Groundwater Application Review Summary Form

Application # G- __18888__

GW Reviewer __Aurora C Bouchier__ **Date Review Completed:** __January 7, 2021__

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   <u>**January 7, 2021**</u>

TO: **Application** G-<u>___**18888**_____</u>

FROM: **GW:** <u>___**Aurora C Bouchier**_____</u>
                          (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**
                      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   January 7, 2021

FROM: Groundwater Section   Aurora C Bouchier

Reviewer's Name

SUBJECT: Application G- 18888   Supersedes review of _May 13, 2020_

Date of Review(s)

PUBLIC INTEREST PRESUMPTION; GROUNDWATER

OAR 690-310-130 (1) *The Department shall presume that a proposed groundwater use will ensure the preservation of the public welfare, safety and health as described in ORS 537.525.* Department staff review groundwater applications under OAR 690-310-140 to determine whether the presumption is established. OAR 690-310-140 allows the proposed use be modified or conditioned to meet the presumption criteria. **This review is based upon available information and agency policies in place at the time of evaluation**.

A. GENERAL INFORMATION: Applicant's Name: **John C. Mayfield**   County: **Wasco**

A1.   Applicant(s) seek(s) ~~0.05*~~ 0.10   cfs from 1 well(s) in the   Deschutes   Basin,

         White River   subbasin

A2.   Proposed use   Irrigation (8.1 acres)   Seasonality: April 15 – October 15

A3.   Well and aquifer data **(attach and number logs for existing wells; mark proposed wells as such under logid)**:

Well	Logid	Applicant's Well #	Proposed Aquifer*	Proposed Rate(cfs)	Location (T/R-S QQ-Q)	Location, metes and bounds, e.g. 2250' N, 1200' E fr NW cor S 36
1	proposed	JCM1	Tygh Valley Fm**	0.10	4S/13E-3 NE-NW	1069' S, 2039' E fr NW cor S 3
2						

* 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	1140				Est 150	TBD	TBD	TBD	TBD			

Use data from application for proposed wells.

A4.   **Comments:** *Section 3 of the application discusses the Highline Ditch and Diversion Elimination project (which includes transferring/converting/using as mitigation surface water rights [in whole or in part] into groundwater rights, and transferring the POU and POA for the remainder and additional surface water rights to remove a 9-mile long ditch). ~~This section explains that Mr. Cubic is one of the users in this project. Also in Section 3 the application requests 22.4 gpm but a specific well rate of 45 gpm. Note: Mr. Cubic has submitted an application (G-18889, under review) which requests 22.4 gpm for irrigation of 4.0 acres, and is also part of the ditch elimination project. It appears possible that the agent who helped with all four of the groundwater rights involved in this project (apps G-18888, G-18889, G-18890 & G-18891) copied and pasted portions of the various applications but failed to update all portions of the various applications. Consequentially, it is not clear what the requested rate was intended to be for this application.~~ An updated application page 4 clarifies that the requested rate is 45 gpm (0.10 cfs).

       Mr. Mayfield's land (downhill from the Highline Ditch) is authorized for use under surface water right Certificate 3733. Certificate 3733 authorizes irrigation for a total of 16.2 acres. A surface water transfer (T-13304, currently under review) involves transferring the POA and POU for 8.0 acres from Certificate 3733, but does not appear to involve the land involved in this application. This application indicates that 8.1 acres from Certificate 3733 could be used as mitigation for a new groundwater right.

       **The application states the source aquifer as the Tygh Valley Formation. However, at the proposed location it appears likely that the well would actually be constructed into water-bearing zones within Dalles Formation (Waters, 1968). The application states that the well inspector will be consulted on all aspects of well completion.

A5. ☒ **Provisions of the** _Deschutes_ 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: Outside the USGS Groundwater Study Area.

A6. ☐ **Well(s) #** _____ , _____ , _____ , _____ , _____ , tap(s) an aquifer limited by an administrative restriction.

Name of administrative area: _____

Version: 03/36/2020

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) **7J, 7N, 7T**   ;
        ii.   ☐ The permit should be conditioned as indicated in item 2 below.
        iii. ☐ The permit should contain special condition(s) as indicated in item 3 below;

B2.   a.   ☐ **Condition** to allow groundwater production from no deeper than _____ ft. below land surface;

    b.   ☐ **Condition** to allow groundwater production from no shallower than _____ ft. below land surface;

    c.   ☐ **Condition** to allow groundwater production only from the _____ 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:** _____
There are a number of nearby wells completed in the Dalles Formation. WASC 3630 (located on the south edge of Tygh Valley) has been monitored since the 1960's and shows no decline and a water-level coincident with nearby reaches of Tygh Creek. Two nearby wells (WASC 51079, located approximately 2 miles to the west along the north flank of Tygh Valley and WASC 51079 located approximately 1-1/2 miles on the hillsides to the northeast) have water-level permit conditions. Water-level measurements from WASC 51079 are relatively erratic, likely a response to pumping and restricted to a small locality. Aside from WASC 51079, the hydrograph for nearby wells indicates overall stable conditions at the current use.

The estimated yield listed on the nearby well logs range from 20 to 500 gpm. It appears likely that a well completed in the same formation should be capable of producing 45 gpm.

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	**Tygh Valley Formation***	☒	☐
		☐	☐

Basis for aquifer confinement evaluation: *Based on the location it appears that the well will be constructed into interbedded sandstones/claystones and lava flows of the Dalles Formation. The nearby well logs list the SWL above the first water-bearing zone, but not by a large amount. It may be more accurate to describe the aquifer as semiconfined.

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**	**Tygh Creek**	**~1100 - 1120**	**~1080- 1120**	**2740**	☒	☐	☐	☐	☒
1	**2**	**White River**	**~1100 - 1120**	**~1060**	**6250**	☒	☐	☐	☐	☒
						☐	☐	☐	☐	☐

Basis for aquifer hydraulic connection evaluation: The geologic maps suggest that a well at the proposed location will be completed into the Dalles Formation. Wells completed in Dalles Formation located within Tygh Valley or along the southern flank of the valley have water-levels which are coincident in elevation with nearby reaches of the surface waters. Wells completed in the Dalles Formation located on the hill slope to the north of the valley are generally located a larger distance above the valley floor and display water-levels ranging from approximately 10 to 60 feet in elevation above the surface water sources. The proposed POA is located right at the northern edge of the valley floor and will likely have an elevation slightly above to coincident with nearby surface waters.

Water Availability Basin the well(s) are located within: 70088: WHITE R > DESCHTUES R – AT MOUTH

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**	☐	☐	**IS 70088**	**60**	☐	**148**	☐	**<<25%**	☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐

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: <u>Interference at 30 days between the well and the surface water sources was estimated using the Hunt 2003 model.</u> <u>The low permeability layers below the stream bed result in an inefficient connection between the aquifer and the stream,</u> <u>therefore interference at 30 days should be less than 25%.</u>

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
1	**2**	**0 %**	**0 %**	**0 %**	**0 %**	**0 %**	**0 %**	**0.01 %**	**0.02 %**	**0.04 %**	**0.06 %**	**1.10 %**	**0.14 %**
Well Q as CFS		**0**	**0**	**0**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0.10**	**0**	**0**
Interference CFS		**0**	**0**	**0**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0001**	**0.0001**	**0.0001**	**0.0002**
Distributed Wells													
Well	SW#	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
(A) = Total Interf.		**0**	**0**	**0**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0001**
(B) = 80 % Nat. Q		**250**	**366**	**376**	**452**	**477**	**290**	**192**	**159**	**148**	**149**	**151**	**211**
(C) = 1 % Nat. Q		**2.50**	**3.66**	**3.76**	**4.52**	**4.77**	**2.90**	**1.92**	**1.59**	**1.48**	**1.49**	**1.51**	**2.11**
(D) = (A) > (C)		X	X	X	X	X	X	X	X	X	X	X	X
(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: Interference at 30 days between the well and the surface water sources was estimated using the Hunt 2003 model. Please note from the above table line (E) the largest value was 4.7 x e-7.

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)___**7J**_____ ;

   ii. ☐ The permit should contain special condition(s) as indicated in "Remarks" below;

C6. **SW / GW Remarks and Conditions:**

The White River is likely a regional sink.

References Used:
Application files: G-18888 and groundwater reviews for nearby applications G-16891 G-16956, G-17852 and G-18295.

OWRD well log database, in particular: WASC 51079, WASC 52540 and WASC 52609.

Sherrod, D. R., and Scott, W. E., 1995, Preliminary map of the Mount Hood 30- by 60-minute quadrangle, Cascade Range, north-central Oregon: Reston, Va., U.S. Geological Survey, Open File Report 95-219, map scale 100,000.

Waters, A.C., 1968, Reconnaissance geologic map of the Dufur quadrangle, Hood River, Sherman, and Wasco Counties, Oregon: U.S. Geological Survey, Miscellaneous Geologic Investigations Map I-556, scale 1:125,000.

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

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                         WATER AVAILABILITY TABLE

                      WHITE R > DESCHUTES R - AT MOUTH
Watershed ID #:   70088          Basin: DESCHUTES            Exceedance Level: 80
Time: 6:08 PM                                                    Date: 04/27/2020
-------------------------------------------------------------------------------
   # Watershed
Nest ID Number Stream Name                   JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC STOR
-------------------------------------------------------------------------------
   1    70087 DESCHUTES R > COLUMBIA R - AB MOUTH AT GAGE 14103000  NO  NO YES YES YES  NO  NO  NO  NO  NO  NO  NO  YES
   2    70088 WHITE R > DESCHUTES R - AT MOUTH                      NO  NO YES YES YES  NO  NO  NO  NO  NO  NO  NO  YES
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              DETAILED REPORT ON THE WATER AVAILABILITY CALCULATION

                      WHITE R > DESCHUTES R - AT MOUTH
Watershed ID #:   70088          Basin: DESCHUTES            Exceedance Level: 80
Time: 6:08 PM                                                    Date: 04/27/2020
-------------------------------------------------------------------------------
```

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	250.00	15.70	234.00	0.00	60.00	174.00
FEB	366.00	24.80	341.00	0.00	100.00	241.00
MAR	376.00	31.30	345.00	0.00	145.00	200.00
APR	452.00	52.70	399.00	0.00	145.00	254.00
MAY	477.00	113.00	364.00	0.00	145.00	219.00
JUN	290.00	121.00	169.00	0.00	100.00	69.00
JUL	192.00	89.60	102.00	0.00	60.00	42.40
AUG	159.00	72.40	86.60	0.00	60.00	26.60
SEP	148.00	64.50	83.50	0.00	60.00	23.50
OCT	149.00	52.00	97.00	0.00	60.00	37.00
NOV	151.00	5.82	145.00	0.00	60.00	85.20
DEC	211.00	8.59	202.00	0.00	60.00	142.00
ANN	276,000	39,400	237,000	0	63,600	173,000

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                  DETAILED REPORT OF INSTREAM REQUIREMENTS

                      WHITE R > DESCHUTES R - AT MOUTH
Watershed ID #:   70088                                        Basin: DESCHUTES
Time: 12:09 PM                                                   Date: 05/13/2020
-------------------------------------------------------------------------------
```

| Application Number	Status	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
					Monthly values are in cfs.								
MF201A	CERTIFICATE	60.0	95.0	95.0	95.0	95.0	95.0	60.0	60.0	60.0	60.0	60.00	60.0
MF202A	CERTIFICATE	60.0	100.0	145.0	145.0	145.0	100.0	60.0	60.0	60.0	60.0	60.00	60.0
IS70088A	CERTIFICATE	60.0	100.0	145.0	145.0	145.0	100.0	60.0	60.0	60.0	60.0	60.00	60.0
MAXIMUM		60.0	100.0	145.0	145.0	145.0	100.0	60.0	60.0	60.0	60.0	60.0	60.0

Well Location Map
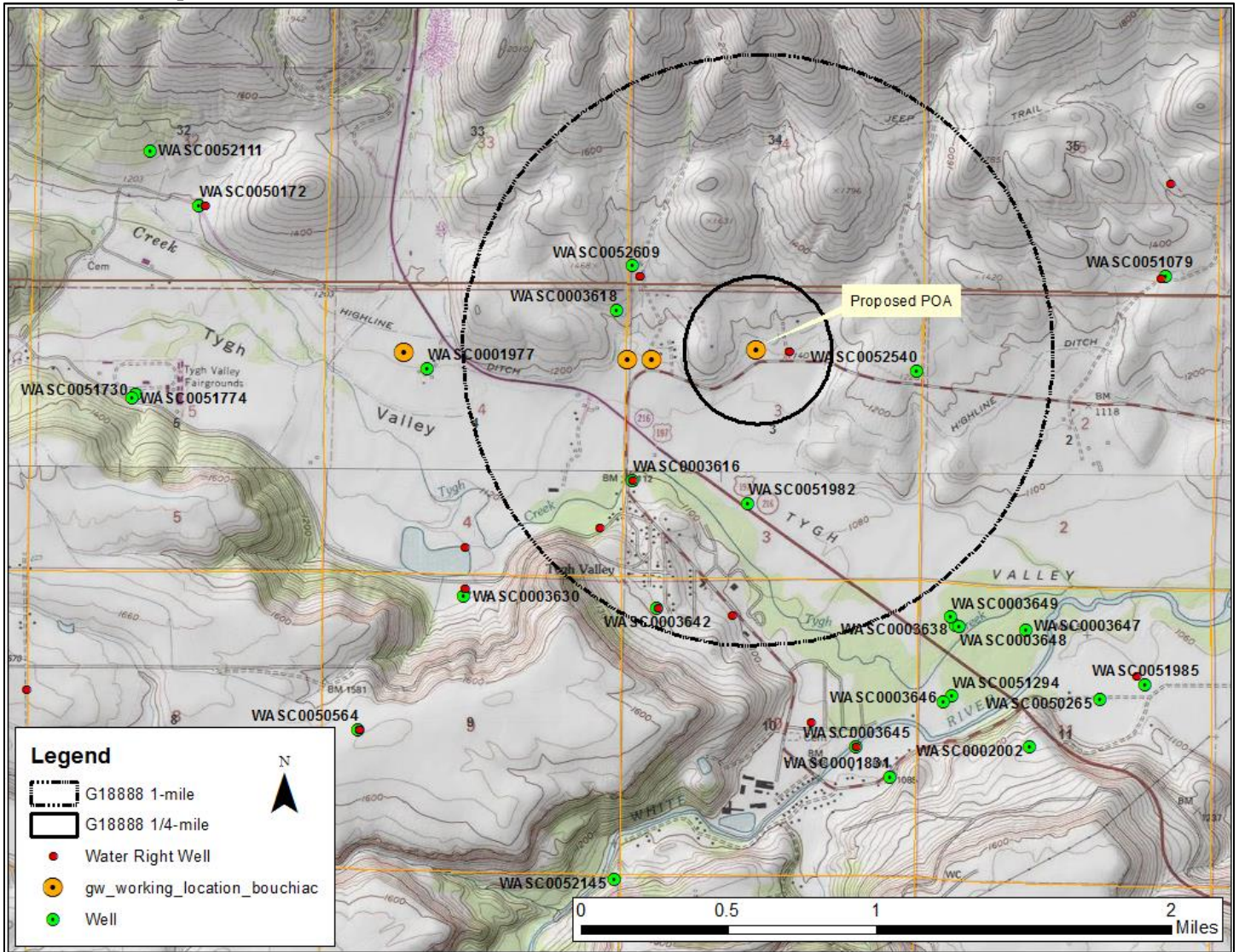
Geologic Map
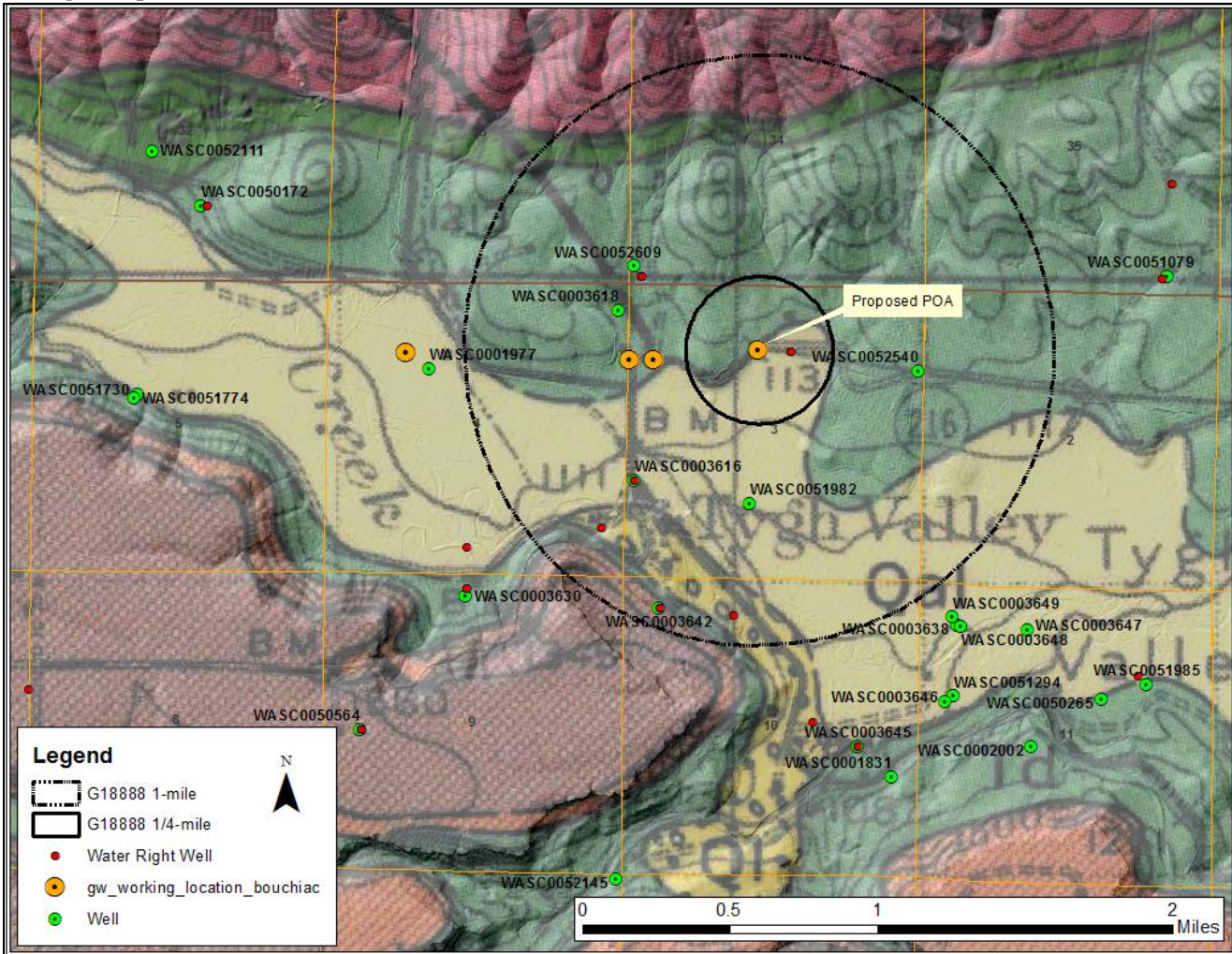
Water-Level Trends in Nearby Wells
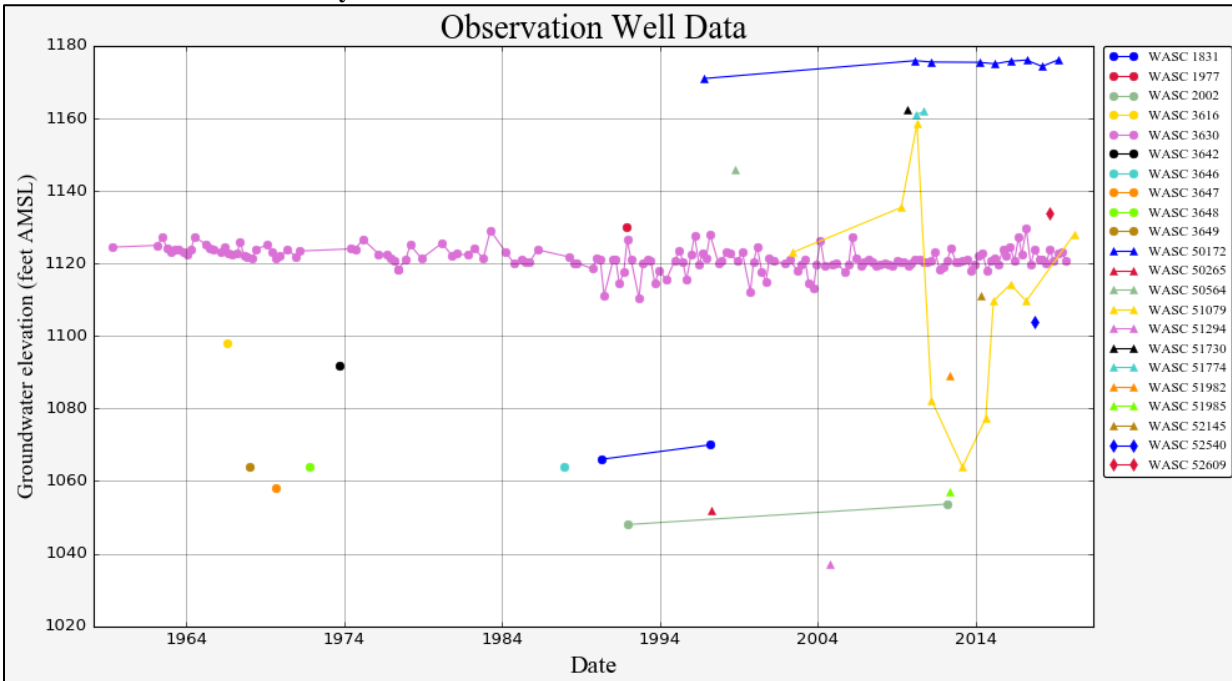
Stratigraphic Cross Section across Tygh Valley
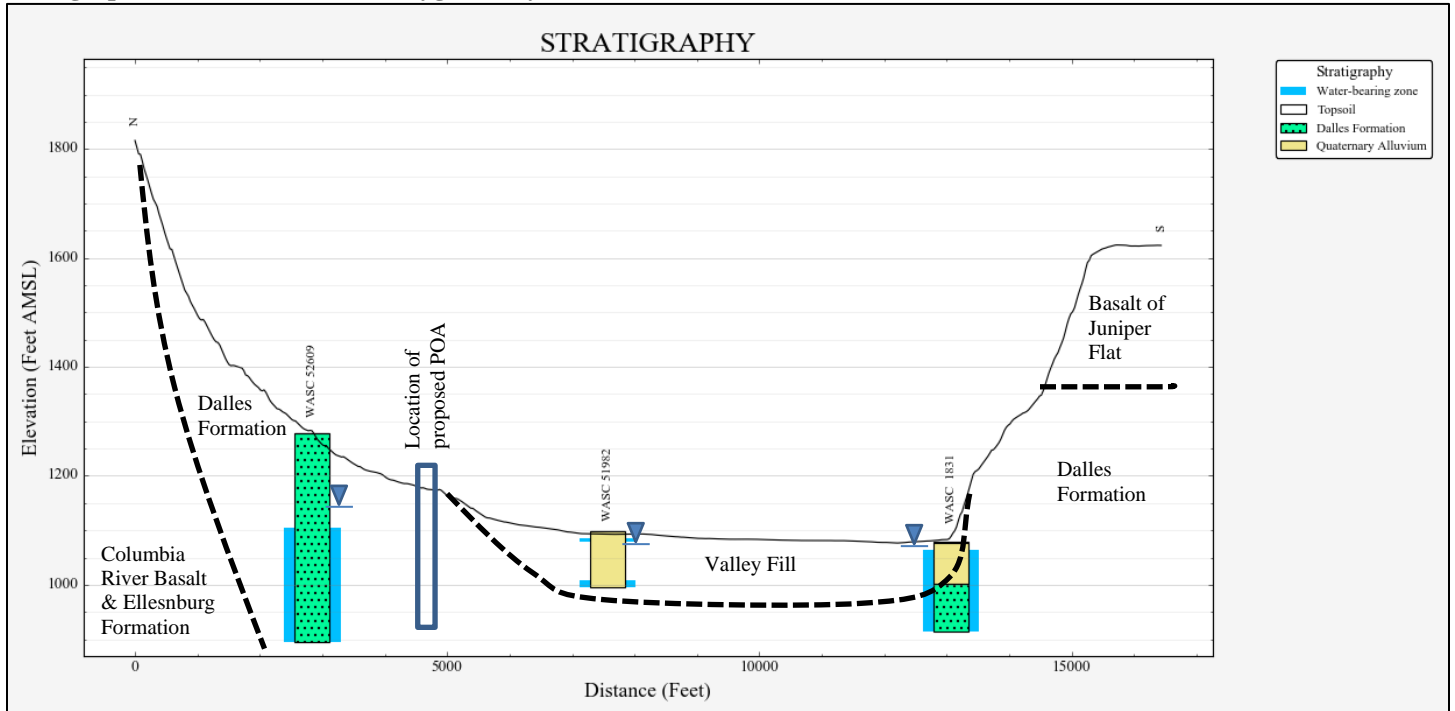
Analytical Model for Stream Depletion of Tygh Creek
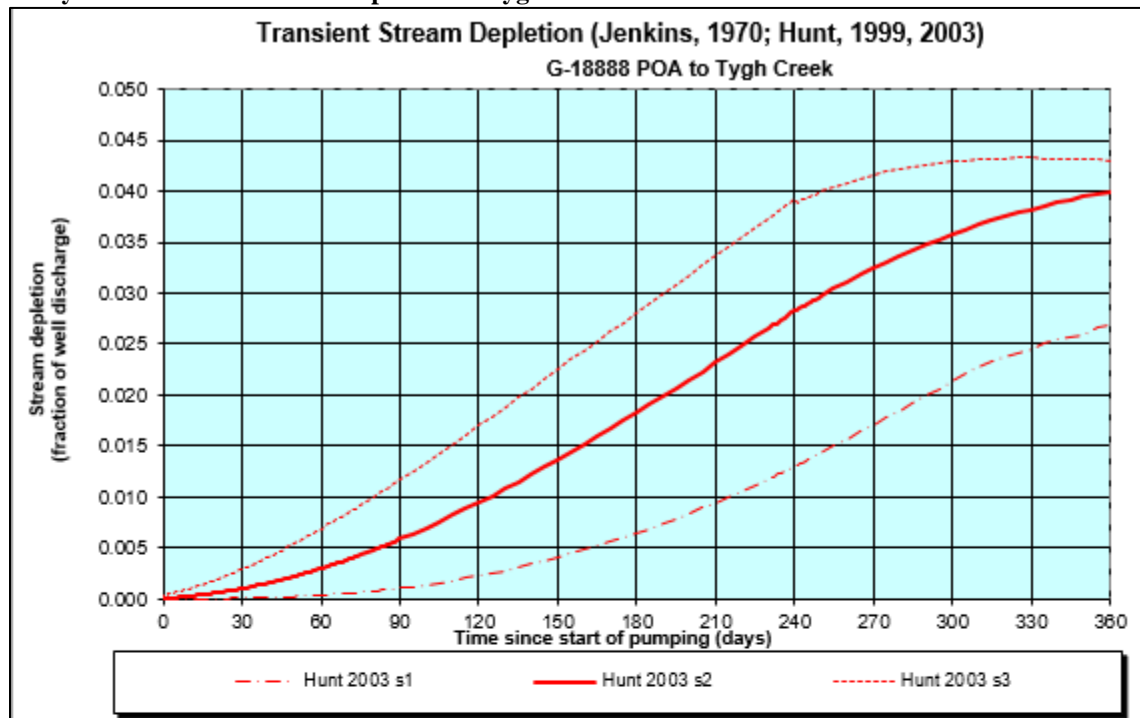
Transient Stream Depletion (Jenkins, 1970; Hunt, 1999, 2003)
G-18888 POA to Tygh Creek

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
J SD	80.2%	86.0%	88.5%	90.0%	91.1%	91.9%	92.5%	93.0%	13.1%	7.7%	5.5%	4.2%
H SD 1999	42.4%	54.2%	60.7%	65.0%	68.1%	70.5%	72.4%	74.0%	33.0%	22.2%	16.8%	13.4%
H SD 2003	0.10%	0.30%	0.59%	0.95%	1.37%	1.83%	2.32%	2.83%	3.24%	3.58%	3.82%	3.99%
Qw, cfs	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
H SD 99, cfs	0.042	0.054	0.061	0.065	0.068	0.070	0.072	0.074	0.033	0.022	0.017	0.013
H SD 03, cfs	0.000	0.000	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.004	0.004	0.004

Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate of well	Qw	0.10	0.10	0.10	cfs
Time pump on (pumping duration)	tpon	240	240	240	days
Perpendicular from well to stream	a	2740	2740	2740	ft
Well depth	d	250	250	250	ft
Aquifer hydraulic conductivity	K	10	25	50	ft/day
Aquifer saturated thickness	b	80	80	80	ft
Aquifer transmissivity	T	800	2000	4000	ft*ft/day
Aquifer storativity or specific yield	S	0.001	0.001	0.001	
Aquitard vertical hydraulic conductivity	Kva	1	1	1	ft/day
Aquitard saturated thickness	ba	90	90	90	ft
Aquitard thickness below stream	babs	80	80	80	ft
Aquitard porosity	n	0.2	0.2	0.2	
Stream width	ws	40	40	40	ft
Streambed conductance (lambda)	sbc	0.500000	0.500000	0.500000	ft/day
Stream depletion factor	sdf	9.384500	3.753800	1.876900	days
Streambed factor	sbf	1.712500	0.685000	0.342500	
input #1 for Hunt's Q_4 function	t'	0.106559	0.266397	0.532793	
input #2 for Hunt's Q_4 function	K'	104.272222	41.708889	20.854444	
input #3 for Hunt's Q_4 function	epsilon'	0.005000	0.005000	0.005000	
input #4 for Hunt's Q_4 function	lamda'	1.712500	0.685000	0.342500	

Analytical Model for Stream Depletion of White River
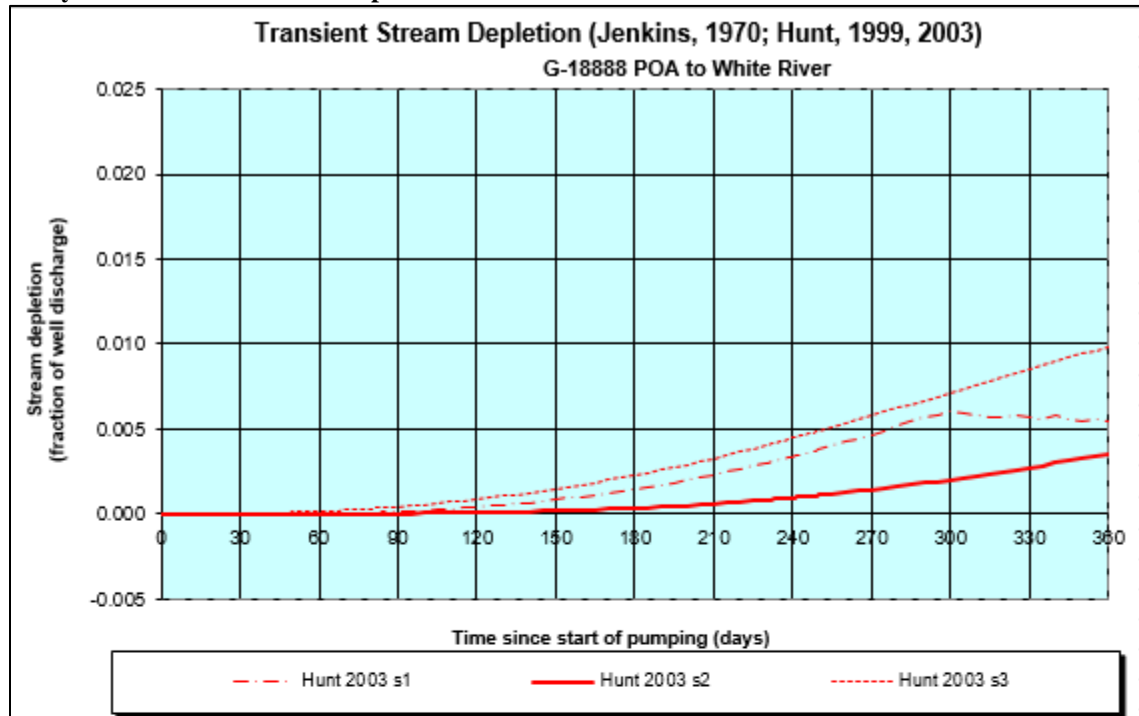
Transient Stream Depletion (Jenkins, 1970; Hunt, 1999, 2003)
G-18888 POA to White River

Stream depletion (fraction of well discharge) vs. Time since start of pumping (days)

Legend: — · — Hunt 2003 s1   —— Hunt 2003 s2   ------- Hunt 2003 s3

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
J SD	56.8%	68.7%	74.2%	77.5%	79.9%	81.6%	82.9%	84.0%	28.1%	17.0%	12.2%	9.4%
H SD 1999	27.6%	41.2%	49.0%	54.4%	58.3%	61.3%	63.8%	65.8%	39.9%	27.8%	21.3%	17.1%
H SD 2003	0.00%	0.00%	0.00%	0.01%	0.02%	0.04%	0.06%	0.10%	0.14%	0.20%	0.27%	0.35%
Qw, cfs	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100	0.100
H SD 99, cfs	0.028	0.041	0.049	0.054	0.058	0.061	0.064	0.066	0.040	0.028	0.021	0.017
H SD 03, cfs	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0001	0.0002	0.0003	0.0004

Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate of well	Qw	0.10	0.10	0.10	cfs
Time pump on (pumping duration)	tpon	240	240	240	days
Perpendicular from well to stream	a	6250	6250	6250	ft
Well depth	d	250	250	250	ft
Aquifer hydraulic conductivity	K	10	25	50	ft/day
Aquifer saturated thickness	b	80	80	80	ft
Aquifer transmissivity	T	800	2000	4000	ft*ft/day
Aquifer storativity or specific yield	S	0.001	0.001	0.001	
Aquitard vertical hydraulic conductivity	Kva	1	1	1	ft/day
Aquitard saturated thickness	ba	90	90	90	ft
Aquitard thickness below stream	babs	80	80	80	ft
Aquitard porosity	n	0.2	0.2	0.2	
Stream width	ws	40	40	40	ft
Streambed conductance (lambda)	sbc	0.500000	0.500000	0.500000	ft/day
Stream depletion factor	sdf	48.828125	19.531250	9.765625	days
Streambed factor	sbf	3.906250	1.562500	0.781250	
input #1 for Hunt's Q_4 function	t'	0.020480	0.051200	0.102400	
input #2 for Hunt's Q_4 function	K'	542.534722	217.013889	108.506944	
input #3 for Hunt's Q_4 function	epsilon'	0.005000	0.005000	0.005000	
input #4 for Hunt's Q_4 function	lamda'	3.906250	1.562500	0.781250	