Groundwater Application Review Summary Form

Application # G- 18729

GW Reviewer Travis Brown **Date Review Completed:** 3/27/2019

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 March 27, 2019

TO: **Application** G- 18729

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 3/27/2019
FROM: Groundwater Section Travis Brown
Reviewer's Name
SUBJECT: Application G- 18729 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: **Charles Christensen** County: **Clackamas**

A1. Applicant(s) seek(s) 0.3743 cfs from 1 well(s) in the Willamette Basin, Clackamas River subbasin

A2. Proposed use Nursery (greenhouse and outdoor) Seasonality: March 1- November 3

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	W-1	Alluvium	0.3743	2S/3E-26 NE-NW	385' S, 1040' W fr NE ¼ cor S 26

* 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	~230[a]				~280[b]	~0-160[b]	0-65 (10")[b] ?-200 (8") ?-280 (6")		~180-280[b]			

Use data from application for proposed wells.

A4. **Comments:** The proposed POA is ~1 mile south of the unincorporated community of Barton, Oregon.

[a] Surface elevation estimated based on proposed well location (Watershed Sciences, 2009; USGS, 2013)

[b] Proposed well construction.

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 will produce water from a confined aquifer; therefore, per OAR 690-502-0240, the relevant Willamette Basin rules (OAR 690-502-0040 & 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), 7t (Dedicated Measuring Tube), Medium 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 _____ groundwater reservoir between approximately_____ ft. and_____ ft. below land surface;

d. ☐ **Well reconstruction** is necessary to accomplish one or more of the above conditions. The problems that are likely to occur with this use and without reconstructing are cited below. Without reconstruction, I recommend withholding issuance of the permit until evidence of well reconstruction is filed with the Department and approved by the Groundwater Section.

Describe injury –as related to water availability– that is likely to occur without well reconstruction (interference w/ senior water rights, not within the capacity of the resource, etc): _____

B3. **Groundwater availability remarks:** **Groundwater for the proposed use cannot be determined to be over-appropriated due to insufficient available data regarding rates of recharge and the current quantity of groundwater withdrawals from the aquifer system.**

The proposed POA would be completed in the Sandy River Mudstone, producing water from thin beds of sand interlayered within predominantly fine-grained sediments. CLAC 5150, the nearest water well report to the proposed POA, noted water-bearing sands between 83-91 ft below land surface (bls), 178-190 ft bls, and 272-280 ft bls; the lower sand units reportedly yielded ~60 gpm. Of 24 known wells completed in the same section as the proposed POA (Section 26), completed depths ranged from 65 to 370 ft bls with a median of 260 ft bls; reported yields ranged from 5.8 to 80 gpm, with a median of 17.5 gpm (see Well Statistics – Section 26, attached). The requested maximum rate of 168 gpm (~0.3743 cfs) is more than twice the highest reported yield (80 gpm) in this area. **The potential for the applicant to achieve the requested total maximum rate from the single proposed POA is questionable.**

There do not appear to be any applicable observation wells with a significant period of record near the proposed POA. Reported static water levels (SWLs) from nearby water well reports range in elevation from ~166 to 290 ft above mean sea level (amsl) (see Static Water Levels Graph, attached), which would correspond to a range of ~64 ft bls to ~60 ft above land surface at the proposed POA. Static water levels therefore appear to vary significantly – on roughly the same order as topography – in the vicinity of the proposed POA. Analysis of reported SWLs and Well Completion Depths does not indicate a trend of either lowering SWLs or deeper well completions over time. **Therefore, based on the available information, it cannot be determined whether water levels are declining in the water-bearing zones of the Sandy River Mudstone.**

Review of nearby domestic/exempt wells indicated one well which may be in close proximity to the proposed POA (see Well Location Map, attached). The water well report for CLAC 5150 indicates its location as in 2S/3E-26 NE-NW (the same quarter-quarter as the proposed POA) on Tax Lot 202, the nearest edge of which is ~320 ft south of the proposed POA (the furthest edge is ~770 ft from the proposed POA). However, CLAC 5150 is registered to owner Allen S. Crandall; Tax Lot 202 is registered to James & Linda Bohl, while Tax Lot 205 (north adjacent of 202) is registered to Allan and Kathleen Crandall. CLAC 5150 may therefore actually be located on Tax Lot 205, the nearest edge of which is only ~90 ft south of the proposed POA. CLAC 5150 is reportedly completed to 280 ft bls and screened from 270 to 280 ft bls. The proposed POA would also be completed to ~280 ft bls and screened from ~180 to 280 ft bls. As such, it is very likely the proposed POA

would tap the same water-bearing zone(s) as CLAC 5150. Due to significant uncertainty regarding the exact location of CLAC 5150 and the hydraulic parameters of the subject aquifer, the degree of interference with CLAC 5150 likely to result from pumping the proposed POA cannot be well-constrained; therefore, the preponderance of evidence cannot support a definitive conclusion that groundwater for the proposed use will not be available in the amounts requested without injury to prior water rights. **However, there is a significant potential risk that pumping the proposed POA at the requested maximum rate may cause substantial interference with CLAC 5150.**

Due to the high requested rate, the lack of information regarding water levels in the local aquifer, the uncertainty regarding aquifer hydraulic parameters and nearby exempt uses, and the risk of potential well-to-well interference, Annual Measurement Condition (7n) and Dedicated Measuring Tube Condition (7t) are recommended to assist in monitoring the local aquifer and to avoid injury to existing groundwater rights and the groundwater resource. Particularly with regard to potential injury to other, nearby groundwater users, it should be emphasized to the applicant that Condition 7n requires that the proposed use be discontinued or that the rate of withdrawal be reduced if hydraulic interference leads to a decline of 25 ft or more in any neighboring well with senior priority (e.g. CLAC 5150).

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	**Sandy River Mudstone**	☒	☐

Basis for aquifer confinement evaluation: Water well reports near the proposed POA generally report SWLs above the shallowest water-bearing zones, indicating confined conditions. Most reported lithologies indicate either predominantly fine-grained sediment (clay/silt) or very tightly-cemented gravels (conglomerate) which may act as confining units overlying the applicable water-bearing zones.

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	**Clackamas River**	**~195-250[a]**	**~140-175[b]**	**~1,320**	☒	☐	☐	☐	☒

Basis for aquifer hydraulic connection evaluation: The estimated groundwater elevation for the proposed POA is at least 20 ft above the estimated surface water elevation for the Clackamas River. This is sufficient to conclude that groundwater in the Sandy River Mudstone is hydraulically connected (and likely discharging) to the Clackamas River.

The proposed POA is above the Clackamas River State Scenic Waterway. Due to the hydraulic connection between the water-bearing sediments to be tapped by the proposed POA and the Clackamas River, the relevant State Scenic Waterway provisions (Condition 7j) apply to the proposed use.

[a] Groundwater elevation estimated from the nearest applicable water well report (CLAC 5150).

[b] Surface water elevation estimated from LIDAR measurements of river channel within 1 mile of proposed POA (Watershed Sciences, 2009).

Water Availability Basin the well(s) are located within: SW 1: CLACKAMAS R > WILLAMETTE 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 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	☒	☐	**MF80A**	**400**	☐	**822**	☐	**<<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 POA appears to be just within ¼ mile of the nearest surface water source, the Clackamas River. On this basis, the Potential for Substantial Interference (PSI) is assumed per OAR 690-009-0040(4)(a). However, this is the only basis for assuming PSI for the proposed POA. Should the applicant revise the location of their proposed POA so that it would be greater than 1,320 ft (i.e. move the proposed location 10 ft or more to the south), a new groundwater review should not be required.

Potential depletion of SW 1 (Clackamas River) due to pumping of the proposed POA was analyzed 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, 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 – SW 1" 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, primarily due to the substantial thickness of low-permeability, fine-grained sediment projected to underlie the Clackamas River at this location.

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: C2: The proposed POA is above and hydraulically-connected to the Clackamas River State Scenic Waterway. Condition 7j (State Scenic Waterway Condition) applies.**

C3a: The proposed POA appears to be within ¼-mile of SW 1 (Clackamas River); PSI is assumed on this basis alone. The applicant may revise the proposed POA location 10 ft or more to the south to avoid triggering PSI on this basis without the need for a new groundwater review.

References Used:

Application File: G-18729

Pumping Test Files: CLAC 4667, 4954, 10930, 56492, 62440

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.

Leonard, A.R., and Collins, C.A., 1983, Ground water in the northern part of Clackamas County, Oregon: Oregon Water Resources Department Ground Water Report 29. 85 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.

Trimble, D.E., 1963, Geology of Portland, Oregon, and adjacent areas: U.S. Geological Survey Bulletin 1119, 119 p.

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

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

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.

Watershed Sciences, 2009, LIDAR remote sensing data collection, Department of Geology and Mineral Industries, Hood to Coast 2009, Portland, OR, May 27.

D. WELL CONSTRUCTION, OAR 690-200

D1. **Well #:** _____ **Logid:** _____

D2. **THE WELL does not appear to meet current well construction standards based upon:**

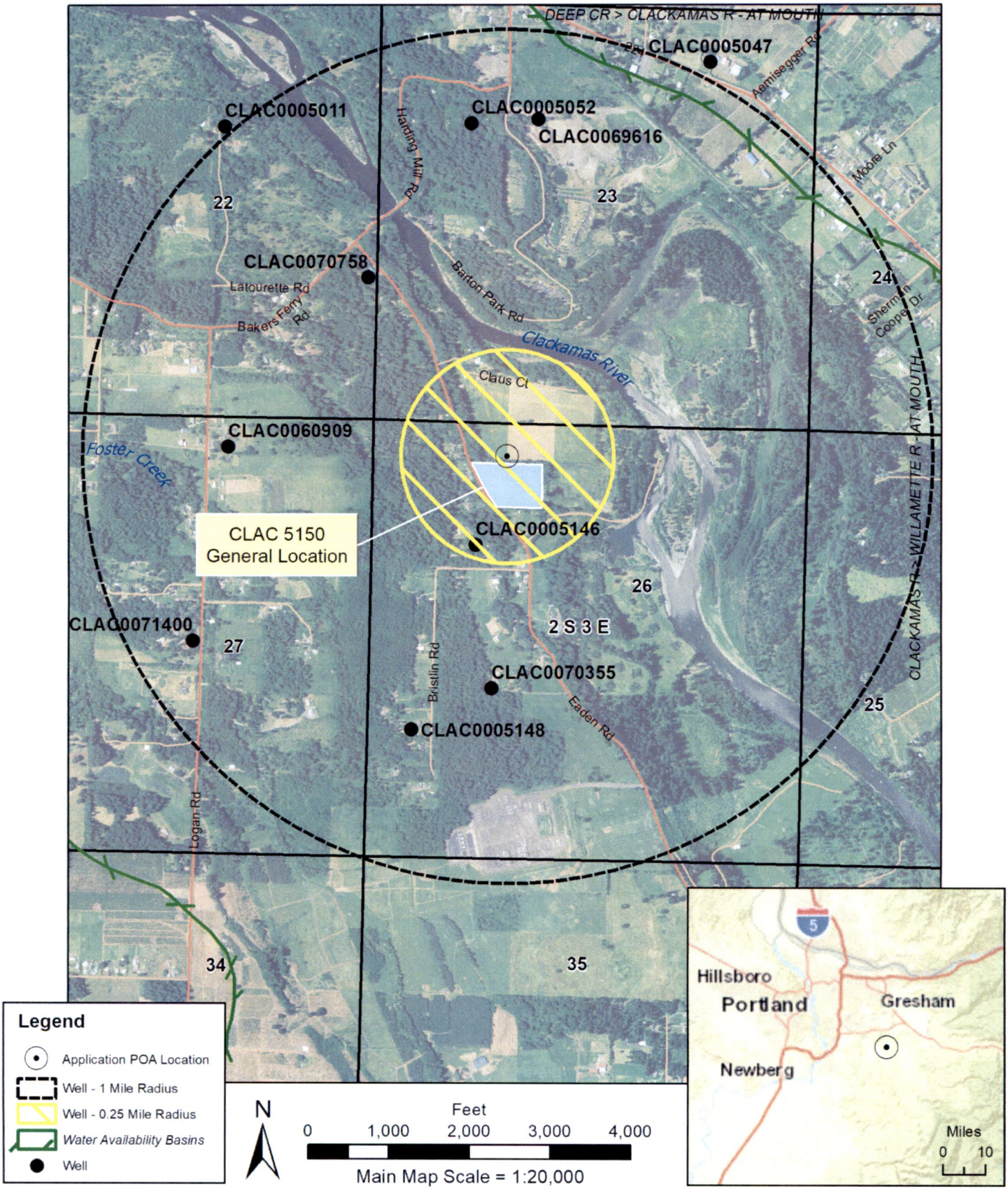
a. ☐ review of the well log;
b. ☐ field inspection by _____;
c. ☐ report of CWRE _____;
d. ☐ other: (specify) _____
_____

D3. **THE WELL construction deficiency or other comment is described as follows:** _____
_____
_____
_____
_____

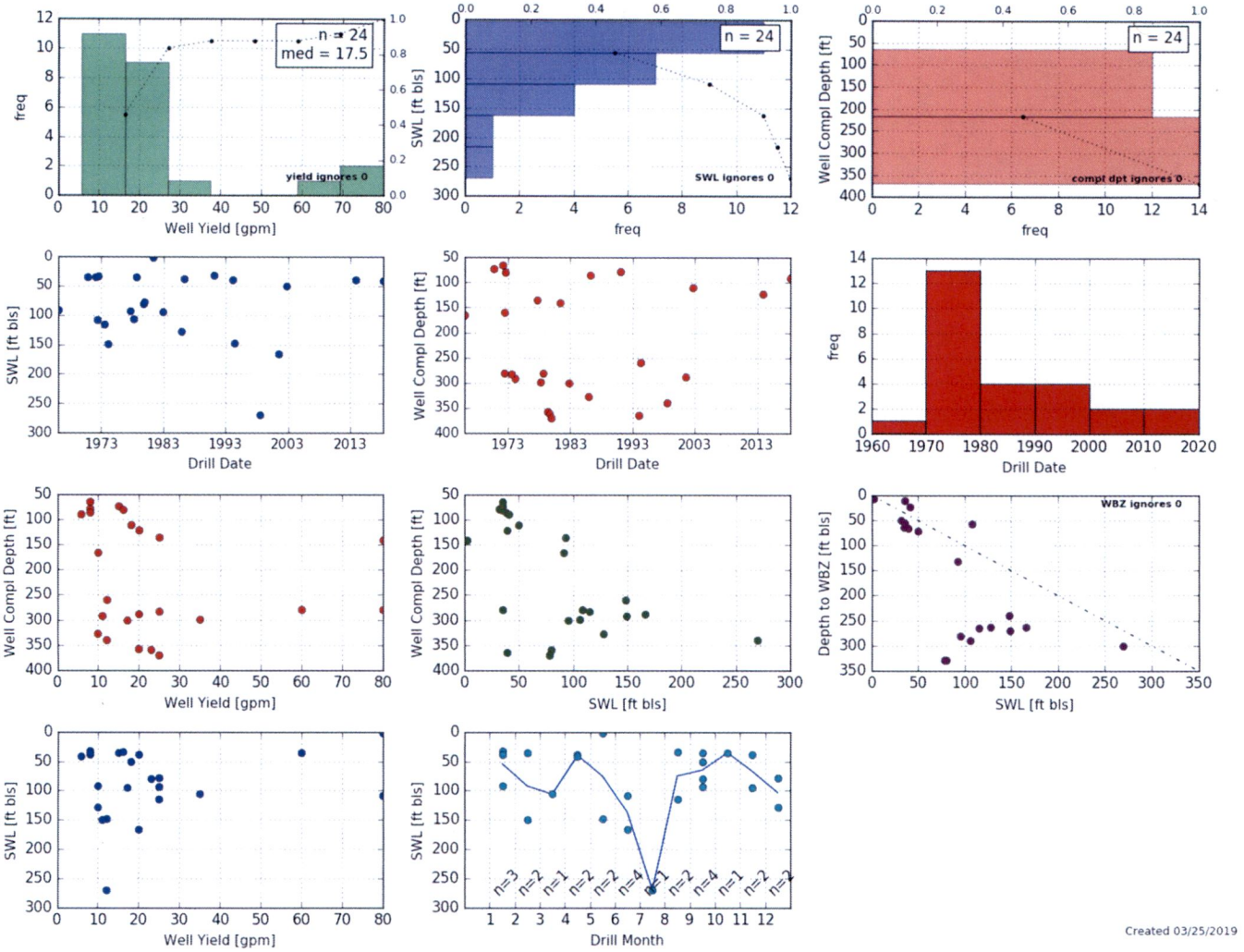
D4. ☐ **Route to the Well Construction and Compliance Section for a review of existing well construction.**

Well Location Map

G-18729 Christensen

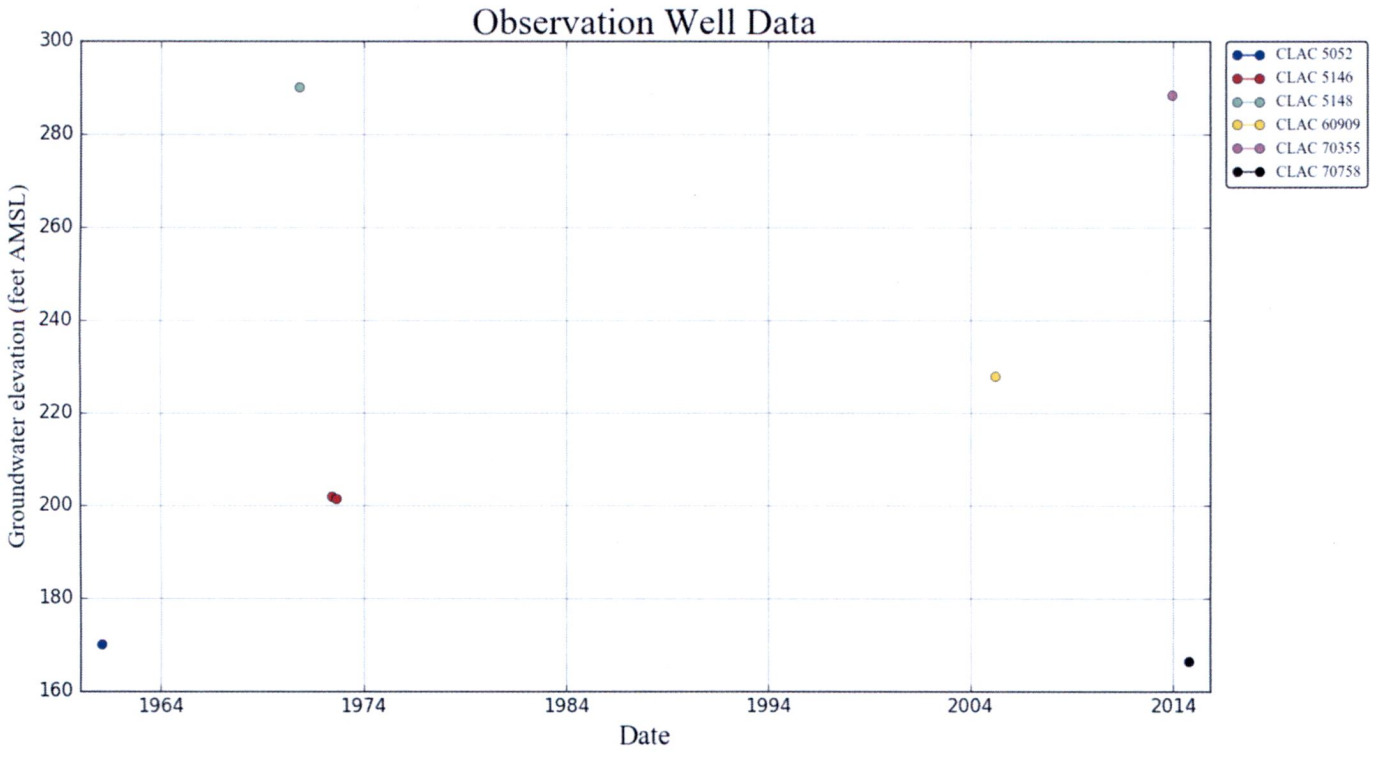


Well Statistics – Section 26



Created 03/25/2019

Static Water Levels Graph



Water Availability Tables

Water Availability Analysis
Detailed Reports

CLACKAMAS R > WILLAMETTE R - AT MOUTH
WILLAMETTE BASIN

Water Availability as of 3/26/2019

Watershed ID #: 80 (Map)
Date: 3/26/2019

Exceedance Level: 80%
Time: 2:19 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	2,670.00	326.00	2,340.00	0.00	1,000.00	1,340.00
FEB	2,900.00	361.00	2,540.00	0.00	1,000.00	1,540.00
MAR	2,800.00	330.00	2,470.00	0.00	1,000.00	1,470.00
APR	3,010.00	399.00	2,610.00	0.00	1,000.00	1,610.00
MAY	2,740.00	398.00	2,340.00	0.00	1,000.00	1,340.00
JUN	1,620.00	309.00	1,310.00	0.00	1,000.00	311.00
JUL	980.00	309.00	671.00	0.00	1,000.00	-329.00
AUG	822.00	294.00	528.00	0.00	890.00	-362.00
SEP	833.00	283.00	550.00	0.00	890.00	-340.00
OCT	882.00	276.00	606.00	0.00	1,000.00	-394.00
NOV	1,630.00	323.00	1,310.00	0.00	1,000.00	307.00
DEC	2,650.00	328.00	2,320.00	0.00	1,000.00	1,320.00
ANN	2,110,000.00	237,000.00	1,870,000.00	0.00	711,000.00	1,200,000.00

Stream Depletion Analysis – SW 1

Application type:	G
Application number:	18729
Well number:	1
Stream Number:	1
Pumping rate (cfs):	0.3743
Pumping duration (days):	247
Pumping start month number (3=March)	3.0

Parameter	Symbol	Scenario 1	Scenario 2	Scenario 3	Units
Distance from well to stream	a	1320	1320	1320	ft
Aquifer transmissivity	T	66	310	700	ft2/day
Aquifer storativity	S	0.15	0.1	0.05	-
Aquitard vertical hydraulic conductivity	Kva	0.01	0.05	0.1	ft/day
Aquitard saturated thickness	ba	140	140	140	ft
Aquitard thickness below stream	babs	30	30	30	ft
Aquitard specific yield	Sya	0.2	0.2	0.2	-
Stream width	ws	165	165	165	ft

Stream depletion for Scenario 2:

Days	10	330	360	30	60	90	120	150	180	210	240	270	300
Depletion (%)	0	5	5	0	0	1	1	2	3	3	4	4	5
Depletion (cfs)	0.00	0.02	0.02	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.02	0.02