Oregon Citizens' Utility Board

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To: Mayor Wheeler, Commissioner Eudaly, Commissioner Fish, Commissioner Fritz, and Commissioner Saltzman
Council Chiefs of Staff and Todd Lofgren, Commissioner Fish liaison to PWB
Mike Stuhr and Gabe Solmer, Portland Water Bureau (PWB)
Cc: Portland Utility Board (PUB) c/o Melissa Merrill
From: Janice Thompson, Oregon Citizens' Utility Board (CUB)
Re: CUB Questions Regarding Options to Address *Cryptosporidium*

CUB Urges Assessment of Ultraviolet and Filtration Treatment Options

CUB's May 18 utility rate hearing testimony urges a thorough assessment of ultraviolet and filtration treatment options to address the revocation of the Oregon Health Authority variance regarding *Cryptosporidium* treatment. Of course, CUB is interested in lower cost options, but our least cost/least risk analytical approach means a careful assessment of risk is also essential. For example, ultraviolet treatment provides less protection against a broader range of risks and the possible costs of those risks could make filtration treatment a better choice. CUB is not jumping to that conclusion, but just because the ultraviolet option was a preferred option in the past does not preclude the current need for a comprehensive review of all treatment options in the present.

CUB's Questions

This memo outlines questions that we urge the PWB and the City Council to consider when assessing water treatment options. For some questions, CUB has prepared background information or has identified background information from other sources that may be helpful in determining next steps.

1) Because Bull Run water is unfiltered, the federal Surface Water Treatment Rule and Oregon Administrative Rules require a set of control programs and an annual report. The PWB submits Annual Watershed Control Program Report to the Oregon Health Authority (OHA). These reports are done on a Water Year basis, for example, the most recent December 2016 report is for Water Year 2016 from October 1, 2015 through September 30, 2016. (This is a separate report than what OHA requires under the *Cryptosporidium* treatment variance.)
    a. What is the annual cost of the current watershed controls and required report due to PWB's use of unfiltered water?
    b. If a filtration treatment option is selected to address *Cryptosporidium*, would all of these costs be eliminated or would some of the control steps such as security measures need to be continued to meet other water quality testing requirements, fish habitat protection requirements, or other operational concerns? If the latter, what percentage of the annual cost identified in question 1(a) would still be considered a required expense?
    c. If ultraviolet treatment (or any other non-filtration method) is selected to address *Cryptosporidium*, would the current watershed control and reporting requirements triggered by continued use of unfiltered water still be required either in part or in their entirety and at what cost?

Groundwater and Water Use Data from PWB - Compiled by CUB

	Section A - GW USE HISTORY				
Reasons for GW use	**dates**	**total days**	**total volume in BG***	**range of daily**	
			(billion gallons)	**production in MGD**	
Bull Run turbidity				(million gallons per day	
	Feb 25 1986	22	1.20	21-84	***Section B***
(flood and turbidity)	Feb 7 1996	8	0.50	4.9-**86.6**	***WINTER & SUMMER***
(rain on snow)	Dec 28 1998	5	0.35	29-**93.6**	***WATER USE***
(flood and turbidity)	Nov 25 1999	19	1.50	19-**89**	
(not full Bull Run shutdown)	Jan 29 2004	4	0.04	**18.4**	***Section B -1***
	Nov 7 2006	14	1.10	27.8-**92.2**	*winter (Nov-Mar)*
	Nov 13 2008	9	0.65	27.4-**96**	*flow average*
	Jan 16 2011	17	1.30	8.5-**88.7**	*84.8 MGD*
(landslide in Jan 2012 = two	Jan 21 2012	11	0.82	18-**83.6**	*5 year average*
turbidity spikes that caused	Feb 23 2012	5	0.22	23.6-**52.4**	*FY 10-11 - FY 14-15*
a shutdown in Jan & reduced conduit flow in Feb.					
This landslide inspected by air in 2016 & no signs of further large-scale sediment movement)					
Landslide - conduit damage	Nov 28 1995	27	0.07	5.1-**29.8**	
					Section B -2
Supply augmentation	July 20 1985	19	0.38	21	*summer (June-Sept)*
	Sept 4 1987	88	0.53	28-86	*flow average*
	Aug 7 1990	23	0.22	4.7-14	*122.8 MGD*
	Aug 17 1992	45	1.50	17-30	*5 year average*
	Aug 2 1994	73	2.50	2-36	*FY 10-11 - FY 14-15*
	Sept 4 1996	27	0.70	13-31	
	Aug 9 2000	41	1.70	10-36	source: Table 3
	Oct 8 2001	12	0.44	6.9-45.8	FY 2014-15 Statistical
	July 22 2003	63	3.70	20.8-72.6	Summary
	July 27 2004	29	1.01	36.5	
	Aug 14 2006	78	3.58	4.5-72	
	June 25 2007	60	1.44	7.7-87.1	
	Sept 28 2007	13	0.43	18.3-36.4	
	Sept 28 2009	31	1.10	36	
	July 16 2015	112	5.30	21-68.5	
					Section C
Maintenance Operation					**Cumulative GW**
	Aug 18 2008	6	0.003	4.7-6.4	**Production Well Yields**
	Aug 5 2009	7	0.03	4-5	**Reliable Rate of Use**
	Aug 9 2010	6	0.03	4.1-5.4	**30 day yield- 88 MGD**
	Aug 9 2011	6	0.03	0-22.3	**30-90 day yield - 80 MGD**
	Aug 6 2012	18	0.03	0-5	**90-151 day yield - 71 MGD**
	July 30 2013	7	0.03	0-5	source: Table 21
	July 25 2016	17	0.28	2.8-18.4	FY 2014-15 Statistical
					Summary
Augmentation during	July 1 2014	9	0.12	0-27.8	
Conduit Repair and	June 11 2015	19	0.49	9-51	
Maintenance Operation					
Crypto and maintenance	Feb 13 2017	30	2.39	33-83	
			*approximate values until 2011		

Source: PWB Development and Use of Groundwater - https://www.portlandoregon.gov/water/article/344756

Winter 2012 event description is from December 2016 Annual Watershed Control Program Report

2) Does ultraviolet treatment only address *Cryptosporidium* and other microbiological contaminants? In general, what risk factors are, and are not, addressed by ultraviolet treatment?

3) Does filtration treatment address *Cryptosporidium* and other microbiological contaminants as well as particulates in water caused by turbidity events? In general, what risk factors are, and are not, addressed by filtration treatment?

4) CUB compiled groundwater and water use information from PWB resources on page 2. Section A summarizes groundwater use history and is organized by the different reasons for groundwater use. Supply augmentation and maintenance are the most frequent reasons for groundwater use during the summer. Winter use of groundwater is primarily linked to turbidity events, though landslides have also been an occasional factor. Section B (upper right on page 2) summarizes system wide water use (Bull Run and groundwater when needed) during the winter and summer. Section B-1 shows that 84.8 MGD is the average winter water use over five years. Section B-2 shows that 122.8 MGD is the average summer water use over five years. Section C (lower right on page 2) summarizes yields from the groundwater production wells that range from 71 MGD to 88 MGD. Yields decline the longer the groundwater wells are in operation. Nevertheless, groundwater capacity has historically been adequate for replacing Bull Run water during the winter. If Bull Run water was not available during the summer, however, groundwater wells would not adequately supply all the needed water, though significant water rationing could be a possible factor in that determination. This is background for the following questions.

    a. Forest fires occur in the summer when a turbidity event caused by increased erosion and runoff from burnt ground or a landslide caused by vegetation destruction could reduce or shutdown availability of Bull Run water.
        i. CUB's review of the information on page 2 as described above is that such a summer shutdown when water use demands are higher could not be addressed by shifting to groundwater, especially for an extended period of time. Is this an accurate assessment?
        ii. What governmental entity (or entities) would fight a fire in the Bull Run and what are firefighting options in that protected area?
        iii. What projections are available about fire potential in the Bull Run watershed?
        iv. How are those projections affected by climate change which seems to already be increasing the frequency and intensity of forest fires?
        v. What projections are available about recovery time from a fire that damaged 10% of the Bull Run, 20%, 30% etc?
        vi. Besides erosion, runoff, and turbidity what other water quality issues could occur during or after a fire? For example, what water quality concerns are linked to ash and for what duration during and after a forest fire?

    b. Winter time turbidity events due to storms and landslides have occurred 10 times between 1986 and 2012. The higher MGD figure in the range of daily production column of Section A has come close to winter water use amounts in eight of those 10 events.
        i. Were there "near misses" in terms of adequacy of groundwater back up during those eight events or are there storage and other operational options such that

groundwater back up for wintertime turbidity events seems adequate for the foreseeable future?

ii. The water quality limit for turbidity is 5 NTU. According to the December 2016 Watershed Control Program Report, that turbidity level is typically approached or exceeded when daily flows at Key Station 18 reaches 5,000 cubic feet per second (cfs). Figure 3 in that Report shows that during Water Year 2016 this 5,000 cfs typical turbidity event threshold was not met, but that flow spikes ranged from about 2,000 cfs to more than 4,000 cfs.

1. At what level below the 5 NTU limit is Bull Run water shut off or mixed with groundwater to address the goal of providing customers with water that not at the 5 NTU limit? In other words, 5 NTU is the required limit but what is the defacto limit since providing water that not at or too close to 5 NTU is an operational goal. Do any wholesale customers stop using PWB water at even lower levels and if yes, what NTU threshold do they use in their water use decision making?
2. What is the cfs flow level that correlates with the defacto "less than the 5 NTU limit" level identified above that typically requires a mitigating measure like shutting off or diluting Bull Run water?
3. How many "near misses" (when cfs flow levels at Key Station 18 were at or exceeded the cfs flow level identified above) have occurred in the last ten years or at least since 2012 when the last turbidity event affected use of Bull Run water?
4. Are projections available regarding the likelihood of future cfs levels at the level identified above?
5. How does climate change affect those projections? If future cfs projections are unavailable, can past cfs levels be adjusted to account for possible climate change related shifts in storm duration and/or intensity?

c. The least common reason for using groundwater rather than Bull Run water is conduit damage due to wintertime landslides. However, long-term conduit damage could extend into the summer when groundwater capacity is adequate to supply water during this warmer time of the year. Earthquakes could occur at any time of year so possible damage to a conduit could occur during the summer when loss of Bull Run water is more challenging to mitigate with groundwater given water supply demand.

i. What operational options are there to switch water between the different conduits in the event of conduit damage?

ii. Has there been an evaluation of landslide hazards along the path of conduits?

iii. What is the goal of the Cascadia Subduction Zone project in the Bull Run Watershed that PWB is getting underway with Oregon State University in terms of possible conduit damage?

iv. Does conduit damage trigger any water quality concerns that are better addressed by ultraviolet treatment as compared to filtration treatment? Or are conduit concerns related to supply with little or no impact on water quality treatment options?

5) Fish habitat protection rules involve meeting water quality requirements such as turbidity and water temperature.

a. Have fish habitat protection and related water quality requirements affected use of Bull Run water? If yes, provide background with an emphasis on timing and the possible effect on the need to use groundwater to supplement Bull Run water?
b. Are there any known upcoming changes or possible future changes regarding fish habitat protection requirements related to climate change that would have water quality treatment implications?

6) Ultraviolet treatment questions
   a. Previous work on an ultraviolet treatment plant was suspended due to receipt of the *Cryptosporidium* treatment variance. How far in the planning and design process was that effort before its suspension? How much of that previous work can be used and/or what level of updating would be required for using the results of that previous effort? How much money could be saved by using previous work after factoring in the cost of work required to update previous planning and design efforts?
   b. The site for the previously planned ultraviolet treatment plant was in the Headworks area. Is that still feasible given subsequent plans for Headworks area improvements such as improving the safety of chlorine gas storage?
   c. Ultraviolet treatment could involve a reasonable level of risk if use of backup groundwater could address turbidity risks due to either storms or forest fires.
      i. Could use of backup groundwater address turbidity concerns during the winter?
      ii. Could use of backup groundwater address turbidity concerns during the summer?
      iii. If groundwater wells are used for longer than the 90-151 days discussed in Section C of page 2, to what extent would yields decline.
      iv. What are the costs related to groundwater use? To get at this question:
         1. In recent budgets how much groundwater use is factored into spending estimates and what is that cost?
         2. If groundwater was used at the 71 MGD yield level for 151 days what would it cost?

7) Filtration treatment questions
   a. If filtration treatment is installed, under what scenarios would groundwater likely be used? Would it likely be just for supply augmentation at the anticipated cost identified above in question 6?

8) Operating costs
   a. What are the anticipated annual operating and maintenance costs for an ultraviolet treatment plant?
   b. What are the anticipated annual operating and maintenance costs for a filtration treatment plant?

9) Longevity
   a. What is the replacement timeline for an ultraviolet treatment plant?
   b. What is the replacement timeline for a filtration treatment plant?

10) Expansion capacity
   a. How do ultraviolet and filtration treatment plants compare in terms of ease of adding possible increased levels of treatment capacity in the future?