PUBLIC INTEREST REVIEW FOR GROUNDWATER APPLICATIONS

TO: Water Rights Section Date **January 29, 2016**

FROM: Groundwater Section **Aurora C Bouchier**
Reviewer's Name

SUBJECT: Application G- **18186** 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: **David Sather** County: **Clackamas**

A1. Applicant(s) seek(s) **0.68** cfs from **2** well(s) in the **Willamette** Basin, **Molalla-Pudding** subbasin (Yoder quad)

A2. Proposed use **Nursery Use (irr & ag) 27.3 acre** Seasonality: **year round**

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	CLAC 57441	Well 3	Alluvium	See below	5S/1E-9 NW-NW	480' S, 50' E fr NW cor S9
2	CLAC 61783	Well 4	Alluvium	See below	5S/1E-9 NW-NW	1290' S, 1309' E fr NW cor S9
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	192	47	58	11/9/2001	337	0-123	+2-337	-	146-167, 251-263, 279-296, 307-317	625	111	P
2	199	13	56	11/8/2005	166	0-90	+1.4-133	113.5-134.5, 139.5-148, 153-166	134.5-139.5, 148-153	25	32	P

Use data from application for proposed wells.

A4. **Comments:** The application lists specific rates per well. However, the rates listed are the same as the pump test yields reported on the well logs - in the case of Well 3 (CLAC 57441) the rate is greater than the total requested rate (requested rate listed as 1/40 cfs/acre, for 27.3 acres this comes to 0.68 cfs or 305 gpm). **Well 3 (CLAC 57441) is authorized for 0.47 cfs under Certificate 90556.** Therefore, this review evaluates: 1.14 cfs from Well 3 (CLAC 57441) to account for water stacking of 0.47 cfs from Certificate 90556 and an undistributed rate of 0.68 cfs from this application, and 0.68 from Well 4 (CLAC 61783) to account for an undistributed rate.

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 applicant's wells are greater than ¼ mile from a perennial surface water body, so the pertinent basin rules (OAR 690-502-0240) do 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:
   i. ☒ The permit should contain condition #(s) **7N, 7T**;
   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 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 _____ 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:**

In this location, low permeability Willamette Silts is found from land surface to a depth of 20-40 feet (Gannett and Caldwell, 1998). The water table occurs near land surface within the Willamette Silt. A thick (>1000 feet) sequence of mostly fine grained alluvium with thin beds of sand and gravel occurs beneath the Willamette Silt. Productive sand and gravel beds occur throughout the sequence separated by layers of lower permeability silts and clays (Conlon et al., 2005) which progressively confine deeper water-bearing zones (Woodward et al., 1998). Because the productive sand and gravel beds are confined, the cone of depression from the wells will spread over a broad area and interact with multiple streams. The interbedded, fine-grained layers beneath the streams will decrease the efficiency of the groundwater/surface water connections.

Observations from nearby wells indicate relatively stable long-term trends for alluvial wells locally (see composite hydrograph below). However, except for CLAC 70824, the water levels in nearby wells are measured in the spring as part of permit conditions. Water level measurements from State Observation Well 44 (CLAC 13431, located ~4 miles to the north) indicate that the seasonal fluctuation in the alluvial aquifer may be increasing, at least in that portion of the valley (see hydrograph below). In the spring of 2015, OWRD started collecting quarterly water level measurements at CLAC 70824. Over time there will be sufficient measurements to determine the seasonal pattern in the vicinity of CLAC 70824. Increased groundwater development in the area indicates a need for additional water-level monitoring (7N) if this permit is issued.

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**	☒	☐
		☐	☐
		☐	☐
		☐	☐

Basis for aquifer confinement evaluation: The well logs for CLAC 57441, CLAC 61783 and nearby wells indicate that upon completion, static water levels are above the water-bearing zones to which the wells are open (shallow water-bearing zones were identified and the associated static water levels are listed on the well logs, but upon completion the static water levels were different – indicating a satisfactory seal of the shallow water-bearing zones).

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**	**Un-named trib. To Bear Ck**	**~150**	**147-210**	**1,700**	☒	☐	☐	☐	☒
	2	**Cedar Creek**	**~150**	**144-197**	**4,310**	☒	☐	☐	☐	☒
	3	**Rock Creek**	**~150**	**112-115**	**5,120**	☒	☐	☐	☐	☒
2	**1**	**Un-named trib. To Bear Ck**	**~150**	**147-210**	**1,475**	☒	☐	☐	☐	☒
	2	**Cedar Creek**	**~150**	**144-197**	**3,610**	☒	☐	☐	☐	☒
	3	**Rock Creek**	**~150**	**112-115**	**6,080**	☒	☐	☐	☐	☒

Basis for aquifer hydraulic connection evaluation: The elevation of the water table (Conlon et al., 2005) is above the elevation of nearby streams within one mile of the applicant's well. Water table maps in the area (Conlon et al, 2005 and Woodward et al., 1998) indicate that groundwater in the area of the wells discharge to nearby streams. Although these two wells are constructed so they produce water from deeper productive layers, we consider the entire sedimentary package here to be one aquifer.

Water Availability Basin the well(s) are located within: 151: PUDDING R> MOLALLA R- AB MILL CR

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**	☐	☐	-	-	☐	**67.30**	☒	**2.1%**	☒
	2	☐	☐	-	-	☐	**67.30**	☒	**<2.1%**	☒
	3	☐	☐	-	-	☐	**67.30**	☒	**<2.1%**	☒
2	**1**	☐	☐	-	-	☐	**67.30**	☒	**2.5%**	☒
	2	☐	☐	-	-	☐	**67.30**	☒	**<2.5%**	☒
	3	☐	☐	-	-	☐	**67.30**	☒	**<2.5%**	☒

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:
Stream depletion at 30 days was estimated using the Hunt 2003 model. The presence of low-permeability interbedded silt and clay layers beneath the streams results in an inefficient connection between the productive water bearing zones and the streams. Therefore, stream depletion at 30 days of much less than 25%. However, stream depletion will increase over time until all of the pumped water is balanced by reduced stream flow. The second unnamed tributary to Bear Creek and Cedar Creek are both similar in elevation and further from the wells, therefore transient stream depletion from the wells will be less than the impacts at the first unnamed tributary which was modeled.

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													
(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:

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:

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:

Application file: G-18186, and nearby G-16418, G-16640, G-16595, and G-17461.

Conlon, T.D., Wozniak, K.C., Woodcock., D., Herrera, N.B., Fisher, 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.

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

Woodward, Dennis BG., 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.

Well logs and water level data : CLAC 57441, CLAC 61783, CLAC 2356, CLAC 2399, CLAC 12676, CLAC 18601, CLAC 52932, CLAC 56644, CLAC 63735, CLAC 65758, CLAC 70824, and CLAC 13431.

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

DETAILED REPORT ON THE WATER AVAILABILITY CALCULATION

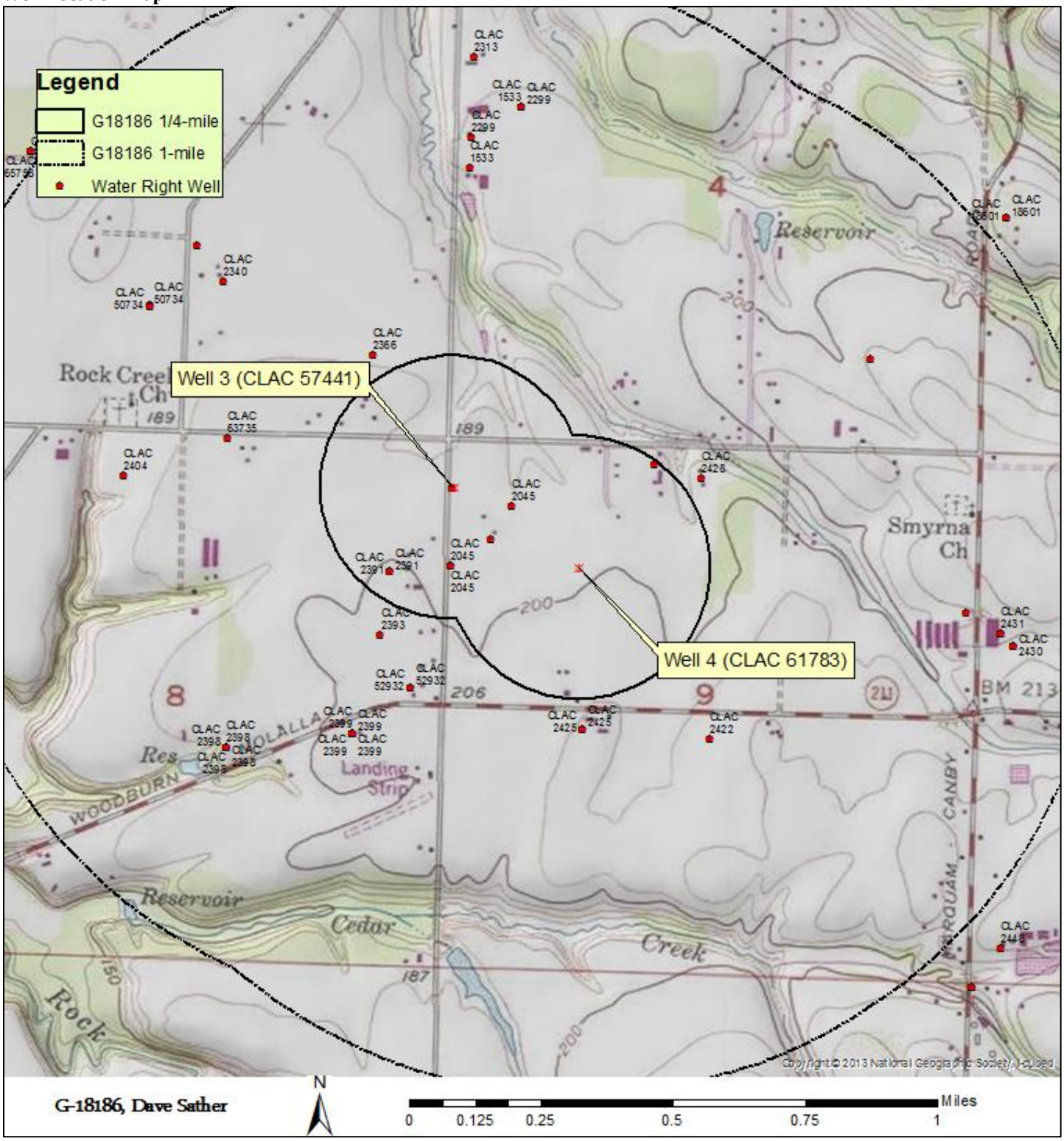
PUDDING R > MOLALLA R - AB MILL CR

Watershed ID #: 151 Basin: WILLAMETTE Exceedance Level: 80

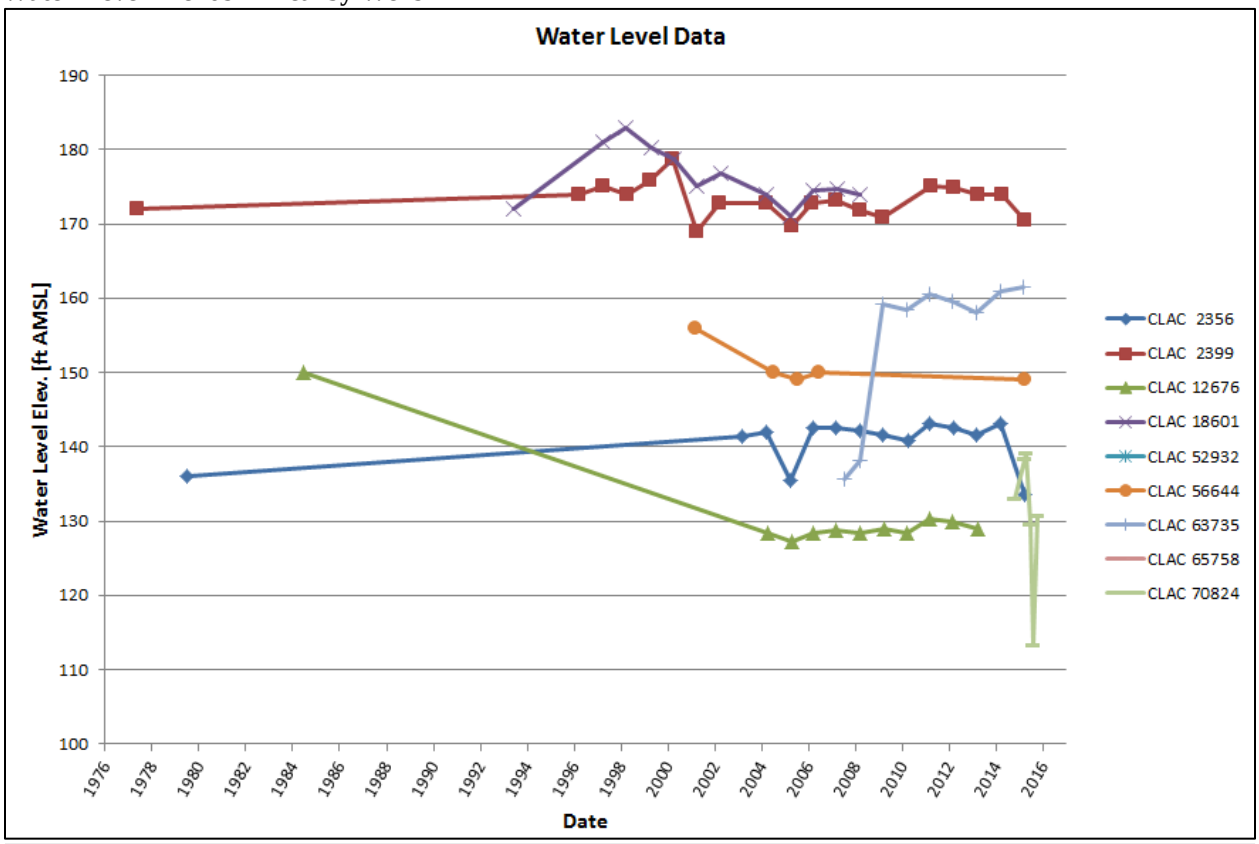
Time: 2:57 PM Date: 01/27/2016

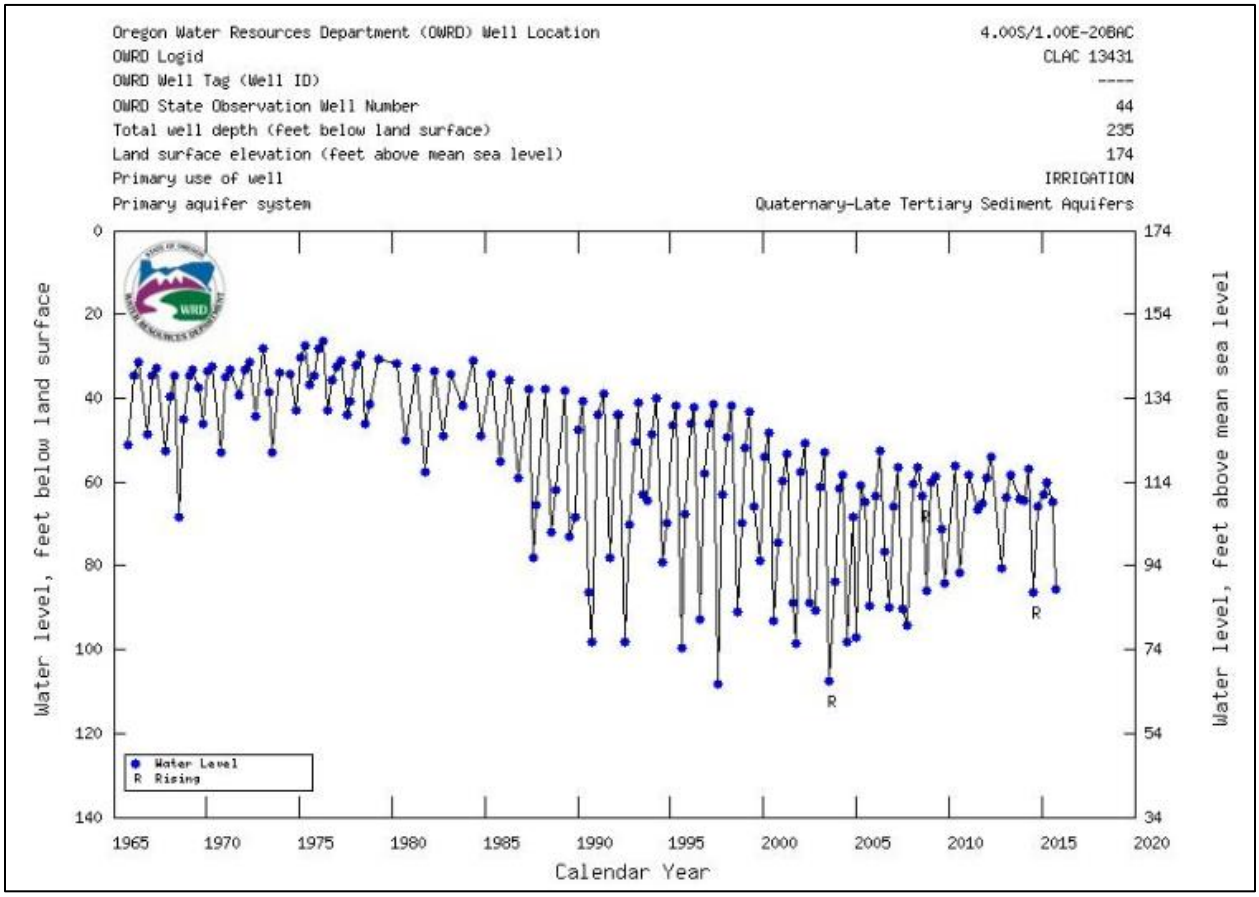
Month	Natural Stream Flow	Consumptive Use and Storage	Expected Stream Flow	Reserved Stream Flow	Instream Requirements	Net Water Available
			Monthly values are in cfs. Storage is the annual amount at 50% exceedance in ac-ft.			
JAN	1,040.00	125.00	915.00	0.00	36.00	879.00
FEB	1,180.00	115.00	1,070.00	0.00	36.00	1,030.00
MAR	1,010.00	79.70	930.00	0.00	36.00	894.00
APR	787.00	55.60	731.00	0.00	36.00	695.00
MAY	425.00	52.50	372.00	0.00	36.00	336.00
JUN	224.00	72.90	151.00	0.00	36.00	115.00
JUL	109.00	113.00	-4.01	0.00	36.00	-40.00
AUG	71.00	93.30	-22.30	0.00	36.00	-58.30
SEP	67.30	54.50	12.80	0.00	36.00	-23.20
OCT	91.60	14.00	77.60	0.00	36.00	41.60
NOV	363.00	48.80	314.00	0.00	36.00	278.00
DEC	957.00	119.00	838.00	0.00	36.00	802.00
ANN	706,000	56,900	649,000	0	26,100	625,000

Well Location Map

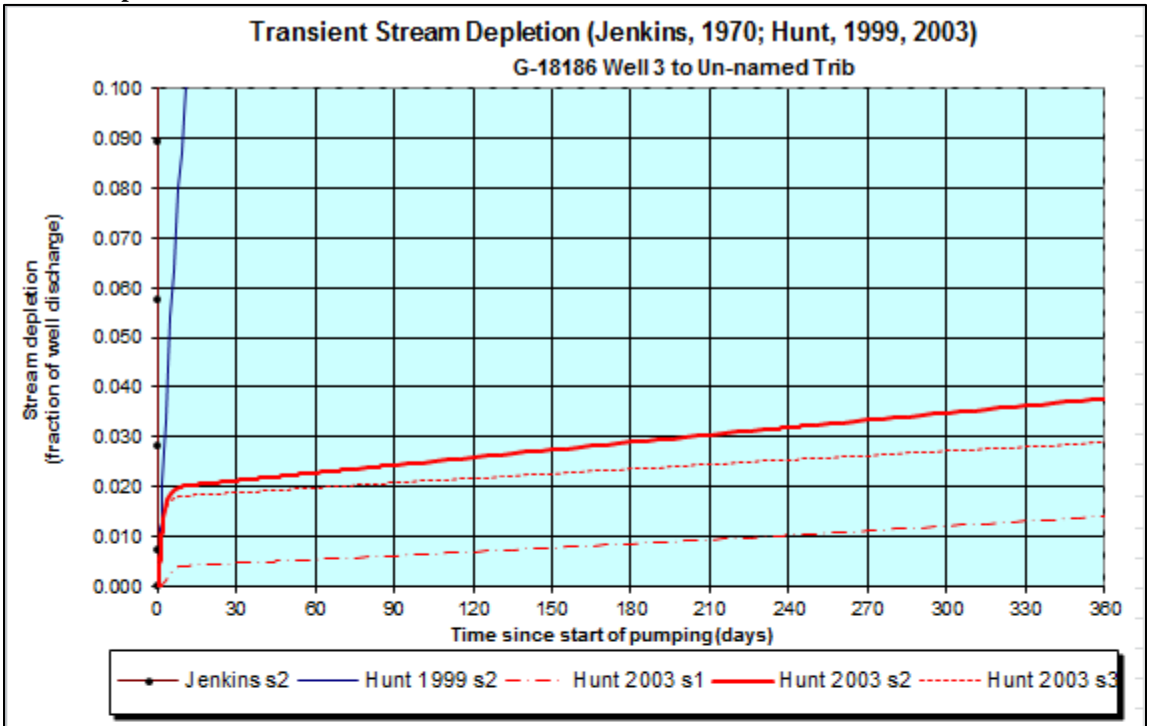


Water-Level Trends in Nearby Wells



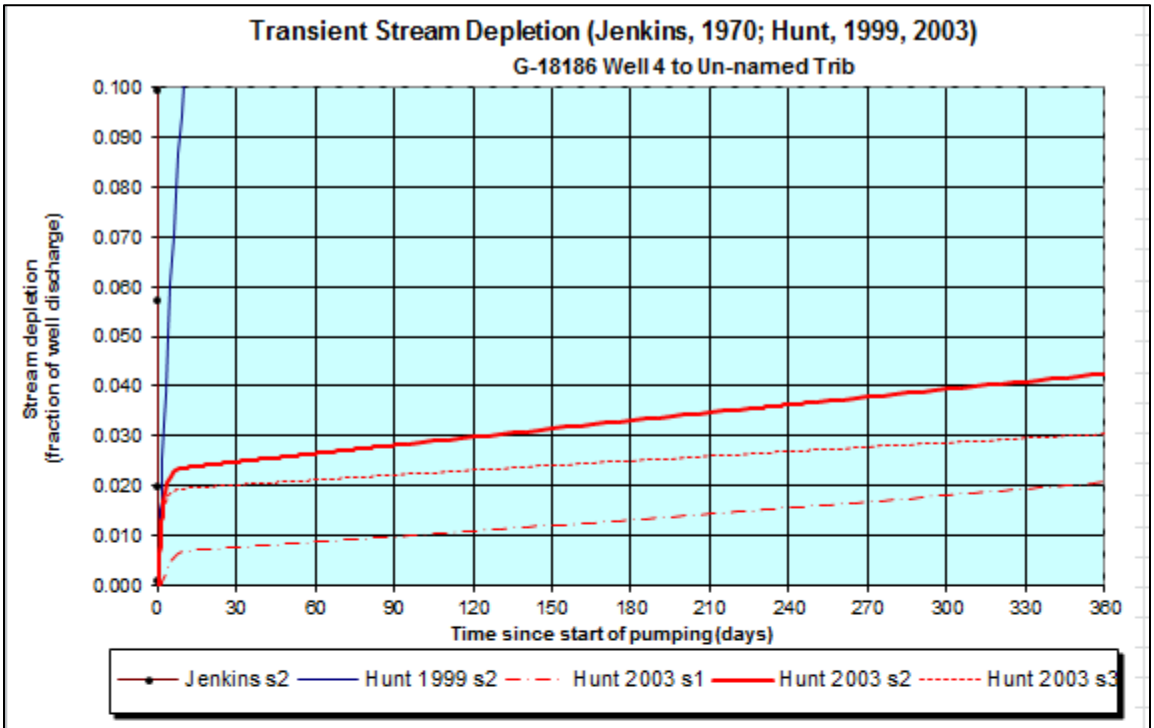


Stream Depletion Model Results



Output for Stream Depletion, Scenerio 2 (s2):	Time pump on (pumping duration) = 365 days											
Days	30	60	90	120	150	180	210	240	270	300	330	360
J SD	82.6%	87.7%	89.9%	91.3%	92.2%	92.9%	93.4%	93.8%	94.2%	94.5%	94.7%	94.9%
H SD 1999	18.8%	26.7%	32.0%	35.9%	39.1%	41.8%	44.1%	46.0%	47.8%	49.4%	50.8%	52.1%
H SD 2003	2.12%	2.28%	2.44%	2.59%	2.74%	2.89%	3.04%	3.19%	3.34%	3.49%	3.63%	3.77%
Qw, cfs	1.140	1.140	1.140	1.140	1.140	1.140	1.140	1.140	1.140	1.140	1.140	1.140
H SD 99, cfs	0.214	0.304	0.364	0.410	0.446	0.476	0.502	0.525	0.545	0.563	0.579	0.594
H SD 03, cfs	0.024	0.026	0.028	0.030	0.031	0.033	0.035	0.036	0.038	0.040	0.041	0.043

Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate of well	Qw	1.14	1.14	1.14	cfs
Time pump on (pumping duration)	tpon	365	365	365	days
Perpendicular from well to stream	a	1700	1700	1700	ft
Well depth	d	337	337	337	ft
Aquifer hydraulic conductivity	K	1	10	50	ft/day
Aquifer saturated thickness	b	100	100	100	ft
Aquifer transmissivity	T	100	1000	5000	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	1	1	1	ft
Aquitard porosity	n	0.2	0.2	0.2	
Stream width	ws	10	10	10	ft
Streambed conductance (lambda)	sbc	0.100000	0.100000	0.100000	ft/day
Stream depletion factor	sdf	28.900000	2.890000	0.578000	days
Streambed factor	sbf	1.700000	0.170000	0.034000	
input #1 for Hunt's Q_4 function	t'	0.034602	0.346021	1.730104	
input #2 for Hunt's Q_4 function	K'	14.450000	1.445000	0.289000	
input #3 for Hunt's Q_4 function	epsilon'	0.005000	0.005000	0.005000	
input #4 for Hunt's Q_4 function	lamda'	1.700000	0.170000	0.034000	



Output for Stream Depletion, Scenerio 2 (s2):	Time pump on (pumping duration) = 365 days											
Days	30	60	90	120	150	180	210	240	270	300	330	360
J SD	84.9%	89.3%	91.2%	92.4%	93.2%	93.8%	94.3%	94.6%	94.9%	95.2%	95.4%	95.6%
H SD 1999	19.5%	27.4%	32.6%	36.6%	39.7%	42.4%	44.6%	46.6%	48.3%	49.9%	51.3%	52.6%
H SD 2003	2.48%	2.65%	2.82%	2.98%	3.15%	3.31%	3.47%	3.63%	3.78%	3.94%	4.09%	4.25%
Qw, cfs	0.670	0.670	0.670	0.670	0.670	0.670	0.670	0.670	0.670	0.670	0.670	0.670
H SD 99, cfs	0.131	0.183	0.218	0.245	0.266	0.284	0.299	0.312	0.324	0.334	0.344	0.352
H SD 03, cfs	0.017	0.018	0.019	0.020	0.021	0.022	0.023	0.024	0.025	0.026	0.027	0.028

Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate of well	Qw	0.67	0.67	0.67	cfs
Time pump on (pumping duration)	tpon	365	365	365	days
Perpendicular from well to stream	a	1475	1475	1475	ft
Well depth	d	166	166	166	ft
Aquifer hydraulic conductivity	K	1	10	50	ft/day
Aquifer saturated thickness	b	100	100	100	ft
Aquifer transmissivity	T	100	1000	5000	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	1	1	1	ft
Aquitard porosity	n	0.2	0.2	0.2	
Stream width	ws	10	10	10	ft
Streambed conductance (lambda)	sbc	0.100000	0.100000	0.100000	ft/day
Stream depletion factor	sdf	21.756250	2.175625	0.435125	days
Streambed factor	sbf	1.475000	0.147500	0.029500	
input #1 for Hunt's Q_4 function	t'	0.045964	0.459638	2.298190	
input #2 for Hunt's Q_4 function	K'	10.878125	1.087813	0.217563	
input #3 for Hunt's Q_4 function	epsilon'	0.005000	0.005000	0.005000	
input #4 for Hunt's Q_4 function	lamda'	1.475000	0.147500	0.029500	