PUBLIC INTEREST REVIEW FOR GROUNDWATER APPLICATIONS

TO: Water Rights Section Date **February 11, 2016**

FROM: Groundwater Section **Michael J Thoma**
Reviewer's Name

SUBJECT: Application G- **18229** 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 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: **Telly and Amorita Wirth** County: **Linn**

A1. Applicant(s) seek(s) **2.3** cfs from **8** well(s) in the **Willamette** Basin, **Calapooia River** subbasin

A2. Proposed use **Irrigation (183.38 ac Primary)** Seasonality: **March 1-October 31 (244 d)**

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	LINN 61336	1	Alluvium		12S/03W-09 NESE	2627'N, 1122'W of SE cor S9
2	LINN 61337	2	Alluvium		12S/03W-09 NESE	2625'N, 921'W of SE cor S9
3	PROP	3	Alluvium		12S/03W-09 NWSE	2637'N, 2179'E of SE cor S9
4	PROP	4	Alluvium		12S/03W-09 NESE	2618'N, 202'W of SE cor S9
5	PROP	5	Alluvium		12S/03W-08 NESW	2549'N, 1512'E of SW cor S8
6	PROP	6	Alluvium		12S/03W-08 NESW	2561'N, 2010'E of SW cor S8
7	PROP	7	Alluvium		12S/03W-08 NWSE	2566'N, 3368'E of SW cor S8
8	PROP	8	Alluvium		12S/03W-08 NWSE	1759'N, 3882'E of SW cor S8

* 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	270	73	12	6/27/2015	302	0-19	+2-160		77-160	1000		A
2	270	52	13	7/3/2015	302	0-19	+2-130		77-130	1000		A
3	270	50-75	12									
4	270	50-75	12									
5	255	50-75	12									
6	255	50-75	12									
7	255	50-75	12									
8	258	50-75	12									

Use data from application for proposed wells.

A4. **Comments:** Only wells #1 and #2 are drilled, the remaining wells are proposed. The applicant did not provide a proposed depth or open interval for the proposed wells so this review will assume similar construction as the existing wells #1 and #2. Since the applicant did propose "gravel and sand" as the source aquifer for all wells, this review will assume that all wells will be producing from the alluvial aquifer. The applicant did not provide well-specific rates so this review assumes the maximum rate of 2.3 cfs (1032 gpm) produced from any well.

A5. ☒ **Provisions of the** Willamette (OAR 690-502) 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: _____

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) **'Large' Water-use reporting**;
   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 **Alluvium** 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 proposed POAs would be producing from thick sequences of alluvium of the Willamette Valley Aquifer referred to as the Lebanon Fan by Woodward et al. (1998). These sediments are comprised of approx. 140 ft of coarse sands and gravels overlying more fine-grained sediments to a total depth of approx. 300 ft. Most wells in the area are completed to < 100 ft deep and yield moderate amounts of water (< 100 gpm).

There are several past and current OWRD observation wells in the surrounding sections completed in the same aquifer (although to shallower depths) as the proposed POAs and data from these wells so stable SWLs over the past several decades indicating that the aquifer is not over-appropriated.

The land surrounding the proposed POAs is mostly large agricultural taxlots with sparse permitted groundwater POAs so injury to existing groundwater users is unlikely.

The applicant's wells #1 - #4 are at the same location as four wells recently permitted on permit G17325 with a maximum rate of 1.952 cfs. It is likely that the same wells will be used under both permit G17325 and the permit produced under this application.

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
1-8	**Alluvium of Lebanon Fan**	☒	☐
		☐	☐
		☐	☐

Basis for aquifer confinement evaluation: well logs for existing wells (LINN 61336 and 61337) report SWLs higher than reported 'first water'; water-bearing zones in this area are generally sand/gravel lenses inter-fingered with finer-grained sediments – confinement may be local.

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
1-8	**1**	**Calapooia River**	**240-260**	**230-235**	**12400-18300**	☒	☐	☐	☐	☐
						☐	☐	☐	☐	☐
						☐	☐	☐	☐	☐

Basis for aquifer hydraulic connection evaluation: similar GW and SW elevations; shallow open interval beginning of the existing wells (77 ft)

Water Availability Basin the well(s) are located within: Calapooia R > Willamette R – AB 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?
		☐	☐			☐		☐		☐

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:

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
5	**1**	**<<1 %**	**<<1 %**	**<<1 %**	**0.2 %**	**0.3 %**	**0.3 %**	**0.3 %**	**0.3 %**	**0.3 %**	**0.3 %**	**0.1 %**	**<<1 %**
Well Q as CFS		**0.76[A]**	**0.76**	**0.76**	**0.76**	**0.76**	**0.76**	**0.76**	**0.76**	**0.76**	**0.76**	**0.76**	**0.76**
Interference CFS		**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**
Distributed Wells													
Well	SW#	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		%	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
Well Q as CFS													
Interference CFS													
(A) = Total Interf.		**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**	**<0.01**
(B) = 80 % Nat. Q		**592**	**650**	**575**	**423**	**234**	**111**	**49**	**26**	**22.7**	**29.6**	**133**	**499**
(C) = 1 % Nat. Q		**5.92**	**6.50**	**5.75**	**4.25**	**2.34**	**1.11**	**0.46**	**0.26**	**0.23**	**0.30**	**1.33**	**4.99**
(D) = (A) > (C)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
(E) = (A / B) x 100		**<<1 %**	**<<1 %**	**<<1 %**	**<<1 %**	**<<1 %**	**<<1 %**	**<<1 %**	**<<1 %**	**<<1 %**	**<<1 %**	**<<1 %**	**<<1 %**

(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 well closest to the Calapooia River was evaluated for impacts because all other wells would have less impact and because, without well-specific rates, any well could be pumped at the full rate. Impacts were modeled using an analytical model based on Hunt (1999) stream-depletion model and model parameters taken from Herrera et al. (2014) and Woodward et al. (1998). Results (attached below and summarized in C4a) show that pumping impacts to the Calapooia River will remain much less than 1% of the natural flows in the river and per OAR 690-009 will not have the potential for substantial interference.

[A]An average pumping rate for the proposed use was determined by dividing the total annual volume (366.68 acre-feet) by the length of the irrigation season (244 d). This provides a closer representation to the long-term pumping impacts.

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:

Herrera, N. B., Burns, E. R., and T. D. Conlon. 2014. *Simulation of Groundwater Flow and the Interaction of Groundwater and Surface Water in the Willamette Basin and Central Willamette Subbasin*, Oregon. USGS Scientific Investigations Report 2014-5136.

Hunt, B. 1999. *Unsteady Stream Depletion from Ground Water Pumping*. Journal of Hydrologic Engineering, Vol 8(1), pp 12-19

Woodward, D. G., M. W. Gannett, and J. J. 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 #:** _____ **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

CALAPOOIA R > WILLAMETTE R - AB MOUTH
WILLAMETTE BASIN

Water Availability as of 2/11/2016

Watershed ID #: 76 (Map) Exceedance Level: 80%
Date: 2/11/2016 Time: 1:49 PM

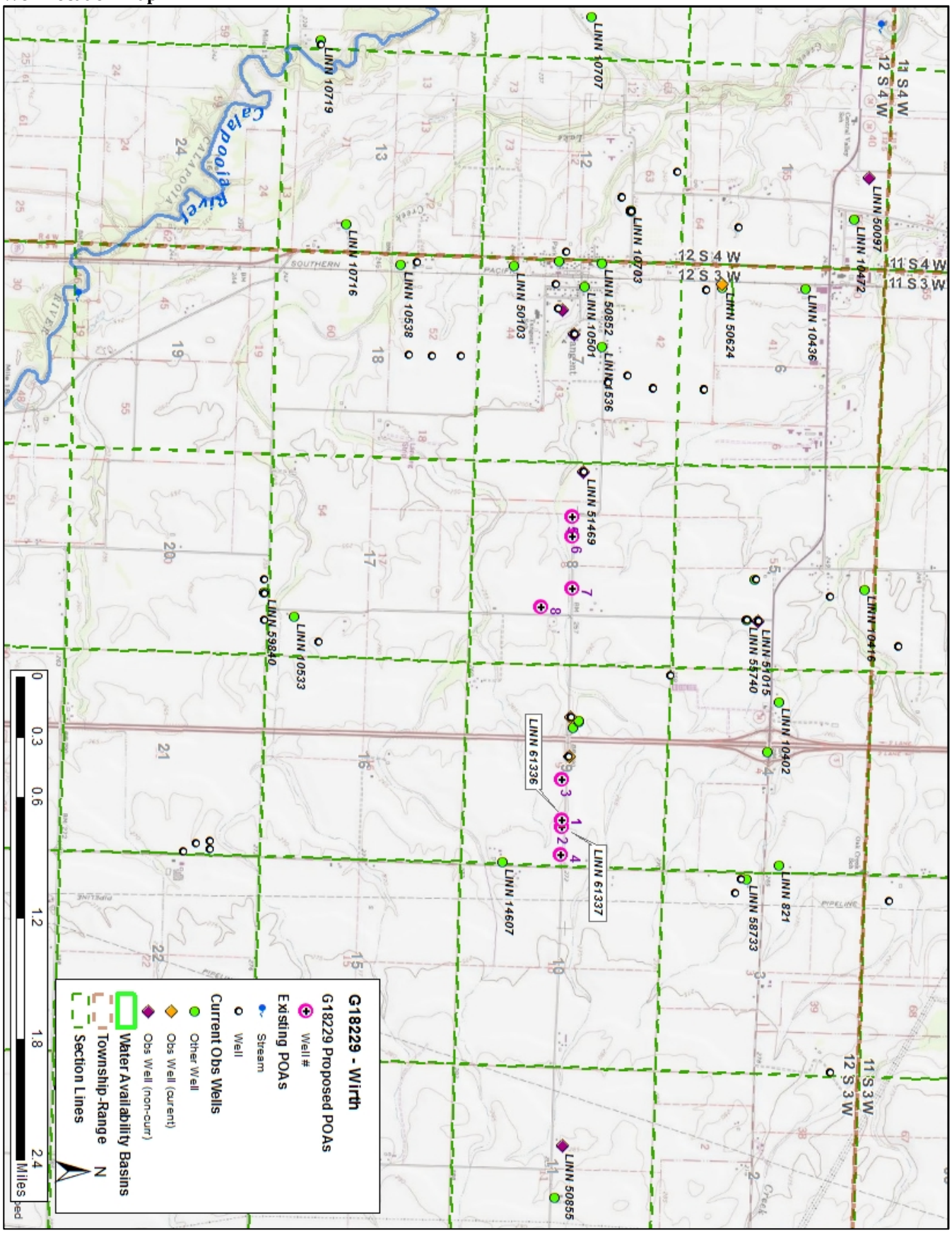
Water Availability Calculation | Consumptive Uses and Storages | Instream Flow Requirements | Reservations
Water Rights | Watershed Characteristics

Water Availability Calculation

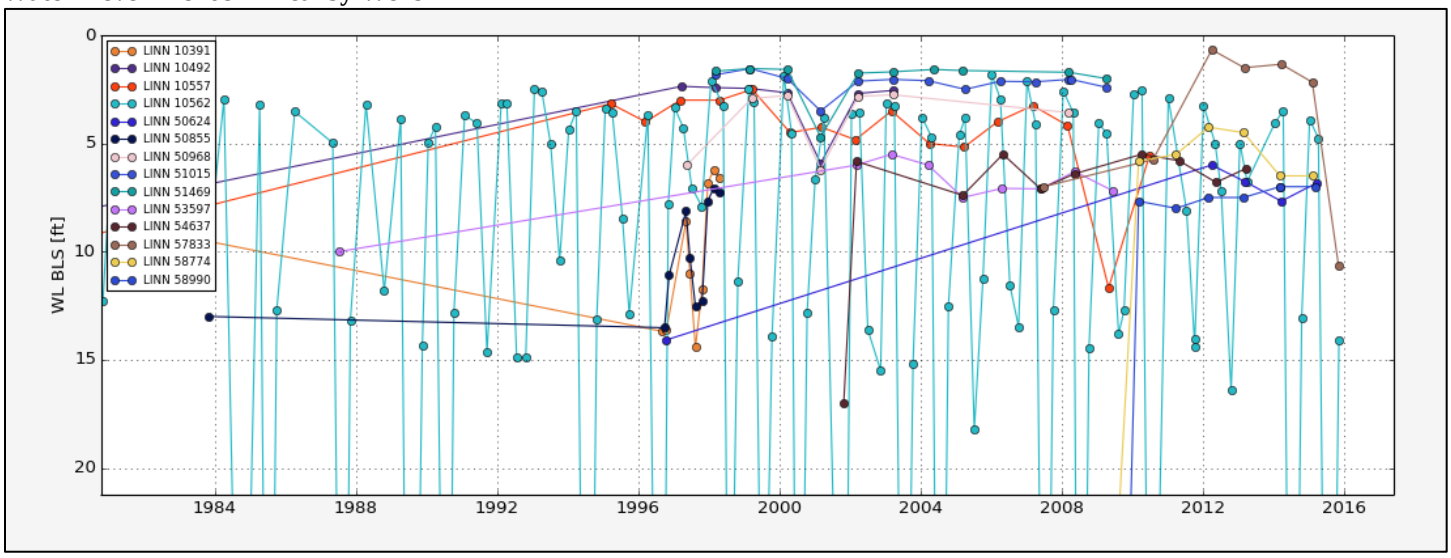
Monthly Streamflow in Cubic Feet per Second
Annual Volume at 50% Exceedance in Acre-Feet

Month	Natural Stream Flow	Consumptive Uses and Storages	Expected Stream Flow	Reserved Stream Flow	Instream Flow Requirement	Net Water Available
JAN	592.00	2.84	589.00	0.00	20.00	569.00
FEB	650.00	2.78	647.00	0.00	20.00	627.00
MAR	575.00	2.11	573.00	0.00	20.00	553.00
APR	423.00	1.81	421.00	0.00	20.00	401.00
MAY	234.00	6.82	227.00	0.00	20.00	207.00
JUN	111.00	12.50	98.50	0.00	20.00	78.50
JUL	49.00	19.30	29.70	0.00	20.00	9.69
AUG	26.00	13.80	12.20	0.00	20.00	-7.82
SEP	22.70	7.25	15.40	0.00	20.00	-4.55
OCT	29.60	1.38	28.20	0.00	20.00	8.22
NOV	133.00	1.87	131.00	0.00	20.00	111.00
DEC	499.00	2.80	496.00	0.00	20.00	476.00
ANN	404,000.00	4,560.00	399,000.00	0.00	14,500.00	385,000.00

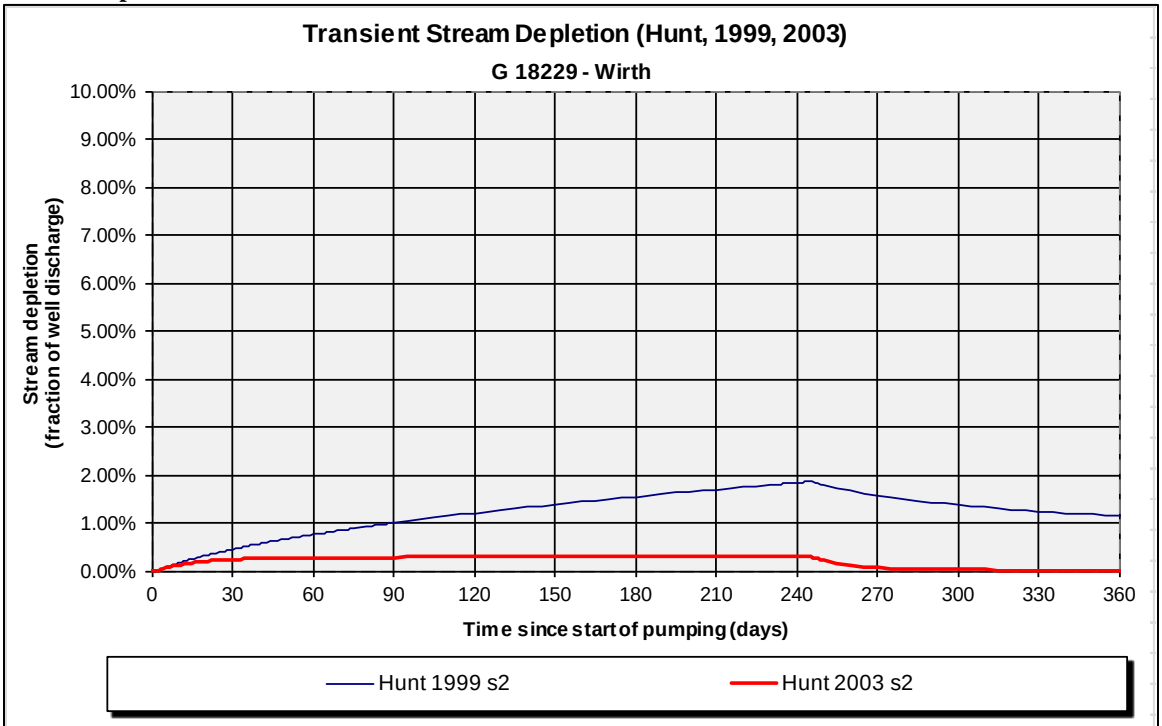
Well Location Map



Water-Level Trends in Nearby Wells



Stream-depletion Model Results



Output for Stream Depletion, Scenerio 2 (s2):						Time pump on (pumping duration) = 244 days						
Days	30	60	90	120	150	180	210	240	270	300	330	360
J SD	67.9%	77.0%	81.1%	83.6%	85.3%	86.6%	87.6%	88.4%	23.3%	13.4%	9.4%	7.2%
H SD 1999	0.4%	0.8%	1.0%	1.2%	1.4%	1.5%	1.7%	1.8%	1.6%	1.4%	1.2%	1.1%
H SD 2003	0.24%	0.27%	0.28%	0.29%	0.29%	0.29%	0.29%	0.29%	0.07%	0.02%	0.02%	0.01%
Qw, cfs	0.760	0.760	0.760	0.760	0.760	0.760	0.760	0.760	0.760	0.760	0.760	0.760
H SD 99, cfs	0.003	0.006	0.008	0.009	0.011	0.012	0.013	0.014	0.012	0.010	0.009	0.009
H SD 03, cfs	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.000	0.000	0.000

Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate of well	Qw	0.76	0.76	0.76	cfs
Time pump on (pumping duration)	tpon	244	244	244	days
Perpendicular from well to stream	a	12400	12400	12400	ft
Well depth	d	300	300	300	ft
Aquifer hydraulic conductivity	K	10	50	70	ft/day
Aquifer saturated thickness	b	300	300	300	ft
Aquifer transmissivity	T	3000	15000	21000	ft*ft/day
Aquifer storativity or specific yield	S	0.001	0.001	0.001	
Aquitard vertical hydraulic conductivity	Kva	0.001	0.001	0.001	ft/day
Aquitard saturated thickness	ba	20	20	20	ft
Aquitard thickness below stream	babs	10	10	10	ft
Aquitard porosity	n	0.2	0.2	0.2	
Stream width	ws	100	100	100	ft
Streambed conductance (lambda)	sbc	0.010000	0.010000	0.010000	ft/day
Stream depletion factor	sdf	51.253333	10.250667	7.321905	days
Streambed factor	sbf	0.041333	0.008267	0.005905	
input #1 for Hunt's Q_4 function	t'	0.019511	0.097555	0.136576	
input #2 for Hunt's Q_4 function	K'	2.562667	0.512533	0.366095	
input #3 for Hunt's Q_4 function	epsilon'	0.005000	0.005000	0.005000	
input #4 for Hunt's Q_4 function	lamda'	0.041333	0.008267	0.005905	