

Groundwater Transfer Review Summary Form

Transfer/PA # T- 14450

GW Reviewer Dennis Orlowski Date Review Completed: February 7, 2025

Summary of Same Source Review:

☒ The proposed change in point of appropriation is not within the same aquifer as per OAR 690-380-2110(2).

NOTE: currently-proposed construction details for six to-be-drilled APOA wells would lead to all of those proposed wells obtaining groundwater from two discrete basalt water-bearing zones (“aquifers”) in the local CRBG aquifer system. Despite the fact that the POA for this application (WASH 62373) is authorized by certificate 95849 in its current configuration in which it obtains groundwater from two discrete WBZ, current well construction regulations limit wells to obtaining groundwater only from a single aquifer, or water-bearing zone (OAR 690-200). This issue is discussed in detail throughout this review.

Summary of Water Level Decline Condition Review:

☐ Water levels at the original point(s) of appropriation have exceeded the allowed decline threshold defined by conditions in the originating water right.

Summary of Injury Review:

☐ The proposed transfer will result in another, existing water right not receiving previously available water to which it is legally entitled or result in significant interference with a surface water source as per 690-380-0100(3).

Summary of GW-SW Transfer Similarity Review:

☐ The proposed SW-GW transfer doesn’t meet the definition of “similarly” as per OAR 690-380-2130.

This is only a summary. Documentation is attached and should be read thoroughly to understand the basis for determinations.



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Ground Water Review Form:

- ☒ **Water Right Transfer**
☐ **Permit Amendment**
☐ **GR Modification**
☐ **Other**

Application: T-14450

Applicant Name: City of Banks

Proposed Changes: ☐ POA ☒ APOA ☐ SW→GW ☒ RA
☐ USE ☐ POU ☐ OTHER

Reviewer(s): Dennis Orlowski

Date of Review: February 7, 2025

Date Reviewed by GW Mgr. and Returned to WRSD: JTI 2/7/25

The information provided in the application is insufficient to evaluate whether the proposed transfer may be approved because:

- ☐ The water well reports provided with the application do not correspond to the water rights affected by the transfer.
- ☐ The application does not include water well reports or a description of the well construction details sufficient to establish the ground water body developed or proposed to be developed.
- ☐ Other _____

1. Basic description of the changes proposed in this transfer: This proposed transfer relates to certificate 95849, which authorizes groundwater pumped from a single authorized POA (WASH 62373, "Well-2") for municipal uses by the City of Banks (maximum instantaneous pumping rate of 1.0 cfs, ~449 gpm).

This transfer proposes to add the following APOA to certificate 95849 (note that all of the proposed APOA are proposed to-be-drilled (TBD) well locations):

- WTP (Water Treatment Plant) well – TBD
- AN (Aerts Rd North) well – TBD
- AS (Aerts Rd South) well – TBD
- Park-A (Park Primary) well – TBD
- Park-B (Park Alternative) well – TBD
- Park-C (Park Alternative) well – TBD

NOTE: the authorized POA for certificate 95849, WASH 62373, is also a currently-proposed APOA for permit G-7593, which authorizes groundwater from a single POA (WASH 7651) for municipal uses by the City of Banks (WASH 7651, "Well-1", is located about 60 feet away from WASH 62373). This proposed change for WASH 62373 is part of transfer application T-14449, which as of this date is under review by OWRD.

2. Will the proposed POA develop the same aquifer (source) as the existing authorized POA?

☒ **Yes, AND** (see comments) ☐ No Comments: Authorized POA WASH 62373 (“Well-2”) is 665 feet deep, with an open interval between 300 and 665 ft bls within the local Columbia River Basalt Group (CRGB) aquifer system. According to the WASH 62373 well log and additional documents provided by the applicant’s agent (CwM-H2O, 2018), there are two principal water-bearing interflow zones in this well: 378-468 ft bls (est. 350 gpm) and 615-660 ft bls (est. 300 gpm).

Transfer application T-14450 provided attached documentation (“Interpretation of Basalt Water-Bearing Zones in the Area of Banks, Oregon”) that provides additional information intended to support “...the development of all basalt WBZs encountered to a depth of 665 feet below ground surface (bgs) as one aquifer unit” (emphasis added). The information provided consists of (1) recent geophysical evidence (video survey, caliper log, spinner logs, temperature log); (2) evidence from area water well reports of equivalent static water levels; and (3) evidence from recent water level elevations: wells 1 and 2.

OWRD has reviewed this additional documentation and concludes that it does **not** support the applicant’s request to consider “all basalt WBZs encountered to a depth of 665 feet bgs as one aquifer unit.” **Instead, OWRD finds the preponderance of the evidence supports a finding that the two WBZs in WASH 62373 are discretely different aquifer sources.**

OWRD comments on the supplemental application documents, and our rationale for considering the presence of two discrete aquifers in WASH 62373, are as follows:

- (1) The spinner log instrumentation used for the 2017 geophysical survey conducted in WASH 62373 has a low-flow measurement threshold of <1.0 ft/minute (pers. comm., Pacific Surveys, 1/24/2025). In WASH 62373 this threshold would equate to a potential vertical flow in the borehole of approximately 6 gpm; this flow rate is that which could exist within the borehole without being detectable by the spinner log instrumentation used for the survey of WASH 62373. The presence of *any* vertical flow in a borehole under otherwise static conditions (i.e., non-pumping) indicates a head differential between successive WBZ, which in turn indicates that each WBZ behaves as a separate “aquifer” (source).

Because vertical flow might exist in WASH 62373 that is below the threshold detection limit of the spinner log device, the interpreted results of this survey do **not** prove conclusively that the two primary WBZ in this well (378-468 ft bls and 615-660 ft bls) behave as “one aquifer unit.”

- (2) The application attachment asserts that the well logs for WASH 62373, nearby WASH 50693 (Quail Valley Golf Course well), and other nearby basalt wells did not indicate changes in static water levels as the wells were being drilled through multiple water-bearing zones. If present, such head changes would indicate a vertical gradient and resultant vertical flow between WBZs, which in turn would imply that each WBZ was a discretely different aquifer. Conversely, no head changes between WBZ would suggest a single aquifer unit.

However, while head changes observed during drilling can be an indication of different aquifers/discrete WBZs, particularly if the change is relatively large (e.g., at least several feet), the absence of such observed changes is not conclusive proof of a single “aquifer unit” comprised of multiple WBZs, for the following reasons: (1) in cases where the actual head differences between WBZ are relatively small (e.g., 1-2 feet), such differences might not be discernible during typically disruptive drilling activities; (2) when drilling through multiple WBZ, the head in the well becomes a composite of various heads under dynamic conditions (with interflow occurring through the borehole); thus it can be impossible to quantify, or even discern, any head changes attributable to a single WBZ; (3) pumping of other nearby CRBG wells could affect water levels measured in the well being drilled (both WASH 62373 and WASH 50693 were drilled primarily in April and May of 2005 and 1996, respectively, which is within the irrigation pumping period for this basin).

- (3) After recently completing an elevation survey of the wellheads of both WASH 7651 (“Well-1”) and WASH 62373 (“Well-2”), the application states that static water level elevations between the wells “differed by 0.62 – 1.12 feet.” This range is comprised of three rounds of contemporaneous measurements made in both wells on March 15th, April 7th, and October 13th, 2023 (T-14449 application attachment).

A similar range of head differences between WASH 7651 and WASH 62373 was measured more recently in February and March of 2024, at 0.7 ft and 1.0 ft, respectively. As reported to OWRD, these measurements were made when the WASH 62373 pump had been idle for at least 24 hours for the February reading, and at least 7 days for the March measurement (for the March 2024 measurement in WASH 7651 it was reported that the pump had been pulled for replacement, and had not been pumped for at least one year) (T-14449 application attachment).

The range of reported static water level differences between WASH 7651 and WASH 62373, though relatively small, indicates the presence of a vertical gradient between the two major WBZ intersected by the wells. This vertical gradient in turn indicates that the two WBZ in WASH 62373 behave as discrete aquifers as defined by different head conditions.

Despite the authorization of WASH 62373 as a POA for certificate 95849 in its current configuration (i.e., obtaining groundwater from two discrete aquifers within the CRBG aquifer system), any APOA wells installed under this transfer application will be limited to only one of the two primary aquifers/WBZ present in WASH 62373. Using information derived primarily from WASH 62373 and WASH 50693 (QVGC well), the two primary WBZ in the vicinity of the authorized and proposed APOAs are estimated to be present at the following approximate elevations:

- **Upper WBZ: ~ -125 to -250 ft msl**
- **Lower WBZ: ~ -320 to -430 ft msl.**

For the six proposed APOA not yet drilled, compliance with the single WBZ provision will require corresponding reductions in planned total well depths, as well as revisions to the planned cased and sealed intervals.

3. a) Is the existing authorized POA subject to a water level decline condition?

☒ Yes ☐ No

Comments: Certificate 95849 has several decline conditions common to CRBG aquifer wells in the Willamette Basin.

b) If yes, for each POA identify the reference level, most recent spring-high water level, and whether an applicable permit decline condition has been exceeded: A reference level for WASH 62373, or a method for prescribing one, is not stipulated in certificate 95849. However, superseded permit G-16312 states that “use of water from a new well shall not begin until an initial static water level in the well has been measured and reported to the Department.”

The first plausible measurement reported to OWRD for WASH 62373 was from 5/25/2005 (48.0 ft bls (~elevation 184 ft msl)), which preceded the 4/28/2008 permit date by several years. However, the March 2009 aquifer test of WASH 62373 shows a similar static level of about 50 ft bls. **Consequently, from this information a reference static water level for WASH 62373 is established at 48.0 ft bls** (note that recent static levels reported to OWRD from March of 2023 and 2024 have been higher at ~35-40 ft bls; these higher levels reflect long-term recovery trends observed in the CRBG aquifer system throughout much of the Tualatin Valley).

- WASH 62373 reference level: 48.0 ft bls.
- Most recent spring high water level: 39.13 ft bls (3/1/2024).
- No exceedances of permit decline conditions.

4. a) Is there more than one source developed under the right (e.g., basalt and alluvium)?

☒ Yes ☐ No

Comments: See discussion in section 2 of this review

b) If yes, estimate the portion of the right supplied by each of the sources and describe any limitations that will need to be placed on the proposed change (rate, duty, etc.): **The potential for commingling sources (i.e., multiple discrete WBZ/aquifers within the local CRBG aquifer system) can be avoided by implementing the changes to planned construction of the proposed APOA wells which will limit the wells to only a single WBZ, as discussed in Section 2 of this review.**

5. a) Will this proposed change, at its maximum allowed rate of use, likely result in an increase in interference with **another ground water right**?

☒ Yes ☐ No

Comments: Relative to the location of authorized POA WASH 62373, several of the proposed APOA locations are nearer to existing groundwater rights. Thus, this proposed change will likely result in an increase in interference with those rights.

b) If yes, would this proposed change, at its maximum allowed rate of use, likely result in another groundwater right not receiving the water to which it is legally entitled?

☐ Yes ☒ No If yes, explain: Each of proposed APOA locations was evaluated for potential injury to applicable existing groundwater rights. For relevant evaluations, the Theis distance-drawdown analysis was performed to estimate the degree of additional interference at the nearest applicable existing well (Theis, 1935). The ranges of aquifer parameter values used were derived primarily from results of a 2009 aquifer test completed in proposed APOA WASH 62373 (Golder Associates, 2009) and in another separate test of WASH 50693 (QVGC well), as well as published values (Conlon et al., 2005; Gannett and Caldwell, 1998).

Because it is not currently known which of the two primary WBZ will be developed in the APOA wells proposed by this application, a potential “worst case” scenario was evaluated for injury potential. This scenario consists of pumping from the proposed “AN Well” location from the upper WBZ only; the “AN Well” location is relatively near to existing wells that obtain groundwater primarily from that same WBZ: WASH 79189 and WASH 56924 (see attached cross-section). Furthermore, because the same “AN Well” location (as well as WASH 62373) was also proposed as an APOA in transfer application T-14449, that well could be authorized to pump a stacked rate of 1.67 cfs (equal to 0.67 cfs from T-14449/permit G-7593, plus 1.0 cfs from this application T-14450/certificate 95849).

(Note that there are several known wells relatively close to the proposed location for the “WTP Well”; however, current OWRD records indicate that these particular wells are owned by the City of Banks, and are associated with irrigation of school grounds (WASH 77871, WASH 7628, WASH 7621, WASH 3184). Consequently, it is assumed that the City can manage potential adverse interference to these existing wells resulting from pumping at the “WTP Well” location).

Relative to the location of authorized POA WASH 62373, the proposed location for the “AN Well” is about 2700 feet nearer to WASH 79189. The results of the Theis interference analysis indicates that additional interference in WASH 79189 could potentially range from about 10 to 50 feet due to pumping the stacked maximum rate (1.67 cfs) 24/7/365 from the “AN Well” (see attached Theis analysis results). Limited water level data from other nearby wells (WASH 56924) indicates that the static water level in WASH 79189 likely ranges from about elevation 180 to 200 ft msl, which would provide roughly 200 feet or more of available drawdown in both it and existing wells of similar completion (i.e., those wells that fully penetrate the upper WBZ present from ~ elevation -125 to -250 ft msl). This approximate range of available drawdown should be sufficient to support ongoing usage of these wells with the change proposed by this application (i.e., the change will not prevent those wells from receiving the groundwater to which they are legally entitled).

The results of the potential injury evaluation suggests that relatively moderate (~10-50 feet) levels of additional drawdown might be imposed in some area wells due to pumping of the “AN Well”, and possibly at other proposed APOA locations. It should be noted, however, that these estimates were completed using very conservative operational parameters for the Theis analytical drawdown method: pumping a single well at the full allocated rate (and in this case a stacked rate) for 24 hours a day, 7 days a week, 365 days a year. Actual pump operation will likely not be this sustained, and/or could be rotated to different locations to distribute overall pumping stresses to the CRBG aquifer system.

Furthermore, from the 2009 aquifer test of WASH 62373 ("Well-2") during which that well was pumped continuously for 47 hours at 465 gpm (~1 cfs), a total of 77 feet of drawdown was observed in adjacent WASH 7651 ("Well-1"), and only 2 feet in WASH 50693 (QVGC well) which is located about 3200 feet from WASH 62373. The results from the aquifer test generally confirm the conservative approach used for the Theis drawdown assessments, and that actual additional drawdown might be somewhat less than predicted, particularly for wells that penetrate the deeper of the two primary WBZ.

NOTE: there are relatively very few deeper CRBG wells in the area, i.e., those that obtain groundwater from the deeper WBZ: WASH 62373, WASH 50693 (QVGC well), WASH 71899, and perhaps a few others in the area. Therefore, despite the generally favorable results from the potential injury evaluation done for this review, **the applicant is encouraged to develop only the deeper of the two primary WBZ when completing any of the proposed APOA; limiting access to only the deeper WBZ will reduce the potential for causing adverse interference to the relatively much greater number of existing groundwater users tapping the shallower WBZ.**

6. a) Will this proposed change, at its maximum allowed rate of use, likely result in an increase in interference with **another surface water source**?

☐ Yes ☒ No Comments: With the planned cased and sealed depth of about 200-250 feet for the proposed APOA not yet drilled, and 300 feet for WASH 62373, water-bearing interflow zone(s) will likely be from many tens to perhaps hundreds of feet below any nearby stream reaches. Consequently, it is unlikely that the proposed change would result in an increase in interference with local surface water sources.

b) If yes, at its maximum allowed rate of use, what is the expected change in degree of interference with any **surface water sources** resulting from the proposed change?

Stream: _____ ☐ Minimal ☐ Significant

Stream: _____ ☐ Minimal ☐ Significant

Provide context for minimal/significant impact: N/A

7. For SW-GW transfers, will the proposed change in point of diversion affect the surface water source similarly (as per OAR 690-380-2130) to the authorized point of diversion specified in the water use subject to transfer?

☐ Yes ☒ No Comments: N/A

8. What conditions or other changes in the application are necessary to address any potential issues identified above: **Despite the authorization of WASH 62373 as a POA for certificate 95849 in its current configuration (i.e., obtaining groundwater from two discrete aquifers within the CRBG aquifer system), any APOA wells installed under this transfer application will be limited to only one of the two primary aquifers/WBZ present in WASH 62373.** Using information derived primarily from WASH 62373 and WASH 50693 (QVGC well), the two primary WBZ in the vicinity of the authorized and proposed APOAs are estimated to be present at the following approximate elevations:

- **Upper WBZ: ~ -125 to -250 ft msl**
- **Lower WBZ: ~ -320 to -430 ft msl.**

For the six proposed APOA not yet drilled, compliance with the single WBZ provision will require corresponding reductions in planned total well depths, as well as revisions to the planned cased and sealed intervals. Despite the generally favorable results from the potential injury evaluation done for this review, **the applicant is encouraged to develop only the deeper of the two primary WBZ when completing any of the proposed APOA; limiting access to only the deeper WBZ will reduce the potential for causing adverse interference to the relatively much greater number of existing groundwater users in the area that tap only the shallower WBZ.**

9. Any additional comments: None

References

Applications: T-14450 RA, T-14449 RA

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.

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

Golder Associates, 2009. Technical Memorandum: March 2009 Well #2 Aquifer Test Data Analysis.

Personal communication (also provided instrument specifications), Mike Schumacher (Pacific Surveys) to Justin Iverson (OWRD), January 24, 2025.

Theis, C.V., 1935, The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage, *American Geophysical Union Transactions*, vol. 16, p. 519-524.

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

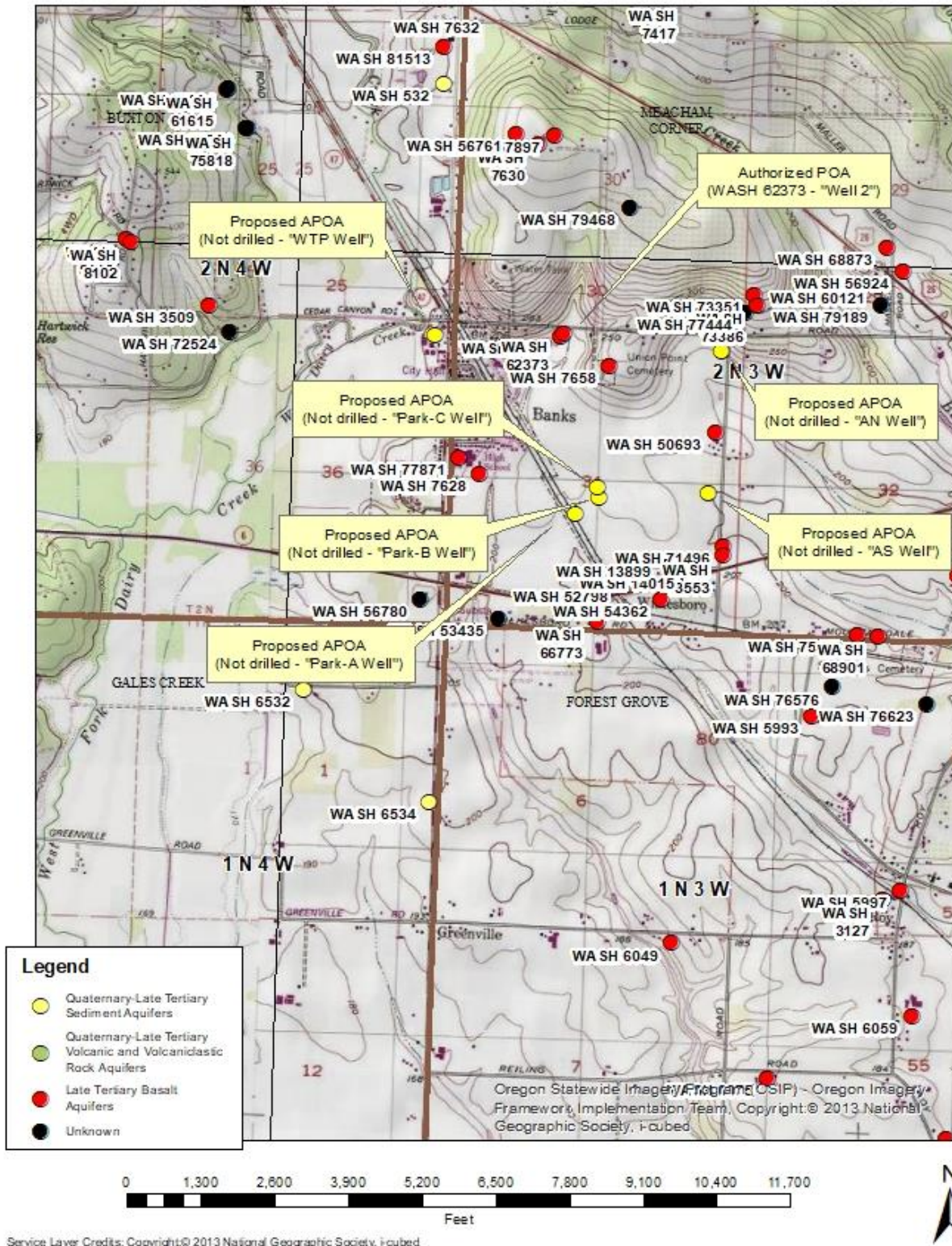
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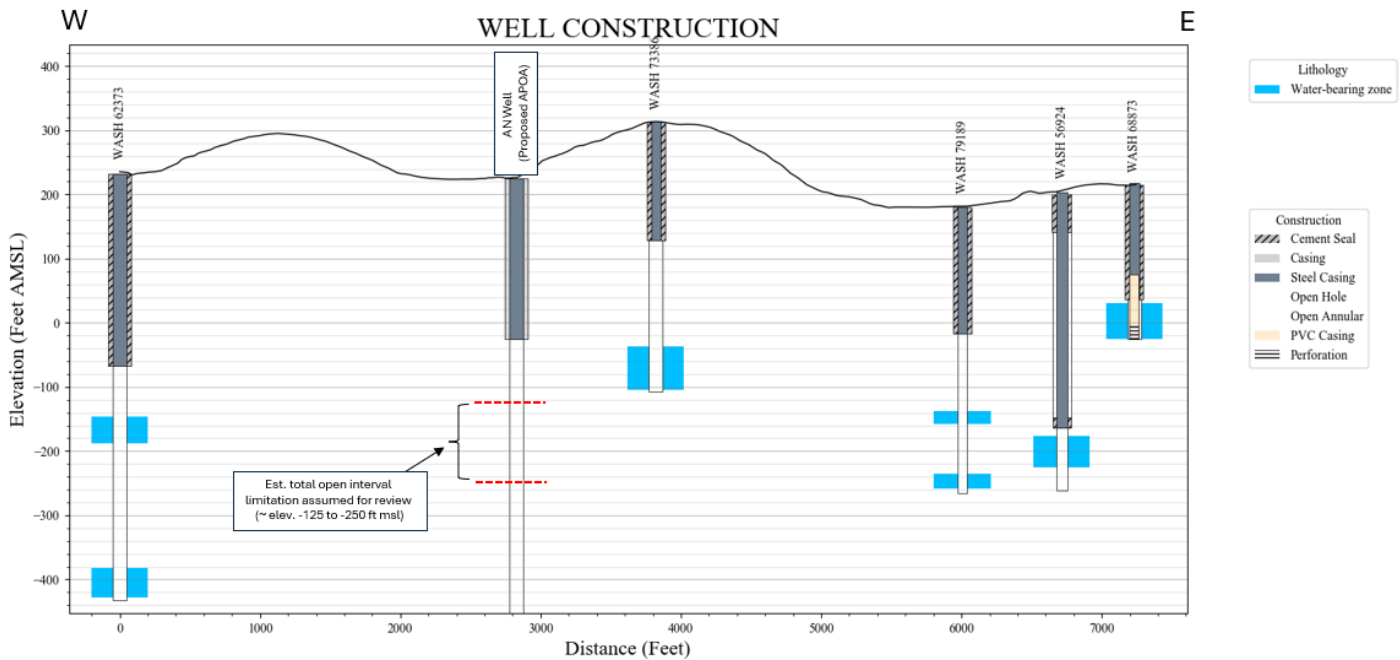
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Application T-14450, City of Banks

T2N, R3W



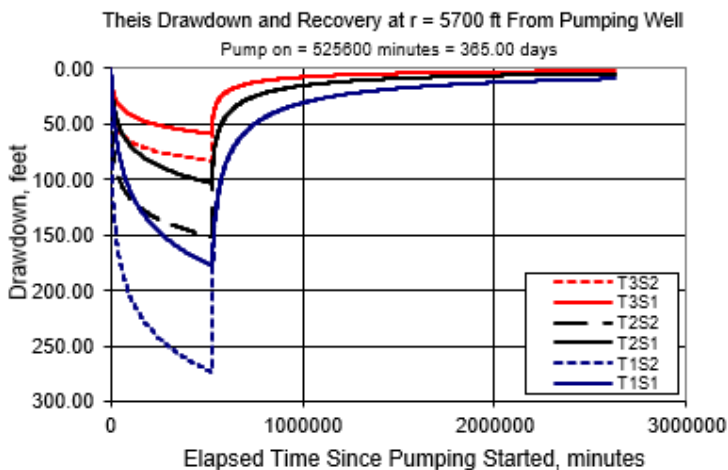
Cross-section : W-E, proposed APOA "AN Well" and WASH 79189**Theis Drawdown Analysis, Authorized POA WASH 62373 to WASH 79189****Theis Time-Drawdown Worksheet** v.5.00

Calculates Theis nonequilibrium drawdown and recovery at any arbitrary radial distance, r , from a pumping well for 3 different T radial distance, r , from a pumping well for 3 different T values and 2 different S values.

Written by Karl C. Wozniak September 1992. Last modified December 17, 2019

Input Data:	Var Name	Scenario 1	Scenario 2	Scenario 3	Units	
Total pumping time	t		365		d	
Radial distance from pumped well:	r		5700		ft	Q conversions
Pumping rate	Q		1.67		cfs	749.50 gpm
Hydraulic conductivity	K	5	10	20	ft/day	1.67 cfs
Aquifer thickness	b		55		ft	100.20 cfm
Storativity	S_1		0.0001			144,288.00 cfd
	S_2		0.00001			3.31 af/d
Transmissivity Conversions	T_ft2pd	275	550	1100	ft2/day	
	T_ft2pm	0.190972	0.381944	0.763889	ft2/min	Recalculate
	T_gpd/ft	2057	4114	8228	gpd/ft	

Use the Recalculate button if recalculation is set to manual



Theis Drawdown Analysis, Proposed APOA "AN Well" to WASH 79189**Theis Time-Drawdown Worksheet** v.5.00

Calculates Theis nonequilibrium drawdown and recovery at any arbitrary radial distance, r , from a pumping well for 3 different T radial distance, r , from a pumping well for 3 different T values and 2 different S values.

Written by Karl C. Wozniak September 1992. Last modified December 17, 2019

Input Data:	Var Name	Scenario 1	Scenario 2	Scenario 3	Units	
Total pumping time	t		365		d	
Radial distance from pumped well:	r		3000		ft	Q conversions
Pumping rate	Q		1.67		cfs	749.50 gpm
Hydraulic conductivity	K	5	10	20	ft/day	1.67 cfs
Aquifer thickness	b		55		ft	100.20 cfm
Storativity	S_1		0.0001			144,288.00 cfd
	S_2		0.00001			3.31 af/d
Transmissivity Conversions	T_f2pd	275	550	1100	ft ² /day	Recalculate
	T_ft2pm	0.190972	0.381944	0.763889	ft ² /min	
	T_gpdft	2057	4114	8228	gpd/ft	

Use the Recalculate button if recalculation is set to manual

