Groundwater Application Review Summary Form

Application # G- 18552

GW Reviewer Aurora Bouchier **Date Review Completed:** 11/27/2017

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:

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

Well 12 (Polk 53561) and Well 28 (no log)

Summary of Well Construction Assessment:

[X] 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.

Well 27 (POLK 2883) and Well 28 (no log)

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).

WATER RESOURCES DEPARTMENT

MEMO Nov. 27 ,20 17

TO: **Application G-** 18552

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

SUBJECT: Scenic Waterway Interference Evaluation

☐ YES
The source of appropriation is within or above a Scenic Waterway

☒ NO

☐ YES
Use the Scenic Waterway condition (Condition 7J)

☒ NO

☐ Per ORS 390.835, the Groundwater Section is **able** to calculate ground water interference with surface water that contributes to a Scenic Waterway. The calculated interference is distributed below.

☐ 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.**

DISTRIBUTION OF INTERFERENCE

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.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

PUBLIC INTEREST REVIEW FOR GROUNDWATER APPLICATIONS

TO: Water Rights Section Date 11/27/2017

FROM: Groundwater Section Aurora C Bouchier
Reviewer's Name

SUBJECT: Application G- 18552 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: **ACMPC Oregon 2, LLC** County: **Polk**

A1. Applicant(s) seek(s) 0.93 cfs from 5 well(s) in the Willamette Basin, Middle Willamette subbasin (Rickreall and Salem West quads)

A2. Proposed use Irrigation (74.3 acres) and Commercial Seasonality: 3/1 – 10/31 and 9/1 – 11/30

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	POLK 53567	New Well 5	Alluvium	0.90	8S/4W-2 NE-SW	~1335' N, ~2055' E fr SW cor S 2 (1)
2	POLK 2791	Well 7	Alluvium	0.90	8S/4W-2 NE-SW	1525' N, 1485' E fr SSW cor S 2
3	POLK 53561	New Well 12	Alluvium	0.90	7S/4W-36 SE-NW	~5' N, ~410' E fr W1/4 cor S 36 (1)
4	POLK 2883	Well 27	Alluvium	0.90	8S/4W-11 NW-SW	~2500' N, ~725' E fr SW cor S 11 (2)
5	No log	Well 28	Alluvium	0.90	7S/4W-36 SW-NW	70' N, 640' E fr W1/4 cor S 36

* 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 (5)	152	25	24	7/31/2014	69	0-18	-1-69	Na	28-68	1000	16 (2 hr)	P
2 (7)	154	35	24	7/31/1975	53	0-18	-1-52	Na	35-48	1700	10 (6 hr)	P
3 (12)	140	20	17	7/22/2014	58	0-18	-2-58	Na	18-58	600	23 (2 hr)	P
4 (27)	156	?	25	1951	50	?	0-50	Na	35-50	300	10	
5 (28)	150	?	26 (3)	?	61.5 (3)	?	-1-61.5 (3)	?	?	?	?	

Use data from application for proposed wells.

A4. **Comments:** (1) The application provides lat/long coordinates for New Well 5 and New Well 12; the estimated meets and bounds listed here are measured by the reviewer. The wells can be seen in recent aerial imagery.
(2) The application provides a bearing and distance for Well 27; the estimated meets and bounds listed here are measured by the reviewer. The application map plots Well 27 in the SW-NW ¼-¼ of Section 11, however the well log and visual clues from the included well photograph indicate the well is actually located in the NW-SW ¼-¼ of Section 11.
(3) There is no well log which can be positively correlated to Well 28. The construction information presented in this review is as provided in the application.

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: Well 28 (no log) is located less than ¼-mile from Hayden Slough. In general, the Holocene floodplain deposits are unconfined. Although there is no log for the applicant's Well 28, other well logs in the section support this generality. Therefore Well 28 is subject to the pertinent rules (OAR 690-502-0240).

Well 5 (POLK 53567), Well 7 (POLK 2791), Well 12 (POLK 53561), and Well 27 (POLK 2883) are located greater than ¼-mile from surface water sources and are therefore not subject to the pertinent rules.

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, Large water use reporting condition**;
   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 wells develop groundwater from predominately course-grained Holocene flood deposits that have a saturated thickness of approximately 20 feet (Conlon et al., 2005). Water levels in the aquifer are closely tied to stream stage in the Willamette River (Conlon et al., 2005). The proposed wells are located within the floodplain/within old meander loops of the Willamette River where the Willamette Silt has largely been removed. Since the water levels in this system are closely tied to the Willamette River stage, the long term stability of the aquifer is not likely to be a problem, but the saturated thickness of the aquifer could crop substantially in late summer in conjunction with lower stream stage. The seasonal fluctuation of the aquifer at this location is unknown at this time. The adjacent reach of the Willamette River has an elevation of approximately 130 feet. A recently constructed observation well (POLK 53369, located approximately 6-miles south of Well 27) demonstrates a seasonal fluctuation of approximately 10 feet and the adjacent reach of the river has an elevation of approximately 150 feet.

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 (5)	**Alluvial**	☐	☒
2 (7)	**Alluvial**	☐	☒
3 (12)	**Alluvial**	☐	☒
4 (27)	**Alluvial**	☐	☒
5 (28)	**Alluvial**	☐	☒

Basis for aquifer confinement evaluation: The wells are located within the Holocene floodplain deposits of the Willamette River which are generally unconfined (Conlon et al., 2005, p. 9).

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 (5)	**1**	**Willamette River**	**~130**	**130**	**3,710**	☒	☐	☐	☐	☒
2 (7)	**1**	**Willamette River**	**~130**	**130**	**4,300**	☒	☐	☐	☐	☒
3 (12)	**1**	**Willamette River**	**~130**	**130**	**2,400**	☒	☐	☐	☐	☒
4 (27)	**1**	**Willamette River**	**~130**	**130**	**3,130**	☒	☐	☐	☐	☒
5 (28)	**1**	**Willamette River**	**~130**	**130**	**3,300**	☒	☐	☐	☐	☒
5 (28)	**2**	**Hayden Slough**	**~130**	**131**	**350**	☒	☐	☐	☒	☐

Basis for aquifer hydraulic connection evaluation: The wells are producing water from Holocene floodplain deposits adjacent to the Willamette River. An efficient hydraulic connection exists between the Willamette River and the Holocene floodplain deposits (Conlon et al., 2005, P. 50). Ponds in the abandoned meanders (for example, Hayden Lake) exist; however they appear to represent daylighting of groundwater and are not evaluated against in this review.
Hayden Slough, tributary to Rickreall Creek, has multiple PODs along its reach. The water level in Well 28 is likely coincident with Hayden Slough.

Water Availability Basin the well(s) are located within: Wells 1 through 4 are located within WAB: 183 [WILLAMETT R > COLUMBIA R – AB MILL CR AT GAGE 1419100], Well 5 (28) is located within WAB 30200702 [RICKREALL CR > WILLAMETTE R – AT MOUTH], but given the difference in stream size will likely also capture from the Willamette River despite the greater distance.

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 (5)	**1**	☐	☐	**MF 183**	**1,300.00**	☐	**3,620.00**	☐	~15%	☐
2 (7)	**1**	☐	☐	**MF 183**	**1,300.00**	☐	**3,620.00**	☐	~10%	☐
3 (12)	**1**	☐	☐	**MF 183**	**1,300.00**	☐	**3,620.00**	☐	~31%	☒
4 (27)	**1**	☐	☐	**MF 183**	**1,300.00**	☐	**3,620.00**	☐	~21%	☐
5 (28)	**1**	☐	☐	**MF 183**	**1,300.00**	☐	**3,620.00**	☐	~19%	☐
5 (28)	**2**	☒	☐	**NA**	**NA**	☐	**5.80**	☒	~22%	☒

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 Hunt 1999 Model (unconfined aquifer with a streambed clogging layer) was used to estimate the impact of pumping from the wells on the Willamette River and Hayden Slough assuming a 3 foot clogging layer. The hydraulic conductivity for the streambed (0.5 ft/day) corresponds to silty sand. The storage coefficient (0.2) is typical for an unconfined aquifer of sand and gravel. A transmissivity value range (6,000 – 90,000 ft^2/day) was estimated based on multiple single well pump tests from wells which are located nearby and also in the meander belt/flood deposits of the Willamette River (MARI 13306, MARI 55403, POLK 2881, POLK 2877, and POLK 3741).

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													

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
(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-18552, and LL-1582, G-18308, G-17623, and G-16164.

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 Report 2005-5168.

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

Hunt, B., 1999. Unsteady stream depletion from ground water pumping: Groundwater, v. 37, no. 1, p. 98-102.

Woodward, D.G., Gannett, M.G., and Vaccaro, J.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 #:** 27 & 28 **Logid:** Well 27 = POLK 2883, Well 28 has no positively correlated well log.

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:**
The log for Well 27 (POLK 2883) is based on information from the application for GR-1511. This well was reported drilled in 1951and no seal information is included on the log. There is no log correlated to Well 28. Therefore, I am unable to determine if wells are sealed adequately to comply with current well construction standards.

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

WILLAMETTE R > COLUMBIA R - AB MILL CR AT GAGE 14191000

Watershed ID #: 183 Basin: WILLAMETTE Exceedance Level: 80
Time: 11:08 AM Date: 11/21/2017

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	18,400.00	2,240.00	16,200.00	0.00	1,300.00	14,900.00
FEB	20,100.00	7,430.00	12,700.00	0.00	1,300.00	11,400.00
MAR	19,600.00	7,220.00	12,400.00	0.00	1,300.00	11,100.00
APR	18,000.00	6,870.00	11,100.00	0.00	1,300.00	9,830.00
MAY	15,500.00	4,160.00	11,300.00	0.00	1,300.00	10,000.00
JUN	8,310.00	1,690.00	6,620.00	0.00	1,300.00	5,320.00
JUL	4,710.00	1,440.00	3,270.00	0.00	1,300.00	1,970.00
AUG	3,620.00	1,330.00	2,290.00	0.00	1,300.00	993.00
SEP	3,680.00	1,150.00	2,530.00	0.00	1,300.00	1,230.00
OCT	4,650.00	744.00	3,910.00	0.00	1,300.00	2,610.00
NOV	9,400.00	853.00	8,550.00	0.00	1,300.00	7,250.00
DEC	16,700.00	913.00	15,800.00	0.00	1,300.00	14,500.00
ANN	13,500,000	2,150,000	11,300,000	0	942,000	10,400,000

DETAILED REPORT OF INSTREAM REQUIREMENTS

WILLAMETTE R > COLUMBIA R - AB MILL CR AT GAGE 14191000

Watershed ID #: 183 Basin: WILLAMETTE
Time: 11:10 AM Date: 11/21/2017

Application Number	Status	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
		Monthly values are in cfs.											
MF183A	APPLICATION	1300.0	1300.0	1300.0	1300.0	1300.0	1300.0	1300.0	1300.0	1300.0	1300.0	1300.00	1300.0
MAXIMUM		1300.0	1300.0	1300.0	1300.0	1300.0	1300.0	1300.0	1300.0	1300.0	1300.0	1300.0	1300.0

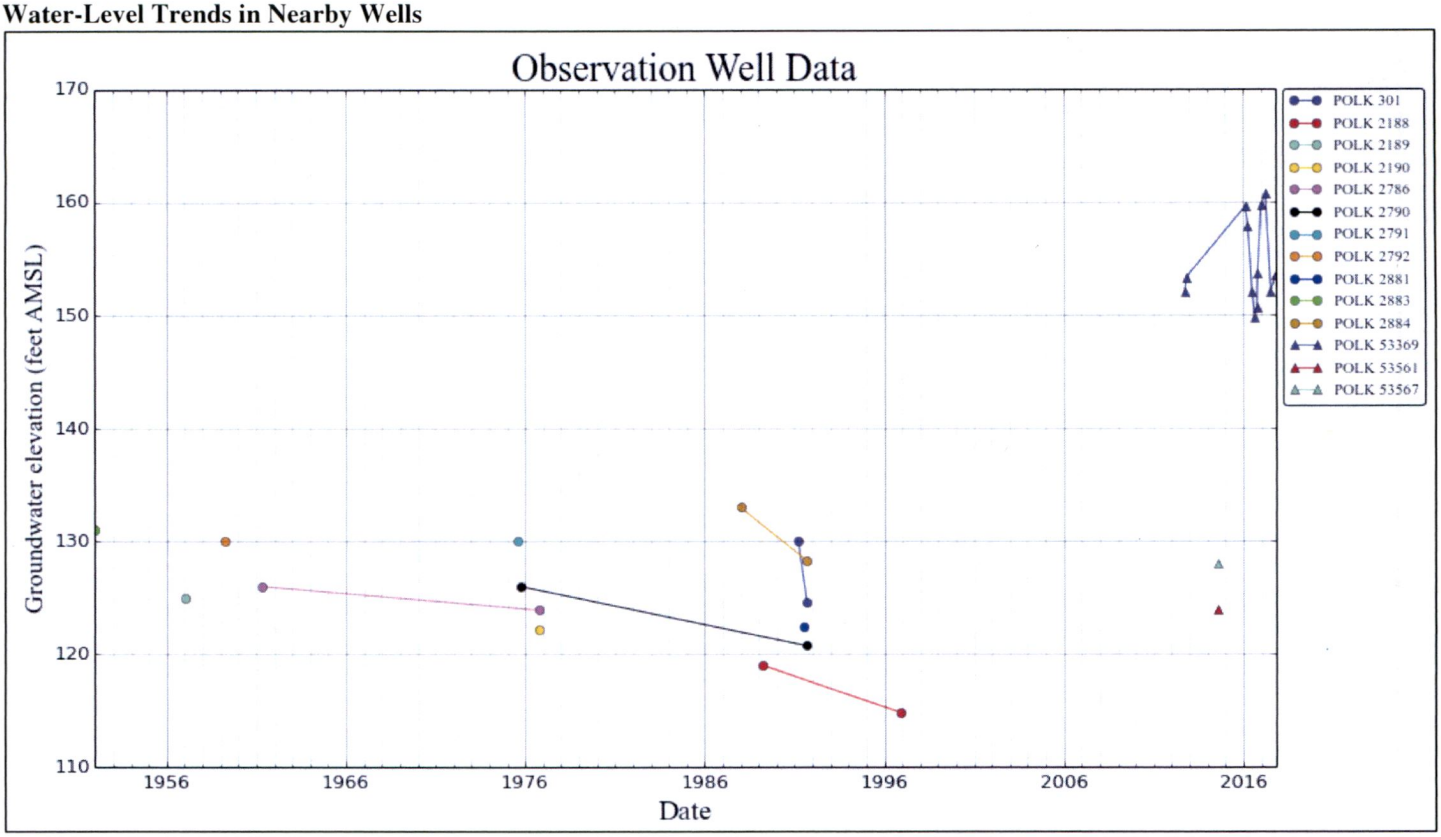
DETAILED REPORT ON THE WATER AVAILABILITY CALCULATION

RICKREALL CR > WILLAMETTE R - AT MOUTH
Watershed ID #: 30200702 Basin: WILLAMETTE Exceedance Level: 80
Time: 10:48 AM Date: 11/27/2017

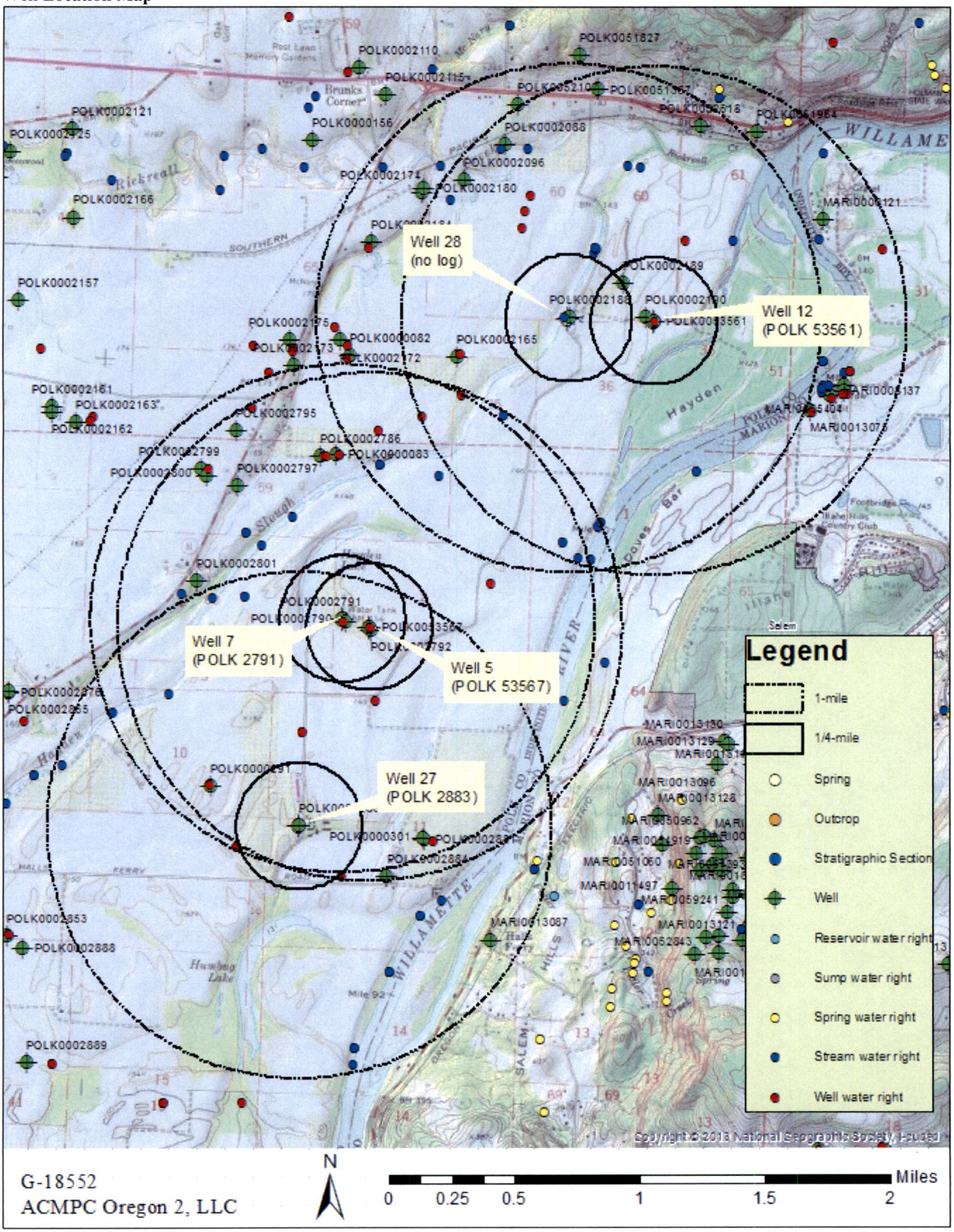
Monthly values are in cfs.
Storage is the annual amount at 50% exceedance in ac-ft.

Month	Natural Stream Flow	Consumptive Use and Storage	Expected Stream Flow	Reserved Stream Flow	Instream Requirements	Net Water Available
JAN	243.00	18.30	225.00	0.00	0.00	225.00
FEB	272.00	17.90	254.00	0.00	0.00	254.00
MAR	215.00	13.30	202.00	0.00	0.00	202.00
APR	134.00	4.19	130.00	0.00	0.00	130.00
MAY	68.70	7.07	61.60	0.00	0.00	61.60
JUN	28.70	12.30	16.40	0.00	0.00	16.40
JUL	11.70	18.10	-6.41	0.00	0.00	-6.41
AUG	6.91	14.80	-7.86	0.00	0.00	-7.86
SEP	5.80	8.71	-2.91	0.00	0.00	-2.91
OCT	6.67	1.49	5.18	0.00	0.00	5.18
NOV	31.50	5.19	26.30	0.00	0.00	26.30
DEC	205.00	17.20	188.00	0.00	0.00	188.00
ANN	142,000	8,360	134,000	0	0	134,000

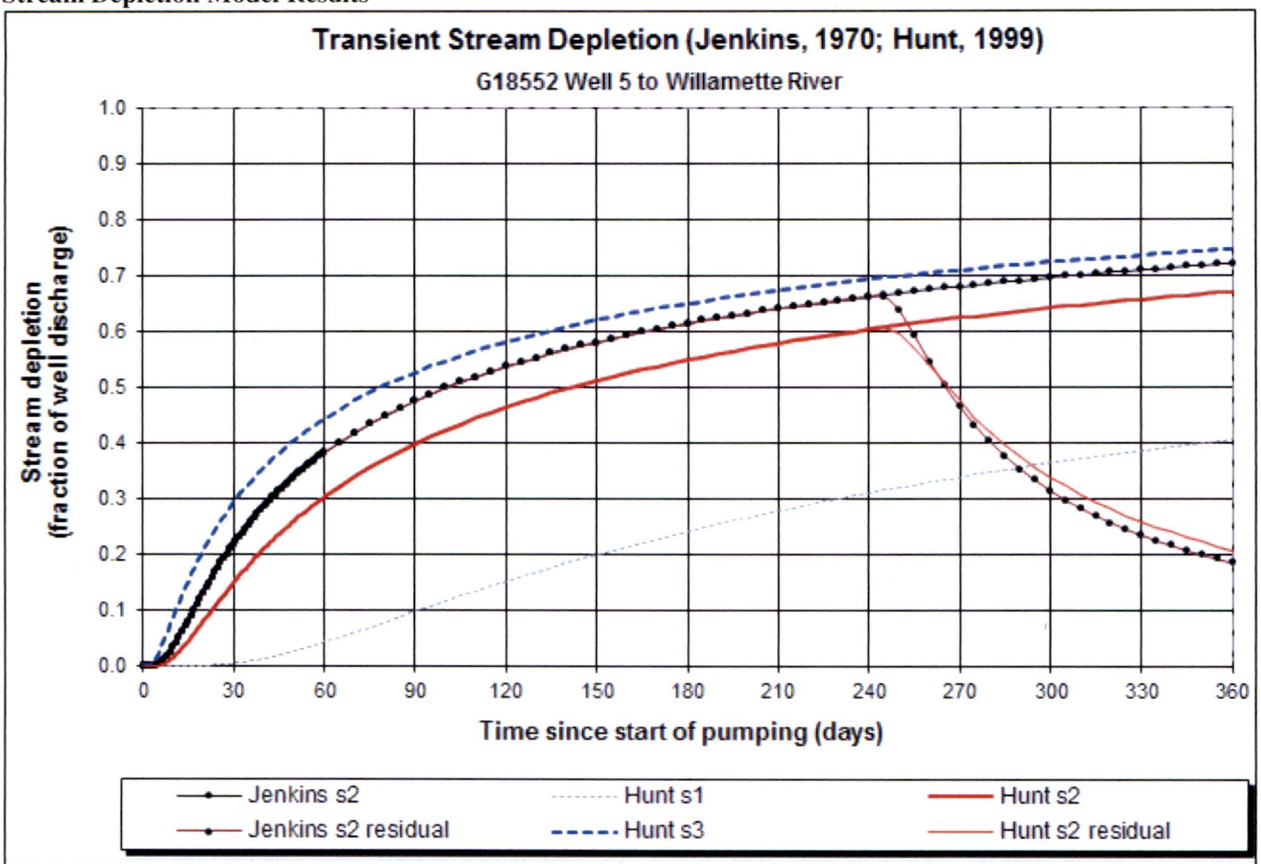
Water-Level Trends in Nearby Wells



Well Location Map



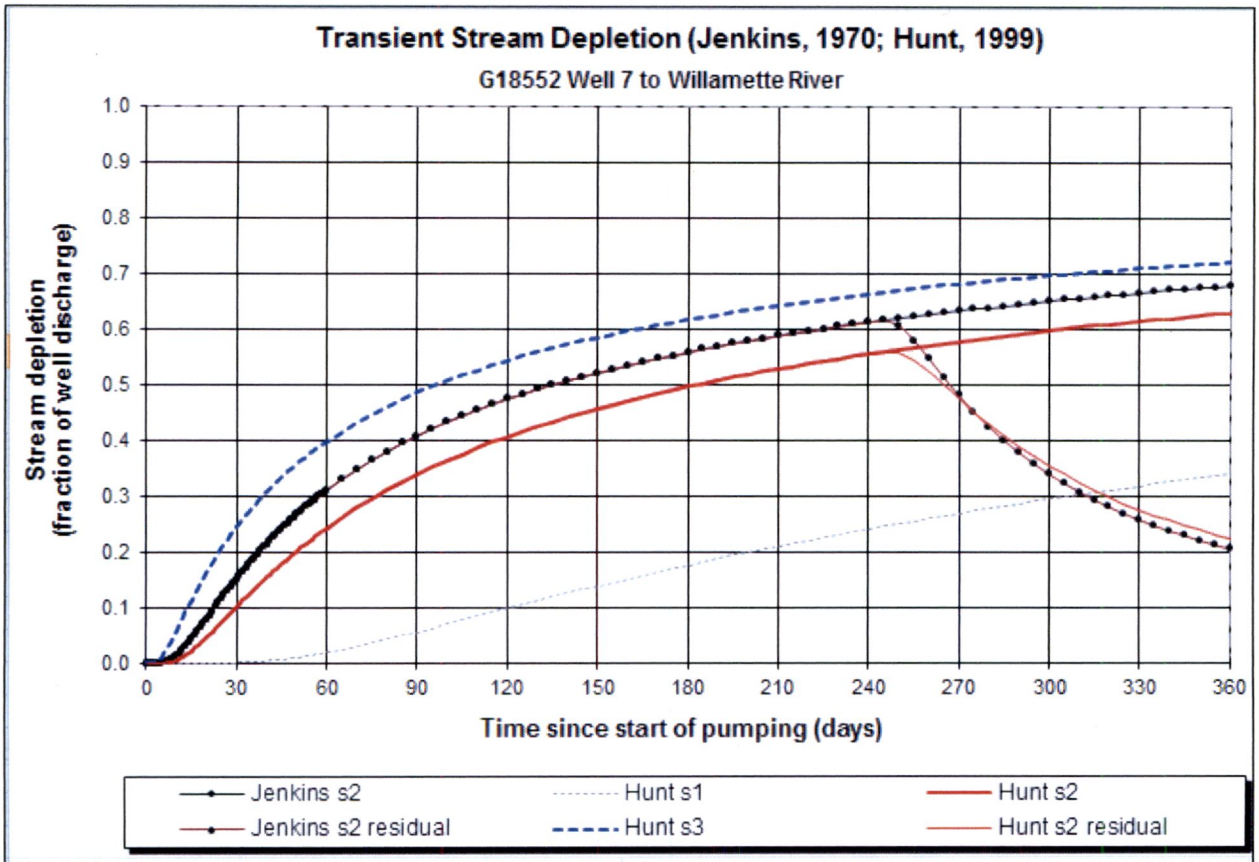
Stream Depletion Model Results



Output for Hunt Stream Depletion, Scenerio 2 (s2): Time pump on = 240 days

Days	**30**	60	90	120	150	180	210	240	270	300	330	360
Qw, cfs	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900
Jenk SD s2 %	**21.62**	38.19	47.52	53.64	58.02	61.37	64.02	66.19	46.40	31.39	23.40	18.47
Jen SD s2 cfs	0.195	0.344	0.428	0.483	0.522	0.552	0.576	0.596	0.418	0.282	0.211	0.166
Hunt SD s2 %	**14.96**	30.31	39.84	46.36	51.15	54.86	57.84	60.30	47.41	33.85	25.86	20.71
Hunt SD s2 cfs	0.135	0.273	0.359	0.417	0.460	0.494	0.521	0.543	0.427	0.305	0.233	0.186

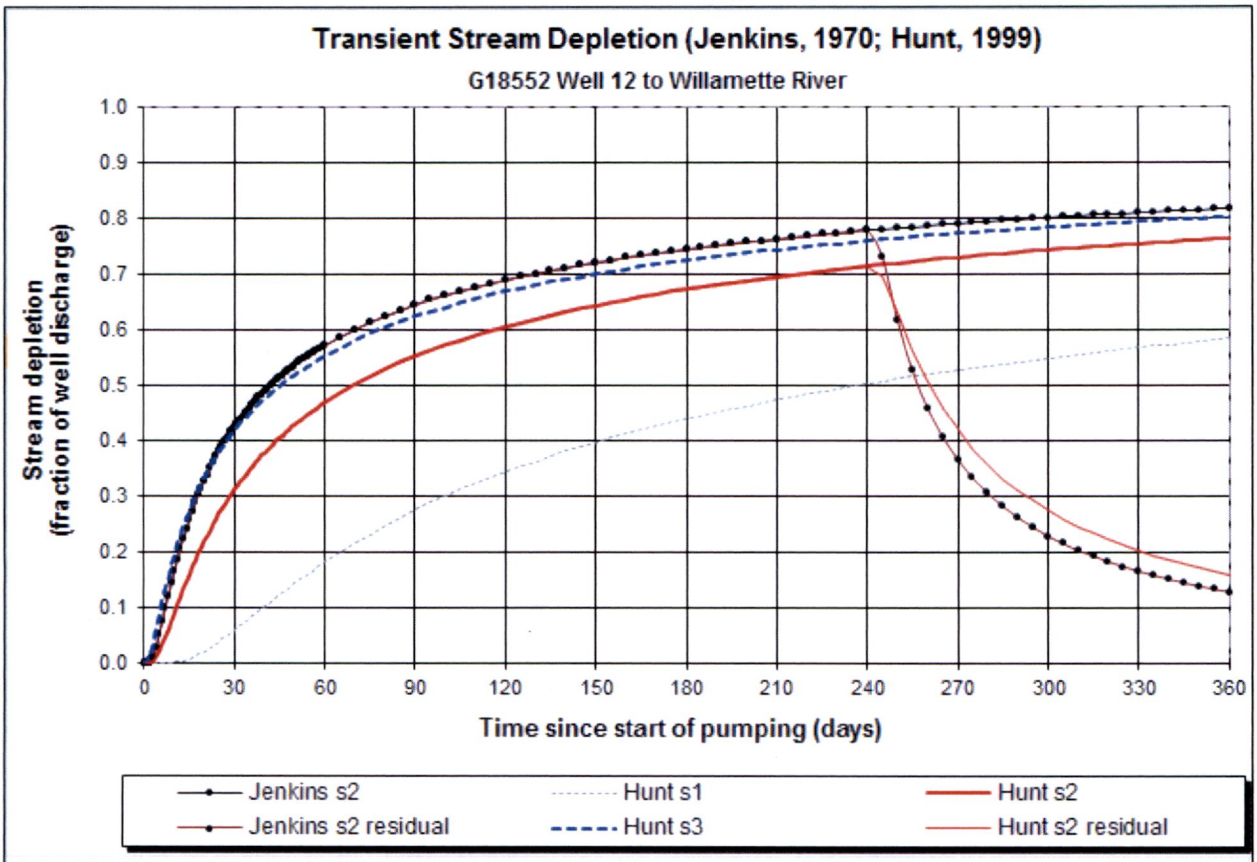
Parameters:		**Scenario 1**	**Scenario 2**	**Scenario 3**	**Units**
Net steady pumping rate	Qw	0.9	0.9	0.9	cfs
Distance to stream	a	3710	3710	3710	ft
Aquifer hydraulic conductivity	K	300	1500	4500	ft/day
Aquifer thickness	b	20	20	20	ft
Aquifer transmissivity	T	6000	30000	90000	ft*ft/day
Aquifer storage coefficient	S	0.2	0.2	0.2	
Stream width	ws	500	500	500	ft
Streambed hydraulic conductivity	Ks	0.5	0.5	0.5	ft/day
Streambed thickness	bs	3	3	3	ft
Streambed conductance	sbc	83.33333333	83.33333333	83.33333333	ft/day
Stream depletion factor (Jenkins)	sdf	458.8033333	91.76066667	30.58688889	days
Streambed factor (Hunt)	sbf	51.52777778	10.30555556	3.435185185	



Output for Hunt Stream Depletion, Scenerio 2 (s2): **Time pump on = 240 days**

Days	**30**	60	90	120	150	180	210	240	270	300	330	360
Qw, cfs	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900
Jenk SD s2 %	**15.18**	31.08	40.79	47.36	52.15	55.84	58.80	61.23	48.10	33.95	25.77	20.55
Jen SD s2 cfs	0.137	0.280	0.367	0.426	0.469	0.503	0.529	0.551	0.433	0.306	0.232	0.185
Hunt SD s2 %	**10.22**	24.31	33.85	40.62	45.69	49.67	52.89	55.56	47.60	35.48	27.63	22.37
Hunt SD s2 cfs	0.092	0.219	0.305	0.366	0.411	0.447	0.476	0.500	0.428	0.319	0.249	0.201

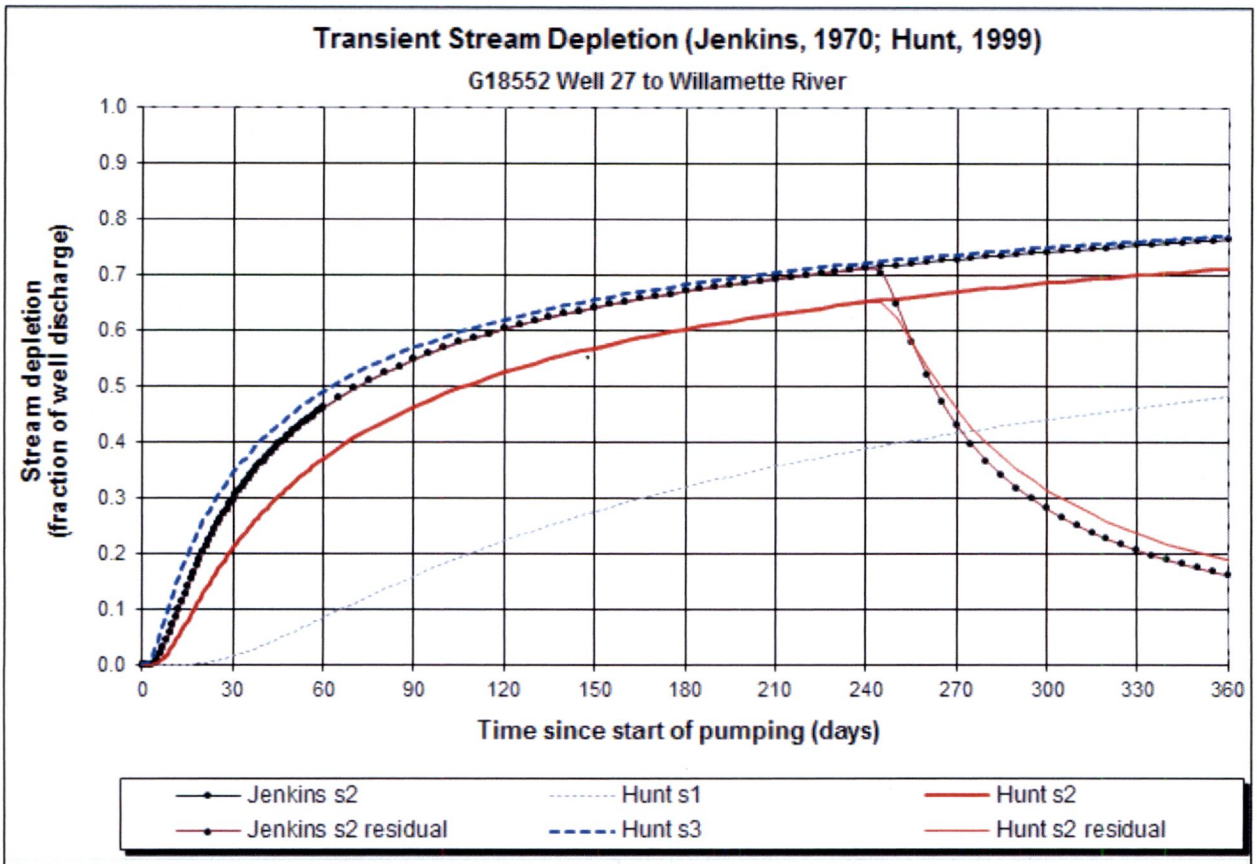
Parameters:		**Scenario 1**	**Scenario 2**	**Scenario 3**	**Units**
Net steady pumping rate	Qw	0.9	0.9	0.9	cfs
Distance to stream	a	4300	4300	4300	ft
Aquifer hydraulic conductivity	K	300	1500	4500	ft/day
Aquifer thickness	b	20	20	20	ft
Aquifer transmissivity	T	6000	30000	90000	ft*ft/day
Aquifer storage coefficient	S	0.2	0.2	0.2	
Stream width	ws	500	500	500	ft
Streambed hydraulic conductivity	Ks	0.5	0.5	0.5	ft/day
Streambed thickness	bs	3	3	3	ft
Streambed conductance	sbc	83.33333333	83.33333333	83.33333333	ft/day
Stream depletion factor (Jenkins)	sdf	616.3333333	123.2666667	41.08888889	days
Streambed factor (Hunt)	sbf	59.72222222	11.94444444	3.981481481	



Output for Hunt Stream Depletion, Scenerio 2 (s2): Time pump on = 240 days

Days	30	60	90	120	150	180	210	240	270	300	330	360
Qw, cfs	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900
Jenk SD s2 %	**42.37**	57.16	64.42	68.92	72.05	74.40	76.24	77.73	36.60	22.87	16.52	12.82
Jen SD s2 cfs	0.381	0.514	0.580	0.620	0.648	0.670	0.686	0.700	0.329	0.206	0.149	0.115
Hunt SD s2 %	**31.13**	46.87	55.23	60.59	64.40	67.28	69.56	71.42	41.85	27.44	20.23	15.87
Hunt SD s2 cfs	0.280	0.422	0.497	0.545	0.580	0.606	0.626	0.643	0.377	0.247	0.182	0.143

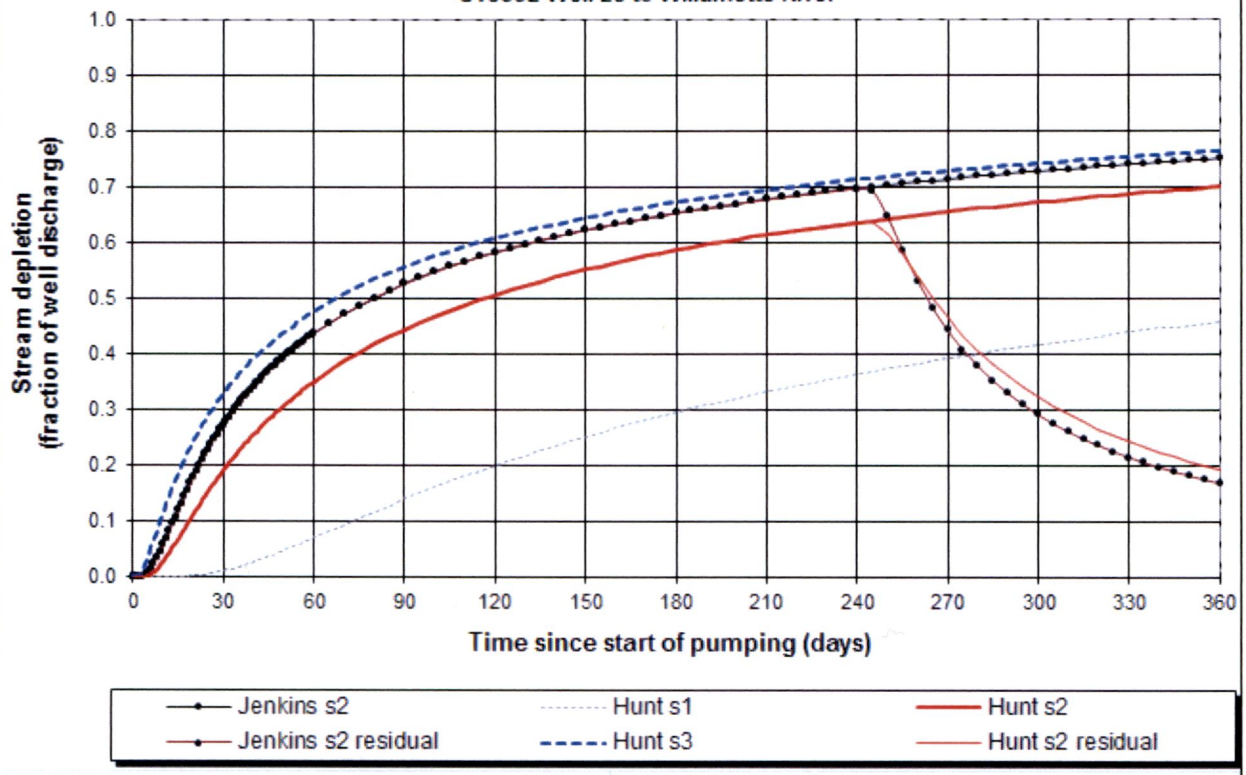
Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate	Qw	0.9	0.9	0.9	cfs
Distance to stream	a	2400	2400	2400	ft
Aquifer hydraulic conductivity	K	300	1500	4500	ft/day
Aquifer thickness	b	20	20	20	ft
Aquifer transmissivity	T	6000	30000	90000	ft*ft/day
Aquifer storage coefficient	S	0.2	0.2	0.2	
Stream width	ws	500	500	500	ft
Streambed hydraulic conductivity	Ks	0.5	0.5	0.5	ft/day
Streambed thickness	bs	3	3	3	ft
Streambed conductance	sbc	83.33333333	83.33333333	83.33333333	ft/day
Stream depletion factor (Jenkins)	sdf	192	38.4	12.8	days
Streambed factor (Hunt)	sbf	33.33333333	6.666666667	2.222222222	



Output for Hunt Stream Depletion, Scenerio 2 (s2): Time pump on = 240 days

Days	30	60	90	120	150	180	210	240	270	300	330	360
Qw, cfs	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900
Jenk SD s2 %	**29.68**	46.07	54.69	60.19	64.08	67.02	69.33	71.22	43.12	28.08	20.62	16.14
Jen SD s2 cfs	0.267	0.415	0.492	0.542	0.577	0.603	0.624	0.641	0.388	0.253	0.186	0.145
Hunt SD s2 %	**21.09**	37.10	46.31	52.42	56.84	60.22	62.92	65.13	45.90	31.49	23.65	18.75
Hunt SD s2 cfs	0.190	0.334	0.417	0.472	0.512	0.542	0.566	0.586	0.413	0.283	0.213	0.169

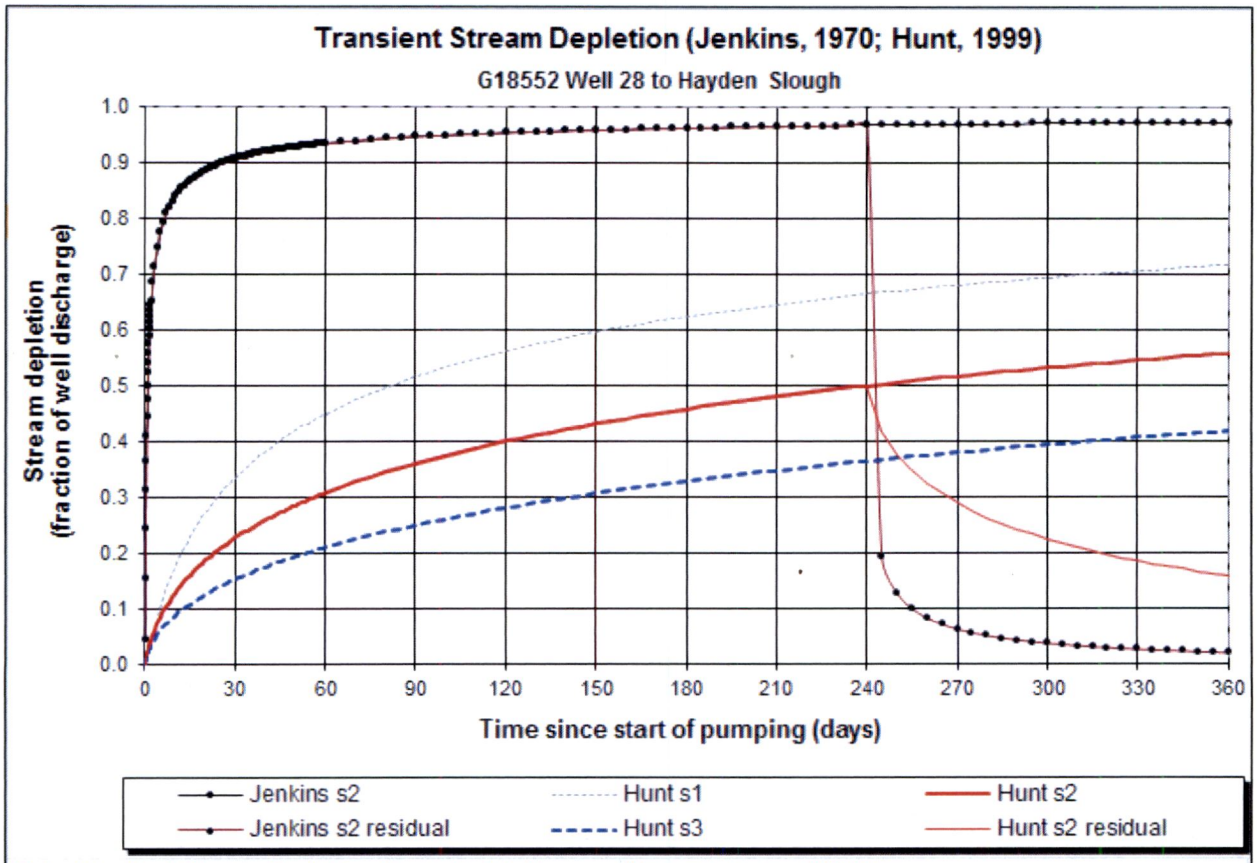
Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate	Qw	0.9	0.9	0.9	cfs
Distance to stream	a	3130	3130	3130	ft
Aquifer hydraulic conductivity	K	300	1500	4500	ft/day
Aquifer thickness	b	20	20	20	ft
Aquifer transmissivity	T	6000	30000	90000	ft*ft/day
Aquifer storage coefficient	S	0.2	0.2	0.2	
Stream width	ws	500	500	500	ft
Streambed hydraulic conductivity	Ks	0.5	0.5	0.5	ft/day
Streambed thickness	bs	3	3	3	ft
Streambed conductance	sbc	83.33333333	83.33333333	83.33333333	ft/day
Stream depletion factor (Jenkins)	sdf	326.5633333	65.31266667	21.77088889	days
Streambed factor (Hunt)	sbf	43.47222222	8.694444444	2.898148148	



Output for Hunt Stream Depletion, Scenerio 2 (s2): Time pump on = 240 days

Days	30	60	90	120	150	180	210	240	270	300	330	360
Qw, cfs	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900
Jenk SD s2 %	**27.13**	43.67	52.54	58.23	62.28	65.34	67.76	69.73	44.25	29.13	21.48	16.85
Jen SD s2 cfs	0.244	0.393	0.473	0.524	0.560	0.588	0.610	0.628	0.398	0.262	0.193	0.152
Hunt SD s2 %	**19.13**	35.01	44.36	50.61	55.14	58.63	61.41	63.70	46.49	32.26	24.34	19.36
Hunt SD s2 cfs	0.172	0.315	0.399	0.455	0.496	0.528	0.553	0.573	0.418	0.290	0.219	0.174

Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate	Qw	0.9	0.9	0.9	cfs
Distance to stream	a	3300	3300	3300	ft
Aquifer hydraulic conductivity	K	300	1500	4500	ft/day
Aquifer thickness	b	20	20	20	ft
Aquifer transmissivity	T	6000	30000	90000	ft*ft/day
Aquifer storage coefficient	S	0.2	0.2	0.2	
Stream width	ws	500	500	500	ft
Streambed hydraulic conductivity	Ks	0.5	0.5	0.5	ft/day
Streambed thickness	bs	3	3	3	ft
Streambed conductance	sbc	83.33333333	83.33333333	83.33333333	ft/day
Stream depletion factor (Jenkins)	sdf	363	72.6	24.2	days
Streambed factor (Hunt)	sbf	45.83333333	9.166666667	3.055555556	



Output for Hunt Stream Depletion, Scenerio 2 (s2): Time pump on = 240 days

Days	30	60	90	120	150	180	210	240	270	300	330	360
Qw, cfs	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900	0.900
Jenk SD s2 %	**90.71**	93.43	94.63	95.35	95.84	96.20	96.48	96.71	6.19	3.63	2.56	1.97
Jen SD s2 cfs	0.816	0.841	0.852	0.858	0.863	0.866	0.868	0.870	0.056	0.033	0.023	0.018
Hunt SD s2 %	**22.72**	30.77	36.05	40.00	43.15	45.76	47.99	49.92	28.90	22.38	18.47	15.76
Hunt SD s2 cfs	0.204	0.277	0.324	0.360	0.388	0.412	0.432	0.449	0.260	0.201	0.166	0.142

Parameters:		**Scenario 1**	**Scenario 2**	**Scenario 3**	**Units**
Net steady pumping rate	Qw	0.9	0.9	0.9	cfs
Distance to stream	a	350	350	350	ft
Aquifer hydraulic conductivity	K	300	1500	4500	ft/day
Aquifer thickness	b	20	20	20	ft
Aquifer transmissivity	T	6000	30000	90000	ft*ft/day
Aquifer storage coefficient	S	0.2	0.2	0.2	
Stream width	ws	50	50	50	ft
Streambed hydraulic conductivity	Ks	0.5	0.5	0.5	ft/day
Streambed thickness	bs	3	3	3	ft
Streambed conductance	sbc	8.333333333	8.333333333	8.333333333	ft/day
Stream depletion factor (Jenkins)	sdf	4.083333333	0.816666667	0.272222222	days
Streambed factor (Hunt)	sbf	0.486111111	0.097222222	0.032407407	