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City of Gearhart

Water Management and Conservation Plan

DRAFT

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Prepared for

City of Gearhart
P.O. Box 2510
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K/J Project No. 036306.50

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Figure 3.2	Comparison of Water Rights, Availability, and Demands

List of Appendices

- A Water Rights Application G-16489, Water Rights Permit G-16390
- B City Water Department Rules and Regulations for Water Conservation

Abbreviations

AWWA	American Water Works Association
bgs	Below ground surface
cfs	cubic feet per second
CF	Cubic Feet
City	City of Gearhart
gpm	gallons per minute
gpcd	gallons per capita per day
mg	million gallons
MGD	million gallons per day
OAR	Oregon Administrative Rules
PVC	Polyvinylchloride
psi	pounds per square inch
R/R	repair/replacement
UGB	Urban Growth Boundary
WMCP	Water Management and Conservation Plan
WRD	Oregon Water Resources Department
WTP	Water Treatment Plant

Section 1: Introduction

1.1 Purpose

The purpose of this Water Management and Conservation Plan (WMCP) is to define the City of Gearhart's (City) water system, and the City's water system needs, as well as identify its sources of water, and explain how the City will manage and conserve those supplies to meet present and future needs.

In Oregon, water conservation is now considered a critical element in the State's water resource inventory. As such, municipal water suppliers are required to have a current, WMCP approved by Water Resources Department (WRD) or complete one within three years of approval of extension of water rights. The WMCP is a mechanism for utilities to demonstrate that they have minimized their water needs and are developing resources in an environmentally responsible manner. This WMCP is designed to meet the regulatory requirements outlined by Oregon Administrative Rules (OAR) 690-086 and describes the following:

- Source of supply reliability and capacity
- Current and future estimated population and water demands
- Existing water rights inventory
- Current and planned Water Conservation Program
- The City's Water Curtailment Plan

1.2 Regulatory Requirement

Oregon Administrative Rule (OAR) 690-086 described the requirement for the development of WMCP's. This requirement is tied to OAR 690-315 which requires suppliers serving populations greater than 1,000 to complete a WMCP in association with water permit extensions. This WMCP has been developed to meet all applicable OAR requirements for WMCPs.

1.3 Progress Report

This WMCP is the first completed by the City of Gearhart and serves as a baseline for measurement. All water conservation and curtailment program elements described within this WMCP reflect the City's current activities. This WMCP lays out additional future activities that the City will be undertaking and a proposed schedule for implementation.

1.4 Summary of Data Sources

Throughout this WMCP are references to data, most of which was obtained from City files and records including population projections, customer billing rates, and conservation program implementation. Historical data related to service areas, such as connections and demands were obtained from the City's water production and demand management software.

1.5 Plan Checklist

Table 1.1 summarizes WMCP requirements, indicates inclusion in this document, and identifies the location of the pertinent information.

Table 1-1: Checklist of Required WMCP Contents

Required	Included	WMCP Topic	Section Location in WMCP
Water Supply System			
X	X	Description of Water Source	2.2
X	X	Delineation of Current Service Area	2.4
X	X	Assessment of Adequacy and Reliability of Existing Supplies	2.6
X	X	Quantification of Present and Historic Use	3.2
X	X	Summary of Water Rights Held	3.5
X	X	Description of Customers Served and Water Use Patterns	2.4, 3.2, 3.4
X	X	Identification of Interconnections with Other Suppliers	2.5
X	X	System Schematic	2.2
X	X	Quantification of System Leakage	3.8
Water Conservation Element			
X	X	Full Metering of System	4.2
X	X	Meter Testing and Maintenance Program	4.3
X	X	Annual Water Audit	4.4
	X	Leak Detection Program	4.5
	X	Leak Repair or Line Replacement Program	4.6
X	X	Rate Structure Based on Quantity of Water Metered	4.7
	X	Rate Structure and Billing Practices that Encourage Conservation	4.8
X	X	Public Education Program	4.9
	X	Technical and Financial Assistance Program	4.10
	X	Retrofit and Replacement of Inefficient Fixtures	4.11
	X	Reuse, Recycle, Non-potable Opportunities	4.12
	X	Other Conservation Measures	4.13
X	X	Progress Report on Previous WMCP	1.3
X	X	Documentation on Water Use Measurement and Reporting	4.14
X	X	List of Measures Already Implemented or Required Under Contract	4.15
Water Curtailment Element			
X	X	Assessing Water Supply	3.9
X	X	Stages of Alert	5.3
X	X	Triggers for Each Stage of Alert	5.3
X	X	Curtailment Actions	5.3

Required	Included	WMCP Topic	Section Location in WMCP
Water Supply Needs			
X	X	Delineation of Current and Future Service Areas	2.4
X	X	Population Projections for Service Area	3.3
X	X	Schedule to Fully Exercise Each Permit	3.5
X	X	Demand Forecast	3.4
X	X	Comparison of Projected Need and Available Sources	3.7
	X	Analysis of Alternative Sources	3.9
	X	Quantification of Maximum Rate and Monthly Volume	6.2
	X	Mitigation Actions Under State and Federal Law	6.3
Other			
X	X	List of Affected Local Governments and Their Comments	6.4
X	X	Date to Submit Next Update	6.5
	X	Documentation, where Additional Time is Requested to Meet Previous Benchmarks or metering.	Appendix

Section 2: Water Supplier Description

2.1 Introduction

This Section provides a description of the water source, information on the City's water system, current service area, interconnections with other municipalities, adequacy and reliability of the water supply, and water use and customer characteristics.

2.2 Sources of Supply

The City of Gearhart is currently, and has historically purchased its potable water supply from the City of Warrenton, through a 20-year wholesale agreement. The City's wholesale agreement expired in 2004, but the City has continued to purchase potable water from the City of Warrenton through an interim agreement, with emergency backup supply being provided by the City of Seaside.

In November of 2008, the City received conditional approval from WRD, for an application for groundwater rights under permit No. G-16390. The permit describes the water source from 14 well sites located as follows:

- Well 1 - SE ¼ SE ¼, Section 4, T6N, R10W, W.M.; 3658 Feet North & 1136 Feet West From E ¼ Corner, Section 9
- Well 2 - SE ¼ SE ¼, Section 4, T6N, R10W, W.M.; 3528 Feet North & 1136 Feet West From E ¼ Corner, Section 9
- Well 3 - SE ¼ SE ¼, Section 4, T6N, R10W, W.M.; 3398 Feet North & 1136 Feet West From E ¼ Corner, Section 9
- Well 4 - SE ¼ SE ¼, Section 4, T6N, R10W, W.M.; 3268 Feet North & 1136 Feet West From E ¼ Corner, Section 9
- Well 5 - SE ¼ SE ¼, Section 4, T6N, R10W, W.M.; 3138 Feet North & 1136 Feet West From E ¼ Corner, Section 9
- Well 6 - SE ¼ SE ¼, Section 4, T6N, R10W, W.M.; 3008 Feet North & 1136 Feet West From E ¼ Corner, Section 9
- Well 7 - SE ¼ SE ¼, Section 4, T6N, R10W, W.M.; 2878 Feet North & 1136 Feet West From E ¼ Corner, Section 9
- Well 8 - SE ¼ SE ¼, Section 4, T6N, R10W, W.M.; 2819 Feet North & 1136 Feet West From E ¼ Corner, Section 9
- Well 9 - SE ¼ SE ¼, Section 4, T6N, R10W, W.M.; 2759 Feet North & 1136 Feet West From E ¼ Corner, Section 9
- Well 10 - NE ¼ NE ¼, Section 9, T6N, R10W, W.M.; 2699 Feet North & 1136 Feet West From E ¼ Corner, Section 9

- Well 11 - NE ¼ NE ¼, Section 9, T6N, R10W, W.M.; 2639 Feet North & 1136 Feet West From E ¼ Corner, Section 9
- Well 12 - NE ¼ NE ¼, Section 9, T6N, R10W, W.M.; 2577 Feet North & 1096 Feet West From E ¼ Corner, Section 9
- Well 13 - NE ¼ NE ¼, Section 9, T6N, R10W, W.M.; 2517 Feet North & 1096 Feet West From E ¼ Corner, Section 9
- Well 14 - NE ¼ NE ¼, Section 9, T6N, R10W, W.M.; 2457 Feet North & 1096 Feet West From E ¼ Corner, Section 9

In 2009, the City began development of production wells located in the Neacoxie Basin, for the purpose of extracting water for municipal water supply. A total of eight of the 14 identified wells (Well Nos. 1, 3, 5, 7, 9, 11, 13, 14) were constructed to provide sufficient capacity for the City's current and projected demands.

2.3 System Description

The City water system consists of production wells, a water treatment plant (WTP), transmission main, reservoir, and water distribution system. The eight production wells were constructed to an overall depth of 119 to 159 feet below ground surface, with 10-inch steel casings. The well design data is shown in Table 2.1

Table 2-1: Well Design Criteria

Well No.	Ground El. (bgs)	Depth (Feet bgs)	Screen Length (Feet)	Top of Screen (bgs)
1	33.83	119	30	84
3	31.79	119	30	84
5	28.03	117	30	81
7	28.56	131	30	95
9	28.12	123	30	88
11	32.34	125	30	90
13	29.59	157	50	100
14	32.23	159	50	102

The raw water from the wells is pumped with submersible pumps through an 8-inch water pipeline to the WTP. The water treatment process utilizes coagulation assisted membrane filtration to remove arsenic from the water. The water is then disinfected in a 0.54 million gallon (mg) clearwell which provides chlorine contact time and water storage for fire flow. Water booster pumps located at the treatment plant pump the treated water from the WTP into the water distribution system.

A 14-inch transmission main connects a 1 mg reservoir located on a hill northeast of the City to the water distribution system. The reservoir provides flow equalization, fire flow and emergency storage.

The City's distribution system consists of one pressure zone with service pressures from 25 to 80 pounds per square inch (psi). The service pressure will be regulated by the reservoir levels and operation of the booster pumps located at the WTP.

The City's water distribution system includes approximately 23 miles of pipe, ranging from 2-inch to 20-inch diameter. The water distribution system pipe materials are comprised of approximately 60 percent asbestos cement and 40 percent polyvinyl chloride (PVC). Approximately 95 percent of the water service connections are copper pipe.

Figure 2.1 provides a schematic of the water system and Figure 2.2 shows the hydraulic profile of the wells, treatment process and reservoir.

2.4 Current Service Area

The 2011 Portland State University Population Research Center Annual Population Estimates list the current City population at 1,465. The City's current service area is not completely contained within City limits, but is completely contained within the Urban Growth boundary (UGB). The City's UGB still allows for development and expansion. The zoning map on Figure 2.3 depicts the City's limits, and UGB.

2.5 Interconnections with Other Municipal Supply Systems

The distribution system is owned by the City of Gearhart which currently purchases water from the City of Warrenton for distribution to the customers and residents of the City of Gearhart, through interconnections at the North Headworks and South Headworks located east of Highway 101. The City of Gearhart's water distribution system is also interconnected with the City of Seaside's water distribution system on the south side of Gearhart.

After the completion of the City's water treatment and supply facilities in 2012, the existing interconnections to Warrenton and Seaside will be maintained to provide a back-up water supply between the cities and would be used in cases of emergency or water shortages. These connections will be normally closed, and the flowmeters will be monitoring for cross-connection flow that may occur.

The City is currently entering into memorandums of understanding with Seaside and Warrenton for use of their water supplies as an emergency backup.

2.6 Adequacy and Reliability of Water Supply

2.6.1 Adequacy of Water Supply

A total of 14 wells were identified as potential water sources in WRD Permit G-16390. In 2009, eight production wells were drilled to provide capacity for current and future water demands. The well pumps were designed to operate at approximately 60 percent of the 24-hour constant rate pump test performed following well completion. Table 2.2 presents the well production data.

Table 2-2: Well Production Data

Well No.	Pump Capacity (GPM)	24-hr Constant Rate Pump Test (GPM)
1	75	125
3	60	100
5	120	200
7	156	260
9	156	260
11	120	200
13	210	350
14	168	280
Total: 1,065		

The combined capacity of the wells is 1,065 gallons per minute (gpm) or 855 gpm with the largest well out of service. The treatment plant capacity is 300 gpm per membrane skid or 600 gpm with both membrane skids in operation. There are provisions to install a future third 300 gpm membrane skid which would provide 600 gpm of treatment capacity with one membrane skid out of service.

The wells and treatment capacities compare with a current peak day demand of 350 gallons per minute (gpm) (0.5 million gallons per day [MGD]) and future (2050) peak day demand of 490 gpm (0.7 MGD) described in Section 3.4.

2.6.2 Reliability of Water Supply

Prior to design and construction of the City's production wells, a preliminary investigation was conducted into the production capacity of the Clatsop Plains Groundwater Aquifer, as well as its adequacy and reliability. This investigation included installing test wells, performing drawdown tests, and classifying the aquifer.

One of the concepts identified early in the hydrogeologic evaluation of the fine sand comprising the water bearing zone of the Clatsop Plains Groundwater Aquifer is its resistance to flow. The sand is fine to medium in consistency. While large volumes of water move through this sand layer, the withdrawal at any one well is limited. This was verified through development of the test well. The test well was able to pump 102 gpm continuously for 72 hours. At the end of the 72-hour test pumping procedure, the pump was turned off and the water in the well rebounded to within three feet of the normal (static) water table in less than two minutes. These observations support the claim that substantial water exists in the Clatsop Plains Groundwater sand dune to support extraction for the City's future water quantity needs.

It is important that water withdrawal from the wellfield not impact the surface water level of Neacoxie Creek. Additional hydrogeologic modeling will be undertaken with new data from the installation and testing of monitoring and production wells. The model input parameters will be adjusted to reflect the aquifer thickness based on new borehole logs, hydraulic conductivity based on aquifer tests, and 18 months of baseline groundwater data. The model update will look to reduce the conservatism in the initial model scenarios by incorporating more site-specific data. The model scenarios results would be used to develop operation plans to evaluate

potential environmental impacts to Neocoxie Creek and seawater intrusion, and provide technical basis for requesting an increase of the permitted summer withdrawal rates currently limited to 129 gpm.

Until additional summer water rights are obtained, the City will request supplemental water from the interconnections with Seaside or Warrenton if City water demand is greater than permitted withdrawal rates.

2.7 Water Use and Customer Characteristics

The City of Gearhart serves a customer base that is a mix of residential and commercial users. The City also provides water for operational and municipal uses such as park, ball fields, and landscape irrigation that is metered, and considered public authority use. Customer accounts by percentage of total and usage is illustrated in Figure 2.4.

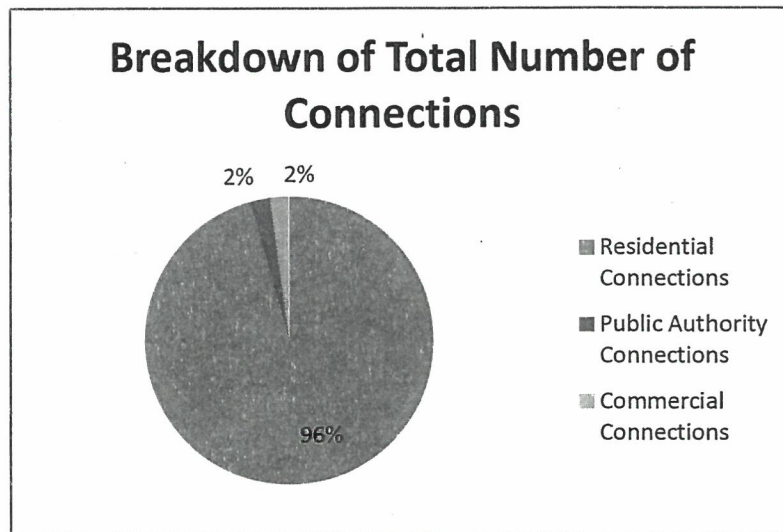


Figure 2.4: Breakdown of Connections and Water Usage by Customer Class

Residential customers in the City are typically single/multi-family residences with typical residential landscaping common to the region. Seasonal water demand varies the most in this customer class. The City's atypical connections that should be noted include the elementary school, and the high density, multiple occupancy dwellings on the west side of Gearhart. The City's commercial customers are restaurants, bars, and retail establishments with indoor water needs and little outdoor water usage. Commercial customer demand is typically consistent throughout the year and diurnal use patterns are consistent as well. It is anticipated that the relative ratio of these two customer classes will remain generally unchanged into the foreseeable future.

Section 3: Water System Supply and Demand Assessment

3.1 Introduction

This section of the WMCP describes the current and future estimated system demands, population projections, water demand forecasts, water rights held by City, a comparison of demand and supply, water rights held by the City, an assessment of alternative sources of supply, water leakage, and water loss reduction measures.

3.2 Demand and Production History

Currently, the City receives its potable water supply from the City of Warrenton. The amount of water purchased by the City each year from 2006 to present is documented in the table below. The total water purchased was then divided by 365 to estimate the average annual daily purchased of treated water.

City meter and billing records for 2006 to 2011 were used to develop annual average daily demand data for the five year period. Data from the billing cycles was used to approximate monthly demand. The City total monthly demand for each year was then divided by the appropriate number of days to approximate average daily demand. A non-revenue demand was approximated based on the difference between the total purchased water from the City of Warrenton, and the total sold water based on the billing records. The difference in purchased and sold amounts can be attributed to municipal use and leakage within the distribution system. Table 3.1 provides a summary comparison of annual average daily purchased versus demand.

Table 3-1: 2006-11 Annual Average Daily Water Demand

	Year					
	2006*	2007	2008	2009	2010	2011*
Annual Average Day Purchased (MGD)	0.29	0.28	0.30	0.29	0.22	0.26
Annual Average Day Revenue Demand (MGD)	0.25	0.21	0.18	0.22	0.20	0.20

Note:

*Years 2006 and 2011 are only partial years of data. Data from 2006 includes months Sept-Dec. Data from 2011 includes months Jan-Sept.

A graph showing the 2006 to 2011 annual average daily water purchase, water revenue (sold), production capacity and water rights is shown in Figure 3.1

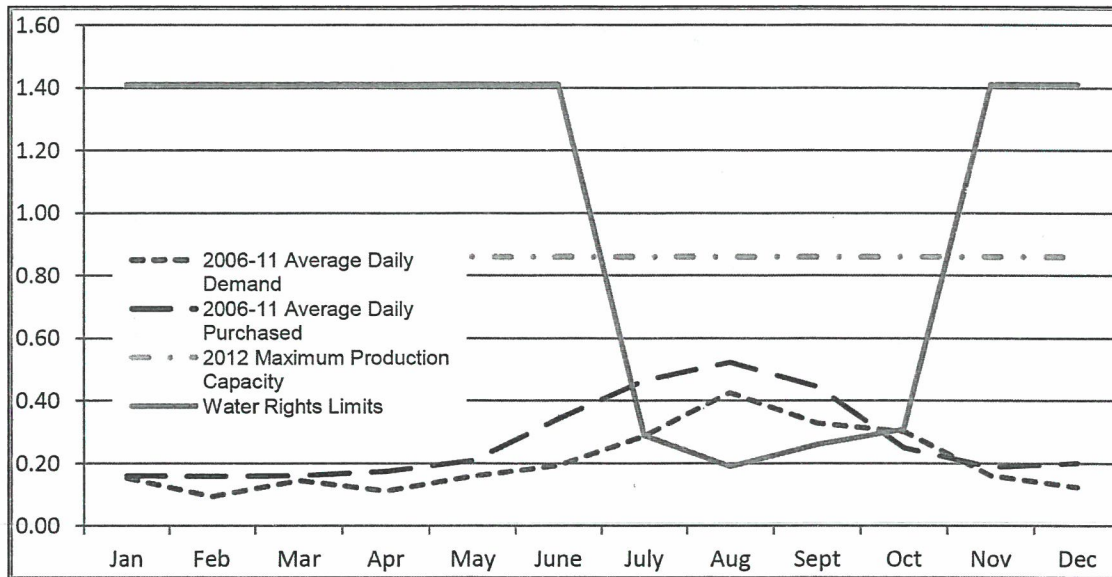


Figure 3.1: 2006-11 Monthly Average Day Production vs. Monthly Average Day Demand and Peak Day Demand

After completion of the City’s water supply and treatment facilities in 2012, the City will be capable of producing sufficient water to satisfy the peak day demand. However, it is expected that the supplemental water from alternative supplies will be required to satisfy the permitted summer water rights.

3.3 Service Area Population Projections

The most recent population figures available for the water service area are those developed by Portland State University Population Research Center Annual Population Estimates, which list the 2011 City population at 1,465. The City’s population estimates for 2015 to 2050 show a growth rate that increases gradually from an annual growth rate of 0.9 percent in 2015 to 1.2 percent in 2040. These growth rates were developed in the NW Coastal Water Supply Task Force Plan (Murray Smith & Associates, May 2009) and were used to extrapolate the future population numbers based on the current 2011 population are shown in Table 3.2.

Table 3-2: City of Gearhart Projected Populations

Year	City Population *
2011	1,465
2015	<i>1,441</i>
2020	<i>1,503</i>
2025	<i>1,569</i>
2030	<i>1,639</i>
2040	<i>1,817</i>
2050	<i>2,015</i>

Note:

*Numbers in Italics have been extrapolated

3.4 Water Demand Forecast

The City's annual average day demand for 2006 through 2011 was used to determine an average daily per capita demand of 174 gallons per capita per day (gpcd). To estimate peak daily demand, peaking factors of 1.6 to 2.2 can be used (Reference: Water Quality, Table 1.9, Tchbanoglous & Schroeder, 1987). A peaking factor of 2.1 was selected for a peak day demand of 365 gpcd. Using this data, future demands were calculated by taking the average and peak demand per capita and multiplying by the projected population projections in Table 3.3.

Table 3-3: Future Average and Peak Day Demand Projections

Year	Population Projection	Projected Average Daily Demand (MGD)	Projected Peak Daily Demand (MGD)
2011	1,465	0.3	0.5
2015	1,441	0.3	0.5
2020	1,503	0.3	0.5
2025	1,569	0.3	0.6
2030	1,639	0.3	0.6
2040	1,817	0.3	0.7
2050	2,015	0.4	0.7

The above demand projections are similar to the estimated projections in the 2009 NW Coastal Water Supply Task Force Plan.

3.5 Water Rights

The City holds groundwater rights in the Clatsop Plains Basin which were seasonally limited to avoid a potential for interference with surface water. Until such time as additional water rights are obtained, the maximum well capacity will be limited seasonally in accordance with Table 3.4. A copy of the water right permit documents is provided in Appendix A.

Table 3-4: Water Rights Summary

Point of Diversion (POD) Description	Clatsop Plains Basin Aquifer			
Approximate POD Location	SE ¼ SE ¼ , Section 4 and 9, T6N, R10W			
Application No.	G-16489			
Permit No.	G-16390			
Permit Date	6/28/2005			
Flow Rates	cfs	MGD	gpm	
Maximum	2.18	1.41	980	
July 1 to 31	0.443	0.29	198	
August 1 to 31	0.289	0.19	129	
Sept. 1 to 30	0.410	0.26	184	
Oct. 1 to 31	0.485	0.31	217	

Upon completion of the water supply and treatment facilities in 2012, the City will commence operation of the facilities to exercise and perfect the permitted water rights.

3.6 Water Supply versus Demand Comparison

The previous sections have evaluated the City's historical demand, production, projected population and demand growth, water rights, and source reliability and production. To determine the adequacy of supply to meet demand, these factors need to be evaluated simultaneously. Figure 3.2 shows the comparison of water rights, production capabilities, projected average day demand and projected peak day demands.

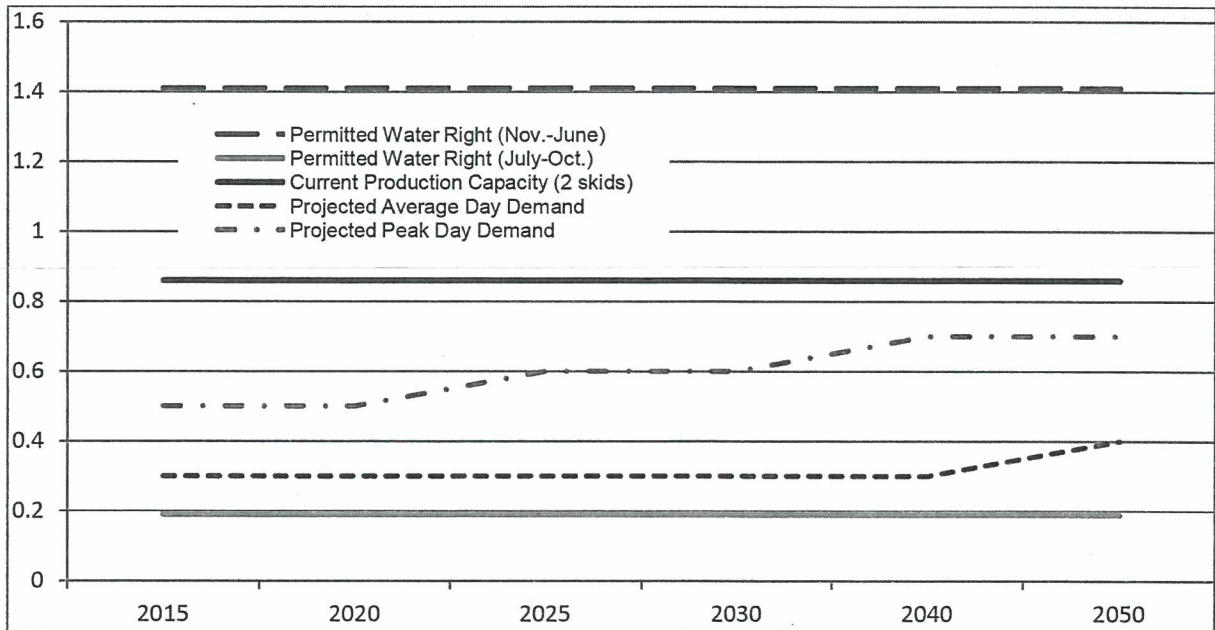


Figure 3.2: Comparison of Water Rights, Availability, and Demands

The data illustrates that the City generally holds sufficient water rights to meet their needs at the current rates of growth beyond the planning horizons for the majority of the year, but from July through the end of October, the water rights are limited to below the current and projected average day demands.

A projected shortage of available water capacity based on the lowest permitting water right allotment during the month of August is shown in Table 3.5.

Table 3-5: Projected Shortage of Available Water Based on Water Rights

Year	Population Projection	Projected Peak Daily Demand (MGD)	Projected Peak Daily Demand Shortfall (MGD) for August
2011	1,465	0.5	0.31 (215 gpm)
2015	1,441	0.5	0.31 (215 gpm)
2020	1,503	0.5	0.31 (215 gpm)
2025	1,569	0.6	0.41 (285 gpm)
2030	1,639	0.6	0.41 (285 gpm)
2040	1,817	0.7	0.51 (354 gpm)
2050	2,015	0.7	0.51 (354 gpm)

The annual water shortfall was also estimated for 2008 to 2020 based on the monthly water rights and projected monthly peak day demand and is shown in Table 3.6.

Table 3-6: Projected Shortage of Water During Water Rights Limited Months (Current to 2020)

Water Rights			Projected peak Daily Demand		Peak Water Shortfall	Total Water Shortfall per Month (Maximum)
	MGD	gpm	MGD	gpm	gpm	Million Gallons (mg)
July	0.29	198	0.5	347	149	6.7
Aug	0.19	129	0.5	347	218	9.7
Sep						
t	0.26	184	0.5	347	163	7.0
Oct	0.31	217	0.5	347	130	5.8
					Total Needed per Year (mg)	29.2

It is apparent from these tables that the water rights for the months of July through October are less than the current and projected peak daily demands.

3.7 Assessment of Alternative Sources of Supply

Alternative sources-of-supply includes:

- Interconnection with the City of Warrenton
- Interconnection with the City of Seaside
- Uptake from the Clatsop Plains Aquifer via Production Wells

The City has opted to maintain interconnections with both the City of Warrenton and the City of Seaside. These connections will be utilized in emergency situations and when demand is greater than the permitted summer withdrawal rates as discussed in the previous sections. The

City of Warrenton obtains surface water from four intakes in the main stem of the Lewis and Clark River and three of its tributaries. The City of Warrenton has three certificated water rights with a total permitted production rate of 17.45 MGD. The water is treated with membrane filtration with a capacity of 6 MGD expandable to 8 MGD and treated water is stored in a 17 mg reservoir. The City of Warrenton has historically provided the City of Gearhart with a reliable water supply.

The City of Seaside obtains surface water from the south fork of the Necanicum River and has a certificated water right for 8 cubic feet per second (cfs) (5.2 MGD). During high demand periods in the summer, the City uses water from the main stem of the Necanicum River at Peterson Point with a 7 cfs (4.5 MGD) certificated water right. The water is treated with coagulation, flocculation, clarification and filtration with a mixed media granular filter and disinfected with calcium hypochlorite. The treatment facility has a capacity of 4.0 MGD. The average daily demand for Seaside is 1.8 MGD with a peak day demand of 3.3 MGD.

There are no known environmental impacts or permitting impediments that would prevent use of these alternative sources of supply.

3.8 Water Leakage

Lost water impacts utilities financially in two ways. First, through the cost of treatment and distribution; second, through the loss of revenue for product that never reaches the intended customer. Utilities now operate in an era when water resources are increasingly difficult to come by, customers are asked to conserve water as a vital resource, budgets require ever tighter control, and there is often political resistance to increasing rates. Under these conditions, a utility must take financially responsible actions to optimize the resource if it expects to encourage customers to do the same.

The American Water Works Association (AWWA) has suggested a target goal of five percent to 15 percent water loss as achievable and realistic, depending on the specifics of the distribution system. If a lower percent loss can be achieved, this would be considered better; however, if major losses have been addressed, "chasing" leaks to reduce water loss beyond this point is often not financially prudent.

The City has a completely metered distribution system, and regularly monitors the in-flow to the system, along with the customer usage. The City uses this information to quantify the "lost" water, or leakage within their distribution system. The difference in water in-flow into the system, and customer usage is considered unaccounted for use, and can most likely be attributed to leakage within the distribution system. A simple annual production versus demand comparison was conducted using data from 2006-2011. Table 3.7 summarizes the data.

Table 3-7: Calculation of Annual Percent Unaccounted Water

	Year					
	2006*	2007	2008	2009	2010	2011*
Annual Production (mg)	34.3	103.0	109.0	106.4	81.5	71.1
Annual Demand (mg)	30.5	75.4	67.2	81.4	72.9	55.2
Unaccounted Water (mg)	3.8	27.6	41.8	25.0	8.6	15.9
% Unaccounted	11.2%	26.8%	38.3%	23.5%	10.6%	22.3%

Note:

*Years 2006 and 2011 are only partial years of data. Data from 2006 includes months Sept-Dec. Data from 2011 includes months Jan-Sept.

The data shows a range from 10.6 percent to 38.3 percent loss of produced water with a peak in 2008. It can be estimated that the water system is, and has been, experiencing an annual unaccounted water percentage of approximately 24 percent. These numbers are based on the purchased water from Warrenton. When the new water supply and treatment facilities are completed, the City will maintain similar records.

When addressing water loss, it is important to understand what type of water losses the system is experiencing. Water loss occurs either as “real” loss or “apparent” loss. Real losses are typically characterized by system leaks. Apparent losses are characterized by meter, human, and computer errors or water theft. Taken as a whole, water loss (unaccounted water) is calculated as follows:

$$\text{Water Loss} = \text{Water Produced} - (\text{Non-Revenue Water} + \text{Revenue Water})$$

A water loss reduction program requires a verification and resolution of apparent losses and reduction of real losses. A comprehensive water loss reduction program should address immediate water loss as well as establish a baseline for long-term leak management.

In discussion of water losses, a standardization of terminology is helpful. In moving forward, the following industry accepted terminology will be used for defining water loss.

Produced water	Water that is produced and sent to the distribution system.
Revenue water	Water that is accounted for and for which the City receives revenue (i.e., metered water and bulk sales).
Non-revenue water	Water that is accounted for but the City does not receive revenue (i.e., flushing, municipal landscaping, fire, etc).
Real losses	Water that is lost from the system, after production but before delivery to the customer.
Apparent losses	Water that is produced and delivered to users but is recorded as a loss due to meter inaccuracy, human error in recording data, computing errors, and theft.
Unaccounted-for-water	The sum total of “real” and “apparent” losses.
Accounted-for-water	The sum total of revenue and non-revenue water.

City staff will identify potential sources of apparent losses as hydrant testing, future water treatment plant operational demands, un-metered water use such as use by contractors in construction activities, distribution system leaks, and erroneous meters.

The City will determine unaccounted-for-water by identifying revenue water and non-revenue water. This water includes water used during flushing of pipes, fire hydrant use, and other non-metered municipal use. Upon completion of the new water treatment facilities, there will be new non-revenue water uses that the City will incur. These uses include filter backwash, filter-to-waste, turbidimeters, and continuous run sample taps.

Table 3.8 summarizes activities that the City will undertake for reducing real and apparent water losses.

Table 3-8: Water Loss Management Activities to Address Real and Apparent Losses

Real Water Loss Reduction Elements	
Transmission Main Inspections	Transmission main inspections are the first activity designed to detect real water loss occurring in large transmission mains between treatment and distribution.
Reservoir Inspections	Inspection of finished water storage reservoirs identifies leaks within storage facilities.
Distribution and Service Line Leak Detection	Distribution and service line leak detection surveys that locate actual leaks in pipes, valves, hydrants, and customer meters and premises.
System Service Pressure Management	This is an operational activity that reduces system pressure to minimize water losses from leaks.
Apparent Water Loss Reduction Elements	
Verification of Water Accounting	This activity is designed to accurately account for all finished water uses, verify accuracy of metered use, and account for un-metered uses.
Master and Large Meter Calibration	This activity verifies the accuracy of water entering the distribution system. This verification provides a baseline to measure water loss against.
Service Meter Testing and Replacement	Meter testing and replacement is an on-going program to inspect and replace small service meters in order to reduce inaccurate measurements.
Water Theft Reduction	This is an activity designed to restrict unauthorized water uses.

Some elements can be implemented for little to no cost and others will require a commitment of resources. Some recommendations address activities to reduce substantial losses while others are targeted at more refined potential losses. Understanding that time and resources will be needed to fully implement the recommendations, yet knowing that there is a condition of

substantial water loss occurring, a prioritization of the water loss reduction activities was prepared.

Table 3.9 presents a qualitative prioritization of the recommended activities. The program activities have been prioritized to assist the City in focusing efforts and resources. The criteria considered in this initial prioritization were:

- Cost
- Potential for water recovery/dollar spent
- Ease of implementation
- Capital and training costs
- Additional staff training

Table 3-9: Water Loss Reduction Activity Prioritization Matrix

Activity	Water Loss Reduction Activity Criteria					Priority Rank
	Cost	Potential for Water Recovery/Dollar Spent	Ease of Implementation	Capital and Training Costs	Additional Staff Training	
Master Supply Meter Calibration	Low	Good	Easy	None	No	1
Large Service Meter Calibration	Moderate	Excellent	Difficult	Low	Yes	2
Unbilled Water Accounting	Moderate	Moderate	Moderate	None	No	3
Transmission Main Inspection	Low	Low	Easy	None	No	4
Reservoir Inspection	Low	Good	Easy	None	No	5
Service Line Leak Detection	High	Excellent	Difficult	High	Yes	6
Water Theft Analysis	Low	Low	Moderate	None	No	7
Small Service Meter Testing	High	Good	Difficult	Low	Yes	8

Based on the comparison of recommended activities, the priority of implementation by real loss and apparent loss reduction activities is:

**Prioritized Real Loss Reduction
Activities**

**Prioritized Apparent Loss Reduction
Activities**

- Transmission Inspection
- Reservoir Inspection
- Service Line Leak Detection

- Master Supply Meter Calibration
- Large Service Meter Calibration
- Unbilled Water Accounting
- Water Theft Analysis
- Small Service Meter Testing

These priorities will simultaneously address anticipated points of real and apparent water loss while doing so in a priority that provides maximum potential benefit for resources invested.

While these recommendations are presented in a linear fashion, one activity is not necessarily dependent on another. Therefore, the list should not be interpreted to mean that each preceding activity must be completed before the next commences. The priorities are meant to provide guidance and structure to the formation of the final comprehensive program.

Section 4: Water System Conservation

4.1 Introduction

This is the first WMCP prepared by the City of Gearhart and the first evaluation of programmatic water conservation activities. The City currently has a water conservation and curtailment plan in effect and has implemented several of the required conservation elements as outlined by OAR 690-086. The City's Rules and Regulations for Water Conservation is provided in Appendix B.

This section describes the City's past, current, and planned conservation activities, compares them to the required and additional program elements and packages them in a programmatic fashion. It demonstrates the City's commitment to implement both supply-side and demand-side conservation measures that make economic and environmental sense.

4.2 System Metering Practices

Currently, the City meters and monitors the water purchased from the City of Warrenton that enters the system, as well as the water delivered to each customer. These readings are used to analyze the system, to estimate how much water loss occurs within the system, most likely due to leaks. After the new water supply and treatment facilities are completed, the City will measure the amount of water produced from the individual wells, meter the amount of water pumped into the distribution system after treatment, and meter each connections usage. This information will be used to better understand the usage characteristics of the system, possible leakages occurring, non-revenue producing water use, and develop conservation plans based on usage characteristics.

4.3 Meter Testing and Replacement Program

The City of Gearhart currently has an informal process to calibrate, test, and maintain customer account water meters when meters fail or accuracy is suspect.

4.4 Water Audit Program

The City does not currently conduct a formal annual system water audit. The City is planning to perform an annual audit starting in 2012 by comparing the water produced to the water sold, and tracking unmetered uses. The audit is designed to identify unaccounted water and define losses as real or apparent.

4.5 Leak Detection Program

OAR 86-0150 (4) (e) requires water suppliers with unaccounted for water losses in excess of 10 percent to implement a leak detection program. As described in previous sections, the City will be conducting a water system audit to better define where real and apparent water losses are occurring. Based on the results of that audit, the City will undertake a leak detection program as appropriate. At a minimum, the City will do a leak detection survey every five years.

4.6 Leak Repair and Pipe Replacement Program

The City of Gearhart currently addresses distribution leakage issues using a two tiered system. First-tier repair/replacement (R/R) applies to emergency pipeline ruptures that prevent the City from providing a minimally acceptable level of service to customers or presents a risk to public safety or property. These issues receive immediate attention and are typically repaired within 24 hours.

Second-tier R/R activities address those pipelines known or suspected to be a source of water loss but do not pose any risk to public safety, public health, or property. These pipelines are prioritized and addressed through annual operation and maintenance budgets.

It is the City's intention to continue this program of pipeline repair and replacement. Should the water audit or future leak detection survey show that substantial water loss reductions can be cost effectively achieved by modification of this program, the City will revise its approach accordingly.

4.7 Water Utility Rate Structure

The City has a uniform rate structure in place for all customer classes under Ordinance No. 852. Under this structure, each customer is charged a flat "meter" fee and "infrastructure" fee each month based on meter size. In addition to these flat fees, customers are charged a usage fee of \$6.13 per 100 cubic feet (CF) over the minimum charge. Table 4.1 summarizes the current water utility rate structure.

Table 4-1: City of Gearhart Water Utility Rate Structure

Meter Size	Minimum Charge	Allowance (CF)	Additional Fee for Water Usage Above Minimum
5/8" to 3/4"	\$23.31	500	All Users \$6.13 per 100 cubic feet of water used per month
1"	\$44.96	1,000	
1 1/2"	\$95.46	1,000	
2"	\$155.40	1,000	
3"	\$289.71	1,000	
4"	\$331.34	1,000	
6"	\$526.14	1,000	

This rate structure meets the requirements of OAR Division 86 rules that require a contemporary rate structure that includes both a commodity rate and fixed charge structure.

4.8 Water Utility Billing Practices

The City uses a two month billing cycle. This frequency is not optimal for using billing practices as a conservation tool. A two month frequency does not communicate usage to customers in a

timely manner to enable them to reduce usage during high demand months. A monthly billing cycle more effectively communicates to customers their usage and effects change.

The City will evaluate revisions to the billing cycle as an appropriate and effective conservation measure for its water system.

4.9 Public Education Program

The City recognizes the value of a Water Conservation Public Education Program to raise and maintain public awareness. The City currently distributes public information packets as part of its water conservation program, and provides guidance to its water users for both indoor water conservation (low flow shower heads, full loads only for dishes and laundry, shorter showers, attention to dripping faucets and indoor leaks) and outdoor water conservation (irrigation timing and volume, volume minimization for vehicle washing and outdoor leaks in faucets and hoses). Water pricing is currently an incentive for efficient water use as well. Additional literature promoting water conservation shall be available at City Hall and the public library. The City will continue to encourage efficient water use practices, and also has a water curtailment program in place.

4.10 Technical and Financial Assistance Programs

The City of Gearhart has limited resources to provide technical and financial assistance programs. Rebate and financial assistance programs are not practical for the City at this time.

The City intends to develop a customer request program to assist customer with ideas for water saving opportunities such as replacing existing water fixtures with efficient fixtures, outdoor irrigation needs, modifying old fixtures without replacement, and household water use practices. A visual and audio inspection for leaks will be conducted and water conservation literature will also be provided. This service will be promoted through the City's Water Conservation Public Education Program materials.

4.11 Retrofit/Replacement Program

The City currently, and in the past, has not had retrofit/replacement program in place due to budgetary constraints. Examples of customer distribution programs that may be considered when funding becomes available, include distribution of low-flow shower heads, toilet tank bags and rain gauges. Each of these programs will include method of implementation tracking to determine effectiveness.

4.12 Identification of Reuse, Recycle, Non-potable Use Opportunities

The City will be investigating the potential application reuse and recycle opportunities within the system. The City will identify potential users, ability to deliver, and cost/benefit of producing reclaimed water for irrigation and industrial uses. The City will also investigate the cost/benefit of filter backwash and filter-to-waste recycling at the water treatment plants. Finally, the City Public education program will include information household uses of grey water.

4.13 Summary of Additional Conservation Measures

Outside of the water conservation requirements for a utility serving a population under 7,500 as outlined by OAR 690-086-0150(6) and OAR 690-086-140(5)(i), the City does not have additional conservation activities underway.

4.14 Documentation of Water Use Measurement and Reporting

As per the requirements of OAR 690-85 for a municipality holding water rights, the City will annually submit a Water Use Measurement Report to the state.

4.15 Conservation Plan Progress Report

This WMCP is the first for the City and the first opportunity to formalize its Water Conservation Plan. Along with the conservation activities discussed above, the City also has an existing, three step water conservation program in place; voluntary conservation, mandatory conservation and mandatory curtailment.

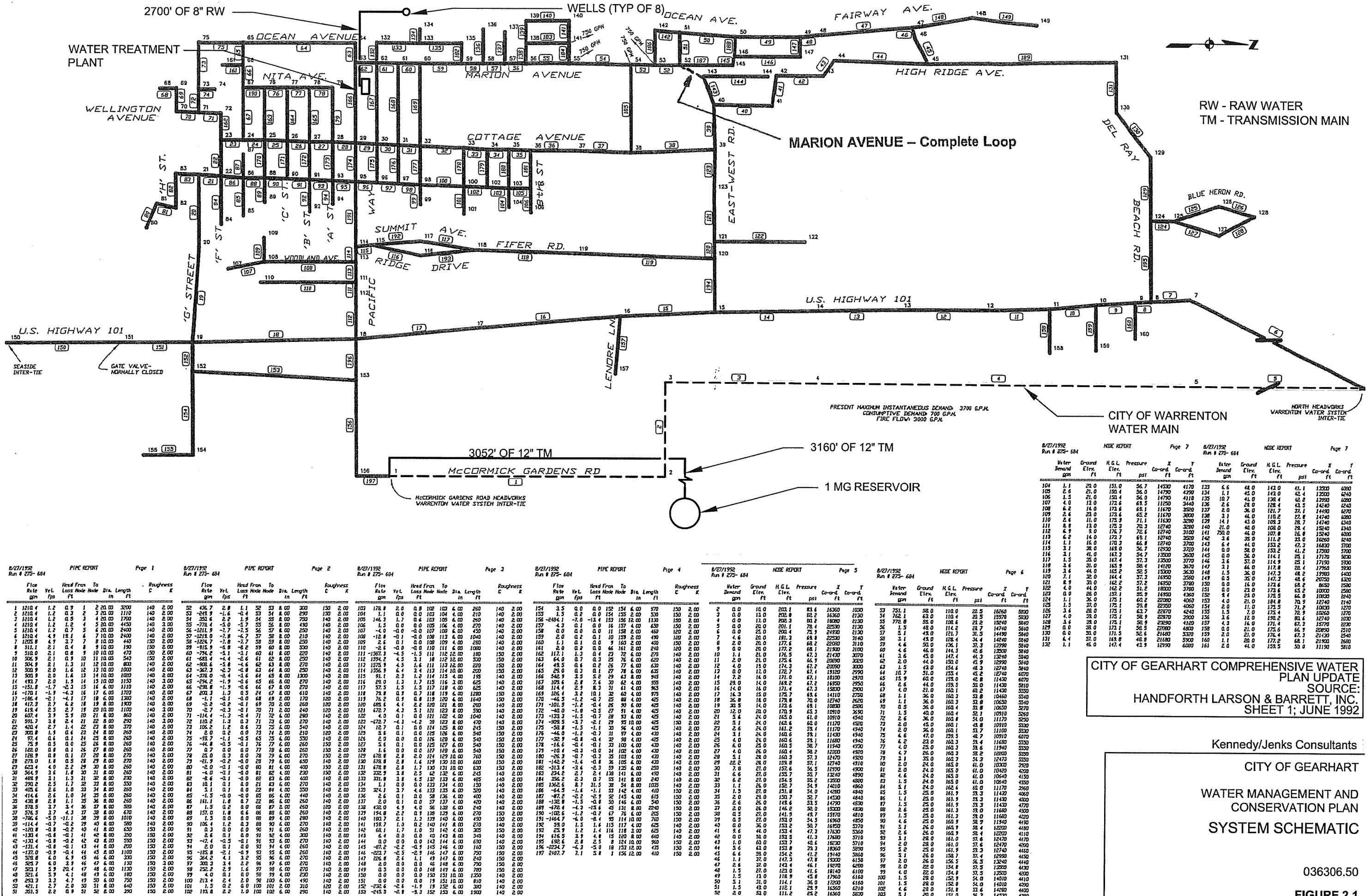
Table 4.2 serves as that baseline to measure progress in the City's water conservation practices in the future. Table 4.2 includes each conservation element, whether it is a requirement for the City of Gearhart, the City's proposed actions and target date for implementation. The City has set a goal of reducing its 2011 demand by 10 percent by 2021 through conservation.

The City does not currently serve a population greater than 7,500 nor does it plan to extend or initiate diversion of water under an extended permit. Therefore, the requirement for "additional conservation measures" as outlined in OAR 690-086-0150(6) and OAR 690-086-140(5)(i) do not apply.

Table 4-2: City of Gearhart Water Conservation Requirements and Planned Implementation

Conservation Plan Element	Required Element	Status or Proposed Action	Date for Implementation or Completed
Full metering of system	X	Complete	Prior to 2000
Meter Testing/Maintenance Program	X	In progress	2013
Annual water audit	X	In Progress	2013
Leak Detection Program	If >10%	In Progress	2013
Leak Repair/ Line Replacement Program		On-going	As funding permits
Conservation Rate Structure	X	Complete	On-Going
Conservation Billing Structure		Complete	On-Going
Public Education Program	X	In Place	On-Going
Technical and Financial Assistance Program		Under evaluation	TBD
Retrofit/Replacement Program		Potential measures under evaluation	TBD
Reuse/Recycle Program		Under evaluation	TBD
Water use measurement and reporting	X	In Place	On-Going
Customer Voluntary, and Mandatory Conservation Practices Implemented by the City		In Place	On-Going
Other Conservation Measures		No other conservation measures are currently underway or previously completed	

Figures



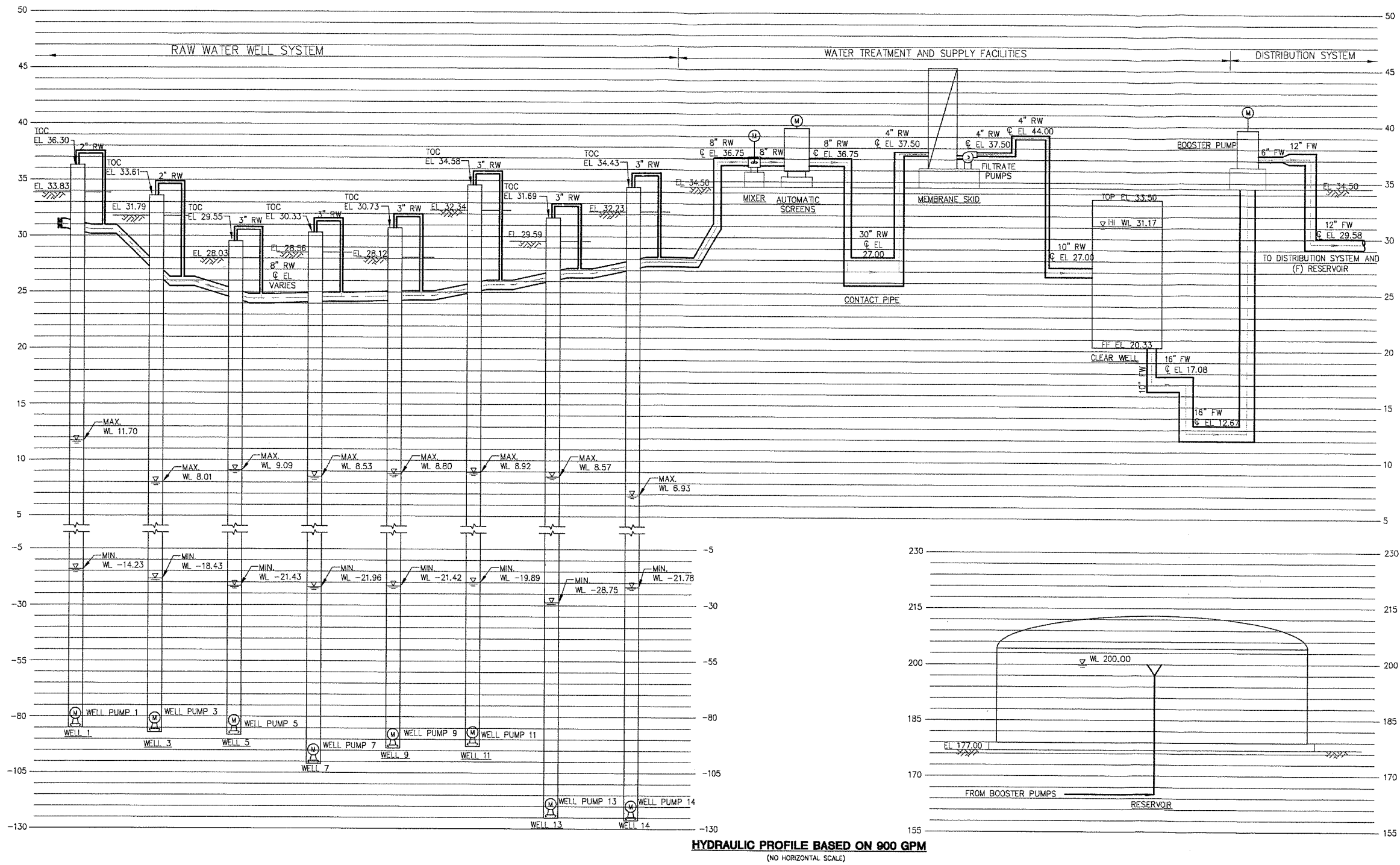
8/27/1992 Run # 275-684 NDE REPORT Page 7

Water Demand (gpm)	Ground Elev. (ft)	H.G.L. Elev. (ft)	Pressure (psi)	X Co-ord. (ft)	Y Co-ord. (ft)	Water Demand (gpm)	Ground Elev. (ft)	H.G.L. Elev. (ft)	Pressure (psi)	X Co-ord. (ft)	Y Co-ord. (ft)
104	1.1	20.0	151.0	56.7	14530	4170	133	6.6	48.0	142.0	41.1
105	2.6	21.0	150.4	56.0	14750	4390	134	1.1	45.0	143.0	42.4
106	1.5	21.0	150.4	56.0	14750	4390	134	1.1	45.0	143.0	42.4
107	4.0	13.0	173.6	63.5	11250	2440	136	2.6	28.0	128.4	45.5
108	6.2	14.0	173.6	63.5	11670	2590	137	2.0	36.0	121.7	37.1
109	2.4	23.0	173.6	63.5	11670	2590	137	2.0	36.0	121.7	37.1
110	2.6	11.0	175.3	71.1	11630	3290	141	1.1	43.0	110.2	57.8
111	8.8	13.0	175.3	71.1	11630	3290	141	1.1	43.0	110.2	57.8
112	6.9	14.0	176.7	76.6	12740	3100	141	21.0	44.0	108.0	59.4
113	6.9	14.0	176.7	76.6	12740	3100	141	21.0	44.0	108.0	59.4
114	1.1	16.0	170.3	66.8	12740	3100	143	6.0	35.0	111.2	53.0
115	3.1	16.0	170.3	66.8	12740	3100	143	6.0	35.0	111.2	53.0
116	3.1	44.0	167.9	54.7	13300	3630	145	0.0	36.0	114.1	25.1
117	1.5	35.0	167.9	54.7	13300	3630	145	0.0	36.0	114.1	25.1
118	3.6	30.0	165.9	58.4	14120	3570	147	3.1	27.0	111.8	28.4
119	3.6	30.0	165.9	58.4	14120	3570	147	3.1	27.0	111.8	28.4
120	4.0	44.0	162.2	51.2	15300	3630	148	1.5	36.0	147.3	48.2
121	6.9	30.0	162.2	51.2	15300	3630	148	1.5	36.0	147.3	48.2
122	4.0	44.0	162.2	51.2	15300	3630	148	1.5	36.0	147.3	48.2
123	1.1	36.0	175.1	60.2	16950	4360	152	4.4	23.0	175.5	66.8
124	1.1	36.0	175.1	60.2	16950	4360	152	4.4	23.0	175.5	66.8
125	3.6	30.0	175.1	60.2	16950	4360	152	4.4	23.0	175.5	66.8
126	3.6	30.0	175.1	60.2	16950	4360	152	4.4	23.0	175.5	66.8
127	4.0	30.0	175.1	60.2	16950	4360	152	4.4	23.0	175.5	66.8
128	4.0	30.0	175.1	60.2	16950	4360	152	4.4	23.0	175.5	66.8
129	1.1	46.0	147.4	43.9	12970	6090	161	2.0	44.0	153.5	53.0

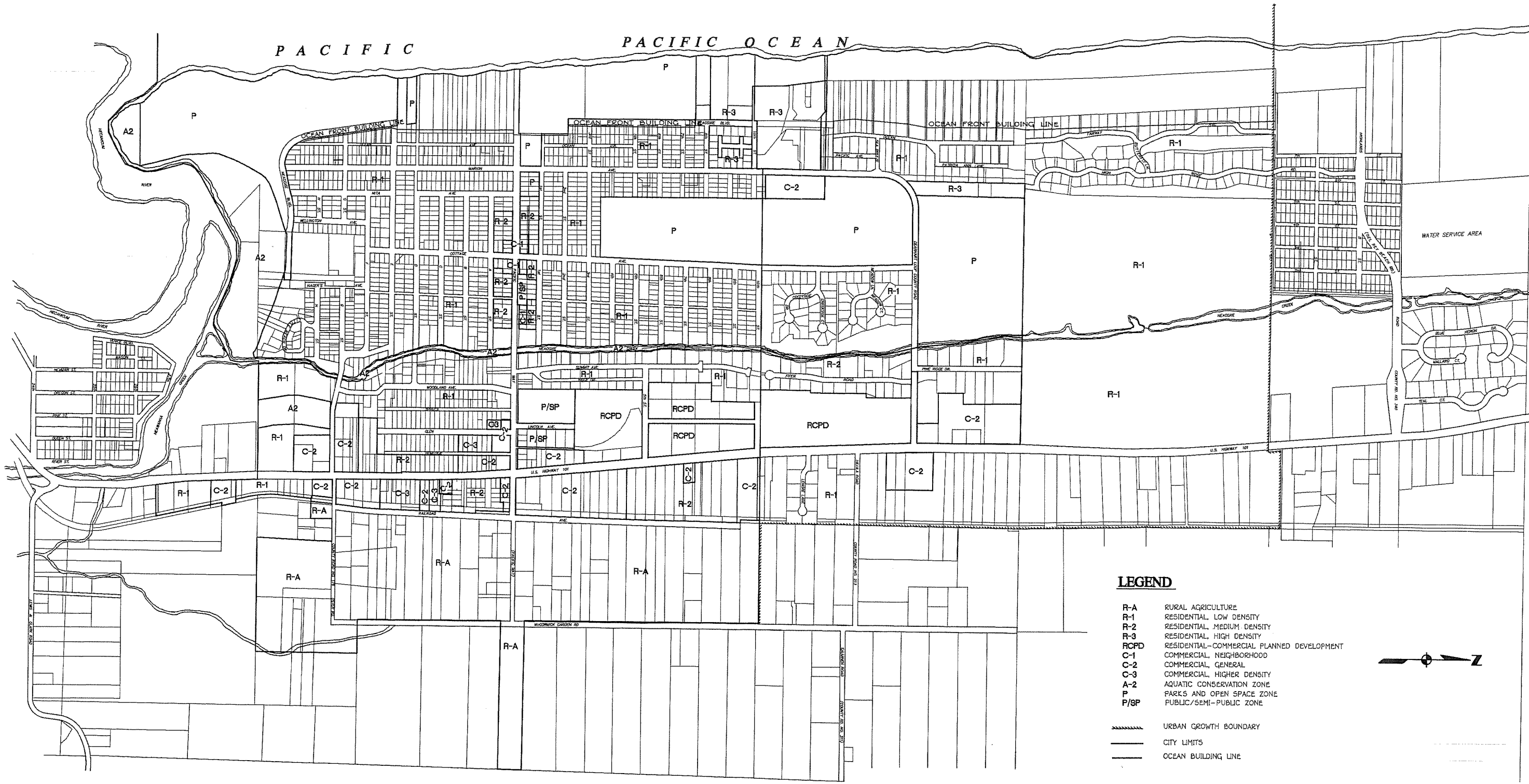
CITY OF GEARHART COMPREHENSIVE WATER PLAN UPDATE SOURCE: HANDFORTH LARSON & BARRETT, INC. SHEET 1; JUNE 1992

Kennedy/Jenks Consultants

CITY OF GEARHART WATER MANAGEMENT AND CONSERVATION PLAN SYSTEM SCHEMATIC

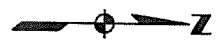


Kennedy/Jenks Consultants
 CITY OF GEARHART
 WATER MANAGEMENT AND
 CONSERVATION PLAN
 HYDRAULIC PROFILE



LEGEND

- R-A RURAL AGRICULTURE
 - R-1 RESIDENTIAL, LOW DENSITY
 - R-2 RESIDENTIAL, MEDIUM DENSITY
 - R-3 RESIDENTIAL, HIGH DENSITY
 - RCPD RESIDENTIAL-COMMERCIAL PLANNED DEVELOPMENT
 - C-1 COMMERCIAL, NEIGHBORHOOD
 - C-2 COMMERCIAL, GENERAL
 - C-3 COMMERCIAL, HIGHER DENSITY
 - A-2 AQUATIC CONSERVATION ZONE
 - P PARKS AND OPEN SPACE ZONE
 - P/SP PUBLIC/SEMI-PUBLIC ZONE
-
- URBAN GROWTH BOUNDARY
 - CITY LIMITS
 - OCEAN BUILDING LINE



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 CITY OF GEARHART
 WATER MANAGEMENT AND
 CONSERVATION PLAN
 ZONING MAP

Appendix A

Oregon Water Resources Department, Water Rights Division

Water Rights Application G-16489, Permit G-16390

Oregon Water Resources Department
Water Rights Division

Water Rights Application
Number G-16489

Superseding Final Order Incorporating Settlement Agreement

Application History

On June 28, 2005, City of Gearhart submitted an application to the Department for a water use permit. The Department issued a Proposed Final Order on July 31, 2007. The protest period closed September 14, 2007, and a timely protest was received from City of Warrenton. In addition, timely requests for standing were received from Oregon Department of Fish and Wildlife, and Deanna Mancill. On June 18, 2008, City of Warrenton withdrew its protest and the Department issued a final order modifying the proposed final order. On June 30, 2008 City of Gearhart filed a timely request for a contested case hearing on the final order. On July 22, 2008 the City of Gearhart filed a timely request for reconsideration of the final order. The Department approved the request for reconsideration on September 19, 2008. A Settlement Agreement was signed by all parties as of October 14, 2008. The Settlement Agreement constitutes an informal disposition of the contested case, and is incorporated into this Superseding Final Order and attached hereto.

The use will ensure the preservation of the public welfare, safety and health, but the Department's continuing evaluation reveals that the Final Order requires modification to correctly describe City of Gearhart's compliance with Section 8 of the Final Order. (ORS 537.625)

The Final Order described Section 8 of the City of Gearhart Monitoring and Action Plan as:

Section 8 of the City of Gearhart Monitoring and Action Plan, as modified in the attached draft permit, is:

SECTION 8 – Objective: Provide alternate source for Gearhart's municipal water in the event of saltwater intrusion or other persistent degradation of the drinking water aquifer.

Gearhart will have a physical connection and will enter into a memorandum of understanding (MOU) with an alternate municipal water supplier for backup emergency water supply sufficient to insure that adequate and safe water is available year round for water customers of Gearhart in the event that the wellfield use is restricted due to saltwater intrusion into the freshwater aquifer, or other water quality or quantity problems. Assurance of this physical connection and a copy of the executed MOU shall be provided to OWRD prior to permit issuance.

The applicant has long standing contractual relationships with neighboring municipalities, and has provided information and documentation from one for the purchase and delivery of water that demonstrates to the satisfaction of OWRD that the City of Gearhart maintains a physical connection with an alternate municipal water supplier and has access to a sufficient backup emergency water supply. Accordingly, the City of Gearhart has complied with Section 8. The requirements of Section 8 have been met for the purposes of permit issuance.

However, the Department has determined that to ensure the preservation of the public welfare, safety and health, it is necessary for Gearhart to have and maintain a physical connection to an alternate municipal water supplier for backup emergency water supply sufficient to ensure that adequate and safe water is available year round for water customers of Gearhart in the event that the permitted use is restricted due to saltwater intrusion into the freshwater aquifer, or other water quality or quantity problems. Section 8 of the City of Gearhart Monitoring and Action Plan, as modified in the attached permit, reads:

SECTION 8 – Objective: Provide alternate source for Gearhart’s municipal water in the event of saltwater intrusion or other persistent degradation of the drinking water aquifer.

Gearhart will have and maintain a physical connection with an alternate municipal water supplier for backup emergency water supply sufficient to insure that adequate and safe water is available year round for water customers of Gearhart in the event that the permitted use is restricted due to saltwater intrusion into the freshwater aquifer, or other water quality or quantity problems.

The Department encourages Gearhart to develop a new or updated water supply agreement with a municipal water supplier for back-up supply. In addition, the Department encourages Gearhart to participate in regional municipal water supply discussions.

Order

Application G-16489 is approved with these modifications to the Final Order and Draft Permit and a permit shall be issued authorizing the proposed water use.

If you need to request additional time, your written request should be received in the Salem office of the Department within 60 days of this Final Order. The Department will evaluate the request and determine whether or not the request may be approved.

DATED October __, 2008

for Phillip C. Ward, Director
Water Resources Department

This document was prepared by Jeana Eastman. If you have any questions about any of the statements contained in this document I am most likely the best person to answer your questions. You can reach me at 503-986-0859.

If you have other questions about the Department or any of its programs please contact our Customer Service Group at 503-986-0801.

*Address all other correspondence to: Water Rights Section, Oregon Water Resources Department, 725
Summer St NE Ste A, Salem OR 97301-1266, Fax: 503-986-0901.*

DRAFT
STATE OF OREGON
COUNTY OF CLATSOP

PERMIT TO APPROPRIATE THE PUBLIC WATERS

THIS PERMIT IS HEREBY ISSUED TO

CITY OF GEARHART
PO BOX 2510
GEARHART, OR 97138

The specific limits and conditions of the use are listed below.

APPLICATION FILE NUMBER: G-16489

SOURCE OF WATER: WELL 1, WELL 2, WELL 3, WELL 4, WELL 5, WELL 6, WELL 7, WELL 8, WELL 9, WELL 10, WELL 11, WELL 12, WELL 13, AND WELL 14 IN NEACOXIE CREEK BASIN

PURPOSE OR USE: MUNICIPAL USE

MAXIMUM RATE: 2.18 CUBIC FEET PER SECOND (CFS), FURTHER LIMITED TO 0.443 CFS FROM JULY 1 THROUGH JULY 31, 0.289 CFS FROM AUGUST 1 THROUGH AUGUST 31, 0.410 CFS FROM SEPTEMBER 1 THROUGH SEPTEMBER 30, AND 0.485 CFS FROM OCTOBER 1 THROUGH OCTOBER 31

PERIOD OF USE: YEAR ROUND

DATE OF PRIORITY: JUNE 28, 2005

WELL LOCATIONS:

WELL 1 - SE $\frac{1}{4}$ SE $\frac{1}{4}$, SECTION 4, T6N, R10W, W.M.; 3658 FEET NORTH & 1136 FEET WEST FROM E $\frac{1}{4}$ CORNER, SECTION 9

WELL 2 - SE $\frac{1}{4}$ SE $\frac{1}{4}$, SECTION 4, T6N, R10W, W.M.; 3528 FEET NORTH & 1136 FEET WEST FROM E $\frac{1}{4}$ CORNER, SECTION 9

WELL 3 - SE $\frac{1}{4}$ SE $\frac{1}{4}$, SECTION 4, T6N, R10W, W.M.; 3398 FEET NORTH & 1136 FEET WEST FROM E $\frac{1}{4}$ CORNER, SECTION 9

WELL 4 - SE $\frac{1}{4}$ SE $\frac{1}{4}$, SECTION 4, T6N, R10W, W.M.; 3268 FEET NORTH & 1136 FEET WEST FROM E $\frac{1}{4}$ CORNER, SECTION 9

WELL 5 - SE $\frac{1}{4}$ SE $\frac{1}{4}$, SECTION 4, T6N, R10W, W.M.; 3138 FEET NORTH
& 1136 FEET WEST FROM E $\frac{1}{4}$ CORNER, SECTION 9

WELL 6 - SE $\frac{1}{4}$ SE $\frac{1}{4}$, SECTION 4, T6N, R10W, W.M.; 3008 FEET NORTH
& 1136 FEET WEST FROM E $\frac{1}{4}$ CORNER, SECTION 9

WELL LOCATIONS (CONTINUED):

WELL 7 - SE $\frac{1}{4}$ SE $\frac{1}{4}$, SECTION 4, T6N, R10W, W.M.; 2878 FEET NORTH
& 1136 FEET WEST FROM E $\frac{1}{4}$ CORNER, SECTION 9

WELL 8 - SE $\frac{1}{4}$ SE $\frac{1}{4}$, SECTION 4, T6N, R10W, W.M.; 2819 FEET NORTH
& 1136 FEET WEST FROM E $\frac{1}{4}$ CORNER, SECTION 9

WELL 9 - SE $\frac{1}{4}$ SE $\frac{1}{4}$, SECTION 4, T6N, R10W, W.M.; 2759 FEET NORTH
& 1136 FEET WEST FROM E $\frac{1}{4}$ CORNER, SECTION 9

WELL 10 - NE $\frac{1}{4}$ NE $\frac{1}{4}$, SECTION 9, T6N, R10W, W.M.; 2699 FEET NORTH
& 1136 FEET WEST FROM E $\frac{1}{4}$ CORNER, SECTION 9

WELL 11 - NE $\frac{1}{4}$ NE $\frac{1}{4}$, SECTION 9, T6N, R10W, W.M.; 2639 FEET NORTH
& 1136 FEET WEST FROM E $\frac{1}{4}$ CORNER, SECTION 9

WELL 12 - NE $\frac{1}{4}$ NE $\frac{1}{4}$, SECTION 9, T6N, R10W, W.M.; 2577 FEET NORTH
& 1096 FEET WEST FROM E $\frac{1}{4}$ CORNER, SECTION 9

WELL 13 - NE $\frac{1}{4}$ NE $\frac{1}{4}$, SECTION 9, T6N, R10W, W.M.; 2517 FEET NORTH
& 1096 FEET WEST FROM E $\frac{1}{4}$ CORNER, SECTION 9

WELL 14 - NE $\frac{1}{4}$ NE $\frac{1}{4}$, SECTION 9, T6N, R10W, W.M.; 2457 FEET NORTH
& 1096 FEET WEST FROM E $\frac{1}{4}$ CORNER, SECTION 9

THE PLACE OF USE IS LOCATED AS FOLLOWS: WITHIN THE SERVICE BOUNDARY
OF THE CITY OF GEARHART

Measurement, recording and reporting conditions:

- A. Before water use may begin under this permit, the permittee shall install a totalizing flow meter at each point of appropriation. The permittee shall maintain the meter(s) in good working order. The permittee shall keep a complete record of the amount of water used each month, and shall submit a report which includes the recorded water use measurements to the Department annually or more frequently as may be required by the Director. Further, the Director may require the permittee to report general water-use information, including the place and nature of use of water under the permit.

- B. The permittee shall allow the watermaster access to the meter(s); provided however, where any meter is located within a private structure, the watermaster shall request access upon reasonable notice.

Prior to diversion and use of water under this permit, the City of Gearhart must resolve the deed restriction with Clatsop County and submit evidence to the Department of the resolution.

Within three years of permit issuance, the permittee shall submit a Water Management and Conservation Plan consistent with OAR Chapter 690, Division 86. The Director may approve an extension of this time line to complete the required Water Management and Conservation Plan.

The wells shall produce ground water only from the unconsolidated sand ground water reservoir.

CITY OF GEARHART MONITORING AND ACTION PLAN

This monitoring and action plan has been prepared consistent with provisions outlined by Oregon Water Resources Department (OWRD), input solicited from Oregon Department of Environmental Quality (DEQ), input solicited from Oregon Department of Fish and Wildlife (ODFW), and discussions held by these agencies in conjunction with the City of Gearhart.

This plan identifies the data collection requirements necessary to ensure sustainability of ground water and surface water resources. The plan may also undergo revision upon a demonstration that an alternative monitoring or action method, or discontinuance of one or more of the methods, can be made without reducing resource protections. Any modification to this plan will require agreement of the City of Gearhart, OWRD, DEQ, and ODFW.

The components of this plan, in conjunction with additional data gathered from baseline monitoring will address the objectives, target levels and concentrations as appropriate. *Following the 4/18/2007 meeting between Gearhart, Kennedy/Jenks, ODFW, DEQ, and OWRD, the monitoring components related to a pump-back mitigation strategy have been removed from this monitoring and action plan. The pump-back mitigation strategy will not be necessary for this permit due to a reduction in Gearhart's proposed groundwater withdrawal rate during the summer months. For clarity, the numbered items follow OWRD's numbered*

provisions from the 4/25/07 draft, and have been labeled as sections.

SECTION 1 - Objective: Measure baseline conditions of the aquifer and Neacoxie Creek prior to wellfield usage in order to establish background water level and water quality data.

A minimum of one year of ground water data and surface water data (outlined below) shall be collected prior to ground water use from the proposed municipal wells. OWRD will allow up to 0.156 cfs (70 gallons per minute) to be used for construction purposes following issuance of a groundwater permit for Gearhart. Construction water may be used during the one-year of baseline data collection.

SECTION 2 - Objective: Monitor for landward migration of the fresh and saline interface.

Gearhart will install three monitoring wells (MW-1, MW-2, MW-3) in a north-south line between the Pacific Ocean and the proposed wellfield generally as shown in **Figure 1**. All wells are expected to be located within publicly owned property. The wells shall be completed into the same waterbearing zone as the production wells (screened near the base of the dunal aquifer). The monitoring wells shall be located in the north-south direction such that the north, south, and central areas of influence on the aquifer from the production wells are monitored. Gearhart will continuously (or at no less frequently than two-hour intervals) measure water levels in each monitoring well. Water level data collection shall begin one year prior to any ground water withdrawal allowed by the permit (*except for construction purposes as indicated in item ONE above*). Gearhart will regulate ground water withdrawal in the wellfield to maintain acceptable aquifer head conditions in the monitoring wells. Acceptable head is assumed to be 3.0 feet above a referenced sea level datum. This initial number and the relative vertical datum are open to revision based on observations following well construction.

Each monitoring well will be sampled quarterly for laboratory chloride and total dissolved solids (TDS) analyses. Water quality sample collection from these monitoring wells will begin one year prior to any ground water withdrawal under this permit (*except for construction purposes as indicated above*). These four quarterly samples collected prior to wellfield use will establish the background chloride and TDS concentrations. Depending on spatial and seasonal variability, more than one background concentration may be established. Gearhart will also

measure and record weekly the specific conductance of ground water from each production well, and sample each production well quarterly for laboratory chloride and TDS analyses. If chloride or TDS concentrations from any monitoring or production well water samples increase by more than 20% above the established background concentration(s) for two consecutive quarterly sampling events, monthly water quality sample collection for all wells shall be implemented, and OWRD shall be notified. Gearhart will report data annually and upon reasonable request to OWRD.

SECTION 3 - Objective: Monitor for impact from wellfield pumping on shallow ground water elevations west and east of Neacoxie Creek.

Gearhart will install three monitoring wells (MW-4, MW-5, MW-6) in an east-west line near Neacoxie Creek east of the center of the wellfield, generally as shown in **Figure 2**. All wells are expected to be located within public rights-of-way. One well will be located east of Neacoxie Creek with the intent to evaluate pumping influence that could potentially propagate beyond the stream. Gearhart will continuously (as above) measure water levels in each well. Gearhart will report data annually and upon reasonable request to OWRD.

SECTION 4 - Objective: Monitor water use from wellfield.

Gearhart will install and maintain totalizing flow meters on each municipal well. Gearhart will record monthly flow values for each well and report annually and upon reasonable request to OWRD.

SECTION 5 - Objective: Monitor potential impacts on Neacoxie Creek.

Gearhart will install and maintain a surface water monitoring station (SW-MS1) on Neacoxie Creek to include stream stage, temperature, and specific conductance, generally as shown in **Figure 3**. Parameters shall be measured and recorded at least once every 15 minutes. Water quality sample collection and stream stage data collection from this monitoring station shall begin at least one year prior to ground water withdrawal under this permit (*except for construction purposes as indicated in Section One above*). Installation, survey, and data collection will be to USGS standards (Rantz, S.E. and others, 1982. *Measurement and Computation of Streamflow: Volume 1 & 2*. U.S. Geological Survey Water Supply Paper 2175). This monitoring station shall be as close as possible to the ground water

monitoring wells installed near Neacoxie Creek. Gearhart will report data annually and upon request to OWRD. OWRD will allow up to 0.156 cfs (70 gallons per minute) total from any combination of wells to be used for construction purposes following issuance of a groundwater permit for Gearhart. Construction water may be used during the one-year of baseline data collection.

If surface water or ground water monitoring data indicate that the impact to Neacoxie Creek stage or quality from wellfield pumping is observed to be increasing beyond model-simulated levels, additional monitoring of surface water and ground water may be required.

SECTION 6 - Objective: Survey each well.

All observation sites shall be surveyed to a horizontal accuracy of +/- five feet. Reported coordinates shall include the datum and projection of the coordinate system. A water level measurement point shall be described for each well. The measurement point elevation shall be surveyed to a vertical accuracy of +/-0.1 feet and referenced to a height above land surface. Surface water sites shall be surveyed to USGS standards.

SECTION 7 - Objective: Use water level and water quality thresholds to implement a water system action plan to halt the landward migration of the fresh/saline ground water interface.

The Department may restrict ground water use based upon increases in ground water salinity or TDS or reductions in aquifer head. This Monitoring and Action Plan includes steps to be taken by the permittee that will halt, if observed, the landward migration of the fresh and saline interface. These steps, consistent with Gearhart's Water Management and Conservation Plan include:

- Voluntary water conservation and curtailment of water use
- Mandatory water conservation with reductions in water use
- Mandatory curtailment of irrigation
- Cessation of ground water use and bringing online backup sources of municipal water

The two primary thresholds are the freshwater head in the aquifer west of the wellfield and the ground water chloride and

TDS concentrations west of, and at, the wellfield. A freshwater head of 3.0 feet above an agreed upon reference datum shall be maintained at all times in the monitoring wells located west of the production wells. This number and the relative vertical datum are open to revision based on observations following well construction.

Dissolved chloride and TDS concentrations in ground water samples collected from the monitoring or production wells shall not increase above the established background concentrations (pre-wellfield development) by more than 20 percent. If the freshwater head at the monitoring wells declines below 3 feet relative to the reference datum, Action Plan operations shall be implemented and OWRD and DEQ shall be notified immediately. If a quarterly chloride or TDS concentration from any well increases by more than 20 percent over the established background concentrations, Action Plan operations shall be implemented and OWRD and DEQ shall be notified immediately. OWRD and Gearhart will agree on the established background chloride and TDS concentrations based on the results of the pre-development monitoring data.

SECTION 8 - Objective: Provide alternate source for Gearhart's municipal water in the event of saltwater intrusion or other persistent degradation of the drinking water aquifer.

Gearhart will have and maintain a physical connection with an alternate municipal water supplier for backup emergency water supply sufficient to insure that adequate and safe water is available year round for water customers of Gearhart in the event that the permitted use is restricted due to saltwater intrusion into the freshwater aquifer, or other water quality or quantity problems.

SECTION 9 - All permit requirements of the Oregon Department of Environmental Quality shall be met and maintained, including, where utilized in the project, water quality of flow augmentation and backwash water, NPDES and/or WPCF permit compliance and associated water quality monitoring.

SECTION 10 - All measurements shall be made by qualified personnel. Qualified personnel include certified water rights examiners, registered professional geologists, registered professional engineers, or licensed well constructors or pump installers licensed by the Construction Contractors Board. Gearhart may work with OWRD to train the licensed water treatment plant operator for data collection purposes.

Measurements shall be submitted on a form provided by the Department or in an electronic form approved by the Department. All water-level measurements shall be made with equipment that is accurate to at least 0.3 percent. Measurements made with a pressure transducer or other automated measuring devices shall be calibrated to an e-tape or steel tape measurement at least once every two months. No air-line measurements will be accepted.

SECTION 11 - The Department requires the individual performing the measurements to:

- A. Identify each well and measurement with an owner's well name and an OWRD well Log ID;
- B. Measure and report water levels to the nearest hundredth of a foot as depth-to-water below ground surface;
- C. Specify the method of measurement;
- D. Specify the status (static, pumping, rising) of each measurement; and
- E. Certify the accuracy of all measurements and calculations submitted to the Department.

SECTION 12 - Gearhart will submit to OWRD all monitoring data annually in a report prepared and stamped by registered professional geologist or a registered professional engineer. The report will include discussions and plots of water level and water quality trends, water use amounts, maps with well and monitoring locations, and amounts of water used for flow augmentation, if any. All of the water level, water use, and water chemistry data shall also be submitted electronically in Microsoft Excel or other delimited file format acceptable to the Department.

SECTION 13 - Gearhart will allow the Department access to all wells, meters, water level, water temperature, and water chemistry data. The Department may request access upon reasonable notice to representatives of the permittee.

SECTION 14 - Other standard permit conditions for ground water permits will also apply, and are attached to this monitoring and action plan for reference.

The water user shall measure and report annually to the Oregon Water Resources Department (OWRD) water levels for each production well in January, April, July, and October for each year. The Director may

require the user to measure and report additional water levels each year if more data are needed to evaluate the aquifer system.

STANDARD CONDITIONS

Failure to comply with any of the provisions of this permit may result in action including, but not limited to, restrictions on the use, civil penalties, or cancellation of the permit.

If the number, location, source, or construction of any well deviates from that proposed in the permit application or required by permit conditions, this permit may not be valid, unless the Department authorizes the change in writing.

If substantial interference with a senior water right occurs due to withdrawal of water from any well listed on this permit, then use of water from the well(s) shall be discontinued or reduced and/or the schedule of withdrawal shall be regulated until or unless the Department approves or implements an alternative administrative action to mitigate the interference. The Department encourages junior and senior appropriators to jointly develop plans to mitigate interferences.

The wells shall be constructed in accordance with the General Standards for the Construction and Maintenance of Water Wells in Oregon. The works shall be equipped with a usable access port, and may also include an air line and pressure gauge adequate to determine water level elevation in the well at all times.

Where two or more water users agree among themselves as to the manner of rotation in the use of water and such agreement is placed in writing and filed by such water users with the watermaster, and such rotation system does not infringe upon such prior rights of any water user not a party to such rotation plan, the watermaster shall distribute the water according to such agreement.

Prior to receiving a certificate of water right, the permit holder shall submit the results of a pump test meeting the department's standards, to the Water Resources Department. The Director may require water level or pump test results every ten years thereafter.

This permit is for the beneficial use of water without waste. The water user is advised that new regulations may require the use of best practical technologies or conservation practices to achieve this end.

By law, the land use associated with this water use must be in compliance with statewide land-use goals and any local acknowledged land-use plan.

The use of water shall be limited when it interferes with any prior surface or ground water rights.

Completion of construction and complete application of the water to the use shall be made on or before five years from the date of permit issuance. If the water is not completely applied before this date, and the permittee wishes to continue development under the permit, the permittee must submit an application for extension of time, which may be approved based upon the merit of the application.

Within one year after complete application of water to the proposed use, the permittee shall submit a claim of beneficial use, which includes a map and report, prepared by a Certified Water Rights Examiner (CWRE).

Issued October , 2008

for Phillip C. Ward, Director
Water Resources Department

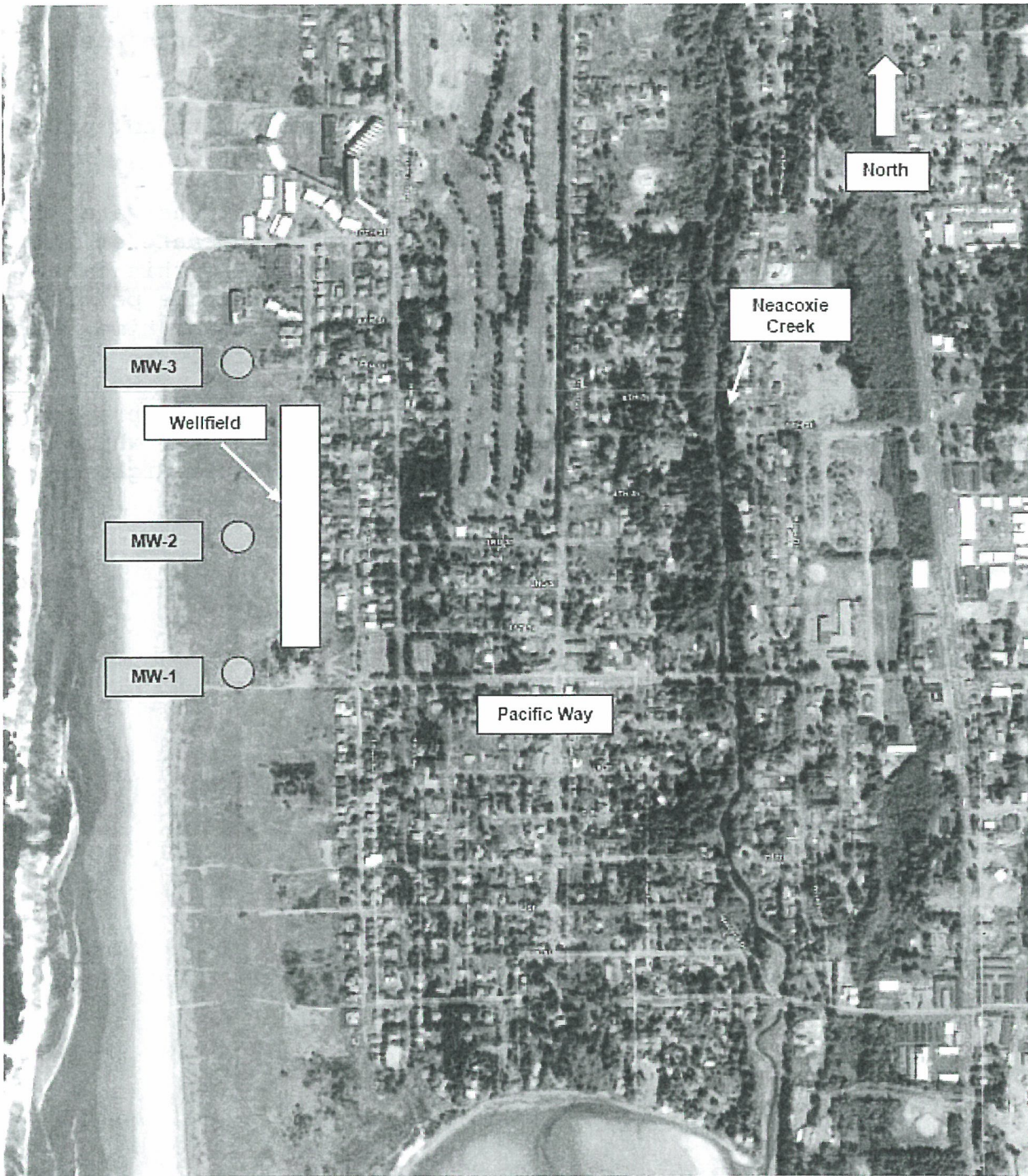


Figure 1 - Monitor for landward migration of fresh and saline interface (MW-1, MW-2, MW-3)

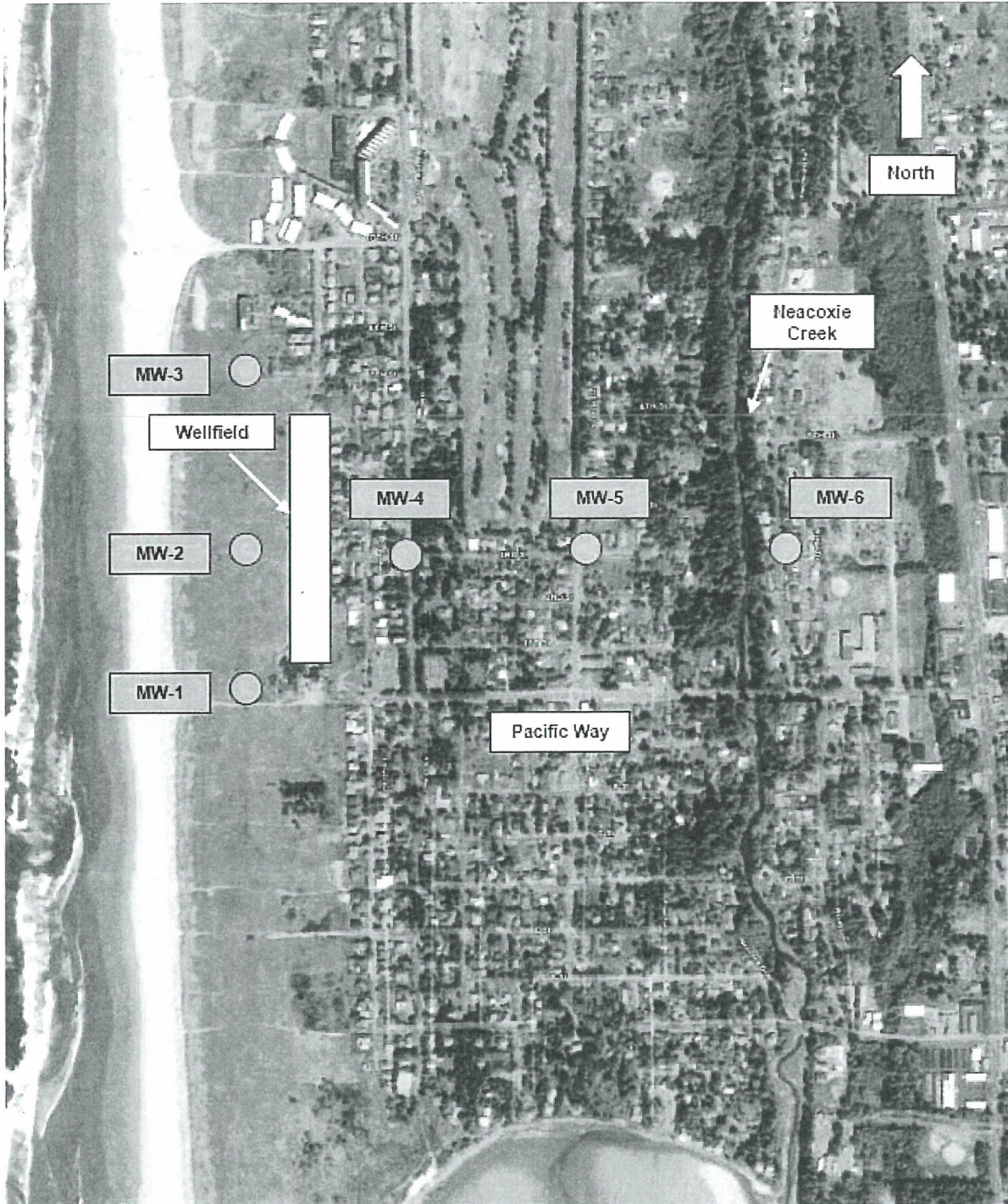


Figure 2 - Monitor for impact from wellfield pumping on shallow ground water elevations (MW-4, MW-5, MW-6)

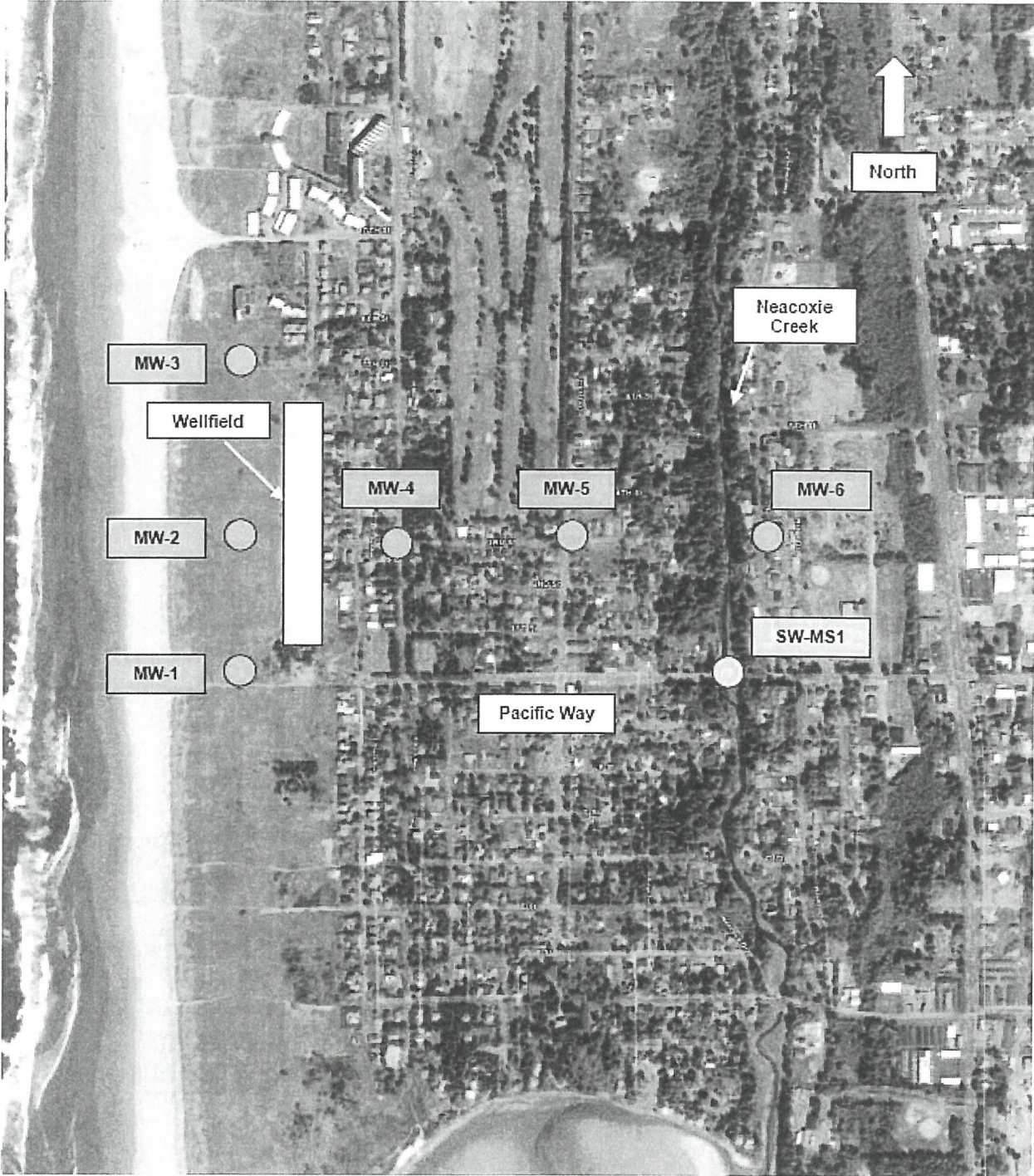
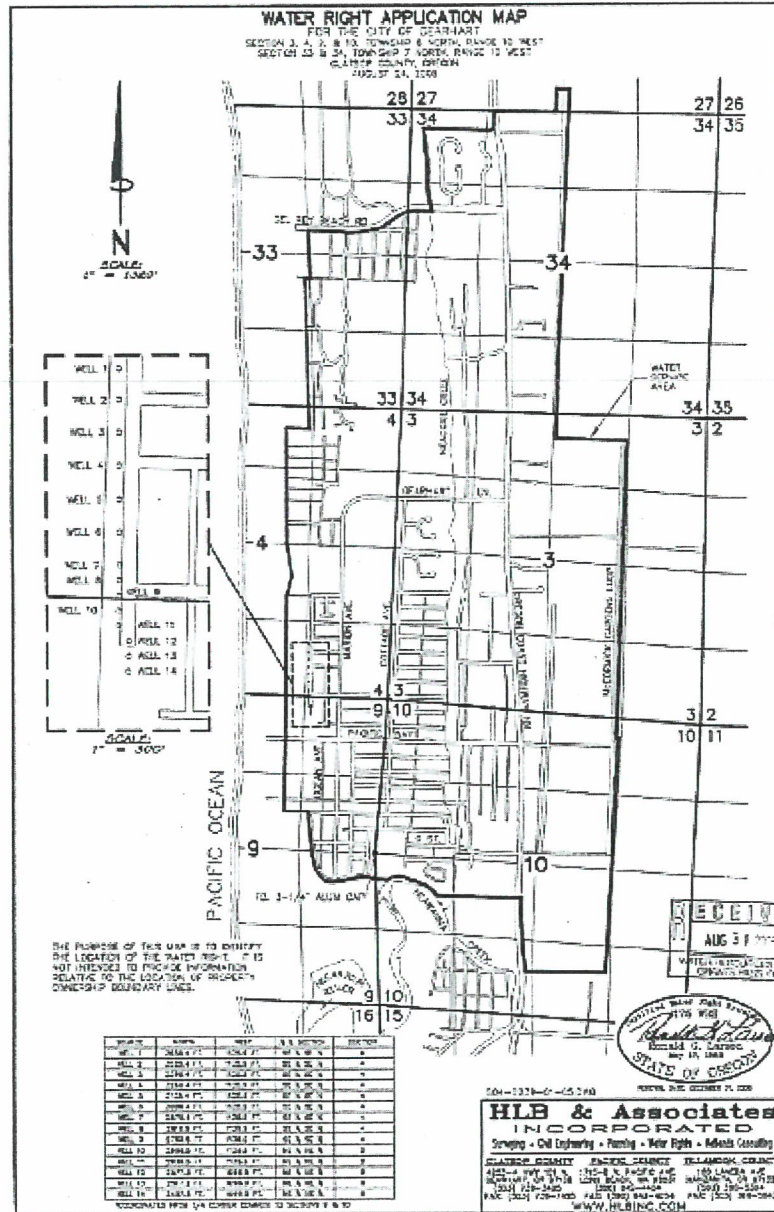


Figure 3 - Monitor potential impacts on Neacoxie Creek (SW-MS1)



Mailing List for Superseding FO Copies

Application #G-16489

Original mailed to applicant with claim of beneficial use form:

DENNIS MCNALLY
CITY OF GEARHART
PO BOX 2510
GEARHART OR 97138

Copies Mailed
By: _____ (SUPPORT STAFF)
on: _____ (DATE)

Copies sent to:

1. WRD - File # G-16489
2. WRD - Water Availability: Ken Stahr
3. WRD - NW Region Well Inspector
4. WRD - Ivan Gall
5. WRD - Doug Woodcock
6. WRD - Bill Fujii
7. ODFW - Rick Kepler, 3406 Cherry Avenue NE, Salem, OR 97303
8. ODFW - Troy Laws, 82656 Hatchery Rd, Hwy 202, Astoria, OR. 97103
9. DEQ - Rodney Weick, DEQ-NWR, 2020 SW 4th Avenue, Ste 400, Portland, OR 97201
10. DSL - Anna Buckley, 775 Summer Street NE, Salem, OR 97301

Copies sent to Other Interested Persons (CWRE, Agent, Well Driller, Commenter, etc.)

11. Ron Larson, CWRE #175
12. Brad Moore, Kennedy/Jenks Consultants, 200 SW Market St, Ste 500, Portland, OR 97201
13. John H Hammond, Beery, Elsner & Hammond, LLP,
1750 SW Harbor Way, Suite 330, Portland, OR 97201
14. Erik Anderson, Governor's Office, 255 Capitol St. NE Suite 126, Salem, OR 97301
15. Mark Ellsworth, Governor's Office, 255 Capitol St. NE Suite 126, Salem, OR 97301
16. Laren Woolley, DLDC, P.O. Box 451, 720 Mill St., Waldport, OR 97394 (541-563-3745)
17. Laird Bryan, OECDD, 775 Summer St NE, Ste 200, Salem, OR 97301-1280 (986-0138)
18. Mikell Omealy, DEQ, 2020 SW 4th Avenue, Suite 400, Portland, OR 97201 (503-229-5588)
19. Betsy Johnson, State Senator, PO Box R, Scappoose, OR, 97056
20. Deborah Boone, State Representative, PO Box 637, Cannon Beach, OR 97110
21. Debbie L. Pickering, The Nature Conservancy, 821 SE 14th Avenue, Portland, OR 97214
22. Clatsop County Community Development, 800 Exchange St., Suite 100, Astoria, OR 97103
23. City of Warrenton Public Works, P.O. Box 250, Warrenton, OR 97146
24. John H Hammond, Beery, Elsner & Hammond, LLP, 1750 SW Harbor Way, Suite 330,
Portland, OR 97201
25. Deanna Mancill, 2495 Hwy 101N, Gearhart, OR 97218 — paid \$10
26. Ted Ressler, Groundwater Solutions, Inc., 55 SW Yamhill Street, Suite 400, Portland, OR
97204 — paid \$10

CASEWORKER : Jeana Eastman

Appendix B

Gearhart Water Department Rules and Regulations for Water Conservation

April 12, 2004

GEARHART WATER DEPARTMENT
RULES AND REGULATIONS FOR WATER CONSERVATION

The Gearhart Water Department Rules and Regulations for water conservation consist of three (3) levels of rules and programs to accomplish a reduction in water consumption by consumers of the water system.

The three (3) levels of water conservation are:

1. Voluntary Water Conservation
2. Mandatory Water Conservation with defined reduction in consumption by irrigation or other unnecessary uses.
3. Mandatory Curtailment of irrigation and all other wasteful practices.

Detailed water conservation practices for each water conservation program are outlined in the attached enclosures.

Dennis McNally
City Administrator
City of Gearhart

- Enc. (1) Voluntary Water Conservation
(2) Mandatory Conservation
(3) Mandatory Water Use Curtailment

VOLUNTARY WATER CONSERVATION

The City of Gearhart requests that all customers VOLUNTARILY limit all non-essential uses of water in order to conserve resources.

These water conservation practices are suggested to reduce the daily consumption:

1. Even number houses irrigate on even number calendar days and odd numbered houses on odd numbered days. Be careful not to over irrigate.
2. Irrigate late evening or early morning hours to avoid evaporation.
3. Have a shut off nozzle on all hoses.
4. Examine soil conditions to determine if water is even necessary.
5. Wash only full loads of laundry and dishes.
6. Take shorter showers and ensure shower heads are water saving heads.
7. Wash vehicles only when necessary and use a bucket instead of a running hose.
8. Repair all leaking faucets and hoses. A leak about the size of the period at the end of this sentence will waste approximately 25000 gallons in a month.

Thank you for your cooperation in reducing the daily water consumption. Hopefully voluntary measures will reach the goals necessary to have the water that is necessary for domestic use and fire protection. If effective voluntary water conservation measures are not successful, mandatory measures may become necessary and implemented.

Dennis McNally
City Administrator

Encl. (1)

MANDATORY CONSERVATION

Due to declining availability of water, it is necessary to place mandatory restrictions on the use of water by consumers of the Gearhart Water System.

Effective immediately, even numbered houses and businesses may irrigate, during evening and early morning hours on even numbered days.

Odd numbered houses and businesses may irrigate during evening and early morning hours on odd numbered days.

All hoses **must** have a shut off nozzle that will be used to avoid unnecessary wasting of water.

Washing and rinsing of vehicles, using a hose will be discontinued, until the water conservation restriction are lifted by the City.

Each customer of the Gearhart Water System should try to reduce the amount of water consumed within their houses and businesses.

Thank you for your cooperation in conserving water during this time of need.

Dennis McNally
City Administrator

Encl. (2)

MANDATORY WATER USE CURTAILMENT

Due to circumstances beyond our control, it has become necessary to place Mandatory Water Use Curtailment for the consumers of the Gearhart Water System.

Effective immediately, all irrigating of lawns will be discontinued for the duration of the water shortage.

Garden irrigating may be continued on an individual permit basis. Permits may be obtained at Gearhart City Hall.

All unnecessary use of water, such as vehicle washing, window washing, etc. shall be discontinued until the water restrictions are removed by the City.

Thank you for your efforts in conserving water.

Dennis McNally
City Administrator

Encl (3)

