

PUBLIC INTEREST REVIEW FOR GROUNDWATER APPLICATIONS

TO: Water Rights Section Date 05/04/2016
 FROM: Groundwater Section Phillip I. Marcy
 SUBJECT: Application G- 18211 Reviewer's Name
 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: Tom and Fawn Kerns County: Baker

A1. Applicant(s) seek(s) 4.99 cfs from 2 well(s) in the Powder River Basin,
 _____ subbasin

A2. Proposed use Irrigation (19.0 acres); Supplementary Irrigation (561.2 acres)
 Seasonality: March 1st - October 31st (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 | Proposed | Pond #2 | Alluvium | 7.25 | 8S/39E-19 NE-NW | 1394'S, 1064'W fr N1/4 cor S 19 |
| 2 | Proposed | Pond #3 | Alluvium | 7.25 | 8S/39E-18 SE-SW | 1320'N, 2590'E fr SW cor S 18 |
| 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 | 3665 | NA | NA | NA | 100 | 0-40 | 0-100 | ? | ? | NA | NA | NA |
| 2 | 3577 | NA | NA | NA | 100 | 0-40 | 0-100 | ? | ? | NA | NA | NA |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

Use data from application for proposed wells.

A4. **Comments:** Applicant proposes to produce from alluvial sands and gravels in the upper unconfined aquifer. The applicant wants the ability to pump at maximum rate from either proposed POA well, or a combination of both.

A5. **Provisions of the** Powder (690-509-0160) 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) 7N; "Large Water Use Reporting";
 - 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:** Wells are unlikely to yield the proposed rate, even if pumping is distributed between the two proposed POAs. Wells in the area producing from alluvium rarely yield greater than 100 GPM, with the highest reported yield at 600 GPM from a well drilled to a depth of 485 feet (BAKE 51383). From the available data, local groundwater levels in the alluvial aquifer appear fairly stable over the past two decades (see attached hydrographs). BAKE 1864 is located less than one mile northeast of proposed POA 2, and shows a ten foot decline between 2013-2015, but is not at historical lows reached in 2008.

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 | Alluvial sands and gravels | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 2 | Alluvial sands and gravels | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | | <input type="checkbox"/> | <input type="checkbox"/> |
| | | <input type="checkbox"/> | <input type="checkbox"/> |
| | | <input type="checkbox"/> | <input type="checkbox"/> |

Basis for aquifer confinement evaluation: Water-bearing zones within alluvial sand and gravel deposits of the Baker Valley are interfingering with lower permeability, fine-grained materials. Based upon the available data, these low permeability zones do not extend for any considerable distance, leading to communication between various sand and gravel deposits encountered within each well. Common head elevations across water-bearing deposits within each well, in addition to common head elevations between wells, as reported on area well logs is evidence for an extensive, interconnected alluvial aquifer system.

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? | | | Potential for Subst. Interfer. Assumed? | |
|------|------|--------------------|----------------|----------------|---------------|-------------------------------------|--------------------------|--------------------------|---|-------------------------------------|
| | | | | | | YES | NO | ASSUMED | YES | NO |
| 1 | 1 | Pine Creek | ? | 3600-3900 | 6900 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 2 | 2 | Willow Creek | ? | 3475-3850 | 8100 | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |

Basis for aquifer hydraulic connection evaluation: Local streams, such as Hunt Creek receive their baseflow from discharge of groundwater through the unconfined alluvial aquifer here. This groundwater originates as surface runoff from the hills and mountains to the west of the proposed POA locations, due to the predominance of low permeability bedrock. As the streams reach the valley floor, they often disappear or become intermittent as water travels through the shallow high permeability aquifer, reappearing when the stream channel intercepts the water table. In this type of system, withdrawal of groundwater has a direct impact on streamflow, most notably during the drier parts of the year, when the lowest flows are expected. According to the local Watermaster (attached memo from Rick Lusk, 02/29/2016), neither Williams Creek nor Hunt Creek are regulated.

Water Availability Basin the well(s) are located within: Willow Creek > Powder River – At Mouth (30920328)

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? |
|------|------|--------------------------|--------------------------|-------------------------|------------------------------|--------------------------|------------------------|------------------------------|----------------------------|---|
| | | <input type="checkbox"/> | <input type="checkbox"/> | | | <input type="checkbox"/> | | <input type="checkbox"/> | | <input type="checkbox"/> |
| | | <input type="checkbox"/> | <input type="checkbox"/> | | | <input type="checkbox"/> | | <input type="checkbox"/> | | <input type="checkbox"/> |
| | | <input type="checkbox"/> | <input type="checkbox"/> | | | <input type="checkbox"/> | | <input type="checkbox"/> | | <input type="checkbox"/> |

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? |
|--|------|--|--------------------------|-------------------------|------------------------------|--------------------------|------------------------|------------------------------|----------------------------|---|
| | | | <input type="checkbox"/> | | | <input type="checkbox"/> | | <input type="checkbox"/> | | <input type="checkbox"/> |
| | | | <input type="checkbox"/> | | | <input type="checkbox"/> | | <input type="checkbox"/> | | <input type="checkbox"/> |
| | | | <input type="checkbox"/> | | | <input type="checkbox"/> | | <input type="checkbox"/> | | <input type="checkbox"/> |
| | | | <input type="checkbox"/> | | | <input type="checkbox"/> | | <input type="checkbox"/> | | <input type="checkbox"/> |

Comments: Due to the intermittent nature of nearby Williams Creek and Hunt Creek, they are not considered for this review. The minimal streamflow in this Water Availability Basin (WAB) permits a very small amount of interference (0.0078 CFS) without triggering PSI.

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 – Pine Creek | | | | | | | | | | | | | |
|--------------------------------------|----------|------|------|------|------|------|------|------|------|------|------|------|------|
| 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 % |
| Well Q as CFS | | | | 4.99 | 4.99 | 4.99 | 4.99 | 4.99 | 4.99 | 4.99 | 4.99 | 4.99 | 4.99 |
| Interference CFS | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| (A) = Total Interf. | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| (B) = 80 % Nat. Q | | 2.13 | 2.70 | 2.85 | 4.82 | 8.60 | 7.46 | 2.30 | 1.12 | 0.78 | 0.78 | 1.60 | 2.02 |
| (C) = 1 % Nat. Q | | .021 | .027 | .029 | .048 | .086 | .075 | .023 | .011 | .008 | .008 | .016 | .020 |
| (D) = (A) > (C) | | | | | | | | | | | | | |
| (E) = (A / B) x 100 | | 0 % | 0 % | 0 % | 0 % | 0 % | 0 % | 0 % | 0 % | 0 % | 0 % | 0 % | 0 % |
| Non-Distributed Wells – Willow Creek | | | | | | | | | | | | | |
| 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 % |
| Well Q as CFS | | | | 4.99 | 4.99 | 4.99 | 4.99 | 4.99 | 4.99 | 4.99 | 4.99 | 4.99 | 4.99 |
| Interference CFS | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| (A) = Total Interf. | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| (B) = 80 % Nat. Q | | 2.13 | 2.70 | 2.85 | 4.82 | 8.60 | 7.46 | 2.30 | 1.12 | 0.78 | 0.78 | 1.60 | 2.02 |
| (C) = 1 % Nat. Q | | .021 | .027 | .029 | .048 | .086 | .075 | .023 | .011 | .008 | .008 | .016 | .020 |
| (D) = (A) > (C) | | | | | | | | | | | | | |
| (E) = (A / B) x 100 | | 0 % | 0 % | 0 % | 0 % | 0 % | 0 % | 0 % | 0 % | 0 % | 0 % | 0 % | 0 % |

(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 model of Hunt(2003) was utilized to model the impacts to surface water resulting from pumping at the proposed POA locations, using aquifer properties derived from local pump tests and well logs. Effects are expected to be minimal at both Willow Creek and Pine Creek due to distance from the POA locations, low hydraulic conductivity values, and relatively high storativity (estimated at 0.01) values in the unconfined alluvial aquifer.

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:** The North Powder Valley is underlain by a complex assemblage of materials derived from alluvial fans and glacial erosion, composed of sands, gravels, and cobbles, intermixed with finer grained silts and clays (Brooks, et al., 1976). Map units Qal and Qtg of Brooks, et al. (1976) do not contain any known laterally extensive barriers to vertical groundwater movement, and wells constructed within these units will be considered hydraulically connected to surface waters.

If a permit is issued, the following conditions shall apply:

Condition 7N – Annual measurement condition; "Large Water Use Reporting"

References Used: Brooks, H.C., McIntyre, J.R., and Walker, G.W. Geologic Map of the Oregon Part of the Baker 1 degree by 2 degree Quadrangle/GMS 7. Scale 1:250,000. State of Oregon Department of Geology and Mineral Industries, 1976.

Trauger, F.D. (1951). Ground-Water Resources of Baker Valley, Baker County, Oregon. Portland, Oregon: United States Geological Survey

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

Memo from District 8 Watermaster Rick Lusk, February 29, 2016. RE: Hunt and Williams Creek Flows.

Nearby well logs, Application file G-18181.

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

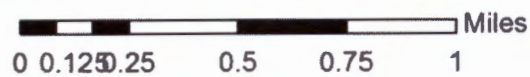
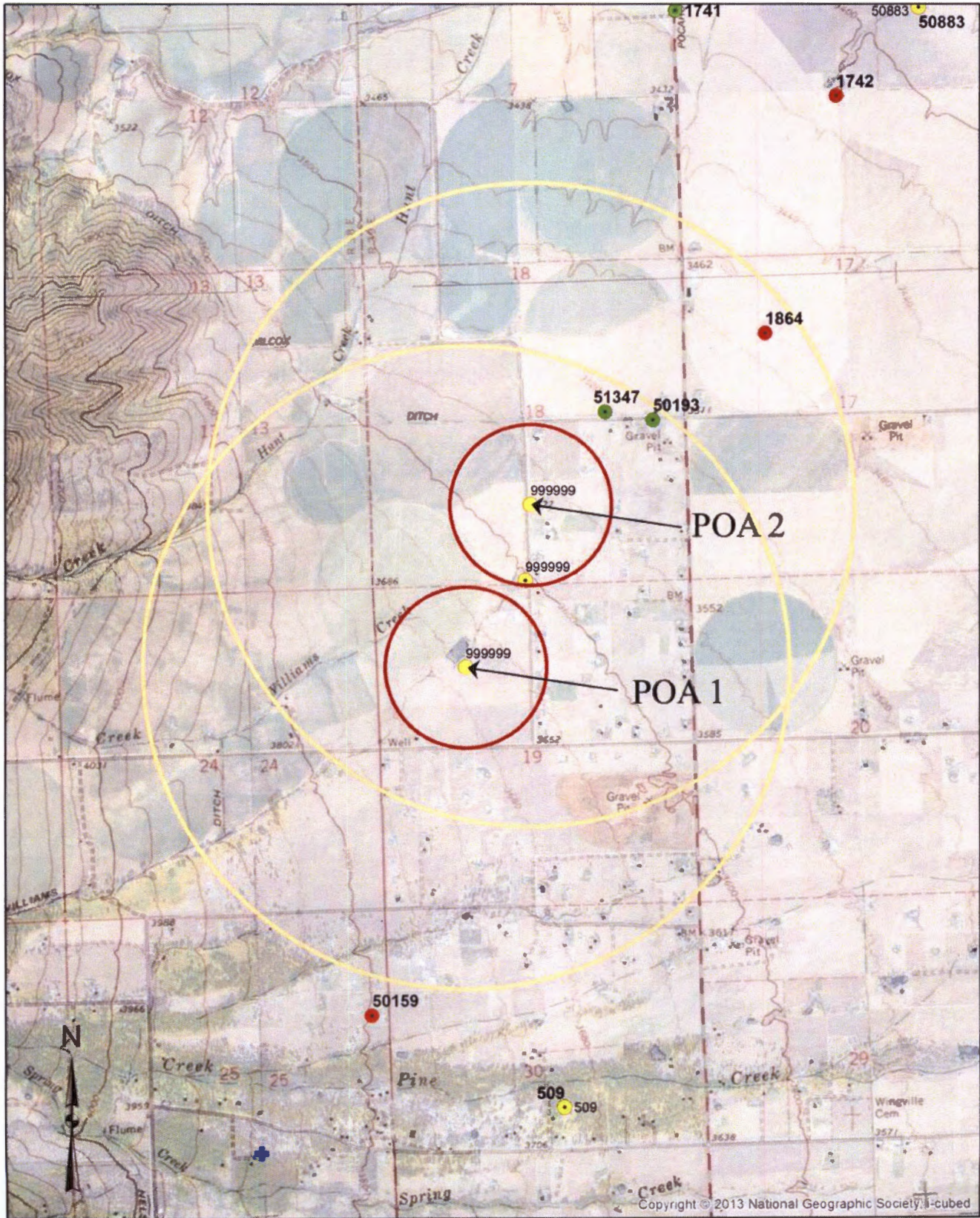
Watershed ID #: 30920328
Time: 10:38 AM

WILLOW CR > POWDER R - AT MOUTH
Basin: POWDER

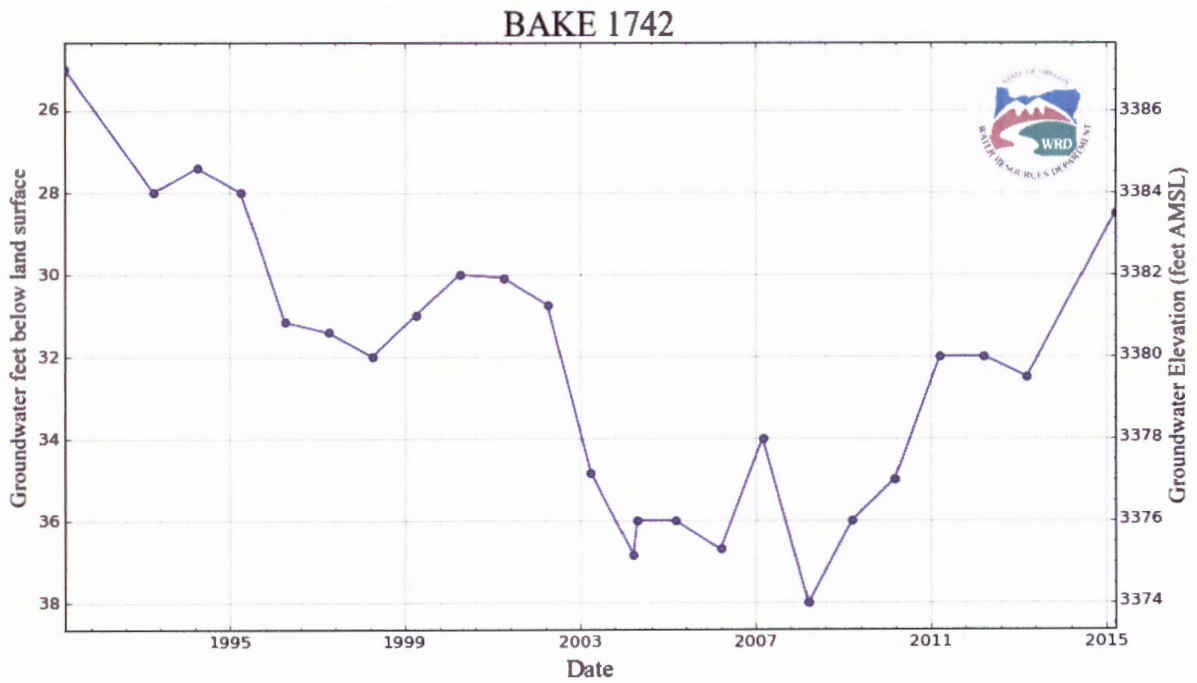
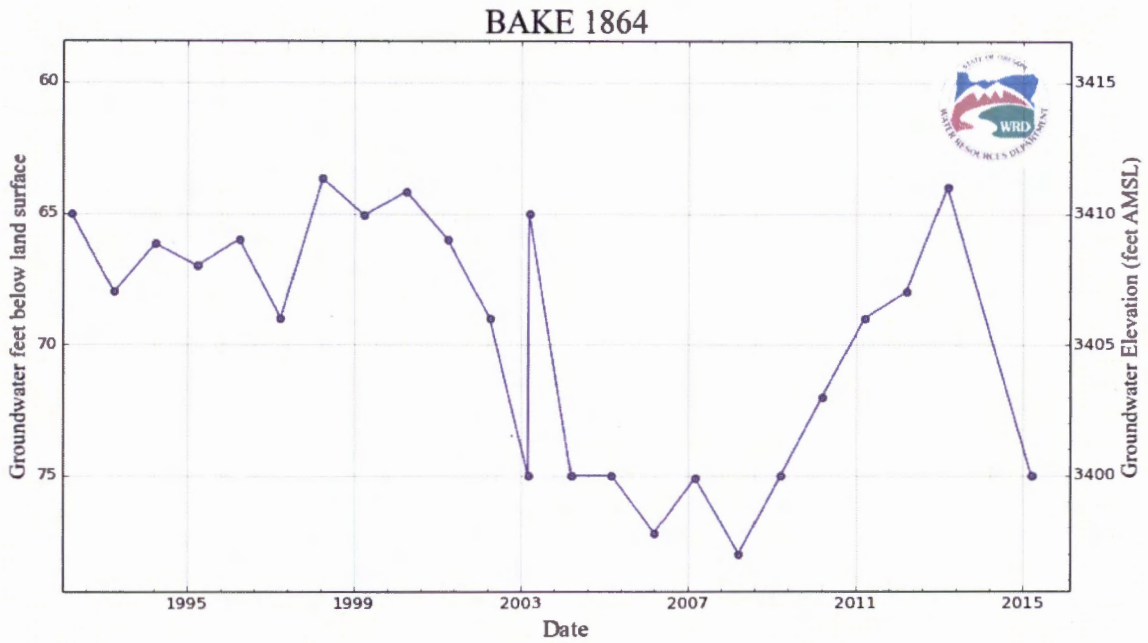
Exceedance Level: 80
Date: 01/14/2016

| Month | Natural Stream Flow | Consumptive Use and Storage | Expected Stream Flow | Reserved Stream Flow | Instream Requirements | Net water Available |
|--|---------------------|-----------------------------|----------------------|----------------------|-----------------------|---------------------|
| Monthly values are in cfs. Storage is the annual amount at 50% exceedance in ac-ft. | | | | | | |
| JAN | 2.13 | 0.08 | 2.05 | 0.00 | 0.00 | 2.05 |
| FEB | 2.70 | 0.08 | 2.62 | 0.00 | 0.00 | 2.62 |
| MAR | 2.85 | 0.08 | 2.77 | 0.00 | 0.00 | 2.77 |
| APR | 4.82 | 5.25 | -0.43 | 0.00 | 0.00 | -0.43 |
| MAY | 8.60 | 32.30 | -23.70 | 0.00 | 0.00 | -23.70 |
| JUN | 7.46 | 38.50 | -31.00 | 0.00 | 0.00 | -31.00 |
| JUL | 2.30 | 17.40 | -15.10 | 0.00 | 0.00 | -15.10 |
| AUG | 1.12 | 5.03 | -3.91 | 0.00 | 0.00 | -3.91 |
| SEP | 0.78 | 2.64 | -1.86 | 0.00 | 0.00 | -1.86 |
| OCT | 0.78 | 0.08 | 0.70 | 0.00 | 0.00 | 0.70 |
| NOV | 1.60 | 0.08 | 1.52 | 0.00 | 0.00 | 1.52 |
| DEC | 2.02 | 0.08 | 1.94 | 0.00 | 0.00 | 1.94 |
| ANN | 3,830 | 6,150 | 1,360 | 0 | 0 | 1,360 |

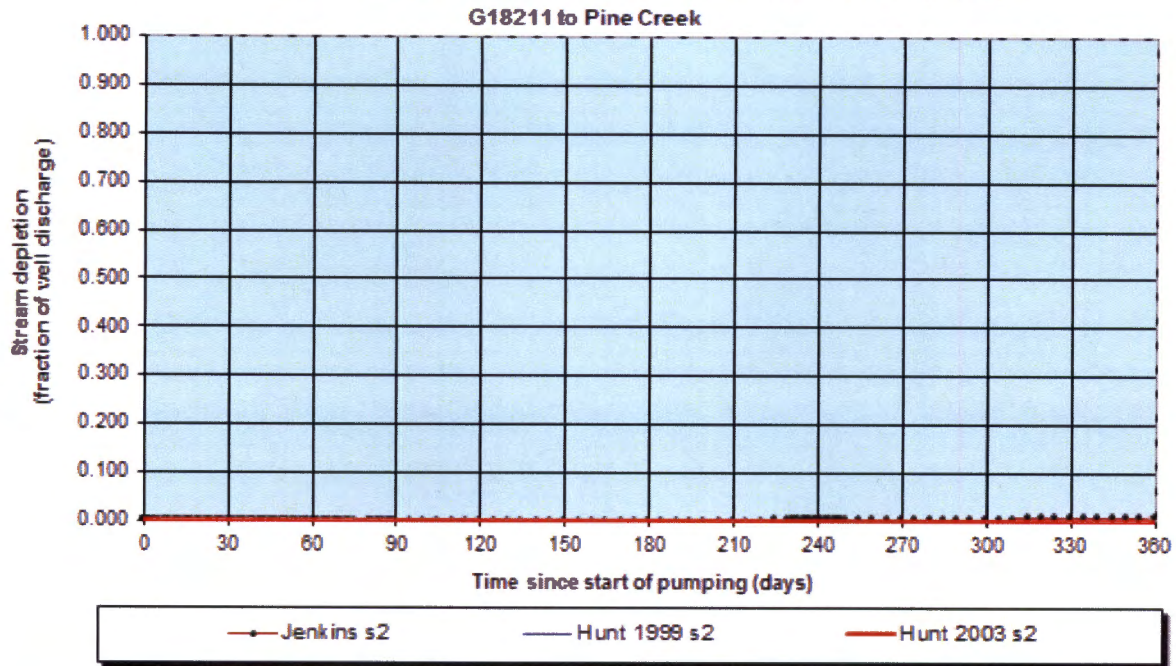
Well Location Map



Water-Level Trends in Nearby Wells

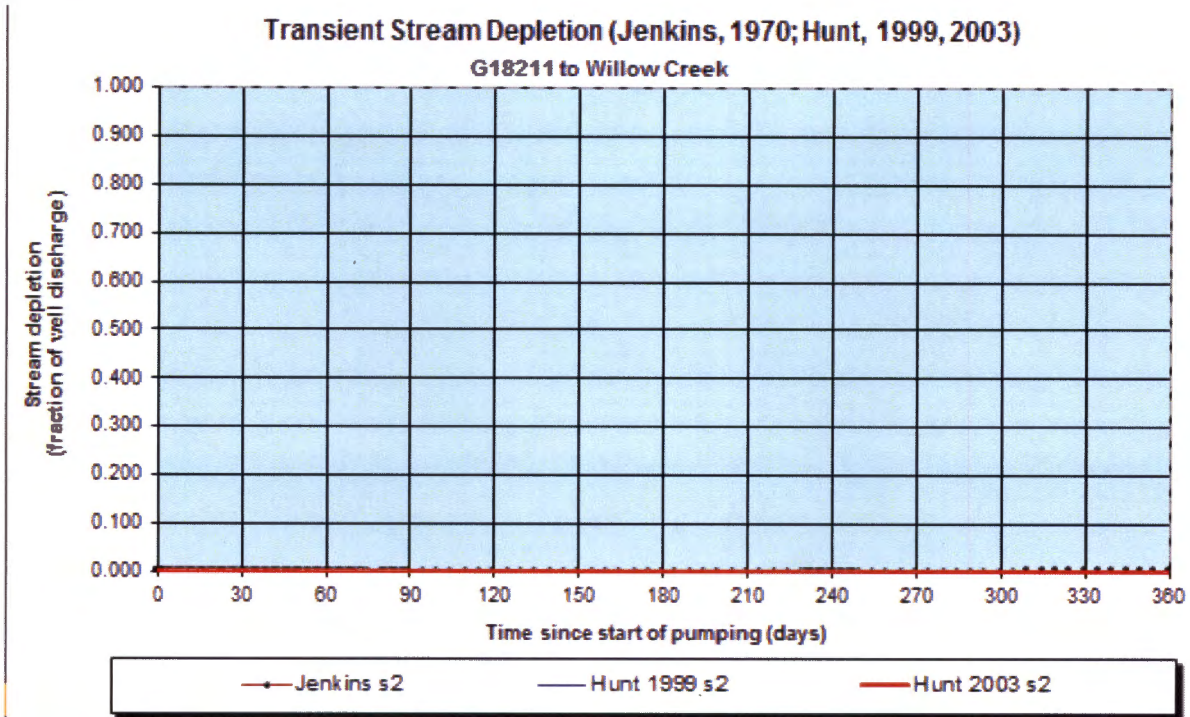


Transient Stream Depletion (Jenkins, 1970; Hunt, 1999, 2003)



| 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 | | |
| JSD | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 0.2% | 0.3% | 0.5% | 0.7% | 1.0% | | |
| HSD 1999 | 0.0% | 0.0% | ##### | ##### | ##### | ##### | ##### | ##### | ##### | ##### | ##### | ##### | | |
| HSD 2003 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | -0.01% | -0.01% | -0.01% | | |
| Qw, cfs | 4.990 | 4.990 | 4.990 | 4.990 | 4.990 | 4.990 | 4.990 | 4.990 | 4.990 | 4.990 | 4.990 | 4.990 | | |
| HSD 99, cfs | 0.000 | 0.000 | ##### | ##### | ##### | ##### | ##### | ##### | ##### | ##### | ##### | ##### | | |
| HSD 03, cfs | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | -0.001 | | |

| Parameters: | | Scenario 1 | Scenario 2 | Scenario 3 | Units |
|--|----------|---------------|---------------|---------------|----------------------|
| Net steady pumping rate of well | Qw | 4.99 | 4.99 | 4.99 | cfs |
| Time pump on (pumping duration) | tpon | 245 | 245 | 245 | days |
| Perpendicular from well to stream | a | 6900 | 6900 | 6900 | ft |
| Well depth | d | 100 | 100 | 100 | ft |
| Aquifer hydraulic conductivity | K | 1 | 2 | 4 | ft/day |
| Aquifer saturated thickness | b | 50 | 50 | 50 | ft |
| Aquifer transmissivity | T | 50 | 100 | 200 | ft ² /day |
| Aquifer storativity or specific yield | S | 0.01 | 0.01 | 0.01 | |
| Aquitard vertical hydraulic conductivity | Kva | 1 | 1 | 1 | ft/day |
| Aquitard saturated thickness | ba | 1 | 1 | 1 | ft |
| Aquitard thickness below stream | babs | 1 | 1 | 1 | ft |
| Aquitard porosity | n | 0.2 | 0.2 | 0.2 | |
| Stream width | ws | 5 | 5 | 5 | ft |
| Streambed conductance (lambda) | sbc | 5.000000 | 5.000000 | 5.000000 | ft/day |
| Stream depletion factor | sdf | 9522.000000 | 4761.000000 | 2380.500000 | days |
| Streambed factor | sbf | 690.000000 | 345.000000 | 172.500000 | |
| input #1 for Hunt's Q_4 function | t' | 0.000105 | 0.000210 | 0.000420 | |
| input #2 for Hunt's Q_4 function | K' | 952200.000000 | 476100.000000 | 238050.000000 | |
| input #3 for Hunt's Q_4 function | epsilon' | 0.050000 | 0.050000 | 0.050000 | |
| input #4 for Hunt's Q_4 function | lamda' | 690.000000 | 345.000000 | 172.500000 | |



| Output for Stream Depletion, Scenario 2 (s2): | | | | | | | | | | | | |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Time pump on (pumping duration) = 245 days | | | | | | | | | | | | |
| Days | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 | 330 | 360 |
| JSD | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.1% | 0.2% | 0.3% |
| HSD 1999 | 0.0% | 0.0% | ##### | ##### | ##### | ##### | ##### | ##### | ##### | ##### | ##### | ##### |
| HSD 2003 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Qw, cfs | 4.990 | 4.990 | 4.990 | 4.990 | 4.990 | 4.990 | 4.990 | 4.990 | 4.990 | 4.990 | 4.990 | 4.990 |
| HSD 99, cfs | 0.000 | 0.000 | ##### | ##### | ##### | ##### | ##### | ##### | ##### | ##### | ##### | ##### |
| HSD 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 | 4.99 | 4.99 | 4.99 | cfs |
| Time pump on (pumping duration) | tpon | 245 | 245 | 245 | days |
| Perpendicular from well to stream | a | 8100 | 8100 | 8100 | ft |
| Well depth | d | 100 | 100 | 100 | ft |
| Aquifer hydraulic conductivity | K | 1 | 2 | 4 | ft/day |
| Aquifer saturated thickness | b | 50 | 50 | 50 | ft |
| Aquifer transmissivity | T | 50 | 100 | 200 | ft ² /day |
| Aquifer storativity or specific yield | S | 0.01 | 0.01 | 0.01 | |
| Aquitard vertical hydraulic conductivity | Kva | 1 | 1 | 1 | ft/day |
| Aquitard saturated thickness | ba | 1 | 1 | 1 | ft |
| Aquitard thickness below stream | babs | 1 | 1 | 1 | ft |
| Aquitard porosity | n | 0.2 | 0.2 | 0.2 | |
| Stream width | ws | 5 | 5 | 5 | ft |
| Streambed conductance (lambda) | sbc | 5.000000 | 5.000000 | 5.000000 | ft/day |
| Stream depletion factor | sdf | 13122.000000 | 6561.000000 | 3280.500000 | days |
| Streambed factor | sbf | 810.000000 | 405.000000 | 202.500000 | |
| input #1 for Hunt's Q_4 function | t' | 0.000076 | 0.000152 | 0.000305 | |
| input #2 for Hunt's Q_4 function | K' | ##### | 656100.000000 | 328050.000000 | |
| input #3 for Hunt's Q_4 function | epsilon' | 0.050000 | 0.050000 | 0.050000 | |
| input #4 for Hunt's Q_4 function | lamda' | 810.000000 | 405.000000 | 202.500000 | |

INTEROFFICE MEMO
WATERMASTER DISTRICT # 8
Water Resources Department
Phone: (541) 523-8224
E-mail: Rick.M.LUSK@wrд.state.or.us

TO: Application File for New Groundwater Permit for Tom and Fawn Kerns appurtenant to lands in T 8 S, R 38 E, sections 13 and 24 and T 8 S, R 39 E, sections 18 and 19

DATE: February 29, 2016

FROM: Rick Lusk *RML*

SUBJECT: Hunt and Williams Creek Flows

On February 22, 2016 I performed a field inspection of the above lands to determine the seasonality of Hunt and Williams Creek. No flow was seen in Williams Creek along Lone Pine Road or in Hunt Creek. Evidence from the inspection indicates Hunt and Williams Creek are intermittent flowing streams. Watermaster District 8 does not regulate on Hunt or Williams Creek. I believe a new groundwater permit could be issued for a use of groundwater less than 5.0 cfs. The new right would not injure creek flows in this area.

RECEIVED BY OWRD

MAR 14 2016

SALEM OR