Groundwater Application Review Summary Form

Application # G- 19411

GW Reviewer Stacey Garrison Date Review Completed: 9/20/2024

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 **_September 20 2024_**

TO: **Application** G-**_19411_**

FROM: **GW: _Stacey Garrison_**
(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 9/20/2024
FROM: Groundwater Section Stacey Garrison
Reviewer's Name
SUBJECT: Application G- **19411** 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: **Ed Landholdings LLC c/o Eric Ditchen** County: **Marion**

A1. Applicant(s) seek(s) 0.67 cfs from 1 well(s) in the Willamette Basin, Molalla-Pudding 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)**:

POA 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	PROP 518	1	Alluvial	0.67	6S/2W-23 SE-SE	1065' N, 585' W fr SE cor S 23[a]

* Alluvium, CRB, Bedrock

[a]There is a discrepancy between the mapped location of the POA as indicated on the applicant's map and the metes-and-bounds description using the Department's PLSS projection. The mapped location is 122 ft NW of the metes-and-bounds location; the mapped location is used.

POA Well	Well Depth (ft)	Seal Interval (ft)	Casing Intervals (ft)	Liner Intervals (ft)	Perforations Or Screens (ft)	Well Yield (gpm)	Drawdown (ft)	Test Type
1	175	20	0 to 175		TBD			

Use data from application for proposed wells.

A4. **Comments:** The POA/POU are located 5.3 miles northwest of Silverton, Oregon. Applicant proposes to irrigate 54.5 ac at 0.67 cfs (300.7 gpm) with a maximum annual volume of 136.25 AF.

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 POA is anticipated to develop a confined aquifer. Per OAR 690-502-0240, the relevant basin rules (OAR 690-502-0120) 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) **7RLN (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:** The POA/POU are located on Missoula Flood deposits also known as the Willamette Silt. (Tolan, 2000; Hampton, 1972). The Willamette Silt in this area is approximately 80 ft thick, although the maximum thickness of clay and silt confining layers recorded in nearby wells is 101 ft[a] (Woodward et al., 1998). This is consistent with the yellow and blue clays recorded in nearby well logs[a] as the Willamette Silt is typified as blue and yellow sand, silt, and clay (Hampton, 1972; Conlon et al., 2005). The water-bearing zone, WBZ, of the proposed POA, PROP 518, is anticipated to utilize the underlying Willamette Aquifer, which is between 120 and 140 ft thick and is part of the Middle Sedimentary Unit (Woodward et al., 1998; Gannett & Caldwell, 1998; Conlon et al., 2005). There is a wide variability in hydraulic characteristics of the Willamette aquifer, owing to the variety of compositions and degree of consolidation (O'Connor et al., 2001). The thickness of WBZs using the MSU of the Willamette Aquifer in surrounding wells varies from 40 to 173 feet in thickness[a].

A review of statistics for nearby well records was completed and compared with the proposed rate of 0.67 cfs (300.7 gpm) for this application (see Well Statistics). The median reported well yield is 100 gpm, and the maximum reported yield is 1,050 gpm. The proposed rate for this application is 301% of the median and 29% of the maximum reported yield. Within a mile of the proposed POA, well yields range from 20 to 2000 gpm with a median of 300 gpm. The proposed rate of 0.67 cfs (300.7 gpm) is likely within the capacity of the groundwater resource.

Water level trends for wells that utilize alluvial aquifers within a mile of the POA appear to be stable (see Water Levels Measurements in Nearby Wells). There are 34 groundwater POAs on 36 water rights within 1 mile of the subject POA (PROP 518). However, the steady trends in water levels indicate that the groundwater resource is not likely over appropriated and the proposed use is within the capacity of the resource.

The nearest groundwater user to the POA is likely the domestic well serving tax lot 800 at 8412 Labish Center Rd NE, with an estimated location 535 ft east of the POA, at an elevation of 196 ft amsl. It is likely the proposed use would cause some degree of well-to-well interference with the domestic well serving tax lot 800. To assess the degree of drawdown, a Theis drawdown analysis was conducted for the proposed use (see Theis Drawdown Analysis). Results indicate that the proposed use is not likely to cause well-to-well interference with the domestic well serving tax lot 800 that exceeds the threshold under the standard condition for alluvial aquifers in the Willamette Basin.

Based on this analysis of the available data and under the assumptions previously identified, groundwater for the proposed use will likely be available in the amounts requested and within capacity of the resource. The conditions specified in B1(d)(i) and B2(c) are recommended to protect senior users and the groundwater resource.

NOTE: This evaluation considers a conservative scenario for the nearest authorized POA not owned by the applicant. Other authorized POAs in the area may also experience an increase in interference as a result of this application, although to a lesser extent than the scenario evaluated here.

[a] MARI 4013, MARI 4442, MARI 4399, MARI 4412, MARI 4439, MARI 4447, MARI 17232, MARI 17320, MARI 50725, MARI 4384, MARI 4443, MARI 4395, MARI 62243, MARI 4392, MARI 4405, MARI 4414, MARI 4454, MARI 18497, MARI 4445, MARI 64480, MARI 4424, MARI 4423, MARI 53344, MARI 67958, MARI 6, MARI 4383, MARI 51502, MARI 51538, MARI 54100, MARI 55658, MARI 66935.

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	**Alluvial**	☒	☐

Basis for aquifer confinement evaluation: The SWL is above the WBZ in 31 wells within a mile of the POA. There is an unconfined alluvial WBZ recorded in some wells within one mile of the POA, but it is anticipated that the proposed POA will be constructed similarly to the wells in the area and utilize the confined alluvial WBZ overlain by clays and silts that range in thickness from 30 to 103 ft[a].

[a] MARI 4013, MARI 4442, MARI 4399, MARI 4412, MARI 4439, MARI 4447, MARI 17232, MARI 17320, MARI 50725, MARI 4384, MARI 4443, MARI 4395, MARI 62243, MARI 4392, MARI 4405, MARI 4414, MARI 4454, MARI 18497, MARI 4445, MARI 64480, MARI 4424, MARI 4423, MARI 53344, MARI 67958, MARI 6, MARI 4383, MARI 51502, MARI 51538, MARI 54100, MARI 55658, MARI 66935.

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[a]	SW Elev ft msl[b]	Distance (ft)	Hydraulically Connected? YES	NO	ASSUMED	Potential for Subst. Interfer. Assumed? YES	NO
1	**1**	**Woods Creek**	**123-163**	**148-168**	**1,348**	☒	☐	☐	☐	☒
1	**2**	**Little Pudding River**	**123-163**	**126-144**	**3,700**	☒	☐	☐	☐	☒

Basis for aquifer hydraulic connection evaluation: Groundwater SWL in nearby wells range from 123 to 163 ft amsl and the reported regional water table elevation is between 140 and 160 ft amsl. (Gannett and Caldwell, 1998; Woodward et al., 1998). The streambed of SW 1 (Woods Creek) is between 148 and 168 ft amsl within a mile of the POA, and between 126 and 144 ft amsl for SW 2 (Little Pudding River) within a mile of the POA. The groundwater elevation is coincident with both SW 1 (Woods Creek) and SW 2 (Little Pudding River). The WBZs of wells within a mile of the POA are between -42 and 144 ft amsl. The streambeds of SW 1 (Woods Creek) and SW 2 (Little Pudding River) have incised below the elevation of the WBZs of the confined alluvial aquifer. Hydraulic connection to SW 1 (Woods Creek) and SW 2 (Little Pudding River) is likely but anticipated to be inefficient due to the low vertical permeability of the overlying fine-grained sediments.

[a] Groundwater elevation calculated from static water level reported in well logs and/or static water level(s) reported for MARI 4013, MARI 4442, MARI 4399, MARI 4412, MARI 4439, MARI 4447, MARI 17232, MARI 17320, MARI 50725, MARI 4384, MARI 4443, MARI 4395, MARI 62243, MARI 4392, MARI 4405, MARI 4414, MARI 4454, MARI 18497, MARI 4445, MARI 64480, MARI 4424, MARI 4423, MARI 53344, MARI 67958, MARI 6, MARI 4383, MARI 51502, MARI 51538, MARI 54100, MARI 55658, MARI 66935.

[b] Surface water elevations were estimated from land surface elevations along stream reaches (Watershed Sciences, 2009; USGS, 2013).

Water Availability Basin the well(s) are located within: PUDDING R>MOLALA R-AB MILL CR

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**	☐	☐			☐	**67.3**	☐	**<25%**	☐
1	**2**	☐	☐			☐	**67.3**	☐	**<25%**	☐

Comments: Potential depletion (interference with) SW 1 (Woods Creek) by proposed pumping at the POA (PROP 518) was estimated using Hunt 2003 analytical model. Hydraulic parameters used for the model were derived from regional data or studies of the hydrogeologic regime (OWRD Well Log Query Report; Conlon et 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 (Freeze and Cherry, 1979; Domenico and Mifflin, 1965). See attached "Stream Depletion Analysis" for the specific parameters used in the analysis. The Hunt 2003 analytical model results indicate that depletion of (interference with) SW 1 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.

Because only the distance is expected to vary between the POA and surface water sources, only the POA-SW pair with the shortest distance (in this case, POA 1 and SW 1) was analyzed quantitatively for interference (stream depletion). All other POA-SW pairs would presumably result in less interference due to their greater separation relative to POA 1 and SW 1. Therefore, the interference of the proposed POA with all surface water sources within 1 mile are anticipated to result in much less than 25 percent of the well discharge at 30 days of continuous pumping.

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: N/A-Q not distributed.

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: N/A-impacts to streams within 1 mile assessed above.

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 File: G-19411

Pumping Test Files: MARI 3583, MARI 62243, MARI 3581, MARI 4399, MARI 18385, MARI 4019, MARI 4407, MARI 51214, MARI 3219, MARI 53725, MARI 3959, MARI 4443, MARI 4004, MARI 4327, MARI 4345, MARI 4373, MARI 4414, MARI 4766, MARI 68598, MARI 17256.

Well Reports: MARI 4013, MARI 4442, MARI 4399, MARI 4412, MARI 4439, MARI 4447, MARI 17232, MARI 17320, MARI 50725, MARI 4384, MARI 4443, MARI 4395, MARI 62243, MARI 4392, MARI 4405, MARI 4414, MARI 4454, MARI 18497, MARI 4445, MARI 64480, MARI 4424, MARI 4423, MARI 53344, MARI 67958, MARI 6, MARI 4383, MARI 51502, MARI 51538, MARI 54100, MARI 55658, MARI 66935

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.

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.

Hampton, E.R. 1972. Geology and Ground Water of the Molalla-Salem Slope Area, Northern Willamette Valley, Oregon. USGS Water Supply Paper 1997.

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.

O'Connor, J.E., Sarna-Wojcick, A., Woznikak, K.C., Polette, D.J., Fleck, R.J., 2001, Origin, Extent, and Thickness of Quaternary Geologic Units in the Willamette Valley, Oregon; U.S. Geological Survey, Professional Paper 1620, 51 p.

Theis, C.V., 1935, The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using ground-water storage: American Geophysical Union transactions, v. 16, p. 519-524.

Tolan, T.L. and Beeson, M.H. Digital Database By DuRoss, C.B. 2001. Geologic Map and Database of the Salem East and Turner 7.5-Minute Quadrangles, Marion County, Oregon: A Digital Database: U.S. Geological Survey Open-file Report 00-351, https://pubs.usgs.gov/of/2000/0351/.

Tolan, T.L., Beeson, M.H., Wheeler, K. L. 1999. Geologic Map of the Scotts Mills, Silverton, and Stayton Northeast 7.5 Minute Quadrangles, Northwest Oregon: A Digital Database: U. S. Geological Survey Open-File Report 99-141, 11 pp., https://pubs.usgs.gov/of/1999/0141/.

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

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.**

Water Availability Tables

Oregon Water Resources Department
Water Availability Analysis

Main Help Return Contact Us

Water Availability Analysis
Detailed Reports

PUDDING R > MOLALLA R - AB MILL CR
WILLAMETTE BASIN
Water Availability as of 9/18/2024

Watershed ID #: 151 (Map)
Date: 9/18/2024

Exceedance Level: 80%
Time: 4:21 PM

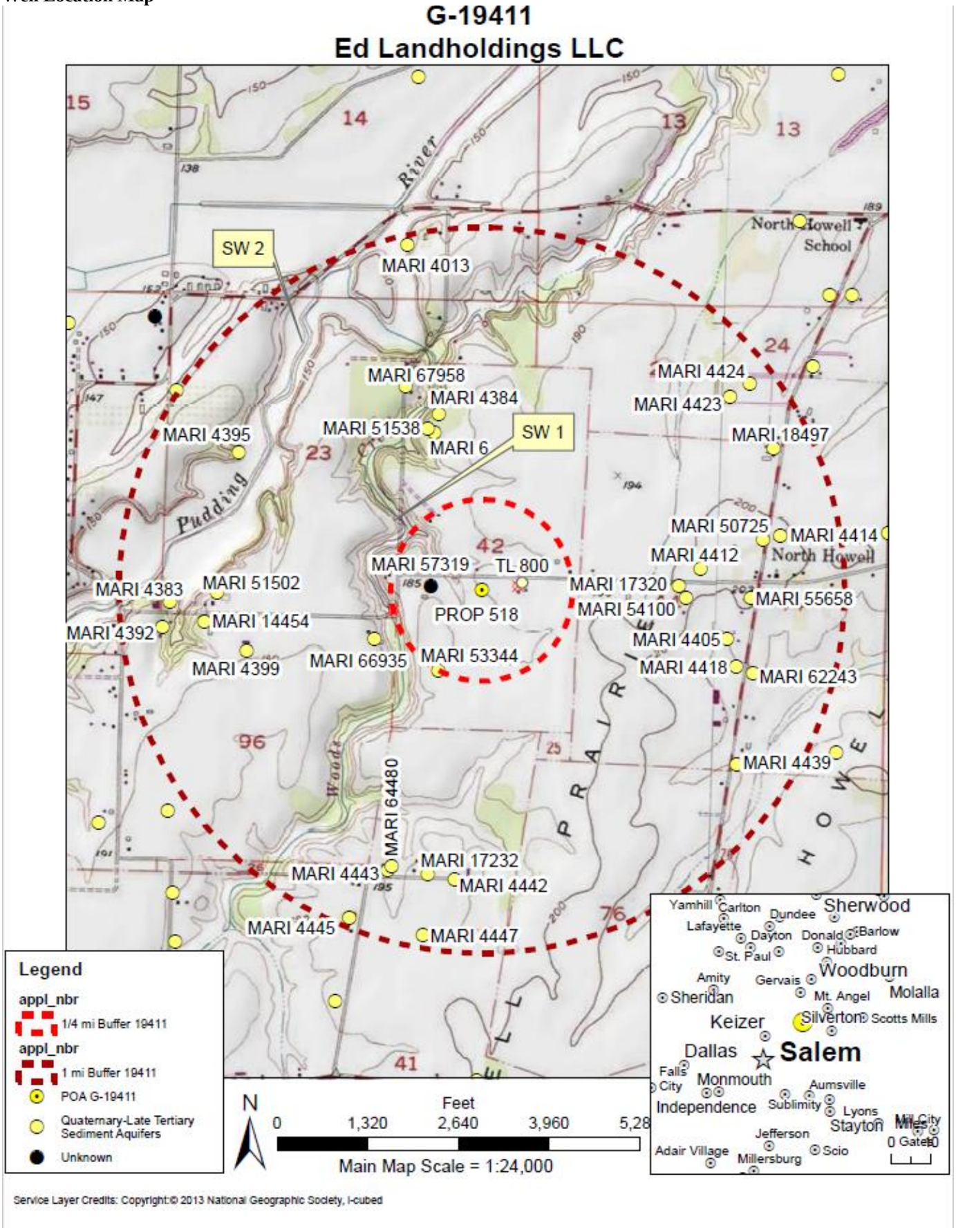
Water Availability Calculation | Consumptive Uses and Storages | Instream Flow Requirements | Reservations | Water Rights | Watershed Characteristics

Water Availability Calculation

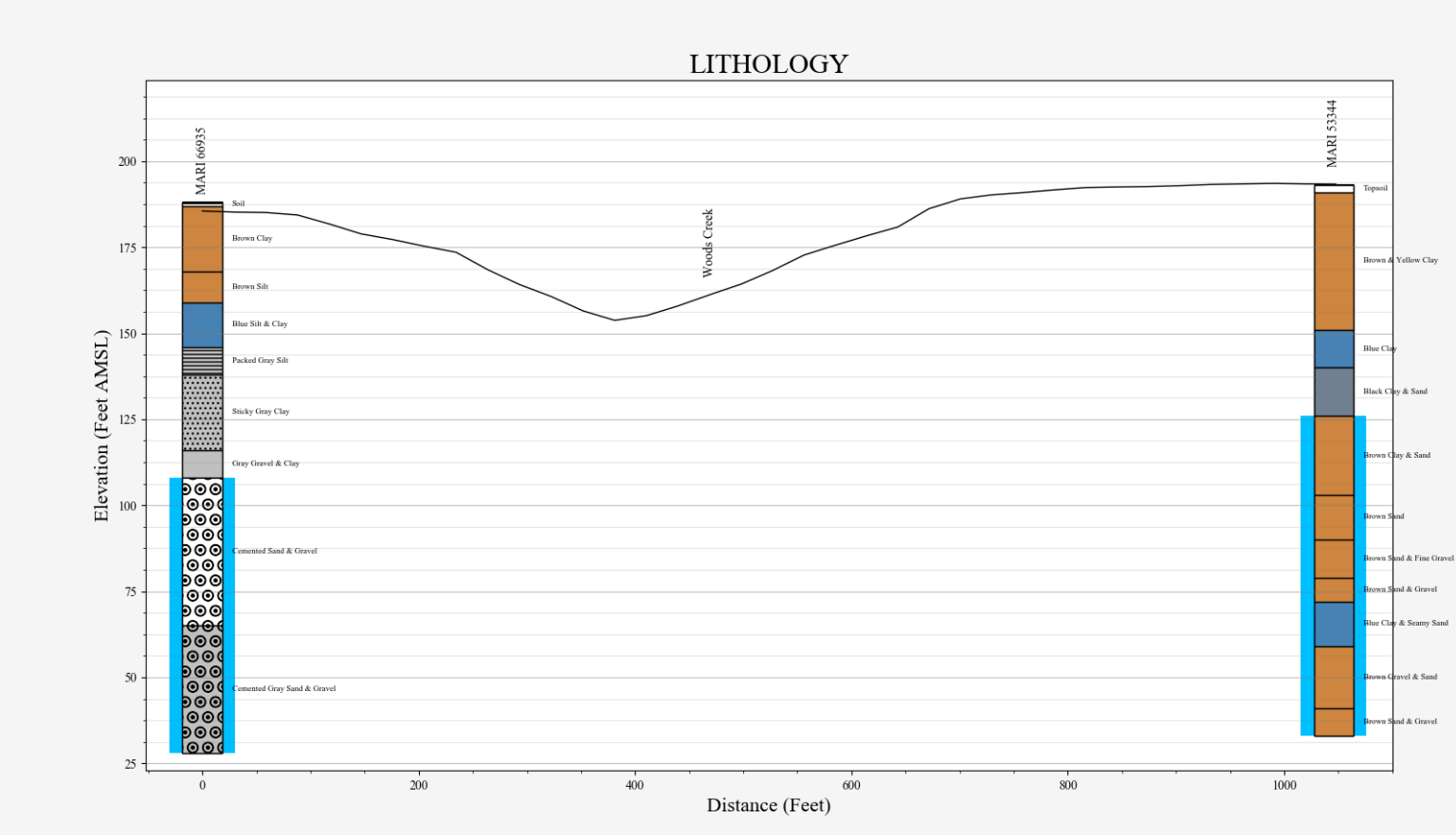
Monthly Streamflow in Cubic Feet per Second
Annual Volume at 50% Exceedance in Acre-Feet

Month	Natural Stream Flow	Consumptive Uses and Storages	Expected Stream Flow	Reserved Stream Flow	Instream Flow Requirement	Net Water Available
JAN	1,040.00	125.00	915.00	0.00	36.00	879.00
FEB	1,180.00	114.00	1,070.00	0.00	36.00	1,030.00
MAR	1,010.00	76.50	934.00	0.00	36.00	898.00
APR	787.00	52.40	735.00	0.00	36.00	699.00
MAY	425.00	51.00	374.00	0.00	36.00	338.00
JUN	224.00	73.10	151.00	0.00	36.00	115.00
JUL	109.00	115.00	-6.14	0.00	36.00	-42.10
AUG	71.00	94.30	-23.30	0.00	36.00	-59.30
SEP	67.30	53.50	13.80	0.00	36.00	-22.20
OCT	91.60	11.50	80.10	0.00	36.00	44.10
NOV	363.00	48.50	314.00	0.00	36.00	278.00
DEC	957.00	118.00	839.00	0.00	36.00	803.00
ANN	706,000.00	56,300.00	650,000.00	0.00	26,100.00	626,000.00

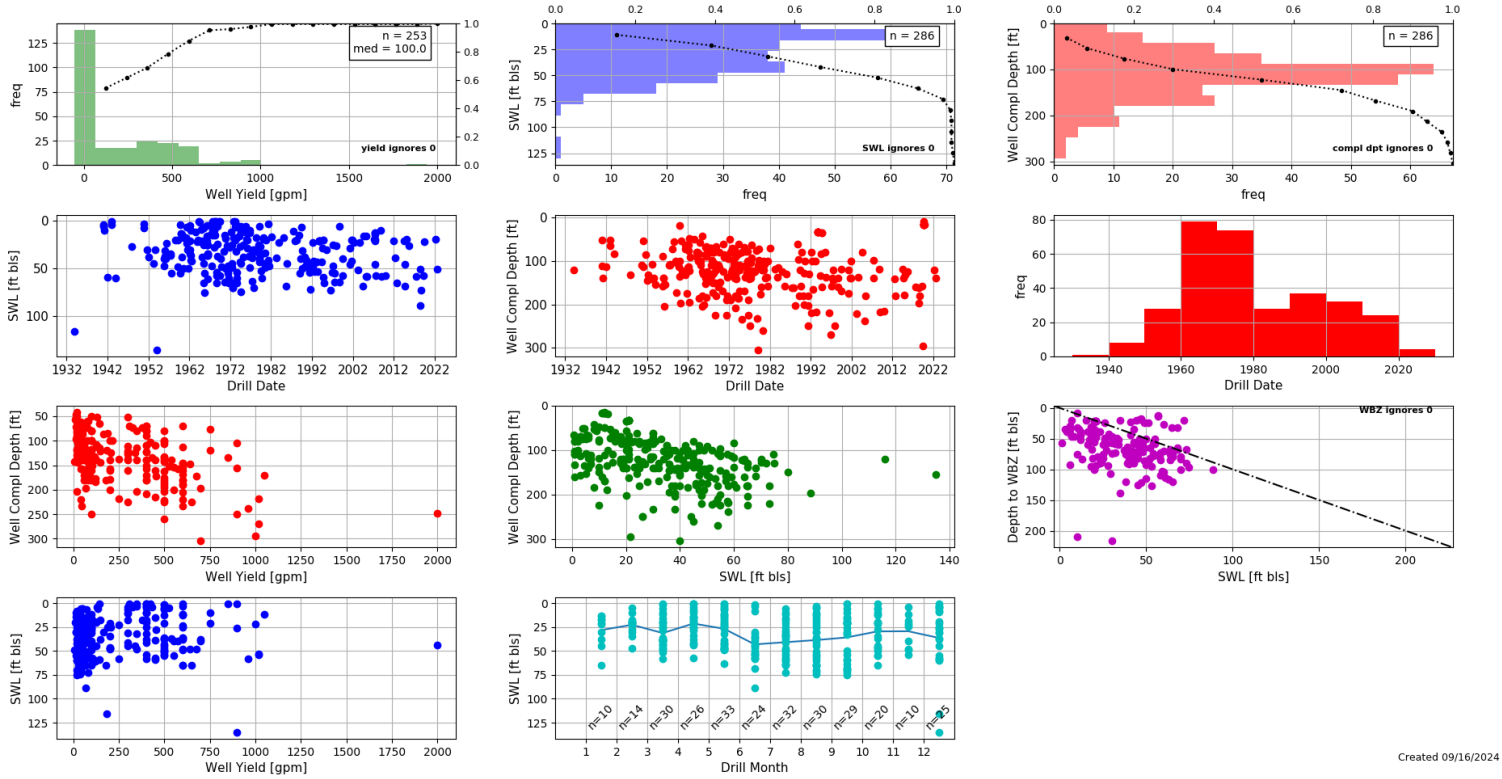
Well Location Map



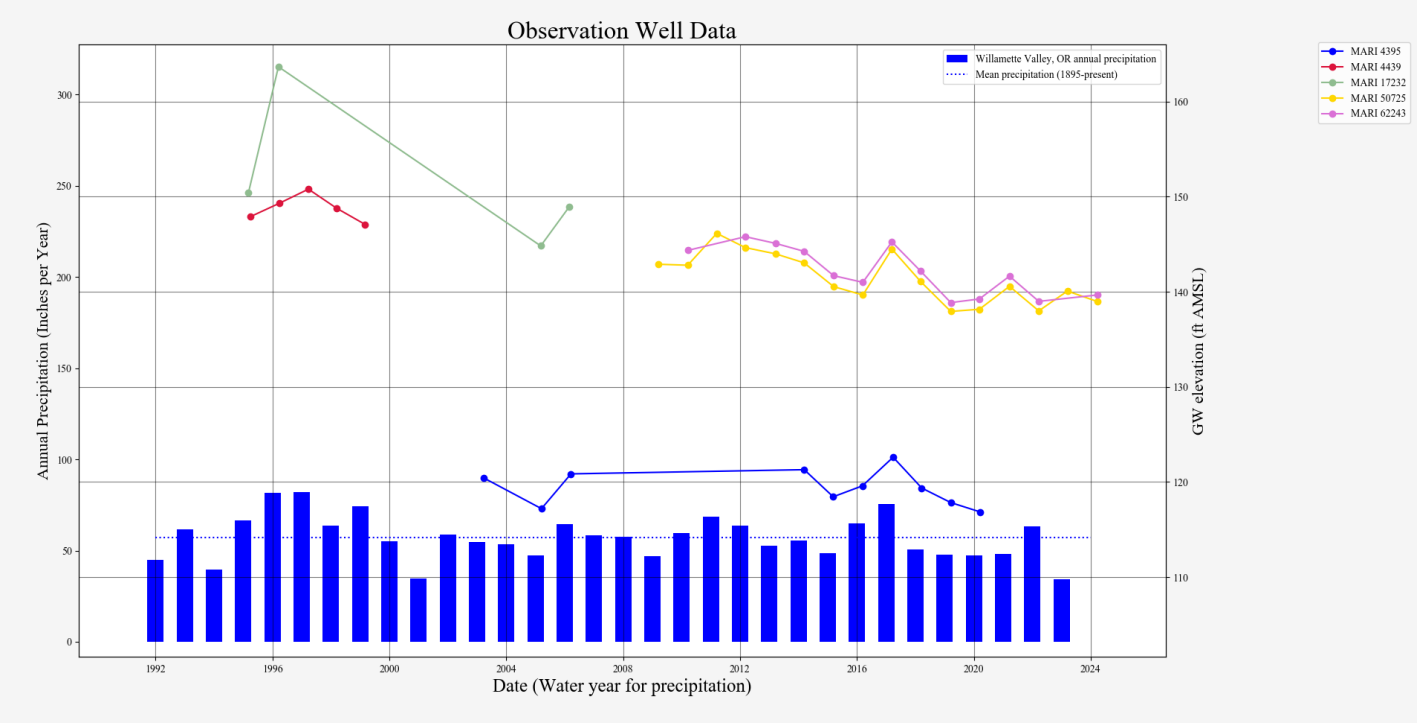
Cross-Section



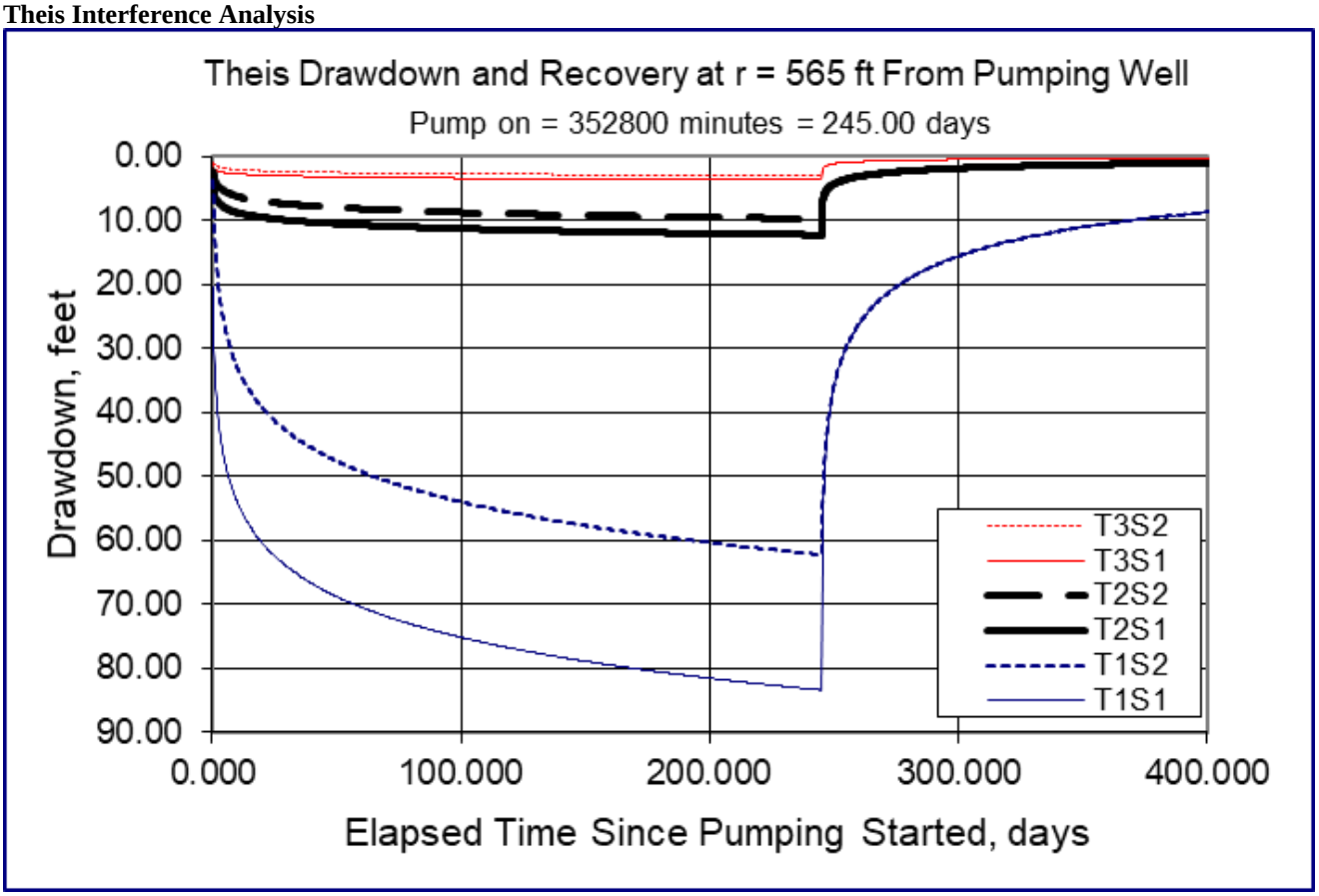
Well Statistics



Water-Level Measurements in Nearby Wells



Theis Interference Analysis



Radial distance from pumping well (r)=535 ft [estimated radial distance to nearest user, 8412 Labish Center Rd NE TL 800]
Pumping Rate (Q)= 0.67 cfs (~ 300.7gpm)
Aquifer Transmissivity (T1)= 3,743 gpd/ft (500 ft^2/day), (T2)= 31,371 gpd/ft (4,194 ft^2/day), (T3)= 116,733 gpd/ft (15,606 ft^2/day)
Storativity (s1) = 0.0001, (s2) = 0.001 [Conlon et al 2005, Table 1 and 2 values for MSU]
Total pumping time=245 days [Irrigation March 1 through October 31]

Stream Depletion (Hunt) Model Analysis

Application type:	G
Application number:	19411
Well number:	1
Stream Number:	1
Pumping rate (cfs):	0.67
Pumping duration (days):	245.0
Pumping start month number (3=March)	3.0
Plotting duration (days)	365

Parameter	Symbol	Scenario 1	Scenario 2	Scenario 3	Units
Distance from well to stream	a	1348.0	1348.0	1348.0	ft
Aquifer transmissivity	T	500.0	4194.0	15606.0	ft2/day
Aquifer storativity	S	0.0001	0.0005	0.001	-
Aquitard vertical hydraulic conductivity	Kva	0.001	0.005	0.01	ft/day
Aquitard saturated thickness	ba	34	34	34	ft
Aquitard thickness below stream	babs	20	20	20	ft
Aquitard specific yield	Sya	0.2	0.2	0.2	-
Stream width	ws	50.0	50.0	50.0	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	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