PUBLIC INTEREST REVIEW FOR GROUNDWATER APPLICATIONS

TO: Water Rights Section Date **December 22, 2015**

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

SUBJECT: Application G- **18164** 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: **Stanley J and Lori L Boshart** County: **LINN**

A1. Applicant(s) seek(s) **2.53** cfs from **2** well(s) in the **Willamette** Basin, **Santiam** subbasin

A2. Proposed use **Irrigation (211 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	PROP	1	Alluvium[A]	2.53	10S/03W-36 SWNE	1320'S, 1480'W of NE cor S36
2	PROP	2	Alluvium[A]	2.53	10S/03W-36 NWNE	100'S, 1450'W of NE cor S36
3						

* 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	245				200	0-100	0-100		150-200			
2	245				200	0-100	0-100		150-200			

Use data from application for proposed wells.

A4. **Comments:** [A]The applicant proposes an alluvial source for the well but based on published bedrock elevation maps by Woodward et al., (1998) there is only ~100 ft of alluvium above the bedrock (marine sediments) at the proposed well locations. The proposed case and seal depth may put production below the alluvial deposits and into the bedrock. Since alluvium is the proposed source, and the most productive aquifer, the application will be reviewed assuming production from the alluvium.

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) **7N (annual SWL); '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 _____ 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 are located in an area where the alluvial material of the Willamette Valley thins against marine sediment bedrock highs (Knox Butte). The alluvium likely extends to < 100 ft BLS at the proposed POA locations, thins to the west, and thickens substantially to the east. Within 1 mile to the north of the proposed POAs lies the South Santiam River. Likely because of the thinness of alluvial sediments there is little groundwater development in the immediate vicinity of the proposed POAs so there is little likelihood of interference. There are also no observation wells within several miles of the proposed POAs so over-appropriation cannot be determined definitively.

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: There are very few well logs in the area in the alluvial aquifer with which to establish confinement but according to geologic maps by Conlon et al., (2005) there is am extensive deposit of Willamette Silt overlying the productive aquifers in the area of the proposed POAs. The Willamette Silt is typically considered a local confining layer.

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**	**South Santiam R.**	**220[B]**	**215-225**	**4380**	☒	☐	☐	☐	☐
2	**1**	**South Santiam R.**	**220[B]**	**215-225**	**3200**	☒	☐	☐	☐	☐
						☐	☐	☐	☐	☐
						☐	☐	☐	☐	☐

Basis for aquifer hydraulic connection evaluation: coincident GW and SW elevations.
[B]GW elevation taken from published water table elevation maps of Conlon et al., (2005).

Water Availability Basin the well(s) are located within: S Santiam R > Santiam R – At Mouth (ID# 30200601)

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**	☐	☐	**none**	**-**	☐	**253**	☐	**< 10 %**	☐
2	**1**	☐	☐	**none**	**-**	☐	**253**	☐	**< 10 %**	☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐

Comments: Interference @ 30 d was estimated using the Hunt (2003) analytical model and parameter values taken from Herrera et al., (2014). Model output for the Well #2 (nearest well) is shown below – results for Well #1 are similar.

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
		%	%	%	%	%	%	%	%	%	%	%	%
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													
(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:

Conlon, T. D., K. C. Wozniak, D. Woodcock, N. B. Herrera, B. J. Fisher, D. S. Morgan, K. K. Lee, S. R. Hinkle. 2005. *Ground-water Hydrology of the Willamette Basin, Oregon*. USGS Scientific Investigation Report 2005-5168.

Gannet, M. W. and R. R. Caldwell. 1998. *Geologic Framework of the Willamette Lowland Aquifer System, Oregon and Washington*. USGS Professional Paper 1424-A.

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. 2003. *Unsteady Stream Depletion when Pumping from a Semiconfined Aquifer*. 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

S SANTIAM R > SANTIAM R - AT MOUTH
WILLAMETTE BASIN

Water Availability as of 12/22/2015

Watershed ID #: 30200601 (Map) Exceedance Level: 80%

Date: 12/22/2015 Time: 2:43 PM

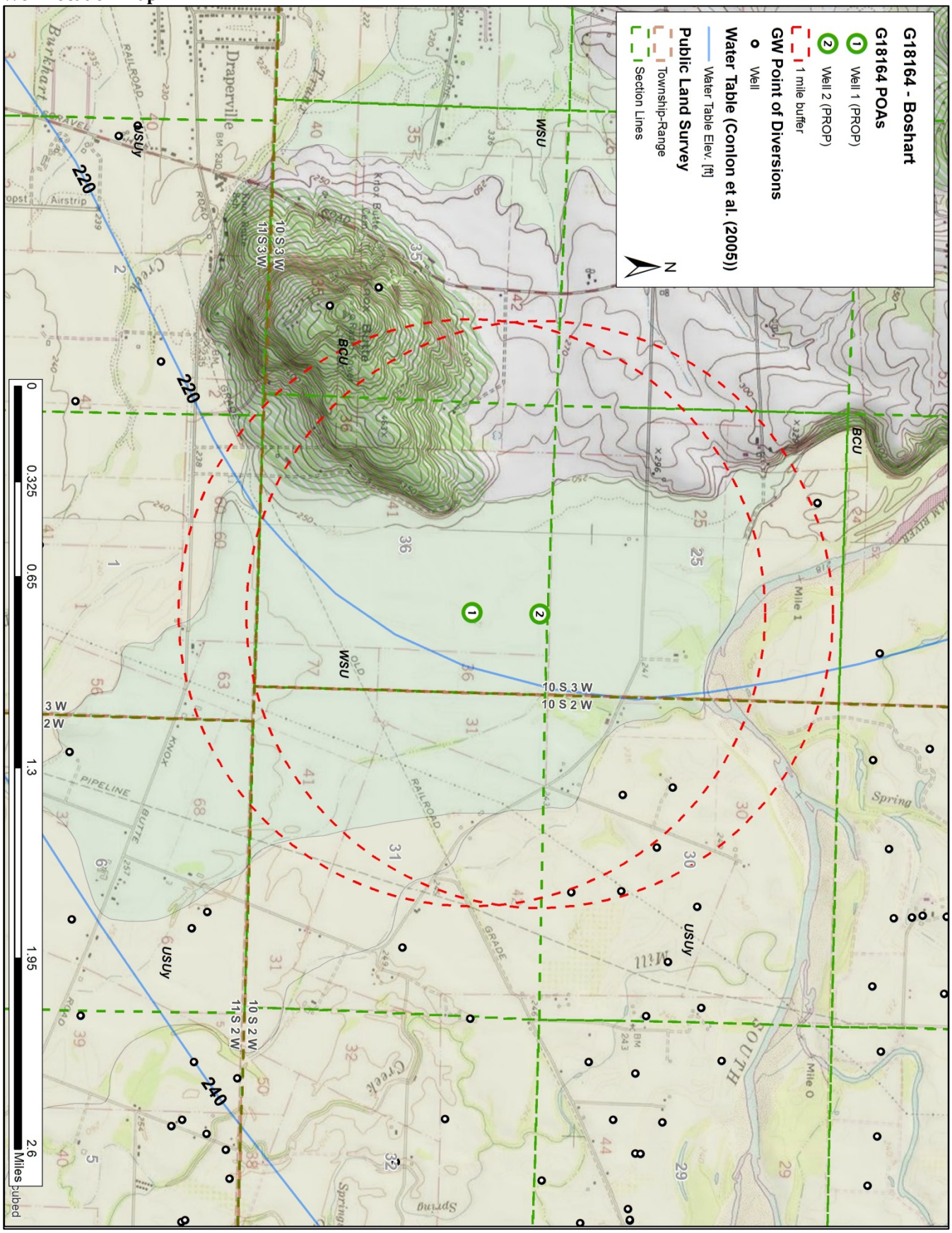
Water Availability Calculation | Consumptive Uses and Storages | Instream Flow Requirements | Reservations | Water Rights | Watershed Characteristics

Water Availability Calculation

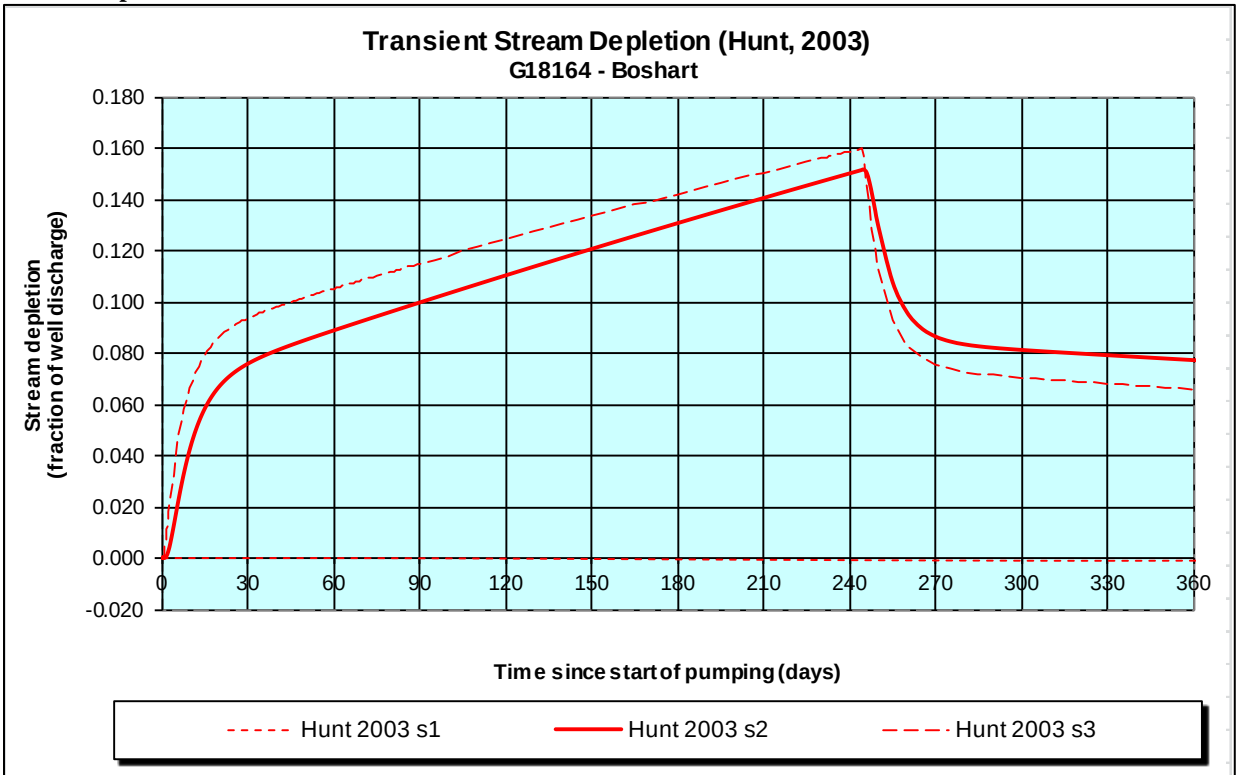
Monthly Streamflow in Cubic Feet per Second
Annual Volume at 50% Exceedance in Acre-Feet

Month	Natural Stream Flow	Consumptive Uses and Storages	Expected Stream Flow	Reserved Stream Flow	Instream Flow Requirement	Net Water Available
JAN	3,090.00	266.00	2,820.00	0.00	0.00	2,820.00
FEB	3,360.00	1,530.00	1,830.00	0.00	0.00	1,830.00
MAR	3,170.00	1,260.00	1,910.00	0.00	0.00	1,910.00
APR	2,950.00	1,050.00	1,900.00	0.00	0.00	1,900.00
MAY	2,050.00	713.00	1,340.00	0.00	0.00	1,340.00
JUN	968.00	184.00	784.00	0.00	0.00	784.00
JUL	450.00	206.00	244.00	0.00	0.00	244.00
AUG	275.00	191.00	84.00	0.00	0.00	84.00
SEP	253.00	161.00	92.20	0.00	0.00	92.20
OCT	363.00	139.00	224.00	0.00	0.00	224.00
NOV	1,450.00	140.00	1,310.00	0.00	0.00	1,310.00
DEC	3,040.00	142.00	2,900.00	0.00	0.00	2,900.00
ANN	2,330,000.00	356,000.00	1,980,000.00	0.00	0.00	1,980,000.00

Well Location Map



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	55.1%	67.3%	73.1%	76.6%	79.0%	80.8%	82.2%	83.3%	32.1%	18.8%	13.3%	10.2%
H SD 1999	23.6%	36.6%	44.4%	49.8%	53.9%	57.1%	59.6%	61.8%	42.5%	30.0%	23.1%	18.7%
H SD 2003	**7.58%**	8.88%	9.97%	11.03%	12.06%	13.07%	14.05%	15.01%	8.65%	8.12%	7.92%	7.73%
Qw, cfs	2.530	2.530	2.530	2.530	2.530	2.530	2.530	2.530	2.530	2.530	2.530	2.530
H SD 99, cfs	0.598	0.926	1.124	1.260	1.363	1.443	1.509	1.564	1.076	0.759	0.585	0.474
H SD 03, cfs	0.192	0.225	0.252	0.279	0.305	0.331	0.356	0.380	0.219	0.206	0.200	0.195

Parameters:		**Scenario 1**	**Scenario 2**	**Scenario 3**	**Units**
Net steady pumping rate of well	Qw	2.53	**2.53**	2.53	cfs
Time pump on (pumping duration)	tpon	244	**244**	244	days
Perpendicular from well to stream	a	3200	**3200**	3200	ft
Well depth	d	200	**200**	200	ft
Aquifer hydraulic conductivity	K	1	**60**	200	ft/day
Aquifer saturated thickness	b	80	**80**	80	ft
Aquifer transmissivity	T	80	**4800**	16000	ft*ft/day
Aquifer storativity or specific yield	S	0.01	**0.01**	0.01	
Aquitard vertical hydraulic conductivity	Kva	0.01	**0.01**	0.01	ft/day
Aquitard saturated thickness	ba	10	**10**	10	ft
Aquitard thickness below stream	babs	1	**1**	1	ft
Aquitard porosity	n	0.2	**0.2**	0.2	
Stream width	ws	200	**200**	200	ft
Streambed conductance (lambda)	sbc	2.000	**2.000**	2.000	ft/day
Stream depletion factor	sdf	1280.000	**21.333**	6.400	days
Streambed factor	sbf	80.000	**1.333**	0.400	
input #1 for Hunt's Q_4 function	t'	0.001	**0.047**	0.156	
input #2 for Hunt's Q_4 function	K'	128.000	**2.133**	0.640	
input #3 for Hunt's Q_4 function	epsilon'	0.050	**0.050**	0.050	
input #4 for Hunt's Q_4 function	lamda'	80.000	**1.333**	0.400	