PUBLIC INTEREST REVIEW FOR GROUND WATER APPLICATIONS

TO: Water Rights Section Date **July 9, 2004**

FROM: Ground Water/Hydrology Section **Marc Norton**
Reviewer's Name

SUBJECT: Application G- **16178** Supersedes review of ____________
Date of Review(s)

PUBLIC INTEREST PRESUMPTION; GROUNDWATER

OAR 690-310-130 (1) *The Department shall presume that a proposed groundwater use will ensure the preservation of the public welfare, safety and health as described in ORS 537.525.* Department staff review ground water applications under OAR 690-310-140 to determine whether the presumption is established. OAR 690-310-140 allows the proposed use be modified or conditioned to meet the presumption criteria. **This review is based upon available information and agency policies in place at the time of evaluation**.

A. GENERAL INFORMATION: Applicant's Name: **Steve Hanson** County: **Benton**

A1. Applicant(s) seek(s) **0.61** cfs from **1** well(s) in the **Willamette River** Basin, ____________ subbasin Quad Map: **Riverside/Lewisburg**

A2. Proposed use: **Irrigation/maintaining pond** Seasonality: **March 1 to October 31**

A3. Well and aquifer data **(attach and number logs for existing wells; mark proposed wells as such under logid)**:

Well	Logid	Applicant's Well #	Proposed Aquifer*	Proposed Rate(cfs)	Location (T/R-S QQ-Q)	Location, metes and bounds, e.g. 2250' N, 1200' E fr NW cor S 36
1	**None**	**2 or East**	**Alluvium**	**0.61**	**11S/04W-7SE SW**	**0' N, 2400'E fr NW cor S 18**
2						
3						
4						
5						

* Alluvium, CRB, Bedrock

Well	Well Elev ft msl	First Water ft bls	SWL ft bls	SWL Date	Well Depth (ft)	Seal Interval (ft)	Casing Intervals (ft)	Liner Intervals (ft)	Perforations Or Screens (ft)	Well Yield (gpm)	Draw Down (ft)	Test Type
1	**212**		**14**	**10/20/94**	**43?**					**250**	**20**	**PT**

Use data from application for proposed wells.

A4. **Comments: See conceptual model discussion for more details on geology, ground water and model parameters. The owner did not submit a well log with the application. The review is based on estimated well depth from owner and information from other wells in section 7 & 18. The water level and yield data came from a pump test submitted by the applicant. Based on other shallow wells in the area, the well develops water from shallow sands and gravels. Deeper wells in the area penetrate claystones that form the bedrock unit. ***NO WELL LOG*** The applicant does not have a well log and knows very little about the well. No knowledge about seal.**

A5. ☐ **Provisions of the** Willamette River Basin rules relative to the development, classification and/or management of ground water hydraulically connected to surface water ☒ **are**, *or* ☐ **are not**, activated by this application. (Not all basin rules contain such provisions.)
Comments: **The well is located within ¼ mile of Frazier Creek Ditch and is in a shallow, unconfined alluvial aquifer. Because of fluctuations in the shallow alluvial material, ground water levels, will be below the creek during the summer months and not hydraulically connected to Frazier Creek Ditch.**

A6. ☐ **Well(s) #** ______, ______, ______, ______, ______, tap(s) an aquifer limited by an administrative restriction.
Name of administrative area: ____________
Comments: ____________

B. GROUND WATER AVAILABILITY CONSIDERATIONS, OAR 690-310-130, 400-010, 410-0070

B1. **Based upon available data**, I have determined that ground water* for the proposed use:

a. ☐ **is** over appropriated, ☒ **is not** over appropriated, *or* ☐ **cannot be determined to be** over appropriated during any period of the proposed use. * This finding is limited to the ground water portion of the over-appropriation determination as prescribed in OAR 690-310-130;

b. ☐ **will not** *or* ☐ **will** likely be available in the amounts requested without injury to prior water rights. * This finding is limited to the ground water portion of the injury determination as prescribed in OAR 690-310-130;

c. ☐ **will not** *or* ☐ **will** likely to be available within the capacity of the ground water resource; or

d. ☒ **will, if properly conditioned**, avoid injury to existing ground water rights or to the ground water resource:
   i. ☒ The permit should contain condition #(s) **7B - Interference** ;
   ii. ☐ The permit should be conditioned as indicated in item 2 below.
   iii. ☐ The permit should contain special condition(s) as indicated in item 3 below;

B2. a. ☐ **Condition** to allow ground water production from no deeper than ________ ft. below land surface;

b. ☐ **Condition** to allow ground water production from no shallower than ________ ft. below land surface;

c. ☐ **Condition** to allow ground water production only from the ________ ground water reservoir between approximately________ ft. and________ ft. below land surface;

d. ☐ **Well reconstruction** is necessary to accomplish one or more of the above conditions. The problems that are likely to occur with this use and without reconstructing are cited below. Without reconstruction, I recommend withholding issuance of the permit until evidence of well reconstruction is filed with the Department and approved by the Ground Water Section.

Describe injury –as related to water availability– that is likely to occur without well reconstruction (interference w/ senior water rights, not within the capacity of the resource, etc): ________

B3. **Ground water availability remarks:** **See conceptual model discussion for more details on geology, ground water and model parameters. Ground water in this area is recharged from precipitation and nearby streams. Stability of the resource should not be a problem.**

No well log was filed with the application. I do not know if the applicant checked with the county tax assessor to try and track down a well log based on ownership and date well was constructed. I do not know when the well may have been constructed. Therefore I can not assess whether or not the well was properly constructed when drilled or meets current standards. It is unlikely that the well has a seal that would meet current standards.

C. GROUND WATER/SURFACE WATER CONSIDERATIONS, OAR 690-09-040

C1. **690-09-040 (1):** Evaluation of aquifer confinement:

Well	Aquifer or Proposed Aquifer	Confined	Unconfined
1	**Sands and Gravels - Willamette Aquifer**	☐	☒
		☐	☐
		☐	☐
		☐	☐
		☐	☐

Basis for aquifer confinement evaluation: See conceptual model discussion for more details on geology, ground water and model parameters. Shallow sands and gravels with shallow water levels - unconfined.

C2. **690-09-040 (2) (3):** Evaluation of distance to, and hydraulic connection with, surface water sources. All wells located a horizontal distance less than ¼ mile from a surface water source that produce water from an unconfined aquifer shall be assumed to be hydraulically connected to the surface water source. Include in this table any streams located beyond one mile that are evaluated for PSI.

Well	SW #	Surface Water Name	GW Elev ft msl	SW Elev ft msl	Distance (ft)	Hydraulically Connected? YES	NO	ASSUMED	Potential for Subst. Interfer. Assumed? YES	NO
1	**1**	**Frazier Creek Ditch**	**210 - 200**	**205**	**410**	☒	☐	☐	☒	☐
	2	**Mountain View Creek**	**210 - 200**	**208**	**1400**	☒	☐	☐	☐	☒
	3	**Ashbar Lake**	**210 - 200**	**190**	**4250**	☒	☐	☐	☐	☒
	4	**Willamette River**	**210 - 200**	**180**	**9150**	☒	☐	☐	☐	☒
						☐	☐	☐	☐	☐
						☐	☐	☐	☐	☐

Basis for aquifer hydraulic connection evaluation: See conceptual model discussion for more details on geology, ground water and model parameters. Because of fluctuations in ground water levels in the shallow alluvial material, ground water levels, will be below the creek during the summer months and not hydraulically connected to Frazier Creek Ditch.

Water Availability Basin the well(s) are located within: WILLAMETTE R > COLUMBIA R - AB PERIWINKLE CR AT GAGE 14174

C3a. **690-09-040 (4):** Evaluation of stream impacts for each well that has been determined or assumed to be **hydraulically connected and less than 1 mile** from a surface water source. Limit evaluation to instream rights and minimum stream flows that are pertinent to that surface water source, and not lower SW sources to which the stream under evaluation is tributary. Compare the requested rate against the 1% of 80% *natural* flow for the pertinent Water Availability Basin (WAB). If Q is not distributed by well, use full rate for each well. Any checked ☒ box indicates the well is assumed to have the potential to cause PSI.

Well	SW #	Well < ¼ mile?	Qw > 5 cfs?	Instream Water Right ID	Instream Water Right Q (cfs)	Qw > 1% ISWR?	80% Natural Flow (cfs)	Qw > 1% of 80% Natural Flow?	Interference @ 30 days (%)	Potential for Subst. Interfer. Assumed?
1	**1**	☐	☐			☐		☐		☐
	2	☐	☐			☐		☐		☐
	3	☐	☐			☐		☐	**<1**	☐
	4	☐	☐			☐		☐	**<1**	☐
		☐	☐			☐		☐		☐

		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐

C3b. **690-09-040 (4):** Evaluation of stream impacts by total appropriation for all wells determined or assumed to be **hydraulically connected and less than 1 mile** from a surface water source. **Complete only if Q is distributed among wells**. Otherwise same evaluation and limitations apply as in C3a above.

	SW #		Qw > 5 cfs?	Instream Water Right ID	Instream Water Right Q (cfs)	Qw > 1% ISWR?	80% Natural Flow (cfs)	Qw > 1% of 80% Natural Flow?	Interference @ 30 days (%)	Potential for Subst. Interfer. Assumed?
			☐			☐		☐		☐
			☐			☐		☐		☐
			☐			☐		☐		☐
			☐			☐		☐		☐

Comments: See conceptual model discussion for more details on geology, ground water and model parameters. The requested discharge rate is far below the 1% value of the in-stream water right or the 80% natural flow. Because of fluctuations in the shallow alluvial material, ground water levels, will be below the creek during the summer months and not hydraulically connected to Frazier Creek Ditch.

C4a. **690-09-040 (5):** Estimated impacts on **hydraulically connected surface water sources greater than one mile** as a percentage of the proposed pumping rate. Limit evaluation to the effects that will occur up to one year after pumping begins. This table encompasses the considerations required by 09-040 (5)(a), (b), (c) and (d), which are not included on this form. Use additional sheets if calculated flows from more than one WAB are required.

Non-Distributed Wells

Well	SW#	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													

Distributed Wells

Well	SW#	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(A) = Total Interf.												
(B) = 80 % Nat. Q												
(C) = 1 % Nat. Q												
(D) = (A) > (C)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
(E) = (A / B) x 100	%	%	%	%	%	%	%	%	%	%	%	%

(A) = total interference as CFS; (B) = WAB calculated natural flow at 80% exceed. as CFS; (C) = 1% of calculated natural flow at 80% exceed. as CFS; (D) = highlight the checkmark for each month where (A) is greater than (C); (E) = total interference divided by 80% flow as percentage.

Basis for impact evaluation: I ran the Hunt Model, results and model values attached. The amount of interference was less than 0.001 cfs at Ashbar Lake. At this level of interference and modeling the results are of limited, therefore I did not complete this section.

C4b. **690-09-040 (5) (b) The potential to impair or detrimentally affect the public interest is to be determined by the Water Rights Section.**

C5. ☐ **If properly conditioned**, the surface water source(s) can be adequately protected from interference, and/or ground water use under this permit can be regulated if it is found to substantially interfere with surface water:

i. ☐ The permit should contain condition #(s)______;

ii. ☐ The permit should contain special condition(s) as indicated in "Remarks" below;

C6. **SW / GW Remarks and Conditions;**

References Used: See conceptual model discussion for more details.

Gannett and Caldwell, 1998, Geologic Framework of the Willamette Lowland Aquifer System, Oregon and Washington, USGS Professional Paper 1424-A

Woodward, Gannett and Vaccaro, 1998, Hydrogeologic Framework of the Willamette Lowland Aquifer System, Oregon and Washington, USGS Professional Paper 1424-B

D. WELL CONSTRUCTION, OAR 690-200

D1. **Well #**: 1 **Logid:** ______

D2. **THE WELL does not meet current well construction standards based upon:**
a. ☐ review of the well log;
b. ☐ field inspection by ______;
c. ☐ report of CWRE ______;
d. ☒ other: (specify) **No well log to review**

D3. **THE WELL construction deficiency**:
a. ☐ constitutes a health threat under Division 200 rules;
b. ☐ commingles water from more than one ground water reservoir;
c. ☐ permits the loss of artesian head;
d. ☐ permits the de-watering of one or more ground water reservoirs;
e. ☐ other: (specify) ______

D4. **THE WELL construction deficiency is described as follows:** **NO LOG -- Can not determine if there is a acceptable seal. Most of the older wells were constructed with "puddled clay" which does not meet standards (See BENT 2586 as example). Owner could attempt to locate well log through county tax records.**

D5. **THE WELL** a. ☐ **was**, *or* ☐ **was not** constructed according to the standards in effect at the time of original construction or most recent modification.

b. ☒ I don't know if it met standards at the time of construction.

D6. ☒ **Route to the Enforcement Section.** I recommend withholding issuance of the permit until evidence of well reconstruction is filed with the Department and approved by the Enforcement Section and the Ground Water Section.

THIS SECTION TO BE COMPLETED BY ENFORCEMENT PERSONNEL

D7. ☐ Well construction deficiency has been corrected by the following actions: ______

______ ______, 200____.
(Enforcement Section Signature)

D8. ☐ **Route to Water Rights Section (attach well reconstruction logs to this page).**

DETAILED REPORT OF INSTREAM REQUIREMENTS
Water Availability as of 7/17/2004 for
WILLAMETTE R > COLUMBIA R - AB PERIWINKLE CR AT GAGE 14174
Watershed ID #: 30200321 Basin: WILLAMETTE Exceedance Level: 80
Time: 05:43 Date: 07/17/2004

APP #	183B	184A	0	0	0	0	0	MAXIMUM
Status	Cert.	App.						
1	1300.00	1750.00	0.00	0.00	0.00	0.00	0.00	1750.00
2	1300.00	1750.00	0.00	0.00	0.00	0.00	0.00	1750.00
3	1300.00	1750.00	0.00	0.00	0.00	0.00	0.00	1750.00
4	1300.00	1750.00	0.00	0.00	0.00	0.00	0.00	1750.00
5	1300.00	1750.00	0.00	0.00	0.00	0.00	0.00	1750.00
6	1300.00	1750.00	0.00	0.00	0.00	0.00	0.00	1750.00
7	1300.00	1750.00	0.00	0.00	0.00	0.00	0.00	1750.00
8	1300.00	1750.00	0.00	0.00	0.00	0.00	0.00	1750.00
9	1300.00	1750.00	0.00	0.00	0.00	0.00	0.00	1750.00
10	1300.00	1750.00	0.00	0.00	0.00	0.00	0.00	1750.00
11	1300.00	1750.00	0.00	0.00	0.00	0.00	0.00	1750.00
12	1300.00	1750.00	0.00	0.00	0.00	0.00	0.00	1750.00

DETAILED REPORT ON THE WATER AVAILABILITY CALCULATION
Water Availability as of 7/17/2004 for
WILLAMETTE R > COLUMBIA R - AB PERIWINKLE CR AT GAGE 14174
Watershed ID #: 30200321 Basin: WILLAMETTE Exceedance Level: 80
Time: 05:43 Date: 07/17/2004

Month	Natural Stream Flow	CU + Stor Prior to 1/1/93	CU + Stor After 1/1/93	Expected Stream Flow	Reserved Stream Flow	Instream Water Rights	Net Water Available
1	17300.00	1260.00	29.90	16000.00	0.00	1750.00	14300.00
2	17400.00	4180.00	29.30	13200.00	0.00	1750.00	11400.00
3	15800.00	4450.00	29.20	11300.00	0.00	1750.00	9570.00
4	13800.00	4150.00	29.20	9620.00	0.00	1750.00	7870.00
5	11400.00	2420.00	33.10	8940.00	0.00	1750.00	7190.00
6	7350.00	792.00	53.30	6500.00	0.00	1750.00	4750.00
7	4100.00	607.00	42.20	3450.00	0.00	1750.00	1700.00
8	2960.00	560.00	37.20	2360.00	0.00	1750.00	613.00
9	2960.00	470.00	46.10	2440.00	0.00	1750.00	694.00
10	3550.00	166.00	25.50	3360.00	0.00	1750.00	1610.00
11	8170.00	251.00	25.30	7890.00	0.00	1750.00	6140.00
12	19100.00	268.00	29.60	18800.00	0.00	1750.00	17100.00
Stor	7460000	1170000	24700	6260000	0	1270000	5000000

Conceptual Model -- Generalized Ground Water Flow Systems.
Marc Norton
January 8, 2004

Based on:

OWRD GRID - Ground water Resource Information Distribution

OWRD Ground Water Database

Memo on Recommended Vertical Hydraulic Conductivity Values for the Willamette Silt Hydrogeologic Unit When Using the Hunt Analytical Model, Karl Wozniak, January 6, 2004.

Ground-Water Resources of the Willamette Valley, Oregon, 1942, Water-Supply Paper 890, Piper.

Hydrogeologic Framework of the Willamette Lowland Aquifer System, Oregon and Washington, 1998, US Geological Survey Professional Paper 1424 B, Woodward, Gannett, and Vaccaro.

GENERALIZED GEOLOGY

The Willamette Lowland in Oregon and Washington encompasses 3,700 square mile and includes the low-lying parts of the Willamette Valley in Oregon and most of Clark county in Washington. About 70% of the population of Oregon and Clark County reside in the lowlands. The lowland is 145 miles long and averages 10 to 15 miles in width. Water is recharged to the Willamette Lowland aquifer system primarily through the direct infiltration of precipitation on the lowland. The regional water-table map shows an overall pattern of ground-water flow to the major streams, indicating that the base flow of these streams is sustained by ground water discharge. This ground-water discharge fully supports the base flow of streams that head in the lowland and partially support the base flow of the other streams.

HYDROGEOLOGIC UNITS

The aquifer system is composed of five hydrogeologic units, from oldest to youngest:

1) the basement confining unit,
2) the Columbia River basalt aquifer,
3) the Willamette confining unit,
4) the Willamette aquifer, and
5) the Willamette silt unit.

The basement-confining unit forms the lateral and basal boundary to the Willamette aquifer system. The basement-confining unit includes all the stratigraphic units that underlie either the Columbia River Basalt Group in the northern part of the basin or the basin-fill deposits in the southern part. The unit is composed of marine sedimentary rocks and volcanic rocks of the Coast and Cascade ranges. The basement-confining unit is generally a low yielding aquifer where wells develop water primarily from fractures in the rock. Ground water can be found under unconfined conditions in the highlands and under confined conditions with greater depth and lower elevations. Yields are generally less than 10 gpm and usually decrease over time. The deeper the well, the greater the chance of brackish water being encountered.

The Columbia River basalt aquifer overlies the basement-confining unit and consists of layers of basalt flows of the Columbia River Basalt Group. The thickness of the aquifer generally is several hundred feet but locally is as much as 1000 feet. Ground water in the basalts is generally under confined conditions except in the foothills where they may be unconfined. Well yields vary from tens to hundreds of gallons per minutes. Brackish water has been encountered in several areas, particularly with depth.

The Willamette confining unit consists primarily of fine-grained, distal alluvial fan and low-gradient stream deposits. The fine-grained deposits are considered a regional confining unit because of their wide spread occurrence and low permeability. Ground water in the Willamette confining unit is generally under confined conditions and well yields are very low to "dry".

The Willamette aquifer consists primarily of coarse-grained proximal alluvial-fan and braided-stream deposits. The greatest thickness, and coarsest materials of the Willamette aquifer outside of the Portland Basin occur in six major alluvial fans that were deposited where major streams from the Cascade Range enter the Willamette Lowland. Ground water in the Willamette aquifer unit varies from unconfined to confined conditions, depending on location and depth. Vertical gradients are usually downward except near major streams. Deposits of lower permeable material can act as a confining layer but are generally of limited aerial extent.

The Willamette silt unit is deposited throughout much of the Willamette Lowland by glacial-outburst floods. The deposits range in thickness from 0 to 130 feet. They consist primarily of silt and fine sand of relatively uniform lithology. Ground water in the Willamette silt unit is generally under unconfined conditions and well yields are low, less than 5 to 10 gpm.

STRUCTURAL BASINS

Outcrops of folded and faulted basalt within the Willamette Valley divide the lowland into four separate areas or structural basins -- from north to south, **the Portland Basin, the Tualatin Basin, the central Willamette Valley, and the southern Willamette valley**. Each of these areas has decidedly different hydrologic and hydrogeologic properties. The aquifer system in each basin, although hydraulically connected through a series of restrictive water gaps, is distinctive.

Tualatin Basin. The Columbia River basalt aquifer and the Willamette confining unit are the only regional hydrogeologic units above the basement-confining unit in the Tualatin Basin. The Columbia River basalt aquifer underlies the entire basin, and its upper surface forms a sediment-filled bowl-like depression.

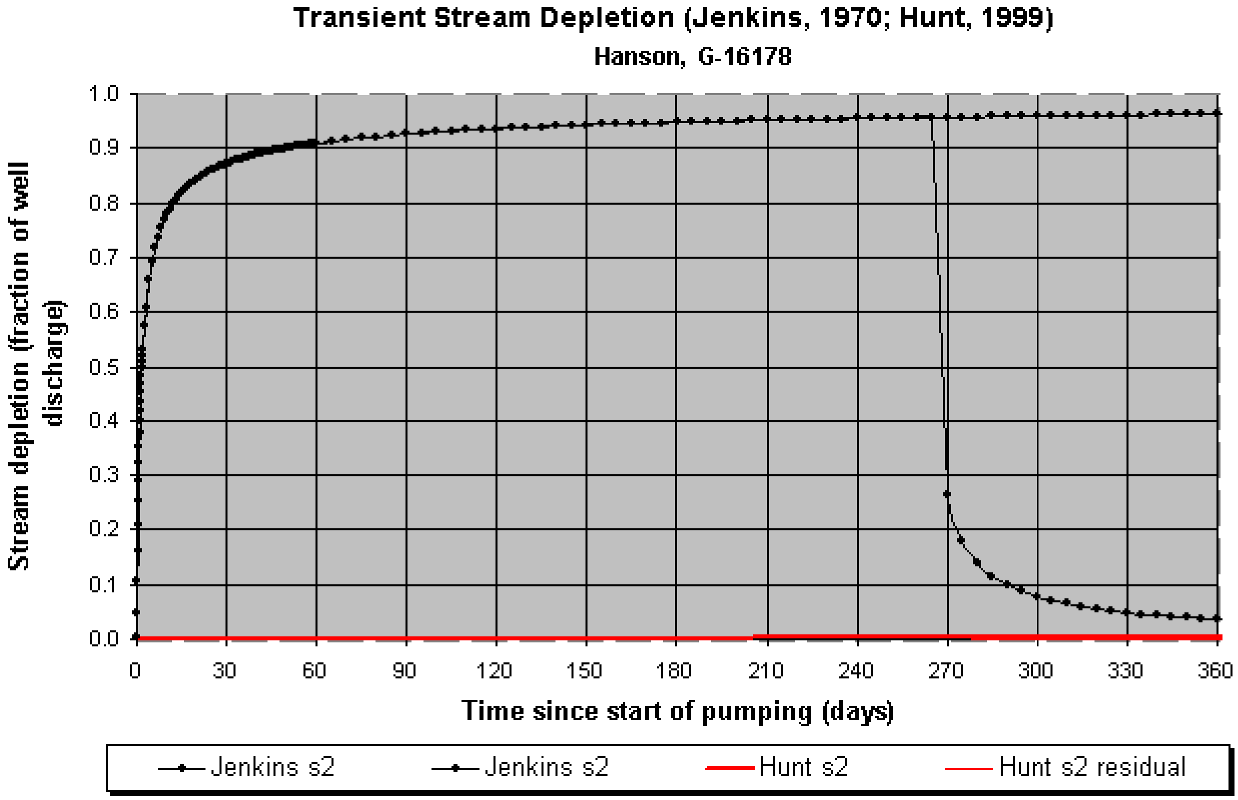
The Central Willamette Valley All five of the hydrogeologic units occur in the central Willamette Valley. The Columbia River basalt aquifer underlies the entire central Willamette Valley, except for small areas along the far eastern margin. A number of faults have been mapped in the central Willamette Valley, some of which offset the aquifer, and numerous other faults have been mapped in the uplands surrounding the basin where the aquifer crops out. The Willamette aquifer in the central Willamette Valley contains three major alluvial fans -- the Salem fan, the Molalla fan, and the Canby fan. The Willamette Silt unit overlies most of the central valley with a maximum thickness of about 130 feet near the center and thins towards the south and near the margins of the basin.

The Southern Willamette Valley In the southern Willamette Valley, all of the regional hydrogeologic units are present; however, the Columbia River basalt aquifer occurs only in the Stayton area. The Willamette confining unit is thinner in the southern Willamette Valley than elsewhere in the Willamette Lowland. The Willamette aquifer contains the Lebanon fan and the Stayton fan. The Willamette aquifer is much thinner (averaging only about 20 to 40 feet thick) between the alluvial fans of the southern Willamette Valley. The Willamette Silt unit covers most of the southern Willamette Valley and generally thin towards the south.

GROUND WATER MODEL PARAMETERS

The version of the Hunt model being used has been modified to account for different units for each parameter. Values for most of the parameters used are taken from the application file. Hydrogeologic conditions at the site are based on the Applicant's and other nearby Water Well Reports. Some of the parameters are discussed below:

Net Steady Pumping Rate:	Calculated discharge rate so as to not exceed allocation for season or year (Examples: 2.5 AF for irrigation, 5.0 AF for Ag use).
Aquifer hydraulic conductivity:	Unless there is site-specific information, use values, based on geologic material, from a table such as Freeze & Cherry, Page 29.
Aquifer storativity or specific yield:	Use the following values unless there is site-specific data: Unconfined = 0.02 and Confined = 0.0001.
Streambed hydraulic conductivity:	Generally use a value that is 2 orders of magnitude less than the aquifer hydraulic conductivity: if the underlying geologic unit is the Willamette Silt, use 0.005.
Streambed thickness:	Generally use 3 feet unless well penetrates the Willamette Silts, then use thickness of the silt based on Water Well Reports or USGS Professional Paper 1424.



Output for Hunt Stream Depletion, Scenerio 2 (s2):

Days	30	60	90	120	150	180	210	240	270	300	330	360
Hunt SD s2	0.0006	0.0009	0.0012	0.0014	0.0015	0.0017	0.0019	0.0020	0.0019	0.0016	0.0014	0.0013
Qw, cfs	0.610	0.610	0.610	0.610	0.610	0.610	0.610	0.610	0.610	0.610	0.610	0.610
H SD s2, cfs	0.000	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001

Parameters:		**Scenario 1**	**Scenario 2**	**Scenario 3**	**Units**
Net steady pumping rate	Qw	0.61	0.61	0.61	cfs
Distance to stream	a	4250	4250	4250	ft
Aquifer hydraulic conductivity	K	500	1000	5000	ft/day
Aquifer thickness	b	23	23	23	ft
Aquifer transmissivity	T	11500	23000	115000	ft*ft/day
Aquifer storage coefficient	S	0.002	0.002	0.002	
Stream width	ws	5	5	5	ft
Streambed hydraulic conductivity	Ks	0.005	0.005	0.005	ft/day
Streambed thickness	bs	15	15	15	ft
Streambed conductance	sbc	0.001666667	0.001666667	0.001666667	ft/day
Stream depletion factor (Jenkins)	sdf	3.141304348	1.570652174	0.314130435	days
Streambed factor (Hunt)	sbf	0.000615942	0.000307971	6.15942E-05	