# Water Quality Issues

**Premise:**

If you accept the premise that there are important economic, historic, aesthetic, and cultural reasons to maintain the open reservoirs if possible or feasible, then this Commission should critically analyze the stated reasons for the burial project.

With regard to Water Quality issues, it is not sufficient to state that "buried storage is the industry standard" or "buried storage is needed to protect our water quality and meet impending federal regulations." Instead the actual specifics of each issue should be examined.

## 1) What is the actual state of Portland's water quality?

The federal government regulates a very wide range of water quality factors such as:

Safe Drinking Water Act
Total Coliform Rule
Enhanced Surface Water Treatment Rule
Microbial-Disinfection Byproducts Rule
Long Term 2 Enhanced Surface Water Treatment Rule (proposed)

These rules address disease-causing organisms, metals, nitrogen nutrients, lead, the amount of disinfectant (chiorarnine residual) that persists in the distribution system, and disinfection byproducts, among other things. The Water Bureau is required to provide water quality data to the public three times a year. The most recent Water Quality Analysis (August 2003) is provided in this report. (1)

Portland water consistently meets and exceeds federal standards as acknowledged by the City of Portland itself, "Overall, the Bureau successfully meets its primary goal of providing a sufficient amount of high quality water to its customers. The Bureau continues to meet or exceed federal water quality standards." City of Portland Service Efforts & Accomplishments: 2002-2003, Office of the City Auditor, Portland, Oregon, November 2003, page *45.*

## 2) What contaminants have actually been measured?

The Water Bureau (WB) measures regulated and unregulated contaminants at 4 levels in the system: (1)

Source water: The pristine unfiltered Bull Run is measured at Headworks. Here the WB tests for a broad range of contaminants. This water is extremely clean, showing coliforms 'well below EPA standard, Giardia not measurable, Crypto **[NOT???]** measurable, turbidity low, and other contaminants extremely low or not detectable. This state of quality has allowed Portland to maintain its Filtration Avoidance Waiver.

Treated water: Testing occurs at Lusted Hill, before the water enters the reservoirs. Here, minerals, metals, alkalinity, and the like are measured.

Distribution system: Post-reservoir testing is done "at sampling stations throughout the areas served by the City of Portland." Here, they measure only for total coliforms, chlorine residual, and disinfection byproducts. (No virus, Crypto, Giardia measurements are required or are done.) Coliforms are usually absent or well below EPA standard. This is critical because positive coliform counts could trigger a reexamination of Portland's Filtration Avoidance Waiver.

Home taps: Measurements are taken only for lead and copper.

Conclusion: There is no MEASURED water quality problem related to coliforms, giardia, crypto, viruses, or other environmental contaminants, from the reservoirs.

**3) Maybe there is no measured problem because the Water Bureau has not been measuring. Has the water quality of the open reservoirs themselves ever actually been studied?**

Yes. The City of Portland Water Bureau Open Reservoir Study Technical Memorandum 2.7. Water Quality Evaluation January 1998, was prepared by Joe Glicker and Kathryn Mallon, et al, of Montgomery Watson. The goal of this study was to see whether water quality is impacted by passage through the open reservoirs. (2)

In the Introduction to this document, we find this statement: "Given a lack of specific identifiable problems attributable to open reservoirs and the new language of the Safe Drinking Water Act requiring more careful balancing of costs and benefits of regulations, EPA may have little interest in establishing a national regulation to mandate covering of existing open reservoirs." (p 7)

The study made the following observations of open reservoirs' test outcomes:

Coliforms: 1990 to 1996, of about 7800 samples, only 27 (0.7%) tested positive for coliforms. Twenty--six of these measurements were observed prior to 1993. "These data indicate that adequate disinfection of any coliform growth which occurs within the open reservoirs is achieved." (p. 29)

Viruses: No virus monitoring has been conducted in the open reservoirs. "The EPA has determined that a utility that meets disinfection requirements for Giardia under the Surface Water Treatment Rule will provide adequate disinfection for viruses. Due to the limited human access in the watershed and the current compliance with SWTR disinfections requirements, it is highly unlikely that active human viruses could be transmitted in the open reservoirs." (p 43)

Pathogenic bacteria. Deemed to be controlled by chlorination (p 38)

Opportunistic bacteria and protozoans: The WB analyzed water from Reservoirs 4 and 6 in December 94, February *95,* and March *95,* and "no Giardia or Cryptosporidium (crypto) cysts were detected in any sample." (p. 40) There has never been evidence of an outbreak of Crypto in the Portland HIV or dialysis communities.

"Aesthetic contaminants": These include bird feathers, fir needles, and leaves, pollen, midge fly larvae, and low level tastes and odors and the like. The study noted "these contaminants do not pose a human risk, but do affect system operation and customer satisfaction." (p 43)

Trash: Inert materials found during cleaning, including glass, metal, wood, paper, beer bottles, tennis balls, Frisbees, rocks, and a bicycle. "These materials in themselves do not pose a risk to human health, although they do provide a conduit for bacterial contamination." (p 46).

Sediment: The report found that "the relatively low rate of sediment deposition, short residence times and the Bureau's program of semi-annual draining and cleaning the open reservoirs ensure that the deposited sediment does not become a water quality problem." (p 34)

Organic chemicals: The report states that "the absence of these compounds in sediment suggests that atmospheric deposition of common pesticides, herbicides and PCB's poses a negligible human health risk from the open reservoirs." (p 37)

Turbidity: The report found that "turbidity levels are very similar amongst the four reservoirs indicating neither settling or external turbidity contamination (e.g. wind blown debris) occurs to any significant degree in the open reservoirs." (p. 23)

Algae: “Algae growth has not created a noticeable water quality problem in the distribution system.” p. 24

Customer complaints: No evidence of increased customer complaints within the distribution of the open reservoirs: “. . . the area served by a completely closed distribution system is similar in the number of complaints to service zones on the East Side served by the open reservoirs.” (p. 21)

Birds: Birds are almost always present on Reservoir 6. They may introduce pathogenic protozoa and opportunistic bacteria. A 1999 EPA study on open reservoirs mentions a 1993 waterborne Salmonella outbreak in Gideon, MO, caused by pigeons roosting in a COVERED reservoir. The study also comments that ducks may transmit crypto in their waste.

This theoretical hazard is rebutted by the facts. If one looks at the actual public health outcome in Portland, one finds no salmonella outbreaks, no crypto outbreaks. In fact, “it should be noted that no waterborne disease outbreak or water quality incident of public health significance has ever been recorded in connection with Portland’s open reservoirs.” (p. 48)

Dogs: When the off-leash dog run above Mt. Tabor was created in *1995,* the original agreement was for Parks to enforce the scoop and leash laws, maintain the park grounds, and make drainage improvements to protect the open reservoirs from surface water runoff. These protective measures were never implemented in the park. The dog run was subsequently moved, but the new plan gives unleashed dogs access again. With the drainage system unimproved, there is at least the potential of runoff with dog waste approaching the reservoirs. This situation should be corrected.

Conclusion: “An evaluation of existing water quality data did not reveal major water quality problems related to Portland’s open reservoirs.” (p. 63)

The memorandum makes a number of practical, low-tech recommendations to maintain water quality and to increase security while maintaining the open reservoirs, opining that “It is likely that the open reservoirs will be an important part of Portland’s water supply system for the next 50 years.” (p. 64) These recommendations will be included in our “Security/Mitigation” section. (2)

**4) What health effects have other cities noted from their open reservoirs?**

The technical memorandum also includes results from a telephone survey of 10 water systems performed by E&S Environmental: 4 in Washington state and one each in Los Angeles, New York City, Victoria BC and Vancouver BC, Philadelphia, and Boston. It notes that “several of the utilities have no real desire to cover their reservoirs but feel that it is inevitable.” (p. *57).* It further stated that “potential for contamination by human activity was not a major issue for the utilities surveyed. Birds were frequently identified as a problem. Seattle and NY had problems with gulls that were readily resolved with wire canopies.” Additionally, the memorandum found that “for most utilities surveyed, Giardia and Cryptosporidium contamination was a concern although there was no evidence of increased protozoan levels in any of the open reservoirs for those that conducted testing.” (p. 60) The ultimate finding of the study was that “No respondents reported any water quality problems associated with areas in the distribution system served by open reservoirs.” (p. 60)

The conclusion of the telephone survey: “There was no clear evidence that open reservoir storage resulted in any significant water quality degradation other than instances of algae growth and resultant taste and odor problems. However, there was clear evidence that covering previously uncovered reservoirs could reduce the need for re-chlorination and the frequency of cleaning.” (p. 62) (2)

**5) Are there any particular health benefits to open water reservoirs**?

Yes. Deep open water reservoirs can actually provide a public health benefit. Gases including radon (a problem in NE Portland) and disinfection byproducts (chloroform), both suspected carcinogens, dissipate in open reservoirs before entering the household tap. Oxygenation from reservoir fountains and the current waterfall action at the inlet provide additional release of disinfection byproducts. Dissolved oxygen in open-air reservoirs allows aerobic bacteria to further break down organic compounds. Sunlight and open air provide additional benefits. See attached Benefits of Deep Open Reservoirs (3) by Scott Fernandez, M. Sc., serving on the Portland Utility Review Board, 2000-present and member of the City Council appointed Water Quality Advisory Committee 1996-2000.

**6) We have been told that buried reservoirs are "the industry standard."**

Here is a quote from Scott Fernandez's 10-15-03 op-ed piece: "Burial proponents claim that open reservoirs are obsolete and scarce. They don't tell you that millions of people in major cities, including New York and San Francisco, continue to drink unfiltered water from open reservoirs. Why does this continue? The reason is that these cities rely on the expertise of microbiologists who scientifically evaluate all aspects of water safety, rather than construction engineers whose reflex is to solve every supposed problem with an expensive structure." (4)

In Summary of Bull Run Water Treatment. Independent Review,(5), Fernandez describes the Hazard Analysis Critical Control Point (HACCP) process, which is the is the quality control system used by the food processing industry, implemented by the FDA to control food-bone illness. This framework can be applied to other environmental hazards. This framework could be implemented as the structure of a comprehensive water quality monitoring plan, which could detect weak links in the water quality distribution and direct mitigation to specific areas when and if needed. Theoretically could produce better water quality than additional treatment, at lower cost.

**7) What about Cryptosporidium and the upcoming new EPA rule known as the Long Term 2 Enhanced Surface Water Treatment Rule (LT2)?**

The proposed rule has received strong challenges from large users with unfiltered source water, known as the Unfiltered Systems Working Group. Challenges have also come individually from the cites of New York, Boston-Metro, San Francisco, Akron Ohio, as well as from the Association of Metropolitan Water Agencies, and a consortium consisting of the American Water Works Association, the Association of Metropolitan Water Agencies, the National Association of Water Companies, and the National League of Cities, among many others. The comments from the Unfiltered Working Group and New York City are included in this report.

In the face of strong and compelling challenges, it is clear that our Water Bureau should NOT move to implement the Rule in its proposed form, as the final rule may be substantially different with regard to unfiltered systems.

With regard to Cryptosporidium in particular, Each of these agencies comment that EPA vastly overstates the risk of contracting cryptosporidiosis in systems with unfiltered water, and that the EPA underestimates the cost of compliance.

The Unfiltered Systems Working Group notes that EPA's conclusions are based on estimates, which are contradicted by actual data. For instance, if EPA estimates were applied to the NYC and Metro-Boston's population of about 10 million, the proposed Rule would avert 145,000 to 455,000 cases of cryptosporidiosis per year. However, the actual number of cases reported in these two systems combined, averages only about 150 cases per year (This is from all causes, not necessarily from drinking water.) EPA estimates suggest that the number of deaths averted in the NYC and Metro Boston area would be 23-75 cases per year. Yet, over the last 6 years, there has been only one death attributed to crypto in NYC (not necessarily from drinking water), and zero deaths in Metro Boston. (6)

New York City (which has uncovered reservoirs as well as unfiltered source water) also criticizes EPA for basing its rule on estimates of disease rates rather than looking at actual published research. A national effort mandated by Congress and led by the CDC and EPA to estimate the amount, if any, of disease caused by water across the country, is years overdue. Several university-based studies have found negligible crypto disease rates among HIV patients. NYC further states: "It is also interesting to note that efforts to study cryptosporidiosis have been limited by the fact *that it is too difficult to find people with the illness to conduct the needed studies."* NYC concludes that the public health benefit from complying with the proposed rule is vastly overestimated, and at the same time the costs are vastly underestimated. (7)

**8) So is there a real health problem related to Portland's open reservoirs?**

There is NO documented health problem. Tennis balls and even duck poop in the water has NOT been shown to translate into documented or even measurable public health effects. Our water meets and exceeds all current federal standards. The main issue will be regulatory compliance, and that will depend on the final shape of the LT2, which is under debate.

For Portland, the LT2 issues are:

- Will a new "risk bin" be created for unfiltered systems which have documented very low to unmeasureable cryptospordium in their source water, such that additional treatment would not need to be instituted so long as watershed management practices control the quality of source water?

- Will systems (like Portland's) that already have effective watershed management practices in place be penalized by being required to "amend and strengthen" their existing programs in order to achieve 0.5-log Crypto removal credit, or will they receive credit for having been pro-active?

- Currently, unfiltered systems are to be held to a higher standard than filtered systems, which are considerably more at risk because of their polluted source water. Will redundancies which are not supported by data be removed, so that unfiltered systems will have the same compliance rules that filtered systems have?

- Portland's own member on the EPA committee, Rosemary Menard, alone among the Unfiltered Working Group members, has consistently lobbied that expensive treatment be mandated to combat a nonexistent cryptosporidium problem. In contrast, the other members of the Unfiltered Working Group have lobbied for a more evidence-based approach.

Finally, the Unfiltered Working Group, in its comments to the EPA states, "An overestimate of risk reduces the consumer's confidence in public water supply and may be misused by less scrupulous interest groups."

Is this what is happening in Portland?

References:

(1) City of Portland Bureau of Water Works: Water Quality Analysis (August 2003) htpp:/www .portlandonline.com/shared/cfm/image. cfm?id~3 3093

(2) Glicker and Mallon, et al, City of Portland Water Bureau Open Reservoir Study Technical Memorandum 2.7. Water quality Evaluation, January 1998, Montgomery Watson

(3) Fernandez, Scott, Benefits of Deep Open Water Reservoirs, Portland Utility Review Board, 2000-present; member of the City Council appointed Water Quality Advisory Committee 1996-2000.

(4) Fernandez, Scott. Burying the reservoirs will be a disaster. *The Oregonian*, Op-ed,10-15-03.

(5) Fernandez, Scott. Summary of Bull Run Water Treatment: and Independent Review. November 2003.

(6) EPA Water Docket OW-2002-0039-0523
Unfiltered Systems Working Group, comment on proposed LT2 Rule, 1-9-04.

(7) EPA Water Docket OW-2002-0039-05 16 New York City, comment on proposed LT2 Rule, 1-9-04.



**Appendix**

A. City of Portland Bureau of Water Works Triannual Water Quality Analysis August 2003: documents excellent water quality meeting Federal requirements, coliforms well below standard, disinfection byproducts well below standard, disinfection residual adequate. http://www.portlandonline.comlsharedlcfinlimage. cfiui?id=3 3093

B. Executive Summar from Open Reservoir Technical Memo 2.. 7. Water quality Evaluation, Glicker and Mallon, et a!, Montgomery Watson, January 1998,

C. Benefits of I)eep Open Water Reservoirs. January 2004. Scott Fernandez, January 2004. Fernandez:, member, Portland Utility Review Board, 2000-present; member Water Quality Advisory Committee 1996-2000.

Open water allows venting of radon and trihalomethane gases and inhibits breakdown of disinfection residuals by nitrification bacteria.

D. Summary of Bull Run Water Treatment, an Independent Review. Long Term 2 Enhanced Surface Water Treatment Rule, Scott Fernandez, November 2003.

Water QuLality Issues at Bull Run, including cryptosporidium, can be effectively managed with watershed control.

Cryptosporidium levels in extremely low levels in Bull Run because there is no exposure to sewage or domestic animal operations.

The immunocompromised population of Portland has observed no health problems from drinking Bull Run water that has passed through open reservoirs.

The $200 million dollar microfiltration plant proposed by Water Bureau would produce a water quality benefit the WB has acknowledged would “probably not be measurable.”

Bull Run Treatment Panel did not discuss watershed management or the fact that no public health risk has ever been observed related to Bull Run water.

Description of the Hazard Analysis Critical Control Point (HACCP) quality control system used by the food processing industry, and how it might be implemented as the structure of a comprehensive water quality monitoring plan Theoretically could produce better water quality than additional treatment, at lower cost.

E. ~~ying the reservoirs will be a disaster. Op-ed, Scott Fernandez, The Oregonian, 10-*15-03.*

Harmful organisms already in the source water grow best when contained without open oxygenated air. Large unfiltered systems continue to use water stored in open reservoirs, protected by quality control management rather than built structures.

F. City of Portland, 09/26/02, Limited Purchase Order Re: Bird Removal at Mt. Tabor