PUBLIC INTEREST REVIEW FOR GROUNDWATER APPLICATIONS

TO: Water Rights Section Date **January 25, 2016**

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

SUBJECT: Application G- **18179** 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: **John W. and Candace L. Kirsch Revocable Living Trust**
County: **Yamhill**

A1. Applicant(s) seek(s) **0.334** cfs from **3** well(s) in the **Willamette** Basin, **Yamhill** subbasin

A2. Proposed use **Irrigation (83.92 acres)** Seasonality: **June 1 – September 1**

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	Proposed	1	Alluvium	50	4S/4W-3 SW-NE	1458' N, 2111' W fr SE cor NE 1/4 S 3
2	Proposed	2	Alluvium	50	4S/4W-3 SW-NE	775' N, 2111' W fr SE cor NE 1/4 S 3
3	Proposed	3	Alluvium	50	4S/4W-3 SW-NE	70' N, 2111' W fr SE cor NE 1/4 S 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	~160				Est 85	Est 0-40	Est 0-40	-	Est 40-85	50		
2	~158				Est 85	Est 0-40	Est 0-40	-	Est 40-85	50		
3	~155				Est 85	Est 0-40	Est 0-40	-	Est 40-85	50		

Use data from application for proposed wells.

A4. **Comments:** The proposed use is irrigation to minimize hazelnut tree death loss.

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 proposed wells will withdraw water from a confined aquifer and are greater than ¼-mile from surface water bodies, therefore the pertinent 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 **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 area around the applicant's proposed wells is underlain by approximately 40 feet of Willamette Silt which is underlain by a series of water-bearing gravel and sand beds interbedded with silts and clays (locally approximately 20 feet thick) (Gannett and Caldwell, 1998). The water table occurs near land surface in the Willamette Silt, which acts as a regional confining unit (Gannett and Caldwell, 1998, and Woodward el 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 may interact with multiple surface water bodies and prior groundwater rights.** The large distance from the proposed wells to the streams results in low stream interference – however, stream depletion will likely increase over time until all of the pumped water is balanced by reduced stream flow.

Water level data from YAMH 5840 (located ~4.1 miles to the southeast) indicate relatively stable long-term trends for alluvial wells (see below), but increased groundwater development in the area indicates a need for additional water-level monitoring.

The proposed location for Well 1 is located less than 500 feet from houses which may have existing domestic wells. The proposed location for Well 2 is located approximately 500 feet from well "C" (YAMH 52664) which is authorized for use under Permit G-16289. The proposed location for Well 3 is approximately 200 feet from well "A" (YAMH 52665), also authorized for use under Permit G-16289. To evaluate potential impacts to the nearby wells, transmissivity results from nearby pump tests (YAMH 4934, located ~ 3.25 miles to the northwest, and YAMH 5340, located ~3 miles to the southeast) were used to model drawdown at the nearby wells (using the Deluxe Drawdown spreadsheet model written by Karl C. Wozniak based up Walton, 1984). There are many uncertainties. **However, results of the drawdown modeling indicate**

that at a horizontal distance of 500 feet, after 7 days of continuous pumping between ~5-10 feet of drawdown could be experienced at a neighboring well due to pumping at one of the proposed wells (assuming a pumping rate of 50 gpm).

SPECIAL CONDITIONS

1. **The wells must be a minimum of 500 feet away from the nearest wells on neighboring properties.**
2. **After two wells have been drilled, a constant-rate aquifer test shall be conducted to determine aquifer properties and to assess the potential impacts from use of the wells. The test shall be designed and conducted by an Oregon Registered Geologist but the test design shall be subject to the approval of the Groundwater Section of the Department prior to the test. The test shall include discharge measurements in the pumping well and water-level measurements in the pumping well and the other permitted well. If practicable, water-level measurements shall also be made in nearby wells that are not on the permit. If a third production well is drilled, at least one additional constant-rate test shall be conducted using one of those wells as the pumping well subject to the same requirements listed for the first test. The results of each test shall be presented in a report that includes an analysis of aquifer properties, aquifer boundaries, and the potential impact on nearby wells that is likely to occur over the duration of an irrigation season if the wells are used at the permitted rate and duty.**
3. **A dedicated water-level measuring tube shall be installed in each well. The measuring tube shall meet the standards described in OAR 690-215-0060. When requested, access to the wells shall be provided to Departmental staff in order to make water-level measurements.**
4. **Drill cuttings shall be collected at 10-foot intervals and at changes in formation in each well and a split of each sampled interval shall be provided to the Department.**

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	**Alluvial**	☒	☐
2	**Alluvial**	☒	☐
3	**Alluvial**	☒	☐

Basis for aquifer confinement evaluation: Groundwater levels in nearby wells (YAMH 52664 and YAMH 52665) rose 30+ feet above the water bearing zone at which water was first encountered. The well logs for these nearby wells report a clay layer approximately 40 feet thick overlying the aquifer.

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**	**North Yamhill River**	**~145**	**95**	**2720**	☒	☐	☐	☐	☒
2	**1**	**North Yamhill River**	**~145**	**95**	**2360**	☒	☐	☐	☐	☒
3	**1**	**North Yamhill River**	**~145**	**95**	**2070**	☒	☐	☐	☐	☒
1	**2**	**Hawn Creek**	**~145**	**131**	**4870**	☒	☐	☐	☐	☒
2	**2**	**Hawn Creek**	**~145**	**131**	**4580**	☒	☐	☐	☐	☒
3	**2**	**Hawn Creek**	**~145**	**131**	**4370**	☒	☐	☐	☐	☒
1	**3**	**Unnamed Trib to N Yamhill R**	**~145**	**114**	**4800**	☒	☐	☐	☐	☒
2	**3**	**Unnamed Trib to N Yamhill R**	**~145**	**114**	**4120**	☒	☐	☐	☐	☒
3	**3**	**Unnamed Trib to N Yamhill R**	**~145**	**114**	**3440**	☒	☐	☐	☐	☒

Basis for aquifer hydraulic connection evaluation: Published water table maps indicate that groundwater in the alluvial aquifer flows towards, and discharges into, nearby perennial streams (Conlon et al., 2005, Woodward et a., 1998). The elevation of the North Yamhill River ranges from 77-97 feet within a mile of the wells, with an elevation of 95 feet at the adjacent reach. The elevation of Hawn Creek ranges from 96-87 feet within a mile of the wells, with an elevation of 87 feet at the adjacent reach. The elevation of the Unamed tributary to the North Yamnhill River ranges from 108-148 feet within a mile of the wells. Based on the well log for YAMH 52665, this creek likely cuts through the confining Willamette Silt at approximately 114 feet in elevation, although the elevation at the adjacent reach in 87 feet. This review evaluates based on the distance where the creek is at an elevation of 114 feet (essentially Aebi Reservoir).

Water Availability Basin the well(s) are located within: 70746: N YAMHILL R> YAMHILL R- AT MOUTH, and 188: YAMHILL R> WILLAMETTE R- AB PALMER 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**	☐	☐	**IS3552**	**5.0**	☒	**16.60**	☐	**~5.3%**	☒
2	**1**	☐	☐	**IS3552**	**5.0**	☒	**16.60**	☐	**~6.2%**	☒
3	**1**	☐	☐	**IS3552**	**5.0**	☒	**16.60**	☐	**~6.6%**	☒
1	**2**	☐	☐	**MF 188**	**15.0**	☐	**56.3**	☐	**~1.9%**	☐
2	**2**	☐	☐	**MF 188**	**15.0**	☐	**56.3**	☐	**~2.3%**	☐

3	**2**	☐	☐	**MF 188**	**15.0**	☐	**56.3**	☐	**~2.5%**	☐
1	**3**	☐	☐	**-**	**-**	☐	**16.6**	☐	**~1.1%**	☐
2	**3**	☐	☐	**-**	**-**	☐	**16.6**	☐	**~1.5%**	☐
3	**3**	☐	☐	**-**	**-**	☐	**16.6**	☐	**~2.0%**	☐

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: Analysis of multiple single well pump tests in the relatively local aquifer system result in transmissivity values ranging from approximately 200 to 300 feet squared per day (ft^2/day). Although at the location of the wells the aquifer is confined, the creeks likely cut entirely through the confining Willamette Silt unit. An approximation of this system was modeled using the Hunt 2003 transient stream depletion model using a 0.5 foot thickness of aquitard below the stream. The transmissivity values from nearby pump tests were matched to determine the stream interference at 30 days (see results from Well 3 to the North Yamhill River analysis below – this is the well and river combination which is likely to have the largest interference).

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 files for: G-18179, and nearby G-16731.

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.

Walton, W.C., 1984, Practical Aspects of Groundwater Modeling: National Water-Well Association, pp. 268-569 & 298-303.

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.

Nearby well logs and water level data YAMH 52664, YAMH 52665, pump test results from YAMH 4934, and YAMH 5340

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

N YAMHILL R > YAMHILL R - AT MOUTH

Watershed ID #: 70746 Basin: WILLAMETTE Exceedance Level: 80
Time: 12:22 PM Date: 01/19/2016

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	395.00	38.40	357.00	0.00	70.00	287.00
FEB	485.00	39.00	446.00	0.00	70.00	376.00
MAR	379.00	30.70	348.00	0.00	70.00	278.00
APR	240.00	31.70	208.00	0.00	70.00	138.00
MAY	124.00	27.70	96.30	0.00	70.00	26.30
JUN	63.60	30.40	33.20	0.00	40.00	-6.84
JUL	30.70	34.60	-3.93	0.00	15.00	-18.90
AUG	22.70	32.40	-9.72	0.00	10.00	-19.70
SEP	17.40	26.20	-8.83	0.00	10.00	-18.80
OCT	16.60	18.80	-2.18	0.00	10.00	-12.20
NOV	68.90	25.40	43.50	0.00	70.00	-26.50
DEC	338.00	37.90	300.00	0.00	70.00	230.00
ANN	249,000	22,500	227,000	0	34,600	193,000

DETAILED REPORT OF INSTREAM REQUIREMENTS

N YAMHILL R > YAMHILL R - AT MOUTH

Watershed ID #: 70746 Basin: WILLAMETTE
Time: 2:23 PM Date: 01/19/2016

Application Number	Status	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
		Monthly values are in cfs.											
IS70746A	CERTIFICATE	70.0	70.0	70.0	70.0	70.0	40.0	15.0	10.0	10.0	10.0	70.00	70.0
IS73551A	CERTIFICATE	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.00	7.0
IS73552A	CERTIFICATE	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.00	5.0
MAXIMUM		70.0	70.0	70.0	70.0	70.0	40.0	15.0	10.0	10.0	10.0	70.0	70.0

DETAILED REPORT ON THE WATER AVAILABILITY CALCULATION

YAMHILL R > WILLAMETTE R - AB PALMER CR

Watershed ID #: 188 Basin: WILLAMETTE Exceedance Level: 80
Time: 9:44 AM Date: 01/25/2016

Monthly values are in cfs.
Storage is the annual amount at 50% exceedance in ac-ft.

Month	Natural Stream Flow	Consumptive Use and Storage	Expected Stream Flow	Reserved Stream Flow	Instream Requirements	Net Water Available
JAN	1,780.00	61.60	1,720.00	0.00	31.00	1,690.00
FEB	2,010.00	59.50	1,950.00	0.00	31.00	1,920.00
MAR	1,710.00	37.80	1,670.00	0.00	31.00	1,640.00
APR	1,030.00	45.30	985.00	0.00	31.00	954.00
MAY	512.00	55.70	456.00	0.00	31.00	425.00
JUN	229.00	76.80	152.00	0.00	31.00	121.00
JUL	107.00	96.80	10.20	0.00	31.00	-20.80
AUG	66.60	86.00	-19.40	0.00	31.00	-50.40
SEP	56.30	55.80	0.48	0.00	31.00	-30.50
OCT	72.70	15.70	57.00	0.00	31.00	26.00
NOV	465.00	31.70	433.00	0.00	31.00	402.00
DEC	1,640.00	58.80	1,580.00	0.00	31.00	1,550.00
ANN	1,150,000	41,200	1,100,000	0	22,500	1,080,000

DETAILED REPORT OF INSTREAM REQUIREMENTS

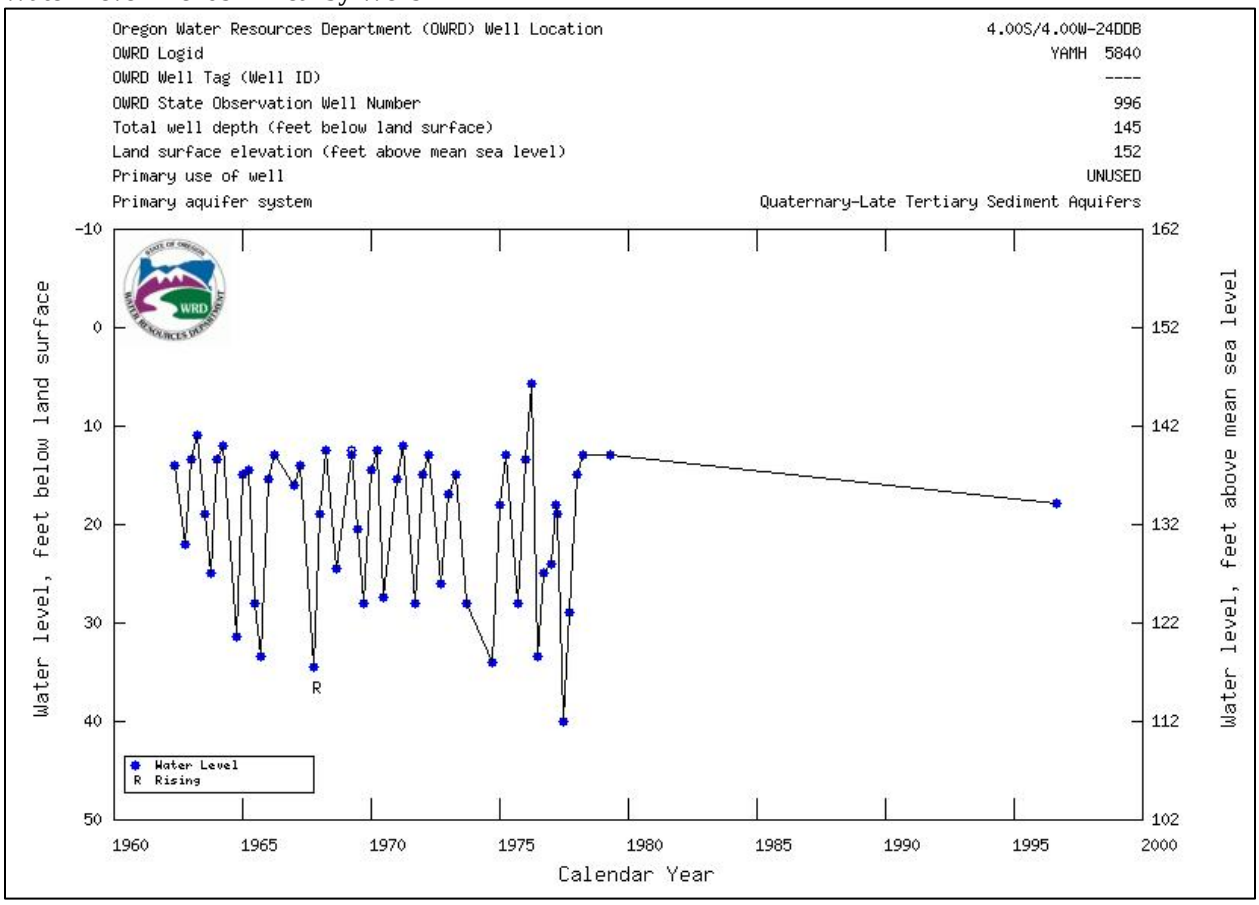
YAMHILL R > WILLAMETTE R - AB PALMER CR

Watershed ID #: 188 Basin: WILLAMETTE
Time: 9:44 AM Date: 01/25/2016

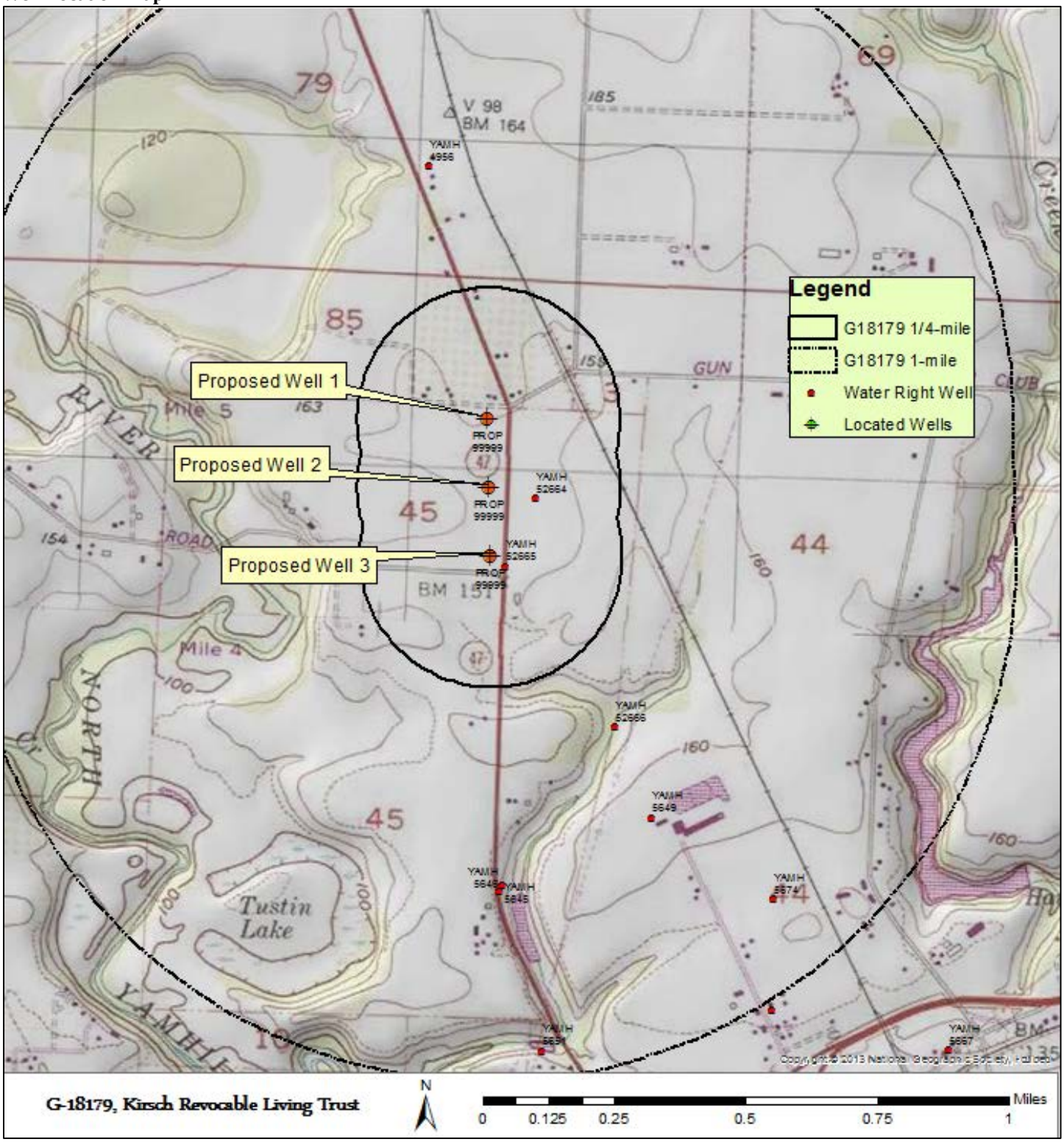
Monthly values are in cfs.

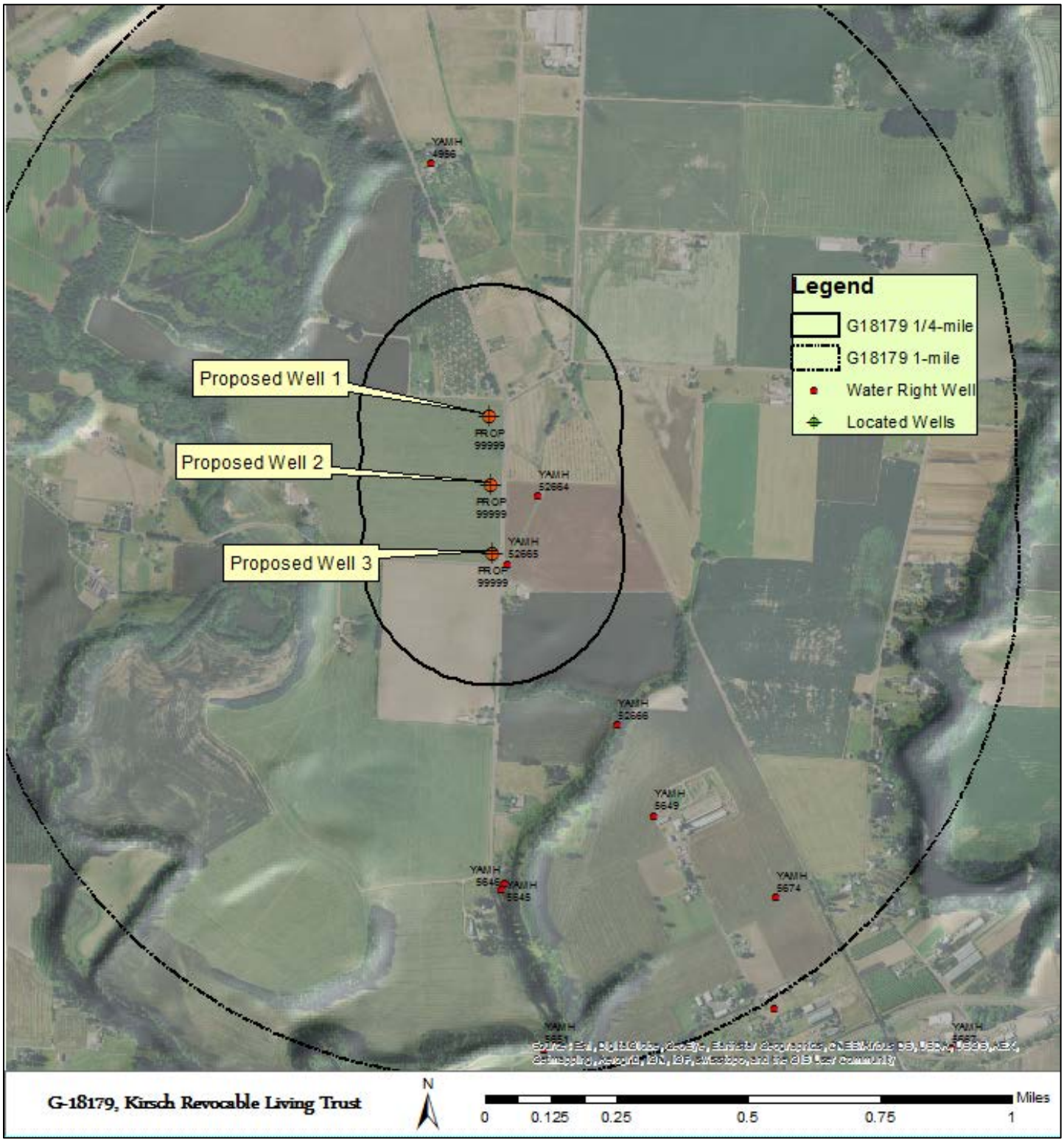
Application Number	Status	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
MF188A	CERTIFICATE	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
IS73549A	CERTIFICATE	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.00	31.0
IS73550A	CERTIFICATE	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.5	28.50	28.5
MAXIMUM		31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0

Water Level Trends in Nearby Wells

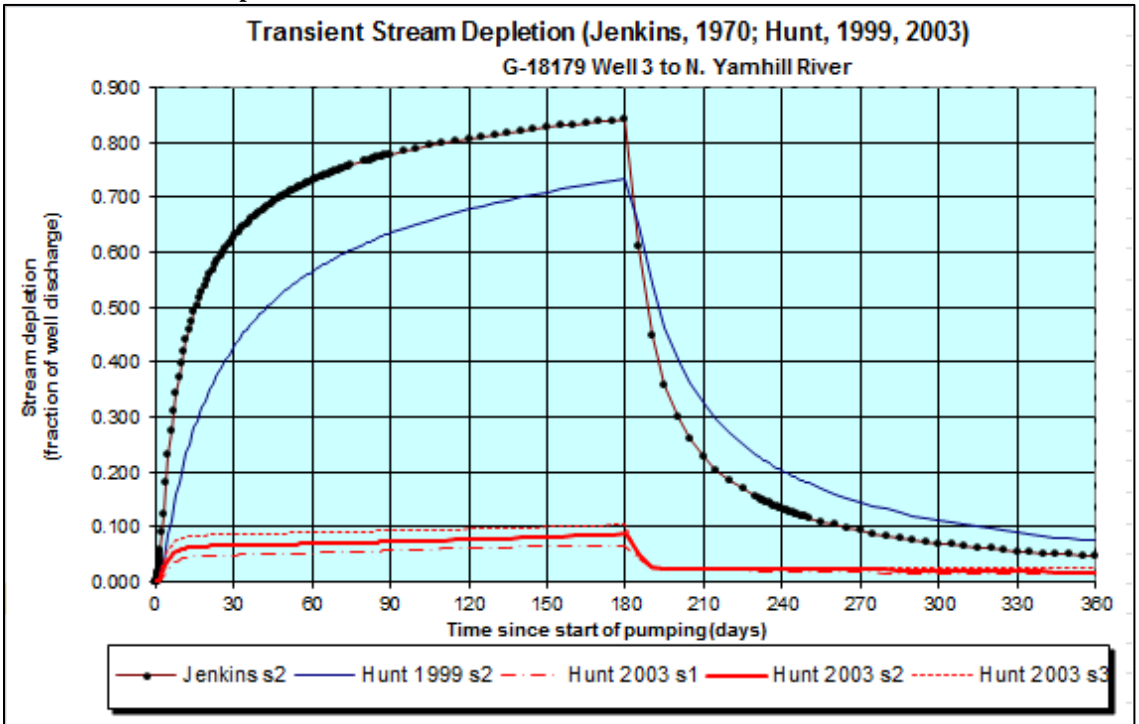


Well Location Map




Legend
G18179 1/4-mile
G18179 1-mile
Water Right Well
Located Wells
Proposed Well 1
Proposed Well 2
Proposed Well 3
PROP 99999
YAMH 52664
YAMH 52665
YAMH 52666
YAMH 5649
YAMH 5674
G-18179, Kirsch Revocable Living Trust
N
0 0.125 0.25 0.5 0.75 1 Miles

Transient Stream Depletion – Well 3 to N. Yamhill River



Output for Stream Depletion, Scenerio 2 (s2):	Time pump on (pumping duration) = 180 days											
Days	30	60	90	120	150	180	210	240	270	300	330	360
J SD	62.6%	73.0%	77.8%	80.7%	82.7%	84.2%	22.8%	13.3%	9.3%	7.0%	5.6%	4.6%
H SD 1999	42.8%	56.5%	63.5%	67.9%	71.0%	73.4%	32.4%	20.2%	14.5%	11.1%	8.9%	7.4%
H SD 2003	6.60%	6.91%	7.27%	7.68%	8.16%	8.68%	2.33%	2.29%	2.20%	2.07%	1.89%	1.64%
Qw, cfs	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110
H SD 99, cfs	0.047	0.062	0.070	0.075	0.078	0.081	0.036	0.022	0.016	0.012	0.010	0.008
H SD 03, cfs	0.007	0.008	0.008	0.008	0.009	0.010	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	0.11	0.11	0.11	cfs
Time pump on (pumping duration)	tpon	180	180	180	days
Perpendicular from well to stream	a	2070	2070	2070	ft
Well depth	d	85	85	85	ft
Aquifer hydraulic conductivity	K	10	15	25	ft/day
Aquifer saturated thickness	b	20	20	20	ft
Aquifer transmissivity	T	200	300	500	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	40	40	40	ft
Aquitard thickness below stream	babs	0.5	0.5	0.5	ft
Aquitard porosity	n	0.2	0.2	0.2	
Stream width	ws	20	20	20	ft
Streambed conductance (lambda)	sbc	0.400000	0.400000	0.400000	ft/day
Stream depletion factor	sdf	21.424500	14.283000	8.569800	days
Streambed factor	sbf	4.140000	2.760000	1.656000	
input #1 for Hunt's Q_4 function	t'	0.046676	0.070013	0.116689	
input #2 for Hunt's Q_4 function	K'	5.356125	3.570750	2.142450	
input #3 for Hunt's Q_4 function	epsilon'	0.005000	0.005000	0.005000	
input #4 for Hunt's Q_4 function	lamda'	4.140000	2.760000	1.656000	

Deluxe Drawdown Model

Written by Karl C. Wozniak September 1992. Last modified December 30, 2014

Input Data:	Var Name	Scenario 1	Scenario 2	Scenario 3	Units	
Total pumping time	t		7		d	
Radial distance from pumped well:	r		500.00		ft	Q conversions
Pumping rate	Q		50.0		gpm	50.00 gpm
Hydraulic conductivity	K	10	15	25	ft/day	0.11 cfs
Aquifer thickness	b		20		ft	6.68 cfm
Storativity	S_1		0.00100			9,625.67 cfd
	S_2		0.00100			0.22 af/d
Transmissivity Conversions	T_f2pd	200	300	500	ft2/day	
	T_ft2pm	0.1389	0.2083	0.3472	ft2/min	
	T_gpdpft	1,496	2,244	3,740	gpd/ft	

Recalculate Use the Recalculate button if recalculation is set to manual