

Groundwater Application Review Summary Form

Application # G- 18536

GW Reviewer Aurora Bouchier Date Review Completed: 4/18/2018

Summary of GW Availability and Injury Review:

[] Groundwater for the proposed use is either over appropriated, will not likely be available in the amounts requested without injury to prior water rights, OR will not likely be available within the capacity of the groundwater resource per Section B of the attached review form.

Summary of Potential for Substantial Interference Review:

[] There is the potential for substantial interference per Section C of the attached review form.

Summary of Well Construction Assessment:

[] The well does not appear to meet current well construction standards per Section D of the attached review form. Route through Well Construction and Compliance Section.

This is only a summary. Documentation is attached and should be read thoroughly to understand the basis for determinations and for conditions that may be necessary for a permit (if one is issued).

MEMO

April 18, 2018

FROM: GW: Aurora Bouchier
(Reviewer's Name)

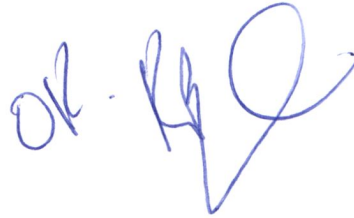
☐ YES☒ NO☐ YES☒ NO

☐ Per ORS 390.835, the Groundwater Section is **unable** to calculate ground water interference with surface water that contributes to a scenic waterway; **therefore, the Department is unable to find that there is a preponderance of evidence that the proposed use will measurably reduce the surface water flows necessary to maintain the free-flowing character of a scenic waterway.**

Calculate the percentage of consumptive use by month and fill in the table below. If interference cannot be calculated, per criteria in 390.835, do not fill in the table but check the "unable" option above, thus informing Water Rights that the Department is unable to make a Preponderance of Evidence finding.

Exercise of this permit is calculated to reduce monthly flows in _____ Scenic Waterway by the following amounts expressed as a proportion of the consumptive use by which surface water flow is reduced.

[illegible]



MEMO

To: Kristopher Byrd, Well Construction and Compliance Section Manager
From: Joel Jeffery, Well Construction Program Coordinator
Subject: Review of Water Right Application G-18536
Date: September 19, 2018

The attached application was forwarded to the Well Construction and Compliance Section by Water Rights. Aurora Bouchier reviewed the application. Please see Aurora's Groundwater Review and the Well Logs.

Applicant's Well #1 (LANE 16008): Based on a review of the Well Report, Applicant's Well #1 does not appear to comply with current minimum well construction standards (See OAR 690 Division 210). Applicant's Well #1 is currently sealed with bentonite grout. Bentonite grout is not an approved seal material. In order to meet minimum well construction standards, Applicant's Well #1 must be resealed by a licensed well constructor with an approved grout.

My recommendation is that the Department **not issue** a permit for Applicant's Well #1 (LANE 16008) unless it is brought into compliance with current minimum well construction standards or information is provided showing that it is in compliance with current minimum well construction standards.

Bringing Applicant's Well #1 into compliance with minimum well construction standards may not satisfy hydraulic connection issues.

Applicant's Well #2 (LANE 15957): Based on a review of the Well Report, Applicant's Well #2 seems to protect the groundwater resource.

The construction of Applicant's Well #2 may not satisfy hydraulic connection issues.

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

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

State Well No. 18512 W-342
State Permit No. LANE 16008

Name H. KILDAL (RW)
Address JASPER ROAD, SPRINGFIELD, OREGON

New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 12.

Rotary ☐ Driven ☐ Domestic ☒ Industrial ☐ Municipal ☐
Cable ☒ Jetted ☐ Irrigation ☐ Test Well ☐ Other ☐
Dug ☐ Bored ☐

6" Diam. from 0 ft. to 77 ft. Gage .250
 " Diam. from ft. to ft. Gage
 " Diam. from ft. to ft. Gage

Type of perforator used		TORCH	
Size of perforations	3/8	in. by 4	in.
44	perforations from	62	ft. to 72
	perforations from		ft. to
	perforations from		ft. to

Manufacturer's Name

Type Model No.

Diam. Slot size Set from ft. to ft.

Diam. Slot size Set from ft. to ft.

Yield:	gal./min. with	ft. drawdown after	hrs.
"	"	"	"
"	"	"	"

Bailer test	28	gal./min. with	20	ft. drawdown after	2	hrs.
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Well seal—Material used BENTONITE
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 -0- sacks
Number of sacks of bentonite used in well seal 2 sacks
Brand name of bentonite YELLOWSTONE WESTERN
Number of pounds of bentonite per 100 gallons
of water 133 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.

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.*

[illegible]

Contractor's License No. 126 Date 10-20-72, 1972

PUBLIC INTEREST REVIEW FOR GROUNDWATER APPLICATIONS

TO: Water Rights Section Date 4/18/2018
 FROM: Groundwater Section Aurora C Bouchier
 Reviewer's Name
 SUBJECT: Application G- 18536 Supersedes review of na
 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 groundwater 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: Aaron Lake County: Lane

A1. Applicant(s) seek(s) 0.36 cfs from 4 well(s) in the Willamette Basin,
Middle Fork Willamette subbasin (Jasper quad)

A2. Proposed use Irrigation (28.7 acres) Seasonality: March 1 – 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	LANE 16008	1	Alluvium	0.36	18S/2W-34 NE-NE	840' S, 490' W fr NE cor S 34
2	LANE 15957	2	Alluvium	0.36	18S/2W-35 NW-NW*	670' S, 40' E fr NW cor S 35*
3	Proposed	3	Alluvium	0.36	18S/2W-35 NW-NW	870' S, 510' E fr NW cor S 35
4	Proposed	4	Alluvium	0.36	18S/2W-35 NW-NW	470' S, 1040' E fr NW cor S 35
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	608	61	13	9/23/1972	77	0-20	0-77	Na	62-72	28	20**	P
2	604	42	17	7/30/1972	92	0-20	0-90	Na	30-90	70	73***	P
3	607				TBD	TBD	TBD	TBD	TBD			
4	597				TBD	TBD	TBD	TBD	TBD			

Use data from application for proposed wells.

A4. **Comments:** *The well log for Well 2 locates the well in Section 34.
 ** The drawdown is at 2 hours of pumping.
 *** The drawdown is at 10 hours of pumping

A5. ☒ **Provisions of the** Willamette Basin rules relative to the development, classification and/or management of groundwater hydraulically connected to surface water ☐ **are**, or ☒ **are not**, activated by this application.
 (Not all basin rules contain such provisions.)
 Comments: The wells are greater than 1/4-mile from a surface water source, so the pertinent rules (OAR 690-52-0240) does not apply.

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

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

B1. **Based upon available data**, I have determined that groundwater* 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 groundwater 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 groundwater 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 groundwater resource; or
- d. ☐ **will, if properly conditioned**, avoid injury to existing groundwater rights or to the groundwater resource:
- ☐ The permit should contain condition #(s) 7N;
 - ☐ The permit should be conditioned as indicated in item 2 below.
 - ☐ The permit should contain special condition(s) as indicated in item 3 below;

- B2. a. ☐ **Condition** to allow groundwater production from no deeper than _____ ft. below land surface;
- b. ☐ **Condition** to allow groundwater production from no shallower than _____ ft. below land surface;
- c. ☒ **Condition** to allow groundwater production only from the alluvial groundwater 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 Groundwater 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. **Groundwater availability remarks:** _____

The water table occurs near land surface in material described on well logs as approximately 40 to 60-feet of clay and gravel/boulders. The applicant's existing wells are producing from gravels underlying the clay and gravel. The area around applicant's wells is mapped as a Pleistocene aged sand and gravel terrace flanking the modern floodplain of the Willamette River.

Nearby State Observation Well (LANE 16030, located approximately ¾- mile to the south-southeast) has been monitored periodically since the 1960's through present. The spring time water-levels in LANE 16030 show no decline over the period of record and a seasonal fluctuation of up to approximately 15-feet. LANE 16030 is located in an area mapped as Tertiary aged, weathered terrace gravels.

C. GROUNDWATER/SURFACE WATER CONSIDERATIONS, OAR 690-09-040**C1. 690-09-040 (1):** Evaluation of aquifer confinement:

Well	Aquifer or Proposed Aquifer	Confined	Unconfined
1	Alluvium	☒	☐
2	Alluvium	☒	☐
3	Alluvium	☒	☐
4	Alluvium	☒	☐

Basis for aquifer confinement evaluation: The water level is reported to rise above the water bearing zone per the well log, indicating the aquifer is more confined than 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?			Potential for Subst. Interfer. Assumed?	
						YES	NO	ASSUMED	YES	NO
1	1	Unnamed Tributary to Rattlesnake Creek	~585	552-672	3,480	☒	☐	☐	☐	☒
2	1		~585	552-672	2,955	☒	☐	☐	☐	☒
3	1		~585	552-672	2,510	☒	☐	☐	☐	☒
4	1		~585	552-672	1,940	☒	☐	☐	☐	☒
1	2	Rattlesnake Creek	~585	551-557	4,845	☒	☐	☐	☐	☒
2	2		~585	551-557	4,300	☒	☐	☐	☐	☒
3	2		~585	551-557	3,910	☒	☐	☐	☐	☒
4	2		~585	551-557	3,310	☒	☐	☐	☐	☒
1	3	Middle Fork Willamette River	~585	548	6,400	☒	☐	☐	☐	☒
2	3		~585	548	5,900	☒	☐	☐	☐	☒
3	3		~585	548	5,690	☒	☐	☐	☐	☒
4	3		~585	548	5,040	☒	☐	☐	☐	☒

Basis for aquifer hydraulic connection evaluation: Groundwater elevation is coincident or above the elevation of nearby perennial streams, indicating groundwater is connected to nearby streams.

Water Availability Basin the well(s) are located within: Watershed ID 535 (M FK WILLAMETTE R > WILLAMETTE R - AT MOUTH)

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	☐	☐	NA	NA	☐	671.00	☐	<25 %	☐
2	1	☐	☐	NA	NA	☐	671.00	☐	<25 %	☐
3	1	☐	☐	NA	NA	☐	671.00	☐	<25 %	☐
4	1	☐	☐	NA	NA	☐	671.00	☐	<25 %	☐
1	2	☐	☐	NA	NA	☐	671.00	☐	<25 %	☐
2	2	☐	☐	NA	NA	☐	671.00	☐	<25 %	☐
3	2	☐	☐	NA	NA	☐	671.00	☐	<25 %	☐
4	2	☐	☐	NA	NA	☐	671.00	☐	<25 %	☐
4	3	☐	☐	MF 535	640	☐	671.00	☐	<25 %	☐

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: The stream depletion at 30 days was estimated using the Hunt 2003 model. Stream depletion was calculated using the ranges of S, Kv of the streambed, Kh of the Middle Sedimentary Unit as described in Conlon et al. (2005). Results show stream depletion is less than 25% at 30 days for the range of available aquifer parameters. Only the impact from pumping at Well 4 was modeled. The greater distance between the other wells and the surface water sources will act to further reduce the impact to the streams at 30-days.

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
3	3	1.48 %	1.39 %	0.66 %	0.77 %	0.92 %	1.11 %	1.34 %	1.62 %	1.93 %	2.06 %	1.49 %	1.52 %
Well Q as CFS		0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
Interference CFS		0.005	0.005	0.002	0.003	0.003	0.004	0.005	0.006	0.007	0.007	0.005	0.005
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													

(A) = Total Interf.	0.005	0.005	0.002	0.003	0.003	0.004	0.005	0.006	0.007	0.007	0.005	0.005
(B) = 80 % Nat. Q	2910	3240	3150	3080	2920	1620	922	709	671	719	1280	2480
(C) = 1 % Nat. Q	29.1	32.4	31.5	30.8	29.2	16.2	9.22	7.09	6.71	7.19	12.8	24.8
(D) = (A) > (C)												
(E) = (A / B) x 100	.0024 %	.0002 %	.0001 2 %	.0001 4 %	.0001 7 %	.0003 6 %	.00073 %	.0011 %	.0014 %	.0014 %	.0005 3 %	.0002 7 %

(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: Only the impact from pumping at Well 3 was modeled. The greater distance between the other wells and the surface water sources will act to further reduce the impact to the streams at 30-days.

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 groundwater use under this permit can be regulated if it is found to substantially interfere with surface water:
- ☐ The permit should contain condition #(s) _____;
 - ☐ The permit should contain special condition(s) as indicated in "Remarks" below;

C6. **SW / GW Remarks and Conditions:** _____

The applicant's proposed well would be producing from an aquifer that has been found to be hydraulically connected to surface water at a distance of less than 1 mile. However, the department is unable to find sufficient evidence that the proposed use will have the Potential for Substantial Interference per OAR 690-009.

References Used: _____

Application files: G-18536.

Conlon, T. D., Wozniak, K. C., Woodcock, D., Herrera, N.B., Fischer, B.J. Morgan, D.S., Lee, K.K., and Hinkle, S.R., 2005, Ground-Water Hydrology of the Willamette Basin, Oregon: U. S. Geological Survey Scientific Investigations Report 2005-5168.

Gannett, Marshall W., and Caldwell, Rodney R., 1998, Geologic Framework of the Willamette Lowland Aquifer System, Oregon and Washington: U. S. Geological Survey Professional Paper 1424-A.

Herra, N. B., Burns, E. R., and Conlon, T. D., 2014, Simulation of groundwater flow and the interaction of groundwater and surface water in the Willamette Basin and Central Willamette subbasin, Oregon: U.S. Geological Survey Scientific Investigations Report 2014-5136, 152 p., <http://dx.doi.org/10.3133/sir20155136>.

Hunt, B., 2003, Unsteady stream depletion when pumping from semiconfined aquifer: Journal of Hydrologic Engineering, January/February, 2003.

O'Connor, J. E., Sarna-Wojcicki, A., Wozniak, K. C., Polette, D. J., and Fleck, R. J., 2001, Geologic map of Quaternary units in the Willamette Valley, Oregon: Reston, Va., U.S. Geological Survey, Professional Paper 1620, map scale 1:250,000.

Woodward, Dennis G., Gannett, Marshall W., and Vaccaro, John J., 1998 Hydrogeologic Framework of the Willamette Lowland Aquifer System, Oregon and Washington: U. S. Geological Survey Professional Paper 1424-B.

D. WELL CONSTRUCTION, OAR 690-200

D1. Well #: _____ Logid: _____

D2. **THE WELL does not appear to meet current well construction standards based upon:**

- a. ☐ review of the well log;
 b. ☐ field inspection by _____;
 c. ☐ report of CWRE _____;
 d. ☐ other: (specify) _____

D3. **THE WELL construction deficiency or other comment is described as follows:** _____

 _____D4. ☐ **Route to the Well Construction and Compliance Section for a review of existing well construction.****Water Availability Tables**

WATER AVAILABILITY TABLE																
watershed ID #:		535		M FK WILLAMETTE R > WILLAMETTE R - AT MOUTH										Exceedance Level: 80		
Time: 1:53 PM				Basin: WILLAMETTE										Date: 04/17/2018		

# watershed																
Nest ID	Number	Stream Name		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	STOR

1	181	WILLAMETTE R > COLUMBIA R - AT MOUTH		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
2	182	WILLAMETTE R > COLUMBIA R - AB MOLALLA R		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
3	183	WILLAMETTE R > COLUMBIA R - AB MILL CR AT GAGE 14191		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
4	30200321	WILLAMETTE R > COLUMBIA R - AB PERIWINKLE CR AT GAGE		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
5	185	WILLAMETTE R > COLUMBIA R - AB MCKENZIE R		YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES
6	535	M FK WILLAMETTE R > WILLAMETTE R - AT MOUTH		YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	YES	YES

DETAILED REPORT ON THE WATER AVAILABILITY CALCULATION						
watershed ID #:		535	M FK WILLAMETTE R > WILLAMETTE R - AT MOUTH			Exceedance Level: 80
Time: 1:53 PM			Basin: WILLAMETTE			Date: 04/17/2018
Month	Natural Stream Flow	Consumptive Use and Storage	Expected Stream Flow	Reserved Stream Flow	Instream Requirements	Net water Available
Monthly values are in cfs. Storage is the annual amount at 50% exceedance in ac-ft.						
JAN	2,910.00	621.00	2,290.00	0.00	640.00	1,650.00
FEB	3,240.00	2,430.00	812.00	0.00	640.00	172.00
MAR	3,150.00	2,370.00	781.00	0.00	640.00	141.00
APR	3,080.00	2,410.00	667.00	0.00	640.00	27.10
MAY	2,920.00	1,470.00	1,450.00	0.00	640.00	806.00
JUN	1,620.00	262.00	1,360.00	0.00	640.00	718.00
JUL	922.00	23.50	898.00	0.00	640.00	258.00
AUG	709.00	21.80	687.00	0.00	640.00	47.20
SEP	671.00	18.40	653.00	0.00	640.00	12.60
OCT	719.00	8.29	711.00	0.00	640.00	70.70
NOV	1,280.00	8.34	1,270.00	0.00	640.00	632.00
DEC	2,480.00	9.24	2,470.00	0.00	640.00	1,830.00
ANN	2,250,000	575,000	1,680,000	0	464,000	1,210,000

DETAILED REPORT OF INSTREAM REQUIREMENTS

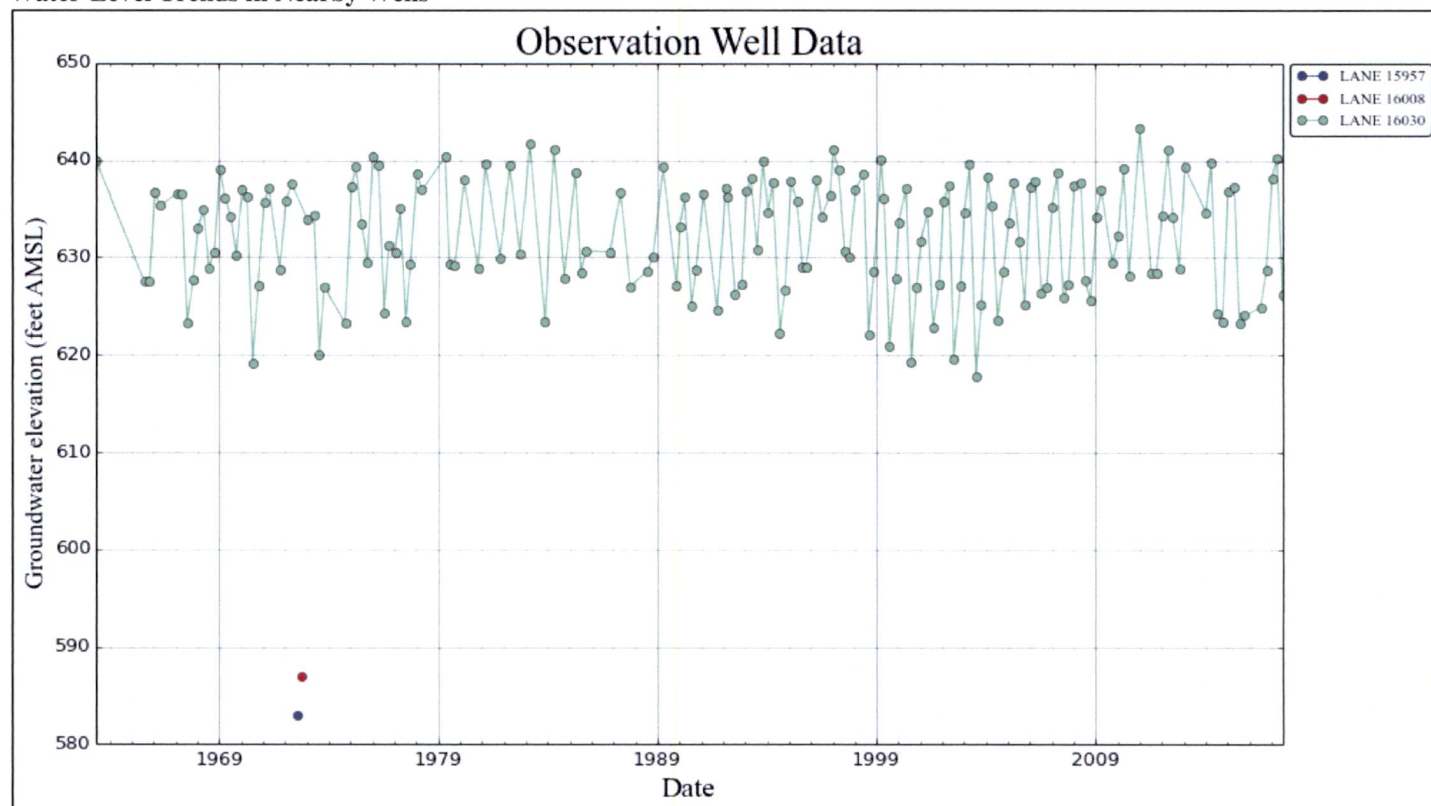
Watershed ID #: 535
Time: 1:53 PM

M FK WILLAMETTE R > WILLAMETTE R - AT MOUTH

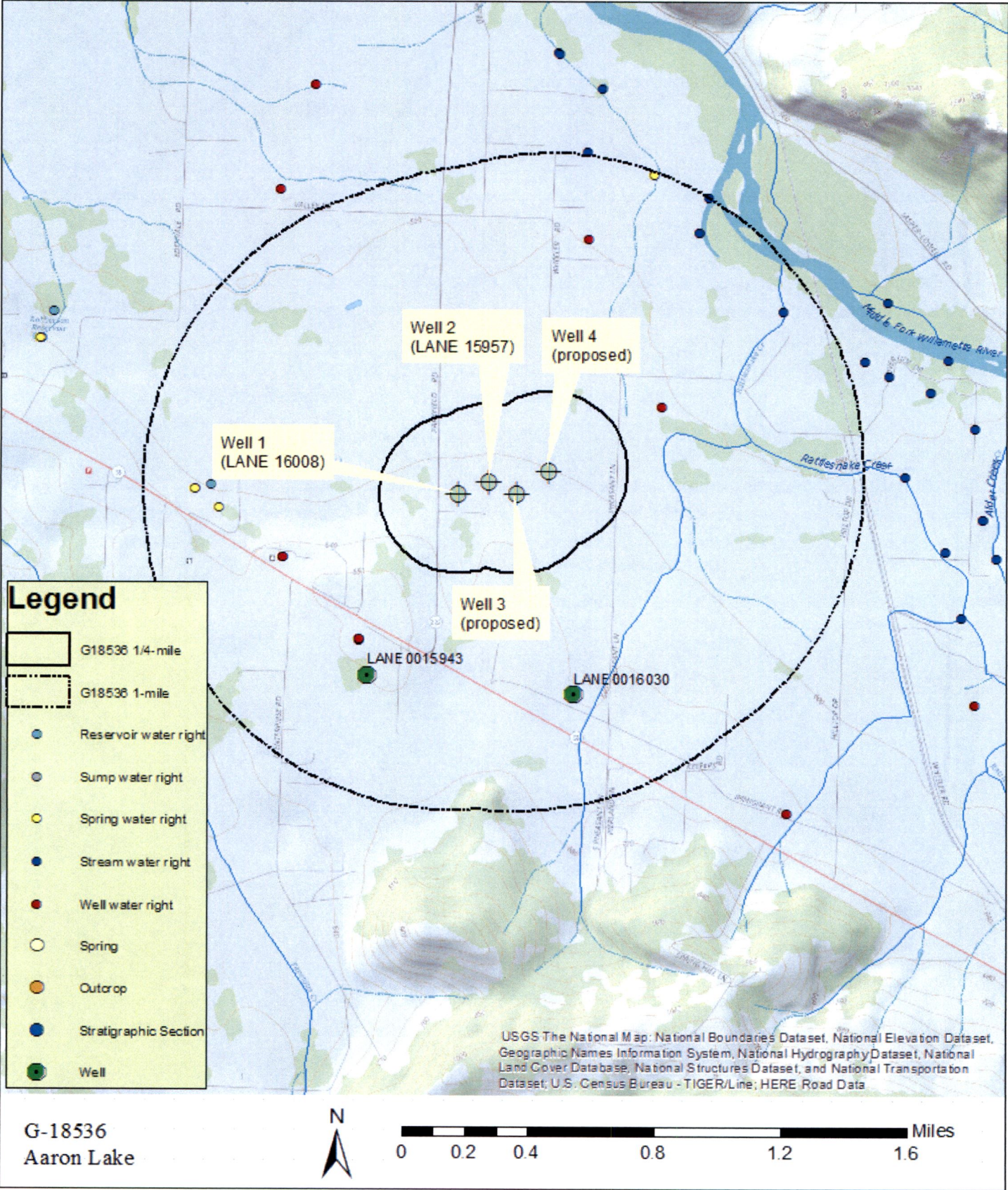
Basin: WILLAMETTE
Date: 04/17/2018

Application Number	Status	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Monthly values are in cfs.													
MF535A	CERTIFICATE	640.0	640.0	640.0	640.0	640.0	640.0	640.0	640.0	640.0	640.0	640.00	640.0
MF128A	APPLICATION	640.0	640.0	640.0	640.0	640.0	640.0	640.0	640.0	640.0	640.0	640.00	640.0
MAXIMUM		640.0	640.0	640.0	640.0	640.0	640.0	640.0	640.0	640.0	640.0	640.0	640.0

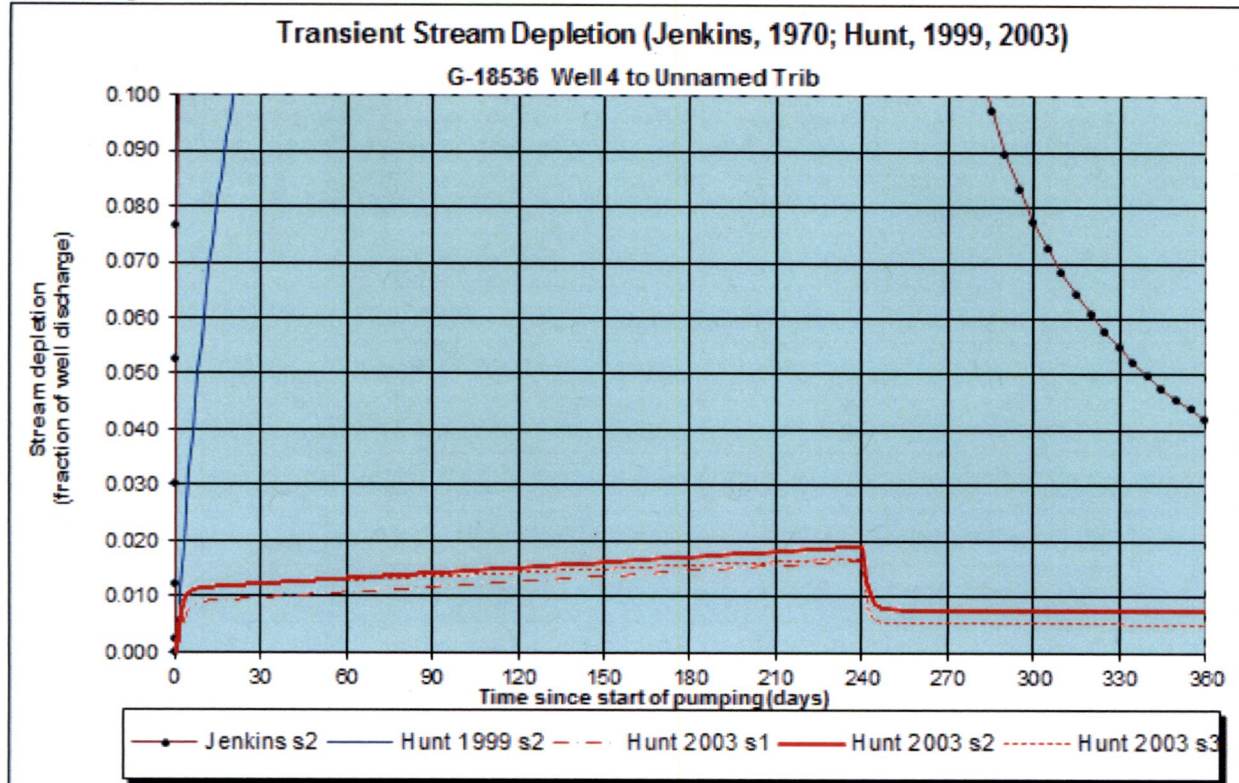
Water-Level Trends in Nearby Wells



Well Location Map

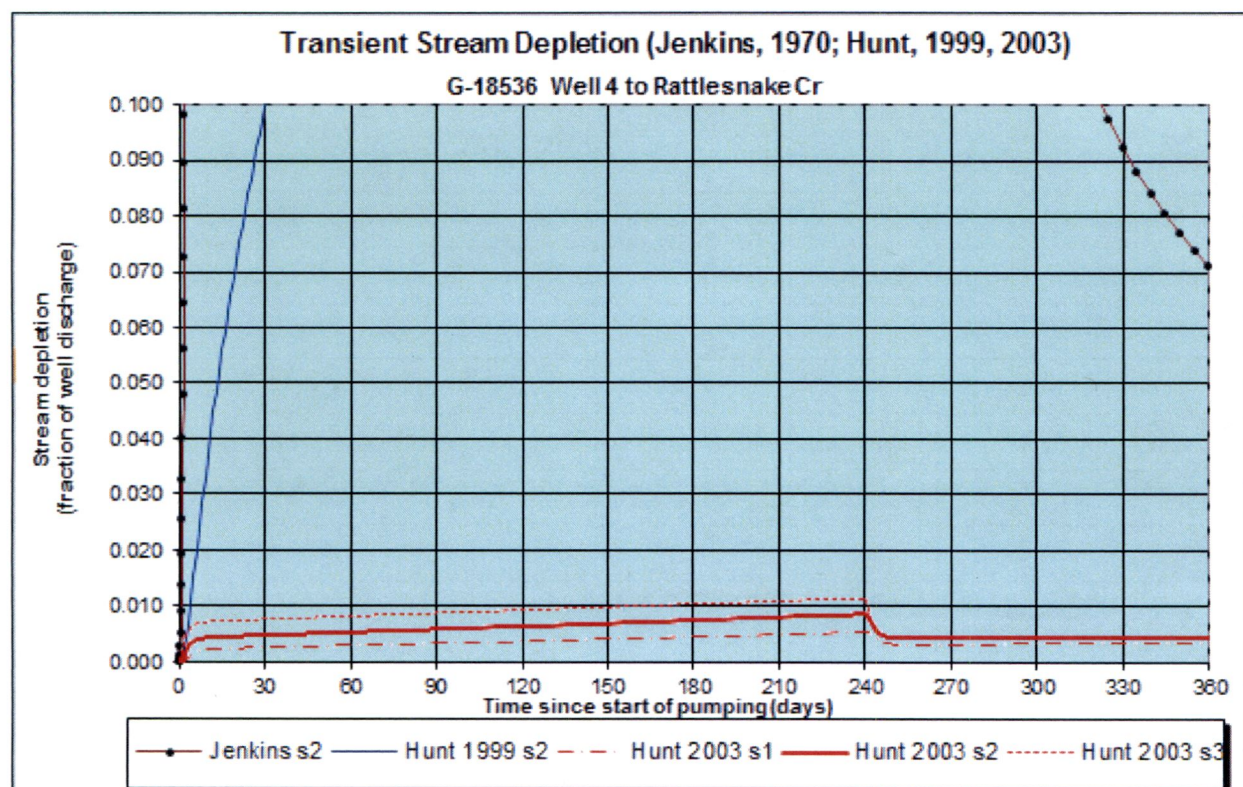


Stream Depletion Model Results



Output for Stream Depletion, Scenierio 2 (s2):						Time pump on (pumping duration) = 240 days							
Days	30	60	90	120	150	180	210	240	270	300	330	360	
J SD	80.2%	85.9%	88.5%	90.0%	91.1%	91.9%	92.5%	92.9%	13.1%	7.7%	5.5%	4.2%	
H SD 1999	12.8%	18.9%	23.2%	26.5%	29.3%	31.6%	33.6%	35.4%	24.2%	19.6%	16.7%	14.6%	
H SD 2003	1.23%	1.33%	1.43%	1.52%	1.62%	1.72%	1.81%	1.91%	0.77%	0.77%	0.76%	0.76%	
Qw, cfs	0.360	0.360	0.360	0.360	0.360	0.360	0.360	0.360	0.360	0.360	0.360	0.360	
H SD 99, cfs	0.046	0.068	0.083	0.095	0.105	0.114	0.121	0.128	0.087	0.071	0.060	0.053	
H SD 03, cfs	0.004	0.005	0.005	0.005	0.006	0.006	0.007	0.007	0.003	0.003	0.003	0.003	

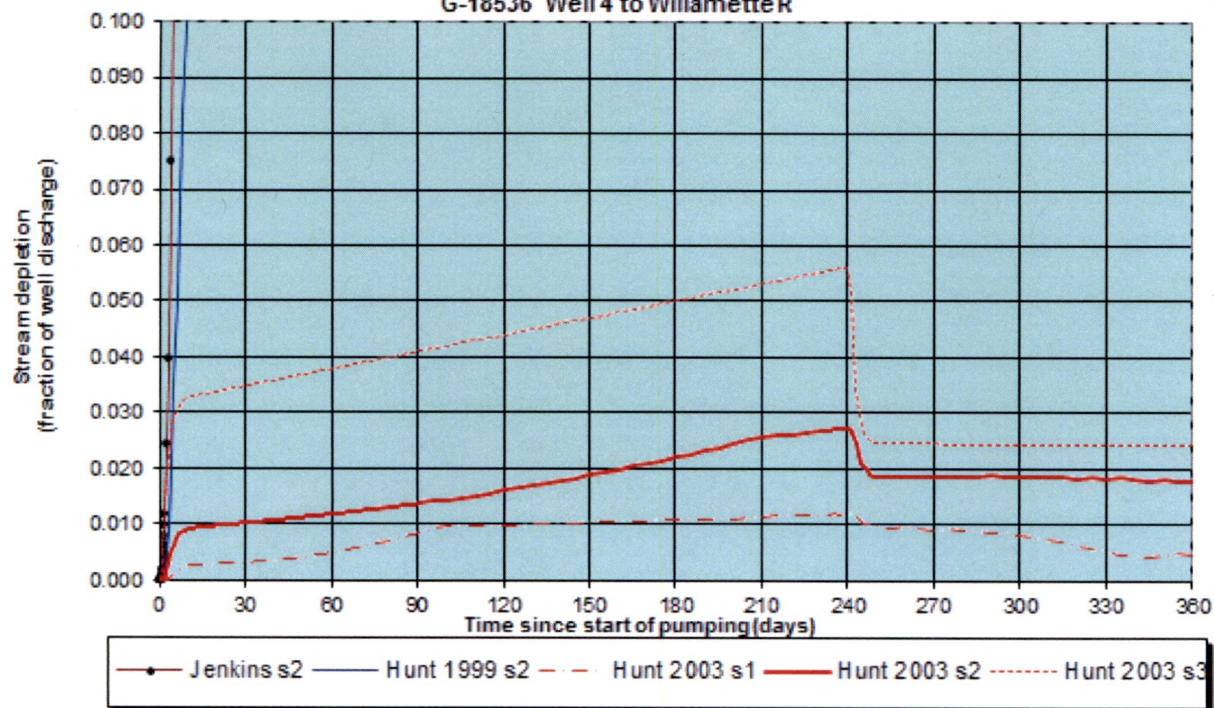
Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate of well	Qw	0.36	0.36	0.36	cfs
Time pump on (pumping duration)	tpon	240	240	240	days
Perpendicular from well to stream	a	1940	1940	1940	ft
Well depth	d	100	100	100	ft
Aquifer hydraulic conductivity	K	25	50	200	ft/day
Aquifer saturated thickness	b	20	20	20	ft
Aquifer transmissivity	T	500	1000	4000	ft*ft/day
Aquifer storativity or specific yield	S	0.001	0.001	0.001	
Aquitard vertical hydraulic conductivity	Kva	0.01	0.01	0.01	ft/day
Aquitard saturated thickness	ba	20	20	20	ft
Aquitard thickness below stream	babs	3	3	3	ft
Aquitard porosity	n	0.2	0.2	0.2	
Stream width	ws	20	20	20	ft
Streambed conductance (lambda)	sbc	0.066667	0.066667	0.066667	ft/day
Stream depletion factor	sdf	7.527200	3.763600	0.940900	days
Streambed factor	sbfb	0.258667	0.129333	0.032333	
input #1 for Hunt's Q_4 function	t'	0.132852	0.265703	1.062812	
input #2 for Hunt's Q_4 function	K'	3.763600	1.881800	0.470450	
input #3 for Hunt's Q_4 function	epsilon'	0.005000	0.005000	0.005000	
input #4 for Hunt's Q_4 function	lamda'	0.258667	0.129333	0.032333	



Output for Stream Depletion, Scenerio 2 (s2):						Time pump on (pumping duration) = 240 days						
Days	30	60	90	120	150	180	210	240	270	300	330	360
J SD	66.9%	76.3%	80.5%	83.1%	84.8%	86.2%	87.2%	88.0%	21.8%	13.0%	9.2%	7.1%
H SD 1999	10.0%	16.0%	20.3%	23.7%	26.5%	28.9%	31.0%	32.9%	24.5%	20.0%	17.1%	15.0%
H SD 2003	0.48%	0.53%	0.59%	0.64%	0.70%	0.75%	0.81%	0.87%	0.45%	0.45%	0.45%	0.45%
Qw, cfs	0.360	0.360	0.360	0.360	0.360	0.360	0.360	0.360	0.360	0.360	0.360	0.360
H SD 99, cfs	0.036	0.058	0.073	0.085	0.095	0.104	0.112	0.118	0.088	0.072	0.062	0.054
H SD 03, cfs	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002
Parameters:												
		Scenario 1		Scenario 2		Scenario 3		Units				
Net steady pumping rate of well	Qw	0.36		0.36		0.36		cfs				
Time pump on (pumping duration)	tpon	240		240		240		days				
Perpendicular from well to stream	a	3310		3310		3310		ft				
Well depth	d	100		100		100		ft				
Aquifer hydraulic conductivity	K	25		50		200		ft/day				
Aquifer saturated thickness	b	20		20		20		ft				
Aquifer transmissivity	T	500		1000		4000		ft*ft/day				
Aquifer storativity or specific yield	S	0.001		0.001		0.001						
Aquitard vertical hydraulic conductivity	Kva	0.01		0.01		0.01		ft/day				
Aquitard saturated thickness	ba	20		20		20		ft				
Aquitard thickness below stream	babs	3		3		3		ft				
Aquitard porosity	n	0.2		0.2		0.2						
Stream width	ws	20		20		20		ft				
Streambed conductance (lambda)	sbc	0.066667		0.066667		0.066667		ft/day				
Stream depletion factor	sdf	21.912200		10.956100		2.739025		days				
Streambed factor	sbf	0.441333		0.220667		0.055167						
input #1 for Hunt's Q_4 function	t'	0.045637		0.091273		0.365093						
input #2 for Hunt's Q_4 function	K'	10.956100		5.478050		1.369513						
input #3 for Hunt's Q_4 function	epsilon'	0.005000		0.005000		0.005000						
input #4 for Hunt's Q_4 function	lamda'	0.441333		0.220667		0.055167						

Transient Stream Depletion (Jenkins, 1970; Hunt, 1999, 2003)

G-18536 Well 4 to Willamette R



Output for Stream Depletion, Scenerio 2 (s2):						Time pump on (pumping duration) = 240 days							
Days	30	60	90	120	150	180	210	240	270	300	330	360	
J SD	51.5%	64.5%	70.7%	74.5%	77.1%	79.1%	80.6%	81.8%	31.3%	19.2%	13.7%	10.6%	
H SD 1999	33.1%	48.0%	55.9%	61.1%	64.8%	67.6%	69.8%	71.6%	40.0%	26.4%	19.6%	15.4%	
H SD 2003	1.03%	1.19%	1.37%	1.60%	1.88%	2.20%	2.56%	2.73%	1.88%	1.86%	1.83%	1.78%	
Qw, cfs	0.360	0.360	0.360	0.360	0.360	0.360	0.360	0.360	0.360	0.360	0.360	0.360	
H SD 99, cfs	0.119	0.173	0.201	0.220	0.233	0.243	0.251	0.258	0.144	0.095	0.070	0.055	
H SD 03, cfs	0.004	0.004	0.005	0.006	0.007	0.008	0.009	0.010	0.007	0.007	0.007	0.006	

Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate of well	Qw	0.36	0.36	0.36	cfs
Time pump on (pumping duration)	tpon	240	240	240	days
Perpendicular from well to stream	a	5040	5040	5040	ft
Well depth	d	100	100	100	ft
Aquifer hydraulic conductivity	K	25	50	200	ft/day
Aquifer saturated thickness	b	20	20	20	ft
Aquifer transmissivity	T	500	1000	4000	ft*ft/day
Aquifer storativity or specific yield	S	0.001	0.001	0.001	
Aquitard vertical hydraulic conductivity	Kva	0.01	0.01	0.01	ft/day
Aquitard saturated thickness	ba	20	20	20	ft
Aquitard thickness below stream	babs	3	3	3	ft
Aquitard porosity	n	0.2	0.2	0.2	
Stream width	ws	200	200	200	ft
Streambed conductance (lambda)	sbc	0.666667	0.666667	0.666667	ft/day
Stream depletion factor	sdf	50.803200	25.401600	6.350400	days
Streambed factor	sbf	6.720000	3.360000	0.840000	
input #1 for Hunt's Q_4 function	t'	0.019684	0.039368	0.157470	
input #2 for Hunt's Q_4 function	K'	25.401600	12.700800	3.175200	
input #3 for Hunt's Q_4 function	epsilon'	0.005000	0.005000	0.005000	
input #4 for Hunt's Q_4 function	lamda'	6.720000	3.360000	0.840000	

Lithology and Well Construction

