

**To:** Region 2050 Policy Advisory Board **Date:** April 10, 2006  
**Copy:** Region 2050 Technical Advisory Committee **DRAFT**  
**From:** Mike Wolf and Bill Mason, RG  
DEQ-Eugene  
**Subject:** Update for Alvadore, Goshen, and Pleasant Hill  
Relative Potential Effects of On-Site Wastewater Treatment Systems on  
Groundwater Quality

As a part of your efforts to develop a Regional Growth Management Strategy, you have been evaluating the potential effects of the Regional Growth Concept on the region's natural resources and environmental quality. We provided guidance via a memorandum entitled *Relative Potential Effects of On-Site Wastewater Treatment Systems on Groundwater Quality under the Rural Growth Scenario* in April 2005. We were asked last month to offer additional guidance on the likely need for community wastewater systems in Alvadore, Goshen, and Pleasant Hill given that the Regional Growth Concept differs from the original Rural Growth scenario. This memorandum summarizes findings of our analysis, and offers recommendations concerning the potential need for community wastewater systems in Goshen and Pleasant Hill, where higher-density development is planned.

## Background

In Oregon, about one quarter of households has an onsite wastewater treatment and disposal system. In conventional onsite systems, household wastewater collects in an underground septic tank, which removes most settleable and floatable material, and acts to partially treat the sewage through anaerobic (low-oxygen) biological decay. The remaining wastewater, which still contains concentrations of pathogens and nutrients, has traditionally been discharged to soil, sand, or other types of absorption fields for further treatment through biological processes, adsorption, filtration, and infiltration into underlying soils. Typically, septic system drainfields "fail" when they allow raw or partially treated sewage to reach the surface where it can pose a threat to human health or the environment.

Given a properly designed, operated, and maintained onsite system in a remote area, we generally expect that the contaminants that are not completely treated (e.g., nitrates) will not reach groundwater in sufficient quantities that they would pose a risk to nearby natural resources (e.g., streams) or beneficial uses (e.g., domestic drinking water well). However, as lot sizes decrease, the chances that the cumulative effects of onsite systems on ground- or surface water increases as the capacity of groundwater to assimilate and dilute contaminants is reached.

In our April 2005 memo, we stated that the highest risk that onsite systems can pose to groundwater is when they are located on small lots in areas with shallow, unconfined, locally used drinking water

aquifers. For surface water, the highest risk scenario is when you have small lots near streams or lakes in areas with relatively permeable soils and shallow sediments.

We also summarized some of the studies that tried to answer the question “how dense is too dense” with respect to lot size and groundwater contamination, and we found that although it is almost impossible to answer that question precisely without extensive, site-specific data collection efforts, we generally can say that onsite systems on lots smaller than one or two acres in size are much more likely to lead to impacts on nearby groundwater sources of drinking water.

## Regional Growth Concept

In the Draft Regional Growth Concept (Concept), Goshen is proposed to have low density urban residential densities and more commercial and industrial uses; Alvadore is proposed to have increased rural residential densities; and Pleasant Hill is proposed to have small city residential densities and more commercial uses. The resulting population, employment, and land area of these three rural communities in the Concept is shown below.

	Regional Growth Concept, 2055				Existing Conditions	
	Population and Housing Densities					
	Housing Units	Res. Acres	Net Density	Land Capacity Population	Net Density	2000 Population
Goshen	968	176	6.9	2,206	0.2	230
Alvadore	1,366	1,202	1.4	3,114	0.7	309
Pleasant Hill	2,842	624	5.7	6,480	0.4	543
	Employment, Employment Densities, and Boundary Acres					
	Jobs	Employment Acres	Emp. Per Acre	Total Acres in RC Boundary		
Goshen	4,624	236	23.5	421	NA	NA
Alvadore	720	73	11.8	1,354	NA	NA
Pleasant Hill	290	34	10.1	720	NA	NA

## Resource Constraints in Selected Region 2050 Areas

The majority of the following material was collected from source-water assessments conducted by the Department of Human Services (DHS) Drinking-Water Protection Program staff.

**Goshen:** The Seavy Loop Water Company installed a drinking-water supply well in the Goshen area in 1962 to a depth of only 60 feet below ground surface. Based on the well logs and regional geologic maps, the aquifer supplying water to the drinking-water supply well is identified as silt,



sand, and gravel from the Willamette River. The first water bearing zone is estimated to occur at a depth of approximately 11 feet below ground.

DHS considers the aquifer to be an unconfined alluvial aquifer (that is, no extensive, low-permeability layer is present that would significantly prevent contaminants infiltrating into the aquifer from the ground surface), and therefore consider it to be “highly sensitive” in several respects (see Table 1).

The geology in the Goshen area is variable, so the above analysis applies primarily to the alluvial aquifer closer to the Willamette River. Other wells in the area have been drilled into marine or terrestrial silt- and sandstones and basalts, and water supplies originating from these often deeper wells likely would be less sensitive to surficial contaminant sources.

**Table 1: Aquifer Sensitivity Analysis for Seavy Loop Water Co**

Parameter	Sensitivity			Comments
	H	M	L	
Depth to first water-bearing zone below casing seal				18 feet
Aquifer characteristics and hydraulic nature				Shallow unconfined alluvial aquifer
Overburden thickness and characteristics				11 feet of sandy soil, silt, and gravel
Highest soil sensitivity in Protection Area				Contributes to moderate aquifer sensitivity
Traverse potential score (10 = High)				Score = 5
Infiltration potential score (10 = High)				Score = 7
Organic chemical detections				None
Inorganic chemical detections				Barium (1997) and copper (1984) <50% of the MCL; see paragraphs following Table 4.1
Source related coliform detections				None
Nitrate concentrations (Drinking Water Standard = 10 mg/L)				Up to 2.80 mg/L; suggests possible pathway from surface to aquifer
Fractured bedrock in Protection Area				None
Other wells score (Significant Risk = 400)				Score = 308; does not contribute to water system sensitivity
Surface water within 500 feet of wellhead				None
Sodium detection >20 mg/L				None

**Pleasant Hill:** There are a few drinking-water supply wells in the Pleasant Hill area that provide us with information on the geology and susceptibility of the groundwater resources in the area. These include the Trent Elementary School well, and the Pleasant Hill schools wells.



The aquifer supplying the drinking water to Trent Elementary, SD #1 Water System consists of primarily alluvial sand and gravel from the Middle Fork of the Willamette River. The first water bearing zone is estimated to occur at a depth of approximately 20 feet below ground. Based on the well log and regional geologic maps, the aquifer supplying water to the well is identified as sand and gravel deposited by the Middle Fork of the Willamette River in the recent geologic past. According to the well report, the static water level (water level when well is not being pumped) was reported as 20 feet below the surface. Since permeable sand and gravel are present from the surface to 25 feet, then it is likely that the static water level is also the location of the water table. However, the fact that the well was drilled an additional 180 feet through bedrock (tuffaceous sedimentary bedrock, likely of the Little Butte Volcanic Series) indicates that water was also found at greater depth. It is possible that the deeper water is confined by unfractured bedrock; however, the casing seal is not deep enough to prevent the shallow, unconfined water from commingling with the deeper water. Therefore, DHS considers the aquifer supplying the well to be an unconfined alluvial aquifer with a depth to the first water-bearing zone of approximately 20 feet (Table 2).

Parameter	Sensitivity			Comments
	H	M	L	
Depth to first water-bearing zone below casing seal				20 feet
Aquifer characteristics and hydraulic nature				Shallow, unconfined, alluvial and fractured bedrock aquifer
Overburden thickness and characteristics				20 feet of highly permeable materials
Highest soil sensitivity in Protection Area				Contributes to moderate aquifer sensitivity
Traverse potential score (10 = High)				Score = 9
Infiltration potential score (10 = High)				Score = 9
Organic chemical detections				None
Inorganic chemical detections				Copper and arsenic <50% of the MCL; see paragraph following Table 4.1
Source related coliform detections				Total coliform detected on 5/22/03
Nitrate concentrations (Drinking Water Standard = 10 mg/L)				Up to 1.90 mg/L; indicates a pathway from surface to aquifer
Fractured bedrock in Protection Area				None
Other wells score (Significant Risk = 400)				Score = 112; does not contribute to water system sensitivity
Surface water within 500 feet of wellhead				Rattlesnake Creek ~400 feet from well
Sodium detection >20 mg/L				Up to 43 mg/L; see paragraphs following Table 4.1



The Pleasant Hill schools, on the other hand, use wells that likely tap the alluvial sand, gravel, and boulders deposited by the Willamette River in the recent geologic past, with a the first water-bearing zone occurring at a depth of about 95 feet. DHS considers the aquifer supplying the wells to be a deep confined alluvial aquifer that is less sensitive to contaminants infiltrating into the aquifer from the ground surface (Table 3).

<b>Table 3: Aquifer Sensitivity Analysis for the Pleasant Hill Schools</b>				
<b>Parameter</b>	<b>Sensitivity</b>			<b>Comments</b>
	<b>H</b>	<b>M</b>	<b>L</b>	
<b>Depth to first water-bearing zone below casing seal</b>				Well #1: ~95 feet Well #2: unknown ~85 feet Well #3: ~85 feet
<b>Aquifer characteristics and hydraulic nature</b>				Deep confined alluvial aquifer
<b>Overburden thickness and characteristics</b>				~90 feet; clay and/or silt and gravel
<b>Highest soil sensitivity in Protection Area</b>				Low; does not contribute to aquifer sensitivity. Area within 2-yr TOT adjusted to moderate sensitivity based on Infiltration Potential.
<b>Traverse potential score (10 = High)</b>				Score = 1
<b>Infiltration potential score (10 = High)</b>				Score = 4
<b>Organic chemical detections</b>				None
<b>Inorganic chemical detections</b>				Copper <50% of the MCL; see paragraph following Table 4.1
<b>Source related coliform detections</b>				None
<b>Nitrate concentrations (Drinking Water Standard = 10 mg/L)</b>				Up to 0.70 mg/L; considered to come from natural sources
<b>Fractured bedrock in Protection Area</b>				No
<b>Other wells score (Significant Risk = 400)</b>				Score = 291
<b>Surface water within 500 feet of wellhead</b>				None

**Alvadore:** There are several community water-supply systems in the Alvadore area, including Fernridge Mobile Estates, Orchard Point Mobile Homes, and Lane County’s Orchard Point Park well. The aquifer supplying the drinking water to these wells (and is typical of other wells in the area) consists of alluvial sand and gravel of the Willamette Aquifer. DHS considers the aquifer to be a shallow but confined (that is, there is a lower-permeability “layer” that helps protect the deeper portions of the aquifer from surficial contaminants). However, some of the wells show nitrate levels above what we might consider “background” concentrations, so it is possible that there are pathways



from the surface to the aquifer (e.g., poorly constructed wells that allow water to migrate downward along the well bore).

<b>Table 4: Aquifer Sensitivity Analysis for Orchard Point Mobile Homes</b>				
<b>Parameter</b>	<b>Sensitivity</b>			<b>Comments</b>
	<b>H</b>	<b>M</b>	<b>L</b>	
<b>Depth to first water-bearing zone below casing seal</b>				Well 2: ~38 feet Well 3: 63 feet
<b>Aquifer characteristics and hydraulic nature</b>				Well 2: shallow confined alluvial aquifer; confining unit >15 feet Well 3: deep confined alluvial aquifer; confining unit >15 feet
<b>Overburden thickness and characteristics</b>				Well 2: <50 feet; silt Well 3: >50 feet; silt and gravel
<b>Highest soil sensitivity in Protection Area</b>				Does not contribute to aquifer sensitivity
<b>Traverse potential score</b>				Well 2: Score = 3 Well 3: Score = 3
<b>Infiltration potential score</b>				Well 2: Score = 6.5 Well 3: Score = 6.5
<b>Organic chemical detections</b>				None
<b>Inorganic chemical detections</b>				Arsenic, barium; <50% MCL; see paragraph following Table 4.1
<b>Source related coliform detections</b>				None
<b>Nitrate concentrations</b>				Up to 3.51 mg/L, suggest pathway from surface to aquifer
<b>Fractured bedrock in Protection Area</b>				None
<b>Other wells score</b>				Score = 149
<b>Surface water within 500 feet of wellhead</b>				Well 2: None Well 3: Fern Ridge Lake ~435 feet

## Recommendations

As mentioned in our April 2005 memo, the highest risk that onsite systems can pose to groundwater is when they are located on small lots in areas with shallow, unconfined, locally used drinking water aquifers. In these areas, it would be more protective of human health and the environment to rely on



centrally managed community wastewater treatment systems instead of using lot-by-lot solutions such as an onsite septic system.

Given the likely small lot sizes (i.e., less than about one or two acres in size), and the susceptibility of some of the current drinking-water supplies in the area, we recommend that Goshen and Pleasant Hill consider community-wide or neighborhood-level wastewater treatment, which is likely to have better controls and monitoring than single-homeowner-based systems.

For Alvadore, we understand that the community is less interested in higher-density development, and therefore is more willing to consider limiting lot-sizes to two-acre parcels or larger. In addition, it appears that the aquifer in the area generally is less susceptible to surficial contamination, so we believe that a community-wide system is not as necessary as for Goshen and Pleasant Hill.

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