Approved: Har My

МЕМО

To: Kristopher Byrd, Well Construction and Compliance Section Manager

From: Travis Kelly, Well Construction Program Coordinator

Subject: Review of Water Right Application G-19073

Date: April 23, 2021

The attached application was forwarded to the Well Construction and Compliance Section by the Groundwater Section. Jen Woody reviewed the application. Please see Jen's Groundwater Review and the Well Report.

Applicant's Well POLK 54000 (POLK 54000): Based on a review of the Well Report, Applicant's Well POLK 54000 seems to protect the groundwater resource.

The construction of Applicant's Well POLK 54000 may not satisfy hydraulic connection issues.

POLK 54000

STATE OF OREGON WATER SUPPLY WELL REPORT (as required by ORS 537.765 & OAR 690-205-0210)

WELL I.D. LABEL# L	124585	
START CARD #	1033627	
ORIGINAL LOG#		

(1) LAND OWNER Owner Well I.D. 5758	LOLK 54000
First Name Wendell & Sherry Last Name Sperling	(9) LOCATION OF WELL (legal description)
Company McKee Farmily Farms Address 11640 Elkins Rd.	County POLK Twp 9 S N/S Range 4 W E/W WM
City Monmouth State OR Zip 97361	Sec <u>5</u> NW 1/4 of the <u>SE</u> 1/4 Tax Lot <u>1200</u>
	Tax Map Number Lot Lat o o DMS or DD
(2) TYPE OF WORK New Well Deepening Conversion Alteration (complete 2a & 10) Abandonment(complete 5a)	Lat o or DD
(2a) PRE-ALTERATION	Longo ' or DMS or DD
Dia + From To Gauge Stl Plstc Wld Thrd	Street address of well Nearest address
Casing:	8305 Corvallis Rd Independence, OR
Material From To Amt sacks/lbs Seal:	
(3) DRILL METHOD	(10) STATIC WATER LEVEL
Rotary Air Rotary Mud Cable Auger Cable Mud	Date SWL(psi) + SWL(ft)
Reverse Rotary Other	Existing Well / Pre-Alteration Completed Well 02-28-2017 16
	Completed Well 02-28-2017 . 16 Flowing Artesian? Dry Hole?
(4) PROPOSED USE Domestic Inrigation Community	
Industrial/Commericial Livestock Dewatering	WATER BEARING ZONES Depth water was first found 25
ThermalInjectionOther	SWL Date From To Est Flow SWL(psi) + SWL(ft)
(5) BORE HOLE CONSTRUCTION Special Standard (Attach copy)	02-27-2017 25 40 50 16
Depth of Completed Well 80 ft.	
BORE HOLE SEAL sacks/ Dia From To Material From To Amt lbs	
Dia From To Material From To Amt lbs 12 0 20 Bentonite 0 18 12 S	
8 20 80 Calculated 10	
	(11) WELL LOG Ground Flavation
Calculated	Ground Elevation
How was seal placed: Method A B C D E	Material From To
X Other Poured dry	Brown clay 0 25
Backfill placed from ft. to ft. Material	
Filter pack from 18 ft. to 26 ft. Material Gravel Size 3/4"	Sand & small gravel PECEIVED BY OWRD30 50 Sand & medium gravel 50 65
Explosives used: Yes Type Amount	Blue clay 65 80
(5a) ABANDONMENT USING UNHYDRATED BENTONITE	MAR 0 9 26
Proposed Amount Pounds Actual Amount Pounds	HIIII U U U
(6) CASING/LINER	
Casing Liner Dia + From To Gauge Stl Plstc Wld Thrd	SALEM, OR S
<u> </u>	
	JONES DRILLING CO., INC.
	29400 SANTIAM HWY.
Shoe Inside Outside Other Location of shoe(s)	LEBANON, OR 97355
Temp casing X Yes Dia 12 From 0 To 20	541-367-2560 541-451-2686
(7) PERFORATIONS/SCREENS	1-800-915-8388
Perforations Method Holte air perforator	
Screens Type Material	Date Started 02-24-2017 Completed 02-28-2017
Perf/S Casing/ Screen Scrn/slot Slot # of Tele/ creen Liner Dia From To width length slots pipe size	(unbonded) Water Well Constructor Certification
Perf Casing 8 25 70 .125 1 2,250	I certify that the work I performed on the construction, deepening, alteration, or
	abandonment of this well is in compliance with Oregon water supply well
	construction standards. Materials used and information reported above are true to
	the best of my knowledge and belief.
	License Number 1888 Date 03-02-2017
(8) WELL TESTS: Minimum testing time is 1 hour	Signed
Pump Bailer Air Flowing Artesian	/ 1/1 / 201/202
Yield gal/min Drawdown Drill stem/Pump depth Duration (hr) 50 37 2hr 150 2th	(bonded) Water Well Constructor Certification
30 37 200 200	I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work
	performed during this time is in compliance with Oregon water supply well
Temperature 53 °F Lab analysis Yes B 189	construction standards. This report is true to the best of my knowledge and belief.
Temperature 53 °F Lab analysis Yes By Water quality concerns? Yes (describe below) TDS amount	License Number 1684 Date 03-02-2017
Water quality concerns? Yes (describe below) TDS amount Units	
	Signed // //
	Contact Info (optional) jonesdrilling@botmail.com
ORIGINAL - WATER RESOURCES I	DEPARTMENT

Groundwater Application Review Summary Form

Application # G- <u>19073</u>
GW Reviewer <u>Jen Woody</u> Date Review Completed: <u>04/22/2021</u>
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:
☐ There is the potential for substantial interference per Section C of the attached review form.
Summary of Well Construction Assessment:
☐ 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.
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

MEM	O							_(04/22/20	21_		
то:		Applica	tion G-	19073								
FRON	1 :	GW: _ <u>Je</u>		<mark>ly</mark> 's Name)								
SUBJ	ECT: S	cenic Wa	aterway	Interf	erence l	Evaluat	ion					
	YES NO			of appro r its trib	_	is hydr	aulically	y connec	cted to a	a State S	Scenic	
	YES NO	Use	the Scei	nic Wate	erway C	Condition	n (Cond	ition 7J)			
	interfer	RS 390.8 rence with rence is d	h surfac	e water	that con					_		
	interfer Depart propos	as 390.8 ence with the sed use in the fr	h surfac unable will me	e water to find easurab	that cor that the ly redu	ntributes ere is a p ace the	to a sce prepone surface	enic wat derance e water	erway; e of evic	therefo lence tl	re, the	
Calcula per crit the Dep	te the per eria in 39 artment i	ON OF II centage of 0.835, do r s unable to	consump ot fill in make a l	tive use b the table Preponde	y month o but check rance of I	k the "und Evidence	ible" optic finding.	on above,	thus info	orming W		
Water	way by	s permit the follow flow is re	wing an			-		_			use by	which
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	7

PUBLIC INTEREST REVIEW FOR GROUNDWATER APPLICATIONS

A2. Proposed use Irrigation Seasonality: March 1- October 31 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* Rate(cfs) (T/R-S QQ-Q) 2250' N, 1200' E fr NW cor S 36 1 POLK 54000 POLK 54000 alluvium 0.11 98/4W-4 SE ½ SW ½ 1100' N, 1400' E fr SW cor S 4 2 3 4 1 100' N, 1400' E fr SW cor S 4 4 4 8 1 100' N, 1400' E fr SW cor S 4 * Alluvium, CRB, Bedrock Well Elev Water ft bls Date (ft) (ft) (ft) (ft) (ft) (ft) (ft) (gpm) (ft) Type (gpm) (ft) (gpm) (g	TO:		Water	r Rights Se	ction					Date		04/22/2	021		
SUBJECT: Application G- 19073 Supersedes review of _n/a	FROM	:	Grou	ndwater Se	ction										
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: McKee Family Farms LLC County: Polk A1. Applicant(s) seck(s) 0.11 cfs up to 20 acre-feet from 1 well(s) in the Willamette subbasin A2. Proposed use Irrigation Seasonality: March 1- October 31 A3. Well and aquifer data (attach and number logs for existing wells; mark proposed wells as such under logid): Well Logid Applicant's Proposed Aquifer's Proposed Location Location Location, metes and bounds, e.g. 1 POLK 54000 POLK 54000 alluvium 0.11 98:4W-4 8E/4 8W/4 1100' N. 1400'E fr SW cor S 4 4 4	SUBIE	ст	Δnnli	cation G-	19073					n/a					
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1 200 25 16 2/27/2017 80 0-18 2-78 n/a 25-70 50 37 pump Use data from application for proposed wells. A4. Comments: There are 2 other current authorizations on this well: LL-1695 for 50 gpm up to 5 acre-feet per year and LL- 1743, for 50 gpm up to 6 acre-feet per year to establish 50.6 acres of filberts. 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 well produces from a confined aquifer and is located greater than ¼ mile from the Willamette River; the	Well	- 1		er ft ble					ıls						
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1 1 (0.47) (0.47) (0.47) (1 1 1		Commer	nts: Th	e well produ	uces from a	confined ac									
pertinent basin rules (OAR 690-502-0240) do not apply.		pertinent	basin	rules (OAR	690-502-02	40) do not	apply.								
A6. Well(s) #,,, tap(s) an aquifer limited by an administrative restriction.	A6. 🗆	Well(s) #	#	,	,	,	,	,	tap(s)	an aquifer	limite	d by an a	dministra	ative rest	riction.
Name of administrative area: <u>none</u>		Name of	admin	istrative are	a: <u>none</u>										
Comments: n/a		Commen	nts: <u>n/a</u>	1											

B. GROUNDWATER AVAILABILITY CONSIDERATIONS, OAR 690-310-130, 400-010, 410-0070

	ed 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.	\square will not or \square 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.	\square will not or \square 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) 7C, medium 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;
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):
	oundwater availability remarks: applicant's proposed well is located on the western margin of the Willamette River floodplain. Fine-grained sedimentary
	erial is found from land surface to a depth of approximately 25 feet. Approximately 40 feet of alluvial sands and gravels
	erlie the fine-grained material. Production in this well and nearby wells comes from the sands and gravels. The aquifer is
	nded by clays found beneath the sands and gravels and by low-permeability Tertiary marine sediments to the west and h (Conlon et al., 2005).
Wat	er level data is sparse in this area, but reported levels from the subject well and POLK 3019 indicate stability at the
	ent level of use (See Figure 3). Water level monitoring and reporting is recommended to assess the impact of the
curr	tional proposed use under this application.
addi The	potential to interfere with a domestic well located approximately 300 feet from the subject well is assessed in Figure 4. additional 4 feet of drawdown at the neighboring well is not expected to prevent that well from accessing their usual
addi The	potential to interfere with a domestic well located approximately 300 feet from the subject well is assessed in Figure 4.
addi The	potential to interfere with a domestic well located approximately 300 feet from the subject well is assessed in Figure 4. additional 4 feet of drawdown at the neighboring well is not expected to prevent that well from accessing their usual

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	\boxtimes	

Basis for aquifer confinement evaluation:	The well log reports a static water level above the water-bearing zone, indicating a
confined aquifer.	<u>_</u>

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			Potentia Subst. In Assum YES	terfer.
1	1	Willamette River	185	135	7040	\boxtimes				\boxtimes

Basis for aquifer hydraulic connection evaluation: The Willamette River incises into the alluvial aquifer system.
Groundwater elevation levels and published water-table maps indicate that groundwater in the alluvial aquifer flows toward,
and discharges to, the Willamette River (Conlon et al., 2005), indicating hydraulic connection.
Water Amilabilet Bosin the mall(s) and leasted mithin. Water had ID # 102, William etc. D. Calumbia D. AD Mill Cont.

Water Availability Basin the well(s) are located within: Watershed ID # 183: Willamette R>Columbia R-AB Mill Cr at gage 14191000

C3a. **690-09-040** (4): Evaluation of stream impacts for <u>each well</u> that has been determined or assumed to be **hydraulically** connected and less than 1 mile from a surface water (SW) source. Limit evaluation to instream rights and minimum stream flows that are pertinent to that SW source, 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 < 1/4 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 <u>by total appropriation</u> 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: n/a. The closest surface water is located greater than 1 mile from the subject well.									

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-Di	istributed	Wells											
Well	SW#	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	3.6 %	3.6 %	2.3 %	2.7 %	3.2 %	3.6 %	4.0 %	4.5 %	4.9 %	5.4 %	3.6 %	3.6
Well Q as CFS		0	0	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0	0
Interference CFS		0.004	0.004	0.003	0.003	0.003	0.004	0.004	0.005	0.005	0.006	0.004	0.004
		•											
Distrib Well	uted Well SW#	ls Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q	as CFS												
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q	as CFS												
Interfere	ence CFS												
(A) - To	tal Interf.	0	0	0.003	0.003	0.003	0.004	0.004	0.005	0.005	0.006	0.004	0.004
-	% Nat. Q	18400	20100	19600	18000	15500	8310	4710	3620	3680	4650	9400	16700
	% Nat. Q	184	201	196	180	155	831	47.1	36.2	36.8	46.5	94.0	16.7
(D) = ((A) > (C)												
$(\mathbf{E}) = (\mathbf{A})$	/ 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: Potential depletion of Willamette River flows by Well 1 was estimated with the Hunt 2003 analytical stream depletion model using the maximum rate requested during the irrigation season. This should include the cumulative impact of uses under LL-1695, LL-1743 and application G-19073. In all months, stream depletion will be much less than 1% of the 80% exceedance flows in the first year of pumping. See Figure 5 for details.

b.	690-09-040 (5) (b) The potential to impair or detrimentally affect the public interest is to be determined by the Water Rights Section.
. [☐ 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;
. S	W / GW Remarks and Conditions: none
_	
_	
_	
_	
_	
_	
_	
	References Used: Explication files: LL-1743 and LL-1695
G	Jonlon, T.D., Wozniak, K.C., Woodcock, D., Herrera, N.B., Fisher, B.J., Morgan, D.S., Lee, K.K., and Hinkle, S.R., 2005, bround-water hydrology of the Willamette Basin, Oregon: U.S. Geological Survey Scientific Investigations Report 2005–168.
	funt, B., 2003, Unsteady stream depletion when pumping from semiconfined aquifer: Journal of Hydrologic Engineering, anuary/February, 2003
0	WRD Groundwater Information System, accessed 4/21/2021.
Т	heis, C.V., 1941, The effect of a well on the flow of a nearby stream: Am. Geophys. Union Trans., v. 22, pt.3, p. 734-738.

Application G-19073

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Date: 4/22/2021

D. WELL CONSTRUCTION, OAR 690-200

D1.	Well #:n/a	Logid: <u>n/a</u>	
D2.	THE WELL does not	appear to meet current well construction standards based upon:	
	a. \square review of the	well log;	
	b. field inspection	on by	;
		RE	
		y)	
D3.	THE WELL construc	ction deficiency or other comment is described as follows:	
D4.	Route to the Well Co	onstruction and Compliance Section for a review of existing well co	nstruction.

Figure 1. Water Availability Tables

Water Availability Analysis

Detailed Reports

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

Water Availability as of 4/21/2021

Watershed ID #: 183 (Map) Exceedance Level:80%

Date: 4/21/2021 Time: 11:55 AM

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	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	4,170.00	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	1,450.00	3,260.00	0.00	1,300.00	1,960.00
AUG	3,620.00	1,330.00	2,290.00	0.00	1,300.00	990.00
SEP	3,680.00	1,150.00	2,530.00	0.00	1,300.00	1,230.00
OCT	4,650.00	745.00	3,910.00	0.00	1,300.00	2,610.00
NOV	9,400.00	854.00	8,550.00	0.00	1,300.00	7,250.00
DEC	16,700.00	915.00	15,800.00	0.00	1,300.00	14,500.00
ANN	13,500,000.00	2,160,000.00	11,300,000.00	0.00	942,000.00	10,400,000.00

Figure 2. Well Location Map



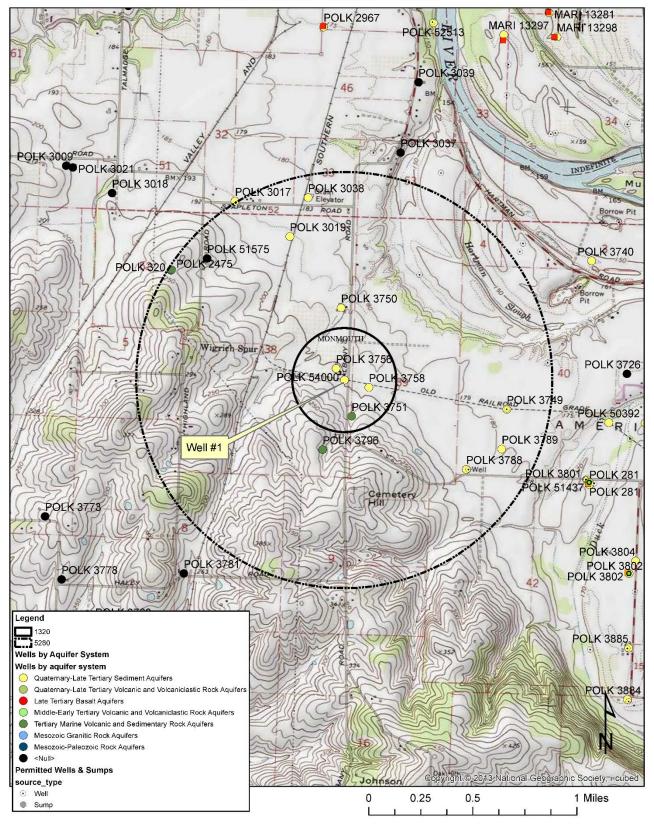


Figure 3. Water-Level Measurements in Nearby Wells

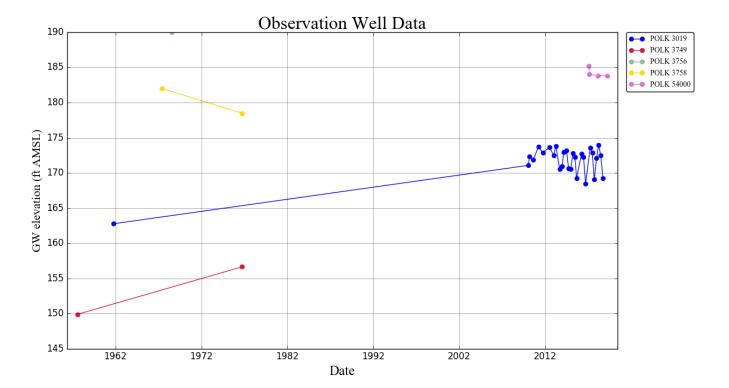


Figure 4. Well to Well Interference Estimate

Theis Drawdown and Recovery at r = 300 ft From Pumping Well

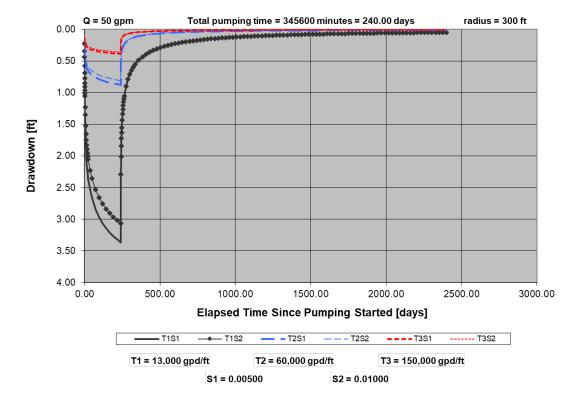
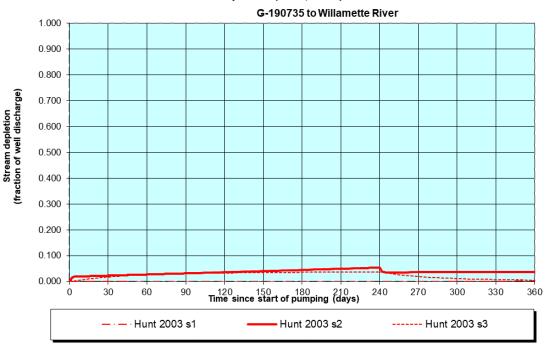


Figure 5. Stream Depletion

Transient Stream Depletion (Hunt, 2003)



Output for Stream Depletion, Scenerio 2 (s2):							Time pump on (pumping duration) = 240 days						
Days	30	60	90	120	150	180	210	240	270	300	330	360	
H SD 2003	2.28%	2.71%	3.15%	3.59%	4.03%	4.48%	4.93%	5.38%	3.56%	3.59%	3.63%	3.66%	
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 03, cfs	0.003	0.003	0.003	0.004	0.004	0.005	0.005	0.006	0.004	0.004	0.004	0.004	
Parameters:					Scenario 1		Scenario 2		Scenario 3		Units		
Net steady pur	mping rate	e of well		Qw		0.11	0.11		0.11		cfs		
Time pump or	(pumpin	g duration)	tpon	240		240		240		days		
Perpendicular	from well	to stream	า	а	7040		7040		7040		ft		
Well depth				d	80		80		80		ft		
Aquifer hydrau	lic condu	ctivity		K	80		500		1000		ft/day		
Aquifer satura	ted thickn	ess		b		20		20	20		ft		
Aquifer transm	nissivity			Т	1600		10000		20000		ft*ft/day		
Aquifer storativ	vity or spe	cific yield		S		0.01		0.001		0.005			
Aquitard vertical hydraulic conductivity Kva					(0.01		0.001			ft/day	
Aquitard saturated thickness ba						5		10		15		ft	
Aquitard thickness below stream babs						3		3		3		ft	
Aquitard porosity n						0.2		0.2		0.2			
Stream width ws						400		400		400		ft	