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9 Re: **PRELIMINARY DRAFT COMMENTS** on Amendment to Chapter 173-501 WAC Instream
10 Resources Protection Program - Nooksack Water Resource Inventory Area (WRIA) 1 Preliminary Draft for
11 Public Comment
12

13 Date: May 8 2019
14

15 Via: online comment form submitted to: <http://ws.ecology.commentinput.com/?id=GFRjc>
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17 **0.0. Summary:**

18 Ecology’s uncritical application of the USGS streamflow-well interaction program STRMDEPL08
19 (Reeves 2008) is fatally flawed. If Ecology intends to rely on said model, it should run the model for
20 realistic domestic permit-exempt well pumping rates and regimes to arrive at a reasonable assessment of
21 permit-exempt well impacts on nearby streams. Doing so will likely demonstrate that actual permit-exempt
22 well impacts on streams is roughly two orders of magnitude less than the figures cited in Reeves. Ecology
23 should then reevaluate its quantity reductions, which are not justified by reliance on the results reported in
24 Reeves.
25

26 **1.0. Introduction and background:**

27 The Preliminary Draft Rule appears to be based in part on its accompanying Background
28 Document, which presents what it terms “Hydrogeologic Information and Assumptions” beginning on page
29 14.

30 Said Hydrogeologic Information and Assumptions in turn relies in part on references to work done
31 by USGS, namely a computer program described in a report by Reeves 2008: STRMDEPL08—An
32 Extended Version of STRMDEPL with Additional Analytical Solutions to Calculate Streamflow Depletion
33 by Nearby Pumping Wells By Howard W. Reeves Open-File Report 2008–1166.
34

35 A cursory examination of Reeves reveals the input data to the computer program included:

36 Well pumping rate: **250 gallons per minute**, or roughly **0.557 cfs**.

37 Well distance from stream: 500 feet.

38 TRANSMISSIVITY: 0.116D-01 square feet per second

39 STORATIVITY: 0.100D+00

40 STREAMBED CONDUCTANCE: 0.231D-03 feet per second

41 Well pumping regime: **91 days** constant pumping at the above rate for the continuous
42 pumping case.
43

44 **2.0. Uncritical application of the Reeves pumping rate is incorrect and misleading:**

45 Obviously, the Reeves input parameters are more representative of (and were likely designed to
46 model) a commercial irrigation pumping regime.

47 By contrast, a single domestic permit-exempt well pumping at its (former) statutory capacity of
48 5,000 gallons per day is pumping at **0.0077 cfs**, or **3.47 gallons per minute**, which is approximately **1.4**
49 **percent** of the rate used in Reeves.

50 Given the nature of the equations used in Reeves, based on Darcy’s Law, we should expect
 51 proportional outcomes. Thus, since the peak streamflow depletion rate in Reeves, which is **0.2437 cfs** after
 52 30 days of continuous pumping at the rate of **0.557 cfs**, then for a permit-exempt well pumping at its
 53 statutory limit, the rate should be something like **0.0034 cfs**.
 54

55 **3.0. Uncritical application of the Reeves pumping regime is incorrect and misleading:**

56 Few, if any, domestic permit-exempt wells pump continuously for 24 hours per day for 90 days. To
 57 obtain a more accurate result, run the STRMDEPL08 program with a pumping regime of something more
 58 like 8 hours per day every day. Using even that regime will err on the (far) side of caution. The results from
 59 using the 8-hours/day pumping regime for a domestic permit-exempt well pumping at its (former) statutory
 60 rate of 5,000 gallons per day are likely to be something like **0.0012 cfs**.

61 Note, however, that since the legislature saw fit to reduce the statutory limit to 3,000 gallons per
 62 day, the impact of that change in the daily quantity would further reduce the simulated pumping rate to 3/5
 63 of 0.0012 cfs, which is **0.00072 cfs**.

64 Note, further, that the preliminary draft rule chose to accept the RH2 estimate of domestic permit-
 65 exempt consumptive use rates, which is substantially less than 3,000 gallons per day. Thus, the rough
 66 streamflow depletion estimate of **0.00072 cfs** per well set forth herein shall hereinafter be referred to as the
 67 worst case streamflow depletion rate.
 68

69 **4.0. The assumption that the quantity of consumptive use equals the quantity of streamflow depletion**
 70 **is problematic.**

71 Based on the results in Reeves, and assuming that consumptive use is equal to roughly half the
 72 gross water quantity pumped, then the assumption that the rate of consumptive use equals the rate of
 73 streamflow depletion seems reasonable, since the rate of streamflow depletion is roughly half of the gross
 74 pumping in Reeves. The problem with that conclusion, however, is that, per **Section 3.0** above herein,
 75 Reeves’ results are based on three months’ worth of continuous pumping, which far overstates the likely
 76 high end of domestic permit-exempt well pumping.
 77

78 **5.0. Multiple wells in each sub-basin:**

79 Table 3 of the RH2 memo, reproduced below, indicates how many new permit-exempt wells are
 80 estimated to be in place by 2038, by sub-basin:

Table 3
Options for Total Projected New Housing Units (outside UGAs) by Aggregated Sub-Basin,
2018 through 2038, Served by DGWPE Wells

Aggregated Sub-Basin	Option 1 All Growth outside UGAs	Option 2 Considering Public Water System Service Areas	Option 3 Historic Ratio*	Option 4 Highest of Options 2 and 3	Option 5 Option 3 Plus 15 Percent
1 - Coastal North	1,017	594	563	594	647
2 - Coastal South	351	241	177	241	204
3 - Coastal West	328	290	276	290	317
4 - Lake Whatcom	205	13	145	145	167
5 - Lower Nooksack	915	495	561	561	645
6 - Middle Fork Nooksack	9	9	9	9	9
7 - North Fork Nooksack	212	126	78	126	90
8 - South Fork Nooksack	27	20	22	22	25
9 - Sumas	196	162	129	162	148
Total	3,260	1,950	1,960	2,150	2,252

* Historic ratio of non-UGA growth served by DGWPE wells vs. water systems.

81

82 Given the estimated streamflow impact given in **Section 3.0** above herein, for the entire 2,150 new
83 permit-exempt wells by 2038, the total worst case streamflow impact in that year would be **1.538 cfs**.

84 For the Lower Nooksack Sub-basin, estimated to have the second-highest number of new permit-
85 exempt wells by 2038, the maximum upper limit of streamflow impact will be the product of 561 wells by
86 the maximum per-well streamflow depletion rate of **0.00072 cfs** noted in **Section 3.0** above herein, for a
87 total of **0.404 cfs**.

88 To distribute this maximum streamflow impact quantity throughout the 15 drainages of the Lower
89 Nooksack, assume only half of them have new domestic permit-exempt wells by 2038; then the total
90 streamflow impact of **0.404 cfs** would be divided by **7.5** to arrive at the worst case streamflow depletion
91 rate per drainage of **0.054 cfs**.

92 Note the median streamflow outfall in the drainages of the Lower Nooksack is **8.3 cfs**. Thus by
93 2038 the maximum possible streamflow depletion will amount to **0.65 percent** of median streamflow, in
94 the worst case.

96 **6.0. Parametric values should be confirmed:**

97 The Reeves transmissivity, storativity, and streambed conductance parameters should be checked
98 to see how well they conform to values for those parameters being used by Associated Earth Sciences,
99 which has contracted to create a numerical ground water model of a significant portion of WRIA 1. The
100 parameters used in Reeves appear to have come from some place in Michigan, where the parameters
101 might be significantly different.

103 **7.0 Sensitivity analyses should be performed:**

104 In WRIA 1, the wide range of well distances from streams, parametric values, pumping regimes and
105 rates create a wide range of potential streamflow depletion estimates. Such a situation cries out for a
106 detailed sensitivity analysis of the full set of permutations of the inputs.

108 **8.0. Conclusion:**

109 Ecology's reliance on an uncritical application of a study that appears to assess the streamflow
110 depletion rate of a single commercial irrigation well to base its proposed regulation of domestic permit-
111 exempt wells is incorrect and misleading. If Ecology intends to rely on such work as Reeves, it should
112 perform, to the level of commonly accepted professional standards, a thorough analysis of streamflow
113 depletion of domestic permit-exempt wells. Certainly far more attention should be paid to the technical
114 underpinnings of a rule amendment that likely will have a substantial adverse impact on the value of the
115 properties to which it will apply.

116 Failure of Ecology to take the corrective measures suggested above to bring the technical basis of
117 their proposed rule amendment into conformance with commonly accepted professional standards will
118 undermine the credibility and validity of the rule amendment and further support the contention that this
119 rulemaking process is being driven by a predetermined outcome based on a political agenda.

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123 **9.0 Sources consulted:**

124
125 December 3, 2014 Department of Ecology Presentation on Instream Flows to WRIA 1 Planning
126 Unit

127 [https://wria1project.whatcomcounty.org/resources/other-resources/december-3-2014-instream-flow-
128 presentation](https://wria1project.whatcomcounty.org/resources/other-resources/december-3-2014-instream-flow-
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129 which includes:

130 Ann Wessel: How was the current Nooksack Instream Flow Rule set and how does it work?

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133 Jim Pacheco Instream Flow Science

134 <https://drive.google.com/file/d/1vkNfmVB-vpIrnIzBDZrXNUkLc9Chyi2T/view>

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136 video of both presentations: <https://www.youtube.com/watch?v=IUVAm6wsXGs>

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139 Program -Nooksack Water Resource Inventory Area (WRIA)1Preliminary Draft for Public Comment

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158 [subsurface-darcys-law](http://www.gwpc.org/water-energy/hydraulic-fracturing/groundwater-protection/fluid-flow-subsurface-darcys-law)

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161 [modeling-groundwater-flow/](https://www.brighthubengineering.com/hydraulics-civil-engineering/58490-darcys-law-for-modeling-groundwater-flow/)

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163 Streamflow Depletion by Wells—Understanding and Managing the Effects of Groundwater
164 Pumping on Streamflow USGS Circular 1376

165 https://pubs.usgs.gov/circ/1376/pdf/circ1376_barlow_report_508.pdf

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167 Streamflow Depletion by Wells—Understanding and Managing the Effects of Groundwater
168 Pumping on Streamflow Leonard Konikow, Paul Barlow, & Stan Leake U.S. Geological Survey

169 Groundwater Protection Council Annual Forum, St. Louis, September 24, 2013

170 http://www.gwpc.org/sites/default/files/event-sessions/Konikow_Leonard2FINAL.pdf

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