

Groundwater Application Review Summary Form

Application # G- 19280

GW Reviewer Darrick E. Boschmann Date Review Completed: 11/08/2024

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

11/08/2024

TO: Application G- 19280

FROM: GW: Darrick E. Boschmann
(Reviewer's Name)

SUBJECT: Scenic Waterway Interference Evaluation

☐ YES The source of appropriation is hydraulically connected to a State Scenic
☒ NO 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 11/08/2024
 FROM: Groundwater Section Darrick E. Boschmann
 Reviewer's Name
 SUBJECT: Application G- 19280 Supersedes review of 07/06/2022
 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: White Sage Land and Cattle CO. LLC County: Harney

White Sage

A1. Applicant(s) seek(s) 4.99 cfs from 3 well(s) in the Malheur Lake Basin,
Alvord Lake/Pueblo Valley subbasin

A2. Proposed use 304.4 acres primary irrigation & 95.1 acres supplemental irrigation Seasonality: 3/1 – 10/31

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*	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	Not drilled	Well #1	Basin Fill	4.99	40.00S-35.00E-34-NW SW	20 FEET SOUTH AND 20 FEET EAST FROM W1/4 CORNER, SECTION 34
2	Not drilled	Well #2	Basin Fill	4.99	40.00S-35.00E-34-SE NW	150 FEET NORTH AND 2640 FEET WEST FROM E1/4 CORNER, SECTION 34
3	Not drilled	Well #3	Basin Fill	4.99	40.00S-35.00E-35-SW NW	740 FEET NORTH AND 10 FEET WEST FROM E1/4 CORNER, SECTION 34
4						

* 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	4210	-	38*	?	460	0-39	0-39	+2-100	100-460	-	-	-
2	4185	-	38*	?	460	0-39	0-39	+2-100	100-460	-	-	-
3	4160	-	38*	?	460	0-39	0-39	+2-100	100-460	-	-	-

Use data from application for proposed wells.

A4. **Comments:** _____

This re-review addresses the finding in section B1a in accordance with the 02/06/2023 clarification memo on the current policy for determining over-appropriation for new groundwater applications. No other modifications from the original 07/06/2022 review were made.

The proposed wells are located on the west side of Pueblo Valley approximately 5 miles northeast of Denio, NV.

The area immediately underlying the proposed wells is mapped as QTs (Sedimentary deposits – lacustrine, fluvialite, and aeolian sedimentary rocks, interstratified tuff, ashy diatomite, and unconsolidated clay, sand, silt, and gravel) and Qal (Unconsolidated fluvialite gravel, sand, and silt) (Walker & Repenning, 1965). These units are likely underlain at an unknown depth by Tst (tuffaceous sedimentary rocks and tuff) and TRPM (metamorphosed sedimentary and volcanic rocks) (Walker and Repenning, 1965).

*The source of the static water level estimate provided on the application is unknown but based on available water level data in this region it is not unreasonable.

- A5. ☐ **Provisions of the** Malheur Lake 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: Currently no administrative area here.

- 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) _____;
 - 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 available water level record does not meet the Division 8 definition of excessively declining or declined excessively (for the storage portion of the source of water to wells).

The nearest current State Observation Well HARN 1806 (SOW 198) is located approximately 7 miles northeast of the proposed wells. The hydrograph for HARN 1806 shows approximately 10 feet of overall decline since the late 1960s.

There are no additional long-term water level records available for wells in the vicinity of the proposed project area.

Elsewhere in the Pueblo Valley, including further south on the Nevada side of the border, water level records associated with areas of groundwater development indicate water level declines over the available period of record. While these records may not be representative of groundwater conditions in the immediate vicinity of the proposed groundwater development, they may be indicative of the effect of groundwater development within the Pueblo Valley.

The proposed project area has similar climate and underlying geology as other areas within the Pueblo Valley that are experiencing water level declines in response to groundwater development. Issuance of a permit for groundwater withdrawals at the rate and duty proposed here will likely result in water level declines that will exceed the limits set forth in permit

condition 7N, which is typically recommended. These declines could impair the function of the resource and therefore the proposed use is found to be not within the capacity of the resource as defined in OAR 690-400-0010.

If a permit is issued the following conditions are recommended:

7N: Annual Measurement and Decline Condition

7P: Well Tag Condition

7T: Dedicated Measuring Tube Condition for all POA wells

Flow meter condition: Use the water rights “large” permit condition requiring a totalizing flow meter and reporting

Special Permit Condition:

The permittee shall construct one (1) minimum six-inch diameter observation well to penetrate the same aquifer as the production wells. The well shall meet the Department’s minimum well construction standards and shall be drilled, cased and sealed to the same depth as the production wells. The well shall be constructed at a location approved by the Department for the purpose of instrumentation with continuous water-level monitoring equipment. The landowner, permittee, or agent shall consult with the Department on the details of well construction and well location prior to construction of the well. The landowner or permittee shall provide access to Department staff to install and maintain the monitoring equipment. The well shall not be used for any other purpose while the Department is monitoring water levels. The well shall be completed prior to water use under the terms of any permit issued. Water level data collected by the Department from the observation well will be used in addition to water level data collected under condition 7N for any evaluation of water level decline or interference.

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	Basin Fill	☐	☒
2	Basin Fill	☐	☒
3	Basin Fill	☐	☒
		☐	☐

Basis for aquifer confinement evaluation: _____

The shallow basin fill material (Qal/QTs) is likely unconfined. Semi-confined conditions may be encountered at greater depth.

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?			Potential for Subst. Interfer. Assumed?	
						YES	NO	ASSUMED	YES	NO
1	1	Van Horn Creek	4172	4280	4130	☒	☐	☐	☐	☒
1	2	Cherry Creek	4147	4320	6350	☒	☐	☐	☐	☒
1	3	Colony Creek	4122	4260	8950	☒	☐	☐	☐	☒
1	4	Pueblo Slough	4172	4150	8250	☒	☐	☐	☐	☒
2	1	Van Horn Creek	4147	4280	2110	☒	☐	☐	☐	☒
2	2	Cherry Creek	4122	4320	4370	☒	☐	☐	☐	☒
2	3	Colony Creek	4172	4260	7430	☒	☐	☐	☐	☒
2	4	Pueblo Slough	4147	4150	6300	☒	☐	☐	☐	☒
3	1	Van Horn Creek	4122	4280	3630	☒	☐	☐	☐	☒
3	2	Cherry Creek	4172	4320	3720	☒	☐	☐	☐	☒
3	3	Colony Creek	4147	4260	5180	☒	☐	☐	☐	☒
3	4	Pueblo Slough	4122	4150	5330	☒	☐	☐	☐	☒

Basis for aquifer hydraulic connection evaluation: _____

Van Horn Creek; Cherry Creek; Colony Creek:

Perennial reaches of these streams in this setting generally infiltrate into the alluvial valley fill material along the valley margins, below which the streams are intermittent/seasonal, only flowing during spring high-flow runoff events. Groundwater down-gradient of these perennial reaches generally does not provide base flow to these streams, however, where groundwater is hydraulically connected, pumping in proximity to these perennial losing reaches can still induce streamflow depletion by increasing the hydraulic gradient between the stream and the groundwater system. The point at which these creeks are hydraulically connected with groundwater is likely variable from year to year. The lowermost point of the perennial reach as depicted on the NHD was used to calculate the distances listed above.

Pueblo Slough:

Groundwater discharges to Pueblo Slough at numerous springs to the east of the proposed wells. Flowing wells are reported adjacent to Pueblo Slough, further suggesting the presence of upward vertical gradients and groundwater discharge to surface water in this area. The nearest perennial reach as depicted on the NHD was used to calculate the distances listed above.

The groundwater elevations cited above are based on the static water level provided on the application. The source of the static water level estimate provided on the application is unknown but based on available water level data in this region it is not unreasonable.

Water Availability Basin the well(s) are located within: No WAB data available.

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?	Q _w > 5 cfs?	Instream Water Right ID	Instream Water Right Q (cfs)	Q _w > 1% ISWR?	80% Natural Flow (cfs)	Q _w > 1% of 80% Natural Flow?	Interference @ 30 days (%)	Potential for Subst. Interfer. Assumed?
1	1	☐	☐	N/A	N/A	☐	N/A	☐	0.14	☐
2	1	☐	☐	N/A	N/A	☐	N/A	☐	0.56	☐
2	2	☐	☐	N/A	N/A	☐	N/A	☐	0.12	☐
3	1	☐	☐	N/A	N/A	☐	N/A	☐	0.20	☐
3	2	☐	☐	N/A	N/A	☐	N/A	☐	0.19	☐
3	3	☐	☐	N/A	N/A	☐	N/A	☐	0.07	☐

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 #		Q _w > 5 cfs?	Instream Water Right ID	Instream Water Right Q (cfs)	Q _w > 1% ISWR?	80% Natural Flow (cfs)	Q _w > 1% of 80% Natural Flow?	Interference @ 30 days (%)	Potential for Subst. Interfer. Assumed?
			☐			☐		☐		☐
			☐			☐		☐		☐

Comments: _____

C3a.

Note that the proposed rate of 4.99 cfs falls just below the 5 cfs maximum rate threshold evaluated above.

There are no instream water rights in this part of Pueblo Valley.

There is no WAB data available for evaluation against 80% natural flow.

Hunt (2003) was used to calculate the interference between the proposed wells within a mile of hydraulically connected surface water. Very little data is available about aquifer parameters at this location. The values used for the calculation are conservative and appropriate until better values become available. The calculations used the average transmissivity derived from pump tests on two nearby wells (HARN 1819; HARN 1818) (7,976 ft²/day). Additionally, the calculation used an assumed intermediate storage coefficient (0.001). The pumping rate used is the maximum rate proposed for the application (4.99 cfs). Interference is less than 25% at 30 days in all cases. See reports attached.

C3b.

No distributed rate requested.

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:

No analysis here as no PSI was found above in C3a.

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:
- ☐ The permit should contain condition #(s) _____;
 - ☐ The permit should contain special condition(s) as indicated in "Remarks" below;

C6. SW / GW Remarks and Conditions:**C1. 690-09-040 (1)**

It is determined that all proposed wells will produce water from an unconfined aquifer.

C2. 690-09-040 (2) (3)

It is determined that all proposed wells are hydraulically connected with Van Horn Creek, Cherry Creek, Colony Creek, and Pueblo Slough.

C3a. 690-09-040(4)

PSI is not assumed for any of the proposed wells.

C3b. 690-09-040(4)

This section does not apply

C4a. 690-09-040(5)

No analysis here as no PSI was found in C3a.

References Used:

Walker, G.W., Repenning, C.A., 1965. Reconnaissance geologic map of the Adel quadrangle, Lake, Harney, and Malheur Counties, Oregon. U.S. Geological Survey Miscellaneous Geologic Investigations Map I-446.

Hunt, B., 2003. Unsteady stream depletion when pumping from semiconfined aquifer. Journal of Hydrologic Engineering, 8(1), pp.12-19.

USGS National Hydrology Dataset

NDWR water level data.

OWRD water well reports, water level data, and/or hydrographs

Oregon Administrative Rules

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.**

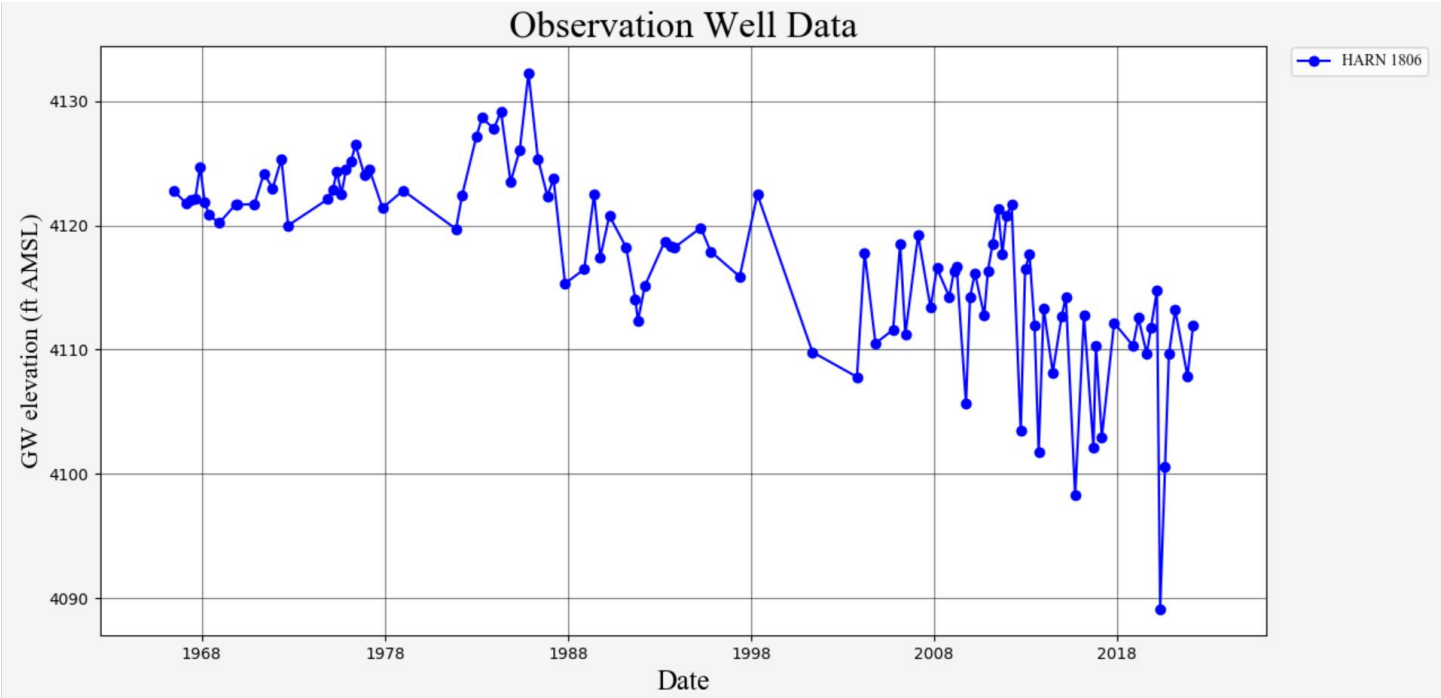
Water Availability Tables

No WAB data available.

Well Location Map

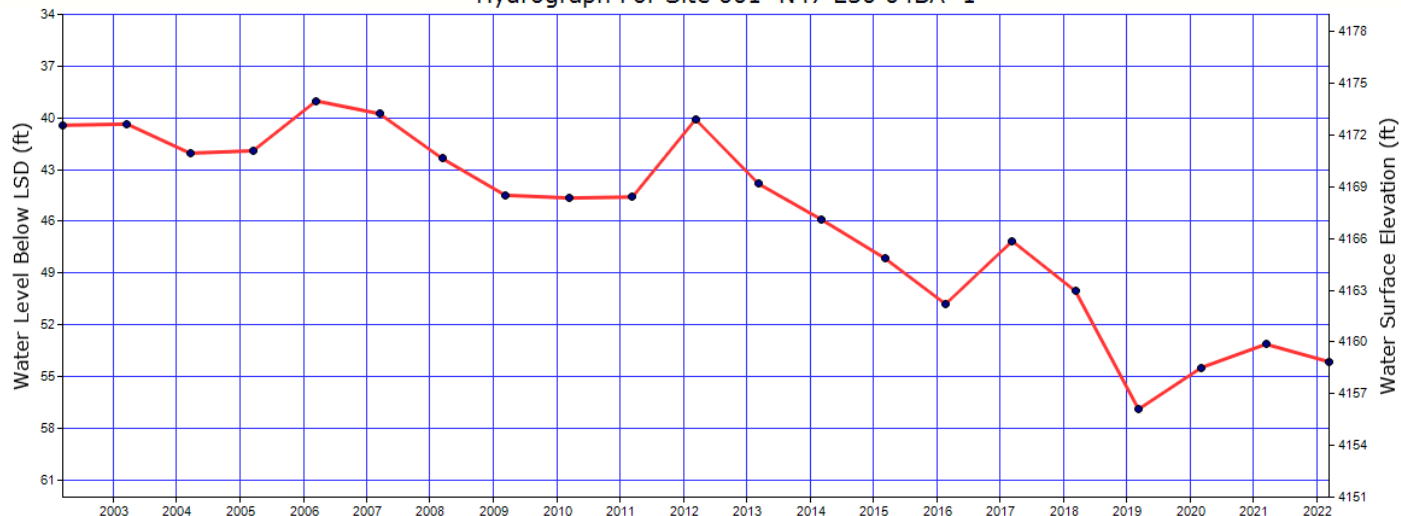


Water-Level Measurements in Nearby Wells

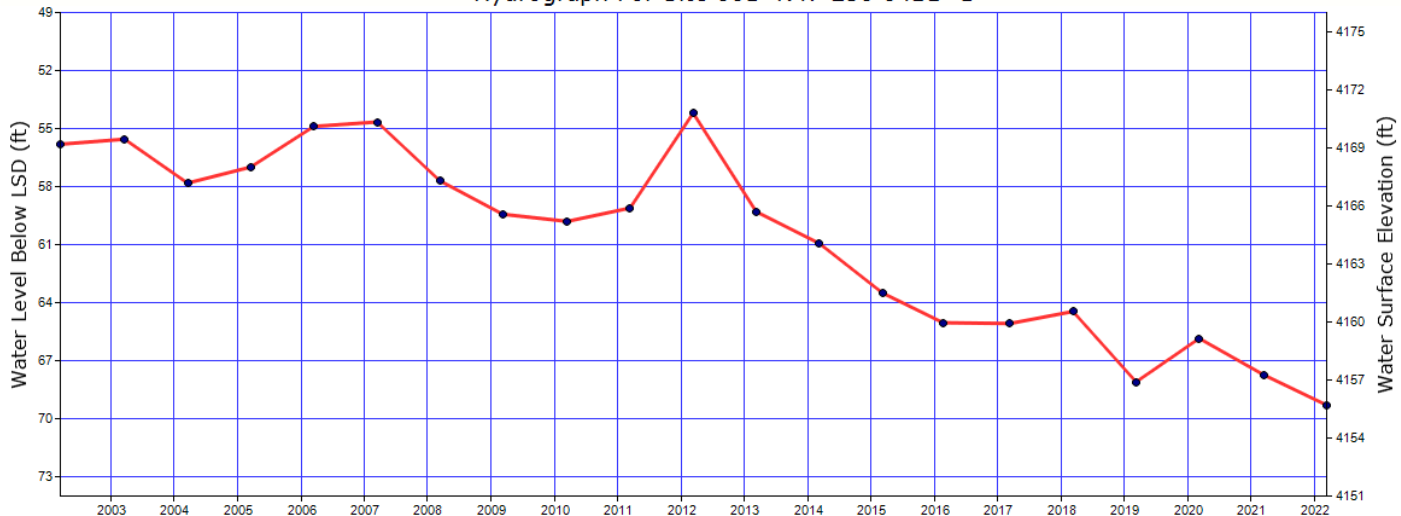


NDWR hydrographs:

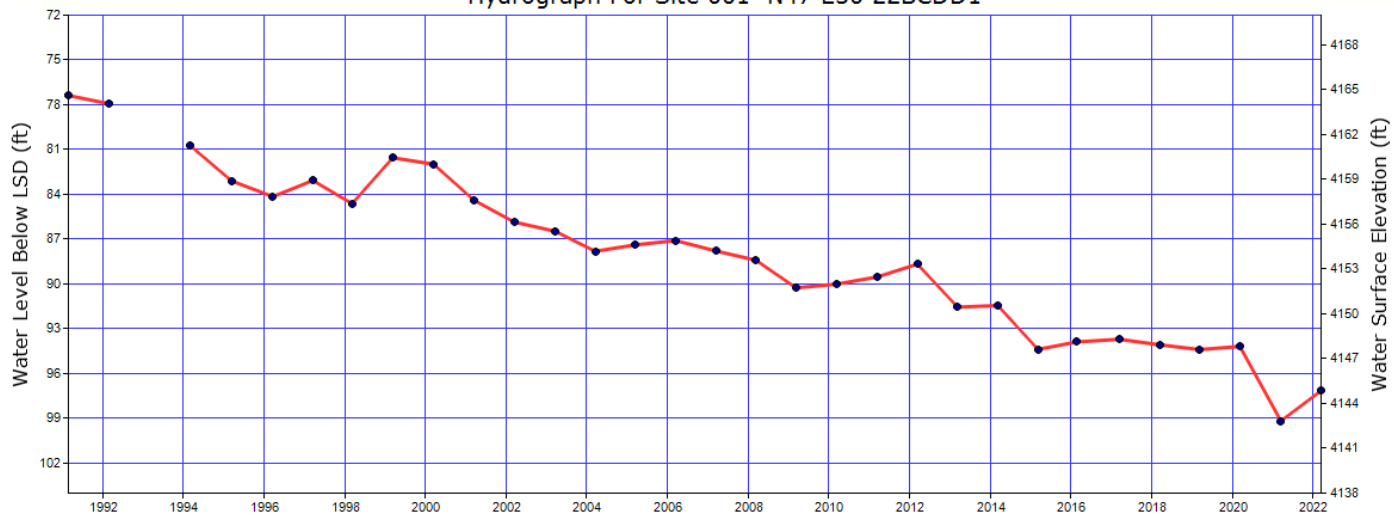
Hydrograph For Site 001 N47 E30 04BA 1



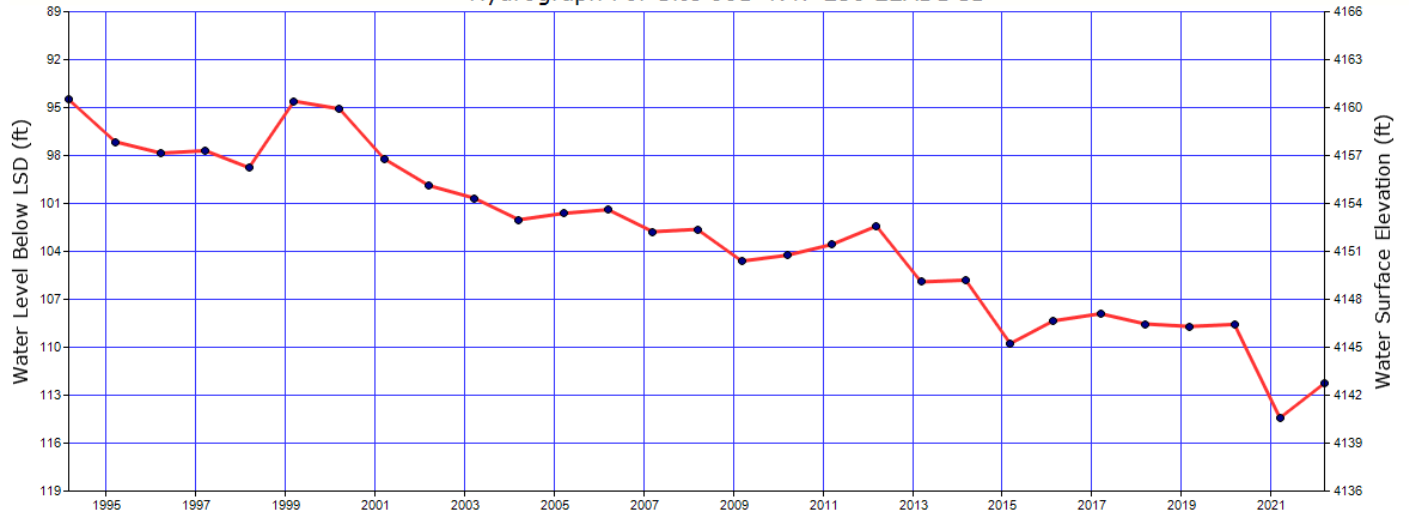
Hydrograph For Site 001 N47 E30 04BB 1



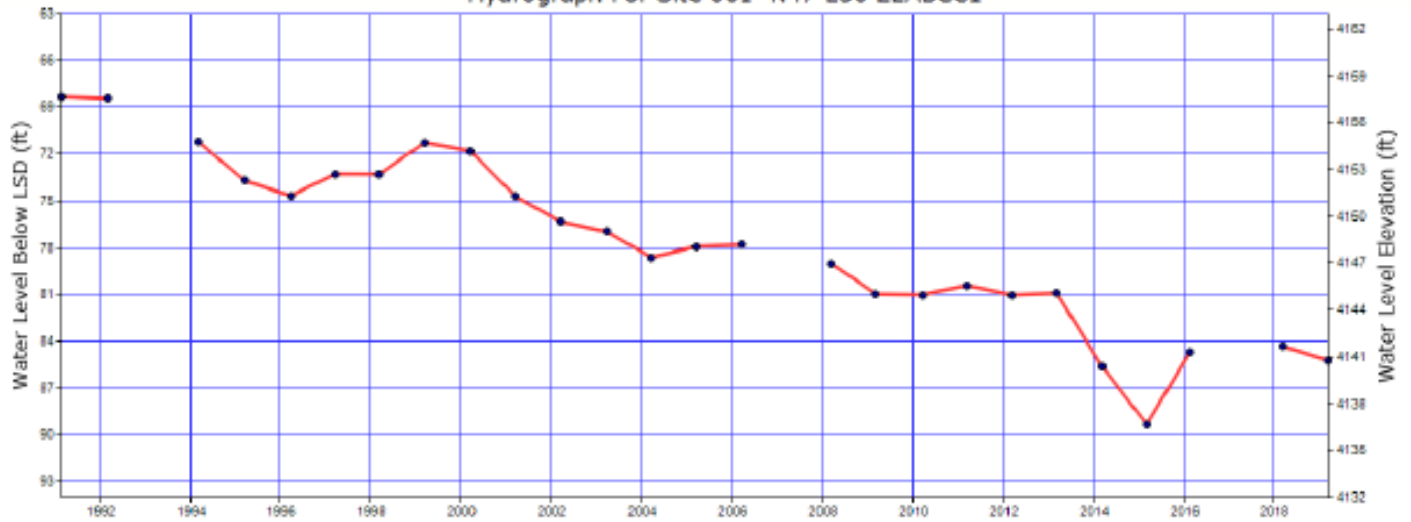
Hydrograph For Site 001 N47 E30 22BCDD1



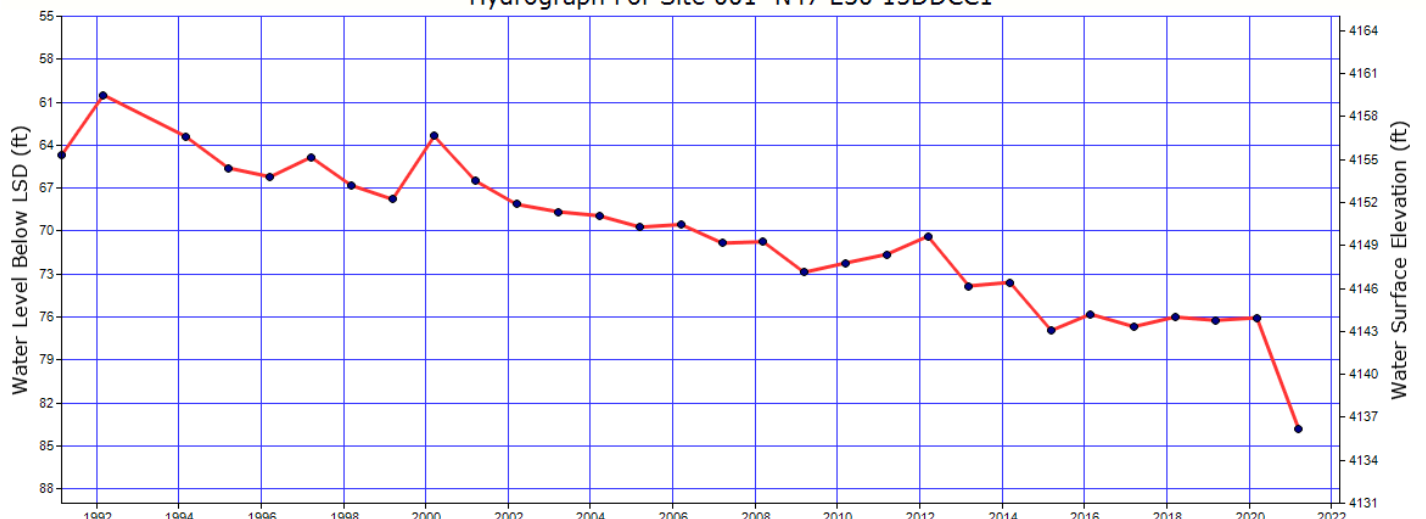
Hydrograph For Site 001 N47 E30 22ADDC1



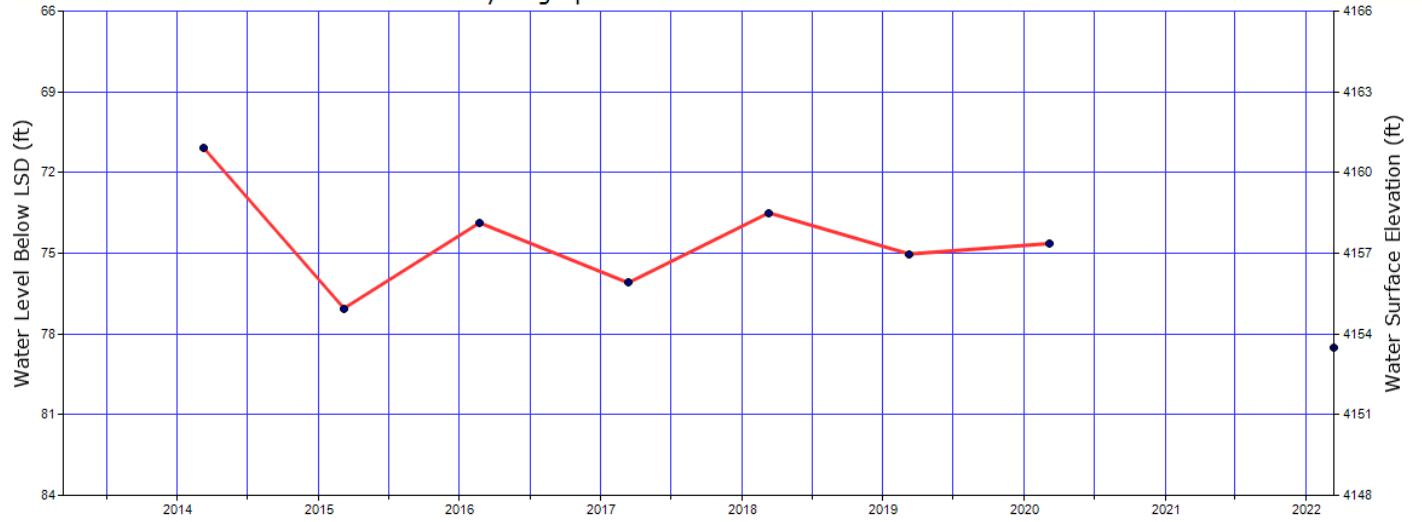
Hydrograph For Site 001 N47 E30 22ABCC1



Hydrograph For Site 001 N47 E30 15DDCC1



Hydrograph For Site 001 N47 E30 15CDD2



Hydrograph For Site 001 N47 E30 15CBAA1



Transient Stream Depletion (Jenkins, 1970; Hunt, 1999, 2003)

Input data

Parameter	Scenario 1	Scenario 2	Scenario 3	Unit	Description
Plot Title	G-19280 Well 1 to SW1				Plot title
Qw		4.99		cfs	Net steady pumping rate of well
tpon		245		days	Time pump on (pumping duration)
a	4130	4130	4130	ft	Perpendicular distance from well to stream
d		460		ft	Well depth
K	100	100	100	ft/day	Aquifer hydraulic conductivity
b	80	80	80	ft	Aquifer saturated thickness
S	0.001	0.001	0.001		Aquifer storativity or specific yield
Kva	0.02	0.02	0.02	ft/day	Aquitard vertical hydraulic conductivity
ba	3	3	3	ft	Aquitard saturated thickness
babs	3	3	3	ft	Aquitard thickness below stream
n	0.2	0.2	0.2		Aquifer porosity
ws	35	35	35	ft	Stream width

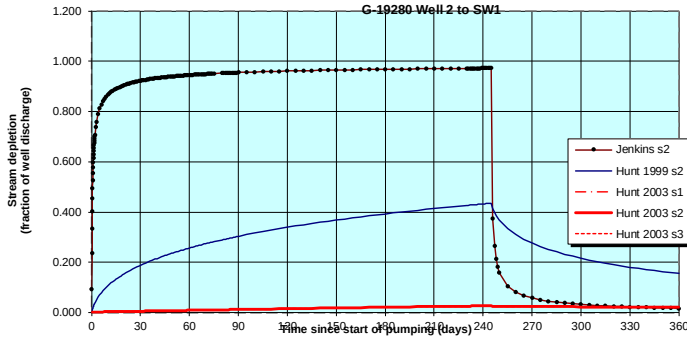
Recalculate

Parameter	Scenario 1	Scenario 2	Scenario 3	Units	
Qw	4.99	4.99	4.99	cfs	= K*b
T	7.976	7.976	7.976	ft ² /day	= K*b
T	59.660	59.660	59.660	gpd/ft	= Ks*ws/bs
sbc	0.233333	0.233333	0.233333	ft/day	= (a ² *S)/(T)
sdf	2.138528	2.138528	2.138528	days	= sbc*a/T
sbf	0.120821	0.120821	0.120821		
r	0.467611	0.467611	0.467611	1/days	= T/(a ² *S) input #1 for Hunt's Q_4 function
K'	14.256854	14.256854	14.256854		= (Ks/bs)*a ² /T input #2 for Hunt's Q_4 function
epsilon/r	0.005000	0.005000	0.005000		= S/n input #3 for Hunt's Q_4 function
lamda'	0.120821	0.120821	0.120821		= sbc*a/T input #4 for Hunt's Q_4 function

Output for Stream Depletion, Scenario 2 (s2):

Days	30	60	90	120	150	180	210	240	270	300	330	360
J SD	85.0%	89.4%	91.3%	92.5%	93.3%	93.9%	94.3%	94.7%	11.4%	6.3%	4.4%	3.3%
H SD 1999	16.7%	23.7%	28.5%	32.2%	35.1%	37.6%	39.8%	41.7%	28.3%	22.1%	18.5%	16.0%
H SD 2003	0.14%	0.27%	0.43%	0.60%	0.77%	0.95%	1.14%	1.32%	1.38%	1.43%	1.46%	1.47%
Qw, cfs	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990
H SD 99, cfs	0.834	1.184	1.422	1.605	1.753	1.878	1.986	2.081	1.411	1.105	0.923	0.797
H SD 03, cfs	0.007	0.014	0.021	0.030	0.039	0.048	0.057	0.066	0.069	0.072	0.073	0.073

Transient Stream Depletion (Jenkins, 1970; Hunt, 1999, 2003)



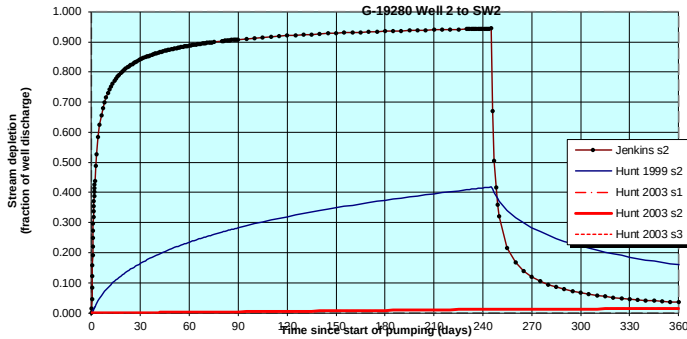
Output for Stream Depletion, Scenario 2 (s2):										Time pump on (pumping duration) = 245 days															
Days	30	60	90	120	150	180	210	240	270	300	330	360													
J SD	92.3%	94.6%	95.6%	96.2%	96.6%	96.9%	97.1%	97.3%	5.8%	3.2%	2.2%	1.7%													
H SD 1999	18.8%	25.7%	30.4%	34.0%	36.9%	39.3%	41.4%	43.3%	27.7%	21.6%	18.1%	15.6%													
H SD 2003	0.56%	0.90%	1.23%	1.55%	1.85%	2.13%	2.40%	2.66%	2.41%	2.31%	2.20%	2.11%													
Qw, cfs	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990													
H SD 99, cfs	0.939	1.283	1.516	1.695	1.840	1.962	2.067	2.160	1.382	1.080	0.901	0.778													
H SD 03, cfs	0.028	0.045	0.061	0.077	0.092	0.106	0.120	0.133	0.120	0.115	0.110	0.105													

Input data					
yellow = required					blue = recommended
Parameter	Scenario 1	Scenario 2	Scenario 3	Unit	Description
Plot Title	G-19280 Well 2 to SW1				Plot title
Qw		4.99		cfs	Net steady pumping rate of well
tpon		245		days	Time pump on (pumping duration)
a	2110		2110	ft	Perpendicular distance from well to stream
d		460		ft	Well depth
K	100	100	100	ft/day	Aquifer hydraulic conductivity
b	80	80	80	ft	Aquifer saturated thickness
S	0.001	0.001	0.001		Aquifer storativity or specific yield
Kva	0.02	0.02	0.02	ft/day	Aquitard vertical hydraulic conductivity
ba	3	3	3	ft	Aquitard saturated thickness
babs	3	3	3	ft	Aquitard thickness below stream
n	0.2	0.2	0.2		Aquitard porosity
ws	35	35	35	ft	Stream width

Recalculate

Parameter	Scenario 1	Scenario 2	Scenario 3	Units	
Qw	4.99	4.99	4.99	cfs	
T	7.976	7.976	7.976	ft ² /day	= K*b
T	59.660	59.660	59.660	gpd/ft	= K*b
sbc	0.233333	0.233333	0.233333	ft/day	= Ks*ws/bs
sdf	0.558187	0.558187	0.558187	days	= (a ² *S)/(T)
sbft	0.061727	0.061727	0.061727		= sbc*a/T
t'	1.791514	1.791514	1.791514	1/days	= T/(a ² *S) input #1 for Hunt's Q ₄ function
K'	3.721247	3.721247	3.721247		= (Ks/bs)*a ² /T input #2 for Hunt's Q ₄ function
epsilon'	0.005000	0.005000	0.005000		= S/n input #3 for Hunt's Q ₄ function
lamda'	0.061727	0.061727	0.061727		= sbc*a/T input #4 for Hunt's Q ₄ function

Transient Stream Depletion (Jenkins, 1970; Hunt, 1999, 2003)



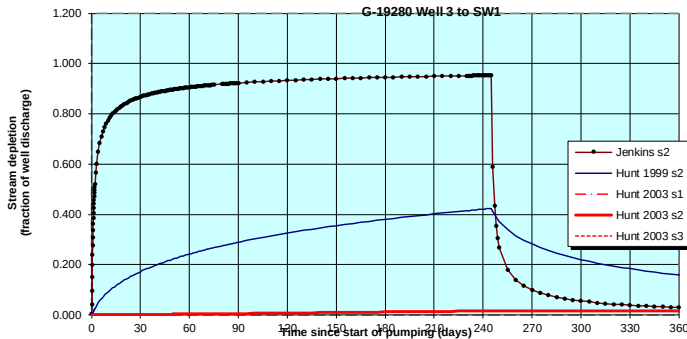
Output for Stream Depletion, Scenario 2 (s2):										Time pump on (pumping duration) = 245 days															
Days	30	60	90	120	150	180	210	240	270	300	330	360													
J SD	84.2%	88.8%	90.8%	92.0%	92.9%	93.5%	94.0%	94.4%	12.0%	6.7%	4.6%	3.5%													
H SD 1999	16.5%	23.5%	28.3%	31.9%	34.9%	37.4%	39.6%	41.5%	28.3%	22.2%	18.6%	16.0%													
H SD 2003	0.12%	0.24%	0.37%	0.53%	0.69%	0.86%	1.03%	1.21%	1.28%	1.34%	1.37%	1.39%													
Qw, cfs	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990													
H SD 99, cfs	0.822	1.173	1.411	1.594	1.743	1.868	1.976	2.071	1.413	1.108	0.926	0.799													
H SD 03, cfs	0.006	0.012	0.019	0.026	0.035	0.043	0.052	0.060	0.064	0.067	0.069	0.069													

Input data					
yellow = required					blue = recommended
Parameter	Scenario 1	Scenario 2	Scenario 3	Unit	Description
Plot Title	G-19280 Well 2 to SW2				Plot title
Qw		4.99		cfs	Net steady pumping rate of well
tpon		245		days	Time pump on (pumping duration)
a	4370		4370	ft	Perpendicular distance from well to stream
d		460		ft	Well depth
K	100	100	100	ft/day	Aquifer hydraulic conductivity
b	80	80	80	ft	Aquifer saturated thickness
S	0.001	0.001	0.001		Aquifer storativity or specific yield
Kva	0.02	0.02	0.02	ft/day	Aquitard vertical hydraulic conductivity
ba	3	3	3	ft	Aquitard saturated thickness
babs	3	3	3	ft	Aquitard thickness below stream
n	0.2	0.2	0.2		Aquitard porosity
ws	35	35	35	ft	Stream width

Recalculate

Parameter	Scenario 1	Scenario 2	Scenario 3	Units	
Qw	4.99	4.99	4.99	cfs	
T	7.976	7.976	7.976	ft ² /day	= K*b
T	59.660	59.660	59.660	gpd/ft	= K*b
sbc	0.233333	0.233333	0.233333	ft/day	= Ks*ws/bs
sdf	2.394295	2.394295	2.394295	days	= (a ² *S)/(T)
sbft	0.127842	0.127842	0.127842		= sbc*a/T
t'	0.417659	0.417659	0.417659	1/days	= T/(a ² *S) input #1 for Hunt's Q ₄ function
K'	15.961969	15.961969	15.961969		= (Ks/bs)*a ² /T input #2 for Hunt's Q ₄ function
epsilon'	0.005000	0.005000	0.005000		= S/n input #3 for Hunt's Q ₄ function
lamda'	0.127842	0.127842	0.127842		= sbc*a/T input #4 for Hunt's Q ₄ function

Transient Stream Depletion (Jenkins, 1970; Hunt, 1999, 2003)



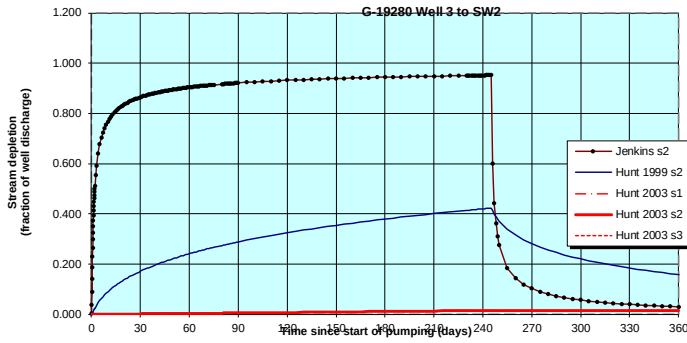
Output for Stream Depletion, Scenario 2 (s2):										Time pump on (pumping duration) = 245 days														
Days	30	60	90	120	150	180	210	240	270	300	330	360												
J SD	86.8%	90.7%	92.4%	93.4%	94.1%	94.6%	95.0%	95.3%	10.0%	5.6%	3.9%	2.9%												
H SD 1999	17.2%	24.2%	29.0%	32.6%	35.6%	38.0%	40.2%	42.1%	28.1%	22.0%	18.4%	15.9%												
H SD 2003	0.20%	0.37%	0.56%	0.76%	0.97%	1.17%	1.38%	1.58%	1.61%	1.64%	1.64%	1.63%												
Qw, cfs	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990												
H SD 99, cfs	0.860	1.208	1.445	1.627	1.774	1.898	2.006	2.100	1.404	1.099	0.918	0.793												
H SD 03, cfs	0.010	0.018	0.028	0.038	0.048	0.059	0.069	0.079	0.080	0.082	0.082	0.081												

Input data					
yellow = required					blue = recommended
Parameter	Scenario 1	Scenario 2	Scenario 3	Unit	Description
Plot Title	G-19280 Well 3 to SW1				Plot title
Qw		4.99		cfs	Net steady pumping rate of well
tpon		245		days	Time pump on (pumping duration)
a	3630		3630	ft	Perpendicular distance from well to stream
d		460		ft	Well depth
K	100	100	100	ft/day	Aquifer hydraulic conductivity
b	80	80	80	ft	Aquifer saturated thickness
S	0.001	0.001	0.001		Aquifer storativity or specific yield
Kva	0.02	0.02	0.02	ft/day	Aquitard vertical hydraulic conductivity
ba	3	3	3	ft	Aquitard saturated thickness
babs	3	3	3	ft	Aquitard thickness below stream
n	0.2	0.2	0.2		Aquitard porosity
ws	35	35	35	ft	Stream width

Recalculate

Parameter	Scenario 1	Scenario 2	Scenario 3	Units	
Qw	4.99	4.99	4.99	cfs	
T	7.976	7.976	7.976	ft ² /day	= K*b
T	59.660	59.660	59.660	gpd/ft	= K*b
sbc	0.233333	0.233333	0.233333	ft/day	= Ks*ws/bs
sdf	1.652069	1.652069	1.652069	days	= (a ² *S)/(T)
sbft	0.106194	0.106194	0.106194		= sbc*a/T
t'	0.605302	0.605302	0.605302	1/days	= T/(a ² *S) input #1 for Hunt's Q ₄ function
K'	11.013791	11.013791	11.013791		= (Ks/bs)*a ² /T input #2 for Hunt's Q ₄ function
epsilon'	0.005000	0.005000	0.005000		= S/n input #3 for Hunt's Q ₄ function
lamda'	0.106194	0.106194	0.106194		= sbc*a/T input #4 for Hunt's Q ₄ function

Transient Stream Depletion (Jenkins, 1970; Hunt, 1999, 2003)



Output for Stream Depletion, Scenario 2 (s2):										
Time pump on (pumping duration) = 245 days										
Days	30	60	90	120	150	180	210	240	270	300
J SD	86.5%	90.4%	92.2%	93.2%	93.9%	94.5%	94.9%	95.2%	10.3%	5.7%
H SD 1999	17.1%	24.1%	28.9%	32.5%	35.5%	38.0%	40.1%	42.0%	28.2%	22.1%
H SD 2003	0.19%	0.35%	0.53%	0.73%	0.93%	1.13%	1.33%	1.53%	1.57%	1.60%
Qw, cfs	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990
H SD 99, cfs	0.855	1.204	1.441	1.623	1.770	1.895	2.002	2.097	1.405	1.100
H SD 03, cfs	0.009	0.017	0.027	0.036	0.046	0.056	0.067	0.077	0.078	0.080

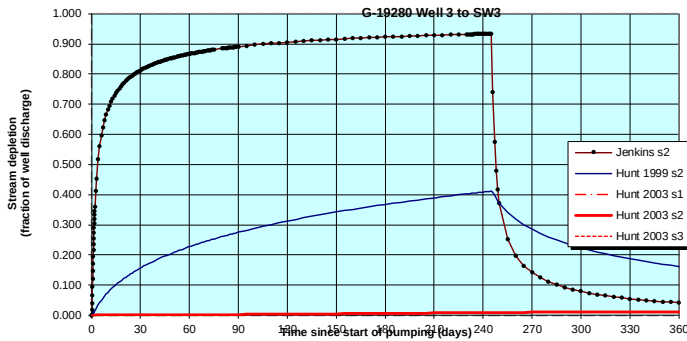
Input data

yellow = required					blue = recommended				
Parameter	Scenario 1	Scenario 2	Scenario 3	Unit	Description				
Plot Title	G-19280 Well 3 to SW2				Plot title				
Qw		4.99		cfs	Net steady pumping rate of well				
tpon		245		days	Time pump on (pumping duration)				
a	3720		3720	ft	Perpendicular distance from well to stream				
d		460		ft	Well depth				
K	100	100	100	ft/day	Aquifer hydraulic conductivity				
b	80	80	80	ft	Aquifer saturated thickness				
S	0.001	0.001	0.001		Aquifer storativity or specific yield				
Kva	0.02	0.02	0.02	ft/day	Aquitard vertical hydraulic conductivity				
ba	3	3	3	ft	Aquitard saturated thickness				
babs	3	3	3	ft	Aquitard thickness below stream				
n	0.2	0.2	0.2		Aquitard porosity				
ws	35	35	35	ft	Stream width				

Recalculate

Parameter	Scenario 1	Scenario 2	Scenario 3	Units	
Qw	4.99	4.99	4.99	cfs	
T	7.976	7.976	7.976	ft ² /day	= K*b
T	59.660	59.660	59.660	gpd/ft	= K*b
sbc	0.233333	0.233333	0.233333	ft/day	= Ks*ws/bs
sdf	1.735005	1.735005	1.735005	days	= (a ² *S)/(T)
sbfc	0.108826	0.108826	0.108826		= sbc*a/T
r	0.576367	0.576367	0.576367	1/days	= T/(a ² *S) input #1 for Hunt's Q_4 function
K'	11.566700	11.566700	11.566700		= (Ks/bs)*a ² /T input #2 for Hunt's Q_4 function
epsilon'	0.005000	0.005000	0.005000		= S/n input #3 for Hunt's Q_4 function
lamda'	0.108826	0.108826	0.108826		= sbc*a/T input #4 for Hunt's Q_4 function

Transient Stream Depletion (Jenkins, 1970; Hunt, 1999, 2003)



Output for Stream Depletion, Scenario 2 (s2):										
Time pump on (pumping duration) = 245 days										
Days	30	60	90	120	150	180	210	240	270	300
J SD	81.3%	86.7%	89.1%	90.6%	91.6%	92.3%	92.9%	93.3%	14.2%	7.9%
H SD 1999	15.7%	22.7%	27.5%	31.2%	34.2%	36.8%	39.0%	40.9%	28.5%	22.4%
H SD 2003	0.07%	0.14%	0.24%	0.35%	0.47%	0.61%	0.75%	0.89%	0.98%	1.05%
Qw, cfs	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990	4.990
H SD 99, cfs	0.783	1.135	1.374	1.559	1.709	1.835	1.944	2.040	1.422	1.117
H SD 03, cfs	0.003	0.007	0.012	0.018	0.024	0.030	0.037	0.044	0.049	0.052

Input data

yellow = required					blue = recommended				
Parameter	Scenario 1	Scenario 2	Scenario 3	Unit	Description				
Plot Title	G-19280 Well 3 to SW3				Plot title				
Qw		4.99		cfs	Net steady pumping rate of well				
tpon		245		days	Time pump on (pumping duration)				
a	5180		5180	ft	Perpendicular distance from well to stream				
d		460		ft	Well depth				
K	100	100	100	ft/day	Aquifer hydraulic conductivity				
b	80	80	80	ft	Aquifer saturated thickness				
S	0.001	0.001	0.001		Aquifer storativity or specific yield				
Kva	0.02	0.02	0.02	ft/day	Aquitard vertical hydraulic conductivity				
ba	3	3	3	ft	Aquitard saturated thickness				
babs	3	3	3	ft	Aquitard thickness below stream				
n	0.2	0.2	0.2		Aquitard porosity				
ws	35	35	35	ft	Stream width				

Recalculate

Parameter	Scenario 1	Scenario 2	Scenario 3	Units	
Qw	4.99	4.99	4.99	cfs	
T	7.976	7.976	7.976	ft ² /day	= K*b
T	59.660	59.660	59.660	gpd/ft	= K*b
sbc	0.233333	0.233333	0.233333	ft/day	= Ks*ws/bs
sdf	3.364142	3.364142	3.364142	days	= (a ² *S)/(T)
sbfc	0.151538	0.151538	0.151538		= sbc*a/T
r	0.297253	0.297253	0.297253	1/days	= T/(a ² *S) input #1 for Hunt's Q_4 function
K'	22.427616	22.427616	22.427616		= (Ks/bs)*a ² /T input #2 for Hunt's Q_4 function
epsilon'	0.005000	0.005000	0.005000		= S/n input #3 for Hunt's Q_4 function
lamda'	0.151538	0.151538	0.151538		= sbc*a/T input #4 for Hunt's Q_4 function