Groundwater Application Review Summary Form

Application # G- 18772

GW Reviewer Travis Brown **Date Review Completed:** 5/3/2019

Summary of GW Availability and Injury Review:

[ ] Groundwater for the proposed use is either over appropriated, will not likely be available in the amounts requested without injury to prior water rights, OR will not likely be available within the capacity of the groundwater resource per Section B of the attached review form.

Summary of Potential for Substantial Interference Review:

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

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 May 3 ,20 19

TO: **Application G-** 18772

FROM: **GW:** Travis Brown
(Reviewer's Name)

SUBJECT: Scenic Waterway Interference Evaluation

☐ YES
The source of appropriation is within or above a Scenic Waterway
☒ NO

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

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

☐ Per ORS 390.835, the Groundwater Section is **unable** to calculate ground water interference with surface water that contributes to a scenic waterway; **therefore, the Department is unable to find that there is a preponderance of evidence that the proposed use will measurably reduce the surface water flows necessary to maintain the free-flowing character of a scenic waterway.**

DISTRIBUTION OF INTERFERENCE

Calculate the percentage of consumptive use by month and fill in the table below. If interference cannot be calculated, per criteria in 390.835, do not fill in the table but check the "unable" option above, thus informing Water Rights that the Department is unable to make a Preponderance of Evidence finding.

Exercise of this permit is calculated to reduce monthly flows in _____ Scenic Waterway by the following amounts expressed as a proportion of the consumptive use by which surface water flow is reduced.

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

PUBLIC INTEREST REVIEW FOR GROUNDWATER APPLICATIONS

TO: Water Rights Section Date 5/3/2019
FROM: Groundwater Section Travis Brown
Reviewer's Name
SUBJECT: Application G- 18772 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: **Brian and Duane LLC c/o Duane Ditchen** County: **Marion**

A1. Applicant(s) seek(s) 0.36 cfs from 2 well(s) in the Willamette River Basin, Molalla-Pudding River subbasin

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

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

Well	Logid	Applicant's 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	1	Alluvium	0.36	6S/1W-31 NE-NW	1590' N, 150' W fr NE cor DLC 38
2	Proposed	2	Alluvium	0.36	6S/1W-31 SE-NW	465' N, 0' W fr NE cor DLC 38

* 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[a]				300		TBD	TBD	TBD			
2	~194[a]				300		TBD	TBD	TBD			

Use data from application for proposed wells.

A4. **Comments:** The proposed POA/POU are located approximately 3.5 miles west of the City of Silverton, Oregon.

[a] Well head elevation estimated based on LIDAR measurements at proposed well locations (Watershed Sciences, 2009)

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 POA are greater than ¼-mile from the nearest surface water source; therefore, per OAR 690-502-0240, the relevant Willamette Basin rules (OAR 690-502-0140) do not apply.

A6. ☐ **Well(s) #** _____, _____, _____, _____, _____, tap(s) an aquifer limited by an administrative restriction.
Name of administrative area: **N/A**
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 (annual measurement condition), medium water use**;
   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.

Although the application does not provide specific casing or perforation/screen depths, the proposed POA will likely produce water from the sands and gravels of the Willamette aquifer, estimated at approximately 80 ft thick in this area (Gannett and Caldwell, 1998). Logs from nearby water well reports indicate water-bearing sands and gravels at elevations between ~100 to 20 ft above mean sea level (amsl) (approximate depths of 80 to 175 ft below land surface [bls] at the proposed POA locations). The Willamette aquifer in this area is sandwiched between the underlying fine-grained Willamette confining unit (~200-400 ft thick in this area) and the overlying Willamette silt (~80 ft thick in this area) (Gannett and Caldwell, 1998).

Reported depths for nearby water wells range from 90 to 227 ft bls, while reported yields range from 15 to 600 gpm (~0.033 to 1.34 cfs) with a median of 150 gpm (~0.33 cfs) (see attached Well Statistics – Section 31). The requested maximum rate (0.36 cfs or ~162 gpm) is well within the range of reported yields for this area, although slightly above the median. Water levels from nearby observation wells do not indicate widespread or excessive declines (see attached Hydrograph).

The nearest known groundwater right to the proposed POA is Certificate 65958* (MARI 3512), ~1,170 ft southwest of proposed POA 2. MARI 3512 is a 160 ft deep well authorized to withdrawal up to 328.75 af of groundwater for supplemental irrigation at a maximum rate of 1.64 cfs (~736 gpm), although the water well report for MARI 3512 only indicated a yield of 400 gpm (~0.89 cfs) upon its completion in 1982. Reported water levels in MARI 3512 range from 27 ft bls (~168 ft amsl) in February 1982 to 58.93 ft bls (~136 ft amsl) in August 1990. The August 1990 water level would equate to ~100 ft of available drawdown in MARI 3512. Pumping test data from alluvial wells in this area indicate transmissivity values ranging from ~900 to 3800 ft^2/day, with a median of 2000 ft^2/day. Based on the relatively high transmissivity of the alluvial aquifer in this area and the substantial (>1,000 ft) distance between the proposed POA and the nearest known groundwater right (Certificate 65958* / MARI 3512), the proposed use is not anticipated to deprive other groundwater rights of their customary use of groundwater.

Based on the preponderance of evidence, the proposed use will likely avoid injury to existing groundwater rights and to the groundwater resource if conditioned as recommended in B(1)(d)(ii) and B(2)(c), above.

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: Nearby water well reports in Section 31 show water levels above the applicable water-bearing zones. The alluvial water level near the proposed POA has been estimated at 180 ft amsl, which is ~40 to 60 ft above the estimated elevation of the top of the Willamette aquifer in this area (Gannett and Caldwell, 1998). Based on the available evidence, the proposed aquifer appears to be 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	**Howell Prairie Creek**	**~160-180**	**166-157**	**2,640**	☒	☐	☐	☐	☒
1	2	**Pudding River**	**~160-180**	**149-144**	**3,820**	☒	☐	☐	☐	☒
1	3	**Holden Reservoir**	**~160-180**	**158-156**	**3,840**	☒	☐	☐	☐	☒
2	1	**Howell Prairie Creek**	**~160-180**	**166-162**	**3,060**	☒	☐	☐	☐	☒
2	2	**Pudding River**	**~160-180**	**149-146**	**3,670**	☒	☐	☐	☐	☒
2	3	**Holden Reservoir**	**~160-180**	**158-156**	**2,750**	☒	☐	☐	☐	☒

Basis for aquifer hydraulic connection evaluation: The estimated groundwater elevation is similar to or above the estimated elevation of the nearby surface water sources. This is sufficient to conclude that there is likely hydraulic connection between nearby surface water and the saturated alluvial sediments in this area.

Water Availability Basin the well(s) are located within: SW1: PUDDING R > MOLALLA R – AB MILL CR
SW2-3: PUDDING R> MOLALLA R – AB HOWELL PRAIRIE

C3a. **690-09-040 (4):** Evaluation of stream impacts for each well that has been determined or assumed to be **hydraulically connected and less than 1 mile** from a surface water source. Limit evaluation to instream rights and minimum stream flows that are pertinent to that surface water source, and not lower SW sources to which the stream under evaluation is tributary. Compare the requested rate against the 1% of 80% *natural* flow for the pertinent Water Availability Basin (WAB). If Q is not distributed by well, use full rate for each well. Any checked ☒ box indicates the well is assumed to have the potential to cause PSI.

Well	SW #	Well < ¼ mile?	Qw > 5 cfs?	Instream Water Right ID	Instream Water Right Q (cfs)	Qw > 1% ISWR?	80% Natural Flow (cfs)	Qw > 1% of 80% Natural Flow?	Interference @ 30 days (%)	Potential for Subst. Interfer. Assumed?
1	1	☐	☐	**N/A**	**N/A**	☐	**67.30**	☐	**<25%**	☐
1	2	☐	☐	**IS73536A**	**5.0**	☒	**22.70**	☒	**<25%**	☒
1	3	☐	☐	**N/A**	**N/A**	☐	**22.70**	☒	**<25%**	☒
2	1	☐	☐	**N/A**	**N/A**	☐	**67.30**	☐	**<25%**	☐
2	2	☐	☐	**IS73536A**	**5.0**	☒	**22.70**	☒	**<25%**	☒
2	3	☐	☐	**N/A**	**N/A**	☐	**22.70**	☒	**<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: C3a: The proposed rate of appropriation (0.36 cfs) is greater than both one percent (0.05 cfs) of the applicable instream water right (IS73536A, 5.0 cfs) for SW 2 and one percent (0.227 cfs) of the discharge that is equaled or exceeded 80 percent of time (22.7 cfs) for SW 2-3. On this basis, PSI is assumed per OAR 690-09-0040(4)(c). (See attached Water Availability Tables.)

Potential depletion of SW 1-3 due to pumping of the proposed POA was estimated using the Hunt 2003 analytical model. Hydraulic parameters used for the model were derived from regional data or studies of the hydrogeologic regime (Pumping Test Reports; Water Well Reports; Conlon el al.., 2003, 2005; Iverson, 2002; McFarland and Morgan, 1996; Woodward et al., 1998) or are within a typical range of values for the parameter within the hydrogeologic regime (Domenico and Mifflin, 1965; Freeze and Cherry, 1979) (see attached Stream Depletion Analyses). To be conservative, the total volume requested (72 af) was pro-rated over the requested period of use (March 1 through October 31 = 245 days) for an effective pumping rate of ~0.15 cfs (~67 gpm).

The Hunt 2003 model results indicate that depletion of (interference with) SW 1-3 due to pumping of the proposed POA is anticipated to be much less than 25 percent of the well discharge at 30 days of continuous pumping. This is most likely due to the substantial thickness of fine-grained sediments underlying the nearby surface water sources creating a highly inefficient hydraulic connection.

C3b: N/A

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													
(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: N/A

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:** The proposed POA are determined to be hydraulically connected to SW 2 (Pudding River) and SW 3 (Holden Reservoir) and the proposed rate of appropriation is greater than one percent of both the instream water right for SW 2 and the discharge that is equaled or exceeded 80 percent of the time for SW 2-3. On these bases, PSI is assumed per OAR 690-09-0040(4)(c).

References Used:

Application File: G-18772

Pump Test Files: MARI 3507, 3510, 3516, 3583, 3584, 4437, 4751

Water Well Reports: MARI 3507, 3512, 3515, 3583, 58801, 61397, 63433

Conlon, T.D., Lee, K.K., and Risley, J.R., 2003, Heat tracing in streams in the central Willamette Basin, Oregon, in Stonestrom, D.A. and Constantz, Jim, eds., Heat as a tool for studying the movement of groundwater near streams: U.S. Geological Survey Circular 1260, chapter 5, p. 29-34.

Conlon, T.D., Wozniak, K.C., Woodcock, D., Herrera, N.B., Fisher, B.J., Morgan, D.S., Lee, K.K., and Hinkle, S.R., 2005, Ground-water hydrology of the Willamette Basin, Oregon: U.S. Geological Survey Scientific Investigations Report 2005-5168.

Domenico, P.A. and Mifflin, 1965, Water from low-permeability sediments and land subsidence: Water Resource Research, v. 1, no. 4, p. 563-576.

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: U.S. Geological Survey Professional Paper 1424-A, 32 p.

Hunt, B., 2003, Unsteady stream depletion when pumping from semiconfined aquifer: Journal of Hydrologic Engineering, January/February, 2003.

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.

McFarland, W.D., and Morgan, D.S., 1996, Description of the Ground-Water Flow System in the Portland Basin, Oregon and Washington: U.S. Geological Survey Water Supply Paper 2470-A, 58 p.

United States Geological Survey, 2013, National Elevation Dataset (NED) [DEM geospatial data]. 1/9th arc-second, updated 2013.

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

Watershed Sciences, 2009. LIDAR Remote Sensing Data Collection: Willamette Valley Phase I, Oregon. 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:**

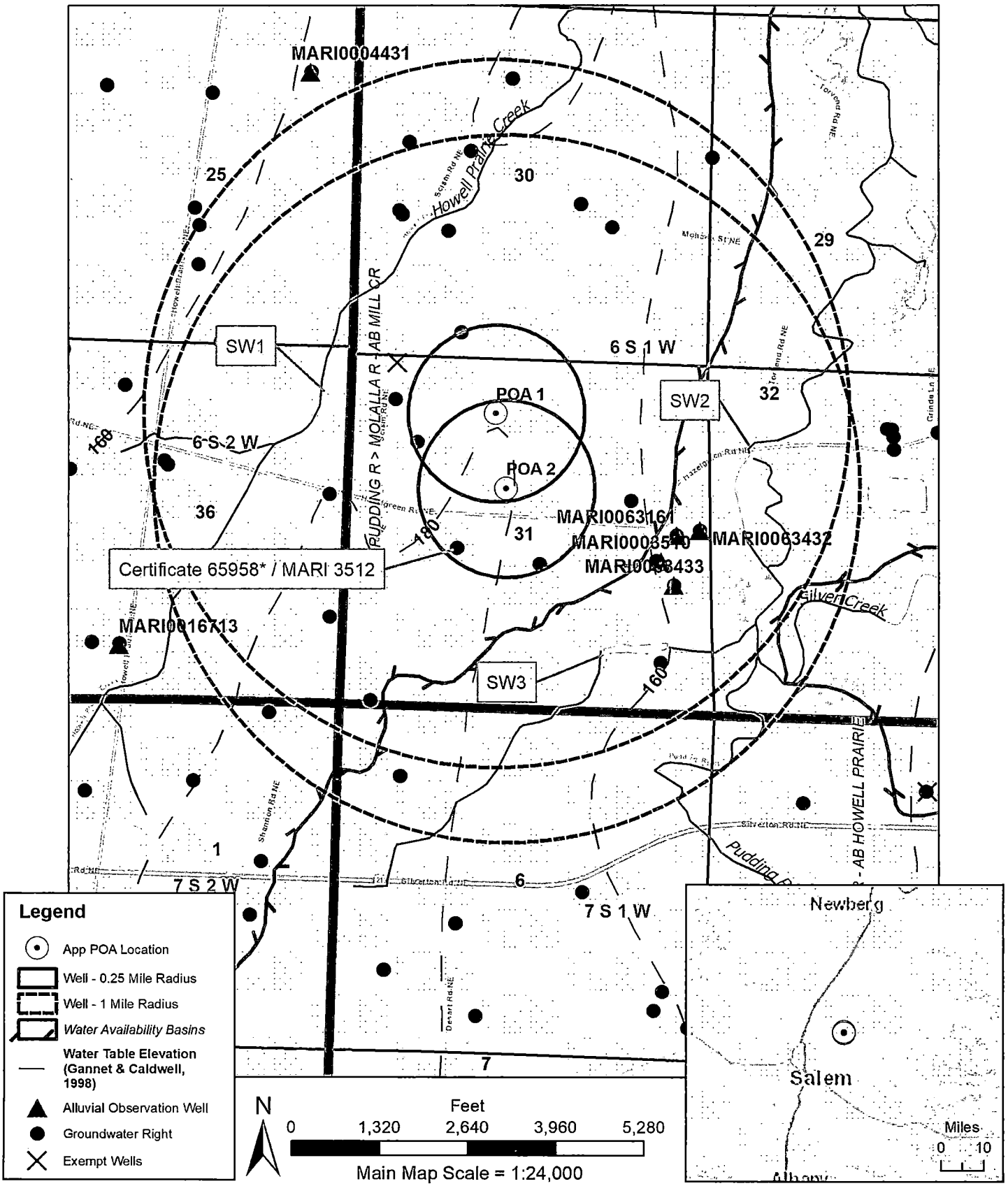
a. ☐ review of the well log;
b. ☐ field inspection by _____;
c. ☐ report of CWRE _____;
d. ☐ other: (specify) _____

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.**

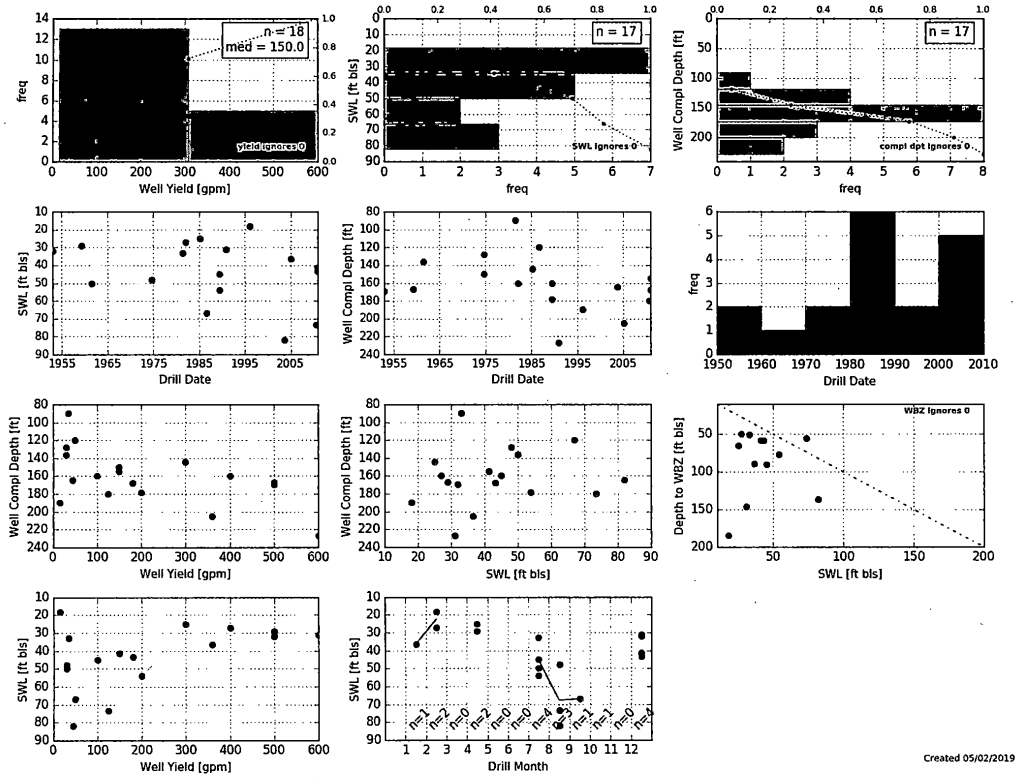
Well Location Map

G-18772 Brian and Duane, LLC



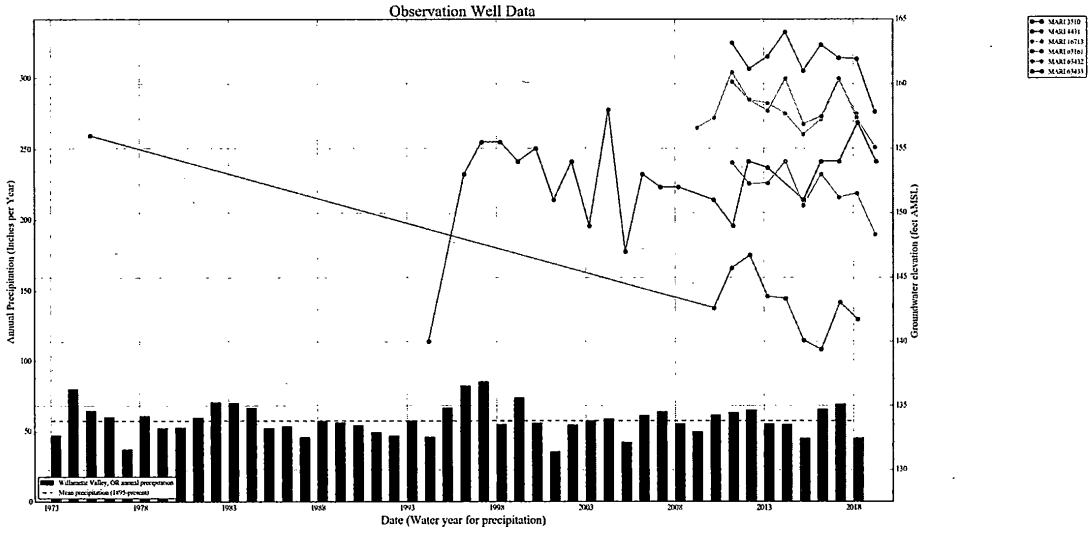
Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Well Statistics



Created 05/02/2019

Hydrograph



Water Availability Tables

Water Availability Analysis
Detailed Reports

PUDDING R > MOLALLA R - AB HOWELL PRAIRIE
WILLAMETTE BASIN

Water Availability as of 5/3/2019

Watershed ID #: 152 (Map) Exceedance Level: 80%
Date: 5/3/2019 Time: 9:24 AM

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	603.00	69.80	533.00	0.00	10.00	523.00
FEB	649.00	60.90	588.00	0.00	10.00	578.00
MAR	587.00	39.90	547.00	0.00	10.00	537.00
APR	451.00	21.20	430.00	0.00	10.00	420.00
MAY	235.00	14.10	221.00	0.00	10.00	211.00
JUN	111.00	28.90	82.10	0.00	10.00	72.10
JUL	43.60	44.30	-0.68	0.00	10.00	-10.70
AUG	24.70	36.70	-12.00	0.00	10.00	-22.00
SEP	22.70	21.90	0.84	0.00	10.00	-9.16
OCT	38.90	3.96	34.90	0.00	10.00	24.90
NOV	233.00	18.60	214.00	0.00	10.00	204.00
DEC	608.00	63.80	544.00	0.00	10.00	534.00
ANN	385,000.00	25,600.00	360,000.00	0.00	7,240.00	353,000.00

Water Availability Analysis
Detailed Reports

PUDDING R > MOLALLA R - AB MILL CR
WILLAMETTE BASIN

Water Availability as of 5/3/2019

Watershed ID #: 151 (Map) Exceedance Level: 80%
Date: 5/3/2019 Time: 9:25 AM

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	1,040.00	124.00	916.00	0.00	36.00	880.00
FEB	1,180.00	114.00	1,070.00	0.00	36.00	1,030.00
MAR	1,010.00	75.60	934.00	0.00	36.00	898.00
APR	787.00	51.40	736.00	0.00	36.00	700.00
MAY	425.00	49.20	376.00	0.00	36.00	340.00
JUN	224.00	70.60	153.00	0.00	36.00	117.00
JUL	109.00	111.00	-2.36	0.00	36.00	-38.40
AUG	71.00	91.20	-20.20	0.00	36.00	-56.20
SEP	67.30	51.70	15.60	0.00	36.00	-20.40
OCT	91.60	10.60	81.00	0.00	36.00	45.00
NOV	363.00	48.10	315.00	0.00	36.00	279.00
DEC	957.00	118.00	839.00	0.00	36.00	803.00
ANN	706,000.00	55,300.00	651,000.00	0.00	26,100.00	627,000.00

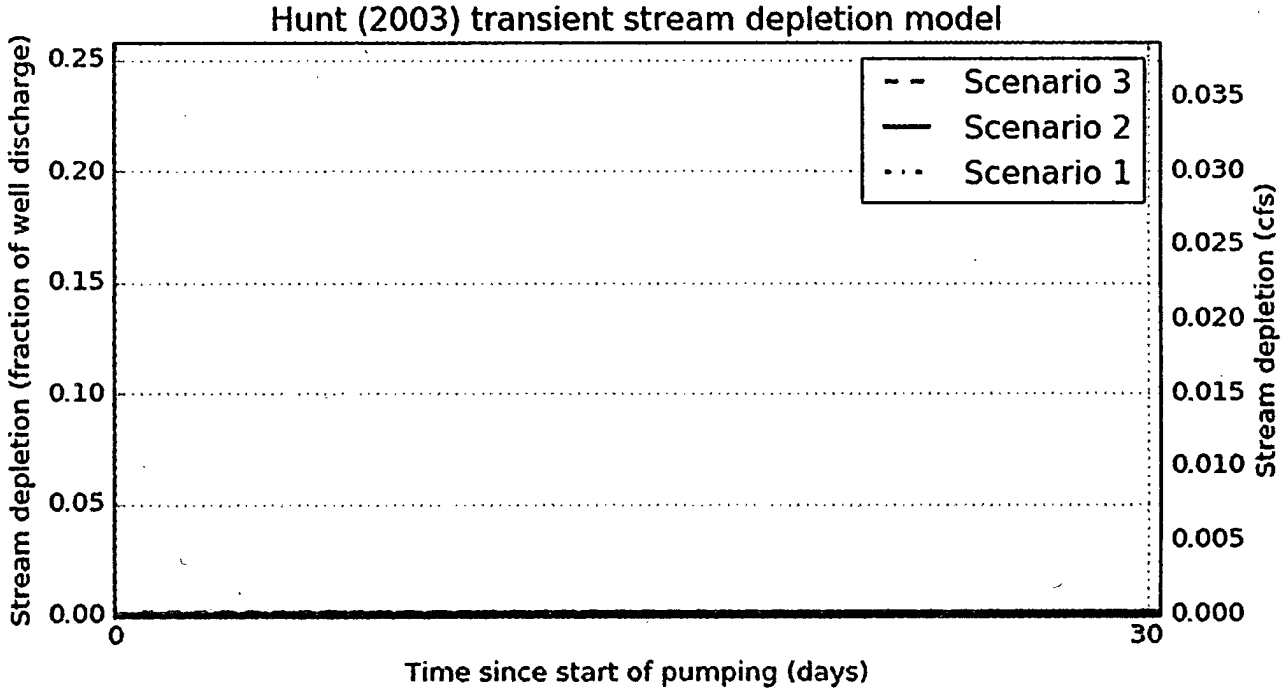
Stream Depletion Analysis – POA 1:SW 1

Application type:	G
Application number:	18772
Well number:	1
Stream Number:	1
Pumping rate (cfs):	0.15
Pumping duration (days):	245
Pumping start month number (3=March)	3.0

Parameter	Symbol	Scenario 1	Scenario 2	Scenario 3	Units
Distance from well to stream	a	2640	2640	2640	ft
Aquifer transmissivity	T	900	2000	3800	ft2/day
Aquifer storativity	S	0.001	0.0005	0.0001	-
Aquitard vertical hydraulic conductivity	Kva	0.001	0.005	0.01	ft/day
Aquitard saturated thickness	ba	80	80	80	ft
Aquitard thickness below stream	babs	75	63	50	ft
Aquitard specific yield	Sya	0.2	0.2	0.2	-
Stream width	ws	10	10	10	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	0	0	0	0	0	0	0	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



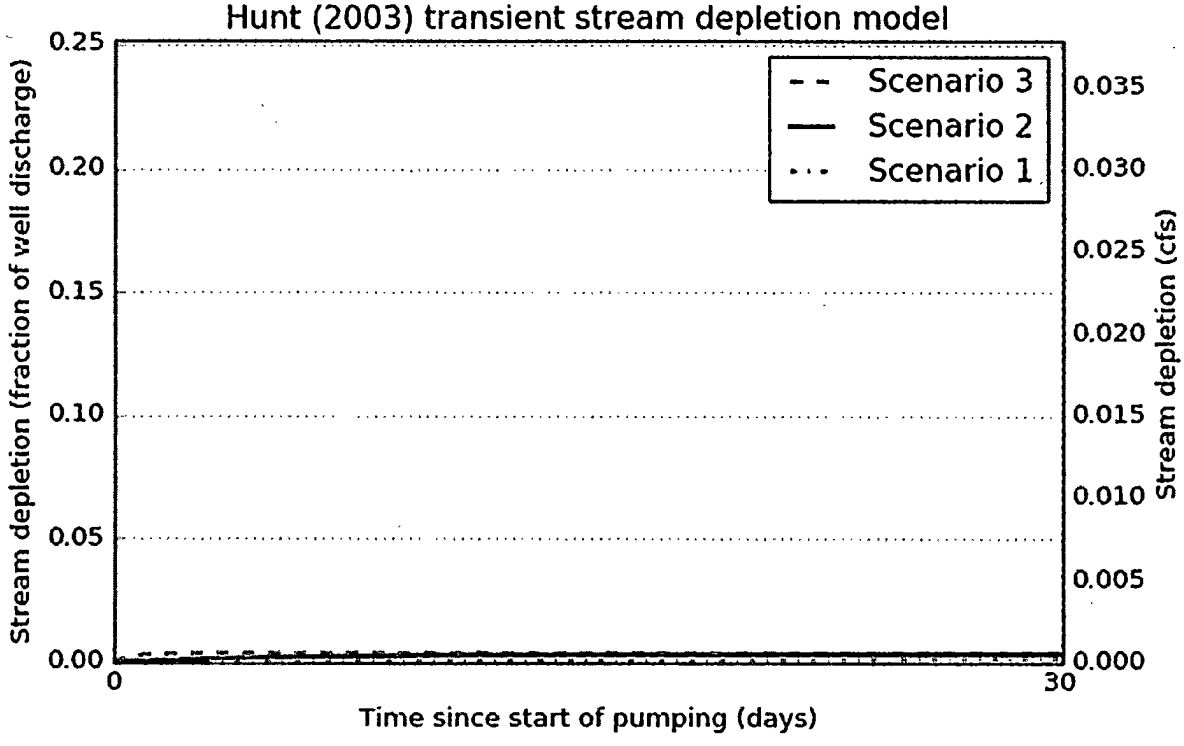
Stream Depletion Analysis – POA 2:SW 2

Application type:	G
Application number:	18772
Well number:	2
Stream Number:	2
Pumping rate (cfs):	0.15
Pumping duration (days):	245
Pumping start month number (3=March)	3.0

Parameter	Symbol	Scenario 1	Scenario 2	Scenario 3	Units
Distance from well to stream	a	3670	3670	3670	ft
Aquifer transmissivity	T	900	2000	3800	ft2/day
Aquifer storativity	S	0.001	0.0005	0.0001	-
Aquitard vertical hydraulic conductivity	Kva	0.001	0.005	0.01	ft/day
Aquitard saturated thickness	ba	80	80	80	ft
Aquitard thickness below stream	babs	50	47	45	ft
Aquitard specific yield	Sya	0.2	0.2	0.2	-
Stream width	ws	40	40	40	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	0	0	0	0	0	0	0	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



Stream Depletion Analysis – POA 2:SW 3

Application type:	G
Application number:	18772
Well number:	2
Stream Number:	3
Pumping rate (cfs):	0.15
Pumping duration (days):	245
Pumping start month number (3=March)	3.0

Parameter	Symbol	Scenario 1	Scenario 2	Scenario 3	Units
Distance from well to stream	a	2750	2750	2750	ft
Aquifer transmissivity	T	900	2000	3800	ft2/day
Aquifer storativity	S	0.001	0.0005	0.0001	-
Aquitard vertical hydraulic conductivity	Kva	0.001	0.005	0.01	ft/day
Aquitard saturated thickness	ba	80	80	80	ft
Aquitard thickness below stream	babs	60	57	55	ft
Aquitard specific yield	Sya	0.2	0.2	0.2	-
Stream width	ws	150	150	150	ft

Stream depletion for Scenario 2:

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