WATER RESOURCES DEPARTMENT MEMO August 5, 2015

TO: **Application G-** 17998

FROM: Phillip Marcy **- Groundwater Section**

SUBJECT: **Scenic Waterway Interference Evaluation**

_____YES
X NO — The source of appropriation is within or above a Scenic Waterway

_____YES
X NO — Use the Scenic Waterway condition (condition 7J)

_____Per ORS 390.835, the Groundwater Section is able to calculate groundwater interference with surface water that contributes to a Scenic Waterway. The calculated interference distribution is provided below.

_____Per ORS 390.835, the Groundwater Section is unable to calculate groundwater 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 flows necessary to maintain the free-flowing character of a scenic waterway.

DISTRIBUTION OF INTERFERENCE

Calculate interference as the monthly fraction of the annual consumptive use and fill in the table below. If interference cannot be calculated, per criteria in 390.839, do not fill in the table but check the "unable" option above, thus informing the Water Rights Section that the Department is unable to make a Preponderance of Evidence finding.

Exercise of this permit is calculated to reduce monthly flows in the _____ Scenic Waterway by the following amounts, expressed as a proportion of the annual consumptive use pumped from the well.

Monthly Fraction of Annual Consumptive Use

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

PUBLIC INTEREST REVIEW FOR GROUNDWATER APPLICATIONS

TO: Water Rights Section Date **08/05/2015**

FROM: Groundwater Section **Phillip I. Marcy / Ivan K. Gall**
Reviewer's Name

SUBJECT: Application G- **17998** 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: **Wilks Ranch Oregon Limited** County: **Malheur**

A1. Applicant(s) seek(s) **2.26** cfs from **1** well(s) in the **Malheur** Basin, **Willow Creek** subbasin

A2. Proposed use **Irrigation (135.50 acres)** Seasonality: **April 1st to October 31st (213 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	Proposed	1	Bedrock	2.26	14S/39E-24 SE-NW	1600'S, 6710'E fr SW cor S 14
2						
3						
4						
5						

* 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	3768*	None	None	None	800	0-300	+1-300	None	None	None	None	None

Use data from application for proposed wells.

A4. **Comments:** *Well head elevation derived from proposed well location.

A5. ☒ **Provisions of the** Malheur (690-510) 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: _____

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

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) _____;
   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 **Fractured Basalt** groundwater reservoir between approximately **700** ft. and **900** 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:** The applicant proposes to produce from a bedrock aquifer that historically has shown high head pressure (see attached well log for MALH 16). There has been minimal groundwater development in the area over the past two decades, so the impacts of additional development in this volcanic aquifer are difficult to quantify. During the period between 1962-1966, measured declines in groundwater levels were observed in the deep volcanic aquifer system near Ironside. This led researchers at the time to conclude that though moderately to highly permeable, there may not be sufficient recharge to support more than the handful of area wells producing from this system (Price, 1967). Therefore, development of further permanent groundwater rights in the volcanic aquifer should be approached with caution.

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	**Fractured Basalt**	☒	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐

Basis for aquifer confinement evaluation: Nearby wells penetrating into this fractured bedrock system show significantly higher head elevations relative to the elevation of their respective water-bearing zones. This suggests some degree of *local* confinement that is not likely to be laterally extensive, based on the limited extent of these lava flows (Price, 1967), in addition to extensive faults mapped within the region (Brooks and others, 1976).

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	**Willow Creek**	?	3622	2280	☒	☐	☐	☐	☒
						☐	☐	☐	☐	☐
						☐	☐	☐	☐	☐
						☐	☐	☐	☐	☐
						☐	☐	☐	☐	☐
						☐	☐	☐	☐	☐

Basis for aquifer hydraulic connection evaluation: Little information is available concerning the local groundwater flow system. The high head pressure within the deep volcanic aquifer system indicates this part of Willow Creek basin to be a regional discharge zone. There is very likely hydraulic connection between the sedimentary deposits and the adjacent and overlying alluvium. The head relationship suggests that indirect and diffuse interference is likely with a downstream reach of Willow Creek, and may be controlled by the placement of sand and gravel lenses within the alluvium.

Water Availability Basin the well(s) are located within: 31011926, WILLOW CR> MALHEUR R- AB LONG CR.

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	☐	☐	**None**	**None**	☐	**2.10**	☒		☒
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐
		☐	☐			☐		☐		☐

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 Water Availability Basin (WAB) in which the proposed well is located has minimal flows for much of the year. For this reason, even fractional impacts from pumping at this location have the potential to substantially interfere with Willow Creek.

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
		%	%	%	%	%	%	%	%	%	%	%	%
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													
		%	%	%	%	%	%	%	%	%	%	%	%
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: This section does not apply.

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, the following conditions should be applied:

7N – Annual Measurement Condition, 7T – Measuring Tube Condition, "Large water use reporting", 7K – "The well may not be completed in such a manner that it allows groundwater to be developed from alluvium overlying the volcanic aquifer."

Special condition:

The applicant shall coordinate with the driller to ensure that drill cuttings are collected at 10-foot intervals and at changes in formation in each well whenever possible. A split of each sampled interval shall be provided to the Department.

References Used: **Local well logs; water-level data at nearby wells; application file G-17996; Geology of the Oregon Part of the Baker 1° by 2° Quadrangle, by Brooks, et al, 1976 (GMS-7); Hydrogeology of the Ontario Area, Malheur County, Oregon, by Gannett, 1990, OWRD Groundwater Report #34. Price, Don. 1967, Ground-Water Reconnaissance in the Burnt River Valley Area, Oregon: Geological Survey Water Supply Paper 1839-1. 27 p.**

D. WELL CONSTRUCTION, OAR 690-200

D1. **Well #:** _____ **Logid:** _____

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

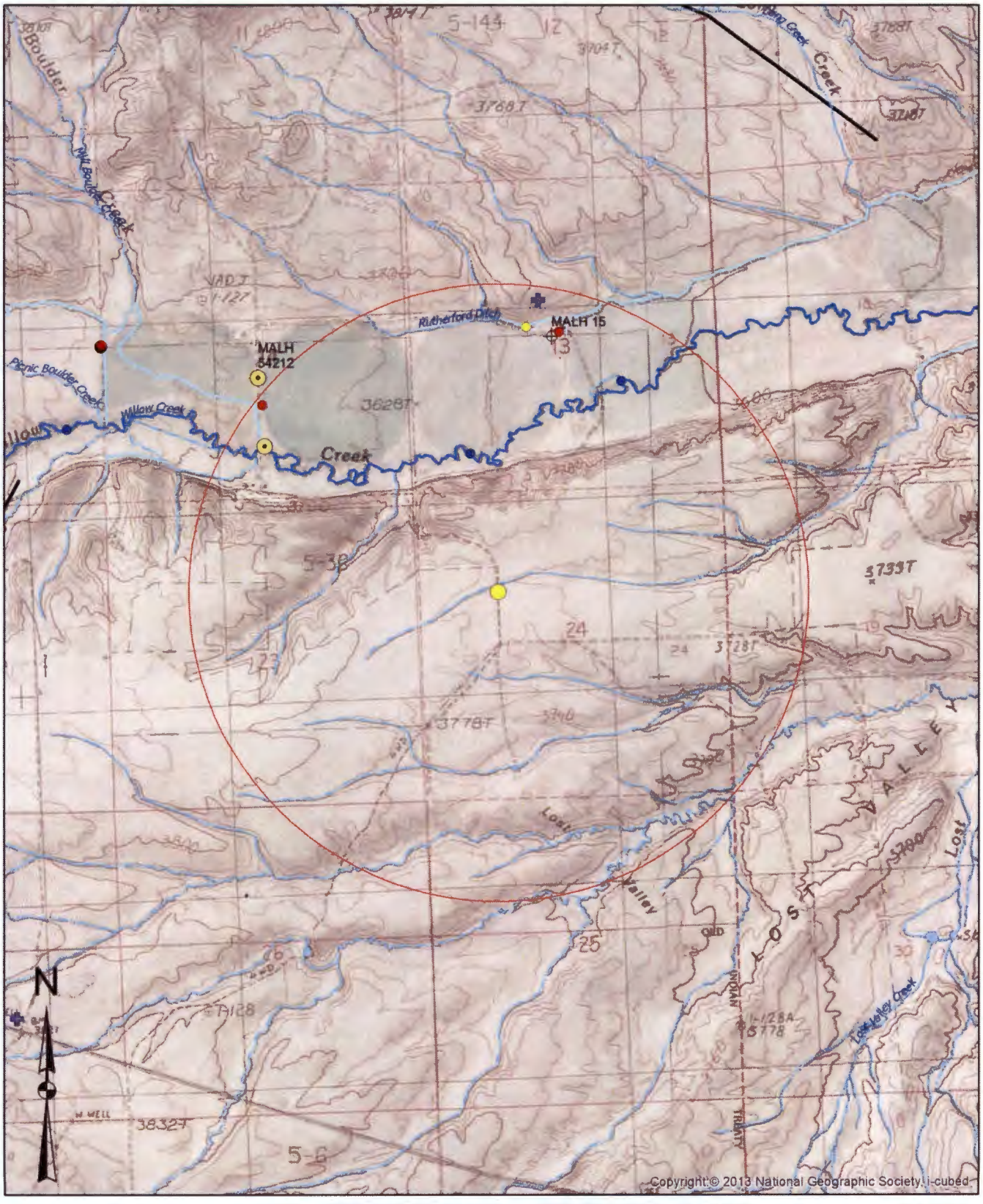
DETAILED REPORT ON THE WATER AVAILABILITY CALCULATION

WILLOW CR > MALHEUR R - AB LONG CR
Watershed ID #: 31011926 Basin: MALHEUR Exceedance Level: 80
Time: 4:19 PM Date: 07/07/2015

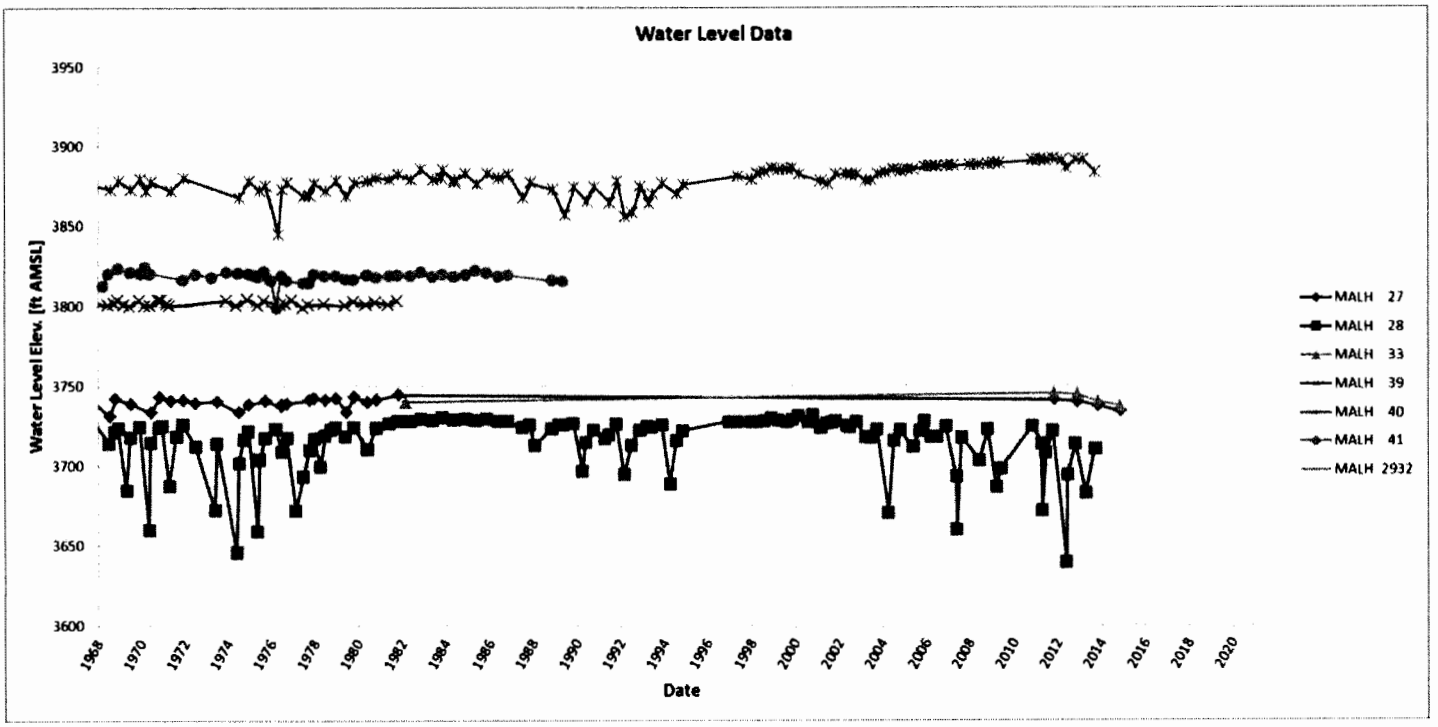
Monthly values are in cfs.
Storage is the annual amount at 50% exceedance in ac-ft.

Month	Natural Stream Flow	Consumptive Use and Storage	Expected Stream Flow	Reserved Stream Flow	Instream Requirements	Net Water Available
JAN	6.35	0.07	6.28	0.00	0.00	6.28
FEB	12.50	0.22	12.30	0.00	0.00	12.30
MAR	17.60	3.89	13.70	0.00	0.00	13.70
APR	32.20	17.90	14.30	0.00	0.00	14.30
MAY	29.20	45.10	-15.90	0.00	0.00	-15.90
JUN	21.50	36.50	-15.00	0.00	0.00	-15.00
JUL	7.90	12.20	-4.29	0.00	0.00	-4.29
AUG	3.25	4.88	-1.63	0.00	0.00	-1.63
SEP	2.10	2.53	-0.43	0.00	0.00	-0.43
OCT	2.75	1.25	1.50	0.00	0.00	1.50
NOV	5.42	0.07	5.35	0.00	0.00	5.35
DEC	5.75	0.07	5.68	0.00	0.00	5.68
ANN	14,200	7,550	7,940	0	0	7,940

Well Location Map



Water-Level Trends in Nearby Wells



Well log for MALH 16, artesian well in the Ironside area producing from deep volcanic aquifer.

Malh 016

STATE ENGINEER
Salem, Oregon

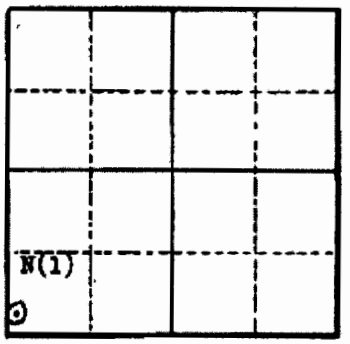
Well Record

STATE WELL NO. 14/39-15N(1)
COUNTY Malheur
APPLICATION NO. U-410
Permit No. 735

OWNER: A. E. Nichols
MAILING ADDRESS: Route 2
CITY AND STATE: Vale, Oregon

LOCATION OF WELL: Owner's No.
SW ¼ SW ¼ Sec. 15 T. 14 N. S., R. 39 E. W., W.M.
Bearing and distance from section or subdivision corner 232' East and 314' North of SW cor. Section 15

Altitude at well



TYPE OF WELL: Drilled Date Constructed 1948-51
Depth drilled 860 Depth cased
Section 15

CASING RECORD:

10 inch

FINISH:

AQUIFERS:

Broken rock from 856 to 860 feet

WATER LEVEL:
Flows approximately 1800 gpm

PUMPING EQUIPMENT: Type None H.P.
Capacity G.P.M.

WELL TESTS:
Drawdown ft. after hours G.P.M.
Drawdown ft. after hours G.P.M.

USE OF WATER Irrigation Temp. °F. 19
SOURCE OF INFORMATION U-410
DRILLER or DIGGER Max Holloway
ADDITIONAL DATA:
Log x Water Level Measurements Chemical Analysis Aquifer Test

REMARKS:

Flow measured on April 11, 1951 3.3 c.f.s.

Malh 016

STATE ENGINEER
Salem, Oregon

State Well No. 14/39-15N(1)
County Malheur
Application No. U-410

Well Log

Owner: A. E. Nichols Owner's No.

Driller: Max Holloway Date Drilled 1948-1951

CHARACTER OF MATERIAL	(Feet below land surface) From	To	Thickness (feet)
Soil	0	8	8
Sand	8	16	8
Gravel	16	38	22
Shale, blue	38	690	652
Sand, water bearing	690	695	5
Shale, blue	695	795	100
Sand, water bearing	795	798	3
Shale, blue	798	856	58
Rock, broken, water bearing	856	860	4
20 gpm artesian flow at 695 feet			
20 gpm artesian flow at 798 feet			
1800 gpm artesian flow at 856 feet			

Well log for MALH 28, State Observation Well #550, drilled into the deep volcanic aquifer in Ironside area.

OBS. WELL 550.

F

RECEIVED

OBSERVATION WELL MALH 28

File Original and First Copy with the STATE ENGINEER, SALEM, OREGON

WATER WELL REPORT
STATE OF OREGON

State Well No. 14/39-21P

State Permit No. 21 PDZ

(1) OWNER: Don & Oakes
Name Ralph [illegible]
Address Ironside Oregon

(2) LOCATION OF WELL:
County MALHEUR Owner's number, if any—
SE ¼ SW ¼ Section 21 T. 14 R. 39 W.M.
Bearing and distance from section or subdivision corner
75' East of County Road
30' from Old windmill well

(3) TYPE OF WORK (check):
New Well ☑ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☑ Test Well ☐ Other ☐

(5) TYPE OF WELL:
Rotary ☐ Driven ☐
Cable ☑ Jetted ☐
Dug ☐ Bored ☐

(6) CASING INSTALLED: Threaded ☐ Welded ☑
12" Diam. from -1 ft. to 161 ft. Gage ¼"
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(7) PERFORATIONS: Perforated? ☑ Yes ☐ No
Type of perforator used TORCH
SIZE of perforations 3/8 in. by 6 in.
1680 perforations from 20 ft. to 140 ft.
perforations from ft. to ft.

(8) SCREENS: Well screen installed ☐ Yes ☑ No
Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.

(9) CONSTRUCTION:
Was well gravel packed? ☐ Yes ☑ No Size of gravel:
Gravel placed from ft. to ft.
Was a surface seal provided? ☐ Yes ☐ No To what depth? ft.
Material used in seal—
Did any strata contain unusable water? ☐ Yes ☑ No
Type of water? Depth of strata
Method of sealing strata off

(10) WATER LEVELS:
Static level 8 ft. below land surface Date 11-6-61
Artesian pressure lbs. per square inch Date

Log Accepted by:
Signed) Dawson & Oakes (Owner) Date 12-4, 1961
by Donald Oakes

(11) WELL TESTS: Drawdown is amount water level is lowered below static level
Was a pump test made? ☑ Yes ☐ No If yes, by whom? DRILLER
Yield: 700 gal./min. with 140 ft. drawdown after 8 hrs.
Bailer test gal./min. with ft. drawdown after hrs.
Artesian flow g.p.m. Date
Temperature of water 58 Was a chemical analysis made? ☐ Yes ☑ No

(12) WELL LOG: Diameter of well 12" + 8" inches.
Depth drilled 734 ft. Depth of completed well 734 ft.

Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

MATERIAL	FROM	TO
TOP SOIL	0	8
CLAY	8	18
GRAVEL WATER	18	40
GREEN CLAY CRUMBLY	40	63
GREEN CLAY	63	140
GRAVEL STRIP	140	145
GREEN CLAY	145	446
BLACK OILY CLAY	446	498
Blue Soap Stone	498	510
SMALL PEA GRAVEL	510	512
GREY CLAY HARD	512	583
BLACK ROCK	583	610
CAVING BLACK ROCK	610	613
GRANITE ROCK	613	621
Reduced to 8" Hole		
BLUE CLAY	621	648
HARD BLACK ROCK	648	680
Red ROCK	680	698
HARD BLACK ROCK	698	714
CREVICE WITH BROWN ROCK	714	730
BROKEN BLACK ROCK	730	734

Work started 9-14 1961 Completed 11-6 1961

(13) PUMP:
Manufacturer's Name No Pump yet.
Type: H.P.

Well Driller's Statement:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
NAME HOLLOWAY DRILLING Co. (Person, firm, or corporation) (Type or print)
Address ONTARIO OREGON
Driller's well number
[Signed] Max Holloway (Well Driller)
License No. 16 Date 12-2 1961

(USE ADDITIONAL SHEETS IF NECESSARY)

Well log for MALH 19, drilled into the deep volcanic aquifer system in Ironside area.

ORIGINAL
File Original, and Duplicate with the STATE ENGINEER, SALEM, OREGON

Malh 019

WATER WELL DRILLERS REPORT
STATE OF OREGON

Malh 019
Do Not Fill In State Well No. C 14739 -160
State Permit No. G-26

(1) OWNER:
Name R. A. DUNCAN
Address IRONSIDE ORE

(2) LOCATION OF WELL:
County Malheur Owner's number, if any #1
R. F. D. or Street No. Ironside Ore
Bearing and distance from section or subdivision corner
Oats with No 2

(3) TYPE OF WORK (check):
New well ☑ Deepening ☐ Reconditioning ☐ Abandon ☐
If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):
Domestic ☐ Industrial ☐ Municipal ☐
Irrigation ☑ Test Well ☐ Other ☐

(5) EQUIPMENT:
Rotary ☐
Cable ☑
Dug Well ☐

CASING INSTALLED:
Threaded ☐ Welded ☑
FROM 0 ft. to 75 ft. 10" Diam. 3/16" Gage or Wall

If gravel packed
Diameter of Bore | from ft. | to ft.

Type and size of shoe or well ring
Size of gravel:
Describe joint

(7) PERFORATIONS:
Type of perforator used
SIZE of perforations in., length, by in.
FROM ft. to ft. perf per foot No. of rows
Above

SCREENS:
Give Manufacturer's Name, Model No. and Size

(8) CONSTRUCTION:
Was a surface sanitary seal provided? ☐ Yes ☑ No To what depth ft.
Were any strata sealed against pollution? ☐ Yes ☑ No
If yes, note depth of strata
FROM ft. to ft.
METHOD OF SEALING

(9) WATER LEVELS:
Depth at which water was first found 19' ft.
Standing level before perforating None ft.
Standing level after perforating Flowing ft.
Log Accepted by:
[Signed] ..... Dated ....., 19.....
Owner

(10) WELL TESTS:
Was a pump test made? ☑ Yes ☐ No If yes, by whom? Hollaway Dr. Co.
Yield: 500 gal./min. with 150 ft. draw down after 4 hrs.
Artesian flow 20 g.p.m.
Shut-in pressure ..... lbs. per square inch.
Bailer test ..... g.p.m. with ..... ft. drawdown
Temperature of water 68 Was a chemical analysis made? ☐ Yes ☑ No
Was electric log made of well? ☐ Yes ☑ No

(11) WELL LOG:
Diameter of well 10" inches.
Total depth 940' ft. Depth of completed well 915' ft.
Formation: Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.

0 ft. to 4 ft.	Top Soil		4'
4' - 19'	"	Hard Clay	15'
19' - 30'	"	Clay Gravel Mixed	11'
30' - 160'	"	Blue Shale	130'
160' - 165'	"	Soapstone	5'
165' - 405'	"	Blue Shale	240'
405' - 408'	"	Sandstrip	3'
408' - 445'	"	Blue Shale	37'
445' - 450'	"	Soap Stone	5'
450' - 454'	"	Brown Sandstone	4'
454' - 605'	"	Hard Black Rock	151'
605' - 630'	"	Blue Shale	25'
630' - 660'	"	Blue Coarse Rock	30'
660 - 665'	"	Soft Coal	5'
665' - 675'	"	Blue Coarse Rock	10'
675' - 680'	"	Red Rock	5'
680' - 700'	"	Black Basalt Rock	20'
700' - 705'	"	Red Rock	5'
705' - 815'	"	Black Basalt Rock	110'
815' - 840'	"	Coarse Grained Rock	25'
840' - 900'	"	Black Basalt Rock	60'
900' - 912'	"	Crack in Rock	12'
912' - 940'	"	Caving Soapstone	

Ground elevation at well site ..... feet above mean sea level.
Work started May 14 19 55 Completed July 8 19 55

Well Driller's Statement:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME Hollaway Drilling Co
(Person, firm, or corporation) (Type or print)
Address 80 Hillcrest Dr.
Driller's well number #1
[Signed] May Hollaway
(Well Driller)
License No. 16 Dated Aug 10, 1955