WATER RESOURCES DEPARTMENT

MEMO **Date: 14 May 2015**

TO: **Application G- 17940**

FROM: **GW: Gerald H. Grondin**
(Reviewer's Name)

SUBJECT: Scenic Waterway Interference Evaluation

☐ YES
The source of appropriation is within or above a Scenic Waterway
☒ NO

☐ YES
Use the Scenic Waterway condition (Condition 7J)
☒ NO

☐ Per ORS 390.835, the Groundwater Section is **able** to calculate ground water interference with surface water that contributes to a Scenic Waterway. The calculated interference is distributed below.

☒ Per ORS 390.835, the Groundwater Section is **unable** to calculate ground water interference with surface water that contributes to a scenic waterway; **therefore, the Department is unable to find that there is a preponderance of evidence that the proposed use will measurably reduce the surface water flows necessary to maintain the free-flowing character of a scenic waterway.**

DISTRIBUTION OF INTERFERENCE

Calculate the percentage of consumptive use by month and fill in the table below. If interference cannot be calculated, per criteria in 390.835, do not fill in the table but check the "unable" option above, thus informing Water Rights that the Department is unable to make a Preponderance of Evidence finding.

Exercise of this permit is calculated to reduce monthly flows in _____ Scenic Waterway by the following amounts expressed as a proportion of the consumptive use by which surface water flow is reduced.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

PUBLIC INTEREST REVIEW FOR GROUNDWATER APPLICATIONS

TO: Water Rights Section Date **14 May 2015**

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

SUBJECT: Application G- **17940** Supersedes review of **26 March 2015**
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 ground water 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: **Gerrit & Patricia Jager & John & Karen Simmons**
County: **Harney**

A1. Applicant(s) seek(s) **1.274 cfs (572 gpm)** cfs from **2** well(s) in the **Malheur Lakes** Basin, **Harney-Malheur Lakes** subbasin Quad Map: **Adobe Flat**

A2. Proposed use **Primary & Supplemental Irrigation (101.95 acres total, 53.44 acres primary, 48.51 supplemental)**
Seasonality: **1 March to 31 October (245 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	HARN 50135	Well 1	Basin-Fill	0.523	T27S/R33E-sec 12 ABA	20' S, 1302' E fr N qtr cor S 12
2	HARN 50151	Well 2	Basin-Fill	0.750	T27S/R33E-sec 12 BAA	9' S, 48' W fr N qtr cor S 12
3						
4						

* 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	4111	16	16	02/24/1997	300	0 – 22	+2 – 98	None	None	1100	34	P
2	4135	30	30	04/19/1997	514	0 – 20	+2 – 128	None	None	30	3	B

Use data from application for proposed wells.

A4. **Comments:**

Groundwater permit application G-17940 pages 4 to 6 contained conflicting and/or inconsistent proposed well and water use information. This review used what is consistent with what is typically allowed and with available well ID and location information.

The proposed maximum pumping rate of 1.274 cfs (572 gpm) is what is typically allowed for 101.95 acres. The proposed maximum allowable annual volume was specified as 3 ac-ft. That is equal to 305.85 ac-ft/yr (3.00 ac-ft per acre), the typical maximum volume allowed for 101.95 acres.

The proposed wells are located at the mouth of Malheur Gap – Virginia Valley in southeastern Harney Valley; they are about 2.3 miles south of New Princeton. The water well reports for the two proposed POA wells (HARN 50135 and HARN 50151) indicate the wells are completed in the predominantly basin-fill sedimentary unit that overlies the predominantly volcanic-basalt rock and sediment unit in the valleys.

Piper (1939) geologically maps the as Qal described as alluvium and/or valley fill composed of clay, silt, sand, gravel, and some pumice and ash. Greene and others (1972) geologically map the area as Qs described as sedimentary deposits composed of unconsolidated silt and clay with some sand and gravel. Brown and McLean (1980) geologically map the area as Qs/Qal described as undifferentiated alluvium and sedimentary deposits composed of silt, sand, and gravel. The surrounding nearby geology is variable. Greene and others (1972) geologically map rhyodacite (Trd), tuffaceous sedimentary rock (Tts), and various basalt (Qb, Tb, and Tdw) south, west and east of the proposed POA wells, and additionally, the geology east of the proposed POA wells includes welded tuff (Tdv). Brown and McLean (1980) geologically map rhyodacite (Tmrd), ash-flow tuff (Tmtd), tuffaceous sedimentary rocks ($Tmst_3$), and basalt and andesite (Tmba) south, west and east of the proposed POA wells.

A5. ☒ **Provisions of the** Malheur lake Basin rules relative to the development, classification and/or management of ground water hydraulically connected to surface water ☐ **are**, *or* ☒ **are not**, activated by this application. (Not all basin rules contain such provisions.)

Comments:

Rule OAR 690-512 states: "(1) Except as provided in section (3) of this rule, the Department shall not accept an application for permit, or issue a permit, for any use of surface water, or of groundwater the use of which has the potential to substantially interfere with surface water, in the Malheur Lake Basin unless the applicant shows, by a preponderance of evidence, that unappropriated water is available to supply the proposed use at the times and in the amounts requested. The evidence provided shall be prepared by a qualified hydrologist or other water resources specialist and shall include:

(a) Streamflow measurements of gage records from the source or, for use of groundwater, the stream in hydraulic connection with the source; or

(b) An estimate of water availability from the source or, for use of groundwater, the stream in hydraulic connection with the source which includes correlations with streamflow measurements or gage records on other, similar streams and considers current demands for water affecting the streamflows."

The rule OAR 690-512 is likely NOT activated given NO potential for substantial interference with surface water was found. There are no surface water availability calculations for the portion of Harney Valley.

A6. ☐ **Well(s) #** N.A. , _____ , _____ , _____ , _____ , tap(s) an aquifer limited by an administrative restriction.

Name of administrative area:

Comments:

Currently, no administrative area.

B. GROUND WATER AVAILABILITY CONSIDERATIONS, OAR 690-310-130, 400-010, 410-0070

B1. **Based upon available data,** I have determined that ground water* 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 ground water 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 ground water 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 ground water resource; or

d. ☐ **will, if properly conditioned,** avoid injury to existing ground water rights or to the ground water resource:
   i. ☐ The permit should contain condition #(s)_____;
   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 ground water production from no deeper than _____ ft. below land surface;

b. ☐ **Condition** to allow ground water production from no shallower than _____ ft. below land surface;

c. ☐ **Condition** to allow ground water production only from the _____ ground water 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 Ground Water 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. **Ground water availability remarks:**

The proposed well(s) for this application is within or near an area of observed groundwater level decline (see attached map). The decline indicates that demand for groundwater is exceeding the average annual recharge. An analysis by the Department confirms the volume of groundwater permitted for annual use exceeds the average annual volume of recharge to groundwater. The Department also estimates that approximately 30 percent of the total acreage permitted for groundwater use for this source has yet to be developed. Groundwater development for these acres under already-existing permits will further increase the groundwater level decline rate. Based on this information, groundwater is determined to be over-appropriated [see OAR 690-400-0010(11)(a)(B)] and the proposed use is not within the capacity of the resource.

If a permit is issued, the following conditions are recommended:

7B: Interference Condition

7F: Proposed Well location Condition

7N: Annual Measurement and Decline Condition

7P: Well Tag Condition

7T: Dedicated Measuring Tube Condition for all POA wells

Flow meter condition: Use the water rights "large" permit condition requiring a totalizing flow meter at each well and reporting

C. GROUND WATER/SURFACE WATER CONSIDERATIONS, OAR 690-09-040

C1. **690-09-040 (1):** Evaluation of aquifer confinement:

Well	Aquifer or Proposed Aquifer	Confined	Unconfined
1	**Predominantly Basin-Fill Sediment Unit**	☐	☒
		☐	☐
		☐	☐
		☐	☐

Basis for aquifer confinement evaluation:

Available data, including Piper and others (1939), Leonard (1970), and water well reports indicate groundwater in the basin fill is generally unconfined and hydraulically connected to Malheur and Harney Lakes. Some local confinement can occur where discontinuous low permeability layers are present. Leonard (1970) indicates confined groundwater occurs at depth in the basin in deep basin fill sediments and underlying Tertiary volcanic and sedimentary rocks. Hubbard (1975) indicates the groundwater contribution to flow into Malheur Lake is small with the lake perched above ground water in most areas.

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	**Malheur Lake**	**4100**	**4098**	**31,320**	☒	☐	☐	☐	☒
2	1	**Malheur Lake**	**4100**	**4098**	**32,030**	☒	☐	☐	☐	☒
						☐	☐	☐	☐	☐
						☐	☐	☐	☐	☐

Basis for aquifer hydraulic connection evaluation:

This review considers perennial surface water only.

Groundwater and perennial surface water are generally hydraulically connected in the Harney Valley. The groundwater elevation is derived from data from the proposed POA wells and from state observation well 183 (well HARN 1408) located about 2.6 miles northwest of the proposed POA wells. The surface water elevation for Malheur Lake is derived from USGS quadrangle contour maps. The maps show the lake elevation varying from 4093 feet elevation in 1975 to 4098 feet elevation in 1983.

There are a number of intermittent streams in the area. Nearby surface water rights appear to depend on run-off.

Water Availability Basin the well(s) are located within: No WAB calculated for this area

C3a. **690-09-040 (4):** Evaluation of stream impacts for <u>each well</u> 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?
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐

C3b. **690-09-040 (4):** Evaluation of stream impacts <u>by total appropriation</u> 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:

<u>No analysis. The proposed POA wells are more than one-mile from the nearest perennial surface water body.</u>

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	%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
Distributed Wells													
Well	SW#	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
		%	%	%	%	%	%	%	%	%	%	%	%
Well Q as CFS													
Interference CFS													
(A) = Total Interf.													
(B) = 80 % Nat. Q													
(C) = 1 % Nat. Q													
(D) = (A) > (C)													
(E) = (A / B) x 100		%	%	%	%	%	%	%	%	%	%	%	%

(A) = total interference as CFS; (B) = WAB calculated natural flow at 80% exceed. as CFS; (C) = 1% of calculated natural flow at 80% exceed. as CFS; (D) = highlight the checkmark for each month where (A) is greater than (C); (E) = total interference divided by 80% flow as percentage.

Basis for impact evaluation:

Analysis was conducted. The proposed POA wells are more than one-mile from the nearest perennial surface water body (Malheur Lake).

The table above is not used because no surface water availability has been calculated for surface water in the vicinity of the POA wells and the closest perennial surface water body identified by this review is Malheur Lake.

Seasonal groundwater level drawdown at at Malheur Lake was estimated using the Theis drawdown equation. The calculation used a transmissivity of 7,500 ft2/day, which is within the 1,000 to 15,000 ft2/day transmissivity range for Eastern Oregon basin-fill as noted by Gonthier (1985). The value used was derived from specific capacity data from well HARN 50135 (owner well 1, proposed POA well 1). Additionally, the calculation used an assumed intermediate storage coefficient (0.001).

The estimated seasonal groundwater level drawdown at Malheur Lake ranged from about 0.21 feet at the end of 30 days to about 1.80 feet at the end of 245 days for continuous pumping at the full proposed rate. The estimated drawdown using a lower pro-rated pumping rate (total volume divided by total days) ranged from about 0.10 feet at the end of 30 days to about 0.89 feet at the end of 245 days.

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 ground water 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**_____

The proposed well(s) for this application is within or near an area of observed groundwater level decline (see attached map). The decline indicates that demand for groundwater is exceeding the average annual recharge. An analysis by the Department confirms the volume of groundwater permitted for annual use exceeds the average annual volume of recharge to groundwater. The Department also estimates that approximately 30 percent of the total acreage permitted for groundwater use for this source has yet to be developed. Groundwater development for these acres under already-existing permits will further increase the groundwater level decline rate. Based on this information, groundwater is determined to be over-appropriated [see OAR 690-400-0010(11)(a)(B)] and the proposed use is not within the capacity of the resource.

NO potential for substantial interference with surface water was found. There are no surface water availability calculations for the portion of Harney Valley.

If a permit is issued, the following conditions are recommended:

7B: Interference Condition

7F: Proposed Well location Condition

7N: Annual Measurement and Decline Condition

7P: Well Tag Condition

7T: Dedicated Measuring Tube Condition for all POA wells

Flow meter condition: Use the water rights "large" permit condition requiring a totalizing flow meter at each well and reporting

References Used:

Oregon Administrative Rules: OAR 690-512

Piper, A.M., Robison, T.W., and Park C.F. 1939. Geology and Ground Water Resources of the Harney Basin, Oregon. USGS Water Supply Paper 841.

Leonard, A.R. 1970. Ground-Water Resources in Harney Valley, Harney County, Oregon. Ground Water Report 16, Oregon Water Resources Department, Salem, Oregon.

Greene, R.C., Walker, G.W., and Corcoran, R.E. 1972. Geologic Map of the Burns Quadrangle, Oregon. USGS Miscellaneous Geologic Investigations Map I-680.

Hubbard, Larry. L. 1975. Hydrology of Malheur Lake, Harney County, Southeastern Oregon. USGS Water Resources Investigation 75-21.

Walker, G.W. 1979. Revisions to the Cenozoic Stratigraphy of Harney Basin, Southeastern Oregon. USGS Bulletin 1475.

Brown, D. E., McLean, G.D., and Black, G.L., 1980, Preliminary geology and geothermal resource potential of the northern Harney Basin, Oregon: Portland, Oreg., Oregon Department of Geology and Mineral Industries Open-File Report O-80-6, scale 1:62,500.

Brown, D. E., McLean, G. D., and Black, G. L. 1980, Preliminary geology and geothermal resource potential of the southern Harney Basin, Oregon: Portland, Oreg., Oregon Department of Geology and Mineral Industries Open-File Report O-80-7, Plates 2 and 4, scale 1:62,500.

Gonthier, J.B. 1985. A Description of Aquifer Units in Eastern Oregon. USGS Water Resources Investigations Report 84-4095.

OWRD water well reports, water level data, and/or hydrographs: HARN 1408 (state observation well 183), HARN 50135, and HARN 50151

USGS Quadrangle Maps (1:24,000 scale): Adobe Flat, New Princeton, and Malheur Lake East, Oregon

D. WELL CONSTRUCTION, OAR 690-200

D1. **Well #:** 1 **Logid:** HARN 50135

Comments: None

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

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

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

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

D1. **Well #:** 2 **Logid:** HARN 50151

Comments: None

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

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

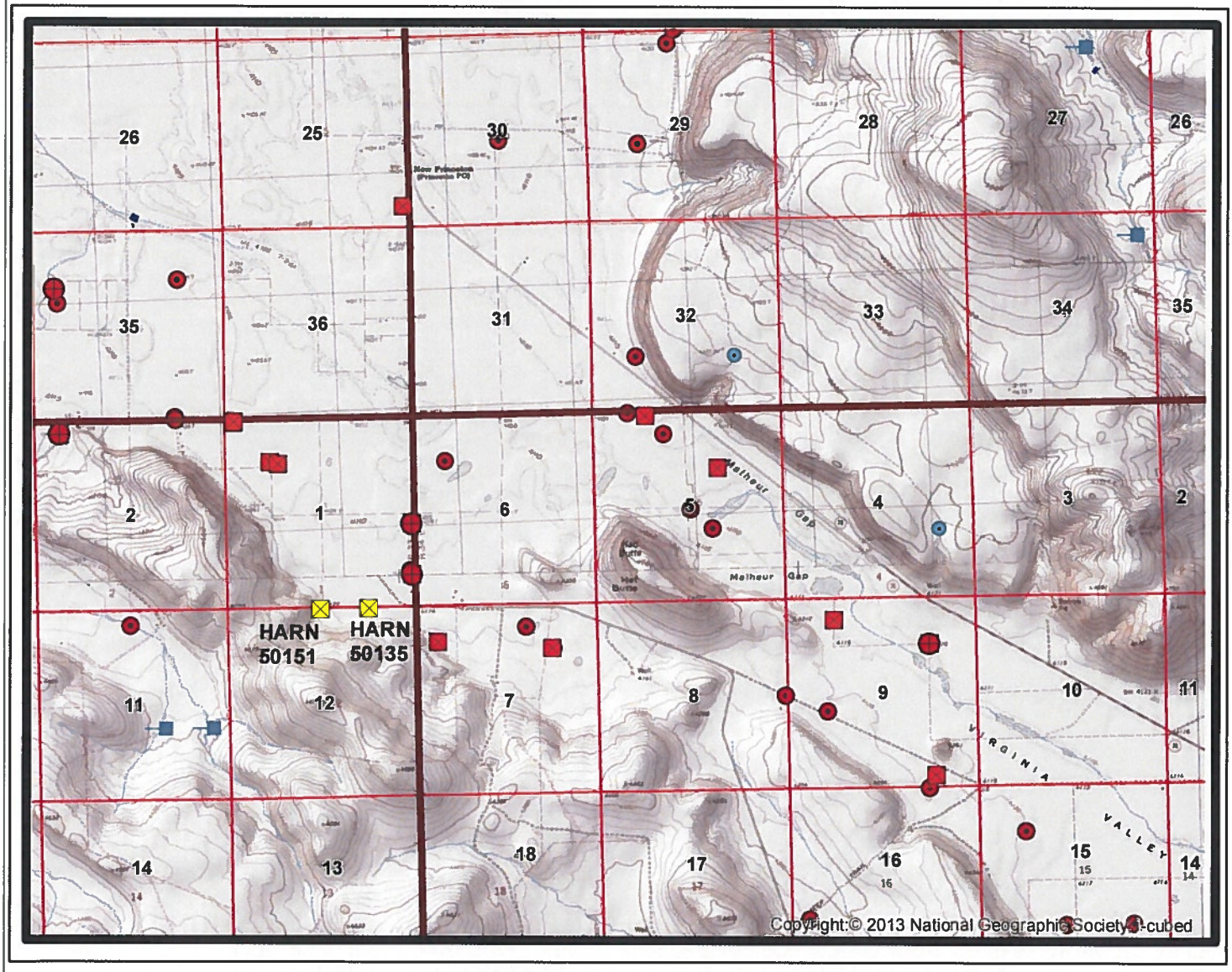
D3. **THE WELL construction deficiency or other comment is described as follows:** _____

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

Water Availability Tables

No water availability tables for this area.

Groundwater Permit Application G-17940
Gerrit & Patricia Jager & John & Karen Simmons



Miles

0 0.475 0.95 1.9 2.85 3.8

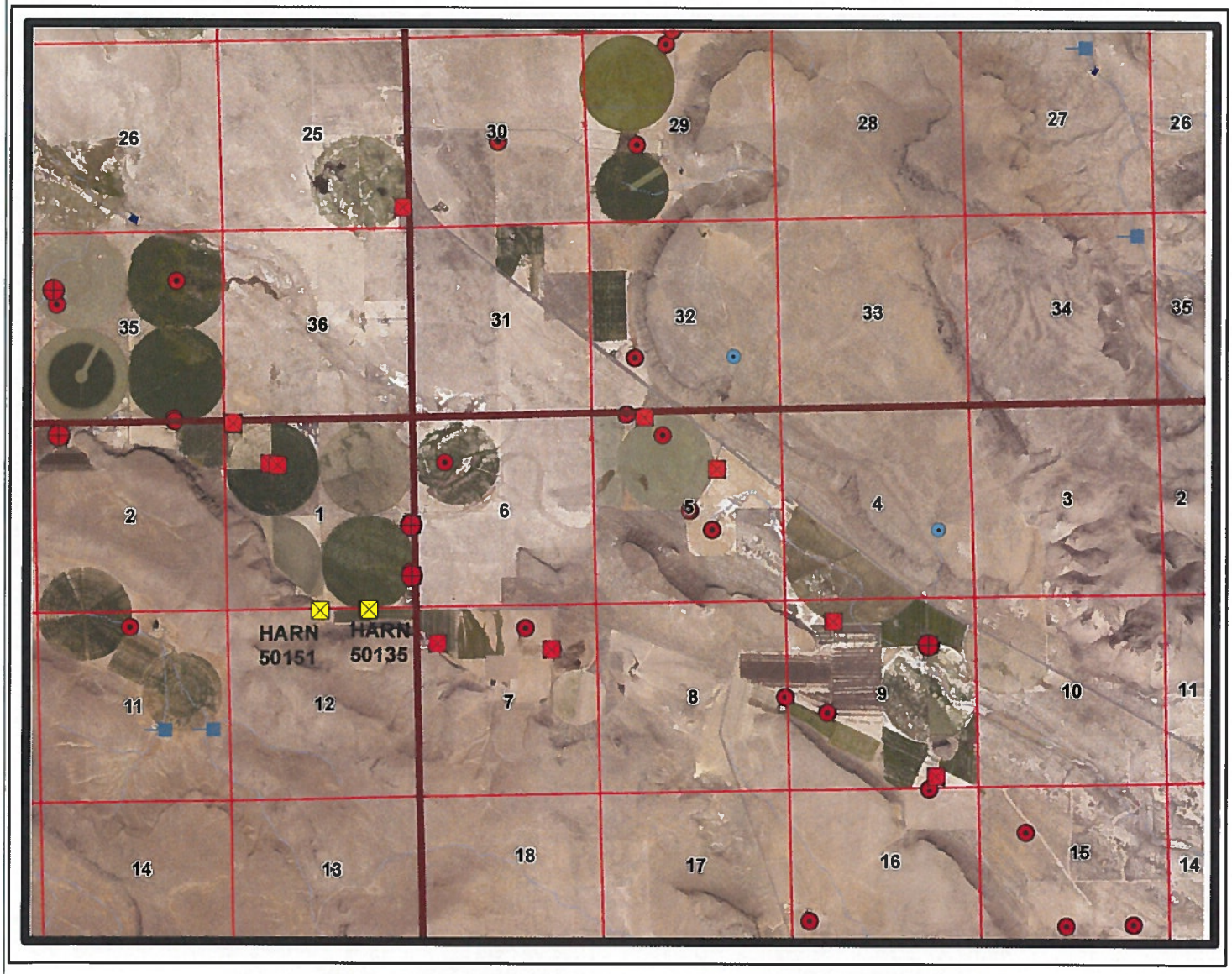
Yellow = Application Noted Well(s)

Red = Other Existing or Proposed Wells

Blue and Other = Surface Water Rights

N

Groundwater Permit Application G-17940
Gerrit & Patricia Jager & John & Karen Simmons



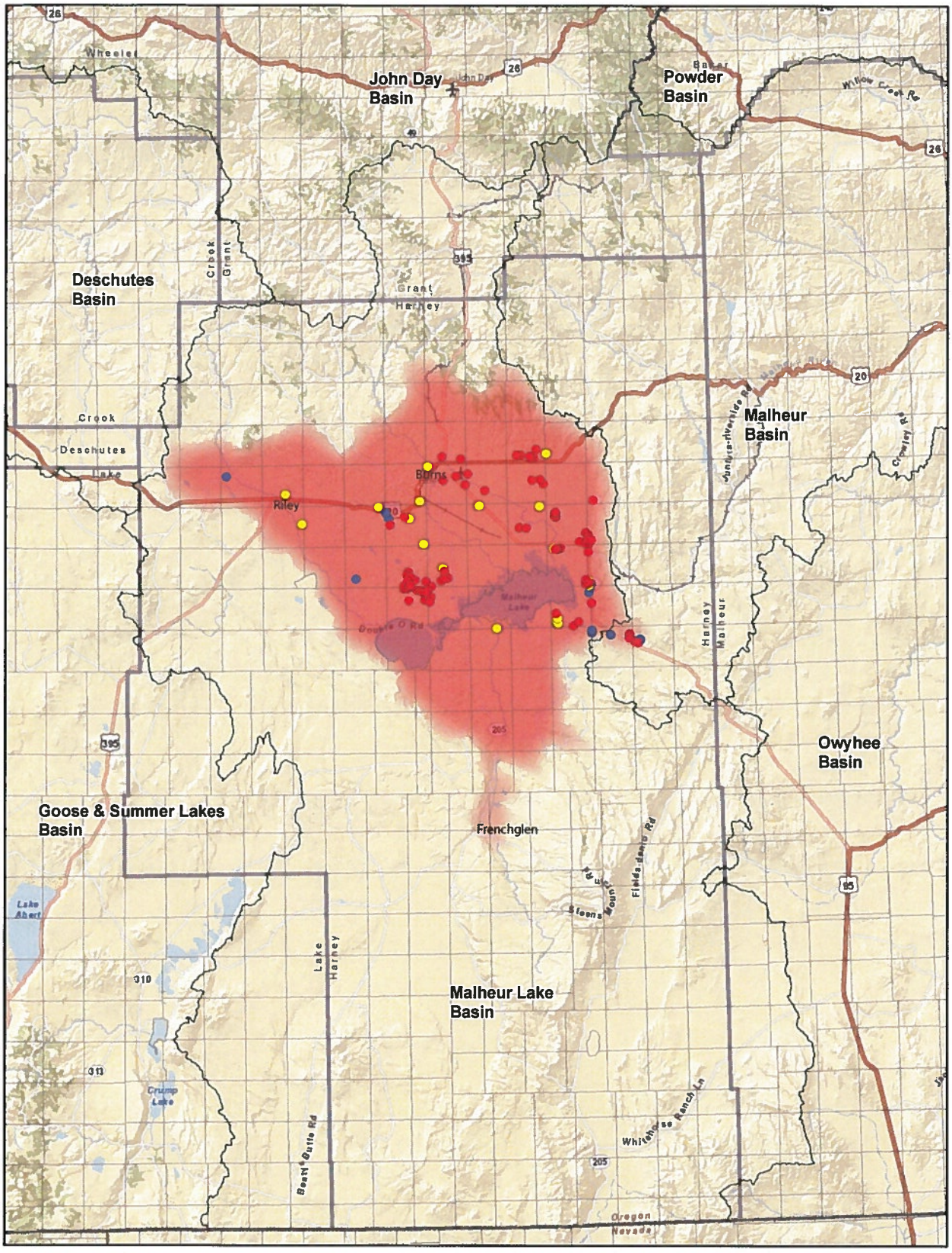
Miles

0 0.475 0.95 1.9 2.85 3.8

Yellow = Application Noted Well(s)

Red = Other Existing or Proposed Wells

Blue and Other = Surface Water Rights



Explanation

- Wells with water level decline
- Wells with no decline
- Wells with uncertain trend

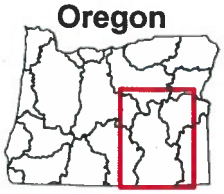
Counties

Basins

Greater Harney Valley Area

N

Oregon



This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information.

Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, OpenStreetMap contributors, and the GIS USer Community.

Oregon Lambert Projection, NAD 83 (EPSG# 2992)

Software: ESRI ArcMap ver. 10.1; Adobe Illustrator 2014.0.0 release.

OWRD (db), 4/14/2015

Greater Harney Valley Groundwater Level Trends
Oregon Water Resources Department
April 2015 Draft

0 5 10 20 30 40 Miles

Oregon Water Resources Department
725 Summer St NE, Suite A
Salem, OR 97301

STATE OF OREGON WATER RESOURCES DEPARTMENT WRD

RECEIVED

MAR - 7 1997

WATER RESOURCES DEPT.
SALEM, OREGON

WELL I.D.# L05041

harn 50135

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)

(START CARD) # W85990

Instructions for completing this report are on the last page of this form.

(1) OWNER: Well Number

Name Roger Hazlett

Address P.O. Box 3030

City Princeton State OR Zip 97721

(2) TYPE OF WORK

☒ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:

☐ Rotary Air ☐ Rotary Mud ☒ Cable ☐ Auger

☐ Other

(4) PROPOSED USE:

☐ Domestic ☐ Community ☐ Industrial ☒ Irrigation

☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION:

Special Construction approval ☐ Yes ☒ No Depth of Completed Well 300 ft.

Explosives used ☐ Yes ☒ No Type Amount

HOLE Diameter	From	To	SEAL Material	From	To	Sacks or pounds
18"	0	22'	Cement	-2'	22'	21
~~22'~~						
12"	22'	300'				

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☒ E

☐ Other

Backfill placed from ft. to ft. Material

Gravel placed from ft. to ft. Size of gravel

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	12"	+2	98'	250	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Final location of shoe(s) 98'

(7) PERFORATIONS/SCREENS:

☐ Perforations Method

☐ Screens Type Material

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
						☐	☐
						☐	☐
NONE						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour

☒ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
1100	34'		1 hr.

Temperature of water 63 Depth Artesian Flow Found

Was a water analysis done? ☐ Yes By whom

Did any strata contain water not suitable for intended use? ☒ Too little

☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other

Depth of strata: 64' - 87'

(9) LOCATION OF WELL by legal description:

County Harney Latitude Longitude

Township 27 N or (S) Range 33 (E) or W. WM.

Section 12 NW 1/4 NE 1/4

Tax Lot 400 Lot Block Subdivision

Street Address of Well (or nearest address) ¼ mile West OF Old Princeton

(10) STATIC WATER LEVEL:

16 ft. below land surface. Date 2-24-97

Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:

Depth at which water was first found 16 Feet

From	To	Estimated Flow Rate	SWL
16'	17'	5 GPM	16
64'	87'	100 GPM	16
176'	264'	500 GPM	16
264'	276'	200 GPM	16

(12) WELL LOG:

Ground Elevation

Material	From	To	SWL
Sandy Loam	0	3	
Brown Clay	3	64	16
Brown Sand	64	87	16
Sand STone Brown	87	176	16
Clay STone Brown	176	264	16
Brown Clay with			
Course Sand	264	276	
Brown Clay	276	300	16

Date started 1-25-97 Completed 2-24-97

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

WWC Number

Signed Date

(bonded) Water Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 1435

Signed Joe Valentine Date 2-24-97

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HARN 50151

RECEIVED
APR 28 1997
WATER RESOURCES DEPT.
SALEM, OREGON

WELL # LO5040

STATE OF OREGON
WATER WELL REPORT
(as required by ORS 537.765)

(START CARD) # 85989

Instructions for completing this report are on the last page of this form.

(1) OWNER: Well Number 2
Name Roger Haworth
Address P.O. Box 3030 Princeton
City Old Princeton State OR Zip 97721

(2) TYPE OF WORK
☒ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:
☐ Rotary Air ☐ Rotary Mud ☒ Cable ☐ Auger
☐ Other

(4) PROPOSED USE:
☐ Domestic ☐ Community ☐ Industrial ☒ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☒ No Depth of Completed Well 514 ft.
Explosives used ☐ Yes ☒ No Type ____ Amount ____

HOLE Diameter	From	To	Material	SEAL From	To	Sacks or pounds
18"	0	20'	cement	0	20'	19
12"	20'	514'				

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☒ E
☐ Other
Backfill placed from ____ ft. to ____ ft. Material ____
Gravel placed from ____ ft. to ____ ft. Size of gravel ____

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	12"	+2'	128'	250	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Final location of shoe(s) 128'

(7) PERFORATIONS/SCREENS:
☐ Perforations Method ____
☐ Screens Type ____ Material ____

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
NONE						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☒ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
50	3'		1 hr.

Temperature of water 55 Depth Artesian Flow Found ____
Was a water analysis done? ☐ Yes By whom ____
Did any strata contain water not suitable for intended use? ☒ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other ____
Depth of strata: 72'

(9) LOCATION OF WELL by legal description:
County Harney Latitude ____ Longitude ____
Township 27 ☐ N or S Range 33 E or ☐ W. WM.
Section 1 E½ 1/4 SW 1/4
Tax Lot 400 Lot ____ Block ____ Subdivision ____
Street Address of Well (or nearest address) ½ mile west of Old Princeton

(10) STATIC WATER LEVEL:
30 ft. below land surface. Date 4/19/97
Artesian pressure ____ lb. per square inch. Date ____

(11) WATER BEARING ZONES:
Depth at which water was first found 30'

From	To	Estimated Flow Rate	SWL
30'	36'	10 GPM	30'
72'	81'	50 GPM	30'
190'	196'	30 GPM	30'
230'	233'	100 GPM	30'
471	498	70 GPM	30'

(12) WELL LOG:
Ground Elevation ____

Material	From	To	SWL
Sandy Loam	0	3'	
Brown Clay	3	72'	30'
Brown Sand	72'	81	30'
Gray Sand Stone	81'	514'	30'

Date started 3/5/97 Completed 4/19/97

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.
WWC Number 1675
Signed George M. Valentine Date 4/19/97

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.
WWC Number 1435
Signed Joe Valentine Date 4/19/97

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Drawdown Calculations Using Theis Equation

Theis Equation: s = [Q/(4*T*pi)][W(u)]
u = (r*r*S)/(4*T*t)
W(u) = (-ln u)-(0.5772157)+(u/1*1!)-(u*u/2*2!)+(u*u*u/3*3!)-(u*u*u*u/4*4!)+...

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

Transmissivity T (gpd/ft)	Transmissivity T (ft2/day)	Storage Coefficient S	Pumping Rate Q (gal/min)	Pumping Rate Q (ft3/sec)	Time t (days)	Distance r (feet)	pi	u	W(u)	Drawdown s (feet)	Total Drawdown s (feet)	Comments
								Note : W(u) calculation valid when u < 7.1				
Note: yellow grid areas are where values are calculated								7.0000	1.1545E-04			W(u) calculation test
HARN 50135 (owner well 1, application POA well 1)to Malheur Lake												
56,103.90	7,500.00	0.00100	234.74	0.52	30.00	31,320.00	3.14	1.0899	0.1891	0.0906		Continuous Pumping at Full Rate
56,103.90	7,500.00	0.00100	234.74	0.52	245.00	31,320.00	3.14	0.1335	1.5659	0.7508		Continuous Pumping at Full Rate
56,103.90	7,500.00	0.00100	116.06	0.26	30.00	31,320.00	3.14	1.0899	0.1891	0.0448		Pro-Rated Pumping Rate
56,103.90	7,500.00	0.00100	116.06	0.26	245.00	31,320.00	3.14	0.1335	1.5659	0.3712		Pro-Rated Pumping Rate
HARN 50151 (owner well 2, application POA well 2)to Malheur Lake												
56,103.90	7,500.00	0.00100	336.62	0.75	30.00	32,030.00	3.14	1.1399	0.1744	0.1199	0.2105	Continuous Pumping at Full Rate
56,103.90	7,500.00	0.00100	336.62	0.75	245.00	32,030.00	3.14	0.1396	1.5268	1.0497	1.8005	Continuous Pumping at Full Rate
56,103.90	7,500.00	0.00100	166.43	0.37	30.00	32,030.00	3.14	1.1399	0.1744	0.0593	0.1041	Pro-Rated Pumping Rate
56,103.90	7,500.00	0.00100	166.43	0.37	245.00	32,030.00	3.14	0.1396	1.5268	0.5190	0.8902	Pro-Rated Pumping Rate

Transmissivity from Specific Capacity using the Theis Equation

Adapted from Vorhis (1979)

Theis Equation: $T = [Q/(4*s*pi)][W(u)]$

$u = (r*r*S)/(4*T*t)$

$W(u) = (-\ln u)-(0.5772157)+(u/1*1!)-(u*u/2*2!)+(u*u*u/3*3!)-(u*u*u*u/4*4!)+...$

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

Note: Transmissivity is derived using an iterative process

The calculations use a known or assumed Storage Coeficient (S) provided by the user
Specific Capacity (Q/s) is used to first approximate the Transmissivity (T) used to calculate u in the first Theis equation iteration
The Transmissivity of the previous iteration is used to calculate u in a given Theis equation iteration
Total Theis Equation iterations = 25 iterations
Can accept answer if difference in calculated Transmissivity for the last 2 iterations is < 0.0001
Can accept answer if u in the last iteration is < 7.1

Note: Well efficiency is not included in the calculations

References:

Theis, C.V. 1935. The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using ground water storage. American Geophysical Union Transactions, 16 annual meeting, vol. 16, pg. 519-524.

Vorhis, R.C. 1979. Transmissivity from pumped well data. Well Log, National Water Well Association newsletter, vol. 10, no. 11, Dec. 1979, pg. 50-52.

Data Entry	Enter Data Below (yellow boxes only)	
Well Log ID or Comment for Records	HARN50135	
Pumping Rate (gpm) = Q =	1,100.00	(gpm)
Drawdown (feet) = s =	34.00	(feet)
Time (hours) = t =	1.0000	(hours)
Storage Coefficient = S =	0.001000	(dimensionless)
Well Diameter (inches) = d =	12.0000	(inches)
	Press F9 to Calculate	

Calculated Results	Calculated Results	
Transmissivity (ft2/day) = T =	7,348.48	(ft2/day)
Transmissivity (gpd/ft) = T =	54,970.43	(gpd/ft)
Transmissivity Difference = (last 2 iterations)	0.0000E+00 okay to use T if diff < 0.0001	(ft2/day)
u = (last iteration)	2.0412E-07 okay to use T if u <7.1	

Drawdown s (feet)	Storage Coefficient S	Pumping Rate Q (gal/min)	Pumping Rate Q (ft3/sec)	Time t (days)	Distance r = d/2 (feet)	u	W(u)	Transmissivity T (ft2/day)	Transmissivity difference from previous	Comments	Theis Equation Iteration
Note: yellow grid areas are where values are calculated						Note : W(u) calculation valid when u < 7.1					
						7.0000	1.1545E-04			W(u) calculation test	
34.00	0.00100	1,100.00	2.45	0.04	0.50			6,227.94		T = Q/s	
34.00	0.00100	1,100.00	2.45	0.04	0.50	2.4085E-07	14.6619	7,266.48	1.0385E+03	T = Theis Equation	1.00
34.00	0.00100	1,100.00	2.45	0.04	0.50	2.0643E-07	14.8161	7,342.92	7.6435E+01	T = Theis Equation	2.00
34.00	0.00100	1,100.00	2.45	0.04	0.50	2.0428E-07	14.8266	7,348.10	5.1860E+00	T = Theis Equation	3.00
34.00	0.00100	1,100.00	2.45	0.04	0.50	2.0413E-07	14.8273	7,348.45	3.4990E-01	T = Theis Equation	4.00
34.00	0.00100	1,100.00	2.45	0.04	0.50	2.0412E-07	14.8273	7,348.48	2.3599E-02	T = Theis Equation	5.00
34.00	0.00100	1,100.00	2.45	0.04	0.50	2.0412E-07	14.8273	7,348.48	1.5916E-03	T = Theis Equation	6.00
34.00	0.00100	1,100.00	2.45	0.04	0.50	2.0412E-07	14.8273	7,348.48	1.0734E-04	T = Theis Equation	7.00
34.00	0.00100	1,100.00	2.45	0.04	0.50	2.0412E-07	14.8273	7,348.48	7.2394E-06	T = Theis Equation	8.00
34.00	0.00100	1,100.00	2.45	0.04	0.50	2.0412E-07	14.8273	7,348.48	4.8825E-07	T = Theis Equation	9.00
34.00	0.00100	1,100.00	2.45	0.04	0.50	2.0412E-07	14.8273	7,348.48	3.2928E-08	T = Theis Equation	10.00
34.00	0.00100	1,100.00	2.45	0.04	0.50	2.0412E-07	14.8273	7,348.48	2.2201E-09	T = Theis Equation	11.00
34.00	0.00100	1,100.00	2.45	0.04	0.50	2.0412E-07	14.8273	7,348.48	1.5007E-10	T = Theis Equation	12.00
34.00	0.00100	1,100.00	2.45	0.04	0.50	2.0412E-07	14.8273	7,348.48	1.0004E-11	T = Theis Equation	13.00
34.00	0.00100	1,100.00	2.45	0.04	0.50	2.0412E-07	14.8273	7,348.48	0.0000E+00	T = Theis Equation	14.00
34.00	0.00100	1,100.00	2.45	0.04	0.50	2.0412E-07	14.8273	7,348.48	0.0000E+00	T = Theis Equation	15.00
34.00	0.00100	1,100.00	2.45	0.04	0.50	2.0412E-07	14.8273	7,348.48	0.0000E+00	T = Theis Equation	16.00
34.00	0.00100	1,100.00	2.45	0.04	0.50	2.0412E-07	14.8273	7,348.48	0.0000E+00	T = Theis Equation	17.00
34.00	0.00100	1,100.00	2.45	0.04	0.50	2.0412E-07	14.8273	7,348.48	0.0000E+00	T = Theis Equation	18.00
34.00	0.00100	1,100.00	2.45	0.04	0.50	2.0412E-07	14.8273	7,348.48	0.0000E+00	T = Theis Equation	19.00
34.00	0.00100	1,100.00	2.45	0.04	0.50	2.0412E-07	14.8273	7,348.48	0.0000E+00	T = Theis Equation	20.00
34.00	0.00100	1,100.00	2.45	0.04	0.50	2.0412E-07	14.8273	7,348.48	0.0000E+00	T = Theis Equation	21.00
34.00	0.00100	1,100.00	2.45	0.04	0.50	2.0412E-07	14.8273	7,348.48	0.0000E+00	T = Theis Equation	22.00
34.00	0.00100	1,100.00	2.45	0.04	0.50	2.0412E-07	14.8273	7,348.48	0.0000E+00	T = Theis Equation	23.00
34.00	0.00100	1,100.00	2.45	0.04	0.50	2.0412E-07	14.8273	7,348.48	0.0000E+00	T = Theis Equation	24.00
34.00	0.00100	1,100.00	2.45	0.04	0.50	2.0412E-07	14.8273	7,348.48	0.0000E+00	T = Theis Equation	25.00