PUBLIC INTEREST REVIEW FOR GROUNDWATER APPLICATIONS

TO: Water Rights Section **Date** 28 June 2010

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

SUBJECT: Application **G-17311** Supersedes review of **N.A.**
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: **Kenneth Hinckle** County: **Lake**

A1. Applicant(s) seek(s) **1.34 (600 gpm)** cfs from **1** well(s) in the **Goose and Summer Lakes** Basin, **Drews Creek watershed in Goose Lake** sub basin Quad Map: **Lakeview NW**

A2. Proposed use: **Irrigation (39.55 primary acres)** Seasonality: **1 May to 31 October (184 days)**

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	**Not Drilled**	**1**	**Basalt**	**1.34**	**39S/19E-sec 32 DCD**	**124' N, 1980' W fr SE cor S 32**
2						
3						

* 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	**4795**	**Prop 62**	**Prop 41**	**N.A.**	**Prop 338**	**Prop 0-30**	**Prop 0-30**		**Prop None**	**Prop 1800**	**Prop 80**	**P**
2												
3												

Use data from application for proposed wells.

A4. **Comments:**

The proposed rate is 600 gpm (1.34 cfs) for primary irrigation of 39.55 acres. The proposed rate is higher than typically allowed for 39.55 acres (0.49 cfs, 222 gpm). The proposed annual volume is 76.0 ac-ft (1.92 feet of water per acre).

The proposed aquifer is identified as basalt based upon an example water well report (LAKE 2306) located T39S/R19E-sec 31 BC, about 1.75 miles northwest of the proposed well. Walker (1963) mapped the site as sedimentary deposits (QTs) that includes lacustrine, fluviatile, and aeolian sedimentary rocks, interstratified tuff, ashy diatomite, and unconsolidated clay, sand, silt, and gravel. Water well reports for 11 wells total in the same section indicate clay, sand, gravel, and "lava" deposits. Many are very low yield (< 5 gpm) with large drawdown. A few have moderate yield (<30 gpm) with little or no drawdown. One (LAKE 2303) has high yield (>1500 gpm).

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 690-513-0040 (Goose Lake Subbasin) does not apply. The proposed well appears to be outside the reach of Thomas Creek and tributaries where groundwater is classified for domestic and stockwater use only OAR 690-513-0030 2(c) and (d).**

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;

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, 7F, 7N, and 7T**
   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:**

Recommend conditions 7B, 7F, 7N, and 7T.

Reports for the Goose and Summer Lakes Basin indicate groundwater occurs in alluvium, basin fill sediments, and different basalt units. The example water well report (LAKE 2306) indicates the proposed well is intended to obtain groundwater from basalt below basin fill sediments. The well yield is 1800 gpm.

Walker (1963) mapped the site as sedimentary deposits (QTs) that includes lacustrine, fluviatile, and aeolian sedimentary rocks, interstratified tuff, ashy diatomite, and unconsolidated clay, sand, silt, and gravel. Water well reports for 11 wells total in the same section indicate clay, sand, gravel, and "lava" deposits. Many are very low yield (< 5 gpm) with large drawdown. A few have moderate yield (<30 gpm) with little or no drawdown. One (LAKE 2303) has high yield (>1500 gpm).

The nearest state observation well found is state observation well 380 (well LAKE 2320). It is located about 2.4 miles east of the proposed well. The groundwater level data is from 1962 through 2009. The data show both seasonal fluctuations and annual climate trends with a possible long term groundwater level rise.

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	**Basalt**	☐	☒
2		☐	☐
3		☐	☐
4		☐	☐

Basis for aquifer confinement evaluation:

The system is identified as generally unconfined with discontinuous low permeability layers causing local (discontinuous, limited) confinement.

The proposed aquifer is identified as basalt. Walker (1963) mapped surficial geology at the site as sedimentary deposits (QTs) that includes lacustrine, fluviatile, and aeolian sedimentary rocks, interstratified tuff, ashy diatomite, and unconsolidated clay, sand, silt, and gravel. Water well reports for 11 wells total in the same section indicate clay, sand, gravel, and "lava" deposits. The example water well report (LAKE 2306) indicates the proposed well is intended to obtain groundwater from basalt below basin fill sediments. Groundwater at the example well was first encountered in the basin-fill at 62 feet below land surface, basalt was encountered at 170 feet depth, and the static groundwater level remained constant at 41 feet to the well bottom (338 feet) . The well yield is 1800 gpm.

Morgan (1988) notes for the Goose Lake subbasin that groundwater flow is generally from upland recharge areas to lowland discharge areas. However, local subsystems discharge to lakes, reservoirs, meadows, and streams. Large quantities of groundwater move through complexly interbedded, discontinuous, unconsolidated sand, gravel, silt, and clay deposits. Morgan characterizes the upper portion of groundwater 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 groundwater being separated from deeper groundwater by a confining layer.

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**	**Antelope Creek**	**4775**	**4765**	**980**	☒	☐	☐	☒	☐
1	**2**	**Cottonwood Creek**	**4775**	**4765**	**6700**	☒	☐	☐	☐	☒
						☐	☐	☐	☐	☐

Basis for aquifer hydraulic connection evaluation:

The proposed well location is more than 0.25-mile northeast from Antelope Creek, about 980 feet.

The proposed well location is more than 1.0-mile west from Cottonwood Creek, about 1.3 miles.

The groundwater elevation is based upon the static water level reported on water well reports LAKE 2315 and LAKE 2763, and LAKE 2153 and the land elevation at their locations derived from USGS topographic maps (1:24,000 scale). The wells are respectively located northwest and south of the proposed well.

Groundwater is determined to be hydraulically connected to Antelope and Cottonwood Creeks due to the nearest reach of both creeks being identified as perennial and the groundwater level being higher than the creek elevations.

Water Availability Basin the well(s) are located within: ANTELOPE CR > GOOSE L - AT MOUTH
COTTONWOOD CR > THOMAS CR > AT <MOUTH

C3a. **690-09-040 (4):** Evaluation of stream impacts for each well that has been determined or assumed to be **hydraulically connected and less than 1 mile** from a surface water source. Limit evaluation to instream rights and minimum stream flows that are pertinent to that surface water source, and not lower SW sources to which the stream under evaluation is tributary. Compare the requested rate against the 1% of 80% *natural* flow for the pertinent Water Availability Basin (WAB). If Q is not distributed by well, use full rate for each well. Any checked ☒ box indicates the well is assumed to have the potential to cause PSI.

Well	SW #	Well < ¼ mile?	Qw > 5 cfs?	Instream Water Right ID	Instream Water Right Q (cfs)	Qw > 1% ISWR?	80% Natural Flow (cfs)	Qw > 1% of 80% Natural Flow?	Interference @ 30 days (%)	Potential for Subst. Interfer. Assumed?
1	**1**	☒	☐	**N.A.**	**N.A**	☐	**0.14**	☒	**0.1**	☒
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐

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:

The proposed well is less than 0.25 mile from Antelope Creek and more than 1.0 mile from Cottonwood Creek.

A potential for substantial interference is assumed given the proposed pumping rate is greater than one-percent of the natural stream flow (80% exceedance).

Hunt (2003) was used to calculate the interference with Antelope Creek. The parameters used were a basalt horizontal hydraulic conductivity of 11.0 feet/day (transmissivity = 5500 ft2/day based on specific capacity data for LAKE 2306), an intermediate value of 0.001 for the storage coefficient, 500 feet of overlying basin-fill with a horizontal hydraulic conductivity of 10.6 feet/day (transmissivity = 5300 ft2/day based on specific capacity data for LAKE 2315 and 2763) and a vertical conductivity of 0.106 feet/day (aquifer horizontal conductivity/100), and an average stream width of 15 feet. These parameters are within the ranges found in Morgan (1988) and Gonthier (1985). A pro-rated pumping rate of 0.208 cfs (93.4 gpm) was used. It was derived from the total annual volume (76 ac-ft) divided by total seasonal time of use.

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
1	**1**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.1%**	**0.1%**	**0.1%**	**0.0%**	**0.0%**
Well Q as CFS		**0.000**	**0.000**	**0.000**	**0.000**	**0.208**	**0.208**	**0.208**	**0.208**	**0.208**	**0.208**	**0.000**	**0.000**
Interference CFS		**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**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													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
(A) = Total Interf.		**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
(B) = 80 % Nat. Q		**6.63**	**9.62**	**17.10**	**38.80**	**40.30**	**15.10**	**4.78**	**2.99**	**2.83**	**3.22**	**4.31**	**5.60**
(C) = 1 % Nat. Q		**0.066**	**0.096**	**0.171**	**0.389**	**0.403**	**0.151**	**0.048**	**0.030**	**0.028**	**0.032**	**0.043**	**0.056**
(D) = (A) > (C)		**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**
(E) = (A / B) x 100		**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**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: ____

The proposed well is more than 1.0 mile from Cottonwood Creek.

Hunt (2003) was used to calculate the interference with Cottonwood Creek. The parameters used were a basalt horizontal hydraulic conductivity of 11.0 feet/day (transmissivity = 5500 ft2/day based on specific capacity data for LAKE 2306), an intermediate value of 0.001 for the storage coefficient, 500 feet of overlying basin-fill with a horizontal hydraulic conductivity of 10.6 feet/day (transmissivity = 5300 ft2/day based on specific capacity data for LAKE 2315 and 2763) and a vertical conductivity of 0.106 feet/day (aquifer horizontal conductivity/100), and an average stream width of 15 feet. These parameters are within the ranges found in Morgan (1988) and Gonthier (1985). A pro-rated pumping rate of 0.208 cfs (93.4 gpm) was used. It was derived from the total annual volume (76 ac-ft) divided by total seasonal time of use.

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, include conditions 7B, 7F, 7N, and 7T.

The system is identified as generally unconfined with discontinuous low permeability layers causing local (discontinuous, limited) confinement.

The proposed aquifer is identified as basalt based upon an example water well report (LAKE 2306) located T39S/R19E-sec 31 BC, about 1.75 miles northwest of the proposed well. Walker (1963) mapped the site as sedimentary deposits (QTs) that includes lacustrine, fluviatile, and aeolian sedimentary rocks, interstratified tuff, ashy diatomite, and unconsolidated clay, sand, silt, and gravel. Water well reports for 11 wells total in the same section indicate clay, sand, gravel, and "lava" deposits.

Morgan (1988) notes for the Goose Lake subbasin that groundwater flow is generally from upland recharge areas to lowland discharge areas. However, local subsystems discharge to lakes, reservoirs, meadows, and streams. Large quantities of groundwater move through complexly interbedded, discontinuous, unconsolidated sand, gravel, silt, and clay deposits. Morgan characterizes the upper portion of groundwater 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 groundwater being separated from deeper groundwater by a confining layer.

References Used:

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

Hunt, B., 2003, Unsteady stream depletion when pumping from semiconfined aquifer: Journal of Hydrologic Engineering, January/February, 2003.

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.

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

State observation well SOW 380 (well LAKE 2320).

Water well reports LAKE 2306, LAKE 2315, LAKE 2763, and 11 water well reports in the same section as the proposed well (39S/19E-sec 32).

D. WELL CONSTRUCTION, OAR 690-200

D1. **Well #**: **1** **Logid:** **Not Drilled Yet**

D2. **THE WELL does not meet current well construction standards based upon:**
- a. ☐ review of the well log;
- b. ☐ field inspection by _____;
- c. ☐ report of CWRE _____;
- d. ☐ other: (specify) _____

D3. **THE WELL construction deficiency**:
- a. ☐ constitutes a health threat under Division 200 rules;
- b. ☐ commingles water from more than one groundwater reservoir;
- c. ☐ permits the loss of artesian head;
- d. ☐ permits the de-watering of one or more groundwater reservoirs;
- e. ☐ other: (specify) _____

D4. **THE WELL construction deficiency is described as follows:** _____

D5. **THE WELL**
- a. ☐ **was**, *or* ☐ **was not** constructed according to the standards in effect at the time of original construction or most recent modification.
- b. ☐ I don't know if it met standards at the time of construction.

D6. ☐ **Route to the Enforcement Section.**

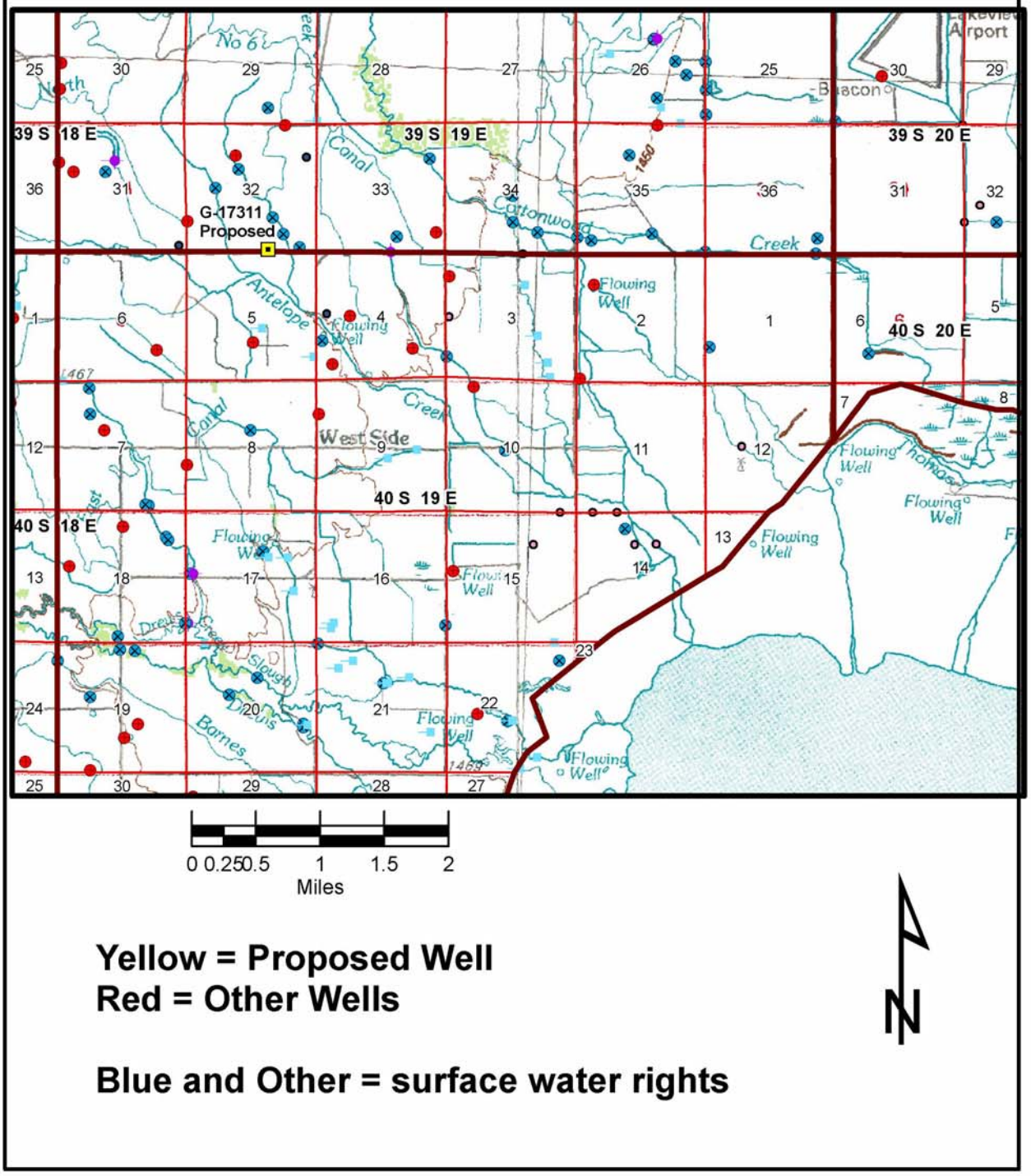
THIS SECTION TO BE COMPLETED BY ENFORCEMENT PERSONNEL

D7. ☐ Well construction deficiency has been corrected by the following actions: _____

_____ _____, 200____.
(Enforcement Section Signature)

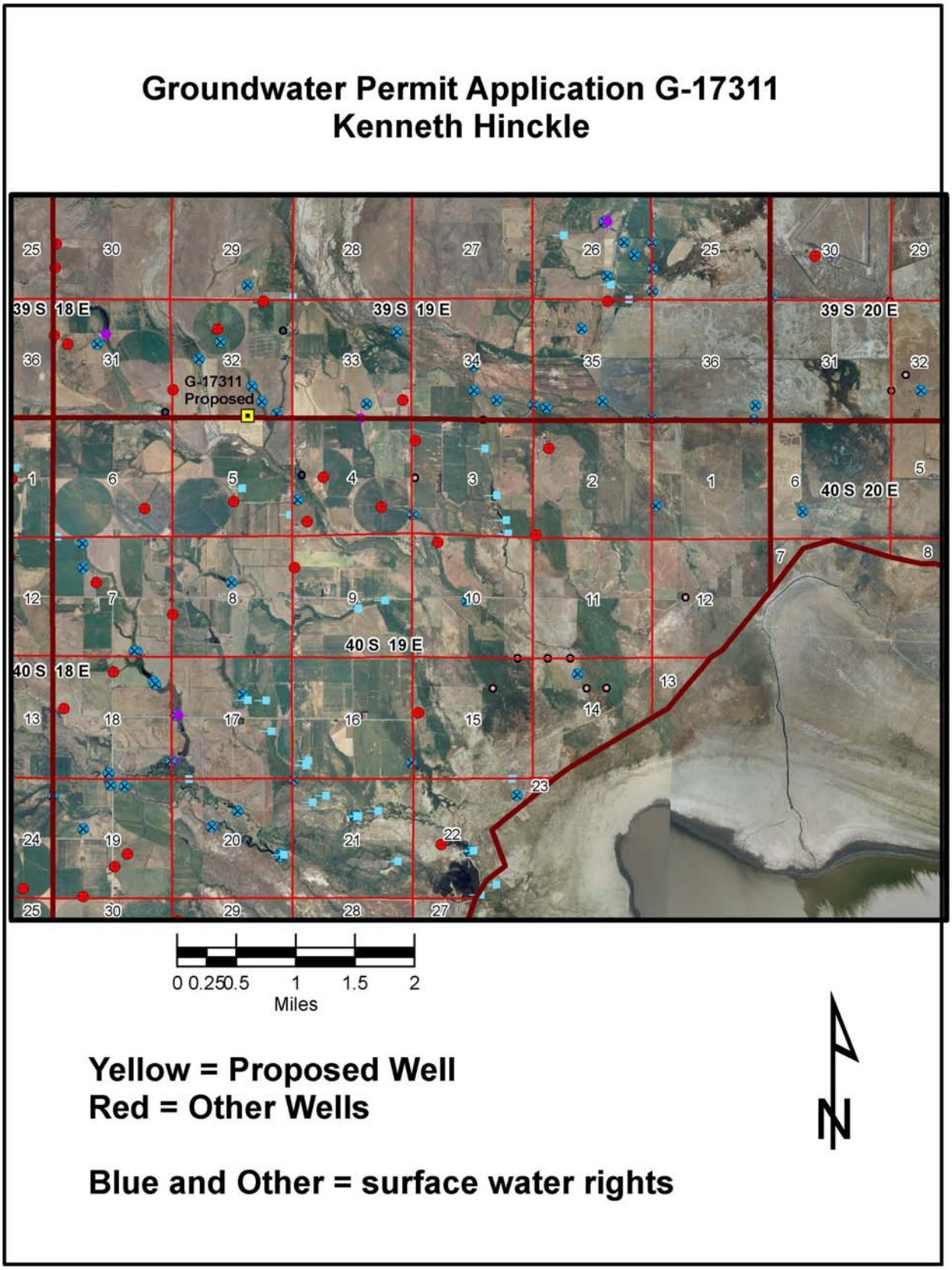
D8. ☐ **Route to Water Rights Section (attach well reconstruction logs to this page).**

Groundwater Permit Application G-17311
Kenneth Hinckle



Yellow = Proposed Well
Red = Other Wells

Blue and Other = surface water rights


Groundwater Permit Application G-17311
Kenneth Hinckle
39 S 18 E
39 S 19 E
39 S 20 E
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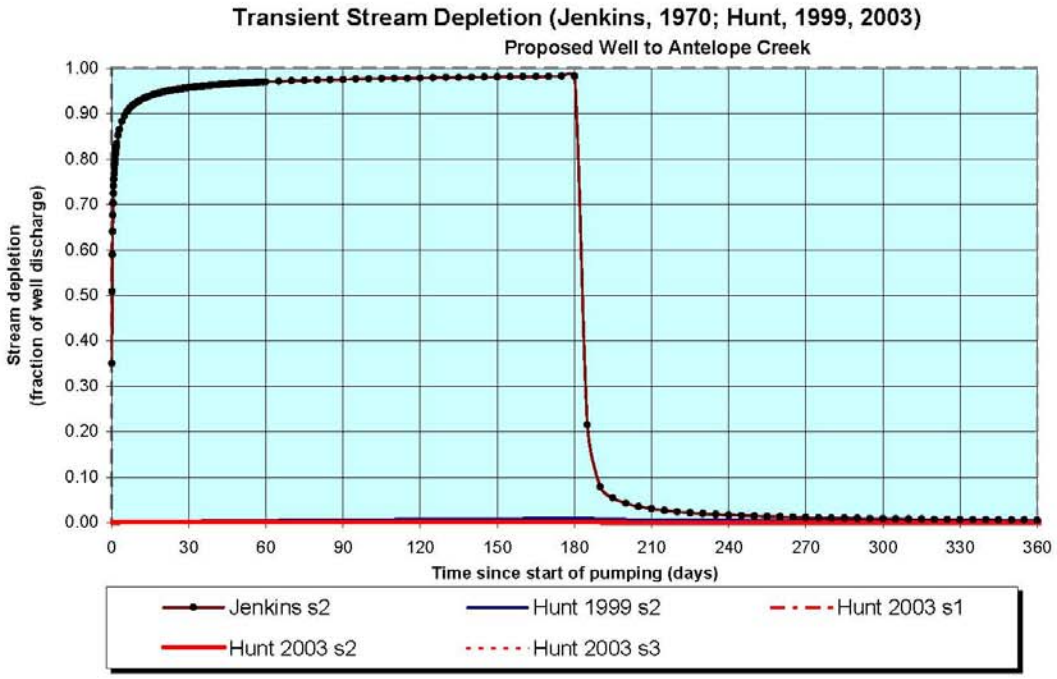
G-17311
Proposed
0 0.250.5 1 1.5 2
Miles
Yellow = Proposed Well
Red = Other Wells
Blue and Other = surface water rights
N



Output for Stream Depletion, Scenerio 2 (s2):						Time pump on (pumping duration) = 184 days						
Days	30	60	90	120	150	180	210	240	270	300	330	360
J SD	95.7%	97.0%	97.5%	97.8%	98.1%	98.2%	3.0%	1.6%	1.1%	0.8%	0.7%	0.5%
H SD 1999	0.4%	0.6%	0.7%	0.8%	0.9%	1.0%	0.7%	0.6%	0.5%	0.5%	0.5%	0.4%
H SD 2003	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Qw, cfs	0.208	0.208	0.208	0.208	0.208	0.208	0.208	0.208	0.208	0.208	0.208	0.208
H SD 99, cfs	0.001	0.001	0.001	0.002	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001
H SD 03, cfs	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate of well	Qw	0.21	0.21	0.21	cfs
Time pump on (pumping duration)	tpon	184	184	184	days
Perpendicular from well to stream	a	980	980	980	ft
Well depth	d	338	338	338	ft
Aquifer hydraulic conductivity	K	11	11	11	ft/day
Aquifer saturated thickness	b	500	500	500	ft
Aquifer transmissivity	T	5500	5500	5500	ft*ft/day
Aquifer storativity or specific yield	S	0.001	0.001	0.001	
Aquitard vertical hydraulic conductivity	Kva	0.106	0.106	0.106	ft/day
Aquitard saturated thickness	ba	500	500	500	ft
Aquitard thickness below stream	babs	500	500	500	ft
Aquitard porosity	n	0.1	0.1	0.1	
Stream width	ws	15	15	15	ft
Streambed conductance (lambda)	sbc	0.003180	0.003180	0.003180	ft/day
Stream depletion factor	sdf	0.174618	0.174618	0.174618	days
Streambed factor	sbf	0.000567	0.000567	0.000567	
input #1 for Hunt's Q_4 function	t'	5.726781	5.726781	5.726781	
input #2 for Hunt's Q_4 function	K'	0.037019	0.037019	0.037019	
input #3 for Hunt's Q_4 function	epsilon'	0.010000	0.010000	0.010000	
input #4 for Hunt's Q_4 function	lamda'	0.000567	0.000567	0.000567	

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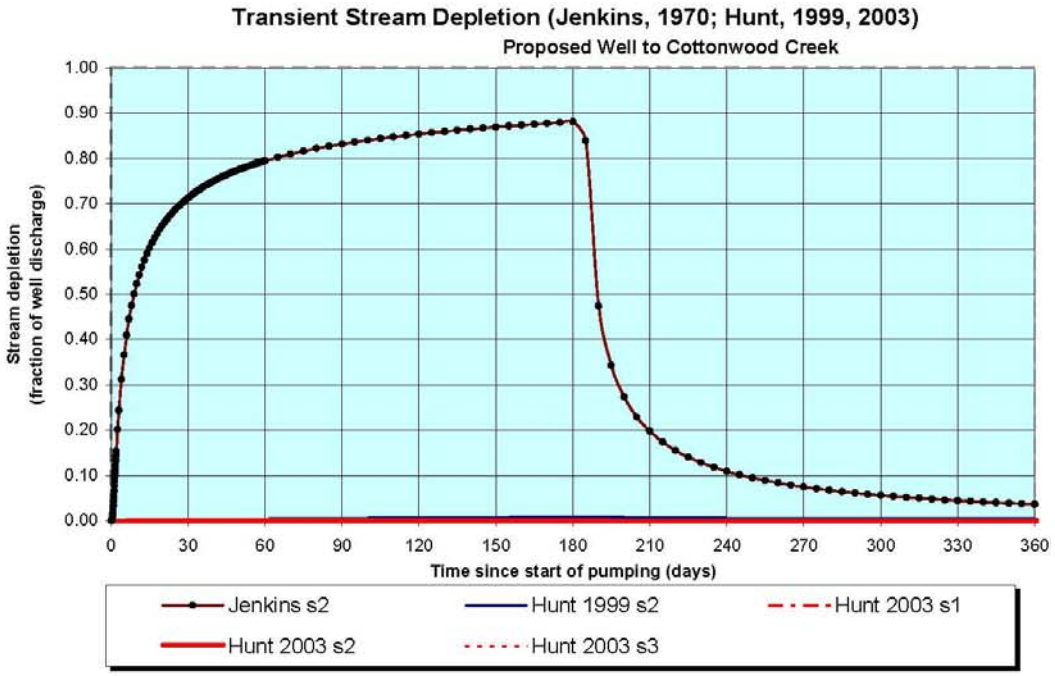

Output for Stream Depletion, Scenerio 2 (s2):						Time pump on (pumping duration) = 184 days						
Days	30	60	90	120	150	180	210	240	270	300	330	360
J SD	71.2%	79.4%	83.1%	85.4%	86.9%	88.0%	19.7%	10.9%	7.5%	5.6%	4.4%	3.6%
H SD 1999	0.3%	0.4%	0.5%	0.7%	0.8%	0.8%	0.7%	0.6%	0.5%	0.5%	0.5%	0.4%
H SD 2003	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Qw, cfs	0.208	0.208	0.208	0.208	0.208	0.208	0.208	0.208	0.208	0.208	0.208	0.208
H SD 99, cfs	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001
H SD 03, cfs	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Parameters:		Scenario 1	Scenario 2	Scenario 3	Units
Net steady pumping rate of well	Qw	0.21	0.21	0.21	cfs
Time pump on (pumping duration)	tpon	184	184	184	days
Perpendicular from well to stream	a	6700	6700	6700	ft
Well depth	d	338	338	338	ft
Aquifer hydraulic conductivity	K	11	11	11	ft/day
Aquifer saturated thickness	b	500	500	500	ft
Aquifer transmissivity	T	5500	5500	5500	ft*ft/day
Aquifer storativity or specific yield	S	0.001	0.001	0.001	
Aquitard vertical hydraulic conductivity	Kva	0.106	0.106	0.106	ft/day
Aquitard saturated thickness	ba	500	500	500	ft
Aquitard thickness below stream	babs	500	500	500	ft
Aquitard porosity	n	0.1	0.1	0.1	
Stream width	ws	15	15	15	ft
Streambed conductance (lambda)	sbc	0.003180	0.003180	0.003180	ft/day
Stream depletion factor	sdf	8.161818	8.161818	8.161818	days
Streambed factor	sbf	0.003874	0.003874	0.003874	
input #1 for Hunt's Q_4 function	t'	0.122522	0.122522	0.122522	
input #2 for Hunt's Q_4 function	K'	1.730305	1.730305	1.730305	
input #3 for Hunt's Q_4 function	epsilon'	0.010000	0.010000	0.010000	
input #4 for Hunt's Q_4 function	lamda'	0.003874	0.003874	0.003874	

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