Groundwater Application Review Summary Form

Application # G- 19189

GW Reviewer Halley Schibel/Travis Brown Date Review Completed: August 1, 2022

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

MEMO **_August 1, 2022_**

TO: **Application** G-**_19189_**

FROM: **GW:** **_Halley Schibel/Travis Brown_**
(Reviewer's Name)

SUBJECT: Scenic Waterway Interference Evaluation

☐ **YES**
☒ **NO** The source of appropriation is hydraulically connected to a State Scenic Waterway or its tributaries

☐ **YES**
☒ **NO** Use the Scenic Waterway Condition (Condition 7J)

☐ 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 _[Enter]_ 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 8/1/2022

FROM: Groundwater Section Halley Schibel/Travis Brown/Justin Iverson
Reviewer's Name

SUBJECT: Application G- **19189** 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: **Blaine Grassman Living Trust** County: **Marion**

A1. Applicant(s) seek(s) 0.25[a] cfs from 1 well(s) in the Willamette Basin, Middle Willamette subbasin

A2. Proposed use Irrigation Seasonality: March 1st – October 31st

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	MARI 2722	Well 1	Alluvium	1.98[a]	5S/2W-29NWSW	30' S, 2030' W fr NE cor, DLC 69

* 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	182	21	30.8	10/12/1972	168	0-35	-2-168.17	-	117-147	600	38	A

Use data from application for proposed wells.

A4. **Comments:** [a]The proposed POA is currently an authorized POA on Certificates 87495 and 87496 (up to 1.14 cfs for Irrigation on 98.6 acres) and Certificate 87496 (0.59 cfs for Irrigation on 47.3 acres). The applicant is seeking an additional 0.25 cfs from the proposed POA under this application (G-19189). The total maximum combined rate would be 1.98 cfs and the total maximum annual volume would be 413.75 af/yr under all applicable rights (authorized and requested).

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 POAs are not within ¼ of the nearest surface water source and do not draw from unconfined alluvium. Per OAR 690-502-0240, the relevant basin rules 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, 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 **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:** Groundwater for the proposed use cannot be determined to be over-appropriated due to insufficient available data regarding rates of recharge and the current quantity of groundwater withdrawals from the aquifer system.

The proposed POA is located in the Central Willamette Valley and produces from approximately 30 feet of sand and gravel (the Willamette Aquifer described by Gannett and Caldwell, 1998), which is overlain by about 100 feet of silt (the Willamette Silt Unit) and overlies fine-grained distal alluvial fan and low gradient stream deposits locally separated by thin layers of sand and fine gravel (Willamette Confining Unit). The majority of wells in the immediate vicinity draw water from the Willamette Aquifer. The requested rate (1.98 cfs) is well within the range of reported yields for water wells in this area (see attached well statistics) and is unlikely to injure the closest neighboring well, MARI 2737 (see attached Theis analysis).

Nearby observation wells include a well on a permit with static water level reporting conditions and two state observation wells measured by OWRD staff dating back to the 1950's. Annual high water levels are relatively stable over time and the aquifer is not overappropriated.

In order to protect the groundwater resource and neighboring users, the conditions specified in B1(d)i and B2(c), above, are recommended for any permit issued pursuant to this application.

C. GROUNDWATER/SURFACE WATER CONSIDERATIONS, OAR 690-09-040

C1. **690-09-040 (1):** Evaluation of aquifer confinement:

Well	Aquifer or Proposed Aquifer	Confined	Unconfined
1	**Alluvium**	☒	☐
2	**Alluvium**	☒	☐

Basis for aquifer confinement evaluation: Water levels in area wells are generally above or coincident with the relevant water-bearing zones, which are overlain by a sequence of fine-grained sediments (Willamette Silt as described by Gannett and Caldwell, 1998 and locally consists of Missoula Flood Deposits). Based on the available evidence, the aquifer is confined.

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**	**East Champoeg Creek**	**150-160**	**169-173**	**2,565**	☒	☐	☐	☐	☒
1	**2**	**Unnamed Trib. to Willamette River**	**150-160**	**104-134**	**4,120**	☒	☐	☐	☐	☒

Basis for aquifer hydraulic connection evaluation: Nearby wells with long records of measurement and published water table maps in the area (Woodward et al., 1998) as well as the well log for the proposed POA (MARI 2722) show water levels generally above or coincident with nearby perennial streams SW1 and SW2. Water table maps in the area indicate that groundwater in the alluvial aquifer system flow toward and discharge into local streams incised into the Willamette Silt (Conlon et al., 2003, 2005; Gannett and Caldwell, 1998). The proposed POA appears to be near a hydraulic divide between the East Champoeg Creek drainage and groundwater draining westward toward the Willamette River.

Water Availability Basin the well(s) are located within: SW 1: Watershed ID# 30200708: CHAMPOEG CREEK > WILLAMETTE RIVER – AT MOUTH

SW 2: Watershed ID#182: WILLAMETTE R > COLUMBIA R – AB MOLALLA R

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 (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 < 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	☐	☐			☐	**1.00**	☒	**<25%**	☒
1	**2**	☐	☐			☐	**3,830**	☐	**<25%**	☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐

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: Interference with nearby surface water due to the proposed use was estimated using the Hunt (2003) transient stream depletion model. Hydraulic parameters used for the analysis were derived from regional data and studies (Pumping Test Reports; Conlon, 2005; Iverson, 2002; Woodward et al., 1998) or are within a typical range of values for the given parameter within the hydrogeologic regime (Domenico and Mifflin, 1965; Freeze and Cherry, 1979). Results indicate that interference with surface water sources due to the proposed use is unlikely to exceed 25 percent of the rate of appropriation within the first 30 days of continuous pumping.

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													
(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 G-19189 and application map received 6/1/2021.

Pumping test reports (MARI 2522, 2541, 2564, 2718, 2735, 2753, 2769, 2789, 17627, 18362, and 53626) and water levels for selected nearby wells (MARI 2541, 3803, 18362).

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, Scientific Investigations Report 2005-5168: U. S. Geological Survey, Reston, VA.

Domenico, P. A., and M. D. Mifflin. "Water from Low-Permeability Sediments and Land Subsidence." *Water Resources Research* 1, no. 4 (1965): 563–76. https://doi.org/10.1029/WR001i004p00563.

Freeze, R.A. and Cherry, J.A., 1979, Groundwater, Prentice Hall, Englewood Cliffs, New Jersey, 604 p.

Gannett, M.W. and Caldwell, R., 1998, Geologic framework of the Willamette Lowland aquifer system, Oregon and Washington, Professional Paper 1424-A, 32 p: U. S. Geological Survey, Reston, VA.

Hunt, B., 2003, Unsteady stream depletion when pumping from semiconfined aquifer: Journal of Hydrologic Engineering, Janu Iverson, J., 2002, Investigation of the hydraulic, physical, and chemical buffering capacity of Missoula flood deposits for water quality and supply in the Willamette Valley of Oregon: Unpublished M.S. thesis, Oregon State University, 147 p.

Iverson, J., 2002, Investigation of the hydraulic, physical, and chemical buffering capacity of Missoula flood deposits for water quality and supply in the Willamette Valley of Oregon: Unpublished M.S. thesis, Oregon State University, 147 p.

Lohman, S.W., 1972, Ground-water hydraulics, U.S. Geological Survey Prof. Paper 708, 70p. [pdf]

Price, D., 1967, Geology and water resources in the French Prairie area, northern Willamette Valley, Oregon: U. S. Geological Survey Water Supply Paper 1833, 98 p., accessed June 25, 2019, at https://pubs.er.usgs.gov/publication/wsp1833.

Theis, 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.

Todd, D.K., 1980. *Groundwater Hydrology*, 2nd ed., John Wiley & Sons, New York, 535p.

United States Geological Survey, 2014, National Hydrography Dataset (NHD), 1:24,000, U. S. Department of the Interior, Reston, VA.

United States Geological Survey, 2017, Gervais quadrangle, Oregon [map], 1:24,000, 7.5 minute topographic series, U.S. Department of the Interior, Reston, VA.

Watershed Sciences, 2009, LIDAR remote sensing data collection, Department of Geology and Mineral Industries, Willamette Valley Phase I, Oregon: Portland, OR, December 21.

Woodward, D.G., Gannett, M.W., and Vaccaro, J.J., 1998, Hydrogeologic framework of the Willamette Lowland aquifer system, Oregon and Washington: U.S. Geological Survey Professional Paper 1424-B, 82 p.

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:** _____

_____

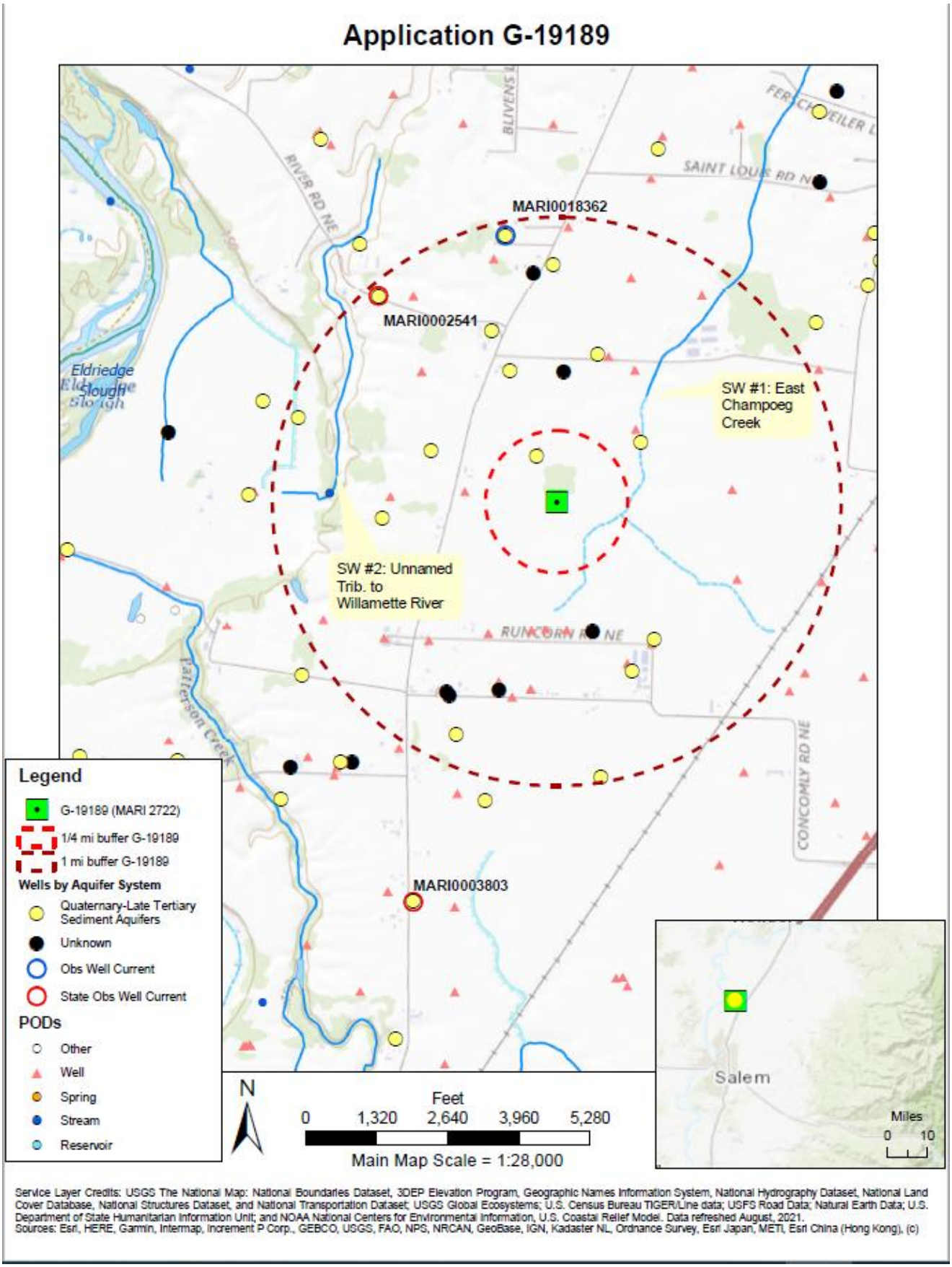
_____

_____

_____

D4. ☐ **Route to the Well Construction and Compliance Section for a review of existing well construction.**

Well Location Map



Water Availability Tables

Water Availability Analysis
Detailed Reports

WILLAMETTE R > COLUMBIA R - AB MOLALLA R
WILLAMETTE BASIN

Water Availability as of 4/19/2022

Watershed ID #: 182 (Map)
Date: 4/19/2022

Exceedance Level: 80%
Time: 1:41 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

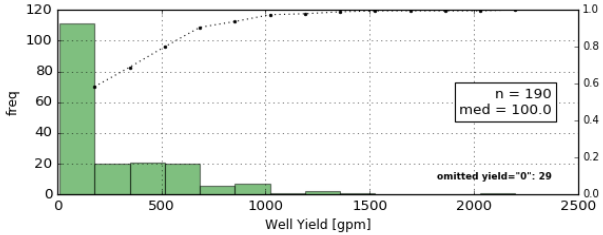
Month	Natural Stream Flow	Consumptive Uses and Storages	Expected Stream Flow	Reserved Stream Flow	Instream Flow Requirement	Net Water Available
JAN	21,400.00	2,300.00	19,100.00	0.00	1,500.00	17,600.00
FEB	23,200.00	7,480.00	15,700.00	0.00	1,500.00	14,200.00
MAR	22,400.00	7,250.00	15,100.00	0.00	1,500.00	13,600.00
APR	19,900.00	6,910.00	13,000.00	0.00	1,500.00	11,500.00
MAY	16,600.00	4,250.00	12,400.00	0.00	1,500.00	10,900.00
JUN	8,740.00	1,980.00	6,760.00	0.00	1,500.00	5,260.00
JUL	4,980.00	1,810.00	3,170.00	0.00	1,500.00	1,670.00
AUG	3,830.00	1,650.00	2,180.00	0.00	1,500.00	681.00
SEP	3,890.00	1,390.00	2,500.00	0.00	1,500.00	998.00
OCT	4,850.00	749.00	4,100.00	0.00	1,500.00	2,600.00
NOV	10,200.00	885.00	9,310.00	0.00	1,500.00	7,810.00
DEC	19,300.00	970.00	18,300.00	0.00	1,500.00	16,800.00
ANN	15,200,000.00	2,250,000.00	13,000,000.00	0.00	1,090,000.00	11,900,000.00

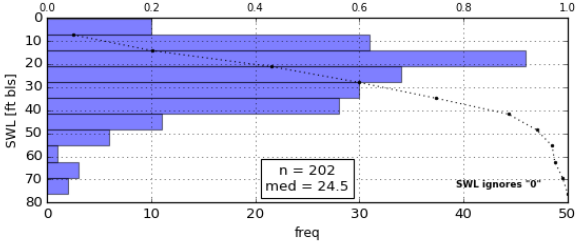
DETAILED REPORT ON THE WATER AVAILABILITY CALCULATION
Water Availability as of 1/7/2020 for
CHAMPOEG CR > WILLAMETTE R - AT MOUTH

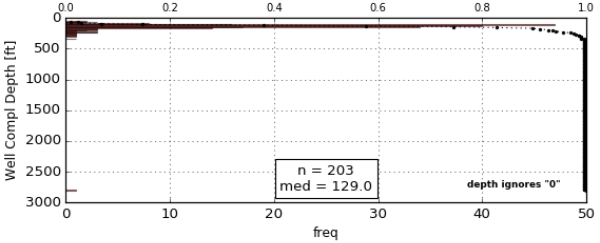
Watershed ID #: 30200708 Basin: WILLAMETTE Exceedance Level: 80
Time: 12:00 Date: 01/07/2020

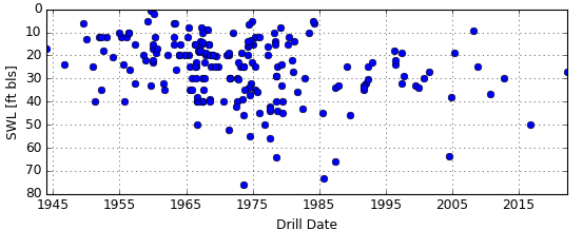
Month	Natural Stream Flow	CU + Stor Prior to 1/1/93	CU + Stor After 1/1/93	Expected Stream Flow	Reserved Stream Flow	Instream Water Rights	Net Water Available
1	37.30	8.64	0.00	28.66	0.00	0.00	28.66
2	51.70	8.16	0.00	43.54	0.00	0.00	43.54
3	22.40	5.11	0.00	17.29	0.00	0.00	17.29
4	10.90	3.96	0.00	6.94	0.00	0.00	6.94
5	6.15	6.11	0.00	0.04	0.00	0.00	0.04
6	3.04	7.88	0.00	-4.84	0.00	0.00	-4.84
7	2.94	12.32	0.00	-9.38	0.00	0.00	-9.38
8	1.88	9.99	0.00	-8.11	0.00	0.00	-8.11
9	1.08	5.42	0.00	-4.34	0.00	0.00	-4.34
10	1.00	1.37	0.00	-0.37	0.00	0.00	-0.37
11	10.10	5.79	0.00	4.31	0.00	0.00	4.31
12	47.80	11.51	0.00	36.29	0.00	0.00	36.29
Stor	28100	5220	0	22880	0	0	22880

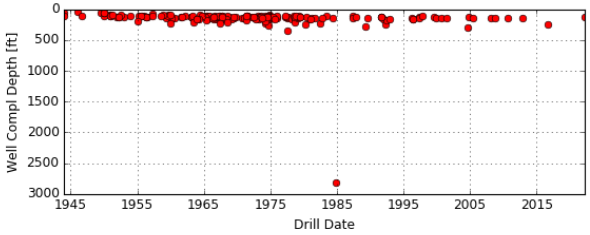
Well Statistics for sections 5S/2W-19-21, 28-33

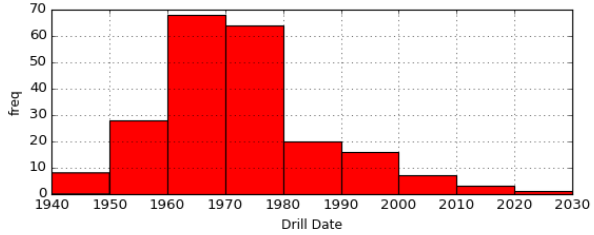


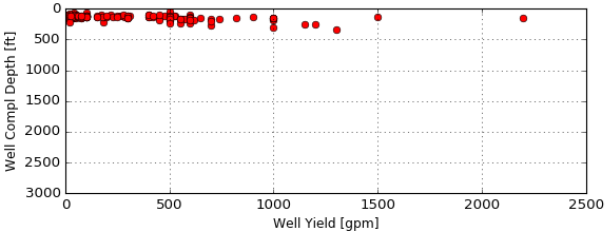


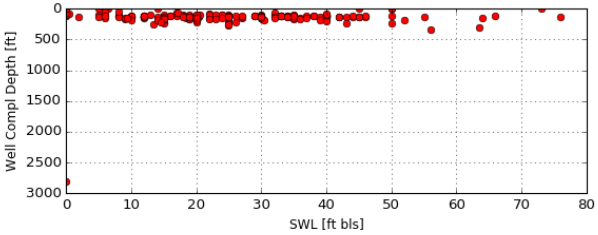


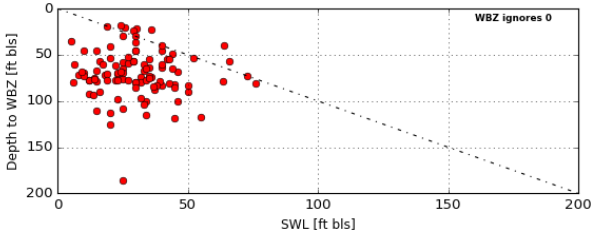


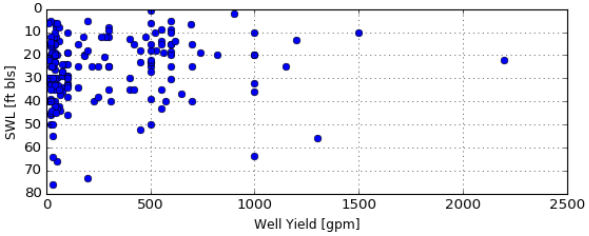


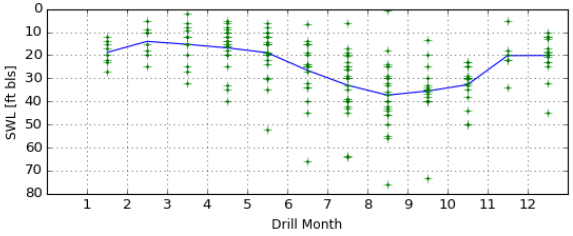












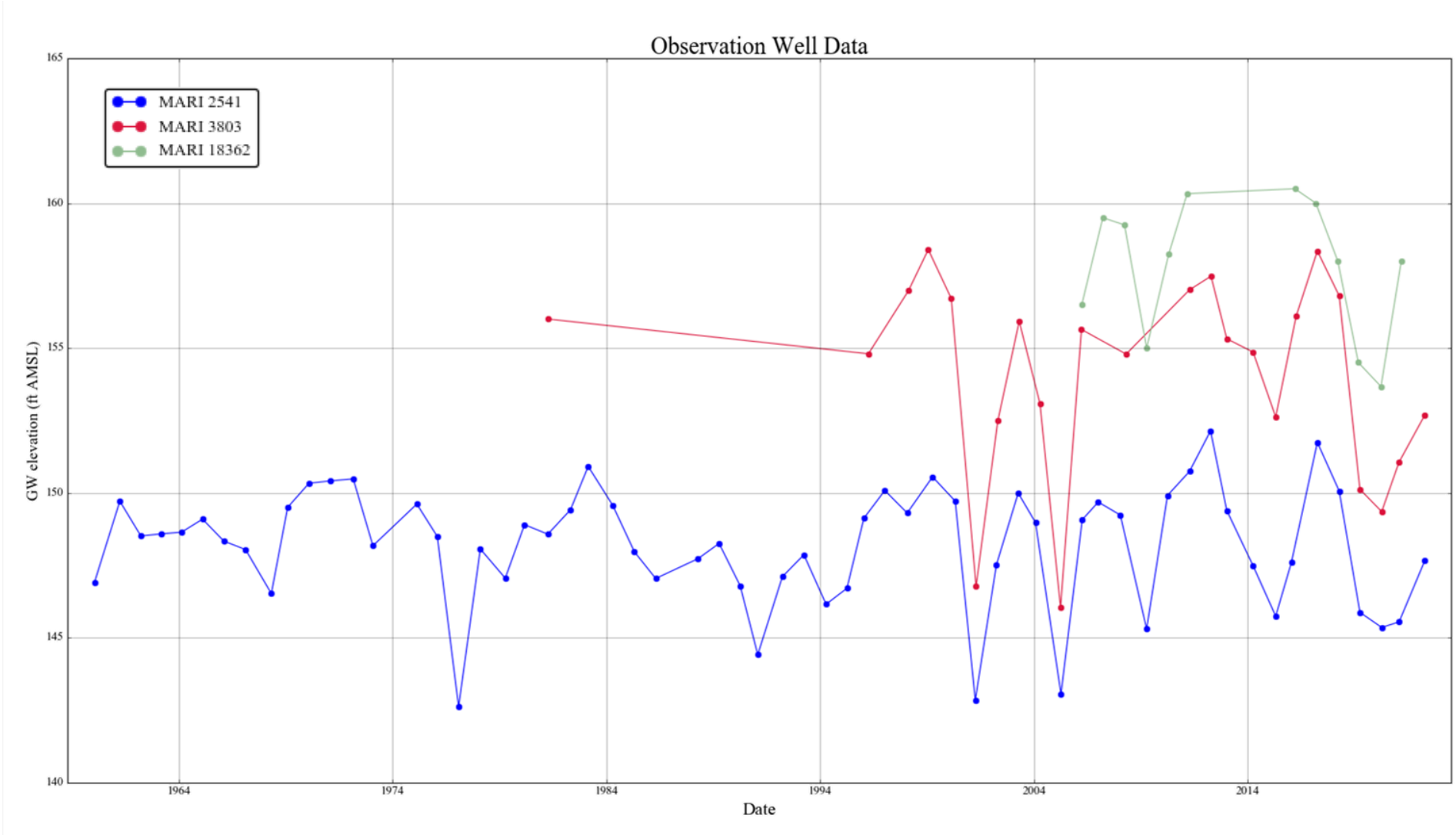
Includes Data from Water Wells only

Well Logs per section exported to file:
C:\Users\Public\found_trs_keys_RESULTS.txt

Well Log Data exported to file:
C:\Users\gwater\Desktop\Working Folder\well_data.txt

Created 04/07/2022

Water-Level Measurements in Nearby Wells



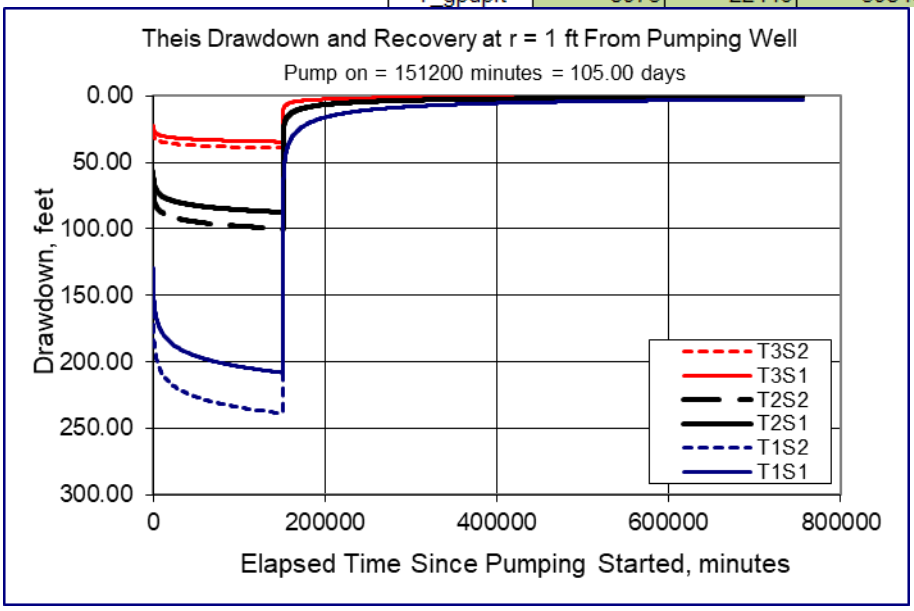
Theis Interference Analysis

Theis Time-Drawdown Worksheet v.5.00

Calculates Theis nonequilibrium drawdown and recovery at any arbitrary radial distance, r, from a pumping well for 3 different T values and radial distance, r, from a pumping well for 3 different T values and 2 different S values.

Written by Karl C. Wozniak September 1992. Last modified December 17, 2019

Input Data:	Var Name	**Scenario 1**	**Scenario 2**	**Scenario 3**	**Units**	
Total pumping time	t		**105**		d	
Radial distance from pumped well:	r		**1**		ft	**Q conversions**
Pumping rate	Q		**1.98**		cfs	888.62 gpm
Hydraulic conductivity	K	**24**	**60**	**160**	ft/day	1.98 cfs
Aquifer thickness	b		**50**		ft	118.80 cfm
Storativity	S_1		**0.003**			171,072.00 cfd
	S_2		**0.0002**			3.93 af/d
Transmissivity Conversions	T_f2pd	1200	3000	8000	ft2/day	
	T_ft2pm	0.8333333	2.0833333	5.5555556	ft2/min	Recalculate
	T_gpdpft	8976	22440	59840	gpd/ft	



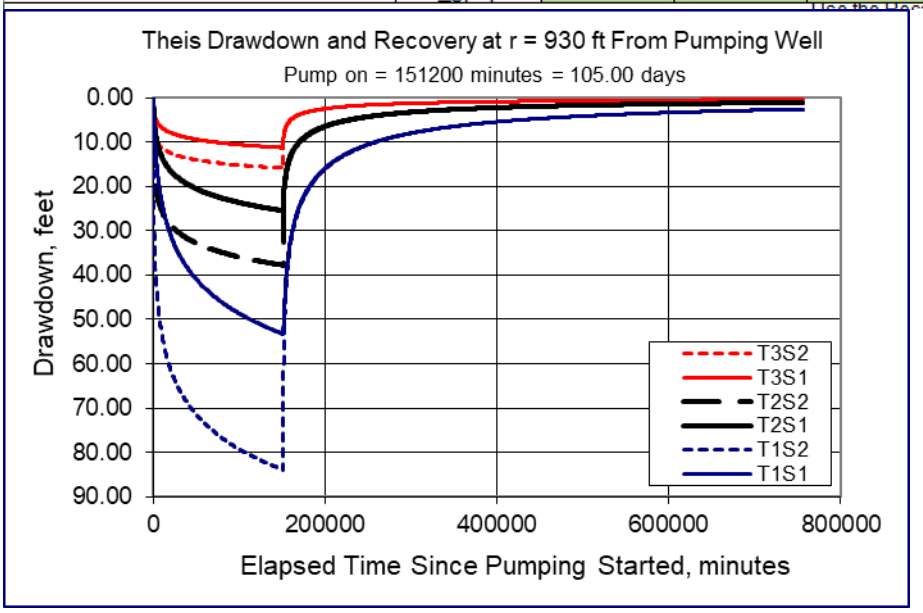
Theis Time-Drawdown Worksheet v.5.00

Calculates Theis nonequilibrium drawdown and recovery at any arbitrary radial distance, r, from a pumping well for 3 different T values and radial distance, r, from a pumping well for 3 different T values and 2 different S values.

Written by Karl C. Wozniak September 1992. Last modified December 17, 2019

Input Data:	Var Name	**Scenario 1**	**Scenario 2**	**Scenario 3**	**Units**	
Total pumping time	t		**105**		d	
Radial distance from pumped well:	r		**930**		ft	**Q conversions**
Pumping rate	Q		**1.98**		cfs	888.62 gpm
Hydraulic conductivity	K	**24**	**60**	**160**	ft/day	1.98 cfs
Aquifer thickness	b		**50**		ft	118.80 cfm
Storativity	S_1		**0.003**			171,072.00 cfd
	S_2		**0.0002**			3.93 af/d
Transmissivity Conversions	T_f2pd	1200	3000	8000	ft2/day	
	T_ft2pm	0.8333333	2.0833333	5.5555556	ft2/min	Recalculate
	T_gpdpft	8976	22440	59840	gpd/ft	

Use the Recalculate button if recalculation is set to



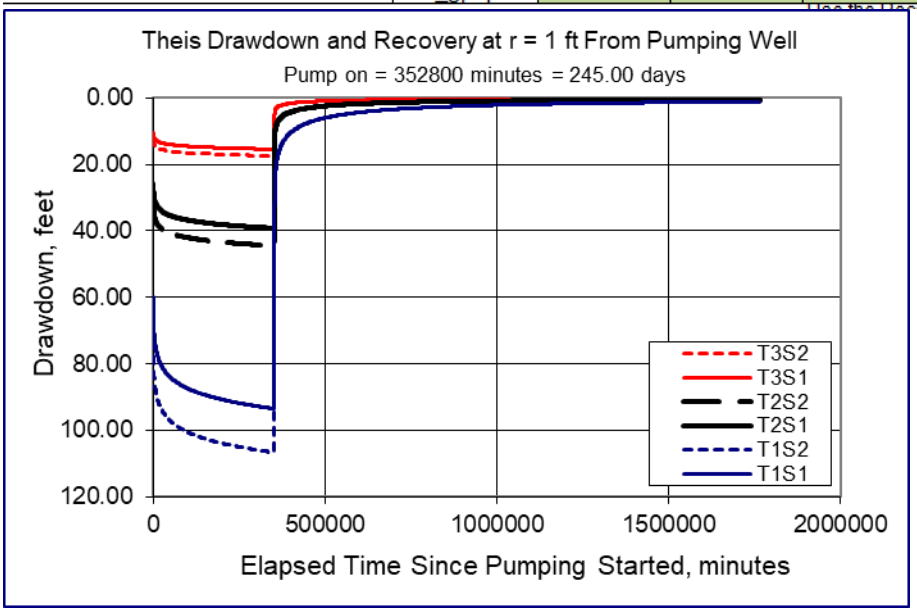
Theis Time-Drawdown Worksheet v.5.00

Calculates Theis nonequilibrium drawdown and recovery at any arbitrary radial distance, r, from a pumping well for 3 different T values and radial distance, r, from a pumping well for 3 different T values and 2 different S values.

Written by Karl C. Wozniak September 1992. Last modified December 17, 2019

Input Data:	Var Name	**Scenario 1**	**Scenario 2**	**Scenario 3**	**Units**	
Total pumping time	t		**245**		d	
Radial distance from pumped well:	r		**1**		ft	**Q conversions**
Pumping rate	Q		**0.85**		cfs	381.48 gpm
Hydraulic conductivity	K	**24**	**60**	**160**	ft/day	0.85 cfs
Aquifer thickness	b		**50**		ft	51.00 cfm
Storativity	S_1		**0.003**			73,440.00 cfd
	S_2		**0.0002**			1.69 af/d
Transmissivity Conversions	T_f2pd	1200	3000	8000	ft2/day	
	T_ft2pm	0.8333333	2.0833333	5.5555556	ft2/min	Recalculate
	T_gpdpft	8976	22440	59840	gpd/ft	

Use the Recalculate button if recalculation is set to



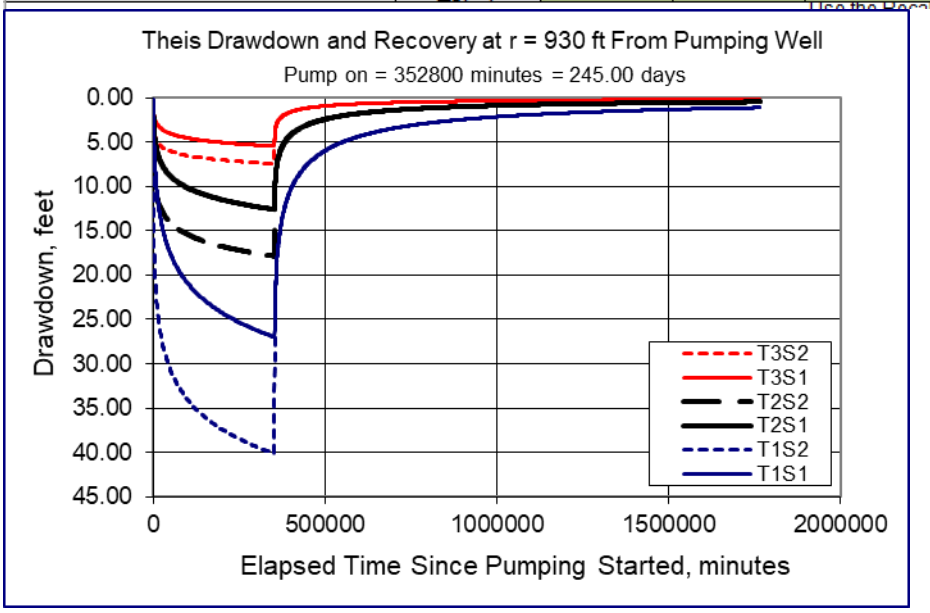
Theis Time-Drawdown Worksheet v.5.00

Calculates Theis nonequilibrium drawdown and recovery at any arbitrary radial distance, r, from a pumping well for 3 different T values and radial distance, r, from a pumping well for 3 different T values and 2 different S values.

Written by Karl C. Wozniak September 1992. Last modified December 17, 2019

Input Data:	Var Name	**Scenario 1**	**Scenario 2**	**Scenario 3**	**Units**	
Total pumping time	t		**245**		d	
Radial distance from pumped well:	r		**930**		ft	**Q conversions**
Pumping rate	Q		**0.85**		cfs	381.48 gpm
Hydraulic conductivity	K	**24**	**60**	**160**	ft/day	0.85 cfs
Aquifer thickness	b		**50**		ft	51.00 cfm
Storativity	S_1		**0.003**			73,440.00 cfd
	S_2		**0.0002**			1.69 af/d
Transmissivity Conversions	T_f2pd	1200	3000	8000	ft2/day	
	T_ft2pm	0.8333333	2.0833333	5.5555556	ft2/min	Recalculate
	T_gpdpft	8976	22440	59840	gpd/ft	

Use the Recalculate button if recalculation is set to



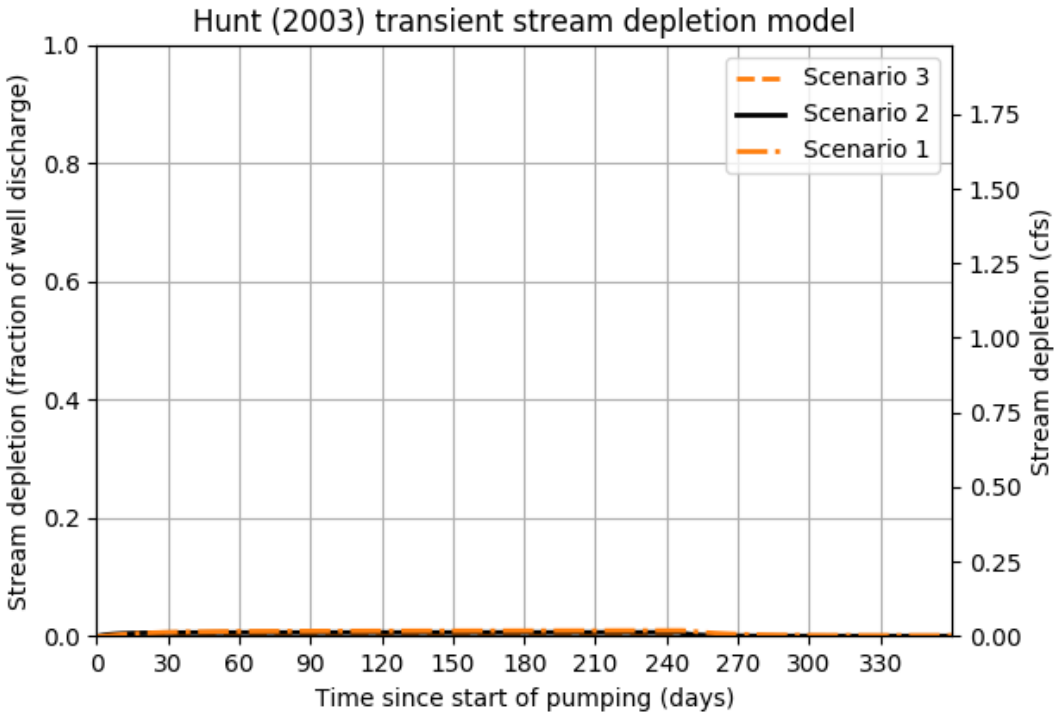
Stream Depletion Model Parameters and Output

Application type:	G
Application number:	19189
Well number:	1
Stream Number:	1
Pumping rate (cfs):	1.98
Pumping duration (days):	245.0
Pumping start month number (3=March)	3.0

Parameter	Symbol	Scenario 1	Scenario 2	Scenario 3	Units
Distance from well to stream	a	2565.0	2565.0	2565.0	ft
Aquifer transmissivity	T	1200.0	3000.0	8000.0	ft2/day
Aquifer storativity	S	0.003	0.0008	0.0002	-
Aquitard vertical hydraulic conductivity	Kva	0.01	0.005	0.0001	ft/day
Aquitard saturated thickness	ba	75.0	75.0	75.0	ft
Aquitard thickness below stream	babs	3.0	3.0	3.0	ft
Aquitard specific yield	Sya	0.2	0.2	0.2	-
Stream width	ws	5.0	5.0	5.0	ft

Stream depletion for Scenario 2:

Days	10	330	360	30	60	90	120	150	180	210	240	270	300
Depletion (%)	0	0	0	1	1	1	1	1	1	1	1	0	0
Depletion (cfs)	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00

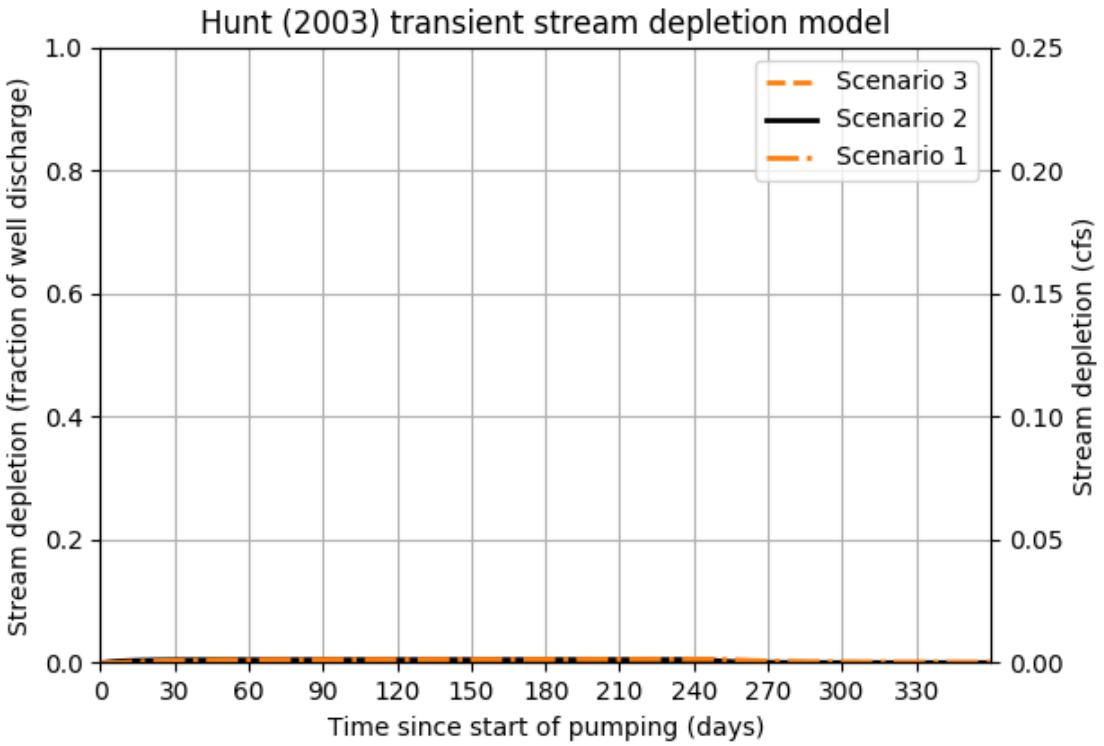


Application type:	G
Application number:	19189
Well number:	1
Stream Number:	1
Pumping rate (cfs):	0.25
Pumping duration (days):	245.0
Pumping start month number (3=March)	3.0

Parameter	Symbol	Scenario 1	Scenario 2	Scenario 3	Units
Distance from well to stream	a	4120.0	4120.0	4120.0	ft
Aquifer transmissivity	T	1200.0	3000.0	8000.0	ft2/day
Aquifer storativity	S	0.003	0.0008	0.0002	-
Aquitard vertical hydraulic conductivity	Kva	0.01	0.005	0.0001	ft/day
Aquitard saturated thickness	ba	75	75	75	ft
Aquitard thickness below stream	babs	3.0	3.0	3.0	ft
Aquitard specific yield	Sya	0.2	0.2	0.2	-
Stream width	ws	5.0	5.0	5.0	ft

Stream depletion for Scenario 2:

Days	10	330	360	30	60	90	120	150	180	210	240	270	300
Depletion (%)	0	0	0	0	1	1	1	1	1	1	1	0	0
Depletion (cfs)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



Application type:	G
Application number:	19189
Well number:	1
Stream Number:	2
Pumping rate (cfs):	1.98
Pumping duration (days):	245.0
Pumping start month number (3=March)	3.0

Parameter	Symbol	Scenario 1	Scenario 2	Scenario 3	Units
Distance from well to stream	a	4120	4120	4120	ft
Aquifer transmissivity	T	1200.0	3000.0	8000.0	ft2/day
Aquifer storativity	S	0.003	0.0008	0.0002	-
Aquitard vertical hydraulic conductivity	Kva	0.01	0.005	0.0001	ft/day
Aquitard saturated thickness	ba	75.0	75.0	75.0	ft
Aquitard thickness below stream	babs	3.0	3.0	3.0	ft
Aquitard specific yield	Sya	0.2	0.2	0.2	-
Stream width	ws	5.0	5.0	5.0	ft

Stream depletion for Scenario 2:

Days	10	330	360	30	60	90	120	150	180	210	240	270	300
Depletion (%)	0	0	0	0	1	1	1	1	1	1	1	0	0
Depletion (cfs)	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00