

Groundwater Transfer Review Summary Form

Transfer/PA # T- 13951

GW Reviewer Gerald H. Grondin

Date Review Completed: 13 December 2022

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).

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.

☒ None of the Above

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



Oregon Water Resources Department
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Ground Water Review Form:

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

Application: **T-13951**

Applicant Name: **Ernest, Dixie, Chaylon & Amber Shuffield.**

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

Reviewer(s): **Gerald H. Grondin**

Date of Review: **13 December 2022**

Date Reviewed by GW Mgr. and Returned to WRSD: **jti 2/16/23**

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 transfer application relates to three water right certificates (75912, 94178, & 75897) for authorized and proposed POU, POA/POD, and APOA located in T29S/R17R-sec 23 & 24 in the north Summer Lake Valley area. The proposed transfer location is about 4 miles south of the Fort Rock Groundwater Classified Area boundary.

The transfer application proposes moving, adjusting POU segments (20.16 acres total) located in T29S/R17R-sec 23 & 24.

The transfer application proposes adjusting 0.25 cfs (113.11 gpm) pumping by moving, adjusting, and adding pumping among three POA/POD wells (existing wells LAKE 4037 & LAKE 52627, and proposed well #3) located in T29S/R17R-sec 23 & 24.

2. Will the proposed POA develop the same aquifer (source) as the existing authorized POA?
☒ Yes ☐ No Comments: _____

Apparently yes, the "same aquifer" (source) given the existing and proposed POA/POD wells obtain groundwater from the likely higher permeability predominantly volcanic rock and sediment unit below the likely lower permeability predominantly basin-fill sediment unit. This is true for existing well LAKE 4037 (owner well #2) and appears true for the proposed construction of proposed owner well #3 (not yet constructed). It is uncertain for existing well LAKE 52627 given that well has no construction or lithologic information, but it is assumed true.

Additionally, groundwater levels related to wells in the north Summer Lake Valley area are similar and show similar decline with time (see attached hydrograph). The groundwater level at well LAKE 1445 near Silver Lake within the Fort Rock Groundwater Limited area is generally several feet higher than at the north Summer Lake Valley area wells, and the groundwater level at well LAKE 1477 west of Ana Spring Reservoir is generally 10 or more feet lower than at the other north Summer Lake Valley area wells.

3. a) Is there more than one source developed under the right (e.g., basalt and alluvium)?
☐ Yes ☒ No _____

Apparently no. See discussion in part 2 above.

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.): _____

No estimate made and no limitation recommended given item 2 and 3a above.

4. 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: _____

The proposed POA well change will move groundwater pumping closer to adjacent groundwater right POA well pair within T29S/R17-sec 23 (SE qtr). The calculated maximum additional seasonal groundwater level drawdown at that POA pair is less than 0.02 feet. **That POA well pair should be able to accommodate the seasonal drawdown change.** The maximum additional seasonal groundwater level drawdown at other POA wells further away will be less.

The long-term impact on the groundwater system should be the same.

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: _____

See discussion in part 4a above.

5. 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: _____

Yes for Johnson Creek and for Ana Spring.

Yes for Johnson Creek: The POA changes moves the net pumping closer to Johnson Creek. The seasonal drawdown at the Johnson Creek reach closest to proposed POA/POD wells is calculated to increase less than 0.005 feet. The long-term interference at the creek should be the same.

Yes for Ana Spring: The POA changes moves the net pumping closer to Ana Spring. The seasonal drawdown at the spring is calculated to increase less than 0.001 feet, a possible seasonal spring discharge decrease up to 0.0015 cfs (about 0.67 gpm). The long-term interference at the spring should be the same.

- 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: Johnson Creek ☒ Minimal ☐ Significant

Stream: Ana Spring ☒ Minimal ☐ Significant

Provide context for minimal/significant impact: _____

See comment in part 5a above.

6. 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: _____

Not Applicable. No SW-GW transfer.

7. What conditions or other changes in the application are necessary to address any potential issues identified above: _____

Note: the proposed transfer location is about 4 miles south of the Fort Rock Groundwater Classified Area boundary.

The following are technical groundwater review recommendations. It is recognized that one or more technically recommended conditions may or may not be allowed under the transfer process rules and statutes. This technical groundwater review relies on other appropriate and authorized Department staff to make that determination.

“Large” flow meter condition for any proposed “To” POA and/or APOA well. Require the flow meter for any POA and/or APOA well to be properly installed and maintained. Each meter shall be either within 50 feet of the well head with a clearly visible monument adjacent to the meter or a surveyed location shall be provided and a clearly visible monument adjacent to the meter shall be installed for each meter more than 50 feet from the well head.

Condition 7P (well tag condition) for all the “To” and “From” POA wells.

Condition 7T (modified) for all “To” POA wells: “Prior to use, all POA wells shall be configured to allow a strictly clean water (no oil) static water level measurements with an electric-tape. That can include measurement access via an unobstructed vertical discharge pipe that allows the groundwater level to fluctuate freely within the discharge pipe (no valves, etc.). Otherwise, a dedicated measuring tube must be installed prior to use. The tube must be unobstructed, have a diameter of ¾ inch (0.75 inch) or greater, and pursuant to figure 200-5 in OAR 690-200.”

Well construction condition for the APOA well to ensure same geologic source (existing well LAKE 4037 (owner well #2) meets the condition and existing well LAKE 52627 (owner well #1) is assumed to meet this condition): “The T-13951 proposed APOA well (proposed owner well #3) shall obtain groundwater solely from the predominantly basalt-volcanic rock and sediment unit (which may contain some sedimentary layers) that underlies the predominantly basin-fill sediment unit (which may contain some basalt layers). Each well shall have continuous casing and continuous seal from land surface, through the predominantly basin-fill unit, and 5 feet into the predominantly basalt-volcanic rock and sediment unit at minimum. Note: the depth to the predominantly basalt-volcanic rock and sediment unit varies with location.”

8. Any additional comments: _____

No additional comments.

References:

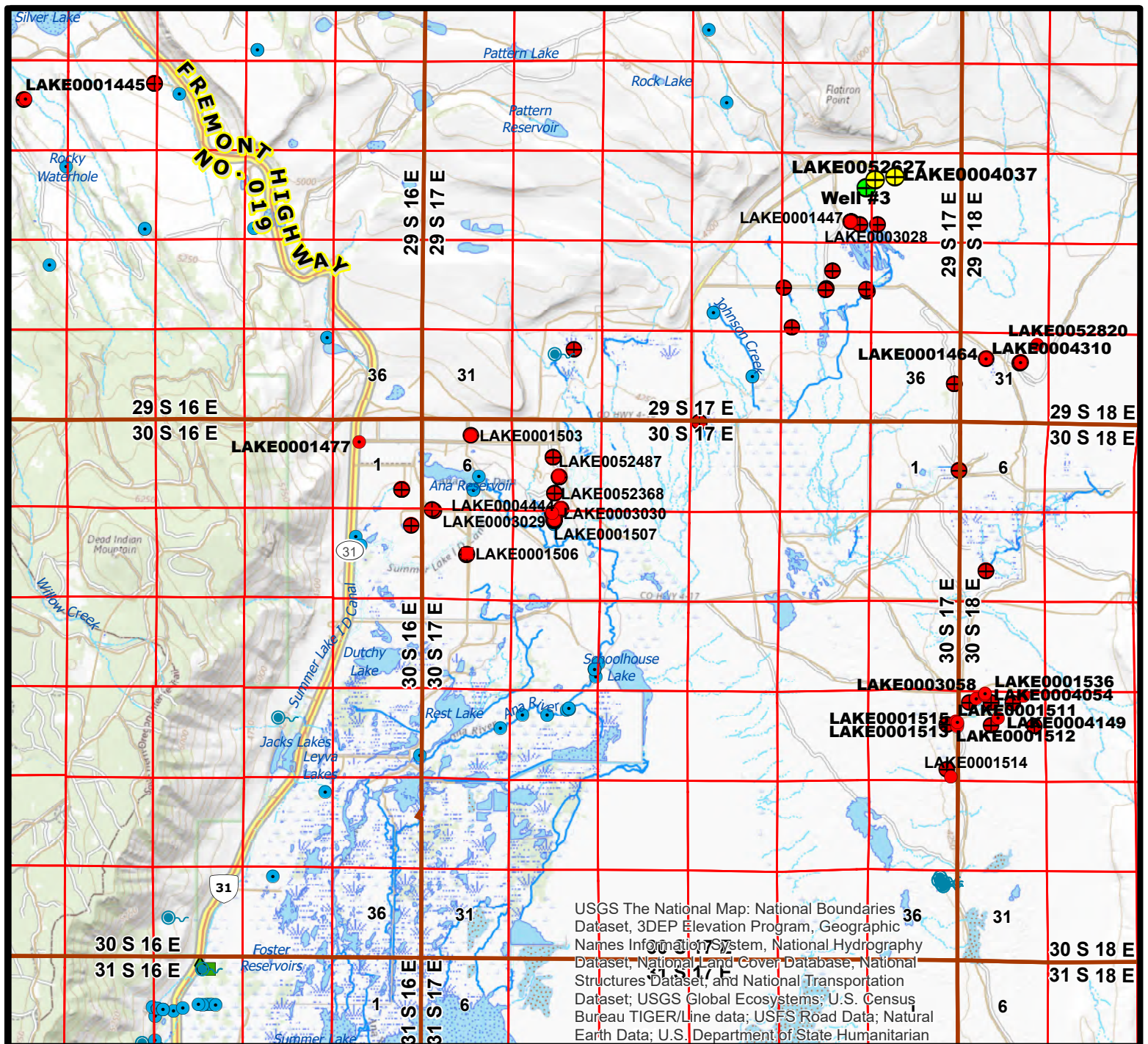
- McFarland, W.D. and Ryals, G.N., 1991, Adequacy of available hydrogeologic data for evaluation of declining ground-water levels in the Fort Rock Basin, south-central Oregon: USGS Water Resources Investigations Report 89-4057, 47 p.
- Miller, D.W., 1986, Appraisal of ground-water conditions in the Fort Rock Basin, Lake County, Oregon: Oregon Water Resources Department, Ground Water Report No. 31, 196 p and plates.
- Morgan, D.S., 1988, Geohydrology and numerical model analysis of ground-water flow in the Goose Lake Basin, Oregon and California: USGS Water Resources Investigations Report 87-4058, 92 p.

T-13951 (Shuffield)
Proposed Change
North Summer Lake Valley

Certificate	From Acres	From CFS	From POD/POA Well		To Acres	To CFS	To POD/POA Well		Change Calculation Comment
			Owner	OWRD			Owner	OWRD	
75912	1.84	0.0230	Well 1	LAKE 52627	6.36	0.0795	Well 2	LAKE 4037	POD/POA Change Calculate for LAKE 4037
	4.52	0.0565							
	3.26	0.0408			Well 1 or 3	LAKE 52627 or Well 3	APOA, Calculate for Well 3		
	9.62	0.1203			9.62	0.1203			
94178	0.44	0.0055	Well 2	LAKE 4037	0.44	0.0055	Well 2	LAKE 4037	No well change
75897	10.10	0.1263	Well 1	LAKE 52627	10.10	0.1263	Well 1 or 3	LAKE 52627 or Well 3	APOA, Calculate for Well 3
Overall Totals	20.16	0.2520			20.16	0.2520			
Totals per Well	19.72	0.2465	Well 1	LAKE 52627	0.00	0.0000	Well 1	LAKE 52627	Net Decrease
	0.44	0.0055	Well 2	LAKE 4037	6.80	0.0850	Well 2	LAKE 4037	Net Increase
	0.00	0.0000	Well 3	Well 3	13.36	0.1670	Well 3	Well 3	Net Increase
	20.16	0.2520			20.16	0.2520			
Note: CFS in Table = (Total Acres) / (80 Acre/CFS)									

Groundwater Transfer Application T-13951

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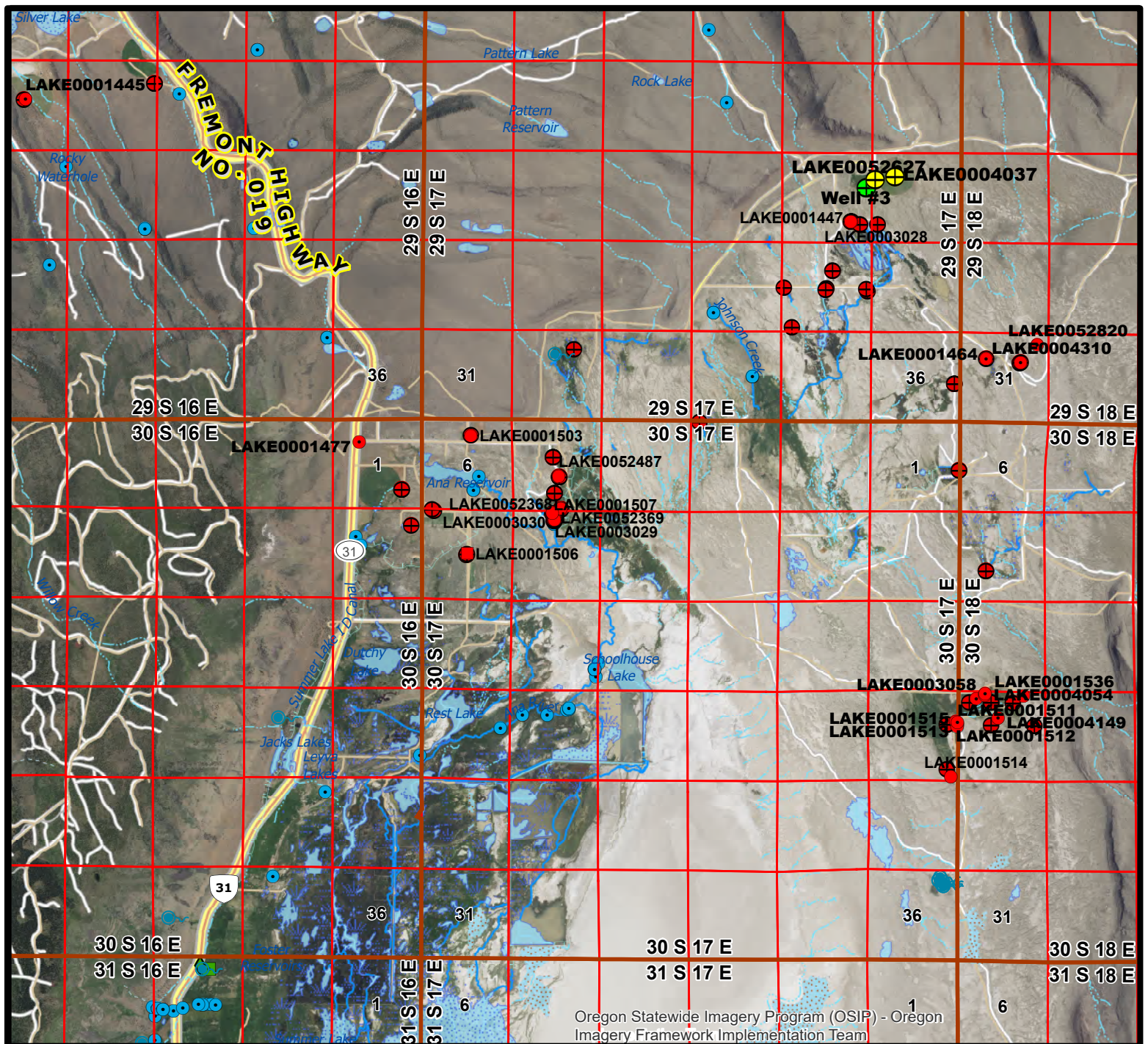


Green = Proposed Well
Yellow = Authorized Wells
Red = Groundwater PODs or Other Wells
Blue = Surface Water PODs



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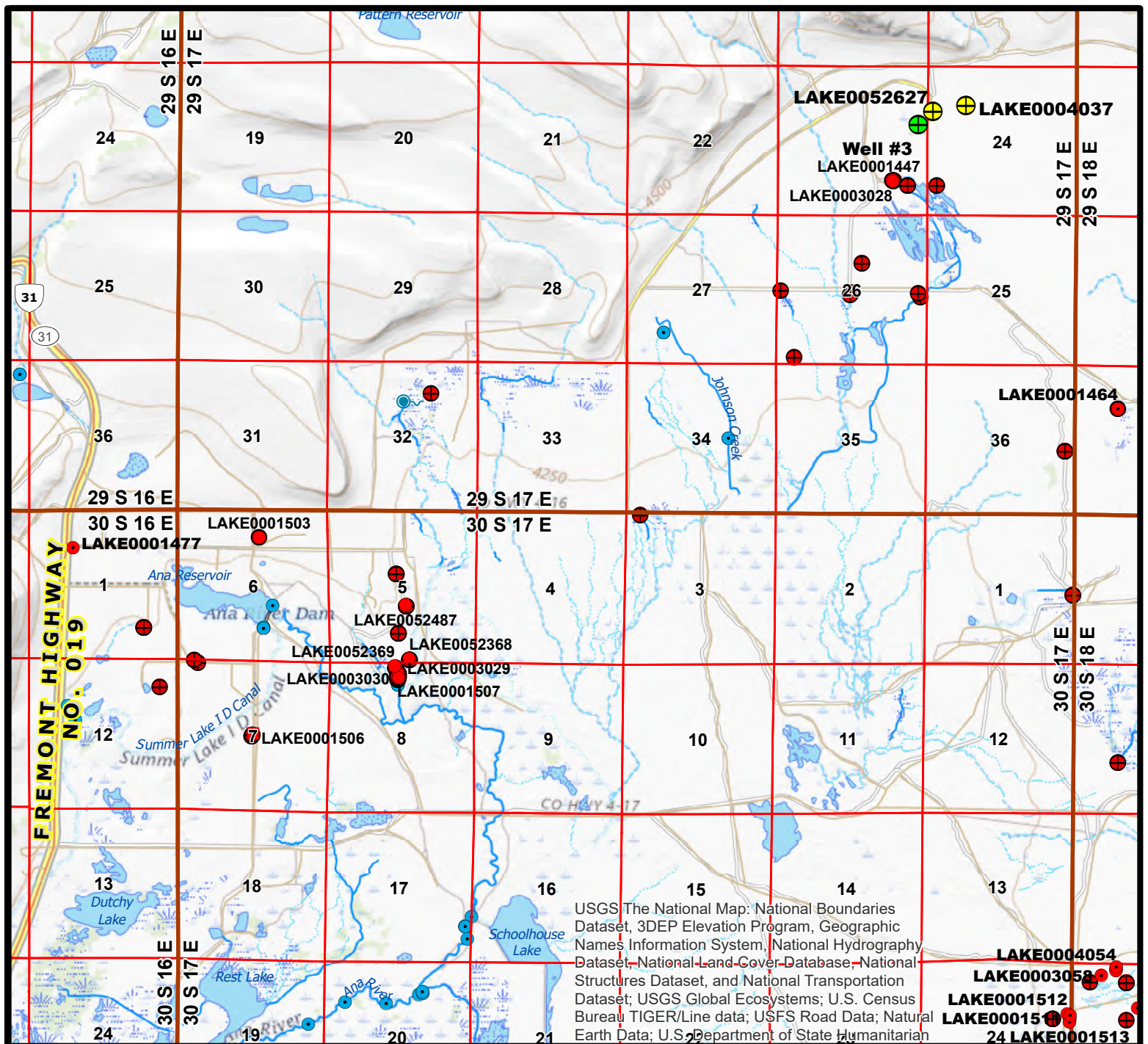


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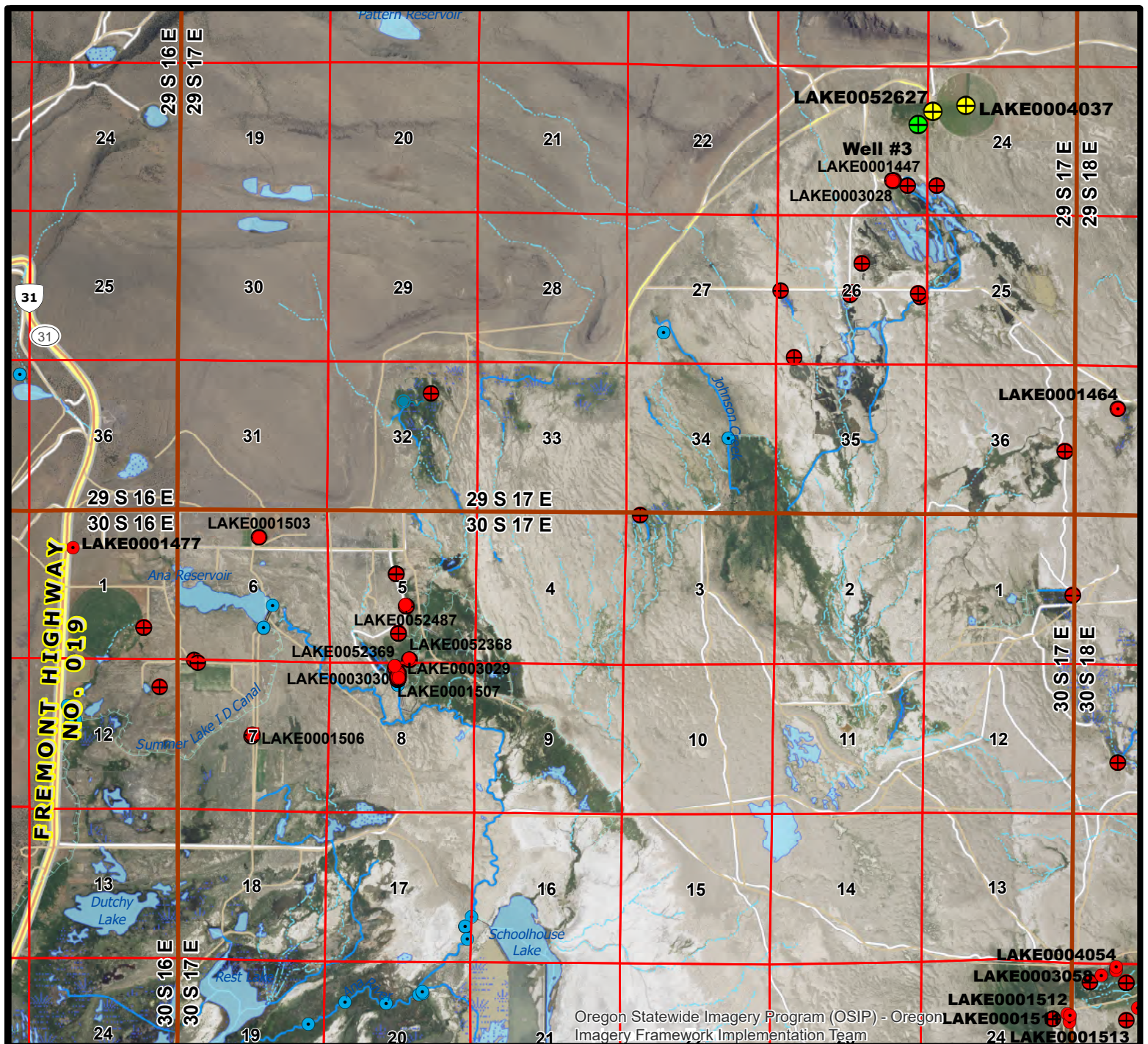


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Groundwater Transfer Application T-13951

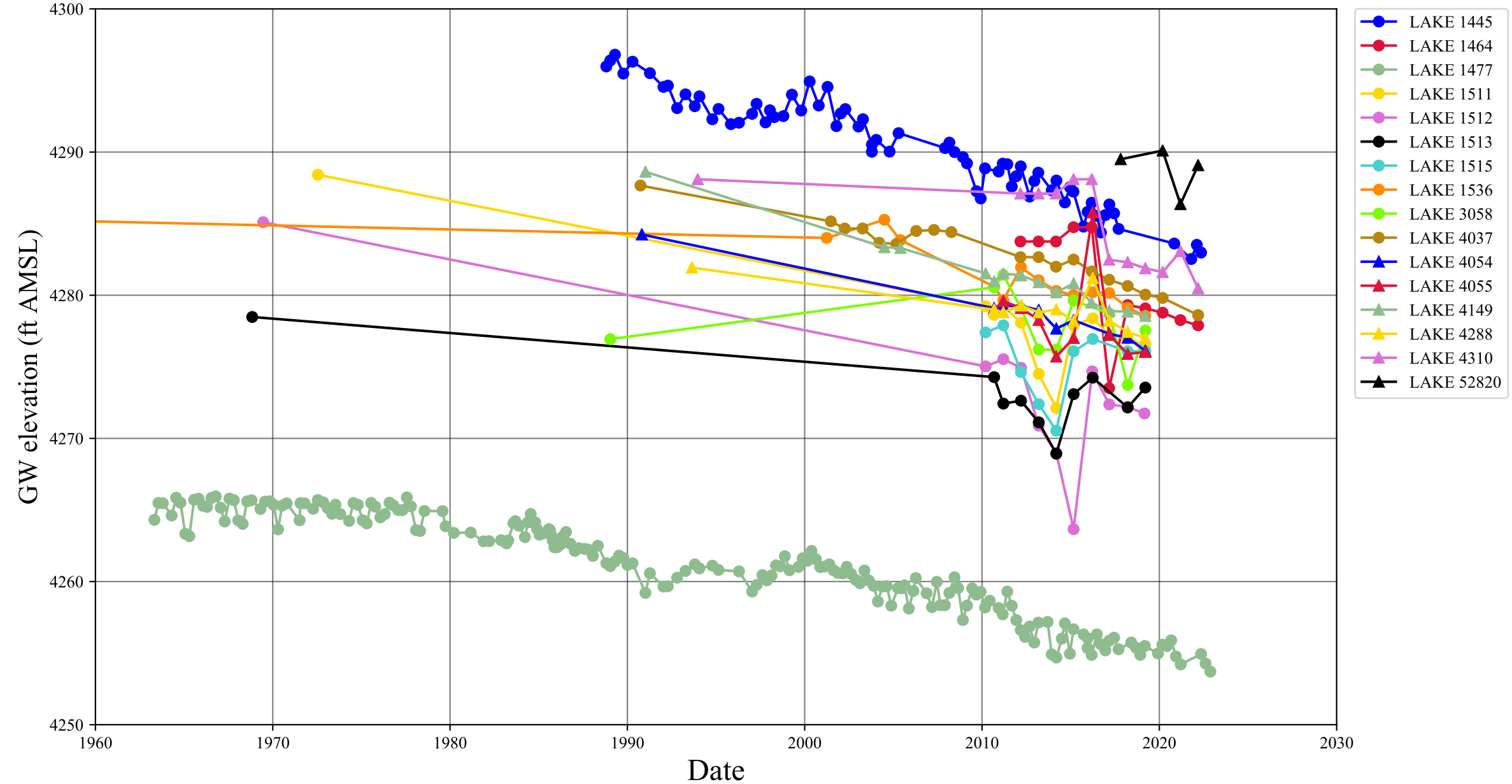
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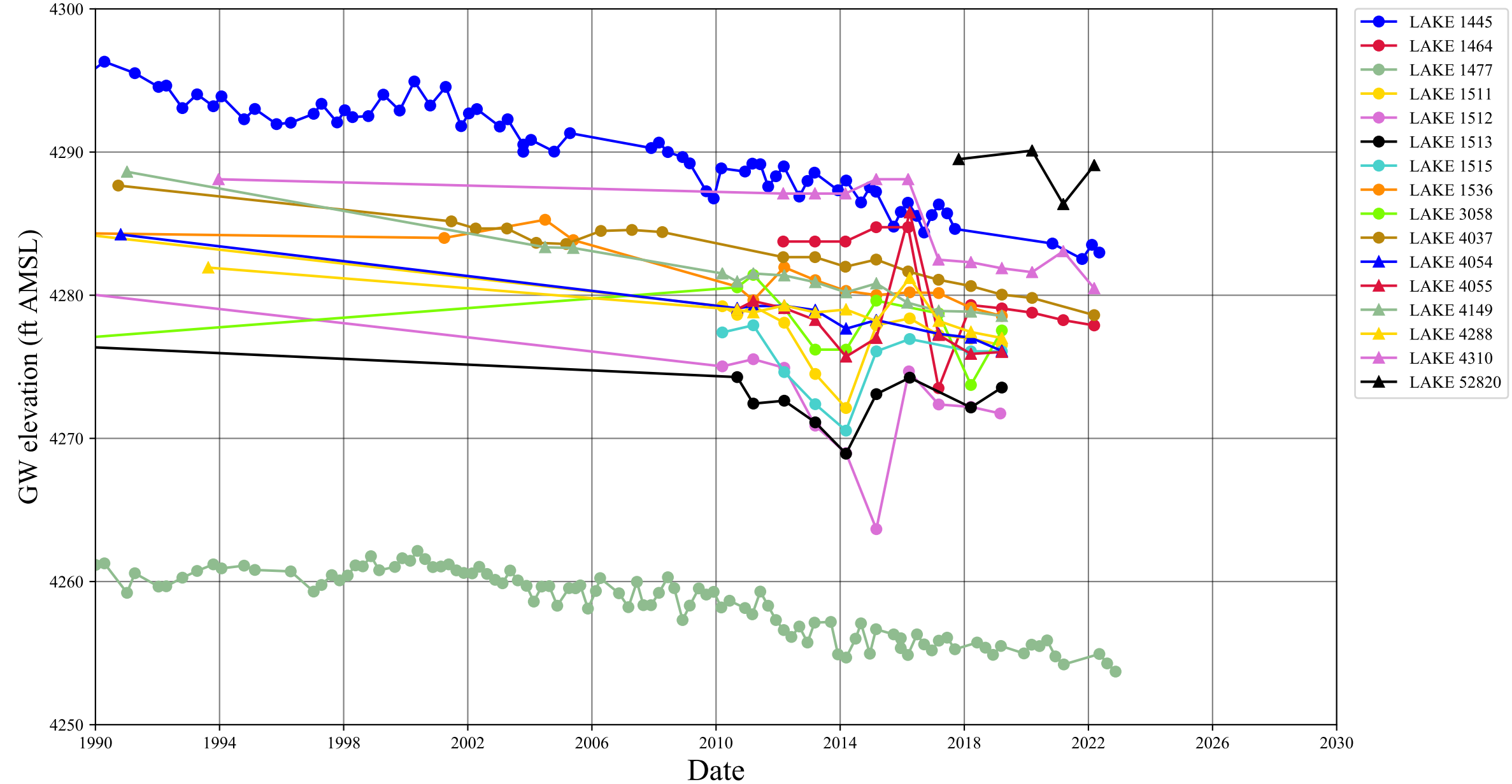
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Observation Well Data



Observation Well Data



Drawdown Calculations Using Theis Equation

Theis Equation: $s = [Q/(4 \cdot T \cdot \pi)] [W(u)]$
 $u = (r^2 \cdot S)/(4 \cdot T \cdot t)$
 $W(u) = (-\ln u) - (0.5772157) + (u/1 \cdot 1!) - (u^2/2 \cdot 2!) + (u^3/3 \cdot 3!) - (u^4/4 \cdot 4!) + \dots$

 s = drawdown (L) r = radial distance (L)
 T = transmissivity (L²/T) t = time (T)
 S = storage coefficient (dimensionless) u = dimensionless
 π = 3.141592654 $W(u)$ = well function

Transmissivity T (gpd/ft)	Transmissivity T (ft ² /day)	Storage Coefficient S	Pumping Rate Q (gal/min)	Pumping Rate Q (ft ³ /sec)	Time t (days)	Distance r (feet)	pi	u	W(u)	Drawdown s (feet)	Pumping Well	Drawdown Change (feet)	Comments
								Note : W(u) calculation valid when u < 7.1					
								7.0000	1.1545E-04				W(u) calculation test
Note: yellow grid areas are where values are calculated													
Authorized Wells to Well Closest to Well #3 (Transmissivity from Morgan (1988) and McFarland and Ryals (1991)): Used S = 0.01													
112,207.80	15,000.00	0.01000	110.64	0.2465	30.00	2,835.00	3.14	0.0447	2.5758	0.2910	LAKE 52627		Continuous Pumping at Full Rate
112,207.80	15,000.00	0.01000	2.47	0.0055	30.00	3,715.00	3.14	0.0767	2.0662	0.0052	LAKE 4037		Continuous Pumping at Full Rate
			113.11	0.25						0.2962			
112,207.80	15,000.00	0.01000	54.64	0.1217	245.00	2,835.00	3.14	0.0055	4.6372	0.2588	LAKE 52627		Pro-Rated Pumping Rate
112,207.80	15,000.00	0.01000	1.22	0.0027	245.00	3,715.00	3.14	0.0094	4.1004	0.0051	LAKE 4037		Pro-Rated Pumping Rate
			55.86	0.12						0.2639			
Authorized Wells to Well Closest to Well #3 (Transmissivity from Morgan (1988) and McFarland and Ryals (1991)): Used S = 0.001													
112,207.80	15,000.00	0.00100	110.64	0.2465	30.00	2,835.00	3.14	0.0045	4.8387	0.5467	LAKE 52627		Continuous Pumping at Full Rate
112,207.80	15,000.00	0.00100	2.47	0.0055	30.00	3,715.00	3.14	0.0077	4.3012	0.0108	LAKE 4037		Continuous Pumping at Full Rate
			113.11	0.25						0.5576			
112,207.80	15,000.00	0.00100	54.64	0.1217	245.00	2,835.00	3.14	0.0005	6.9348	0.3870	LAKE 52627		Pro-Rated Pumping Rate
112,207.80	15,000.00	0.00100	1.22	0.0027	245.00	3,715.00	3.14	0.0009	6.3946	0.0080	LAKE 4037		Pro-Rated Pumping Rate
			55.86	0.12						0.3949			
Authorized Wells to Well Closest to Well #3 (Transmissivity from Morgan (1988) and McFarland and Ryals (1991)): Used S = 0.0001													
112,207.80	15,000.00	0.00010	110.64	0.2465	30.00	2,835.00	3.14	0.0004	7.1373	0.8064	LAKE 52627		Continuous Pumping at Full Rate
112,207.80	15,000.00	0.00010	2.47	0.0055	30.00	3,715.00	3.14	0.0008	6.5969	0.0166	LAKE 4037		Continuous Pumping at Full Rate
			113.11	0.25						0.8231			
112,207.80	15,000.00	0.00010	54.64	0.1217	245.00	2,835.00	3.14	0.0001	9.2369	0.5154	LAKE 52627		Pro-Rated Pumping Rate
112,207.80	15,000.00	0.00010	1.22	0.0027	245.00	3,715.00	3.14	0.0001	8.6963	0.0108	LAKE 4037		Pro-Rated Pumping Rate
			55.86	0.12						0.5263			
Proposed Wells to Well Closest to Well #3 (Transmissivity from Morgan (1988) and McFarland and Ryals (1991)): Used S = 0.01													
112,207.80	15,000.00	0.01000	38.15	0.0850	30.00	3,715.00	3.14	0.0767	2.0662	0.0805	LAKE 4037		Continuous Pumping at Full Rate
112,207.80	15,000.00	0.01000	74.95	0.1670	30.00	2,190.00	3.14	0.0266	3.0744	0.2353	Well #3		Continuous Pumping at Full Rate
			113.11	0.25						0.3158		0.0196	
112,207.80	15,000.00	0.01000	18.84	0.0420	245.00	3,715.00	3.14	0.0094	4.1004	0.0789	LAKE 4037		Pro-Rated Pumping Rate
112,207.80	15,000.00	0.01000	37.02	0.0825	245.00	2,190.00	3.14	0.0033	5.1513	0.1947	Well #3		Pro-Rated Pumping Rate
			55.86	0.12						0.2736		0.0098	
Proposed Wells to Well Closest to Well #3 (Transmissivity from Morgan (1988) and McFarland and Ryals (1991)): Used S = 0.001													
112,207.80	15,000.00	0.00100	38.15	0.0850	30.00	3,715.00	3.14	0.0077	4.3012	0.1676	LAKE 4037		Continuous Pumping at Full Rate
112,207.80	15,000.00	0.00100	74.95	0.1670	30.00	2,190.00	3.14	0.0027	5.3532	0.4098	Well #3		Continuous Pumping at Full Rate
			113.11	0.25						0.5774		0.0198	
112,207.80	15,000.00	0.00100	18.84	0.0420	245.00	3,715.00	3.14	0.0009	6.3946	0.1230	LAKE 4037		Pro-Rated Pumping Rate
112,207.80	15,000.00	0.00100	37.02	0.0825	245.00	2,190.00	3.14	0.0003	7.4509	0.2817	Well #3		Pro-Rated Pumping Rate
			55.86	0.12						0.4047		0.0098	
Proposed Wells to Well Closest to Well #3 (Transmissivity from Morgan (1988) and McFarland and Ryals (1991)): Used S = 0.0001													
112,207.80	15,000.00	0.00010	38.15	0.0850	30.00	3,715.00	3.14	0.0008	6.5969	0.2570	LAKE 4037		Continuous Pumping at Full Rate
112,207.80	15,000.00	0.00010	74.95	0.1670	30.00	2,190.00	3.14	0.0003	7.6534	0.5858	Well #3		Continuous Pumping at Full Rate
			113.11	0.25						0.8429		0.0198	
112,207.80	15,000.00	0.00010	18.84	0.0420	245.00	3,715.00	3.14	0.0001	8.6963	0.1673	LAKE 4037		Pro-Rated Pumping Rate
112,207.80	15,000.00	0.00010	37.02	0.0825	245.00	2,190.00	3.14	0.0000	9.7532	0.3687	Well #3		Pro-Rated Pumping Rate
			55.86	0.12						0.5361		0.0098	

Drawdown Calculations Using Theis Equation

Theis Equation: $s = [Q/(4 \cdot T \cdot \pi)] [W(u)]$
 $u = (r^2 S)/(4 \cdot T \cdot t)$
 $W(u) = (-\ln u) - (0.5772157) + (u/1^{*}1!) - (u^2/2^{*}2!) + (u^3/3^{*}3!) - (u^4/4^{*}4!) + \dots$

 s = drawdown (L) r = radial distance (L)
 T = transmissivity (L²/T) t = time (T)
 S = storage coefficient (dimensionless) u = dimensionless
 π = 3.141592654 $W(u)$ = well function

Transmissivity T (gpd/ft)	Transmissivity T (ft ² /day)	Storage Coefficient S	Pumping Rate Q (gal/min)	Pumping Rate Q (ft ³ /sec)	Time t (days)	Distance r (feet)	pi	u	W(u)	Drawdown s (feet)	Pumping Well	Drawdown Change (feet)	Comments
								Note : W(u) calculation valid when u < 7.1					
								7.0000	1.1545E-04				W(u) calculation test
Authorized Wells to Johnson Creek Reach Closest to Well #3 (Transmissivity from Morgan (1988) and McFarland and Ryals (1991)): Used S = 0.01													
112,207.80	15,000.00	0.01000	110.64	0.2465	30.00	12,250.00	3.14	0.8337	0.2924	0.0330	LAKE 52627		Continuous Pumping at Full Rate
112,207.80	15,000.00	0.01000	2.47	0.0055	30.00	13,310.00	3.14	0.9842	0.2253	0.0006	LAKE 4037		Continuous Pumping at Full Rate
			113.11	0.25						0.0336			
112,207.80	15,000.00	0.01000	54.64	0.1217	245.00	12,250.00	3.14	0.1021	1.8043	0.1007	LAKE 52627		Pro-Rated Pumping Rate
112,207.80	15,000.00	0.01000	1.22	0.0027	245.00	13,310.00	3.14	0.1205	1.6557	0.0021	LAKE 4037		Pro-Rated Pumping Rate
			55.86	0.12						0.1027			
Authorized Wells to Johnson Creek Reach Closest to Well #3 (Transmissivity from Morgan (1988) and McFarland and Ryals (1991)): Used S = 0.001													
112,207.80	15,000.00	0.00100	110.64	0.2465	30.00	12,250.00	3.14	0.0834	1.9889	0.2247	LAKE 52627		Continuous Pumping at Full Rate
112,207.80	15,000.00	0.00100	2.47	0.0055	30.00	13,310.00	3.14	0.0984	1.8373	0.0046	LAKE 4037		Continuous Pumping at Full Rate
			113.11	0.25						0.2294			
112,207.80	15,000.00	0.00100	54.64	0.1217	245.00	12,250.00	3.14	0.0102	4.0175	0.2242	LAKE 52627		Pro-Rated Pumping Rate
112,207.80	15,000.00	0.00100	1.22	0.0027	245.00	13,310.00	3.14	0.0121	3.8534	0.0048	LAKE 4037		Pro-Rated Pumping Rate
			55.86	0.12						0.2290			
Authorized Wells to Johnson Creek Reach Closest to Well #3 (Transmissivity from Morgan (1988) and McFarland and Ryals (1991)): Used S = 0.0001													
112,207.80	15,000.00	0.00010	110.64	0.2465	30.00	12,250.00	3.14	0.0083	4.2182	0.4766	LAKE 52627		Continuous Pumping at Full Rate
112,207.80	15,000.00	0.00010	2.47	0.0055	30.00	13,310.00	3.14	0.0098	4.0537	0.0102	LAKE 4037		Continuous Pumping at Full Rate
			113.11	0.25						0.4868			
112,207.80	15,000.00	0.00010	54.64	0.1217	245.00	12,250.00	3.14	0.0010	6.3109	0.3522	LAKE 52627		Pro-Rated Pumping Rate
112,207.80	15,000.00	0.00010	1.22	0.0027	245.00	13,310.00	3.14	0.0012	6.1451	0.0077	LAKE 4037		Pro-Rated Pumping Rate
			55.86	0.12						0.3598			
Proposed Wells to Johnson Creek Reach Closest to Well #3 (Transmissivity from Morgan (1988) and McFarland and Ryals (1991)): Used S = 0.01													
112,207.80	15,000.00	0.01000	38.15	0.0850	30.00	13,310.00	3.14	0.9842	0.2253	0.0088	LAKE 4037		Continuous Pumping at Full Rate
112,207.80	15,000.00	0.01000	74.95	0.1670	30.00	11,550.00	3.14	0.7411	0.3460	0.0265	Well #3		Continuous Pumping at Full Rate
			113.11	0.25						0.0353		0.0017	
112,207.80	15,000.00	0.01000	18.84	0.0420	245.00	13,310.00	3.14	0.1205	1.6557	0.0319	LAKE 4037		Pro-Rated Pumping Rate
112,207.80	15,000.00	0.01000	37.02	0.0825	245.00	11,550.00	3.14	0.0908	1.9112	0.0723	Well #3		Pro-Rated Pumping Rate
			55.86	0.12						0.1041		0.0014	
Proposed Wells to Well Johnson Creek Reach to Well #3 (Transmissivity from Morgan (1988) and McFarland and Ryals (1991)): Used S = 0.001													
112,207.80	15,000.00	0.00100	38.15	0.0850	30.00	13,310.00	3.14	0.0984	1.8373	0.0716	LAKE 4037		Continuous Pumping at Full Rate
112,207.80	15,000.00	0.00100	74.95	0.1670	30.00	11,550.00	3.14	0.0741	2.0977	0.1606	Well #3		Continuous Pumping at Full Rate
			113.11	0.25						0.2322		0.0028	
112,207.80	15,000.00	0.00100	18.84	0.0420	245.00	13,310.00	3.14	0.0121	3.8534	0.0741	LAKE 4037		Pro-Rated Pumping Rate
112,207.80	15,000.00	0.00100	37.02	0.0825	245.00	11,550.00	3.14	0.0091	4.1341	0.1563	Well #3		Pro-Rated Pumping Rate
			55.86	0.12						0.2304		0.0015	
Proposed Wells to Johnson Creek Reach Closest to Well #3 (Transmissivity from Morgan (1988) and McFarland and Ryals (1991)): Used S = 0.0001													
112,207.80	15,000.00	0.00010	38.15	0.0850	30.00	13,310.00	3.14	0.0098	4.0537	0.1579	LAKE 4037		Continuous Pumping at Full Rate
112,207.80	15,000.00	0.00010	74.95	0.1670	30.00	11,550.00	3.14	0.0074	4.3349	0.3318	Well #3		Continuous Pumping at Full Rate
			113.11	0.25						0.4898		0.0029	
112,207.80	15,000.00	0.00010	18.84	0.0420	245.00	13,310.00	3.14	0.0012	6.1451	0.1182	LAKE 4037		Pro-Rated Pumping Rate
112,207.80	15,000.00	0.00010	37.02	0.0825	245.00	11,550.00	3.14	0.0009	6.4285	0.2430	Well #3		Pro-Rated Pumping Rate
			55.86	0.12						0.3613		0.0015	

Drawdown Calculations Using Theis Equation

Theis Equation: $s = [Q/(4 \cdot T \cdot \pi)] [W(u)]$
 $u = (r^2 \cdot S)/(4 \cdot T \cdot t)$
 $W(u) = (-\ln u) - (0.5772157) + (u/1 \cdot 1!) - (u^2/2 \cdot 2!) + (u^3/3 \cdot 3!) - (u^4/4 \cdot 4!) + \dots$

 s = drawdown (L)
 T = transmissivity (L²/T)
 S = storage coefficient (dimensionless)
 π = 3.141592654

 r = radial distance (L)
 t = time (T)
 u = dimensionless
 $W(u)$ = well function

Transmissivity T (gpd/ft)	Transmissivity T (ft ² /day)	Storage Coefficient S	Pumping Rate Q (gal/min)	Pumping Rate Q (ft ³ /sec)	Time t (days)	Distance r (feet)	pi	u	W(u)	Drawdown s (feet)	Pumping Well	Drawdown Change (feet)	Ana Spring Flow Change ft ³ /s	Spring Flow Change ft ³ /s	Comments
Note: yellow grid areas are where values are calculated									7.0000	1.1545E-04					W(u) calculation test
Authorized Wells to Ana Spring Reservoir (Transmissivity from Morgan (1988) and McFarland and Ryals (1991)): Used S = 0.01															
112,207.80	15,000.00	0.01000	110.64	0.2465	30.00	29,220.00	3.14	4.7434	0.0016	0.0002	LAKE 52627		0.0003		Continuous Pumping at Full Rate
112,207.80	15,000.00	0.01000	2.47	0.0055	30.00	30,305.00	3.14	5.1022	0.0010	0.0000	LAKE 4037		0.0000		Continuous Pumping at Full Rate
			113.11	0.25						0.0002					
112,207.80	15,000.00	0.01000	54.64	0.1217	245.00	29,220.00	3.14	0.5808	0.4724	0.0264	LAKE 52627		0.0439		Pro-Rated Pumping Rate
112,207.80	15,000.00	0.01000	1.22	0.0027	245.00	30,305.00	3.14	0.6248	0.4325	0.0005	LAKE 4037		0.0009		Pro-Rated Pumping Rate
			55.86	0.12						0.0269			0.0448		
Authorized Wells to Ana Spring Reservoir (Transmissivity from Morgan (1988) and McFarland and Ryals (1991)): Used S = 0.001															
112,207.80	15,000.00	0.00100	110.64	0.2465	30.00	29,220.00	3.14	0.4743	0.5921	0.0669	LAKE 52627		0.1115		Continuous Pumping at Full Rate
112,207.80	15,000.00	0.00100	2.47	0.0055	30.00	30,305.00	3.14	0.5102	0.5476	0.0014	LAKE 4037		0.0023		Continuous Pumping at Full Rate
			113.11	0.25						0.0683			0.1138		
112,207.80	15,000.00	0.00100	54.64	0.1217	245.00	29,220.00	3.14	0.0581	2.3259	0.1298	LAKE 52627		0.2163		Pro-Rated Pumping Rate
112,207.80	15,000.00	0.00100	1.22	0.0027	245.00	30,305.00	3.14	0.0625	2.2573	0.0028	LAKE 4037		0.0047		Pro-Rated Pumping Rate
			55.86	0.12						0.1326			0.2210		
Authorized Wells to Ana Spring Reservoir3 (Transmissivity from Morgan (1988) and McFarland and Ryals (1991)): Used S = 0.0001															
112,207.80	15,000.00	0.00010	110.64	0.2465	30.00	29,220.00	3.14	0.0474	2.5181	0.2845	LAKE 52627		0.4742		Continuous Pumping at Full Rate
112,207.80	15,000.00	0.00010	2.47	0.0055	30.00	30,305.00	3.14	0.0510	2.4487	0.0062	LAKE 4037		0.0103		Continuous Pumping at Full Rate
			113.11	0.25						0.2907			0.4845		
112,207.80	15,000.00	0.00010	54.64	0.1217	245.00	29,220.00	3.14	0.0058	4.5771	0.2554	LAKE 52627		0.4257		Pro-Rated Pumping Rate
112,207.80	15,000.00	0.00010	1.22	0.0027	245.00	30,305.00	3.14	0.0062	4.5046	0.0056	LAKE 4037		0.0093		Pro-Rated Pumping Rate
			55.86	0.12						0.2610			0.4350		
Proposed Wells to Ana Spring Reservoir (Transmissivity from Morgan (1988) and McFarland and Ryals (1991)): Used S = 0.01															
112,207.80	15,000.00	0.01000	38.15	0.0850	30.00	30,305.00	3.14	5.1022	0.0010	0.0000	LAKE 4037		0.0001		Continuous Pumping at Full Rate
112,207.80	15,000.00	0.01000	74.95	0.1670	30.00	28,540.00	3.14	4.5252	0.0020	0.0002	Well #3		0.0003		Continuous Pumping at Full Rate
			113.11	0.25						0.0002		0.0000	0.0003	0.0000	
112,207.80	15,000.00	0.01000	18.84	0.0420	245.00	30,305.00	3.14	0.6248	0.4325	0.0083	LAKE 4037		0.0139		Pro-Rated Pumping Rate
112,207.80	15,000.00	0.01000	37.02	0.0825	245.00	28,540.00	3.14	0.5541	0.4991	0.0189	Well #3		0.0314		Pro-Rated Pumping Rate
			55.86	0.12						0.0272		0.0003	0.0453	0.0005	
Proposed Wells to Ana Spring Reservoir (Transmissivity from Morgan (1988) and McFarland and Ryals (1991)): Used S = 0.001															
112,207.80	15,000.00	0.00100	38.15	0.0850	30.00	30,305.00	3.14	0.5102	0.5476	0.0213	LAKE 4037		0.0356		Continuous Pumping at Full Rate
112,207.80	15,000.00	0.00100	74.95	0.1670	30.00	28,540.00	3.14	0.4525	0.6218	0.0476	Well #3		0.0793		Continuous Pumping at Full Rate
			113.11	0.25						0.0689		0.0006	0.1149	0.0011	
112,207.80	15,000.00	0.00100	18.84	0.0420	245.00	30,305.00	3.14	0.0625	2.2573	0.0434	LAKE 4037		0.0724		Pro-Rated Pumping Rate
112,207.80	15,000.00	0.00100	37.02	0.0825	245.00	28,540.00	3.14	0.0554	2.3704	0.0896	Well #3		0.1494		Pro-Rated Pumping Rate
			55.86	0.12						0.1330		0.0004	0.2217	0.0007	
Proposed Wells to Ana Spring Reservoir (Transmissivity from Morgan (1988) and McFarland and Ryals (1991)): Used S = 0.0001															
112,207.80	15,000.00	0.00010	38.15	0.0850	30.00	30,305.00	3.14	0.0510	2.4487	0.0954	LAKE 4037		0.1590		Continuous Pumping at Full Rate
112,207.80	15,000.00	0.00010	74.95	0.1670	30.00	28,540.00	3.14	0.0453	2.5630	0.1962	Well #3		0.3270		Continuous Pumping at Full Rate
			113.11	0.25						0.2916		0.0009	0.4860	0.0015	
112,207.80	15,000.00	0.00010	18.84	0.0420	245.00	30,305.00	3.14	0.0062	4.5046	0.0867	LAKE 4037		0.1445		Pro-Rated Pumping Rate
112,207.80	15,000.00	0.00010	37.02	0.0825	245.00	28,540.00	3.14	0.0055	4.6239	0.1748	Well #3		0.2913		Pro-Rated Pumping Rate
			55.86	0.12						0.2615		0.0005	0.4358	0.0008	

Ana Spring Flow Change: $Q(\text{change}) = Q(\text{original}) - (Q(\text{original}) \cdot ((h(\text{original}) - h(\text{change})) / h(\text{original})))$

 $Q(\text{change})$ = change in flow rate at Ana Spring (ft³/s)
 $Q(\text{original})$ = Ana Spring flow rate observed by Brown (1957) = 90 ft³/s
 $h(\text{original})$ = GW head above Ana Reservoir lake lake observed by Brown (1957) = 54 ft
 $h(\text{change})$ = calculated drawdown at Ana Spring

Note: Given the equation above, a positive value is a decrease in flow and a negative value is an increase in flow

Note: the change in Ana Spring flow is about 1.67 ft³/s per 1.0 foot of groundwater level change using the Brown (1957) methodology



Oregon Water Resources Department
725 Summer Street NE, Suite A
Salem Oregon 97301
(503) 986-0900
www.wrd.state.or.us

Application for Well ID Number

RECEIVED

JUN 10 2015

**WATER RESOURCES DEPT
SALEM, OREGON**

Do not complete if the well already has a Well Identification Number.

I. OWNER INFORMATION

Current Owner Name (please print): Ernest & Dixie Shuffield, Shuffield Ranch

Mailing Address: P.O. Box 85

City, State, Zip: Summer Lake, OR 97640

Mail Well ID Tag to: ☒ SAME AS ABOVE ☐ In Care Of (C/O)

Name & Address: _____

City, State, Zip: _____

II. WELL LOCATION INFORMATION (Please fill out as completely as possible)

Township: 29 S (North / South) Range: 17 E (East / West) Section: 24

Tax Lot: 600 County Lake SW 1/4 NW 1/4

GPS Coordinates: 1600' South and 160' East from the NW corner of Section 24

Street Address of Well, City: 50969 Shuffield Rd, Summer Lake, OR 97640

If the property had a different street address in the past: End of County Rd 4-16A

III. GENERAL WELL INFORMATION (Please fill out as completely as possible)

Use of Well (domestic, irrigation, commercial, industrial, monitoring): Irrigation, Domestic, Livestock

Date Well Constructed (or property built): 1914 / 1946 Total Well Depth: N/A Casing Diameter: 6"

Owner at time the well was constructed (if known): Floyd N. Arnott Original Well Constructor: Frank Harvey Williams

Other Information: Well and original homesteader discussed in 'Settlers of the Summer Lake Valley' by Teresa Foster

SUBMITTED BY (please print): Chaylon Shuffield, Shuffield Ranch Water Resources Agent

PHONE: 541.213.0093

EMAIL &/or FAX: c_shuffield@hotmail.com

Send application to: Oregon Water Resources Department 725 Summer St NE, Suite A, Salem, Oregon 97301; or fax to (503) 986-0902. Applications are processed in the order they are received, and Well ID Numbers are mailed within 4-5 business days.

For Official Use Only by the Oregon Water Resources Department:

Received Date:

6-10-15

Well Log Number:

LAKE 52627

Well Identification #:

L-118706

(NO ORIGINAL WELL LOG)



Oregon Water Resources Department
725 Summer Street NE, Suite A
Salem Oregon 97301
(503) 986-0900
www.wrd.state.or.us

Application for Well ID Number

Do not complete if the well already has a Well I.D Number.

I. OWNER INFORMATION

Current Owner Name (please print): Ernest Duane Shuffield
Mailing Address: P.O. Box 85
City: Summer Lake State: Oregon Zip: 97640
Mailing Address (to send Well I.D.): P.O. Box 85
City: Summer Lake State: Oregon Zip: 97640

II. WELL INFORMATION (Do not complete this section if the well report is attached.)

Township: _____ (North/South) Range: _____ (East/West) Section: _____
Tax Lot: _____ County: _____ 1/4 _____ 1/4
Street Address of Well: _____ City: _____
Owner at time the well was constructed, (if known): _____
If the property had a different street address in the past: County Rd 416-A is now Shuffield Rd

III. GENERAL WELL INFORMATION (Do not complete this section if the well report is attached)

Use of Well (domestic, irrigation, commercial, industrial, monitoring): _____
Date Well Constructed: _____ Total Well Depth: _____ Casing Diameter: _____
Other Information: _____

SUBMITTED BY (please print): Chaylon Duane Shuffield (for Ernest Duane Shuffield)

PHONE: 541.207.2310 FAX: 541.943.3170

Send application to Oregon Water Resources Department; 725 Summer St NE, Suite A; Salem, Oregon 97301-1266; fax (503) 986-0902. Applications are processed and Well I.D. Numbers are mailed every Wednesday.

For Official Use Only by the Oregon Water Resources Department:

Received Date: _____

Well Log Number: _____

Well Identification #: _____

LAKE 4037

107330