at his own expense, if such repairs are necessitated as the result of furnishing poor materials and/or workmanship. The Developer shall obtain warranties from the contractors, subcontractors and suppliers of material or equipment where such warranties are required and shall deliver copies to the City upon completion of the work.

GENERAL REQUIREMENTS

A. Prior to construction, the Contractor shall schedule a pre-construction meeting with the Public Works Superintendent, stakeholders, and all other interested parties.

B. Work shall be performed only by contractors experienced in laying public water mains.

C. Prior to any work being performed, the Contractor shall contact the Public Works Superintendent to set forth his proposed work schedule.

D. D. Contractor shall obtain approval of materials to be used from the Public Works Superintendent prior to ordering of materials.

E. Water mains shall be laid only in dedicated street, rights-of-ways or easements shown on preliminary plats or which have been granted to the City. A street is normally not considered dedicated until the plat which created it has been officially filed with the County Auditor.

F. All water main distribution pipeline construction shall have a minimum 36" cover from finished grade and 42-inch cover over transmission mains (Standard Detail W-D1). Mains shall generally be located parallel to and 10 feet northerly or easterly of street centerline. Water mains shall be extended to the far property line(s) of the property being served. Off-site extensions may be required to hydraulically loop existing and new

systems. Oversizing of water mains may be required to be installed per City's current Water System Plan.

G. Minimum distance between sewer and water lines shall be 10 feet horizontally and 1 foot vertically. Refer to Standard Detail W-D17 for requirements regarding utility separation and crossing.

H. Water main pie and service connections shall be a minimum of 10 feet away from building foundations and/or roof lines.

I. Air relief valves are required at high points in water lines. Air relief valves shall be installed in accordance with Standard Detail W-D4 or Standard Detail W-D5.

J. Fire hydrants are generally required approximately every 600 feet in residential areas, and every 300 feet in commercial areas. However, fire hydrants shall be furnished and installed at all locations as specifically mandated by the local fire marshall and/or per City Building Code. Refer to Standard Detail W-D2 and Standard Detail W-D3 for information regarding fire hydrant installation.

K. Fire hydrants on dead end streets and roads shall be located within approximately 300 feet from the frontage center of the farthest lot. Distances required herein shall be measured linearly along street or road.

L. Pipes connecting hydrants to mains shall be at least 6 inch in diameter and be less then 17 feet in length.

M. Dead end lines are not permitted except where the Developer can demonstrate to the City's satisfaction that it would be impractical to extend the line at a future date. Water mains on platted cul-de-sacs shall extend to the plat line beyond the cul-de-sac to neighboring property for a convenient future connection, and extended off-site to create a hydraulic loop, or, as minimum, have a four (4") inch blow off assembly installed at the termination point (Standard Detail W-D7).

N. All materials shall be new and undamaged.

O. Unless otherwise approved or required by the Public Works Superintendent, the water main shall be HDPE or C-900 PVC. Ductile iron pipe may be appropriate in special circumstances and must receive specific approval from the Public Works Superintendent. The minimum nominal size for water mains shall be 8 inches, unless otherwise approved/required by City.

EXCEPTION: 6-inch hydrant spools and pipelines located beneath rock or retaining walls shall be Class 53 ductile iron.

P. Fittings shall be compatible with HDPE, C-900 PVC, and ductile iron as appropriate. Ductile iron fittings shall be cement-lined.

Q. Provide bends in field to suit construction and in accordance with pipe manufacturer's recommendations so as not to exceed allowable deflection at pipe joints.

R. Provide thrust blocking and/or restrained joints at all fittings and bends in accordance with the City standards and conditions (Standard Detail W-D10 and Standard Detail W-D12). Blocking is to be designed by Developer's Engineer.

S. Provide anchor blocking at all up-thrust vertical bends in accordance with City standards (Standard Detail W-D11). Blocking is to be designed by Developer's Engineer.

T. Water valves shall be located in clusters when possible and shall be located so that each leg of the main line system can be isolated separately.

U. All water valve marker posts shall be painted yellow and marked with the distance to valve being referenced (Standard Detail W-D4, Standard Detail W-D5).

V. Residential water service pipe shall be one-inch diameter copper or PE pipe (no joints beneath pavement areas), meeting or exceed ASTM D2239, SDR-7 as manufactured by Driscopipe (CL 200), or City approved equal (Standard Detail W-D8).

W. Minimum size service lines between the water main and the water meter shall be 1 inch unless otherwise specified (W-D8). All service lines shall be the minimum size otherwise specified by the Uniform Plumbing Code in accordance with fixture units, unless otherwise specified.

X. Meter services and meter boxes shall be set to final grade and all adjustments shall be made prior to final pressure testing of the system, centerline of service inlets shall be located to match bottom elevation of meter box in such a manner that meter inlet and outlet will be the same elevation as bottom of meter box. Refer to Standard Detail W-D8 for required materials and installation information for water services 2” and smaller. Refer to Standard Detail W-D9 for required materials and installation information for water services 3” and larger.

Y. All water services shall end within road right-of-way or easements.

Z. All meters shall be installed by the City, and the Developer shall pay the current meter installation charge.

AA. All meters shall be compatible with the radio-read meter system used by the City.

BB. Contractor shall install water sampling stations per Figure W-D21. Contractor shall furnish the location of water sample stations to City Utilities Department. One station is required for development in size of 1 to 10 lots. One additional station is required for each additional 50 lots or portions thereof.

CC. All new buildings and residences shall include in their water service a suitable pressure reducing valve to protect the plumbing from excessive pressures, unless waived on the application form of the City. Refer to Standard Detail W-D24 for installation requirements for pressure reducing stations.

DD. All new construction shall comply with the "Accepted Procedure and Practice in Cross Connection Control Manual" as published by the Pacific Northwest Section of the American Water Works Committee", November 1995, Sixth Edition, and current amendments thereto. A copy of such is available for review at the City office. Where required, backflow and cross-control devises will be installed.

EE. Cut in connections shall <u>not</u> be made on Fridays, holidays or weekends. All tapping sleeves and tapping valves shall be pressure tested prior to making connection to existing mains.

FF. Contractor shall notify the Public Works Superintendent and obtain approval from him prior to any water shut-off or turn-on, affecting the water system, a minimum of 48 hours in advance.

GG. Biological test samples will be taken by the City and paid for by the contractor.

HH. All water mains and appurtenances shall be hydrostatically tested at 200 psi in accordance with City Standards.

II. Resilient seated wedge gate valves shall be used for 10-inch mains and smaller. Butterfly valves shall be used for mains greater than 10 inches.

JJ. Road restoration shall be in accordance with City, County and State design and construction standards, as may be applicable. Developer and Contractor shall become familiar with all City, County and State conditions of required permits, and shall adhere to all conditions and requirements.

MATERIALS

A. Water Mains & Fittings

1. Water mains to be installed shall be HDPE or if approved by the Public Works Superintendent, C-900 PVC. Under special circumstances the Public Works Superintendent may approve the limited use of ductile iron of an appropriate class.

B. HDPE Pipe and Fittings

1. HDPE pipe for water mains shall be manufactured from PE 3408.3608 resin conforming to ASTM D3350. 4" and greater pipe shall be IPS/DIPS, DR9 conforming to ASTM F714, AWWA C906, NSF. ½" through 3" pipe shall be IPS, DR9, conforming to D3035, AWWA C901, NFS.

2. All HDPE molded fittings and fabricated fittings shall be fully pressure rated to match the pipe DR pressure rating to which they are made. All fittings shall be molded or fabricated by the manufacturer. No Contractor fabricated fittings shall be used unless approved by the City.

3. The manufacture of the HDPE pipe shall supply all HDPE fittings and accessories as well as any adapters and/or specials required to perform the work.

4. All fittings shall be installed using butt-fused fittings, thermo-fused fittings/couplings, or flanged adapters and must be approved by the City.

5. All transition from HDPE pipe to ductile iron or PVC shall be made per the approval of the City and per the HDPE pipe manufacturer's recommendations and specifications. A molded flange connector adapter within a carbon steel back-up ring assembly shall be used for pie type transitions. Ductile iron back-up rings shall mate with cast iron flanges per ANSI B16.1. A 316

stainless steel back-up ring shall mate with a 316 stainless steel flange per ANSI B16.1.

C. PVC Pipe and Fittings

1. PVC pipe for water mains shall C-900 be made from material conforming to ASTM C1784. The pipe shall be DR 18 and conform to ANSI/AWWA C900 specification, with gaskets meeting ASTM F477 and joints in compliance with ASTM D3139. Pipe joints shall be gasketed. Solvent-cement joints are not acceptable.

2. PVC Schedule 80 fittings shall conform to ASTM D 2467. PVC Schedule 80 threaded fittings shall conform to ASTM D 2464.Pipe and fittings shall be manufactured as a system and be the product of one manufacturer. Pipe and fittings shall conform to National Sanitation Foundation (NSF) Standard 61 or the health effects portion of NSF Standard 14.

D. Ductile Iron Pipe and Fittings:

1. If approved, ductile iron pipe shall conform to ANSI/AWWA C151/A21.51-91 Standards, and current amendments thereto, except the ductile iron pipe shall be thickness Class 52 for 4" through 14" diameter pipe (except for 6-inch hydrant spools which shall be Cl. 53) and Class 50 for 16" and larger. Grade of iron shall be a minimum of 60-42-10. The pipe shall be cement lined to a minimum thickness of 1/16", and the exterior shall be coated with an asphaltic coating. Each length shall be plainly marked with the manufacturer's identification, year case, thickness, class of pipe and weight.

2. If approved, ductile iron joints shall be mechanical joint or push-on type, employing a single gasket, such as "Tyton", except where otherwise calling for flanged ends. Bolts furnished for mechanical joint pipe and fittings shall be high strength ductile iron, with a minimum tensile strength of 50,000 psi.

3. If approved, restrained ductile iron joint pipe, where shown on the plans shall be push-on joint pipe with "Fast Tight" gaskets as furnished by U.S. Pipe or equal for 12" diameter and smaller pipe and "TR FLEX" as furnished by U.S. Pipe or equal for 16" and 24" diameter pipes. The restrained joint pipe shall meet all other requirements of the non-restrained pipe.

4. All ductile iron fittings shall be short-bodied and comply with applicable ANSI/AWWA C110 or C153 Standards for 350 psi pressure rating for mechanical joint fittings and 250 psi pressure rating for flanged fittings. All fittings shall be lined and either mechanical joint or flanged, as indicated on the plans.

E. All pipe shall be jointed by the manufacturer's standard coupling, be all of one manufacturer, and be carefully installed in complete compliance with the manufacturer's recommendations.

F. Joints shall be "made up" in accordance with the manufacturer's recommendations. Standard joint materials, including rubber ring gaskets, shall be furnished with the pipe. Material shall be suitable for the specified pipe size and pressures.

G. Fittings in areas shown on the plans for restrained joints shall be mechanical joint fittings with a mechanical joint restraint device. The mechanical joint restraint device shall have a working pressure of at least 250 psi with a minimum safety factor of 2:1 and shall be City approved.

H. The pipe and fittings shall be inspected for defects and prepped prior to installation. HDPE and PVC piping shall be wiped clean. If ductile iron has been approved, all lumps, blisters and excess coal tar coating shall be removed from the bell and spigot end of each pipe, and the outside of the spigot and the inside of the bell shall be wire-brushed and wiped clean and dry, and free from oil and grease before the pipe is laid.

I. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the line. After placing a length of pipe in the trench, the spigot end shall be centered in the bell and pipe forced home and brought to correct line and grade. The pipe shall be secured in place with select backfill tamped under it. Precaution shall be taken to prevent dirt from entering the joint space. At times when pipe laying is not in progress, the open ends of pipe shall be closed by a water-tight plug. If water is in the trench when work resumes, the seal shall remain in place until the trench is pumped completely dry. No pipe shall be laid in water or when trench conditions are unsuitable.

J. The cutting of pipe for inserting fittings or closure pieces shall be done in a neat and workmanlike manner, without damage to the pipe or lining, and so as to leave a smooth end at right angles to the axis of the pipe. Pipe shall be laid with bell ends facing in the direction of the laying, unless directed otherwise by the City. Wherever it is necessary to deflect pipe from a straight line, the amount of deflection allowed shall not exceed pipe manufacturer's recommendations.

K. For connection of mechanical joints, the socket, plain end of each pipe and gasket shall be cleaned of dirt before jointing, and shall be jointed according to manufacturer's directions. Bolts shall be tightened alternately at top, bottom and sides, so pressure on gasket is even.

L. For connection of "Tyton" joints, the jointing shall be done according to manufacturer's recommendations, with special care used in cleaning gasket seat to prevent any dirt or sand from getting between the gasket and pipe. Lubricant to be used on the gasket shall be non-toxic and free from contamination. When a pipe length is cut, the outer edge of the cut shall be beveled with a file to prevent injury to the gasket during jointing.

M. Valves, fittings, plugs and caps shall be set and jointed to pipe in the manner as required. All dead ends on new mains shall be closed with dead end M.J. caps and thrust blocks.

N. Fittings shall be "blocked" with poured-in-place concrete, with a firm minimum bearing against an undisturbed earth wall per Standard Detail W-D10 or Standard Detail W-D12. Thrust blocks shall be poured as soon as possible after setting the fittings in place to allow the concrete to "set" before applying the pressure test. The concrete thrust blocks shall be in place before beginning the pressure test. Anchor blocks shall be allowed to set sufficiently to develop the necessary bond strength between the reinforcing rods and the concrete anchor before beginning the pressure test.

O. All of the new piping, valves and blocking shall have been installed, disinfected and tested up to the point of cutting into existing lines before the crossover is made. The crossover to the existing system shall be in full readiness, including the cut and sized specials. Forty-eight (48) hour notice shall be given the City in advance of the planned "cut-ins".

P. Valves

1. All valves larger than 10” shall generally be furnished and installed as butterfly valves. All valves 10" and smaller shall generally be furnished and installed as resilient seat gate valves.

Q. Resilient-Seated Gate Valves.

1. All gate valves shall conform to ANSI/AWWA C509-87 Standards for resilient-seated, high strength, bronze stemmed gate valves. The valves shall be iron-bodied, iron disk completely encapsulated with polyurethane rubber and bronze, non-rising stem with "O" ring seals. The polyurethane sealing rubber shall be fusion bonded to the wedge to meet ASTM tests for rubber to metal bond ASTM D429. The valves shall open counter-clockwise and be furnished with 2-inch square operating nuts except valves in vaults shall be furnished with handwheels. All surfaces, interior and exterior shall be fusion bonded epoxy coated, acceptable for potable water.

2. For applications with working pressure above 175 psi, a ductile iron valve rated as 250 psi or higher shall be used.

3. The valves shall be set with stems vertical. The axis of the valve box shall be common with the axis projected off the valve stem. The tops of the adjustable valve boxes shall be set to the existing or established grade, whichever is applicable.

4. Valves shall be Dresser, M&H, Waterous, or Mueller.

R. Butterfly Valves.

1. Butterfly valves shall be ductile iron body of the tight closing rubber seat type with rubber seat either bonded to the body or mechanically retained in the body with no fasteners or retaining hardware in the flowstream. The valves shall meet the full requirements of AWWA C504, Class 150B except the valves shall be able to withstand 200 psi differential pressure without leakage. The valves may have rubber seats mechanically affixed to the valve vane. Where threaded fasteners are used, the fasteners shall be retained with a locking wire or equivalent provision to prevent loosening. Rubber seats attached to the valve vane shall be equipped with stainless steel seat ring integral with the body, and the body internal surfaces shall be epoxy coated to prevent tuberculations buildup, which might damage the disc-mounted rubber seat.

2. No metal-to-metal sealing surfaces shall be permitted. The valves shall be bubble-tight at rated pressures with flow in either direction, and shall be satisfactory for applications involving valve operations after long periods of inactivity. Valve discs shall rotate ninety (90) degrees from the full open position to the tight shut position. The valve shall be Henry Pratt Company *"Groundhog",* or owner approved equal.

S. Tapping Sleeves & Tapping Valves

1. Connections to existing water mains typically shall be wet taps through a tapping tee and tapping valve and shall be made by a city approved contractor. The tapping sleeves shall be rated for a working pressure of 250 psi minimum and furnished complete with joint accessories. Refer to Standard Detail W-D6 for detailed information regarding tapping sleeves.

2. Size-on-size tapping sleeves shall be stainless steel. Stainless steel sleeves only shall be used on AC pipe. Ductile iron tapping tees shall be allowed if tap is at least 2" smaller in diameter than the existing water main.

3. Cut in connections shall not be made on Fridays, holidays or weekends.

4. All tapping sleeves and tapping valves shall be pressure tested to a minimum of 200 psi prior to making connection to existing mains.

T. Pressure Reducing and Relief Valves.

1. Pressure reducing valves in the water service pipe are required when street main pressure exceeds 80 psi, as follows:

2. When street main pressure exceeds 80 psi, an approved pressure reducing valve with an approved pressure relief device shall be installed in the water service pipe near its entrance to the building to reduce the pressure to 80 psi or lower, except where the water service pipe supplies water directly to a water-pressure boost system, an elevated water gravity tank, or to pumps provided in connection with a hydro pneumatic or elevated gravity water-supply tank system. Pressure at any fixture shall be limited to no more than 80 psi under no-flow conditions. Refer to Standard Detail WD-24 – Pressure Reducing Stations.

U. All Valves

1. All valves with operating nuts located more than 42" below finished grade shall be equipped with extension stems to bring the operating nut to within 18" of the finished grade. Cast iron or PVC adjustable valve boxes shall be provided for all valves.

2. At the top of the extension stem, there shall be a two-inch (2") standard operating nut, complete with a centering flange that closely fits the five-inch (5") pipe encasement of the extension stem. The valve box shall be set in a telescoping fashion around the five-inch (5") pipe cut to the correct length to allow future adjustment up or down.

V. Fire Hydrants

1. All fire hydrants shall be Mueller Super Centurion – 250, Model A-421 in conformance with AWWA Standard Specification C-502. Each hydrant shall be equipped with one (1) 4-1/2” and two (2) 2-1/2" hose ports with permanent Storz hydrant adaptor and Storz blind cap. Refer to Standard Detail W-D2 for fire hydrant details.

2. The hydrant shall be prime coated with Steelcote SR53 Heavy Duty brush type enamel. Top coat shall be two coats of

Sherwin/Williams blue industrial enamel (#B54W101) or Krylon Industrial Rust Tough blue enamel.

3. A blue reflective pavement marker shall be furnished and installed 6 to 12 inches off center on the hydrant side of the road adjacent to the hydrant.

4. The holding spools between the gate valve and fire hydrant shall be made from six-inch (6") Class 52 ductile iron pipe, 3 foot minimum length and 17 foot maximum length without restrained joints.

W. Blow-offs & Air Relief Assemblies

1. Two (2") or Four (4") inch blowoff assemblies shall be installed at the terminus of all dead end water mains (Standard Detail W-D7). Blowoffs utilized by the Contractor for flushing the water main shall be sufficient size to obtain 2.5 feet per second velocity in the main. Temporary blow-offs shall be removed and replaced with a suitably sized watertight brass plug.

2. Two (2") inch air and vacuum release valves shall be installed at principal high points in the system (Standard Detail W-D4 and Standard Detail W-D5).

3. The installation of these items shall include connection piping, gate valve, valve box, and all accessories. Valve markers shall be installed.

X. Water Sampling Station

1. One water sampling station shall be provided to the City for each development in size of 1 to 10 lots. One additional sampling station shall be provided for each additional 50 lots or portion thereof. The water sampling station shall be furnished and installed at a location as determined by the Public Works Superintendent and as further shown in Standard Detail W-D21.

WATER PIPE TESTING & DISINFECTING

A. A water hydrant meter shall be required and procured from the City for all water utilized for flushing pipelines. All pumps, gauges, plugs, saddles, corporation stops, miscellaneous hose and piping, and measuring

equipment necessary for performing the test shall be furnished, installed and operated by the Contractor.

B. Feed for the pump shall be from a barrel or other container within the actual amount of "makeup" water, so that it can be measured periodically during the test period.

C. The pipeline shall be backfilled sufficiently to prevent movement of the pipe under pressure. All thrust blocks shall be in place and time allowed for the concrete to cure before testing. Where permanent blocking is not required, the Contractor shall furnish and install temporary blocking.

D. As soon as pipe is secured against movement under pressure, it may be filled with water. Satisfactory performance of all valves shall be checked while the line is filling.

E. Contractor shall preflush all water mains after water has remained in the main for 24 hours and before pressure testing the main.

F. After the pipe is filled and all air expelled, it shall be pumped to a test pressure of 250 psi, and this pressure shall be maintained for a period of not less than thirty (30) minutes to insure the integrity of the thrust and anchor blocks. **The contractor/developer is cautioned regarding pressure limitations on butterfly valves.** All tests shall be made with the hydrant auxiliary gate valves open and pressure against the hydrant valve. Hydrostatic tests shall be performed on every complete section of water main between two valves, and each valve shall withstand the same test pressure as the pipe with no pressure active in the section of pipe beyond the closed valve.

G. In addition to the hydrostatic pressure test, a leakage test shall be conducted on the pipeline. The leakage test shall be conducted at 150 psi for a period of not less than one (1) hour. The quantity of water lost from the main shall not exceed the number of gallons per hour determined by the formula:

$$L = \frac{ND(P)}{7{,}400}^{0.5}$$

in which

L = Allowable leakage, gallons/hour
N = Number of joints in the length of pipeline tested

D = Nominal diameter of the pipe in inches
P = Average test pressure during the leakage test, psi

H. Defective materials or workmanship, discovered as a result of the tests, shall be replaced by the Contractor at the Contractor's expense. Whenever it is necessary to replace defective material or correct the workmanship, the tests shall be re-run at the Contractor's expense until a satisfactory test is obtained.

I. As sections of pipe are constructed and before pipelines are placed in service, they shall be sterilized in conformance with the requirements of the State of Washington Department of Health Services.

J. The Contractor shall be responsible for flushing all water mains prior to water samples being acquired. The water mains shall be flushed at a rate to provide a minimum 2.5 feet per second velocity in the main.

K. In all disinfection processes, the Contractor shall take particular care in flushing and wasting the chlorinated water from the mains to assure that the flushed and chlorinated water does no physical or environmental damage to property, streams, storm sewers or any waterways. The Contractor shall chemically or otherwise treat the chlorinated water to prevent damage to the affected environment, particularly aquatic and fish life of receiving streams.

L. Chlorine shall be applied in one of the following manners, listed in order of preference, to secure a concentration in the pipe of at least 50 ppm.

1. Injection of chlorine-water mixture from chlorinating apparatus through corporation cock at beginning of section after pipe has been filled, and with water exhausting at end of section at a rate controlled to produce the desired chlorine concentration;

2. Injection similarly of a hypochlorite solution;

3. Other City pre-approved method(s) selected by the Developer and/or Contractor.

4. After the desired chlorine concentration has been obtained throughout the section of line, the water in the line shall be left standing for a period of twenty-four (24) hours. Following this, the line shall be thoroughly flushed and a water sample collected. The line shall not be placed in service until a satisfactory bacteriological report has been received.

M. Only City employees only will be allowed to operate existing and new tie-in valves. The Contractor, his subcontractors, and their respective employees are expressly forbidden to operate any valve on any section of line which has been accepted by the City.

BACKFLOW PREVENTION AND SPRINKLER SYSTEMS

A. All water systems connected to the public water system shall have backflow prevention as required by WAC 248-54-285. Refer to Standard Detail W—D22 regarding Reduced Pressure Backflow Assembly ¾" to 2" and Standard Detail W-D23 regarding Reduced Pressure Backflow Assembly 3" and Larger.

B. Fire sprinkler systems as mandated, proposed, or required by the local Fire Marshal and/or City Ordinance that have a fire department connection shall have backflow prevention as required by WAC 248-54-285. Refer to Standard Detail W-D15 regarding Fire Line Connection and Standard Detail W-D16 regarding Fire Line Riser Details.

C. Building sprinkler systems may be required based on Building Codes and Fire Marshall requirements.

STAKING

A. All surveying and staking shall be performed by an engineering or surveying firm employed by the Developer and capable of performing such work. The engineer or surveyor directing and/or performing such work shall be currently licensed by the State of Washington to perform said tasks.

B. A preconstruction meeting shall be held with the Public Works Superintendent prior to commencing staking. All construction staking shall be inspected by the City prior to construction.

C. The minimum staking of water systems shall be as follows:

1. Provide staking sufficient to satisfy Public Works Superintendent. In new plat development roadway centerline staking must be readily identifiable; and

2. Stake locations of all proposed fire hydrant, blow-off, air-vac,valves, meters, etc.

TRENCH EXCAVATION

A. Clearing and grubbing where required shall be performed within the easement or public right-of-way as permitted by the City and/or governing agencies. Debris resulting from the clearing and grubbing shall be disposed of by the owner or contractor in accordance with the terms of all applicable permits.

B. Trenches shall be excavated to the line and depth designated by the City to provide a minimum of 36 inches of cover over the pipe. Except for unusual circumstances where approved by the City, the trench sides shall be excavated vertically and the trench width shall be excavated only to such widths as are necessary for adequate working space as allowed by the governing agency and in compliance with all safety requirements of the prevailing agencies. See Standard Detail W-D1. The trench shall be kept free from water until joining is complete. Surface water shall be diverted so as not to enter the trench. The owner shall maintain sufficient pumping equipment on the job to insure that these provisions are carried out.

C. The contractor shall perform all excavation of every description and whatever substance encountered and boulders, rocks, roots and other obstructions shall be entirely removed or cut out to the width of the trench and to a depth 6 inches below the pipeline grade. Where materials are removed from below the pipeline grade, the trench shall be backfilled to grade with material satisfactory to the City and thoroughly compacted.

D. Trenching and shoring operations shall not proceed more than 100 feet in advance of pipe laying without approval of the City, and shall be in conformance with Washington Industrial Safety and Health Administration (WISHA) and Office of Safety and Health Administration (OSHA) Safety Standard.

E. The bedding course shall be finished to grade with hand tools in such a manner that the pipe will have bearing along the entire length of the barrel. The bell holes shall be excavated with hand tools to sufficient size to make up the joint.

BACKFILLING

a. Backfilling and surface restoration shall closely follow installation of pipe. The City, based on the location of construction, shall designate the amount of trenching which may be left exposed. In no case shall more than 100 feet be left exposed during construction hours without approval of the Public Works Superintendent.

b. Selected material shall be placed and compacted around and under the storm drain by hand tools. Special precautions should be provided to

protect the pipe to a point 12 inches above the crown of the pipe. The remaining backfill shall be compacted to 95 percent of the maximum density in traveled areas and road prisms, 90 percent outside driveway, roadways, road prism, shoulders, parking or other traveled areas. Where governmental agencies other than the City have jurisdiction over roadways, the backfill and compaction shall be done to the satisfaction of the agency having jurisdiction. Typically, all trenches located in roadway sections, roadway "prisms", and in traffic bearing areas shall be required to be backfilled and compacted with 5/8-inch minus crushed rock.

c. Due to local conditions, as may be specifically approved by the Public Works Superintendent, suitable excavated backfill material or sand, as determined by the Public Works Superintendent, may be utilized as backfill, or if such material is not available from trenching operations, the Public Works Superintendent may order the placing of CDF or gravel base conforming with Section 9-03.10 of the Standard Specifications (WSDOT) as appropriate for backfilling the trench. All excess material shall be promptly loaded and hauled to waste.

STREET PATCHING AND RESTORATION

A. See Chapter 4 and Standard Details for requirements regarding street patching and trench restoration.

EROSION CONTROL

A. The detrimental effects of erosion and sedimentation shall be minimized by conforming to the following general principles:

1. Soil shall be exposed for the shortest possible time;

2. Reducing the velocity and controlling the flow of runoff;

3. Detaining runoff on the site to trap sediment; and

4. Releasing runoff safely to downstream areas.

B. In applying these principles, the Developer and/or Contractor shall provide for erosion control by conducting work in workable units; minimizing the disturbance to cover crop materials; providing mulch and/or temporary cover crops, sedimentation basins, and/or diversions in critical areas during construction; controlling and conveying runoff; and establishing permanent vegetation and installing erosion control structures as soon as possible.

C. Trench mulching will be required where there is danger of backfill material being washed away due to steepness of the slope along the direction of the trench, backfill material shall be compacted and held in place by covering the disturbed area with straw and held with a covering of jute matting or wire mesh anchored in place.

D. Cover Crop Seeding.

1. A cover crop shall be sown in all areas excavated or disturbed during construction that were not paved, landscaped and/or seeded prior to construction. Areas landscaped and/or seeded prior to construction shall be restored to their original or superior condition.

2. Contact the City Clerk for water charges if use of City water is contemplated and the Public Works Superintendent for use of a hydrant for water in furtherance of seeding.

3. Hydrants shall only be opened and closed by members of the City crew.

4. Cover-crop seeding shall follow backfilling operations. The Developer and/or Contractor shall be responsible for protecting all areas from erosion until the cover crop affords such protection.

5. The cover crop shall be re-seeded if required and additional measures taken to provide protection from erosion until the cover crop is capable of providing protection.

6. During winter months, the Contractor may postpone seeding, if conditions are such that the seed will not germinate and grow. The Developer and/or Contractor will not, however, be relieved of the responsibility of protecting all areas until the cover crop has been sown and affords protection from erosion.

7. The cover crop shall be sown at a rate of 10 to 15 pounds of seed per acre using a hand or power operated mechanical seeder capable of providing a uniform distribution of seed.

FINISHING AND CLEANUP

A. After all other work on this project is completed and before final acceptance, the entire roadway, including the roadbed, planting, sidewalk areas, shoulders, driveways, alley and side street approaches, slopes, ditches, utility trenches, and construction areas shall be neatly finished to

the lines, grades and cross sections of a new roadway consistent with the original section, and as hereinafter specified.

B. On water system construction where all or portions of the construction is in undeveloped areas, the entire area which has been disturbed by the construction shall be shaped so that upon completion the area will present a uniform appearance, blending into the contour of the adjacent properties. All other requirements outlined previously shall be met. All pipes, valves, tanks, reservoirs, boost pumps, boost pump stations and building associated therewith shall be cleaned of all debris and foreign material.

C. Slopes, sidewalk areas, planting areas and roadway shall be smoothed and finished to the required cross section and grade by means of a grading machine insofar as it is possible to do so without damaging existing improvements, trees and shrubs. Machine dressing shall be supplemented by hand work to meet requirements outlined herein, to the satisfaction of the City Inspector and/or the Public Works Superintendent.

D. Upon completion of the cleaning and dressing, the project shall appear uniform in all respects. All graded areas shall be true to line and grade. Where the existing surface is below sidewalk and curb, the area shall be filled and dressed out to the walk. Wherever fill material is required in the planting area, the finished grade shall be elevated to allow for final settlement, but nevertheless, the raised surface shall present a uniform appearance.

E. All rocks in excess of one (1) inch diameter shall be removed from the entire construction area and shall be disposed of the same as required for other waste material. In no instance shall the rock be thrown onto private property. Overhang on slopes shall be removed and slopes dressed neatly so as to present a uniform, natural, well-sloped surface.

F. All excavated material at the outer lateral limits of the project shall be removed entirely. Trash of all kinds resulting from clearing and grubbing or grading operations shall be removed and not placed in areas adjacent to the project. Where machine operations have broken down brush and trees beyond the lateral limits of the project, the Developer and/or Contractor shall remove and dispose of same and restore said disturbed areas at his own expense.

G. Drainage facilities such as inlets, catch basins, culverts, and open ditches shall be cleaned of all debris, which is the result of the Developer and/or Contractor's operations.

H. All pavements and oil mat surfaces, whether new or old, shall be thoroughly cleaned. Existing improvements such as Portland cement concrete curbs, curb and gutters, walls, sidewalks, and other facilities, which have been sprayed by the asphalt cement, shall be cleaned and re-painted where needed, all to the satisfaction of the Public Works Superintendent.

I. Castings for monuments, water valves, vaults and other similar installations which have been covered with the asphalt material shall be cleaned to the satisfaction of the Public Works Superintendent.

GENERAL GUARANTEE AND WARRANTY

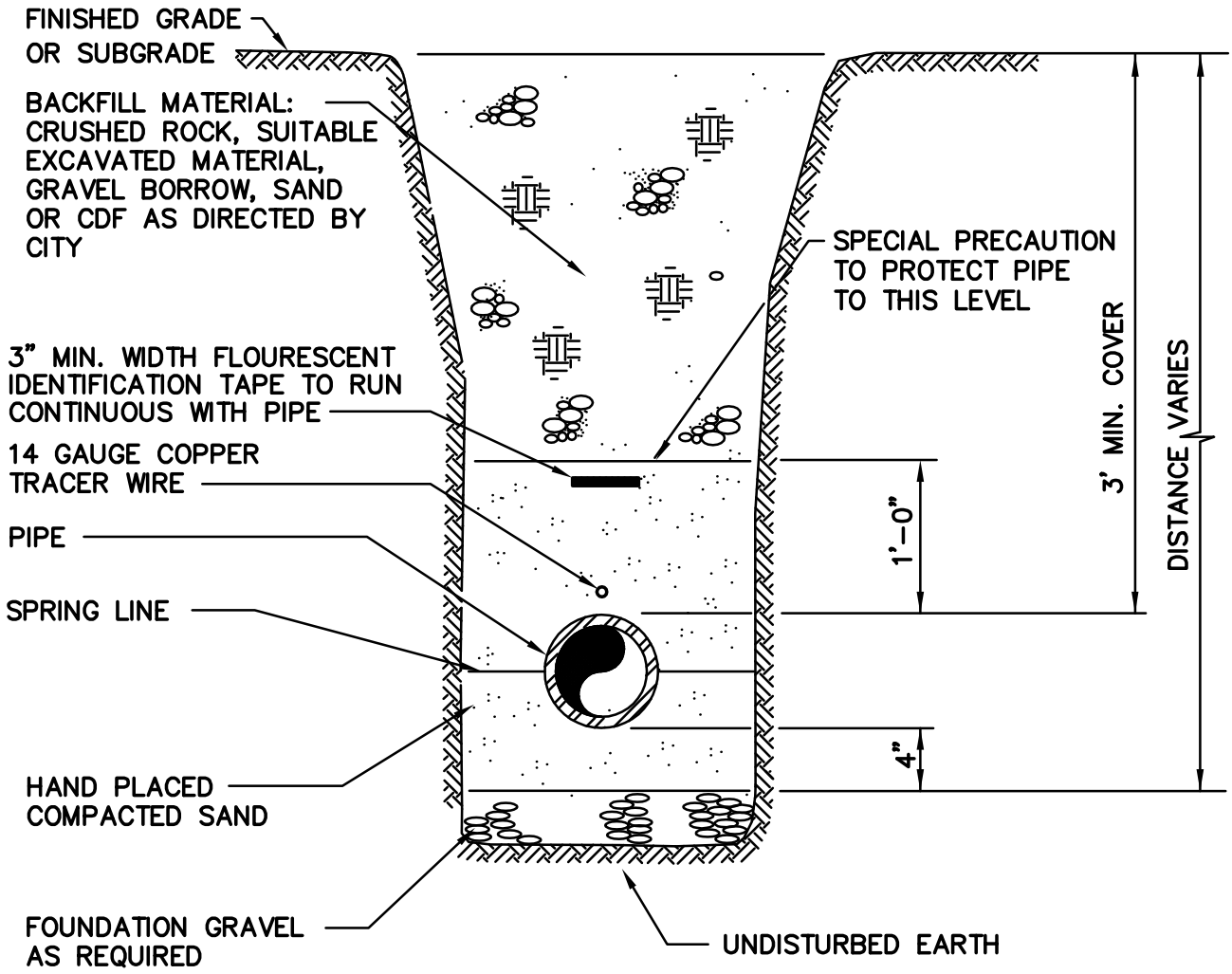
A. The Developer shall be required, upon completion of the work and prior to acceptance by the City, to furnish the City a written guarantee covering all material and workmanship for a period of two years after the date of final acceptance and he shall make all necessary repairs during that period at his own expense, if such repairs are necessitated as the result of furnishing poor materials and/or workmanship.

B. The Developer shall obtain warranties from the contractors, subcontractors and suppliers of material or equipment where such warranties are required, and shall deliver copies to the City upon completion of the work. Delivery of such warranties to the City shall not relieve the Developer of liability under his guarantee.

C. Easement documents, if applicable, shall be filed and recorded with the County Auditor's office and the documents reviewed by the City prior to project acceptance.

CITY OF ILWACO
WATER SYSTEM STANDARDS
STANDARD DETAILS

Detail Number	Title
W-D1	Trench Section for Water Pipe
W-D2	Fire Hydrant Assembly
W-D3	Fire Hydrant Use
W-D4	1" Air Release Assembly
W-D5	2" Air Release Assembly
W-D6	Wet Tap Connection
W-D7	In-Line Blow Off Assembly
W-D8	Water Service Installation (2" and Smaller)
W-D9	3" and Larger Water Service and Installation
W-D10	Thrust Blocking
W-D11	Vertical Anchor Block
W-D12	Thrust Restraint for Ductile Iron Pipe
W-D13	"Individual" Double Check Detector Assembly
W-D14	Double Check Detector Backflow Prevention Assembly
W-D15	Fire Line Connection
W-D16	Fire Line Riser Detail
W-D17	Typical Utility Crossing
W-D18	Asphalt Pavement Repair
W-D19	Concrete Pipe Encasement
W-D20	Water Valve Stem Extension
W-D21	Water Sampling Station
W-D22	Reduced Pressure Backflow Assembly 3/4" to 2"
W-D23	Reduced Pressure Backflow Assembly 3" and Larger
W-D24	Pressure Reducing Station



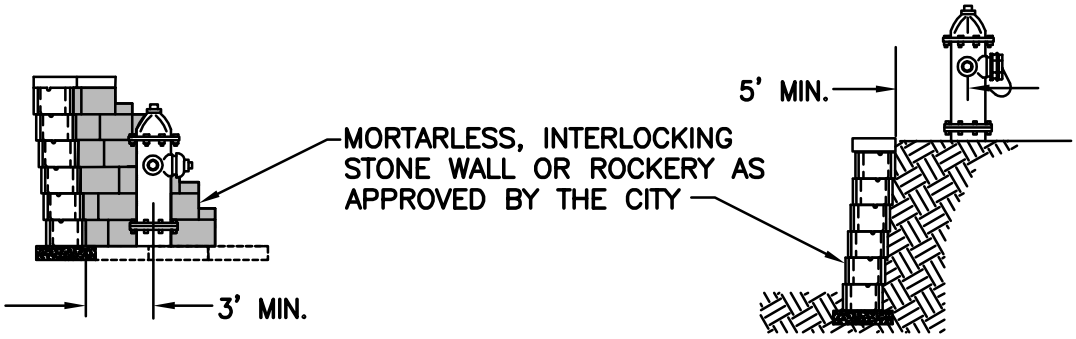
NOTE:

BACKFILL MATERIAL AND COMPACTION SHALL BE IN CONFORMANCE WITH CITY STANDARDS AND/OR THE STATE OR COUNTY PERMIT REQUIREMENTS (AS MAY BE APPLICABLE);

MINIMUM REQUIREMENTS:
ALL GRANULAR BACKFILL SHALL BE COMPACTED TO 95% MODIFIED PROCTOR, ASTM D1557

TRENCH SECTION FOR WATER PIPE

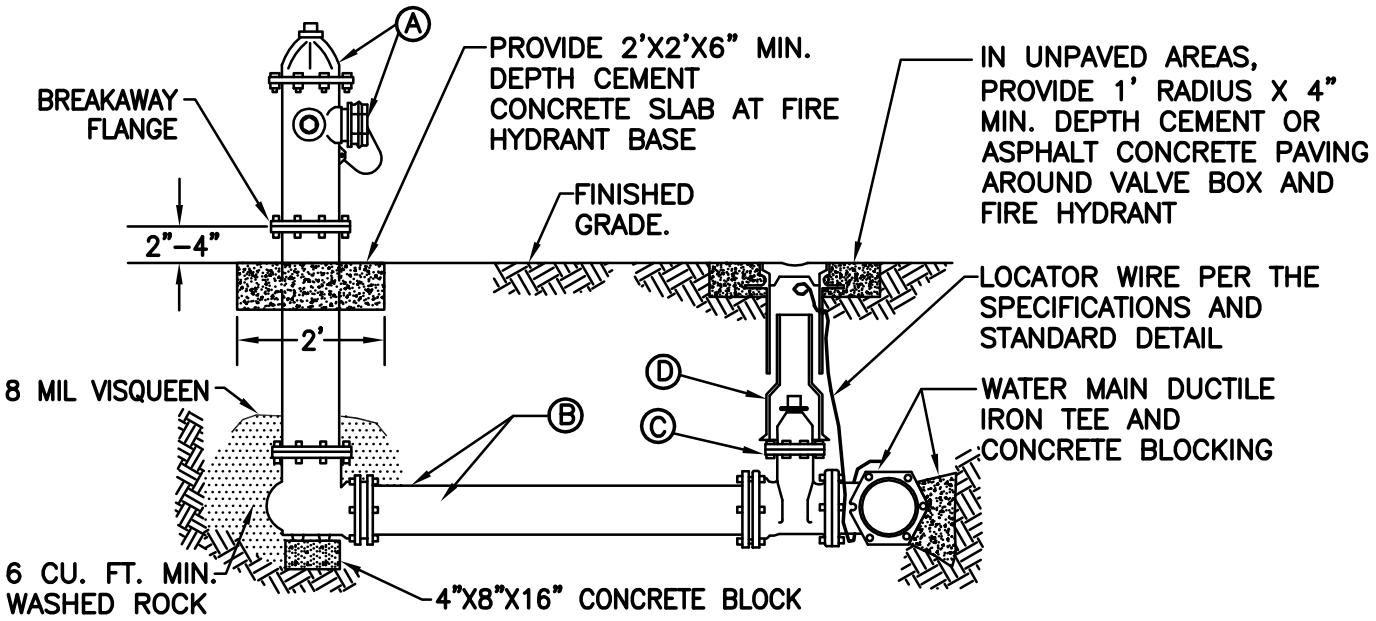
Detail Approval Engineer: N.E.L.	CITY OF ILWACO STANDARD WATER DETAILS February 2011	W-D1



FIRE HYDRANT IN CUT

FIRE HYDRANT IN FILL

FIRE HYDRANT LOCATION IN CUT OR FILL



MATERIALS LIST

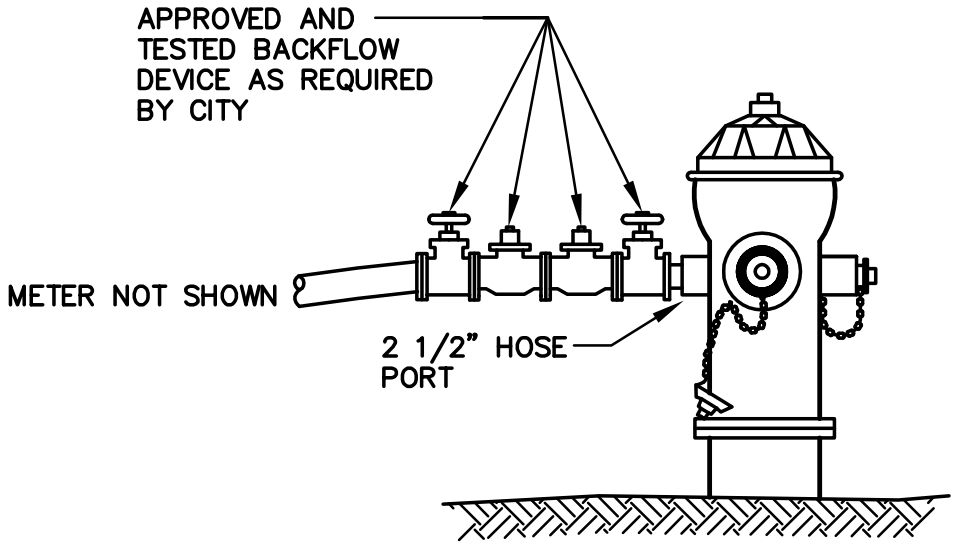
ITEM	DESCRIPTION
Ⓐ	HYDRANT: SHALL BE MUELLER SUPER CENTURION-250, MODEL A-421 IN CONFORMANCE WITH AWWA STANDARD SPECIFICATION C-502. PROVIDE STORZ ADAPTERS AS FOLLOWS: 4-1/2" (ONE EACH) AND 2-1/2" (TWO EACH). HYDRANT SHALL BE PRIME COATED WITH STEELCOTE SR53 HEAVY DUTY BRUSH TYPE ENAMEL. TOP COAT SHALL BE TWO COATS OF SHERWIN/WILLIAMS BLUE INDUSTRIAL ENAMEL #B54W101 OR KRYLON INDUSTRIAL RUST TOUGH BLUE ENAMEL.
Ⓑ	6" CL. 52 D.I. PIPE, 3' MIN. AND 50' MAX. WITH RESTRAINED JOINTS.
Ⓒ	6" R.W. GATE VALVE, FL. X M.J.: SHALL BE AMERICAN FLOW CONTROL SERIES 2500, CLOW 2638, MUELLER 2361, KENNEDY 7000 OR M&H 7000 IN CONFORMANCE WITH AWWA C515.
Ⓓ	TWO-PIECE VALVE BOX PER THE SPECIFICATIONS AND STANDARD DETAIL.

NOTES:

1. HYDRANT SHALL BE ORIENTED PER FIRE MARSHALL AND HAVE 3' MIN. CLEARANCE AROUND CENTERLINE.
2. GATE VALVE OPERATING NUT SHALL BE 2' MINIMUM AND 4'-6" MAXIMUM FROM FINISHED GRADE.

FIRE HYDRANT ASSEMBLY

Detail Approval Engineer: N.E.L.	CITY OF ILWACO STANDARD WATER DETAILS February 2011	W-D2

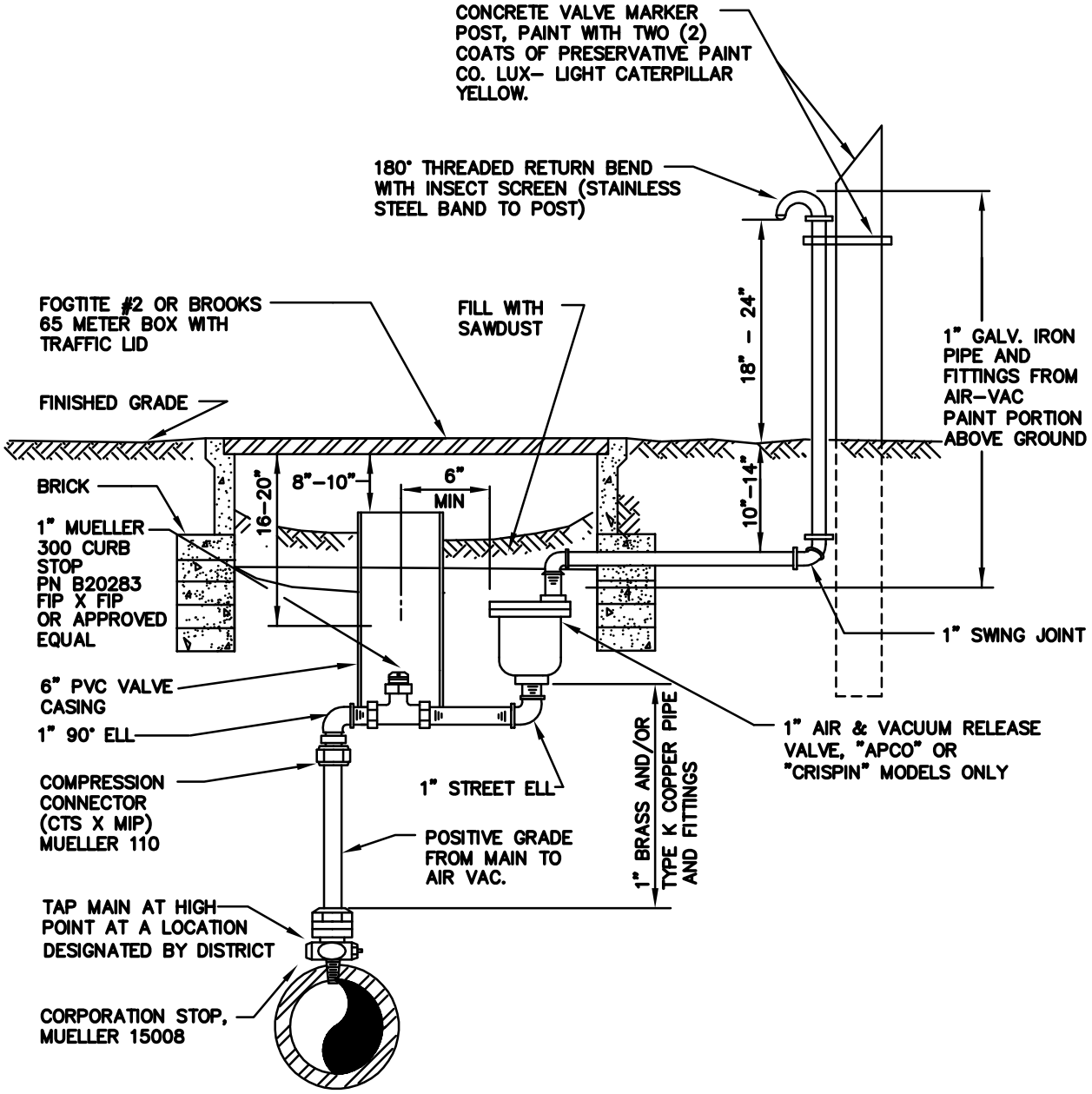


HYDRANT USE PROCEDURES

1. THERE SHALL BE AN ACCEPTABLE WASHINGTON STATE APPROVED BACKFLOW DEVICE. A HYDRANT METER SHALL BE OBTAINED FROM CITY. (NOT SHOWN ABOVE).
2. OPENING & CLOSING OF HYDRANT VALVE SHALL BE WITH AN ACCEPTABLE WRENCH TO RECEIVE THE 5–SIDED NUT.
3. THERE SHALL BE AN AUXILIARY VALVE ATTACHED TO THE 2 1/2" HOSE PORT OF THE HYDRANT.
4. THE HYDRANT VALVE SHALL BE FULLY OPENED AND THE WATER USE CONTROLLED EXCLUSIVELY BY THE AUXILIARY VALVE.
5. THE AUXILIARY VALVE SHALL BE OPERATED IN A SLOW MANNER TO PREVENT UNDUE SHOCK PRESSURE ON THE WATER SYSTEM.

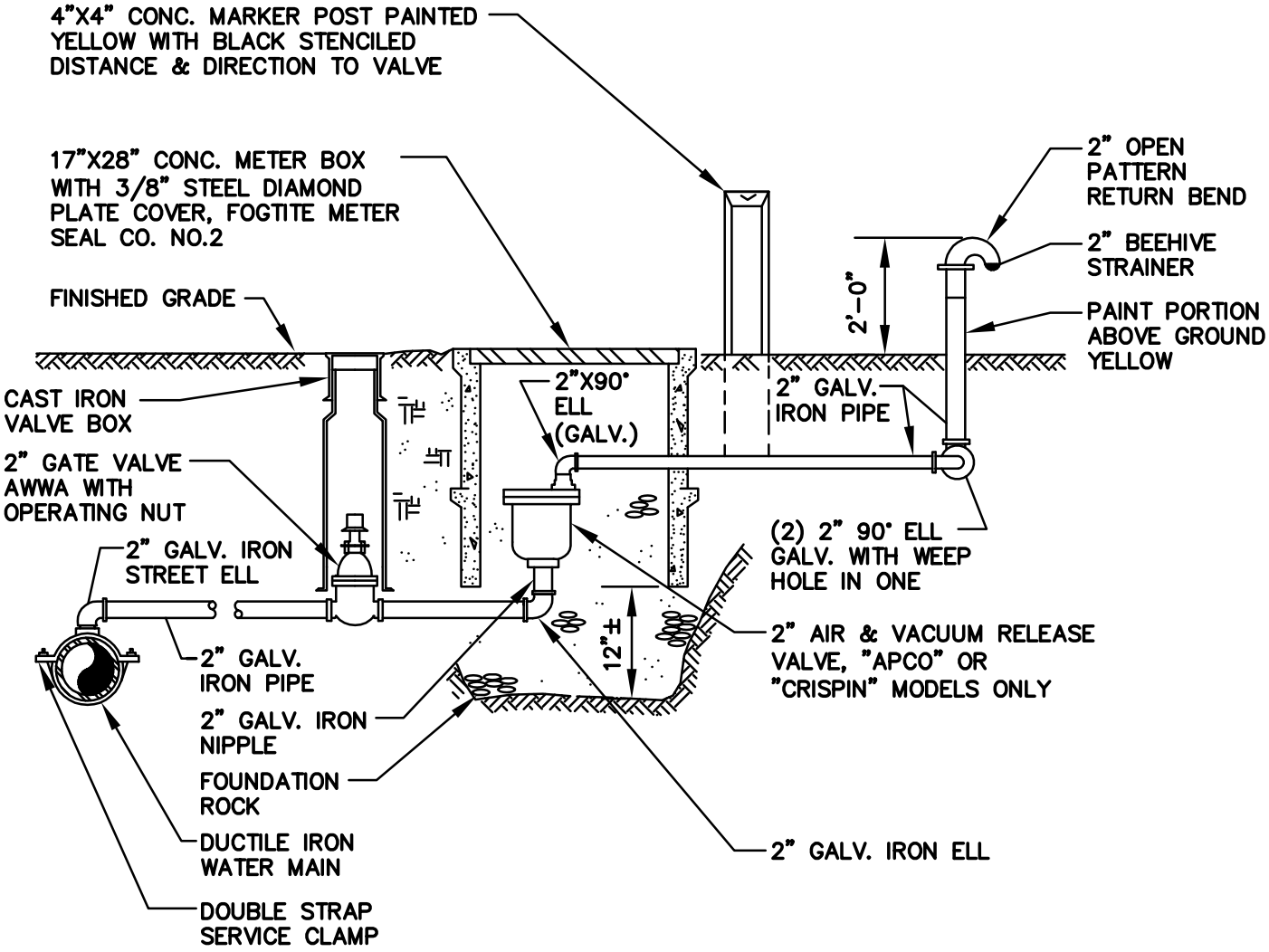
FIRE HYDRANT USE

Detail Approval Engineer: N.E.L.	CITY OF ILWACO STANDARD WATER DETAILS February 2011	W–D3



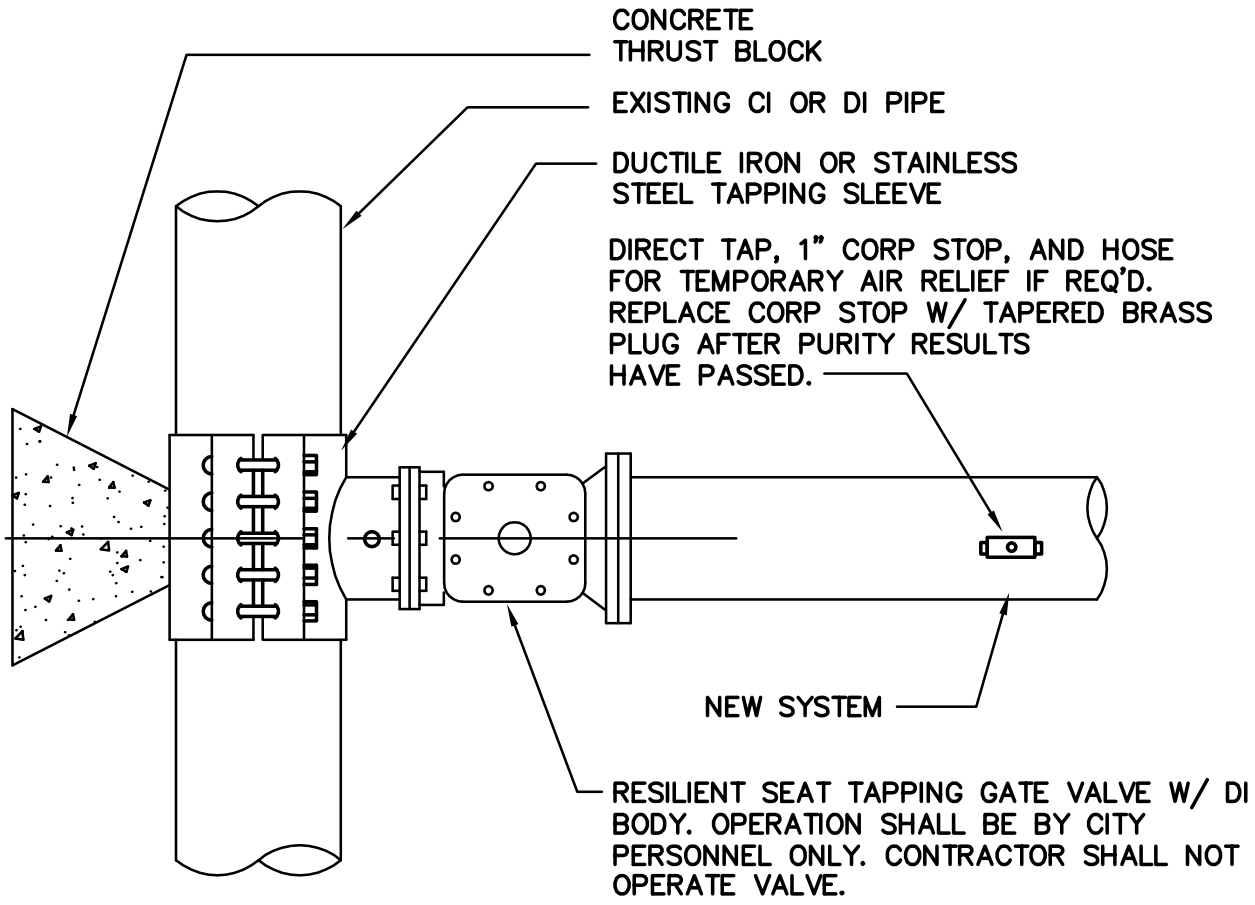
1" AIR RELEASE ASSEMBLY

Detail Approval Engineer: N.E.L.	CITY OF ILWACO STANDARD WATER DETAILS February 2011	W–D4



2" AIR RELEASE ASSEMBLY

Detail Approval Engineer: N.E.L.	CITY OF ILWACO STANDARD WATER DETAILS February 2011	W–D5

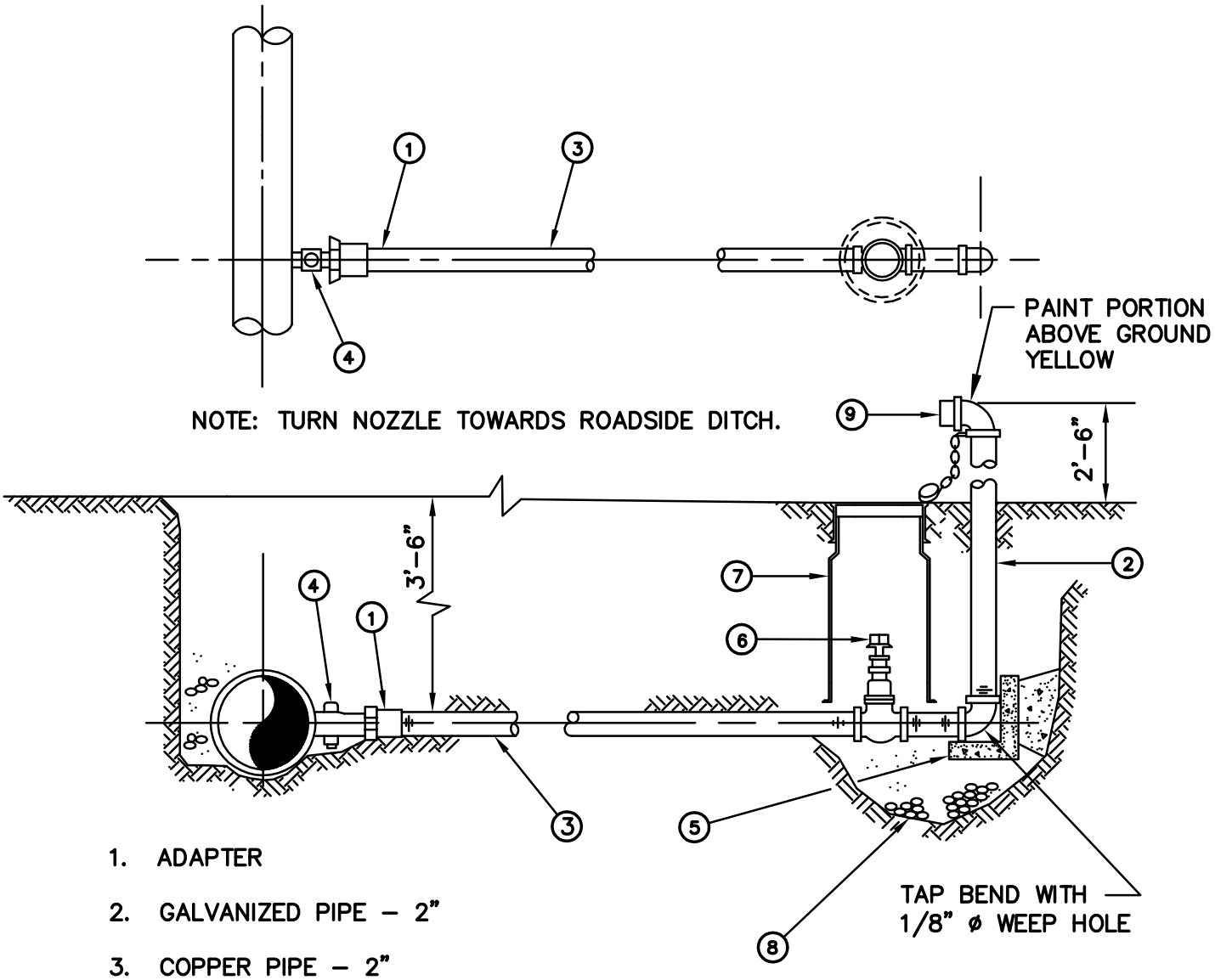


NOTES:

1. SIZE-ON-SIZE TAPPING TEES SHALL BE STAINLESS STEEL FULL CIRCLE MECHANICAL SLEEVE.
2. DUCTILE IRON TAPPING TEES SHALL BE ALLOWED IF TAP IS AT LEAST 2" SMALLER IN DIAMETER THAN THE EXISTING WATER MAIN.
3. TAPPING TEES SHALL BE PRESSURE TESTED TO 200 PSI
4. CONNECTIONS NOT ALLOWED ON FRIDAYS, HOLIDAYS, OR WEEKENDS

WET TAP CONNECTION

Detail Approval Engineer: N.E.L.	CITY OF ILWACO STANDARD WATER DETAILS February 2011	W-D6

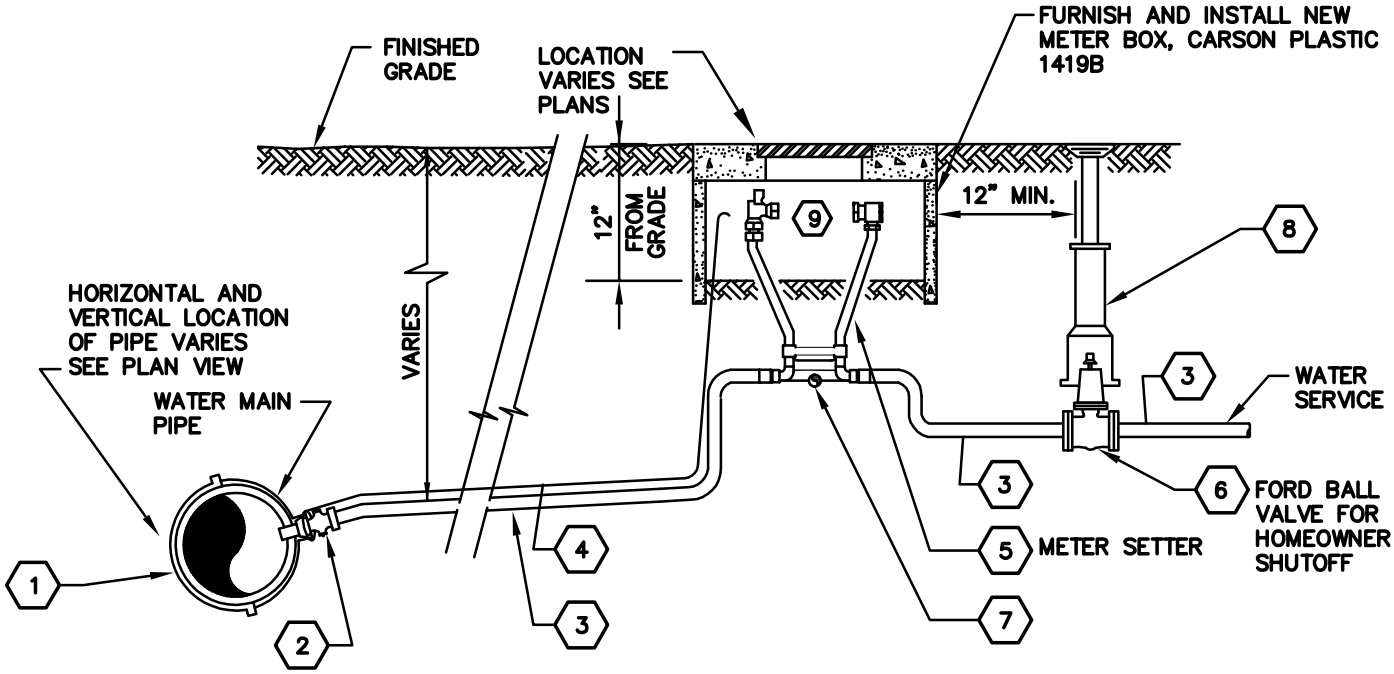


1. ADAPTER
2. GALVANIZED PIPE – 2"
3. COPPER PIPE – 2"
4. 1–1/2" CORP STOP.
5. 2 – 2"X8"X16" CONC. BLOCKS.
6. 2" GATE VALVE WITH HEX NUT.
7. CAST IRON VALVE BOX
8. 1/4 CUBIC YARD WASHED GRAVEL POCKET.
9. 2"X2–1/2" HOSE THREADS BRASS INSERT WITH CUP AND CHAIN (ELIMINATE HOSE THREADS ON TEMPORARY ASSEMBLY).

IN–LINE BLOW OFF ASSEMBLY

Detail Approval Engineer: N.E.L.	CITY OF ILWACO STANDARD WATER DETAILS February 2011	W–D7

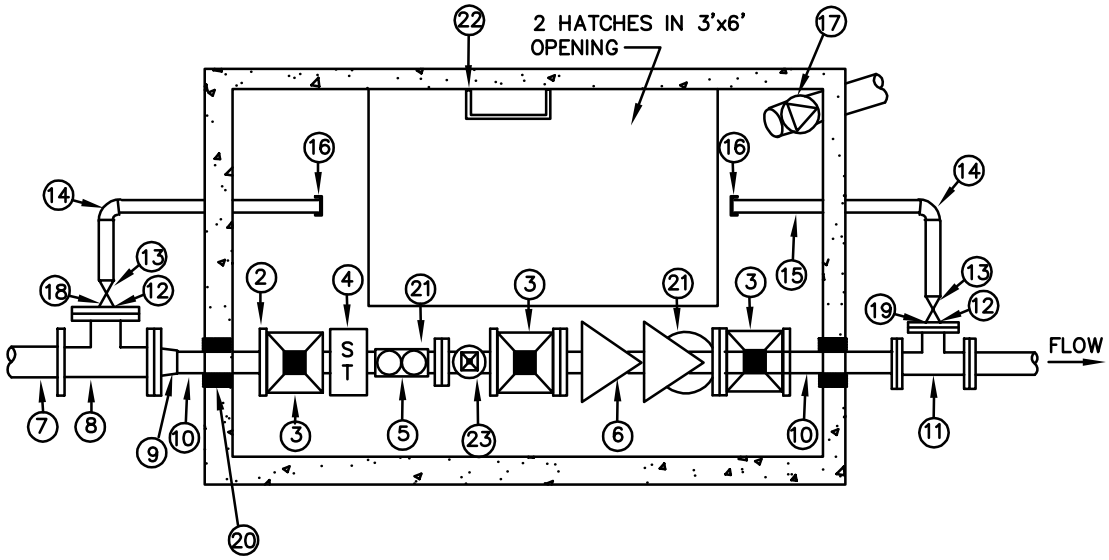
ITEM NUMBER	ITEM DESCRIPTION	**FORD** = FORD METER BOX CO. CATALOG NUMBER **ALASKAN** = ALASKAN COPPER AND BRASS COMPANY **APCO** = APCO WILLAMETTE VALVE & PRIMER CORPORATION **FOG TITE** = FOG TITE INC., SEATTLE, WA.		
		FOR 2" SERVICE W/ COPPER OR CTS PE	FOR 1" SERVICE W/ COPPER OR CTS PE	FOR 1" SERVICE W/ PEP
			COMMON TO BOTH TYPES	
1	TAPPING SADDLE			
	FOR DI PIPE	FORD – 202B–XXX–CC7	FORD – 202B–XXX–CC4	
	FOR AC & PVC PIPE	FORD – FC202–XXX–CC7	FORD – FC202–XXX–CC4	
2	CORPORATION STOP – 2"	FORD – FB1000–7	FORD FB1000–4	FORD FB1001–4
3	TUBING / PIPE	2" COPPER OR PE TUBING	1" COPPER OR PE TUBING	1" PE PIPE
4	TRACER WIRE	14 GAUGE COPPER	14 GAUGE COPPER	14 GAUGE COPPER
5	METER SETTER	FORD VHH77–12B–44–77	FORD VBHC74–12W–44–44	FORD VBHC74–12W–66–44
6	CURB STOP VALVE	FORD – B44–777	FORD – B44–444	FORD B66–444
7	BRACE PIPE	G.I. PIPE – 18" LENGTH	G.I. PIPE – 12" LENGTH	
8	CURB BOX	FORD – EA1–30–40–18R	FORD – EA1–30–40–18R	FORD – EA1–30–40–18R
NOTE – XXX=PIPE SIZE CODE FOR LINE BEING TAPPED				



NOTE: (9) NEW METER (SUPPLIED BY THE CITY)

WATER SERVICE INSTALLATION (2" AND SMALLER)

Detail Approval Engineer: N.E.L.	CITY OF ILWACO STANDARD WATER DETAILS February 2011	W–D8



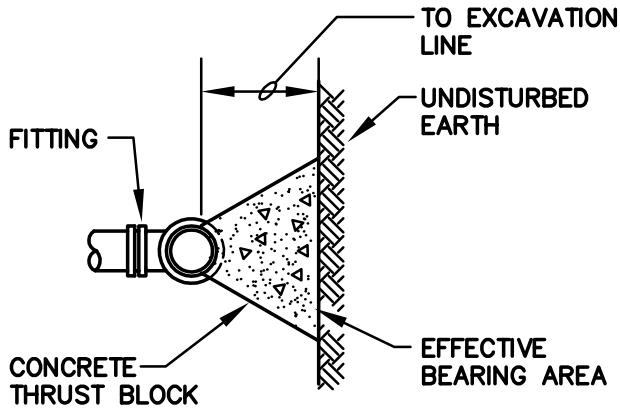
NO.	DESCRIPTION
1	UTILITY VAULT 4484–LA OR APPROVED EQUAL
2	UNIFLANGE ADAPTER
3	3" RWGV
4	3" STRAINER
5	NEW METER (SUPPLIED BY THE CITY)
6	STATE HEALTH DEPT. APPROVED 3" DOUBLE CHECK VALVE ASSEMBLY
7	4" DIP
8	4" TEE (MF X FL) W/ MEGA LUGS
9	4" X 3" REDUCER (4" PE X 3" MJ) W/MEGA LUG
10	3" DIP
11	3" TEE (MJ X FL) W/ MEGA LUGS
12	2" BRASS CLOSE NIPPLE
13	2" RWGV W/ STANDARD C.. VALVE BOX AND COVER
14	2" BRASS ELBOW
15	2" THREADED BRASS PIPE
16	2" BRASS CAP
17	6" PVC DRAIN TO DAYLIGHT OR CB. MINIMUM SLOPE 1%, SCREENS AT BOTH ENDS W/ BACKWATER VALVE IN VAULT
18	4" BLIND FLANGE TAPPED 2"
19	3" BLIND FLANGE TAPPED 2"
20	NON SHRINK WATER TIGHT GROUT, INLETS AND OUTLETS
21	PLACE PIPE SUPPORTS STANDON S–92 OR EQUAL UNDER ASSEMBLY IN TWO PLACES
22	GALV. STEEL LADDER, LOCATE AS DIRECTED BY DISTRICT, SECURE TO VAULT
23	3" TEE (FL), 3" BLIND FLANGE TAPPED 2" (FIP), 2" CLOSE NIPPLE BRASS, 2" BALL VALVE, 2" MIP X 2 1/2" NST HOSE NOZZLE

* LARGER SERVICES REQUIRE 3" FITTINGS AND PIPE BE REPLACED WITH LARGER/LIKE SIZE.

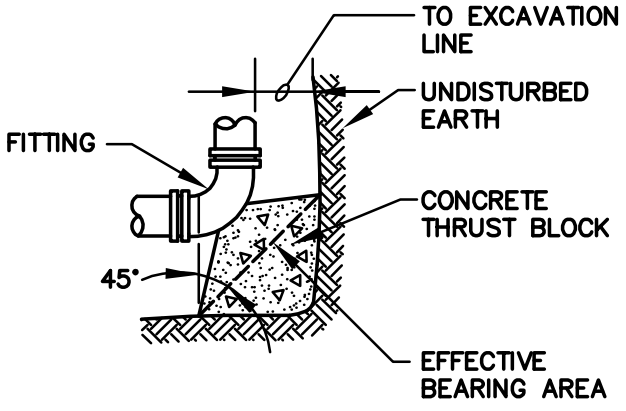
** 4" DIAMETER AND SMALLER DIP SHALL BE CLASS 53 IF USED IN A THREADED APPLICATION.

3" AND LARGER WATER SERVICE AND INSTALLATION

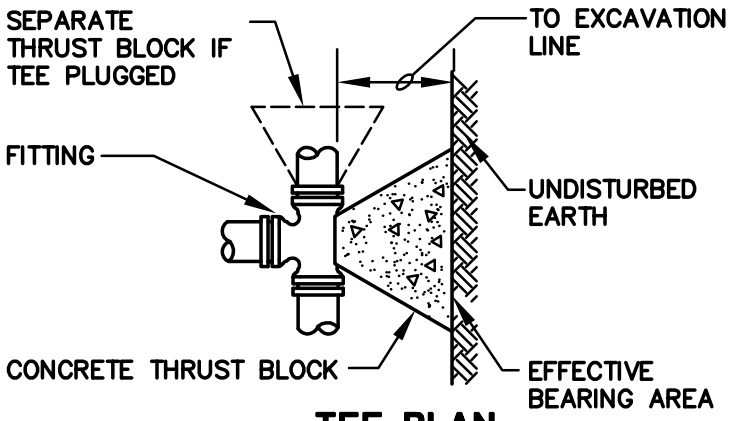
Detail Approval Engineer: N.E.L.	CITY OF ILWACO STANDARD WATER DETAILS February 2011	W–D9



TYPICAL SECTION



90° EL PLAN



TEE PLAN

EFFECTIVE BEARING AREA REQUIRED

FITTING D	TEE	90°	45°	22 1/2°	11 1/4°
6"	4 SQ. FT.	6 SQ. FT.	3 SQ. FT.	2 SQ. FT.	2 SQ. FT.
8"	7 SQ. FT.	10 SQ. FT.	6 SQ. FT.	3 SQ. FT.	2 SQ. FT.
10"	10 SQ. FT.	15 SQ. FT.	9 SQ. FT.	5 SQ. FT.	3 SQ. FT.
12"	14 SQ. FT.	22 SQ. FT.	12 SQ. FT.	6 SQ. FT.	4 SQ. FT.
16"	25 SQ. FT.	38 SQ. FT.	21 SQ. FT.	11 SQ. FT.	7 SQ. FT.
18"	32 SQ. FT.	48 SQ. FT.	27 SQ. FT.	14 SQ. FT.	8 SQ. FT.

TYPICAL FOR SANDY SOIL WITH 2,000 P.S.F. BEARING STRENGTH & 100 P.S.I. WORKING PRESSURE. ADJUST BEARING AREA BY PRESSURE & SOIL BEARING CAPACITY. USE TEE FOR DEAD ENDS

NOTES:

1. BLOCKING SHALL BE TO SOLID BEARING SURFACE.
2. FITTING SHALL BE PROTECTED WITH VISQUEEN.
3. BEARING AREA SHALL BE PROPORTIONALLY INCREASED WITH PRESSURES IN EXCESS OF 100 P.S.I OR IN SOIL CONDITIONS WITH LESS THAN 2,000 P.S.F BEARING STRENGTH.
4. ALL BLOCKS ON TEES SHALL BE SEPARATED FOR DIRECTION OF THRUST.

THRUST BLOCKING

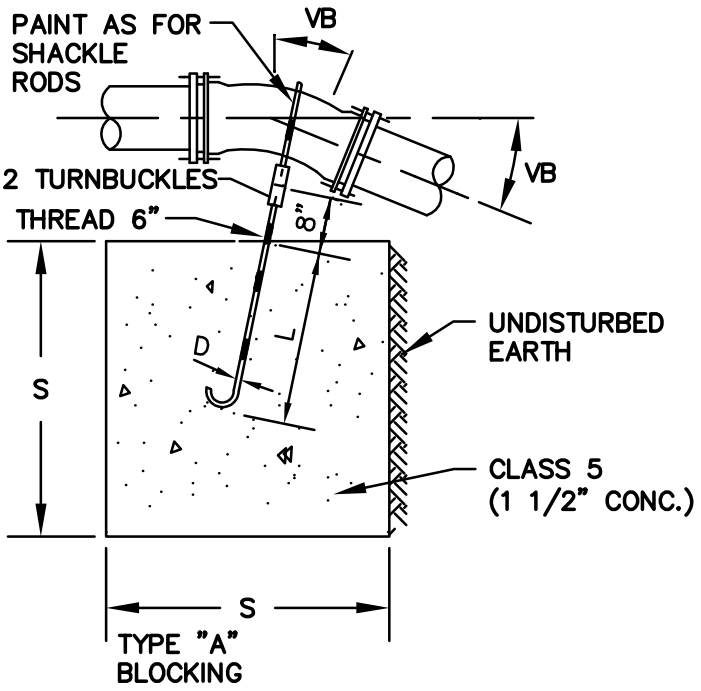
Detail Approval Engineer: N.E.L.	CITY OF ILWACO STANDARD WATER DETAILS February 2011	W–D10

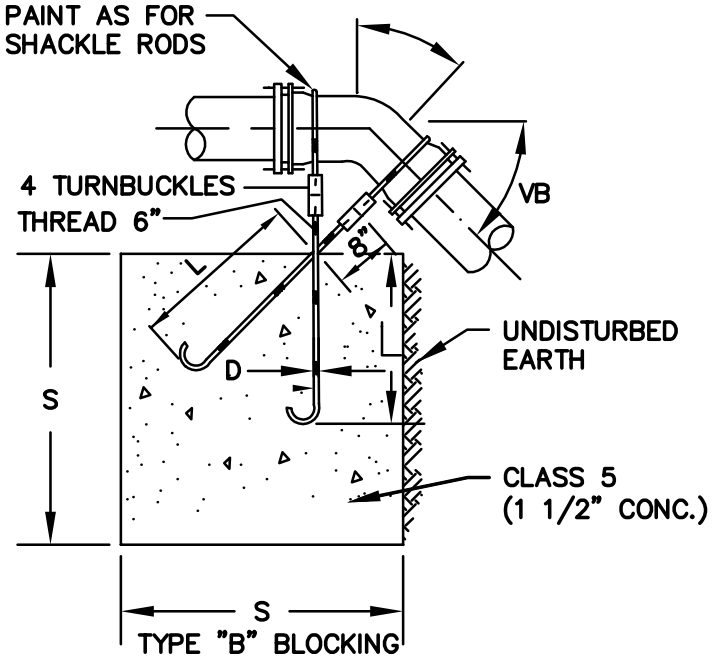
TYPE "A" BLOCKING
FOR 11 1/4°–22 1/2°–30° VERTICAL BENDS

PIPE SIZE NOMINAL DIAMETER– INCHES	TEST PRESSURE PSI	VB VERTICAL BEND DEGREES	No. OF CU. FT. OF CONC. BLOCKING	S SIDE OF CUBE LIN. FT.	D DIAM. OF SHACKLE RODS (2) INCHES	L DEPTH OF RODS IN CONCRETE LIN. FT.
4"	300	11 1/4	8	2	5/8"	1.5
		22 1/2	11	2.2		2.0
		30	17	2.6		
6"	300	11 1/4	11	2.2	5/8"	2.0
		22 1/2	25	2.9		
		30	41	3.5		
8"	300	11 1/4	16	2.5	5/8"	2.0
		22 1/2	47	3.6		
		30	70	4.1	3/4"	2.5
12"	250	11 1/4	32	3.2	5/8"	2.0
		22 1/2	88	4.5	7/8"	3.0
		30	132	5.1		
16"	225	11 1/4	70	4.1	7/8"	3.0
		22 1/2	184	5.7	1 1/8"	4.0
		30	275	6.5	1 1/4"	
20"	200	11 1/4	91	4.5	7/8"	3.0
		22 1/2	225	6.1	1 1/4"	4.0
		30	330	6.9	1 3/8"	4.5
24"	200	11 1/4	128	5.0	1"	3.5
		22 1/2	320	6.8	1 3/8"	4.5
		30	480	7.9	1 7/8"	5.5

TYPE "B" BLOCKING
FOR – 45° VERTICAL BENDS

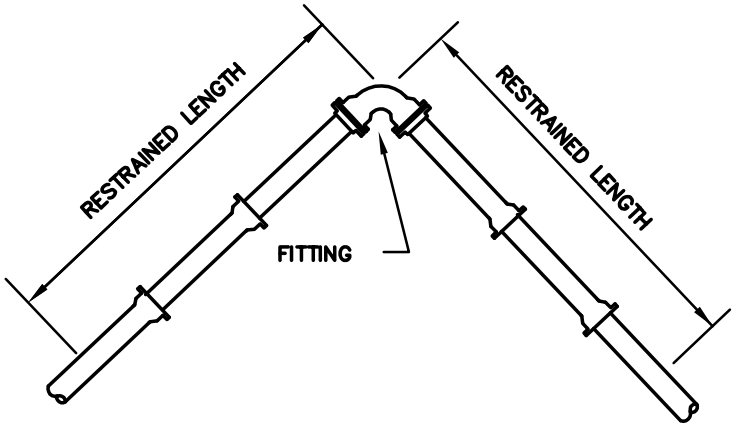
		VB		S	D	L
4"	300	45	30	3.1	5/8"	2.0
6"			68	4.1		
8"			123	5.0		
12"	250		232	6.1	3/4"	2.5
16"	225		478	7.8	1 1/8"	4.0
20"	200		560	8.2	1 1/4"	
24"			820	9.4	1 3/8"	4.5





VERTICAL ANCHOR BLOCK

Detail Approval	CITY OF ILWACO STANDARD WATER DETAILS	W–D11
Engineer: N.E.L.	February 2011	



PIPE SIZE	90° BEND	45° BEND	22 1/2° BEND	11 1/4° BEND	TEE OR DEAD END CAP
	RESTRAINED LENGTH IN FEET				
4"	32	14	7	3	26
6"	44	19	9	5	32
8"	58	24	12	6	43
10"	70	29	14	7	54
12"	82	34	16	8	66
16"	106	44	21	11	88
18"	116	48	23	12	100

NOTES:

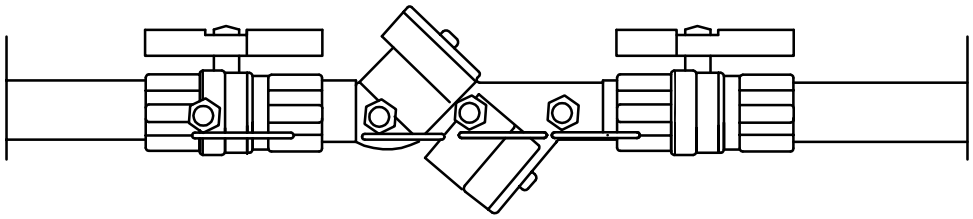
① RESTRAINED LENGTHS SHOWN ARE MINIMUM AND FOR LINEAL FEET REQUIRED ON EACH SIDE OF FITTING INDICATED.

② FOOTAGES ARE BASED ON 200 PSI PRESSURE AND 42 INCHES COVER. IF PRESSURE IS GREATER OR COVER IS LESS, THE RESTRAINED LENGTH SHALL BE INCREASED.

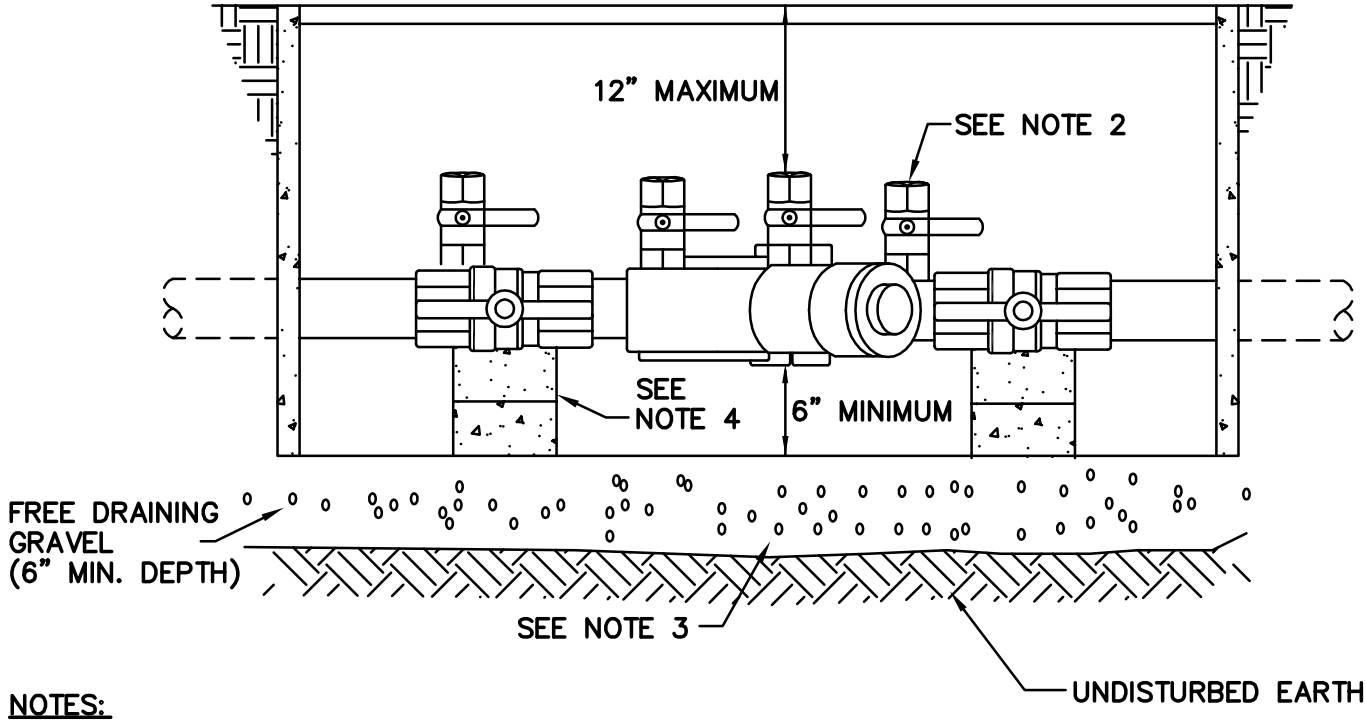
③ THIS TABLE REPRESENTS THE "MINIMUM" CONSTRUCTION STANDARDS. THE DEVELOPER'S ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING THE APPROPRIATE LENGTH OF ALL RESTRAINED JOINT BASED ON EXISTING AND LOCAL CONDITIONS.

THRUST RESTRAINT FOR DUCTILE IRON PIPE

Detail Approval Engineer: N.E.L.	CITY OF ILWACO STANDARD WATER DETAILS February 2011	W–D12



PLAN VIEW

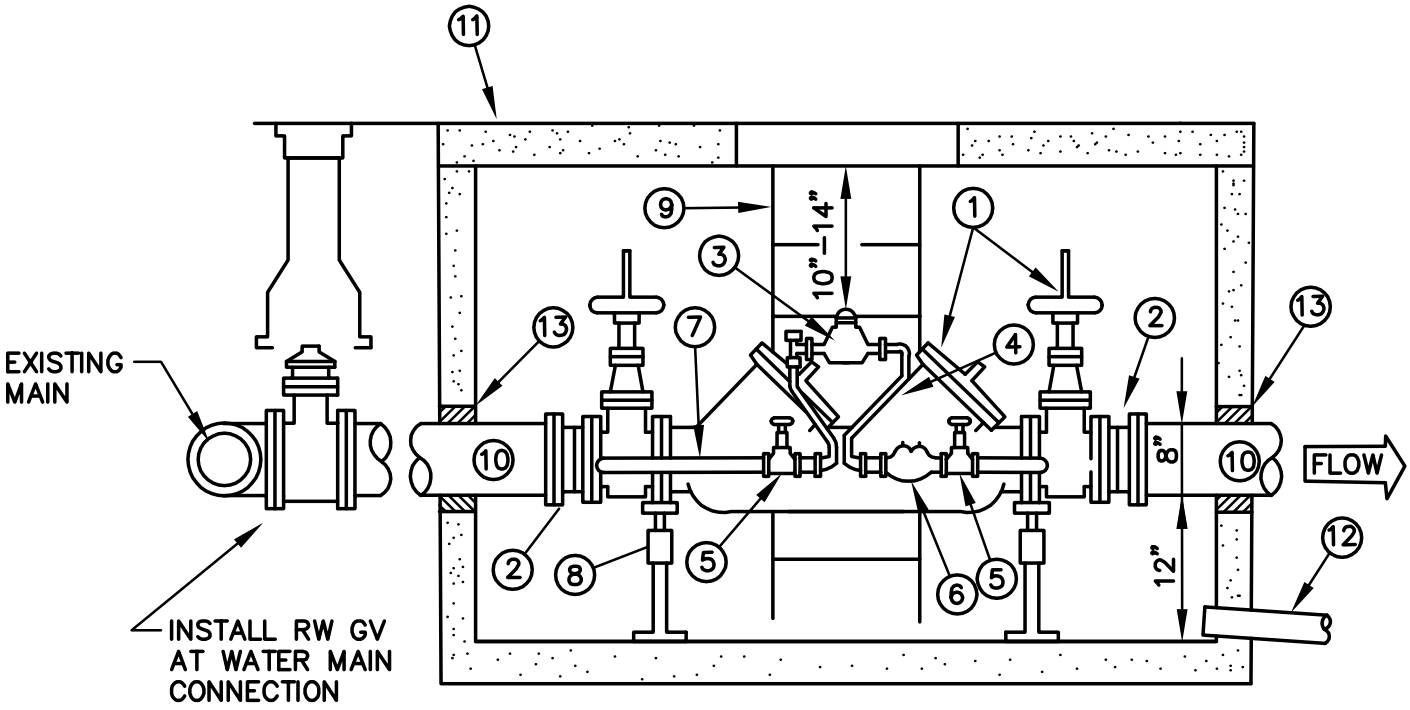


NOTES:

1. MINIMUM BOX SIZE 3/4"– 1" ASSEMBLIES, 10"X13"
   1 1/4"– 2" ASSEMBLIES, 14"X20"
2. ASSEMBLY MUST BE INSTALLED WITH TEST COCKS FACING UP OR TO ONE SIDE. INSTALL WATERTIGHT PLUGS IN ALL TEST COCKS.
3. SUFFICIENT DRAINAGE MUST BE PROVIDED TO PREVENT ASSEMBLY FROM BEING SUBMERGED.
4. PROVIDE SUPPPORT BLOCKS AS MAY BE REQUIRED.
5. PROVIDE A STRAINER WITH BLOW OUT TAPPING AHEAD OF DEVICE IF REQUIRED BY CITY.
6. THOROUGHLY FLUSH THE LINE, PRIOR TO THE INSTALLATION OF THE DCVA.
7. PROTECT DEVICE FROM FREEZING BY INSTALLING IN STRUCTURE OR PER "HOT BOX" SHOWN IN REDUCED PRESSURE BACKFLOW ASSEMBLY DETAIL.

"INDIVIDUAL" DOUBLE CHECK DETECTOR ASSEMBLY

Detail Approval Engineer: N.E.L.	CITY OF ILWACO STANDARD WATER DETAILS February 2011	W–D13



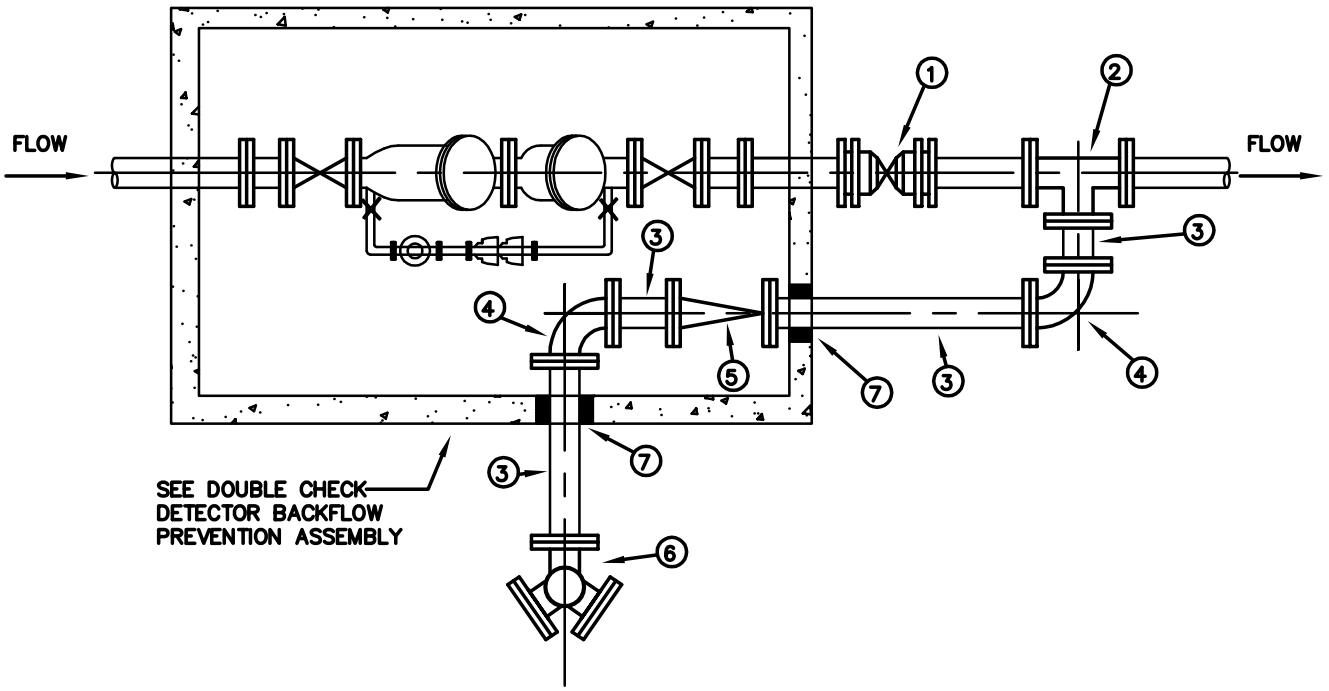
NO.	DESCRIPTION
1	STATE APPR'D DOUBLE CHECK DETECTOR BACKFLOW PREV. ASSY, (W/O.S.&Y. V.)
2	ROMAC STYLE 'FCA 501' FLANGED COUPLING ADAPTER
3	5/8" X 3/4" ROCKWELL OR NEPTUNE METER (GALLON READING)
4	FORD V42 RESETTER
5	SHUT–OFF VALVE
6	STATE APPROVED 3/4" DOUBLE CHECK VALVE ASSY.
7	BRASS OR TYPE K COPPER
8	2 EA. ADJUSTABLE STANCHIONS (LOCATE AT ENDS OF DOUBLE CHECK)
9	GALV. STEEL LADDER (LOCATE AS SHOWN ON PLAN)
10	PIPE SPOOL, CL. 52 D.I. PLAIN END
11	UTILITY VAULT. NO. 612–LA (6' X 12' X 6'–6" H, INSIDE DIM.), HINGED AND SPRING LOCKED STL. PL. COVER NO. 5106 TL–2–332 P (DOUBLE HATCH COVER) CHECK VAULT SIZE REQ'D. FOR ENCLOSING ASSY'S. SMALLER OR LARGER THAN 8" SIZE
12	6" PVC DRAIN LINE, DAYLIGHT WITH SCREEN OR CONNECT TO CATCH BASIN
13	WATER TIGHT GROUT, INLET AND OUTLET PIPE

NOTES:

AFTER PRESSURE TEST AND PURITY SAMPLES ARE RECEIVED A CERTIFIED BACKFLOW TECHNICIAN MUST SUPPLY CITY WITH A WRITTEN TEST REPORT ON EACH BACKFLOW ASSEMBLY.

DOUBLE CHECK DETECTOR BACKFLOW PREVENTION ASSEMBLY

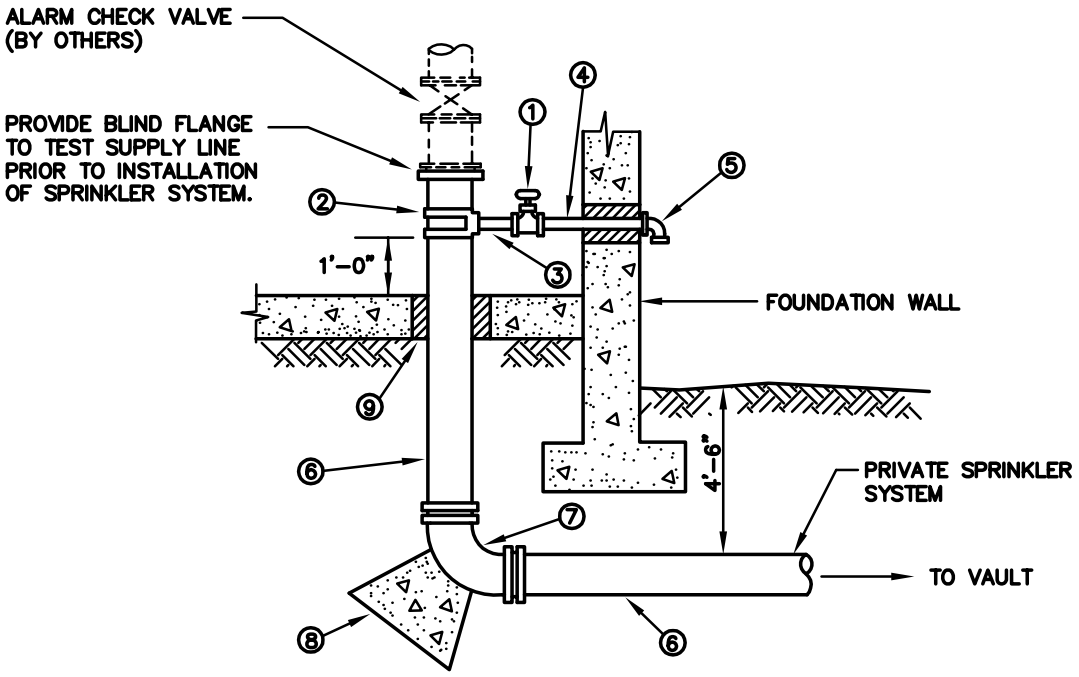
Detail Approval Engineer: N.E.L.	CITY OF ILWACO STANDARD WATER DETAILS February 2011	W–D14



NO.	DESCRIPTION
1	POST INDICATOR VALVE, MJ WITH MEGALUGS
2	4" TEE, MJ WITH MEGALUGS
3	4" DUCTILE IRON PIPE, CLASS 52
4	4" X 90° BENDS, MJ WITH MEGALUGS
5	4" FLAPPER CHECK VALVE, MJ WITH MEGALUGS
6	FIRE DEPARTMENT CONNECTION, MJ WITH MEGALUGS. CONNECTION TO COMPLY WITH FIRE DEPARTMENT REQUIREMNETS.
7	WATERTIGHT GROUT

FIRE LINE CONNECTION

Detail Approval Engineer: N.E.L.	CITY OF ILWACO STANDARD WATER DETAILS February 2011	W–D15



No.	DESCRIPTION
1	2" RWGV OR BRONZE BALL VALVE
2	ROMAC STYLE 202S STAINLESS STEEL DOUBLE STRAP SADDLE (OR APPROVED EQUAL)
3	2" BRASS NIPPLE
4	2" GALVANIZED NIPPLE
5	2" GALVANIZED 90° EL
6	D.I. CL. 52 SUPPLY MAIN (SIZE AS DETERMINED BY FIRE FLOW REQUIREMENTS).
7	90° BEND (MJ X MJ) WITH MEGALUG
8	CONCRETE THRUST BLOCK (SIZE TO BE APPROVED BY CITY)
9	1/2" EXPANSION JOINT

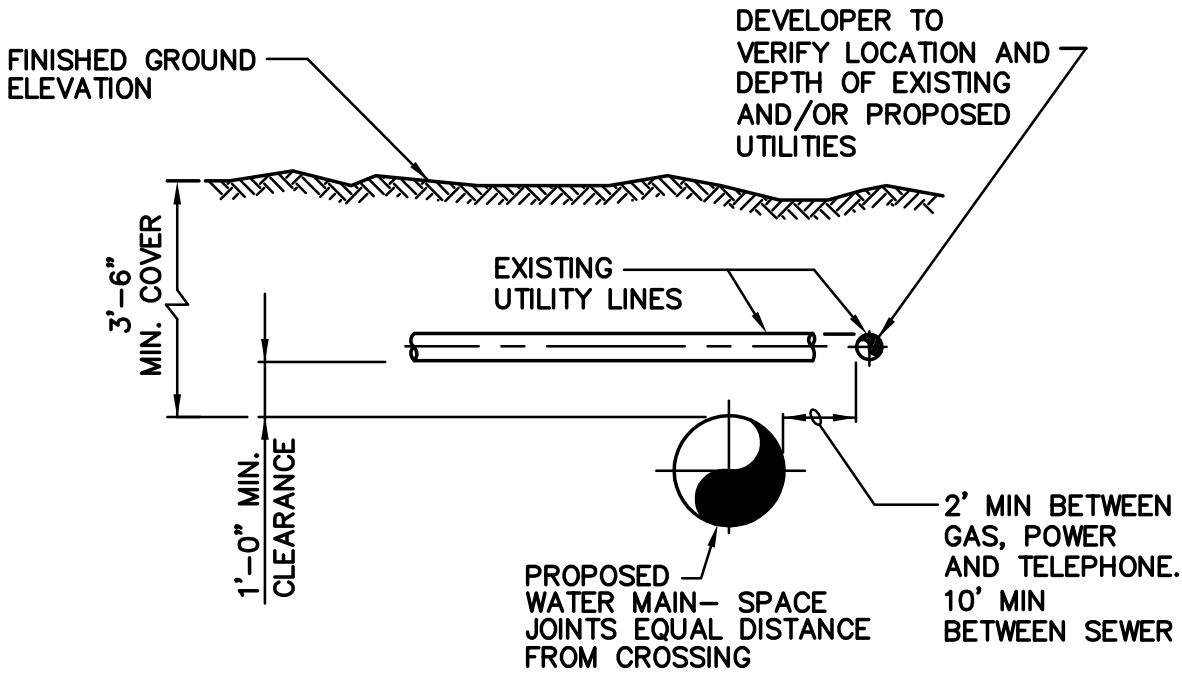
NOTE

AFTER SYSTEM IS PRESSURE TESTED, PURITY SAMPLES SHALL BE TAKEN AT ALL RISERS IN SYSTEM.

4" DIAMETER AND SMALLER DUCTILE IRON PIPE SHALL BE CLASS 53 IF USED IN A THREADED APPLICATION.

FIRE LINE RISER DETAIL

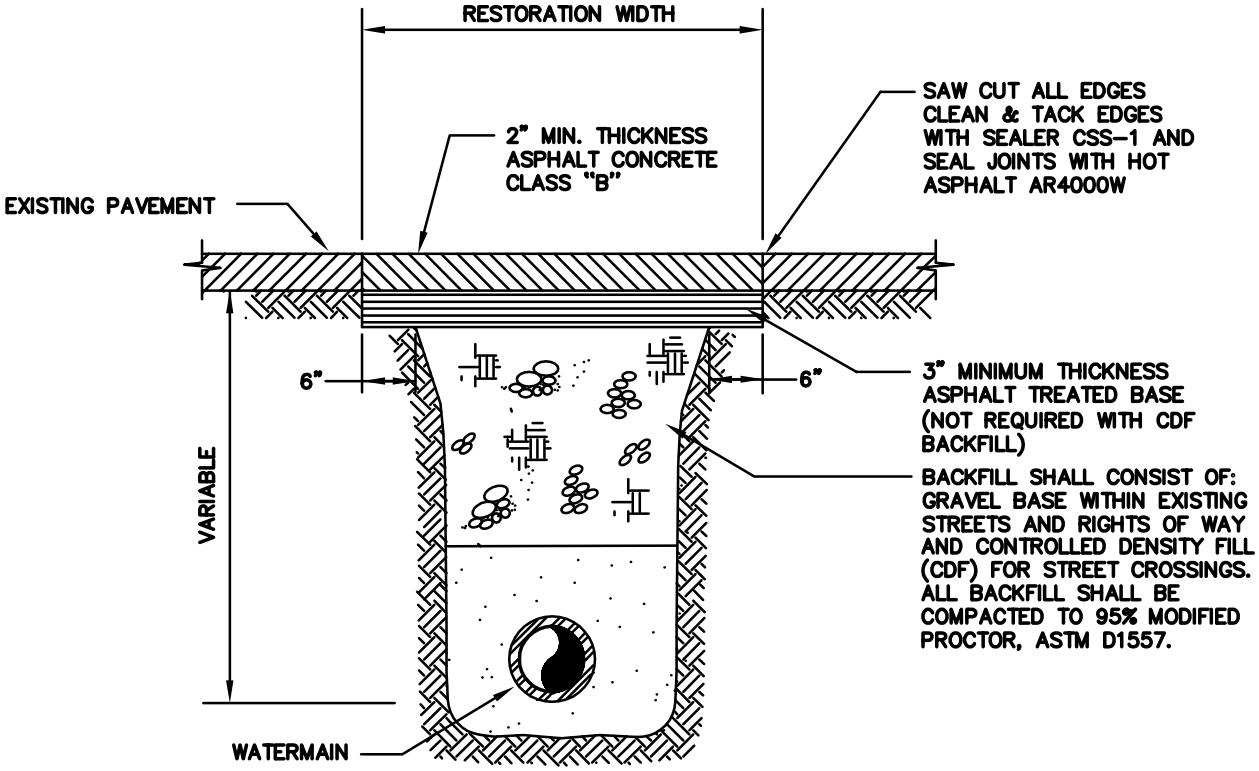
Detail Approval Engineer: N.E.L.	CITY OF ILWACO STANDARD WATER DETAILS February 2011	W-D16



NOTE: CONCRETE ENCASEMENT (BEDDING) SHALL BE UTILIZED, IF APPROVED BY THE CITY, AT LOCALIZED UTILITY CROSSING IF MINIMUM PIPE SEPARATION (ELEVATION) CANNOT BE MAINTAINED / ACHIEVED.

TYPICAL UTILITY CROSSING

Detail Approval Engineer: N.E.L.	CITY OF ILWACO STANDARD WATER DETAILS February 2011	W-D17

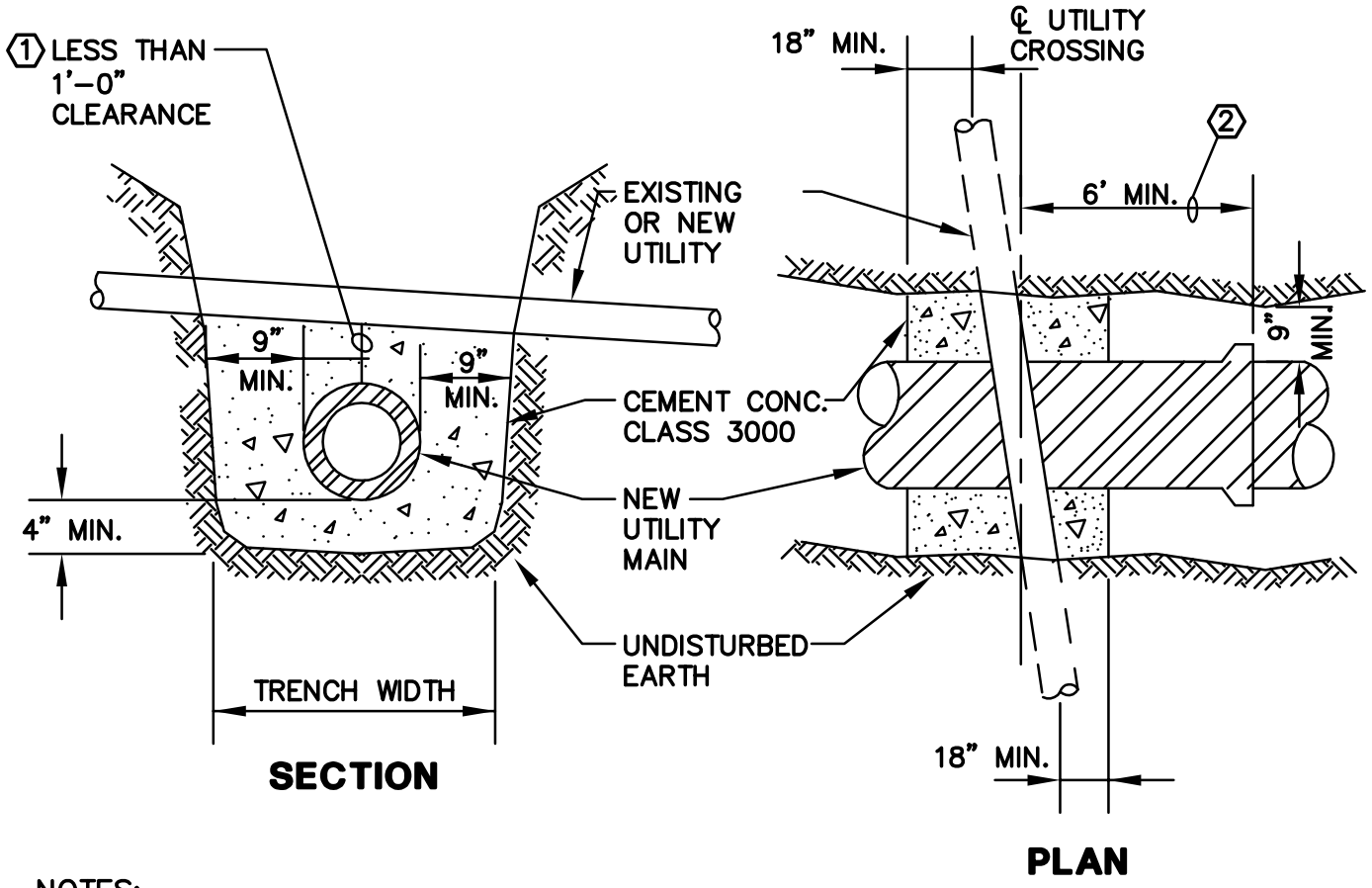


NOTES:

1. ALL ASPHALT STREETS AND DRIVEWAYS SHALL BE TEMPORARILY REPAIRED WITH COLD MIX, EXCEPT CROSSINGS WITH CDF SHALL BE COVERED WITH STEEL PLATES UNTIL THE CDF HAS CURRED TO ALLOW FOR PLACEMENT OF THE ASPHALT.
2. PATCH SHALL BE MACHINE ROLLED FLUSH WITH EXISTING PAVEMENT AND SHALL BE PLACED PER SEC. 5-04 OF THE WA. STATE D.O.T. SPECIFICATIONS.

ASPHALT PAVEMENT REPAIR

Detail Approval Engineer: N.E.L.	CITY OF ILWACO STANDARD WATER DETAILS February 2011	W-D18



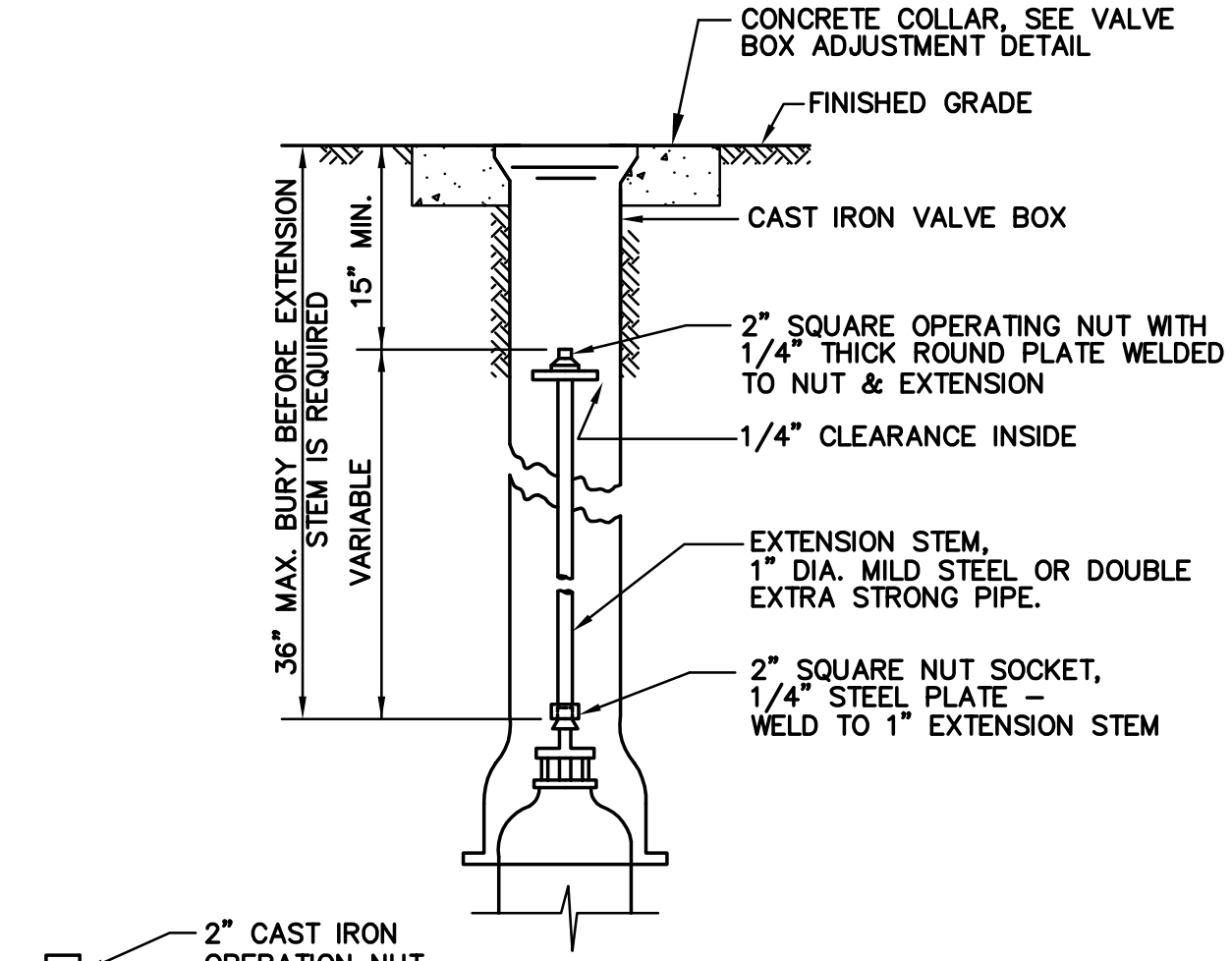
NOTES:

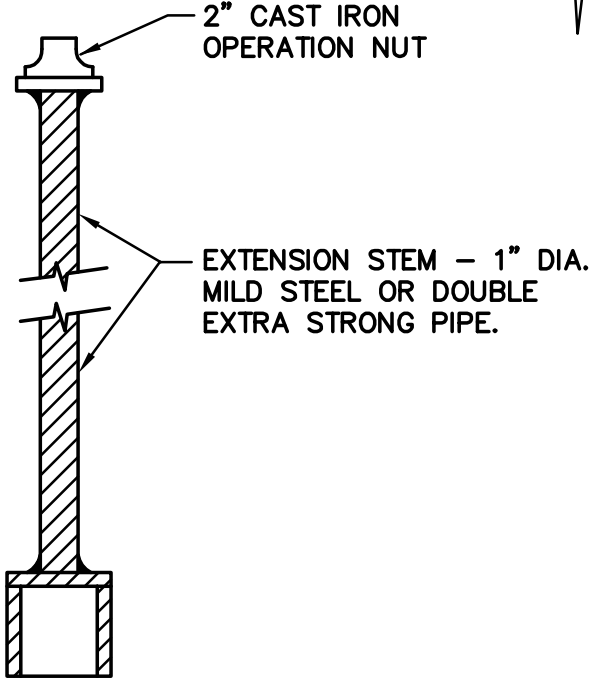
① CONTRACTOR SHALL PROVIDE CONCRETE PIPE ENCASEMENT AT ALL EXISTING UTILITY CROSSINGS IN THE EVENT THAT A 1 FOOT SEPARATION CANNOT BE PROVIDED. THE CONTRACTOR SHALL FAMILIARIZE THEMSELVES WITH THE SITE UTILITIES TO ANTICIPATE PROVIDING AND INSTALLING CONCRETE ENCASEMENTS WHERE NECESSARY.

② CONTRACTOR SHALL NOT CONSTRUCT ANY NEW PIPE JOINT WITHIN 6 FEET OF THE EXISTING CENTERLINE OF THE UTILITY CROSSING.

CONCRETE PIPE ENCASEMENT

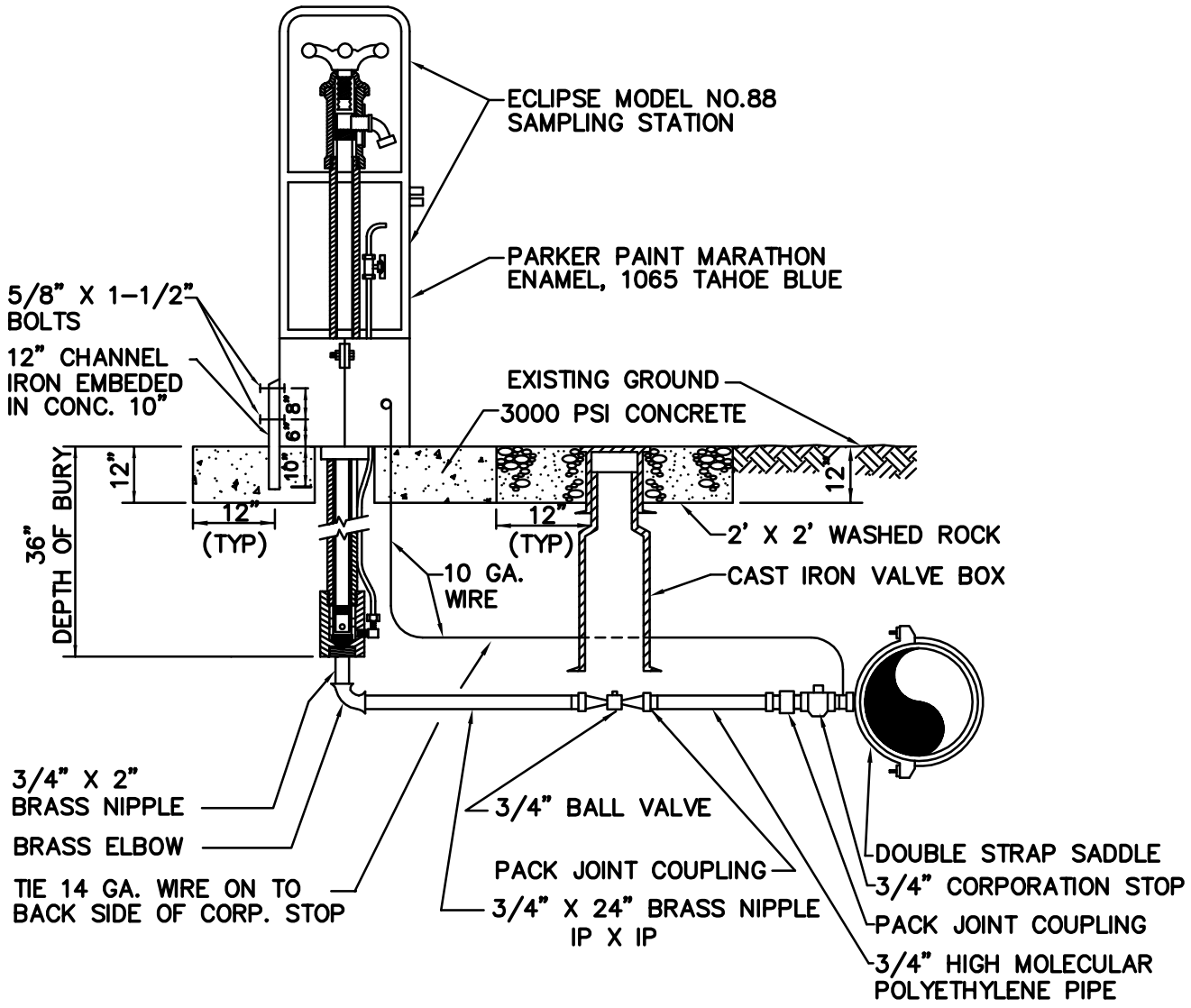
Detail Approval Engineer: N.E.L.	CITY OF ILWACO STANDARD WATER DETAILS February 2011	W–D19





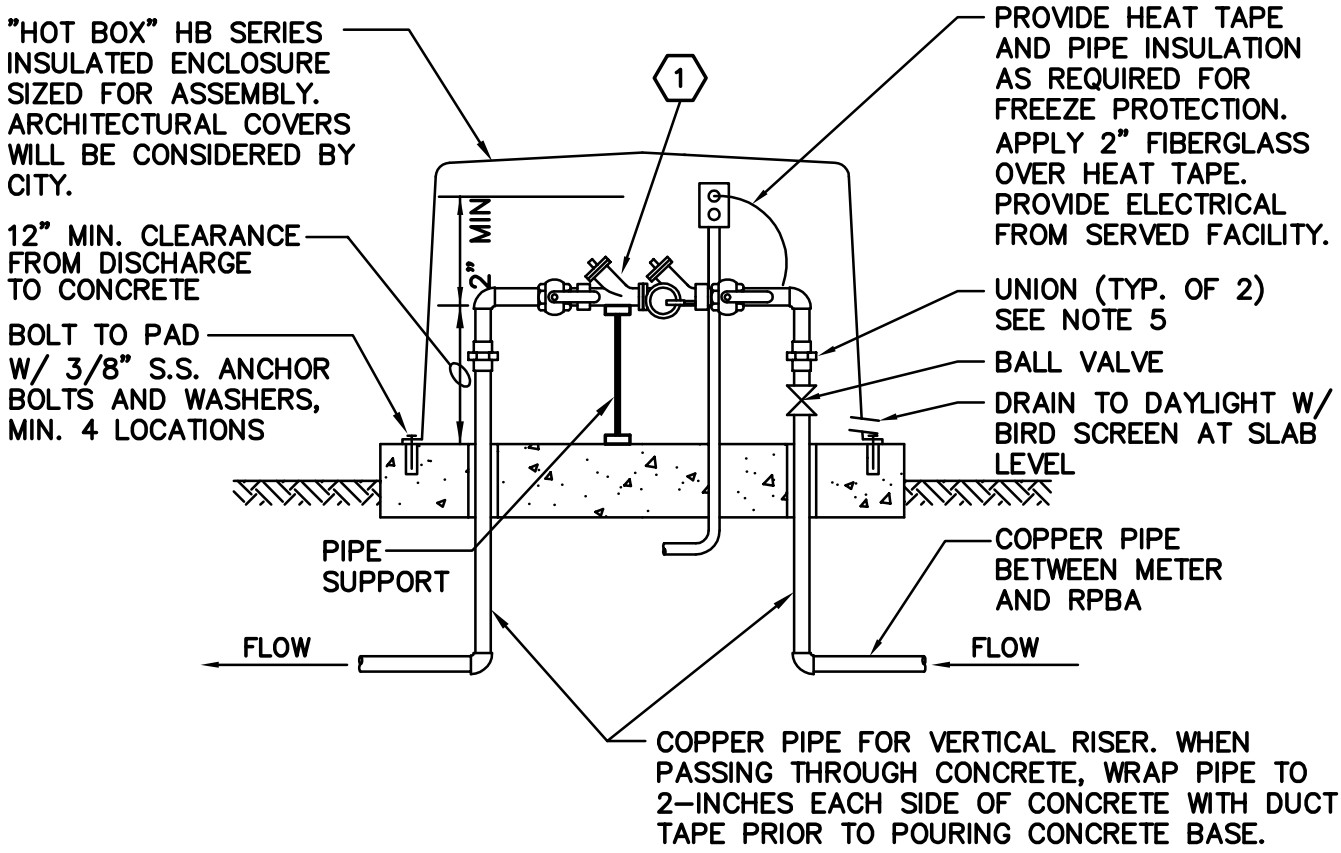
WATER VALVE STEM EXTENSION

Detail Approval Engineer: N.E.L.	CITY OF ILWACO STANDARD WATER DETAILS February 2011	W–D20



WATER SAMPLING STATION

Detail Approval Engineer: N.E.L.	CITY OF ILWACO STANDARD WATER DETAILS February 2011	W-D21



REDUCED PRESSURE BACKFLOW DEVICE

NOT TO SCALE

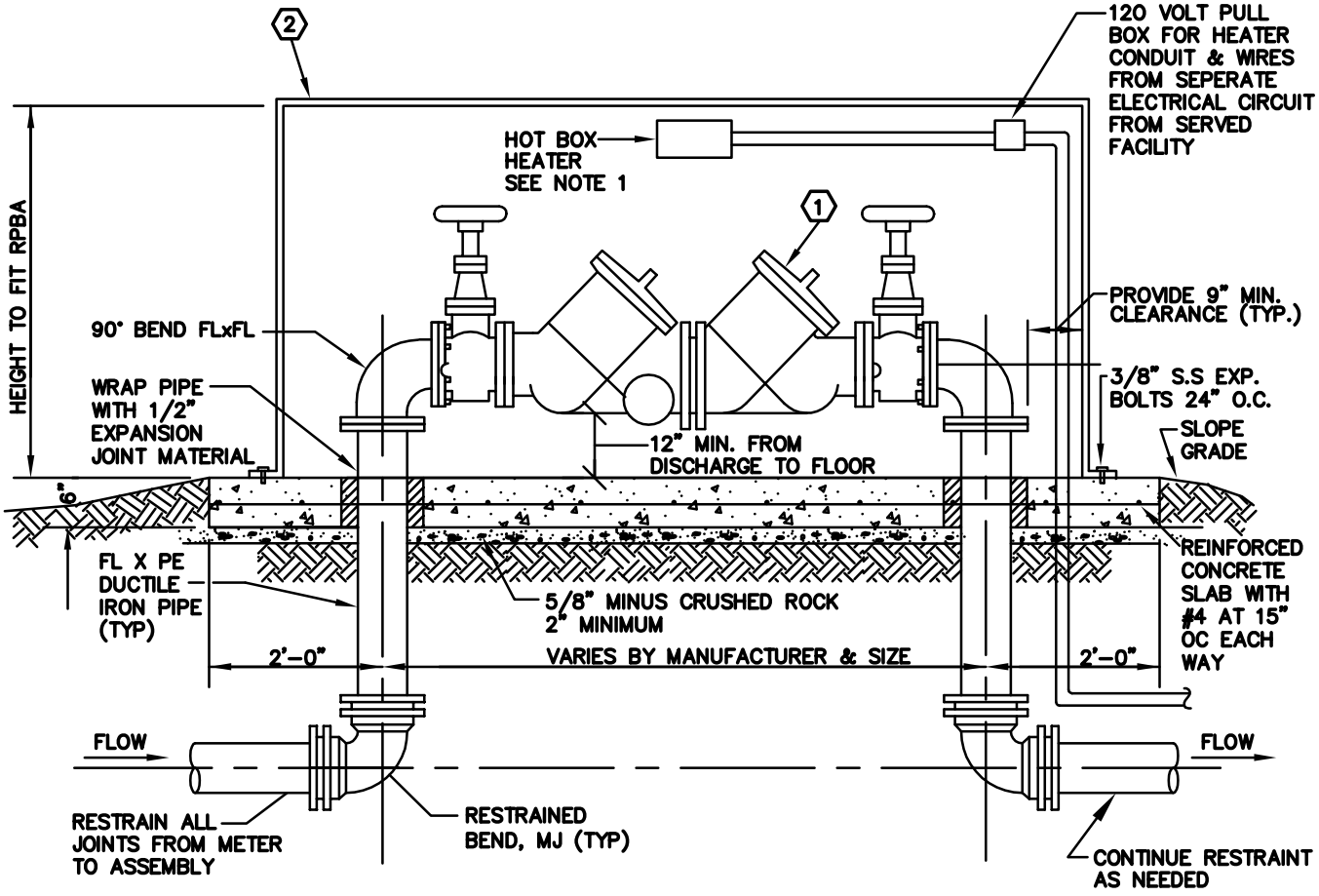
(1) WASHINGTON STATE APPROVED REDUCED PRESSURE BACKFLOW ASSEMBLY (RPBA) WITH TEST COCK PROTECTION AND BRONZE BODY BALL VALVE AT EACH END.

NOTES:

1. CONCRETE TO BE 2500 PSI (MINIMUM) MIX WITH AIR ENTRAINMENT.
2. COMPLETE ALL WORK IN ACCORDANCE WITH STATE, CITY AND MANUFACTURER STANDARDS.
3. SYSTEM SHALL NOT BE PUT INTO SERVICE UNTIL RPBA IS APPROVED BY THE CITY AND TESTED/CERTIFIED BY A WASHINGTON STATE LICENSED TESTER.
4. RPBA IS CONSIDERED PART OF THE PRIVATE SYSTEM AND SHALL BE MAINTAINED BY THE PROPERTY OWNER WITH ANNUAL CERTIFICATION REQUIRED.
5. DIELECTRIC UNIONS SHALL BE USED TO SEPARATE DISSIMILAR MATERIALS.
6. NO BRANCH CONNECTIONS ALLOWED BETWEEN METER AND RPBA.

REDUCED PRESSURE BACKFLOW ASSEMBLY 3/4" TO 2"

Detail Approval Engineer: N.E.L.	CITY OF ILWACO STANDARD WATER DETAILS February 2011	W-D22



(1) WASHINGTON STATE APPROVED REDUCED PRESSURE BACKFLOW ASSEMBLY (RPBA) WITH RESILIENT SEAT GATE VALVE EACH END

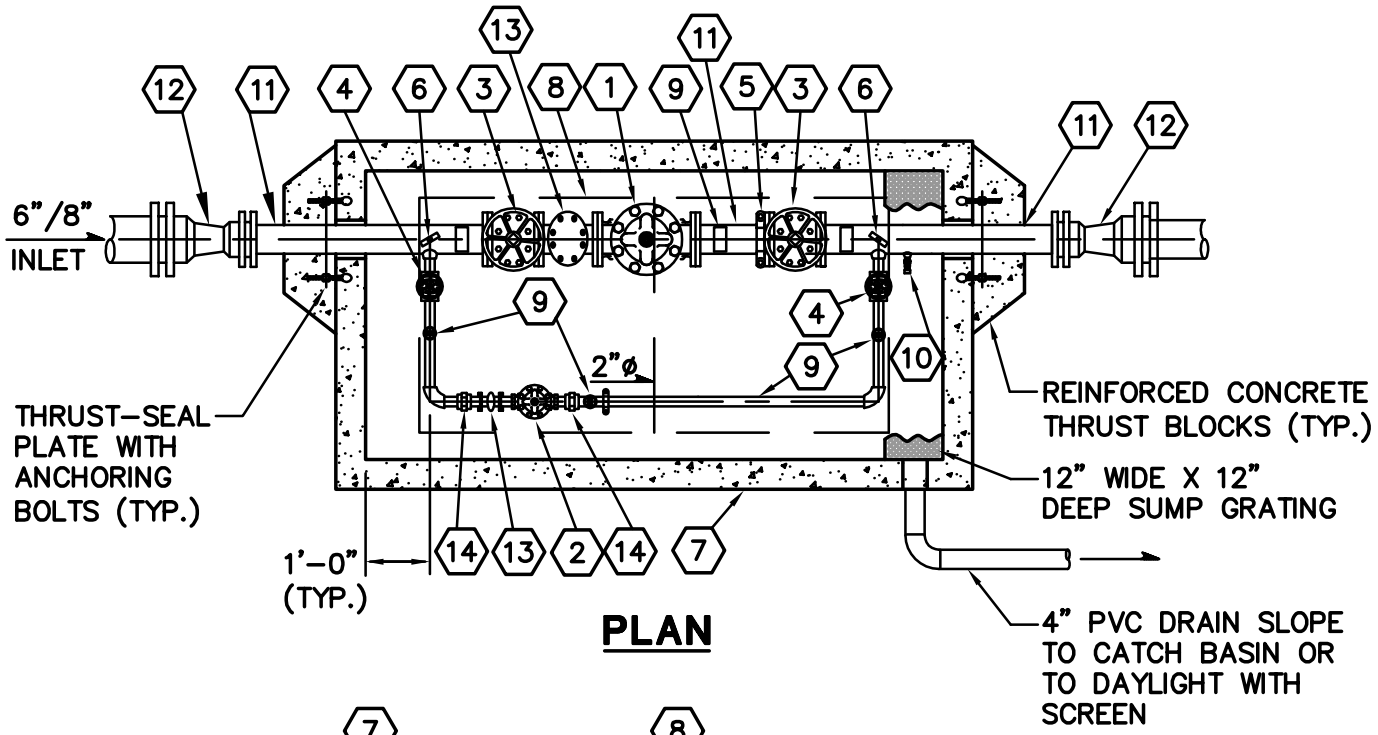
(2) ALUMINUM "HOT BOX" MODELS 4 THROUGH 10 FOR RESPECTIVE SIZE RPBA SHALL BE MODIFIED TO FIT ABOVE HEIGHT REQUIREMENTS. VALVE STEM SHALL NOT EXTEND OUTSIDE OF BOX.

NOTES:

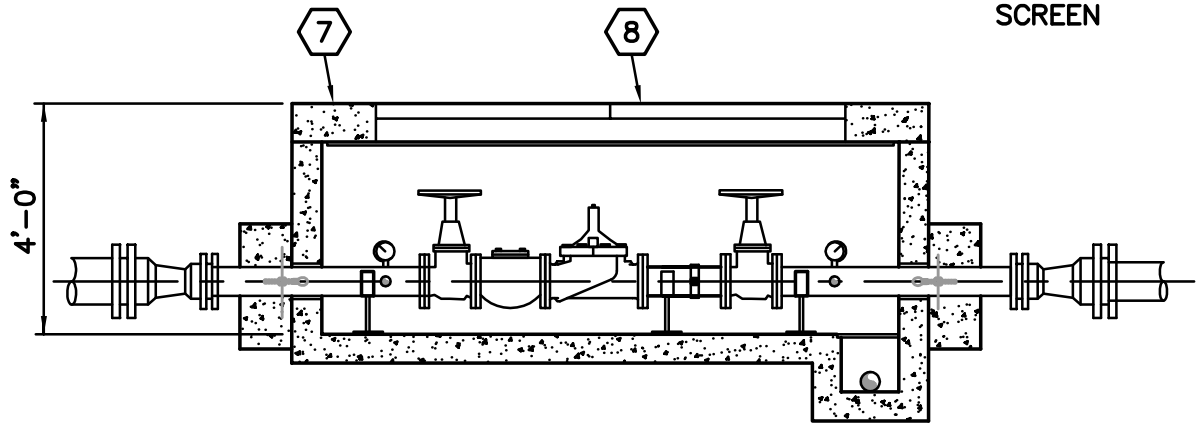
1. "HOT BOX" TO BE LOCATED OUTDOORS AND ACCESSIBLE TO CITY. ALTERNATE LOCATION REQUIRES CITY APPROVAL.
2. HEATERS AND WIRING SHALL BE RATED AT 2,000 WATT FOR 8" AND UNDER: 3,000 WATT FOR 10".
3. CONCRETE TO BE 2500 PSI (MINIMUM) MIX WITH AIR ENTRAINMENT.
4. COMPLETE ALL WORK IN ACCORDANCE WITH STATE, CITY AND MANUFACTURER STANDARDS.
5. SYSTEM SHALL NOT BE PUT INTO SERVICE UNTIL RPBA IS APPROVED BY THE CITY AND TESTED/CERTIFIED BY A WASHINGTON STATE LICENSED TESTER.
6. RPBA IS CONSIDERED PART OF THE PRIVATE SYSTEM AND SHALL BE MAINTAINED BY THE PROPERTY OWNER WITH ANNUAL CERTIFICATION REQUIRED.
7. DRAIN TO DAYLIGHT WITH BIRD SCREEN LOCATED AT SLAB LEVEL (SIZED PER MANUFACTUERS RECOMMENDATION).
8. NO BRANCH CONNECTIONS ALLOWED BETWEEN METER AND RPBA.

REDUCED PRESSURE BACKFLOW ASSEMBLY 3" AND LARGER

Detail Approval Engineer: N.E.L.	CITY OF ILWACO STANDARD WATER DETAILS February 2011	W-D23



PLAN



SECTION

NOTE:

ALTERNATE TO FIELD ASSEMBLED PRV AND VAULT IS SYSTEM AS MANUFACTURED BY GC SYSTEMS.

SEE PAGE 2 FOR CALLOUTS AND NOTES

PRESSURE REDUCING STATION
(1 OF 2)

Detail Approval Engineer: N.E.L.	CITY OF ILWACO STANDARD WATER DETAILS February 2011	W-D24 1/2

PRESSURE REDUCING STATION

(TO BE SIZED BY CITY)

LEGEND - SEE PAGE 1 FOR PLAN AND SECTION

1. 6" CLA-VAL 92G-01BCSY PRESSURE REDUCING VALVE WITH X101 POSITION INDICATOR DI BODY, S.S. TRIM, #150 FL.
2. 2" CLA-VAL 90G-01BC PRESSURE REDUCING VALVE WITH X101 POSITION INDICATOR DI BODY, BRONZE TRIM - THREADED.
3. 6" D.I. RW NRS GATE VALVE WITH HANDWHEEL, #150 FL.
4. 2" MUELLER A2360-6W41 W55 RW NRS GATE VALVE WITH HANDWHEEL, THD.
5. UNIFLANGE
6. 4" 0-300 PSI PRESSURE GAUGE WITH SNUBBER AND GAUGE COCK; TOP OF PIPE.
7. PRECAST CONCRETE VAULT 10'L X 5'W X 3'-7"H INSIDE, SOLID WALL WITH WHITE INTERIOR & BLACK EXTERIOR SEALANT
8. 48" X 96" DOUBLE DOOR ALUMINUM HATCH, LW PRODUCTS OR EQUAL. H-20 RATED. DRAIN HATCH TO VAULT FLOOR.
9. ADJUSTABLE PIPE SUPPORTS
10. 3/4" HOSE BIB ASSEMBLY
11. PIPE SPOOL (FLxPE) LENGTH AS REQUIRED.
12. REDUCER (AS REQUIRED), MJ WITH MEGA-LUGS
13. WATER METER STRAINER, INVENSYS OR EQUAL, FL
14. UNIONS

NOTES:

1. 6" x 2" PRV ASSEMBLY SHOWN. SIZES TO BE DETERMINED BY THE CITY BASED ON DOWNSTREAM DEMANDS.
2. ALL 3" AND LARGER PIPE INSIDE WETTED SURFACES TO BE SANDBLASTED, EPOXY LINED AND COATED TO AWWA C210 AND NSF-61 SPECIFICATION. EXTERIOR COATING SHALL BE BLUE ENAMEL.
3. ALL PIPE 2" AND SMALLER TO BE BRASS.

PRESSURE REDUCING STATION
(2 OF 2)

Detail Approval Engineer: N.E.L.	CITY OF ILWACO STANDARD WATER DETAILS February 2011	W-D24 2/2

APPENDIX E

MODELING RESULTS AND NODE MAP

2011 Peak Hour Demand

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
10	4.42	18.00	152.42	58.25
12	4.42	18.00	152.54	58.30
14	4.42	20.00	153.09	57.67
16	4.42	20.00	152.83	57.55
18	4.42	20.00	153.07	57.66
20	4.42	20.00	153.00	57.63
22	4.42	22.00	152.89	56.72
24	4.42	24.00	152.89	55.85
26	4.42	70.00	152.89	35.92
28	4.42	75.00	152.89	33.75
30	4.42	21.00	152.89	57.15
32	4.42	16.00	152.90	59.32
34	4.42	16.00	152.50	59.14
36	4.42	20.00	152.74	57.52
38	4.42	17.00	152.47	58.70
40	4.42	17.00	152.47	58.70
42	4.42	15.00	152.42	59.55
44	4.42	15.00	152.42	59.54
46	4.42	20.00	152.42	57.38
48	4.42	17.00	152.43	58.68
50	4.42	14.00	152.46	59.99
52	4.42	18.00	152.82	58.42
54	4.42	15.00	152.39	59.53
56	4.42	17.00	152.39	58.66
58	4.42	16.00	152.37	59.09
60	4.42	13.00	152.32	60.37
62	4.42	5.00	152.32	63.83
64	416.70	12.00	152.30	60.79
66	4.42	11.00	152.41	61.27
68	4.42	11.00	152.52	61.32
70	4.42	11.00	152.58	61.35
72	4.42	10.00	152.58	61.78
74	4.42	10.00	152.58	61.78
76	4.42	12.00	152.70	60.96
78	4.42	11.00	152.65	61.38
80	4.42	11.00	152.70	61.40
84	4.42	18.00	152.89	58.45
86	4.42	20.00	152.38	57.36
88	4.42	24.00	152.75	55.79
90	4.42	24.00	152.75	55.79
92	22.00	24.00	152.87	55.84
94	4.42	20.00	152.86	57.57
96	4.42	50.00	153.10	44.67
98	4.42	50.00	153.22	44.72
100	4.42	50.00	153.27	44.75
102	4.42	55.00	153.38	42.63
104	4.42	55.00	153.30	42.59
106	4.42	55.00	153.30	42.59
108	4.42	55.00	153.39	42.63
110	4.42	50.00	153.68	44.92
112	4.42	50.00	153.28	44.75
114	4.42	60.00	153.22	40.39
116	4.42	60.00	153.28	40.42
118	4.42	55.00	153.60	42.72
120	4.42	129.00	154.67	11.12
122	4.42	129.00	154.66	11.12
124	4.42	25.00	154.59	56.15
126	4.42	25.00	154.41	56.07
128	4.42	25.00	154.35	56.05
130	0.00	25.00	142.10	50.74
132	0.00	70.00	272.99	87.96
134	2.05	230.00	272.99	18.63
136	2.05	220.00	272.99	22.96
138	2.05	200.00	272.99	31.63
142	2.05	250.00	272.99	9.96
144	2.05	250.00	272.99	9.96
146	2.05	260.00	273.00	5.63

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
148	2.05	250.00	273.00	9.96
150	2.05	215.00	273.00	25.13
152	2.05	155.00	273.00	51.13
154	4.42	45.00	152.36	46.52
156	4.42	70.00	152.35	35.68
158	4.42	60.00	152.34	40.01
160	2.05	175.00	273.00	42.46
170	117.30	25.00	310.04	123.51
172	78.00	1.00	308.37	133.18
180	2.05	260.00	336.65	33.21
182	2.05	250.00	336.65	37.54
186	0.00	180.00	331.21	65.52
188	0.00	180.00	331.21	65.52
190	0.00	20.00	331.21	134.85
192	0.00	100.00	331.21	100.18
194	0.00	100.00	324.58	97.31
202	2.05	200.00	272.99	31.63
204	0.00	25.00	225.00	86.66
206	4.42	20.00	154.30	58.19
208	4.42	10.00	154.26	62.51
210	4.42	10.00	154.26	62.51
212	4.42	0.00	154.26	66.84
214	4.42	10.00	154.26	62.51
216	4.42	10.00	154.26	62.51
218	4.42	25.00	152.86	55.40
220	4.42	10.00	154.24	62.50
222	4.42	10.00	154.24	62.50
224	0.54	25.00	142.10	50.74
226	0.54	25.00	142.10	50.74
228	0.54	25.00	142.10	50.74
234	4.42	25.00	154.35	56.05
236	4.42	50.00	154.34	45.21
238	4.42	30.00	154.34	53.88
240	4.42	50.00	154.34	45.21
242	4.42	15.00	154.41	60.41
244	51.10	60.00	152.35	40.01
246	4.42	74.00	152.42	33.98
248	2.05	250.00	336.65	37.54
250	2.05	320.00	574.10	110.10
252	2.05	320.00	574.10	110.10
256	4.42	210.00	317.32	46.50
258	4.42	70.00	317.33	107.17
260	0.00	45.00	317.33	118.00
262	0.00	45.00	152.86	46.74
264	4.42	130.00	317.32	81.17
266	2.05	311.00	574.10	114.00
268	0.54	25.00	142.10	50.74
270	2.05	261.00	273.00	5.20
276	2.05	265.00	336.65	31.04
278	0.00	250.00	336.14	37.32
280	0.00	260.00	336.65	33.21
282	0.00	90.00	154.37	27.89

2016 Peak Hour Demand

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
10	4.76	18.00	152.30	58.19
12	4.76	18.00	152.42	58.25
14	4.76	20.00	152.99	57.62
16	4.76	20.00	152.72	57.51
18	4.76	20.00	152.97	57.62
20	4.76	20.00	152.90	57.59
22	4.76	22.00	152.79	56.67
24	4.76	24.00	152.79	55.80
26	4.76	70.00	152.78	35.87
28	4.76	75.00	152.78	33.70
30	4.76	21.00	152.79	57.10
32	4.76	16.00	152.79	59.27
34	4.76	16.00	152.37	59.09
36	4.76	20.00	152.63	57.47
38	4.76	17.00	152.35	58.65
40	4.76	17.00	152.35	58.65
42	4.76	15.00	152.30	59.49
44	4.76	15.00	152.30	59.49
46	4.76	20.00	152.30	57.33
48	4.76	17.00	152.31	58.63
50	4.76	14.00	152.34	59.94
52	4.76	18.00	152.71	58.37
54	4.76	15.00	152.27	59.48
56	4.76	17.00	152.27	58.61
58	4.76	16.00	152.25	59.04
60	4.76	13.00	152.20	60.32
62	4.76	5.00	152.20	63.78
64	416.70	12.00	152.17	60.74
66	4.76	11.00	152.29	61.22
68	4.76	11.00	152.40	61.27
70	4.76	11.00	152.47	61.30
72	4.76	10.00	152.47	61.73
74	4.76	10.00	152.47	61.73
76	4.76	12.00	152.58	60.91
78	4.76	11.00	152.54	61.33
80	4.76	11.00	152.58	61.35
84	4.76	18.00	152.79	58.40
86	4.76	20.00	152.26	57.31
88	4.76	24.00	152.64	55.74
90	4.76	24.00	152.63	55.74
92	22.00	24.00	152.76	55.79
94	4.76	20.00	152.75	57.52
96	4.76	50.00	153.00	44.63
98	4.76	50.00	153.12	44.68
100	4.76	50.00	153.18	44.71
102	4.76	55.00	153.29	42.59
104	4.76	55.00	153.21	42.55
106	4.76	55.00	153.21	42.55
108	4.76	55.00	153.30	42.59
110	4.76	50.00	153.61	44.89
112	4.76	50.00	153.18	44.71
114	4.76	60.00	153.12	40.35
116	4.76	60.00	153.19	40.38
118	4.76	55.00	153.53	42.69
120	4.76	129.00	154.65	11.11
122	4.76	129.00	154.64	11.11
124	4.76	25.00	154.56	56.14
126	4.76	25.00	154.35	56.05
128	4.76	25.00	154.28	56.02
134	4.03	230.00	336.37	46.09
136	4.03	220.00	336.37	50.42
138	4.03	200.00	336.37	59.09
142	4.03	250.00	336.37	37.43
144	4.03	250.00	336.37	37.43
146	4.03	260.00	336.39	33.10
148	4.03	250.00	336.39	37.43
150	4.03	215.00	336.38	52.60

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
152	4.03	155.00	336.37	78.59
154	4.76	45.00	152.23	46.46
156	4.76	70.00	152.22	35.62
158	4.76	60.00	152.21	39.95
160	4.03	175.00	336.38	69.92
170	117.30	25.00	309.83	123.42
172	78.00	1.00	308.16	133.09
180	4.03	260.00	336.42	33.11
182	4.03	250.00	336.43	37.45
202	4.03	200.00	336.37	59.09
206	4.76	20.00	154.23	58.16
208	4.76	10.00	154.18	62.47
210	4.76	10.00	154.18	62.47
212	4.76	0.00	154.18	66.81
214	4.76	10.00	154.18	62.47
216	4.76	10.00	154.18	62.47
218	4.76	25.00	152.75	55.35
220	4.76	10.00	154.15	62.46
222	4.76	10.00	154.16	62.46
224	0.57	25.00	142.10	50.74
226	0.57	25.00	142.10	50.74
228	0.57	25.00	142.10	50.74
234	4.76	25.00	154.28	56.02
236	4.76	50.00	154.28	45.18
238	4.76	30.00	154.28	53.85
240	4.76	50.00	154.28	45.18
242	4.76	15.00	154.35	60.38
244	51.10	60.00	152.22	39.96
246	4.76	74.00	152.30	33.93
248	4.03	250.00	336.40	37.44
250	4.03	320.00	574.10	110.10
252	4.03	320.00	574.10	110.10
256	4.76	210.00	317.32	46.50
258	4.76	70.00	317.33	107.17
264	4.76	130.00	317.32	81.17
266	4.03	311.00	574.10	114.00
268	0.57	25.00	142.10	50.74
270	4.03	261.00	336.38	32.66
276	4.03	265.00	336.41	30.94
280	0.00	260.00	336.41	33.11
282	0.00	90.00	154.34	27.88

2030 Peak Hour Demand

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
10	4.42	18.00	152.42	58.25
12	4.42	18.00	152.54	58.30
14	4.42	20.00	153.09	57.67
16	4.42	20.00	152.83	57.55
18	4.42	20.00	153.07	57.66
20	4.42	20.00	153.00	57.63
22	4.42	22.00	152.89	56.72
24	4.42	24.00	152.89	55.85
26	4.42	70.00	152.89	35.92
28	4.42	75.00	152.89	33.75
30	4.42	21.00	152.89	57.15
32	4.42	16.00	152.90	59.32
34	4.42	16.00	152.50	59.14
36	4.42	20.00	152.74	57.52
38	4.42	17.00	152.47	58.70
40	4.42	17.00	152.47	58.70
42	4.42	15.00	152.42	59.55
44	4.42	15.00	152.42	59.54
46	4.42	20.00	152.42	57.38
48	4.42	17.00	152.43	58.68
50	4.42	14.00	152.46	59.99
52	4.42	18.00	152.82	58.42
54	4.42	15.00	152.39	59.53
56	4.42	17.00	152.39	58.66
58	4.42	16.00	152.37	59.09
60	4.42	13.00	152.32	60.37
62	4.42	5.00	152.32	63.83
64	416.70	12.00	152.30	60.79
66	4.42	11.00	152.41	61.27
68	4.42	11.00	152.52	61.32
70	4.42	11.00	152.58	61.35
72	4.42	10.00	152.58	61.78
74	4.42	10.00	152.58	61.78
76	4.42	12.00	152.70	60.96
78	4.42	11.00	152.65	61.38
80	4.42	11.00	152.70	61.40
84	4.42	18.00	152.89	58.45
86	4.42	20.00	152.38	57.36
88	4.42	24.00	152.75	55.79
90	4.42	24.00	152.75	55.79
92	22.00	24.00	152.87	55.84
94	4.42	20.00	152.86	57.57
96	4.42	50.00	153.10	44.67
98	4.42	50.00	153.22	44.72
100	4.42	50.00	153.27	44.75
102	4.42	55.00	153.38	42.63
104	4.42	55.00	153.30	42.59
106	4.42	55.00	153.30	42.59
108	4.42	55.00	153.39	42.63
110	4.42	50.00	153.68	44.92
112	4.42	50.00	153.28	44.75
114	4.42	60.00	153.22	40.39
116	4.42	60.00	153.28	40.42
118	4.42	55.00	153.60	42.72
120	4.42	129.00	154.67	11.12
122	4.42	129.00	154.66	11.12
124	4.42	25.00	154.59	56.15
126	4.42	25.00	154.41	56.07
128	4.42	25.00	154.35	56.05
134	2.05	230.00	336.54	46.17
136	2.05	220.00	336.54	50.50
138	2.05	200.00	336.54	59.16
142	2.05	250.00	336.55	37.50
144	2.05	250.00	336.55	37.50
146	2.05	260.00	336.55	33.17
148	2.05	250.00	336.55	37.50
150	2.05	215.00	336.55	52.67

2030 Peak Hour Demand

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
152	2.05	155.00	336.55	78.66
154	4.42	45.00	152.36	46.52
156	4.42	70.00	152.35	35.68
158	4.42	60.00	152.34	40.01
160	2.05	175.00	336.55	70.00
170	117.30	25.00	309.96	123.47
172	78.00	1.00	308.29	133.15
180	2.05	260.00	336.56	33.17
182	2.05	250.00	336.56	37.51
202	2.05	200.00	336.54	59.16
206	4.42	20.00	154.30	58.19
208	4.42	10.00	154.26	62.51
210	4.42	10.00	154.26	62.51
212	4.42	0.00	154.26	66.84
214	4.42	10.00	154.26	62.51
216	4.42	10.00	154.26	62.51
218	4.42	25.00	152.86	55.40
220	4.42	10.00	154.24	62.50
222	4.42	10.00	154.24	62.50
224	0.54	25.00	142.10	50.74
226	0.54	25.00	142.10	50.74
228	0.54	25.00	142.10	50.74
234	4.42	25.00	154.35	56.05
236	4.42	50.00	154.34	45.21
238	4.42	30.00	154.34	53.88
240	4.42	50.00	154.34	45.21
242	4.42	15.00	154.41	60.41
244	51.10	60.00	152.35	40.01
246	4.42	74.00	152.42	33.98
248	2.05	250.00	336.55	37.50
250	2.05	320.00	574.10	110.10
252	2.05	320.00	574.10	110.10
256	4.42	210.00	317.32	46.50
258	4.42	70.00	317.33	107.17
264	4.42	130.00	317.32	81.17
266	2.05	311.00	574.10	114.00
268	0.54	25.00	142.10	50.74
270	2.05	261.00	336.55	32.74
276	2.05	265.00	336.56	31.00
280	0.00	260.00	336.56	33.17
282	0.00	90.00	154.37	27.89

2030 Peak Hour Demand with Improvements

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
10	4.42	18.00	153.05	58.52
12	4.42	18.00	153.18	58.57
14	4.42	20.00	153.89	58.02
16	4.42	20.00	153.56	57.87
18	4.42	20.00	153.90	58.02
20	4.42	20.00	153.90	58.02
22	4.42	22.00	153.91	57.16
24	4.42	24.00	153.91	56.29
26	4.42	70.00	153.97	36.38
28	4.42	75.00	154.15	34.30
30	4.42	21.00	153.86	57.57
32	4.42	16.00	153.75	59.69
34	4.42	16.00	153.15	59.43
36	4.42	20.00	153.53	57.86
38	4.42	17.00	153.10	58.97
40	4.42	17.00	153.10	58.97
42	4.42	15.00	153.05	59.82
44	4.42	15.00	153.04	59.81
46	4.42	20.00	153.04	57.65
48	4.42	17.00	153.05	58.95
50	4.42	14.00	153.09	60.27
52	4.42	18.00	153.64	58.77
54	4.42	15.00	153.00	59.79
56	4.42	17.00	153.00	58.93
58	4.42	16.00	152.97	59.35
60	4.42	13.00	152.90	60.62
62	4.42	5.00	152.90	64.09
64	416.70	12.00	152.87	61.04
66	4.42	11.00	152.95	61.51
68	4.42	11.00	153.03	61.54
70	4.42	11.00	153.08	61.56
72	4.42	10.00	153.08	62.00
74	4.42	10.00	153.08	62.00
76	4.42	12.00	153.45	61.29
78	4.42	11.00	153.25	61.64
80	4.42	11.00	153.45	61.72
84	4.42	18.00	153.81	58.85
86	4.42	20.00	152.99	57.63
88	4.42	24.00	153.41	56.07
90	4.42	24.00	153.41	56.07
92	22.00	24.00	153.54	56.13
94	4.42	20.00	153.66	57.92
96	4.42	50.00	153.72	44.94
98	4.42	50.00	153.81	44.98
100	4.42	50.00	153.86	45.00
102	4.42	55.00	153.94	42.87
104	4.42	55.00	153.88	42.84
106	4.42	55.00	153.88	42.84
108	4.42	55.00	153.95	42.87
110	4.42	50.00	154.19	45.14
112	4.42	50.00	153.95	45.04
114	4.42	60.00	153.93	40.70
116	4.42	60.00	154.11	40.78
118	4.42	55.00	154.28	43.02
120	4.42	129.00	270.00	61.30
122	4.42	129.00	270.00	61.30
124	4.42	25.00	154.36	56.05
126	4.42	25.00	153.96	55.88
128	4.42	25.00	153.81	55.81
134	2.05	230.00	336.54	46.17
136	2.05	220.00	336.54	50.50
138	2.05	200.00	336.54	59.16
142	2.05	250.00	336.55	37.50
144	2.05	250.00	336.55	37.50
146	2.05	260.00	336.55	33.17
148	2.05	250.00	336.55	37.50
150	2.05	215.00	336.55	52.67

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
152	2.05	155.00	336.55	78.66
154	4.42	45.00	152.97	46.78
156	4.42	70.00	152.96	35.94
158	4.42	60.00	152.95	40.27
160	2.05	175.00	336.55	70.00
170	117.30	25.00	309.96	123.47
172	78.00	1.00	308.29	133.15
180	2.05	260.00	336.56	33.17
182	2.05	250.00	336.56	37.51
202	2.05	200.00	336.54	59.16
206	4.42	20.00	153.76	57.96
208	4.42	10.00	153.72	62.27
210	4.42	10.00	153.72	62.27
212	4.42	0.00	153.71	66.60
214	4.42	10.00	153.71	62.27
216	4.42	10.00	153.71	62.27
218	4.42	25.00	153.54	55.70
220	4.42	10.00	153.69	62.26
222	4.42	10.00	153.70	62.26
224	0.54	25.00	142.10	50.74
226	0.54	25.00	142.10	50.74
228	0.54	25.00	142.10	50.74
234	4.42	25.00	153.81	55.81
236	4.42	50.00	153.80	44.98
238	4.42	30.00	153.80	53.64
240	4.42	50.00	153.80	44.98
242	4.42	15.00	153.96	60.21
244	51.10	60.00	152.97	40.28
246	4.42	74.00	153.04	34.25
248	2.05	250.00	336.55	37.50
250	2.05	320.00	574.10	110.10
252	2.05	320.00	574.10	110.10
256	4.42	210.00	317.32	46.50
258	4.42	70.00	317.33	107.17
264	4.42	130.00	317.32	81.17
266	2.05	311.00	574.10	114.00
268	0.54	25.00	142.10	50.74
270	2.05	261.00	336.55	32.74
276	2.05	265.00	336.56	31.00
280	0.00	260.00	336.56	33.17
282	0.00	90.00	270.00	78.26

2011 Fire Flow

ID	Total Demand (gpm)	Critical Node 1 ID	Critical Node 1 Pressure (psi)	Critical Node 1 Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow @Hydrant (gpm)	Critical Node 2 ID	Critical Node 2 Pressure (psi)	Critcal Node 2 Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
10	1,002.81	282	22.07	140.94	3,521.38	2,842.73	244	1.87	64.32	1,845.59	1,845.59
12	3,002.81	246	16.99	113.21	2,558.19	4,884.53	246	0.38	74.89	2,558.41	2,558.19
14	1,002.81	282	22.08	140.95	3,350.26	4,230.33	114	8.96	80.68	3,137.44	3,137.44
16	1,002.81	282	22.07	140.94	3,395.97	2,442.04	16	20.06	66.29	2,444.45	2,444.45
18	1,002.81	282	22.1	141	3,542.37	4,505.10	114	12.73	89.37	3,633.17	3,542.37
20	1,002.81	282	22.14	141.09	3,913.05	5,446.18	28	3.82	83.82	3,011.65	3,011.65
22	1,002.81	28	16.26	112.52	825.54	1,581.77	28	-0.05	74.87	825.55	825.54
24	1,002.81	28	15.77	111.39	808.47	1,606.86	28	-2.07	70.22	808.48	808.47
26	1,002.81	28	7.31	91.86	615.40	694.18	28	17.84	116.17	615.40	615.40
28	1,002.81	28	1.49	78.43	540.45	540.37	28	20	121.16	540.46	540.45
30	1,002.81	28	19.37	119.7	966.20	1,892.79	28	-1.2	72.24	965.36	965.36
32	1,002.81	282	22.1	141	3,651.96	4,202.70	28	-1.74	70.98	2,082.79	2,082.79
34	1,002.81	282	22.08	140.96	3,569.50	3,291.15	246	15.32	109.36	2,610.44	2,610.44
36	1,002.81	282	22.09	140.98	3,603.20	2,793.32	28	16.83	113.85	2,342.38	2,342.38
38	1,002.81	282	22.08	140.95	3,556.44	3,612.48	246	12.21	102.18	2,555.68	2,555.68
40	3,002.81	246	16.36	111.75	2,488.36	4,887.90	246	-1.55	70.43	2,488.60	2,488.36
42	1,002.81	282	22.08	140.95	3,576.67	3,865.26	246	0.83	75.91	2,067.35	2,067.35
44	1,002.81	282	22.08	140.96	3,602.36	3,967.01	246	-5.41	61.52	1,904.50	1,904.50
46	3,002.81	246	16.32	111.67	2,484.73	4,743.70	246	0.06	74.14	2,484.99	2,484.73
48	1,002.81	282	22.08	140.96	3,566.13	3,976.74	246	8.91	94.57	2,545.10	2,545.10
50	1,002.81	282	22.08	140.96	3,566.56	2,961.82	246	17.44	114.26	2,579.77	2,579.77
52	1,002.81	282	22.09	140.98	3,620.57	3,160.84	28	12.64	104.18	2,236.33	2,236.33
54	1,002.81	282	22.1	141	3,874.20	4,378.06	246	3.59	82.29	2,533.20	2,533.20
56	3,002.81	246	16.69	112.53	2,526.12	4,780.48	246	0.2	74.45	2,526.33	2,526.12
58	3,002.81	246	16.86	112.9	2,544.96	4,724.11	246	1.47	77.39	2,545.16	2,544.96
60	3,002.81	246	17.21	113.72	2,587.14	4,521.58	246	4.43	84.22	2,587.31	2,587.14
62	1,002.81	282	22.08	140.97	3,601.49	4,462.40	246	5	85.54	2,587.35	2,587.35
64	3,277.80	246	17.35	114.04	2,879.36	4,695.51	246	5.68	87.11	2,879.40	2,879.36
66	3,002.81	28	17.19	114.67	2,558.75	4,252.84	28	7.51	92.34	2,558.98	2,558.75
68	3,002.81	28	16.84	113.87	2,515.86	4,131.53	28	7.94	93.32	2,516.14	2,515.86
70	3,002.81	28	16.62	113.36	2,490.21	4,085.63	28	7.95	93.35	2,490.50	2,490.21
72	1,002.81	282	22.09	140.97	3,604.06	2,134.53	74	20.05	56.26	2,135.96	2,135.96
74	1,002.81	282	22.09	140.97	3,604.06	1,570.18	74	20.02	56.21	1,570.75	1,570.75
76	1,002.81	282	22.09	140.99	3,636.97	4,136.46	28	1.17	77.69	2,164.68	2,164.68
78	1,002.81	282	22.09	140.98	3,619.75	4,016.04	28	5.22	87.06	2,292.25	2,292.25
80	1,002.81	282	22.09	140.99	3,636.97	3,236.00	28	10.92	100.2	2,164.68	2,164.68
84	1,002.81	282	22.1	141.01	3,673.46	2,832.54	28	-0.6	73.61	1,450.36	1,450.36
86	1,002.81	276	21.63	314.91	1,471.56	3,539.73	156	-1.55	66.43	2,327.92	1,471.56
88	3,002.81	246	19.29	118.51	2,877.26	4,211.90	246	11.21	99.87	2,877.20	2,877.20
90	1,002.81	282	22.03	140.85	3,174.71	3,190.56	246	18.16	115.92	2,878.02	2,878.02
92	3,011.70	282	20.07	136.33	3,063.61	4,178.35	246	13.37	104.85	3,070.30	3,063.61
94	1,002.81	94	14.53	53.52	922.31	921.98	94	20.01	66.18	922.09	922.09
96	1,002.81	282	21.99	140.75	2,896.43	3,328.49	282	19.34	134.64	2,899.24	2,896.43
98	1,002.81	282	21.98	140.72	2,814.80	3,429.69	282	19	133.86	2,816.84	2,814.80
100	1,002.81	282	21.96	140.68	2,742.72	1,921.38	100	20.04	96.24	1,923.35	1,923.35
102	1,002.81	282	21.95	140.67	2,715.31	2,734.20	282	19.97	136.09	2,716.76	2,715.31
104	1,002.81	282	21.96	140.69	2,755.99	3,262.38	282	19.17	134.24	2,757.44	2,755.99
106	1,002.81	282	21.96	140.69	2,755.99	3,077.99	282	19.49	134.97	2,757.67	2,755.99
108	1,002.81	282	21.95	140.66	2,699.64	3,425.79	282	18.74	133.25	2,700.98	2,699.64
110	1,002.81	282	21.9	140.53	2,490.34	4,433.69	282	15.66	126.14	2,490.86	2,490.34
112	1,002.81	282	21.98	140.73	2,824.13	2,808.08	282	20.03	136.22	2,825.86	2,824.13
114	1,002.81	282	22.04	140.87	3,095.84	2,302.70	114	20.05	106.28	2,307.05	2,307.05
116	1,002.81	282	22.15	141.12	4,010.53	1,581.35	116	20.02	106.21	1,582.76	1,582.76
118	1,002.81	282	22.17	141.18	4,298.14	4,392.45	28	17.45	115.27	3,797.70	3,797.70
124	1,002.81	282	22.28	141.43	7,845.77	2,846.51	236	9.2	71.24	2,239.79	2,239.79
134	1,001.33	270	5.2	273	0.00	-306.78	-	-	-	-	0.00
136	1,001.33	270	5.2	273	0.00	365.66	-	-	-	-	0.00
138	1,001.33	270	5.2	273	0.00	734.63	-	-	-	-	0.00
142	1,001.33	270	5.2	273	0.00	-1,170.40	-	-	-	-	0.00
144	1,001.33	270	5.2	273	0.00	-704.02	-	-	-	-	0.00
146	1,001.33	270	5.2	273	0.00	-2,630.65	-	-	-	-	0.00
148	1,001.33	270	5.2	273	0.00	-1,246.08	-	-	-	-	0.00
150	1,001.33	270	5.2	273	0.00	1,552.21	-	-	-	-	0.00
152	1,001.33	270	5.2	273	0.00	808.11	-	-	-	-	0.00

ID	Total Demand (gpm)	Critical Node 1 ID	Critical Node 1 Pressure (psi)	Critical Node 1 Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow @Hydrant (gpm)	Critical Node 2 ID	Critical Node 2 Pressure (psi)	Critcal Node 2 Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
154	1,002.81	156	-0.85	68.03	571.28	820.83	156	9.17	91.17	571.59	571.28
156	1,002.81	156	-39.81	-21.88	376.05	376.02	156	20	116.16	376.04	376.04
180	1,001.33	276	18.59	307.91	815.95	1,089.33	276	17.85	306.18	815.97	815.95
182	1,001.33	276	19.81	310.72	969.10	1,803.16	276	13.53	296.23	969.09	969.09
202	1,001.33	270	5.2	273	0.00	753.50	-	-	-	-	0.00
206	1,002.81	236	16.54	88.17	915.61	995.68	236	16.83	88.84	915.62	915.61
210	1,002.81	210	6.98	26.11	848.32	848.23	210	20.01	56.17	848.32	848.32
216	1,002.81	220	7.51	27.33	853.30	853.26	220	20	56.16	853.30	853.30
218	1,002.81	282	22.02	140.81	3,056.81	2,275.80	218	20.05	71.28	2,277.91	2,277.91
220	1,002.81	220	-80.31	-175.35	488.69	488.70	220	20	56.16	488.72	488.69
222	1,002.81	220	-46	-96.16	570.98	570.99	220	20	56.16	571.01	570.98
224	1,000.28	268	30.43	95.23	1,323.00	1,322.29	268	20.02	71.2	1,322.78	1,322.78
226	1,000.28	268	35.53	106.99	1,644.36	1,642.99	268	20.03	71.22	1,643.91	1,643.91
228	1,000.28	268	41.35	120.43	2,581.35	2,576.45	268	20.07	71.31	2,580.03	2,580.03
242	1,002.81	236	22.2	101.23	1,071.61	1,268.09	236	13.07	80.16	1,071.61	1,071.61
248	1,001.33	276	17.83	306.15	749.47	1,293.35	276	14.69	298.9	749.50	749.47
250	1,001.33	276	21.6	314.86	1,480.84	1,740.40	276	18.93	308.68	1,481.03	1,480.84
252	1,001.33	276	21.6	314.86	1,480.84	1,741.96	276	18.92	308.67	1,481.03	1,480.84
256	1,002.81	256	-48.43	98.23	616.14	616.07	256	20	256.17	616.09	616.09
264	1,002.81	256	-48.43	98.23	616.14	812.58	256	-10.8	185.07	616.09	616.09
266	1,001.33	276	21.6	314.86	1,480.84	1,797.96	250	16.13	357.23	1,768.27	1,480.84
280	1,000.00	276	18.52	307.74	807.26	1,057.96	276	18.02	306.59	807.28	807.26
282	1,000.00	282	21.69	140.06	2,000.18	1,981.94	282	20.04	136.25	2,000.17	2,000.17

2016 Fire Flow

ID	Total Demand (gpm)	Critical Node 1 ID	Critical Node 1 Pressure (psi)	Critical Node 1 Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow @Hydrant (gpm)	Critical Node 2 ID	Critical Node 2 Pressure (psi)	Critcal Node 2 Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
10	1,002.99	282	22.10	141.01	3,536.26	2,841.12	244	1.87	64.32	1,844.42	1,844.42
12	3,002.99	246	16.95	113.11	2,553.32	4,879.43	246	0.37	74.86	2,553.55	2,553.32
14	1,002.99	282	22.10	141.01	3,363.42	4,228.46	114	8.96	80.67	3,135.84	3,135.84
16	1,002.99	282	22.10	141.00	3,409.94	2,441.53	16	20.06	66.29	2,443.94	2,443.94
18	1,002.99	282	22.13	141.07	3,555.98	4,503.07	114	12.72	89.35	3,630.68	3,555.98
20	1,002.99	282	22.16	141.15	3,927.89	5,443.13	28	3.78	83.73	3,005.69	3,005.69
22	1,002.99	28	16.24	112.49	825.45	1,581.11	28	-0.06	74.86	825.45	825.45
24	1,002.99	28	15.75	111.36	808.42	1,606.11	28	-2.07	70.21	808.43	808.42
26	1,002.99	28	7.29	91.82	615.60	694.24	28	17.84	116.17	615.61	615.60
28	1,002.99	28	1.47	78.38	540.71	540.62	28	20.00	121.16	540.72	540.71
30	1,002.99	28	19.36	119.68	965.91	1,891.83	28	-1.20	72.22	965.00	965.00
32	1,002.99	282	22.12	141.06	3,666.72	4,198.87	28	-1.75	70.95	2,079.54	2,079.54
34	1,002.99	282	22.11	141.02	3,584.43	3,288.77	246	15.30	109.31	2,605.54	2,605.54
36	1,002.99	282	22.12	141.04	3,618.07	2,791.62	28	16.81	113.79	2,338.10	2,338.10
38	1,002.99	282	22.11	141.02	3,571.38	3,609.59	246	12.19	102.13	2,550.96	2,550.96
40	3,002.99	246	16.32	111.66	2,483.92	4,878.16	246	-1.56	70.39	2,484.19	2,483.92
42	1,002.99	282	22.11	141.02	3,591.76	3,862.11	246	0.82	75.89	2,064.55	2,064.55
44	1,002.99	282	22.11	141.03	3,617.55	3,963.66	246	-5.41	61.52	1,902.29	1,902.29
46	3,002.99	246	16.29	111.58	2,480.29	4,733.98	246	0.05	74.11	2,480.57	2,480.29
48	1,002.99	282	22.11	141.02	3,581.11	3,973.17	246	8.89	94.52	2,540.43	2,540.43
50	1,002.99	282	22.11	141.02	3,581.50	2,960.00	246	17.42	114.21	2,574.95	2,574.95
52	1,002.99	282	22.12	141.05	3,635.39	3,158.67	28	12.62	104.12	2,232.49	2,232.49
54	1,002.99	282	22.13	141.07	3,881.99	4,369.50	246	3.57	82.24	2,528.74	2,528.74
56	3,002.99	246	16.66	112.44	2,521.55	4,770.79	246	0.18	74.41	2,521.79	2,521.55
58	3,002.99	246	16.82	112.82	2,540.32	4,714.73	246	1.45	77.34	2,540.54	2,540.32
60	3,002.99	246	17.17	113.63	2,582.34	4,516.99	246	4.41	84.19	2,582.53	2,582.34
62	1,002.99	282	22.11	141.03	3,616.56	4,458.35	246	4.98	85.49	2,582.58	2,582.58
64	3,277.80	246	17.31	113.95	2,874.34	4,690.95	246	5.66	87.07	2,874.37	2,874.34
66	3,002.99	28	17.15	114.57	2,553.44	4,248.79	28	7.49	92.28	2,553.70	2,553.44
68	3,002.99	28	16.80	113.77	2,510.81	4,127.68	28	7.91	93.26	2,511.11	2,510.81
70	3,002.99	28	16.58	113.27	2,485.29	4,081.87	28	7.93	93.30	2,485.61	2,485.29
72	1,002.99	282	22.11	141.04	3,619.05	2,133.57	74	20.05	56.26	2,135.00	2,135.00
74	1,002.99	282	22.11	141.04	3,619.05	1,569.76	74	20.02	56.21	1,570.33	1,570.33
76	1,002.99	282	22.12	141.05	3,651.77	4,132.82	28	1.15	77.66	2,161.13	2,161.13
78	1,002.99	282	22.12	141.05	3,634.63	4,012.56	28	5.20	87.01	2,288.22	2,288.22
80	1,002.99	282	22.12	141.05	3,651.77	3,233.92	28	10.89	100.14	2,161.13	2,161.13
84	1,002.99	282	22.13	141.07	3,688.19	2,830.67	28	-0.61	73.58	1,448.91	1,448.91
86	1,002.99	276	21.31	314.17	1,380.51	3,532.62	156	-1.55	66.43	2,326.18	1,380.51
88	3,002.99	246	19.25	118.42	2,871.02	4,208.19	246	11.18	99.81	2,870.94	2,870.94
90	1,002.99	282	22.06	140.91	3,189.56	3,188.59	246	18.13	115.85	2,871.83	2,871.83
92	3,011.70	282	20.09	136.37	3,076.14	4,174.71	246	13.34	104.78	3,063.05	3,063.05
94	1,002.99	94	14.51	53.49	922.35	921.99	94	20.01	66.18	922.10	922.10
96	1,002.99	282	22.02	140.82	2,912.29	3,325.78	282	19.36	134.69	2,912.63	2,912.29
98	1,002.99	282	22.00	140.78	2,827.23	3,427.10	282	19.03	133.91	2,829.61	2,827.23
100	1,002.99	282	21.99	140.75	2,754.90	1,921.11	100	20.04	96.24	1,923.08	1,923.08
102	1,002.99	282	21.98	140.73	2,727.41	2,732.95	282	19.99	136.14	2,729.13	2,727.41
104	1,002.99	282	21.99	140.75	2,768.27	3,260.06	282	19.19	134.29	2,770.01	2,768.27
106	1,002.99	282	21.99	140.75	2,768.27	3,076.01	282	19.51	135.02	2,770.01	2,768.27
108	1,002.99	282	21.98	140.72	2,711.73	3,423.46	282	18.76	133.30	2,713.33	2,711.73
110	1,002.99	282	21.92	140.60	2,501.52	4,431.52	282	15.68	126.19	2,502.19	2,501.52
112	1,002.99	282	22.01	140.80	2,835.73	2,807.44	282	20.05	136.26	2,837.80	2,835.73
114	1,002.99	282	22.07	140.93	3,110.78	2,302.31	114	20.05	106.28	2,306.65	2,306.65
116	1,002.99	282	22.18	141.19	4,025.98	1,581.87	116	20.02	106.21	1,583.26	1,583.26
118	1,002.99	282	22.20	141.24	4,314.06	4,391.22	28	17.41	115.18	3,789.27	3,789.27
124	1,002.99	282	22.32	141.50	7,882.37	2,845.22	236	9.20	71.22	2,238.50	2,238.50
134	1,002.38	144	16.19	287.36	832.14	992.23	144	16.43	287.92	832.16	832.14
136	1,002.38	144	16.19	287.36	832.14	956.05	144	17.28	289.88	832.16	832.14
138	1,002.38	144	16.19	287.36	832.14	1,100.94	144	13.72	281.66	832.16	832.14
142	1,002.38	144	16.19	287.36	832.14	831.83	270	19.02	304.90	749.57	749.57
144	1,002.38	144	4.35	260.04	589.02	588.94	144	20.00	296.17	589.05	589.02
146	1,002.38	270	16.74	299.63	749.48	786.36	276	19.46	309.90	717.31	717.31
148	1,002.38	270	16.74	299.63	749.48	868.78	270	18.56	303.82	749.57	749.48
150	1,002.38	270	14.87	295.32	668.07	1,519.51	270	3.76	269.68	668.20	668.07
152	1,002.38	270	14.87	295.32	668.07	952.11	270	15.75	297.34	668.20	668.07

ID	Total Demand (gpm)	Critical Node 1 ID	Critical Node 1 Pressure (psi)	Critical Node 1 Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow @Hydrant (gpm)	Critical Node 2 ID	Critical Node 2 Pressure (psi)	Critcal Node 2 Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
154	1,002.99	156	-0.88	67.97	571.27	820.65	156	9.17	91.17	571.57	571.27
156	1,002.99	156	-39.87	-22.00	376.03	376.01	156	20.00	116.16	376.03	376.03
180	1,002.38	276	18.31	307.26	783.14	1,056.91	276	17.84	306.18	783.25	783.14
182	1,002.38	276	19.60	310.23	935.20	1,770.10	276	13.53	296.22	935.14	935.14
202	1,002.38	144	16.19	287.36	832.14	1,123.25	144	13.13	280.30	832.16	832.14
206	1,002.99	236	16.46	87.99	913.98	994.12	236	16.82	88.83	913.99	913.98
210	1,002.99	210	6.84	25.80	847.08	846.99	210	20.01	56.17	847.09	847.08
216	1,002.99	220	7.37	27.02	852.03	852.01	220	20.00	56.16	852.04	852.03
218	1,002.99	282	22.04	140.88	3,070.22	2,274.54	218	20.05	71.28	2,276.65	2,276.65
220	1,002.99	220	-80.49	-175.77	488.24	488.25	220	20.00	56.16	488.27	488.24
222	1,002.99	220	-46.17	-96.55	570.35	570.37	220	20.00	56.16	570.39	570.35
224	1,000.31	276	23.19	318.52		1,322.24	268	20.02	71.20	1,322.72	1,322.72
226	1,000.31	276	23.19	318.52		1,642.91	268	20.03	71.22	1,643.84	1,643.84
228	1,000.31	276	23.19	318.52		2,576.36	268	20.07	71.31	2,579.94	2,579.94
242	1,002.99	236	22.14	101.10	1,069.94	1,266.75	236	13.05	80.12	1,069.94	1,069.94
248	1,002.38	276	17.51	305.40	717.13	1,261.77	276	14.68	298.88	717.31	717.13
250	1,002.38	276	21.49	314.59	1,442.06	1,737.24	276	18.77	308.33	1,442.41	1,442.06
252	1,002.38	276	21.49	314.59	1,442.06	1,738.80	276	18.77	308.31	1,442.41	1,442.06
256	1,002.99	256	-48.54	97.97	615.89	615.82	256	20.00	256.17	615.85	615.85
264	1,002.99	256	-48.54	97.97	615.89	812.29	256	-10.80	185.07	615.85	615.85
266	1,002.38	276	21.49	314.59	1,442.06	1,794.73	250	16.13	357.23	1,765.03	1,442.06
280	1,000.00	276	18.22	307.06	772.33	1,025.20	276	18.00	306.55	772.47	772.33
282	1,000.00	282	21.72	140.12	2,008.76	1,990.51	282	20.04	136.25	2,008.78	2,008.76

2030 Fire Flow

ID	Total Demand (gpm)	Critical Node 1 ID	Critical Node 1 Pressure (psi)	Critical Node 1 Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow @Hydrant (gpm)	Critical Node 2 ID	Critical Node 2 Pressure (psi)	Critcal Node 2 Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
10	1,003.81	282	21.97	140.70	3,388.00	2,824.74	244	1.87	64.32	1,825.75	1,825.75
12	3,003.81	246	16.58	112.27	2,501.49	4,840.54	246	0.29	74.68	2,501.85	2,501.49
14	1,003.81	282	21.97	140.70	3,225.71	4,204.63	114	8.89	80.53	3,103.67	3,103.67
16	1,003.81	282	21.97	140.69	3,270.31	2,430.49	16	20.06	66.29	2,432.88	2,432.88
18	1,003.81	282	21.99	140.76	3,408.37	4,477.42	114	12.61	89.10	3,590.70	3,408.37
20	1,003.81	282	22.03	140.84	3,762.58	5,409.36	28	3.57	83.23	2,938.66	2,938.66
22	1,003.81	28	15.95	111.82	812.73	1,572.08	28	-0.10	74.78	812.74	812.73
24	1,003.81	28	15.47	110.69	796.13	1,596.45	28	-2.07	70.21	796.14	796.13
26	1,003.81	28	6.97	91.09	606.97	686.03	28	17.84	116.17	606.99	606.97
28	1,003.81	28	1.14	77.64	533.52	533.45	28	20.00	121.16	533.54	533.52
30	1,003.81	28	19.08	119.03	949.24	1,880.51	28	-1.24	72.13	949.24	949.24
32	1,003.81	282	21.99	140.75	3,512.42	4,167.75	28	-1.84	70.76	2,036.07	2,036.07
34	1,003.81	282	21.98	140.72	3,433.96	3,267.65	246	15.08	108.80	2,552.96	2,552.96
36	1,003.81	282	21.98	140.73	3,466.18	2,774.46	28	16.56	113.23	2,286.38	2,286.38
38	1,003.81	282	21.97	140.71	3,421.48	3,585.11	246	11.99	101.68	2,499.95	2,499.95
40	3,003.81	246	15.95	110.82	2,434.65	4,835.83	246	-1.61	70.28	2,435.06	2,434.65
42	1,003.81	282	21.97	140.71	3,441.01	3,836.23	246	0.74	75.70	2,027.94	2,027.94
44	1,003.81	282	21.98	140.72	3,466.07	3,936.67	246	-5.41	61.51	1,869.96	1,869.96
46	3,003.81	246	15.92	110.74	2,431.15	4,691.96	246	0.00	73.99	2,431.57	2,431.15
48	1,003.81	282	21.97	140.71	3,430.67	3,944.48	246	8.73	94.15	2,489.78	2,489.78
50	1,003.81	282	21.97	140.71	3,431.12	2,942.71	246	17.19	113.67	2,523.20	2,523.20
52	1,003.81	282	21.99	140.74	3,482.65	3,138.32	28	12.40	103.61	2,184.09	2,184.09
54	1,003.81	282	22.00	140.76	3,725.30	4,337.71	246	3.40	81.85	2,477.27	2,477.27
56	3,003.81	246	16.29	111.60	2,471.39	4,729.35	246	0.11	74.26	2,471.75	2,471.39
58	3,003.81	246	16.46	111.98	2,489.65	4,674.16	246	1.36	77.14	2,489.99	2,489.65
60	3,003.81	246	16.81	112.79	2,530.58	4,482.47	246	4.30	83.91	2,530.88	2,530.58
62	1,003.81	282	21.98	140.72	3,464.39	4,427.72	246	4.83	85.14	2,530.95	2,530.95
64	3,277.80	246	16.95	113.12	2,821.42	4,657.01	246	5.53	86.76	2,821.43	2,821.42
66	3,003.81	28	16.76	113.67	2,494.39	4,217.97	28	7.29	91.81	2,494.82	2,494.39
68	3,003.81	28	16.41	112.87	2,453.14	4,097.97	28	7.71	92.79	2,453.62	2,453.14
70	3,003.81	28	16.19	112.36	2,428.44	4,052.64	28	7.73	92.83	2,428.95	2,428.44
72	1,003.81	282	21.98	140.73	3,466.91	2,122.83	74	20.04	56.26	2,124.24	2,124.24
74	1,003.81	282	21.98	140.73	3,466.91	1,563.03	74	20.02	56.21	1,563.60	1,563.60
76	1,003.81	282	21.99	140.75	3,498.18	4,103.54	28	1.02	77.35	2,115.06	2,115.06
78	1,003.81	282	21.98	140.74	3,481.88	3,984.69	28	5.03	86.60	2,238.10	2,238.10
80	1,003.81	282	21.99	140.75	3,498.18	3,214.55	28	10.67	99.63	2,115.06	2,115.06
84	1,003.81	282	21.99	140.76	3,532.94	2,812.50	28	-0.70	73.39	1,422.00	1,422.00
86	1,003.81	276	21.08	313.64		3,513.15	156	-1.55	66.41	2,303.69	2,303.69
88	3,003.81	246	18.89	117.59	2,810.06	4,176.02	246	11.00	99.38	2,810.27	2,810.06
90	1,003.81	282	21.93	140.60	3,057.13	3,168.05	246	17.89	115.30	2,810.56	2,810.56
92	3,011.70	276	19.85	310.80	2,931.82	4,142.79	246	13.12	104.29	2,995.64	2,931.82
94	1,003.81	94	14.22	52.81	918.97	918.47	94	20.01	66.18	918.59	918.59
96	1,003.81	282	21.88	140.51	2,799.27	3,293.49	282	19.25	134.42	2,799.79	2,799.27
98	1,003.81	282	21.87	140.47	2,721.01	3,394.65	282	18.91	133.65	2,721.31	2,721.01
100	1,003.81	282	21.85	140.43	2,649.04	1,907.89	100	20.04	96.24	1,909.83	1,909.83
102	1,003.81	282	21.85	140.42	2,622.99	2,708.30	282	19.87	135.86	2,625.44	2,622.99
104	1,003.81	282	21.86	140.44	2,661.97	3,227.08	282	19.08	134.04	2,664.50	2,661.97
106	1,003.81	282	21.86	140.44	2,661.97	3,045.86	282	19.39	134.75	2,664.50	2,661.97
108	1,003.81	282	21.84	140.41	2,608.28	3,389.22	282	18.66	133.06	2,610.57	2,608.28
110	1,003.81	282	21.79	140.28	2,407.74	4,393.94	282	15.60	125.99	2,408.81	2,407.74
112	1,003.81	282	21.87	140.48	2,726.82	2,787.11	282	19.91	135.95	2,726.93	2,726.82
114	1,003.81	282	21.93	140.61	2,983.97	2,282.14	114	20.05	106.28	2,286.42	2,286.42
116	1,003.81	282	22.05	140.88	3,859.47	1,571.02	116	20.02	106.21	1,572.40	1,572.40
118	1,003.81	282	22.07	140.94	4,133.06	4,354.38	28	17.19	114.67	3,701.17	3,701.17
124	1,003.81	282	22.20	141.23	7,589.34	2,826.70	236	9.17	71.15	2,216.77	2,216.77
134	1,002.57	144	16.13	287.24	830.15	990.65	144	16.42	287.90	830.17	830.15
136	1,002.57	144	16.13	287.24	830.15	954.81	144	17.26	289.85	830.17	830.15
138	1,002.57	144	16.13	287.24	830.15	1,099.77	144	13.70	281.61	830.17	830.15
142	1,002.57	144	16.13	287.24	830.15	829.85	270	19.01	304.88	746.88	746.88
144	1,002.57	144	4.29	259.91	587.95	587.88	144	20.00	296.17	588.00	587.95
146	1,002.57	270	16.70	299.53	746.78	783.68	276	19.45	309.90	714.38	714.38
148	1,002.57	270	16.70	299.53	746.78	867.06	270	18.54	303.80	746.88	746.78
150	1,002.57	270	14.83	295.21	665.77	1,517.53	270	3.76	269.67	665.91	665.77
152	1,002.57	270	14.83	295.21	665.77	951.64	270	15.72	297.27	665.91	665.77

ID	Total Demand (gpm)	Critical Node 1 ID	Critical Node 1 Pressure (psi)	Critical Node 1 Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow @Hydrant (gpm)	Critical Node 2 ID	Critical Node 2 Pressure (psi)	Critcal Node 2 Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
154	1,003.81	156	-1.19	67.25	565.73	815.77	156	9.17	91.16	566.16	565.73
156	1,003.81	156	-40.29	-22.99	372.90	372.88	156	20.00	116.16	372.90	372.90
180	1,002.57	276	18.29	307.20	780.10	1,053.92	276	17.84	306.18	780.22	780.10
182	1,002.57	276	19.58	310.18	931.97	1,766.99	276	13.53	296.22	931.91	931.91
202	1,002.57	144	16.13	287.24	830.15	1,122.05	144	13.11	280.26	830.17	830.15
206	1,003.81	236	15.84	86.56	899.69	982.58	236	16.72	88.59	899.70	899.69
210	1,003.81	210	5.97	23.78	838.06	837.99	210	20.01	56.17	838.08	838.06
216	1,003.81	220	6.50	24.99	842.86	842.88	220	20.00	56.16	842.87	842.86
218	1,003.81	282	21.91	140.57	2,948.24	2,260.13	218	20.05	71.27	2,262.22	2,262.22
220	1,003.81	220	-81.58	-178.28	484.27	484.31	220	20.00	56.16	484.32	484.27
222	1,003.81	220	-47.21	-98.95	565.23	565.27	220	20.00	56.16	565.29	565.23
224	1,003.21	276	23.19	318.51		1,316.56	268	20.02	71.20	1,317.03	1,317.03
226	1,003.21	276	23.19	318.51		1,635.87	268	20.03	71.22	1,636.77	1,636.77
228	1,003.21	276	23.19	318.51		2,567.69	268	20.06	71.31	2,571.15	2,571.15
242	1,003.81	236	21.63	99.91	1,054.44	1,255.51	236	12.91	79.79	1,054.45	1,054.44
248	1,002.57	276	17.48	305.33	714.18	1,258.94	276	14.68	298.88	714.38	714.18
250	1,002.57	276	21.47	314.56	1,438.16	1,736.76	276	18.76	308.29	1,438.53	1,438.16
252	1,002.57	276	21.47	314.56	1,438.16	1,738.32	276	18.75	308.28	1,438.53	1,438.16
256	1,003.81	256	-49.29	96.25	612.95	612.88	256	20.00	256.17	612.91	612.91
264	1,003.81	256	-49.29	96.25	612.95	809.69	256	-10.83	185.01	612.91	612.91
266	1,002.57	276	21.47	314.56	1,438.16	1,794.24	250	16.13	357.23	1,764.55	1,438.16
280	1,000.00	276	18.20	306.99	769.03	1,022.10	276	18.00	306.55	769.18	769.03
282	1,000.00	282	21.58	139.79	1,933.96	1,916.76	282	20.04	136.24	1,934.09	1,933.96

2030 Fire Flow with Improvements

ID	Total Demand (gpm)	Critical Node 1 ID	Critical Node 1 Pressure (psi)	Critical Node 1 Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow @Hydrant (gpm)	Critical Node 2 ID	Critical Node 2 Pressure (psi)	Critcal Node 2 Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
10	1,003.81	282	23.05	143.19	5,698.62	3,080.30	244	1.89	64.35	2,035.59	2,035.59
12	3,003.81	276	20.15	311.50	3,072.25	5,968.83	246	3.21	81.41	3,426.94	3,072.25
14	1,003.81	282	23.04	143.17	5,254.82	4,376.92	114	7.54	77.39	3,195.83	3,195.83
16	1,003.81	282	23.04	143.17	5,382.90	2,530.00	16	20.06	66.30	2,532.62	2,532.62
18	1,003.81	282	23.06	143.21	5,622.25	4,828.83	114	11.44	86.40	3,817.13	3,817.13
20	1,003.81	282	23.09	143.28	6,505.46	6,939.94	26	9.94	92.93	4,897.81	4,897.81
22	1,003.81	282	23.10	143.31	6,798.61	2,911.31	26	14.67	103.86	2,371.99	2,371.99
24	1,003.81	282	23.10	143.31	6,841.52	3,649.25	26	3.81	78.80	2,271.77	2,271.77
26	1,003.81	282	23.11	143.33	7,023.59	2,000.90	26	20.04	116.25	2,004.61	2,004.61
28	1,003.81	282	23.12	143.37	7,845.38	1,772.49	28	20.03	121.23	1,775.64	1,775.64
30	1,003.81	282	23.10	143.30	6,709.38	3,797.45	26	7.30	86.85	2,539.40	2,539.40
32	1,003.81	282	23.08	143.27	6,404.61	6,772.32	26	8.00	88.46	4,561.23	4,561.23
34	1,003.81	282	23.06	143.22	5,941.37	3,744.66	276	18.69	308.13	3,168.98	3,168.98
36	1,003.81	282	23.07	143.24	6,127.55	3,187.11	36	20.10	66.39	3,192.40	3,192.40
38	1,003.81	282	23.05	143.21	5,850.90	4,144.20	246	16.32	111.67	3,475.06	3,475.06
40	3,003.81	276	19.81	310.72	2,922.14	6,093.90	246	-0.04	73.90	3,285.68	2,922.14
42	1,003.81	282	23.05	143.20	5,824.17	4,403.28	246	2.59	79.97	2,523.82	2,523.82
44	1,003.81	282	23.05	143.21	5,875.64	4,551.75	246	-5.36	61.63	2,271.88	2,271.88
46	3,003.81	276	19.61	310.27	2,845.00	5,960.78	246	1.31	77.03	3,298.93	2,845.00
48	1,003.81	282	23.05	143.21	5,865.99	4,678.28	246	12.79	103.51	3,447.38	3,447.38
50	1,003.81	282	23.06	143.21	5,895.27	3,266.09	276	19.51	310.03	3,051.52	3,051.52
52	1,003.81	282	23.07	143.25	6,208.90	3,805.11	276	19.75	310.58	3,671.42	3,671.42
54	1,003.81	276	22.93	317.93	2,186.53	5,332.65	270	3.72	269.57	2,350.51	2,186.53
56	3,003.81	276	19.48	309.96	2,794.30	6,071.80	246	1.80	78.17	3,393.55	2,794.30
58	3,003.81	276	19.63	310.30	2,850.33	5,961.89	246	3.41	81.86	3,442.27	2,850.33
60	3,003.81	276	19.89	310.90	2,955.50	5,642.15	246	7.28	90.80	3,559.37	2,955.50
62	1,003.81	282	23.06	143.22	5,978.48	5,406.99	246	8.94	94.63	3,559.40	3,559.40
64	3,277.80	276	20.00	311.17	3,281.88	5,776.60	246	8.88	94.49	3,890.28	3,281.88
66	3,003.81	276	20.23	311.70	3,112.96	5,288.48	246	11.46	100.45	3,736.96	3,112.96
68	3,003.81	276	20.42	312.14	3,209.16	5,151.37	246	13.18	104.42	3,843.38	3,209.16
70	3,003.81	276	20.51	312.34	3,258.54	5,109.75	246	13.83	105.92	3,897.14	3,258.54
72	1,003.81	282	23.07	143.23	6,091.44	2,286.42	74	20.05	56.28	2,288.14	2,288.14
74	1,003.81	282	23.07	143.23	6,093.54	1,641.11	74	20.03	56.22	1,641.75	1,641.75
76	1,003.81	282	23.07	143.25	6,198.81	5,369.97	246	14.62	107.74	4,210.38	4,210.38
78	1,003.81	282	23.07	143.24	6,141.45	5,114.65	246	14.85	108.27	4,046.80	4,046.80
80	1,003.81	282	23.07	143.25	6,198.81	3,573.84	276	19.97	311.09	3,558.33	3,558.33
84	1,003.81	282	23.09	143.29	6,584.01	4,214.05	26	9.90	92.84	2,991.34	2,991.34
86	1,003.81	276	21.14	313.79	1,309.90	4,328.63	270	-3.13	253.77	1,428.21	1,309.90
88	3,003.81	276	21.03	313.53	3,582.29	4,995.79	246	15.27	109.23	4,012.85	3,582.29
90	1,003.81	282	23.00	143.09	4,834.31	3,537.84	276	20.08	311.35	3,583.59	3,583.59
92	3,011.70	276	21.42	314.43	3,902.74	5,016.00	96	15.30	85.32	4,472.98	3,902.74
94	1,003.81	282	23.06	143.22	6,312.22	1,713.35	94	20.03	66.22	1,714.18	1,714.18
96	1,003.81	282	22.95	142.97	4,120.61	3,855.55	96	20.15	96.50	3,871.50	3,871.50
98	1,003.81	282	22.93	142.92	3,922.20	3,908.72	282	20.02	136.20	3,922.02	3,922.02
100	1,003.81	282	22.91	142.88	3,771.26	2,024.18	100	20.04	96.25	2,026.37	2,026.37
102	1,003.81	282	22.91	142.86	3,708.19	2,980.85	102	20.09	101.36	2,988.77	2,988.77
104	1,003.81	282	22.92	142.89	3,788.72	3,682.50	106	20.14	101.47	3,697.59	3,697.59
106	1,003.81	282	22.92	142.89	3,788.72	3,438.20	106	20.12	101.43	3,450.55	3,450.55
108	1,003.81	282	22.90	142.85	3,669.86	3,846.71	282	19.72	135.50	3,670.07	3,669.86
110	1,003.81	282	22.83	142.70	3,266.70	4,836.33	282	16.68	128.50	3,269.06	3,266.70
112	1,003.81	282	23.00	143.09	4,694.27	2,436.03	114	19.37	104.70	2,385.40	2,385.40
114	1,003.81	282	23.01	143.10	4,776.48	2,249.52	114	20.05	106.27	2,253.36	2,253.36
116	1,003.81	282	23.09	143.29	6,530.17	1,662.32	116	20.03	106.22	1,663.85	1,663.85
118	1,003.81	282	23.11	143.34	7,378.43	5,127.10	118	20.26	101.76	5,168.01	5,168.01
124	1,003.81	282	23.14	143.41	9,116.42	4,541.15	28	7.09	91.36	2,841.27	2,841.27
134	1,002.57	144	16.13	287.24	830.15	990.65	144	16.42	287.90	830.17	830.15
136	1,002.57	144	16.13	287.24	830.15	954.81	144	17.26	289.84	830.17	830.15
138	1,002.57	144	16.13	287.24	830.15	1,099.77	144	13.70	281.61	830.17	830.15
142	1,002.57	144	16.13	287.24	830.15	829.85	270	19.01	304.88	746.88	746.88
144	1,002.57	144	4.29	259.91	587.95	587.88	144	20.00	296.17	588.00	587.95
146	1,002.57	270	16.70	299.53	746.78	783.68	276	19.45	309.90	714.38	714.38
148	1,002.57	270	16.70	299.53	746.78	867.06	270	18.54	303.80	746.88	746.78
150	1,002.57	270	14.83	295.21	665.77	1,517.53	270	3.76	269.67	665.91	665.77
152	1,002.57	270	14.83	295.21	665.77	951.63	270	15.72	297.27	665.91	665.77

ID	Total Demand (gpm)	Critical Node 1 ID	Critical Node 1 Pressure (psi)	Critical Node 1 Head (ft)	Adjusted Fire-Flow (gpm)	Available Flow @Hydrant (gpm)	Critical Node 2 ID	Critical Node 2 Pressure (psi)	Critcal Node 2 Head (ft)	Adjusted Available Flow (gpm)	Design Flow (gpm)
154	1,003.81	270	18.50	303.71	829.89	1,631.97	270	12.19	289.14	829.30	829.30
156	1,003.81	152	7.48	172.26	861.41	1,583.56	152	-13.55	123.72	861.39	861.39
180	1,002.57	276	18.29	307.20	780.10	1,053.92	276	17.84	306.18	780.22	780.10
182	1,002.57	276	19.58	310.18	931.97	1,767.00	276	13.53	296.22	931.91	931.91
202	1,002.57	144	16.13	287.24	830.15	1,122.05	144	13.11	280.26	830.17	830.15
206	1,003.81	282	23.10	143.32	9,073.51	1,517.74	206	20.02	66.21	1,518.65	1,518.65
210	1,003.81	282	23.11	143.34	9,632.46	1,102.98	210	20.01	56.19	1,103.32	1,103.32
216	1,003.81	282	23.13	143.37	10,113.99	1,291.74	216	20.02	56.20	1,292.22	1,292.22
218	1,003.81	282	23.01	143.11	4,865.26	2,906.96	218	20.08	71.35	2,911.26	2,911.26
220	1,003.81	220	22.68	62.34	1,116.60	1,116.12	220	20.01	56.19	1,116.62	1,116.60
222	1,003.81	222	19.95	56.04	1,003.07	1,002.00	222	20.01	56.18	1,002.30	1,002.30
224	1,003.21	276	23.19	318.51		1,316.56	268	20.02	71.20	1,317.03	1,317.03
226	1,003.21	276	23.19	318.51		1,635.87	268	20.03	71.22	1,636.77	1,636.77
228	1,003.21	276	23.19	318.51		2,567.69	268	20.06	71.31	2,571.15	2,571.15
242	1,003.81	282	23.11	143.34	8,553.73	1,698.76	242	20.03	61.22	1,699.52	1,699.52
248	1,002.57	276	17.48	305.33	714.18	1,258.94	276	14.68	298.88	714.38	714.18
250	1,002.57	276	21.47	314.56	1,438.16	1,736.76	276	18.76	308.29	1,438.52	1,438.16
252	1,002.57	276	21.47	314.56	1,438.16	1,738.32	276	18.75	308.28	1,438.52	1,438.16
256	1,003.81	256	-45.93	103.99	627.35	627.28	256	20.00	256.17	627.31	627.31
264	1,003.81	256	-45.93	103.99	627.35	823.67	256	-10.70	185.30	627.31	627.31
266	1,002.57	276	21.47	314.56	1,438.16	1,794.24	250	16.13	357.23	1,764.55	1,438.16
280	1,000.00	276	18.20	306.99	769.03	1,022.10	276	18.00	306.55	769.18	769.03
282	1,000.00	282	22.61	142.18	2,505.17	2,479.28	282	20.06	136.30	2,505.67	2,505.17

PACIFIC OCEAN

N

0 1,750 3,500 7,000 Feet

LOOP 100

STATE RT 101

STATE RT 101/ALT

CHINOOK VALLEY RD

WALLBURG RD

STRINGTOWN RD

ROBERT GRAY DR

CHINOOK DIKE RD

FIRST AVE N

SPRUCE ST

WTP

101

LEGEND:

- JUNCTION
- BPS
- PRV
- RESERVOIR
- WATER LINES
- WATER SERVICE AREA
- ILWACO CITY LIMITS
- WATER BODY
- PARCELS

CITY OF ILWACO

NODE MAP

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\Ilwaco\10565 Water System Plan Update\GIS\NODE_MAP.mxd

APPENDIX F

WATER USE EFFICIENCY INFORMATION

AWWA WLCC Free Water Audit Software: Reporting Worksheet

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WAS v4.2

Back to Instructions

? Click to access definition

Water Audit Report for: City of Ilwaco
Reporting Year: 2010 (1/2010 - 12/2010)

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

WATER SUPPLIED

<< Enter grading in column 'E'

Volume from own sources:	?	8	128.835	Million gallons (US)/yr (MG/Yr)
Master meter error adjustment (enter positive value):	?	n/a		MG/Yr
Water imported:	?	8	0.098	MG/Yr
Water exported:	?	n/a	0.000	MG/Yr
WATER SUPPLIED:			128.933	MG/Yr

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

					Pcnt:	Value:
Billed metered:	?	8	76.050	MG/Yr		
Billed unmetered:	?	n/a	0.000	MG/Yr		
Unbilled metered:	?	5	3.414	MG/Yr		
Unbilled unmetered:	?		1.612	MG/Yr	1.25%	
AUTHORIZED CONSUMPTION:	?		81.076	MG/Yr		

Default option selected for Unbilled unmetered - a grading of 5 is applied but not displayed

Use buttons to select percentage of water supplied **OR** value

WATER LOSSES (Water Supplied - Authorized Consumption)			47.857	MG/Yr

Apparent Losses

					Pcnt:	Value:
Unauthorized consumption:	?		0.322	MG/Yr	0.25%	
Customer metering inaccuracies:	?	5	4.182	MG/Yr	5.00%	
Systematic data handling errors:	?	4	0.001	MG/Yr		
Apparent Losses:	?		4.506			

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

? Choose this option to enter a percentage of billed metered consumption. This is NOT a default value

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses:	?		43.351	MG/Yr
WATER LOSSES:			47.857	MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER:	?		52.883	MG/Yr

= Total Water Loss + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	?	5	16.4	miles	
Number of active AND inactive service connections:	?	8	698		
Connection density:			43	conn./mile main	
Average length of customer service line:	?	1	30.0	ft	(pipe length between curbstop and customer meter or property boundary)
Average operating pressure:	?	4	54.9	psi	

COST DATA

Total annual cost of operating water system:	?	7	$500,000	$/Year
Customer retail unit cost (applied to Apparent Losses):	?	6	$1.89	$/100 cubic feet (ccf)
Variable production cost (applied to Real Losses):	?	5	$600.00	$/Million gallons

PERFORMANCE INDICATORS

Financial Indicators

Non-revenue water as percent by volume of Water Supplied:	41.0%
Non-revenue water as percent by cost of operating system:	8.1%
Annual cost of Apparent Losses:	$11,384
Annual cost of Real Losses:	$26,011

Operational Efficiency Indicators

Apparent Losses per service connection per day:	17.69	gallons/connection/day
Real Losses per service connection per day*:	170.16	gallons/connection/day
Real Losses per length of main per day*:	N/A	
Real Losses per service connection per day per psi pressure:	3.10	gallons/connection/day/psi
? Unavoidable Annual Real Losses (UARL):	Not Valid	

*** UARL cannot be calculated as either average pressure, number of connecions or length of mains is too small: SEE UARL DEFINITION ***

From Above, Real Losses = Current Annual Real Losses (CARL):	43.35	
? Infrastructure Leakage Index (ILI) [CARL/UARL]:		

* only the most applicable of these two indicators will be calculated

WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 65 out of 100 *****

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Volume from own sources
2: Unbilled metered
3: Customer metering inaccuracies

For more information, click here to see the Grading Matrix worksheet

AWWA WLCC Free Water Audit Software: Water Balance

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Water Audit Report For:	Report Yr:
City of Ilwaco	2010

	Water Exported 0.000	Billed Water Exported			
Own Sources (Adjusted for known errors) 128.835	Water Supplied 128.933	Authorized Consumption 81.076	Billed Authorized Consumption 76.050	Billed Metered Consumption (inc. water exported) 76.050	Revenue Water 76.050
				Billed Unmetered Consumption 0.000	
			Unbilled Authorized Consumption 5.026	Unbilled Metered Consumption 3.414	Non-Revenue Water (NRW) 52.883
				Unbilled Unmetered Consumption 1.612	
		Water Losses 47.857	Apparent Losses 4.506	Unauthorized Consumption 0.322	
				Customer Metering Inaccuracies 4.182	
				Systematic Data Handling Errors 0.001	
Water Imported 0.098			Real Losses 43.351	Leakage on Transmission and/or Distribution Mains Not broken down	
				Leakage and Overflows at Utility's Storage Tanks Not broken down	
				Leakage on Service Connections Not broken down	

AWWA WLCC Free Water Audit Software: Grading Matrix

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Back to Instructions

In the Reporting Worksheet, grades were assigned to each component of the audit to describe the confidence and accuracy of the input data. The grading assigned to each audit component and the corresponding recommended improvements and actions are highlighted in yellow. Audit accuracy is likely to be improved by prioritizing those items shown in red

Grading

	n/a	1	2	3	4	5	6	7	8	9	10
Volume from own sources:	Select this grading only if the water utility purchases/imports all of its water resources (i.e. has no sources of its own)	Less than 25% of water production sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of treated water production sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of treated water production sources are metered, other sources estimated. Occasional meter accuracy testing	Conditions between 4 and 6	At least 75% of treated water production sources are metered, or at least 90% of the source flow is derived from metered sources. Meter accuracy testing and/or electronic calibration conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of treated water production sources are metered, meter accuracy testing and electronic calibration conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of treated water production sources are metered, meter accuracy testing and electronic calibration conducted semi-annually, with less than 10% found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Volume from own Sources" component:		to qualify for 2: Organize efforts to begin to collect data for determining volume from own sources	to qualify for 4: Locate all water production sources on maps and in field, launch meter accuracy testing for existing meters, begin to install meters on unmetered water production sources and replace any obsolete/defective meters		to qualify for 6: Formalize annual meter accuracy testing for all source meters. Complete installation of meters on unmetered water production sources and complete replacement of all obsolete/defective meters.		to qualify for 8: Conduct annual meter accuracy testing on all meters. Complete project to install new, or replace defective existing, meters so that entire production meter population is metered. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 6% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Master meter error adjustment:	Select n/a only if the water utility fails to have meters on its sources of supply, either its own source, and/or imported (purchased) water sources	Inventory information on meters and paper records of measured volumes in crude condition; data error cannot be determined	No automatic datalogging of production volumes; daily readings are scribed on paper records. Tank/storage elevation changes are not employed in calculating "Volume from own sources" component. Data is adjusted only when grossly evident data error occurs.	Conditions between 2 and 4	Production meter data is logged automatically in electronic format and reviewed at least on a monthly basis. "Volume from own sources" tabulations include estimate of daily changes in tanks/storage facilities. Meter data is adjusted when gross data errors occur, or occasional meter testing deems this necessary.	Conditions between 4 and 6	Hourly production meter data logged automatically & reviewed on at least a weekly basis. Data adjusted to correct gross error from equipment malfunction and error confirmed by meter accuracy testing. Tank/storage facility elevation changes are automatically used in calculating a balanced "Volume from own sources" component.	Conditions between 6 and 8	Continuous production meter data logged automatically & reviewed daily. Data adjusted to correct gross error from equipment malfunction & results of meter accuracy testing. Tank/storage facility elevation changes are automatically used in "Volume from own sources" tabulations.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically balances flows from all sources and storages; results reviewed daily. Mass balance technique compares production meter data to raw (untreated) water and treatment volumes to detect anomalies. Regular calibrations between SCADA and sources meters ensures minimal data transfer error.
Improvements to attain higher data grading for "Master meter error adjustment" component:		to qualify for 2: Develop plan to restructure recordkeeping system to capture all flow data; set procedure to review data daily to detect input errors	to qualify for 4: Install automatic datalogging equipment on production meters. Identify tanks/storage facilities and include estimated daily volume of water added to, or subtracted from, "Water Supplied" volume based upon changes in storage		to qualify for 6: Review hourly production meter data for gross error on, at least, a weekly basis. Begin to install instrumentation on tanks/storage facilities to record elevation changes. Use daily net storage change to balance flows in calculating "Water Supplied" volume.		to qualify for 8: Complete installation of elevation instrumentation on all tanks/storage facilities. Continue to use daily net storage change in calculating balanced "Volume from own sources" component. Adjust production meter data for gross error and inaccuracy confirmed by testing.		to qualify for 10: Link all production and tank/storage facility elevation change data to a Supervisory Control & Data Acquisition (SCADA) System, or similar computerized monitoring/control system, and establish automatic flow balancing algorithm and regularly calibrate between SCADA and source meters.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters. Continue to replace or repair meters as they perform outside of desired accuracy limits.
Water Imported:	Select n/a if the water utility's supply is exclusively from its own water resources (no bulk purchased/ imported water)	Less than 25% of imported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of imported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of imported water sources are metered, other sources estimated. Occasional meter accuracy testing	Conditions between 4 and 6	At least 75% of imported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of imported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of imported water sources are metered, meter accuracy testing and/or electronic calibration conducted semi-annually, with less than 10% found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Imported Volume" component:		to qualify for 2: Review bulk water purchase agreements with partner suppliers; confirm requirements for use and maintenance of accurate metering. Identify needs for new or replacement meters with goal to meter all imported water sources.	To qualify for 4: Locate all imported water sources on maps and in field, launch meter accuracy testing for existing meters, begin to install meters on unmetered imported water interconnections and replace obsolete/defective meters		to qualify for 6: Formalize annual meter accuracy testing for all imported water meters. Continue installation of meters on unmetered exported water interconnections and replacement of obsolete/defective meters.		to qualify for 8: Complete project to install new, or replace defective, meters on all imported water interconnections. Maintain annual meter accuracy testing for all imported water meters. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 6% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.

Grading											
	n/a	1	2	3	4	5	6	7	8	9	10
Water Exported:	Select n/a if the water utility sells no bulk water to neighboring water utilities (no exported water sales)	Less than 25% of exported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of exported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of exported water sources are metered, other sources estimated. Occasional meter accuracy testing	Conditions between 4 and 6	At least 75% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted semi-annually, with less than 10% found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Exported Volume" component:		to qualify for 2: Review bulk water sales agreements with partner suppliers; confirm requirements for use & upkeep of accurate metering. Identify needs to install new, or replace defective meters as needed.	To qualify for 4: Locate all exported water sources on maps and in field, launch meter accuracy testing for existing meters, begin to install meters on unmetered exported water interconnections and replace obsolete/defective meters		to qualify for 6: Formalize annual meter accuracy testing for all exported water meters. Continue installation of meters on unmetered exported water interconnections and replacement of obsolete/defective meters.		to qualify for 8: Complete project to install new, or replace defective, meters on all exported water interconnections. Maintain annual meter accuracy testing for all imported water meters. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 6% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
AUTHORIZED CONSUMPTION											
Billed metered:	n/a (not applicable). Select n/a only if the entire customer population is not metered and is billed for water service on a flat or fixed rate basis. In such a case the volume entered must be zero.	Less than 50% of customers with volume-based billings from meter readings; flat or fixed rate billed for the majority of the customer population	At least 50% of customers with volume-based billing from meter reads; flat rate billed for others. Manual meter reading, under 50% read success rate, remainder estimated. Limited meter records, no regular meter testing or replacement. Billing data maintained on paper records, with no auditing.	Conditions between 2 and 4	At least 75% of customers with volume-based billing from meter reads; flat or fixed rate billed for remainder. Manual meter reading used, at least 50% meter read success rate, failed reads are estimated. Purchase records verify age of customer meters; only very limited meter accuracy testing is conducted. Customer meters replaced only upon complete failure. Computerized billing records, but only periodic internal auditing conducted.	Conditions between 4 and 6	At least 90% of customers with volume-based billing from meter reads; remaining accounts are estimated. Manual customer meter reading gives at least 80% customer meter reading success rate, failed reads are estimated. Good customer meter records, limited meter accuracy testing, regular replacement of oldest meters. Computerized billing records with routine auditing of global statistics.	Conditions between 6 and 8	At least 97% of customers with volume-based billing from meter reads. At least 90% customer meter read success rate; or minimum 80% read success rate with planning and budgeting for trials of Automatic Metering Reading (AMR) in one or more pilot areas. Good customer meter records. Regular meter accuracy testing guides replacement of statistically significant number of meters each year. Routine auditing of computerized billing records for global and detailed statistics; verified periodically by third party.	Conditions between 8 and 10	At least 99% of customers with volume-based billing from meter reads. At least 95% customer meter reading success rate; or minimum 80% meter reading success rate, with Automatic Meter Reading (AMR) trials underway. Statistically significant customer meter testing and replacement program in place. Computerized billing with routine, detailed auditing, including field investigation of representative sample of accounts. Annual audit verification by third party.
Improvements to attain higher data grading for "Billed Metered Consumption" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	to qualify for 2: Conduct investigations or trials of customer meters to select appropriate meter models. Budget funding for meter installations. Investigate volume based water rate structures.	to qualify for 4: Purchase and install meters on unmetered accounts. Implement policies to improve meter reading success. Catalog meter information during meter read visits to identify age/model of existing meters. Test a minimal number of meters for accuracy. Install computerized billing system.		to qualify for 6: Purchase and install meters on unmetered accounts. Eliminate flat fee billing and establish appropriate water rate structure based upon measured consumption. Continue to achieve verifiable success in removing manual meter reading barriers. Expand meter accuracy testing. Launch regular meter replacement program. Conduct routine audit of global statistics.		to qualify for 8: Purchase and install meters on unmetered accounts. Assess cost-effectiveness of Automatic Meter Reading (AMR) system for portion or entire system; or achieve ongoing improvements in manual meter reading success rate. Refine meter accuracy testing program. Set meter replacement goals based upon accuracy test results. Refine routine auditing procedures based upon third party guidance.		to qualify for 10: Purchase and install meters on unmetered accounts. Launch Automatic Meter Reading (AMR) system trials if manual meter reading success rate of at least 95% is not achieved within a five-year program. Continue meter accuracy testing program. Conduct planning and budgeting for large scale meter replacement based upon meter life cycle analysis using cumulative flow target. Continue routine auditing and require annual third party review.		to maintain 10: Regular internal and third party auditing, and meter accuracy testing ensures that accurate customer meter readings are obtained and entered as the basis for volume based billing. Stay abreast of improvements in Advanced Metering Infrastructure (AMI) and information management. Plan and budget for justified upgrades in metering, meter reading and billing data management.
Billed unmetered:	Select n/a if it is the policy of the water utility to meter all customer connections and it has been confirmed by detailed auditing that all customers do indeed have a water meter; i.e. no unmetered accounts exist	Water utility policy does not require customer metering; flat or fixed fee billed. No data collected on customer consumption. Only estimates available are derived from data estimation methods using average fixture count multiplied by number of connections, or similar approach.	Water utility policy does not require customer metering; flat or fixed fee billed. Some metered accounts exist in parts of the system (pilot areas or District Metered Areas) with consumption recorded on portable dataloggers. Data from these sample meters are used to infer consumption for the total customer population. Site specific estimation methods are used for unusual buildings/water uses.	Conditions between 2 and 4	Water utility policy does require metering and volume based billing but lacks written procedures and employs casual oversight, resulting in up to 20% of billed accounts believed to be unmetered. A rough estimate of the annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 4 and 6	Water utility policy does require metering and volume based billing but exemption exist for a portion of accounts such as municipal buildings. As many as 15% of billed accounts are unmetered due to this exemption or meter installation difficulties. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 6 and 8	Water utility policy requires metering and volume based billing for all customer accounts. However, less than 5% of billed accounts remain unmetered because because installation is hindered by unusual circumstances. The goal is to minimize the number of unmetered accounts. Reliable estimates of consumption are obtained for unmetered accounts via site specific estimation methods.	Conditions between 8 and 10	Water utility policy requires metering and volume based billing for all customer accounts. Less than 2% of billed accounts are unmetered and exist because meter installation is hindered by unusual circumstances. The goal exists to minimize the number of unmetered accounts to the extent that is economical. Reliable estimates of consumption are obtained at these accounts via site specific estimation methods.

Grading											
	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Billed Unmetered Consumption" component:		to qualify for 2: Investigate a new water utility policy to require metering of the customer population, and a reduction of unmetered accounts. Conduct pilot metering project by installing water meters in small sample of customer accounts and datalogging the water consumption.	to qualify for 4: Implement a new water utility policy requiring customer metering. Expand pilot metering study to include several different meter types, which will provide data for economic assessment of full scale metering options. Assess sites with access difficulties to devise means to obtain water consumption volumes.		to qualify for 6: Budget for staff resources to review billing records to identify unmetered properties. Specify metering needs and funding requirements to install sufficient meters to significant reduce the number of unmetered accounts		to qualify for 8: Install customer meters on a full scale basis. Refine metering policy and procedures to ensure that all accounts, including municipal properties, are designated for meters. Implement procedures to obtain reliable consumption estimate for unmetered accounts awaiting meter installation.		to qualify for 10: Continue customer meter installation throughout the service area, with a goal to minimize unmetered accounts. Sustain the effort to investigate accounts with access difficulties to devise means to install water meters or otherwise measure water consumption.		to maintain 10: Continue to refine estimation methods for unmetered consumption and explore means to establish metering, for as many billed unmetered accounts as is economically feasible.
Unbilled metered:	select n/a if all billing-exempt consumption is unmetered.	Billing practices exempt certain accounts, such as municipal buildings, but written policies do not exist; and a reliable count of unbilled metered accounts is unavailable. Meter upkeep and meter reading on these accounts is rare and not considered a priority. Due to poor recordkeeping and lack of auditing, water consumption for all such accounts is purely guesstimated.	Billing practices exempt certain accounts, such as municipal buildings, but only scattered, dated written directives exist to justify this practice. A reliable count of unbilled metered accounts is unavailable. Sporadic meter replacement and meter reading occurs on an as-needed basis. The total annual water consumption for all unbilled, metered accounts is estimated based upon approximating the number of accounts and assigning consumption from actively billed accounts of same meter size.	Conditions between 2 and 4	Dated written procedures permit billing exemption for specific accounts, such as municipal properties, but are unclear regarding certain other types of accounts. Meter reading is given low priority and is sporadic. Consumption is quantified from meter readings where available. The total number of unbilled, unmetered accounts must be estimated along with consumption volumes.	Conditions between 4 and 6	Written policies regarding billing exemptions exist but adherence in practice is questionable. Metering and meter reading for municipal buildings is reliable but sporadic for other unbilled metered accounts. Periodic auditing of such accounts is conducted. Water consumption is quantified directly from meter readings where available, but the majority of the consumption is estimated.	Conditions between 6 and 8	Written policy identifies the types of accounts granted a billing exemption. Customer meter management and meter reading are considered secondary priorities, but meter reading is conducted at least annually to obtain consumption volumes for the annual water audit. High level auditing of billing records ensures that a reliable census of such accounts exists.	Conditions between 8 and 10	Clearly written policy identifies the types of accounts given a billing exemption, with emphasis on keeping such accounts to a minimum. Customer meter management and meter reading for these accounts is given proper priority and is reliably conducted. Regular auditing confirms this. Total water consumption for these accounts is taken from reliable readings from accurate meters.
Improvements to attain higher data grading for "Unbilled metered Consumption" component:		to qualify for 2: Reassess the water utility's policy allowing certain accounts to be granted a billing exemption. Draft an outline of a new written policy for billing exemptions, with clear justification as to why any accounts should be exempt from billing, and with the intention to keep the number of such accounts to a minimum.	to qualify for 4: Review historic written directives and policy documents allowing certain accounts to be billing-exempt. Draft an outline of a written policy for billing exemptions, identify criteria that grants an exemption, with a goal of keeping this number of accounts to a minimum.		to qualify for 6: Draft a new written policy regarding billing exemptions based upon consensus criteria allowing this occurrence. Assign resources to audit meter records and billing records to obtain census of unbilled metered accounts.		to qualify for 8: Communicate billing exemption policy throughout the organization and implement procedures that ensure proper account management. Conduct inspections of accounts confirmed in unbilled metered status and verify that accurate meters exist and are scheduled for routine meter readings.		to qualify for 10: Ensure that meter management (meter accuracy testing, meter replacement) and meter reading activities are accorded the same priority as billed accounts. Establish ongoing annual auditing process to ensure that water consumption is reliably collected and provided to the annual water audit process.		to maintain 10: Reassess philosophy in allowing any water uses to go "unbilled". It is possible to meter and bill all accounts, even if the fee charged for water consumption is discounted or waived. Metering and billing all accounts ensures that water consumption is tracked and water waste from plumbing leaks is detected and minimized.
Unbilled unmetered:		Extent of unbilled, unmetered consumption is unknown due to unclear policies and poor recordkeeping. Total consumption is quantified based upon a purely subjective estimate.	Clear extent of unbilled, unmetered consumption is unknown, but a number of events are randomly documented each year, confirming existence of such consumption, but without sufficient documentation to quantify an accurate estimate of the annual volume consumed.	Conditions between 2 and 4	Extent of unbilled, unmetered consumption is partially known, and procedures exist to document certain events such as miscellaneous fire hydrant uses. Formulae is used to quantify the consumption from such events (time running x typical flowrate x number of events).	Default value of 1.25% of system input volume is employed	Coherent policies exist for some forms of unbilled, unmetered consumption but others await closer evaluation. Reasonable recordkeeping for the managed uses exists and allows for annual volumes to be quantified by inference, but unsupervised uses are guesstimated.	Conditions between 6 and 8	Clear policies and good recordkeeping exist for some uses (ex: unmetered fire connections registering consumption), but other uses (ex: miscellaneous uses of fire hydrants) have limited oversight. Total consumption is a mix of well quantified use such as from formulae (time x typical flow) or temporary meters, and relatively subjective estimates of less regulated use.	Conditions between 8 and 10	Clear policies exist to identify permitted use of water in unbilled, unmetered fashion, with the intention of minimizing this type of consumption. Good records document each occurrence and consumption is quantified via formulae (time x typical flow) or use of temporary meters.

Grading											
	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Unbilled Unmetered Consumption" component:		to qualify for 5: Utilize accepted default value of 1.25% of system input volume as an expedient means to gain a reasonable quantification of this use. to qualify for 2: Establish a policy regarding what water uses should be allowed as unbilled and unmetered. Consider tracking a small sample of one such use (ex: fire hydrant flushings).	to qualify for 5: Utilize accepted default value of 1.25% of system input volume as an expedient means to gain a reasonable quantification of this use. to qualify for 4: Evaluate the documentation of events that have been observed. Meet with user groups (ex: for fire hydrants - fire departments, contractors to ascertain their need for water from fire hydrants).		to qualify for 5: Utilize accepted default value of 1.25% of system input volume as expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process.	to qualify for 6 or greater: Finalize policy and do field checks. Proceed if top-down audit exists and/or a great volume of such use is suspected.	to qualify for 8: Assess water utility policy and procedures to ensure that fire hydrant permits are issued for use by persons outside of the utility. Create written procedures for use and documentation of fire hydrants by water utility personnel.		to qualify for 10: Refine written procedures to ensure that all uses of unbilled, unmetered water are overseen by a structured permitting process managed by water utility personnel. Reassess policy to determine if some of these uses have value in being converted to billed and/or metered status.		to maintain 10: Continue to refine policy and procedures with intention of reducing the number of allowable uses of water in unbilled and unmetered fashion. Any uses that can feasibly become billed and metered should be converted eventually.
APPARENT LOSSES											
Unauthorized consumption:		Extent of unauthorized consumption is unknown due to unclear policies and poor recordkeeping. Total unauthorized consumption is guesstimated.	Unauthorized consumption is a known occurrence, but its extent is a mystery. There are no requirements to document observed events, but periodic field reports capture some of these occurrences. Total unauthorized consumption is approximated from this limited data.	conditions between 2 and 4	Procedures exist to document some unauthorized consumption such as observed unauthorized fire hydrant openings. Use formulae to quantify this consumption (time running x typical flowrate x number of events).	Default value of 0.25% of system input volume is employed	Coherent policies exist for some forms of unauthorized consumption but others await closer evaluation. Reasonable surveillance and recordkeeping exist for occurrences that fall under the policy. Volumes quantified by inference from these records. Unsupervised uses are guesstimated.	Conditions between 6 and 8	Clear policies and good recordkeeping exist for certain events (ex: tampering with water meters); other occurrences have limited oversight. Total consumption is a combination of volumes from formulae (time x typical flow) and subjective estimates of unconfirmed consumption.	Conditions between 8 and 10	Clear policies exist to identify all known unauthorized uses of water. Staff and procedures exist to provide enforcement of policies and detect violations. Each occurrence is quantified via formulae (time x typical flow) or similar methods.
Improvements to attain higher data grading for "Unauthorized Consumption" component:		to qualify for 5: Use accepted default of 0.25% of system input volume. to qualify for 2: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)	to qualify for 5: Use accepted default of 0.25% of system input volume to qualify for 4: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)		to qualify for 5: Utilize accepted default value of 0.25% of system input volume as expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process.	to qualify for 6 or greater: Finalize policy and do field checks. Proceed if top-down audit exists and/or a great volume of such use is suspected.	to quality for 8: Assess water utility policies to ensure that all known occurrences of unauthorized consumption are outlawed, and that appropriate penalties are prescribed. Create written procedures for use and documentation of various occurrences of unauthorized consumption as they are uncovered.		to qualify for 10: Refine written procedures and assign staff to seek out likely occurrences of unauthorized consumption. Explore new locking devices, monitors and other technologies designed to detect and thwart unauthorized consumption.		to maintain 10: Continue to refine policy and procedures to eliminate any loopholes that allow or tacitly encourage unauthorized consumption. Continue to be vigilant in documentation and enforcement efforts.
Customer metering inaccuracies:	select n/a only if the entire customer population is unmetered. In such a case the volume entered must be zero.	Customer meters exist, but with unorganized paper records on meters; no meter accuracy testing or meter replacement program. Workflow is driven chaotically by customer complaints with no proactive management. Loss volume due to aggregate meter inaccuracy is guesstimated.	Poor recordkeeping and meter oversight is recognized by water utility management who has allotted staff and funding resources to organize improved recordkeeping and start meter accuracy testing. Existing paper records gathered and organized to provide cursory disposition of meter population.	Conditions between 2 and 4	Reliable recordkeeping exists; meter information is improving as meters are replaced. Meter accuracy testing is conducted annually for a small number of meters. Limited number of oldest meters replaced each year. Inaccuracy volume is largely an estimate, but refined based upon limited testing data.	Conditions between 4 and 6	A reliable electronic recordkeeping system for meters exists. Population includes a mix of new high performing meters and dated meters with suspect accuracy. Routine, but limited, meter accuracy testing and meter replacement occur. Inaccuracy volume is quantified using a mix of reliable and less certain data.	Conditions between 6 and 8	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Testing is conducted on samples of meters at varying lifespans to determine optimum replacement time for various types of meters.	Conditions between 8 and 10	Good records of number, type and size of customer meters; ongoing meter replacement occurs. Regular meter accuracy testing gives reliable measure of composite inaccuracy volume for the system. New metering technology is embraced to keep overall accuracy improving.
Improvements to attain higher data grading for "Customer meter inaccuracy volume" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	to qualify for 2: Gather available meter purchase records. Conduct testing on a small number of meters believed to be the most inaccurate. Review staffing needs of metering group and budget for necessary resources to better organize meter management.	to qualify for 4: Implement a reliable record keeping system for customer meter histories, preferably using electronic methods typically linked to, or part of, the Customer Billing System or Customer Information System. Expand meter accuracy testing to a larger group of meters.		to qualify for 6: Standardize procedures for meter recordkeeping with the electronic information system. Accelerate meter accuracy testing and meter replacements guided by testing results.		to qualify for 8: Expand annual meter accuracy testing to evaluate a statistically significant number of meter makes/models. Expand meter replacement program to replace statistically significant number of poor performing meters each year.		to qualify for 10: Continue efforts to manage meter population with reliable recordkeeping, meter testing and replacement. Evaluate new meter types and install one or more types in 5-10 customer accounts each year in order to pilot improving metering technology.		to maintain 10: Increase the number of meters tested and replaced as justified by meter accuracy test data. Continually monitor development of new technology in Advanced Metering Infrastructure (AMI) to grasp opportunities for greater accuracy in metering and customer consumption data.

Grading											
	n/a	1	2	3	4	5	6	7	8	9	10
Systematic Data Handling Error:	Note: all water utilities incur some amount of this error. Even in water utilities with unmetered customer populations and fixed rate billing, errors occur in annual billing tabulations. Enter a positive value for the volume and select a grading.	Vague policy for permitting (creating new customer accounts) and billing. Billing data maintained on paper records which are in disarray. No audits conducted to confirm billing data handling efficiency. Unknown number of customers escape routine billing due to lack of billing process oversight.	Policy for permitting and billing exists but needs refinement. Billing data maintained on paper records or insufficiently capable electronic database. Only periodic unstructured auditing work conducted to confirm billing data handling efficiency. Volume of unbilled water due to billing lapses is a guess.	Conditions between 2 and 4	Policy and procedures for permitting and billing exist but needs refinement. Computerized billing system exists, but is dated or lacks needed functionality. Periodic, limited internal audits conducted and confirm with approximate accuracy the consumption volumes lost to billing lapses.	Conditions between 4 and 6	Policy for permitting and billing is adequate and reviewed periodically. Computerized billing system in use with basic reporting available. Any effect of billing adjustments on measured consumption volumes is well understood. Internal checks of billing data error conducted annually. Reasonably accurate quantification of consumption volume lost to billing lapses is obtained.	Conditions between 6 and 8	Permitting and billing policy reviewed at least biannually. Computerized billing system includes an array of reports to confirm billing data and system functionality. Annual internal checks conducted with periodic third party audit. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year.	Conditions between 8 and 10	Sound policy exists for permitting of all customer billing accounts. Robust computerized billing system gives high functionality and reporting capabilities. Assessment of policy and data handling errors conducted internally and audited by third party annually, ensuring consumption lost to billing lapses is minimized and detected as it occurs.
Improvements to attain higher data grading for "Systematic Data Handling Error volume" component:		to qualify for 2: Draft written policy for permitting and billing. Investigate and budget for computerized customer billing system. Conduct initial audit of billing records by flow-charting the basic business processes of the customer account/billing function.	to qualify for 4: Finalize written policy for permitting and billing. Implement a computerized customer billing system. Conduct initial audit of billing records as part of this process.		to qualify for 6: Refine permitting and billing procedures and ensure consistency with the utility policy regarding billing, and minimize opportunity for missed billings. Upgrade or replace customer billing system for needed functionality - ensure that billing adjustments don't corrupt the value of consumption volumes. Procedurize internal annual audit process.		to qualify for 8: Formalize regular review of permitting and billing practices. Enhance reporting capability of computerized billing system. Formalize regular auditing process to reveal scope of data handling error.		to qualify for 10: Close policy/procedure loopholes that allow some customer accounts to go unbilled, or data handling errors to exist. Ensure that internal and third party audits are conducted annually.		to maintain 10: Stay abreast of customer information management developments and innovations. Monitor developments of Advanced Metering Infrastructure (AMI) and integrate technology to ensure that customer endpoint information is well-monitored and errors/lapses are at an economic minimum.
SYSTEM DATA											
Length of mains:		Poorly assembled and maintained paper as-built records of existing water main installations makes accurate determination of system pipe length impossible. Length of mains is guesstimated.	Paper records in poor condition (no annual tracking of installations & abandonments). Poor procedures to ensure that new water mains installed by developers are accurately documented.	Conditions between 2 and 4	Sound policy and procedures for permitting and documenting new water main installations, but gaps in management result in a uncertain degree of error in tabulation of mains length.	Conditions between 4 and 6	Sound policy and procedures exist for permitting and commissioning new water mains. Highly accurate paper records with regular field validation; or electronic records and asset management system in good condition. Includes system backup.	Conditions between 6 and 8	Sound policy and procedures exist for permitting and commissioning new water mains. Electronic recordkeeping and asset management system are used to store and manage data.	Conditions between 8 and 10	Sound policy exists for managing water mains extensions and replacements. Geographic Information System (GIS) data and asset management database agree and random field validation proves truth of databases.
Improvements to attain higher data grading for "Length of Water Mains" component:		to qualify for 2: Assign personnel to inventory current as-built records and compare with customer billing system records and highway plans. Assemble policy documents regarding permitting and documentation of water main installations by the utility and building developers; identify gaps in procedure that result in poor documentation.	to qualify for 4: Complete inventory of paper records of water main installations & abandonments for a number of years prior to audit year. Review policy and procedures for commissioning and documenting new water main installation and abandonments.		to qualify for 6: Finalize updates/improvements to policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions.		to qualify for 8: Launch random field checks of limited number of locations. Convert to electronic databases with backup as justified.		to qualify for 10: Link Geographic Information System (GIS) and asset management databases, conduct field verification of data.		to maintain 10: Continue with standardization and random field validation to improve knowledge of system.
Number of active AND inactive service connections:		Vague permitting (of new service connections) policy and poor paper recordkeeping of customer connections/billings result in suspect determination of the number of service connections, which may be 10-15% in error from actual count.	General permitting policy exists but paper records, procedural gaps, and weak oversight result in questionable total for number of connections, which may vary 5-10% of actual count.	Conditions between 2 and 4	Permitting policy and procedures exist, but with some gaps in performance and oversight. Computerized information management system is being brought online to replace dated paper recordkeeping system. Reasonably accurate tracking of service connection installations & abandonments; but count can be up to 5% in error from actual total.	Conditions between 4 and 6	Permitting policy and procedures are adequate and reviewed periodically. Computerized information management system is in use with annual installations & abandonments totaled. Very limited field verifications and audits. Error in count of number of service connections is believed to be no more that 3%.	Conditions between 6 and 8	Permitting policy and procedures reviewed at least biannually. Well-managed computerized information management system and routine, periodic field checks and internal system audits allows counts of connections that is no more than 2% in error.	Conditions between 8 and 10	Sound permitting policy and well managed and audited procedures ensure reliable management of service connection population. Computerized information management system and Geographic Information System (GIS) information agree; field validation proves truth of databases. Count of connections believed to be in error by less than 1%.

Grading											
	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Number of Active and Inactive customer service connections" component:		to qualify for 2: Draft new policy and procedures for permitting and billing. Research and collect paper records of installations & abandonments for several years prior to audit year.	to qualify for 4: Refine policy and procedures for permitting and billing. Research computerized recordkeeping system (Customer Information System or Customer Billing System) to improve documentation format for service connections.		to qualify for 6: Refine procedures to ensure consistency with permitting policy to establish new service connections or decommission existing connections. Improve process to include all totals for at least five years prior to audit year.		to qualify for 8: Formalize regular review of permitting policy and procedures. Launch random field checks of limited number of locations. Develop reports and auditing mechanisms for computerized information management system.		to qualify for 10: Close any procedural loopholes that allow installations to go undocumented. Link computerized information management system with Geographic Information System (GIS) and formalize field inspection and information system auditing processes. Documentation of new or decommissioned service connections encounters several levels of checks and balances.		to maintain 10: Continue with standardization and random field validation to improve knowledge of system.
Average length of customer service line:	Note: if customer water meters are located outside of the customer building next to the curbstop or boundary separating utility/customer responsibility, follow the grading description for 10(a). Also see the Service Connection Diagram worksheet.	Gradings 1-9 apply if customer properties are **unmetered**, if customer meters exist and are located **inside the customer building premises, or if the water utility owns and is responsible for the entire service connection piping from the water main to the customer building**. In any of these cases the average distance between the curbstop or boundary separating utility/customer responsibility for service connection piping, and the typical first point of use (ex: faucet) or the customer meter must be quantified. Gradings of 1-9 are used to grade the validity of the means to quantify this value. (See the "Service Connection Diagram" worksheet)									Either of two conditions can be met to obtain a grading of 10: a) The customer water meter is located outside of the customer building adjacent to the curbstop or boundary separating utility/customer responsibility for the service connection piping. In this case enter a value of zero in the Reporting Worksheet with a grading of 10. b). Customer water meters are located inside customer buildings, or the properties are unmetered. In either case the distance is highly reliable since data is drawn from a Geographic Information System (GIS) and confirmed by routine field checks.
		Vague policy exists to define the delineation of water utility ownership and customer ownership of the service connection piping. Curbstops are perceived as the breakpoint but these have not been well-maintained or documented. Most are buried or obscured. Their location varies widely from site-to-site, and estimating this distance is arbitrary due to the unknown location of many curbstops.	Policy requires that the curbstop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. The piping from the water main to the curbstop is the property of the water utility; and the piping from the curbstop to the customer building is owned by the customer. Curbstop locations are not well documented and the average distance is based upon a limited number of locations measured in the field.	Conditions between 2 and 4	Good policy requires that the curbstop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. Curbstops are generally installed as needed and are reasonably documented. Their location varies widely from site-to-site, and an estimate of this distance is hindered by the availability of paper records.	Conditions between 4 and 6	Clear policy exists to define utility/customer responsibility for service connection piping. Accurate, well-maintained paper or basic electronic recordkeeping system exists. Periodic field checks confirm piping lengths for a sample of customer properties.	Conditions between 6 and 8	Clearly worded policy standardizes the location of curbstops and meters, which are inspected upon installation. Accurate and well maintained electronic records exist with periodic field checks to confirm locations of service lines, curbstops and customer meter pits. An accurate number of customer properties from the customer billing system allows for reliable averaging of this length.	Conditions between 8 and 10	
Improvements to attain higher data grading for "Average Length of Customer Service Line" component:		to qualify for 2: Research and collect paper records of service line installations. Inspect several sites in the field using pipe locators to locate curbstops. Obtain the length of this small sample of connections in this manner.	to qualify for 4: Formalize and communicate policy delineating utility/customer responsibilities for service connection piping. Assess accuracy of paper records by field inspection of a small sample of service connections using pipe locators as needed. Research the potential migration to a computerized information management system to store service connection data.		to qualify for 6: Establish coherent procedures to ensure that policy for curbstop, meter installation and documentation is followed. Gain consensus within the water utility for the establishment of a computerized information management system.		to qualify for 8: Implement an electronic means of recordkeeping, typically via a customer information system or customer billing system. Standardize the process to conduct field checks of limited number of locations.		to qualify for 10: Link customer information management system and Geographic Information System (GIS), standardize process for field verification of data.		to maintain 10: Continue with standardization and random field validation to improve knowledge of system.
Average operating pressure:		Available records are poorly assembled and maintained paper records of supply pump characteristics and water distribution system operating conditions. Average pressure is guesstimated based upon this information and ground elevations from crude topographical maps. Widely varying distribution system pressures due to undulating terrain, high system head loss and weak/erratic pressure controls further compromise the validity of the average pressure calculation.	Limited telemetry monitoring of scattered sites provides some static pressure data, which is recorded in handwritten logbooks. Pressure data is gathered at individual sites only when low pressure complaints arise. Average pressure is determined by averaging relatively crude data, and is affected by significant variation in ground elevations, system head loss and gaps in pressure controls in the distribution system.	Conditions between 2 and 4	Effective pressure controls separate different pressure zones; moderate pressure variation across the system, occasional open boundary valves are discovered that breech pressure zones. Basic telemetry monitoring of the distribution system logs pressure data electronically. Pressure data gathered by gauges or dataloggers at fire hydrants or buildings when low pressure complaints arise, and during fire flow tests and system flushing. Reliable topographical data exists. Average pressure is calculated using this mix of data.	Conditions between 4 and 6	Reliable pressure controls separate distinct pressure zones; only very occasional open boundary valves are encountered that breech pressure zones. Well-covered telemetry monitoring of the distribution system logs extensive pressure data electronically. Pressure gathered by gauges/dataloggers at fire hydrants and buildings when low pressure complaints arise, and during fire flow tests and system flushing. Average pressure is determined by using this mix of reliable data.	Conditions between 6 and 8	Well-managed, discrete pressure zones exist with generally predictable pressure fluctuations. A current full-scale SCADA System exists to monitor the water distribution system and collect data, including real time pressure readings at representative sites across the system. The average system pressure is determined from reliable SCADA System data.	Conditions between 8 and 10	Well-managed pressure districts/zones, SCADA System and hydraulic model exist to give very precise pressure data across the water distribution system. Average system pressure is reliably calculated from extensive, reliable, and cross-checked data.

Grading											
	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Average Operating Pressure" component:		to qualify for 2: Employ pressure gauging and/or datalogging equipment to obtain pressure measurements from fire hydrants. Locate accurate topographical maps of service area in order to confirm ground elevations. Research pump data sheets to find pump pressure/flow characteristics	to qualify for 4: Formalize a procedure to use pressure gauging/datalogging equipment to gather pressure data during various system events such as low pressure complaints, or operational testing. Gather pump pressure and flow data at different flow regimes. Identify faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) and plan to properly configure pressure zones. Make all pressure data from these efforts available to generate system-wide average pressure.		to qualify for 6: Expand the use of pressure gauging/datalogging equipment to gather scattered pressure data at a representative set of sites, based upon pressure zones or areas. Utilize pump pressure and flow data to determine supply head entering each pressure zone or district. Correct any faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) to ensure properly configured pressure zones. Use expanded pressure dataset from these activities to generate system-wide average pressure.		to qualify for 8: Install a Supervisory Control and Data Acquisition (SCADA) System to monitor system parameters and control operations. Set regular calibration schedule for instrumentation to insure data accuracy. Obtain accurate topographical data and utilize pressure data gathered from field surveys to provide extensive, reliable data for pressure averaging.		to qualify for 10: Obtain average pressure data from hydraulic model of the distribution system that has been calibrated via field measurements in the water distribution system and confirmed in comparisons with SCADA System data.		to maintain 10: Continue to refine the hydraulic model of the distribution system and consider linking it with SCADA System for real-time pressure data calibration, and averaging.

Grading											
	n/a	1	2	3	4	5	6	7	8	9	10
COST DATA											
Total annual cost of operating water system:		Incomplete paper records and lack of documentation on many operating functions making calculation of water system operating costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to estimate the major portion of water system operating costs.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. Gaps in data known to exist, periodic internal reviews conducted but not a structured audit.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited periodically by utility personnel, not a Certified Public Accountant (CPA).	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited at least annually by utility personnel, and periodically by third-party CPA.	Conditions between 8 and 10	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited annually by utility personnel and by third-party CPA.
Improvements to attain higher data grading for "Total Annual Cost of Operating the Water System" component:		to qualify for 2: Gather available records, institute new procedures to regularly collect and audit basic cost data of most important operations functions.	to qualify for 4: Implement an electronic cost accounting system, structured according to accounting standards for water utilities		to qualify for 6: Establish process for periodic internal audit of water system operating costs; identify cost data gaps and institute procedures for tracking these outstanding costs.		to qualify for 8: Standardize the process to conduct routine financial audit on an annual basis.		to qualify for 10: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		to maintain 10: Maintain program, stay abreast of expenses subject to erratic cost changes and budget/track costs proactively
Customer retail unit cost (applied to Apparent Losses):		Antiquated, cumbersome water rate structure is use, with periodic historic amendments that were poorly documented and implemented; resulting in classes of customers being billed inconsistent charges. The actual composite billing rate likely differs significantly from the published water rate structure, but a lack of auditing leaves the degree of error indeterminate.	Dated, cumbersome water rate structure, not always employed consistently in actual billing operations. The actual composite billing rate is known to differ from the published water rate structure, and a reasonably accurate estimate of the degree of error is determined, allowing a composite billing rate to be quantified.	Conditions between 2 and 4	Straight-forward water rate structure in use, but not updated in several years. Billing operations reliably employ the rate structure. The composite billing rate is derived from a single customer class such as residential customer accounts, neglecting the effect of different rates from varying customer classes.	Customer population unmetered. Fixed fee charged; single composite number derived from multiple customer classes.	Clearly written, up-to-date water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average residential rate using volumes of water in each rate block.	Conditions between 6 and 8	Effective water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average composite consumption rate, including residential, commercial, industrial and any other customer classes within the water rate structure.	Conditions between 8 and 10	Third party reviewed weighted average composite consumption rate (includes residential, commercial, industrial, etc.)
Improvements to attain higher data grading for "Customer Retail Unit Cost" component:		to qualify for 2: Formalize the process to implement water rates, including a secure documentation procedure. Create a current, formal water rate document and gain approval from all stakeholders.	to qualify for 4: Review the water rate structure and update/formalize as needed. Assess billing operations to ensure that actual billing operations incorporate the established water rate structure.		to qualify for 6: Evaluate volume of water used in each usage block by residential users. Multiply volumes by full rate structure.	Meter customers and charge rates based upon water volumes	to qualify for 8: Evaluate volume of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		to qualify for 10: Conduct a periodic third-party audit of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		to maintain 10: Keep water rate structure current in addressing the water utility's revenue needs. Update the calculation of the customer unit rate as new rate components, customer classes, or other components are modified.
Variable production cost (applied to Real Losses):	Note: if the water utility purchases/imports its entire water supply, then enter the unit purchase cost of the bulk water supply in the Reporting Worksheet with a grading of 10	Incomplete paper records and lack of documentation on primary operating functions (electric power and treatment costs most importantly) makes calculation of variable production costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to roughly estimate the basic operations costs (pumping power costs and treatment costs) and calculate a unit variable production cost.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. Electric power and treatment costs are reliably tracked and allow accurate calculation of unit variable production costs based on these two inputs only. All costs are audited internally on a periodic basis.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Pertinent additional costs beyond power and treatment (ex: liability, residuals management, etc.) are included in the unit variable production cost. Data audited at least annually by utility personnel.	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent variable production costs tracked. Data audited at least annually by utility personnel, and periodically by third-party.	Conditions between 8 and 10	Either of two conditions can be met to obtain a grading of 10: 1) Third party CPA audit of all primary and secondary cost components on an annual basis. or: 2) Water supply is entirely purchased as bulk imported water, and unit purchase cost serves as the variable production cost.
Improvements to attain higher data grading for "Variable Production Cost" component:		to qualify for 2: Gather available records, institute new procedures to regularly collect and audit basic cost data and most important operations functions.	to qualify for 4: Implement an electronic cost accounting system, structured according to accounting standards for water utilities		to qualify for 6: Formalize process for regular internal audits of production costs. Assess whether additional costs (liability, residuals management, etc.) should be included to calculate a more accurate variable production cost.		to qualify for 8: Formalize the accounting process to include primary cost components (power, treatment) as well as secondary components (liability, residuals management, etc.) Conduct periodic third-party audits.		to qualify for 10: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		to maintain 10: Maintain program, stay abreast of expenses subject to erratic cost changes and budget/track costs proactively

Annual Water Use Efficiency Performance Report Form

You must submit this report by email.
Save the completed form with your water system's name and email it to WUE@doh.wa.gov by July 1.

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

General Water System Information:

System Name: City of Ilwaco

System ID #: 355002

County: Pacific

Your Name: Nancy E. Lockett

Your Title: Engineer

Your email address: nlockett@g-o.com

Your Phone Number: (206) 284-0860 Enter without dashes. Example: 3601234567

Today's Date: 07/23/09 Enter as mm/dd/yy. Example: 01/01/09

Who should we contact if we have questions about this report?

Name: Randy Lavold

Phone Number: (360) 642-3357 Enter without dashes. Example: 3601234567

Meter Installation Information:

Is your water system fully metered? Yes **If Yes, continue to next page.**

If not fully metered:
Current status of meter installation:

Describe efforts to minimize leakage:

Production, Authorized Consumption, and Distribution System Leakage Information:

Reporting Year: 2008

12-Month WUE Reporting Period:

06/30/08 to 06/30/09 Enter as mm/dd/yy. Example: 07/01/08

Incomplete or missing data for the year? No

If yes, explain:

Distribution System Leakage Summary:	
Total Water Produced and Purchased (TP) – Annual Volume	13,602,674 gallons
Authorized Consumption (AC) – Annual Volume	9,585,487 gallons
Distribution System Leakage – Annual Volume **TP - AC**	4,017,187 gallons
Distribution System Leakage – Percent **DSL = [(TP - AC) / TP] x 100**	29.5 %

Goal Setting Information:

Date of Most Recent Public Forum: _____ Enter as mm/dd/yy. Example: 10/01/08

Goals must be established through a public process.

Has goal been changed since last annual WUE report? No

Each goal must identify the measurable water savings that will be achieved at a specific time in the future. Identify all water saving goals established by elected governing board.

WUE Goals:

Supply Side Goal (if applicable):

Supply and demand side goals discussed in 2003 City of Ilwaco Water System Plan.
City will test and calibrate source meter at the water treatment plant annually.

Demand Side Goal (required):

1.Replace service meters with electronic read meters. Goal to replace 100 meters per year.
2. Complete water audit survey to determine number and size of water connections.
3. Conservation goal of 5% decrease in demand by 2013.
4. Reduce lost and accounted for water to less than 15% by 2006.

*Date of most recent public forum is unknown

☐ I don't have this information

Describe Progress in Reaching Goals:

- Estimate how much water you have saved.
- Report progress toward meeting goals within your established timeframe.
- Identify any WUE measures you are currently implementing.

Supply Side Goal Progress:

City tests and calibrates source meter at the water treatment plant annually. This is not a water saving measure, however, accurate production information allows accurate accounting of lost and unaccounted for water.

Demand Side Goal Progress:

1. The City has completed replacement of approximately 50% of the service meters. Remaining meters will be replaced as funds become available.
2. The City has completed a water audit of all commercial and residential accounts. The City will review the audit to verify that all customers currently receiving water are charged appropriately.
3. Water sales decreased by 8.9% from 2007 to 2008 indicating conservation by the consumers. The City will continue to inform the consumers about opportunities to conserve water through bill inserts and the annual water report to increase consumer conservation.

Additional Information Regarding Supply and Demand Side WUE Efforts

- If you established a goal to maintain a historic level (such as maintaining daily consumption at 65 gallons per person per day), you must explain why you are unable to reduce water use below that level.
- Include any other information that describes how you and your customers use water efficiently.

(Continued from previous page)
4. The City has not been able to meet the goal of reducing lost and accounted for water to 15%. The City will continue to identify and repair leaks in the distribution system and at the two wood reservoirs. Replacement of the remaining service meters and verifying that all customers are metered and accounted for will allow the City to maintain accurate sales records. The City tracks the amount of water produced and sold every two months which allows any large increase in the amount of lost and unaccounted for water to be identified.

The City will continue to implement the conservation program outlined in the 2003 Water System Plan. The program consists of:

+ Program Promotion
+ Source and Service Meter Testing
+ Service Meter Replacement
+ Leak Detection Program
+ Customer Assistance

For more information, visit our Web at http://www.doh.wa.gov/ehp/dw/programs/wuc.htm or contact a regional planner:

Eastern Regional Office—Spokane—Main Office: (509) 456-3115
Southwest Regional Office—Tumwater—Main Office: (360) 236-3030
Northwest Regional Office—Kent—Main Office: (253) 395-6750

The Department of Health is an equal opportunity agency. For persons with disabilities, this document is available on request in other formats. To submit a request, please call 1-800-525-0127 (TTY 1-800-833-6388).

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Date Submitted: 10/10/2010

Water Use Efficiency
Annual Performance Report - 2009

WS Name: ILWACO WATER DEPARTMENT, CITY OF Water System ID# : 35500 WS County: PACIFIC

Report submitted by: *Daryl Gardner*

Meter Installation Information:

Is your water system fully metered? *Yes*

If not fully metered - Current status of meter installation:

Production, Authorized Consumption, and Distribution System Leakage Information:

12-Month WUE Reporting Period: *01/01/2009* To *12/31/2009*

Incomplete or missing data for the year? *No*

If yes, explain:

Distribution System Leakage Summary:

Total Water Produced and Purchased (TP) – Annual Volume	*71,876,000* gallons
Authorized Consumption (AC) – Annual Volume	*60,819,880* gallons
Distribution System Leakage – Annual Volume TP – AC	*11,056,120* gallons
Distribution System Leakage – Percent DSL = [(TP – AC) / TP] x 100	*15.4 %*
3-year annual average	*%*

Goal-Setting Information:

Date of Most Recent Public Forum: _____ Has goal been changed since last performance report? *No*

Note: Customer goal must be re-established every 6 years through a public process

WUE Goals:

Customer Goal (Demand Side):

1.Continue replacing service meters with electronic read meters.
2. Reduce water loss below 15%.
3. Repair leak in wood tank.

Describe Progress in Reaching Goals:

Customer (Demand Side) Goal Progress:

1. Have reduced water loss from 29.5% t0 15.4%
2. Have replaced 75% of meters.

Additional Information Regarding Supply and Demand Side WUE Efforts

Include any other information that describes how you and your customers use water efficiently:

1. Repair leak in wood tank. *2. Reduce water loss to less than 15%.*

Do not mail, fax, or email this report to DOH

WATER AUDIT PROCEDURE

FOR

LARGE WATER CONSUMERS

INTRODUCTION

This Water Audit Procedure has been developed by the Department of Environmental Protection, Division of Water Use Planning to guide large water consumers in estimating the water and energy savings that can be realized as a result of installing low flow plumbing fixtures and reducing potable water consumption. The procedure consists of four stages:

Background Information

Savings

Investment

Return on Investment

This Water Audit Procedure is intended to serve as a guide for facility management personnel who wish to conduct their own audit. By completing the calculations on the following pages, facility managers will be able to anticipate the capital and labor costs of a plumbing refit program and predict the monetary savings that will result from water conservation measures. Since water-use characteristics and the types of plumbing fixtures vary, some assumptions are necessary when working through the calculations. The Department has provided water consumption data and other information, based on past experience, that is necessary to complete the audit. However, since these assumptions will result in conservation savings figures, actual data should be incorporated wherever possible to improve the accuracy of the results.

BACKGROUND INFORMATION

Utility Rates

Facility Names: _____

Number of Users: _____

Water Utility: _____

Sewage Utility: _____

Energy Utility: _____

Water Cost per 1000 gallons: $_____/1000 gal.

Sewage Cost per 1000 gallons: $_____/1000 gal.

Cost to raise 1000 gallons 80°F: $_____/1000 gal.

BACKGROUND INFORMATION
Water Heating Energy Costs

Electricity $/kwh	Cost to Raise 1000 Gallons 80°F
0.07	13.69
0.08	15.65
0.09	17.61
0.10	19.57
0.11	21.53
0.12	23.49

Natural Gas $/mcf	Cost to Raise 1000 gallons 80°F
4.00	2.67
5.00	3.34
6.00	4.00
7.00	4.67
8.00	5.34
9.00	6.00
10.00	6.48

Fuel Oil $/gal	Cost to Raise 1000 gallons 80°F
0.50	2.40
0.60	2.89
0.70	3.36
0.80	3.84
0.90	4.32
1.00	4.80

Coal $/ton	Cost to Raise 1000 Gallons 80°F
40.00	1.03
60.00	1.54
80.00	2.06
100.00	2.57
120.00	3.08
140.00	3.60

BACKGROUND INFORMATION

Determine Plumbing Fixture Flow Rates

Showerheads and Faucets:

To obtain showerhead and faucet flowrates, measure the time necessary for the fixture with both controls open to fill a container. Compare the average of five such test results with the table below:

Time Required to Fill Container (sec)	1 Gallon	Flowrate (gal/min) ½ Gallons	Quart
60	1	0.5	0.25
30	2	1.0	0.5
20	3	1.5	0.75
15	4	2.0	1.0
12	5	2.5	1.25
10	6	3.0	1.5
8.6	7	3.5	1.75
7.5	8	4.0	2.0
6.7	9	4.5	2.25
6	10	5.0	2.5

Since measurements of toilet and urinal flush volumes are difficult to obtain, use the typical flush volumes provided on page 6. However, in all cases, use manufacturer's information if available.

BACKGROUND INFORMATION
Flow Rate Tabulation

Fixture	Number of Fixtures	Average Flow Rate/Flush Volume
Flush Tank Toilets		gal/flush
Flush Valve Toilets		gal/flush
Flush Valve Urinals		gal/flush
Bathroom Faucet		gal/flush
Showerheads		gal/min
Faucets		gal/min

SAVINGS

Water Savings

	WATER USAGE Typical or Measured		WATERUSAGE Recommended	=	WATER SAVINGS
Flush Tank Toilet (gal/flush)	3.5	or _____	1.6	=	_____
Flush Valve Toilet (gal/flush)	3.5	or _____	1.6	=	_____
Flush Valve Urinal (gal/flush)	3.5	or _____	1.0	=	_____
Shower (gal/min)	3.5	or _____	2.5	=	_____
Bathroom Faucet (gal/min)	3.5	or _____	0.5	=	_____
Kitchen Faucet (gal/min)	3.5	or _____	2.5	=	_____

*If plumbing equipment was installed prior to 1978, typical water usage may be greater than noted above.

SAVINGS

Water Savings

	Savings (gal/flush)	x	Uses (flushes/day)	=	Water Savings (gal/day)
Flush Tank Toilet		x		=	
Flush Valve Toilet		x		=	
Flush Valve Urinal		x		=	

	Savings (gal/min)	x	**Average Time Each Use (min/use)**	x	**Uses (uses/day)**	=	**Water Savings (gal/day)**
Shower		x		x		=	
Faucet		x		x		=	

Total Water Savings (gal/day) = _____

SAVINGS

Heated Water Savings

Shower Water Savings	x	60%	=	Heated Water Savings
(gal/day)	x	(0.60)	=	(gal/day)
_____	x	0		_____

Heated Water Savings: = _____
(gal/day)

SAVINGS

Total Savings

Water Cost per 1000 gal	x	Total Daily Water Savings	x	Operating Days Per Year	=	Water Savings ($ per year)
_____ x .001	x	_____	x	_____	=	_____

Sewage Cost per 1000 gal	x	Total Daily Water Savings	x	Operating Days Per Year	=	Sewage Savings ($ per year)
_____ x .001	x	_____	x	_____	=	_____

Cost to Raise 1000 gal 80°F	x	Total Daily Heated Water Savings	X	Operating Days Per Year	=	Energy Savings ($ per year)
_____ x .001	x	_____	X	_____	=	_____

Total Savings: ($ per year) = _____

INVESTMENT

Estimated Capital Costs and Labor

Water Saving Device	Typical Capital Cost ($)	Labor (hours)
Low Consumption Flush Tank Toilet	140	2.0
Low Consumption Flush Valve Toilet	180	1.0
Flush Valve Refit Kit	15	0.25
Low Flow Showerhead	15	0.25
Low Flow Aerator	10	0.25

Use actual information if available

INVESTMENT

Capital Costs and Labor Tabulation

Water Saving Device	Capital cost of Device	+	cost of Installation	x	Number of Devices	=	TOTAL COST
Low Consumption Toilet							
Flush Tank	(_____	+	_____	x	_____	=	_____
Flush Valve	_____	+	_____)	x	_____	=	_____
Flush Valve Refit Kit	(_____	+	_____)		_____	=	_____
Showerhead	(_____	+	_____)	x	_____	=	_____
Faucet Aerator	_____	+	_____)	x	_____		_____

Total Investment: = _____
($)

RETURN ON INVESTMENT

Total Investment ($)	+	Total Savings ($/year)	x	12 (months/year)	=	R.O.I. (months)
				12		
_____	+	_____	x	_____	=	_____

Return on Investment: (months) _____

WATER AUDIT WORKSHEET

For: _____ **Audit Study Period:** _____

Line	Item	Water Volume Subtotal	Water Volume Total Cumulative	Units
Task 1–Measure Supply				
1	Uncorrected total water supply to the distribution system (total of master meters)		_____	_____
2A-C	**Adjustment to total water supply**			
2A	Source meter error (+ or -)	_____		_____
2B	Change in reservoir and tank storage (+ or -)	_____		_____
2C	Other contributions or losses (+ or -)	_____		_____
3	Total adjustments to total water supply (add lines 2A, 2B, and 2C)		_____	_____
4	Adjusted total water supply to the distribution system (add line 1 and line 3)		_____	_____
Task 2–Measure Metered Use				
5	Uncorrected total metered water use	_____		_____
6	Adjustments due to meter reading lag time (+ or -)	_____		_____
7	Metered deliveries (add lines 5 and 6)		_____	_____
8A-C	**Total sales meter error and system-service meter errors (+ or -)**			
8A	Residential meter error	_____		_____
8B	Large meter error	_____		_____
8C	Total sales meter error and system-service meter errors (+ or -)		_____	_____
9	Corrected total metered water deliveries		_____	_____
10	Corrected total unmetered water (subtract line 9 from 4)		_____	_____
11A-B	**Authorized unmetered water uses**			
11A	Firefighting and firefighting training	_____		_____

*Units of measure must be consistent throughout the worksheet. The particular unite used (that is acre-feet, millions of gallons, cubic feet, cubic meters, or other unit) is left to the user.
Note: 1ac-ft = 43,560 ft^3 = 325,851 gal.

11B	Main flushing			
11C	Storm drain flushing			
11D	Sewer cleaning			
11E	Street Cleaning			
11F	School			
11G	Landscaping in large public areas			
	Parks			
	Golf courses			
	Cemeteries			
	Playgrounds			
	Highway median strips			
	Other landscaping			
11H	Decorative water facilities			
11I	Swimming pools			
11J	Construction sites			
11K	Water quality and other testing (pressure testing pipe, water quality, etc.)			
11L	Process water at treatment plants			
11M	Other unmetered uses			
12	Total authorized unmetered water (add lines 11A through 11M)			
13	Total water losses (subtract line 12 from 10)			
14A-H	**Identified water losses**			
14A	Accounting procedure errors			
14B	Illegal connections			
14C	Malfunctioning distribution system controls			
14D	Reservoir seepage and leakage			
14E	Evaporation			
14F	Reservoir overflow			

*Units of measure must be consistent throughout the worksheet. The particular unite used (that is acre-feet, millions of gallons, cubic feet, cubic meters, or other unit) is left to the user.

Note: 1ac-ft = 43,560 ft^3 = 325,851 gal.

14G	Discovered leaks	_____		_____
14H	Theft	_____		_____
15	Total identified water losses (add lines 14A through 14H)		_____	_____
16	Potential water system leakage (subtract line 15 from line 13)		_____	_____
17	Recoverable leakage (multiply line 16 by 0.75)			

Line	Item	Dollars per Unit of Volume
18A-B	**Cost savings**	
18A	Cost of water supply	$ _____
18B	Variable operation and maintenance costs	$ _____
19	Total costs per unit of recoverable leakage (add line 18A and line 18B)	$ _____

Line	Item	Dollars per Year
20	One-year benefit from recoverable leakage (multiply line 17 by line 19)	_____
21	Total benefits from recovered leakage (multiply line 20 by 2)	_____
22	Total costs of leak det4ection project	_____
23	Benefits to cost ratio (divide line 21 by line 22)	_____

Prepared by:

Name _____

Title _____ Date _____

*Units of measure must be consistent throughout the worksheet. The particular unite used (that is acre-feet, millions of gallons, cubic feet, cubic meters, or other unit) is left to the user.
Note: 1ac-ft = 43,560 ft^3 = 325,851 gal.

APPENDIX G

IMPOUNDMENT DATA

City Of Ilwaco Water Treatment Plant

Indian Creek Reservoir Level 1990

Normal Pool Elevation: 90 ft

Date	*Elevation (ft)*	*Downstream flow (cfs)*	*Operator (Initial)*	*Date*	*Elevation (ft)*	*Downstream flow (cfs)*	*Operator (Initial)*
05-Jan	90+	2.0	JM	07-Sep	84	2.0	JM
12-Jan	90+	2.0	JM	14-Sep	85	2.0	JM
20-Jan	90+	2.0	JM	21-Sep	85	2.0	JM
27-Jan	90+	2.0	JM	28-Sep	85	2.0	AH
09-Feb	90+	2.0	JM	04-Oct	85	2.0	AH
09-Feb	90+	2.0	JM	12-Oct	85	2.0	AH
16-Feb	90+	2.0	JM	19-Oct	85	2.0	JM
22-Feb	90+	2.0	JM	26-Oct	86	2.0	JM
02-Mar	90+	2.0	JM	02-Nov	86	2.0	CS
16-Mar	90+	2.0	JM	09-Nov	86	2.0	AH
22-Mar	90+	2.0	JM	16-Nov	88	2.0	CS
30-Mar	90+	2.0	JM	23-Nov	88	2.0	AH
06-Apr	90+	2.0	JM	30-Nov	88	2.0	AH
12-Apr	90+	2.0	CS	07-Dec	90+	2.0	JM
20-Apr	90+	2.0	JM	14-Dec	90+	2.0	JM
28-Apr	90+	2.0	JM	21-Dec	90+	2.0	JM
07-May	90	2.0	JM	28-Dec	90+	2.0	JM
15-May	90	2.0	JM				
29-May	90	2.0	JM				
04-Jun	90	2.0	JM				
13-Jun	90	2.0	JM				
28-Jun	89.6	2.0	CS				
05-Jul	89	2.0	JM				
20-Jul	88	2.0	JM				
31-Jul	86	2.0	JM				
06-Aug	85	2.0	JM				
16-Aug	85	2.0	JM				
31-Aug	85	2.0	JM				

City Of Ilwaco Water Treatment Plant

Indian Creek Reservoir Level 1991

Normal Pool Elevation: 90 ft

Date	Elevation (ft)	Downstream flow (cfs)	Operator (Initial)	Date	Elevation (ft)	Downstream flow (cfs)	Operator (Initial)
01-Jan	90+	2.0	JM	18-Oct	85	2.0	JM
04-Feb	90+	2.0	CS	29-Oct	85	2.0	JM
08-Mar	90+	2.0	AH	01-Nov	86	2.0	JM
10-Apr	90+	2.0	JM	07-Nov	89	2.0	AH
03-May	90+	2.0	JM	15-Nov	89	2.0	JM
07-Jun	89	2.0	JM	29-Nov	90	2.0	JM
21-Jun	88	2.0	AH	06-Dec	90+	2.0	JM
05-Jul	88	2.0	JM				
19-Jul	87	2.0	AH				
26-Jul	85	2.0	AH				
02-Aug	84	2.0	AH				
08-Aug	83	2.0	JM				
16-Aug	83	2.0	JM				
30-Aug	83	2.0	JM				
06-Sep	83	2.0	JM				
11-Sep	83	2.0	CS				
20-Sep	83	2.0	JM				
27-Sep	84	2.0	JM				
04-Oct	84	2.0	JM				

City Of Ilwaco Water Treatment Plant

Indian Creek Reservoir Level 1992

Normal Pool Elevation: 90 ft

Date	Elevation (ft)	Downstream flow (cfs)	Operator (Initial)	Date	Elevation (ft)	Downstream flow (cfs)	Operator (Initial)
03-Jan	90+	2.0	JM	10-Sep	80	2.0	JM
31-Jan	90+	2.0	AH	18-Sep	80	2.0	AH
07-Feb	90+	2.0	AH	23-Sep	80	2.0	AH
28-Feb	90+	2.0	JW	02-Oct	80	2.0	AH
13-Mar	90+	2.0	JW	08-Oct	80	2.0	AH
27-Mar	90+	2.0	AH	16-Oct	81	2.0	JW
10-Apr	90	2.0	JW	22-Oct	81	2.0	AH
08-May	88	2.0	JM	30-Oct	81	2.0	JM
29-May	87	2.0	JM	06-Nov	81	2.0	JM
05-Jun	86	2.0	JM	20-Nov	83	2.0	JM
11-Jun	86	2.0	AH	04-Dec	85	2.0	JM
19-Jun	85	2.0	JM	22-Dec	90+	2.0	JM
03-Jul	84	2.0	AH				
17-Jul	84	2.0	JM				
31-Jul	83	2.0	AH				
07-Aug	82	2.0	AH				
12-Aug	82	2.0	JW				
21-Aug	82	2.0	AH				
04-Sep	81	2.0	JM				

City Of Ilwaco Water Treatment Plant

Indian Creek Reservoir Level 1993

Normal Pool Elevation: 90 ft

Date	Elevation (ft)	Downstream flow (cfs)	Operator (Initial)	Date	Elevation (ft)	Downstream flow (cfs)	Operator (Initial)
01-Jan	90+	2.0	JM	01-Oct	82	2.0	PL
29-Jan	90+	2.0	JM	26-Oct	83	2.0	JM
04-Feb	90+	2.0	JM	03-Nov	85	2.0	JM
26-Feb	90+	2.0	JM	26-Nov	88	2.0	PL
03-Mar	90+	2.0	JM	03-Dec	89	2.0	PL
26-Mar	90+	2.0	JM	17-Dec	90+	2.0	JM
08-Apr	90+	2.0	JM	30-Dec	90+	2.0	PL
29-Apr	89	2.0	JM				
10-May	89	2.0	JM				
28-May	88	2.0	CS				
04-Jun	88	2.0	JM				
23-Jun	86	2.0	JM				
02-Jul	86	2.0	JM				
23-Jul	85	2.0	CS				
06-Aug	84	2.0	JM				
18-Aug	84	2.0	JM				
31-Aug	83	2.0	JM				
03-Sep	83	2.0	CS				
21-Sep	82	2.0	PL				

City Of Ilwaco Water Treatment Plant

Indian Creek Reservoir Level 1994

Normal Pool Elevation: 90 ft

Date	Elevation (ft)	Downstream flow (cfs)	Operator (Initial)	Date	Elevation (ft)	Downstream flow (cfs)	Operator (Initial)
07-Jan	90+	2.0	JM	05-Oct	85	2.0	JM
27-Jan	90+	2.0	PL	21-Oct	87	2.0	PL
02-Feb	90+	2.0	CS	04-Nov	90	2.0	CS
25-Feb	90+	2.0	JM	21-Nov	90+	2.0	JM
07-Mar	90+	2.0	JM	09-Dec	90+	2.0	PL
24-Mar	90+	2.0	JM	20-Dec	90+	2.0	PL
06-Apr	90+	2.0	JM				
28-Apr	90+	2.0	CS				
13-May	90+	2.0	CS				
26-May	89	2.0	CS				
03-Jun	89	2.0	PL				
22-Jun	88	2.0	PL				
05-Jul	87	2.0	PL				
20-Jul	87	2.0	JM				
05-Aug	86	2.0	JM				
22-Aug	86	2.0	JM				
01-Sep	85	2.0	JM				
16-Sep	85	2.0	CS				
29-Sep	85	2.0	JM				

APPENDIX H

COLIFORM MONITORING PLAN

Coliform Monitoring Schedule

7/13/2011

CITY OF ILWACO

System ID 35500

Sources SO2-Long Beach Intertie (emergency), SO3-Indian Creek (primary)

The City of Ilwaco is in Pacific county, Washington State. It serves a population of approximately 1,262.

The City of Ilwaco collects 2 samples from two different sites for bacteriological analysis per month. A list of six sample locations that are used as sampling points are presented below.

If any sample is found to be unsatisfactory, three repeat samples must be collected for each unsatisfactory result. The three samples must include the site of the previous sample with a coliform presence, a site within 5 active service connections upstream, and a site within 5 active service connections downstream of the site of coliform presence.

In the month following an unsatisfactory result, the City of Ilwaco must take 5 samples that month.

Sampling Locations and locations:

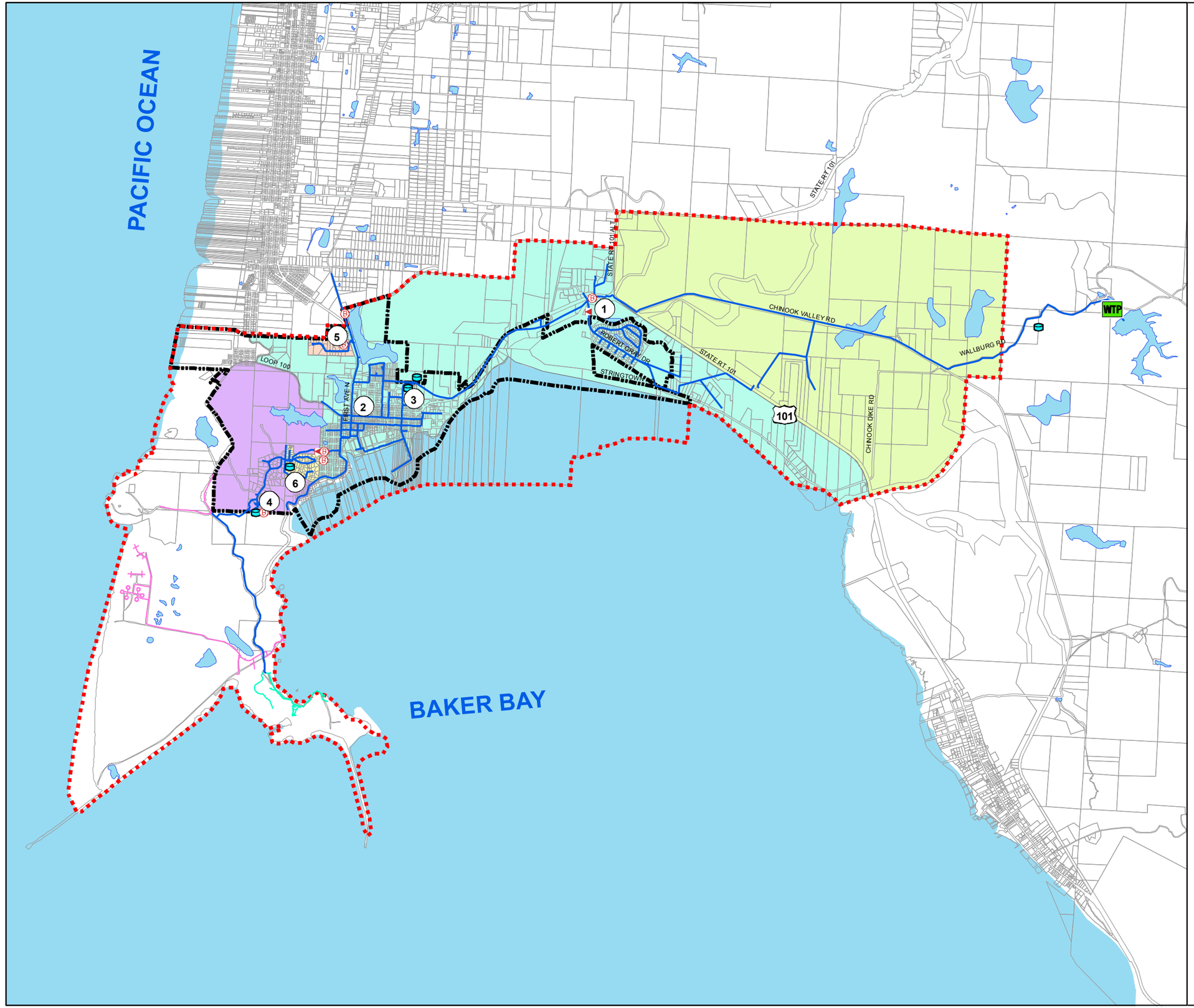
Site	Location
Sample Site #1	Stringtown Booster Pump Station
Repeat Sample 1A	3007 Foxglove
Repeat Sample 1B	431 Stringtown Rd.
Sample Site 2	City Hall
Repeat Sample 2A	109 First Ave.
Repeat Sample 2B	Community Bldg. 158 First Ave.
Sample Site 3	Steel Resv. @ 510 Weldon
Repeat Sample 3A	510 Weldon
Repeat Sample 3B	518 Weldon
Sample Site 4	Discovery Booster Pump Station
Repeat Sample 4A	3001 Discovery Heights
Repeat Sample 4B	3210/3208 Discovery Heights
Sample Site 5	Lakeview Booster Pump Station
Repeat Sample 5A	451 Lakeview Dr.
Repeat Sample 5B	605 Hwy 101 @ intertie
Sample Site 6	2142 Klahanee Dr.
Repeat Sample 6A	2150 Klahanee Dr.
Repeat Sample 6B	2103 Ilahee Pl.

The City will rotate sampling sites. Samples will be taken from the following locations:

Month 1: Sample Sites 1 and 4
Month 2: Sample Sites 2 and 5
Month 3: Sample Sites 3 and 6

Daily Population by Month

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
2,407	2,408	2,437	2,447	2,477	1,737	1,887	1,937	2,587	2,487	2,437	2,407



N

0 1,750 3,500 7,000 Feet

LEGEND:

- BPS
- PRV
- RESERVOIR
- ILWACO WATER LINES
- WASHINGTON STATE PARKS WATER LINES
- USCG WATER LINES
- WATER SERVICE AREA
- ILWACO CITY LIMITS

PRESSURE ZONES:

- CITY CENTER (157 FT)
- COASTAL RIDGE (574 FT)
- DISCOVERY HEIGHTS (339 FT)
- INDIAN CREEK (160 FT)
- LAKEVIEW ESTATES (317 FT)
- SAHALEE (275 FT)
- WATER BODY
- PARCELS
- 1 SAMPLING SITE

CITY OF ILWACO

COLIFORM MONITORING PLAN

Gray & Osborne, Inc.
CONSULTING ENGINEERS

L:\Ilwaco\10565 Water System Plan Update\GIS\COLIFORM.mxd

APPENDIX I

(RESERVED)

APPENDIX J

ANNUAL WATER QUALITY REPORT

2009 Annual Drinking Water Quality Report

Spanish (Espanola)
Este informe contiene informacion muy importante sobre la calidad de su agua beber. Traduscalo o hable con alguien que lo entienda bien.

Do I need to take special precautions?
Some people may be more vulnerable to contaminants in drinking water 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 about drinking water from their healthcare providers. EPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Water Drinking Hotline at 800-426-4791.

Where does my water come from?
Our water source is Indian Creek Reservoir, held by an earthen dam built in 1989, which is fed by Indian Creek. Our treatment process utilizes water treatment technology to remove both particulate matter and dissolved contaminates from the water before it is disinfected and pumped to the distribution system for delivery to your homes or business.

Source water assessment and its availability
The potential for contamination of our raw water supply is minimal. Because we rely upon surface water, there is a considerable amount of biodegradable matter, as well as a large amount of dissolved iron and manganese, dissolved into the water. These three raw water contaminants must be removed during the treatment process. In addition to being expensive, the removal process is difficult and demanding, requiring considerable expertise and continual attention to detail. Temperature variations and other changes in raw water conditions may create additional processing difficulties.

Why are there contaminants in my drinking water?
Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's Safe Drinking Water Hotline listed previously. The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, 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 material, and can pick up substances resulting from the presence of animals or from human activity. Microbial contaminants, such as viruses and bacteria, may come from wastewater treatment plants, septic systems, agricultural livestock operations and wildlife. Inorganic contaminants, such as salts and metals, which can be naturally occurring or result from urban storm-water runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming. Pesticides and herbicides may come from a variety of sources, such as agriculture, urban storm water runoff and residential uses. Organic chemical contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, can also come from gas stations, urban storm water runoff and septic systems. Radioactive contaminants can be naturally occurring or the result of oil and gas production and mining activities. In order to ensure that tap water is safe to drink, EPA prescribes regulations that limit the amount of certain contaminants in water provided by public water systems. Food and Drug Administration (FDA) regulations establish limits for contaminants in bottled water, which must provide the same protection for public health.

Other information
This past year has seen a substantial increase in demand for our water from homeowners and commercial interests. We recognize water is a precious commodity that we must manage very carefully and conserve wherever possible. Large leaks are immediately obvious to everyone. The small leak, repeated a hundred times throughout our community, adds up to substantial losses. Repairing these leaks, installing low-flow toilets and water displacement devices within toilet tanks, installing flow-restricting showerheads and replacing old dish and clothes washers with low water use appliances will all help our conservation efforts. Over watering lawns and gardens is wasteful, and in many cases counterproductive. This is especially true when the water simply runs off your property and into the storm drains. We ask everyone to consider these suggestions whenever possible.

Monitoring and reporting of compliance and data violations
The city ha**s** initiated an aggressive hydrant flushing program, which has cut down on the amount of dirty water complaints. The months that the city flushes are March and October, and flushing is done at night to inconvenience as few customers as possible.

The City is required to test for inorganic chemicals (I.O.C.S) and volatile organic chemicals (Vocs). We also test for microbial contaminates, such as fecal chloroforms. This past year, we also tested for asbestos, lead and copper. All the test results have been non-detectable in the samples and well below trigger level for contaminates.

For more information
If you have any questions regarding your water quality or service, please contact our Water Treatment Plant Operator at 360-777-8330. For billing and account information, contact Ilwaco City Hall at 360-642-3145. You are also invited to attend City Council meetings on the second and fourth Monday of each month at the Ilwaco Community Center located at 158 First Avenue North in Ilwaco.

Ilwacoadmin@willapabay.org
www.ilwacowashington.com
PO Box 548
Ilwaco, WA 98624

APPENDIX K

CROSS CONNECTION CONTROL

ILWACO MUNICIPAL CODE

Chapter 8.01

CROSS-CONNECTION CONTROL PROGRAM

Sections:

8.01.010 Purpose.
8.01.020 Definitions, acronyms and abbreviations.
8.01.030 Prevention of contamination.
8.01.040 Conditions for providing service.
8.01.050 Implementation of the cross-connection control program.
8.01.060 Severability.
8.01.070 Effective.

8.01.010 Purpose.

The city of Ilwaco, hereinafter referred to as the purveyor, establishes the following ordinance codified in this chapter to protect the purveyor-owned water system from the risk of contamination due to backflow through service connections to customer's water systems. For public health and safety, this policy shall apply equally to all new and existing customers. (Ord. 690 (part), 2004)

8.01.020 Definitions, acronyms and abbreviations.

AG--Air gap;
AVB--Atmospheric vacuum breaker;
AWWA--American Water Works Association;
BAT--Backflow assembly tester;
CCS--Cross-connection control specialist;
DCDA--Double check detector assembly;
DCVA--Double check valve assembly;
DOH--Washington State Department of Health;
IAPMO--International Association of Plumbing and Mechanical Officials;
PVBA--Pressure vacuum breaker assembly;
RPBA--Reduced pressure backflow assembly;
RPDA--Reduced pressure detector assembly;
SVBA--Spill resistance vacuum breaker assembly;
UPC--Uniform Plumbing Code;

WAC--Washington Administrative Code.

"Approved air gap" means a physical separation between the free-flowing end of a potable water supply pipeline and the overflow rim of an open or nonpressurized receiving vessel. To be an air gap approved by the department, the separation must be at least:

1. Twice the diameter of the supply piping measured vertically from the overflow rim of the receiving vessel, and in no case be less than one inch, when unaffected by vertical surfaces (sidewalls); and

2. Three times the diameter of the supply piping, if the horizontal distance between the supply pipe and a vertical surface (sidewall) is less than or equal to three times the diameter of the supply pipe, or if the horizontal distance between the supply pipe and intersecting vertical surfaces (sidewalls) is less than or equal to four times the diameter of the supply pipe and in no case less than one and one-half inches.

"Approved atmospheric vacuum breaker" means an AVB of make, model and size that is approved by the department. AVBs that appear on the current approved backflow prevention assemblies list developed by the University of Southern California's Foundation for Cross-Connection Control and Hydraulic Research or that are listed or approved by other nationally recognized testing agencies (such as IAPMO, ANSI, or UL) acceptable to the local administrative authority are considered approved by the department.

"Approved backflow preventer" means an approved air gap, an approved backflow prevention assembly, or an approved AVB. The terms "approved backflow preventer," "approved air gap," or "approved backflow prevention assembly" refer only to those approved backflow preventers relied upon by the purveyor for the protection of the public water system. The requirements of WAC 246-290-490 do not apply to backflow preventers installed for other purposes.

"Approved backflow prevention assembly" means an RPBA, RPDA, DCVA, DCDA, PVBA, or SVBA of make, model and size that is approved by the department. Assemblies that appear on the current approved backflow prevention assemblies list developed by the University of Southern California's Foundation for Cross-Connection Control and Hydraulic Research or other entity acceptable to the department are considered approved by the department.

"Backflow" means the undesirable reversal of flow of water or other substances through a cross-connection into the public water system or consumer's potable water system.

"Backflow assembly tester" means a person holding a valid BAT certificate issued in accordance with Chapter 246-292 of WAC.

"Backpressure" means a pressure, caused by a pump, elevated tank or piping, boiler, or other means, on the consumer's side of the services connection that is greater than the pressure provided by the public water system and which may cause backflow.

"Backsiphonage" means backflow due to a reduction in system pressure in the purveyor's distribution system and/or consumer's water system.

"Closed system" means any water system or portion of a water system in which water is transferred to a higher pressure zone closed to the atmosphere, such as when no gravity storage is present.

"Combination fire protection system" means a fire sprinkler system that:

1. Is supplied only by the purveyor's water;
2. Does not have a fire department pumper connection; and
3. Is constructed of approved potable water piping and materials that serve both the fire sprinkler system and the consumer's potable water system.

"Contaminant" means a substance present in drinking water that may adversely affect the health of the consumer or the aesthetic qualities of the water.

"Cross-connection" means any actual or potential physical connection between a public water system or the consumer's water system and any source of nonpotable liquid, solid, or gas that could contaminate the potable water supply by backflow.

"Cross-connection control program" means the administrative and technical procedures the purveyor implements to protect the public water system from contamination via cross-connections as required in WAC 246-290-490.

"Cross-connection control specialist" means a person holding a valid CCS certificate issued in accordance with Chapter 246-292 of WAC.

"Cross-connection control summary report" means the annual report that describes the status of the purveyor's cross-connection control program.

"Customer" means any person receiving water from a public water system from either the meter, or the point where the service line connects with the distribution system, if no meter is present. For purposes of cross-connection control, "consumer" means the owner or operator of a water system connected to a public water system through a service connection.

"Customer's water system" as used in WAC 246-290-490, means any potable and/or industrial water system that begins at the point of delivery from the public water system and is located on the consumer's premises. The consumer's water system includes all auxiliary sources of supply, storage, treatment, and distribution facilities, piping, plumbing, and fixtures under the control of the consumer.

"Department of Health" means the Washington State Department of Health (DOH) or health officer as identified in a joint plan of operation in accordance with WAC 246-3990-030(1).

"Down stream" means on the customer's side of the meter or service connection or on the outlet side of a backflow preventer.

"Flow-through fire protection system" means a fire sprinkler system that:

1. Is supplied only by the purveyor's water;
2. Does not have a fire department pumper connection;
3. Is constructed of approved potable water piping and materials to which sprinkler heads are attached; and
4. Terminates at a connection to a toilet or other plumbing fixture to prevent the water from becoming stagnant.

"High health cross-connection hazard" means a cross-connection, which could impair the quality of potable water and create an actual public health hazard through poisoning or spread of disease by sewage, industrial liquids or waste.

"In-premises protection" means a method of protecting the health of consumers served by the consumer's potable water system, located within the property lines of the consumer's premises by the installation of an approved air gap or backflow prevention assembly at the point of hazard, which is generally a plumbing fixture.

"Intertie" means an interconnection between public water systems permitting the exchange or delivery of water between those systems.

"Local administrative authority" means the local official, board, department, or agency authorized to administer and enforce the provisions of the Uniform Plumbing Code as adopted under Chapter 19.27 of RCW.

"Low health cross-connection hazard" means a cross-connection that could cause an impairment of the quality of potable water to a degree that does not create a hazard to the public health, but does adversely and unreasonably affect the aesthetic qualities of such potable waters for domestic use.

"Potable" means water suitable for drinking by the public.

"Premises isolation" means a method of protecting a public water system by installation of approved air gaps or approved backflow prevention assemblies at or near the service connection or alternative location acceptable to the purveyor to isolate the consumer's water system from the purveyor's distribution system.

"Public water system" is defined and referenced under WAC 246-290-020.

"Purchased source" means water purveyor purchases from a public water system not under the control of the purveyor for distribution to the purveyor's consumers.

"Purveyor" means an agency, subdivision of the state, municipal corporation, firm, company, mutual or cooperative association, institution, partnership, or person or other entity owning or operating a public water system. Purveyor also means the authorized agents of such entities.

"Reclaimed water" means effluent derived in any part from sewage from a wastewater treatment system that has been adequately and reliably treated, so that as a result of that treatment, it is suitable for beneficial use or a controlled use that would not otherwise occur, and it is no longer considered wastewater.

"Service connection" means a connection to a public water system designed to provide potable water to a single-family residence, or other residential or nonresidential population.

"Unapproved auxiliary water supply" means a water supply, other than the purveyor's water supply, on or available to the consumer's premises that is either not approved for human consumption by the health agency having jurisdiction or is not otherwise acceptable to the purveyor.

"Uniform Plumbing Code" means the code adopted under RCW 19.27.031(4) and amended under Chapter 51-46 of WAC. This code establishes statewide minimum plumbing standards applicable within the property lines of the consumer's premises.

"Up stream" means on the purveyor's side of the water meter or on the inlet side of a backflow preventer.

"Used water" means water which has left the control of the purveyor.
(Ord. 690 (part), 2004)

8.01.030 Prevention of contamination.

The customer's plumbing system, starting from the termination of the purveyor's water service pipe, shall be considered a potential high health hazard requiring the isolation of the customer's premises by a purveyor/DOH approved, customer installed and maintained reduced pressure backflow assembly (RPBA) or detector derivative (RPDA) thereof. The RPBA or RPDA shall be located at the end of the purveyor's water service pipe (i.e., at the service connection and immediately downstream of the meter). Water shall only be supplied to the customer through a purveyor and Washington State DOH approved, customer installed, and maintained, RPBA or RPDA.

Notwithstanding the aforesaid, the purveyor, upon an assessment of the risk of contamination and the degree of hazard posed by the customer's plumbing system and use of water, may allow:

A. Any customer, as a minimum, to be supplied through a purveyor/DOH approved, customer installed and maintained double check valve assembly (DCVA) or double check detector assembly (DCDA);

B. A single-family or duplex residential customer to connect directly to the water service pipe, i.e., without a purveyor/DOH approved RBPA or DCBA; and

C. Any customer, other than a single-family or duplex residential customer to connect directly to the water service pipe without a purveyor/DOH approved DCVA or RPBA; provided, that the customer signs the purveyor's water service agreement and installs and maintains backflow preventers, at the point of hazard, commensurate with the degree of hazard, as assessed by the purveyor. (Ord. 690 (part), 2004)

8.01.040 Conditions for providing service.

Water service is provided based on the following terms and limitations:

A. The customer agrees to take all measures necessary to prevent the contamination of the plumbing system within his or her premises and the purveyor's potable water system that may occur from backflow through a cross-connection. These measures shall include the preventions of backflow under any backpressure or backsiphonage condition, including the disruption of supply from the purveyor's system that may occur during routine system maintenance or during emergency conditions, such as a water main break.

B. The customer agrees to install, operate and maintain at all times his or her plumbing system in compliance with the current edition of the city of Ilwaco Plumbing Code as it pertains to:

1. The prevention of contamination; and

2. Protection from thermal expansion due to a closed system that could occur with the present or future installation of backflow preventers at the customer's service connection and/or at plumbing fixtures.

C. For cross-connection control or other public health-related surveys, the customer agrees to provide free access for the employees or agents of the purveyor to all parts of the premises during reasonable working hours of the day for routine surveys, and at all times during emergencies.

D. Where agreement for free access for the purveyor is denied, water service will only be supplied after premises isolation is provided by a purveyor/DOH approved reduced pressure backflow assembly (RPBA). All required RPBA shall be installed, tested and maintained at the owner's expense.

E. The customer agrees to install all backflow prevention assemblies requested by the purveyor, and to maintain those assemblies in good working order. The assemblies shall be the type, size and make approved by the purveyor and the department of health.

The assemblies shall be installed in accordance with the purveyor's backflow assembly installation standards and specifications.

F. The customer agrees to have all backflow prevention assemblies installed to protect the purveyor's water system:

1. To be tested upon installation, annually thereafter or when requested by the purveyor, after repair and after relocation of all RPBA or DCVA installed to protect the purveyor's distribution system;

2. To have the testing done by purveyor's approval and Washington State Department of Health's currently certified backflow assembly tester (BAT);

3. To have the RPBA or DCVA tested, following the procedures approved by the DOH; and

4. To submit to the purveyor the results of the test(s) on the purveyor supplied test report from within the time period specified by the purveyor.

G. The customer agrees to bear all costs for the aforementioned installation, testing, repair, maintenance and replacement of the RPBA or DCVA or derivative thereof installed to protect the purveyor's distribution system:

1. Plumbing plans; and/or

2. A cross-connection control survey of the premises conducted by purveyor's approval by the department of health's certified cross-connection control specialist (CCS).

The survey shall assess the cross-connection hazards and list all approved backflow preventers provided within the premises. The results of the survey shall be submitted prior to the purveyor turning on water service to a new customer. The cost of the survey shall be borne by the customer.

H. All customers, other than single-family residences, when required by the purveyor, agree to submit a cross-connection control resurvey of the premises by purveyor's approval and the department of health's certified cross-connection control specialist (CCS). The purveyor may require the resurvey to be performed in response to changes in customer's plumbing, or performed periodically, annually or less frequently, where the purveyor considers the customer's plumbing system to be complex or subject to frequent changes in water use. The cost of the resurvey shall be borne by the customer.

I. Residential customer shall agree to complete and submit to the purveyor a "Water Use Questionnaire" within thirty (30) days of a request by the purveyor, for the purpose of surveying the health hazard posed by the customer's plumbing system on the purveyor's water system. Further, the residential customer agrees to provide within thirty (30) days of a request by the purveyor a cross-connection control survey of the premises

by a purveyor's approval and the department of health's certified cross-connection control specialist (CCS).

J. The customer agrees to obtain the prior approval from the purveyor for all changes in water use and any alterations or additions to the plumbing system; and shall comply with any additional requirements imposed by the purveyor for cross-connection control.

K. The customer agrees to immediately notify the purveyor and the local health department of any backflow incident occurring within the premises (i.e., entry into the potable water of any contaminant or pollutant) and shall cooperate fully with the purveyor to determine the reason for the backflow incident.

L. The customer acknowledges the right of the purveyor to discontinue water supply within seventy-two (72) hours of giving notice, or a lesser period of time, if required to protect the public health, if:

1. The customer fails to cooperate with the purveyor in the survey of premises, or in the installation, maintenance, repair, inspection or testing of backflow prevention assemblies or air gaps required by the purveyor; or

2. It is necessary in the purveyor's effort to contain a contaminant or pollutant that is detected in the customer's system.

M. The purveyor may install a reduced pressure backflow assembly (RPBA) on the service pipe to provide premises isolation in lieu of discontinuing water service. The customer acknowledges the right of the purveyor to recover all costs associated with the installation and subsequent maintenance and repair of the assembly, appurtenances and enclosure from the customer as fees and charges for water. The failure of the customer to pay these fees and charges may result in termination of service in accordance with the purveyor's water billing policies.

N. The purveyor shall require premise isolation for a customer that falls within any category for "Mandatory Premises Isolation" established by the department of health regulations (Table 9, found in WAC 246-290-490(4)(b)).

O. The customer acknowledges his or her obligation to comply with the other cross-connection control regulations having jurisdictions (e.g., plumbing code requirements) when:

1. The purveyor imposes mandatory premise isolation in compliance with DOH regulations; or

2. The purveyor agrees to the customer's voluntary premises isolation through the installation of a reduced pressure backflow assembly immediately downstream of the purveyor's water meter.

P. Although the purveyor's requirements for installation, testing and repair of backflow prevention assemblies may be limited to the approved backflow prevention assemblies used for premises isolation, the customer agrees to the other terms in this chapter as a condition of allowing a direct connection to the purveyor's service pipe.

Q. The customer agrees to indemnify and hold harmless the purveyor for all contamination of the customer's plumbing system or the purveyor's distribution system that results from an unprotected or inadequately protected cross-connection within the customer's premises. This indemnification shall pertain to all backflow conditions that may arise from the purveyor's suspension of water supply or reduction of water pressure, recognizing that the air gap separation, otherwise required would require the customer to provide adequate facilities to collect, store and pump water for his or her premises.

R. The customer agrees that, in the event legal action is required and commenced between the purveyor and the customer to enforce the terms and conditions in this chapter, the substantially prevailing party shall be entitled to reimbursement of all its costs and expenses, including but not limited to reasonable attorney's fees as determined by the court.

S. The customer acknowledges that the purveyor's survey of a customer's premises is for the sole purpose of establishing the purveyor's minimum requirements for the protection of the purveyor's water system, commensurate with the purveyor's assessment of the degree of hazard. It shall not be assumed by the customer, or any regulatory agency, that the purveyor's water use survey, requirements for the installation of backflow prevention assemblies, lack of requirements for the installation of backflow prevention assemblies, or other actions by purveyor personnel constitutes an approval of the customer's plumbing system, or an assurance to the customer of the absence of cross-connections therein.

T. The customer acknowledges the right of the purveyor, in keeping with changes to state regulations, industry standards, or the purveyor's risk management policies, to impose retroactive requirements for additional cross-connection control measures.

U. The purveyor shall record the customer's agreement to this section's terms for service on an "Application for Water Service," "Application for Change of Water Service," or other such form prepared by the purveyor and signed by the customer. (Ord. 690 (part), 2004)

8.01.050 Implementation of the cross-connection control program.

A. The purveyor shall engage the services of department of health's certified cross-connection control specialist (CCS) to implement and be responsible in charge of the city of Ilwaco water system's cross-connection control program.

B. The purveyor, under the direction of the purveyor's CCS, shall prepare written cross-connection control operating policies for the day-to-day operation of the purveyors' cross-connection control program in order to implement the requirements of this chapter.

C. The purveyor shall use the following publications as references and technical aids in the development and implementation of the cross-connection control program:

1. "Cross-Connection Control Manual, Accepted Procedures and Practice," Sixth Edition, December 1995, published by the Pacific Northwest Section, American Water Works Association, or latest edition thereof.

2. "Manual of Cross-Connection Control," Ninth Edition, December 1993, published by the Foundation for Cross-Connection Control and Hydraulic Research, University of Southern California, or latest edition thereof.

D. The purveyor shall incorporate the written cross-connection control program into the water system plan and shall submit the program for approval by the department of health when requested.

E. The purveyor, in consultation with the purveyor's CCS, shall have the authority to make reasonable decisions related to cross-connections in cases and situations not provided in this chapter or written cross-connection control operating policies.

F. The purveyor, under the direction of the purveyor's CCS, shall prepare the written cross-connection control program. The written program shall be a description of the cross-connection control program and be included in the water system plan as required under WAC 246-290-100. (Ord. 690 (part), 2004)

8.01.060 Severability.

If any provision in this chapter, or in the written cross-connection control program is found to be invalid or ineffective and/or less stringent than or inconsistent with the drinking water regulations (Chapter 246-290 of WAC), or other state statutes or rules, the state statute, rule, or regulation shall apply. (Ord. 690 (part), 2004)

8.01.070 Effective.

This chapter shall be in full force and effective five days from and after its passage, approval and publication as provided by law. (Ord. 690 (part), 2004)

APPENDIX L

CIP COST ESTIMATES

CITY OF ILWACO
GRAY & OSBORNE PRELIMINARY PROJECT COST ESTIMATE
GENERAL IMPROVEMENT G-1
Control Improvements

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Control Improvements	LUMP SUM	$ 50,000	$ 50,000

Subtotal	$ 50,000
Tax rate (7.8%)	3,900
Subtotal:	$ 53,900
Contingency (20%)	$ 11,100
TOTAL ESTIMATED CONSTRUCTION COST:	$ 65,000
Administration (5%):	$ 3,300
Engineering (15%):	$ 9,800
Construction Management (10%):	$ 6,500
TOTAL ENGINEERING AND ADMINISTRATIVE COSTS (30%):	$ 20,000
TOTAL ESTIMATED PROJECT COST:	$ 85,000

ENR Construction Cost Index = 8,698 (August 2010)

CITY OF ILWACO
GRAY & OSBORNE PRELIMINARY PROJECT COST ESTIMATE
SOURCE IMPROVEMENT SO-1
New 1.0 MGD Treatment Unit

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 34,000	$ 34,000
2	Demolition of Existing Treatment Units	LUMP SUM	$ 40,000	$ 40,000
3	1.0 MGD Upflow Clarifier Filter Unit	LUMP SUM	$ 300,000	$ 300,000
3	Piping and Chemical Feed Modifications	LUMP SUM	$ 30,000	$ 30,000
4	Electrical and Controls	LUMP SUM	$ 50,000	$ 50,000
	Subtotal			$ 454,000
	Tax rate (7.8%)			35,412
	Subtotal:			$ 489,412
	Contingency (20%)			$ 97,588
	TOTAL ESTIMATED CONSTRUCTION COST:			$ 587,000
	Administration (5%):			$ 29,400
	Engineering (15%):			$ 88,100
	Construction Management (10%):			$ 58,700
	TOTAL ENGINEERING AND ADMINISTRATIVE COSTS (30%):			$ 176,000
	TOTAL ESTIMATED PROJECT COST:			$ 763,000

ENR Construction Cost Index = 8,698 (August 2010)

CITY OF ILWACO
GRAY & OSBORNE PRELIMINARY PROJECT COST ESTIMATE
SOURCE IMPROVEMENT SO-2
Backwash Basin Improvements

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM	$ 4,000	$ 4,000
2	Concrete Basin Wall and Ramp	50 CY	$ 800	$ 40,000
3	New Underdrain	LUMP SUM	$ 10,000	$ 10,000
4	Existing Underdrain Repair	LUMP SUM	$ 5,000	$ 5,000
	Subtotal			$ 59,000
	Tax rate (7.8%)			4,602
	Subtotal:			$ 63,602
	Contingency (20%)			$ 12,398
	TOTAL ESTIMATED CONSTRUCTION COST:			$ 76,000
	Administration (5%):			$ 3,800
	Engineering (15%):			$ 11,400
	Construction Management (10%):			$ 7,600
	TOTAL ENGINEERING AND ADMINISTRATIVE COSTS (30%):			$ 23,000
	TOTAL ESTIMATED PROJECT COST:			$ 99,000

ENR Construction Cost Index = 8,698 (August 2010)

CITY OF ILWACO
GRAY & OSBORNE PRELIMINARY PROJECT COST ESTIMATE
SOURCE IMPROVEMENT SO-3
Floating Intake Repair

NO.	ITEM	QUANTITY	UNIT PRICE	AMOUNT
1	Intake Repair	LUMP SUM	$ 15,000	$ 15,000
	Subtotal			$ 15,000
	Tax rate (7.8%)			1,170
	Subtotal:			$ 16,170
	Contingency (20%)			$ 2,830
	TOTAL ESTIMATED CONSTRUCTION COST:			$ 19,000
	Administration (5%):			$ 1,000
	Engineering (15%):			$ 2,900
	Construction Management (10%):			$ 1,900
	TOTAL ENGINEERING AND ADMINISTRATIVE COSTS (30%):			$ 6,000
	TOTAL ESTIMATED PROJECT COST:			$ 25,000

ENR Construction Cost Index = 8,698 (August 2010)

CITY OF ILWACO
GRAY & OSBORNE PRELIMINARY PROJECT COST ESTIMATE
STORAGE IMPROVEMENT ST-1
New Indian Creek Reservoir

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM		$ 26,000	$ 26,000
2	0.16 MG Reservoir	LUMP SUM		$ 300,000	$ 300,000
3	12-inch DI Water Pipe, Including Fittings	50	LF	$ 75	$ 3,750
4	Locate Existing Utilities	LUMP SUM		$ -	$ -
5	Erosion Control	LUMP SUM		$ -	$ -
6	Additional Pipe Fittings	-	LB	$ 3.50	$ -
7	Trench Safety Systems	LUMP SUM		$ 1,000	$ 1,000
8	12-inch Gate Valves	2	EA	$ 2,250	$ 4,500
9	Fire Hydrants	1	EA	$ 4,000	$ 4,000
10	Crushed Surfacing, Top Course	10	TN	$ 25	$ 250
11	Foundation Gravel	-	TN	$ 35	$ -
12	HMA Cl. 1/2 PG 58-22	10	TN	$ 150	$ 1,500
13	Sawcutting	100	LF	$ 3	$ 300
13	Cold Mix Asphalt	-	TN	$ 150	$ -
14	Connections to Existing System	2	EA	$ 3,000	$ 6,000
15	3/4" Service Connections, complete	-	EA	$ 500	$ -
16	Traffic Control	4	HRS	$ 95	$ 380
	Subtotal.....				$ 347,680
	Tax rate (7.8%)…..……..…..…..……..…….				27,119
	Subtotal:.....				$ 374,799
	Contingency (20%)……..…..…..……..…….				$ 75,201
	TOTAL ESTIMATED CONSTRUCTION COST:.....				$ 450,000
	Administration (5%):.....….....				$ 22,500
	Engineering (15%):.....….....				$ 67,500
	Construction Management (10%):.....….....				$ 45,000
	TOTAL ENGINEERING AND ADMINISTRATIVE COSTS (30%):.....				$ 135,000
	TOTAL ESTIMATED PROJECT COST:.....				$ 585,000

ENR Construction Cost Index = 8,698 (August 2010)

CITY OF ILWACO
GRAY & OSBORNE PRELIMINARY PROJECT COST ESTIMATE
STORAGE IMPROVEMENT ST-2
New City Center Reservoir

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM		$ 50,000	$ 50,000
2	0.5 MG Reservoir	LUMP SUM		$ 600,000	$ 600,000
3	12-inch DI Water Pipe, Including Fittings	50	LF	$ 75	$ 3,750
4	Locate Existing Utilities	LUMP SUM		$ -	$ -
5	Erosion Control	LUMP SUM		$ -	$ -
6	Additional Pipe Fittings	-	LB	$ 3.50	$ -
7	Trench Safety Systems	LUMP SUM		$ 1,000	$ 1,000
8	12-inch Gate Valves	2	EA	$ 2,250	$ 4,500
9	Fire Hydrants	1	EA	$ 4,000	$ 4,000
10	Crushed Surfacing, Top Course	10	TN	$ 25	$ 250
11	Foundation Gravel	-	TN	$ 35	$ -
12	HMA Cl. 1/2 PG 58-22	10	TN	$ 150	$ 1,500
13	Sawcutting	100	LF	$ 3	$ 300
13	Cold Mix Asphalt	-	TN	$ 150	$ -
14	Connections to Existing System	2	EA	$ 3,000	$ 6,000
15	3/4" Service Connections, complete	-	EA	$ 500	$ -
16	Traffic Control	4.0	HRS	$ 95	$ 380
	Subtotal.....				$ 671,680
	Tax rate (7.8%)…..……..…..…..……..…….				52,391
	Subtotal:.....				$ 724,071
	Contingency (20%)……..…..…..……..…….				$ 144,929
	TOTAL ESTIMATED CONSTRUCTION COST:.....				$ 869,000
	Administration (5%):.....….....				$ 43,500
	Engineering (15%):.....….....				$ 130,400
	Construction Management (10%):.....….....				$ 86,900
	TOTAL ENGINEERING AND ADMINISTRATIVE COSTS (30%):.....				$ 261,000
	TOTAL ESTIMATED PROJECT COST:.....				$ 1,130,000

ENR Construction Cost Index = 8,698 (August 2010)

CITY OF ILWACO
GRAY & OSBORNE PRELIMINARY PROJECT COST ESTIMATE
BOOSTER STATION IMPROVEMENT BS-1
Whealdon Street Booster Station

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM		$ 6,000	$ 6,000
2	Booster Station Skid	LUMP SUM		$ 15,000	$ 15,000
3	Booster Station Building	LUMP SUM		$ 15,000	$ 15,000
4	2-inch DI Water Pipe, Including Fittings	500	LF	$ 20	$ 10,000
5	Locate Existing Utilities	LUMP SUM		$ 1,000	$ 1,000
6	Erosion Control	LUMP SUM		$ 1,000	$ 1,000
7	Additional Pipe Fittings	-	LB	$ 3.50	$ -
8	Trench Safety Systems	LUMP SUM		$ 1,000	$ 1,000
9	2-inch Gate Valves	4	EA	$ 750	$ 3,000
10	Fire Hydrants	-	EA	$ 4,000	$ -
11	Gravel Backfill	160	TN	$ 15	$ 2,400
12	Crushed Surfacing, Top Course	40	TN	$ 25	$ 1,000
13	Foundation Gravel	20	TN	$ 35	$ 700
14	HMA Cl. 1/2 PG 58-22	50	TN	$ 150	$ 7,500
15	Sawcutting	1,000	LF	$ 3	$ 3,000
13	Cold Mix Asphalt	20	TN	$ 150	$ 3,000
14	Connections to Existing System	1	EA	$ 3,000	$ 3,000
15	3/4" Service Connections, complete	8	EA	$ 500	$ 4,000
16	Traffic Control	20	HRS	$ 95	$ 1,900
	Subtotal.....				$ 78,500
	Tax rate (7.8%)…..……..…..……..…….				6,123
	Subtotal:.....				$ 84,623
	Contingency (20%)……..…..……..…….				$ 17,377
	TOTAL ESTIMATED CONSTRUCTION COST:.....				$ 102,000
	Administration (5%):.....				$ 5,100
	Engineering (15%):.....				$ 15,300
	Construction Management (10%):.....				$ 10,200
	TOTAL ENGINEERING AND ADMINISTRATIVE COSTS (30%):.....				$ 31,000
	TOTAL ESTIMATED PROJECT COST:.....				$ 133,000

ENR Construction Cost Index = 8,698 (August 2010)

CITY OF ILWACO
GRAY & OSBORNE PRELIMINARY PROJECT COST ESTIMATE
DISTRIBUTION SYSTEM IMPROVEMENT D-1
Sahalee Connection to Discovery Heights

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM		$ 1,000	$ 1,000
2	8-inch DI Water Pipe, Including Fittings	20	LF	$ 50	$ 1,000
3	Locate Existing Utilities	LUMP SUM		$ -	$ -
4	Erosion Control	LUMP SUM		$ -	$ -
5	Additional Pipe Fittings	-	LB	$ 3.50	$ -
6	Trench Safety Systems	LUMP SUM		$ 1,000	$ 1,000
7	8-inch Gate Valves	1	EA	$ 1,200	$ 1,200
8	Fire Hydrants	-	EA	$ 4,000	$ -
8	Gravel Backfill	10	TN	$ 15	$ 150
9	Crushed Surfacing, Top Course	-	TN	$ 25	$ -
10	Foundation Gravel	-	TN	$ 35	$ -
11	HMA Cl. 1/2 PG 58-22	-	TN	$ 150	$ -
12	Sawcutting	-	LF	$ 3	$ -
13	Cold Mix Asphalt	-	TN	$ 150	$ -
14	Connections to Existing System	2	EA	$ 3,000	$ 6,000
15	3/4" Service Connections, complete	-	EA	$ 500	$ -
16	Traffic Control	0	HRS	$ 95	$ -
	Subtotal.....				$ 10,350
	Tax rate (7.8%)…..……..…..……..……				807
	Subtotal:.....				$ 11,157
	Contingency (20%)……..…..……..……				$ 1,843
	TOTAL ESTIMATED CONSTRUCTION COST:.....				$ 13,000
	Administration (5%):.....				$ 700
	Engineering (15%):.....				$ 2,000
	Construction Management (10%):.....				$ 1,300
	TOTAL ENGINEERING AND ADMINISTRATIVE COSTS (30%):.....				$ 4,000
	TOTAL ESTIMATED PROJECT COST:.....				$ 17,000

ENR Construction Cost Index = 8,698 (August 2010)

CITY OF ILWACO
GRAY & OSBORNE PRELIMINARY PROJECT COST ESTIMATE
DISTRIBUTION SYSTEM IMPROVEMENT D-2
Elizabeth Avenue Waterline Replacement

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM		$ 4,000	$ 4,000
2	12-inch DI Water Pipe, Including Fittings	200	LF	$ 75	$ 15,000
3	Locate Existing Utilities	LUMP SUM		$ 1,000	$ 1,000
4	Erosion Control	LUMP SUM		$ 1,000	$ 1,000
5	Additional Pipe Fittings	100	LB	$ 3.50	$ 350
6	Trench Safety Systems	LUMP SUM		$ 1,000	$ 1,000
7	12-inch Gate Valves	2	EA	$ 2,250	$ 4,500
8	Fire Hydrants	1	EA	$ 4,000	$ 4,000
8	Gravel Backfill	110	TN	$ 15	$ 1,650
9	Crushed Surfacing, Top Course	40	TN	$ 25	$ 1,000
10	Foundation Gravel	10	TN	$ 35	$ 350
11	HMA Cl. 1/2 PG 58-22	30	TN	$ 150	$ 4,500
12	Sawcutting	400	LF	$ 3	$ 1,200
13	Cold Mix Asphalt	10	TN	$ 150	$ 1,500
14	Connections to Existing System	2	EA	$ 3,000	$ 6,000
15	3/4" Service Connections, complete	1	EA	$ 500	$ 500
16	Traffic Control	8	HRS	$ 95	$ 760
	Subtotal				$ 48,310
	Tax rate (7.8%)				3,768
	Subtotal:				$ 52,078
	Contingency (20%)				$ 9,922
	TOTAL ESTIMATED CONSTRUCTION COST:				$ 62,000
	Administration (5%):				$ 3,100
	Engineering (15%):				$ 9,300
	Construction Management (10%):				$ 6,200
	TOTAL ENGINEERING AND ADMINISTRATIVE COSTS (30%):				$ 19,000
	TOTAL ESTIMATED PROJECT COST:				$ 81,000

ENR Construction Cost Index = 8,698 (August 2010)

CITY OF ILWACO
GRAY & OSBORNE PRELIMINARY PROJECT COST ESTIMATE
DISTRIBUTION SYSTEM IMPROVEMENT D-3
Sahalee Waterline Replacements

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM		$ 32,000	$ 32,000
2	8-inch DI Water Pipe, Including Fittings	3,000	LF	$ 50	$ 150,000
3	Locate Existing Utilities	LUMP SUM		$ 8,000	$ 8,000
4	Erosion Control	LUMP SUM		$ 8,000	$ 8,000
5	Additional Pipe Fittings	1,400	LB	$ 3.50	$ 4,900
6	Trench Safety Systems	LUMP SUM		$ 6,000	$ 6,000
7	8-inch Gate Valves	20	EA	$ 1,200	$ 24,000
8	Fire Hydrants	8	EA	$ 4,000	$ 32,000
8	Gravel Backfill	1,470	TN	$ 15	$ 22,050
9	Crushed Surfacing, Top Course	550	TN	$ 25	$ 13,750
10	Foundation Gravel	170	TN	$ 35	$ 5,950
11	HMA Cl. 1/2 PG 58-22	370	TN	$ 150	$ 55,500
12	Sawcutting	6,000	LF	$ 3	$ 18,000
13	Cold Mix Asphalt	140	TN	$ 150	$ 21,000
14	Connections to Existing System	2	EA	$ 3,000	$ 6,000
15	3/4" Service Connections, complete	20	EA	$ 500	$ 10,000
16	Traffic Control	120	HRS	$ 95	$ 11,400
	Subtotal				$ 428,550
	Tax rate (7.8%)				33,427
	Subtotal:				$ 461,977
	Contingency (20%)				$ 92,023
	TOTAL ESTIMATED CONSTRUCTION COST:				$ 554,000
	Administration (5%):				$ 27,700
	Engineering (15%):				$ 83,100
	Construction Management (10%):				$ 55,400
	TOTAL ENGINEERING AND ADMINISTRATIVE COSTS (30%):				$ 166,000
	TOTAL ESTIMATED PROJECT COST:				$ 720,000

ENR Construction Cost Index = 8,698 (August 2010)

CITY OF ILWACO
GRAY & OSBORNE PRELIMINARY PROJECT COST ESTIMATE
DISTRIBUTION SYSTEM IMPROVEMENT D-4
Cooks Hill Road Waterline Extension

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM		$ 25,000	$ 25,000
2	8-inch DI Water Pipe, Including Fittings	2,700	LF	$ 50	$ 135,000
3	Locate Existing Utilities	LUMP SUM		$ 6,000	$ 6,000
4	Erosion Control	LUMP SUM		$ 6,000	$ 6,000
5	Additional Pipe Fittings	1,200	LB	$ 3.50	$ 4,200
6	Trench Safety Systems	LUMP SUM		$ 5,400	$ 5,400
7	8-inch Gate Valves	18	EA	$ 1,200	$ 21,600
8	Fire Hydrants	7	EA	$ 4,000	$ 28,000
8	Gravel Backfill	1,320	TN	$ 15	$ 19,800
9	Crushed Surfacing, Top Course	340	TN	$ 25	$ 8,500
10	Foundation Gravel	150	TN	$ 35	$ 5,250
11	HMA Cl. 1/2 PG 58-22	230	TN	$ 150	$ 34,500
12	Sawcutting	3,700	LF	$ 3	$ 11,100
13	Cold Mix Asphalt	80	TN	$ 150	$ 12,000
14	Connections to Existing System	2	EA	$ 3,000	$ 6,000
15	3/4" Service Connections, complete	-	EA	$ 500	$ -
16	Traffic Control	108	HRS	$ 95	$ 10,260
17	Highway 101 Crossing Directional Drilling	LUMP SUM		$ 20,000	$ 20,000
	Subtotal.....				$ 358,610
	Tax rate (7.8%)…..……..…..…..……..…….				27,972
	Subtotal:.....				$ 386,582
	Contingency (20%)……..…...……..…….				$ 77,418
	TOTAL ESTIMATED CONSTRUCTION COST:.....				$ 464,000
	Administration (5%):.....….....				$ 23,200
	Engineering (15%):.....….....				$ 69,600
	Construction Management (10%):.....…..				$ 46,400
	TOTAL ENGINEERING AND ADMINISTRATIVE COSTS (30%):.....				$ 139,000
	TOTAL ESTIMATED PROJECT COST:.....				$ 603,000

ENR Construction Cost Index = 8,698 (August 2010)

CITY OF ILWACO
GRAY & OSBORNE PRELIMINARY PROJECT COST ESTIMATE
DISTRIBUTION SYSTEM IMPROVEMENT D-5
Klahanee Drive Waterline Extension

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM		$ 7,000	$ 7,000
2	8-inch DI Water Pipe, Including Fittings	400	LF	$ 50	$ 20,000
3	Locate Existing Utilities	LUMP SUM		$ 2,000	$ 2,000
4	Erosion Control	LUMP SUM		$ 2,000	$ 2,000
5	Additional Pipe Fittings	200	LB	$ 3.50	$ 700
6	Trench Safety Systems	LUMP SUM		$ 1,000	$ 1,000
7	8-inch Gate Valves	2	EA	$ 1,200	$ 2,400
8	Fire Hydrants	2	EA	$ 4,000	$ 8,000
8	Gravel Backfill	200	TN	$ 15	$ 3,000
9	Crushed Surfacing, Top Course	70	TN	$ 25	$ 1,750
10	Foundation Gravel	20	TN	$ 35	$ 700
11	HMA Cl. 1/2 PG 58-22	50	TN	$ 150	$ 7,500
12	Sawcutting	800	LF	$ 3	$ 2,400
13	Cold Mix Asphalt	20	TN	$ 150	$ 3,000
14	Connections to Existing System	2	EA	$ 3,000	$ 6,000
15	Pressure Reducing Valve Vault	LUMP SUM		$ 30,000	$ 30,000
16	Traffic Control	16	HRS	$ 95	$ 1,520
	Subtotal				$ 98,970
	Tax rate (7.8%)				7,720
	Subtotal:				$ 106,690
	Contingency (20%)				$ 21,310
	TOTAL ESTIMATED CONSTRUCTION COST:				$ 128,000
	Administration (5%):				$ 6,400
	Engineering (15%):				$ 19,200
	Construction Management (10%):				$ 12,800
	TOTAL ENGINEERING AND ADMINISTRATIVE COSTS (30%):				$ 38,000
	TOTAL ESTIMATED PROJECT COST:				$ 166,000

ENR Construction Cost Index = 8,698 (August 2010)

CITY OF ILWACO
GRAY & OSBORNE PRELIMINARY PROJECT COST ESTIMATE
DISTRIBUTION SYSTEM IMPROVEMENT D-6
China Hill Improvements

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM		$ 20,000	$ 20,000
2	8-inch DI Water Pipe, Including Fittings	1,900	LF	$ 50	$ 95,000
3	Locate Existing Utilities	LUMP SUM		$ 5,000	$ 5,000
4	Erosion Control	LUMP SUM		$ 5,000	$ 5,000
5	Additional Pipe Fittings	900	LB	$ 3.50	$ 3,150
6	Trench Safety Systems	LUMP SUM		$ 3,800	$ 3,800
7	8-inch Gate Valves	12	EA	$ 1,200	$ 14,400
8	Fire Hydrants	5	EA	$ 4,000	$ 20,000
8	Gravel Backfill	930	TN	$ 15	$ 13,950
9	Crushed Surfacing, Top Course	350	TN	$ 25	$ 8,750
10	Foundation Gravel	100	TN	$ 35	$ 3,500
11	HMA Cl. 1/2 PG 58-22	230	TN	$ 150	$ 34,500
12	Sawcutting	3,800	LF	$ 3	$ 11,400
13	Cold Mix Asphalt	90	TN	$ 150	$ 13,500
14	Connections to Existing System	2	EA	$ 3,000	$ 6,000
15	3/4" Service Connections, complete	-	EA	$ 500	$ -
16	Traffic Control	76	HRS	$ 95	$ 7,220
	Subtotal				$ 265,170
	Tax rate (7.8%)				20,683
	Subtotal:				$ 285,853
	Contingency (20%)				$ 57,147
	TOTAL ESTIMATED CONSTRUCTION COST:				$ 343,000
	Administration (5%):				$ 17,200
	Engineering (15%):				$ 51,500
	Construction Management (10%):				$ 34,300
	TOTAL ENGINEERING AND ADMINISTRATIVE COSTS (30%):				$ 103,000
	TOTAL ESTIMATED PROJECT COST:				$ 446,000

ENR Construction Cost Index = 8,698 (August 2010)

CITY OF ILWACO
GRAY & OSBORNE PRELIMINARY PROJECT COST ESTIMATE
DISTRIBUTION SYSTEM IMPROVEMENT D-7
Stringtown Loop

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM		$ 196,000	$ 196,000
2	12-inch DI Water Pipe, Including Fittings	15,000	LF	$ 75	$ 1,125,000
3	Locate Existing Utilities	LUMP SUM		$ 47,000	$ 47,000
4	Erosion Control	LUMP SUM		$ 47,000	$ 47,000
5	Additional Pipe Fittings	7,500	LB	$ 3.50	$ 26,250
6	Trench Safety Systems	LUMP SUM		$ 30,000	$ 30,000
7	12-inch Gate Valves	100	EA	$ 2,250	$ 225,000
8	Fire Hydrants	38	EA	$ 4,000	$ 152,000
8	Gravel Backfill	8,560	TN	$ 15	$ 128,400
9	Crushed Surfacing, Top Course	3,030	TN	$ 25	$ 75,750
10	Foundation Gravel	960	TN	$ 35	$ 33,600
11	HMA Cl. 1/2 PG 58-22	2,020	TN	$ 150	$ 303,000
12	Sawcutting	30,000	LF	$ 3	$ 90,000
13	Cold Mix Asphalt	690	TN	$ 150	$ 103,500
14	Connections to Existing System	2	EA	$ 3,000	$ 6,000
15	3/4" Service Connections, complete	-	EA	$ 500	$ -
16	Traffic Control	600	HRS	$ 95	$ 57,000
	Subtotal				$ 2,645,500
	Tax rate (7.8%)				206,349
	Subtotal:				$ 2,851,849
	Contingency (20%)				$ 570,151
	TOTAL ESTIMATED CONSTRUCTION COST:				$ 3,422,000
	Administration (5%):				$ 171,100
	Engineering (15%):				$ 513,300
	Construction Management (10%):				$ 342,200
	TOTAL ENGINEERING AND ADMINISTRATIVE COSTS (30%):				$ 1,027,000
	TOTAL ESTIMATED PROJECT COST:				$ 4,449,000

ENR Construction Cost Index = 8,698 (August 2010)

CITY OF ILWACO
GRAY & OSBORNE PRELIMINARY PROJECT COST ESTIMATE
DISTRIBUTION SYSTEM IMPROVEMENT D-8
Old Railroad Loop

NO.	ITEM	QUANTITY		UNIT PRICE	AMOUNT
1	Mobilization, Cleanup, and Demobilization	LUMP SUM		$ 131,000	$ 131,000
2	12-inch DI Water Pipe, Including Fittings	10,000	LF	$ 75	$ 750,000
3	Locate Existing Utilities	LUMP SUM		$ 31,000	$ 31,000
4	Erosion Control	LUMP SUM		$ 31,000	$ 31,000
5	Additional Pipe Fittings	5,000	LB	$ 3.50	$ 17,500
6	Trench Safety Systems	LUMP SUM		$ 20,000	$ 20,000
7	12-inch Gate Valves	66	EA	$ 2,250	$ 148,500
8	Fire Hydrants	26	EA	$ 4,000	$ 104,000
8	Gravel Backfill	5,700	TN	$ 15	$ 85,500
9	Crushed Surfacing, Top Course	2,020	TN	$ 25	$ 50,500
10	Foundation Gravel	640	TN	$ 35	$ 22,400
11	HMA Cl. 1/2 PG 58-22	1,340	TN	$ 150	$ 201,000
12	Sawcutting	20,000	LF	$ 3	$ 60,000
13	Cold Mix Asphalt	460	TN	$ 150	$ 69,000
14	Connections to Existing System	2	EA	$ 3,000	$ 6,000
15	3/4" Service Connections, complete	-	EA	$ 500	$ -
16	Traffic Control	400	HRS	$ 95	$ 38,000
	Subtotal				$ 1,765,400
	Tax rate (7.8%)				137,701
	Subtotal:				$ 1,903,101
	Contingency (20%)				$ 380,899
	TOTAL ESTIMATED CONSTRUCTION COST:				$ 2,284,000
	Administration (5%):				$ 114,200
	Engineering (15%):				$ 342,600
	Construction Management (10%):				$ 228,400
	TOTAL ENGINEERING AND ADMINISTRATIVE COSTS (30%):				$ 685,000
	TOTAL ESTIMATED PROJECT COST:				$ 2,969,000

ENR Construction Cost Index = 8,698 (August 2010)

APPENDIX M

WATER RATE ORDINANCE

CITY OF ILWACO
ORDINANCE NO. 774

AN ORDINANCE OF THE CITY OF ILWACO, WASHINGTON, AMENDING THE ILWACO MUNICIPAL CODE, CHAPTER 13 REGARDING THE WATER RATE SCHEDULE.

WHEREAS, it is the desire of the City Council to amend Chapter 13 of the Ilwaco Municipal Code with regards to the monthly rates charged for residential and commercial water users; and

WHEREAS, RCW 35.92.010 provides for the City Council to have the authority to set water rates, fees and charges by resolution.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF ILWACO, WASHINGTON, DOES ORDAIN AS FOLLOWS:

Section 1. Water rate schedule. Section 13.04.010 is amended as follows:

The minimum monthly rates for residential and commercial water users shall be on meter size basis for zero to five hundred (500) cubic feet shall be billed according to a schedule set forth by resolution of the Ilwaco City Council and shall be reviewed annually and amended, as necessary. Table of schedules in 13.04.010 Section A is therefore deleted.

Sections 13.04.010 B through D inclusive shall remain the same *except* all rates shall be billed according to a schedule set forth by resolution of the Ilwaco City Council and shall be reviewed annually and amended, as necessary.

Section 2. Lien Filing Fee. The lien filing fees set forth by Ordinance #760 shall be amended to read as follows:

The City of Ilwaco will charge a lien filing fee of ~~fifty dollars ($50)~~ one hundred dollars ($100) for any accounts found delinquent and requiring such action. Once the account is brought current, a fee of one hundred dollars ($100) will be charged to release the lien.

Section 3. Effective Date. This Ordinance takes effect and is in full force five (5) days after its passage, approval and publication of an approved summary of the title as provided by law.

PASSED BY THE CITY COUNCIL OF THE CITY OF ILWACO, AND SIGNED IN AUTHENTIFICATION OF ITS PASSAGE THIS 22ND DAY OF NOVEMBER, 2010.

Mike Cassinelli, Mayor

ATTEST:

PJ Kezele, Deputy City Clerk

VOTE	Jensen	Chin	Marshall	Greene	Forner	Cassinelli
Ayes	X	X	X	X	X	
Nays						
Abstentions						
Absent						

PUBLISHED: December 1, 2010

EFFECTIVE: December 6, 2010

CITY OF ILWACO
RESOLUTION NO. 2010-09

A RESOLUTION OF THE CITY OF ILWACO, WASHINGTON, ESTABLISHING A FEE SCHEDULE FOR THE 2011 SEWER RATE AND WATER RATE AND CONNECTION CHARGES.

WHEREAS, it is the desire of the City Council to adjust water and sewer rates and connection charges annually, as needed, to align with service costs.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF ILWACO, WASHINGTON, DOES RESOLVE AS FOLLOWS:

Section 1. Sewer Rates. The monthly rates and charges for each class of sanitary sewage disposal are fixed as follows, and all rates and charges outside the Ilwaco city limits shall pay a surcharge of fifty (50) percent of the amount computed.

Type of Unit	2011
Residential and Apartment Units	$ 64.50
Hotel/Motel	
1. Administrative Unit	89.64
2. Transient Unit – Each	16.10
3. Residential Unit – Each	64.50
RV/Trailer Parks	
1. Administrative Unit	89.64
2. Transient Unit – Each	16.10
3. Residential Unit – Each	64.50
Mobile/Manufacture Home Park	
1. Occupied Space	64.50
2. Vacant Space	16.10
Business Houses	89.64
Connected moorages within the Port of Ilwaco	
1. Live-aboard vessels	16.10
2. Transient rental vessels	16.10

Type of Unit	2011
Restaurants/Taverns	
0—15 Person seating capacity	$89.64
16—59 Person seating capacity	161.28
60 Person or over seating capacity	435.90
Hospitals	941.46
Churches	98.02
Lodges and Halls	118.16
Schools – Base	182.85
Plus student enrollment & personnel	3.25

Section 2. Water Rates. The minimum monthly rates for residential and commercial water users shall be on meter size basis for zero to five hundred (500) cubic feet as follows, and all rates and charges outside the Ilwaco city limits shall pay a surcharge of fifty (50) percent of the amount computed.

Meter Size	2011
5/8" or 3/4"	$34.76
1"	58.00
1 ¼"	77.33
1 ½"	115.64
2"	185.13
3"	347.42
4"	578.79
6"	1157.90
8"	1852.75

Type of Charge	2011
For each one hundred (100) cubic feet of usage over five hundred (500) cubic feet	$1.89
Class B—Hotels and Motels and Class C—Trailer/RV Parks. For each transient space	$2.11
Class D—Mobile/Manufactured Home Parks. For each space when no mobile/manufactured home is present for the entire month	$6.19

Section 3. Water connection charges. In addition to the foregoing rates and charges, the city shall charge for each building or service connection to the water system a connection charge of two thousand four hundred dollars ($2,400) per meter equivalent.

The connection charge will be determined by multiplying the total number of equivalent water meter factors for the water service to be installed by two thousand four hundred dollars

($2,400), and all connections outside the Ilwaco city limits shall pay a surcharge of fifty (50) percent of the amount computed.

All water meter connections for fire sprinkler installation shall be at the rate of one thousand seven hundred fifty dollars ($1,750) per connection, and shall be charged a flat monthly fee of seventeen dollars and fifty cents ($17.50).

Section 4. Sewer connection charges. In addition to the foregoing rates and charges, the city shall charge for each connection to the sanitary sewer system a six thousand dollar ($6,000.00) connection charge, and all connections outside the Ilwaco city limits shall pay a surcharge of fifty (50) percent of the amount computed.

Section 5. Effective Date. This resolution, being an exercise of power specifically delegated to the city legislative body, is not subject to referendum and shall take effect on January 1, 2011.

PASSED BY THE CITY COUNCIL OF THE CITY OF ILWACO, AND SIGNED IN AUTHENTIFICATION OF ITS PASSAGE THIS 27TH DAY OF DECEMBER, 2010.

Mike Cassinelli, Mayor

ATTEST:

PJ Kezele, Deputy City Clerk

VOTE	Jensen	Chin	Marshall	Greene	Forner	Cassinelli
Ayes	X	X	X	X	X	X
Nays						
Abstentions						
Absent						

EFFECTIVE: January 1, 2011

APPENDIX N

PUBLIC NOTIFICATION FORMS

DRINKING WATER WARNING

City of Ilwaco water is contaminated with [fecal coliform/*E. coli*]

BOIL YOUR WATER BEFORE USING

[Fecal coliform or *E. coli*] bacteria were found in the water supply on [date]. These bacteria can make you sick, and are a particular concern for people with weakened immune systems.

What should I do?

- **DO NOT DRINK THE WATER WITHOUT BOILING IT FIRST.** Bring all water to a boil, let it boil for one minute, and let it cool before using, or use bottled water. Boiled or bottled water should be used for drinking, making ice, brushing teeth, washing dishes, and food preparation **until further notice**. Boiling kills bacteria and other organisms in the water.

  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 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.

- The symptoms above are not caused only by organisms in drinking water. If you experience any of these symptoms and they persist, you may want to seek medical advice. People at increased risk should seek advice about drinking water from their health care providers.

What happened? What is being done?

Bacterial contamination can occur when increased run-off enters the drinking water source (for example, following heavy rains). It can also happen due to a break in the distribution system (pipes) or a failure in the water treatment process.

[Describe corrective action.] We will inform you when tests show no bacteria and you no longer need to boil your water. We anticipate resolving the problem within [estimated time frame].

For more information, please contact [name of contact] at [phone number] or [mailing address]. General guidelines on ways to lessen the risk of infection by microbes are available from the EPA Safe Drinking Water Hotline at 1(800) 426-4791.

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.

This notice is being sent to you by **City of Ilwaco**. State Water System ID#: **355002**. Date distributed: [date]

DRINKING WATER WARNING

City of Ilwaco water has high levels of nitrate –

DO NOT GIVE THE WATER TO INFANTS UNDER 6 MONTHS OLD OR USE IT TO MAKE INFANT FORMULA

Water sample results received [date] showed nitrate levels of [level and units]. This is above the nitrate standard, or maximum contaminant level (MCL), of 10 milligrams per liter. Nitrate in drinking water is a serious health concern for infants less than six months old.

What should I do?

- **DO NOT GIVE THE WATER TO INFANTS.** ***Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue baby syndrome.*** Blue baby syndrome is indicated by blueness of the skin. Symptoms in infants can develop rapidly, with health deteriorating over a period of days. If symptoms occur, seek medical attention immediately.
- Water, juice, and formula for children under six months of age should not be prepared with tap water. Bottled water or other water low in nitrates should be used for infants until further notice.
- **DO NOT BOIL THE WATER.** Boiling, freezing, filtering, or letting water stand does not reduce the nitrate level. Excessive boiling can make the nitrates more concentrated, because nitrates remain behind when the water evaporates.
- Adults and children older than six months can drink the tap water (nitrate is a concern for infants because they can't process nitrates in the same way adults can). However, if you are pregnant or have specific health concerns, you may wish to consult your doctor.

What happened? What is being done?

Nitrate in drinking water can come from natural, industrial, or agricultural sources (including septic systems and run-off). Levels of nitrate in drinking water can vary throughout the year. We'll let you know when the amount of nitrate is again below the limit.

[Describe corrective action, seasonal fluctuations, and when system expects to return to compliance.]

For more information, please contact [name of contact] at [phone number] or [mailing address].

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.

This notice is being sent to you by the City of Ilwaco Water System (ID#: 355002).
Date distributed: [date]

DRINKING WATER WARNING

City of Ilwaco has high turbidity levels

BOIL YOUR WATER BEFORE USING

We routinely monitor your water for turbidity (cloudiness). This tells us whether we are effectively filtering the water supply. A water sample taken [date] showed turbidity levels of [number] turbidity units. This is above the standard of [standard depending on treatment technique] turbidity units. Because of these high levels of turbidity, there is an increased chance that the water may contain disease-causing organisms.

What should I do?

- **DO NOT DRINK THE WATER WITHOUT BOILING IT FIRST.** Bring all water to a boil, let it boil for one minute, and let it cool before using, or use bottled water. Boiled or bottled water should be used for drinking, making ice, washing dishes, brushing teeth, and food preparation until further notice.

- *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. These organisms include bacteria, viruses, and parasites, which can cause symptoms such as nausea, cramps, diarrhea, and associated headaches.*

- People with severely compromised immune systems, infants, and some elderly may be at increased risk. These people should seek advice about drinking water from their health care providers. The symptoms above are not caused only by organisms in drinking water. If you experience any of these symptoms and they persist, you may want to seek medical advice.

What happened? What is being done?

[Describe reason for the high turbidity, corrective action, and when the system expects to return to compliance.]

We will inform you when turbidity returns to appropriate levels and when you no longer need to boil your water.

For more information, please contact [name of contact] at [phone number] or [mailing address]. General guidelines on ways to lessen the risk of infection by microbes are available from the EPA Safe Drinking Water Hotline at 1(800) 426-4791.

> *Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.*

This notice is being sent to you by **City of Ilwaco**. State Water System ID#: **355002**. Date distributed: [date]

IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER
Tests Showed Coliform Bacteria in City of Ilwaco Water

Our water system recently violated a drinking water standard. Although this incident was not an emergency, as our customers, you have a right to know what happened and what we did to correct this situation.

We routinely monitor for drinking water contaminants. We took [number] samples to test for the presence of coliform bacteria during [month]. [Number/percentage] of our samples showed the presence of total coliform bacteria. The standard is that no more than [1 sample per month/5 percent of samples] may do so.

What should I do?

- You do not need to boil your water or take other corrective actions. However, if you have specific health concerns, consult your doctor.
- People with severely compromised immune systems, infants, and some elderly may be at increased risk. These people should seek advice about drinking water from their health care providers. General guidelines on ways to lessen the risk of infection by microbes are available from EPA's Safe Drinking Water Hotline at 1 (800) 426-4791.

What does this mean?

This is not an emergency. If it had been, you would have been notified immediately. Coliform bacteria are generally not harmful themselves. *Coliforms are bacteria which are naturally present in the environment and are used as an indicator that other potentially-harmful bacteria may be present. Coliforms were found in more samples than allowed and this was a warning of potential problems.*

Usually, coliforms are a sign that there could be a problem with the system's treatment or distribution system (pipes). Whenever we detect coliform bacteria in any sample, we do follow-up testing to see if other bacteria of greater concern, such as fecal coliform or *E. coli*, are present. **We did not find any of these bacteria in our subsequent testing, and further testing shows that this problem has been resolved.**

What happened? What was done?

[Describe corrective action.]

For more information, please contact [name of contact] at [phone number] or [mailing address].

> *Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.*

This notice is being sent to you by **City of Ilwaco**. State Water System ID#: **355002**. Date distributed: [date]

IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER
Tests Show Coliform Bacteria in City of Ilwaco Water

Our water system recently violated a drinking water standard. Although this is not an emergency, as our customers, you have a right to know what happened, what you should do, and what we are doing to correct this situation.

We routinely monitor for the presence of drinking water contaminants. We took [number] samples for coliform bacteria during [month]. [Number/percentage] of those samples showed the presence of coliform bacteria. The standard is that no more than [1 sample per month/5 percent of our samples] may do so.

What should I do?

- You do not need to boil your water or take other corrective actions. However, if you have specific health concerns, consult your doctor.
- People with severely compromised immune systems, infants, and some elderly may be at increased risk. These people should seek advice about drinking water from their health care providers. General guidelines on ways to lessen the risk of infection by microbes are available from EPA's Safe Drinking Water Hotline at 1 (800) 426-4791.

What does this mean?

This is not an emergency. If it had been you would have been notified immediately. Total coliform bacteria are generally not harmful themselves. *Coliforms are bacteria which are naturally present in the environment and are used as an indicator that other, potentially-harmful, bacteria may be present. Coliforms were found in more samples than allowed and this was a warning of potential problems.*

Usually, coliforms are a sign that there could be a problem with the treatment or distribution system (pipes). Whenever we detect coliform bacteria in any sample, we do follow-up testing to see if other bacteria of greater concern, such as fecal coliform or *E. coli*, are present. **We did not find any of these bacteria in our subsequent testing.** If we had, we would have notified you immediately. However, we are still finding coliforms in the drinking water.

What happened? What is being done?

[Describe corrective action.]

We are still detecting coliform bacteria. We will inform you when our sampling shows that no bacteria are present. We anticipate resolving the problem within [estimated time frame].
For more information, please contact [name of contact] at [phone number] or [mailing address].

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.

This notice is being sent to you by **City of Ilwaco**. State Water System ID#: **355002**. Date distributed: [date]

IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER

The City of Ilwaco Has Levels of [Contaminant] Above Drinking Water Standards

Our water system recently violated a drinking water standard. Although this is not an emergency, as our customers, you have a right to know what happened, what you should do, and what we are doing to correct this situation.

We routinely monitor for the presence of drinking water contaminants. Testing results we received on [date] show that our system exceeds the standard or maximum contaminant level (MCL), for [contaminant]. The standard for [contaminant] is [MCL]. The average level of [contaminant] over the last year was [level]. *or* [Contaminant] was found at [level].

What should I do?

- **You do not need to use an alternative (e.g., bottled) water supply.** However, if you have specific health concerns, consult your doctor.

What does this mean?

This is not an immediate risk. If it had been, you would have been notified immediately. However, [Insert relevant health effects language from Appendix B.]

What happened? What is being done?

[Describe corrective action.] We anticipate resolving the problem within [estimated time frame]. For more information, please contact [name of contact] at [phone number] or [mailing address].

> *Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.*

This notice is being sent to you by **City of Ilwaco**. State Water System ID#: **355002**. Date distributed: [date]

IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER

Monitoring Requirements Not Met for City of Ilwaco

Our water system violated several drinking water standards over the past year. Even though these were not emergencies, as our customers, you have a right to know what happened and what we did to correct these situations.

We are required to monitor your drinking water for specific contaminants on a regular basis. Results of regular monitoring are an indicator of whether or not our drinking water meets health standards. During [compliance period] we ['did not monitor or test' or 'did not complete all monitoring or testing'] for [contaminant(s)] and therefore cannot be sure of the quality of our drinking water during that time.

What should I do?

There is nothing you need to do at this time.

The table below lists the [contaminant/ contaminants] we did not properly test for during the last year and how often we are supposed to sample for [this contaminant/these contaminants]. Also shown are how many samples we are supposed to take, how many samples we took, when samples should have been taken, and the date on which follow-up samples were (or will be) taken.

Contaminant	Required sampling frequency	Number of samples taken	When all samples should have been taken	When samples were or will be taken
VOCs[1] (example)	1 sample every three years	0	1996-1998	February 1999

What happened? What is being done?

[Describe corrective action.]

For more information, please contact [name of contact] at [phone number] or [mailing address].

Please share this information with all the other people who drink this water, especially those who may not have received this notice directly (for example, people in apartments, nursing homes, schools, and businesses). You can do this by posting this notice in a public place or distributing copies by hand or mail.

This notice is being sent to you by **City of Ilwaco**. State Water System ID#: **355002**. Date distributed: [date]

[1] VOCs, also known as volatile organic compounds, are tested by collecting one sample and testing that sample for all the VOCs. VOCs are commonly used in industrial and manufacturing processes and include benzene, carbon tetrachloride, chlorobenzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 1,2-dichloroethane, cisdichloroethylene, trans-dichloroethylene, dichloromethane, 1,2-dichloropropane, ethylbenzene, styrene, tetrachlorethylene, 1,1,1-trichloroethane, trichloroethylene, toluene, 1,2,4-trichlorobenzene, 1,1-dichloroethylene, 1,1,2-trichloroethane, vinyl chloride, and xylene.

Standard Health Effects Language for Public Notification

(From Appendix B of 40 CFR 141, Subpart Q)

Contaminant	MCLG[1] mg/L	MCL[2] mg/L	Standard Health Effects Language for Public Notification
National Primary Drinking Water Regulations (NPDWR):			
A. Microbiological Contaminants			
1a. Total coliform	Zero	See footnote[3]	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 were found in more samples than allowed and this was a warning of potential problems.
1b. Fecal coliform/*E. coli*	Zero	Zero	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 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.
2a. Turbidity (MCL)[4]	None	1 NTU[5]/ 5 NTU	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. These organisms include bacteria, viruses, and parasites that can cause symptoms such as nausea, cramps, diarrhea and associated headaches.
2b. Turbidity (SWTR TT)[6]	None	TT [7]	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. These organisms include bacteria, viruses, and parasites that can cause symptoms such as nausea, cramps, diarrhea and associated headaches.
2c. Turbidity (IESWTR TT)[8]	None	TT	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. These organisms include bacteria, viruses, and parasites that can cause symptoms such as nausea, cramps, diarrhea and associated headaches.

Standard Health Effects Language for Public Notification

(From Appendix B of 40 CFR 141, Subpart Q)

Contaminant	MCLG[1] mg/L	MCL[2] mg/L	Standard Health Effects Language for Public Notification
B. Surface Water Treatment Rule (SWTR) and Interim Enhanced Surface Water Treatment Rule (IESWTR)			
3. *Giardia lamblia* (SWTR/IESWTR) 4. Viruses (SWTR/IESWTR) 5. Heterotrophic plate count (HPC) bacteria[9] (SWTR/IESWTR) 6. Legionella (SWTR/IESWTR) 7. Cryptosporidium (IESWTR)	Zero	TT[10]	Inadequately treated water may contain disease-causing organisms. These organisms include bacteria, viruses, and parasites which can cause symptoms such as nausea, cramps, diarrhea, and associated headaches.
C. Inorganic Chemicals (IOCs)			
8. Antimony	0.006	0.006	Some people who drink water containing antimony well in excess of the MCL over many years could experience increases in blood cholesterol and decreases in blood sugar.
9. Arsenic	None	0.05	Some people who drink water containing arsenic in excess of the MCL over many years could experience skin damage or problems with their circulatory system, and may have an increased risk of getting cancer.
10. Asbestos (>10 µm)	7 MFL[11]	7 MFL	Some people who drink water containing asbestos in excess of the MCL over many years may have an increased risk of developing benign intestinal polyps.
11. Barium	2	2	Some people who drink water containing barium in excess of the MCL over many years could experience an increase in their blood pressure.
12. Beryllium	0.004	0.004	Some people who drink water containing beryllium well in excess of the MCL over many years could develop intestinal lesions.
13. Cadmium	0.005	0.005	Some people who drink water containing cadmium in excess of the MCL over many years could experience kidney damage.
14. Chromium (total)	0.1	0.1	Some people who use water containing chromium well in excess of the MCL over many years could experience allergic dermatitis.
15. Cyanide	0.2	0.2	Some people who drink water containing cyanide well in excess of the MCL over many years could experience nerve damage or problems with their thyroid.

Standard Health Effects Language for Public Notification

(From Appendix B of 40 CFR 141, Subpart Q)

Contaminant	MCLG[1] mg/L	MCL[2] mg/L	Standard Health Effects Language for Public Notification
16. Fluoride	4.0	4.0	Some people who drink water containing fluoride in excess of the MCL over many years could get bone disease, including pain and tenderness of the bones. Fluoride in drinking water at half the MCL or more may cause mottling of children's teeth, usually in children less than nine years old. Mottling, also known as dental fluorosis, may include brown staining and/or pitting of the teeth, and occurs only in developing teeth, before they erupt from the gums.
17. Mercury (inorganic)	0.002	0.002	Some people who drink water containing inorganic mercury well in excess of the MCL over many years could experience kidney damage.
18. Nitrate	10	10	Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.
19. Nitrite	1	1	Infants below the age of six months who drink water containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.
20. Total Nitrate and Nitrite	10	10	Infants below the age of six months who drink water containing nitrate and nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue baby syndrome.
21. Selenium	0.05	0.05	Selenium is an essential nutrient. However, some people who drink water containing selenium in excess of the MCL over many years could experience hair or fingernail losses, numbness in fingers or toes, or problems with their circulation.
22. Thallium	0.0005	0.002	Some people who drink water containing thallium in excess of the MCL over many years could experience hair loss, changes in their blood, or problems with their kidneys, intestines, or liver.
D. Lead and Copper Rule			
23. Lead	Zero	TT[12]	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.

Standard Health Effects Language for Public Notification

(From Appendix B of 40 CFR 141, Subpart Q)

Contaminant	MCLG[1] mg/L	MCL[2] mg/L	Standard Health Effects Language for Public Notification
24. Copper	1.3	TT[13]	Copper is an essential nutrient, but some people who drink water containing copper in excess of the action level over a relatively short amount 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.
E. Synthetic Organic Chemicals (SOCs)			
25. 2,4-D	0.07	0.07	Some people who drink water containing the weed killer 2,4-D well in excess of the MCL over many years could experience problems with their kidneys, liver, or adrenal glands.
26. 2,4,5-TP (Silvex)	0.05	0.05	Some people who drink water containing silvex in excess of the MCL over many years could experience liver problems.
27. Alachlor	Zero	0.002	Some people who drink water containing alachlor in excess of the MCL over many years could have problems with their eyes, liver, kidneys, or spleen, or experience anemia, and may have an increased risk of getting cancer.
28. Atrazine	0.003	0.003	Some people who drink water containing atrazine well in excess of the MCL over many years could experience problems with their cardiovascular system or reproductive difficulties.
29. Benzo(a)pyrene (PAHs)	Zero	0.0002	Some people who drink water containing benzo(a)pyrene in excess of the MCL over many years may experience reproductive difficulties and may have an increased risk of getting cancer.
30. Carbofuran	0.04	0.04	Some people who drink water containing carbofuran in excess of the MCL over many years could experience problems with their blood, or nervous or reproductive systems.
31. Chlordane	Zero	0.002	Some people who drink water containing chlordane in excess of the MCL over many years could experience problems with their liver, or nervous system, and may have an increased risk of getting cancer.
32. Dalapon	0.2	0.2	Some people who drink water containing dalapon well in excess of the MCL over many years could experience minor kidney changes.
33. Di (2-ethylhexyl) adipate	0.4	0.4	Some people who drink water containing di (2-ethylhexyl) adipate well in excess of the MCL over many years could experience general toxic effects or reproductive difficulties.

Standard Health Effects Language for Public Notification

(From Appendix B of 40 CFR 141, Subpart Q)

Contaminant	MCLG[1] mg/L	MCL[2] mg/L	Standard Health Effects Language for Public Notification
34. Di(2-ethylhexyl) phthalate	Zero	0.006	Some people who drink water containing di (2-ethylhexyl) phthalate in excess of the MCL over many years may have problems with their liver, or experience reproductive difficulties, and may have an increased risk of getting cancer.
35. Dibromochloropropane (DBCP)	Zero	0.0002	Some people who drink water containing DBCP in excess of the MCL over many years could experience reproductive difficulties and may have an increased risk of getting cancer.
36. Dinoseb	0.007	0.007	Some people who drink water containing dinoseb well in excess of the MCL over many years could experience reproductive difficulties.
37. Dioxin (2,3,7,8-TCDD)	Zero	3×10^{-8}	Some people who drink water containing dioxin in excess of the MCL over many years could experience reproductive difficulties and may have an increased risk of getting cancer.
38. Diquat	0.02	0.02	Some people who drink water containing diquat in excess of the MCL over many years could get cataracts.
39. Endothall	0.1	0.1	Some people who drink water containing endothall in excess of the MCL over many years could experience problems with their stomach or intestines.
40. Endrin	0.002	0.002	Some people who drink water containing endrin in excess of the MCL over many years could experience liver problems.
41. Ethylene dibromide	Zero	0.00005	Some people who drink water containing ethylene dibromide in excess of the MCL over many years could experience problems with their liver, stomach, reproductive system, or kidneys, and may have an increased risk of getting cancer.
42. Glyphosate	0.7	0.7	Some people who drink water containing glyphosate in excess of the MCL over many years could experience problems with their kidneys or reproductive difficulties.
43. Heptachlor	Zero	0.0004	Some people who drink water containing heptachlor in excess of the MCL over many years could experience liver damage and may have an increased risk of getting cancer.
44. Heptachlor epoxide	Zero	0.0002	Some people who drink water containing heptachlor epoxide in excess of the MCL over many years could experience liver damage, and may have an increased risk of getting cancer.

Standard Health Effects Language for Public Notification

(From Appendix B of 40 CFR 141, Subpart Q)

Contaminant	MCLG[1] mg/L	MCL[2] mg/L	Standard Health Effects Language for Public Notification
45. Hexachlorobenzene	Zero	0.001	Some people who drink water containing hexachlorobenzene in excess of the MCL over many years could experience problems with their liver or kidneys, or adverse reproductive effects, and may have an increased risk of getting cancer.
46. Hexachlorocyclo-pentadiene	0.05	0.05	Some people who drink water containing hexachlorocyclopentadiene well in excess of the MCL over many years could experience problems with their kidneys or stomach.
47. Lindane	0.0002	0.0002	Some people who drink water containing lindane in excess of the MCL over many years could experience problems with their kidneys or liver.
48. Methoxychlor	0.04	0.04	Some people who drink water containing methoxychlor in excess of the MCL over many years could experience reproductive difficulties.
49. Oxamyl (Vydate)	0.2	0.2	Some people who drink water containing oxamyl in excess of the MCL over many years could experience slight nervous system effects.
50. Pentachlorophenol	Zero	0.001	Some people who drink water containing pentachlorophenol in excess of the MCL over many years could experience problems with their liver or kidneys, and may have an increased risk of getting cancer.
51. Picloram	0.5	0.5	Some people who drink water containing picloram in excess of the MCL over many years could experience problems with their liver.
52. Polychlorinated biphenyls (PCBs)	Zero	0.0005	Some people who drink water containing PCBs in excess of the MCL over many years could experience changes in their skin, problems with their thymus gland, immune deficiencies, or reproductive or nervous system difficulties, and may have an increased risk of getting cancer.
53. Simazine	0.004	0.004	Some people who drink water containing simazine in excess of the MCL over many years could experience problems with their blood.
54. Toxaphene	Zero	0.003	Some people who drink water containing toxaphene in excess of the MCL over many years could have problems with their kidneys, liver, or thyroid, and may have an increased risk of getting cancer.
F. Volatile Organic Chemicals (VOCs)			
55. Benzene	Zero	0.005	Some people who drink water containing benzene in excess of the MCL over many years could experience anemia or a decrease in blood platelets, and may have an increased risk of getting cancer.

Standard Health Effects Language for Public Notification

(From Appendix B of 40 CFR 141, Subpart Q)

Contaminant	MCLG[1] mg/L	MCL[2] mg/L	Standard Health Effects Language for Public Notification
56. Carbon tetrachloride	Zero	0.005	Some people who drink water containing carbon tetrachloride in excess of the MCL over many years could experience problems with their liver and may have an increased risk of getting cancer.
57. Chlorobenzene (monochlorobenzene)	0.1	0.1	Some people who drink water containing chlorobenzene in excess of the MCL over many years could experience problems with their liver or kidneys.
58. *o*-Dichlorobenzene	0.6	0.6	Some people who drink water containing o-dichlorobenzene well in excess of the MCL over many years could experience problems with their liver, kidneys, or circulatory systems.
59. *p*-Dichlorobenzene	0.075	0.075	Some people who drink water containing p-dichlorobenzene in excess of the MCL over many years could experience anemia, damage to their liver, kidneys, or spleen, or changes in their blood.
60. 1,2-Dichloroethane	Zero	0.005	Some people who drink water containing 1,2-dichloroethane in excess of the MCL over many years may have an increased risk of getting cancer.
61. 1,1-Dichloroethylene	0.007	0.007	Some people who drink water containing 1,1-dichloroethylene in excess of the MCL over many years could experience problems with their liver.
62. *cis*-1,2-Dichloroethylene	0.07	0.07	Some people who drink water containing cis-1,2-dichloroethylene in excess of the MCL over many years could experience problems with their liver.
63. *trans*-1,2-Dichloroethylene	0.1	0.1	Some people who drink water containing trans-1,2-dichloroethylene well in excess of the MCL over many years could experience problems with their liver.
64. Dichloromethane	Zero	0.005	Some people who drink water containing dichloromethane in excess of the MCL over many years could have liver problems and may have an increased risk of getting cancer.
65. 1,2-Dichloropropane	Zero	0.005	Some people who drink water containing 1,2-dichloropropane in excess of the MCL over many years may have an increased risk of getting cancer.
66. Ethylbenzene	0.7	0.7	Some people who drink water containing ethylbenzene well in excess of the MCL over many years could experience problems with their liver or kidneys.
67. Styrene	0.1	0.1	Some people who drink water containing styrene well in excess of the MCL over many years could have problems with their liver, kidneys, or circulatory system.

Standard Health Effects Language for Public Notification

(From Appendix B of 40 CFR 141, Subpart Q)

Contaminant	MCLG[1] mg/L	MCL[2] mg/L	Standard Health Effects Language for Public Notification
68. Tetrachloroethylene	Zero	0.005	Some people who drink water containing tetrachloroethylene in excess of the MCL over many years could have problems with their liver, and may have an increased risk of getting cancer.
69. Toluene	1	1	Some people who drink water containing toluene well in excess of the MCL over many years could have problems with their nervous system, kidneys, or liver.
70. 1,2,4-Trichlorobenzene	0.07	0.07	Some people who drink water containing 1,2,4-trichlorobenzene well in excess of the MCL over many years could experience changes in their adrenal glands.
71. 1,1,1-Trichloroethane	0.2	0.2	Some people who drink water containing 1,1,1-trichloroethane in excess of the MCL over many years could experience problems with their liver, nervous system, or circulatory system.
72. 1,1,2-Trichloroethane	0.003	0.005	Some people who drink water containing 1,1,2-trichloroethane well in excess of the MCL over many years could have problems with their liver, kidneys, or immune systems.
73. Trichloroethylene	Zero	0.005	Some people who drink water containing trichloroethylene in excess of the MCL over many years could experience problems with their liver and may have an increased risk of getting cancer.
74. Vinyl chloride	Zero	0.002	Some people who drink water containing vinyl chloride in excess of the MCL over many years may have an increased risk of getting cancer.
75. Xylenes (total)	10	10	Some people who drink water containing xylenes in excess of the MCL over many years could experience damage to their nervous system.
G. Radioactive Contaminants			
76. Beta/photon emitters	Zero	4 mrem/yr[14]	Certain minerals are radioactive and may emit forms of radiation known as photons and beta radiation. Some people who drink water containing beta and photon emitters in excess of the MCL over many years may have an increased risk of getting cancer.
77. Alpha emitters (Gross alpha)	Zero	15 pCi/L[15]	Certain minerals are radioactive and may emit a form of radiation known as alpha radiation. Some people who drink water containing alpha emitters in excess of the MCL over many years may have an increased risk of getting cancer.
78. Combined radium (226 & 228)	Zero	5 pCi/L	Some people who drink water containing radium 226 or 228 in excess of the MCL over many years may have an increased risk of getting cancer.

Standard Health Effects Language for Public Notification

(From Appendix B of 40 CFR 141, Subpart Q)

Contaminant	MCLG[1] mg/L	MCL[2] mg/L	Standard Health Effects Language for Public Notification
H. Disinfection Byproducts (DBPs), Byproduct Precursors, and Disinfectant Residuals*:* Where disinfection is used in the treatment of drinking water, disinfectants combine with organic and inorganic matter present in water to form chemicals called disinfection byproducts (DBPs). EPA sets standards for controlling the levels of disinfectants and DBPs in drinking water, including trihalomethanes (THMs) and haloacetic acids (HAAs).[16]			
79. Total trihalomethanes (TTHMs)	N/A	0.10/ 0.080[17,18]	Some people who drink water containing trihalomethanes in excess of the MCL over many years may experience problems with their liver, kidneys, or central nervous system, and may have an increased risk of getting cancer.
80. Haloacetic Acids (HAA)	N/A	0.060[19]	Some people who drink water containing haloacetic acids in excess of the MCL over many years may have an increased risk of getting cancer.
81. Bromate	Zero	0.010	Some people who drink water containing bromate in excess of the MCL over many years may have an increased risk of getting cancer.
82. Chlorite	0.08	1.0	Some infants and young children who drink water containing chlorite in excess of the MCL could experience nervous system effects. Similar effects may occur in fetuses of pregnant women who drink water containing chlorite in excess of the MCL. Some people may experience anemia.
83. Chlorine	4 (MRDLG)[20]	4.0 (MRDL)[21]	Some people who use drinking water containing chlorine well in excess of the MRDL could experience irritating effects to their eyes and nose. Some people who drink water containing chlorine well in excess of the MRDL could experience stomach discomfort.
84. Chloramines	4 (MRDLG)	4.0 (MRDL)	Some people who use drinking water containing chloramines well in excess of the MRDL could experience irritating effects to their eyes and nose. Some people who drink water containing chloramines well in excess of the MRDL could experience stomach discomfort or anemia.

(From Appendix B of 40 CFR 141, Subpart Q)

Contaminant	MCLG[1] mg/L	MCL[2] mg/L	Standard Health Effects Language for Public Notification
85a. Chlorine dioxide, where any 2 consecutive daily samples taken at the entrance to the distribution system are above the MRDL	0.8 (MRDLG)	0.8 (MRDL)	Some infants and young children who drink water containing chlorine dioxide in excess of the MRDL could experience nervous system effects. Similar effects may occur in fetuses of pregnant women who drink water containing chlorine dioxide in excess of the MRDL. Some people may experience anemia. *Add for public notification only*: The chlorine dioxide violations reported today are the result of exceedances at the treatment facility only, not within the distribution system which delivers water to consumers. Continued compliance with chlorine dioxide levels within the distribution system minimizes the potential risk of these violations to consumers.
85b. Chlorine dioxide, where one or more distribution system samples are above the MRDL	0.8 (MRDLG)	0.8 (MRDL)	Some infants and young children who drink water containing chlorine dioxide in excess of the MRDL could experience nervous system effects. Similar effects may occur in fetuses of pregnant women who drink water containing chlorine dioxide in excess of the MRDL. Some people may experience anemia. *Add for public notification only*: The chlorine dioxide violations reported today include exceedances of the EPA standard within the distribution system which delivers water to consumers. Violations of the chlorine dioxide standard within the distribution system may harm human health based on short-term exposures. Certain groups, including fetuses, infants, and young children, may be especially susceptible to nervous system effects from excessive chlorine dioxide exposure.
86. Control of DBP precursors (TOC)	None	TT	Total organic carbon (TOC) has no health effects. However, total organic carbon provides a medium for the formation of disinfection byproducts. These byproducts include trihalomethanes (THMs) and haloacetic acids (HAAs). Drinking water containing these byproducts in excess of the MCL may lead to adverse health effects, liver or kidney problems, or nervous system effects, and may lead to an increased risk of getting cancer.

(From Appendix B of 40 CFR 141, Subpart Q)

Contaminant	MCLG[1] mg/L	MCL[2] mg/L	Standard Health Effects Language for Public Notification
I. Other Treatment Techniques			
87. Acrylamide	Zero	TT	Some people who drink water containing high levels of acrylamide over a long period of time could have problems with their nervous system or blood, and may have an increased risk of getting cancer.
88. Epichlorohydrin	Zero	TT	Some people who drink water containing high levels of epichlorohydrin over a long period of time could experience stomach problems, and may have an increased risk of getting cancer.

Endnotes

1. MCLG - Maximum contaminant level goal

2. MCL - Maximum contaminant level

3. For water systems analyzing at least 40 samples per month, no more than 5.0 percent of the monthly samples may be positive for total coliforms. For systems analyzing fewer than 40 samples per month, no more than one sample per month may be positive for total coliforms.

4. There are various regulations that set turbidity standards for different types of systems, including 40 CFR 141.13, the 1989 Surface Water Treatment Rule, and the 1998 Interim Enhanced Surface Water Treatment Rule. The MCL for the monthly turbidity average is 1 NTU; the MCL for the 2-day average is 5 NTU for systems that are required to filter but have not yet installed filtration (40 CFR 141.13).

5. NTU - Nephelometric turbidity unit

6. There are various regulations that set turbidity standards for different types of systems, including 40 CFR 141.13, the 1989 Surface Water Treatment Rule (SWTR), and the 1998 Interim Enhanced Surface Water Treatment Rule (IESWTR). Systems subject to the Surface Water Treatment Rule (both filtered and unfiltered) may not exceed 5 NTU. In addition, in filtered systems, 95 percent of samples each month must not exceed 0.5 NTU in systems using conventional or direct filtration and must not exceed 1 NTU in systems using slow sand or diatomaceous earth filtration or other filtration technologies approved by the primacy agency.

7. TT - Treatment technique

8. There are various regulations that set turbidity standards for different types of systems, including 40 CFR 141.13, the 1989 Surface Water Treatment Rule (SWTR), and the 1998 Interim Enhanced Surface Water Treatment Rule (IESWTR). For systems subject to the IESWTR (systems serving at least 10,000 people, using surface water or ground water under the direct influence of surface water), that use conventional filtration or direct filtration, after January 1, 2002, the turbidity level of a system's combined filter effluent may not exceed 0.3 NTU in at least 95 percent of monthly measurements, and the turbidity level of a system's combined filter effluent must not exceed 1 NTU at any time. Systems subject to the IESWTR using technologies other than conventional, direct, slow sand, or diatomaceous earth filtration must meet turbidity limits set by the primacy agency.

9. The bacteria detected by heterotrophic plate count (HPC) are not necessarily harmful. HPC is simply an alternative method of determining disinfectant residual levels. The number of such bacteria is an indicator of whether there is enough disinfectant in the distribution system.

10. SWTR and IESWTR treatment technique violations that involve turbidity exceedances may use the health effects language for turbidity instead.

11. Millions of fibers per liter

12. Action Level = 0.015 mg/L

13. Action Level = 1.3 mg/L

14. Millirems per year

15. Picocuries per liter

16. Surface water systems and ground water systems under the direct influence of surface water are regulated under Subpart H of 40 CFR 141. Subpart H community and non-transient non-community systems serving $10,000 must comply with DBP MCLs and disinfectant maximum residual disinfectant levels (MRDLs) beginning January 1, 2002. All other community and non-transient noncommunity systems must meet the MCLs and MRDLs beginning January 1, 2004. Subpart H transient non-community systems serving 10,000 or more persons and using chlorine dioxide as a disinfectant or oxidant must comply with the chlorine dioxide MRDL beginning January 1, 2002. Subpart H transient non-community systems serving fewer than 10,000 persons and systems using only ground water not under the direct influence of surface water and using chlorine dioxide as a disinfectant or oxidant must comply with the chlorine dioxide MRDL beginning January 1, 2004.

17. The MCL of 0.10 mg/l for TTHMs is in effect until January 1, 2002 for Subpart H community water systems serving 10,000 or more. This MCL is in effect until January 1, 2004 for community water systems with a population of 10,000 or more using only ground water not under the direct influence of surface water. After these deadlines, the MCL will be 0.080 mg/l. On January 1, 2004, all systems serving less than 10,000 will have to comply with the new MCL as well.

18. The MCL for total trihalomethanes is the sum of the concentrations of the individual trihalomethanes.

19. The MCL for haloacetic acids is the sum of the concentrations of the individual haloacetic acids.

20. MRDLG - Maximum residual disinfectant level goal

21. MRDL - Maximum residual disinfectant level

APPENDIX O

SHORT-LIVED ASSET ANALYSIS

City of Ilwaco

Short Lived Assets	Year in service	Estimated Life	Remaining Life	Original Cost	Replace from Reserves
Security windows/door	1990	20	-	$10,000	
Miles of Water Line	1950	50	-	$900,000	
10 Float Switches	2000	5	-	$500	
700 Water Meters	1990	20	-	$105,000	
3 - Heaters	1988	10	-	$4,500	
Water Rights	1988	20	-	$50,000	
Backwash Pond NPDES Permit	2005	5	-	$6,000	
30 Water Shed Signs	1998	5	-	$3,500	
Safety Equipment	1998	10	-	$15,000	
Residential meters	2005	5.5	0.5	$35,000	x
Water system plan	2005	6	0.8	$35,000	x
Computer Software Upgrade	2000	11	1.0	$4,600	x
Paint water tanks	1995	20	1.0	$85,000	x
4 Actuators 10",install 1988 $3,500 each	2011	0.5	1.5	$14,000	x
Stringtown Pump #2 20hp	1988	24	2.0	$5,000	x
Chemical mixer #4	2010	2	2.0	$2,500	x
4 Chemical Feed Verification Sensors	2006	6	2.0	$1,000	x
Outoboard motor for boat	1988	24	2.0	$20,000	x
Effluent pump #3 20hp	1988	24	2.0	$5,000	x
Effluent pump #5spare 15hp	1988	24	2.0	$3,000	x
4 Actuators 10",install 1988 $3,500 each	2011	1	2.0	$14,000	x
Stringtown Pump #1 20hp	1988	24	2.0	$5,000	x
Stringtown 3" Cla Val. (2)	1988	24	2.0	$500	x
Chemical Pumps	2008	4	2.0	$5,500	x
Blowers - 2	1998	14	2.0	$36,000	x
5 Actuators 10",install 1988 $3,500 each	2011	1.5	2.5	$17,500	x
6 Level Transmitters	2000	12	2.0	$6,000	
Weather Station	2004	8	2.0	$1,500	
Security Equipment	2000	12	2.0	$5,000	
Clearing Easements	2011	2	3.0	$6,000	x
RTU (Telemetry Radios)	2011	2	3.0	$1,500	x
Commercial Meters	2003	10	3.0	$35,000	x
Vehicles - 1	2008	5	3.0	$5,000	x
Clean Tanks	2008	5	3.0	$3,500	x
2x 30 hp Intertie pump	1998	15	3.0	$12,000	x
RTU (Telemetry Radios) 2	2011	2	3.0	$3,000	x
(PLC units)RUGGED Units	2011	2	3.0	$1,800	x
Lighting	1988	25	3.0	$5,000	
Office Equipment	1998	15	3.0	$5,000	
Vehicles - 1	2009	5	4.0	$5,000	x
Chemical mixer #2	2010	4	4.0	$2,500	x
Chemical mixer #3	2010	4	4.0	$2,500	x
Clearing Easements	2011	3	4.0	$6,000	x
RTU (Telemetry Radios)	2011	3	4.0	$1,500	x
(PLC units)RUGGED Units	2011	3	4.0	$1,800	x
Lab Analyzers	2010	5	5.0	$15,000	x
Lawn Mower	2010	5	5.0	$3,000	x
2 FLOW METERS	2000	15	5.0	$16,000	x
6 Chemical Mixers	2010	5	5.0	$12,500	x
Chemical mixer #1	2010	5	5.0	$2,500	x

City of Ilwaco

Short Lived Assets	Year in service	Estimated Life	Remaining Life	Original Cost	Replace from Reserves
Chemical mixer #5	2010	5	5.0	$2,500	x
Stringtown 2" Cla Val (1)	2010	5	5.0	$500	x
Clearing Easements	2011	4	5.0	$6,000	x
RTU (Telemetry Radios)	2011	4	5.0	$1,500	x
(PLC units)RUGGED Units	2011	4	5.0	$2,800	x
Tools	2010	5	5.0	$3,000	
7 Pressure Transmitters	2005	10	5.0	$1,100	
Effluent pump #4 20hp	1988	28	6.0	$5,000	x
Clearing Easements	2011	5	6.0	$6,000	x
RTU (Telemetry Radios)	2011	5	6.0	$1,500	x
(PLC units)RUGGED Units	2011	5	6.0	$2,800	x
NTU Meters (6) turbidity	2007	10	7.0	$20,000	x
(PLC units)RUGGED Units	2011	6	7.0	$2,800	x
83 Fire Hydrant Valves	1968	50	7.6	$24,000	x
Compressors - 2	2008	10	8.0	$8,000	x
(23)Valves 10inch	1988	30	8.0	$23,000	x
4 Check Valves	1988	30	8.0	$10,000	x
83 FIRE HYDRANTS ($2,409 ea.)	1968	50	8.0	$200,000	x
7 Chemical Mixing Tanks	1998	20	8.0	$17,500	x
Water Plant Fence	1998	20	8.0	$15,000	
(PLC units)RUGGED Units	2011	7	8.0	$2,800	x
2 Pumps 60hp- Spring St.	2005	15	10.0	$12,000	x
2 Pumps 5hp- Discovery Ht.	2005	15	10.0	$3,000	x
1 Pump/motor 40hp - Discovery Ht.	2005	15	10.0	$6,000	x
700 Meter Boxes	1990	30	10.0	$26,000	
Bench Lab Equipment	2008	12	10.0	$10,000	x
Effluent pump #1 10hp	1988	32	10.0	$3,000	x
Effluent pump #2 15hp	1988	32	10.0	$3,000	x
(computer) SCADA	2010	11	11.0	$50,000	x
3 Pressure Reducing Valves	2004	20	14.0	$12,000	x
Stringtown 2" valves (4)	1988	37	15.0	$400	x
Stringtown 3" valves (2)	1988	37	15.0	$200	x
Aluminum Boat	1988	40	18.0	$25,000	x
Lakeview Pump/motor(2) 5hp	2006	24	20.0	$10,000	x
Lakeview (fire) Pump/motor(1) 30hp	2006	24	20.0	$6,000	x
Stringtown 8" flow meter	1988	42	20.0	$7,000	x
Spring Street 6" flow meter	2005	25	20.0	$6,000	x
Spring Street 8" Cla Val (1)	2005	25	20.0	$4,000	x
Spring Street 1 pump control panel	2005	25	20.0		x
Spring Street 1 cll7 chlorine analyzer (missing	2005	25	20.0	$2,500	x
Spring Street 3" Cla Val (1)	2005	25	20.0	$1,500	x
Spring Street 8" valves (2)	2005	25	20.0	$600	x
Spring Street 6" valves (2)	2005	25	20.0	$400	x
Spring Street 4" valves (2)	2005	25	20.0	$250	x
Spring Street 3" valve (1)	2005	25	20.0	$220	x
Spring Street 1 pressure sensor	2005	25	20.0		x
Spring Street chem feed pump	2005	25	20.0	$400	x
Spring Street 1 rugid com box	2005	25	20.0		x
Discovery Heights 2" valves (6)	2005	25	20.0	$900	x
Discovery Heights 6" valves (2)	2005	25	20.0	$800	x

City of Ilwaco

Short Lived Assets	Year in service	Estimated Life	Remaining Life	Original Cost	Replace from Reserves
Discovery Heights 8" flowmeter (1)	2005	25	20.0	$7,000	x
Discovery Heights pressure sensor	2005	25	20.0		x
Discovery Heights rugid com panel	2005	25	20.0		x
Lakeview 6" valve (1)	2006	25	21.0	$400	x
Lakeview 4" valve (1)	2006	25	21.0	$250	x
Lakeview 2" valve (5)	2006	25	21.0	$500	x
Lakeview 2" Cla val (1)	2006	25	21.0	$1,000	x
Lakeview pressure sensor	2006	25	21.0		x
Lakeview pump control panel	2006	25	21.0		x
Lakeview 1 rugid com box	2006	25	21.0		x
Stringtown Pump #3 15hp	2011	23	24.0	$5,000	x
Generator	1988	50	28.0	$50,000	x
Stringtown 1 pump control panel	1988				
Stringtown 1 rugid com panel	1988				
Stringtown 1 PLC (not used)	1988				

APPENDIX P

APPROVALS AND CORRESPONDENCE

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
SOUTHWEST DRINKING WATER REGIONAL OPERATIONS
PO Box 47823, Olympia, Washington 98504-7823
TDD Relay 1-800-833-6388

July 25, 2011

Mike Cassinelli
City of Ilwaco Water Department
Post Office Box 538
Ilwaco, Washington 98624

Subject: City of Ilwaco Water Department, ID #355002, Pacific County; Water System Plan Update, ODW Project #11-0302

Dear Mike Cassinelli:

The Water System Plan (WSP) received by the Office of Drinking Water (ODW) on March 3, 2011, along with subsequent submittals received on June 15, 2011, and July 18, 2011, has been reviewed, and in accordance with the provisions of WAC 246-290, is **APPROVED**.

Approval of this WSP is valid as it relates to current standards outlined in WAC 246-290-100 revised November 1, 2010, WAC 246-293 revised September 1997, and RCW 70.116 (Municipal Water Law) effective September 2003, and is subject to the qualifications herein. Future changes in the rules and statutes may be more stringent and require facility modification or corrective action. An approved update of this WSP is required on or before July 25, 2017, unless ODW requests an update or plan amendment pursuant to WAC 246-290-100(9).

APPROVED NUMBER OF CONNECTIONS

Based on the information supplied in this WSP, this system has sufficient capacity to meet the growth projections for the identified six-year planning period. ODW will reflect this condition by noting on the water facilities inventory (WFI) form and operating permit an "unspecified" designation for this system's approved number of connections. You are responsible for permitting the addition of new service connections to this system in a manner consistent with the approved document. ODW expects you to maintain a process that recognizes all new connections added to this system, and the water demands associated with each connection. The process must assure that physical capacity and water right limitations are not exceeded. The limiting factor is storage.

LOCAL GOVERNMENT CONSISTENCY

Mike Cassinelli, Mayor of the City of Ilwaco, signed the local consistency statement on May 25, 2011. In addition, Michael Desimone, Director of Department of Community Development for Pacific County, signed the local consistency on March 3, 2011. This meets local government consistency requirements for WSP approval pursuant to RCW 90.03.386 and RCW 43.20.

SERVICE AREA AND DUTY TO SERVE

Pursuant to RCW 90.03.386(2), the service area identified in the WSP service area map may now represent an expanded "place of use" for this system's water rights. Changes in service area should be made through a WSP amendment.

This system has a duty to provide new water service within its retail service area. This WSP includes service policies to describe how this system plans to provide new service within its retail service area.

WATER RESOURCES

This approval does not provide any guarantee and should not be considered to provide any guarantee concerning legal use of water or any subsequent water right decisions by the Department of Ecology (Ecology). A copy of this document was sent to Ecology on March 10, 2011. As of the date of this letter, comments have not been received from Ecology. ODW is making this approval based upon this system's water right analysis.

WATERSHED PLANNING

The Willapa Watershed (WRIA 24) does not have an approved watershed plan at this time. ODW encourages this system to be aware of any watershed activities. Please contact Ecology for more information.

CONSTRUCTION WAIVERS

Standard Construction Specifications for distribution main extensions in this WSP are approved. Consistent with WAC 246-290-125(2), this system may proceed with the installation of distribution main extensions provided this system completes and keeps on file the enclosed construction completion report form in accordance with WAC 246-290-125(2) and WAC 246-290-120(5) and makes it available for review upon request by ODW.

We recognize the significant effort and resource commitment involved in the preparation of this WSP. Thank you for your cooperation.

If you have any questions, please contact Corina Hayes at (360) 236-3031 or Teresa Walker at (360) 236-3032.

Sincerely,

Corina Hayes
Office of Drinking Water, Regional Planner

Teresa Walker, P.E.
Office of Drinking Water, Regional Engineer

cc: Nancy Lockett, Gray & Osborne, Inc.
Pacific County Health Department
Pacific County Planning Department
Amy Nielson, Department of Ecology
Brad Brooks, ODW
Cheri Paine, ODW

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Local Government Consistency Review Checklist

Water System Name: City of Ilwaco PWS ID: 35500

Planning/Engineering Document Title: Water System Plan Plan Date: February 2011

Local Government with Jurisdiction: City of Ilwaco

WAC 246-290-108 Consistency with local plans and regulations:
Consistency with local plans and regulations applies to planning and engineering documents under WAC 246-290-106, 246-290-107, and 246-290-110(4)(b (ii).

1) Municipal water suppliers must include a consistency review and supporting documentation in its planning or engineering document describing how it has addressed consistency with **local plans and regulations**. This review must include specific elements of local plans and regulations, as they reasonably relate to water service as determined by Department of Health (DOH). Complete the table below and see instructions on back.

Local Government Consistency Statement	Page(s) in Planning Document	Yes – No – Not Applicable
a) The water system service area is consistent with the adopted land use and zoning within the applicable service area.	1-9	Yes
b) The six-year growth projection used to forecast water demand is consistent with the adopted city/county's population growth projections. If a different growth projection is used, provide an explanation of the alternative growth projection and methodology.	2-15	Yes
c) Applies to cities and towns that provide water service: All water service area policies of the city or town are consistent with the utility service extension ordinances of the city or town.	1-21	Yes
d) Service area policies for new service connections are consistent with the adopted local plans and adopted development regulations of all jurisdictions with authority over the service area [City(ies), County(ies)].	1-21	Yes
e) Other relevant elements related to water supply are addressed in the water system plan, if applicable; Coordinated Water System plans, Regional Wastewater plans, Reclaimed Water plans, Groundwater Area Management plans, and Capital Facilities Element of Comprehensive plans.	1-17	Yes

I certify that the above statements are true to the best of my knowledge and that these specific elements are consistent with adopted local plans and development regulations.

Signature

May 25th, 2011
Date

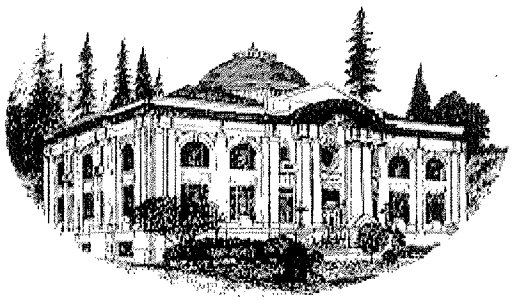
Mike Cassinelli, Mayor, City of Ilwaco
Printed Name, Title, & Jurisdiction

Pacific County Department of Community Development

PLANNING • ENVIRONMENTAL HEALTH • BUILDING

SOUTH BEND OFFICE
Courthouse Annex
1216 W. Robert Bush Drive
P.O. Box 68
South Bend, WA 98586
Website: www.co.pacific.wa.us

(360) 875-9356
FAX (360) 875-9304
Tokeland (360) 267-8356
Naselle (360) 484-7356



PACIFIC COUNTY COURTHOUSE
National Historic Site

LONG BEACH OFFICE
South County Administration Facility
7013 Sandridge Road
Long Beach, WA 98631
Website: www.co.pacific.wa.us

(360)642-9382
FAX (360) 642-9387
Naselle (360) 484-7382
Tokeland (360) 267-8382

"Pacific County is an equal opportunity provider and employer."

GRAY & OSBORNE, INC.
REC'D - SEATTLE
MAR 14 2011
JOB #

March 10, 2011

Nancy E. Lockett, P.E.
Gray & Osborne, Inc.
701 Dexter Ave. N, Suite 200
Seattle, WA 98109

RE: City of Ilwaco Water System Plan
Consistency Review

Dear Ms. Lockett:

Enclosed is the Local Government Consistency Review Checklist. I have reviewed the City of Ilwaco's Water System Plan to consistency with the Pacific County Comprehensive Plan and have determined it to be consistent with the latest Comprehensive Plan (2010) adopted by the County Commission.

If you have any questions about this matter, please don't hesitate to contact me at (360) 642-9382.

Sincerely,

Michael A. DeSimone

Enclosure

Washington State Department of Health
Division of Environmental Health
Office of Drinking Water

Local Government Consistency Review Checklist

Water System Name: City of Ilwaco PWS ID: 35500

Planning/Engineering Document Title: Water System Plan Plan Date: Feb. 2011

Local Government with Jurisdiction: Pacific County

WAC 246-290-108 Consistency with local plans and regulations:
Consistency with local plans and regulations applies to planning and engineering documents under WAC 246-290-106, 246-290-107, and 246-290-110(4)(b (ii).

1) Municipal water suppliers must include a consistency review and supporting documentation in its planning or engineering document describing how it has addressed consistency with **local plans and regulations**. This review must include specific elements of local plans and regulations, as they reasonably relate to water service as determined by Department of Health (DOH). Complete the table below and see instructions on back.

Local Government Consistency Statement	Page(s) in Planning Document	Yes – No – Not Applicable
a) The water system service area is consistent with the adopted land use and zoning within the applicable service area.	SECTION 2 of PC CP.	Yes
b) The six-year growth projection used to forecast water demand is consistent with the adopted city/county's population growth projections. If a different growth projection is used, provide an explanation of the alternative growth projection and methodology.	APPENDIX A of PC C.P.	Yes
c) Applies to cities and towns that provide water service: All water service area policies of the city or town are consistent with the utility service extension ordinances of the city or town.	8	
d) Service area policies for new service connections are consistent with the adopted local plans and adopted development regulations of all jurisdictions with authority over the service area [City(ies), County(ies)].	Section 6 of PC C.P.	Yes
e) Other relevant elements related to water supply are addressed in the water system plan, if applicable; Coordinated Water System plans, Regional Wastewater plans, Reclaimed Water plans, Groundwater Area Management plans, and Capital Facilities Element of Comprehensive plans.	Section 6 + Appx. A of PC CP	Yes

I certify that the above statements are true to the best of my knowledge and that these specific elements are consistent with adopted local plans and development regulations.

[signature] 3/10/11
Signature Date

MICHAEL A. DESIMONE, DIRECTOR-DCD, PACIFIC COUNTY
Printed Name, Title, & Jurisdiction

STATE OF WASHINGTON
DEPARTMENT OF HEALTH
SOUTHWEST DRINKING WATER REGIONAL OPERATIONS
PO Box 47823, Olympia, Washington 98504-7823
TDD Relay 1-800-833-6388

May 6, 2011

Mike Cassinelli, Mayor
City of Ilwaco Water Department
Post Office Box 538
Ilwaco, Washington 98624

Subject: City of Ilwaco Water Department, ID #355002, Pacific County; Water System Plan Updates, ODW Project #11-0302

Dear Mike Cassinelli:

Thank you for submitting the Water System Plan (WSP) for the City of Ilwaco Water Department (City) received by the Office of Drinking Water (ODW) on March 3, 2011. We have reviewed this WSP and the following comments must be addressed prior to ODW approval:

GENERAL COMMENTS

1. Municipal Water Suppliers must provide a consistency review and supporting documentation showing how it has addressed consistency with local plans and regulations. **Please provide a signed and dated local government consistency checklist form from the City and Pacific County. Also, please include any comments received from adjacent purveyors or the County.**
2. Prior to ODW approval, the City must hold an informational meeting for the water consumers. **Please provide documentation showing how the customers were notified, the time and date the meeting was held, and if any comments were received.**
3. Prior to approval, the City must obtain approval of this WSP from the governing body. **Please provide a signed resolution, signed board minutes, or other appropriate documentation showing the governing body has adopted this WSP.**
4. Prior to approval, an updated and signed Water Facilities Inventory (WFI) form must be provided that clearly reflects the current status of this system as outlined in the plan. **Please submit an updated and signed WFI.**

Chapter 1 – Water System Description

5. Page 1-3, the City provides water to water systems operated by Washington State Parks and Recreation Commission (WSPRC) for the water supplied to Cape Disappointment

State Park and Coast Guard Station. **Please include a copy of the agreement between the City and WSPRC or discuss the status of these agreements.**

6. Page 1-13, this page discusses storage and states that the 160,000-gallon concrete reservoir in the city center zone is not functional at this time. This reservoir was not functioning at the time of the last plan. **Please confirm if the reservoir has been abandoned.**
7. Page 1-15. The Plan states "The Sahalee subdivision will be connected to the Discovery Heights Reservoir." **Please state by what date.**
8. Page 1-19, Under Related Planning Documents. **Please describe the City of Long Beach Feasibility Study, completed in 2006, which analyzed regional-wide opportunities for water system management, operations, and finances, and the conclusion of this study as they relate to Ilwaco.**
9. Page 1-22, states that dispute decisions regarding water service connections are appealed to the County's Hearing Examiner. How is this accomplished, is there an agreement with the county to use their hearing examiner to address city issues? **Please provide additional discussion.**
10. Page 1-23, table 1-8, Wholesaling water. Does the City provide wholesale water to Cape Disappointment State Park and Coast Guard Station? **Please modify table.**

Chapter 2 – Basic Planning Data

11. Page 2-2, table 2-2 shows a total number of connections of 1,168, (698 residential and commercial, and 470 transient). **Please modify this table to make a distinction between transient units served directly by the City and those that are a part of the Cape Disappointment State Park and Coast Guard Station water system.**
12. Table 2-15, Projected Water System Demands. This system should plan to decrease Distribution System Leakage (DSL) to 10 percent by 2016. **Please revise this table to be consistent with Tables 5-2 and 5-5.**

Chapter 3 – System Analysis

13. Page 3-6, this section discusses the City's ability to meet projected maximum daily demand through 2012 with the current treatment facility using only filter number 3. A new treatment plant is not scheduled until 2018. How will the City meet projected maximum daily demand between 2012 and 2018? **Please describe the current modifications of the Water Treatment Plant in terms of Filters 1 and 2 now being operational and how that will change the plant capacity and the maximum daily demand from 2012-2018.**
14. Page 3-27, System Capacity. The system capacity must also analyze the Pumping Capacity of this system. **Please evaluate pumping capacity by Booster Pump Station and discuss in the system capacity section.**
15. Page 3-15, Table 3-10 and 3-11, show the average day and maximum day demand booster station analysis for the Baker Bay and Spring Street booster stations, but does not

include the Lakeview or Coastal ridge booster stations. **Please clarify or provide additional information.**

Chapter 5 – Water Use Efficiency Program

16. Page 5-11. The wood reservoir is known to contribute a significant amount to the systems DSL. **Please evaluate what percent of this system's DSL would be reduced if the wood reservoir was replaced.**
17. Page 5-11 says that the City has replaced 60 percent of service meters. Page 5-6 says that the City has replaced 75 percent of service meters. **Please clarify which quantity is correct.**

Chapter 6 – Watershed Control Program

18. Page 6-1, Source Protection is WAC 246-290-135(4). **Please revise.**
19. Page 6-2, WSP states "City staff walks the abandoned roads around the perimeter of the impoundment to patrol the area". **Please describe frequency and who is responsible for this duty.** (When I mentioned it to operators, they had never heard of it).
20. Page 6-5. **Please specify what agreements exists with external timber companies and what specific actions are notified (for example spraying, logging spills, and so on).**
21. Page 6-7, WSP states "The City has obtained satisfactory water supply from Indian Creek since 1989". **Please describe how the capacity from Indian Creek is evaluated.** Is there a flowmeter? Staff report low reservoir levels in drought summer months but is this monitored and recorded? Also, clarify if surface measurements of the impound have been evaluated since 1994. **Please clarify.**
22. Page 6-7. Is logging allowed in the watershed? If so, that would be major activity.

Chapter 7 – Operation and Maintenance

23. As discussed in the pre-plan meeting, this section should include a plan to develop new standard operating procedures (SOP) that will be developed with management and operator involvement. **Please discuss and describe elements to be included in the revised SOPs.**
24. Page 7-1, the City currently does not have a Cross Connection Control Specialists. **Please discuss how the City plans to meet these requirements.**
25. Page 7-1. The plan states that this system is under the direction of the City's Public Works Director. The mayor indicates that no one is in this position. **This WSP should specify that this position is vacant and describe a plan and budget for replacement.**
26. Page 7-1. The City has had problems maintaining qualified operators at the Water Treatment Plant. **Please discuss any plans for a personnel retention program.**
27. Page 7-2, The city has had problems with overdosing potassium permanganate to reduce iron during periods of reservoir temp fluctuation. **Please discuss operation revisions to address this problem.**

28. Page 7-7. **Please discuss events that result in Treatment Technique Violations (TTV) and the appropriate response to these events.**
29. Page 7-8, Emergency Response. Please discuss water outage emergencies in this section. Are there any ordinances which allow the City to place customers on mandatory conservation measure or voluntary conservation measures?
30. Page 7-7 to 7-9, figure 7-1, 7-2, and 7-3. These figures do not properly represent the current regulations. Please contact Sandy Brentlinger for Figure 7-1 and Sophia Petro for figures 7-2 and 7-3 for assistance in modifying these table or use a different method to present this information.
31. Page 7-9. The City does not meet all requirements of WAC 246-290-490. Element 2 must maintain an inventory of backflow devices. Please discuss deficiencies in the Cross Connection Control Program and what actions the City plans to do to meet these requirements.

Chapter 8 – Water Quality Monitoring

32. Page 8-4, Stage 2. Please discuss the implications of disinfection byproduct (DBP)-Stage 2 on the City. The City will have to add an additional monitoring point. Did this system meet exemption for an IDSE waiver? **Please discuss specific DBP results in this section and update table 8-1 if applicable.**
33. Page 8-7, LT2. The Office of Drinking Water was able to let systems whose raw water fecal coliform results were low to grandfather their results and avoid the first round of *E. coli* sampling under LT2. There will be a second round of LT2 sampling for Schedule 4 systems, which will begin in 2016. **Please include this in the City's Operations and Maintenance (O&M) budget for this sampling and a discussion of additional LT2 sampling requirements.**

Chapter 9 – Capital Improvement Plan

34. Page 9-3. There have been some questions about the City's legal ability to connect the Sahalee Zones to the Discovery Height reservoir. **Please discuss how the City plans to address these issues and take the Sahalee reservoir offline.**
35. Page 9-5. ODW has received several complaints from citizens in the China Hill section regarding water quality, taste, and odor issues. Could D-6 be moved up the capital improvement plan (CIP) schedule sooner?
36. Please clarify if all improvements outlined in the previous plan have been completed or their current status.
37. The following items were mentioned in pervious chapters and should be included in the CIP or O&M budget: seismic upgrades to reservoirs, impoundment float repair, SCADA upgrades, generator for booster stations. **Please revise.**

Chapter 10 – Financial Analysis

38. This chapter should include an analysis of short-lived assets and O&M budget. **Please include.**

39. Page 10-1, Financial Analysis. **Please update and describe new rates with the work Skip Rand, Rural Community Assistance Corporation, provided for the City.**
40. Page 10-3. Please provide a balanced budget that clearly shows existing reserves or shortfalls.
41. Page 10-4, table 10-6. The values for the loan proceeds do not match those outlined in table 9-1. **Please correct or provide additional discussion.**
42. Page 10-5. Please clarify if the recent rate adoption will change the forecast summary outlined in Table 10-7.

Appendix A

43. The Water Quality Monitoring Report should be included in the Appendix.

Appendix H

44. Coliform Monitoring Plan. This plan should include the system ID, county, sources, population served, and number of routine samples and repeats. The repeat sites are not identified on the map, and two of the routine sites are from reservoirs. Are these distribution sites? This plan did not include the rotation schedule for routine side or an explanation of where the five routine samples following a present sample would be collected from contact Sandy Brentlinger for assistance. **Please update the coliform monitoring plan.**

Appendix N

45. **Please update this plan to reflect current staff and procedures and remove figures located after page 44.** It appears these have been updated and included in chapter 7.

RECOMMENDATIONS

46. Page 7-4. The city should have a prepared written notice. Please consider preparing one and including it in the plan.
47. Page 8-5, minor text error – last paragraph "manganese in the pas t6".

DEPARTMENT OF ECOLOGY

On February 11, 2011, a copy of this WSP was sent to the Department of Ecology (Ecology). ODW has not received comments from Ecology regarding this system's water rights. Please note that ODW's approval of this WSP will not provide any guarantee and should not be considered to provide any guarantee concerning legal use of water or subsequent water rights decisions by Ecology. Depending on Ecology's future actions on this system's water rights, additional planning or other submittals may be required by ODW.

Please submit three copies of the revised WSP on or before June 1, 2011. Please note this WSP is a State Revolving Fund Project and must be approved by August 1, 2011. To expedite

the review of the revised WSP, please summarize how each of the above comments was addressed and where each response is located (for example, page numbers, appendices).

Regulations establishing a schedule of fees for review of planning, engineering, and construction documents were adopted August 3, 2007 (WAC 246-290-990). An itemized invoice for $2,280 is enclosed.

If you have any questions concerning our review, please contact me at (360) 236-3031 or Teresa Walker (360) 236-3032.

Sincerely,

Corina Hayes
Office of Drinking Water, Regional Planner

Teresa Walker, P.E.
Office of Drinking Water, Regional Engineer

Enclosures

cc: Nancy Lockett, Gray & Osborne, Inc.
Pacific County Health Department
Pacific County Planning Department
Amy Nielson, Department of Ecology

Gray & Osborne, Inc.
CONSULTING ENGINEERS

June 14, 2011

Ms. Corina Hayes
Office of Drinking Water, Regional Planner
Ms. Teresa Walker, P.E.
Office of Drinking Water, Regional Engineer
Washington State Department of Health
Southwest Drinking Water Regional Operations
243 Israel Road SE, 1st Floor
Tumwater, Washington 98501

SUBJECT: RESPONSES TO COMMENTS ON WATER SYSTEM PLAN UPDATE
FOR SYSTEM ID #355002, ODW PROJECT #11-0302
CITY OF ILWACO, PACIFIC COUNTY, WASHINGTON
G&O #10565.00

Dear Ms. Hayes and Ms. Walker:

The following is in response to comments from DOH dated May 6, 2011, regarding the water system plan for the City of Ilwaco, DOH ID #355002, Office of Drinking Water Project #11-0302. We have inserted the DOH comments as they appear in the comment letter in *italics* followed by our responses to the comments.

GENERAL COMMENTS

1. *Municipal Water Suppliers must provide a consistency review and supporting documentation showing how it has addressed consistency with local plans and regulations. Please provide a signed and dated local government consistency checklist form from the City and Pacific County. Also, please include any comments received from adjacent purveyors or the County.*

   Consistency checklists from the City and Pacific County have been added to Appendix P. The City has not received any comments from adjacent purveyors.

2. *Prior to ODW approval, the City must hold an informational meeting for the water consumers. Please provide documentation showing how the customers were notified, the time and date the meeting was held, and if any comments were received.*

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The City Council meeting approving the final Water System Plan will be conducted in accordance with WAC 246-290-100(8) to allow for consumer input. The advertisement and minutes for this meeting will be provided to DOH when they become available.

3. *Prior to approval, the City must obtain approval of this WSP from the governing body. Please provide a signed resolution, signed board minutes, or other appropriate documentation showing the governing body has adopted this WSP.*

Meeting minutes from the City Council meeting approving the final Water System Plan will be provided to DOH when they become available.

4. *Prior to approval, an updated and signed Water Facilities Inventory (WFI) form must be provided that clearly reflects the current status of this system as outlined in the plan. Please submit an updated and signed WFI.*

The status of the system has not significantly changed from the current Water Facilities Inventory. See the response to Comment 11.

Chapter 1 – Water System Description

5. *Page 1-3, the City provides water to water systems operated by Washington State Parks and Recreation Commission (WSPRC) for the water supplied to Cape Disappointment State Park and Coast Guard Station. Please include a copy of the agreement between the City and WSPRC or discuss the status of these agreements.*

A summary of the agreement between the Washington State Parks & Recreation Commission and the City has been added to page 1-19, and a copy of this agreement has been added to Appendix C.

6. *Page 1-13, this page discusses storage and states that the 160,000-gallon concrete reservoir in the city center zone is not functional at this time. This reservoir was not functioning at the time of the last plan. Please confirm if the reservoir has been abandoned.*

The concrete reservoir has been permanently abandoned and physically disconnected from the water system. The storage discussion on page 1-13 has been updated to reflect the current status.

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7. *Page 1-15. The plan states "The Sahalee subdivision will be connected to the Discovery Heights Reservoir." Please state by what date.*

The City plans to connect the Sahalee Zone to the Discovery Heights Zone this year. The Capital Improvement Plan on page 9-4 has been revised to reflect the new schedule. See also the response to Comment 34.

8. *Page 1-19, Under Related Planning Documents. Please describe the City of Long Beach Feasibility Study, completed in 2006, which analyzed regional-wide opportunities for water system management, operations, and finances, and the conclusion of this study as they relate to Ilwaco.*

A discussion of the Regional Joint Operations Feasibility Study has been added to the Related Planning Documents section on page 1-19.

9. *Page 1-22, states that dispute decisions regarding water service connections are appealed to the County's Hearing Examiner. How is this accomplished, is there an agreement with the county to use their hearing examiner to address city issues? Please provide additional discussion.*

The reference to the County Hearing Examiner on page 1-22 has been corrected to indicate that appeals to planning decisions regarding new water service are made to the City Council.

10. *Page 1-23, table 1-8, Wholesaling water. Does the City provide wholesale water to Cape Disappointment State Park and Coast Guard Station? Please modify table.*

Washington State Parks has been added to the list of systems supplied with wholesale water in the service area policy table on page 1-23. The Coast Guard is not a water purveyor and is therefore considered a retail commercial customer.

Chapter 2 – Basic Planning Data

11. *Page 2-2, table 2-2 shows a total number of connections of 1,168, (698 residential and commercial, and 470 transient). Please modify this table to make a distinction between transient units served directly by the City and those that are a part of the Cape Disappointment State Park and Coast Guard Station water system.*

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The transient units given in Table 2-2 are not connections, but units counted by the City's billing system because of the City's rate structure. The units are included in the commercial connections given in the table. These units have been removed from Table 2-2 and instead described in general terms in the Population section on page 2-2 for clarity.

12. *Table 2-15, Projected Water System Demands. This system should plan to decrease Distribution System Leakage (DSL) to 10 percent by 2016. Please revise this table to be consistent with Tables 5-2 and 5-5.*

The City has not identified all of the sources of DSL. Some of the losses may be apparent losses due to metering or accounting errors rather than actual losses from leaks. Also, while the City has a goal of reducing leakage to 10 percent by 2016 as outlined in the Water Use Efficiency Plan and intends to make efforts to do so, the City also recognizes that the goal may not be achieved on the proposed schedule. Because reducing DSL increases the ERU capacity of the system available for consumption, we believe it is a more conservative approach to project DSL at current levels in the projections without conservation in Chapter 2.

The population and water use projections on pages 2-10 through 2-15 have been revised per the Discovery Heights Development Agreement described on page 1-19 and included in Appendix C.

Chapter 3 – System Analysis

13. *Page 3-6, this section discusses the City's ability to meet projected maximum daily demand through 2012 with the current treatment facility using only filter number 3. A new treatment plant is not scheduled until 2018. How will the City meet projected maximum daily demand between 2012 and 2018? Please describe the current modifications of the Water Treatment Plant in terms of Filters 1 and 2 now being operational and how that will change the plant capacity and the maximum daily demand from 2012-2018.*

The Maximum Day Production Analysis on page 3-10 has been revised to include production capacity from Filters 1 and 2, which can be operated in parallel with Filter 3 in an operator-attended manual mode. The ability to operate all three filters simultaneously, even

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without an automatic mode, should allow the City to meet maximum day demands until a new filter can be installed. The City has rescheduled the filter replacement project for 2013 as indicated on page 9-2.

14. *Page 3-27, System Capacity. The system capacity must also analyze the Pumping Capacity of this system. Please evaluate pumping capacity by Booster Pump Station and discuss in the system capacity section.*

The booster pump capacity has been added to the system capacity summary on page 3-27.

15. *Page 3-15, Table 3-10 and 3-11, show the average day and maximum day demand booster station analysis for the Baker Bay and Spring Street booster stations, but does not include the Lakeview or Coastal ridge booster stations. Please clarify or provide additional information.*

The Lakeview Estates and Coastal Ridge Booster Stations are closed-zone stations that serve single developments. As described in the text on pages 3-15 and 3-16, these booster stations were designed to provide the peak hour and fire flow demands for these developments, which will not be expanding.

Chapter 5 – Water Use Efficiency Program

16. *Page 5-11. The wood reservoir is known to contribute a significant amount to the systems DSL. Please evaluate what percent of this system's DSL would be reduced if the wood reservoir was replaced.*

The City recently repaired a major leak in the wood reservoir, which was estimated to be leaking at a rate of 15,000 gallons per day. Thus, the total contribution of the wood reservoir leakage to the City's DSL may have been as high as 5.5 million gallons annually, which corresponds to 10 percent of the annual DSL volume. Replacement of the wood reservoir may therefore reduce the City's DSL on a percentage basis by 3 to 4 percent. This information has been added to the Field Activities to Reduce Leakage section on page 5-11.

17. *Page 5-11 says that the City has replaced 60 percent of service meters. Page 5-6 says that the City has replaced 75 percent of service meters. Please clarify which quantity is correct.*

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These references on pages 5-6 and 5-11 have both been revised to indicate that the City has replaced approximately 50 percent of the service meters. The previous figure of 60 percent did not include commercial customer service meters.

Chapter 6 – Watershed Control Program

18. *Page 6-1, Source Protection is WAC 246-290-135(4). Please revise.*

This reference on page 6-1 has been corrected.

19. *Page 6-2, WSP states "City staff walks the abandoned roads around the perimeter of the impoundment to patrol the area". Please describe frequency and who is responsible for this duty. (When I mentioned it to operators, they had never heard of it).*

The water system operators plan to patrol the watershed on a weekly basis. The references to patrolling on pages 6-2 and 6-9 have been revised to add this information.

20. *Page 6-5. Please specify what agreements exists with external timber companies and what specific actions are notified (for example spraying, logging spills, and so on).*

The Land Use and Ownership section on page 6-6 has been revised to refer to the timber reservations held by Longview Timberlands, LLC, and the associated activities allowed and notices required by the agreement. Figure 6-2 has also been revised to indicate the timber reservation areas.

21. *Page 6-7, WSP states "The City has obtained satisfactory water supply from Indian Creek since 1989". Please describe how the capacity from Indian Creek is evaluated. Is there a flowmeter? Staff report low reservoir levels in drought summer months but is this monitored and recorded? Also, clarify if surface measurements of the impound have been evaluated since 1994. Please clarify.*

The capacity from Indian Creek is evaluated based on water levels in the impoundment. During the winter, the water level in the reservoir is typically above normal pool and water is observed overflowing via the spillways. During summer months, inflow decreases and the water level drops 10 to 15 feet, indicating that approximately half of

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the reservoir storage is being depleted. The City has observed but not measured and recorded reservoir levels since 1994. The City plans to begin recording reservoir levels again on a weekly basis, a reference to which has been added to the Hydrology section on page 6-3.

22. *Page 6-7. Is logging allowed in the watershed? If so, that would be a major activity.*

A reference to logging has been added to this statement on page 6-7.

Chapter 7 – Operation and Maintenance

23. *As discussed in the pre-plan meeting, this section should include a plan to develop new standard operating procedures (SOP) that will be developed with management and operator involvement. Please discuss and describe elements to be included in the revised SOPs.*

The City is currently preparing its Standard Operating Procedures, which will be submitted to DOH upon completion. The Standard Operating Procedures are described on page 7-5.

24. *Page 7-1, the City currently does not have a Cross Connection Control Specialists. Please discuss how the City plans to meet these requirements.*

The City will be retaining the services of an external Cross-Connection Control Specialist to fully implement its Cross-Connection Control Program, as indicated in the Operation and Maintenance Deficiencies section on page 7-14. The City is currently reviewing proposals and intends to obtain the services of the Cross-Connection Control Specialist as soon as is practical.

25. *Page 7-1. The plan states that this system is under the direction of the City's Public works Director. The mayor indicates that no one is in this position. This WSP should specify that this position is vacant and describe a plan and budget for replacement.*

The reference to the City's Public Works Director on page 7-1 has been corrected to indicate that the City's Water Department is under direction of the Mayor. At this time, the City does not intend to hire a Public Works Director.

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26. *Page 7-1. The City has had problems maintaining qualified operators at the Water Treatment Plant. Please discuss any plans for a personnel retention program.*

A Job Retention Plan has been added on page 7-2 outlining the City's plans to retain qualified operators.

27. *Page 7-2, The city has had problems with overdosing potassium permanganate to reduce iron during periods of reservoir temp fluctuation. Please discuss operation revisions to address this problem.*

The City has installed a continuous permanganate monitor. If the monitor detects high levels of permanganate, the SCADA system will alarm the operator. A reference to permanganate monitoring has been added to the System Monitoring and Control section on page 7-5.

28. *Page 7-7. Please discuss events that result in Treatment Technique Violations (TTV) and the appropriate response to these events.*

A section discussing Treatment Technique Violations and the responses to these violations has been added to page 7-9. The public notification section has also been updated to reflect current regulations.

29. *Page 7-8, Emergency Response. Please discuss water outage emergencies in this section. Are there any ordinances which allow the City to place customers on mandatory conservation measure or voluntary conservation measures?*

A section discussing water shortages has been added to page 7-8. Ilwaco Municipal Code 13.04.090 indicates that the City may restrict water usage in the event of a water shortage.

30. *Page 7-7 to 7-9, figure 7-1, 7-2, and 7-3. These figures do not properly represent the current regulations. Please contact Sandy Brentlinger for Figure 7-1 and Sophia Petro for figures 7-2 and 7-3 for assistance in modifying these table or use a different method to present this information.*

Figures 7-1, 7-2, and 7-3 have been combined into Figures 7-1 and 7-2, and have been updated to reflect current regulations.

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31. *Page 7-9. The City does not meet all requirements of WAC 246-290-490. Element 2 must maintain an inventory of backflow devices. Please discuss deficiencies in the Cross Connection Control Program and what actions the City plans to do to meet these requirements.*

Additional information on the City's Cross-Connection Control Program deficiencies has been added to the Operation and Maintenance Deficiencies section on page 7-14. The City plans to retain the services of a Cross-Connection Control Specialist to fully implement the City's program.

Chapter 8 – Water Quality Monitoring

32. *Page 8-4, Stage 2. Please discuss the implications of disinfection byproduct (DBP)-Stage 2 on the City. The City will have to add an additional monitoring point. Did this system meet exemption for an IDSE waiver? Please discuss specific DBP results in this section and update table 8-1 if applicable.*

The City conducted standard monitoring to meet the IDSE requirements of the Stage 2 DBPR. The City has already begun monitoring at the highest TTHM and HAA5 sampling points, which will meet the requirements of Stage 2 DBPR compliance monitoring. This information has been added to page 8-4. Monitoring results are discussed in the Monitoring Results section on page 8-4. Water quality monitoring is included in the City's budget forecast on page 10-4.

33. *Page 8-7, LT2. The Office of Drinking Water was able to let systems whose raw water fecal coliform results were low to grandfather their results and avoid the first round of E. coli sampling under LT2. There will be a second round of LT2 sampling for Schedule 4 systems, which will begin in 2016. Please include this in the City's Operations and Maintenance (O&M) budget for this sampling and a discussion of additional LT2 sampling requirements.*

The LT2ESWTR section on page 8-7 has been revised to indicate that the second round of monitoring will begin in 2016. Water quality monitoring is included in the City's budget forecast on page 10-4.

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Chapter 9 – Capital Improvement Plan

34. *Page 9-3. There have been some questions about the City's legal ability to connect the Sahalee Zones to the Discovery Height reservoir. Please discuss how the City plans to address these issues and take the Sahalee reservoir offline.*

The City has completed a review of the applicable documents and found no legal impediments to connecting the Sahalee Zone to the Discovery Heights Zone in 2011.

35. *Page 9-5. ODW has received several complaints from citizens in the China Hill section regarding water quality, taste, and odor issues. Could D-6 be moved up the capital improvement plan (CIP) schedule sooner?*

The China Hill Improvements project (D-6) has been rescheduled for 2015 as shown on page 9-5 in anticipation of it being completed with funding from a Local Improvement District (LID).

36. *Please clarify if all improvements outlined in the previous plan have been completed or their current status.*

The projects that have been completed since the 2003 Water System Plan have been added on page 9-1. The remaining major projects are included in the current Capital Improvement Plan.

37. *The following items were mentioned in pervious chapters and should be included in the CIP or O&M budget: seismic upgrades to reservoirs, impoundment float repair, SCADA upgrades, generator for booster stations. Please revise.*

The seismic upgrade reference on page 7-6 has been updated to indicate that the City has determined that seismic upgrades are not necessary to the reservoirs that will remain in service, and that the City will take seismic events into consideration when designing future reservoirs.

SCADA upgrades were included in the Control Improvements project (G-1) on page 9-2. The Intake Repair project has been added to the Capital Improvement Plan as Project SO-3 on page 9-2.

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The Plan indicates that the City intends to continue using its portable generator at booster station sites as necessary during prolonged power outages. The City does not currently intend to install permanent automatic backup power supplies at its booster stations.

Revised project cost estimates have been added to replace the previous cost estimates in Appendix L.

Chapter 10 – Financial Analysis

38. *This chapter should include an analysis of short-lived assets and O&M budget. Please include.*

A line item for the Net Operating Revenue for the water system has been added to the budget forecast on page 10-4 for the purposes of operation and maintenance budget analysis.

A description of the City's short-lived asset analysis has been added to page 10-5, and the analysis has been included in Appendix O. A line item for the Short-Lived Asset Replacements has been added to the budget forecast on page 10-4.

39. *Page 10-1, Financial Analysis. Please update and describe new rates with the work Skip Rand, Rural Community Assistance Corporation, provided for the City.*

The Rate section on pages 10-1 and 10-2 has been revised to reflect the rates that went into effect on April 1, 2011, and the rate ordinance reflecting these rates has been added to Appendix M to replace the previous rate ordinance.

40. *Page 10-3. Please provide a balanced budget that clearly shows existing reserves or shortfalls.*

Table 10-4 on page 10-3 has been revised to include starting and ending water fund balances as well as net revenues.

41. *Page 10-4, table 10-6. The values for the loan proceeds do not match those outlined in table 9-1. Please correct or provide additional discussion.*

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The loan proceed values in Table 10-5 on page 10-4 have been corrected to match the corresponding capital project estimates.

42. *Page 10-5. Please clarify if the recent rate adoption will change the forecast summary outlined in Table 10-7.*

The new rates have been included in the budget forecast on page 10-4.

Appendix A

43. *The Water Quality Monitoring Report should be included in the Appendix.*

The Water Quality Monitoring Report has been added to Appendix A.

Appendix H

44. *Coliform Monitoring Plan. This plan should include the system ID, county, sources, population served, and number of routine samples and repeats. The repeat sites are not identified on the map, and two of the routine sites are from reservoirs. Are these distribution sites? This plan did not include the rotation schedule for routine side or an explanation of where the five routine samples following a present sample would be collected from contact Sandy Brentlinger for assistance. Please update the coliform monitoring plan.*

The Coliform Monitoring Plan in Appendix H has been revised to include the required information. The scale of the site map is too large to clearly show the repeat sampling sites, which are all immediately upstream and downstream of the routine sampling sites.

Appendix N

45. *Please update this plan to reflect current staff and procedures and remove figures located after page 44. It appears these have been updated and included in chapter 7.*

The Emergency Response Plan has been removed from Appendix N. The Emergency Response Plan will be included in the City's Standard Operating Procedures, which the City is currently preparing.

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RECOMMENDATIONS

46. *Page 7-4. The city should have a prepared written notice. Please consider preparing one and including it in the plan.*

    Public Notification Forms have been added to Appendix N.

47. *Page 8-5, minor text error – last paragraph "manganese in the pas t6".*

    This text error has been corrected.

Enclosed are replacement pages for the water system plan chapters and additional/replacement pages for the appendices.

We hope that the foregoing adequately addresses your concerns. Please contact me at (206) 284-0860 if you have any questions or would like to discuss this further.

Very truly yours,

GRAY & OSBORNE, INC.

Nancy E. Lockett, P.E.

NEL/hhj
Encl.

cc: Mayor Mike Cassinelli, City of Ilwaco
Mr. Don Zuern, Water & Wastewater Supervisor, City of Long Beach
Mr. Charles Fraley, Plant Manager, Chinook Water District
Mr. Lynn Nordloh, Washington State Parks & Recreation Commission
Mr. Mike Stevens, Community Development Director, Pacific County

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Affidavit of PUBLICATION

I, Carol Christiansen , being first duly sworn, depose and say that I am the principal clerk of the manager of the Chinook Observer, say that the

CHINOOK OBSERVER

a weekly newspaper printed in the English language and published and circulated continuously as a weekly newspaper in the City of Long Beach, Pacific County, Washington, and established, published and circulated for more than six months prior to the date of the publication of the annexed notice; is a newspaper of general circulation in said city, county and state and that on April 27th, 1942, was approved as a legal newspaper by the Superior Court of said Pacific County, and that the annexed notice is a true copy of a

Legal Notice

as it was published in the regular and entire issue of said newspaper, (and not in supplement form) in **2** issue(s) being dated **June 22 & 29, 2011** and that said newspaper was regularly distributed to its subscribers during all of said period.

Carol Christiansen

Subscribed and sworn to before me this

29th day of **June 2011**

Marlene E. Quillin

Notary Public for the State of Washington, residing at Ilwaco, Washington, in Pacific County.

My commission expires 12/20/11

MARLENE E. QUILLIN
COMMISSION EXP.
NOTARY
PUBLIC
DEC. 20, 2011
STATE OF WASHINGTON

Copy of Advertisement

City of Ilwaco
NOTICE OF PUBLIC HEARING

Notice is hereby given that the Ilwaco City Council will hold a public hearing at the Ilwaco Community Building Meeting Room, 158 First Avenue North, Ilwaco, WA 98624, at 6:00 p.m. or as soon thereafter as can be heard, on Monday, July 11, 2011, for the purpose of accepting public comments on the adoption of the City's 2011 Water System Plan, including the adoption of Water Use Efficiency goals. Copies of the Water System Plan, which includes the City's Water Use Efficiency Program, are available for viewing at City Hall at 120 First Avenue North, Ilwaco WA 98624.

PJ Kezele, Deputy City Clerk
Published June 22 and June 29, 2011
Legal No. 192-11

CITY OF ILWACO
RESOLUTION NO. 2011-08

A RESOLUTION OF THE CITY OF ILWACO, WASHINGTON, ADOPTING THE 2011 WATER SYSTEM PLAN

WHEREAS, water purveyors including the City of Ilwaco are required by RCW 57.16.010 to prepare a Water System Plan every six years; and,

WHEREAS, the previous plan was approved in 2003; and,

WHEREAS, the City of Ilwaco's engineering consultants have prepared the 2011 Water System Plan in accordance with the Washington State Department of Health Guidelines; and,

WHEREAS, the public has had an opportunity to review the Water System Plan and the City Council held a public hearing on July 11, 2011, at which the City's water customers have had an opportunity to make comments on the Plan;

WHEREAS, the City Council finds that the 2011 Water System Plan meets the needs of the city and the State;

WHEREAS, the City of Ilwaco 2011 Water Plan sets the goals for Water Use Efficiency; and

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF ILWACO, WASHINGTON, DOES RESOLVE AS FOLLOWS:

The City Council of the City of Ilwaco approves and adopts the 2011 Water System Plan.

Effective Date. This Resolution, being an exercise of power specifically delegated to the city legislative body, is not subject to referendum and shall take effect five (5) days after passage by the City Council.

PASSED BY THE CITY COUNCIL OF THE CITY OF ILWACO, AND SIGNED IN AUTHENTIFICATION OF ITS PASSAGE THIS 11TH DAY OF JULY, 2011.

Mike Cassinelli, Mayor

ATTEST:

PJ Kezele, Deputy City Clerk

VOTE	Jensen	Berger	Marshall	Smith	Forner	Cassinelli
Ayes	X	X	X	X	X	
Nays						
Abstentions						
Absent						

EFFECTIVE: July 16, 2011

CITY OF ILWACO
CITY COUNCIL MEETING
Monday, July 11, 2011

A. **Call to Order**
Mayor Cassinelli called the meeting to order at 6:00 p.m.

B. **Flag Salute**
The Pledge of Allegiance was recited.

C. **Roll Call**
Present: Mayor Cassinelli and Councilmembers Jensen, Berger, Marshall, Smith and Forner.

D. **Approval of Agenda**
Councilmember Marshall requested a discussion item be added for non-payment of utilities.
ACTION: Motion to approve agenda as amended by adding a discussion item for non-payment of utilities (Marshall/Smith) 5 Ayes 0 Nays 0 Abstain.

E. **Approval of Consent Agenda**
ACTION: Motion to approve the consent agenda (Forner/Marshall) 5 Ayes 0 Nays 0 Abstain.

F. **Public Hearing: Water System Plan**
   a. Mayor Cassinelli opened the public hearing at 6:07 p.m.
   b. Rich Marshall, representing Discovery Heights/MSW, spoke about his written memorandum provided to council regarding the water system plan. Discussion ensued.
   c. Mayor Cassinelli closed the public hearing at 6:25 p.m.

G. **Reports**
   1. **Staff Reports**
      a. Chief Flint Wright provided a written report for June 2011.
      b. Fire Chief Tom Williams reported that Project Manager Gary Kobes had contacted him regarding Team Construction coming to fix items at the Fire Hall and Ilwaco Community Building, but had not heard back.
      c. Deputy City Clerk PJ Kezele provided a written report for June 2011.

   1. **Council Reports**
      a. Councilmember Berger reported he attended the Water/Sewer Rate Study Workshop and met with the city attorney regarding ordinance changes.
      b. Councilmember Marshall reported he attended the Water/Sewer Rate Study Workshop.

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c. Councilmember Forner reported he attended the Water/Sewer Rate Study Workshop and thanked Long Beach Police Department for their assistance on July 3, 2010, working with the Coast Guard to halt fireworks on the beach during a rescue attempt.

2. **Mayor's Report**
Mayor Cassinelli reported the Ilwaco fireworks were well attended and traffic cleared fairly quickly. He also attended a number of meetings with different entitities.

G. Comments of Citizens and Guests present:
1. None

H. Business

1. **Water System Plan**
Mayor Cassinelli presented the item. Councilmember Marshall made a motion to adopt the plan with amendments to the footnotes. No second. Marshall withdrew his motion. Discussion ensued regarding the footnote changes.
ACTION: Motion to adopt the resolution adopting the 2011 City of Ilwaco water system plan with clarification to Table 2-10 footnote #2 to further separate Sahalee and Discovery Heights ERUs and add a footnote to Tables 2-10, 2-11, 3-15 and 3-16 as follows: "The city reserves 450 ERUs of water storage capacity for Discovery Heights to be used for either residential or commercial development. For planning purposes only, this plan uses 100 commercial ERUS and 350 residential ERUs for Discovery Heights." (Marshall/Jensen) 5 Ayes 0 Nays 0 Abstain.

2. **Relief Wastewater Treatment Plant Operator**
Mayor Cassinelli presented the item. Councilmember Smith noted that Department of Ecology requires a Level II Relief Operator at the Wastewater Treatment Plant. Councilmember Marshall agreed with the grade increase, but objected to the step increase as proposed as it did not comply with personnel policies. Discussion ensued.
ACTION: Motion to confirm the promotion of David Gustafson from a Grade 5 Step 4 to a Grade 8 Step 1 Relief Wastewater Treatment Plant Operator (Marshall/Jensen) 3 Ayes (Jensen/Marshall/Forner) 1 Nay (Smith) 1 Abstain (Berger).

3. **Sale of Steed House**
ACTION: Motion to accept a bid from Robert Weber Housemoving to purchase the residence at 112 Myrtle Street, commonly known as the Steed House, for $2,500 (Jensen/Smith) 5 Ayes 0 Nays 0 Abstain.

4. **Non-Payment of Utilities**
ACTION: Motion to recommend the mayor proceed immediately with a shut-off notice to Cape Disappointment State Park and subsequent shut-off actions as required by law (Berger/Forner) 5 Ayes 0 Nays 0 Abstain.

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I. Discussion

1. **Cross-Connection Services**
   Mayor Cassinelli presented the item. Discussion ensued.
   ACTION: Council would like Backflow Management Inc. to make a presentation before council, with the intent to take the matter up in the budget process.

2. **Sale of Steed House**
   Mayor Cassinelli presented the item. Discussion ensued.
   ACTION: Motion to move to business (Marshall/Smith).

3. **Non-Payment of Utilities**
   Councilmember Marshall read "A Motion of the City Council of the City of Ilwaco Regarding Non-Payment of Utility Bills by Washington State Parks," as herein attached to the minutes as Exhibit A.
   ACTION: Motion to move to business (Jensen/Forner).

J. Executive Session

1. Mayor Cassinelli cancelled the executive session to discuss individual employee evaluations.

K. Future Discussion

1. Final Pacific County Communication (PACCOM) Interlocal Agreement
2. Stormwater utility district—*Streets Committee*
3. Amended procedures ordinance—*City Planner*

L. Adjournment

ACTION: Motion to adjourn the meeting (Smith/Marshall). Mayor Cassinelli adjourned the meeting at 7:45 p.m.

_____
Mike Cassinelli, Mayor

_____
PJ Kezele, Deputy City Clerk

City of Ilwaco is an equal opportunity provider and employer.

EXHIBIT A

A Motion of the City Council of the City of Ilwaco Regarding Non-Payment of Utility Bills by Washington State Parks July 11, 2011

WHEREAS, the City of Ilwaco provides water and wastewater utility services to Cape Disappointment State Park; and

WHEREAS, Cape Disappointment State Park is outside the City Limits of the City of Ilwaco; and

WHEREAS, the Ilwaco Municipal Code requires a 50% surcharge for all utility customers outside the City Limits; and

WHEREAS, there is a contract between the City and Washington State Parks for water and wastewater utility services which appears to call for application of all provisions of the Ilwaco Municipal Code; and

WHEREAS, Washington State Parks has been billed for water and wastewater utility services that are believed to be in accordance with the contract and are in accordance with the Ilwaco Municipal Code; and

WHEREAS, Washington State Parks has failed to pay that portion of their bill which amounts to the 50% surcharge required by law; and

WHEREAS, the City of Ilwaco has informed Washington State Parks of the requirement to pay the surcharge and has consistently kept Washington State Parks up to date regarding the amounts in arrears; and

WHEREAS, the billing practice of the City of Ilwaco requires that accounts in arrears have their water turned off; and

WHEREAS, the City of Ilwaco has heretofore avoided confronting Washington State Parks with a shut off notice as required by the Ilwaco Municipal Code.

NOW THEREFORE in view of these facts, the City Council of the City of Ilwaco hereby moves to make their strongest possible recommendation to the mayor to proceed immediately with a shut-off notice to Cape Disappointment State Park and subsequent shut-off actions as required by law.

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Gray & Osborne, Inc.
CONSULTING ENGINEERS
701 DEXTER AVENUE NORTH SUITE 200
SEATTLE, WASHINGTON 98109 • (206) 284-0860

MEMORANDUM

TO:	Mayor and City Council, City of Ilwaco
FROM:	Nancy Lockett, P.E.
DATE:	July 8, 2011
SUBJECT:	Rich Marshall, 2011 Water System Plan Comments
G&O#:	10565

Comment 1. The City's previous "2003" Water System Plan Table 3-13 on page 3-24 analyzes the capacity of the DH reservoir at full buildout of Discovery Heights and concludes that there would be only 16,969 gallons (4%) of excess capacity in 20 years. The corresponding table in the 2011 Draft Water System Plan, (Table 3-16, pg 3-23) illustrates a significantly different situation, with 100,626 gallons (25%) of excess storage capacity plus an additional 82,332 gallons (20%) of excess capacity within the reservoirs 'nesting' capacity. With a requirement of 2 days standby storage per ERU at 244 gpd per ERU, the Discovery Heights reservoir as analyzed can accommodate 749 additional residences above those needed by existing and anticipated users. The reservoir is substantially oversized, built by MSW.

Response: The water reservoir capacity analysis presented in Chapter 3 of the 2003 and 2011 Plans is based on the Department of Health methodology for determining operational storage (OS), equalizing storage (ES), standby storage (SB), fire suppression storage (FSS) and dead storage (DS). MSW's design engineers used the same methodology to size the reservoir. Changes in the DS, ES, OS and SB categories included in the 2011 Plan account for the change in surplus capacity.

DS: Approximately 57,000 gallons of dead storage was included in the 2003 Plan based on the determination that the lowest tank level that could be used to serve the highest service elevation at 30 psi was 315 feet (page 3-23, 2003 Plan). The base of the reservoir is 311 feet. The highest service elevation proposed in the MSW development plan is the area now known as Coastal Ridge. This area was not served by a booster pump station in 2003. Since 2003, the Coastal Ridge booster station (Table 1-5, 2011 Plan) has been installed to serve the town homes. The use of the booster station to serve this area allows the total storage capacity of the reservoir to be available. The DS component is shown as 0 in the 2011 analysis.

OS: The 2003 Plan assumed that the operating storage range was 1 foot (page 3-23) which resulted in OS component of 14,000 gallons. The operating storage range in the 2011 Plan is based on the current practice of using the top 2 feet of the reservoir as operational storage. The OS component in the 2011 Plan is 29,374 gallons.

ES: The peak hour demand (PHD) projected in the 2003 Plan is greater than the PHD projected in the 2011 Plan due to a decrease in the average day consumption per ERU. The average day consumption is based on the current water use data. The 2003 Plan assumed average day consumption of 172.3 gpd/ERU (page 2-4). The 2011 Plan assumes average day consumption of 122 gpd (page 2-8). Additionally, the 2003 Plan assumed average day consumption of 7,610 gpd for the Coast Guard Station and 29,025 gpd for State Parks, total of 36,635 gpd, at the end of the 20 year planning period (page 3-20). The water reservoir design, prepared by HLB, assumed 31,680 gpd for the combined Coast Guard/State Parks average day consumption. The projected average day consumption for the Coast Guard Station and State Parks of 10,000 gpd and 12,000 gpd, respectively, in the 2011 Plan is based on current water sales records.

The projected PHD, which is used to determine the need to account for equalizing storage, was 773 gpm in the 2003 Plan. The projected PHD in the 2011 Plan is 359 gpm. The difference is accounted for by a decrease in projected PHD of approximately 40% due to the decrease in average water consumption/ERU, and approximately 44% decrease in PHD for State Parks and the Coast Guard Station.

The number of residential ERUs assumed in the Discovery Heights zone at the end of the 20 year planning horizon is 382 in the 2003 Plan (page 3-20) and 386 in the 2011 Plan (page 2-10 877 population/2.27 people/ERU) and the number of commercial ERUs in Discovery Heights within the 20 year planning horizon in both plans is 100 (page 2-7 – 2003 Plan and page 2-11 – 2011 Plan). Therefore, the decrease in PHD is not due to a decrease in the projected growth in Discovery Heights but is a result of revised average consumption values and decreased projected water use for State Parks and the Coast Guard Station.

Equalizing storage is required if the booster pump station is not able to meet PHD. Since the PHD determined in the 2011 Plan is less than the pumping capacity of the Spring Street Booster pump station the ES component is zero in the 2011 Plan.

FSS: The volume required for fire suppression storage, approximately 48% of the storage capacity, is dictated by the development in Discovery Heights. The FSS

component of 270,000 gallons (1,500 gpm for 3 hours) is the same in the 2003 and 2011 Plans.

SB: The volume required for standby storage, determined as 2 times the average day consumption, is nested with the FSS storage. As discussed in the explanation of the ES component, the average day consumption in the 2003 Plan was greater than the average day consumption and the total average day consumption for State Parks and the Coast Guard Station in the 2011 Plan. Therefore, the standby storage component in the 2003 Plan was greater than the standby storage component in the 2011 Plan. The number of ERUs for commercial and residential development in the Discovery Heights zone is similar between the two plans. When the volume of the SB component exceeds the FSS component the difference is figured into the calculation of surplus/deficit storage. The 2003 Plan identified that the SB component would exceed the FSS component by 40,978 gallons at the end of the 20 year planning period. The SB component does not exceed the FSS component within the 20 year planning horizon in the 2011 Plan and therefore, the SB component does not have an effect on the surplus/deficient capacity of the reservoir.

The difference between the Storage Surplus/Deficit for the Discovery Heights Reservoir presented in Table 3-13 (2003 Plan) and Table 3-15 (2011 Plan) at the end of the 20year planning horizon is summarized as follows.

Storage Component	2003 Plan	2011 Plan	Difference (2003-2011)
DS	57,141 gallons	0 gallons	57,141 gallons
OS	14,000 gallons	29,374 gallons	(-15,374) gallons
ES	40,978 gallons	0 gallons	40,978 gallons
SB[1]	270,912 gallons	187,668 gallons	912 gallons
FSS	270,000 gallons	270,000 gallons	0 gallons
Total Required Storage	383,031 gallons	299,374 gallons	83,657 gallons
Storage Volume	400,000 gallons	400,000 gallons	
Surplus/Deficit	16,969 gallons	100,626 gallons	83,657 gallons

1) Storage required in excess of FSS component included in reservoir capacity analysis

In conclusion, the difference in the calculated surplus capacity is due to changes in average day consumption and use at State Parks/Coast Guard. Water system plans are required to be prepared every six years to identify changes in use and well as growth.

With the current projected water use there is a surplus reservoir capacity. The next plan will be developed using current water consumption data which may result in a different surplus/deficit volume. Based on the analysis in the 2011 Plan it appears the reservoir has sufficient capacity for the buildout capacity of the development within the planning horizon.

The HLB reservoir design criteria determined a 400,000 gallon reservoir was required.

Comment 2. MSW's Development Agreement with the City is referenced only briefly at the bottom of pg. 1-19 in Chapter One, with a comment that the Agreement simply identifies the responsibilities of the parties. It would be appropriate to reference the Development Agreement again in Chapter 3, as that is where the Plans' "Storage Analysis" is documented. As is, there is no mention of reserved storage capacity of Discovery Heights in the Plan's Chapter 3. See suggested new footnote in item #4 below.

Response: The Development Agreement is referenced in Chapter 1 and included in Appendix C. The Development Agreement states that as part of the Preliminary Plat and Master Plan Application, MSW has prepared and submitted to the City a Narrative describing the proposed future uses of the property. The Narrative was incorporated by reference into the Development Agreement. The City has a copy of the Discovery Heights Narrative (submitted January 29, 2003, Landerholm Law Firm) which identifies the potential build-out conditions of each of the six phases of the development including the number of ERUs anticipated in each phase. A copy of the Narrative will also be included in Appendix C of the final 2011 Water System Plan. The number of ERUs for Discovery Heights that are included in the planning projections in Chapter 2 in both the 2003 and 2011 Plan include the number of residential and commercial ERUs identified in the referenced Narrative – 350 residential ERUs and 100 commercial ERUs.

Comment 3: The Development Agreement calls for the reservation of 450 ERUs of storage capacity for Discovery Heights, but also allows for an additional 15% cushion. Keeping in mind the substantial 'oversized' capacity of the reservoir, MSW requests that the 15% cushion be added to the reserved storage capacity for Discovery Heights. That is, the reserved storage capacity for Discovery Heights should be 520 ERUs (450s + 15%).

Response: The Development Agreement, item 4, states that "the City shall reserve for a period of fifteen (15) years, four hundred fifty Equivalent Residential Units (450 ERU's) of water storage capacity in the water reservoir on MSW's property." The Development Agreement does not say that the City will reserve 450 ERUs + 15%. The number of residential and commercial ERUs included in the reservoir analysis in the 2003 and 2011

plans totals 450. The reservoir capacity analysis indicates that in 2018, 15 years after the agreement was signed, there is sufficient capacity to accommodate the planned Discovery Heights buildout development of 450 ERUs and the needs of all the participants in the reservoir. The reservoir was designed by the MSW engineers for planned growth included in the 2003 and 2011 Water System Plans.

A 15% cushion has not been added to the reservoir capacity analysis.

Comment 4. Ambiguity between the Development Agreement and the Water System Plan should be eliminated. The 2011 Draft Water System Plan creates ambiguity regarding how many ERUs Discovery Heights is approved to be, by stating different numbers in different places. In Table 2-10's footnotes, 350 residential ERUs are mentioned. Table 2-11's footnotes refer to 100 Commercial ERUs within Discovery Heights; yet on page 2-9 of the Draft, the text reads "The City anticipates that the Discovery Heights development may reach buildout of 350 residential units within the 20-year planning period." Yes, the combination of residential and commercial ERUs add up to 450 ERUs; but the Development Agreement does not distinguish between commercial and residential ERUs. For clarity and the avoidance of future misunderstanding, Tables 2-10, 2-11, 3-15 and 3-16 should be footnoted as follows:

> **"By Development Agreement attached hereto in Appendix C (an presently under review for amendment), the City reserves 520 ERUs of water storage capacity of Discovery Heights to be used for either residential or commercial development at MSW's option. For planning purposes only, the City has chosen to reflect within this Water System Plan an estimated 100 commercial ERUs for Discovery Heights, and 420 residential ERUs.**

Response: The Development Agreement referenced Narrative identifies that the number of ERUs contemplated for the Discovery Heights development is 350 Residential and 100 Commercial. This number has not changed between the 2003 and 2011 Plans.

Fred Marshall previously commented that the 2011 Plan should assume Discovery Heights reaching residential build-out within the 20 year planning period which represents an annual growth of approximately 20% (Table 2-10) (Fred Marshall email March 14, 2011 - attached). Fred Marshall also said the plan was to include construction of 100 commercial ERUs between 2013 and 2016 (Table 2-11). The 2003 Plan also included the planning for 350 residential ERUs and 100 commercial ERUs (Table 2-7 2003 Plan and Page 2-7 2003 Plan).

The Development Agreement referenced Narrative identifies the number of commercial and residential lots and non-residential uses on Page 1. "At full build out, the Master Plan proposes the creation of approximately 210 residential lots, 140 condominiums a 100-unit hotel, golf course and other complementary commercial/recreational uses." A residential lot and a condominium are both considered a residential ERU. Therefore, the Narrative identified 350 residential ERUs and 100 commercial/recreational ERUs.

In keeping with the planning numbers provided in the 2003 Plan and Fred Marshall's written comments the 2011 Plan assumes full build-out of Discovery Heights includes 350 residential ERUs and 100 commercial ERUs. The recommended footnote has not been included in the 2011 Plan.

a) Table 2-10 and page 2-9 ambiguity between the Development Agreement and WSP

Table 2-10 addresses the projected service area population. As discussed above, 350 residential ERUs are in keeping with the Narrative referenced in the Development Agreement and the 2003 Plan. Page 2-9 is an introduction to the population projections in Table 2-10 and talks about residential development including 350 units in Discovery Heights with-in the 20-year planning period. The information in Table 2-10, page 2-9, the Development Agreement referenced Narrative and the 2003 Water System Plan are consistent.

b) Table 2-11 ambiguity between the Development Agreement and WSP

Table 2-11 includes the population projected in Table 2-10 as identified in Footnote 1. The reader should look to Table 2-10 for information regarding residential population. The "Comm." Column refers to the projected average day consumption for commercial ERUs. As stated in footnote 5 all commercial consumption is based on historical usage projected to grow at a growth rate of 1.4% with the exception of the Discovery Heights zone. A commercial ERU water use is the same projected water use as a residential ERU - 122 gpd (page 2-10). One hundred commercial ERUs are projected to be in place in the Discovery Heights zone by 2016. The 100 commercial ERUs planned for Discovery Heights is consistent with the Development Agreement referenced Narrative, 2003 Water System Plan and Fred Marshall's comments.

Comment 5. Footnote #2 of Table 2-10 of the 2011 Ilwaco Water System Plan is vague in its description of Sahalee's population growth. That is, the footnote refers to a 350 unit total and then states "Discovery Heights Zone population projects include the population in the existing Sahalee Zone, which will become part of the Discovery Heights Zone in the future". Does this somehow mean that Sahalee's

population (present and projected) becomes a deduction from or an addition to Discovery Heights ERUs? This is just a poorly worded footnote, and some clarification is needed. Note also that there are over 200 legally platted lots within the "old" Sahalee pressure Zone. Accordingly, there is a need for Sahalee's population growth to be documented in the Water System Plan separate from Discovery Heights projected growth. See Attached map of Sahalee platted lots.

Response: The population in Sahalee, similar to the remainder of the existing developed portions of the City of Ilwaco, is projected to grow at an annual growth rate of 1.4%. The Discovery Heights development is projected to grow at an annual growth rate of approximately 20% over the 20 year planning period. Based on the information in Table 2-10 the number of ERUs assumed in the Sahalee area in 2030 is 36 (Discovery Heights Zone population: 877/2.27 people/ERU = 386 ERUs. 350 ERUs – Discovery Heights. Remaining 36 ERUs Sahalee). The Sahalee pressure zone includes only those lots within the 1970s plat of Sahalee which does not include 200 platted lots. Sahalee ERUs do not deduct from planning for water supply for the 350 residential ERUs or 100 commercial ERUs assumed in the Discovery Heights development.

Footnote 2, Table 2-10 will be revised in the pages we send the City as follows:

> (2) Discovery Heights zone population projects are based on a growth rate of approximately 17 residential units per year through 2030, for a total of 350 residential units in this development by 2030 (approximate annual growth rate of 20%). Discovery Heights zone population projections include the population in the existing Sahalee Zone projected to increase at an annual growth rate of 1.4%.

Nancy Lockett

From: Fred Marshall [fmarshall@acm.org]
Sent: Monday, March 14, 2011 5:39 PM
To: Nancy Lockett; Elaine McMillan; 'Mayor, City of Ilwaco"
Subject: Water Plan Comments

Nancy,

Since I'm in the comment loop re: the Water Plan for the City as a member of the Water and Sewer Committee, I need to make sure that I'm being clear - as I'm not sure you've fully responded to my earlier inputs. I think I've already provided the rationale for the numbers but let me just say:

- There is a formal agreement regarding Discovery Heights with the City that reflects my inputs.

- The 2003 Water Plan does reflect that agreement and the developer plans. Any reason for departure is unclear.

- We all understand that the market has slowed but a slower market and investment initiative are two different things.

- The developer informs us that they are maintaining an aggressive posture relative to the development of their property and the current version of the draft plan doesn't completely reflect this. I don't see how we can ignore that.

So, I would simply respond with:

- add the appropriate number of Discovery Heights residential ERUs between 2016 and 2030 so that they will total 400 in 2030.

- In addition, add 120 commercial ERUs, (30 per year in 2013, 2014, 2015 and 2016).

- A footnote to Table 3-12: Discovery Heights build-out of 400 residential ERUs and 120 commercial ERUs in accordance with the City/MSW Developers Agreement of 2003.

So, the main concern I have is the lack of growth beyond 2015 and the number of commercial ERUs

As slow the market may be, we are very mindful that the Discovery Heights development remains the one single best opportunity for Ilwaco to increase much needed tax revenues. The numbers are compelling even if the development only generates 10% of projections. So, from the City's perspective it's an important ingredient.

Regards,

--
Fred Marshall
City of Ilwaco Councilmember
Water and Sewer Committee
PO Box 159
Ilwaco, WA 98624
(360) 642-2073

B-1

Skip

From: Sharon Osborn [SharonO@landerholm.com]
Sent: Wednesday, January 29, 2003 10:36 AM
To: skip@eco-land.com
Subject: Discovery Heights Narrative

narrative.doc (36 KB)

Please see attached revised Narrative for your review.

"Landerholm Law Firm" made the following
annotations on 01/29/03 10:33:10

[ALERT] -- Content Manager:
The information contained in this e-mail communication and any attached documentation may be privileged, confidential or otherwise protected from disclosure and is intended only for the use of the designated recipient(s). If the reader or recipient of this communication is not the intended recipient, or an employee or agent of the intended recipient who is responsible for delivering it to the intended recipient, you are hereby notified that any review, dissemination, distribution, copying or other use of this communication is strictly prohibited. If you have received this communication in error, please immediately notify us by return e-mail and promptly delete the original electronic e-mail communication and any attached documentation. Receipt by anyone other than the intended recipient is not a waiver of any attorney-client or work-product privilege. Users of unencrypted e-mail are cautioned that interception of messages by unauthorized persons is possible although unlikely. Landerholm, Memovich, Lansverk & Whitesides offers its clients the option of using encrypted e-mail upon request.

Feb 04 03 03:47p ecological Land Services (360)414-9305 p.1

B2

DISCOVERY HEIGHTS

NARRATIVE

I. PURPOSE

The purpose of this narrative is to provide the City and all interested persons or agencies with information regarding the Discovery Heights Preliminary Plat Application and Master Plan. Information regarding the potential adverse environmental impacts associated with this project is also included.

II. GENERAL OVERVIEW

A. Location

Discovery Heights (hereinafter "the Property") is a piece of property approximately 350 acres in size and located adjacent to and immediately east and south of State Route Loop 100, all within the municipal boundaries of the City of Ilwaco. Portions of the property lie north and west of the Sa-Ha-Lee Subdivision. The Property is bordered on the south by land owned by the United States Bureau of Land Management. Across Loop 100 to the west, lies property owned by the Washington State Parks Department.

B. General Plan.

The owner of the Property is MSW Venture, L.L.C. (hereinafter "the Applicant"). The Applicant is requesting: Preliminary Plat Approval, including a Phasing Plan; and Master Plan/Development Agreement Approval. Approval of the Preliminary Plat Application will create 64 legal lots for current and future residential and commercial/recreational development.

The Approval of the Master Plan will provide the City and the Applicant with a conceptual plan for future phases of development. At full buildout, the Master Plan proposes the

creation of approximately 210 residential lots, 140 condominiums a 100-unit hotel, golf course and other complimentary commercial/recreational uses. The Property's major transportation corridors and access points to the public road system, as well as major utility corridors are depicted on the Master Plan drawings.

A Traffic Study analyzing the trip generation and trip distribution of the project's transportation impacts is included within the Preliminary Plat Application. An internal network of private streets will serve the individual lots and uses within the Master Plan area. These will connect with State Route Loop 100 at three locations around the site. These locations are also depicted on the Applicant's Traffic Study.

At full buildout, it is estimated the development will consume approximately 450 ERUs of sewer and water capacity. Sewer and water transmission mains are currently under construction by the Applicant. The design and construction of these facilities has been approved by the City of Ilwaco, the Washington Department of Ecology ("WDOE") and the Washington Department of Health ("WDOH"). Construction and design of these facilities has been coordinated with the Washington State Parks Department and the United States Coast Guard in conjunction with sewer and water upgrades currently being implemented on properties owned or controlled by those agencies.

Approval of a Development Agreement, pursuant to RCW 36.70B, will provide the City and the Applicant with predictable development standards for the anticipated 15-year buildout of the project. These development standards will include, but not be necessarily be limited to, private road standards, water, sewer, stormwater utility standards, maximum densities for residential development, a timetable for sewer and water availability and usage, mitigation for transportation impacts and setbacks from critical areas.

The Master Plan and associated Development Agreement are intended to serve as the basis for the major planning and public works components of the development. It is anticipated and expected that some deviation from the approved Master Plan will occur; and, that precise locations and engineering and lot layout of the various features of the development will change slightly as future phases are developed and more detailed engineering occurs. Minor deviations or greater specificity are anticipated, and should be considered consistent with the Master Plan.

If deviations are proposed in the future, that increase the cumulative number of residential units for the project as a whole by more than fifteen percent (15%); or seek to add uses which are not permitted under the Development Agreement; or otherwise materially increase the probable significant adverse environmental impacts of the development, then further analysis of these impacts by the Applicant, and additional SEPA review by the City, including consideration of additional mitigation measures, should occur.

C. Topography.

The Property consists of an old clear-cut on stable but hilly soils, small drainage courses, Holman Lake and a few small wetlands. A significant amount of environmental analysis and review has recently occurred on the Property in conjunction with proposed and approved small wetland fills and hydraulics permits associated with road and utility crossings. Analysis and review included a complete Biological Assessment of the direct impacts to a variety of threatened, endangered and sensitive species created by the critical area fills, as well as the indirect consequences to those species from development of the surrounding upland areas.

Review and approval of these impacts and proposed mitigation measures was obtained from the Washington Department of Fish and Wildlife ("WDFW"), the United States

Army Corps of Engineers ("USACE"), United States Fish and Wildlife Services ("USFWS"), the National Marine Fisheries Service ("NMFS") and the City of Ilwaco. This review and approval included the issuance of a Nationwide 26 Wetland Fill Permit from the USACE, a 401 Water Quality Certification from the WDOE a "not likely to adversely effect" determination from NMFS, USFW, Hydraulic Permits from the WDFW and State Environmental Policy Act (SEPA) review from the City of Ilwaco. These permits and their associated environmental analysis are part of this Application.

III. PROJECT PHASES

A. Phase One

1.) Lots 1-56

Phase One consists of approximately 40 acres subdivided into 57 (Lots 1-57) residential lots. The average lot size for Lots 1-56 is approximately one-half acre (22,000 square feet). The primary use of these lots will be for single family homes (primarily residences and vacation homes). The Property's R-3 Zoning allows for a variety of residential types and densities, including duplex or single family attached homes. While not contemplated by the Applicant, it is possible that some of the Phase One lot purchasers might select one of these other housing options. After Preliminary Plat Approval of Phase One, but before Final Plat Approval, dependent upon market conditions, the Applicant may elect to split Phase One into Phase 1a and Phase 1b. Phase 1a would consist of Lots 1-26 and Phase 1b would consist of Lots 27-57. All infrastructure necessary to serve each phase of the development and platting of each phase would be in place or bonded prior to Final Plat Approval of each phase.

2.) Lot 57

Lot 57 comprises approximately 17.7 acres and lies immediately to the south of Lots 50-56. Lot 57 will be utilized for an approximate 65-unit condominium village. In addition to the condominiums, this village could include a restaurant. All lots in Phase One will be served by sewer and water facilities currently being constructed by the Applicant. They will eventually be owned and operated by the City of Ilwaco. Approximately 121 ERUs of sewer and water capacity will be utilized by Phase One. The transportation needs of Phase One will be served by an internal circulation system consisting of 22-foot wide curvilinear private streets. These streets provide adequate space and turning radii for emergency vehicles. Traffic along these streets will primarily access Loop 100 at the project's southerly most access point.. Stormwater will be managed consistent with the methodologies outlined in the Biological Assessment and Wetland Fill Permits obtained from the above-mentioned State and Federal Agencies.

While it is not anticipated that many school age children will reside on the property, appropriate arrangements with the local school districts will be made for bus stop locations that will provide safe walking for school bound children. Appropriate covenants, conditions and restrictions shall be recorded with each phase of the Final Plat that will assure all drainage facilities, roads and other common areas are adequately maintained. These will also include design standards and other restrictions, such as no waste, junk cars or other rubbish shall be allowed to remain upon any of the created lots.

B. Phase Two.

Development of Phase Two will occur on the 27.2 acre Lot 61. This area will include an approximate 100-unit hotel on the western portion of Lot 61 and a village containing

approximately 75 condominium units on the more easterly portions of Lot 61, generally along golf course fairways. The village would also likely include such commercial activities as restaurants, coffee shops, gift shops, pro shop/clubhouse and other specialty retail, recreational/commercial activities, i.e., kayak/bike rental, clothing boutique.

Access to the hotel and condominium village will be provided from an internal private road that will intersect Loop 100 northeast of the Beard's Hollow Overlook. The Applicant has applied for a Road Approach Permit from the Washington Department of Transportation ("WSDOT"). Sewer and water will be supplied by the City of Ilwaco through onsite conveyance facilities constructed by the Applicant. It is anticipated that approximately 175 ERUs of sewer and water capacity will be utilized by Phase Two (Condo--75, Hotel--50, Commercial--50). Appropriate landscaping shall be provided for the hotel and condominium village. A small portion of the golf course will likely traverse the easterly portions of this phase.

C. Phase Three.

Phase Three comprises approximately 75 acres and is located on Lot 58 in the southwesterly portion of the property. Proposed development in Phase Three will occur primarily upon a series of ridge tops traversing Lot 58. Development in this area will consist of approximately 40 residential lots. These lots will likely average in excess of one acre. It is anticipated that the vast majority of housing types in this phase will be single family detached. The area will be served by the internal private road system. Primary access to the public road system will likely occur at the Property's southern most Loop 100 access. The Applicant has applied to WSDOT for a Road Approach Permit in this area. This phase will also have sewer and water provided by the City of Ilwaco through transmission mains constructed by the

Applicant. Approximately 40 ERUs of sewer and water capacity will be utilized by this phase. Covenants, conditions and restrictions consistent with those in Phase One will be implemented.

D. Phase Four.

Phase Four comprises approximately 60 acres located upon Lot 59 in the center of the Property. The primary developable topography consists of approximately 15 acres located upon an approximate 1600 foot by 400-foot ridge which runs in a northeasterly/southwesterly direction through this phase. Approximately 30 lots in this area would average approximately one-half acre in size and be located on top of the ridge. Various golf course fairways will surround the residential lots. Each lot will be served by the internal private road network and will be provided sewer and water by the City of Ilwaco through a series of transmission lines constructed by the Applicant. Approximately 30 ERUs of sewer and water capacity will be utilized by this phase. The predominant housing type in this area would be single family detached homes, but a few condominium or townhomes could be constructed. CC&Rs consistent with those in Phase One would be implemented.

E. Phase Five.

Phase Five is located upon Lot 63 north of Holman Lake and east of the intersection of Loop 100 and Willows Road. The area consists of approximately 53 acres of gently rolling hills and portions of Holman Lake. A significant portion of this area will consist of golf course fairways. Approximately 34 single family homes or condominiums could be constructed within this area. Most of Phase Five will access the public road system at the northerly most access proposed for the Property. This intersection with Loop 100 is approximately across from Willows Road's terminus with Loop 100. As with other phases of the development, sewer and water will be provided by the City through transmission lines

constructed by the Applicant; and approximately 34 ERUs of capacity are anticipated to be utilized by this phase. CC&Rs consistent with those in Phase One will be implemented.

F. Phase Six.

Phase Six is located on Lot 64 south of Holman Lake and at the east edge of the property. The developable topography consists of a small hilltop overlooking Baker Bay and the Port of Ilwaco. Development could include a mixture of single family homes and condominiums totaling approximately 50 residential units. Approximately 50 ERUs of sewer and water capacity would be utilized by this phase. Access to this phase would be through internal private roads connecting to Eagle and Bay Streets located in the downtown area of the City of Ilwaco. Portions of Holman Lake and several drainage courses traverse this area. CC&Rs consistent with Phase One would be implemented.

G. Phase Seven.

Phase Seven consists of Lots 60 and 62. This approximate 48-acre area will be developed primarily as golf course fairways. Transportation needs would be served through utilization of the local and internal private street network. Access to the public road system from Lot 60 will be primarily through the Loop 100 access point northeast of the Beard's Hollow Overlook; and from Lot 62 will access Loop 100 primarily at the access across from Willows Road. Covenants, conditions and restrictions consistent with Phase One will be implemented. Some small number of residences could be located in this phase. This could occur as a result of building fewer homes in other phases, or from future permitting processes authorizing additional residential units.

IV. CONCLUSION

Gray & Osborne, Inc.
CONSULTING ENGINEERS

July 15, 2011

Ms. Corina Hayes
Office of Drinking Water, Regional Planner
Ms. Teresa Walker, P.E.
Office of Drinking Water, Regional Engineer
Washington State Department of Health
Southwest Drinking Water Regional Operations
P.O. Box 47823
Olympia, Washington 98504-7823

SUBJECT: REVISED RESPONSES TO COMMENTS ON WATER SYSTEM PLAN UPDATE FOR SYSTEM ID #355002, ODW PROJECT #11-0302 CITY OF ILWACO, PACIFIC COUNTY, WASHINGTON G&O #10565.00

Dear Ms. Hayes and Ms. Walker:

The following is in response to comments from DOH dated May 6, 2011, regarding the Water System Plan for the City of Ilwaco (City), DOH ID #35500, Office of Drinking Water Project #11-0302, per the follow-up e-mails received on July 7 and 11, 2011. We have inserted the DOH comments as they appear in the comment letter in *italics* followed by our responses to the comments.

#2 and #3 – The plan will not be approved until these items are received.

The Affidavit of Publication for the public meeting notice, the draft City Council meeting minutes, and the City Council resolution adopting the Plan are attached for inclusion in Appendix P. In addition, a customer comment e-mail and the memorandum responding to the comments are also attached for inclusion in Appendix P. Revisions made to the Plan in response to the customer comment are also attached.

#4. – a signed copy of the current WFI needs to be provided.

A signed and updated WFI is attached to replace the WFI in Appendix A.

#11 – This table and the WFI need to show the number of motel, RV and campsite units served by the city (this should not include any served by state parks or the coast guard).

Table 2-2 on page 2-2 has been updated to include transient units served by the City.

#23 – Please provide a timeline in the plan for when the SOP will be complete.

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The SOP section on page 7-5 has been updated to indicate that the City plans to have the SOPs completed and implemented by the end of the year.

#30 – Table 7-2, add "take action as directed by DOH" to the last two boxes or in a separate box below for the Primary MCL violation path.

Figures 7-1 and 7-2 have been revised as requested.

#39 – Table 10-1 has a value for 8" meters that I did not see reflected in the resolution. Please revise the table.

Table 10-1 has been corrected to remove the reference to 8-inch meters.

#44 – The population listed at the top should reflect the changes to the WFI and should include the daily population. Please include the systems sources SO2 – intertie with Long Beach (emergency) & SO3 – Indian Creek (primary).

The Coliform Monitoring Plan has been revised as requested and is attached to replace the existing plan in Appendix H.

#45 – This plan needs to include an emergency response program. Please include the city's current emergency response plan.

A chain of command and an emergency contact list have been added to the Emergency Response section on pages 7-13 and 7-14.

Enclosed are replacement pages for the Water System Plan chapters and additional/replacement pages for the appendices.

We hope that the foregoing adequately addresses your concerns. Please contact me at (206) 284-0860 if you have any questions or would like to discuss this further.

Very truly yours,

GRAY & OSBORNE, INC.

Nancy Lockett, P.E.

NEL/hhj
Encl.

cc: Mayor Mike Cassinelli, City of Ilwaco
Mr. Don Zuern, Water & Wastewater Supervisor, City of Long Beach
Mr. Charles Fraley, Plant Manager, Chinook Water District
Mr. Lynn Nordloh, Washington State Parks & Recreation Commission
Mr. Mike Stevens, Community Development Director, Pacific County

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