City of Veneta

WATER SYSTEM MASTER PLAN

City of Veneta, Oregon

MSA
Murray, Smith & Associates, Inc.
Engineers/Planners

May 2009/Updated March 2012

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FOR

CITY OF VENETA, OREGON

May 2009
Updated March 2012

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

Authorization

In June 2008, the firm of Murray, Smith & Associates, Inc. (MSA) was authorized by the City of Veneta to prepare this Water System Master Plan (WSMP).

Plan Update

This plan was updated in March 2012 to reflect the City's decision to proceed to develop a new water supply source from the Eugene Water and Electric Board (EWEB). Certain sections of the May 2009 plan are updated to reflect the integration of the new water supply system with the existing water system infrastructure. The page footers note the sections that have been changed as a result of this plan update.

Purpose

The purpose of this study is to perform a comprehensive analysis of the City's water system, to identify system deficiencies, to determine future water supply requirements, and to recommend water system facility improvements that correct existing deficiencies and provide for future system expansion. The planning and analysis efforts include consideration of the ultimate integration of recommended distribution system improvements with the City's long-term water source and supply decision.

Background and Study Area

The City's current water service area includes all areas within the current City limits and Urban Growth Boundary (UGB). The City provides potable water to approximately 4,244 people through approximately 1,555 residential, commercial and industrial service connections. The study area of this planning effort is the entire area within the UGB.

Existing System Description

Supply Sources

The City operates five groundwater wells within the City's water system service area limits. The wells produce water year round and serve as the City's sole water supply source. Wells 4, 9, 10, 11 and 12 have an existing combined production capacity of approximately 1.76 million gallons per day (mgd).

Pressure Zones

The City's existing distribution system is divided into three service levels or pressure zones. A fourth proposed pressure zone, the 750-foot zone, is designed to serve potential future development. Pressure zones are usually defined by ground topography and designated by overflow elevations of water storage facilities or outlet settings of pressure reducing facilities serving the zone.

Storage Reservoirs

Veneta's water system contains three reservoirs with a total combined storage capacity of approximately 3.5 million gallon (mg). Table ES-1 presents a summary of the City's existing storage reservoirs, including capacity, overflow elevations, and pressure zones served.

Table ES-1
Reservoir Summary

Reservoir	General Location	Capacity (mg)	Overflow Elevation (ft)	Pressure Zone Served By Reservoir
Public Works Yard Reservoir	Public Works Yard	2.0	457	582-Foot Pressure Zone
Dogwood Reservoir	Dogwood Lane & Bolton Hill Road	0.5	582	582-Foot Pressure Zone
Bolton Hill High Level Reservoir	Bolton Hill Road	1.0	842	658-Foot & 842-Foot Pressure Zones

Pump Stations

The City's water system contains three pump stations. A description of each station is presented below and key parameters are summarized in Table ES-2, including the service zone supplied and pump information including the unit numbers, motor horsepowers and the nominal pump capacities.

Distribution System

The water distribution system is composed of various pipe types in sizes up to 16-inches in diameter. The total length of piping in the service area is approximately 29 miles. The pipe types include asbestos cement, cast iron, ductile iron, PVC and copper. The majority of the piping in the system is asbestos cement piping.

Table ES-2
Pump Station Summary

Pump Station	Unit No.	HP	Nominal Capacity (gpm)	Supply To
Public Works Yard Booster Pump Station	1	40	400	582-Foot Pressure Zone
	2	50	700	
	3	30	500	
Jean Road WTP Pump Station	1	20	170	582-Foot Pressure Zone
	2	20	170	
Dogwood Pump Station	1	30	190	658-Foot & 750-Foot Pressure Zones
	2	30	190	

Water Requirements

Service Area

The current water service area is the area within the existing City limits which are contiguous with the UGB. The City water system planning area, which includes all land within the current UGB, encompasses a total area of approximately 1,637 acres.

Planning Period

The planning period for this master plan is approximately 20 years. Certain planning and facility sizing efforts will use estimated water demands at saturation development. Saturation development occurs when all existing developable land within the planning area has been developed to its ultimate capacity according to current land use and zoning designations. Unless otherwise noted, recommended improvements identified in this plan are sized for saturation development within the water system planning area.

Historical Population

The existing population and total number of dwelling units were derived from current City planning data supported by projections from the United States Census and Portland State University Population Research Center (PRC), which provides current and historical population estimates for the State of Oregon. The City supplied water to approximately 4,244 people in the water service area through approximately 66 commercial and 1,489 residential service connections during 2007. Due to the downturn in the economy, population and service connection figures have not increased significantly since that time.

Historical Water Usage

The term "water demand" refers to all of the water requirements of the system including domestic, commercial, municipal, institutional and industrial. Demands are discussed in terms of gallons per unit of time such as gallons per day (gpd), mgd or gallons per minute (gpm). Demands are also related to per capita use as gallons per capita per day (gpcd). The City maintains daily water production records at its supply wells and treatment facilities which have been evaluated to estimate water demands. Historically, average daily demand within the City has been approximately 0.4 to 0.7 mgd and per capita consumption has ranged from approximately 120 to 170 gpcd. Recent maximum daily usage has been as high as approximately 1.7 mgd, with a maximum day demand (MDD) per capita consumption range of approximately 320 to 460 gpcd.

Population Forecasts

The forecasted population at saturation development, or build out, for the City's water system planning area was taken from City planning data which draws upon current residential densities and United States 2010 Census data to determine the number of potential dwelling units within the existing City limits and UGB. An ultimate population of approximately 10,158 is anticipated for the City's water system planning area. The population forecast for the City from the adopted 2009 Coordinated Population Forecast for Lane County is 9,847 in 2030 and 10,505 in 2035. These figures were adopted after the modeling of demand projections was completed using population figures for 2030 and 2035 of 9,640 and 10,158 respectively. The differences between the adopted forecast and the figures used in development of this master plan are insignificant, and therefore, the original figures are retained for consistency.

Water Demand Projections

Estimates of future water demands were developed from the City's present per capita water usage and population forecasts from City planning data. For the purposes of this plan, estimated average daily water usage is assumed to be approximately 165 gpcd. As conservation plays an increasing role in water usage patterns, it is anticipated that City's average daily per capita usage can ultimately be reduced to and maintained at 150 gpcd.

For the purposes of this study, current maximum daily per capita usage is estimated at approximately 375 gpcd. Due to City's proximity to the Eugene Metro Area, it is expected that changes in water demand due to conservation will influence the City's water needs in the long term. It is anticipated that the City's maximum daily per capita use can ultimately be reduced to and maintained at approximately 350 gpcd, even in drought years.

Water demand forecasts are summarized in Table ES-3.

Table ES-3
Water Demand Projection Summary

Year	Population	Water Demand (mgd)				
		Average Day Demand	Maximum Day Demand[3]	Peak Season Demand[1]	Peak Month Demand[2]	Peak Hour Demand
2010	5,185	0.9	2.3	1.1	1.5	3.5
2020	7,401	1.2	3.3	1.6	2.0	5.0
2030	9,640	1.6	4.2	2.0	2.7	6.3
Build-out	10,158	1.7	4.5	2.2	2.8	6.8

Notes:
1. Peak Season Demand is the average daily demand for the 92 days of the peak water use season; defined as July 1st to September 30th.
2. Peak Month Demand is the average daily demand for the 31 days of the peak water use month based on available data. The peak month in the Pacific Northwest is usually either July or August.
3. Based on conversations with City staff, MDD assumes a storage loss of 3ft of depth in all three City storage reservoirs. This volume is added to the MDD that was calculated using only well log data.

Planning and Analysis Criteria

Water Supply Source

Given the understanding that the City's existing supply sources will not be adequate to meet all future water demands, the City has explored other supply options and has proceeded on a program to obtain a new water supply from the Eugene Water and Electric Board (EWEB). The City will not continue to develop additional groundwater sources. In order to be considered a feasible option for the City, a long-term water supply source must meet several criteria which are aligned with those used by other communities in the region. The criteria that were used to evaluate the supply source options and which led to the selection of the EWEB option were:

- Ability to meet all, or a substantial portion, of the City's long-term water supply needs.
- Ability to cost-effectively integrate source options into the current treatment, supply and distribution system.
- Supply source development cost.

Distribution System

The water distribution system should be capable of operating within certain system performance limits, or guidelines, under several varying demand and operational conditions. The recommendations include requirements for supplying peak hour demand without significant variations in service pressure and maintenance of a 20 pound per square inch (psi)

residual pressure under MDD conditions while supplying the recommended fire flow to a given location. This is the minimum water system pressure required by the Oregon Health Authority, Drinking Water Program.

Typically, proposed or new water mains should be at least 8-inches in diameter in order to supply minimum fire flows. In special cases, 6-inch diameter mains are acceptable if no fire hydrant connection is required, there are limited services on the main, the main is dead-ended and looping or future extension of the main is not anticipated.

Service Pressures

Generally, 80 psi is considered the desirable upper pressure limit and 35 psi the lower limit. Whenever feasible, it is desirable to achieve the 35 psi lower limit at the point of the highest fixture within a given building being served. Conformance to this pressure range may not always be possible or practical due to topographical relief, existing system configurations and economic considerations. In the case of the upper pressure limit, while pressures in excess of 100 psi may be acceptable in water mains, services must be equipped with individual pressure reducing valves (PRVs) to maintain their static pressures at no more than 80 psi.

Storage Volume

Water storage facilities are typically provided for three purposes: operational or equalization storage, fire storage, and emergency storage. A brief discussion of each storage element is provided below. This three component criteria for storage volume is commonly used by other water providers and by the AWWA. Recommended system wide storage is the sum of the operational, fire and emergency storage volume components.

Operational storage is required to meet water system demands in excess of delivery capacity from the supply source to system reservoirs. Standard industry practice indicates that operational storage equal to approximately 25 percent of a system's MDD is typically sufficient for analysis and planning purposes.

Fire storage should be provided to meet the single most severe fire flow demand within each zone. The fire storage volume is determined by multiplying the recommended fire flow rate by the expected duration of that flow.

Emergency storage is often provided to supply water from storage during emergencies such as pipeline failures, equipment failures, power outages or natural disasters. The amount of emergency storage provided can be highly variable depending upon an assessment of risk and the desired degree of system reliability. Provisions for emergency storage in other systems vary from none to a volume that is twice the average daily demand to a volume that would supply a maximum day's flow or higher. A reasonable volume for emergency storage for the water service area considering the City's proposed new supply from EWEB is two

times average daily demand. This amount of storage volume for emergency purposes is consistent with accepted water industry practices and guidelines.

Booster Station Pumping Capacity

When pumping to storage facilities, a firm pumping capacity equal to the pressure zone's MDD is recommended. Pump stations supplying constant pressure service without the benefit of storage should have firm pumping capacity to meet MDD while simultaneously supplying fire suppression flow for the largest fire flow demand in the pressure zone.

Water Distribution System Analysis

A hydraulic network analysis computer program was used to evaluate the performance of the existing distribution system and to aid in the development of proposed system improvements. The computerized model of the City's water system uses a digital base map of the distribution system and WaterCAD hydraulic network analysis software. The purpose of the model is to determine pressure and flow relationships throughout the distribution system for a variety of critical water demand and hydraulic conditions.

The results of the fire flow analysis indicate that the City's water distribution system is currently able to supply the required 1,000 gpm fire flow for residential areas of the City while providing for existing MDD and maintaining minimum service pressures throughout the system. The fire flow analysis of the existing distribution system under projected water demands at saturation development found that these residential fire flow requirements could not be met without piping improvements. Under higher fire flow conditions in commercial and industrial areas, the existing system has inadequate capacity to supply required commercial fire flows under both existing and future demand conditions. Additional hydraulic capacity is needed in the system to correct these deficiencies.

The analysis also found that the City's existing 4-inch diameter and smaller piping is not adequate to meet existing and future needs and should be replaced with larger diameter piping. A large number of the City's distribution pipes are asbestos cement pipes. In many other water systems, this pipe material is failing requiring expensive emergency repairs. The City should consider implementing a program for the systematic replacement of all asbestos cement pipe.

Pressure Zone Analysis

Some adjustments to existing pressure zones may be beneficial to accommodate future development around Bolton Hill and in the southern part of the City. As development continues south of the Dogwood Reservoir site, it is recommended that pressure reducing facilities be installed at Bolton Hill Road to establish a 750-foot pressure zone. Although previous planning efforts identified a new 750-foot pressure zone for this area, some slight adjustments to existing pressure zone boundaries will ensure that minimum service pressures

are met in all parts of the City while minimizing the use of individual pressure reducing valves (PRV) for services with static pressures in excess of 80 psi.

Pump Station Capacity Analysis

The City's existing water system contains three booster pumps stations. Two of these pump stations, at the Public Works Yard and Jeans Road Water Treatment Plant (WTP), serve the 582-foot pressure zone boosting water to the Dogwood Reservoir. The third pump station, next to the Dogwood Reservoir boosts water to the Bolton Hill Reservoir, supplying the 842-foot, proposed 750-foot and 658-foot pressure zones.

The Public Works Yard Booster Pump Station has a firm capacity below that currently needed to meet maximum day demands of the entire system. With a build-out pumping capacity deficit of 3.2 mgd, this station will require significant improvements to meet demands at saturation development. The MDD of the entire system is the recommended firm capacity for the Public Works Yard Booster Pump Station as it is anticipated that the Jeans Road supply facilities will not be normally used after the new supply system from EWEB is in service.

The recommended firm capacity of the Dogwood Pump Station is the combined MDD of the 842-foot, proposed 750-foot and 658-foot pressure zones. While the firm capacity of the Dogwood Pump Station is sufficient to meet existing demands in the 842-foot, an additional 0.2 mgd (139 gpm) pumping capacity will be required to meet demands at saturation development.

Storage Volume Analysis

Table ES-4 illustrates the individual storage components and combined storage needs recommended for operational, fire and emergency purposes under existing demand conditions, projected demands in the year 2030 and at saturation development.

Table ES-4
Storage Volume Recommendation Summary

Year	Storage Components			Recommended Total Storage (mg)	Existing Storage (mg)	Storage Deficit (mg)
	Operating (mg)	Fire (mg)	Emergency (mg)			
2007	0.5	0.6	1.4	2.5	3.5	--
2020	0.8	0.6	2.4	3.8	3.5	0.3
2030	1.1	0.6	3.2	4.9	3.5	1.4
Build-out	1.1	0.6	3.4	5.1	3.5	1.6

Notes: 1. Single most severe fire flow demand for all pressure zones is assumed to be industrial/commercial at 3,500 gpm for a duration of 3 hours. See Tables 4-2 and 4-3.

Water Supply and Treatment Analysis and Recommendations

Supply Well Capacity and Performance

The projected MDD of the City's water system customers at saturation development is approximately 4.5 mgd which exceeds existing well capacity. Some evidence indicates that the existing wells may be vulnerable to over-pumping, resulting in excessive drawdowns in the wells. Over-pumping of Well 9, and possibly Wells 4 and 10, may result in dewatering and exposure of the upper portions of the well screens to the atmosphere resulting in potential screen damage. Data for Wells 11 and 12 were not available to evaluate pumping levels. Cyclic dewatering of the screen and aquifer and exposure to the atmosphere promotes conditions favorable to well clogging due to bacterially-induced precipitation, which in turn may reduce the productivity of the well.

Treatment Capacity

The City owns and operates two sand pressure filter water treatment plants (WTP), at Jeans Road and at the Public Works Yard, that provide filtering for iron removal for all groundwater production in the City's existing system. The Jeans Road WTP has two sand filters with a total approximate capacity of 0.6 mgd. The Public Works Yard WTP has three filters with a total capacity of approximately 1.2 mgd. Additional groundwater wells would be expected to show the same high iron concentration as the existing wells thereby requiring additional filters to accommodate expanded groundwater capacity. The City will need to develop additional supply capacity soon in order to meet increasing customer demands. If this new supply capacity were to be developed through expanded groundwater supply, the City should anticipate the need to develop additional treatment capacity.

Well Monitoring and Data Collection

A review of data that the City collects from its groundwater wells indicates that the City would benefit from a systematic well monitoring and data collection program. As part of the program, an increase in both the frequency and amount of data collection is needed to facilitate a comprehensive evaluation of the wellfield and the local aquifer system. Once wells are equipped to collect data a baseline of well and pump performance can be established against which future performance trends may be compared. A data collection program should include groundwater levels under non-pumping conditions on a semi-annual to quarterly basis at non-pumping wells such as pilot Well 11 and at pumped wells as required under the applicable water right permits.

Alternative Supply Options Analysis

Four long-term water supply options are evaluated. These options are as follows:

- Option 1 - Continued Groundwater Development
- Option 2 - Wholesale Supply from Eugene Water and Electric Board
- Option 3 - Regional Supply from Federal Water Storage Projects
- Option 4 - New Surface Water Supply

The key findings of the supply options analysis are summarized as follows:

- The City is taking the necessary water rights administrative actions to support the use of the recently constructed Well 12 to its maximum capacity. If the City were to pursue continued groundwater development, it is recommended that the City submit an application for a new water right permit as soon as possible, requesting additional water for municipal use from new wells.
- Steps should be taken to gather and log relevant data related to the City's existing groundwater supply system in order to support on-going efforts to optimize the capacity of the existing groundwater wells. It is assumed that the City will continue to rely on this resource for some of its long-range water supply capacity, even if another source is developed.
- Further groundwater development to serve the City's future demands is possible. If the City were to pursue continued groundwater development, additional data collection and an exploratory well drilling program should precede development of a production well to confirm aquifer suitability, water quality conditions and anticipated sustainable yield at a given site.
- In order to meet the City's build-out water supply needs, groundwater supply development would likely need to be extended outside of the current UGB to avoid significant well interference and localized drawdown of the aquifer.
- In January 2010, the Oregon Department of Water Resources determined that further groundwater development by the City within one mile of the Long Tom River and the Fern Ridge Reservoir has the potential for substantial interference to surface water availability in those water bodies. This determination essentially excludes the City from areas of further groundwater development that have been determined to be the most productive (east and northeast of the City) and into areas where groundwater quantity is known to be limited and quality is known to be poor (south and southeast of the City).
- If the City were to pursue continued groundwater development, additional treatment capacity will be required in the near future assuming that new groundwater wells will continue to see similar concentrations of iron as with existing wells.
- Purchase of wholesale water supply from EWEB may present an opportunity to secure a reliable long-term water supply; however, the initial cost of this option is high.

- Development of a new surface water supply to serve the City's long-term water supply needs faces several obstacles, including potentially high project costs, water rights acquisition uncertainty, potential water availability limitations and environmental permitting challenges. Development of a new surface water supply would take a number of years and there is a high likelihood that one or more of the obstacles presented herein will prove to be a fatal flaw to this option. Pursuit of a surface water supply option is not recommended at this time.
- Development of a regional water supply to serve the City from federal water storage projects, as currently being investigated by the SWMWP, may present an opportunity for the City to develop a reliable long-term water supply. A mechanism to acquire access to stored water does not currently exist and will require lengthy coordination with federal agencies.

Supply Development Strategy

The ultimate development and implementation of a long term water supply strategy has a number of variables and unknowns. Figure ES-1 illustrates the recommended water supply strategy decision schematic for systematically evaluating supply options 1 through 4, and the key issues associated with these options to minimize the cost and risk as the City pursues the development of a long-term water supply. The City proceeded through this decision schematic to select a preferred approach to water supply development as described below. The City should also consider implementing water efficiency and water reuse measures to reduce peak demands on the system.

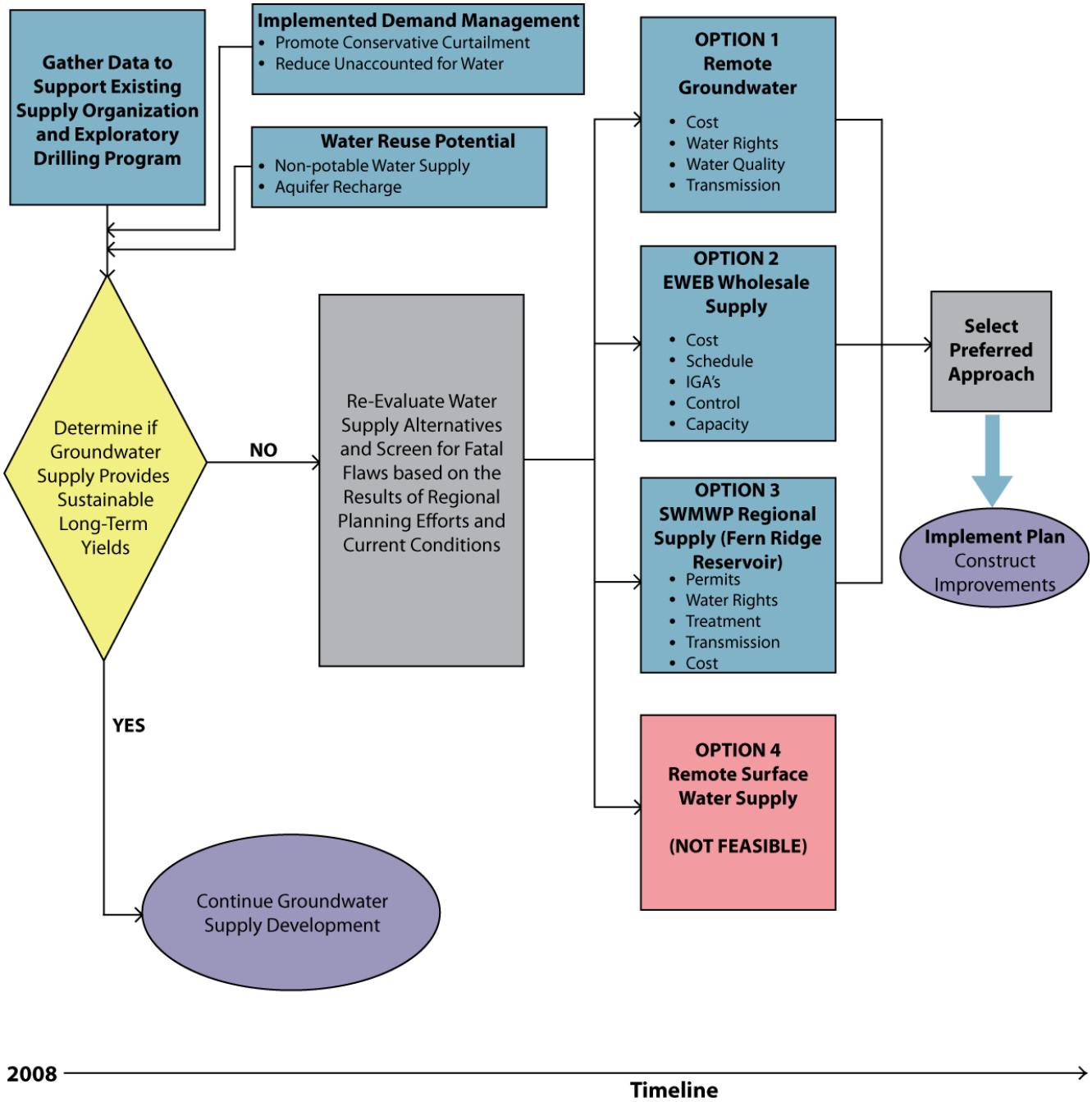
Selection of Preferred Approach

Subsequent to the preparation of the City's Water System Master Plan in May 2009, the City considered the alternatives presented above and selected Option 2 - Wholesale Supply from Eugene Water and Electric Board – as the preferred approach. The City has committed to this alternative and has taken definitive steps to implement this new supply source. The new water supply system is anticipated to be in service in 2013. The City will discontinue any further development and expansion of its groundwater resources.

Recommendations and Capital Improvement Program

Water system improvements are recommended based on the analysis and findings presented in this plan. These improvements include proposed supply source, storage reservoir, pressure reducing facility and water line improvements.

Figure ES-1
Water Supply Development Strategy Decision Schematic



Additional water supply capacity is needed to meet the City of Veneta's existing maximum day demand and to provide for future increases in demand resulting from population growth. The City is implementing the new water supply system from EWEB which will augment the existing groundwater supply from Wells 4, 9, and 12 to meet the future water demands. The project has a current estimated project cost of $13.9 million and is scheduled to be in service in 2013. The project is being funded through a grant and loan program with Rural Development, U.S. Department of Agriculture.

A summary of all the recommended improvements is presented in Table ES-5 which provides for project sequencing by showing prioritized immediate, short, medium and long-term recommendations. Immediate recommendations are those suggested to be completed in the next one to five years, short-term in the next six to 10 years, medium-term in the next 11 to 20 years and long-term beyond 20 years in the future. Estimated project costs are also summarized in Table ES-5.

Table ES-5
Capital Improvement Program Summary

Category	Project Description	Project Priority	Project Location	CIP Schedule and Project Cost Summary: Immediate (2010 - 2014)	Short-Term (2015 - 2019)	Medium-Term (2020 - 2030)	Long-Term (2030+)	Estimated Project Cost	SDC Eligibility: %	SDC Eligibility: Cost
Pumping Facilities	582-Foot Pressure Zone		Expand capacity of Public Works Yard Booster Pumping Station		$ 50,000	$ 50,000	$ 50,000	$ 150,000	0%	$ -
	Upper Pressure Zones		Expand capacity of Dogwood Pump Station (0.2 mgd)			$ 65,000		$ 65,000	100%	$ 65,000
			Sub-Total	$ -	$ 50,000	$ 115,000	$ 50,000	$ 215,000		$ 65,000
Storage Facilities	582-Foot Pressure Zone		New 1.6 MG Reservoir at UGB southeast of Bolton Hill	$ 150,000	$ 1,750,000			$ 1,900,000	100%	$ 1,900,000
			Sub-Total	$ 150,000	$ 1,750,000	$ -	$ -	$ 1,900,000		$ 1,900,000
Distribution System Piping	582-Foot Pressure Zone	1	Build 12-inch extension on E Broadway Ave from Public Works Yard to Westwood Ct.				$ 333,000	$ 333,000	100%	$ 333,000
		2	Build 12-inch extension on E Broadway Ave from Eastwood Ct to Huston Rd.			$ 277,000		$ 277,000	100%	$ 277,000
		3	Build 12-inch extension on Luther Ln from dead-end northeast to 12-inch in Hope Ln.		$ 93,000			$ 93,000	100%	$ 93,000
		6	Build 8-inch waterline on 3rd St. between W. Broadway Ave and W. Hunter Ave.			$ 113,000		$ 113,000	100%	$ 113,000
		7	Build 8-inch extension on 6th St. between W. Broadway Ave. and W Hunter Ave.			$ 113,000		$ 113,000	100%	$ 113,000
		8	Build 8-inch waterline on Baker Ln. from E. Hunter Rd. south then west to the existing 8-inch dead-end on Trinity St. at Longwood Ln.				$ 262,000	$ 262,000	0%	Developer Funded
		9	Build 8-inch waterline on Baker Ln. from Trinity St., south then west to the dead-end of Jake St. at Longwood Ln.				$ 175,000	$ 175,000	0%	Developer Funded
		10	Build 12-inch loop from Perkins Rd. east of Territorial Hwy. south then east to connect with the dead-end of Allure Ave. 12-inch				$ 203,000	$ 203,000	100%	$ 203,000
		11	Build 12-inch line east from proposed reservoirs to meet new 8th St. 12-inch main at southern UGB		$ 203,000			$ 203,000	100%	$ 203,000
	Pressure Reducing Facilities		750-Foot Pressure Zone PRV constructed off 8-inch from Bolton Hill Reservoir		$ 100,000			$ 100,000		$ -
	Routine Pipe Replacement		Funds replacement of asbestos cement (AC) pipe at $25,000 per year	$ 125,000	$ 125,000	$ 125,000	$ 125,000	$ 500,000	0%	$ -
			Sub-Total	$ 125,000	$ 521,000	$ 628,000	$ 1,098,000	$ 2,372,000		$ 1,335,000
Long-Term Supply			Long-Term Water Supply Development (Option 2 - EWEB)	$ 13,900,000				$ 13,900,000	100%	To be determined
			Sub-Total	$ 13,900,000	$ -	$ -	$ -	$ 13,900,000		$ -
Other	Planning Studies		Water Rate and SDC Study	$ 30,000	$ 10,000	$ 10,000	$ 10,000	$ 60,000	50%	$ 30,000
			Water System Master Plan Update			$ 60,000		$ 60,000	50%	$ 30,000
			Sub-Total	$ 30,000	$ 10,000	$ 70,000	$ 10,000	$ 120,000		$ 60,000
Capital Improvement Plan (CIP) Total				**$ 14,205,000**	**$ 2,331,000**	**$ 813,000**	**$ 1,158,000**	**$ 18,507,000**		

SECTION 1

SECTION 1
INTRODUCTION

Authorization

In June 2008, the firm of Murray, Smith & Associates, Inc. was authorized by the City of Veneta (City) to prepare this Water System Master Plan (WSMP).

Purpose

The purpose of this study is to perform a comprehensive analysis of the City's water system, to identify system deficiencies, to determine future water distribution system supply requirements, and to recommend water system facility improvements that correct existing deficiencies and that provide for future system expansion. The planning and analysis efforts include consideration of the ultimate integration of recommended distribution system improvements with the City's long-term water source and supply decision.

Compliance

This plan complies with water system master planning requirements established under Oregon Administrative Rules (OAR) for Public Water Systems, Chapter 333, Division 61. A Water Management and Conservation Plan complying with OAR Division 86 was completed by Weber Elliott Engineers, P.C. for the City dated November 2003.

Scope

The scope of work for this study includes the following work tasks:

- ***Information Compilation and Review*** -- Compile and review existing maps, drawings, plans, studies and reports.
- ***Develop Inventory of Existing Facilities*** -- Prepare an inventory of existing water system facilities including supply, transmission and distribution piping, storage reservoirs, pumping stations, and control systems.
- ***Develop Water Demand Forecasts*** -- Review information related to service area, land use, population distribution, and historical water demands. Develop water demand forecasts for existing and undeveloped areas within the City's water service area.
- ***Establish System Analysis Criteria*** -- Develop system performance criteria for distribution and transmission systems and storage and pumping facilities. Develop analysis and planning criteria for pressure zone service pressure limits, for emergency fire suppression water needs, as well as other system performance parameters.

- ***Develop and Calibrate Water System Hydraulic Model*** -- Prepare of a computerized water distribution system hydraulic network analysis model using Bentley (Haestad Methods) CyberNet/WaterCAD software.
- ***Hydrogeologic Review*** -- Complete a review of local hydrogeologic (groundwater) conditions that are critical to the City's current short-term and long-term water supply interests and make recommendations to secure long-term water supplies for the City.
- ***Perform Water System Analysis*** -- Perform a detailed analysis of the City's transmission and distribution system, analyze storage and pumping capacity needs, and evaluate pressure zone limits.
- ***Develop Recommended System Improvements*** -- Develop recommended water system facilities improvements which correct existing deficiencies and that provide for future system expansion.
- ***Prepare Capital Improvement Plan*** -- Develop estimated project costs for recommended improvements, recommend project sequencing and develop a Capital Improvement Program.
- ***Prepare Water System Master Plan*** -- Prepare a WSMP that documents and describes the planning and analysis work efforts, including a color map identifying all existing and proposed water system facilities.

Plan Update

This plan was updated in March 2012 to reflect the City's decision to proceed to develop a new water supply source from the Eugene Water and Electric Board (EWEB). Certain sections of the May 2009 plan are updated to reflect the integration of the new water supply system with the existing water system infrastructure. The page footers note the sections that have been changed as a result of this plan update.

SECTION 2

SECTION 2
EXISTING WATER SYSTEM

General

This section describes and inventories the City of Veneta's water service area and water distribution system facilities. Included in this section is a discussion of existing supply and transmission facilities, treatment processes, groundwater wells, water rights, pressure zones, storage and pumping facilities and distribution system piping. Also included is a discussion of the facilities to be included in the City's new water supply source from the Eugene Water and Electric Board (EWEB).

Background and Study Area

The City's current water service area includes all areas within the current City limits and Urban Growth Boundary (UGB). The City provides potable water to approximately 4,070 people through approximately 1,555 residential, commercial and industrial service connections. The study area of this planning effort is the entire area within the UGB.

Currently, the City's water supply is from five groundwater wells owned and operated by the City. The City's water distribution system currently consists of three service zones supplied by three storage facilities and three booster pumping stations.

Plate 1 in Appendix A illustrates the City's water system service area limits, water system facilities and distribution system piping. Plate 1 is also a digital representation of the computerized distribution system hydraulic model used for water system analysis efforts.

Supply Sources

Groundwater Wells

The City operates five groundwater wells within the City's water system service area limits. The wells produce water year round and serve as the City's sole water supply source. Wells 4, 9, 10, 11 and 12 have an existing combined production capacity of approximately 1.76 million gallons per day (mgd). Water from Wells 4, 9 and 12 is pumped to the Water Treatment Plant (WTP) at the Public Works Yard where it is treated and stored in a 2.0 million gallon (mg) ground level reservoir. A booster pump station pumps water from the reservoir into the distribution system.

Water from Well 10 is treated at the adjacent Jeans Road WTP and is pumped into the distribution system from the WTP clearwell. Well 11 also pumps to the Jeans Road WTP for treatment.

Table 2-1 lists the location, year constructed and operational status, approximate depth, approximate production capacity and casing diameter for each of the City's groundwater wells. The City has abandoned several older wells due to capacity and/or water quality issues.

Table 2-1
Groundwater Well Summary

Well	Location	Year Constructed	Production Capacity (gpm)	Approx. Depth (feet)	Casing Dia. (inches)
1	Well Abandoned				
2	Well Out of Service				
3	Well Abandoned				
4	SW ¼ NW ¼, Section 31, T17S R5W	1973	190	166	8
5	Well Abandoned				
6	Well Abandoned				
7	Well Out of Service				
8	Well Abandoned				
9	SE ¼ NE ¼ Section 31, T17S R5W Tax Lot 2713	1991	550	180	18
10	SE ¼ SW ¼ Section 31, T17S R5W Tax Lot 915	2006	160	92	10
11	NE ¼ NW ¼ Section 31, adjacent to Jeans Road WTP	2007	100	138	6
12	SE ¼ NW ¼ Section 31, T17S R5W	2009	225	180	6
Total Production Capacity (gpm):			**1,225**		
(mgd):			**1.76**		

Treatment

The City's existing groundwater wells have high levels of iron concentration, ranging from 0.3 milligrams per liter (mg/L) to 3.5 mg/L. The City has two sand pressure filter water treatment plants to treat the groundwater for iron removal and chlorinate the water before delivery to the distribution system.

The Public Works Yard WTP is located at the City's Public Works Yard and contains three pressure filters each with a rated capacity of approximately 280 gpm. The total capacity of the plant is approximately 840 gpm or 1.2 mgd. Finished water from this plant is delivered to the 2.0 mg Public Works Yard Reservoir. The plant includes backwash pumps and backwash water decant tank.

The Jeans Road WTP is located on the north side of Jeans Road and consists of two pressure filters with a capacity of approximately 200 gpm each. The total capacity of the WTP is approximately 400 gpm or 0.6 mgd. Finished water from the plant is delivered to the clearwell which provides suction supply for distribution system booster pumps and the backwash pump. The plant includes a sand filter system to treat backwash water.

Water Rights Summary

Table 2-2 summarizes the existing water rights that the City holds. The total permitted production from the five existing wells is 1.85 mgd.

Table 2-2
Water Rights Summary

Well	Application	Permit	Certificate	Priority Date	Permitted Production Rate		
					Cubic feet per Second (cfs)	Gallon per Minute (gpm)	Million Gallons per Day (mgd)
4	G-6783	G-6355	52379	1/9/1975	0.67	300	0.43
9	G-12780	G-11551		2/18/1992	1.11	500	0.72
10	G-4204	G-3968	41536 & T-10003	7/18/1968	0.58	260	0.38
11							
12	LL-1219			7/27/2009	0.50	225	0.32
	G-17291			12/1/2009	0.32[1]	144	0.21
				Total	**2.86**	**1,285**	**1.85**

[1] Per proposed final order dated June 21, 2011. City anticipates accomplishing sufficient transfers to authorize 0.50 cfs capacity from Well 12. This capacity from Well 12 is assumed in the totals.

Pressure Zones

General

The City's existing distribution system is divided into three existing service levels, or pressure zones. A fourth proposed pressure zone, the 750-foot zone, is designed to serve potential future development. Pressure zones are usually defined by ground topography and designated by overflow elevations of water storage facilities or outlet settings of pressure reducing facilities serving the zone. A description of each of the City's pressure zones is presented below and includes a description of the service area, storage facilities, pumping facilities and groundwater sources serving the zone.

582-Foot Pressure Zone

The 582-foot pressure zone is the largest pressure zone in the City, and it serves most customers below an approximate ground elevation of 430 feet above mean sea level (msl). The zone operates at an approximate hydraulic grade line (HGL) of 582 feet. The zone is composed of residential, commercial and industrial land uses. The Dogwood Reservoir serves the 582-foot pressure zone by gravity, which is supplied by the booster pump station adjacent to the Public Works Yard Reservoir.

658-Foot Pressure Zone

The 658-foot pressure zone includes areas with ground elevations between 430 and 560 feet msl on the west side of the service area. The zone is composed primarily of residential land uses and some commercial land uses. The Bolton Hill High Level Reservoir was constructed in 2001 to serve both the 658-foot pressure zone and the proposed 750-foot pressure zone by gravity and through pressure reducing valve stations (PRVs).

750-Foot Pressure Zone

The 750-foot pressure zone will serve areas with ground elevations between 560 and 660 feet msl in the southwest area of the City. The zone will be composed entirely of residential land uses. The Bolton Hill High Level Reservoir will serve the 750-foot pressure zone by gravity although there are currently no water services within this zone.

842-Foot Pressure Zone

The 842-foot pressure zone is served by gravity directly from the Bolton Hill High Level Reservoir. There are currently no customers in the 842-foot pressure zone although it will ultimately serve ground elevations between 660 and 750 feet msl in the southwest area of the City.

Storage Reservoirs

General

Veneta's water system contains three reservoirs with a total combined storage capacity of approximately 3.5 mg. Table 2-3 presents a summary of the City's existing storage reservoirs, including capacity, overflow elevations, and pressure zones served.

Table 2-3
Reservoir Summary

Reservoir Name	General Location	Capacity (mg)	Overflow Elevation (ft)	Pressure Zone Served By Reservoir
Public Works Yard Reservoir	Public Works Yard	2.0	457	582-Foot Pressure Zone
Dogwood Reservoir	Dogwood Lane & Bolton Hill Road	0.5	582	582-Foot Pressure Zone
Bolton Hill High Level Reservoir	Bolton Hill Road	1.0	842	658-Foot & 842-Foot Pressure Zones

Public Works Yard Reservoir

The 2.0 mg Public Works Yard Reservoir is located adjacent to the water treatment plant site at the City's Public Works Yard. The reservoir is a welded-steel, ground-supported reservoir with a diameter of 103 feet and a side wall height of 32 feet with an overflow elevation of 457 feet. The reservoir is supplied water from three of the City's groundwater wells, Wells 4, 9 and 12. The Public Works Yard Reservoir provides storage for the City's treated water prior to water being pumped into the distribution system by the Public Works Yard Booster Pump Station.

Dogwood Reservoir

The 0.5 mg Dogwood Reservoir is located adjacent to the intersection of Bolton Hill Road and Dogwood Lane. The reservoir has an overflow elevation of approximately 582 feet and a floor elevation of approximately 552 feet. The reservoir is a welded-steel, ground-supported reservoir with a diameter of 52 feet and a side wall height of 32 feet. The reservoir is supplied water from the Public Works Yard Booster Pump Station and serves the 582-foot pressure zone by gravity.

Bolton Hill High Level Reservoir

The 1.0 mg Bolton Hill High Level Reservoir is located southwest of the UGB on Bolton Hill Road. The reservoir has an overflow elevation of approximately 842 feet and a floor elevation of approximately 813 feet. The reservoir is a welded-steel, ground-supported reservoir with a diameter of 75 feet and a side wall height of 32 feet. The reservoir is supplied water from the Bolton Hill Pump Station and serves both the 658-foot and 842-foot pressure zones. The reservoir will also supply future development in the proposed 750-foot pressure zone.

Pump Stations

General

The City's water system contains three pump stations. A description of each station is presented below and key parameters are summarized in Table 2-4, including the service zone supplied and pump information including the unit numbers, motor horsepowers and the nominal pump capacities.

Table 2-4
Pump Station Summary

Pump Station	Unit No.	HP	Nominal Capacity (gpm)	Supply To
Public Works Yard Booster Pump Station	1	40	400	582-Foot Pressure Zone
	2	50	700	
	3	30	500	
Jean Road WTP Pump Station	1	20	170	582-Foot Pressure Zone
	2	20	170	
Dogwood Pump Station	1	30	190	658-Foot & 750-Foot Pressure Zones
	2	30	190	

Public Works Yard Booster Pump Station

The Public Works Yard Booster Pump Station is located in the City's Public Works Yard adjacent to the Public Works Yard Reservoir and houses three close coupled end suction centrifugal pumps with capacities and motor horsepowers as shown in Table 2-4. This station supplies water to the Dogwood Reservoir which serves the 582-foot pressure zone. Pump station suction piping is connected to the Public Works Yard Reservoir. The pump station is equipped with a 200-kilowatt engine-generator set that provides emergency power to the pump station and the adjacent WTP.

Jeans Road WTP Pump Station

The Jeans Road WTP Pump Station is located at the Jeans Road WTP and consists of two vertical turbine pumps drawing suction supply from the WTP clearwell. The two 20-hp pumps each have a nominal capacity of approximately 205 gpm and boost water from the clearwell into the 582-foot pressure zone. City staff reports that the observed capacity of each pump at the Jeans Road WTP Pump Station is approximately 170 gpm. The pump station and WTP include a manual transfer switch and receptacle for a portable generator.

Dogwood Pump Station

The Dogwood Pump Station is located at the intersection of Bolton Hill Road and Dogwood Lane adjacent to the Dogwood Reservoir and houses two can-type vertical turbine pumps. Two 30-hp pumps with variable frequency drives (VFDs) supply water from the 582-foot pressure zone to the Bolton Hill High Level Reservoir. Each of these pumps has a nominal capacity of approximately 250 gpm although City staff has observed operating capacity of each pump at only 190 gpm.

Distribution System

The water service area water distribution system is composed of various pipe types in sizes up to 16 inches in diameter. The total length of piping in the service area is approximately 29 miles. The pipe types include asbestos cement, cast iron, ductile iron, PVC and copper. The majority of the piping in the system is asbestos cement piping. Table 2-5 presents a summary of pipe lengths by diameter.

Table 2-5
Distribution System Pipe Summary

Pipe Diameter	Estimated Length (miles)
4-inch or Less	4.2
6-inch	9.7
8-inch	9.1
10-inch	1.1
12-inch	3.1
14-inch	0.8
16-inch	1.0
Total Length	**29.0**

Proposed New Water Supply System from EWEB

The City's proposed new water supply system from EWEB is presently in the implementation phase. The system is anticipated to be in service in 2013. The system will supply water to the Public Works Yard Reservoir through a new 24-inch diameter water transmission main connecting to the EWEB water distribution system. The new transmission main will extend from the intersection of Green Hill Road and Highway 126 (W. 11th Avenue) westerly to the City's Public Works Yard located at the east end of East Broadway Avenue.

Proceeding westerly from Green Hill Road, the pipeline will be located on the south side of Highway 126 from Green Hill Road to Kenneth Nielson Road. From that location the

pipeline will proceed westerly on Kenneth Nielson Road, Cantrell Road, Central Road, Perkins Road, Huston Road and Hunter Avenue to the Public Works Yard. The project will include flow and pressure control facilities as well as improvements to the Public Works Yard Booster Pump Station. The project also includes replacement of the existing 6-inch main on Hunter Avenue from approximately Pine Street east to Huston Road with a 12-inch main.

SECTION 3
WATER REQUIREMENTS

General

This section presents population projections and the development of water demand forecasts for the City of Veneta's (City) water service area. Population and water demand forecasts are developed from regional and City planning data, current land use designations, historical water demand records, and previous City water supply planning efforts. Also included in this section is a description of the water service area limits.

Service Area

The current water service area is the area within the existing City limits which are contiguous with the City's Urban Growth Boundary (UGB). The City water system planning area, which includes all land within the current UGB, encompasses a total area of approximately 1,637 acres. This information is drawn from the Lane Council of Governments (LCOG) November 2000 report to the Region 2050 Technical Advisory Committee entitled 'City of Veneta: A Profile of the Veneta Community'. Plate 1 in Appendix A illustrates the City's service area.

Planning Period

The planning period for this master plan is approximately 20 years. Certain planning and facility sizing efforts will use estimated water demands at saturation development. Saturation development occurs when all existing developable land within the planning area has been developed to its ultimate capacity according to current land use and zoning designations. Planning and analysis for transmission and distribution facilities is based on saturation development of the City's water system planning area. This assumption allows for a determination of the ultimate size of facilities. Typically, if substantial improvements are required beyond the planning period in order to accommodate water demands at saturation development, staging is often recommended for certain facilities where incremental expansion is feasible and practical. Unless otherwise noted, recommended improvements identified in this plan are sized for saturation development within the water system planning area.

Historical Population

The existing population and total number of dwelling units were derived from current City planning data supported by projections from the United States Census and Portland State University Population Research Center (PRC), which provides current and historical population estimates for the State of Oregon. Estimates of the City's historical population are taken from the 2007 Oregon Population Report (PRC, March 2008) and are summarized

in Table 3-1. Due to the downturn in the economy, population and service connection figures have not increased significantly since that time.

Table 3-1
Historical Population and
Water Use Summary

Year	Water Service Area Population[1]	Historical Water Demands							
		Average Day Demand (ADD)		Peak Season[2] Demand (PSD)		Peak Month[3] Demand (PMD)		Maximum Day Demand[4] (MDD)	
		mgd	gpcd	mgd	gpcd	mgd	gpcd	mgd	gpcd
2003	3,084	0.4	123	0.7	211	0.8	249	1.3	429
2004	3,264	0.6	172	0.7	220	0.8	259	1.8	559
2005	3,559	0.6	157	0.8	220	0.9	260	1.5	407
2006	4,024	0.7	167	0.9	215	1.2	298	1.8	452
2007	4,244	0.7	163	0.9	213	1.2	289	2.0	466

Notes:
1. Historical population does not include approximately 396 residents who are served by individual wells outside the City system.
2. Peak Season Demand is the average daily demand for the 92 days of the peak water use season; defined as July 1st to September 30th.
3. Peak Month Demand is the average daily demand for the 31 days of the peak water use month based on available data. The peak month in the Pacific Northwest is usually either July or August.
4. Based on conversations with City staff, Maximum Day Demand (MDD) assumes a storage loss of 3ft of depth in all three City storage reservoirs. This volume is added to the MDD that was calculated using only well log data.

The City supplied water to approximately 4,244 people in the water service area through approximately 66 commercial and 1,489 residential service connections during 2007. Based on a review of City planning data derived from the United States 2000 Census, the number of persons per dwelling unit is approximately 2.85. This results in approximately 1,628 existing dwelling units. The larger number of dwelling units relative to the number of service connections reflects units within the City's water service area which are served with individual wells. Planning data provided by the City estimates that approximately 396 people within the water service area are currently served by individual wells.

Historical Water Usage

The term "water demand" refers to all of the water requirements of the system including domestic, commercial, municipal, institutional and industrial. Demands are discussed in terms of gallons per unit of time such as gallons per day (gpd), million gallons per day (mgd) or gallons per minute (gpm). Demands are also related to per capita use as gallons per capita per day (gpcd). The City maintains daily water production records at its supply wells and treatment facilities which have been evaluated to estimate water demands. Table 3-1 summarizes this data for the years 2003 through 2007.

Historically, average daily demand within the City has been approximately 0.4 to 0.7 mgd and per capita consumption has ranged from approximately 120 to 170 gpcd. Recent maximum daily usage has been as high as approximately 1.7 mgd, with a maximum daily demand per capita consumption range of approximately 320 to 460 gpcd.

Population Forecasts

The forecasted population at saturation development, or build out, for the City's water system planning area was taken from City planning data which draws upon current residential densities and United States 2010 Census data to determine the number of potential dwelling units within the existing City limits and UGB. Assuming that 25 percent of remaining developable land will be necessary for roads and open space, the City data concludes that the total number of dwellings at saturation development will be approximately 3,740. Based on an average household size of approximately 2.85 persons per dwelling unit and a vacancy rate of 4.8 percent as indicated in 2010 Census data, an ultimate population of approximately 10,158 is anticipated for the City's water system planning area.

Table 3-2 presents population projections based on an Average Annual Growth Rate (AAGR) of approximately 3.6 percent as indicated in City planning data. These population projections include approximately 396 residents currently served by individual wells as it is assumed that their water services will be integrated into the City system over the 20-year planning period. The saturation development population is also shown in Table 3-2. Although there is a slight difference between the forecasted population at the planning horizon (2030) and the build-out population; for the purposes of this master plan it is estimated that the existing water service area will approach saturation development within the planning period. The population forecast for the City from the adopted 2009 Coordinated Population Forecast for Lane County is 9,847 in 2030 and 10,505 in 2035. The differences between the adopted forecast and the figures used in development of this master plan are insignificant, and therefore, the original figures are retained for consistency.

Table 3-2
Population Forecast Summary

Year	Population
2010	5,185
2020	7,401
2030	9,640
Build-out	10,158

Water Demand Projections

Estimates of future water demands were developed from the City's present per capita water usage as summarized in Table 3-1 and population forecasts from City planning data summarized in Table 3-2. For the purposes of this plan, estimated average daily water usage is assumed to be approximately 165 gpcd. Although stated as gallons per person this estimate accounts for more than just domestic water use. Total water demand is assigned a per capita value in order to more accurately project water demands with increasing population. Per capita values given here incorporate water used for commercial, industrial and public purposes as well. As conservation plays an increasing role in water usage patterns, it is anticipated that City's average daily per capita usage can ultimately be reduced to and maintained at 150 gpcd.

For the purposes of this study, current maximum daily per capita usage is estimated at approximately 375 gpcd. Public education campaigns in water conservation throughout the Pacific Northwest are widely credited for measurable changes in water demand. These conservation measures have seen their greatest success in metropolitan areas. Due to City's proximity to the Eugene Metro Area, it is expected that changes in water demand due to conservation will influence the City's water needs in the long term. It is anticipated that City's maximum daily per capita use can ultimately be reduced to and maintained at approximately 350 gpcd, even in drought years.

Estimated average and maximum day water demands are developed by multiplying the estimated per capita water usage by the anticipated population for that year. To provide an estimate of peak hourly usage, a factor of approximately 1.5 was applied to estimated maximum day demands. This is consistent with water demand patterns of similar communities in the region. Peak month demand and peak season demand (July 1 to September 30) forecasts are also developed based on per capita water demands of 280 gpcd and 215 gpcd, respectively. Water demand forecasts are summarized in Table 3-3.

Summary

The City's water system planning area, which includes all developable land within the current UGB, encompasses approximately 1,637 acres. Land use analysis and growth rates developed by the City anticipate an ultimate population within the City's current UGB of approximately 10,158 people.

As tabulated above the City's current maximum daily water demand is approximately 2.0 mgd. A maximum daily water demand of 4.5 mgd is anticipated at saturation development within the City's current UGB.

Table 3-3
Water Demand Projection Summary

Year	Population	Water Demand (mgd)				
		Average Day Demand	Maximum Day Demand[3]	Peak Season Demand[1]	Peak Month Demand[2]	Peak Hour Demand
2010	5,185	0.9	2.3	1.1	1.5	3.5
2020	7,401	1.2	3.3	1.6	2.0	5.0
2030	9,640	1.6	4.2	2.0	2.7	6.3
Build-out	10,158	1.7	4.5	2.2	2.8	6.8

Notes:

1. Peak Season Demand is the average daily demand for the 92 days of the peak water use season; defined as July 1st to September 30th.
2. Peak Month Demand is the average daily demand for the 31 days of the peak water use month based on available data. The peak month in the Pacific Northwest is usually either July or August.
3. Based on conversations with City staff, Maximum Day Demand (MDD) assumes a storage loss of 3ft of depth in all three City storage reservoirs. This volume is added to the MDD that was calculated using only well log data.

SECTION 4
PLANNING AND ANALYSIS CRITERIA

General

This section presents the planning and analysis criteria used for the City of Veneta's water system analysis. Criteria are presented for water supply source, distribution system piping, service pressures, storage and pumping facilities. Recommended water needs for emergency fire suppression are also presented. These criteria are used in conjunction with the water demand forecasts presented in Section 3 to complete the analysis of the City's water distribution system presented in Section 5.

Water Supply Source

As described in Section 2, the City's current sole water supply is from City-owned groundwater wells 4, 9, 10, 11 and 12. Given the understanding that the City's existing supply sources will not be adequate to meet all future water demands, the City has explored other supply options and has proceeded on a program to obtain a new water supply from the Eugene Water and Electric Board (EWEB). The City will not continue to develop additional groundwater sources. In order to be considered a feasible option for the City, a long-term water supply source must meet several criteria which are aligned with those used by other communities in the region. The criteria that were used to evaluate the supply source options and which led to the selection of the EWEB option were:

- Ability to meet all, or a substantial portion, of the City's long-term water supply needs.
- Ability to cost-effectively integrate source options into the current treatment, supply and distribution system.
- Supply source development cost.

Distribution System

The water distribution system should be capable of operating within certain system performance limits, or guidelines, under several varying demand and operational conditions. The recommendations of this plan are based on the following performance guidelines, which have been developed through a review of State requirements, American Water Works Association (AWWA) acceptable practice guidelines, Insurance Services Office, Inc. (ISO) guidelines and operational practices of similar water providers. The recommendations are as follows:

- The distribution system should be capable of supplying the peak hourly demand while maintaining minimum service pressures of not less than approximately 75 percent of

normal system pressures. The system should meet this criterion with the reservoirs approximately two-thirds full.

- The distribution system should be capable of providing the recommended fire flow to a given location while, at the same time, supplying the maximum daily demand and maintaining a minimum residual service pressure at any meter in the system of 20 pounds per square inch (psi). This is the minimum water system pressure required by the Oregon Health Authority, Drinking Water Program. The system should meet this criterion with the reservoirs approximately two-thirds full.

Typically, proposed or new water mains should be at least 8-inches in diameter in order to supply minimum fire flows. In special cases, 6-inch diameter mains are acceptable if no fire hydrant connection is required, there are limited services on the main, the main is dead-ended and looping or future extension of the main is not anticipated.

Service Zones Pressure

As discussed in Section 2, water distribution systems are typically separated into pressure zones or service levels to provide service pressures within an acceptable range to all customers. The existing water service area distribution system is divided into three service levels or pressure zones. Pressure zones are usually defined by ground topography and designated by overflow elevations of water storage facilities or outlet settings (discharge pressure) of pressure reducing facilities or booster pump stations serving the zone. Typically, water from a reservoir will serve customers by gravity within a specified range of ground elevations so as to maintain acceptable minimum and maximum water pressures at individual service connections. When it is not feasible or practical to have a separate reservoir serving each pressure zone, pumping facilities or pressure reducing facilities are used to serve customers in different pressure zones from a single reservoir.

Generally, 80 psi is considered the desirable upper pressure limit and 35 psi the lower limit. Whenever feasible, it is desirable to achieve the 35 psi lower limit at the point of the highest fixture within a given building being served. Conformance to this pressure range may not always be possible or practical due to topographical relief, existing system configurations and economic considerations. In the case of the upper pressure limit, while pressures in excess of 100 psi may be acceptable in water mains, services must be equipped with individual pressure reducing valves (PRVs) to maintain their static pressures at no more than 80 psi. Table 4-1 summarizes the service pressure criteria used in the analysis of the water system.

Table 4-1
Recommended Service Pressure Criteria

Condition	Pressure(psi)
Minimum Service Pressure Under Fire Flow Conditions	20
Minimum Normal Service Pressure	35
Maximum Service Pressure	80

Storage Volume

Water storage facilities are typically provided for three purposes: operational or equalization storage, fire storage, and emergency storage. A brief discussion of each storage element is provided below. This three component criteria for storage volume is commonly used by other water providers and by the AWWA.

Operational Storage

Operational storage is required to meet water system demands in excess of delivery capacity from the supply source to system reservoirs. Operational storage volume should be sufficient to supply demand fluctuations throughout the day resulting from typical customer water use patterns and is generally considered as the difference between peak hour demand and maximum day demand (on a 24-hour duration basis). In other words, operational storage is the volume of water available to meet system demands when demands exceed the capacity of the supply source. Standard industry practice indicates that operational storage equal to approximately 25 percent of a system's maximum daily demand is typically sufficient for analysis and planning purposes.

Fire Storage

Fire storage should be provided to meet the single most severe fire flow demand within each zone. The fire storage volume is determined by multiplying the recommended fire flow rate by the expected duration of that flow. Specific fire flow and duration recommendations are discussed later in this section.

Emergency Storage

Emergency storage is often provided to supply water from storage during emergencies such as pipeline failures, equipment failures, power outages or natural disasters. The amount of emergency storage provided can be highly variable depending upon an assessment of risk and the desired degree of system reliability. Provisions for emergency storage in other systems vary from none to a volume that is twice the average daily demand to a volume that would supply a maximum day's flow or higher. A reasonable volume for emergency storage for the water service area considering the City's proposed new supply from EWEB is two times

average daily demand. This amount of storage volume for emergency purposes is consistent with accepted water industry practices and guidelines.

Recommended system-wide storage is the sum of the operational, fire and emergency storage volume components.

Booster Station Pumping Capacity

Pumping capacity requirements vary depending on how much storage is available and the number of pumping facilities serving a particular pressure zone. Firm pumping capacity is defined as a station's pumping capacity with the largest pump out of service. Back-up power is recommended for all stations in the event of power failure. When pumping to storage facilities, a firm pumping capacity equal to the pressure zone's maximum day demand is recommended. Pump stations supplying constant pressure service without the benefit of storage should have firm pumping capacity to meet maximum day demands while simultaneously supplying fire suppression flow for the largest fire flow demand in the pressure zone.

Fire Flow Recommendations

While the water distribution system provides water for domestic uses, it is also expected to provide water for fire suppression. The amount of water recommended for fire suppression purposes is typically associated with the local building type or land use of a specific location within the distribution system. Fire flow recommendations are typically much greater in magnitude than the normal maximum day demand present in any local area. Adequate hydraulic capacity must be provided for these potential large fire flow demands.

Fire protection for the City's service area is provided by Lane County Fire District No. 1. The fire district has adopted fire flow requirements as defined in the 2007 State of Oregon Fire Code. A summary of fire flow recommendations based on the state fire code, fire flow criteria adopted by similar communities and fire flow guidelines as developed by the AWWA is presented in Table 4-2. Water stored for fire suppression is typically provided to meet the single most severe fire flow demand within each zone. The recommended fire storage volume is determined by multiplying the fire flow rate by the duration of that flow. Table 4-3 summarizes fire flow durations recommended by the AWWA.

Table 4-2
Summary of Recommended Fire Flows

Land Use Type	Applicable Zoning	Recommended Fire Flow (gpm)
Residential	R, L, M	1,000
Commercial/Industrial	U, C, D, I, X	3,500

Table 4-3
Fire Flow Duration Summary

Recommended Fire Flow (gpm)	Duration (hours)
Up to 3,000	2
3,000 to 3,500	3
Greater than 3,500	4

Summary

The criteria developed in this section are used in Section 5 to assess the system's ability to provide adequate water service under existing conditions and to guide improvements needed to provide service for future water needs. Planning criteria for the City's booster pump stations, distribution system, pressure zones, and storage facilities are summarized as follows:

- ***Booster Station Pumping Capacity:*** When pumping to storage facilities, a firm pumping capacity equal to the pressure zone's maximum day demand is recommended. Pump stations supplying constant pressure service without the benefit of storage should have firm pumping capacity to meet maximum day demands while simultaneously supplying fire suppression flow for the largest fire flow demand in the pressure zone.

- ***Distribution System Criteria:*** The distribution system should be capable of supplying the peak hourly demand while maintaining minimum service pressures of not less than approximately 75 percent of normal system pressures.

- ***Service Pressure Criteria:*** Minimum static system service pressures within each pressure zone should be at least 35 psi, with a recommended maximum upper limit of approximately 80 psi.

- ***Storage Volume Criteria:*** Recommended storage volume capacity for the City is the sum of the operational, fire and emergency storage volume components.

- ***Fire Flow Criteria:*** The distribution system should be capable of supplying the recommended fire flows while maintaining minimum residual pressures everywhere in the system of 20 psi.

SECTION 5
WATER DISTRIBUTION SYSTEM ANALYSIS

General

This section describes the analysis of the City of Veneta's water distribution system. The analysis is based on water demands presented in Section 3 and the planning and analysis criteria outlined in Section 4. This section includes a detailed evaluation of the City's distribution system and presents findings of a computerized hydraulic network analysis of the system. Included in the analysis is an evaluation of the system's existing pressure zones, pump stations and storage facilities. The findings and recommendations of this water system analysis are developed into a capital improvement program which is summarized in Section 7.

Distribution System Analysis

A hydraulic network analysis computer program was used to evaluate the performance of the existing distribution system and to aid in the development of proposed system improvements. The computerized model of the City's water system uses a digital base map of the distribution system and WaterCAD hydraulic network analysis software. The purpose of the model is to determine pressure and flow relationships throughout the distribution system for a variety of critical water demand and hydraulic conditions. System performance and adequacy is then evaluated on the basis of planning criteria presented in Section 4.

Computerized Hydraulic Network Analysis Model

For modeling purposes, the water distribution system was digitized onto a base map derived from geographical information systems (GIS) data provided by the City. This file and its supporting database were then used to perform the system analysis and to illustrate recommended improvements. A map of the water system is presented as "Water System Plan Map", Plate 1 in Appendix A.

All pipes are shown as "links" between "nodes" which represent pipeline junctions or pipe size changes. Pipes and nodes are numbered to allow for easy system updating and revision. These numbers have not been shown on Plate 1 for drawing clarity but are available within the computer model for future use. Diameter and length are specified for each pipe although only pipe diameters are illustrated for drawing clarity. Pipe lengths are drawn to approximate scale. An approximate ground elevation is specified for each node. Ground elevations were extracted from available United States Geological Survey (USGS) 10-foot contours topographic data for the City's Urban Growth Boundary (UGB) and surrounding area. Hydraulic elements, such as pressure reducing valves, pump stations and reservoirs, are also illustrated and operating parameters are incorporated into the model database.

Modeling Conditions

The analysis of the existing and proposed system was performed to assess the distribution system's ability to provide recommended fire flows throughout the system during maximum day demand (MDD) conditions. The system's adequacy under existing demand conditions was evaluated. Existing current water demands as presented in Section 3 were applied to the existing system. The analysis was then extended to evaluate system performance under water demands at saturation development. All fire flow modeling assumes that the City's storage reservoirs are approximately two-thirds full and that the City's three pump stations are operating at firm capacity. Fire flow scenarios test system performance providing the recommended fire flow to a given location while at the same time supplying the MDD and maintaining a minimum residual service pressure of 20 pounds per square inch (psi) at all services in the system.

Model Calibration

The hydraulic network model of the City's water distribution system was calibrated using fire hydrant flow test data provided by the City. The hydrant flow tests were completed in early March 2007. In order to calibrate the model, 40 hydrant test locations distributed throughout the water system were chosen from the provided flow test data. The selected hydrants were then matched with the corresponding nodes in the model and the demand at the model node was set equal to the flow rate measured during the hydrant test. The model then calculated the residual pressure at that node. The field measured static and residual pressure was compared to the calculated static and residual pressures in the model to verify that the model is accurately representing the performance on the water distribution system.

The resulting data shows that both static and residual pressures in the model closely approximate those measured during the fire hydrant flow tests indicating that the model's performance reflects a reasonable approximation of the actual performance of the City's water distribution system. The calibration data is summarized in Appendix B.

Modeling Results

The results of the fire flow analysis indicate that the City's water distribution system is currently able to supply the required 1,000 gallon per minute (gpm) fire flow for residential areas of the City while providing for existing MDD and maintaining minimum service pressures throughout the system. The fire flow analysis of the existing distribution system under projected water demands at saturation development found that these residential fire flow requirements could not be met without piping improvements. Under higher fire flow conditions in commercial and industrial areas, the existing system has inadequate capacity to meet system performance requirements under both existing and future demand conditions. Additional hydraulic capacity is needed in the system to correct these deficiencies. Specifically, piping improvements are needed to improve looping east of Territorial Highway and increased transmission capacity is required west of the highway on Broadway,

McCutcheon and Hunter Avenues in order to supply the recommended fire flows and maintain minimum pressure.

The analysis found that the City's existing 4-inch diameter and smaller piping is not adequate to meet existing and future needs and should be replaced with larger diameter piping. Many of the City's distribution pipes are asbestos cement pipes. In many systems, this pipe material is failing, requiring expensive emergency repairs. The City should consider implementing a program for the systematic replacement of all asbestos cement pipe in the system. In order to meet hydraulic capacity requirements, it is recommended that all new piping in the system should be a minimum of 8-inch diameter with the exception of short dead-end mains where no fire hydrant is required and it is not likely that future looping of the water main will occur.

Recommended distribution system piping improvements are shown on Plate 1. Further descriptions of recommended distribution system improvements and cost estimates for these improvements may be found in Section 7.

Pressure Zone Analysis

As discussed in Section 2, the City is currently divided into three pressure zones. Typically, municipal water systems are designed to operate at static pressures ranging from 35 to 100 psi. The City's existing pressure zone configuration supplies water effectively within these pressure ranges.

Some adjustments to existing pressure zones may be beneficial to accommodate future development around Bolton Hill and in the southern part of the City. As development continues south of the Dogwood Reservoir site, it is recommended that pressure reducing facilities be installed at Bolton Hill Road to establish a 750-foot pressure zone. Although previous planning efforts identified a new 750-foot pressure zone for this area, some slight adjustments to existing pressure zone boundaries will ensure that minimum service pressures are met in all parts of the City while minimizing the use of individual pressure reducing valves (PRV) for services with static pressures in excess of 80 psi. A summary of existing and proposed pressure zones and their static pressure ranges is shown in Table 5-1 and on Plate 1.

Table 5-1
Pressure Zone Summary

Pressure Zone	Approximate Elevation (ft)	Approximate Existing Static Pressure (psi)
582-foot	380 - 480	44 - 87
658-foot	430 - 560	42 - 99
Proposed 750-foot	560 - 660	39 - 82
842-foot	660 - 750	40 - 80

Pump Station Capacity Analysis

The City's existing water system contains three booster pumps stations. Two of these pump stations, at the Public Works Yard and Jeans Road Water Treatment Plant (WTP), serve the 582-foot pressure zone boosting water to the Dogwood Reservoir. The third pump station, next to the Dogwood Reservoir boosts water to the Bolton Hill Reservoir, supplying the 842-foot, proposed 750-foot and 658-foot pressure zones. As outlined in Section 4, firm pumping capacity is defined as a pump station's capacity with the largest pump out of service. A firm pumping capacity equal to the MDD of the pressure zone served by that pump station is recommended because each of the City's booster pump stations is pumping to a storage facility.

The Public Works Yard Booster Pump Station has a firm capacity below that currently needed to meet maximum day demands of the entire system. With a build-out pumping capacity deficit of 3.2 mgd, this station will require significant improvements to meet demands at saturation development. The MDD of the entire system is the recommended firm capacity for the Public Works Yard Booster Pump Station.

The recommended firm capacity of the Dogwood Pump Station is the combined MDD of the 842-foot, proposed 750-foot and 658-foot pressure zones. For the purpose of this pump station capacity analysis, the MDD for each pressure zone was established using the ratio of that zone's land area to the total land area served by the City accounting for actual and anticipated development densities. While the firm capacity of the Dogwood Pump Station is sufficient to meet existing demands in the 842-foot, proposed 750-foot and 658-foot pressure zones, an additional 0.2 mgd (139 gpm) pumping capacity will be required to meet demands at saturation development. Recommended pump station firm capacities are summarized in Table 5-2.

Table 5-2
Pumping Capacity Recommendation Summary

Pump Stations	Estimated Nominal Firm Capacity (mgd)	Zone Supplied	Recommended Firm Capacity		
			Existing MDD (mg)	2030 MDD (mg)	Build-out MDD (mg)
Public Works Yard	1.3	582-foot	2.0	4.2	4.5
Jeans Road WTP[1]	0.25	582-foot	--	--	--
Dogwood	0.27	842-, 750- & 658-foot	0.2	0.4	0.5

[1] With the new EWEB supply system, it is anticipated that the Jeans Road WTP and pump station will not be used for normal supply. Therefore, the Public Works Yard Booster Pumping Station is assumed to supply the entire system demand under normal operating conditions.

Storage Volume Analysis

As discussed in Section 4, the total volume of storage required for the City's distribution system includes operational storage, emergency storage and storage for fire suppression. Operational storage volume should be sufficient to supply demand fluctuations throughout the day resulting from typical customer water use patterns. Operational storage volume in the amount of 25 percent of maximum daily demand is sufficient for the purposes of this plan. Emergency storage is provided to supply water from storage during emergencies such as pipeline failures, power outages or natural disasters. A reasonable volume for emergency storage is two times average daily demand. Fire storage is provided to meet the single most severe fire flow demand within the service area.

Table 5-3 illustrates the individual storage components and combined storage needs recommended for operational, fire and emergency purposes under existing demand conditions, projected demands in the years 2020 and 2030, and at saturation development. Recommendations for adding additional storage reservoirs are presented in Section 7. Most developable land is in the southwest corner of the City, some of which will be served by the Bolton Hill Reservoir; however, storage improvements are needed more in the 582-foot pressure zone which already serves the largest number of customers and will ultimately serve many new services south of Kingpin Loop.

New services south of Kingpin Loop in the 582-foot pressure zone may be served with a new reservoir or reservoirs near the urban growth boundary directly south of the intersection of 10th Street and Bolton Hill Road. The new reservoir or reservoirs would be at the same overflow elevation as the existing Dogwood Reservoir and would provide gravity service to the 582-foot pressure zone. Further discussion of storage improvement needs is presented in Section 7.

Table 5-3
Storage Volume Recommendation Summary

Year	Storage Components			Recommended Total Storage (mg)	Existing Storage (mg)	Storage Deficit (mg)
	Operating (mg)	Fire (mg)	Emergency (mg)			
2007	0.5	0.6	1.4	2.5	3.5	--
2020	0.8	0.6	2.4	3.8	3.5	0.3
2030	1.1	0.6	3.2	4.9	3.5	1.4
Build-out	1.1	0.6	3.4	5.1	3.5	1.6

Notes: 1. Single most severe fire flow demand for all pressure zones is assumed to be industrial/commercial at 3,500 gpm for a duration of 3 hours. See Tables 4-2 and 4-3.

Summary

This section developed and presented an analysis of the City's water distribution system. Recommended system improvements discussed in this section are illustrated on Plate 1. Plate 1 illustrates recommended piping, pumping, reservoir and PRV facility improvements needed to correct existing system deficiencies and to serve the City at saturation development. Section 6 presents an analysis of water supply options for the City. Section 7 presents recommended capital improvements and estimates of project costs.

SECTION 6
WATER SUPPLY AND TREATMENT ANALYSIS AND RECOMMENDATIONS

General

This section presents the analysis of the City of Veneta's water supply system. This analysis is based on water demand projections established in Section 3 as well as criteria established in Section 4. Findings generated through this analysis are further developed and incorporated into the capital improvement program as presented in Section 7.

Subsequent to the preparation of the original Water System Master Plan in May 2009, the City evaluated the source alternatives and decided to proceed with the implementation of a new water supply source from the Eugene Water and Electric Board (EWEB). While this decision makes consideration of the other water supply options moot, the material in this section is retained from the original plan so as to memorialize the information available to the City in making its supply source decision.

Covered in this section is an evaluation of the City's existing water supply wells and associated pumping and water treatment capacity needs. Evaluations of these existing system components are used to determine capacity upgrades needed to meet future water demands at saturation development.

Water demand projections established in Section 3 indicate that securing additional groundwater supply wells or an alternate supply source is necessary to meet increased capacity needs in the future. Alternative water supply source options for the City are considered including analysis of potential fatal flaws to long-term supply options. The conceptual alternatives considered include continued groundwater supply, new surface water supply, a supply pipeline from the Eugene Water and Electric Board (EWEB) and obtaining water from federal storage projects. Evaluating alternative water supply options allows the City to plan for improvements which will offer maximum flexibility in providing potable water to existing and future customers.

This section includes a hydrogeologic review of the local groundwater aquifer used by existing City supply wells and provides recommendations for future well exploration and siting if the City were to use expanded groundwater sources to meet future supply needs. Other concerns for future supply wells are also addressed including water quality, potential groundwater-surface water interactions and recommendations for well maintenance and data collection. Two technical memorandums documenting the hydrogeologic assessment and water rights reviews referenced herein are included in Appendix D.

Existing Supply System Evaluation

Supply Well Capacity and Performance

As discussed in Section 2, the City operates five active groundwater wells. The total capacity of these wells is approximately 1.76 million gallons per day (mgd). It is assumed that the supply capacity should be equal to or greater than the maximum day demand. Storage reservoirs are not considered a part of supply as storage is intended to provide water for emergencies, fire suppression and peaks in water usage at different times of day. The projected maximum day demand (MDD) of the City's water system customers at saturation development is approximately 4.5 mgd which exceeds existing well capacity. Some evidence indicates that the existing wells may be vulnerable to over-pumping, resulting in excessive drawdowns in the wells. Over-pumping of Well 9, and possibly Wells 4 and 10, may result in dewatering and exposure of the upper portions of the well screens to the atmosphere resulting in potential screen damage. Data for Wells 11 and 12 were not available to evaluate pumping levels. Cyclic dewatering of the screen and aquifer and exposure to the atmosphere promotes conditions favorable to well clogging due to bacterially-induced precipitation, which in turn may reduce the productivity of the well.

Treatment Capacity

The City owns and operates two sand pressure filter water treatment plants (WTP), at Jeans Road and at the Public Works Yard, that provide filtering for iron removal for all groundwater production in the City's existing system. The Jeans Road WTP has two sand filters with a total approximate capacity of 0.6 mgd. The Public Works Yard WTP has three filters with a total capacity of approximately 1.2 mgd. Additional groundwater wells would be expected to show the same high iron concentration as the existing wells thereby requiring additional filters to accommodate expanded groundwater capacity. Table 6-1 contrasts maximum day demand projections through saturation development with existing water supply and treatment capacities.

As Table 6-1 shows, the City will need to develop additional supply capacity soon in order to meet increasing customer demands. If this new supply capacity were to be developed through expanded groundwater supply, the City should anticipate the need to develop additional treatment capacity. The water quality in Wells 4 and 12 is better than in the City's other wells. Well 4 has been supplied directly to the 2 MG reservoir for immediate distribution without treatment for more than 8 years. Well 12 is currently piped directly to the 2 MG reservoir for immediate distribution without treatment.

For the purpose of this Master Plan, it is assumed that the Jeans Road WTP has limited excess capacity and is fully utilized treating Wells 10 and 11. If Wells 4 and 12 are pumped directly to the system, the Public Works Yard WTP has approximately 0.2 mgd of available capacity beyond that currently required to treat Well 9.

Table 6-1
Existing Supply and Treatment Capacity Needs Summary

Year	Projected Max Day Demand (mgd)	Existing Groundwater Supply Capacity (mgd)	Supply Deficit (mgd)	Water Treatment Capacity (mgd)	Treatment Deficit (mgd)
2010	2.3	1.76	0.54	1.8	0.5
2020	3.3	1.76	1.54	1.8	1.5
2030	4.2	1.76	2.44	1.8	2.4
Build-Out	4.5	1.76	2.74	1.8	2.7

Based on this analysis, it is anticipated that the City would be close to exceeding available treatment capacity with the development of one more groundwater supply well within the vicinity of the Public Works Yard. Groundwater supply development beyond this initial increment should include either satellite treatment facilities, similar to Jeans Road WTP, or raw water transmission mains and expansion of treatment facilities at the Public Works Yard. Further discussion of recommended treatment and supply improvements is presented at the end of this section.

Well Monitoring and Data Collection

A review of data that the City collects from its groundwater wells indicates that the City would benefit from a systematic well monitoring and data collection program. As part of the program, an increase in both the frequency and amount of data collection is needed to facilitate a comprehensive evaluation of the wellfield and the local aquifer system. Once wells are equipped to collect data, a baseline of well and pump performance can be established against which future performance trends may be compared. A data collection program should include measurement of groundwater levels under non-pumping conditions on a semi-annual to quarterly basis at non-pumping wells such as pilot Well 11 and at pumped wells as required under the applicable water right permits. More frequent measurements that could be obtained from well instrumentation and a Supervisory Control and Data Acquisition (SCADA) system would provide higher resolution data regarding the response of the aquifer under different pumping conditions. Detailed recommendations for a well monitoring program are presented in Section 7.

Alternative Supply Options

Four long-term water supply options are evaluated in this section. These options are as follows:

- Option 1 - Continued Groundwater Development
- Option 2 - Wholesale Supply from Eugene Water and Electric Board
- Option 3 - Regional Supply from Federal Water Storage Projects
- Option 4 - New Surface Water Supply

A detailed discussion of each of the following supply alternatives is presented below followed by a summary of findings and presentation of a water supply development strategy.

Option 1 - Continued Groundwater Development

Hydrogeologic Review

The City's existing groundwater supply wells draw from an aquifer composed primarily of alluvial sand and gravel deposits. The aquifer is sandwiched between the blue clay of the Tyee Formation below and a silt or clay alluvial sediment layer above. Increases in static water levels recorded during well drilling in the aquifer indicate that it is semi-confined or confined by these two clay layers.

Groundwater in this aquifer is generally encountered at depths of 40 to 70 feet below ground surface (bgs). Recharge of the aquifer from precipitation and surface runoff occurs in upland areas to the west and southwest of the City. Higher capacity water supply wells constructed in the aquifer have reported yields of up to 500 gpm, but the majority produces less than 200 gpm.

Limited data is available to determine the long-term viability of the groundwater resource. The nearest Oregon Water Resources Department (OWRD) observation well completed in the alluvial aquifer is located east of the Fern Ridge Reservoir, approximately six miles from the City, and shows a generally stable groundwater level with a seasonal fluctuation of approximately 10 feet. A discussion with the OWRD Watermaster for Lane County found that groundwater from the alluvial aquifer is open to further appropriation, indicating that OWRD believes that the resource can support pumping withdrawals.

A data collection program would need to be performed in order to better understand local aquifer characteristics and determine the long-term yield capabilities of the aquifer.

Groundwater Rights

OWRD recently approved the City's water right transfer application requesting to use one or more new wells to develop unused capacity in the City's existing water rights. The unused water right capacity at several existing wells can be transferred to one or more new wells where the water can be more readily appropriated and provide redundancy to the existing system. This is a way of matching the City's water right capacity with its well production capacity. Initial research indicates that there are a number of certificated water rights in the

area around the City. It may be possible to work with these water right holders and apply for a transfer that could benefit the City.

The City may also pursue an application for a new groundwater permit. OWRD should find a new municipal-use groundwater application to be consistent with the Willamette Basin Program rules for the Long Tom River Sub-basin which covers the area surrounding the City, so long as the groundwater is not found to be linked to surface water. If the aquifer is in hydraulic connection with surface water, OWRD's requirements for surface water rights may apply to the City's groundwater application. This would likely result in a rejection of the groundwater permit application because surface water in the Long Tom River Sub-basin is not classified for municipal use and the Long Tom River near the City is considered to be fully-allocated meaning there is no additional water available for new surface water rights. OWRD will assume outright that a groundwater well is hydraulically connected to surface water if the well is less than one-fourth mile from a surface water source and the well produces water from an unconfined aquifer. While the hydrogeologic review presented above indicates that the aquifer the City's wells draw from is semi-confined or confined, this determination has not been confirmed by OWRD. Therefore, potential well locations should be carefully identified such that hydraulic connection between groundwater and surface water is unlikely.

Table 6-2 presents a comparison of the permitted and certificated water right capacity held by the City to the City's existing groundwater supply capacity. As Table 6-2 shows, if all existing groundwater wells are operated at their maximum production capacities, they do not exceed the permitted capacity of the City's water rights. Potential locations for new wells are discussed below and should be coordinated with future water rights applications to ensure the water rights points of diversion represent anticipated water supply development locations.

Table 6-2
Water Rights and Supply Source Comparison Summary

Existing Permitted Groundwater Supply Capacity		Existing Groundwater Production Capacity		Water Rights Surplus (+)/Deficit (-)	
mgd	**gpm**	**mgd**	**gpm**	**mgd**	**gpm**
1.85	1,285	1.76	1,225	+0.09	+60

Selection Criteria for Potential New Well Sites

In order to provide additional water supply capacity to meet increasing demands the City would need to drill additional groundwater wells if expanded groundwater supply is part of the City's water supply development strategy. Well exploration areas would be selected based on key considerations which will affect the well's productivity and relative cost. These factors include:

- Potential well yield based on existing well data and the saturated thickness of sand and gravel deposits in the aquifer
- Potential for hydraulic connection with surface water
- Water quality
- Interference between new and existing wells
- Available infrastructure

The saturated thickness and available drawdown in the aquifer are two key hydrogeologic criteria for identifying promising locations for new groundwater supply wells. These criteria are an indicator of potential well yields. Thicker layers of sand and gravel are likely to transmit more water to a well and in part, provide for greater available drawdown and higher production rates. Available drawdown is the difference between the static water level of the well and the depth above the pump intake required to maintain operation of the pump; greater available drawdown allows higher pumping rates.

Available well information indicates that greater thicknesses of sand and gravel are present along an east-west axis through the City and tend to thicken towards the east and southeast. The aquifer thins significantly towards the western edge of the City as well as in a southwestern direction. Some thinning is also noted in a northwestern direction, in the vicinity of Wells 10 and 11. Based solely on the thickness of the aquifer, the more favorable locations for installation of a water supply well appear to be within the eastern half of the City limits, south of the railroad line.

Due to the shallow depth to groundwater in the area, hydraulic connection to surface water is a potential concern. All wells located a horizontal distance less than one-fourth mile from a surface water source that produce water from an unconfined aquifer are presumed to be hydraulically connected to the surface water source, unless satisfactory information or demonstration indicates the contrary. As discussed previously, the available geologic information indicates that the aquifer is confined to semi-confined with a low permeability clay underlying most of the area within the City and separating the aquifer from shallow surface waters. A strong case can be made that the aquifer is confined and not directly connected to shallow surface water bodies within the City. However, the City should not invest any resources in completion of a well located within one fourth-mile of a surface water body until OWRD has concurred with this opinion.

Water Quality and Treatment

In general, the existing City wells produce water with iron concentrations ranging from 0.37 to 3.7 milligrams per liter (mg/L), exceeding the secondary drinking water standard of 0.3 mg/L. Due to the presence of iron in the groundwater over a widespread area within the City, it is anticipated that treatment will be required for any new groundwater source that is developed. Limited available information on the distribution of iron in groundwater near the

City suggests that iron concentrations may be lower in the western and southern portions of the City.

New Well Siting

New wells would ideally be placed at locations suited to use existing water treatment and distribution facilities because of the high cost to construct separate facilities for each additional increment of capacity. Based on this consideration, ideal new well sites would be near existing water treatment facilities at the Public Works Yard. A significant drawback to locating new wells close to existing wells or to each other is the increased potential for excessive well interference drawdowns, which may limit or reduce individual well capacities.

The potential interference drawdown in wells that are located in close proximity drawing from the aquifer is significant. When the potential interference is factored in with the limited available drawdown in the aquifer, new water supply wells should be located as far as practicable from existing public water supply wells to minimize interference. A data collection program, as discussed previously, would provide a better understanding of well interference in the City which would facilitate efforts to optimize pumping operations and site future wells.

Based on these findings, two areas were identified in the May 2009 plan for the siting of potential future wells. A discussion of these areas is presented below.

<u>Well Exploration Sites within the UGB</u>

Two potential groundwater well exploration areas within the City are shown in Figure 6-1. Area 1 encompasses the area west of Huston Road and south of Hunter Road. The nearest existing City wells are Wells 4 and 12 to the northwest and Well 9 to the northeast. Available well log information indicates that the saturated thickness of sand and gravel in the aquifer is greater here than in other portions of the City and specific capacity data from Wells 4 and 9 and Pilot Well B indicate a potential for higher well productivity. Potential interference from Wells 9 and 10 should be considered in identifying a candidate well site in Area 1.

Area 2 is centered near Territorial Highway and East Broadway Avenue, east of abandoned City Well 8. A review of the geology in Area 2 indicates the presence of a significant saturated thickness of coarse sediments in the aquifer. Potential interference from existing Wells 4, 10, 11 and 12 should be considered in identifying a candidate well site in this area. There is a greater density of domestic wells in this area; therefore, minimal well interference effects on City wells from domestic wells are a possibility. Due to higher pumping rates, nearby domestic wells completed in the alluvial aquifer likely would experience interference from a City production well.

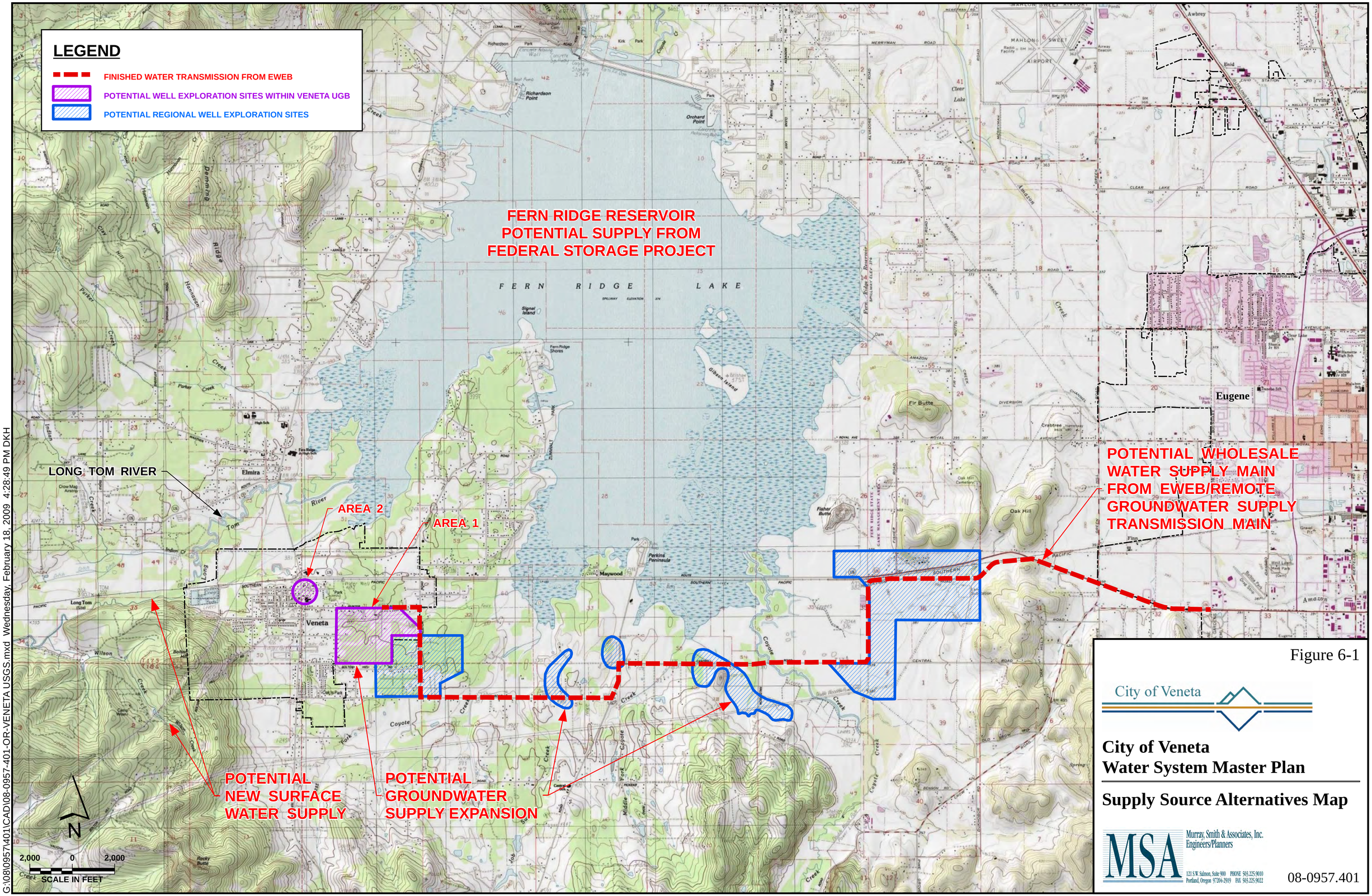


Figure 6-1

City of Veneta

City of Veneta
Water System Master Plan

Supply Source Alternatives Map

MSA Murray, Smith & Associates, Inc. Engineers/Planners
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08-0957.401

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Well Exploration Sites beyond the UGB

A cursory evaluation of the potential for developing groundwater source capacity outside the City's UGB shows that the aquifer is thinner to the south and west of the City indicating a lower potential for groundwater source development in this direction. Groundwater expansion to the east, northeast or southeast of the City appears to offer a better chance for higher yield production wells based on aquifer thicknesses determined from existing well logs. The limiting factor for expansion in these directions may be the presence of surface water bodies. However, OWRD did review the water right transfer at Well 10 and agreed that groundwater and surface water were not connected. Given this consideration, future well sites should be selected with regard to distance from existing or planned water system infrastructure, land ownership and distance from surface water. Potential groundwater exploration areas outside of the UGB are also shown in Figure 6-1.

In January 2010, the Oregon Department of Water Resources determined that further groundwater development by the City within one mile of the Long Tom River and the Fern Ridge Reservoir has the potential for substantial interference to surface water availability in those water bodies. This determination essentially excludes the City from areas of further groundwater development that have been determined to be the most productive (east and northeast of the City) and into areas where groundwater quantity is known to be limited and quality is known to be poor (south and southeast of the City).

Option 2 - Wholesale Supply from Eugene Water and Electric Board

EWEB, in cooperation with the City, completed a planning-level evaluation of pipeline routing and development costs to supply water from EWEB to the City under a wholesale water supply agreement. The study concluded that a pipeline route on rural roads south of the Florence-Eugene Highway (Highway 126) with an approximate length of 9.7 miles would be the most feasible. The summary report of this study indicates that EWEB would be able to provide a high quality water supply with sufficient capacity for the City's needs. The EWEB evaluation estimated the project cost of constructing the water supply system at approximately $13.9 million in 2008 dollars.

Option 3 - Regional Supply from Federal Water Storage Project

The City is a member of the Southern Willamette Municipal Water Providers (SWMWP) group led by EWEB. SWMWP applied for and received an Oregon Water Supply and Conservation Initiative grant to conduct an evaluation of opportunities for, and obstacles to, obtaining water from federal storage projects in the Willamette Basin for municipal and industrial use. Willamette Basin storage projects are currently managed by the United States Army Corps of Engineers (USACE) and the Bureau of Reclamation (BOR) who issue new contracts for stored water. The BOR only issues contracts for irrigation use and the USACE

is not currently issuing contracts for municipal and industrial use. The primary impediments to the municipal use of stored water from the Willamette Basin projects are:

Limitations in the BOR's existing storage water rights for the projects, which only authorize the use of water for irrigation.

- Anticipated pricing formulas for municipal and industrial use water, which could result in costs of over $1,500 per acre foot, or approximately $4.60 per 1,000 gallons in addition to current retail water rates of $1.92 per 1,000 gallons for a total of $6.52 per 1,000 gallons, not considering additional rate impacts related to treatment and transmission of the surface water supply.
- The need for an organizational entity to become the contracting authority.

SWMWP's efforts may identify a pathway towards obtaining contracts for municipal and industrial use that does not currently exist, but this option will require lengthy coordination with and approval by the relevant federal agencies.

Option 4 - New Surface Water Supply

If the City were to pursue a new surface water supply, the most likely candidate for a surface water source is the nearby Long Tom River. However, the Willamette Basin program rules do not classify the waters of the Long Tom River for municipal use. Therefore, any new application for a surface water right would require a basin plan exception by the Water Resources Commission, which is a separate process from an actual surface water application. Also as noted previously, the Long Tom River near the City is considered to be fully-allocated meaning there is no additional water available for new surface water rights. Thus, a new surface water application for municipal use in this area is unlikely to be approved.

Construction of a new raw water storage reservoir using a seasonal surface water supply source may be another option. Although water storage applications have many of the same requirements as surface water right applications, the Willamette Basin program rules do allow storage for municipal use. The OWRD Watermaster for Lane County has stated that the Long Tom River is fully appropriated during the peak water use season; however, water is likely available for storage during the winter months. Other key considerations for a storage facility would include dam siting and development, annual basin water yield, environmental and water quality issues. Additional analysis is needed to identify to what extent water is available for storage and whether a feasible storage site is available. Different water quality requirements must be adhered to for surface water than those requirements for groundwater. The cost of development of new raw water storage facilities and associated surface water treatment facilities would be prohibitive even if other regulatory and permitting concerns could be addressed. As such, no further consideration of this alternative is recommended.

The City may also pursue a local supply from the nearby Fern Ridge federal water storage project. This supply option would face the same challenges as the SWMWP's venture to obtain water from federal storage projects for municipal and industrial use and as such will require lengthy coordination with federal agencies.

Supply Analysis Findings Summary

The key findings of the supply options analysis are summarized as follows:

- The City is taking the necessary water rights administrative actions to support the use of the recently constructed Well 12 to its maximum capacity. If the City were to pursue continued groundwater development, it is recommended that the City submit an application for a new water right permit as soon as possible, requesting additional water for municipal use from new wells.
- Steps should be taken to gather and log relevant data related to the City's existing groundwater supply system in order to support on-going efforts to optimize the capacity of the existing groundwater wells. It is assumed that the City will continue to rely on this resource for some of its long-range water supply capacity, even if another source is developed.
- Further groundwater development to serve the City's future demands is possible. If the City were to pursue continued groundwater development, additional data collection and an exploratory well drilling program should precede development of a production well to confirm aquifer suitability, water quality conditions and anticipated sustainable yield at a given site.
- In order to meet the City's build-out water supply needs, groundwater supply development would likely need to be extended outside of the current UGB to avoid significant well interference and localized drawdown of the aquifer.
- In January 2010, the Oregon Department of Water Resources determined that further groundwater development by the City within one mile of the Long Tom River and the Fern Ridge Reservoir has the potential for substantial interference to surface water availability in those water bodies. This determination essentially excludes the City from areas of further groundwater development that have been determined to be the most productive (east and northeast of the City) and into areas where groundwater quantity is known to be limited and quality is known to be poor (south and southeast of the City).
- If the City were to pursue continued groundwater development, additional treatment capacity will be required in the near future assuming that new groundwater wells will continue to see similar concentrations of iron as existing wells.
- Purchase of wholesale water supply from EWEB may present an opportunity to secure a reliable long-term water supply; however, the initial cost of this option is high.

- Development of a new surface water supply to serve the City's long-term water supply needs faces several obstacles, including potentially high project costs, water rights acquisition uncertainty, potential water availability limitations and environmental permitting challenges. Development of a new surface water supply would take a number of years and there is a high likelihood that one or more of the obstacles presented herein will prove to be a fatal flaw to this option. Pursuit of a surface water supply option is not recommended at this time.
- Development of a regional water supply to serve the City from federal water storage projects, as currently being investigated by the SWMWP, may present an opportunity for the City to develop a reliable long-term water supply. A mechanism to acquire access to stored water does not currently exist and will require lengthy coordination with federal agencies.

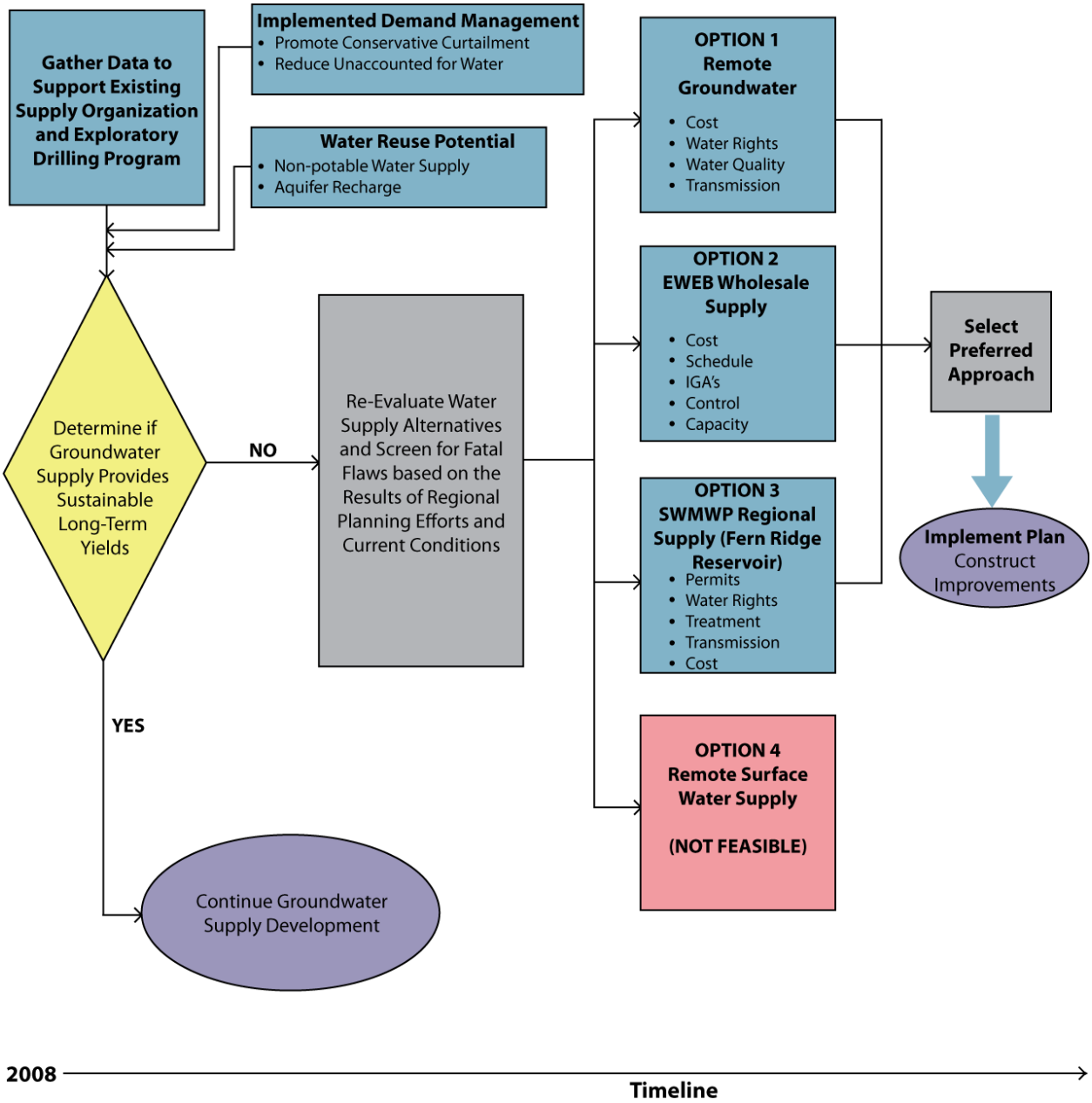
Supply Development Strategy

The ultimate development and implementation of a long term water supply strategy has a number of variables and unknowns. Figure 6-2 illustrates the recommended water supply strategy decision schematic for systematically evaluating supply options 1 through 4, and the key issues associated with these options to minimize the cost and risk as the City pursues the development of a long-term water supply. The City proceeded through this decision schematic to select a preferred approach to water supply development as described below.

The City should also consider water efficiency and water reuse measures to reduce peak demands on the system. These measures, discussed below, if deemed feasible and cost effective, could allow the City to possibly defer water supply development projects.

- Water System Efficiency: These measures include implementation of water conservation programs (customer education, rebates for high efficiency appliances and fixtures, etc.) and water loss audits and actions to reduce system losses (water main replacement, leak detection program, improved metering). These programs could be used by the City to change customer use characteristics and make better use of existing supplies.
- Water Reuse: The City is currently contemplating the treatment of wastewater treatment plant effluent to levels acceptable for reuse in non-potable applications, such as irrigation. Options for reuse include development of a non-potable water distribution system for irrigation (high cost) to exploration of underground injection of the effluent, not currently allowed under State law, to recharge the aquifer (low cost). Further details related to reuse of the wastewater treatment plant effluent are presented in the City's Wastewater Facilities Plan.

Figure 6-2
Water Supply Development Strategy Decision Schematic



Selection of Preferred Approach

Subsequent to the preparation of the City's Water System Master Plan in May 2009, the City considered the alternatives presented above and selected Option 2 - Wholesale Supply from Eugene Water and Electric Board – as the preferred approach. The City has committed to this alternative and has taken definitive steps to implement this new supply source. The new water supply system is anticipated to be in service in 2013. The City will discontinue any further development and expansion of its groundwater resources.

SECTION 7
RECOMMENDATIONS AND CAPITAL IMPROVEMENT PROGRAM

General

This section presents recommended water system improvements based on the analysis and findings presented in Sections 5 and 6. These improvements include the proposed supply source, storage reservoir, pressure reducing facility and water line improvements. Also presented is a capital improvement program (CIP) schedule for all recommended improvements. All proposed system improvements are illustrated on Plate 1 in Appendix A.

With the City's selection of the new water supply source from the Eugene Water and Electric Board (EWEB), substantial changes in the CIP have been made in this section from the original May 2009 plan. The City's intent is to operate the Public Works Yard supply facilities (Wells 4, 9 and 12) and the water treatment plant at maximum capacity with the new supply augmenting to meet system demands as required. It is the City's further intent that the Jeans Road water supply and treatment facilities will be not be operated to meet water system demands except as a potential emergency backup supply. The City will discontinue any expansion of its current groundwater supply. The updated CIP reflects these operational considerations.

Cost Estimating Data

An estimated project cost has been developed for each improvement project recommendation presented in this section. Cost estimates represent opinions of cost only, acknowledging that final costs of individual projects will vary depending on actual labor and material costs, market conditions for construction, regulatory factors, final project scope, project schedule and other factors. The American Association of Cost Engineers (AACE) classifies cost estimates depending on project definition, end usage and other factors. The cost estimates presented here are considered Class 4 with an end usage being a study or feasibility evaluation and an expected accuracy range of -30 percent to +50 percent. As the project is better defined the accuracy level of the estimates can be narrowed. Itemized project cost estimate summaries are presented in Appendix C. This appendix also includes a cost data summary for recommended water main improvements developed on a unit cost basis. Estimated project costs include approximate construction costs and an allowance for administrative, engineering and other project-related costs.

Water System Capital Improvement Program

A summary of all the recommended improvements is presented in Table 7-3 which provides for project sequencing by showing prioritized immediate, short, medium and long-term recommendations. Immediate recommendations are those suggested to be completed in the next one to five years, short-term in the next six to 10 years, medium-term in the next 11 to

20 years and long-term beyond 20 years in the future. Estimated project costs are also summarized in Table 7-3.

Recommended Supply Improvements

General

Based on the analysis in Section 5, additional water supply capacity is needed to meet the City of Veneta's existing maximum day demand and to provide for future increases in demand resulting from population growth. The City is implementing the new water supply system from EWEB which will augment the existing groundwater supply from Wells 4, 9, and 12 to meet the future water demands.

Proposed New Water Supply System from EWEB

The City's proposed new water supply system from EWEB is presently in the implementation phase. The project has a current estimated project cost of $13.9 million and is scheduled to be in service in 2013. The project is being funded through a grant and loan program with Rural Development, U.S. Department of Agriculture.

Well Data Collection and Maintenance

It is recommended that the City consider implementing periodic well performance testing to identify potential well performance degradation so that timely corrective actions can be taken to prevent permanent capacity losses. To establish a baseline for future performance comparison, it is recommended that the City complete a step-rate pumping test at existing production wells.

Recommended Distribution System Improvements

General

Presented below are recommended water distribution system improvements for pump stations, storage reservoirs, pressure reducing facilities and distribution system piping. Project cost estimates are presented for all recommended improvements. The recommendations are presented by project type and discussed in order of need.

Pump Stations

As presented in Section 5, the Public Works Yard Booster Pump Station needs to be expanded to meet maximum projected 2030 MDD in the entire water system. Incremental expansion of the station capacity is recommended. Substantial improvements to the station will be accomplished as part of the new EWEB water supply system. These improvements will provide for minimal expansion costs of pump replacement to match demand growth.

The major piping and electrical and control system improvements will already have been accomplished. For the purposes of budgeting, it is recommended that a $50,000 budget allowance be provided in the short-term, medium-term, and long-term periods for pump replacement and upgrading, all towards providing a pump station with a firm capacity of 4.2 mgd by the year 2030 and an ultimate capacity of 4.5 mgd.

As presented in Section 5, the Dogwood Pump Station should be expanded by approximately 0.2 mgd to meet 2030 MDD. It is recommended that this be a medium-term (2020-2030) project.

Storage Reservoir

It is recommended that a finished water reservoir be constructed southwest of the intersection of 8th Street and Kingpin Loop near the southern Urban Growth Boundary (UGB). The new reservoir will serve the 582-Foot Pressure Zone with an approximate capacity of 1.6 million gallons (mg). The reservoir will provide for anticipated demands at saturation development and boost fire flows to new development southeast of the intersection of Territorial Highway and Perkins Road.

The 1.6 mg reservoir will address storage deficiencies that begin to occur in approximately the year 2020. The reservoir should be constructed by approximately that year. It is recommended that siting analyses and property acquisition for this reservoir begin soon.

Supply to this reservoir will be provided through the 12-inch distribution main in 8th Street which runs from Kingpin Loop south to the UGB. The recommended overflow elevation for the reservoir is 582 feet. The estimated project cost for the reservoir is approximately $1,900,000.

Pressure Reducing Facilities

As properties develop west of 10th Street at the base of Bolton Hill, an intermediate 750-foot pressure zone is proposed to ensure sufficient fire flows and minimum water pressures for these new customers. The proposed zone will be supplied through a proposed pressure reducing valve (PRV) station on the existing 8-inch water main between the Bolton Hill Reservoir and Bolton Hill Road. The estimated project cost for this PRV station is approximately $100,000.

Distribution System Piping Improvements

General

The analysis found that distribution water main improvements are needed to provide sufficient fire flow capacities and accommodate system expansion. Each of these water line improvements is detailed below in order of priority and summarized in Tables 7-1 and 7-2.

The total cost for distribution piping improvements through the 20-year planning period is approximately $1,274,000. This cost includes $25,000 per year ($250,000 total) for an asbestos cement (AC) pipe replacement program.

Table 7-3 presents prioritized recommendations for distribution system water line improvements. Each improvement is identified by category and includes an estimated project cost. Improvements that involve construction of new waterlines to expand the distribution system capacity are considered 100 percent eligible for System Development Charges (SDCs). The costs of improvements involving replacement of existing lines are partially eligible for SDCs. The SDC eligible percentage can be determined by the percentage of increased pipe capacity.

Recommended Immediate Water Line Improvements

4. Replace approximately 4,300 linear feet of 6-inch diameter piping with 12-inch diameter piping on E. Hunter Road between the Public Works Yard and Huston Road. Replacing this water main with one of larger diameter will increase commercial fire flow capacity in this area. This project also has the added benefit of replacing AC pipe. This main replacement, which was previously included as a short-term improvement, is being accomplished as part of the new EWEB water supply system project.

Recommended Short-Term Water Line Improvements

3. Install approximately 500 linear feet of 12-inch diameter piping from the existing dead-end of Luther Lane northeast to connect with the existing 12-inch in Hope Lane. This water main extension combined with recommended Improvements 1 and 2 increase waterline looping between Territorial Highway and Huston Road which will ensure sufficient commercial fire flows in this area. Estimated Project Cost: $93,000

Recommended Medium-Term Water Line Improvements

2. Install approximately 1,500 linear feet of 12-inch diameter piping along the E. Broadway Avenue alignment from Eastwood Court to Huston Road, connecting an existing dead-end 8-inch water main on E. Broadway Avenue at Fern Meadows Lane to Huston Road. This water main extension along with recommended Improvement 1 completes a loop of E. Broadway Avenue and Hunter Avenue between Territorial Highway and Huston Road which will ensure sufficient commercial fire flows in this area. Both this improvement and Improvement 1 should be completed as the surrounding area develops. Estimated Project Cost: $277,000

6. Install approximately 900 linear feet of 8-inch diameter piping on 3rd Street between W. Broadway Avenue and W. Hunter Avenue. This improvement will provide

additional looping between W. Broadway Avenue and W. Hunter Avenue to ensure adequate commercial fire flows in this area. Estimated Project Cost: $113,000

7. Install approximately 900 linear feet of 8-inch diameter piping on 6th Street between W. Broadway Avenue and W. Hunter Avenue. This improvement will provide additional looping between W. Broadway Avenue and W. Hunter Avenue to ensure adequate commercial fire flows in this area. Estimated Project Cost: $113,000

Recommended Long-Term Water Line Improvements

1. Install approximately 1,800 linear feet of 12-inch diameter piping along the E. Broadway Avenue alignment from the Public Works Yard west to Westwood Court, connecting existing dead-end 8-inch water mains on E. Broadway Avenue at Lindsay Lane and Fern Meadows Lane. This water main extension along with recommended Improvement 2 completes a loop of E. Broadway Avenue and Hunter Avenue between Territorial Highway and Huston Road which will ensure sufficient commercial fire flows in this area. Both this improvement and Improvement 2 will be completed as the surrounding area develops. Estimated Project Cost: $333,000

8. Install approximately 2,100 linear feet of 8-inch diameter waterline on Baker Lane from E. Hunter Road south then west to the existing 8-inch dead-end on Trinity Street at Longwood Lane. This water line, in conjunction with Improvement 9 below, will deliver improved fire flows in the southeast of the City. It is anticipated that this waterline would be entirely developer funded, to be constructed as development occurs in this area. Estimated Project Cost: $262,000

9. Install approximately 1,400 linear feet of 8-inch diameter piping on Baker Lane from Trinity Street, south then west to the dead-end of Jake Street at Longwood Lane. This waterline, in conjunction with Improvement 8 above, will deliver improved fire flows in the southeast of the City. It is anticipated that this waterline would be entirely developer funded, to be constructed as development occurs in this area. Estimated Project Cost: $175,000

10. Install approximately 1,100 linear feet of 12-inch diameter piping to create a loop from Perkins Road east of Territorial Highway south then east to the 12-inch diameter dead-end waterline on Allure Avenue. This waterline will ensure adequate fire flows to existing development south of Perkins Road. Estimated Project Cost: $203,000

Reservoir-Dependent Water Line Improvements

11. Install approximately 1,100 linear feet of 12-inch diameter piping from the proposed reservoir east to meet the new 8th St. 12-inch main at southern UGB. The reservoir is proposed for construction by 2020; therefore, this water line is included in Table 7-1 under short-term water line improvements. Estimated Project Cost: $203,000

Table 7-1
Short-Term and Medium-Term Distribution Water Line Improvements

CIP Priority	Location	From	To	Diameter (inches)	Length (ft)	Estimated Project Cost
Short-Term Improvements (2015 - 2019)						
3	Luther Ln.	East dead-end	Hope Ln. dead-end	12	500	$93,000
11	Southwest UGB	New reservoir	8th St. main	12	1,100	$203,000
Short-Term Improvements Total						**$296,000**
Medium-Term Improvements (2020-2030)						
2	E. Broadway Ave.	Eastwood Ct.	Huston Rd.	12	1,500	$277,000
6	3rd St.	W. Broadway Ave.	W. Hunter Ave.	8	900	$113,000
7	6th St.	W. Broadway Ave.	W. Hunter Ave.	8	900	$113,000
Medium-Term Improvements Total						**$503,000**

Table 7-2
Long-Term Distribution Water Line Improvements

CIP Priority	Location	From	To	Diameter (inches)	Length (ft)	Estimated Project Cost
Long-Term Improvements (2030+)						
1	E. Broadway Ave.	Public Works Yard	Westwood Ct.	12	1,800	$333,000
8	Baker Ln.	E. Hunter Rd.	Trinity St. at Longwood Ln.	8	2,100	$262,000
9	Baker Ln.	Trinity St.	Jake St. at Longwood Ln	8	1,400	$175,000
10	Territorial Hwy.	Perkins Rd.	Allure Ave.	12	1,100	$203,000
Long-Term Improvements Total						**$973,000**

Additional Recommendations

General

It is recommended that additional engineering and financial studies be conducted to advance the planning work completed in this master plan. Of highest priority is completion of a cost-of-service (water rate) and System Development Charge analysis. Updates to the existing Water Management and Conservation Plan as well as this master plan will also be required within the 20-year planning horizon.

Financial Evaluation and Plan

A long-term financial planning evaluation and strategy is recommended to support the recommended capital improvement plan. Revenue generated from water rates and system connection fees is typically used to fund operating and maintenance costs, renewal and replacement costs of existing facilities, debt service and capital improvement projects. Adequate SDCs should be established to collect funds from new customers to pay for improvements that expand the capacity of the system without placing an undue burden on existing customers. It is also recommended that the City's current water rate structure be evaluated and updated as necessary. It is recommended that approximately $30,000 be budgeted in the next five years to develop the financial plan and $10,000 every five years after that to review and update the plan.

Water Management and Conservation Plan

The Oregon Administrative Rules (OAR) for Public Water Systems, Chapter 690, Division 86 requires water systems with water rights to submit a Water Management and Conservation Plan that documents current water conservation measures, provides a water curtailment plan, evaluates long-term water supply planning and provides a water rights implementation schedule. The City completed a Water Management and Conservation Plan in 2003. A Water Management and Conservation Plan Update to comply with Oregon Water Resources Department (OWRD) requirements (see OAR 690-086-0125) has been completed and is currently under review by OWRD.

Summary

This section presents recommendations for improvements to the City's water supply and distribution system. The total estimated project cost of these improvements is approximately $18.5 million for the 20-year planning horizon and beyond to the ultimate full development of the City's existing UGB. Approximately $13.9 million of the total estimated improvement cost is for the City's new water supply system from EWEB which will be accomplished within the immediate time period (2010-2014).

Table 7-3
Capital Improvement Program Summary

Category	Project Description	Project Priority	Project Location	CIP Schedule and Project Cost Summary: Immediate (2010 - 2014)	Short-Term (2015 - 2019)	Medium-Term (2020 - 2030)	Long-Term (2030+)	Estimated Project Cost	SDC Eligibility: %	SDC Eligibility: Cost
Pumping Facilities	582-Foot Pressure Zone		Expand capacity of Public Works Yard Booster Pumping Station		$ 50,000	$ 50,000	$ 50,000	$ 150,000	0%	$ -
	Upper Pressure Zones		Expand capacity of Dogwood Pump Station (0.2 mgd)			$ 65,000		$ 65,000	100%	$ 65,000
			Sub-Total	$ -	$ 50,000	$ 115,000	$ 50,000	$ 215,000		$ 65,000
Storage Facilities	582-Foot Pressure Zone		New 1.6 MG Reservoir at UGB southeast of Bolton Hill	$ 150,000	$ 1,750,000			$ 1,900,000	100%	$ 1,900,000
			Sub-Total	$ 150,000	$ 1,750,000	$ -	$ -	$ 1,900,000		$ 1,900,000
Distribution System Piping	582-Foot Pressure Zone	1	Build 12-inch extension on E Broadway Ave from Public Works Yard to Westwood Ct.				$ 333,000	$ 333,000	100%	$ 333,000
		2	Build 12-inch extension on E Broadway Ave from Eastwood Ct to Huston Rd.			$ 277,000		$ 277,000	100%	$ 277,000
		3	Build 12-inch extension on Luther Ln from dead-end northeast to 12-inch in Hope Ln.		$ 93,000			$ 93,000	100%	$ 93,000
		6	Build 8-inch waterline on 3rd St. between W. Broadway Ave and W. Hunter Ave.			$ 113,000		$ 113,000	100%	$ 113,000
		7	Build 8-inch extension on 6th St. between W. Broadway Ave. and W Hunter Ave.			$ 113,000		$ 113,000	100%	$ 113,000
		8	Build 8-inch waterline on Baker Ln. from E. Hunter Rd. south then west to the existing 8-inch dead-end on Trinity St. at Longwood Ln.				$ 262,000	$ 262,000	0%	Developer Funded
		9	Build 8-inch waterline on Baker Ln. from Trinity St., south then west to the dead-end of Jake St. at Longwood Ln.				$ 175,000	$ 175,000	0%	Developer Funded
		10	Build 12-inch loop from Perkins Rd. east of Territorial Hwy. south then east to connect with the dead-end of Allure Ave. 12-inch				$ 203,000	$ 203,000	100%	$ 203,000
		11	Build 12-inch line east from proposed reservoirs to meet new 8th St. 12-inch main at southern UGB		$ 203,000			$ 203,000	100%	$ 203,000
	Pressure Reducing Facilities		750-Foot Pressure Zone PRV constructed off 8-inch from Bolton Hill Reservoir		$ 100,000			$ 100,000		$ -
	Routine Pipe Replacement		Funds replacement of asbestos cement (AC) pipe at $25,000 per year	$ 125,000	$ 125,000	$ 125,000	$ 125,000	$ 500,000	0%	$ -
			Sub-Total	$ 125,000	$ 521,000	$ 628,000	$ 1,098,000	$ 2,372,000		$ 1,335,000
Long-Term Supply			Long-Term Water Supply Development (Option 2 - EWEB)	$ 13,900,000				$ 13,900,000	100%	To be determined
			Sub-Total	$ 13,900,000	$ -	$ -	$ -	$ 13,900,000		$ -
Other	Planning Studies		Water Rate and SDC Study	$ 30,000	$ 10,000	$ 10,000	$ 10,000	$ 60,000	50%	$ 30,000
			Water System Master Plan Update			$ 60,000		$ 60,000	50%	$ 30,000
			Sub-Total	$ 30,000	$ 10,000	$ 70,000	$ 10,000	$ 120,000		$ 60,000
Capital Improvement Plan (CIP) Total				**$ 14,205,000**	**$ 2,331,000**	**$ 813,000**	**$ 1,158,000**	**$ 18,507,000**		

APPENDIX

APPENDIX A
Water System Master Plan Map

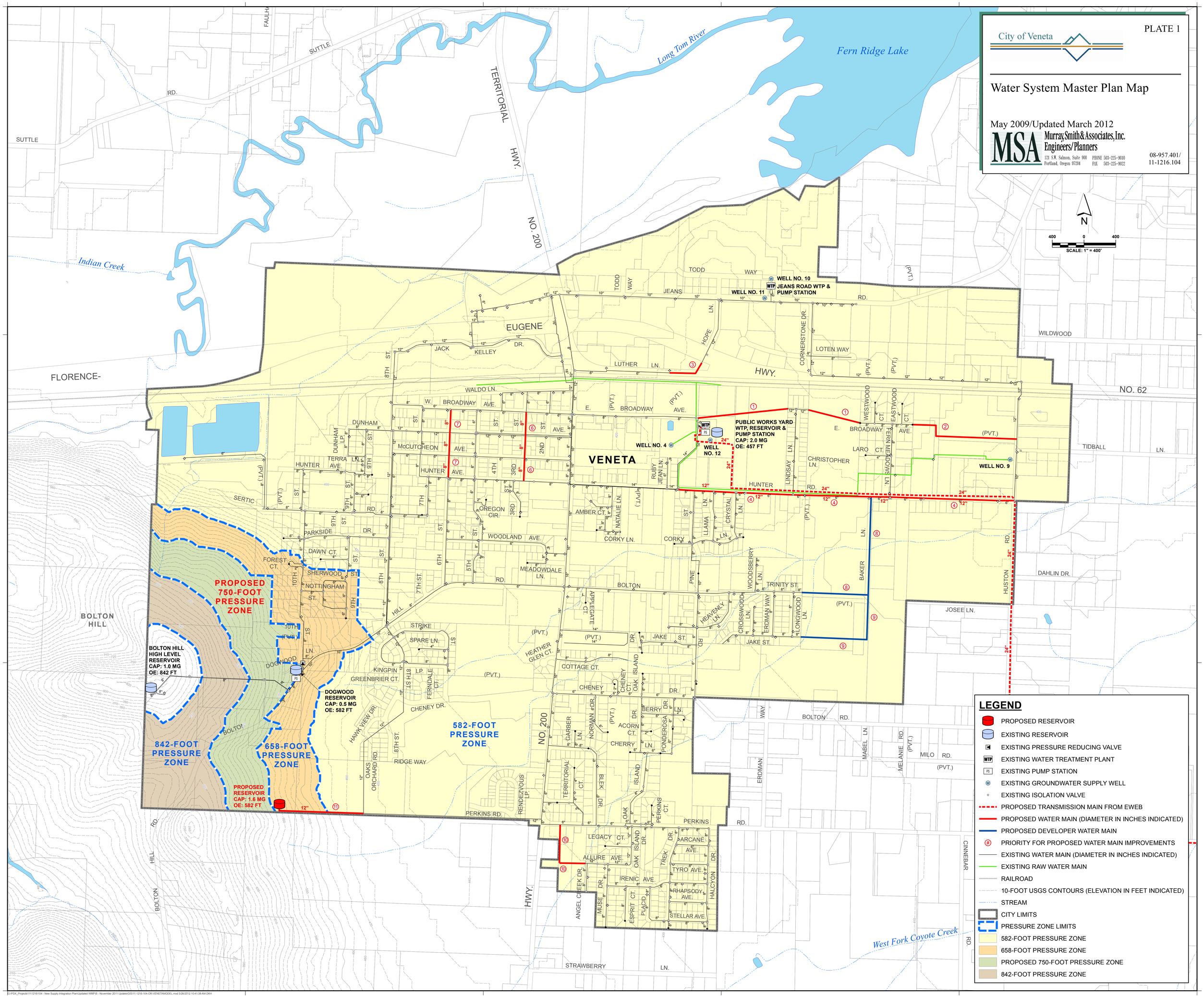


PLATE 1
City of Veneta
Water System Master Plan Map
May 2009/Updated March 2012
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PHONE 503-225-9010 FAX 503-225-9022
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N
SCALE: 1" = 400'
Fern Ridge Lake
Long Tom River
Indian Creek
West Fork Coyote Creek
VENETA
EUGENE
FLORENCE-
BOLTON HILL
WELL NO. 10
WELL NO. 11
JEANS ROAD WTP & PUMP STATION
WELL NO. 4
WELL NO. 12
WELL NO. 9
PUBLIC WORKS YARD WTP, RESERVOIR & PUMP STATION CAP: 2.0 MG OE: 457 FT
BOLTON HILL HIGH LEVEL RESERVOIR CAP: 1.0 MG OE: 842 FT
DOGWOOD RESERVOIR CAP: 0.5 MG OE: 582 FT
PROPOSED RESERVOIR CAP: 1.6 MG OE: 582 FT
PROPOSED 750-FOOT PRESSURE ZONE
842-FOOT PRESSURE ZONE
658-FOOT PRESSURE ZONE
582-FOOT PRESSURE ZONE
LEGEND
PROPOSED RESERVOIR
EXISTING RESERVOIR
EXISTING PRESSURE REDUCING VALVE
EXISTING WATER TREATMENT PLANT
EXISTING PUMP STATION
EXISTING GROUNDWATER SUPPLY WELL
EXISTING ISOLATION VALVE
PROPOSED TRANSMISSION MAIN FROM EWEB
PROPOSED WATER MAIN (DIAMETER IN INCHES INDICATED)
PROPOSED DEVELOPER WATER MAIN
PRIORITY FOR PROPOSED WATER MAIN IMPROVEMENTS
EXISTING WATER MAIN (DIAMETER IN INCHES INDICATED)
EXISTING RAW WATER MAIN
RAILROAD
10-FOOT USGS CONTOURS (ELEVATION IN FEET INDICATED)
STREAM
CITY LIMITS
PRESSURE ZONE LIMITS
582-FOOT PRESSURE ZONE
658-FOOT PRESSURE ZONE
PROPOSED 750-FOOT PRESSURE ZONE
842-FOOT PRESSURE ZONE

APPENDIX B
Model Calibration Table

Appendix B
Model Calibration Table

Flow Test Location	Model Node No.	Test Static Pressure (psi)	Model Static Pressure (psi)	Test Residual Pressure (psi)	Model Residual Pressure (psi)	Test Flow (gpm)
E. Broadway @ Public Wks	J858	0	70	62	65	954
25160 E. Broadway	J742	56	68	62	62	954
2nd & Broadway	J448	72	70	62	63	1,040
5th & Broadway	J450	58	69	60	62	1,040
6th & Broadway	J598	70	69	62	60	1,012
8th & Broadway	J604	70	70	60	66	954
Territorial & Hunter	J640	64	69	52	66	939
87950 Territorial	J628	64	70	52	65	1,040
87911 Territorial	J408	63	68	50	64	984
Irenic & Esprit	J334	66	61	42	49	754
87585 Placid	J326	66	61	42	47	809
Steller & Trek	J330	56	62	36	49	754
Steller & Halcyon	J314	54	64	30	52	735
Halcyon & Rhapsody	J308	58	64	34	52	695
Trek & Rhapsody	J302	58	62	30	49	795
87806 Norman	J396	none given	67	52	48	860
25122 Cheney	J398	72	68	54	57	860
Berry & Oak Island	J246	70	68	54	55	893
87799 Ponderosa	J234	64	68	52	55	860
Cheney & Ponderosa	J208	70	69	48	58	826
25269 E. Bolton	J878	70	70	48	58	860
25207 Jake	J220	52	69	46	56	716
Jake & Oak Island	J224	52	68	45	51	754
Crystal & Hunter	J114	70	68	56	54	843
Christopher & Lindsey	J104	72	69	42	44	809
Lindsey & E. Broadway	J106	70	69	42	40	808
Hunter & Baker	J98	76	74	42	50	809
Hunter & Fern Meadows	J76	76	75	40	52	773
Fern Meadows & Laro	J78	72	71	40	47	735
E. Broadway & Eastwood	J88	74	70	38	49	653
10th & Forrest	J664	76	84	56	60	984
10th & Parkside	J676	60	61	40	51	826
9th & Sertic	J718	74	72	52	66	860
9th & Sertic West side	J714	72	70	52	62	893
10th & Hunter	J700	74	77	54	70	893
Strike & Spare	J522	66	63	50	58	843
8th & Kingpin	J530	64	60	66	57	939
Strike & 8th	J518	64	60	60	54	924
8th & Bolton Hill	J512	62	58	42	55	809
9th & Parkside	J554	70	68	50	62	1,040

Note:
1. Model assumes one pump is active at each pump station.
2. Node in question has a demand equal to the flow recorded in the fire hydrant flow test. All other nodes have existing MDD as distributed over the entire system (i.e. 3.12 gpm per node).
3. Assume all flow test residual pressures are measured at the same location as the flow.
4. Not all model nodes were calibrated to FH flow tests, only those summarized above.

APPENDIX C
Cost Allocation for Facilities and Piping Improvements

MSA

APPENDIX C
COST ALLOCATION FOR FACILITIES AND PIPING IMPROVEMENTS

Appendix C contains cost data for recommended improvements to reservoirs, pressure reducing valves, and system piping. Improvement project cost estimates presented in this appendix are based upon recent experience with construction costs for similar work in the area and assume improvements will be accomplished by private contractors. Estimates include provisions for approximate construction costs plus an aggregate 45 percent allowance for contingencies, engineering, administration and other project-related costs. Since construction costs change periodically, an indexing method to adjust present estimates in the future is useful. The Engineering News-Record (ENR) Construction Cost Index (CCI) is a commonly used index for this purpose. For purposes of future cost estimate updating; the current ENR CCI for Seattle, Washington is 8738 (December 2008).

[1] The cost estimates presented are opinions of cost based on the assumptions stated and developed from information available at the time of the estimate. Final costs for all projects will depend on actual field conditions, on actual material and labor costs, final project scope, project implementation and other variables.

Table C-1
Reservoir Project Cost Estimate Summary
Southwest Veneta Storage Reservoir (1.6 MG)

Reservoir project cost estimates are based on the following assumptions:

No rock excavation included.
No property acquisition costs included.
Construction by private contractors.
Reservoir is welded steel.
An Engineering (ENR) construction cost index of 8738 for Seattle, Washington (12/2008).

Item No.	Description	Estimated Project Cost[1]
1.	Reservoir Structure	$880,000
2.	Site Work	$200,000
3.	Drainage System	$35,000
4.	Geotextiles	$25,000
5.	Access/Parking	$30,000
6.	Yard Piping	$75,000
7.	Electrical	$25,000
8.	Landscaping/Fencing	$50,000
	Total Construction Cost	$1,315,000
	45% Contingency, Administration & Engineering	$592,000
	Total Project Cost	$1,907,000
	SAY	$1,900,000

[1] The cost estimates presented are opinions of cost based on the assumptions stated and developed from information available at the time of the estimate. Final costs for all projects will depend on actual field conditions, on actual material and labor costs, final project scope, project implementation and other variables.

Table C-2
750-Foot Pressure Zone PRV Station Project Cost Estimate Summary

PRV station project cost estimates are based on the following assumptions:

- No rock excavation
- No property acquisition costs included.
- Construction by private contractors.

Item No.	Description	Estimated Project Cost[1]
1.	Vault	$15,000
2.	Valves	$15,000
3.	Fittings	$8,000
4.	Piping	$15,000
5.	Supports/Restraint	$3,000
6.	Excavation/Backfill/Surface Restoration	$5,000
7.	Testing/Calibration	$2,000
	Total Construction Cost	$63,000
	45% Contingency, Administration & Engineering	$28,000
	Total Project Cost	$91,000
	SAY	$100,000

[1] The cost estimates presented are opinions of cost based on the assumptions stated and developed from information available at the time of the estimate. Final costs for all projects will depend on actual field conditions, on actual material and labor costs, final project scope, project implementation and other variables.

Table C-3
Piping Unit Project Cost Summary

Pipe Diameter	Cost per Linear Foot
8-inch	$125
12-inch	$184

Basic Assumptions:

- No rock excavation
- No dewatering
- No property or easement acquisitions
- No specialty construction included
- A 45% contingency, administration and engineering allowance included
- Construction by private contractors
- An Engineering News Record (ENR) construction cost index CCI for Seattle, Washington of 8738 (December 2008).
- Add an additional 60% for construction with rock excavation the entire depth of trench

[1] The cost estimates presented are opinions of cost based on the assumptions stated and developed from information available at the time of the estimate. Final costs for all projects will depend on actual field conditions, on actual material and labor costs, final project scope, project implementation and other variables.

APPENDIX D
Hydrogeologic Assessment and Water Rights Technical Memorandums

MSA

GSI Water Solutions, Inc.

REGISTERED OREGON CHRISTOPHER D. AUGUSTINE G2247 GEOLOGIST

Expires 4/23/10

Technical Memorandum

To: Brian Ginter, PE - Murray Smith & Associates

From: Walter Burt, RG; Chris Augustine, RG

Date: **May 7, 2008**

Re: **City of Veneta Groundwater Supply Evaluation**

Introduction

GSI Water Solutions, Inc.'s (GSI), evaluation of the City of Veneta's (City) municipal groundwater supply system and recommendations for groundwater capacity expansion are summarized in this technical memorandum(TM). The City contracted Murray Smith & Associates, Inc. (MSA), to prepare a Water System Master Plan (WMP) update. GSI, under subcontract to MSA, evaluated conditions affecting the capacity of the City's existing groundwater supply system and identified options for developing additional groundwater source capacity to meet projected future City water demands. The results of our evaluation are summarized in this TM.

The contents of the TM include the following elements:

- Summary of the hydrogeologic setting of the Veneta area
- Discussion of key considerations for future expansion of the City's groundwater supply
- Recommendations for well siting, drilling, and well construction
- Recommendations for operation and maintenance of existing water supply wells

Hydrogeologic Setting

The hydrogeologic setting of the Veneta area, including the geology and characteristics of the primary aquifers in the area, are summarized in this section. This summary is derived from water well reports, published geologic and hydrogeologic reports and the report *Water Well Exploration Study* (Weber Elliott Engineers, P.C., 2001).

The City is located in the southern Willamette Valley, on the eastern margins of the Coast Range. The general location of the City and local physiographic features are shown in Figure 1. Most of the area within the City limits is located in the valley lowlands and thus is topographically relatively flat except for Bolton Hill, located in the southwest corner of the City.

The Long Tom River skirts the northwest portion of the City limits and discharges to the Fern Ridge Reservoir, located near the north edge of the City.

Geology

The geology underlying the City includes a sequence of unconsolidated to poorly consolidated sedimentary deposits of alluvial origin, consisting of clay, silt, sand, and gravel, which overlie older consolidated marine sedimentary units of the Tyee Formation (Frank, 1973). The shallow alluvial sedimentary deposits have been previously described as the Older alluvium unit (Frank, 1973) and, more recently, the middle sedimentary unit (Conlon et al., 2005). The alluvial sediments generally are thought to represent alluvial fan and braided-plain gravels of Pliocene to Pliestocene age.

The shallowest unit of the alluvial sediments is generally described as a silt or clay unit in driller's logs and is up to 40 feet thick. Underlying the clay unit is a sand and gravel unit up to 140 feet thick, which is interspersed with lenses of sand, silt, and clay. The sand and gravel apparently become more consolidated with depth and sometimes are described as cemented or as "sandstone." Underlying the alluvial sedimentary deposits is a unit generally described as blue clay or shale in drillers logs; this unit is interpreted to be the Tyee Formation. The Tyee Formation is exposed at the surface west and southwest of Veneta, at Bolton Hill and Rocky Butte, respectively. Geologic cross sections based on well log information from Oregon Water Resources Department (OWRD) near the City are shown in Figure 2 and Figure 3. OWRD water well reports used to develop these cross sections are included in Attachment A.

Hydrogeology

The hydrogeology of the Eugene-Springfield area (including Veneta) was previously described by Frank (1973). GSI reviewed drilling logs of wells to develop a more localized conceptual model of the shallow subsurface geology in the area near Veneta. While some driller's logs have noted the occurrence of groundwater in the uppermost silt/clay unit, and the older marine sediments may yield a moderate amount of generally poorer quality water, the saturated alluvial sand and gravel unit described above is the primary groundwater source near the City. The saturated thickness of the sands and gravels comprising this primary alluvial water-bearing unit (hereafter referred to as the alluvial water-bearing unit) ranges from approximately 60 to 140 feet near the City's existing wells.

Based on a review of the drilling logs, groundwater generally is encountered at depths of 40 to 70 feet below ground surface (bgs) in the alluvial water-bearing unit. Static water levels in the unit vary across the study area from approximately 20 to 70 feet bgs. The general groundwater flow direction is toward the east-northeast, based on previous investigations (Frank, 1973; DHS and DEQ, 2000). The observed groundwater flow direction suggests that recharge of the alluvial sediments from infiltration of precipitation and surface runoff occurs in upland areas to the west and southwest of Veneta. The alluvial sediments also may receive some recharge from the deeper marine Tyee Formation. During drilling, static water levels are observed to rise above the depth where water is first encountered, indicating that the alluvial water bearing zone is under semi-confined to confined conditions. Observations of diurnal water level fluctuations in pump test data indicate barometric changes affect water levels in wells, which also is indicative of confinement of the aquifer.

Information provided on the water well reports and a review of available water supply reports and publications were used to identify representative storativity and transmissivity values for the alluvial water-bearing unit. Transmissivity is defined as the rate at which water is

transmitted through a unit width of an aquifer or confining bed under a unit hydraulic gradient. Storativity is the volume of water an aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in head. Where observation wells are available, the storativity of the aquifer and lateral variation in transmissivity also can be estimated from analysis of aquifer test data. Higher values for transmissivity would indicate higher potential well yield.

Transmissivity values derived from a review of the literature were approximately 7,000 gallons per day/foot (gpd/ft) for the alluvial water-bearing unit (DHS and DEQ, 2000). Transmissivity of the alluvial water-bearing unit also can be estimated using specific capacity data. The specific capacity, which is a measure of the overall productivity of the well, is dependent on both aquifer productivity and well efficiency. The specific capacity is expressed in terms of pumping rate per unit of drawdown, such as gallons per minute per foot (gpm/ft) of drawdown, and is calculated by dividing the flow rate by the drawdown.

The higher the specific capacity, the more effective the well is at producing groundwater and generally the more transmissive the aquifer. The specific capacity of Pilot Well B was 5 gpm/ft and Wells 4 and 9 are 8.3 to 9.7 gpm/ft of drawdown, which results in estimates of 7,500 to 18,000 gpd/ft for aquifer transmissivity in this area using the approximation method of Driscoll (1986). Storativity values for the alluvial water-bearing unit have not been determined. However, an average storativity value for a confined aquifer is approximately 1 $x10^{-4}$ ft/ft (Driscoll, 1986).

Higher capacity water supply wells constructed in the primary alluvial water-bearing unit have reported yields of up to 500 gpm, but most produce less than 200 gpm. Domestic wells completed into the underlying marine sediments generally have much lower yields, commonly less than 10 gpm.

City Wells

The City currently operates four wells (Wells 4, 9, 10, and 11) to meet its water demand. The active wells have a combined permitted capacity of 1,058 gpm and a reported capacity of 1,000 gpm. The City has abandoned several wells and deactivated several others because of performance or water quality issues. In 2008, the City installed two new wells (Wells 11 and 12) to increase available capacity. Both of these wells produce relatively low yields; however, Well 11 has been brought online and is currently active. Well 12 is anticipated to be brought online during the winter of 2008/2009 with a design pumping capacity of 225 gpm. Table 1 summarizes the available information for the City water supply wells.

Based on the limited information regarding well construction details, pumping data, and static and pumping water levels for the City's operating wells, it appears that the wells may be vulnerable to overpumping, resulting in excessive drawdowns in the wells. Overpumping of Well 9, and possibly Wells 4 and 10, results in dewatering and exposure of the upper portions of the screens to air. Data for Wells 11 and 12 were not available to evaluate operational pumping levels, but based on 24-hour aquifer test data it would appear that the screens would be dewatered under proposed operational pumping rates. Cyclic dewatering of the screen and aquifer promotes conditions favorable to well clogging as a result of bacterially induced precipitation, which in turn may reduce the productivity of the well. Although the cause is not known, recent pumping data from Well 9 indicate that the specific capacity may have declined by 25 percent from what was originally reported (Table 1).

Groundwater Supply Expansion

We understand that the City plans to add water supply capacity to provide redundancy to its system and to meet projected future demands. This section summarizes some of the considerations for selection of new well sites to increase the City's groundwater source capacity. Key considerations include: (1) potential well yield based on existing well data and the saturated thickness of coarse (sand and gravel) alluvial deposits, (2) potential for substantial interference with surface water, (3) water quality, (4) well interference, and (5) available infrastructure. This section does not include consideration of land ownership.

The focus of our groundwater supply expansion evaluation was the area within the City's urban growth boundary (UGB). However, areas outside the UGB toward the east also hold potential if the City should elect to explore options for augmenting its supply in that direction.

Well Site Selection

Saturated Thickness, Available Drawdown, and Long-Term Aquifer Trends

The saturated thickness and available drawdown in the primary alluvial water-bearing unit are two key hydrogeologic criteria for identifying promising locations for new groundwater supply wells. These criteria determine potential well yields. Thicker sequences of sand and gravel are likely to transmit more water to a well and, in part, provide for greater available drawdown. Available drawdown is the difference between the static water level of the well and the depth above the pump intake required to maintain operation of the pump; greater available drawdown allows higher pumping rates.

Available well information indicates that greater thicknesses of the alluvial water-bearing unit are present along an east-west axis through the City, and tend to thicken toward the east and southeastern portion of the City (Figures 2 and 3). The unit thins significantly toward the western edge of the City (Figure 3), as well as in a southwestern direction (Figure 2). Some thinning of the unit also is noted in a northwestern direction, near Wells 10 and 11 (Figure 2).

Based solely on the thickness of the alluvial water-bearing unit, the more favorable locations for installation of a water supply well appear to be within the eastern half of City limits, south of the railroad line. Three of the four City wells with the highest specific capacities, including Wells 4, 9, and 12, are located along the axis of greater thicknesses of coarse alluvial sediments in the eastern half of the City.

Limited data are available regarding the long-term viability of the groundwater resource. The nearest OWRD observation well (Lane 14470) is located south of Veneta, but is completed in the Tyee Formation. The nearest OWRD observation well (Lane 13501) completed in alluvial material is located east of the Fern Ridge Reservoir, approximately 6 miles from the City, and shows a generally stable groundwater level with a seasonal fluctuation of approximately 10 feet. The OWRD Watermaster for Lane County, Mike Mattick, has stated that groundwater from the alluvial aquifer is not closed to appropriation, indicating that OWRD does not believe that the resource is being overdrawn under current pumping withdrawals.

Although there are no indications that the groundwater resource currently is being overdrawn, the long-term pumping capacity of the aquifer cannot be determined from available data. We recommend that the City actively maintain records of water levels to compare with withdrawals and precipitation trends to allow evaluation of the response of the aquifer to pumping stresses.

This will allow evaluation of potential impacts to the aquifer as a result of increased pumping and the pumping capacity of the aquifer. In particular, we recommend that groundwater levels be measured under nonpumping conditions on a semi-annual to quarterly basis at non-pumping wells, such as Pilot Well 11, and at pumped wells as required under the applicable water right permits. More frequent measurements, such as might be obtained from well instrumentation and a SCADA system would provide higher resolution data regarding the response of the aquifer to pumping and potential well interference. Better understanding of well interference would facilitate efforts in optimizing pumping operations.

Groundwater-Surface Water Connection

Because of the shallow depth to groundwater in the region, hydraulic connection to surface water is a potential concern. Oregon Administrative Rules (OAR) 690-009 provides criteria for making determinations whether wells have the potential to cause substantial interference with surface water supplies or are in hydraulic communication. All wells located a horizontal distance less than ¼ mile from a surface water source that produce water from an *unconfined* aquifer are presumed to be hydraulically connected to the surface water source, unless satisfactory information or demonstration indicates the contrary. During review of a transfer application to add Well 10 to an existing water right, OWRD issued a determination that Well 10 has a potential to cause substantial interference with nearby surface water based on the proximity of Well 10 to the surface water. The City subsequently challenged this determination and provided additional data in support of the transfer. OWRD concurred that the potential for interference was low based on the geology of the area and has approved the water right transfer.

Several surface water drainages are located within the City limits. Oregon Department of Human Services (DHS) and Oregon Department of Environmental Quality (DEQ) (2000) noted that there was evidence for groundwater discharge to surface water along the West Fork of Coyote Creek and an unnamed stream in Section 31 of T17S R5W. Wells 4 and 9 are within ¼ mile of the unnamed stream. However, the available geologic information indicates that the aquifer is confined to semi-confined and a low permeability clay unit approximately 40 feet thick underlies most of the area within the City, separating the alluvial water-bearing unit from shallow surface waters within the City. It is our opinion that a strong case can be made that the alluvial water-bearing unit is confined and not directly connected to shallow surface water bodies within the City. However, the City should not invest any resources in completion of a well located within ¼-mile of a surface water body until OWRD has concurred with this opinion.

Water Quality

The City wells completed in the alluvial water-bearing unit generally produce water with iron concentrations ranging from 0.37 to 3.7 milligrams per liter (mg/L), which exceed the secondary drinking water standard of 0.3 mg/L. Because of the presence of iron in the groundwater over a widespread area within the City, treatment likely will be required for any new groundwater source that is developed. Although the understanding of the distribution of iron in groundwater in the City is limited, available information suggests that iron concentrations may be somewhat lower in the western and southern portions of the City. This type of distribution suggests that iron concentrations are lower in upgradient portions of the flow path, nearer to recharge areas.

Based on a review of DHS data, Well 8 also had minor water quality issues associated with sodium and chloride. Sodium concentrations in Well 8 were greater than 100 mg/L, or five times the recommended drinking water standard. The OWRD water well report indicates that Well 8 was constructed with a portion of the borehole open to the Tyee Formation, likely resulting in mixing of poor quality water from the Tyee Formation with water from the alluvial water-bearing unit. Finally, Well 1 had low-level detections of perchlorethylene based on data available from the DHS public water system database. Wells 1, 3, 5, and 8 are listed as abandoned. Wells 2 and 7 currently are inactive.

DHS and DEQ (2000) performed a Source Water Assessment (SWA) to identify potential contaminant sources that have the potential to affect Wells 4 and 9 in the event of a release. An updated review of identified sources should be performed before final selection of any future well location. Additionally, the City may want to confer with DEQ and other state agencies to identify any new potential contaminant sources since the original SWA was completed.

Existing Infrastructure and Well Spacing

New wells ideally would be placed at locations suited to utilize existing water treatment facilities and conveyance because of the high cost to construct separate treatment and conveyance for each additional increment of capacity. Based on this consideration, ideal new well sites would be near existing water treatment facilities at Wells 4, 9, and 10. However, a significant drawback to locating new wells close to existing wells or to each other is the increased potential for excessive well interference drawdowns, which may limit or reduce individual well capacities.

GSI completed a preliminary estimation of potential interference drawdowns to evaluate potential effects from placement of new wells near existing facilities. A simple quantitative approach using the Theis equation (Driscoll, 1986) was used to predict the potential drawdown at varying distances from a pumping well. The Theis equation predicts the cone of depression (i.e., drawdown) at some distance from a pumping well based on the transmissivity, storativity, pumping rate, and duration. Table 2 summarizes the estimated drawdown depth (in feet) caused by a well pumping 200 gpm at increasing distances from the well for an expected range of values for transmissivity and storativity. For illustration purposes, interference drawdowns at a new well located 250 feet from the pumping well are estimated to range between 11 and 25 feet. If the new well had a specific capacity of 8 gpm/ft (typical of Wells 4, 9, 10, and 11), the potential unrealized capacity of the new well could range between 88 and 200 gpm because of interference drawdown caused by the existing pumping well. In actuality, joint operation of the wells would result in capacity losses in both wells.

Based on our analysis, the potential interference drawdown in wells that are located in close proximity drawing from the alluvial water-bearing unit is significant. When the potential interference is factored in with the limited available drawdown in the alluvial water-bearing unit, new water supply wells should be located as far as practicable from existing public water supply wells to minimize interference.

Preferred Areas for Well Site Exploration Within the UGB

GSI identified two potential areas within the UGB to be evaluated for construction of a new water supply well, based on the criteria discussed in the prior sections. These general areas are shown in Figure 4, and a brief description of each location and a summary of the rationale for selection are presented below.

Area 1: West of Huston Road and south of Hunter Road (17S 5W 31)

This location encompasses the area west of Huston Road and south of Hunter Road, which is south and southwest of Well 9 and south of Well 4 (Figure 4). Available well log information indicates that the saturated thickness of sand and gravel in the alluvial water-bearing unit generally is greater here than in other portions of the study area. Specific capacity data from Wells 4 and 9 and Pilot Well B indicate a potential for higher transmissivity in this area. Potential interference from existing Wells 4, 9 and 12should be considered in identifying a candidate well site in this area. Because of a low density of development in this area, the potential for interference with domestic water wells is low. U.S. Geological Survey topographic maps indicate the presence of surface water drainage in this area, which may trigger an OWRD review during processing of the water right transfer or application.

Area 2: Near Broadway and 2nd Street (East of abandoned City Well 8)

A review of the geology in this area indicates the presence of a significant saturated thickness of coarse alluvial sediments. Potential interference from existing Wells 4, 11, and 12 should be considered in identifying a candidate well site in this area. A greater density of domestic wells occurs in this area and therefore well interference effects from domestic wells are a possibility, and nearby domestic wells completed in the alluvial aquifer likely would experience interference from a City production well. However, because of the lower water demands and pumping rates for a domestic well, the potential effects of well interference on a City production well should be minimal. One additional siting requirement should be to locate the well greater than ¼ mile from the surface water feature that drains into Fern Ridge Reservoir, to avoid triggering a hydrogeologic review by OWRD.

Potential Areas for Expansion Outside the UGB

A cursory evaluation of the potential for developing additional groundwater source capacity outside the City's UGB is summarized in this section. Although, the extent and thickness have not been thoroughly evaluated, it appears the alluvial aquifer is thinner to the south and west of the City, where older marine rocks are exposed at the surface at Bolton Hill, indicating a low potential for groundwater source development in this direction.

Expansion to the east, northeast, or southeast of the City appears to be possible based on the observed aquifer thicknesses in Figures 1 and 2. The limiting factor for expansion in these directions may be the presence of surface water bodies. However, OWRD reviewed the water right transfer at Well 10 and agreed that groundwater and surface water were not connected. A review of well logs indicates yields of up to 100 gpm (LANE 548) in a northerly direction.

Substantial thicknesses of the sand and gravel are present just southeast of the UGB, based on well log LANE 1523 (Figure 2). Expansion to the south of the UGB may be limited because of the presence of the West Fork of Coyote Creek, which DHS and DEQ (2000) found to be connected to shallow groundwater. Additionally, Frank (1973) indicated that the older alluvium in the vicinity outside of Veneta had slightly lower yields than the aquifer near the City.

Well sites should be selected with regard to distance from existing or planned conveyance, land ownership, and distance from surface water. Although OWRD has agreed that Well 10 does not substantially interfere with nearby surface water, there may be other surface water bodies that

are in direct connection with the alluvial aquifer unit. Consequently, selected well sites should be at least ¼ mile from existing surface water bodies.

Exploratory Drilling and Production Well Construction Program

Approach

The actual hydrogeologic conditions at any particular location within the well site exploration areas outlined in Figure 4 are uncertain. For example, the bedrock surface of the Tyee Formation is highly irregular across the study area, resulting in variability in the thickness and nature of the overlying alluvial sediments. Consequently, we recommend that the City complete exploratory borings at each potential well site under consideration within the areas described above. Each boring could be abandoned upon completion of data collection or completed as an observation well if a production well was to be installed at the site.
We recommend advancing exploratory borings using rotosonic drilling equipment because the technique results in good geologic sample quality, and is well-suited for both hydraulic testing of potentially productive intervals and water quality sampling. The technique allows collection of continuous cores, which provides good control on geologic conditions and may allow pre-design of a screen for a production well drilled at the same site. Also, short duration hydraulic testing of potentially productive intervals within the aquifer can be completed to evaluate aquifer productivity. The hydraulic testing would be accomplished by installing a temporary screen, withdrawing the casing to expose the screen and pumping the borehole while measuring water levels. Additionally, water quality samples may be collected for colorimetric estimates of iron concentrations at different depth intervals. The screen then can be removed and the borehole further advanced until the underlying bedrock of the Tyee Formation is encountered.

Completion of the exploratory borings will reduce uncertainty and thus risk associated with investing in a production well at a given site by helping identify the highest yield intervals, provide data for well interference analysis, and provide samples for soil gradation analysis and water quality testing. We recommend that the City contract an Oregon-registered geologist with requisite well design and testing experience to supervise the drilling, completion, testing, and sampling of the exploratory borings.

Production Well Drilling

We recommend that future production wells be drilled either with cable tool or drill-through-casing air rotary techniques, preferably using reverse circulation techniques. During drilling, subsurface samples should be collected at discrete intervals throughout the encountered saturated thickness. The samples will be used to perform soil gradation analysis on intervals identified as water bearing zones in the sand and gravel. We recommend that the City contract an Oregon-registered geologist with requisite well design and testing experience to supervise the drilling, screen design, and testing of the production well(s).

Production Well Design

Because of the limited saturated thickness of the shallow aquifer in the Veneta area, a properly designed, developed, and constructed well is critical to maximize the well yield and extend the life of the well. We recommend that future wells include the following design elements:

- A continuous wire-wrap screen with a slot size selected to retain the formation or selected filter pack gradation while maximizing screen capacity

- A screen interval over the coarsest grained sedimentary intervals, including sand if it is not too fine
- A deep screen interval to maintain the pumping level above the screen and maximize available drawdown
- Casing and borehole diameters sufficient to allow the installation of a pump capable of up to 500 gpm

While perforated casing is a less expensive construction alternative to wire-wrap screen, it also typically has three to five times less open area. The lower percentage of open area restricts groundwater flow to the well, increasing the entrance velocities into the well and head losses, ultimately resulting in a less efficient and lower yielding well. Given the limited available drawdown in the alluvial water-bearing unit, minimizing head losses during pumping is important for maximizing well yields. Significant head losses are evident in the pump testing curves for Pilot Well B and Pilot Well C (Attachment B), both of which are perforated. The nearly immediate stabilization of drawdown at the start of pumping coupled with observation of the nearly instantaneous recovery of the water level at the termination of pumping is typically the sign of an inefficient pumping well.

Ideally, a well can be designed so that the pump intake is set at a depth that maintains a pumping level above the screen (or perforated) interval in the well. Most of the City wells have relatively shallow tops of screens. For example, the top of the screen in Well 10 is at a depth of 40 feet bgs and data we reviewed suggest that the pumping water level in three operating wells (Wells 4, 9, and 10) and newly constructed Wells 11 and 12 may be below the top of the upper screen in one or more of these wells. In general, it is recommended to avoid drawing the water level down below the screened or perforated interval in a well. Continual dewatering of the well screen has been observed to result in plugging, bio-fouling (i.e., iron-reducing bacteria) and loss of well yield, especially in wells which yield water with elevated iron and mineral content. Periodic testing of water quality for the presence of iron-reducing bacteria and other microbiota will help identify the potential for bio-fouling.

Many of the City wells have multiple screen or perforated intervals with tens of feet of screen. It is our opinion that shorter screens may be advisable to maximize available drawdown while providing sufficient design flow rates, assuming that adequately productive aquifer materials are present at deeper intervals. For example, based on the observed yields of the City wells, only 5 feet of 0.050 slot wire wrap screen would be required to yield 200 gpm and still maintain entrance velocities below the recommended 0.1 foot/second to 1.5 feet/second (AWWA, 2006). Further, a shorter screen, set at a greater depth, will provide for more available drawdown, thus increasing the sustainable pumping rate of the well, particularly where well interference is an issue. Reducing the length of screen also results in cost savings during construction. Another design consideration would be to install a sump at the bottom of the well and place the pump intake within the sump. This approach has been used to maximize available drawdown in communities with challenges similar to Veneta.

Well Operations

Well Performance Data Collection

We recommend that the City consider installing instrumentation at existing and future wells to automate data collection, including flow rate, total volume pumped, water level below ground

surface and above the pump intake, pump on and off times, system pressure, and motor amperage and voltage. These data will provide crucial information for the following diagnostics: (1) identify well and pump performance trends to evaluate rehabilitation or maintenance needs, (2) identify when the well is being overpumped through comparison of the pumping level relative to the top of screen, (3) monitor water level trends, which will aid in evaluating the pumping capacity of the aquifer, and (4) evaluate well interference effects to optimize well field pumping capacity.

We also recommend that the City consider implementing periodic well performance testing to identify potential well performance degradation so that timely corrective actions can be implemented to prevent permanent capacity losses. For example, empirical evidence indicates that rehabilitation generally is not successful in restoring a well to its original capacity if capacity losses exceed more than 25 percent as a result of clogging or incrustation. To establish a baseline for future performance comparison, we recommend completing a step-rate pumping test at Wells 4, 9, and 10. A step-rate test measures the drawdown within the pumping well at various pumping rates. As the step-rate test is performed, the pump and motor condition also can be evaluated to determine if the pumping system has lost capacity. This requires the measurement of total dynamic head (discharge pressure, elevation of pressure gauge and water level in the well), and amperage and voltage at the pumping electrical panel over each pumping rate step. These observations then can be plotted and compared to the original pump curve supplied by the vendor to see if the pump has undergone significant wear.

If decreases in well performance approach 25 percent and/or the presence of significant iron-reducing bacteria populations are observed, we recommend that a well rehabilitation program be implemented to maintain well yield. A typical well rehabilitation program includes the following:

- Removal/reinstallation of the pumping system
- Video survey of the well and well screen to document the screen condition, identify zones of increased plugging and bio-fouling
- Mechanical rehabilitation of the well using brushing, bailing, surging, and pumping to remove fines, encrustation, and biomass from the screen and filter pack
- Super chlorination of the well to control bacterial populations

More intensive well rehabilitation techniques utilize the introduction of acids and polymer chemicals into the well in addition to mechanical rehabilitation. Costs associated with performing chemical rehabilitation are significant compared to simple mechanical rehabilitation. Chemical rehabilitation generally is attempted only in deeper wells that have experienced significant loss of production because the cost of replacing the well is significantly more expensive than rehabilitation. Rehabilitation, whether mechanical or chemical, is not guaranteed to recover the production capacity of the well; however it generally will prevent further loss of well yield. Performing periodic mechanical rehabilitation every 2 to 5 years is recommended for wells completed in alluvial aquifers (Driscoll, 1986).

Water Quality Testing

The high iron content in the water around Veneta and operational characteristics of the existing wells increases the potential for iron-reducing bacteria and other bacteria species to affect water supply well performance, particularly in wells that are overpumped enough to expose the screen. Bacteria species can lead to loss of well yield and taste and odor issues within groundwater wells. GSI recommends submitting water quality samples for analysis of iron-

reducing bacteria, which is relatively easy and inexpensive and can be performed by City personnel. In addition, we recommend that the City collect field water quality data when conducting water quality sampling of wells. Field data should include pH, oxidation reduction potential (ORP), dissolved oxygen, temperature, and conductivity. These data will help in evaluating the nature and distribution of geochemical properties that control iron occurrence (e.g., pH and ORP) within the aquifer, which may be used to select well sites with regard to minimizing iron concentrations in raw water produced from the wells.

Summary of Recommendations

Based on increased projected capacity requirements from 1.5 million gallons per day (mgd) in the present to 4.5 mgd in 2030, it is our opinion that the full future demand needs of the City cannot be met solely by development of groundwater sources within the UGB. We recommend that the City implement (1) a groundwater development and groundwater system asset management program to maximize reliable groundwater source capacity within the UGB, and (2) begin to evaluate groundwater source expansion outside the UGB, in the area between the City and the City of Eugene. These recommendations are summarized as three general tasks:

- Groundwater expansion within the UGB
- Groundwater expansion outside the UGB
- Wellfield Operation and Management Program

Groundwater Supply Expansion within the UGB

GSI identified two potential areas to be evaluated for drilling and construction of a new water supply well. These general areas are shown in Figure 4 and are listed below:

1. West of Huston Road and south of Hunter Road (17S 5W 31)
2. Near Broadway and 2nd Street (East of abandoned City Well 8)

We recommend advancing exploratory borings at selected well sites using rotosonic drilling techniques before drilling a new production well. Each boring could be abandoned upon completion of data collection or completed as an observation well if a production well was to be installed at the site. The following summarizes our recommended program for identifying suitable sites and drilling one production well within the UGB:

- Contact land owners for access agreements (or easements) to perform exploratory drilling at preferred locations.
- Contract with exploratory drilling subcontractor.
- Perform exploratory drilling with rotosonic drilling methods.
- Review subsurface, water quality, and hydraulic data for the three exploratory wells.
- Provide recommendations for production well location and design.
- Submit groundwater rights application to OWRD for groundwater rights transfer\appropriation of water (this will include evaluation of a potential surface water connection).
- Acquire land (or easement agreement) at preferred production well location.

- Submit plans to DHS for approval of production well design.
- Contract production well drilling subcontractor.
- Drill, install, and develop production well sized for 250- to 500-gpm capacity.
- Perform pumping test at new production well.
- Provide pumping test interpretation and recommendations in a TM for target pumping rate at the new well and, if interference is a concern, target pumping rates for nearby existing wells.
- Install pumping system, conveyance, and treatment, and connect to the system.

Groundwater Supply Expansion Outside the UGB

The shallow alluvial aquifer present within the UGB also is present in areas east of the City, although the thickness and productivity of the unit is uncertain and would need to be evaluated. A well siting study focusing on target areas outside the UGB would need to be performed to identify locations for expansion. The following sections summarize our recommended program for identifying suitable sites, and exploring and developing each site outside the UGB.

Well Siting Study

We recommend completion of a groundwater feasibility and well siting evaluation before initiating any drilling in areas that the City may contemplate for exploration and expansion of the City's conveyance system. The general scope of the evaluation is as follows:

- Identify target areas near Veneta and along the proposed pipeline route.
- Review OWRD water well reports, water rights, land use, and available published and unpublished data and reports.
- Contact OWRD, DHS, and DEQ staff regarding target locations.
- Summarize finding and make recommendations for target locations based on hydrogeology, surface water, land use, and proximity to proposed pipeline.

Exploratory Drilling and Production Well Installation

- Contact land owners for access agreements (or easements) to perform exploratory drilling at preferred location.
- Contract with exploratory drilling subcontractor.
- Perform exploratory drilling with rotosonic drilling methods.
- Review subsurface, water quality, and hydraulic data for the each exploratory well.
- Provide recommendations for production well location and design.
- Submit groundwater rights application to OWRD for groundwater rights transfer\appropriation of water (this will include evaluation of a potential surface water connection).
- Acquire land (or easement agreement) at preferred production well location.
- Submit plans to DHS for approval of production well design.

- Contract production well drilling subcontractor.
- Drill, install, and develop production well.
- Perform pumping test and water quality sampling at new production well.
- Provide pumping test interpretation and recommendations in a technical memorandum for target pumping rate at the new well for pump selection and target pumping rates for nearby existing wells if interference is a concern.

Operation and Maintenance of Existing Wells and Wellfield

A review of data that the city collects from it groundwater wells indicates that an operation and maintenance program should be implemented. As part of the program, we suggest an increase in both the frequency of data collection and additional data collection to allow evaluation of the wellfield and aquifer system. The initial step of the program should be to equip wells to collect data with which to evaluate performance trends. The next step would be to establish a baseline of well and pump performance against which to compare future trends. Our recommended program for well field management is outlined below.

Well Instrumentation and Baseline Data Collection

- Survey new and existing well locations including multiple elevation control locations such as top of casing, measuring point elevation, and ground elevation (e.g., pumphouse floor).
- Replace airlines with dedicated water level sounding ports to allow manual water level measurements accurate to 0.01 of a foot. Incorporate dedicated water level sounding ports in the design of new water supply wells.
- Install instrumentation at wells to automate data collection including flow rate, total volume pumped, water level below ground surface and above the pump intake, pump on and off times, system pressure, and motor amperage and voltage. Data frequency should be increased to adequately evaluate pumping trends, pumping optimization, aquifer trends, and well interference.
- Conduct baseline performance testing of all the wells, including measuring the system back pressure, depth to water, discharge, amperage, voltage, and power factor at multiple total dynamic heads and flow rates to document that the pump is still operating within its designed capacity. The depth to water and flow rate information will be used to evaluate well specific capacity and well efficiency.
- Conduct additional pump testing at the existing wells to evaluate the potential well interference.
- Collect groundwater quality samples for groundwater conditions, general chemistry, and bacterial analysis. This will allow for the presence of bacterial species and evaluation of the potential for bio-fouling to occur.

The baseline information will allow interpretation pump and well performance, wellfield capacity, and long-term trends within the shallow aquifer supply.

Wellfield Operations Monitoring and Maintenance

- Begin monitoring water levels in both pumping and non-pumping wells. The water level data should be collected on a quarterly basis, or more frequently as additional

wells are brought online during groundwater system expansion. The data should be reviewed on an annual basis by a hydrogeologist to determine long-term groundwater trends and well capacity issues.

- Conduct annual step-rate testing of the wells to identify decreases in well or pumping system performance.
- Conduct quarterly water quality testing at existing wells for general water quality including submitting a water sample for bacterial analysis. Additionally, to evaluate iron and manganese trends, the City should consider purchasing Hach colorimetric test kit.
- Implement a periodic well evaluation program to identify wells for rehabilitation based on observed decreases in well performance, observed fouling when pumps are removed and water quality results. Rehabilitate wells before well performance decreases more than 25 percent from baseline.
- When pumping systems are removed for maintenance or replacement, conduct a downhole well video survey and well rehabilitation/redevelopment, if necessary.

Wellfield Operation Optimization and Wellhead Protection

The City should consider development of a simple calibrated numerical groundwater flow model in the future to better evaluate long-term aquifer pumping capacity, optimize wellfield capacity, and to support a wellhead protection program. Numerical groundwater models are tools used to evaluate groundwater expansion alternatives, in addition to allowing ongoing evaluation of the existing aquifer and wellfield system capacity. As the City expands groundwater production, the model could be refined using information from the exploratory drilling program. Ultimately, we recommend that the City develop an updated wellhead protection program using delineated capture zones from the model.

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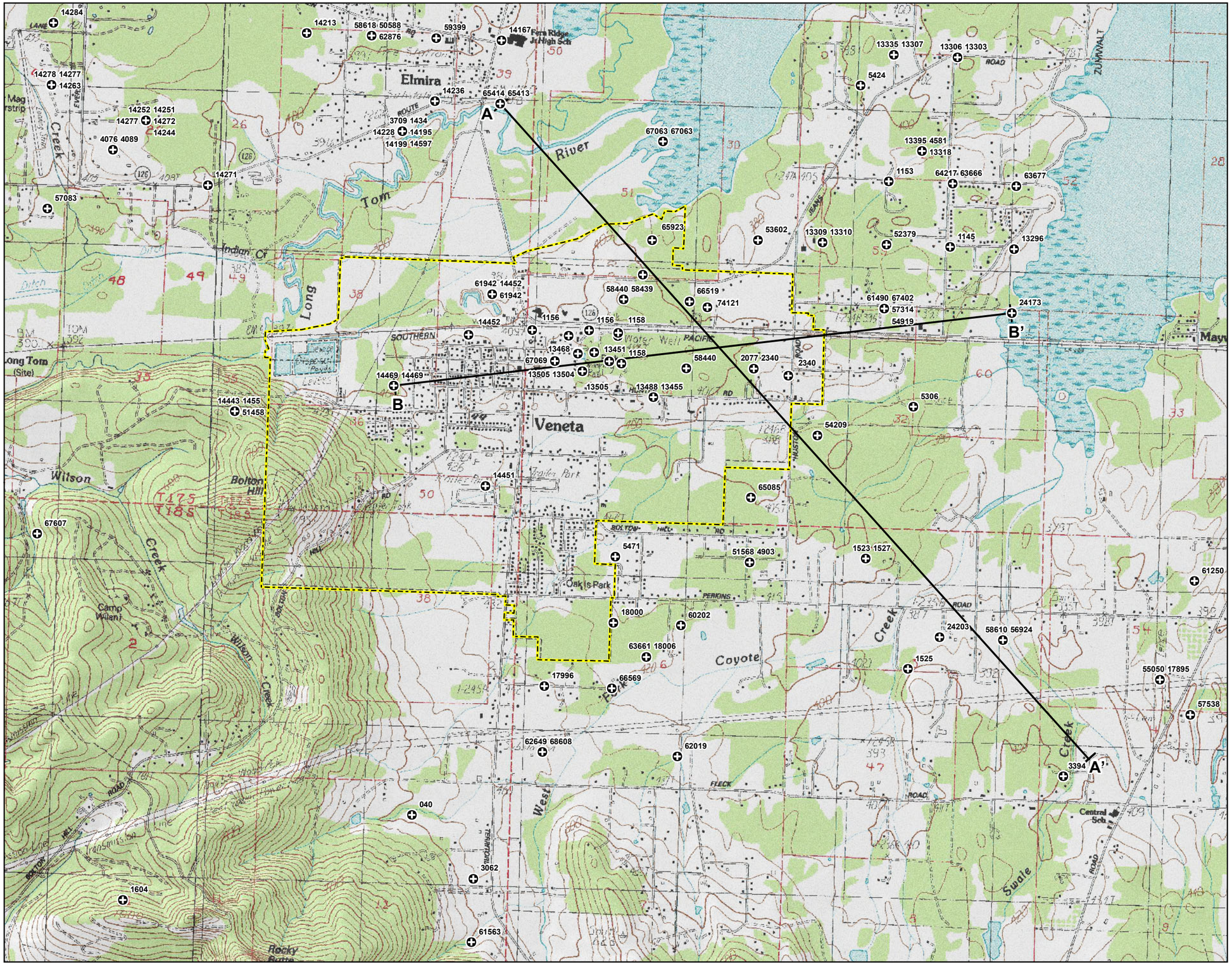


FIGURE 1

Study Area
Groundwater Supply Evaluation

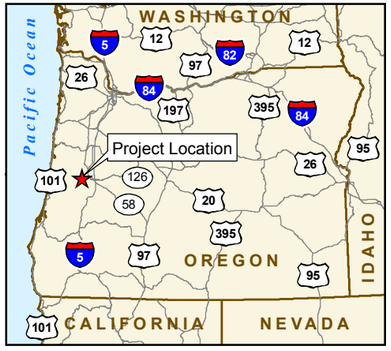
City of Veneta
Lane County, Oregon

LEGEND

52379
Locations of Select Wells with OWRD Well Number for Lane County

Cross Sections

Veneta City Limits



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Scale
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0 1000 2000 3000 4000
Feet

MAP NOTES:
Projection: Oregon State Plane South Zone
Datum: North American Datum of 1983
Date: October 28, 2008
Data Sources: OWRD, Oregon Geospatial Data Clearinghouse

GSI Water Solutions, Inc.

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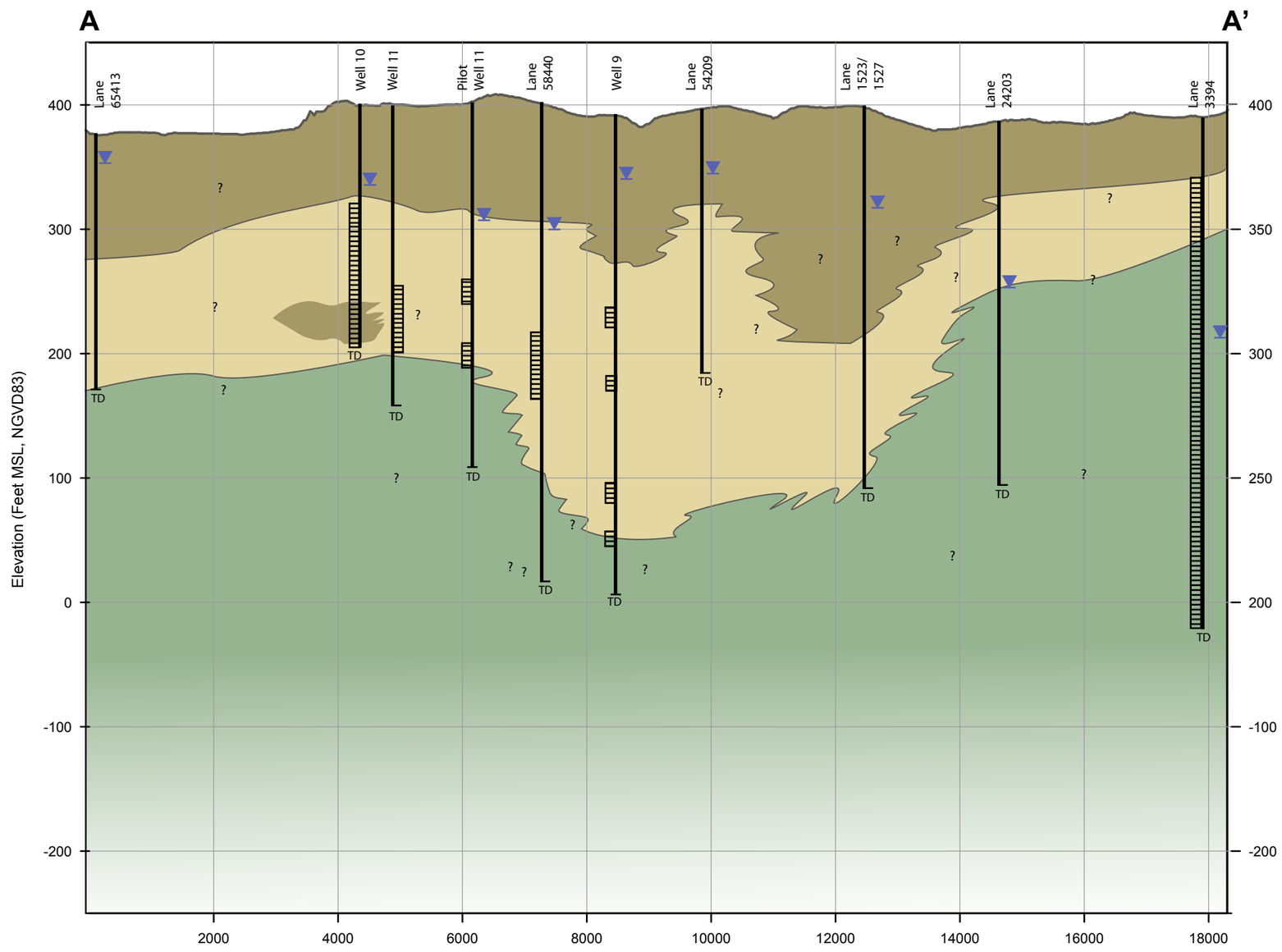

FIGURE 2

Cross Section A - A'
Groundwater Supply Evalution

Lane County, Oregon

LEGEND

- Sand and Gravel
- Clay, Sandy Clay, Silt
- Marine Sediments, Tyee Formation
- Inferred Contact
- ? Estimated Contact
- Surface Elevation
- Static GW Level
- Screened Interval or Perforated

Scale

Horizontal: 1" = 2000'
Vertical: 1" = 50'

MAP NOTES:
Projection: None
Datum: None
Date: August 8, 2008
Data Sources: USGS, OWRD, City of Veneta

GSI Water Solutions, Inc.

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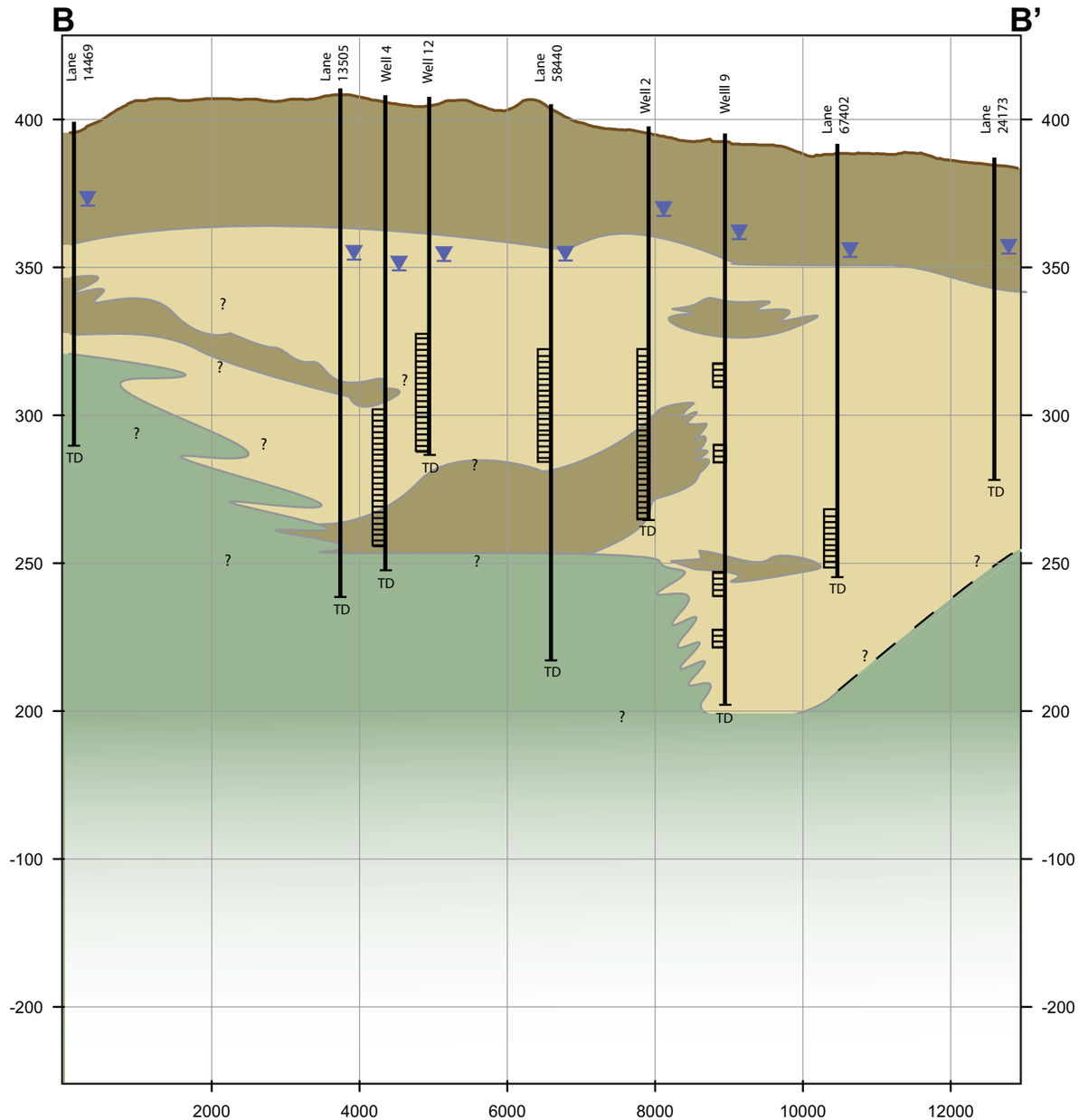
FIGURE 3

Cross Section B - B'

City of Veneta
Lane County, Oregon



LEGEND

- Sand and Gravel
- Clay, Sandy Clay, Silt
- Marine Sediments, Tyee Formation
- Inferred Contact
- ? Estimated Contact
- Surface Elevation
- Static GW Level
- Screened Interval or Perforated

N

Scale

Horizontal: 1" = 2000'
Vertical: 1" = 100'

MAP NOTES:
Projection: None
Datum: None
Date: August 8, 2008
Data Sources: USGS, OWRD, City of Veneta

GSI Water Solutions, Inc.

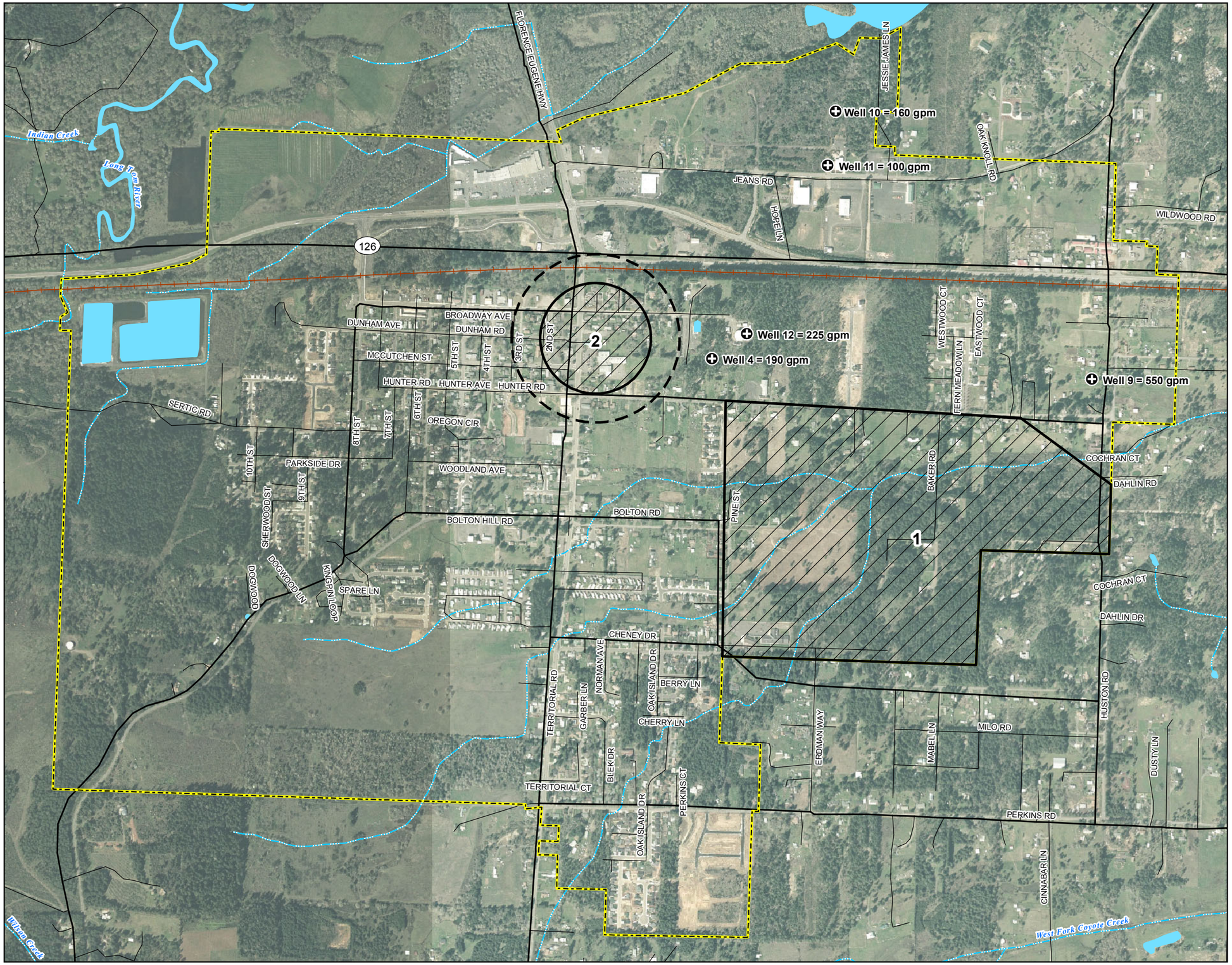


FIGURE 4

High Priority Well Locations Groundwater Supply Evaluation

City of Veneta
Lane County, Oregon

LEGEND

- Potential Well Locations
- .25 Miles From Surface Water
- Existing City Wells
- Veneta City Limits
- Railroads
- Watercourses
- Waterbodies

N

Scale
1:12,000

0 500 1000 1500 2000
Feet

MAP NOTES:
Projection: Oregon State Plane South Zone
Datum: North American Datum of 1983
Date: February 19, 2009
Data Sources: Oregon Geospatial Data Clearing-house, Aerial Photo taken in 2004 by LCOG

GSI Water Solutions, Inc.

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Table 1. City of Veneta Well Summary Table

City of Veneta Hydrogeologic Evaluation

Well Number	OWRD Well Designation	Date Constructed	Public Land Survey Location	Easting	Northing	Total Depth (feet bgs)	Coarse-Grained Facies Thickness (feet)	Pumping Rate	Initial Specific Capacity (gpm/ft)	2008 Specific Capacity (gpm/ft)*	Open Interval	Type of Openings	Status	Comments
Production Wells														
1	LANE 13450	1967	17S 5W Sec. 31	NA	NA	124	>78	190	3.3 (24-hr)	NA	79 - 119	V-wire screen	Abandoned	
2	LANE 13451	1967	17S 5W Sec. 31	NA	NA	120	52	185	3.3 (24-hr)	NA	75 - 115	V-wire screen	Inactive	
3	LANE 13468	1964	17S 5W Sec. 31 SW NW	472280	4877610	120	>55	100	2.2 (22-hr)	NA	80 - 120	V-wire screen	Abandoned	
4	LANE 13505	1973	17S 5W Sec. 31 SW NW	472208	4877488	166	>57	190	9.7 (24-hr)	6.2	110 - 135, 145 - 156	V-wire screen and perforations	Active	Chemically Rehabilitated in 1996
5	LANE 1158	1877	17S 5W Sec. 31 SE NW	472430	4877737	150	>42	84	2.8 (8-hr)	NA	90 -120	V-wire screen	Abandoned	
6	LANE 13444	1978	17S 5W Sec. 31 SW NW	472114	4877711	285	46	30	3 (1-hr)	NA	90 - 100, 160 - 165	Perforations	Abandoned	
7	LANE 1156	1979	17S 5W Sec. 31 SW NW	471882	4877739	110	45	130	3.6 (8-hr)	NA	55 - 90	V-wire screen	Inactive	
8	LANE 14452	1984	17S 6W Sec 36 NE NE	471479	4877698	185	>46	170	1.8 (4-hr)	NA	75 - 80, 95 - 105, 115 - 120, 125 - 135, 160 - 165	V-wire screen	Abandoned	
9	LANE 2340	1991	17S 5W Sec. 31 SE NE	473518	4877497	180	>119	550	8.3 (1 -hr)	6.4	75 - 80, 105 - 110, 150 - 160, 169 - 179	V-wire screen	Active	
10	LANE 65923	2006	17S 5W Sec. 30 SE SW	472626	4878333	92	>24	160	8.5 (1-hr)	NA	40 - 80	V-wire screen	Active	Pilot Well C Location
11	LANE 69818	2008	17S 5W Sec. 31 NE NW	472378	4877555	100	58	100	3.6 (24-hr)	3.6	63-93	V-wire screen	Active	Screen only14 feet below SWL
12	LANE 68919	2008	17S 5W Sec. 31 SW NW			160	109	225	9.13 (24-hr)	9.13	80-152	V-wire screen	Online in winter 2008/2009	Screen only 6 feet below SWL
Pilot Wells														
Pilot Hole 11	LANE 67063	2006	17S 5W Sec. 31 NE NW	472574	4878111	~115	>33	100	NA	NA	60-95	Perforations	Inactive	
Pilot Hole 12	LANE 67069	2006	17S 5W Sec. 31 NE NW	472378	4877555	~180	102	225	8.7(1-hr)	NA	95-108, 116, 145	Perforations	Inactive	
Pilot Well A	LANE 31758	2000	17S 5W Sec. 31 NE NW	NA	NA	89	17	NA	NA	NA	NA	NA	Abandoned	
Pilot Well B	LANE 31751	2000	17S 5W Sec. 31 NE NW	NA	NA	179	44	60	5.0 (24-hr)	NA	83 - 119	Perforations	Abandoned	
Pilot Well C	LANE 31765	2000	17S 5W Sec. 31 NE NW	NA	NA	100	55	110	7.0 (24-hr)	NA	61 - 81	Perforations	Abandoned	Well 10 drilled at site
Pilot Well D	NA	2000	17S 6W Sec 36 SW SE	NA	NA	200	0	NA	NA	NA	NA	NA	Abandoned	

Notes:

OWRD = Oregon Water Resources Department

bgs - below ground surface

gpm = gallons per minute

NA = not applicable

* = 2008 specific capacity estimated from Spring 2008 daily production data. Pumping duration indeterminable

Table 2. Predicted Drawdown in Feet with Distance from a Well Pumping 200 gpm

City of Veneta Groundwater Supply Evaluation

Distance from Well (in feet)	Transmissivity (gpd/ft)		
	10,000	7,000	5,000
250	11	19	25
500	9	15	19
750	8	12	15
1000	6	10	12
1500	5	7	9
2000	2	5	6
3500	2	2	1

Notes:

s = (-528*Q/T)*(LOG(r)+(0.5*(LOG(S/0.3*T*t)))

s = drawdown in feet

T = transmissivity in gpd/ft

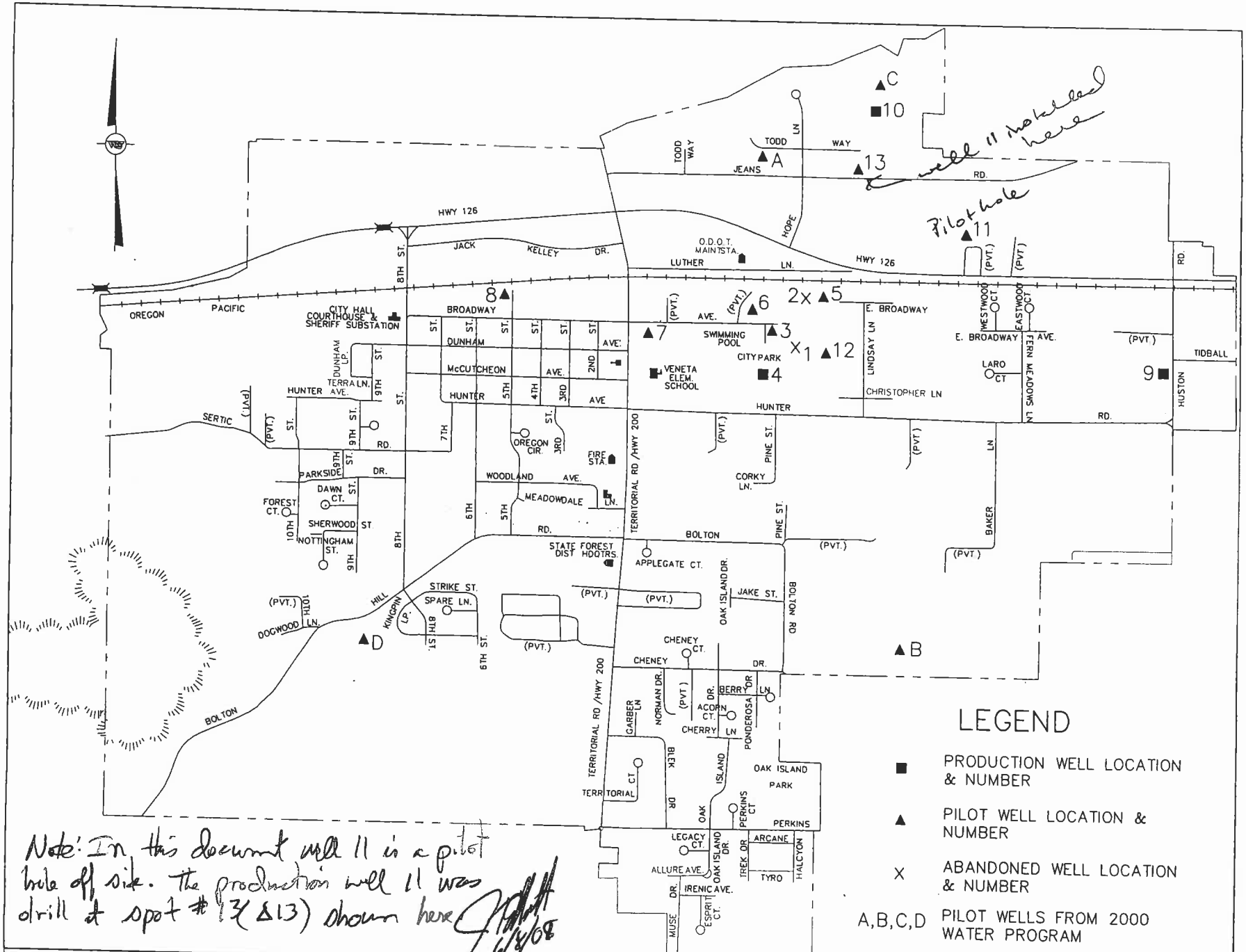
Q = pumping rate (gpm), 200 gpm

r = distance (ft)

S = storativity (ft/ft), 0.0001

t = time (days), 1 day

Attachment A – OWRD Water Well Reports



LEGEND

- ■ PRODUCTION WELL LOCATION & NUMBER
- ▲ PILOT WELL LOCATION & NUMBER
- X ABANDONED WELL LOCATION & NUMBER
- A,B,C,D PILOT WELLS FROM 2000 WATER PROGRAM

Note: In this document well 11 is a pilot hole off site. The production well 11 was drill at spot #13 (Δ13) shown here 6/8/08

WEBER ELLIOTT ENGINEERS, P.C.
Civil Engineering Municipal Engineering Land Planning
P.O. Box 10145
Eugene, OR 97440
Phone: 541-461-9779

CITY OF VENETA
WATER ASSESSMENT DECEMBER 2007

Well 1

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the
STATE ENGINEER, SALEM, OREGON 97310
within 30 days from the date of well completion.

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line)

RECEIVED DEC 27 1968 STATE ENGINEER SALEM OREGON

State Well No. 17/5w-31
State Permit No. LANE 13450

(1) OWNER:
Name CITY OF VENETA
Address VENETA, ORETON

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☒
Irrigation ☐ Test Well ☐ Other ☐

CASING INSTALLED:
Threaded ☐ Welded ☒
12" Diam. from 0 ft. to 76 ft. Gage .250
10" Diam. from 72 ft. to 79 ft. Gage .250
10" Diam. from 119 ft. to 124 ft. Gage .250

PERFORATIONS:
Perforated? ☐ Yes ☒ No.
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS:
Well screen installed? ☒ Yes ☐ No
Manufacturer's Name JOHNSON
Type STAINLESS STEEL Model No. PIPE SIZE 304
Diam. 10" Slot size 50 Set from 79 ft. to 96 ft.
Diam. 10" Slot size 100 Set from 96 ft. to 119 ft.

(8) WATER LEVEL: Completed well.
Static level 51 ft. below land surface Date 8-3-67
Artesian pressure lbs. per square inch Date

(9) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☐ No If yes, by whom? CARTER'S
Yield: 190 gal./min. with 58 ft. drawdown after 24 hrs.
" " "
" " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

(10) CONSTRUCTION:
Well seal—Material used CEMENT
Depth of seal 32' ft.
Diameter of well bore to bottom of seal 18 in.
Were any loose strata cemented off? ☐ Yes ☒ No Depth
Was a drive shoe used? ☒ Yes ☐ No
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.

(11) LOCATION OF WELL:
County LANE Driller's well number
¼ ¼ Section 31 T. 17S R. 5W W.M.
Bearing and distance from section or subdivision corner

(12) WELL LOG:
Diameter of well below casing ---
Depth drilled 124 ft. Depth of completed well 124 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level as drilling proceeds. Note drilling rates.

MATERIAL	From	To	SWL
TOP SOIL	0	4	
YELLOW CLAY	4	46	12
SAND- COARSE GRAVEL	46	57	
FINE SAND	57	64	54
COARSE SAND	64	79	
COARSE SAND- GRAVEL	79	124	51

Work started 7-15-67 19 Completed 8-3-67 19
Date well drilling machine moved off of well 8-3-67 19

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Alfred Cronin (Drilling Machine Operator) Date 8-11-67, 19
Drilling Machine Operator's License No. 148

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
NAME CARTER'S DRILLING & PUMP SERVICE
(Person, firm or corporation) (Type or print)
Address 325 SO. 2ND ST., SPRINGFIELD, OREGON
[Signed] James J. Carter (Water Well Contractor)
Contractor's License No. 126 Date 8-11-67, 19

(USE ADDITIONAL SHEETS IF NECESSARY)

Well 2

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the STATE ENGINEER, SALEM, OREGON 97310 within 30 days from the date of well completion.

RECEIVED
DEC 27 1968
STATE ENGINEER
SALEM OREGON

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line)

State Well No. 17/5w-31
Permit No. LANE 13451

(1) OWNER:
Name CITY OF VENETA
Address VENETA, OREGON

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☒
Irrigation ☐ Test Well ☐ Other ☐

CASING INSTALLED:
Threaded ☐ Welded ☒
12" Diam. from 0 ft. to 73 ft. Gage .250
10" Diam. from 69 ft. to 75 ft. Gage .250
10" Diam. from 115 ft. to 120 ft. Gage .250

PERFORATIONS:
Perforated? ☐ Yes ☒ No.
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS:
Well screen installed? ☒ Yes ☐ No
Manufacturer's Name JOHNSON
Type STAINLESS STEEL PIPE SIZE Model No. 304
Diam. 10 Slot size 100 Set from 75 ft. to 115 ft.
Diam. Slot size Set from ft. to ft.

(8) WATER LEVEL: Completed well.
Static level 54 ft. below land surface Date 9-22-67
Artesian pressure lbs. per square inch Date

(9) WELL TESTS:
Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☐ No If yes, by whom? CARTER'S
Yield: 185 gal./min. with 56 ft. drawdown after 24 hrs.
" " " "
" " " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

(10) CONSTRUCTION:
Well seal—Material used CEMENT
Depth of seal 30' ft.
Diameter of well bore to bottom of seal 18 in.
Were any loose strata cemented off? ☐ Yes ☒ No Depth
Was a drive shoe used? ☒ Yes ☐ No
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.

(11) LOCATION OF WELL:
County LANE Driller's well number
¼ ¼ Section 31 T. 17S R. 5W W.M.
Bearing and distance from section or subdivision corner

(12) WELL LOG:
Diameter of well below casing ---
Depth drilled 120 ft. Depth of completed well 120 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level as drilling proceeds. Note drilling rates.

MATERIAL	From	To	SWL
TOP SOIL	0	4	
YELLOW CLAY	4	45	8
RED CLAY-GRAVEL MIXED	45	56	
SAND-GRAVEL SOME CLAY	56	64	52
SAND-GRAVEL	64	86	
SAND-COARSE GRAVEL	86	116	
SOFT BLUE SHALE	116	120	56

Work started 7-25-67 19 Completed 9-22-67 19
Date well drilling machine moved off of well 9-22-67 19

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.

[Signed] Alfred Prosser (Drilling Machine Operator) Date 9-28-67, 19

Drilling Machine Operator's License No. 148

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME CARTER'S DRILLING & PUMP SERVICE
(Person, firm or corporation) (Type or print)
Address 325 SO. 2ND STREET, SPRINGFIELD, OREGON

[Signed] James G. Carter (Water Well Contractor)

Contractor's License No. 126 Date 9-28-67, 19

(USE ADDITIONAL SHEETS IF NECESSARY)

Well 3

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the STATE ENGINEER, SALEM, OREGON 97310 within 30 days from the date of well completion.

RECEIVED JUN 10 1964 STATE ENGINEER SALEM, OREGON

WATER WELL REPORT
STATE OF OREGON
(Please type or print)

State Well No. 17/5W-31

State Permit No. LANE 13468

(1) OWNER:
Name City of Veneta
Address Veneta, Oregon

(2) LOCATION OF WELL:
County Lane Driller's well number
¼ ¼ Section 31 T. 17 R. 5W W.M.
Bearing and distance from section or subdivision corner

(3) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☒ Other ☐

(5) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED: Threaded ☐ Welded ☒
6" Diam. from 0 ft. to 80 ft. Gage 250
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(7) PERFORATIONS: Perforated? ☐ Yes ☐ No
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(8) SCREENS: Well screen installed? ☒ Yes ☐ No
Manufacturer's Name Johnson
Type Armco Iron Model No. Telescope
Diam. 6" Slot size 100 Set from 80 ft. to 120 ft.
Diam. Slot size Set from ft. to ft.

(9) CONSTRUCTION:
Well seal—Material used in seal Bentonite
Depth of seal 21 ft. Was a packer used? no
Diameter of well bore to bottom of seal 6 in.
Were any loose strata cemented off? ☐ Yes ☒ No Depth
Was a drive shoe used? ☒ Yes ☐ No
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.
Did any strata contain unusuable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off

(10) WATER LEVELS:
Static level 41 ft. below land surface Date 5/6/64
Artesian pressure lbs. per square inch. Date

(11) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☐ No If yes, by whom? Carter's
Yield: 100 gal./min. with 46 ft. drawdown after 22 hrs.
" " " " "
" " " " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☒ Yes ☐ No

(12) WELL LOG: Diameter of well below casing 6"
Depth drilled 120 ft. Depth of completed well 120 ft.
Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Top Soil	0	5
Yellow Clay	5	45
Fine Sand & Gravel	45	55
Fine Sand	55	65
Medium Sand	65	115
Sand & Gravel	115	120

Work started 4/28/ 1964. Completed 5/6 1964
Date well drilling machine moved off of well 5/6 1964

(13) PUMP:
Manufacturer's Name
Type: H.P.

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME CARTER'S DRILLING & PUMP SERVICE (Person, firm or corporation) (Type or print)
Address 325 S. 2nd St. Springfield, Oregon
Drilling Machine Operator's License No. 148
[Signed] (Water Well Contractor)
Contractor's License No. 126 Date 5/28, 1964

(USE ADDITIONAL SHEETS IF NECESSARY)

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the

STATE ENGINEER, SALEM, OREGON 97310
within 30 days from the date of well completion.

RECEIVED NOV 2 1973 STATE ENGINEER SALEM, OREGON

Well 4 bc

WATER WELL REPORT
STATE OF OREGON

(Please type or print)
(Do not write above this line)

State Well No. 17S/5W-31
State Permit No. LANE G6783 13505

(1) OWNER:
Name City of Veneta
Address Venata, Oregon

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☒ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

CASING INSTALLED: Threaded ☐ Welded ☐
8" Diam. from Gl ft. to 110 ft. Gage 277
8" Diam. from 136' ft. to 166' ft. Gage 277
" Diam. from ft. to ft. Gage

PERFORATIONS: Perforated? ☒ Yes ☐ No.
Type of perforator used Torch
Size of perforations 1/8 in. by 4 in.
100 perforations from 145 ft. to 156 ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS: Well screen installed? ☒ Yes ☐ No
Manufacturer's Name Johnson
Type Stainless Model No.
Diam. 8" Slot size 100 Set from 110 ft. to 135 ft.
Diam. Slot size Set from ft. to ft.

(8) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☐ No If yes, by whom? W.W. Drilling
Yield: 400 gal./min. with 45 ft. drawdown after 10 hrs.
310 " 32 " 24 "
" " " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:
Well seal—Material used Cement
Well sealed from land surface to 30 ft.
Diameter of well bore to bottom of seal 16 in.
Diameter of well bore below seal 16 in.
Number of sacks of cement used in well seal 18 sacks
Number of sacks of bentonite used in well seal sacks
Brand name of bentonite
Number of pounds of bentonite per 100 gallons of water lbs./100 gals.
Was a drive shoe used? ☐ Yes ☒ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☐ No Size of gravel:
Gravel placed from 30 ft. to 166 ft.

(10) LOCATION OF WELL:
County Lane Driller's well number
SW¼ NW¼ Section 31 T. 17S R. 5W W.M.
Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.
Depth at which water was first found 95 ft.
Static level 58 ft. below land surface. Date 10/8/73
Artesian pressure lbs. per square inch. Date

(12) WELL LOG: Diameter of well below casing
Depth drilled 166 ft. Depth of completed well 166 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. *Report each change in position of Static Water Level and indicate principal water-bearing strata.*

MATERIAL	From	To	SWL
yellow clay	0	38'	
Brown sandy clay	38	40'	
Brown sand	40	52'	
Brown cemented gravel	52	85'	
Brown sandy clay	85	90'	
loose small gravel	90	132'	
Brown sandy clay	132	138'	
Blue sandy clay	138	145'	
Sand and gravel blue cemented	145	166'	

Work started 10.1. 1973 Completed 10.8. 1973
Date well drilling machine moved off of well 10/9 1973

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Frank Wilson (Drilling Machine Operator) Date 10/10 1973
Drilling Machine Operator's License No. 404

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name W.W. Drilling and Pump Service (Person, firm, or corporation) (Type or print)
Address 2320 Main Street Springfield, Oregon 97407
[Signed] Frank Wilson (Water Well Contractor)
Contractor's License No. 562 Date 10/10 1973

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

Wells

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the

STATE ENGINEER, SALEM, OREGON 97310
within 30 days from the date of well completion.

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line)

RECEIVED
MAR 31 1977
WATER RESOURCES DEPT.
SALEM, OREGON

State Well No. 17S/5W31bd
State Permit No.

(1) OWNER:
Name City of Veneta
Address

(2) TYPE OF WORK (check):
New Well ☑ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☑ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☑
Irrigation ☐ Test Well ☐ Other ☐

CASING INSTALLED: Threaded ☐ Welded ☑
12" Diam. from 0 ft. to 30 ft. Gage 250
8" Diam. from 0 ft. to 90 ft. Gage 250
8" Diam. from 120 ft. to 150 ft. Gage 250

PERFORATIONS: Perforated? ☐ Yes ☑ No.
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS: Well screen installed? ☑ Yes ☐ No
Manufacturer's Name Johnson
Type Irrigator Model No.
Diam. 8 Slot size 100 Set from 90 ft. to 120 ft.
Diam. Slot size Set from ft. to ft.

(8) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☑ Yes ☐ No If yes, by whom? W.W.
Yield: 84 gal./min. with 30 ft. drawdown after 8 hrs.
" " "
" " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:
Well seal—Material used Cement
Well sealed from land surface to 30 ft.
Diameter of well bore to bottom of seal 16 in.
Diameter of well bore below seal 16 in.
Number of sacks of cement used in well seal 30 sacks
Number of sacks of bentonite used in well seal sacks
Brand name of bentonite
Number of pounds of bentonite per 100 gallons of water lbs./100 gals.
Was a drive shoe used? ☐ Yes ☑ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☑ No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☑ Yes ☐ No Size of gravel: 1/4-3/4
Gravel placed from 0 ft. to 150 ft.

(10) LOCATION OF WELL:
County Lane Driller's well number
SE ¼ NW ¼ Section 31 T. 17S R. 5W W.M.
Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.
Depth at which water was first found 70 ft.
Static level 65 ft. below land surface. Date 3/18/77
Artesian pressure lbs. per square inch. Date

(12) WELL LOG: Diameter of well below casing +
Depth drilled 150 ft. Depth of completed well 150 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. *Report each change in position of Static Water Level and indicate principal water-bearing strata.*

MATERIAL	From	To	SWL
Top Soil	0	4'	
Brown Clay	4'	12'	
Yellow Clay	12'	20'	
Gray Clay	20'	30'	
Brown Clay	30'	40'	
Sand Gravel - Small	40'	45'	
Sand Gravel & Clay	45'	60'	
Sand & Gravel - Large	60'	70'	
Sand Gravel & Clay	70'	90'	
Sand Gravel - Large	90'	112'	
Blue Clay & Gravel	112'	120'	65'

Work started 2/21 1977 Completed 2/28 1977
Date well drilling machine moved off of well 2/28 1977

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Frank Wilson (Drilling Machine Operator) Date 3/15, 1977
Drilling Machine Operator's License No. 404

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name W. W. Drilling + Pump Ser (Person, firm or corporation) (Type or print)
Address 2320 Main St. Spfd, Ore.
[Signed] Walt Wilson (Water Well Contractor)
Contractor's License No. 268 Date 3/25, 1977

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the

WATER RESOURCES DEPARTMENT,
SALEM, OREGON 97310
within 30 days from the date of well completion.

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line)

RECEIVED JUN 20 1978 WATER RESOURCES DEPT. SALEM, OREGON

Well 6

State Well No. 17S/5W-31b

State Permit No. LANE 13444

(1) OWNER:
Name City of Veneta
Address 21,957 McCutcheon St.
Veneta, Oregon

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☒ Other ☐

(5) CASING INSTALLED: Threaded ☐ Welded ☒
6" Diam. from +1 ft. to 167 ft. Gage .280
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(6) PERFORATIONS: Perforated? ☒ Yes ☐ No.
Type of perforator used Torch & Mills Knife
Size of perforations 3/4 in. by 3/8 in. 4 in.
54 M.K perforations from 90 ft. to 100 ft.
20 T perforations from 160 ft. to 165 ft.
perforations from ft. to ft.

(7) SCREENS: Well screen installed? ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(8) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "
Bailer test 30 gal./min. with 10 ft. drawdown after 1 hrs.
Artesian flow g.p.m.
Temperature of water 51 Depth artesian flow encountered ft.

(9) CONSTRUCTION:
Well seal—Material used Portland Cement Type III
Well sealed from land surface to 30 ft.
Diameter of well bore to bottom of seal 10 in.
Diameter of well bore below seal 6 in.
Number of sacks of cement used in well seal 16 sacks
How was cement grout placed? Poured From Top

Was a drive shoe used? ☒ Yes ☐ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.

(10) LOCATION OF WELL:
County Lane Driller's well number 2332/22W
¼ NW ¼ Section 31 T. 17S R. 5W W.M.
Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.
Depth at which water was first found 96 ft.
Static level 55 ft. below land surface. Date 5/19/78
Artesian pressure lbs. per square inch. Date

(12) WELL LOG: Diameter of well below casing 6"
Depth drilled 300 ft. Depth of completed well 285 ft.
Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
Dark Sandy Soil	0	2	
Grey Sticky Clay	2	5	
Yellow Clay	5	27	
Grey Clay	27	40	
Black Sandy Clay	40	50	
Fine Gravel & Clay	50	60	
Black Sandstone	60	75	
Fine Gravel & Sand	75	78	
Black Sandstone	78	96	55
Fine Black Sand	96	105	55
Sandy Clay	105	110	55
Soft Grey Clay	110	130	55
Yellow Sandy Clay	130	135	55
Grey Sandy Clay	135	190	55
Hard Sandstone	190	200	55
Grey Sandy Claystone	200	215	55
Grey Sandy Claystone	215	300	55

Work started 5/15/ 1978 Completed 6/2/ 1978
Date well drilling machine moved off of well 6/2/ 1978

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Alvin Dunsbergh (Drilling Machine Operator) Date 6/2/, 19 78
Drilling Machine Operator's License No. 652

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name Carter's Drilling & Pump Service (Person, firm or corporation) (Type or print)
Address P.O. Box 46-Springfield, Oregon 97477
[Signed] James D. Carter (Water Well Contractor)
Contractor's License No. 126 Date 6/2/, 19 78

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the
WATER RESOURCES DEPARTMENT, SALEM, OREGON 97310 within 30 days from the date of well completion.

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line)

Well 7

Lane 1756

State Well No. 17s/5w-31b

State Permit No. .....

(1) OWNER:
Name City of Veneta
Address 24591 McCutcheon
Veneta, Oregon

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☒
Irrigation ☐ Test Well ☐ Other ☐

(5) CASING INSTALLED: Threaded ☐ Welded ☒
12" Diam. from +1 ft. to 30 ft. Gage .250
8" Diam. from +2 ft. to 55 ft. Gage 277
8" Diam. from 90 ft. to 110 ft. Gage 277

PERFORATIONS: Perforated? ☐ Yes ☒ No.
Type of perforator used
Size of perforations in. by in.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.
..... perforations from ..... ft. to ..... ft.

(7) SCREENS: Well screen installed? ☒ Yes ☐ No
Manufacturer's Name Johnson
Type Stainless Steel Model No. .....
Diam. 8 Slot size 100 Set from 55 ft. to 90 ft.
Diam. ..... Slot size ..... Set from ..... ft. to ..... ft.

(8) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☐ No If yes, by whom? Ramsey Waite Co
Yield: 130 gal./min. with 36 ft. drawdown after 8 hrs.
" " " "
" " " "
Bailer test 60 gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m.
Temperature of water 52° Depth artesian flow encountered ..... ft.

(9) CONSTRUCTION:
Well seal—Material used Cement Type III
Well sealed from land surface to 30 ft.
Diameter of well bore to bottom of seal 16 in.
Diameter of well bore below seal 16 in.
Number of sacks of cement used in well seal 26 sacks
How was cement grout placed? Pressure Grouted & Pumped From Bottom Up
Was a drive shoe used? ☒ Yes ☐ No Plugs ..... Size: location ..... ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☒ No Size of gravel: 5/16
Gravel placed from 0 ft. to 110 ft.

(10) LOCATION OF WELL:
County Lane Driller's well number 1672/22
¼ NW ¼ Section 31 T. 17S R. 5W W.M.
Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.
Depth at which water was first found 55 ft.
Static level 43 ft. below land surface. Date
Artesian pressure lbs. per square inch. Date

(12) WELL LOG: Diameter of well below casing .....
Depth drilled 115 ft. Depth of completed well 110 ft.
Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
Brown Clay	0	2	
Yellow Clay	2	7	
Gray Clay	7	14	
Red Clay	14	15	
Yellow Clay	15	20	
Gray Clay	20	24	
Blue Clay	24	40	
Sandy Blue Clay	40	55	
Sand & Gravel	55	90	43
Brown Clay	90	115	43

RECEIVED
JUN 21 1979
WATER RESOURCES DEPT
SALEM, OREGON

Work started 2/16/ 1979 Completed 5/12/ 1979
Date well drilling machine moved off of well 5/12/ 1979

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] ..... (Drilling Machine Operator) Date 5/12/, 1979
Drilling Machine Operator's License No. 40

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name Carter's Drilling & Pump Service (Person, firm or corporation) (Type or print)
Address P.O. Box 46 - Springfield, Oregon
[Signed] James J. Carter (Water Well Contractor)
Contractor's License No. 126 Date 5/12/, 1979

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

Well 8

WATER WELL REPORT
STATE OF OREGON

RECEIVED
FEB 14 1984
WATER RESOURCES DEPT.
SALEM, OREGON

State Well No. 17S/6W-36aa
State Permit No. LANE 14452

PLEASE TYPE or PRINT IN INK

(1) OWNER:
Name City of Veneta
Address 24951 McCutcheon
City Veneta, State Oregon

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary Air ☐ Driven ☐
Rotary Mud ☐ Dug ☐
☒ Bored ☐

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☒
Irrigation ☐ Test Well ☐ Other ☐
Thermal: Withdrawal ☐ Reinjection ☐

(5) CASING INSTALLED: Steel ☒ Threaded ☐ Plastic ☐ Welded ☒
16" Diam. from +1 ft. to 60 ft. Gauge .312
8" Diam. from +18 ft. to 185 ft. Gauge .312

LINER INSTALLED:
" Diam. from ft. to ft. Gauge

(6) PERFORATIONS: Perforated? ☐ Yes ☒ No

7 Was Well Screen Installed Yes

Manufactures Name: Johnson
Type: Stainless Steel 304 Model No. Pipe Size

Diam 8" Slot Size	Set From	75' - 80'	5'
DAIM 8" SLOT SIZE 100		95' - 105'	10'
		115' - 120	5'
		125' - 135'	10'
		160' - 165'	5'

Was a pump test made? ☒ Yes ☐ No If yes, by whom? Ramsey Waite
Yield: 170 gal./min. with 95 ft. drawdown after 4 hrs.
" " " "
Air test gal./min. with drill stem at ft. hrs.
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m.
Temperature of water 52° Depth artesian flow encountered ft.

(9) CONSTRUCTION: Special standards: Yes ☐ No ☒
Well seal—Material used Type III Cement
Well sealed from land surface to 20 ft.
Diameter of well bore to bottom of seal 20 in.
Diameter of well bore below seal 16 in.
Number of sacks of cement used in well seal 17 sacks
How was cement grout placed? Forced Pump 20 Feet
Was pump installed? no Type HP Depth ft.
Was a drive shoe used? ☒ Yes ☐ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of Water? depth of strata
Method of sealing strata off
Was well gravel packed? ☒ Yes ☐ No Size of gravel: 3/8
Gravel placed from 185 ft. to 0 ft.

(10) LOCATION OF WELL:
County Lane Driller's well number 1508/22W
NE ¼ NE ¼ Section 36 T. 17 R. 6W W.M.
Tax Lot # Lot Blk Subdivision
Address at well location: Street Varinace Granted W 5th & Waldo - Next to Tax Lot 1000

(11) WATER LEVEL: Completed well.
Depth at which water was first found 65 ft.
Static level 48 ft. below land surface. Date 1/16/84
Artesian pressure lbs. per square inch. Date

(12) WELL LOG: Diameter of well below casing 16
Depth drilled 185 ft. Depth of completed well 185 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
Top Soil	0	4	
Red Clay	4	26	
Red Clay Mixed With Gravel	26	40	
Blue Sand- Gravel & Clay	40	46	
Coarse Gravel Mix Clay Cemented	46	72	48
Med. Gravel	72	78	48
Fine Gravel	78	90	48
Coarse Gravel - Small Cobbles	90	106	48
Red Clay Gravel Coarse	106	112	48
Coarse Gravel Clean	112	117	48
Small Gravel With Clay	117	126	48
Coarse Gravel	126	133	48
Med Gravel Mixed Clay	133	150	48
Gray Clay, Gravel	150	154	48
Gravel, Heavey Clay	154	162	48
Gray Clay	162	170	48
Gray Sandy Shale, Small Gravel	170	185	48

Work started 10/31/ 19 83 Completed 1/16/ 19 84
Date well drilling machine moved off of well 1/17/ 19 84

(unbonded) Water Well Constructor Certification (if applicable):
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] [signature] Date 1/17/ 19 84

Bonded Water Well Constructor Certification:
Bond U3-66353 (number) Issued by: United Pacific Insurance (Surety Company Name)
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name Carter's Drilling & Pump Service (Person, firm or corporation) (Type or print)
Address 330 S. 3rd - P.O. Box 46 Spfd. Oregon
[Signed] [signature] Water Well Constructor
Date 1/17/84 19

NOTICE TO WATER WELL CONSTRUCTOR
The original and first copy of this report are to be filed with the WATER RESOURCES DEPARTMENT, SALEM, OREGON 97310 within 30 days from the date of well completion.

SP*45292-690

2

Lane 2340

Well 9

SEP 23 1991

WATER RESOURCES DEPT

N0175/5W-31 Ad

15259

STATE OF OREGON
WATER WELL REPORT
(as required by ORS 537.765)

(1) OWNER:
Well Number: Huston Rd

Name: City of Veneta Cond # 15259

Address: PO Box 458

City: VENETA State: ORE Zip:

(2) TYPE OF WORK:
☒ New Well ☐ Deepen ☐ Recondition ☐ Abandon

(3) DRILL METHOD
☒ Rotary Air ☐ Rotary Mud ☐ Cable

☐ Other

(4) PROPOSED USE:
☒ Domestic ☒ Community ☐ Industrial ☐ Irrigation

☐ Thermal ☐ Injection ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval Yes ☐ No ☒ Depth of Completed Well 180 ft.

Explosives used Yes ☐ No ☒ Type Amount

HOLE Diameter	From	To	SEAL Material	From	To	Amount sacks or pounds
24"	0	19'	PORT. CEMENT	6"	19'	34 Sacks
24						

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E

☐ Other

Backfill placed from 0 ft. to 0 ft. Material

Gravel placed from 180 ft. to 0 ft. Size of gravel Turkey Grit

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	18"	+2'	180'		☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:	N/A				☐	☐	☐	☐
					☐	☐	☐	☐

Location of shoe(s) 40'

(7) PERFORATIONS/SCREENS:
☐ Perforations Method

☒ Screens Type Wound Wire Material S.S.

From 75	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
75	80	100		10"	PS	☒	☐
105	110	100		10"	PS	☒	☐
150	160	100		10"	PS	☒	☐
169	179	100		10"	PS	☒	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☒ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
300	21		1 hr.
550	66		

Temperature of water 52° Depth Artesian Flow Found

Was a water analysis done? ☒ Yes By whom Water Analysis + Cons.

Did any strata contain water not suitable for intended use? ☐ Too little

☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☒ Other IRON

Depth of strata:

(9) LOCATION OF WELL by legal description:
County LANE Latitude Longitude

Township 17 South N or (S) Range 5 E or (W) WM.

Section 31 SE ¼ NE ¼

Tax Lot 2713 Lot Block Subdivision

Street Address of Well (or nearest address) Huston Rd

(10) STATIC WATER LEVEL:
29.6 ft. below land surface. Date

Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:
Depth at which water was first found 70'

From	To	Estimated Flow Rate	SWL
70	85		
120	145		
175	180		

(12) WELL LOG:
Ground elevation

Material	From	To	SWL
LIGHT BROWN CLAY	0	41	
MED SAND SOME COBLES	41	51	
LIGHT GREY CLAY WITH SOME SAND	51	60	
BLACK SAND MED.	60	90	
GREY CLAY	90	91	
COURSE SAND	91	135	
GREY CLAY	135	138	
COURSE SAND	138	176	
SAND AND GRAVEL	176	180	

Date started 7-11-91 Completed

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to my best knowledge and belief.

WWC Number

Signed Date

(bonded) Water Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. all work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 1200

Signed [signature] Date 9-20-91

WHITE COPIES - WATER RESOURCES DEPARTMENT YELLOW COPY - CONSTRUCTOR PINK COPY - CUSTOMER 9809C 10/86

Well 10 well 10 JE 4/3/06 Production Well

amended copy

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765 & OAR 690-205-0210)

WELL LABEL # L 74108

START CARD # 180393

(1) LAND OWNER

Owner Well I.D. _____

First Name _____ Last Name _____

Company City of Veneta

Address 88184 8th Street / PO Box 458

City Veneta State OR Zip 97487

(2) TYPE OF WORK

[X] New Well [ ] Deepening [ ] Conversion [ ] Alteration (repair/recondition) [ ] Abandonment

(3) DRILL METHOD

[ ] Rotary Air [ ] Rotary Mud [X] Cable [ ] Auger [ ] Cable Mud [ ] Reverse Rotary [ ] Other _____

(4) PROPOSED USE

[ ] Domestic [ ] Irrigation [X] Community [ ] Industrial/ Commericial [ ] Livestock [ ] Dewatering [ ] Thermal [ ] Injection [ ] Other _____

(5) BORE HOLE CONSTRUCTION

Special Standard [ ] (Attach copy)

Depth of Completed Well 92 ft.

BORE HOLE Dia	From	To	SEAL Material	From	To	Amt	sacks/ lbs
16	6	92	Cement	2	34	21	S

How was seal placed: Method [ ] A [ ] B [X] C [ ] D [ ] E

[ ] Other _____

Backfill placed from _____ ft. to _____ ft. Material _____

Filter pack from 34 ft. to 92 ft. Material _____ Size 6/9

Explosives used: [ ] Yes Type _____ Amount _____

(6) CASING/LINER

Casing	Liner	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd
(•)	( )	10	[X]	2	40	.250	(•)	( )	[X]	[ ]
(•)	( )	10	[ ]	80	92	.250	(•)	( )	[X]	[ ]
( )	( )		[ ]				( )	( )	[ ]	[ ]
( )	( )		[ ]				( )	( )	[ ]	[ ]
( )	( )		[ ]				( )	( )	[ ]	[ ]

Shoe [ ] Inside [ ] Outside [ ] Other Location of shoe(s) _____

Temp casing [ ] Yes Dia _____ From _____ To _____

(7) PERFORATIONS/SCREENS

Perforations Method _____

Screens Type "v" wire Material stainless

Perf/ Screen	Casing/ Screen Liner	Dia	From	To	Scrn/slot width	Slot length	# of slots	Tele/ pipe size
Screen	Casing	10	40	80	.05			10

(8) WELL TESTS: Minimum testing time is 1 hour

(•) Pump ( ) Bailer ( ) Air ( ) Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)
200	23.5		1
Well output may fluctuate			

Temperature 50 °F Lab analysis [ ] Yes By _____

Water quality concerns? [ ] Yes (describe below)

From	To	Description	Amount	Units

(9) LOCATION OF WELL (legal description)

County LANE Twp 17 S N/S Range 5 W E/W WM

Sec 31 NE 1/4 of the NW 1/4 Tax Lot 915

Tax Map Number _____ Lot _____

Lat ° 0 ' " or _____ DMS or DD

Long ° 0 ' " or _____ DMS or DD

( ) Street address of well (•) Nearest address

approx. 550' east (on Jeans Rd.) of intersection of Jeans Rd and Hope Rd and then 300' north.

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL(ft)
Existing Well / Predeepening			[ ]	
Completed Well	02-24-2006		[ ]	27.5

Flowing Artesian? [ ] Dry Hole? [ ]

WATER BEARING ZONES Depth water was first found 34

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)
	34	38	40		[ ]	27.5
	42	52	65		[ ]	27.5
	65	79	155		[ ]	27.5
					[ ]	
					[ ]	

(11) WELL LOG

Ground Elevation _____

Material	From	To
Topsoil	0	2
Clay, light brown	2	14
Clay, brown/yellow	14	18
Clay, gravel small	18	34
Sand	34	38
Clay, brown	38	42
Gravel, med blue	42	52
Sand w/ clay	52	65
Gravel	65	79
Clay, gravel	79	92

Date Started 09-27-2005 Completed 03-22-2006

(unbonded) Water Well Constructor Certification

I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

License Number _____ Date _____

Password : (if filing electronically) _____

Signed _____

(bonded) Water Well Constructor Certification

I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

License Number 636 Date 03-22-2006

Password : (if filing electronically) _____

Signed Paul Christensen V Pres

Contact Info (optional) Christensen Well Drilling

ORIGINAL - WATER RESOURCES DEPARTMENT

THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

Well 11

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)

WELL I.D. # L 74121

START CARD # 189247

Instructions for completing this report are on the last page of this form.

(1) LAND OWNER Well Number #11
Name McDougal Brothers
Address PO Box 518
City Creswell State OR Zip 97426

(2) TYPE OF WORK ☑ New Well
☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment ☐ Conversion

(3) DRILL METHOD
☑ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger ☐ Cable Mud
☐ Other

(4) PROPOSED USE
☐ Domestic ☐ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☑ Other test well

(5) BORE HOLE CONSTRUCTION Special Construction: ☐ Yes ☑ No
Depth of Completed Well 138 ft.
Explosives used: ☐ Yes ☑ No Type Amount

BORE HOLE Diameter	From	To	SEAL Material	From	To	Sacks or Pounds
10"	0'	20'	bentonite	0'	20'	16 sacks
6"	20'	138'	chips			

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☐ E
☑ Other as per OAR 690-210-340
Backfill placed from ft. to ft. Material
Gravel placed from ft. to ft. Size of gravel

(6) CASING/LINER

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	6"	+2'	138'	.250	☑	☐	☑	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Drive Shoe used ☐ Inside ☑ Outside ☐ None
Final location of shoe(s) 138'

(7) PERFORATIONS/SCREENS
☑ Perforations Method Star wheel
☐ Screens Type Material

From	To	Slot Size	Number	Diameter	Tele/pipe size	Casing	Liner
						☐	☐
60'	75'		300	6"		☑	☐
						☐	☐
90'	105'		300	6"		☑	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☑ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
100	19.50'		

Temperature of water 50 Depth Artesian Flow Found
Was a water analysis done? ☐ Yes By whom
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other
Depth of strata:

(9) LOCATION OF WELL (legal description)
County Lane
Tax Lot unknown Lot
Township 19 S Range 3 W WM
Section 13 1/4 1/4
Lat ° ' " or . (degrees or decimal)
Long ° ' " or . (degrees or decimal)
Street Address of Well (or nearest address) 25469 Hwy 26, Veneta, OR

(10) STATIC WATER LEVEL
44.5 ft. below land surface. Date 7-21-06
ft. below land surface. Date
Artesian pressure lb. per square inch Date

(11) WATER BEARING ZONES
Depth at which water was first found 48'

From	To	Estimated Flow Rate	SWL
48'	55'	5gpm	44.5'
57'	60'	27 gpm	44.5'
90'	100'	33 gpm	44.5'

(12) WELL LOG Ground Elevation

Material	From	To	SWL
top soil	0'	2'	
clay-yellow	2'	33'	
clay-yellow w/gravel	33'	43'	
gravel-black	43'	48'	
sand-w/gravel	48'	55'	44.5'
sand-brown	55'	57'	44.5'
gravel-brown	57'	60'	44.5'
gravel-black	60'	75'	44.5'
sand-brown	75'	90'	44.5'
gravel-black	90'	100'	44.5'
clay-brown	100'	131'	44.5'
clay-blue	131'	138'	44.5'

Date Started 7-11-06 Completed 7-21-06

(unbonded) Water Well Constructor Certification
I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

WWC Number Date

Signed

(bonded) Water Well Constructor Certification
I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 636 Date 7-26-06

Signed

LANE 67069

#12

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)

WELL I.D. # L 85811

START CARD # 189264

Instructions for completing this report are on the last page of this form.

(1) LAND OWNER Well Number _____
Name City of Veneta
Address PO Box 458
City Veneta State OR Zip 97487

(2) TYPE OF WORK ☑ New Well
☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment ☐ Conversion

(3) DRILL METHOD
☑ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger ☐ Cable Mud
☐ Other _____

(4) PROPOSED USE
☐ Domestic ☐ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☑ Other test

(5) BORE HOLE CONSTRUCTION Special Construction: ☐ Yes ☑ No
Depth of Completed Well 180 ft.
Explosives used: ☐ Yes ☑ No Type _____ Amount _____

BORE HOLE Diameter	From	To	SEAL Material	From	To	Sacks or Pounds
10"	0'	18'	cement	0'	18'	
			with 4%			
6"	18'	180'	bentonite			

How was seal placed: Method ☐ A ☐ B ☑ C ☐ D ☐ E
☐ Other _____
Backfill placed from _____ ft. to _____ ft. Material _____
Gravel placed from _____ ft. to _____ ft. Size of gravel _____

(6) CASING/LINER

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	6"	1.5'	158'	.250	☑	☐	☑	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Drive Shoe used ☐ Inside ☑ Outside ☐ None
Final location of shoe(s) 158.2'

(7) PERFORATIONS/SCREENS
☑ Perforations Method star wheel
☐ Screens Type _____ Material _____

From	To	Slot Size	Number	Diameter	Tele/pipe size	Casing	Liner
95'	108'		65		pipesize	☑	☐
						☐	☐
116'	145'		145		pipesize	☑	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☑ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
87.81	10'		1/hr

Temperature of water 50 Depth Artesian Flow Found _____
Was a water analysis done? ☐ Yes By whom _____
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other _____
Depth of strata: _____

(9) LOCATION OF WELL (legal description)
County Lane
Tax Lot city lot Lot _____
Township 17 S Range 5 W WM
Section 31 SW 1/4 NW 1/4
Lat ___° ___' ___" or _____.____ (degrees or decimal)
Long ___° ___' ___" or _____.____ (degrees or decimal)
Street Address of Well (or nearest address) 25190 E. Broadway
Veneta, OR

(10) STATIC WATER LEVEL
68.5 ft. below land surface. Date 12-12-06
_____ ft. below land surface. Date _____
Artesian pressure _____ lb. per square inch Date _____

(11) WATER BEARING ZONES
Depth at which water was first found 100'

From	To	Estimated Flow Rate	SWL
100'	145'	45 gpm	68.5'

(12) WELL LOG Ground Elevation _____

Material	From	To	SWL
crushed rock	0	1	
clay, brown	1	5	
clay, yellow	5	9	
clay, redish	9	10	
clay, yellow brown	10	30	
clay, dark brown	30	40	
clay, sandy, brown	40	45	
clay, small rock	45	52	
gravel, with sand	52	55	
gravel, sand	55	60	
gravel, sand	60	70	68.5'
sand, small gravel	70	80	68.5'
sand, gravel w/clay	80	95	68.5'
sand, small gravel	95	100	68.5'
sand, gravel	100	112	68.5'
SEE PAGE 2			

Date Started 11-13-06 Completed 12-12-06

(unbonded) Water Well Constructor Certification
I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

WWC Number _____ Date _____

Signed _____

(bonded) Water Well Constructor Certification
I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 636 Date 12-29-06

Signed Earl Christensen

ORIGINAL – WATER RESOURCES DEPT. FIRST COPY – CONSTRUCTOR SECOND COPY – CUSTOMER 06/16/2004

RECEIVED
JAN 05 2007
WATER RESOURCES DEPT
SALEM, OREGON

LANE 67063

#13 LANE 67063
AMENDED

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)
Instructions for completing this report are on the last page of this form.

(WELL I.D.)# L 86811
(START CARD) # 190396

(1) OWNER: Well Number

Name City of Veneta
Address PO Box 438
City Veneta State OR Zip 97487

(2) TYPE OF WORK
☑ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:
☑ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger
☐ Other

(4) PROPOSED USE:
☐ Domestic ☑ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other pilot test hole

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☑ No Depth of Completed Well 115 ft.
Explosives used ☐ Yes ☑ No Type Amount

HOLE Diameter	From	To	SEAL Material	From	To	Sacks or pounds
10	0	20	Bentonite	0	20	9 Sacks
6	20	115				

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☐ E
☑ Other Poured
Backfill placed from ft. to ft Material
Gravel placed from ft. to ft. Size of gravel

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	6"	+1	99	250	☑	☐	☑	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Final location of shoe(s)

(7) PERFORATIONS/SCREENS:
☑ Perforations Method Holt perf.
☐ Screens Type Material

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
60	95	3/8"x1"	22/ ft.	6"		☑	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ☑ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
60+	total	115	1 hr.

Temperature of water 56 Depth Artesian Flow Found
Was a water analysis done? ☐ Yes By whom
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other
Depth of strata:

(9) LOCATION OF WELL by legal description:
County Lane Latitude 44.03.349 Longitude 123.20.522
Township 17 S Range 05 W WM.
Section 30 1/4 1/4
Tax Lot Lot Block Subdivision
Street Address of Well (or nearest address) Hope Lane and Todd Way

(10) STATIC WATER LEVEL:
40 ft. below land surface. Date 12-01-06
Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:
Depth at which water was first found 60

From	To	Estimated Flow Rate	SWL
60	95	60+	40

(12) WELL LOG:
Ground Elevation

Material	From	To	SWL
Top soil	0	1	
Brown Clay	1	22	
Blue Clay	22	64	40
Blue Sand and Gravel	64	97	
Blue Gray Sandy Claystone	97	115	

RECEIVED
FEB 20 2007
WATER RESOURCES DEPT
SALEM, OREGON

Date started 11-30-06 Completed 12-01-06

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

WWC Number 1800
Signed Terry Queen Date 12-04-06

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 1553
Signed Jeffrey Lenhardt Date 12-04-06

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

LANE 68918

LANE 68918

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)

WELL I.D. # L 92347

START CARD # 195450

Instructions for completing this report are on the last page of this form.

(1) LAND OWNER Well Number 11
Name City of Veneta
Address PO Box 458
City Veneta State OR Zip 97487

(2) TYPE OF WORK ☑ New Well
☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment ☐ Conversion

(3) DRILL METHOD
☑ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger ☐ Cable Mud
☐ Other

(4) PROPOSED USE
☑ Domestic ☐ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION Special Construction: ☐ Yes ☑ No
Depth of Completed Well 97 ft.
Explosives used: ☐ Yes ☑ No Type Amount

BORE HOLE Diameter	From	To	SEAL Material	From	To	Sacks or Pounds
16"	0	30	cement	0	30	19 sacks
			with 4%			
12"	30	97	bentonite			

How was seal placed: Method ☐ A ☐ B ☑ C ☐ D ☐ E
☐ Other
Backfill placed from ft. to ft. Material
Gravel placed from ft. to ft. Size of gravel

(6) CASING/LINER

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	12"	+2'	63'	.250	☑	☐	☑	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Drive Shoe used ☐ Inside ☑ Outside ☐ None
Final location of shoe(s) 63'

(7) PERFORATIONS/SCREENS
☐ Perforations Method
☑ Screens Type "V" wire Material SS

From	To	Slot Size	Number	Diameter	Tele/pipe size	Casing	Liner
63	93	.022		12" tele	Tele	☐	☐
93	97	blank		10" pipe	pipe	☑	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☑ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
100	28		24 hours

Temperature of water 50 Depth Artesian Flow Found
Was a water analysis done? ☐ Yes By whom
Did any strata contain water not suitable for intended use? ☐ Too little ☐ Too salty
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other
Depth of strata:

RECEIVED
OCT 22 2008
WATER RESOURCES DEPT
SALEM, OREGON

RECEIVED
SEP 02 2008
WATER RESOURCES DEPT
SALEM, OREGON

(9) LOCATION OF WELL (legal description)
County Lane
Tax Lot 915 Lot
Township 17 S Range 5 W WM
Section 31 NE 1/4 NW 1/4
Lat ° ' " or . (degrees or decimal)
Long ° ' " or . (degrees or decimal)
Street Address of Well (or nearest address) Intersection of Jeans Rd and Hope Rd--500' East then 300' North

(10) STATIC WATER LEVEL
49 ft. below land surface. Date 1-30-08
ft. below land surface. Date
Artesian pressure lb. per square inch Date

(11) WATER BEARING ZONES
Depth at which water was first found 53'

From	To	Estimated Flow Rate	SWL
60'	93'	120 gpm	49

(12) WELL LOG Ground Elevation

Material	From	To	SWL
crush rock	0	2	
top soil	2	6	
clay,tan/ light brown	6	42	
gravels, sandy dark purple	42	45	
gravels, sandy grey brown	45	48	
sand, brownish	48	58	
sand, grey	58	60	49
sand, black grey	60	63	49
gravels, sandy black grey	63	73	49
sand, black grey	73	76	49
gravels, sandy, black grey	76	88	49
sand, grey	88	93	49
clay, grey	93	100	49
bottom plate at 97'			

Date Started 9-24-07 Completed 1-30-08

(unbonded) Water Well Constructor Certification
I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

WWC Number Date

Signed

(bonded) Water Well Constructor Certification
I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 636 Date

Signed Paul Christensen V-Pres
Christensen Well Drilling Co.

ORIGINAL – WATER RESOURCES DEPARTMENT FIRST COPY – CONSTRUCTOR SECOND COPY – CUSTOMER 06/16/2004

LANE 68919

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)

WELL I.D. # L 92348

START CARD # 195451

Instructions for completing this report are on the last page of this form.

(1) LAND OWNER Well Number 12
Name City of Veneta
Address P.O. Box 458
City Veneta State OR Zip 97487

(2) TYPE OF WORK ☑ New Well
☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment ☐ Conversion

(3) DRILL METHOD
☑ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger ☐ Cable Mud
☐ Other

(4) PROPOSED USE
☐ Domestic ☑ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION Special Construction: ☐ Yes ☑ No
Depth of Completed Well 160 ft.
Explosives used: ☐ Yes ☑ No Type Amount

BORE HOLE Diameter	From	To	SEAL Material	From	To	Sacks or Pounds
16"	0'	27'	Cement w/	0'	27'	20 sacks
			4% benton	ite		
12"	27'	160'				

How was seal placed: Method ☐ A ☐ B ☑ C ☐ D ☐ E
☐ Other
Backfill placed from ft. to ft. Material
Gravel placed from ft. to ft. Size of gravel

(6) CASING/LINER

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	12"	+2'	82'	.250	☑	☐	☑	☐
	10"	152'	160'	.250	☑	☐	☑	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Drive Shoe used ☐ Inside ☑ Outside ☐ None
Final location of shoe(s) 82'

(7) PERFORATIONS/SCREENS
☐ Perforations Method
☑ Screens Type "V" wire Material stainless

From	To	Slot Size	Number	Diameter	Tele/pipe size	Casing	Liner
80'	100'	.040		12	tele	☐	☐
100'	111'	.025		12	tele	☐	☐
111'	131'	.020		12	tele	☐	☐
131'	152'	.032		12	tele	☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☑ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
223 gpm	24.4		24 hrs

Temperature of water 51 Depth Artesian Flow Found
Was a water analysis done? ☐ Yes By whom
Did any strata contain water not suitable for intended use? ☐ Too little ☐ Too much
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other
Depth of strata:

RECEIVED
SEP 02 2008
WATER RESOURCES DEPT
SALEM, OREGON

(9) LOCATION OF WELL (legal description)
County Lane
Tax Lot city lot Lot
Township 17 S N or S Range 5 W E or W WM
Section 31 SW 1/4 NW 1/4

Lat °' " or . (degrees or decimal)
Long °' " or . (degrees or decimal)

Street Address of Well (or nearest address) 25190 E Broadway
Veneta, OR

(10) STATIC WATER LEVEL
74 ft. below land surface. Date 7/31/08
ft. below land surface. Date
Artesian pressure lb. per square inch Date

(11) WATER BEARING ZONES
Depth at which water was first found 74'

From	To	Estimated Flow Rate	SWL
74'	154'	200 gpm	74'

(12) WELL LOG Ground Elevation

Material	From	To	SWL
Rock, crushed	0'	1'	
Clay, brown	1'	5'	
Clay, light tan	5'	9'	
Clay, red	9'	10'	
Clay, brown	10'	50'	
Clay, sandy	50'	51'	
Sand	51'	55'	
Gravels, sand	55'	160'	74'

Date Started 10/1/07 Completed 8/1/08

(unbonded) Water Well Constructor Certification
I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

WWC Number Date

Signed

(bonded) Water Well Constructor Certification
I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 636 Date

Signed Paul Christensen, V-Pres
Christensen Well Drilling Co.

ORIGINAL – WATER RESOURCES DEPARTMENT FIRST COPY – CONSTRUCTOR SECOND COPY – CUSTOMER 06/16/2004

LANE 24173

17S / 5W / 32 AA

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)

(START CARD) # W84005

2 Instructions for completing this report are on the last page of this form.

(1) OWNER: Well Number _____
Name Joleen Lacy
Address 8830 Elmaker Rd.
City Veneta State OR Zip 97487

(2) TYPE OF WORK
[X] New Well [ ] Deepening [ ] Alteration (repair/recondition) [ ] Abandonment

(3) DRILL METHOD:
[X] Rotary Air [ ] Rotary Mud [ ] Cable [ ] Auger
[ ] Other _____

(4) PROPOSED USE:
[X] Domestic [ ] Community [ ] Industrial [ ] Irrigation
[ ] Thermal [ ] Injection [ ] Livestock [ ] Other _____

(5) BORE HOLE CONSTRUCTION:
Special Construction approval [ ] Yes [X] No Depth of Completed Well 101 ft.
Explosives used [ ] Yes [X] No Type _____ Amount _____

HOLE Diameter	From	To	SEAL Material	From	To	Sacks or pounds
10"	0	60'	Cement	0		16 sacks
6"	60'	101'				

How was seal placed: Method [ ] A [ ] B [X] C [ ] D [ ] E
[ ] Other _____
Backfill placed from _____ ft. to _____ ft. Material _____
Gravel placed from _____ ft. to _____ ft. Size of gravel _____

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	6"	+1'	101'	.250	[X]	[ ]	[X]	[ ]
					[ ]	[ ]	[ ]	[ ]
					[ ]	[ ]	[ ]	[ ]
					[ ]	[ ]	[ ]	[ ]
Liner:					[ ]	[ ]	[ ]	[ ]
					[ ]	[ ]	[ ]	[ ]

Final location of shoe(s) _____

(7) PERFORATIONS/SCREENS:
[ ] Perforations Method _____
[ ] Screens Type _____ Material _____

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
						[ ]	[ ]
						[ ]	[ ]
						[ ]	[ ]
						[ ]	[ ]
						[ ]	[ ]

(8) WELL TESTS: Minimum testing time is 1 hour
[ ] Pump [ ] Bailer [X] Air [ ] Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
60	68'	101'	1 hr.
	Could flucuate		

Temperature of water 56 Depth Artesian Flow Found _____
Was a water analysis done? [ ] Yes By whom not tested
Did any strata contain water not suitable for intended use? [ ] Too little
[ ] Salty [ ] Muddy [ ] Odor [ ] Colored [ ] Other _____
Depth of strata: _____

(9) LOCATION OF WELL by legal description:
County Lane Latitude _____ Longitude _____
Township 17S N or S Range 5W E or W. WM.
Section 32 NE 1/4 NE 1/4
Tax Lot 1100 Lot _____ Block _____ Subdivision _____
Street Address of Well (or nearest address) 8830 Elmaker Rd.
Veneta, OR

(10) STATIC WATER LEVEL:
33 ft. below land surface. Date 8-18-95
Artesian pressure _____ lb. per square inch. Date _____

(11) WATER BEARING ZONES:
Depth at which water was first found 91'

From	To	Estimated Flow Rate	SWL
91'	101'	60 gpm	33'

(12) WELL LOG:
Ground Elevation _____

Material	From	To	SWL
Topsoil	0	2'	
Brown, yellow clay	2'	6'	
Red clay	6'	8'	
Brown, yellow clay	8'	43'	
Gray, clay, gravel	43'	62'	
sand & gravel	62'	101'	33'

RECEIVED
AUG 30 1995
WATER RESOURCES DEPT.
SALEM, OREGON

Date started 8-17-95 Completed 8-18-95

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.
WWC Number 1617
Signed [signature] Date 8-18-95

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.
WWC Number 1541
Signed [signature] Date 8-18-95

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765 & OR 690-205-0210)

LANE 67402
04-02-2007

WELL LABEL # L 89156

START CARD # 1000793

(1) LAND OWNER

Owner Well I.D. _____

First Name PHIL Last Name KERSENBROCK
Company
Address PO BOX 747
City VENETA State OR Zip 97487

(2) TYPE OF WORK

[X] New Well [ ] Deepening [ ] Conversion
[ ] Alteration (repair/recondition) [ ] Abandonment

(3) DRILL METHOD

[X] Rotary Air [ ] Rotary Mud [ ] Cable [ ] Auger [ ] Cable Mud
[ ] Reverse Rotary [ ] Other

(4) PROPOSED USE

[X] Domestic [ ] Irrigation [ ] Community
[ ] Industrial/ Commericial [ ] Livestock [ ] Dewatering
[ ] Thermal [ ] Injection [ ] Other

(5) BORE HOLE CONSTRUCTION

Special Standard [ ] (Attach copy)
Depth of Completed Well 140.00 ft.

BORE HOLE Dia	From	To	SEAL Material	From	To	Amt	sacks/ lbs
10	0	40	Bentonite	0	40	17	S
6	40	140					

How was seal placed: Method [ ] A [ ] B [ ] C [ ] D [ ] E
[X] Other POURED AND TAMPED
Backfill placed from ____ ft. to ____ ft. Material
Filter pack from ____ ft. to ____ ft. Material ____ Size
Explosives used: [ ] Yes Type ____ Amount

(6) CASING/LINER

Casing	Liner	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd
(•)	( )	6	[X]	1.5	118.5	.25	(•)	( )	[X]	[ ]
( )	(•)	4.5	[ ]	2	120	sdr26	( )	(•)	[X]	[ ]
( )	( )		[ ]				( )	( )	[ ]	[ ]
( )	( )		[ ]				( )	( )	[ ]	[ ]
( )	( )		[ ]				( )	( )	[ ]	[ ]

Shoe [X] Inside [ ] Outside [ ] Other Location of shoe(s) 118.5
Temp casing [ ] Yes Dia ____ From ____ To ____

(7) PERFORATIONS/SCREENS

Perforations Method
Screens Type FACTORY Material plastic

Perf/ Screen	Casing/ Screen Liner	Dia	From	To	Scrn/slot width	Slot length	# of slots	Tele/ pipe size
Screen	Liner	4.5	120	140	.01		1000	

(8) WELL TESTS: Minimum testing time is 1 hour

( ) Pump ( ) Bailer (•) Air ( ) Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)
100		140	1

Temperature 55 °F Lab analysis [ ] Yes By
Water quality concerns? [ ] Yes (describe below)

From	To	Description	Amount	Units

(9) LOCATION OF WELL (legal description)

County Lane Twp 17.00 S N/S Range 5.00 W E/W WM
Sec 32 NE 1/4 of the NW 1/4 Tax Lot 1405
Tax Map Number Lot
Lat ° ' " or DMS or DD
Long ° ' " or DMS or DD
(•) Street address of well ( ) Nearest address

25841 HWY 126 VENETA, OREGON

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL(ft)
Existing Well / Predeepening			[ ]	
Completed Well	03-29-2007		[ ]	40

Flowing Artesian? [ ] Dry Hole? [ ]

WATER BEARING ZONES Depth water was first found 54

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)
03-29-2007	54	140			[ ]	40
					[ ]	
					[ ]	
					[ ]	
					[ ]	

(11) WELL LOG

Ground Elevation

Material	From	To
TOP SOIL	0	3
BROWN CLAY	3	39
BLUE CLAY	39	47
SAND AND GRAVEL	47	87
BLACK SAND	87	92
SAND AND GRAVEL	92	127
BLACK SAND	127	140

Date Started 03-28-2007 Completed 03-29-2007

(unbonded) Water Well Constructor Certification

I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

License Number 1839 Date 04-02-2007
Electronically Filed
Signed MICHAEL J HOLLEY (E-filed)

(bonded) Water Well Constructor Certification

I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

License Number 1541 Date 04-02-2007
Electronically Filed
Signed CASEY JONES JR (E-filed)
Contact Info (optional) Casey Jones Well Drilling 541-747-280

ORIGINAL - WATER RESOURCES DEPARTMENT
THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

Form Version: 0.88

2

Lane 2340

STATE OF OREGON
WATER WELL REPORT
(as required by ORS 537.765)

SEP 23 1991
WATER RESOURCES DEPARTMENT

NO 17.5/5W-31 Ad
15259

(1) OWNER:
Well Number: Huston Rd
Name: City of Veneta Card # 15259
Address: PO Box 458
City: JENETA State: ORE Zip:

(2) TYPE OF WORK:
☒ New Well ☐ Deepen ☐ Recondition ☐ Abandon

(3) DRILL METHOD
☒ Rotary Air ☐ Rotary Mud ☐ Cable
☐ Other

(4) PROPOSED USE:
☒ Domestic ☒ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval Yes ☐ No ☒ Depth of Completed Well 180 ft.
Explosives used Yes ☐ No ☒ Type Amount

HOLE Diameter	From	To	SEAL Material	From	To	Amount sacks or pounds
24"	0	19'	PORT. CEMENT	1' 6"	19'	34 SACKS
24						

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E
☐ Other
Backfill placed from 0 ft. to 0 ft. Material
Gravel placed from 180 ft. to 0 ft. Size of gravel Turkey Grit

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	18"	+2'	180		☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:	N/A				☐	☐	☐	☐
					☐	☐	☐	☐

location of shoe(s) 40'

(7) PERFORATIONS/SCREENS:
☐ Perforations Method
☒ Screens Type Wound Wire Material S.S.

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
75	80	100		10"	PS	☒	☐
105	110	100		10"	PS	☒	☐
150	160	100		10"	PS	☒	☐
169	179	100		10"	PS	☒	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☒ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
300	21		1 hr.
550	64		

Temperature of water 52° Depth Artesian Flow Found
Was a water analysis done? ☒ Yes By whom Water Analysis & Cor.
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☒ Other IRON
Depth of strata:

(9) LOCATION OF WELL by legal description:
County LANE Latitude Longitude
Township 17 South N or (S) Range 5 E or (W) WM.
Section 31 SE ¼ NE ¼
Tax Lot 2713 Lot Block Subdivision
Street Address of Well (or nearest address) Huston Rd

(10) STATIC WATER LEVEL:
29.6 ft. below land surface. Date
Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:
Depth at which water was first found 70'

From	To	Estimated Flow Rate	SWL
70	85		
120	145		
175	180		

(12) WELL LOG:
Ground elevation

Material	From	To	SWL
LIGHT BROWN CLAY	0	41	
MED SAND SOME COBLES	41	51	
LIGHT GREY CLAY WITH SOME SAND	51	60	
BLACK SAND MED.	60	90	
GREY CLAY	90	91	
COURSE SAND	91	135	
GREY CLAY	135	138	
COURSE SAND	138	176	
SAND AND GRAVEL	176	180	

Date started 7-11-91 Completed

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to my best knowledge and belief.
WWC Number
Signed Date

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. all work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.
WWC Number 1700
Signed Date 9-20-91

WHITE COPIES - WATER RESOURCES DEPARTMENT YELLOW COPY - CONSTRUCTOR PINK COPY - CUSTOMER 9809C 10/86

LANE 58440

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)
Instructions for completing this report are on the last page of this form.

WELL I.D. # L 31759
START CARD # 121896

(1) OWNER: Well Number _____
Name Greg DeMers
Address 25269 E. Bolton Rd.
City Veneta State OR Zip 97487

(2) TYPE OF WORK
[X] New Well [ ] Deepening [ ] Alteration (repair/recondition) [ ] Abandonment

(3) DRILL METHOD:
[X] Rotary Air [ ] Rotary Mud [ ] Cable [ ] Auger
[ ] Other _____

(4) PROPOSED USE:
[ ] Domestic [ ] Community [ ] Industrial [ ] Irrigation
[ ] Thermal [ ] Injection [ ] Livestock [X] Other test well

(5) BORE HOLE CONSTRUCTION:
Special Construction approval [ ] Yes [X] No Depth of Completed Well 179 ft.
Explosives used [ ] Yes [X] No Type _____ Amount _____

HOLE Diameter	From	To	SEAL Material	From	To	Sacks or pounds
10"	0	20'	bentonite	0	20	13
6"	20'	179'				

How was seal placed: Method [ ] A [ ] B [ ] C [ ] D [ ] E
[X] Other as per OAR 690-210-340
Backfill placed from _____ ft. to _____ ft. Material _____
Gravel placed from _____ ft. to _____ ft. Size of gravel _____

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	6"	+2'	160	.250	[X]	[ ]	[X]	[ ]
					[ ]	[ ]	[ ]	[ ]
					[ ]	[ ]	[ ]	[ ]
					[ ]	[ ]	[ ]	[ ]
Liner:					[ ]	[ ]	[ ]	[ ]
					[ ]	[ ]	[ ]	[ ]

Final location of shoe(s) _____

(7) PERFORATIONS/SCREENS:
[X] Perforations Method Star
[ ] Screens Type _____ Material _____

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
83'	119'	1/4 x 1/2	954			[X]	[ ]
						[ ]	[ ]
						[ ]	[ ]
						[ ]	[ ]
						[ ]	[ ]

(8) WELL TESTS: Minimum testing time is 1 hour
well output may fluctuate
[ ] Pump [ ] Bailer [ ] Air [ ] Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
60	75	125	1 hr.

Temperature of water 51° Depth Artesian Flow Found _____
Was a water analysis done? [ ] Yes By whom _____
Did any strata contain water not suitable for intended use? [ ] Too little
[ ] Salty [ ] Muddy [ ] Odor [ ] Colored [ ] Other _____
Depth of strata: _____

(9) LOCATION OF WELL by legal description:
County Lane Latitude _____ Longitude _____
Township 17S N or S Range 5W E or W. WM.
Section 31 NE 1/4 NW 1/4
Tax Lot 4100 Lot _____ Block _____ Subdivision _____
Street Address of Well (or nearest address) 25269 E. Bolton Rd. Veneta, OR

(10) STATIC WATER LEVEL:
50 ft. below land surface. Date 6/13/00
Artesian pressure _____ lb. per square inch. Date _____

(11) WATER BEARING ZONES:
Depth at which water was first found 75

From	To	Estimated Flow Rate	SWL
75	76	8	
83	119	+52	

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SALEM, OREGON

(12) WELL LOG:
Ground Elevation _____

Material	From	To	SWL
Clay brown sandy	0	6	
Clay red / brown	6	17	
Clay yellow	17	21	
Clay gray / blue	21	26	
Clay yellow	26	32	
Clay gray / blue	32	46	
Sand w/ clay & small gravel	46	54	
Sand blue / black	54	75	
Sand black w/ med. gravel	75	83	50
Sand coarse black w/ med. gravel	83	95	50
Gravel sm to large w/ sand	95	104	50
Gravel sm w/ more sand	104	119	50
Clay blue w/ gravel	119	121	50
Clay blue	121	129	50
Clay blue sandy	129	138.5	50
Sand blue	138.5	144	50
Clay gray w/ sand	144	152.5	50
Clay gray w/ small sand	152.5	158.5	50
Clay gray / blue	158.5	169	50
Clay stone, gray blue (firm)	169	179	50

Date started 6/7/00 Completed 6/14/00

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.
WWC Number _____
Signed _____ Date _____

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.
WWC Number 636
Signed Paul Christensen Date _____

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER
Christensen Well Drilling Co.

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WATER RESOURCES DEPT.
SALEM, OREGON

LANE
54209

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)

Instructions for completing this report are on the last page of this form.

WELL I.D. # L17316
START CARD # 105804

(1) OWNER: Well Number 6
Name Kevin Cochran
Address 90136 Baker Rd.
City Elmira State OR Zip 97437

(2) TYPE OF WORK
[X] New Well [ ] Deepening [ ] Alteration (repair/recondition) [ ] Abandonment

(3) DRILL METHOD:
[X] Rotary Air [ ] Rotary Mud [ ] Cable [ ] Auger
[ ] Other

(4) PROPOSED USE:
[X] Domestic [ ] Community [ ] Industrial [ ] Irrigation
[ ] Thermal [ ] Injection [ ] Livestock [ ] Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval [ ] Yes [X] No Depth of Completed Well 100 ft.
Explosives used [ ] Yes [X] No Type Amount

HOLE Diameter	From	To	SEAL Material	From	To	Sacks or pounds
10"	0	19	cement	0	19	8 sacks
6"	19	100				

How was seal placed: Method [ ] A [ ] B [X] C [ ] D [ ] E
[ ] Other
Backfill placed from ft. to ft. Material
Gravel placed from ft. to ft. Size of gravel

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	6"	+3	99	.250	[X]	[ ]	[X]	[ ]
					[ ]	[ ]	[ ]	[ ]
					[ ]	[ ]	[ ]	[ ]
					[ ]	[ ]	[ ]	[ ]
Liner:					[ ]	[ ]	[ ]	[ ]
					[ ]	[ ]	[ ]	[ ]

Final location of shoe(s) 99 ft.

(7) PERFORATIONS/SCREENS:
[ ] Perforations Method
[ ] Screens Type Material

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
						[ ]	[ ]
						[ ]	[ ]
						[ ]	[ ]
						[ ]	[ ]
						[ ]	[ ]

(8) WELL TESTS: Minimum testing time is 1 hour
[ ] Pump [ ] Bailer [X] Air [ ] Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
40	72	100	1 hr.

Temperature of water 56 Depth Artesian Flow Found
Was a water analysis done? [ ] Yes By whom
Did any strata contain water not suitable for intended use? [ ] Too little
[ ] Salty [ ] Muddy [ ] Odor [ ] Colored [ ] Other
Depth of strata:

(9) LOCATION OF WELL by legal description:
County Lane Latitude Longitude
Township 17S N or S Range 5W E or W. WM.
Section 32 NW 1/4 SW 1/4
Tax Lot 1100 Lot 7 Block Subdivision
Street Address of Well (or nearest address) 88061 Huston Rd., Veneta, OR

(10) STATIC WATER LEVEL:
28 ft. below land surface. Date 10-17-97
Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:
Depth at which water was first found 70 ft.

From	To	Estimated Flow Rate	SWL
70	100	40	28

(12) WELL LOG:
Ground Elevation

Material	From	To	SWL
topsoil	0	1	
clay	1	35	
gravel & sand	35	100	28

Date started 10-16-97 Completed 10-20-97

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.
WWC Number 1564
Signed Date 10-20-97

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.
WWC Number 1541
Signed Date 10-20-97

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

LANE 24203

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185/05W/05AC

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)

2

(START CARD) # 81505

Instructions for completing this report are on the last page of this form.

(1) OWNER: Well Number _____

Name JOHN OSBURN
Address 26204 PERKINS Rd.
City EUGENE State OR Zip

(2) TYPE OF WORK
☑ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:
☑ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger
☐ Other _____

(4) PROPOSED USE:
☑ Domestic ☐ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other _____

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☑ No Depth of Completed Well 140 ft.
Explosives used ☐ Yes ☑ No Type _____ Amount _____

HOLE Diameter	From	To	SEAL Material	From	To	Sacks or pounds
10"	0	39	BENTONITE	0	39	16 SACKS
6"	39	140				

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☐ E
☐ Other _____
Backfill placed from _____ ft. to _____ ft. Material _____
Gravel placed from _____ ft. to _____ ft. Size of gravel _____

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	6"	+1	39	250	☑	☐	☑	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:	4"	2	140		☐	☑	☐	☐
					☐	☐	☐	☐

Final location of shoe(s) _____

(7) PERFORATIONS/SCREENS:
☑ Perforations Method SAW
☐ Screens Type _____ Material _____

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
80	140	6	150	1/4		☐	☑
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ☑ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
25		140	1 hr.

Temperature of water 56 Depth Artesian Flow Found _____
Was a water analysis done? ☐ Yes By whom _____
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other _____
Depth of strata: _____

(9) LOCATION OF WELL by legal description:
County LANE Latitude _____ Longitude _____
Township 18S N or S Range 5W E or W. WM.
Section 5 SW 1/4 NE 1/4
Tax Lot _____ Lot _____ Block _____ Subdivision _____
Street Address of Well (or nearest address) SAME

(10) STATIC WATER LEVEL:
62 ft. below land surface. Date 8-3-95
Artesian pressure _____ lb. per square inch. Date _____

(11) WATER BEARING ZONES:
Depth at which water was first found 125

From	To	Estimated Flow Rate	SWL
125	140	25	62

(12) WELL LOG:
Ground Elevation _____

Material	From	To	SWL
SOIL BROWN	0	4	
CLAY BROWN	4	10	
CLAY RED	10	31	
CLAY STONE SANDY "	31	33	
CLAY STONE SANDY GRAY	33	125	
CLAY STONE W/B "	125	140	62

Date started 8-1-95 Completed 8-2-95

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.
WWC Number 1572
Signed Rick Mallett Date 9-1-95

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.
WWC Number 1563
Signed [illegible] Date 8-1-95

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the

STATE ENGINEER, SALEM, OREGON 97310
within 30 days from the date of well completion.

RECEIVED
NOV 2 1973
STATE ENGINEER
SALEM, OREGON

bc

WATER WELL REPORT
STATE OF OREGON

(Please type or print)
(Do not write above this line)

State Well No. 17S/5W-31
State Permit No. LANE G6783 13505

(1) OWNER:
Name City of Veneta
Address Venata, Oregon

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☒ Driven ☐
Cable ☐ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

CASING INSTALLED: Threaded ☐ Welded ☐
8" Diam. from G1 ft. to 110 ft. Gage 277
8" Diam. from 136' ft. to 166' ft. Gage 277
" Diam. from ft. to ft. Gage

PERFORATIONS: Perforated? ☒ Yes ☐ No.
Type of perforator used Torch
Size of perforations 1/8 in. by 4 in.
100 perforations from 145 ft. to 156 ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS: Well screen installed? ☒ Yes ☐ No
Manufacturer's Name Johnson
Type Stainless Model No.
Diam. 8" Slot size 100 Set from 110 ft. to 135 ft.
Diam. Slot size Set from ft. to ft.

(8) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☒ Yes ☐ No If yes, by whom? W.W. Drilling
Yield: 400 gal./min. with 45 ft. drawdown after 10 hrs.
310 " 32 " 24 "
" " " "
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:
Well seal—Material used Cement
Well sealed from land surface to 30 ft.
Diameter of well bore to bottom of seal 16 in.
Diameter of well bore below seal 16 in.
Number of sacks of cement used in well seal 18 sacks
Number of sacks of bentonite used in well seal sacks
Brand name of bentonite
Number of pounds of bentonite per 100 gallons of water lbs./100 gals.
Was a drive shoe used? ☐ Yes ☒ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☐ No Size of gravel:
Gravel placed from 30 ft. to 166 ft.

(10) LOCATION OF WELL:
County Lane Driller's well number
SW¼ NW ¼ Section 31 T. 17S R. 5W W.M.
Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.
Depth at which water was first found 95 ft.
Static level 58 ft. below land surface. Date 10/8/73
Artesian pressure lbs. per square inch. Date

(12) WELL LOG: Diameter of well below casing
Depth drilled 166 ft. Depth of completed well 166 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. *Report each change in position of Static Water Level and indicate principal water-bearing strata.*

MATERIAL	From	To	SWL
yellow clay	0	38'	
Brown sandy clay	38	40'	
Brown sand	40	52'	
Brown cemented gravel	52	85'	
Brown sandy clay	85	90'	
loose small gravel	90	132'	
Brown sandy clay	132	138'	
Blue sandy clay	138	145'	
Sand and gravel blue cemented	145	166'	

Work started 10.1. 1973 Completed 10.8. 1973
Date well drilling machine moved off of well 10/9 1973

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Frank Wilson Date 10/10, 1973
(Drilling Machine Operator)
Drilling Machine Operator's License No. 404

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name W.W. Drilling and Pump Service
(Person, firm, or corporation) (Type or print)
Address 2320 Main Street, Springfield, Oregon 97407
[Signed] Frank Wilson
(Water Well Contractor)
Contractor's License No. 562 Date 10/10, 1973

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

WATER WELL REPORT
STATE OF OREGON

RECEIVED
MAY 7 1981
WATER RESOURCES DEPT
SALEM, OREGON

1583 Lane

State Well No. 18S/5W-5bb

State Permit No. .....

(1) OWNER:
Name Mark Kurzhal
Address 25721 Perkins Rd
City Veneta 97487 State Or

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary Air ☒ Driven ☐
Rotary Mud ☐ Dug ☐
Cable ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐
Thermal: Withdrawal ☐ Reinjection ☐

(5) CASING INSTALLED: Steel ☒ Threaded ☐ Plastic ☐ Welded ☒
6" Diam. from +1 ft. to 118 ft. Gauge .250
..." Diam. from ... ft. to ... ft. Gauge ...

LINER INSTALLED:
..." Diam. from ... ft. to ... ft. Gauge ...

(6) PERFORATIONS: Perforated? ☒ Yes ☐ No
Type of perforator used Punched Slots 1½" Long 1/16" between
Size of perforations 1/16" in. by 1½" in.
240 perforations from 98 ft. to 118 ft.
... perforations from ... ft. to ... ft.
... perforations from ... ft. to ... ft.

(7) SCREENS: Well screen installed? ☐ Yes ☒ No
Manufacturer's Name ...
Type ... Model No. ...
Diam. ... Slot Size ... Set from ... ft. to ... ft.
Diam. ... Slot Size ... Set from ... ft. to ... ft.

(8) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
Air test 30 + gal./min. with drill stem at 118 ft. 2 hrs.
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ... ft.

(9) CONSTRUCTION: Special standards: Yes ☐ No ☒
Well seal—Material used Cement
Well sealed from land surface to 20 ft.
Diameter of well bore to bottom of seal 10 in.
Diameter of well bore below seal 6 in.
Number of sacks of cement used in well seal 10½ sacks
How was cement grout placed? Trimmer pipe
Was pump installed? NO Type ... HP ... Depth ... ft.
Was a drive shoe used? ☐ Yes ☒ No Plugs ... Size: location ... ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of Water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☐ No Size of gravel: ...
Gravel placed from ... ft. to ... ft.

(10) LOCATION OF WELL:
County Lane Driller's well number 4-81
NW ¼ NW ¼ Section 5 T. 18S R. 5W W.M.
Tax Lot # Lot Blk Subdivision
Address at well location: 25721 Perkins Rd
Veneta Or 97487

(11) WATER LEVEL: Completed well.
Depth at which water was first found 100 ft.
Static level 38 ft. below land surface. Date 4-8-81 +
Artesian pressure lbs. per square inch. Date

(12) WELL LOG: Diameter of well below casing 0
Depth drilled 150 ft. Depth of completed well 120 ft.
Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. Report each change in position of Static Water Level and indicate principal water-bearing strata.

MATERIAL	From	To	SWL
Dirt	0	6	
Clay	6	80	
Sand stone	80	100	
Sand & gravel	100	150	

Work started 4-3- 1981 Completed 4-6- 1981
Date well drilling machine moved off of well 4-6- 1981

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] [signature] (Drilling Machine Operator) Date 4-8, 1981
Drilling Machine Operator's License No. 417

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name Art Hoffe Well Drilling (Person, firm or corporation) (Type or print)
Address PO Box 148 Elmira Or 97437
[Signed] [signature] (Water Well Contractor)
Contractor's License No. 771 Date 4-8-81, 19...

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the WATER RESOURCES DEPARTMENT, SALEM, OREGON 97310 within 30 days from the date of well completion.

SP*12658-690

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the

STATE ENGINEER, SALEM, OREGON 97310
within 30 days from the date of well completion.

WATER WELL REPORT
STATE OF OREGON
(Please type or print)
(Do not write above this line)

RECEIVED
FEB 14 1977
WATER RESOURCES DEPT.
SALEM, OREGON

State Well No. 18S/5W-5bb
State Permit No.

Lane 1527

(1) OWNER:
Name Jerry L. Hall
Address 25723 Perkins Rd, Veneta, Oreg 97487

(2) TYPE OF WORK (check):
New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):
Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

CASING INSTALLED: Threaded ☐ Welded ☒
6 5/8 OD Diam. from 0 ft. to 92 3/4 ft. Gage .250
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

PERFORATIONS: Perforated? ☐ Yes ☒ No.
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS: Well screen installed? ☐ Yes ☒ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(8) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☒ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "
Bailer test 40 gal./min. with 40 ft. drawdown after 1 hrs.
Artesian flow g.p.m.
Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:
Well seal—Material used Bentonite
Well sealed from land surface to 35 ft.
Diameter of well bore to bottom of seal 10 in.
Diameter of well bore below seal 6 in.
Number of sacks of cement used in well seal sacks
Number of sacks of bentonite used in well seal 1½ sacks
Brand name of bentonite Yellowstone
Number of pounds of bentonite per 100 gallons of water 175 lbs./100 gals.
Was a drive shoe used? ☒ Yes ☐ No Plugs Size: location ft.
Did any strata contain unusable water? ☐ Yes ☒ No
Type of water? depth of strata
Method of sealing strata off
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.

(10) LOCATION OF WELL:
County Lane Driller's well number
NW¼ NW¼ Section 5 T. 18S R. 5W W.M.
Bearing and distance from section or subdivision corner
Tax lot # 406

(11) WATER LEVEL: Completed well.
Depth at which water was first found 75 ft.
Static level 40 ft. below land surface. Date 1-20-77
Artesian pressure lbs. per square inch. Date

(12) WELL LOG: Diameter of well below casing Cased full depth
Depth drilled 93 ft. Depth of completed well 92 3/4 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. *Report each change in position of Static Water Level and indicate principal water-bearing strata.*

MATERIAL	From	To	SWL
Soil	0	2±	
Clay - brown	2	15	
Clay - grayish brown	15	25	
Clay - brown or reddish brown	25	55	
Clay - gray	55	75	
Sand + gravel + clay - a little water	75	80	
Sand + gravel - dark blue or black - water bearing	80	82	
Sand + gravel - brown - water bearing	82	93	40
Bottom of well in water bearing Sand + gravel	92 3/4		

Work started 1-13 1977 Completed 1-20 1977
Date well drilling machine moved off of well 1-20 1977

Drilling Machine Operator's Certification:
This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.
[Signed] Dell Page (Drilling Machine Operator) Date 1-20, 1977
Drilling Machine Operator's License No. 159

Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Name Dell Page Well Drilling (Person, firm or corporation) (Type or print)
Address 25861 Hwy 126, Veneta, Oregon 97487
[Signed] Dell Page (Water Well Contractor)
Contractor's License No. 104 Date 1-20, 1977

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

5

NOV - 9 1992 LANE 3394

18S/5W/4cc

STATE OF OREGON
WATER WELL REPORT
(as required by ORS 537.765)

WATER RESOURCES DEPT
SALEM, OREGON

(START CARD) # 47250

(1) OWNER: Well Number

Name RITCH DANNER

Address 87334 CHINQUAPIN LOOP

City VENETA State OREGON Zip 97487

(2) TYPE OF WORK:

☒ New Well ☐ Deepen ☐ Recondition ☐ Abandon

(3) DRILL METHOD:

☒ Rotary Air ☐ Rotary Mud ☐ Cable

☐ Other

(4) PROPOSED USE:

☒ Domestic ☐ Community ☐ Industrial ☐ Irrigation

☐ Thermal ☐ Injection ☐ Other

(5) BORE HOLE CONSTRUCTION:

Special Construction approval ☐ Yes ☒ No Depth of Completed Well 204 ft.

Explosives used ☐ Yes ☒ No Type Amount

HOLE Diameter	From	To	SEAL Material	From	To	Amount sacks or pounds
10	0	38	CEMENT	0	38	13 sacks
6	38	204				

How was seal placed: Method ☐ A ☐ B ☒ C ☐ D ☐ E

☐ Other

Backfill placed from ft. to ft. Material

Gravel placed from ft. to ft. Size of gravel

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	6	+2	38	.250	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Final location of shoe(s) NONE USED

(7) PERFORATIONS/SCREENS:

☒ Perforations Method SKIL SAW

☐ Screens Type Material

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
24	204	1/4x3	184			☐	☒
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour

☐ Pump ☐ Bailer ☒ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
2/3		200	1 hr.

Temperature of Water 56° Depth Artesian Flow Found

Was a water analysis done? ☐ Yes By whom

Did any strata contain water not suitable for intended use? ☐ Too little

☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other

Depth of strata:

(9) LOCATION OF WELL by legal description:

County LANE Latitude Longitude

Township 18S N or S. Range 5W E or W. WM.

Section 4 SW ¼ SW ¼

Tax Lot 1120 Lot Block Subdivision

Street Address of Well (or nearest address) 87298 CHINQUAPIN LOOP VENETA, OREGON

(10) STATIC WATER LEVEL:

82 ft. below land surface. Date 10-13-92

Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:

Depth at which water was first found 120

From	To	Estimated Flow Rate	SWL
120	124	2/3	82

(12) WELL LOG:

Ground elevation

Material	From	To	SWL
SOIL-BROWN	0	2	
CLAY-SANDY-BROWN	2	31	
ROCK-GRAY SEDIMENTARY-SOFT	31	204	82
SMALL AMOUNT OF WATER AT 120-124			

Date started 10-19-92 Completed 10-13-92

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materi used and information reported above are true to my best knowledge and belief.

WWC Number 104

Signed Dell Page Date 10-13-92

(bonded) Water Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work p formed on this well during the construction dates reported above. All work perforn during this time is in compliance with Oregon well construction standards. This rep is true to the best of my knowledge and belief.

WWC Number 104

Signed Dell Page Date 10-13-92

ORIGINAL & FIRST COPY - WATER RESOURCES DEPARTMENT SECOND COPY - CONSTRUCTOR THIRD COPY - CUSTOMER 9809C

LANE 65413

RECEIVED
OCT 21 2005
WATER RESOURCES DEPT
SALEM, OREGON

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)

WELL I.D. # L 81283

START CARD # 181988

Instructions for completing this report are on the last page of this form.

(1) LAND OWNER Well Number 1
Name MONARCH PACIFIC LLC
Address P.O. BOX 667
City ELMIRA State OR Zip 97437

(2) TYPE OF WORK ☑ New Well
☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment ☐ Conversion

(3) DRILL METHOD
☑ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger ☐ Cable Mud
☐ Other

(4) PROPOSED USE
☑ Domestic ☐ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION Special Construction: ☐ Yes ☑ No
Depth of Completed Well 100 ft.
Explosives used: ☐ Yes ☑ No Type Amount

BORE HOLE Diameter	From	To	SEAL Material	From	To	Sacks or Pounds
10"	0	20	Bentonite	0	20	11 SACKS
6"	20	100				

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☐ E
☑ Other POURED AND TAMPED
Backfill placed from ft. to ft. Material
Gravel placed from ft. to ft. Size of gravel

(6) CASING/LINER

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	6"	+2	78	.250	☑	☐	☑	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:	4 1/2	-5	100	SDR26	☐	☑	☑	☐
					☐	☐	☐	☐

Drive Shoe used ☑ Inside ☐ Outside ☐ None
Final location of shoe(s) 78'

(7) PERFORATIONS/SCREENS
☐ Perforations Method
☑ Screens Type FERGUSON Material PVC

From	To	Slot Size	Number	Diameter	Tele/pipe size	Casing	Liner
80	100	.010	2000	1"		☐	☑
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ☑ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
50	88	100	1 hr

Temperature of water 55 Depth Artesian Flow Found
Was a water analysis done? ☐ Yes By whom
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other
Depth of strata:

(9) LOCATION OF WELL (legal description)
County LANE
Tax Lot 1500 Lot #1
Township 17 S Range 6 W WM
Section 25 SE 1/4 NE 1/4
Lat ° ' " or . (degrees or decimal)
Long ° ' " or . (degrees or decimal)
Street Address of Well (or nearest address) East side of Territorial Rd at Suttle Rd Elmira

(10) STATIC WATER LEVEL
12 ft. below land surface. Date 10/18/2005
ft. below land surface. Date
Artesian pressure lb. per square inch Date

(11) WATER BEARING ZONES
Depth at which water was first found 45

From	To	Estimated Flow Rate	SWL
45	96	50	12

(12) WELL LOG Ground Elevation

Material	From	To	SWL
TOP SOIL	0	3	
BROWN CLAY	3	22	
GRAY SANDY CLAY	22	39	
GRAVEL	39	48	
GRAY SAND	48	96	12
BROWN CLAYSTONE	96	100	
Cssey Jones Well Drilling Co.,Inc			
37115 Immigrant Road			
Pleasant Hill, OR 97455			
541-747-2806			

Date Started 10/18/2005 Completed 10/18/2005

(unbonded) Water Well Constructor Certification
I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

WWC Number 1722 Date 10/19/2005
Signed

(bonded) Water Well Constructor Certification
I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 1541 Date 10/19/2005
Signed

ORIGINAL – WATER RESOURCES DEPARTMENT FIRST COPY – CONSTRUCTOR SECOND COPY – CUSTOMER 06/16/2004

RECEIVED
MAR 2 1962
STATE ENGINEER
SALEM, OREGON

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the STATE ENGINEER, SALEM 10, OREGON within 30 days from the date of well completion.

WATER WELL REPORT
STATE OF OREGON
(Please type or print)

State Well No. 17/6W-36

State Permit No. LANE 14469

(1) OWNER:
Name George Cook
Address 1610 8th St
Veneta Oregon

(2) LOCATION OF WELL:
County Lane Driller's well number 7
¼ ¼ Section 36 T. 17 S R. 6 W W.M.
Bearing and distance from section or subdivision corner

(3) TYPE OF WORK (check):
New Well ☑ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

(4) PROPOSED USE (check):
Domestic ☑ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(5) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☑ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED: Threaded ☐ Welded ☑
6" Diam. from 62 ft. to 68 ft. Gage 188
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(7) PERFORATIONS: Perforated? ☐ Yes ☑ No
Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(8) SCREENS: Well screen installed ☐ Yes ☑ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(9) CONSTRUCTION:
Well seal—Material used in seal Clay
Depth of seal 20 ft. Was a packer used? No
Diameter of well bore to bottom of seal 8 in.
Were any loose strata cemented off? ☐ Yes ☑ No Depth
Was a drive shoe used? ☑ Yes ☐ No
Was well gravel packed? ☐ Yes ☑ No Size of gravel:
Gravel placed from ft. to ft.
Did any strata contain unusable water? ☐ Yes ☑ No
Type of water? Depth of strata
Method of sealing strata off

(10) WATER LEVELS:
Static level 30 ft. below land surface Date 3-15-62
Artesian pressure lbs. per square inch Date

(11) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☐ Yes ☑ No If yes, by whom?
Yield: gal./min. with ft. drawdown after hrs.
" " " "
" " " "
Bailer test 10 gal./min. with 20 ft. drawdown after 1 hrs.
Artesian flow g.p.m. Date
Temperature of water Was a chemical analysis made? ☐ Yes ☐ No

(12) WELL LOG: Diameter of well below casing 6
Depth drilled 168 ft. Depth of completed well 168 ft.
Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
Yellow Clay	0	20
Sandy Clay (Yellow	26	40
Black Sand	40	45
Sandy Clay (Yellow	45	60
Sand & Small gravel	60	68
Blue gray Sandstone	68	103

Work started 19 Completed 3-15 1962
Date well drilling machine moved off of well 3-16 1962

(13) PUMP:
Manufacturer's Name
Type: H.P.

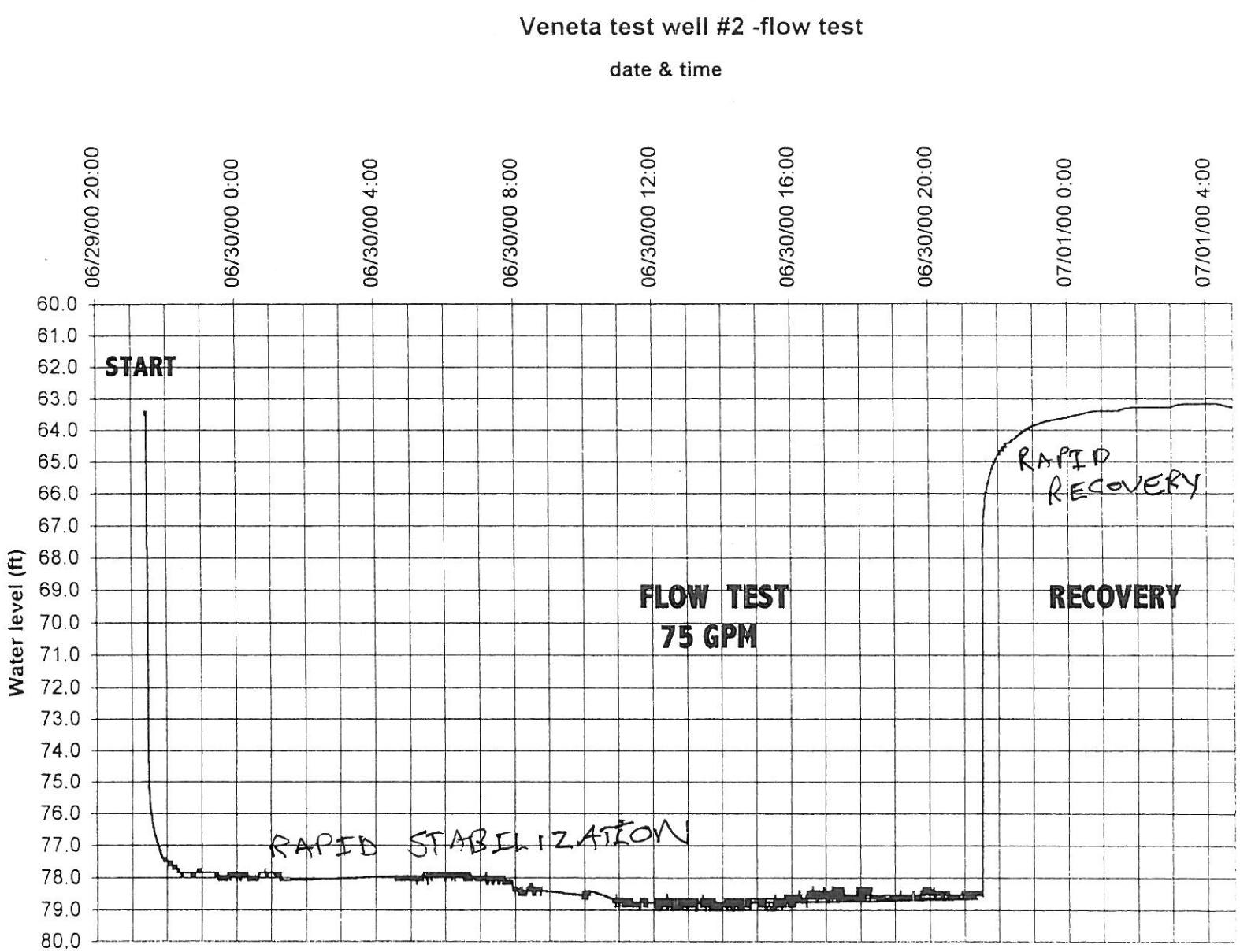
Water Well Contractor's Certification:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

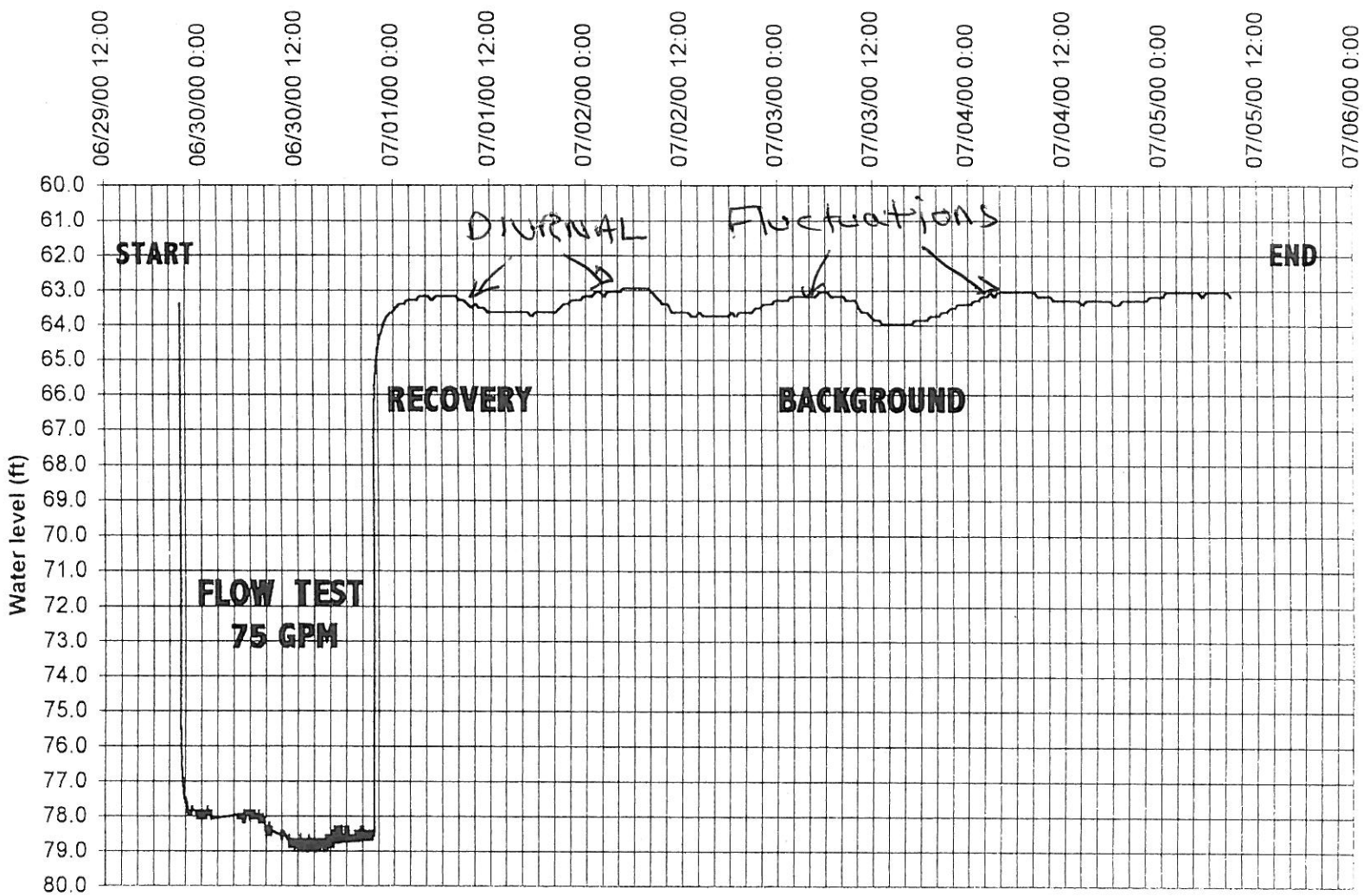
NAME Bonnie Blue Well Drilling
(Person, firm or corporation) (Type or print)
Address RR 2 Box 195 Springfield Ore
Drilling Machine Operator's License No. 8
[Signed] [illegible]
(Water Well Contractor)
Contractor's License No. 307 Date 3/16, 1962

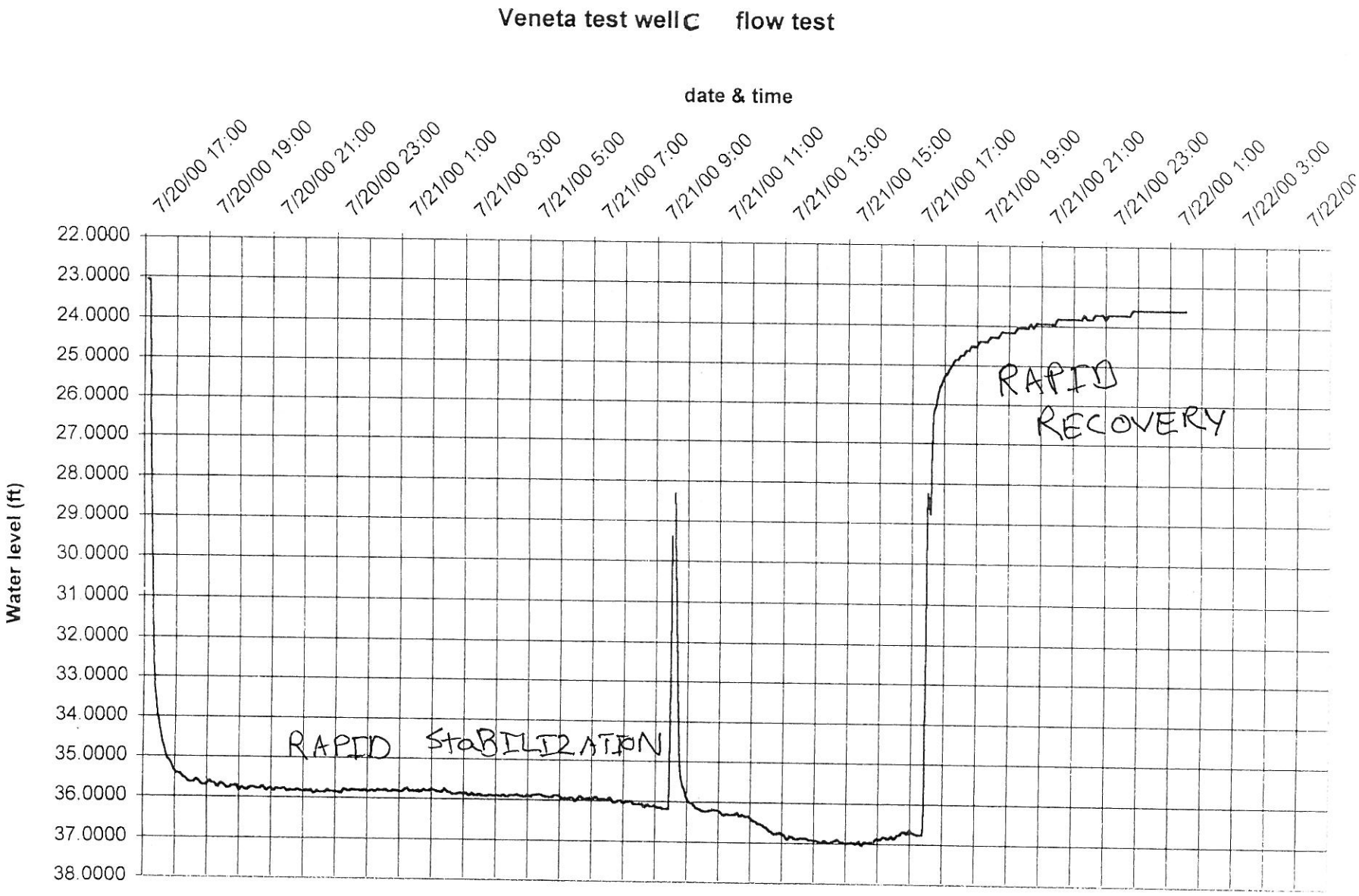
(USE ADDITIONAL SHEETS IF NECESSARY)

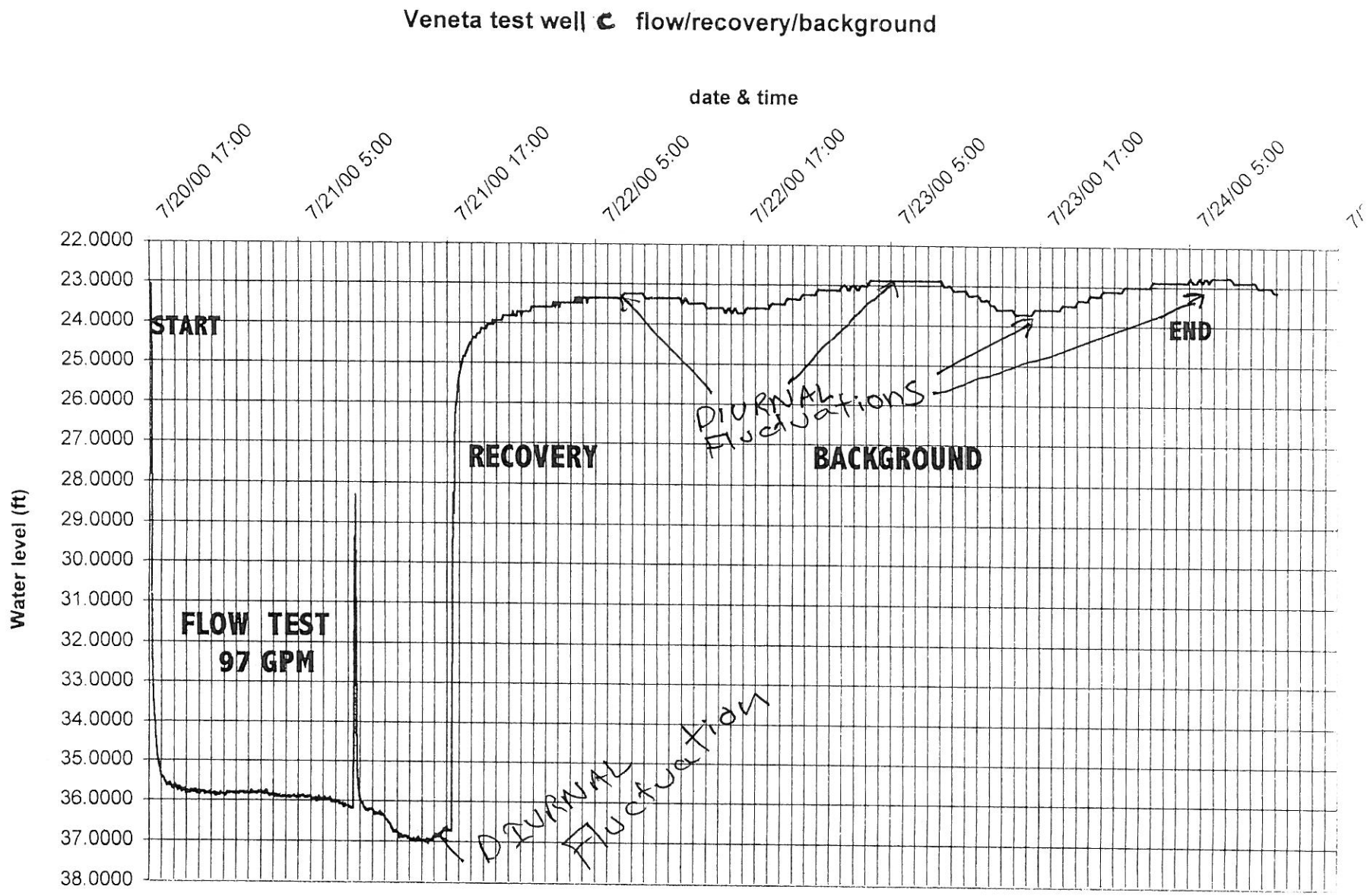
Attachment B – Pump Test Curves for Pilot Wells

PILOT WELL B


Veneta test well #2 -flow test
date & time
06/29/00 20:00
06/30/00 0:00
06/30/00 4:00
06/30/00 8:00
06/30/00 12:00
06/30/00 16:00
06/30/00 20:00
07/01/00 0:00
07/01/00 4:00
Water level (ft)
60.0
61.0
62.0
63.0
64.0
65.0
66.0
67.0
68.0
69.0
70.0
71.0
72.0
73.0
74.0
75.0
76.0
77.0
78.0
79.0
80.0
START
FLOW TEST
75 GPM
RECOVERY
RAPID RECOVERY
RAPID STABILIZATION


Veneta test well #2 -flow test/recovery/background
date & time
06/29/00 12:00
06/30/00 0:00
06/30/00 12:00
07/01/00 0:00
07/01/00 12:00
07/02/00 0:00
07/02/00 12:00
07/03/00 0:00
07/03/00 12:00
07/04/00 0:00
07/04/00 12:00
07/05/00 0:00
07/05/00 12:00
07/06/00 0:00
Water level (ft)
60.0
61.0
62.0
63.0
64.0
65.0
66.0
67.0
68.0
69.0
70.0
71.0
72.0
73.0
74.0
75.0
76.0
77.0
78.0
79.0
80.0
START
END
DIURNAL
Fluctuations
RECOVERY
BACKGROUND
FLOW TEST
75 GPM


Veneta test well C flow test
date & time
7/20/00 17:00
7/20/00 19:00
7/20/00 21:00
7/20/00 23:00
7/21/00 1:00
7/21/00 3:00
7/21/00 5:00
7/21/00 7:00
7/21/00 9:00
7/21/00 11:00
7/21/00 13:00
7/21/00 15:00
7/21/00 17:00
7/21/00 19:00
7/21/00 21:00
7/21/00 23:00
7/22/00 1:00
7/22/00 3:00
Water level (ft)
22.0000
23.0000
24.0000
25.0000
26.0000
27.0000
28.0000
29.0000
30.0000
31.0000
32.0000
33.0000
34.0000
35.0000
36.0000
37.0000
38.0000
RAPID STABILIZATION
RAPID RECOVERY


Veneta test well C flow/recovery/background
date & time
7/20/00 17:00
7/21/00 5:00
7/21/00 17:00
7/22/00 5:00
7/22/00 17:00
7/23/00 5:00
7/23/00 17:00
7/24/00 5:00
Water level (ft)
22.0000
23.0000
24.0000
25.0000
26.0000
27.0000
28.0000
29.0000
30.0000
31.0000
32.0000
33.0000
34.0000
35.0000
36.0000
37.0000
38.0000
START
FLOW TEST
97 GPM
RECOVERY
BACKGROUND
END
DIURNAL FLUCTUATIONS
DIURNAL FLUCTUATION

Memorandum

TO: **Walter Burt, RG**

FROM: **Adam Sussman**
Mike Reynolds

DATE: **November 18, 2008**

RE: **City of Veneta – Water Supply Alternatives**

Introduction

This memorandum provides a general overview of water source alternatives for the City of Veneta (City), including analysis of potential fatal flaws that may hinder the City's efforts. The primary alternatives considered here include conservation, improving the capacity and efficiency of the City's existing wells and distribution system, water right transfers, new surface water rights, new groundwater rights and obtaining water from federal storage projects. This memorandum also provides an introduction to the Oregon water right system. Further detailed analysis of the alternatives should be completed as part of on-going supply development planning.

Alternatives for Additional Water Supply for the City of Veneta

The City should consider the following water supply opportunities, either separately or in combination, as a means to meet its future water supply needs.

Conservation

The City's November 2003 Water Management and Conservation Plan (WMCP) includes a number of conservation measures that will assist the City in reducing demand and maximizing the efficient use of its water. The City should track conservation savings and factor those savings into its water demand forecasting.

SB 1069 Water Conservation Grant – Conserve Backwash Water

Recently, GSI Water Solutions, Inc. (GSI) submitted an application on behalf of the City to Oregon Water Resources Department (OWRD) for a grant under the Department's Conservation, Reuse and Storage grant program (SB 1069 Water Conservation Grant). The purpose of this grant application is to obtain funding for an engineering study of conservation options for approximately 25,000 gallons of water per day that is "lost" through the backwash process used to clean water treatment filters. These filters remove iron and other particles from water pumped out of the City's wells. If an engineering solution is identified and implemented, the conserved water could be placed back into the City's water treatment process and would be

available for use in the community. This is a conservation opportunity that would help the City meet its water demand.

Improving the Capacity and Efficiency of the City's Existing Wells and Distribution System

The Water System Master Plan currently being developed includes an evaluation of whether the City's existing wells are producing water up to the full rate authorized in the applicable water rights. Increasing production from the City's existing wells has the potential to be a cost-effective method for the City to increase its actual water supply without needing to pursue any new water right applications or other administrative processes. In addition, there may be opportunities to increase the efficiency of the City's water distribution system, such as reducing water leakage and improving metering of water use.

Water Rights Application or Transfer

Overview of Oregon Water Rights System

The ground water and surface water in Oregon is publicly owned and, therefore, belongs to the state. With a few exceptions, the use of water in Oregon requires the user to obtain a water right permit from OWRD.

The administration of water rights by OWRD is based on the doctrine of prior appropriation. Under this doctrine, in times of shortage the first person to have obtained a water right permit (the senior appropriator) is the last to be limited in low water conditions. The date of application for the water right permit usually establishes the "priority date" or place in line of an appropriator. In water-short times, the senior appropriator can demand the full amount of their water right regardless of the needs of junior appropriators. If there is surplus beyond the needs of the senior appropriator, the next most senior appropriator can take as much water as needed to satisfy their right and so on down the line until there is no surplus. A state officer (an OWRD Watermaster) oversees which junior appropriators must stop using water so that senior users can be satisfied.

The right to use water is typically first granted in the form of a water use permit. The permit describes the priority date, the amount of water that can be used, the location and type of water use and often a number of water use conditions. The permit allows the water user to develop the infrastructure needed to put the water to full beneficial use – a requirement of Oregon water law. When the report of beneficial use, called a Claim of Beneficial Use (COBU), is approved by OWRD, a water right certificate is issued confirming the status of the right.

Water right permits typically have timelines for making full beneficial use of the water. If more time is needed than provided in the permit, the permit holder may request an "extension of time" from OWRD.

Groundwater registrations are claims of beneficial use of groundwater initiated prior to enactment of the 1955 groundwater code. Ultimately, OWRD will adjudicate these groundwater registrations and send its final determination to the circuit court for the issuance of a decree vesting the water use; however, until that time, they are treated by OWRD as existing water rights of record authorizing the use of groundwater.

There are two different application processes that allow modification of a water right. When a water right is in the permit phase (still being developed), the permit holder may modify the water use by changing the location of use and the point where water is appropriated through an application for a permit amendment. Under a water right certificate, the water right holder can modify the location of use, the point where water is diverted and the type of use made under the water right through an application for a water right transfer.

Water Right Transfers

As described above, water right holders can file a transfer application with OWRD to modify a water right by changing the point where water is diverted, the type of use, the place of use, or any combination of these. Transfers can be used to modify a surface water right, a groundwater right, and in some cases change a surface water right to a groundwater right.

The transfer process can be used to maximize the use of existing water rights and to obtain water from other external water rights. For example, the City has a pending transfer application requesting to use one or more new wells to develop unutilized capacity on its existing water rights and to provide additional redundancy to the system. In essence, the unutilized capacity at several existing wells can be transferred to one or more new wells where the water can be more readily appropriated. This is a way of matching the City's water right capacity with its well production capacity.

Another type of transfer involves finding water rights that are not held by the City and transferring the rights to a new or existing well that the City owns. In order for such transfers to be approved, the sources (aquifers) of both water rights would need to be the same, there could be no expansion of the original right, and OWRD would need to find that the transfer would not result in injury to other water users. OWRD may require conditions, which limit use of water at the new point of appropriation, such as the rate of withdrawal, duty (volume), and the season of use.

Our initial research indicates that there are a number of certificated water rights located in the area around the City. It may be possible to work with holders of these water rights and apply for a transfer that could benefit the City. For example, the City could explore transfers from other groundwater rights to new municipal wells. If the original groundwater right is for a use other than municipal, the City would need to request a change in type of use as well as point of appropriation. In addition, there are several pre-1955 groundwater registrations in the area around Veneta. There is a process allowing modifications to groundwater registrations, which could benefit the City.

New Water Right Permit for Groundwater

The City could pursue an application for a new groundwater permit. The criteria in OWRD's permit application review process are: 1) whether the proposed use is allowed in the basin program; 2) whether water is available; 3) whether the proposed use would cause injury; and 4) whether the proposed use is consistent with other rules of the Water Resources Commission. First, OWRD will determine whether the proposed use is allowed in the relevant basin program. Basin programs are administrative rules which establish water management policies and objectives and which govern the appropriation and use of the surface and groundwater within each basin. The basin program rules that "classify" uses of water in the Veneta area are contained in OWRD's Willamette Basin Program. These rules classify groundwater and surface

water separately. The Willamette Basin program rules for the Long Tom Sub-Basin do not place restrictions on the use of groundwater. As a result, OWRD should find a new groundwater application by the City for municipal use to be consistent with the basin program, so long as the groundwater is not too closely linked to surface water.

If, however, the groundwater is in hydraulic connection with surface water, the surface water classifications could apply to a new groundwater application. The Willamette Basin Program specifies that groundwater in unconfined alluvium within 1/4 mile of the banks of a stream or surface water source is presumed to be in hydraulic connection with the surface water source and that this hydraulically connected groundwater shall be classified the same as the surface water source, unless the applicant or appropriator provides satisfactory information or demonstration to the contrary. Since surface water in the Long Tom sub-basin is not classified for municipal use, Veneta would need to carefully identify proposed well locations such that hydraulic connection between ground and surface water is unlikely to avoid having the surface water classifications apply to its groundwater application.

Second, OWRD will determine whether water is available for the proposed use. OWRD's groundwater section has not recently analyzed the shallow alluvial aquifer in the area of Veneta. Michael Mattick, the OWRD Watermaster for the region has indicated (personal communication, 2008) that other than areas where there is a potential for substantial interference (PSI), there are presently no restrictions issuing new groundwater permits for the shallow alluvial aquifer. OWRD will be looking at that aquifer in fall/winter 2008 in connection with a transfer application for Veneta. OWRD will likely have substantive input at that time.

If the proposed groundwater source is determined to have PSI with surface water, OWRD will also determine whether surface water is available in the adjacent (subject) surface water body. OWRD's process for determining whether a groundwater use will have PSI with surface water is established in the agency's Division 9 rules. These rules provide for the following process. OWRD will first determine whether a proposed well is developing water from a confined or unconfined aquifer. Next, OWRD will determine whether the aquifer is hydraulically connected to surface water. OWRD will assume that a well less than one-quarter mile from a surface water source that produces water from an unconfined aquifer is hydraulically connected to the surface water. Finally, if the well is determined to produce water from an aquifer that is hydraulically connected to surface water, OWRD will determine whether it has the potential to cause substantial interference with surface water. OWRD will assume that use of hydraulically-connected ground water will have PSI if it meets <u>any</u> of the following criteria:

1. The well is less than one-quarter mile from the surface water, unless it can be demonstrated that an intervening confining unit hydraulically separates the aquifer from the surface water body

2. Water would be appropriated at a rate greater than five cubic feet per second (cfs) and the well is less than one mile from the surface water

3. Water would be appropriated at a rate greater than the discharge rate of the stream that is expected 80 percent of the time and the well is less than one mile from the surface water

4. Groundwater appropriation for a period of 30 days would cause stream depletion greater than 25 percent of the rate of appropriation and the well is less than one mile from the surface water

If OWRD determined that the proposed use of groundwater would have PSI with surface water, the agency will consider whether water is available from that surface water source. According to the OWRD's water availability report, which is based on the gage on the Long Tom River in Monroe, surface water is available in the Long Tom River year-round except August, at an 80 percent exceedance. However, Watermaster Michael Mattick has communicated to GSI (personal communication, 2008) that the Long Tom River is fully allocated during peak water use season. Accordingly, the agency would most likely not approve such a new municipal groundwater application except in areas where it has been determined that PSI with surface water is not an issue. To avoid a finding of PSI, the City should look to place the wells greater than one-quarter mile from any surface water source and groundwater could be appropriated at a rate of five cfs or less.

Third, OWRD will determine whether a new groundwater use will cause injury. As previously stated, OWRD's groundwater section has not recently analyzed the shallow alluvial aquifer in the area of Veneta, and cannot indicate whether a new groundwater use would injure other groundwater users. OWRD's upcoming review of Veneta's water right transfer application will likely provide substantive input.

Finally, OWRD will determine whether the proposed use is consistent with other rules of the Commission. This criterion is particularly relevant if the proposed ground water use is determined to have PSI with surface water as described above. In such cases, the groundwater application would be subject to review under OWRD's Additional Public Interest Review process as defined in OAR Chapter 690 Division 33. A Division 33 review often results in the identification of concerns about fish, wildlife, water quality, and related issues. These issues can result in the denial of an application or imposition of additional conditions on the permit that limit use of water under the right in order to protect fish, wildlife or water quality.

GSI recommends that the City submit an application for a new groundwater permit as soon as possible, requesting additional water for municipal use from existing wells or from new wells. In the event that OWRD provides feedback indicating that the aquifer is at or beyond its limits, GSI and the City should discuss whether to continue the pursuit of a new groundwater right.

New Surface Water Permit

In order to approve an application for a new surface water right OWRD would need to find that; the proposed use is consistent with the classification in the Willamette Basin Program, the proposed use would not cause injury to other water rights, water is available and the application complies with other rules of the Water Resources Commission. The basin program rules for the Long Tom Sub-Basin do not classify surface water for municipal use. Thus, any new application for surface water would require a basin plan exception by the Water Resources Commission, which is a separate (although possible) process from an actual surface water application. As noted above, OWRD's water availability report shows that surface water is available at an 80 percent exceedance level year-round except for August. However, as described above, the OWRD's analysis is at the gage on the Long Tom River at Monroe, and the OWRD Watermaster has stated that the Long Tom River is fully appropriated during peak

water use season in the vicinity of Veneta, based on more localized information. Thus, new surface water applications for municipal use in this area appear unlikely to be approved.

New Storage Permit

In order to approve an application for a new municipal storage reservoir OWRD would need to find that; the proposed use is consistent with the basin program, the proposed use would not cause injury to other water rights, water is available and the application complies with other rules of the Water Resources Commission. Other key considerations would include site development, annual basin water yield, fish and wildlife, and water quality issues. The Willamette Basin program rules allow storage for municipal use. Based on OWRD's water availability report surface water is available for storage year-round, although the Watermaster may provide input that further restricts water availability based on more localized information. As indicated previously, the Watermaster has stated that the Long Tom River is fully appropriated during the peak water use season; however, water is likely available for storage during the winter months. Additional analysis is needed to identify to what extent water is available for storage and whether a feasible storage site is available.

Obtaining Water From Federal Storage Projects

The City of Veneta is currently involved with the Southern Willamette Municipal Water Suppliers (SWMWP) group that is led by the Eugene Water and Electric Board (EWEB). The SWMWP applied for and received an Oregon Water Supply and Conservation Initiative grant to conduct an evaluation of opportunities and obstacles for obtaining water from federal storage projects in the Willamette Basin for municipal and industrial use. Currently, the projects are managed by the Army Corps of Engineers (Corps) and the Bureau of Reclamation (BOR) issues new contracts for stored water. However, BOR only issues contracts for irrigation use and the Corps is not issuing any contracts for municipal and industrial use. The primary impediments to the use of stored water from the Willamette Basin Project have been identified as: the limitations in the BOR's existing storage water rights for the projects, which only authorize the use of water for irrigation; the anticipated pricing formulas for municipal and industrial use water, which could result in costs of over $1500 per acre foot; and the lack of an entity to assume the role of contracting authority. The SWMWP's efforts may identify a pathway towards obtaining contracts for municipal and industrial use, but this option is unlikely to be available for several years. The City should continue its participation with SWMWP and EWEB to obtain access to water from federal storage projects in the Willamette Basin.

Conclusion

The City of Veneta has a variety of options to maximize access to water from its existing sources and to obtain additional sources of water to meet its present and future demands. From our initial research, it appears that new surface water applications are unlikely to be approved by OWRD. However, several options may warrant additional investigation by the City. Those options include:

- general conservation
- conservation of backwash water
- improving capacity and efficiency of existing wells and distribution system;
- water right transfers

- new groundwater applications
- new storage applications
- obtaining contracts for use of stored water from federal storage projects for municipal use.

In the short-term, GSI recommends that the City prioritize development of an application for a new groundwater permit for municipal use, in addition to the City's pending transfer application. In the event that a new groundwater application cannot be approved, the City should pursue opportunities for additional water right transfers.

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