Groundwater Application Review Summary Form

Application # G- G-19043

GW Reviewer Gerald H. Grondin Date Review Completed: 11/19/2021

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 (LAKE 1628/1626/52582) does not appear to meet current well construction standards per Section D of the attached review form. A previous video log indicates the well has collapsed. 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 **11/19/2021**

TO: **Application** G- **19043**

FROM: **GW:** **Gerald H. Grondin**
(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 **19 November 2021**

FROM: Groundwater Section **Gerald H. Grondin**
Reviewer's Name

SUBJECT: Application G- **19043** 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: **Colahan Enterprises Inc. / Erin Douglas** County: **Lake**

A1. Applicant(s) seek(s) **745 gpm / 1.66** cfs from **4** well(s) in the **Goose & Summer Lakes** Basin, **Lake Abert** subbasin, **Middle Chewaucan River** watershed

A2. Proposed use **Irrigation (supplemental) (317.4 acres)** Seasonality: **Irrigation Season (1 March through 31 October)**

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	LAKE 1627 LAKE 4448	Well #1	Basalt	1.66	33 S / 18 E – sec 23 cbd	1680' N, 1240' E fr SW cor S 23
2	LAKE 1628 LAKE 1626 LAKE 52582	Little Hot	Basin Fill Caved-in	1.66	33 S / 18 E – sec 23 adc	310' N, 1270' W fr E qtr cor S 23
3	LAKE 52530 LAKE 52866	SVE #1	Basalt	1.66	33 S / 18 E – sec 23 cba	2090' N, 1275' E fr SW cor S 23
4	LAKE 52529 LAKE 52865	SVE #2	Basalt	1.66	33 S / 18 E – sec 23 dba	2665' N, 1725' W fr SE cor S 23

* 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	4499	170	143.69	02/27/2014	983	0-21	0-22	+1-770	476-758	800	8	P
2	4466	92	83.85	03/25/2020	432* (270)	0-22	270	+2-300	100-240	150	83	P
3	4494	75	145	10/04/2011	1360	0-900	+4-900	806-1310	None	1300	?	P
4	4469	445	145	02/09/2012	1260	0-495	+4-495	445-1210	445-1046	2000	50	P

Use data from application for proposed wells.

A4. **Comments:**

This application requests up to 745 gpm (1.66 cfs) of groundwater for supplemental irrigation of 317.4 acres under five primary surface water right certificates (82231, 81169, 64776, 64777, and 82232) that the application notes authorize 1,755 gpm (3.91 cfs).

The proposed POD wells are related to multiple groundwater rights, groundwater right transfers, and groundwater limited licenses for Colahan Enterprises and/or Surprise Valley Electric (see attached).

A video log of well LAKE 1628/1626/52582 (Little Hot Well) indicates the well has caved-in from 432 ft. depth to the casing bottom (270 ft. depth). The Department has previously recommended abandoning and replacing the well. Surprise Valley Electric has attempted a replacement with LAKE 52506 (SVE #4).

The groundwater permit application does not identify a groundwater source for each proposed POD well.

For well LAKE 1628/1626/52582 (Little Hot), this review identifies the predominantly basin-fill sediments overlying the predominantly volcanic rock and sediments as the groundwater source. The water well reports indicate predominantly basin fill materials with 62 feet of basalt from 298 to 360 feet depth. Hot water was encountered. The temperature was reported as 104 degrees when the well was originally constructed and 175 degrees after the well was deepened.

For wells LAKE 1627/4448 (Well #1), LAKE 52530/52866 (SVE #1), and LAKE 52529/52865 (SVE #2), this review identifies the predominantly volcanic rock and sediments below the predominantly basin-fill sediments as the groundwater source.

Walker (1963) shows the area mapped as sedimentary deposits (QTs) that are bounded by volcanic and sedimentary rocks (Tvb) to the west and alluvium (Qal) to the east. QTs is described as lacustrine, fluviatile, and Aeolian sedimentary rocks, interstratified tuff, ashy diatomite, and unconsolidated clay, sand, silt, and gravel, mostly in pluvial basins that correlates to water laid volcanic deposits of Wells and Peck (1961). Tvb is described as basalt flows. Qal is described as unconsolidated fluviatile gravel, sand, and silt. In places, it can include talus, fanglomerate, lakebed deposits, and wind-blown sand. Well LAKE 1628/1626/52582 (Little Hot) and well LAKE 52529/52865 (SVE #2) are within the area mapped as QTs. Well LAKE 1627/4448 (Well #1) and well LAKE 52530/52866 (SVE #1) are within the area mapped as Tvb.

A5. ☐ **Provisions of the** **Goose & Summer Lakes** 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:

OAR 690-513-0050 (Chewaucan Subbasin) does not apply. The proposed wells and use appear to be within the allowable groundwater classifications for the subbasin OAR 690-513-0050 (2).

A6. ☐ **Well(s) #** **N.A.** , _____ , _____ , _____ , ___ , tap(s) an aquifer limited by an administrative restriction.
Name of administrative area:
Comments:

Currently, no administrative area.

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;

The groundwater levels at the proposed POD wells are more than 60 feet higher than the groundwater levels at wells east of Highway 31 (see attached hydrograph) and more than 40 higher than the groundwater levels at Paisley. The attached hydrograph does not show a groundwater level decline at the proposed POD wells, but a comparison of driller measurements to 2014 watermaster measurements indicates a possible decline (perhaps 20-feet) between older well construction and 2014 (see attached table). Longer term data is needed to determine the groundwater level trend at the POD wells. A groundwater level decline is occurring at the wells east of Highway 31.

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)
7B (interference), 7N (annual measurement), 7P (well tag), 7T (dedicated measuring tube), "large" (totalizing flow meter at each well, recording, and reporting), "All wells shall be continuously cased and sealed from land surface through the entire thickness of the predominantly basin-fill sedimentary unit into the predominantly volcanic rock and sediment unit to a depth in consultation with the Department well inspector staff." and "The groundwater temperature and conductivity at each POD well shall be annually measured, recorded and reported to the Department concurrent with the groundwater level measurements using a Department approved TLC (temperature, level, conductivity) field probe lowered into the water within the well.";

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:**

If a permit is issued, recommend conditions 7B (interference), 7N (annual measurement), 7P (well tag), 7T (dedicated measuring tube), and "large" (totalizing flow meter at each well, recording, and reporting), "All wells shall be continuously cased and sealed from land surface through the entire thickness of the predominantly basin-fill sedimentary unit into the predominantly volcanic rock and sediment unit to a depth in consultation with the Department well inspector staff." and "The groundwater temperature and conductivity at each POD well shall be annually measured, recorded and reported to the Department concurrent with the groundwater level measurements using a Department approved TLC (temperature, level, conductivity) field probe lowered into the water within the well"

Reports for the Goose and Summer Lakes Basin indicate ground water occurs in a predominantly basin-fill sediment unit and an underlying predominantly volcanic rocks and sediments unit that are hydraulically connected.

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	**Volcanic rock and sediment (basalt)**	☐	☒
2	**Basin Fill**	☐	☒
3	**Volcanic rock and sediment (basalt)**	☐	☒
4	**Volcanic rock and sediment (basalt)**	☐	☒

Basis for aquifer confinement evaluation:

The system is identified as generally unconfined with discontinuous low permeability layers causing local (discontinuous, limited) confinement. This appears consistent with observations Miller (1984 and 1986) made for the Fort Rock Basin and with observations Morgan (1988) made for the Goose Lake subbasin.

Morgan (1988) notes for the Goose Lake subbasin that ground water flow is generally from upland recharge areas to lowland discharge areas. However, local subsystems discharge to lakes, reservoirs, meadows, and streams. Large quantities of ground water move through complexly interbedded, discontinuous, unconsolidated sand, gravel, silt, and clay deposits. Morgan characterizes the upper portion of ground water as unconfined with confined-like conditions increasing with depth. This appears related to anisotropic hydraulic conductivities with horizontal hydraulic conductivity much greater than vertical hydraulic conductivity. For one site noted, the estimated ratios ranged from 2:1 to 179:1. There is no indication of shallower ground water being separated from deeper ground water by a confining layer.

Miller (1984 and 1986) notes the main groundwater reservoir in the Fort Rock Basin occurs as a single flow system under both unconfined and confined conditions. The unconfined-confined variability reflects the permeability variation of the overlying units.

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**	**Chewaucan River**	**4355**	**4410 (4345)**	**1630 (7710)**	☒	☐	☐	☐	☒
2	**1**	**Chewaucan River**	**4382**	**4388 (4345)**	**950 (5000)**	☒	☐	☐	☐	☒
3	**1**	**Chewaucan River**	**4349**	**4410 (4345)**	**1930 (7670)**	☒	☐	☐	☐	☒
4	**1**	**Chewaucan River**	**4324**	**4388 (4345)**	**920 (5460)**	☒	☐	☐	☐	☒

Basis for aquifer hydraulic connection evaluation:

The Chewaucan River elevations at the reaches closest to the proposed POA/POD wells appear to be above the static groundwater level. The groundwater level appears to slope down to the east. The level in Paisley is about 4345 feet elevation. That elevation was used to determine the groundwater-river intercept until better data showing the groundwater potentiometric surface becomes available. The 4345-foot river elevation and the distance to each POD well used for analyses are in parentheses and highlighted in yellow.

Hydraulic connection explanation:
1. The Chewaucan River is a perennial stream.
2. The river quickly drops in elevation to below the groundwater level and intercepts groundwater east of the POD wells.

Water Availability Basin the well(s) are located within: **CHEWAUCAN R > L ABERT – 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 (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?
2	**1**	☐	☐	**N.A.**	**N.A.**	☐	**32.80**	☐	**1.02**	☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐

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:

Well LAKE 1628/1626/52582 (Little Hot) is the only proposed POD well within one-mile of the estimated groundwater level-river level intercept. Hunt (1999) was used to calculate groundwater interference with surface water given the POD well obtains groundwater from the predominantly basin-fill unit which is in direct contact with the river. The calculation used the full rate requested (1.66 cfs) given the application appears to request being able to use up to 1.66 cfs at any combination of POD wells including a single POD well. The calculation used an average basin fill transmissivity of 115 ft2/day for the predominantly basin fill (see attached transmissivity calculation summary) and an intermediate storage coefficient of 0.001. The results do not trigger a potential for substantial interference assumption.

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
4	**1**	**0.0 %**	**0.0 %**	**0.1 %**	**0.1 %**	**0.1 %**	**0.1 %**	**0.1 %**	**0.1 %**	**0.1 %**	**0.1 %**	**0.0 %**	**0.0 %**
Well Q as CFS		**0.00**	**0.00**	**1.66**	**1.66**	**1.66**	**1.66**	**1.66**	**1.66**	**1.66**	**1.66**	**0.00**	**0.00**
Interference CFS		**0.000**	**0.000**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.000**	**0.000**
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.		**0.000**	**0.000**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.001**	**0.000**	**0.000**
(B) = 80 % Nat. Q		**33.80**	**64.90**	**103.0**	**161.0**	**314.0**	**234.0**	**81.90**	**47.40**	**42.30**	**42.20**	**34.40**	**32.80**
(C) = 1 % Nat. Q		**0.338**	**0.649**	**1.030**	**1.610**	**3.140**	**2.340**	**0.819**	**0.474**	**0.423**	**0.422**	**0.344**	**0.328**
(D) = (A) > (C)		**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**
(E) = (A / B) x 100		**0.000 %**	**0.000 %**	**0.001 %**	**0.001 %**	**<0.001 %**	**<0.001 %**	**0.001 %**	**0.002 %**	**0.002 %**	**0.002 %**	**0.000 %**	**0.000 %**

(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:

Wells LAKE 1627/4448 (Well #1), LAKE 52530/52866 (SVE #1), and LAKE 52529/52865 (SVE #2) are more than one-mile from the estimated groundwater level-river level intercept. Hunt (2003) was used to calculate groundwater interference with surface water given the POD wells obtain groundwater from the predominantly volcanic rock and sediment unit which is hydraulically connected to the river through the overlying predominantly basin-fill unit. The calculation used the full rate requested (1.66 cfs) at the closest well (LAKE 52529) given the application appears to request being able to use up to 1.66 cfs at any combination of POD wells including a single POD well. Additionally, the calculation represents the maximum possible interference. The calculation used an average basin fill transmissivity of 18,000 ft2/day for the predominantly volcanic rock and sediment unit (see attached transmissivity calculation summary) and an intermediate storage coefficient of 0.001. The results do not exceed one percent of the natural river flow for any month.

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:**

If a permit is issued, recommend the following conditions

7B (interference),

7N (annual measurement),

7P (well tag),

7T (dedicated measuring tube), and "large" (totalizing flow meter at each well, recording, and reporting),

Also: "All wells shall be continuously cased and sealed from land surface through the entire thickness of the predominantly basin-fill sedimentary unit into the predominantly volcanic rock and sediment unit to a depth in consultation with the Department well inspector staff." and

Also: "The groundwater temperature and conductivity at each POD well shall be annually measured, recorded and reported to the Department concurrent with the groundwater level measurements using a Department approved TLC (temperature, level, conductivity) field probe lowered into the water within the well"

Reports for the Goose and Summer Lakes Basin indicate ground water occurs in a predominantly basin-fill sediment unit and an underlying predominantly volcanic rocks and sediments unit that are hydraulically connected. One proposed POD well obtains groundwater from the predominantly basin-fill sediment unit. Three proposed POD wells obtain groundwater from the predominantly volcanic rock and sediment unit.

The groundwater system is identified as generally unconfined with discontinuous low permeability layers causing local (discontinuous, limited) confinement. This appears consistent with observations Miller (1984 and 1986) made for the Fort Rock Basin and with observations Morgan (1988) made for the Goose Lake subbasin.

References Used:

Davis, Leland, Jill Haizlip, and Sabodh Garg. 2013, Multi-well interference test of the Paisley geothermal reservoir: Geologica, memorandum report dated 19 April 2013, 12 p.

Gonthier, J.B. 1985, A description of aquifer units in eastern Oregon: USGS Water Resources Investigations Report 84-4095, 39 p., 4 plates.

Miller, D.W., 1984, Appraisal of ground-water conditions in the Fort Rock Basin, Lake County, Oregon: Oregon Water Resources Department, Open File Report, 157 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.

Oregon Water Resources Department, 1989, Goose and Summer Lakes Basin report: OWRD Basin Report, 112 p.

Peterson, N.V. and McIntyre, J.R., 1970, The reconnaissance geology and mineral resources of eastern Klamath County and western Lake County, Oregon: DOGAMI Bulletin 66, 70 p.

Peterson, N.V., and Brown, D.E., 1980, Preliminary geology and geothermal resource potential of the Lakeview area, Oregon: DOGAMI Open-File Report O-80-09, 57 p., 1:62,500 maps.

Phillips, K.N. and VanDenburgh, A.S., 1971, Hydrology and geochemistry of Abert, Summer, and Goose Lakes, and other closed-basin lakes in south-central Oregon: USGS Professional Paper 502-B, 86p.

Walker, G.W., 1963, Reconnaissance geologic map of the eastern half of the Klamath Falls (AMS) quadrangle, Lake and Klamath Counties, Oregon: USGS Mineral Investigations Field Studies Map MF-260.

Walker, G.W. and Reppening, C.A., 1965, Reconnaissance geologic map of the Adel quadrangle, Lake, Harney, and Malheur Counties, Oregon: USGS Miscellaneous Geologic Investigations Map I-446.

Waring, G.A., 1908, Geology and water resources of a portion of south-central Oregon: USGS Water Supply Paper 220, 85 p.

Wells, F.G., and Peck, D.L., 1961, Geologic map of Oregon west of the 121st meridian: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-325.

Goose and Summer Lakes Basin Program rules (OAR 690-513).

Groundwater level data for LAKE 1628, LAKE 1633, LAKE 4564, LAKE 50941, LAKE 51031, LAKE 51059, LAKE 51182, LAKE 51588, LAKE 52506, LAKE 52683

Water well reports for proposed well LAKE 1627/4447, LAKE 1628/1626/52582, LAKE 52530/52866, LAKE 52529/52865, LAKE 52506, and LAKE 52683.

USGS Paisley, Oregon quadrangle map (1:24,000)

D. WELL CONSTRUCTION, OAR 690-200

D1. **Well #:** 2 **Logid:** LAKE 1628/1626/52582 (Little Hot Well)

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) _____

Watermaster Brian Mayer previously noted a video log of well LAKE 1628/1626/52582 (Little Hot Well) indicates the well has caved-in from 432 ft. depth to the casing bottom (270 ft. depth). The Department has previously recommended abandoning and replacing the well. Surprise Valley Electric has attempted a replacement with LAKE 52506 (SVE #4).

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

Well Summary Table

Well Water Right Correlation Table

Hydrograph of Water-Level Measurements in Vicinity Wells

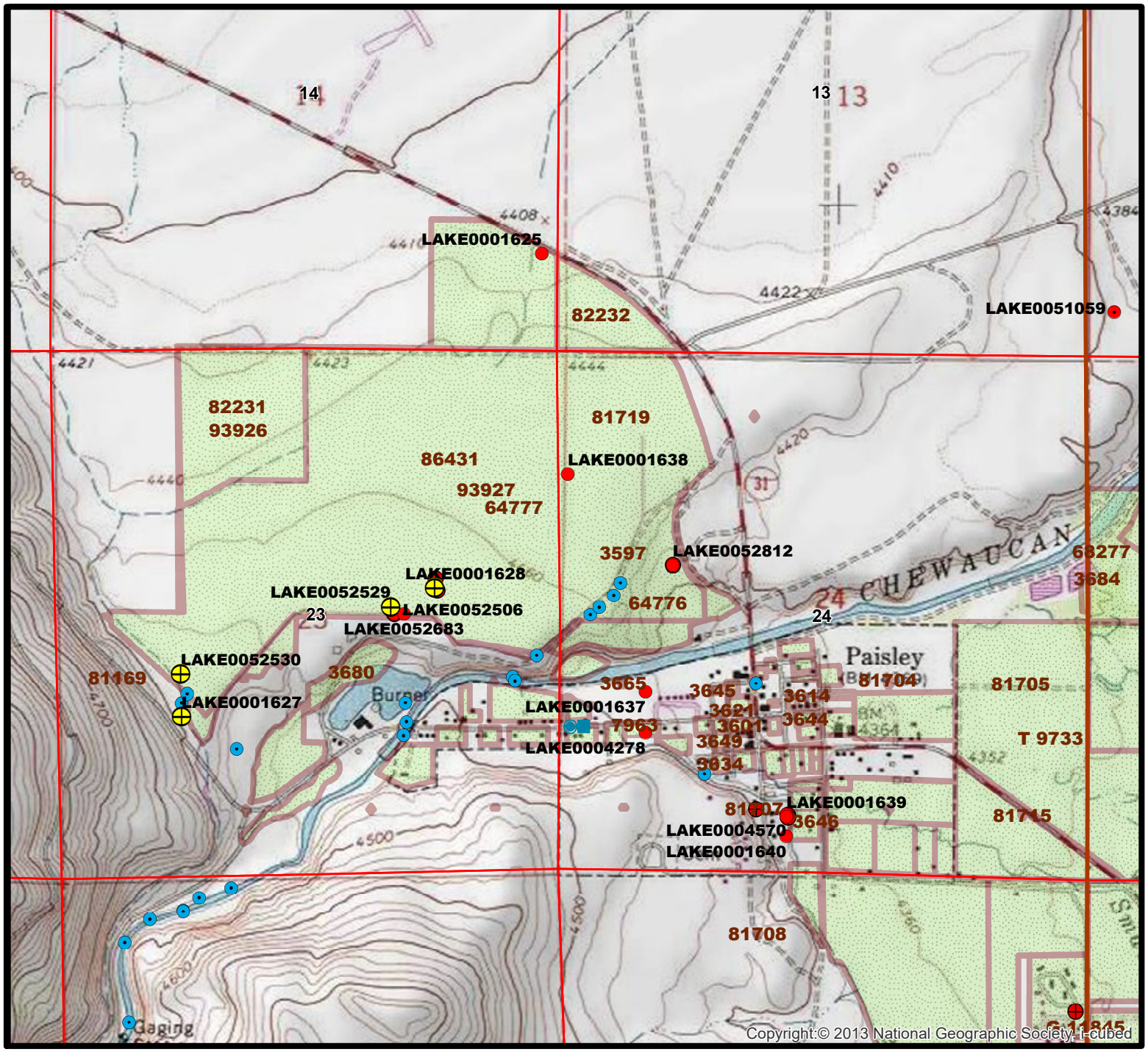
Map showing location of Water-Level Measurement Wells

Groundwater Interference Calculations (Hunt 1999 and Hunt 2003)

Water Availability Tables

Water Well Reports for Proposed POD Wells

Groundwater Permit Application G-19043
Colahan Enterprises Inc. / Erin Douglas



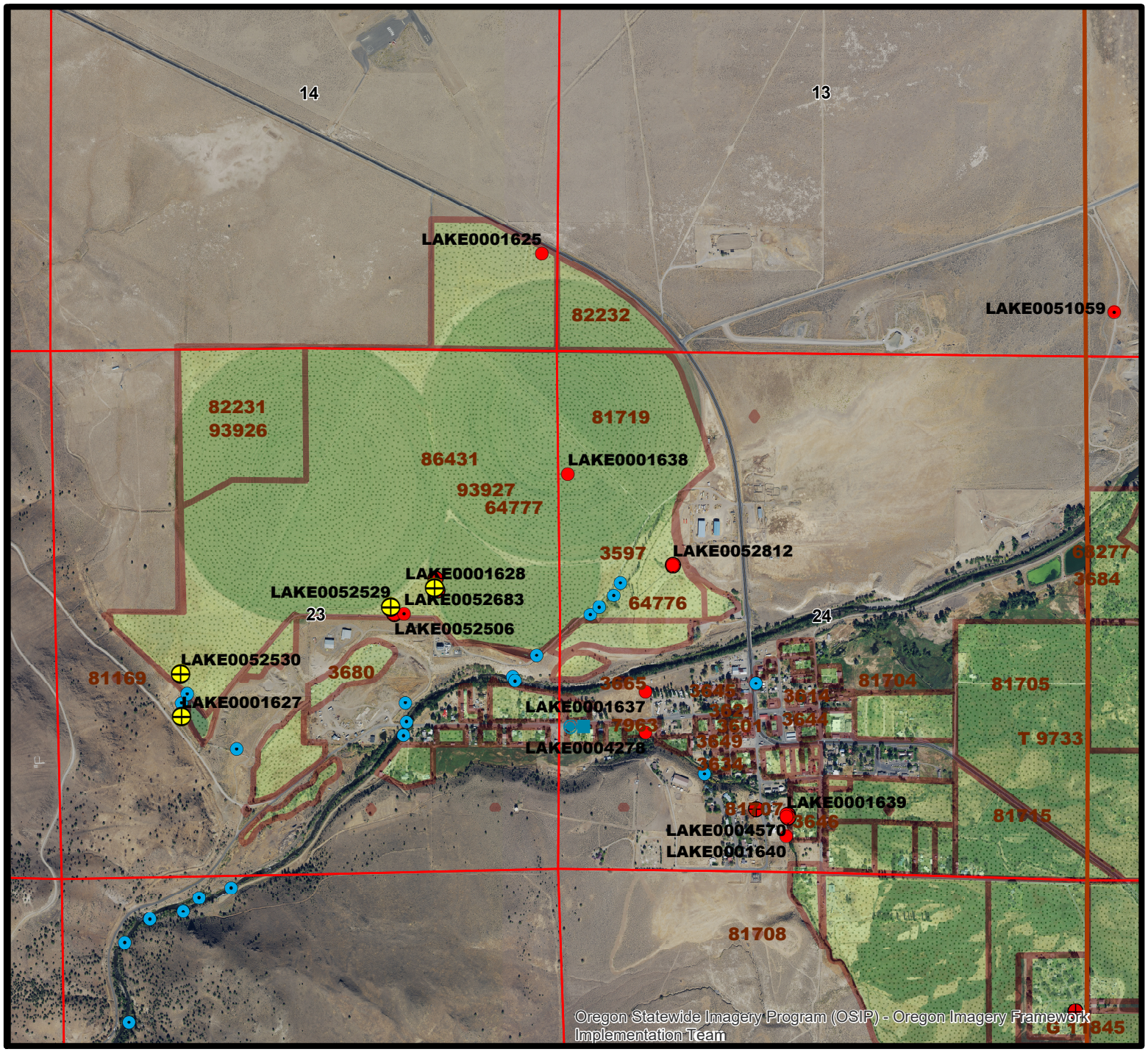
0 0.5 1 2

Miles

Yellow = Proposed Wells
Red = Other Wells
Blue = Surface Water PODs
Green = Water Right Place of Use

N

Groundwater Permit Application G-19043
Colahan Enterprises Inc. / Erin Douglas



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Miles

Yellow = Proposed Wells
Red = Other Wells
Blue = Surface Water PODs
Green = Water Right Place of Use

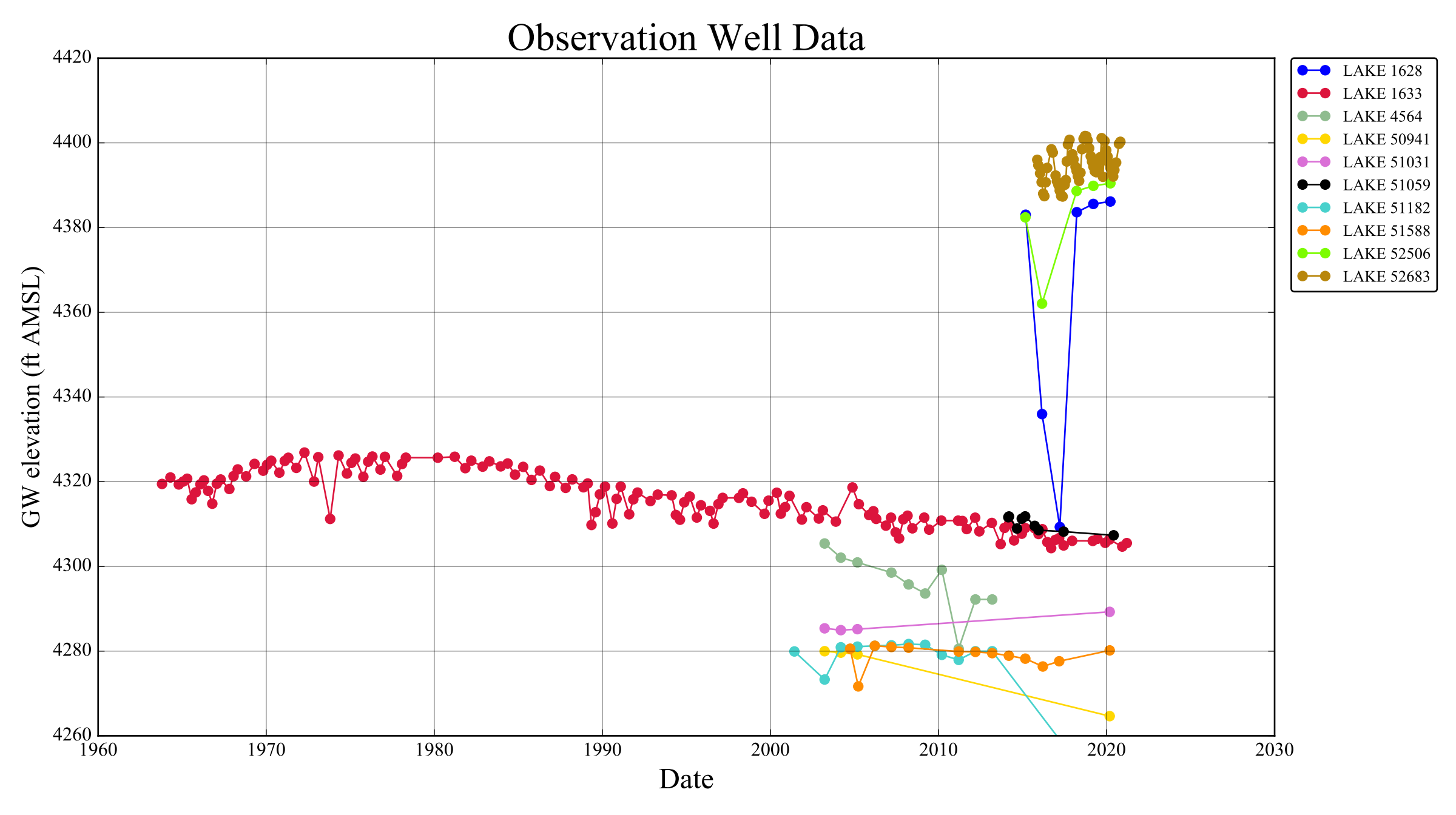
N

G-19043: Colahan Enterprises Inc. / Erin Douglas							
Well Summary							
Date = 17 November 2021							
Parameter	**Application G-19043 POD Wells**					**Other Nearby Wells**	
Log_ID 1	LAKE 1627	LAKE 1628	LAKE 52530	LAKE 52529		LAKE 52506	LAKE 52683
Log_ID 2	LAKE 4448	LAKE 1626	LAKE 52866	LAKE 52865			
Log_ID 3		LAKE 52582					
Owner Well ID	Well #1	Little Hot	SVE #1	SVE #2		SVE #4	SVE #5
Latitude	42.693621	42.697281	42.694837	42.696740		42.696532	42.696542
Longitude	-120.567824	-120.558102	-120.567858	-120.559791		-120.559659	-120.559280
Land Elev. (feet)	4,498.75	4,466.09	4,493.52	4,469.38		4,468.73	4,468.08
Basin Fill Bottom (ft blsd)	775.00	not reached	675.00	410.00		not reached	not reached
Basin Fill Bottom (ft elev.)	3,723.75	not reached	3,818.52	4,059.38		not reached	not reached
Casing Depth (ft blsd)	22.00	270.00	900.00	495.00		315.00	380.00
Casing Depth (ft elev.)	4,476.75	4,196.09	3,593.52	3,974.38		4,153.73	4,088.08
Seal Depth (ft blsd)	21.00	22.00	900.00	495.00		20.00	40.00
Seal Depth (ft elev.)	4,477.75	4,444.09	3,593.52	3,974.38		4,448.73	4,428.08
Well Bottom (ft blsd)	983.00	432.00	1,360.00	1,260.00		378.00	380.00
Well Bottom (ft elev.)	3,515.75	4,034.09	3,133.52	3,209.38		4,090.73	4,088.08
First Water (ft blsd)	170.00	92.00	75.00	445.00		83.00	80.00
First Water (ft elev.)	4,328.75	4,374.09	4,418.52	4,024.38		4,385.73	4,388.08
Other Water (ft blsd)	720.00	339.00	900.00	-----		-----	360.00
Other Water (ft elev.)	3,778.75	4,127.09	3,593.52	-----		-----	4,108.08
Driller Temperature (F)	220.00	175.00	240.00	225.00		118.00	115.00
Driller Rate (gpm)	800.00	150.00	1,300.00	2,000.00		< 100	24.00
Driller SWL (ft blsd)	122.00	83.00	145.00	145.00		83.00	79.00
Driller SWL (ft elev.)	4,376.75	4,383.09	4,348.52	4,324.38		4,385.73	4,389.08
Driller SWL Date	10/22/1980	04/03/1964	10/04/2011	02/09/2012		02/08/2014	11/18/2015
Watermaster SWL (ft blsd)	143.69	96.50	None	None		94.00	None
Watermaster SWL (ft elev.)	4,355.06	4,369.59	None	None		4,374.73	None
Watermaster SWL Date	02/27/2014	02/27/2014	None	None		02/27/2014	None
Comment	Irrigation	pumping level, caved to 270	Thermal Water	Thermal Water		Cooling Water	Obs Well

Application G-19043: Well to Other Water Right Correlations

Water Right					Wells			
					Owner ID	Well #1	Little Hot Well	SVE #1	SVE #2
					Original	LAKE 1627	LAKE 1628	LAKE 52530	LAKE 52529
					Duplicate			LAKE 52866	LAKE 52865
					Deepening		LAKE 1626		
Application	Permit	Certificate	Transfer	Status	Alteration-Other	LAKE 4448	LAKE 52582		
Colahan Enterprises Inc.									
G-10683	G-9765	64775	T-11214	CN		X			
G-10683	G-9765	89546	T-11214	CN		X			
G-10683	G-9765	89546	T-11894	CN		X			
G-10683	G-9765	93927	T-11894	NC		X	X	X	X
G-10931	G-10059	82230	T-11214	CN		X			
G-10931	G-10059	89355	T-11214	CN		X			
G-10931	G-10059	89355	T-11860	CN		X			
G-10931	G-10059	89355	T-11894	CN		X			
G-10931	G-10059	93926	T-11894	NC		X	X	X	X
Surprise Valley Electrification Corp.									
G-17985	G-17855			NC			X		
G-18594	G-18460			NC				X	X
G-18595	G-18461			NC				X	X
LL-1334				CN		X			
LL-1450				EX			X		
LL-1508				EX			X		
LL-1726				NC				X	X
LL-1727				NC				X	X

Yellow = currently active water rights and associated wells


Observation Well Data
GW elevation (ft AMSL)
Date
4420
4400
4380
4360
4340
4320
4300
4280
4260
1960
1970
1980
1990
2000
2010
2020
2030
LAKE 1628
LAKE 1633
LAKE 4564
LAKE 50941
LAKE 51031
LAKE 51059
LAKE 51182
LAKE 51588
LAKE 52506
LAKE 52683

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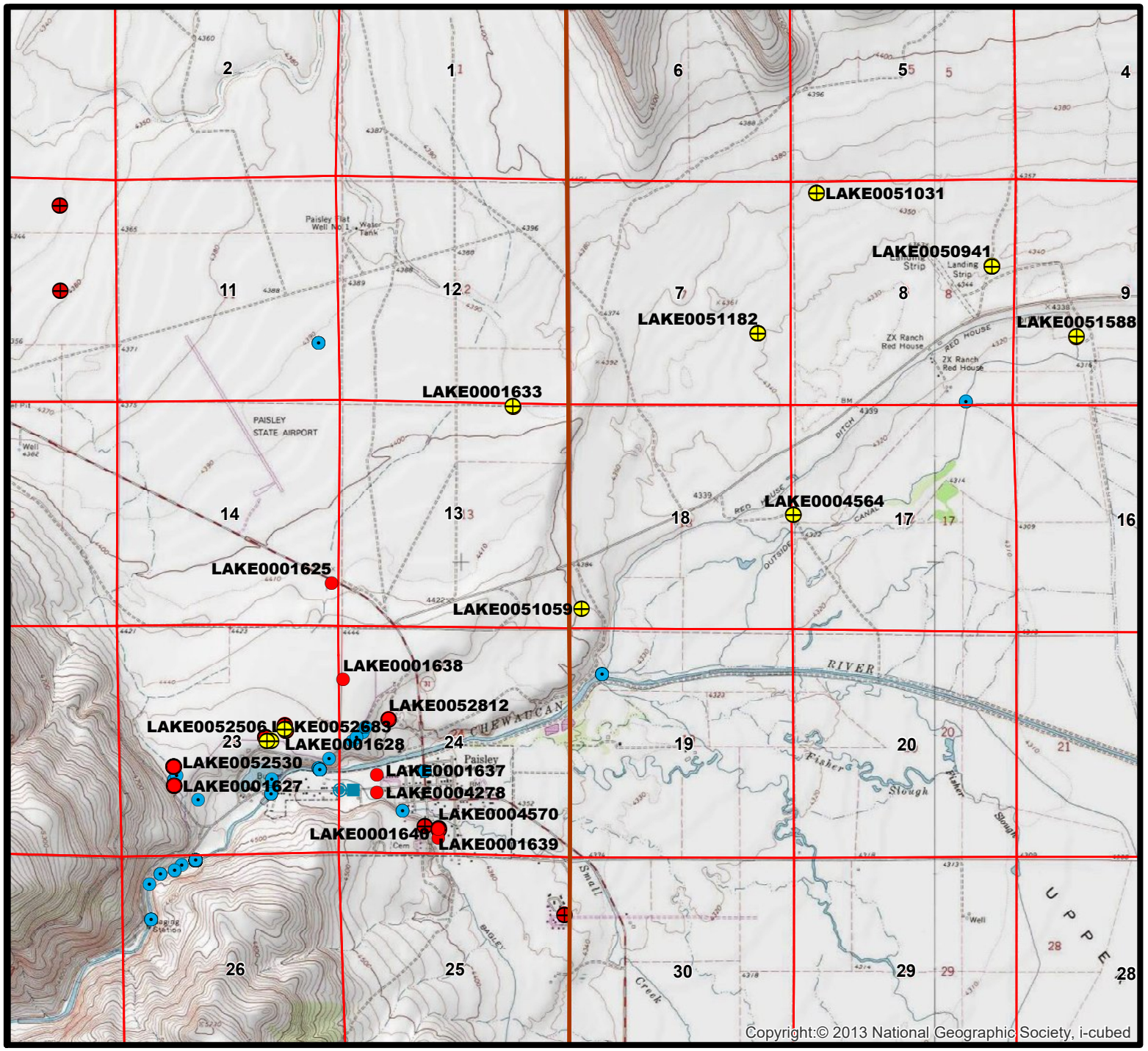

0 0.5 1 2 3 4

Miles

Yellow = GW Well Sites On Hydrograph
Red = GW Well Sites With No Hydrograph Data
Blue = Surface Water POD Sites

N

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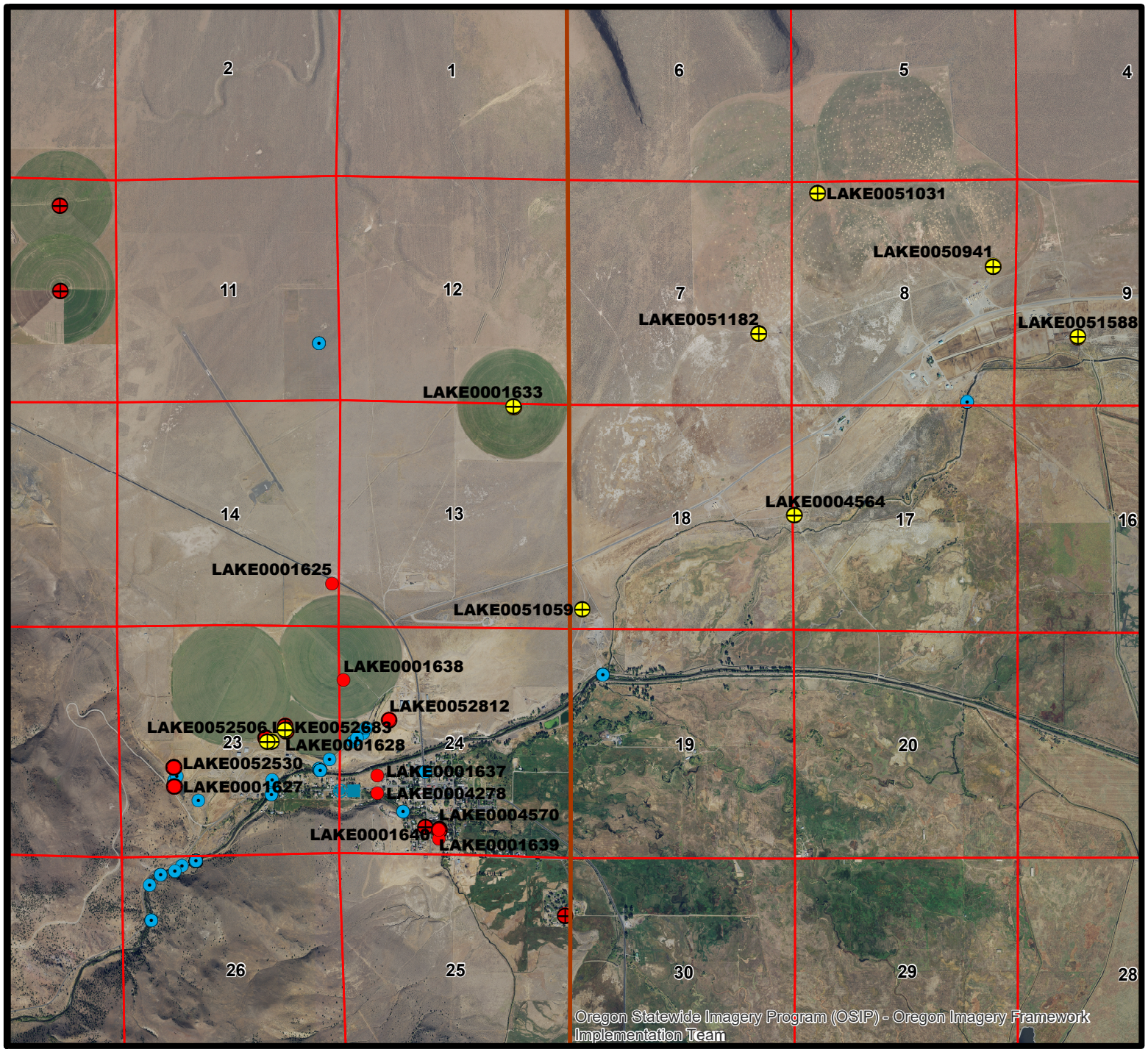

0 0.5 1 2 3 4

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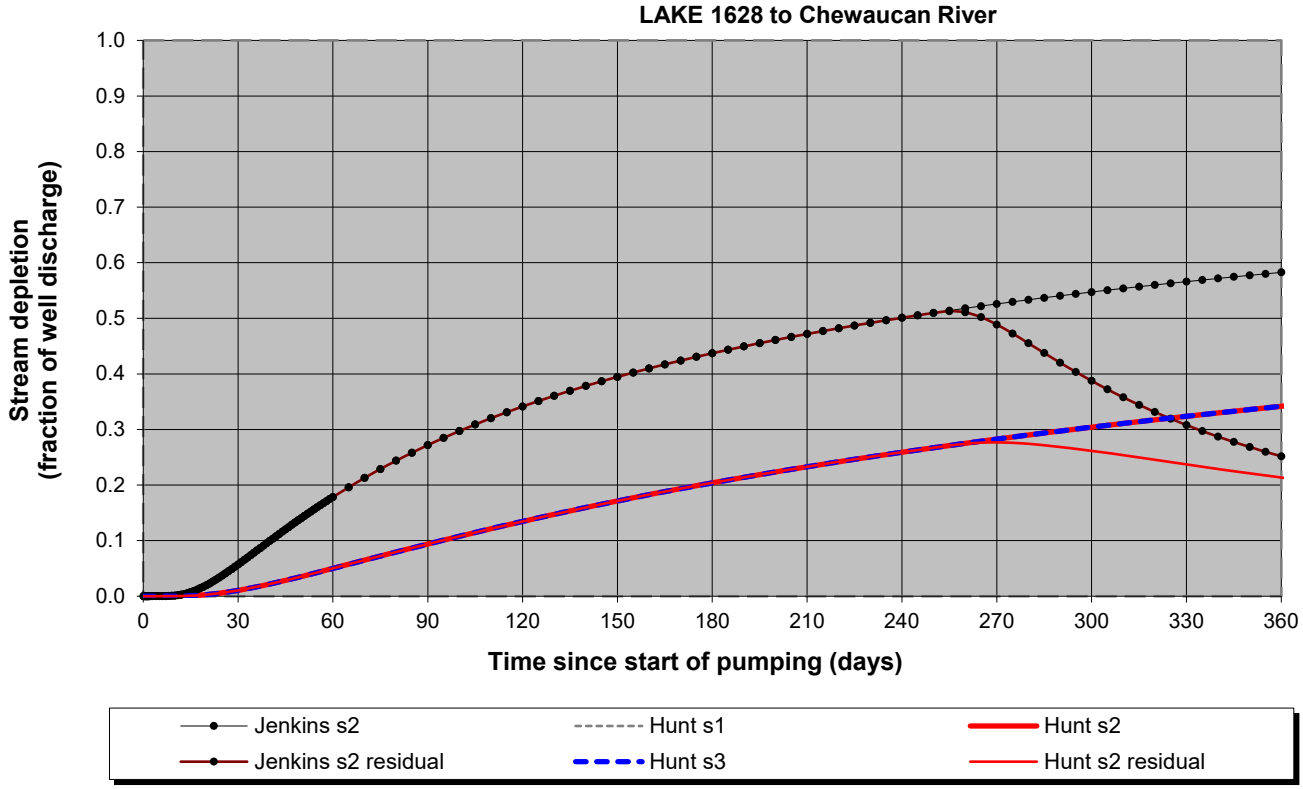
Transient Stream Depletion (Jenkins, 1970; Hunt, 1999)

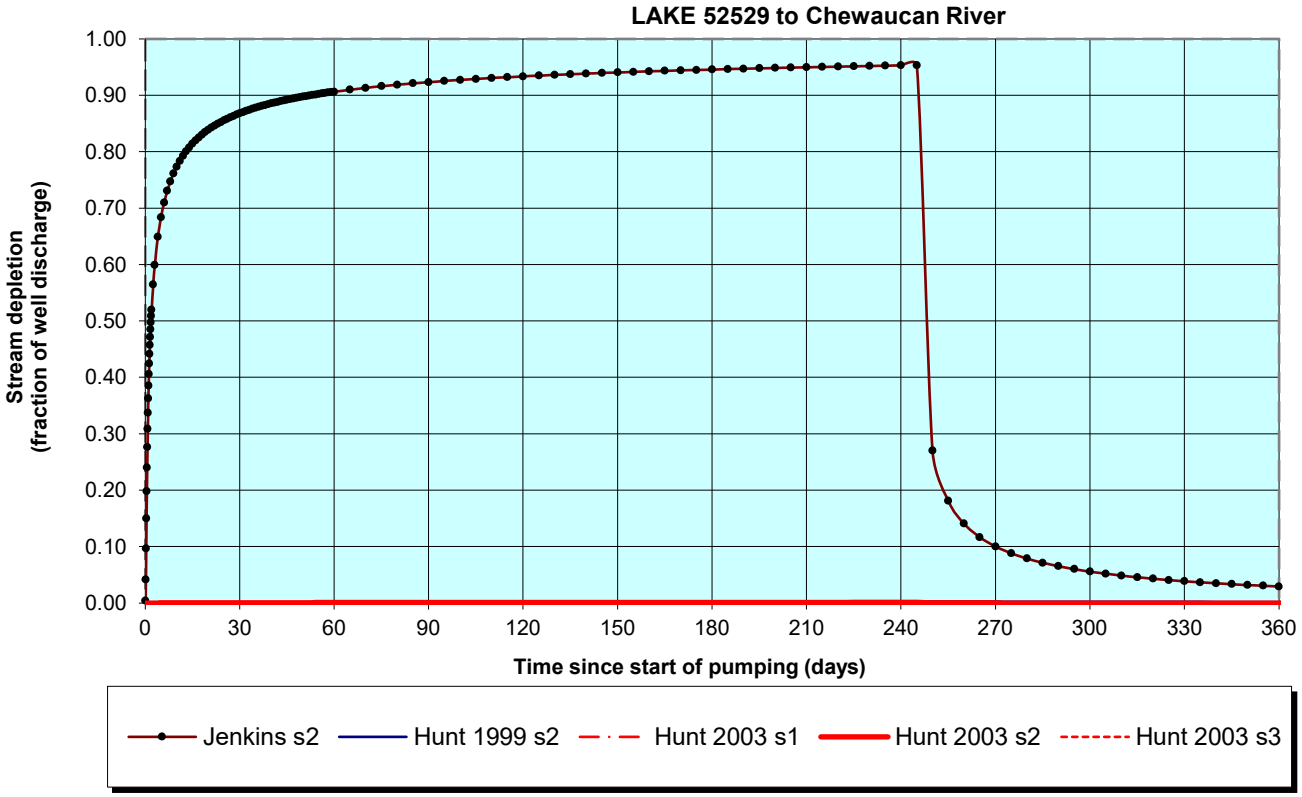


Output for Hunt Stream Depletion, Scenerio 2 (s2): Time pump on = 245 days

Days	30	60	90	120	150	180	210	240	270	300	330	360
Qw, cfs	1.660	1.660	1.660	1.660	1.660	1.660	1.660	1.660	1.660	1.660	1.660	1.660
Jenk SD %	0.057	0.178	0.272	0.341	0.395	0.437	0.472	0.501	0.489	0.387	0.308	0.252
Jen SD cfs	0.095	0.296	0.451	0.566	0.655	0.726	0.783	0.832	0.811	0.643	0.511	0.418
Hunt SD %	0.010	0.050	0.094	0.135	0.171	0.204	0.233	0.259	0.277	0.262	0.237	0.214
Hunt SD cfs	0.017	0.083	0.156	0.224	0.284	0.338	0.387	0.430	0.459	0.434	0.394	0.355

Parameters:		**Scenario 1**	**Scenario 2**	**Scenario 3**	**Units**
Net steady pumping rate	Qw	1.66	1.66	1.66	cfs
Distance to stream	a	5000	5000	5000	ft
Aquifer hydraulic conductivity	K	0.191667	0.191667	0.191667	ft/day
Aquifer thickness	b	600	600	600	ft
Aquifer transmissivity	T	115.0002	115.0002	115.0002	ft*ft/day
Aquifer storage coefficient	S	0.001	0.001	0.001	
Stream width	ws	50	50	50	ft
Streambed hydraulic conductivity	Ks	0.02	0.02	0.02	ft/day
Streambed thickness	bs	20	20	20	ft
Streambed conductance	sbc	0.05	0.05	0.05	ft/day
Stream depletion factor (Jenkins)	sdf	217.3909263	217.3909263	217.3909263	days
Streambed factor (Hunt)	sbf	2.173909263	2.173909263	2.173909263	

Transient Stream Depletion (Jenkins, 1970; Hunt, 1999, 2003)



Output for Stream Depletion, Scenerio 2 (s2):						Time pump on (pumping duration) = 245 days						
Days	30	60	90	120	150	180	210	240	270	300	330	360
J SD	86.8%	90.6%	92.4%	93.4%	94.1%	94.6%	95.0%	95.3%	10.0%	5.6%	3.9%	2.9%
H SD 1999	0.1%	0.1%	0.2%	0.2%	0.2%	0.3%	0.3%	0.3%	0.3%	0.2%	0.2%	0.2%
H SD 2003	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
Qw, cfs	1.660	1.660	1.660	1.660	1.660	1.660	1.660	1.660	1.660	1.660	1.660	1.660
H SD 99, cfs	0.002	0.002	0.003	0.004	0.004	0.005	0.005	0.005	0.004	0.004	0.003	0.003
H SD 03, cfs	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000

Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate of well	Qw	1.66	1.66	1.66	cfs
Time pump on (pumping duration)	tpon	245	245	245	days
Perpendicular from well to stream	a	5460	5460	5460	ft
Well depth	d	1260	1260	1260	ft
Aquifer hydraulic conductivity	K	30	30	30	ft/day
Aquifer saturated thickness	b	600	600	600	ft
Aquifer transmissivity	T	18000	18000	18000	ft*ft/day
Aquifer storativity or specific yield	S	0.001	0.001	0.001	
Aquitard vertical hydraulic conductivity	Kva	0.02	0.02	0.02	ft/day
Aquitard saturated thickness	ba	600	600	600	ft
Aquitard thickness below stream	babs	600	600	600	ft
Aquitard porosity	n	0.2	0.2	0.2	
Stream width	ws	50	50	50	ft
Streambed conductance (lambda)	sbc	0.001667	0.001667	0.001667	ft/day
Stream depletion factor	sdf	1.656200	1.656200	1.656200	days
Streambed factor	sbf	0.000506	0.000506	0.000506	
input #1 for Hunt's Q_4 function	t'	0.603792	0.603792	0.603792	
input #2 for Hunt's Q_4 function	K'	0.055207	0.055207	0.055207	
input #3 for Hunt's Q_4 function	epsilon'	0.005000	0.005000	0.005000	
input #4 for Hunt's Q_4 function	lamda'	0.000506	0.000506	0.000506	

Transmissivity Calculation Summary						
Theis_Equation_specific_capacity_to_transmissivity						
Basalt						
Well County	**Well Num**	**Transmissivity**	**Transmissivity**	**Open Interval**	**Conductivity**	
		ft2/day	**gpd/ft**	**feet**	**ft/day**	
LAKE	1627	26,820.35	200,630.16	507.00	52.90	
LAKE	52865	9,463.84	70,794.44	765.00	12.37	
		18,142.10	**135,712.30**	**Average**	**32.64**	
Basin-Fill						
Well County	**Well Num**	**Transmissivity**	**Transmissivity**	**Open Interval**	**Conductivity**	
		ft2/day	**gpd/ft**	**feet**	**ft/day**	
LAKE	1628	339.88	2,542.48	215.00	1.58	
LAKE	52506	62.07	464.32	338.00	0.18	
		200.98	**1,503.40**	**Average**	**0.88**	
GSI-SVE pump test (February 2016)						
Basin-Fill						
Well County	**Well Num**	**Transmissivity**	**Transmissivity**	**Open Interval**	**Conductivity**	**Comment**
		ft2/day	**gpd/ft**	**feet**	**ft/day**	
LAKE	52506	25.70	192.25	338.00	0.08	drawdown data
LAKE	52506	36.10	270.05	338.00	0.11	recovery data
		30.90	**231.15**	**Average**	**0.09**	
Basin Fill	**All Tests**	**115.94**	**867.27**	**307.25**	**0.38**	All tests average

Oregon Water Resources Department
Water Availability Analysis

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Water Availability Analysis

CHEWAUCAN R > L ABERT - AT MOUTH
GOOSE & SUMMER LAKE BASIN
Water Availability as of 11/18/2021

Watershed ID #: 31300602 (Map)
Date: 11/18/2021

Exceedance Level: 80%
Time: 2:48 PM

Download Data

Water Availability

Select any Watershed for Details

Nesting Order	Watershed ID #	Stream Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Sto
1	31300602	CHEWAUCAN R> L ABERT- AT MOUTH	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes

Limiting Watersheds

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

Month	Limiting Watershed ID #	Stream Name	Water Available?	Net Water Available
JAN	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	Yes	32.90
FEB	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	Yes	63.80
MAR	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	Yes	79.20
APR	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	Yes	47.60
MAY	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	Yes	13.90
JUN	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	No	-16.40
JUL	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	No	-2.71
AUG	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	No	-1.68
SEP	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	Yes	0.82
OCT	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	Yes	19.40
NOV	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	Yes	32.90
DEC	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	Yes	31.20
ANN	31300602	CHEWAUCAN R > L ABERT - AT MOUTH	Yes	66,000.00

Detailed Reports for Watershed ID #31300602

CHEWAUCAN R > L ABERT - AT MOUTH
GOOSE & SUMMER LAKE BASIN
Water Availability as of 11/18/2021

Watershed ID #: 31300602 (Map)
Date: 11/18/2021

Exceedance Level: 80%
Time: 2:48 PM

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	33.80	0.87	32.90	0.00	0.00	32.90
FEB	64.90	1.15	63.80	0.00	0.00	63.80
MAR	103.00	23.80	79.20	0.00	0.00	79.20
APR	161.00	113.00	47.60	0.00	0.00	47.60
MAY	314.00	300.00	13.90	0.00	0.00	13.90
JUN	234.00	250.00	-16.40	0.00	0.00	-16.40
JUL	81.90	84.60	-2.71	0.00	0.00	-2.71
AUG	47.40	49.10	-1.68	0.00	0.00	-1.68
SEP	42.30	41.50	0.82	0.00	0.00	0.82
OCT	42.20	22.80	19.40	0.00	0.00	19.40
NOV	34.40	1.49	32.90	0.00	0.00	32.90
DEC	32.80	1.57	31.20	0.00	0.00	31.20
ANN	120,000.00	54,000.00	66,000.00	0.00	0.00	66,000.00

Detailed Report of Consumptive Uses and Storage

Consumptive Uses and Storages in Cubic Feet per Second

Month	Storage	Irrigation	Municipal	Industrial	Commercial	Domestic	Agricultural	Other	Total
JAN	0.62	0.00	0.00	0.23	0.00	0.02	0.01	0.00	0.87
FEB	0.89	0.00	0.00	0.23	0.00	0.02	0.01	0.00	1.15
MAR	1.27	22.30	0.00	0.23	0.00	0.02	0.01	0.00	23.80
APR	2.29	111.00	0.00	0.23	0.00	0.02	0.01	0.00	113.00
MAY	3.69	296.00	0.00	0.23	0.00	0.02	0.01	0.00	300.00
JUN	1.88	248.00	0.00	0.17	0.00	0.02	0.01	0.00	250.00
JUL	0.55	83.90	0.00	0.17	0.00	0.02	0.01	0.00	84.60
AUG	0.30	48.60	0.00	0.17	0.00	0.02	0.01	0.00	49.10
SEP	0.32	40.90	0.00	0.23	0.00	0.02	0.01	0.00	41.50
OCT	0.32	22.20	0.00	0.23	0.00	0.02	0.01	0.00	22.80
NOV	1.23	0.00	0.00	0.23	0.00	0.02	0.01	0.00	1.49
DEC	1.31	0.00	0.00	0.23	0.00	0.02	0.01	0.00	1.57

Detailed Report of Reservations for Storage and Consumptive Uses

Reserved Streamflow in Cubic Feet per Second

No reservations were found for this watershed.

Detailed Report of Instream Flow Requirements

Instream Flow Requirements in Cubic Feet per Second

No instream flow requirements were found for this watershed.