Adam, Hillary

From: Scott Fernandez <scottfernandez.pdx@gmail.com>
Sent: Monday, January 12, 2015 1:21 PM
To: Adam, Hillary; Ashenfelter, Paige (BDS); Scott Fernandez
Subject: Historic Landmarks Commission Public Comment
Attachments: 1=6=15 BRW SBOR -waive2014.pdf

Follow Up Flag: Follow up
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Good afternoon,

The City of Portland Oregon has, as one of its greatest assets, an ample supply of clear potable water. Not only have Oregonians always taken great pride in the quality of water, but its importance to Portland's welfare has been evident throughout the city's history. Understanding the open reservoir history of the development, engineering, and pure ingenuity of this water supply always had a direct impact on planning and preparing for the future. The open reservoirs provide safe healthy drinking water for over 100 years without microbial or chemical illness.

Well managed water utility systems have "barrier" points where drinking water contaminants leading to illness cannot enter the distribution system. The Bull Run watershed is an example of a "barrier" where municipal, agricultural and industrial sewage does cannot enter the water system. Portland's open reservoirs at Mount Tabor and Washington Park are the strongest and most important "barrier" points in the entire system; removing toxic and carcinogenic contaminants before entering distribution system because of the following scientific principles -

- Sunlight - to break down unwanted chemicals and providing supportive disinfection
- Oxygenation – allowing aerobic bacteria to breakdown unwanted chemicals
- Open air exposure- to allow volatilization/vaporization of unwanted chemicals such as radon, chloroform, etc.

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The public health science and benefits of open air reservoirs were well known in the late 1800's at the time Portland's open reservoirs' were engineered and constructed; historically still applying today.

OPEN RESERVOIRS-

The fundamental principles of sunlight disinfection are well established

Written by esteemed epidemiologist Milton J. Rosenau in 1902: **"Sunlight (direct) is an active germicide. It destroys spores as well as bacteria. The importance of the sun's rays in destroying or preventing the development or growth of microorganisms in nature cannot be overestimated. Even diffused light retards the growth and development of microorganisms, and if strong enough may finally kill them. In water or clear solutions it penetrates some distance.**

The importance of oxygen in the influence of light upon bacteria is emphasized. Bacteria in light, in the presence of oxygen and water, cause a production of hydrogen peroxide which is well known to have strong disinfection powers."

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Because of this the community prefers the open reservoirs be retained in its original purpose. (2004 City of Portland Independent Review Panel majority) The reservoirs' historical primary purpose is to be an integral part of the water system ensuring safe drinking water. The community has certainly acknowledged the advantages over the last +100 years as only open drinking water reservoirs can provide. The use of the open reservoirs as part of the drinking water system for all intents and purposes is not invisible to the public, but recognized for their public health benefits. Any deviation from retaining their historical structure value and drinking water utility as they are today would generate profound adverse public health effects from loss of the open reservoir "barrier"; a stronghold to unwanted contaminants entering distribution system.

Sincerely,

Scott Fernandez M.Sc. Biology/ microbiology-water chemistry
1821 NE 65th
Portland, Oregon 97213

City of Portland Mayor appointed-

Portland Utility Review Board 2001-2008

Portland Water Quality Advisory Committee 1996-2000

SCIENTIFIC and PUBLIC HEALTH BASIS to

RETAIN OPEN RESERVOIR WATER SYSTEM

for the CITY OF PORTLAND, OREGON

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Request for Waiver from the U.S. EPA Long Term 2

Enhanced Surface Water Treatment Rule (LT2)

Regarding Covered Reservoirs

"Science will determine the ultimate outcome."
–EPA Administrator Lisa Jackson, August 2011
letter to U.S. Sen. Charles E. Schumer (D-NY) acknowledging
his request for an "LT2 Rule" reservoir waiver

"We're just trying to get at the public health impacts and if there's a better way to do that we'll be wide open to it."
–EPA Administrator Gina McCarthy, April 2014
Congressional testimony response to U.S. Rep. Eliot Engel's (D-NY)
question about the status of New York City's reservoir waiver request

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By Scott Fernandez
M.Sc. Biology / microbiology & water chemistry

May 2014

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Preface

Scientific accuracy is of utmost concern when determining the best system for treatment and storage of Portland's water supply. However in recent years public officials and some of the media have framed decisions affecting the city's water policy around opinion and expediency instead of sound science and engineering.

Far from being merely an "aesthetic" issue affecting Mt. Tabor and Washington parks, open reservoirs are of critical importance to drinking water quality and public health for every Portland resident. This paper addresses the urgent need to clear up confusion surrounding the vital public health component of open reservoirs for maintaining Portland's record of exceptional municipal water quality and will show that:

- City Council's push to cover Portland's open reservoirs – before the Environmental Protection Agency (EPA) completes its "LT2 Rule" review and waiver process in 2016 – will create more public health problems for residents than it solves.

- Unlike in other cities, Portland's water supply from the federally protected Bull Run watershed is not at-risk from sewage based microorganisms such as "Cryptosporidium" – which the EPA's blanket "LT2 Rule" is meant to address.

- Covering Portland's reservoirs will carry risk from enabling toxic and carcinogenic contaminants such as radon, chloroform and other disinfection chemical byproducts to accrue in the water supply in addition to nitrification, lack of oxygenation, and absence of sunlight.

- There are demonstrable public health benefits of open reservoirs due to efficient atmospheric volatilization, chemical biodegradation, and broad-spectrum sunlight saturation that reduce and eliminate contaminants. Portland's open reservoirs can already meet EPA microbial standard and are the most important water quality "barrier" in the Bull Run system. They block contaminants from reaching the downstream distribution system using the scientific principles of chemistry, physics, and microbiology.

- Public officials must preserve Portland's open reservoirs as an essential component of the water system to maintain municipal water quality and protect public health. The basis and merits for communicating effectively with EPA on this matter simply requires coordinated and committed support from Portland City Council, the Oregon Health Authority, Gov. Kitzhaber, and Oregon's Congressional delegation.

Contents

I. EXECUTIVE SUMMARY

The letter and spirit of the EPA drinking water regulation is to provide equal or greater public health benefits. ***A decade of experience under the 1986 EPA Safe Drinking Water Act (SDWA) revealed several areas where responsible, science-based flexibilities and a better prioritization of effort could improve protection of public health compared to the one-size-fits-all approach of the 1986 statute.*** **(EPA 1996)** It will be shown that the chemistry, physics, and microbiology principles of open reservoirs of Mt. Tabor Park and Washington Park will continue to provide safe healthy drinking water for generations to come. The reliable and scientifically-sound approach to unwanted environmental chemicals will be achieved through open reservoirs. Covered reservoirs degrade drinking water quality and increase public health risk through toxic and carcinogenic chemicals progression.

In the past 30 years the Safe Drinking Water Act has been highly effective in protecting public health and has also evolved to respond to new and emerging threats to safe drinking water. Disinfection of drinking water is one of the major public health advances of the 20th Century. One hundred years ago typhoid and cholera epidemics were common throughout American cities; disinfection from chlorine was a major factor in reducing these epidemics.

EPA's "Long Term 2 Enhanced Surface Water Treatment Rule" (LT2) addresses microorganisms which is the primary reason Portland deserves a waiver from the regulation. Because the Bull Run watershed does not have exposure to industrial, agricultural, or municipal sewage, Cryptosporidium, viruses, and other microorganisms become a non-issue in regard to public health risk for water users. In addition, sunlight is a powerful source of natural broad spectrum ultraviolet light (UV) that reduces infectivity of microorganisms. Portland's open reservoirs already meet EPA microbiological standards.

There have been no positives for Cryptosporidium, Giardia, and viral microorganisms in sampling of Portland open reservoir drinking water throughout the 1990's and beyond; in addition to a recent year-long study (AWWA RF 3021) in which the sampling methodologies used were more rigorous in assessment. Furthermore EPA assertions for the basis of LT2 nationwide proved to be incorrect. Cryptosporidium has not had the negative public health impact EPA projected. Scientists have not seen the deaths, widespread outbreaks, or endemic disease identified from Cryptosporidium drinking water public health data around the U.S.

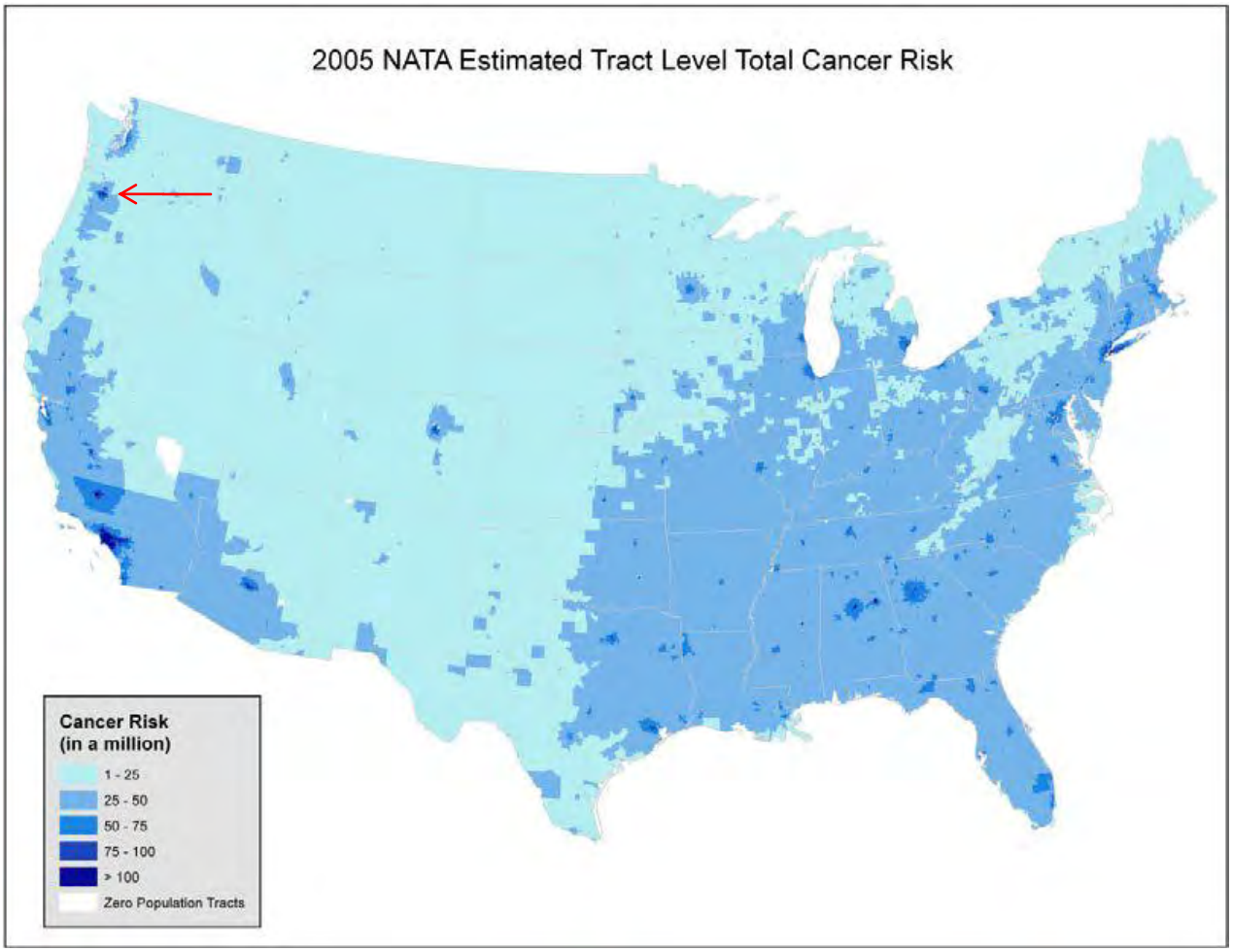
Second, open reservoirs allow for efficient ventilation of toxic gases such as radon.

Third, over the years scientists have learned that chlorine and chloramine can generate many unwanted disinfection byproducts. Open reservoirs address the issue of effectively managing chemical disinfection byproducts using a natural ecosystem, thus providing safer water quality in complete contrast to that of covered reservoirs. Open reservoirs provide safe drinking water by acting as a barrier to toxic and carcinogenic chemicals along with disinfection byproducts by vaporizing, microbial biodegradation, or sunlight break down of molecules.

While critical to maintaining Portland's healthy drinking water system, these scientifically supported public health benefits of open reservoirs have not been recognized by Portland City

Council and the Portland Water Bureau. These open reservoir public health benefits must be recognized as the basis for responsible management of Portland's existing high-quality water treatment and delivery system.

An additional note is that Portland has significant air quality problems. Thirty-five (35) Portland schools were ranked in the bottom 5% in the nation's high toxic hot spots from airborne metals and gases. Covering the reservoirs will not allow the chemical disinfection byproducts and other toxic and carcinogenic gases to vaporize efficiently before entering the water distribution system. These toxic and carcinogenic chemicals will end up being released from drinking water into homes, schools, and workplaces, thus adding to the already present and problematic environmental air public health burden.



Portland ranks in the highest percentile of U.S. cities for toxic air quality cancer risk. Residents, especially children with their lower body weight, are at highest risk from the additional toxic burden of degraded water quality. (See Refs. 1-5)

II. GLOSSARY

AWWA RF – American Water Works Association Research Foundation

CSSW – Columbia South Shore Wellfield located on the Columbia River between the Portland airport and Blue Lake areas. It is the source of our drinking water containing radioactive radon 222.

DBP – Disinfection By-product

pCi – pico Curie- measurement of radioactive material

EPA – United States Environmental Protection Agency

IARC – International Agency for Research on Cancer

LT2 – EPA Long Term 2 Enhanced Surface Water Treatment Rule

NAS – National Academy of Sciences

NDMA – Nitrosodimethylamine, a drinking water disinfectant byproduct that is broken down by sunlight in open reservoirs

NOM – Natural Organic Material, reaction with chlorine and chloramines

OHA – Oregon Health Authority

PAEC – Potential Alpha Energy Concentration

Precautionary Principle – Adopted by Portland City Council in 2006. "When an activity raises threats of harm to the environment or human health, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically." See "Toxics Reduction Strategy: A plan for minimizing use of toxic substances of concern in government operations by using the Precautionary Principle" (http://www.sehn.org/pdf/portland.pdf)

PWB – Portland Water Bureau

Radioactive Chemicals from Columbia South Shore Wellfield –
Bi- bismuth 214, 210 β, Γ
Pb- lead 214, 210, 206 β, Γ
Po- polonium 218, 214, 210 α
Rn- radon 222 α, Γ
(Symbol Key: α-alpha / β-beta / Γ-gamma – forms of radioactive particles)

S2DBP – Stage 2 Disinfection and Disinfectant Byproduct Rule

SDWA – EPA Safe Drinking Water Act

USGS – United States Geological Survey

WHO – World Health Organization

III. INTRODUCTION

Citizens of Portland have been asking City Council to formally request a waiver from the EPA "Long Term 2 Enhanced Surface Water Treatment Rule" regulation for over a decade. We are not alone in requesting this waiver. The City of New York, the New York State Department of Health, and the entire New York Congressional delegation are all requesting a similar waiver for their Hillview open reservoir.(Ref. 6) Portland City Council needs to join the citizens of Portland in pursuit of a scientifically supported EPA open reservoir waiver of the "LT2 Rule."

This paper will review, identify, and demonstrate the superior public health benefits of the open reservoirs at Mt. Tabor Park and Washington Park that covered reservoirs cannot provide. These public health benefits were known over 100 years ago (see sidebar at right). Misinformation presented by the Portland Water Bureau will also be scientifically corrected.

Portland has had safe and healthy drinking water for over 100 years because federally protected Bull Run and the open reservoirs have been the foundation of the multiple-barrier approach to public health. This multiple-barrier approach allows Portland to already meet and exceed EPA regulated contaminant standards. Microbial contaminants have traditionally received more attention from a public health standpoint. Bull Run has no sewage exposures so microorganisms are principally a non-issue. However in recent years there has been a growing concern regarding chemical contaminants present in drinking water that affect public health.

The fundamental principles of sunlight disinfection are well-established. Esteemed epidemiologist Milton J. Rosenau wrote in 1902:

"Sunlight (direct) is an active germicide. It destroys spores as well as bacteria. The importance of the sun's rays in destroying or preventing the development or growth of microorganisms in nature cannot be overestimated. Even diffused light retards the growth and development of microorganisms, and if strong enough may finally kill them. In water or clear solutions it penetrates some distance. The importance of oxygen in the influence of light upon bacteria is emphasized. Bacteria in light, in the presence of oxygen and water, cause a production of hydrogen peroxide which is well known to have strong disinfection powers."

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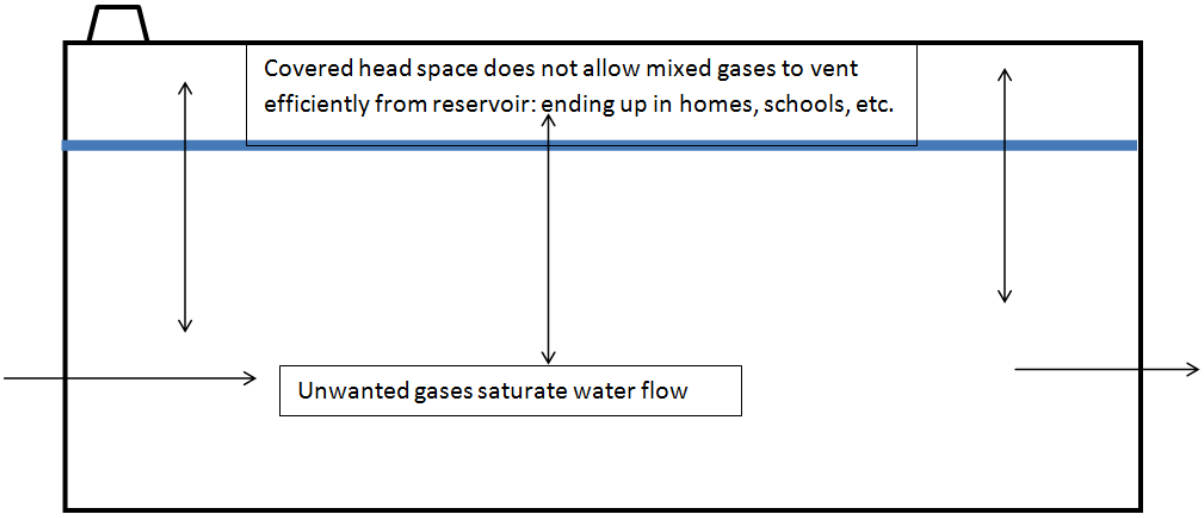
As a community we have challenged the applicability of EPA's LT2 Rule and Cryptosporidium in Portland's drinking water system as a public health problem that does not exist because we don't have agricultural, industrial, or municipal sewage exposures in our Bull Run source water. Cryptosporidium has never been found in our open drinking water reservoirs. Equally important for continued public health, we need to include a discussion of the EPA Stage 2 Disinfection and Disinfectant Byproducts Rule (S2DBP) relating to disinfection byproducts and other unwanted chemicals that our open reservoirs remove from our drinking water. Utilizing the applied natural laws of microbiology, chemistry, and physics we show that our open reservoirs in Mt. Tabor Park and Washington Park provide safe and healthy drinking water superior to water in covered reservoirs. Direct sunlight, oxygenation, an aerobic microbial ecosystem, and the large surface areas of open-air reservoirs allow break down and venting of harmful gaseous chemicals reflecting the functioning of a healthy water system.

A. Adverse effects and public health problems of covered reservoirs

Covered reservoirs cannot effectively remove toxic and carcinogenic gases and other chemicals. Gases such as radon and chloroform remain saturated in the drinking water and they cannot efficiently escape. Because covering the reservoirs creates a drinking water system closed to sunlight and poorly exposed to the atmosphere, these toxic and carcinogenic gases then end up venting in our schools, homes, and businesses. Without sunlight carcinogenic chemicals such as NDMA (Nitrosodimethylamine) are not broken down and bacterial metabolic processes promoting toxic nitrification byproducts continue on unimpeded.



Two (2) small air vents opening combine to ~75 sq. ft. on a ~217,000 sq. ft. ~5-acre reservoir roof such as PWB 9-6-2013 Powell Butte 2. Small vent allows water to move through covered reservoir – otherwise a vacuum would be created and water flow would be restricted. Small air vents are inefficient in removing toxic and carcinogenic gases. The history of U.S. covered reservoirs also documents bird entry through small air vents to roost and contaminate water resulting in human death.

B. Public health benefits of open reservoirs

The Portland open reservoirs provide safe and healthy drinking water by naturally engaging in removal of toxic and carcinogenic disinfection byproducts and other chemicals. It is important to remove these environmental chemical exposures because they are the sources of great health risks, such as lung and other cancers from radon gas and radon progeny of which "there is no safe level of radon exposure." (US EPA) (Refs. 7-14)

Affected organ systems from chloroform include: Cardiovascular (heart and blood vessels); Hepatic (liver); Neurological (nervous system); Renal (urinary system or kidneys); Reproductive (producing children); Developmental (effects during periods when organs are developing). (Refs. 15-16)

Nitrosodimethylamine (NDMA), a drinking water disinfectant byproduct that is broken down by sunlight in open reservoirs, has been classified by the International Agency for Research on Cancer (IARC) as a probable carcinogen for humans (liver cancer). The mechanism by which NDMA produces cancer is well understood to involve biotransformation by liver microsomal enzymes generating the methyldiazonium ion. This reactive metabolite forms DNA adducts, with most evidence pointing to O6-methylguanine as the likely proximal carcinogenic agent. (Ref. 17)

Visionary leaders fought for our Bull Run water source over 100 years ago. **Bull Run source water is federally protected from human entry that is not exposed to industrial, agricultural, or municipal activities.** Portland is fortunate to have very few chemicals in our drinking water. Open reservoirs are efficient in removing the chemicals we don't want to drink or have in our environment. We want chemicals removed because EPA long-term drinking water standards are based only on adults, not considering the extended exposures that increase health risks for younger ages. EPA long-term chemical exposure risk levels are based on 70 kg / +154 lb. adults, not children. (Ref. 18)

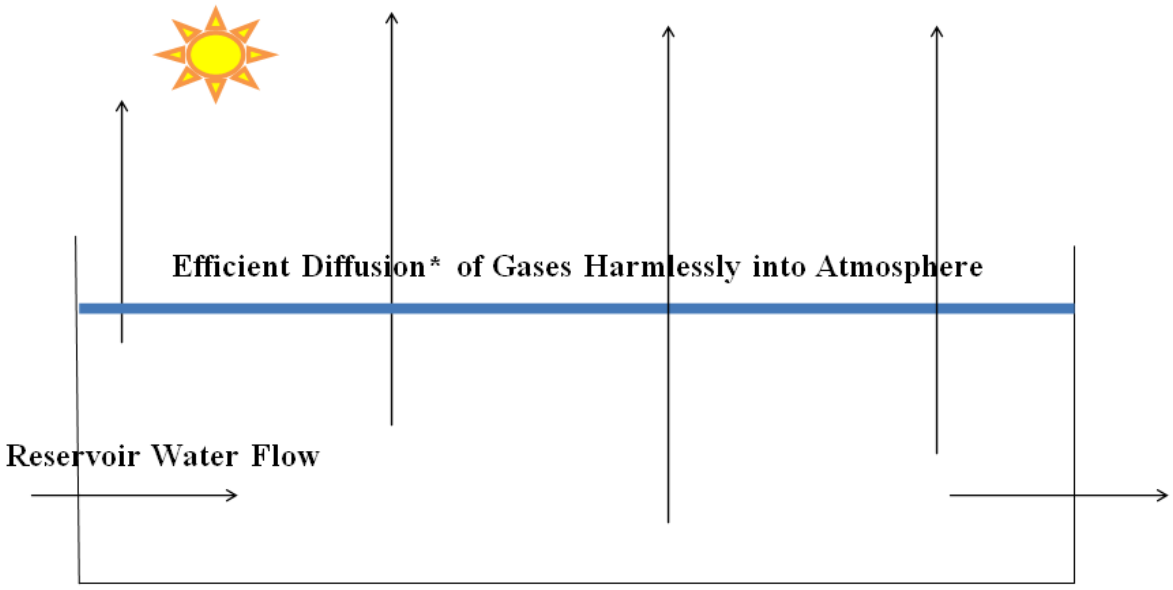
Portland's open reservoirs operate as unique barriers and provide superior efficiencies impeding the movement of toxic and carcinogenic gases and chemicals into the distribution system by utilizing the following scientific principles:

- Atmospheric volatilization of toxic, carcinogenic gases – Radon
- Atmospheric volatilization, Trihalomethanes, (THM) – Chloroform
- Aerobic microbial biodegradation – Haloacetic acids, (HAA5), Stage 2 DBP
- Natural oxygenation – Increases presence of helpful aerobic microorganisms
- Aerobic bacteria – 18x increased oxidative activity v. anaerobic bacteria
- Direct sunlight – Degrades carcinogenic N-nitrosodimethylamine (NDMA)
- Direct sunlight – Inhibits nitrification bacteria and the buildup of nitrites, nitrates and nitrosamines from ammonia disinfection
- Direct sunlight – Oxygen/photons, natural disinfection from oxides

Removing Portland's open reservoirs raises the threat to public health from increased exposure to toxic and carcinogenic chemicals. (Ref. 19)

Portland water users benefit from the environmentally sustainable and effective open air reservoir processes that remove or impede movement of toxic and carcinogenic gases and chemicals from our drinking water system. The "Precautionary Principle" (see Glossary) – the public health policy adopted by Portland City Council in 2006 – applies directly to decisions affecting Portland's water reservoirs. Open reservoirs provide an efficient method of eliminating unwanted drinking water gases such as radon-222 and chloroform through the process of *atmospheric volatilization*. Open reservoirs provide a natural, cost effective, and healthy solution to a recognized public health problem.

Reasons Open Reservoirs Function So Well: Open reservoirs act as a natural barrier to toxic and carcinogenic chemicals, harmlessly releasing them before they enter the drinking water distribution system.



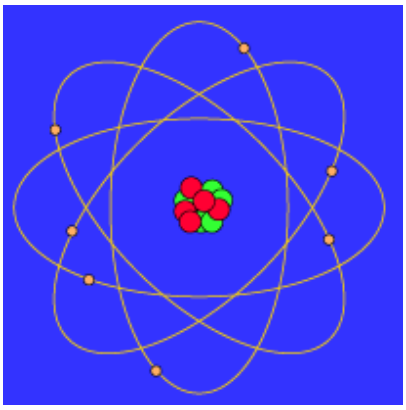
Highly efficient open reservoir chemical movement from water (high gas concentration) to air (low gas concentration) provides the desired natural and harmless removal of chloroform and radon gases from open reservoirs. Open reservoirs keep toxic gases out of water used in homes, schools, and workplaces.

Mt. Tabor Reservoir 6. Open reservoir water oxygenation from fountain and waterfall aeration also removes toxic and carcinogenic gases such as radon and chloroform. Gases escape efficiently through diffusion – the movement of particles from high concentration to lower concentration. Diffusion is enhanced by wind and natural convection in water wave action.

Mt. Tabor Reservoir 5. Open reservoir drinking water inlet: waterfall agitating action aerates water providing oxygen, promotes water movement, while removing unwanted gases. Open reservoir sunlight also provides a public health barrier, using a natural, sustainable, gravity fed carbon-free process delivering safe and healthy water.

IV. FINDINGS: PROBLEMS VS. BENEFITS

A. Radon – Concentration vs. Dissipation



Covered reservoirs are inefficient in allowing escape of radioactive radon and other toxic gases. Open reservoir atmospheric volatilization provides efficient escape of toxic and carcinogenic gases.

Portland's open reservoirs can efficiently vaporize /diffuse radioactive radon-222 gas to the atmosphere using natural aeration. Due to a high Henry's Law constant, radon can leave water on contact with air when agitated. Radioactive radon gas is a serious and widely underestimated health risk that is naturally occurring in soil and groundwater. Portland's drinking water radon gas originates from the Columbia South Shore Well field. Because it is not chemically reactive with most materials it will move freely as a gas and can move substantial distances from its point of origin. Ingestion of radon through drinking water can also contribute to internal organ illness such as stomach cancer once it is absorbed into the blood stream.

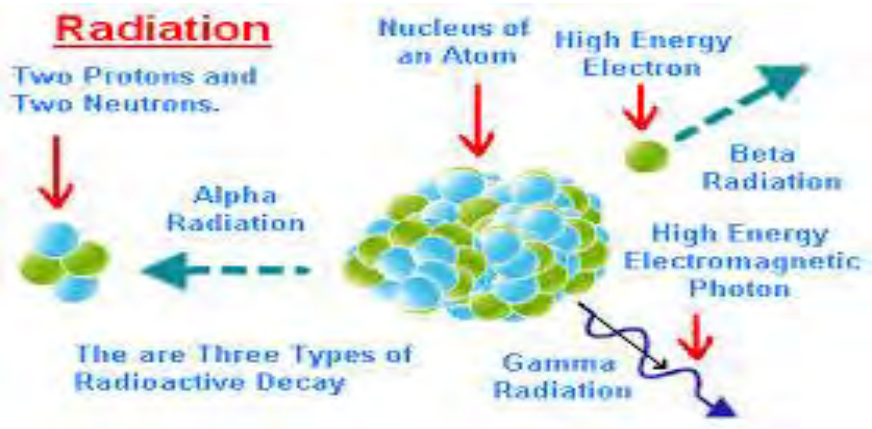
EPA acknowledges there is ***no safe level of radon exposure***, regardless of the source, air or water. The cancer risk of radon in water is higher than cancer risk from any other drinking water contaminant. Radon from drinking water can end up in the air of buildings in several different ways: **substantial radioactive water aerosols** can be created from showering, clothes washing, dishwashing, flushing toilets, and bathing.

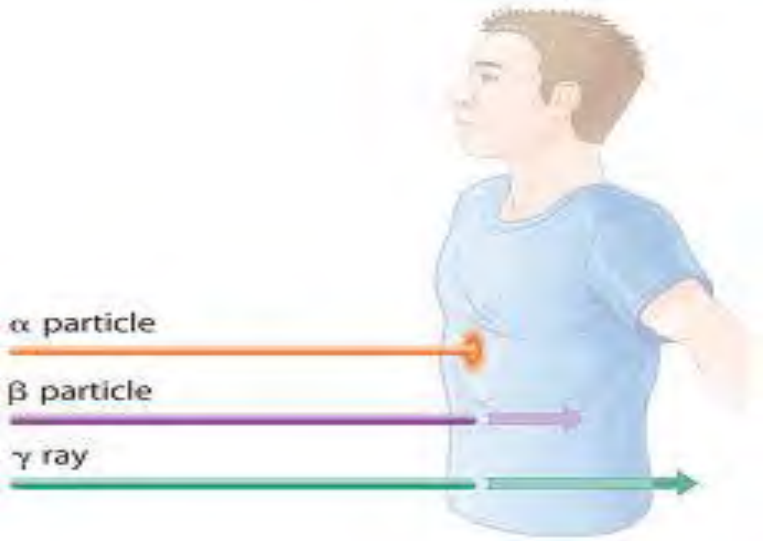
Radon is the second leading cause of lung cancer and contributes to +20,000 deaths each year. Radioactive alpha emitting radon gas also decays into radioactive atoms such as daughter progeny *polonium, lead*, and *bismuth.* These atoms can get trapped in the lungs when you breathe also emitting alpha, beta, and gamma particles continuing to release bursts of energy-damaging cells. This energy can genetically damage lung, blood, and other tissues' DNA. Over time these atomic exposures can lead to lung and other types of cancer. Because ***children have a much higher respiration rate than adults more radon can be inhaled***. EPA danger levels **underestimate** increased risk of radioactive particle inhalation and public health impact expectation in children.

Radon-222 Decay Process contains radioactive isotopes emitting all 3 types: Alpha, Beta, and Gamma particles

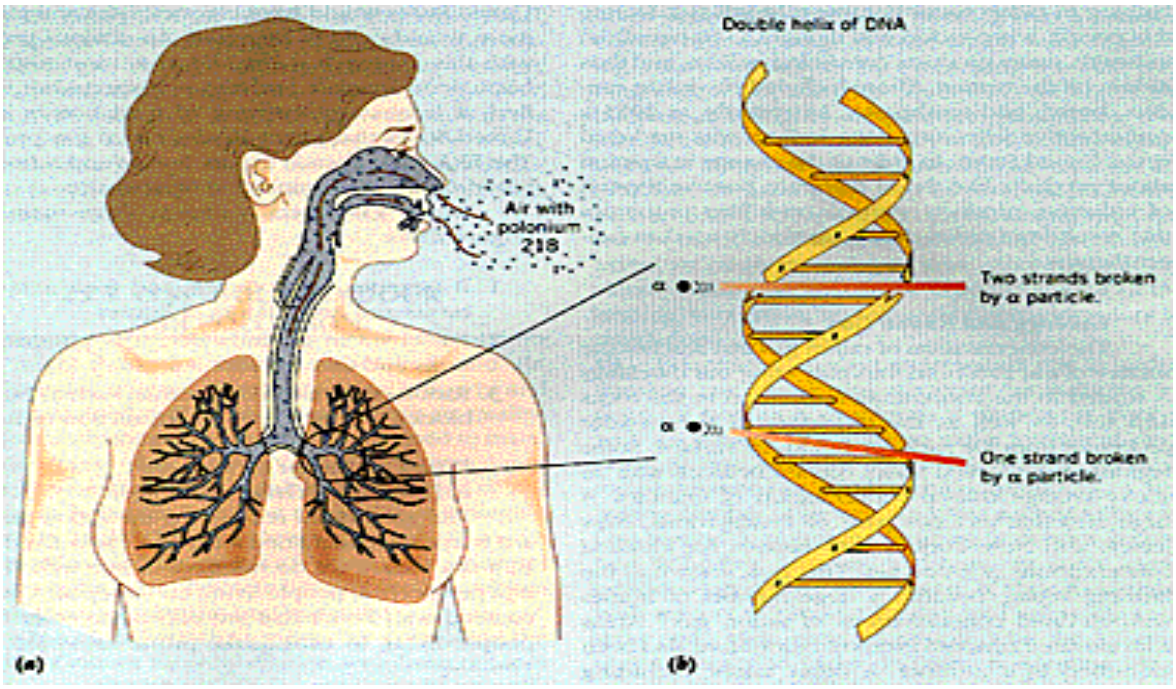
- Radon 222 – alpha particles and few gamma particles
- Polonium 218 – alpha decay
- Lead 214 – beta particles and gamma particles
- Bismuth 214 – beta particles and gamma particles
- Polonium 214 – alpha particles and few gamma particles
- Lead 210 – 22-year half-life so first 5 are basis for effect (Ref. 20)

Radon Isotopes And Decay Particles – Three (3) types of radioactive radon decay particle energy and negative impact on health:

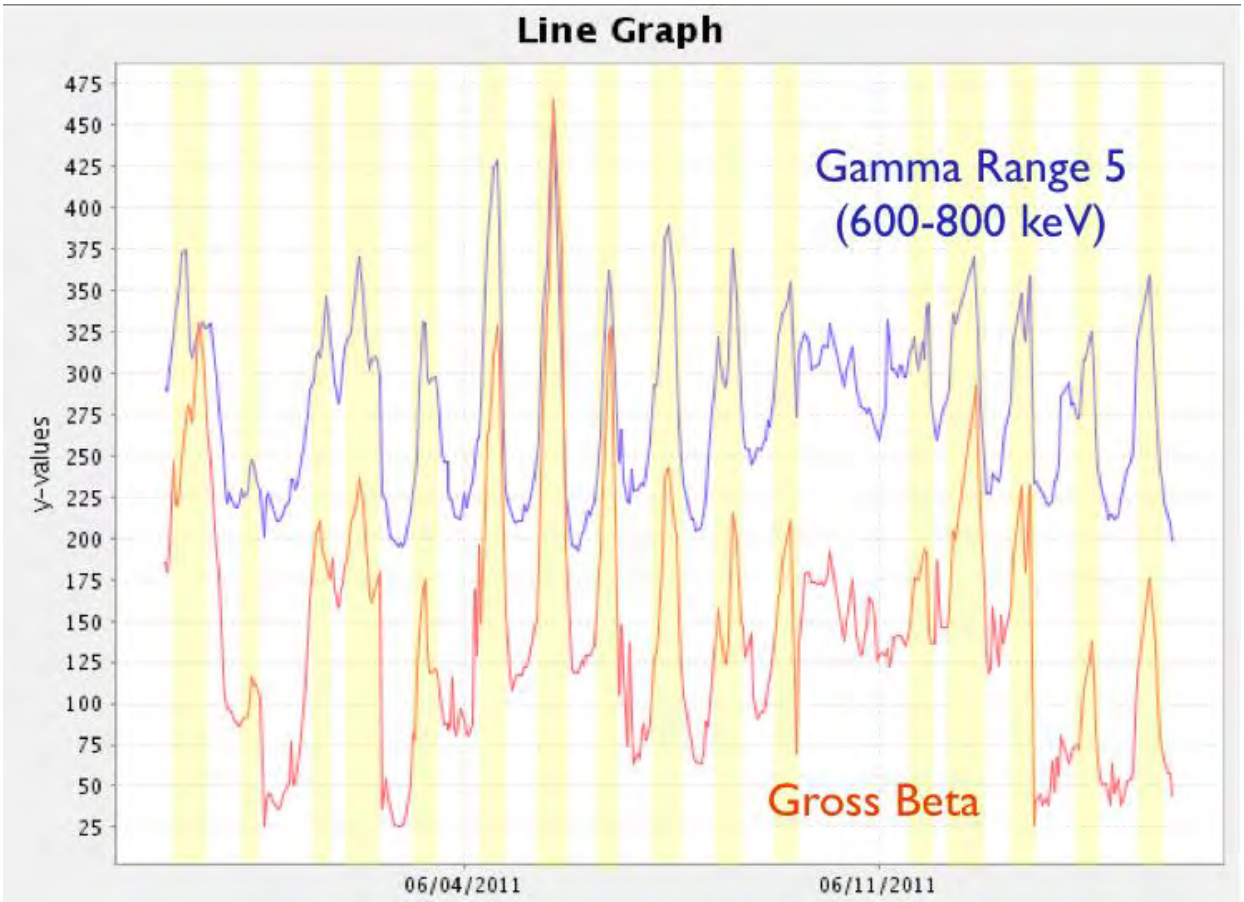




All radon decay particles – alpha, beta and gamma radioactive energy levels – can initiate negative health effects. Alpha particles, i.e., polonium, can penetrate cellular DNA promoting tissue damage and cancers. Beta and gamma particles have *much* higher energy levels that promote greater tissue damage resulting in *increased* health risks.



Radon- alpha particles penetrating cell DNA ending in tissue damage and cancers



Concurrent radioactive beta β and gamma Γ activity from radon 222 progeny

Data from the Oregon Department of Health and Human Services show more than 25% of the homes tested in Multnomah County exceed the soil origin ***indoor air*** action level of 4pCi / liter due to geological conditions. The Portland Water Bureau wrongly downplays the high public health risk of ***any*** level of radon in our drinking water by not acknowledging subsequent inhalation.

In a closed drinking water system without open reservoirs the risk of aerosolized radon inhalation from drinking water increases substantially. ***Any*** level of radon exposure from water would contribute to the total cumulative effect of inhalation risk associated with radioactive indoor air. A 1000 sq. foot house with a 4 pCi / of radon has nearly 2 million atoms in the air decaying every minute in *addition* to the decay atoms of the radioactive progeny such as polonium, etc. (USGS)

One single atom / alpha/ beta/ gamma particle can begin the cancer process when inhaled. Homes in the zip codes 97210- 97213 in north and northeast Portland are especially at risk, and there are many other areas in the city. ***Open air reservoirs provide the most efficient and sustainable radioactive radon risk mitigation process through volatilization***. The open reservoirs use the laws of chemistry and physics; utilizing diffusion up the water column, water agitation at the inlet, wind action promoting diffusion, leading to natural and harmless volatilization free of electricity. (EPA radon map)

The City of Portland Columbia South Shore Well fields (CSSW) produce radon 222 in excess of 300 pCi /L, exceeding the EPA action level. The Portland Water Bureau will tell the community the radon levels are diluted to 10% during summer usage. However if we incur turbidity events excluding Bull Run water we will be using CSSW water with radon 222 gas exceeding recommended levels. This does not include the cancer causing radioactive progeny atoms such as bismuth, polonium, lead, etc., from radon 222 decay. (Ref. 21)

EPA and Drinking Water Radon
EPA does not regulate radon in drinking water. The health concern with radon in drinking water is also associated with everyday household uses that can transfer radon to indoor air throughout the house along with the many radioactive decay isotopes. Radon in water can be released into the air when water is used for showering, laundry, washing dishes, toilet use, and other household activities. Some researchers have estimated that 1 pCi /L of airborne radon will result from the normal use of a water supply containing 10,000 pCi /L. This number is only an average and ***subject to variation***. The amount of radon transferred from water to air is a function of:

- The waterborne radon level;
- The amount of water used;
- The type of water use activity, e.g. shower (high transfer) vs. running water in a sink (low transfer); and
- The water and air temperatures (as the temperature of the water increases, radon transfer increases).

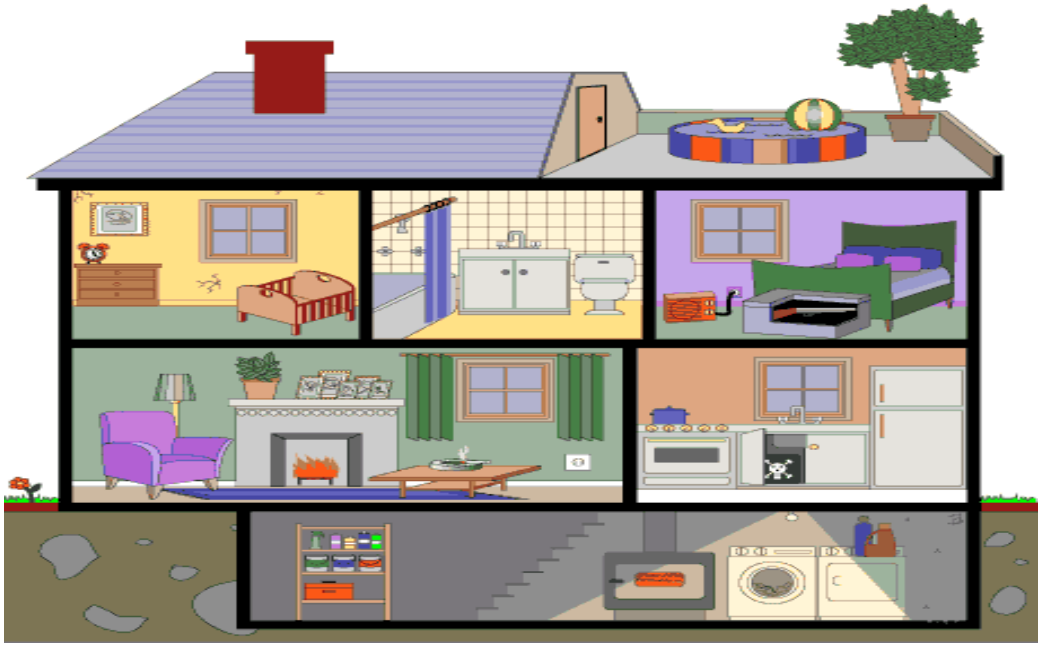
Because radon 222 is an unregulated EPA radioactive contaminant in drinking water, the Portland Water Bureau did not include it in our Water Quality Report in 2013. In past years we

have seen drinking water radon levels from the Columbia South Shore Well field above 350 pCi/L. The Portland Water Bureau continually yet incorrectly states that radon is a non-issue at these levels, yet EPA says "***there is no safe level of radon***". (EPA)

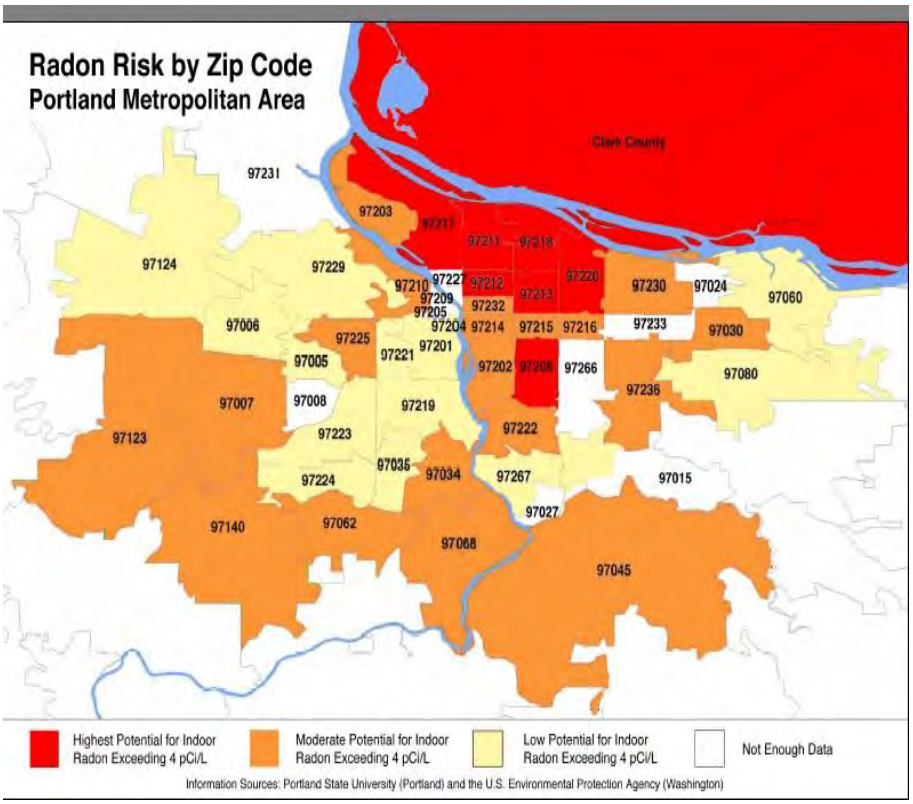
Even at small levels of radon, the cumulative effect of continuous household multiple water uses profoundly impacts the ultimate level of radon and daughter radioactive particles accumulating daily and weekly. Radon needs to be removed from our drinking water even if EPA has not completed a final radon drinking water rule.

National Academy of Sciences (NAS) conclusions are assumptions based on estimates that underestimate the overall public health effect. If the NAS study was acceptable as scientific fact, why was it not adopted by EPA as the standard for the final EPA Radon regulation? EPA says radon is the most cancer causing contaminant, yet there is **no** EPA Radon drinking water regulation.

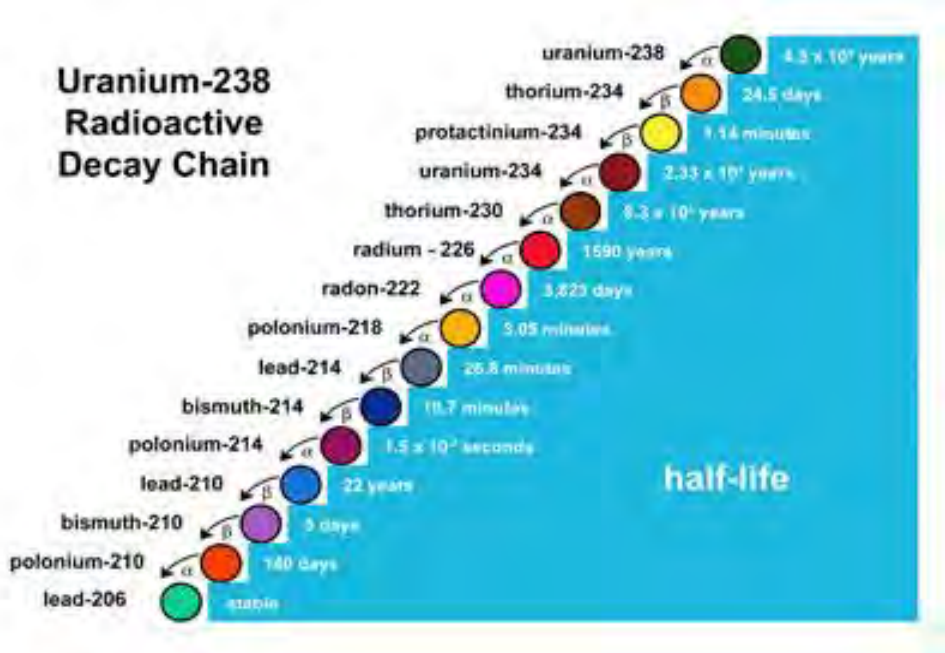
Open reservoirs will harmlessly and efficiently vent the radon and other gases into the atmosphere. Covered reservoirs are not designed for such activity of radon removal. So we begin to see what the effect of even conservatively estimated exposures will present from our closed water system and covered reservoirs.



Radon and other drinking water gases can enter your entire home, school, and workplace through the shower, toilet, washing machine, and faucets. Open reservoirs act as a barrier allowing gases to harmlessly vent into atmosphere before entering distribution system downstream.



Portland metropolitan radioactive radon-222 areas of risk. (US EPA)



Radon -222 is a gas with a half-life of about 4 days. However, the radon 222 decay products are isotopes of *solid elements* and will quickly attach themselves to molecules of water and other atmospheric gases. These, in turn, attach to dust particles. If inhaled, the decay products, whether attached to aerosol particles or 'unattached', will largely be deposited on the surface of the respiratory tract and, because of their short half-lives (↓half an hour), will begin to decay there.

Projection Estimate: Drinking Water Radon-222 Exposure in Closed System During Bull Run Turbidity Event

Radioactive decay process for radon-222 from Portland CSSW drinking water

–Radon-222 decays / 1000 sq. foot house with 4pCi radon = 2,000,000/min (USGS)

–In one hour there would be 120,000,000/hour radon 222 radioactive decays not including progeny.

–PWB CSSW >300 pCi / L radon x .0001 water transfer/air variable = .03 pCi /L (EPA)

1 pCi/L air = 500,000 radon decays/ minute

500,000 x .03 = 15,000 radon decays / minute

Decay time for daughter progeny

–Estimated radioactive decays in ~ one hour with continuous .03 pCi /L exposure

–Radon-222- 60 min. x 15,000 decay/min = 900,000 decay

–Polonium 218- 3minutes

–Lead 214- 29 minutes

–Bismuth 214- ~11 minute

–Polonium 214- <1 second

–Lead 210- 22 years

Estimated Household Impact from Continuous Decay of Radon 222 and Radioactive Decay Chain Progeny Over One-Hour Period

Minutes	RADON 222 α	POLONIUM 218 α	LEAD 214 β Γ	BISMUTH 214 β Γ	POLONIUM 214 α	LEAD 210
1	15kdirect >	15k				
2	15k	15k				
3	15k	15k 3 min >	15k			
4	15k	15k	15k			
5	15k	15k	15k			
6	15k	15k	15k			
7	15k	15k	15k			
8	15k	15k	15k			
9	15k	15k	15k			
10	15k	15k	15k			
11	15k	15k	15k			
12	15k	15k	15k			
13	15k	15k	15k			
14	15k	15k	15k			
15	15k	15k	15k			
16	15k	15k	15k			
17	15k	15k	15k			
18	15k	15k	15k			
19	15k	15k	15k			
20	15k	15k	15k			
21	15k	15k	15k			
22	15k	15k	15k			
23	15k	15k	15k			
24	15k	15k	15k			

25	15k	15k	15k			
26	15k	15k	15k			
27	15k	15k	15k			
28	15k	15k	15k			
29	15k	15k	15k			
30	15k	15k	15k			
31	15k	15k	15k			
32	15k	15k	15K29min>	15k		
33	15k	15k	15k	15k		
34	15k	15k	15k	15k		
35	15k	15k	15k	15k		
36	15k	15k	15k	15k		
37	15k	15k	15k	15k		
38	15k	15k	15k	15k		
39	15k	15k	15k	15k		
40	15k	15k	15k	15k		
41	15k	15k	15k	15k		
42	15k	15k	15k	15k		
43	15k	15k	15k	15k11min>	15k x 60/min	Stable
44	15k	15k	15k	15k	15k	
45	15k	15k	15k	15k	15k	
46	15k	15k	15k	15k	15k	
47	15k	15k	15k	15k	15k	
48	15k	15k	15k	15k	15k	
49	15k	15k	15k	15k	15k	
50	15k	15k	15k	15k	15k	
51	15k	15k	15k	15k	15k	
52	15k	15k	15k	15k	15k	
53	15k	15k	15k	15k	15k	
54	15k	15k	15k	15k	15k	
55	15k	15k	15k	15k	15k	
56	15k	15k	15k	15k	15k	
57	15k	15k	15k	15k	15k	
58	15k	15k	15k	15k	15k	
59	15k	15k	15k	15k	15k	
60 min	15k	15k	15k	15k	15k	
	~ 900,000	~ 900,000	~ 855,000	~ 420,000	~ 15,200,000	Decays

Hour = ~18,275,000

Public Health Risks from Showering With Radon-Rich Water

- ~70% of radioactive radon 222 gas is released in shower aerosol into household
- Percentage measurements of radioactive radon 222 gas becoming aerosol from shower heads at different water temperature
- Aerosol dynamics of radon in water before and after shower eventually decaying into radioactive daughter progeny

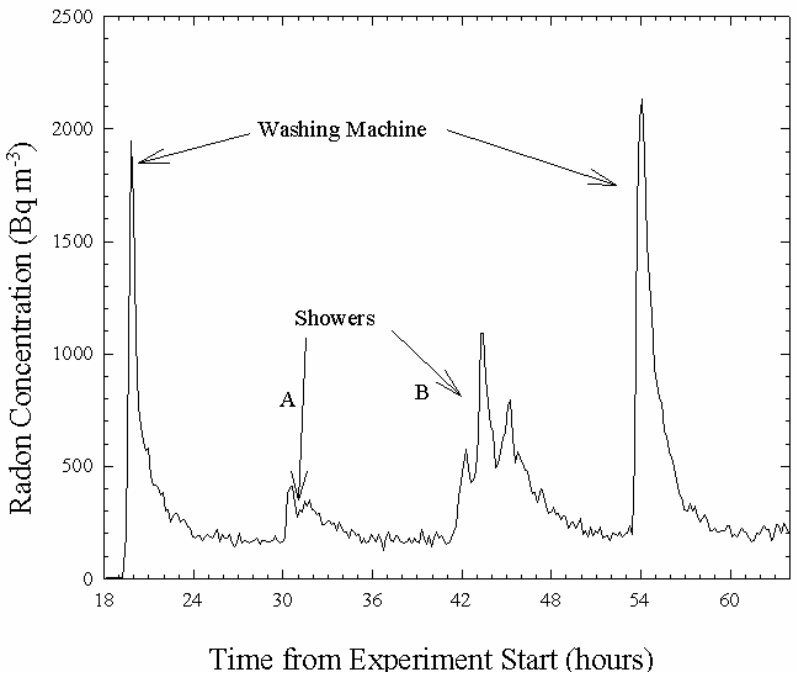
- One of the potentially important sources of short-term exposure is the emanation (discharge) of radon from water during showering and the subsequent in-growth of the radon decay products that continue to produce radioactive materials shower after shower.

TABLE 1. Laboratory Measured Emanation Fraction

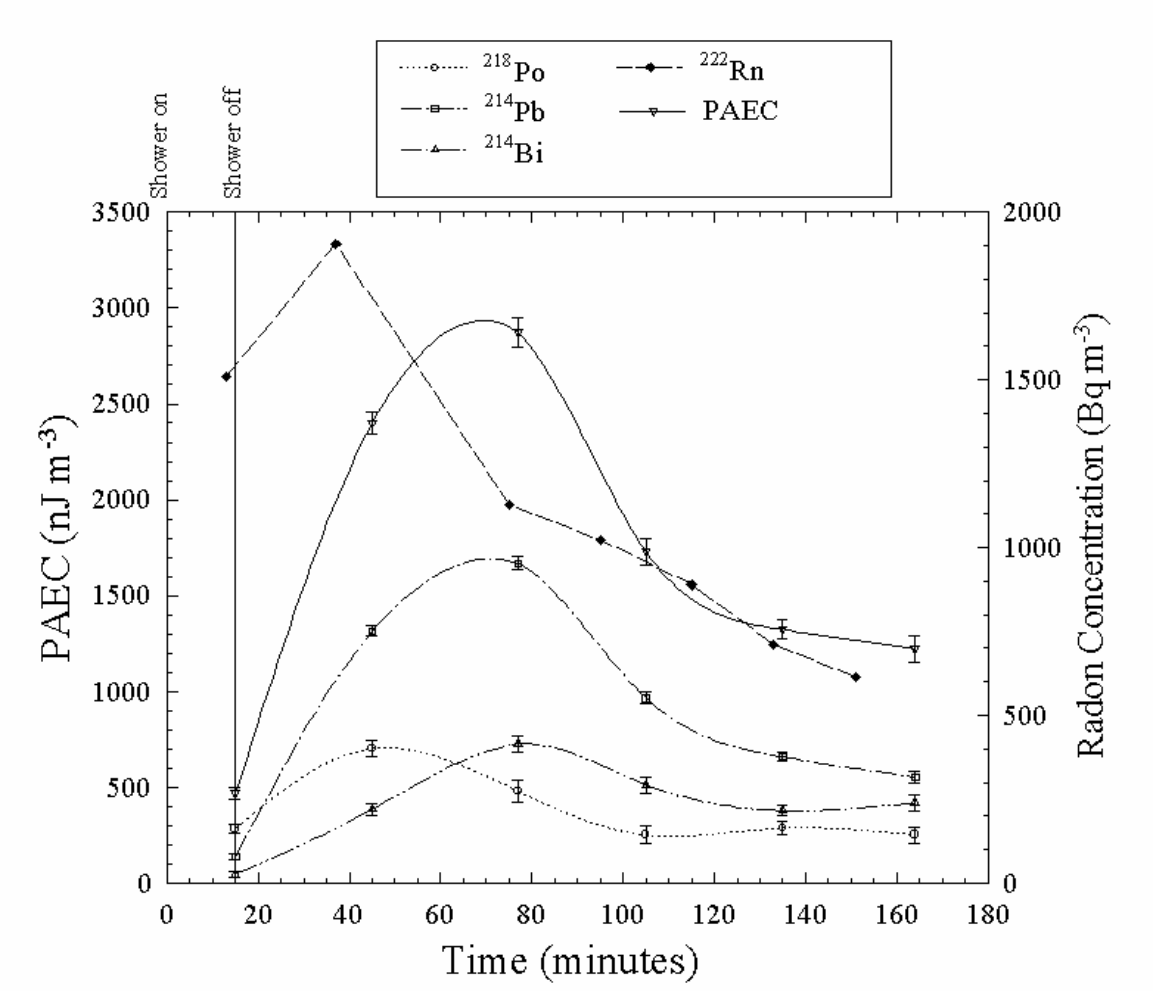
shower head	water temp (°C)	^{222}Rn in water concn before shower (kBq m^{-3})	^{222}Rn in water concn after shower (kBq m^{-3})	emanation (%)
head 1	32	374	108	71
	32	773	233	70
	21	375	124	67
	21	207	58	72
head 2	32	254	69	73

[a] Errors in these values are approximately ±2%.

Household – Aerosol of Radon 222 Gas Exposures from Everyday Activities

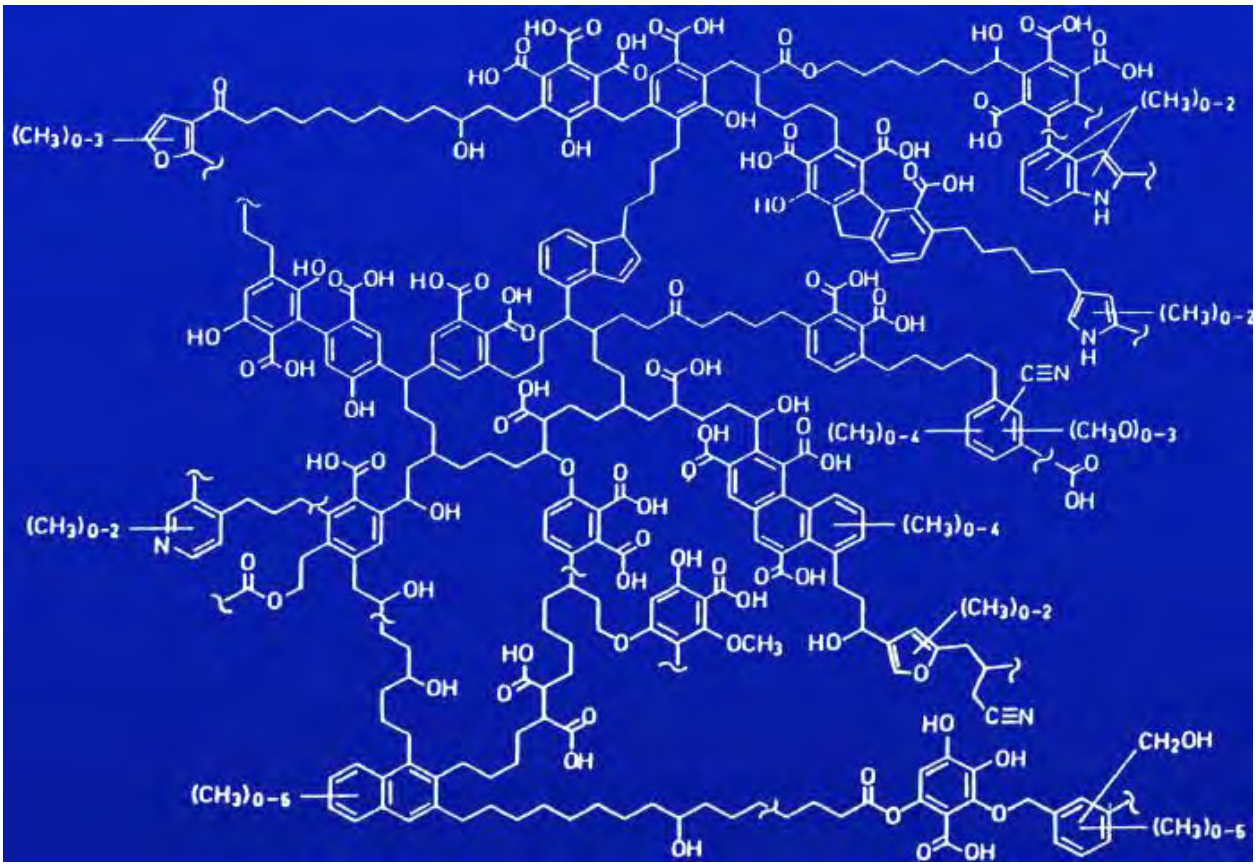


Spikes of radon 222 gas filled drinking water entering home from closed system that did not allow radioactive gas escape, ie., covered reservoirs.



Drinking water- aerosol of radioactive radon decay. Radioactive radon decay appeared later as expected establishing an aerosol presence over a long time period. (PAEC – potential alpha energy concentration) (Ref. 22)

B. Chloroform Formation – Concentration vs. Dissipation



Structure of acidic natural organic material (NOM) reacts with chlorine generating disinfection by-products such as chloroform. Chlorine alone added at Bull Run Headworks in the Bull Run Management Unit watershed for hours of disinfection exposure.

Elimination of Disinfection Byproducts Produced By Chlorine

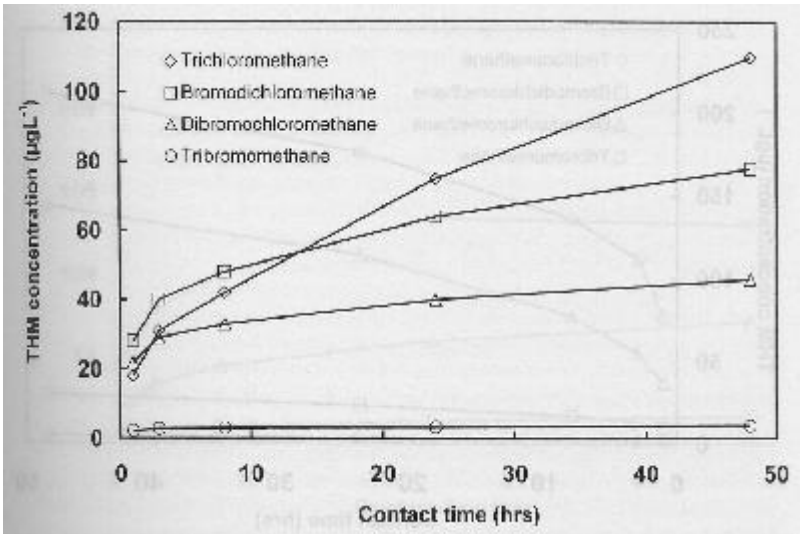
TTHM –Trihalomethanes

Trihalomethanes were among the first disinfection byproducts to be discovered in chlorinated water. These EPA regulated chemical substances are one of many types formed during the disinfection process. The EPA regulated Stage 2 DBP chemicals such as trihalomethanes and haloacetic acids are tested by Portland every three months. TTHM's can be divided into four different classes:

- Trichloromethane (chloroform, $CHCl_3$)
- Bromine dichloromethane (BDCM, $CHBrCl_2$) (no bromines in system)
- Chlorine dibromomethane (CDBM $CHBr_2Cl$)
- Tribromomethane (TBM $CHBr_3$)

These chemicals contain chlorine and bromine but are not in a reaction with methane. These reactions originate with NOM such as humic acid. Chloroform is a commonly occurring trihalomethane and the principle DBP, making it the most important chemical of this group to

remove from our drinking water. One of the important chemical properties of chloroform's environmental fate is its ability to volatilize, easily passing into air as a gas. Open air reservoirs naturally provide volatilization, enhanced through the fountain spray effect as seen in reservoir 6 and water fall/ agitation used in other reservoirs. Open air reservoir actions efficiently vaporize this unwanted toxic gas where it is then harmlessly broken down by sunlight. (Refs. 23-25)



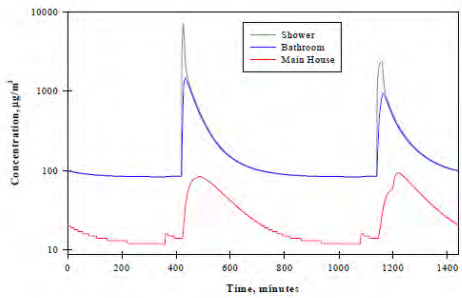
Chloroform (trichloromethane) production v. contact time. Chloroform gas content increases with increase in organic material contact time. PWB distribution system has been poorly maintained leading to increase in biofilm/sediment reactions resulting in greater chloroform gas generation. Open air reservoirs allow increases in chloroform to vaporize before entering distribution.

Covered reservoirs distribute toxic and carcinogenic contaminants into homes daily

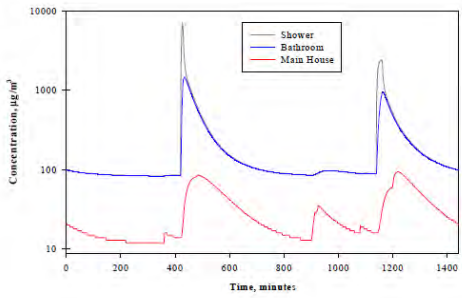
Reasons for open reservoirs and unwanted chemicals

"***Some people who drink water containing haloacetic acids in excess of the MCL over many years may have an increased risk of getting cancer. Some people who drink water containing trihalomethanes in excess of the MCL over many years may experience problems with their liver, kidneys, or central nervous system, and may have an increased risk of getting cancer."*** (EPA)

The following diagrams demonstrate how chloroform can increase – in a home supplied with water from a covered reservoir system – through drinking water aerosols formed through evaporation or routine activities such as showering, bathing, washing clothes, and cleaning. Because of the high Henry's Law constant, inhalation can provide the greatest public health risk by absorption in the human respiratory system including the surface of the lung. The primary factor that determines the relative magnitude of deposition in different regions of the respiratory tract (nose, airways, and alveolar) is the particle size distribution of the aerosol. Another potential source of exposure from aerosols is via dermal sorption when the aerosols are deposited on the exposed skin surface during different water use activities. Open reservoirs can reduce or eliminate THM chloroform gases using efficient open air reservoir volatilization before entering homes, schools, and work places.



a: Concentration Profile of Chloroform – Washing Machine Off



b: Concentration Profile of Chloroform – Washing Machine On

(a.) Concentration of household drinking water chloroform: shower, bath room, main house. Washing Machine OFF
(b.) Concentration of drinking water chloroform increasing: shower (top), bathroom (middle), main house with washing machine ON (bottom) (Ref. 26)

Waterfall effects of an open reservoir promote volatilization of gases before they enter your home.

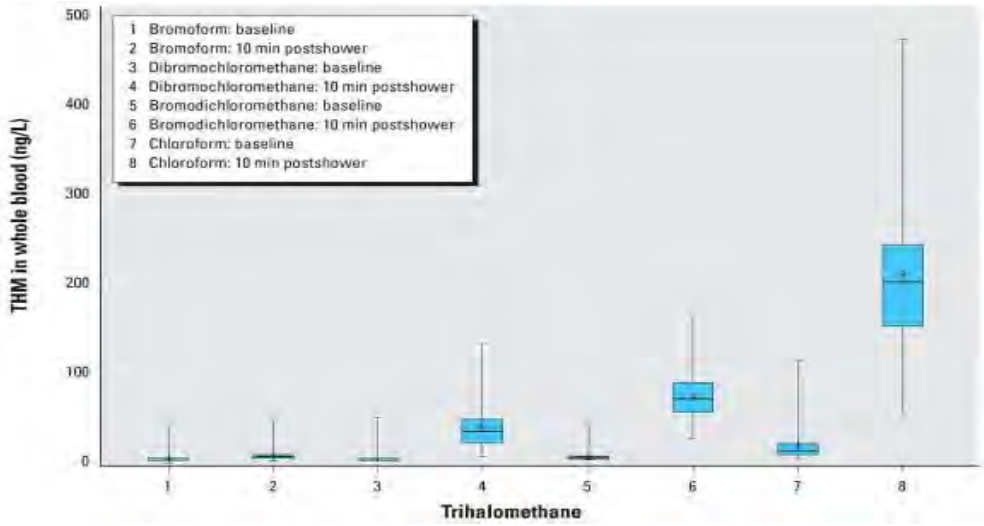
Water use in homes contributes considerably to levels of chloroform in indoor air and total exposure. Toxic and carcinogenic chloroform can enter your body in four ways: as you breathe, eat food, drink water, and it easily passes through your skin as you take a bath or shower. Chloroform can cross the placenta and is also found in breast milk. When chloroform crosses the placenta in humans, it can result in concentrations in fetal blood that are greater than maternal blood concentrations.

An epidemiological study indicated an association between chloroform concentrations in drinking water and intrauterine growth retardation. Concentrations of chloroform in indoor air were higher than those in ambient outdoor air owing primarily to volatilization during water use. When the shower water is hot enough for it to vaporize, inhalation of even more chloroform will occur. Ongoing and continuous exposures to chloroform – such as showering from the inefficiently vented closed reservoir water system – can allow for increased toxicity. Studies in people and in animals show that after you breathe air or consume food that contains chloroform it can quickly enter your bloodstream from your lungs or intestines.

Chloroform is carried by the blood to all parts of your body, such as the nervous system, fat, liver, and kidneys. Indoor air exposure to the volatile THMs such as chloroform is particularly important with houses having low rates of ventilation and high rates of showering and bathing. Chloroform is a California Proposition 65 carcinogen. (Refs. 27-30)

Open Reservoir Atmospheric Volatilization – Total Trihalomethanes (TTHM)
THM concentrations were important predictors of blood THM concentrations immediately after showering. Chloroform concentrations in the shower stall air are the most important predictor in determining blood concentrations after the shower.

Chloroform can be degraded photo-chemically by sunlight and evaporates easily utilizing the open reservoir air surface/ water partial pressure differences in promoting atmospheric volatilization. The open reservoirs provide significant opportunities to efficiently volatilize toxic and carcinogenic THMs. In a closed system such as a covered reservoir, such sunlight degradation and atmospheric volatilization does not occur.



High chloroform blood level saturation from shower shown at 7 & 8. (Ref. 31)

More EPA Regulated Disinfection By-Products Generated from Chlorine and Chloramine

Haloacetic Acids – HAA_5
The five most common are

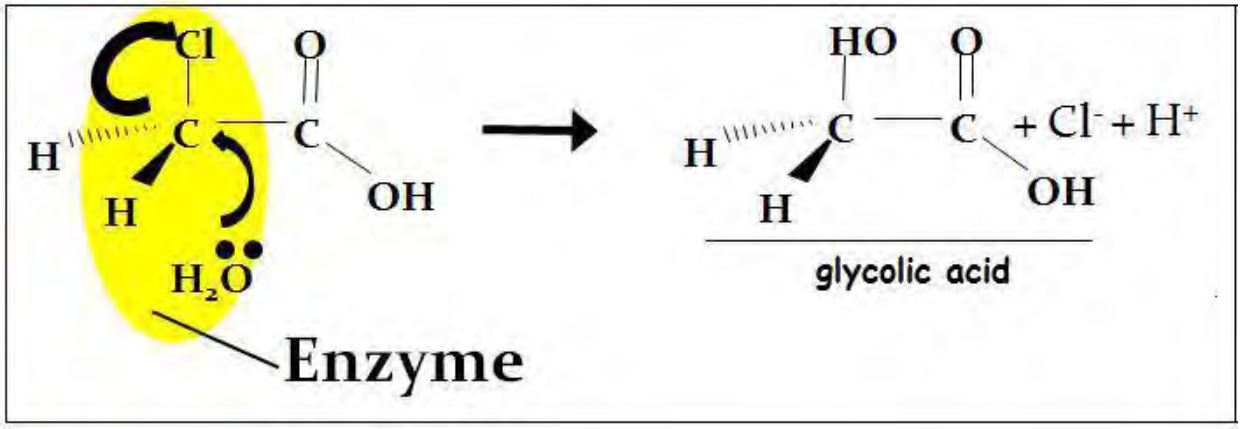
- Monochloroacetic acid (MCAA) ClCH2COOH
- Dichloroacetic acid (DCAA) Cl2CHCOOH
- Trichloroacetic acid (TCAA) Cl3CCOOH
- Monobromoacetic acid (MBAA) BrCH2COOH
- Dibromoacetic acid (DBAA) Br2CHCOOH

In addition to trihalomethanes (THM), haloacetic acids HAA_5 are a class of disinfection byproducts produced by chlorine and chloramine chemical reactions with natural organic material in the water. These disinfection byproducts are also regulated by EPA because of public health concerns. Loss of HAA_5's in water distribution systems has been frequently attributed to biodegradation. Experimental *aerobic* biodegradation rates have shown to be rapid. Oxygen loving aerobic bacteria are associated with the biodegradation and removal of the HAA_5's toxic and carcinogenic disinfection byproducts. Aerobic bacteria have a beneficial role in suppressing the concentrations in tap water. They are integral part of the efficient HAA_5 removal in drinking water such as open reservoir system. (Refs. 32-35)

Oxygen loving aerobic bacteria in our open reservoirs can biodegrade and remove HAA_5 from water

HAA_5 are the second most prominent class of EPA regulated drinking water halogenated disinfection byproducts and are water soluble. HAA_5 chemicals such as DCAA and TCAA present a toxic and potentially hepatocarcinogenic public health hazard that can be expected to be detected in chlorinated drinking water distribution systems. Genotoxicity, reproductive toxicity, embryo toxicity, neurotoxicity and immunotoxicity of DCAA have also been reported. The presence of DCAA and TCAA increases the toxicity of chloroform in female animal studies. (Refs. 36-38)

Microbial removal of these HAA_5's increases water quality and health.



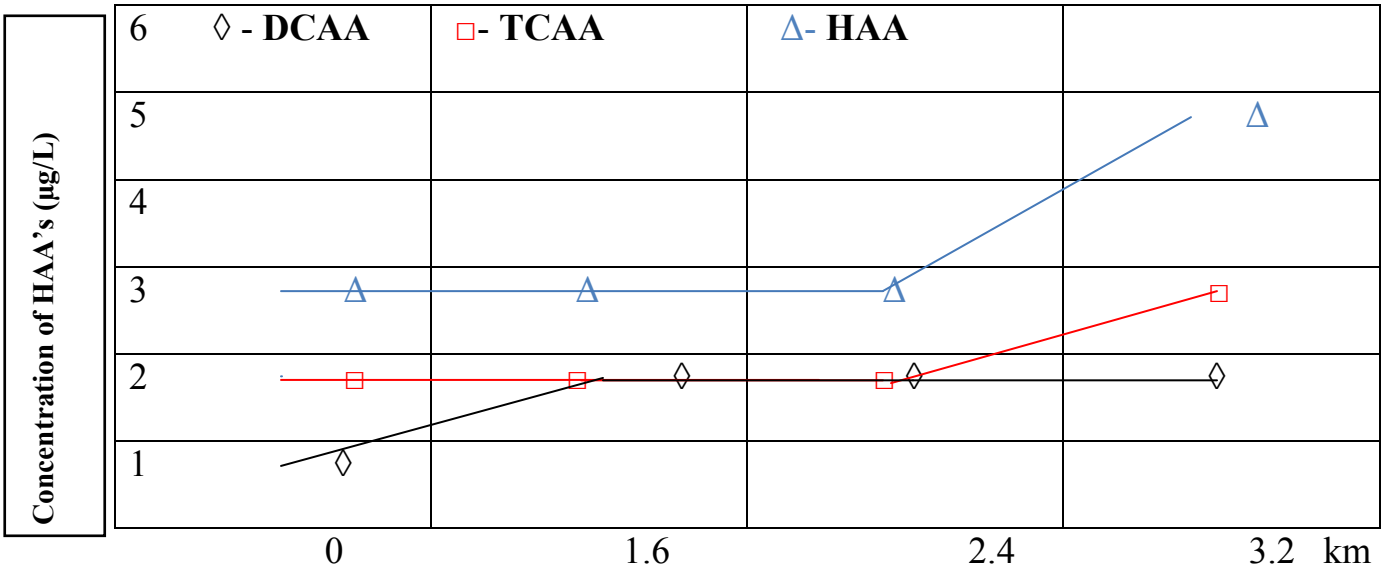
Potential bacterial biodegradation pathway of MCAA. Glycolic acid is then in the general metabolism, and may be photodegraded by sunlight, stopping the HAA from being able to biopersist or bioaccumulate in the environment. (Refs. 39-40)

Summary of how open reservoirs provide support removing HAA_5

- The open reservoirs can provide a natural and sustainable aerobic biodegradation process of the unwanted HAA_5
- Different bacteria are known to aerobically degrade HAA_5 either co-metabolically or as a sole carbon and energy source
- Because HAA_5 are biodegradable compounds they can utilize the enhanced efficiency of *aerobic* microorganisms as a benefit for the open reservoir drinking water quality

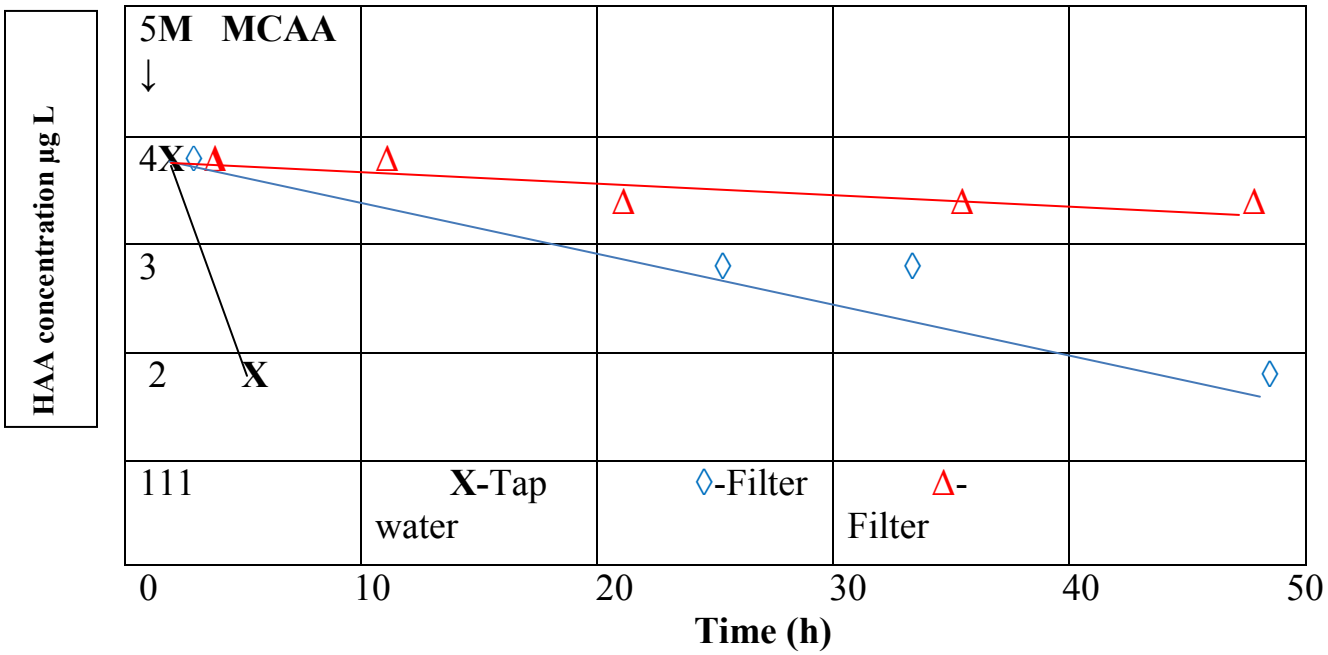
- Aerobic microorganisms are 18 times more efficient in metabolizing chemical compounds than the *anaerobic* microorganisms, found in closed and covered reservoirs
- Oxygen loving aerobic microorganisms degrading HAA_5 act as another desirable public health barrier found in the open reservoirs
- Photolysis/ sunlight can provide additional degradation pathways for HAA_5 in natural waters
- Open reservoirs support peroxide formation in aerobic biodegradation as a mechanism for reduction HAA5 in surface waters before entering distribution systems
- **Aerobic biodegradation in open reservoirs provides superior public health benefits to the anaerobic conditions of covered and closed reservoirs**

Haloacetic Acids Increase in Poorly Maintained Distribution System

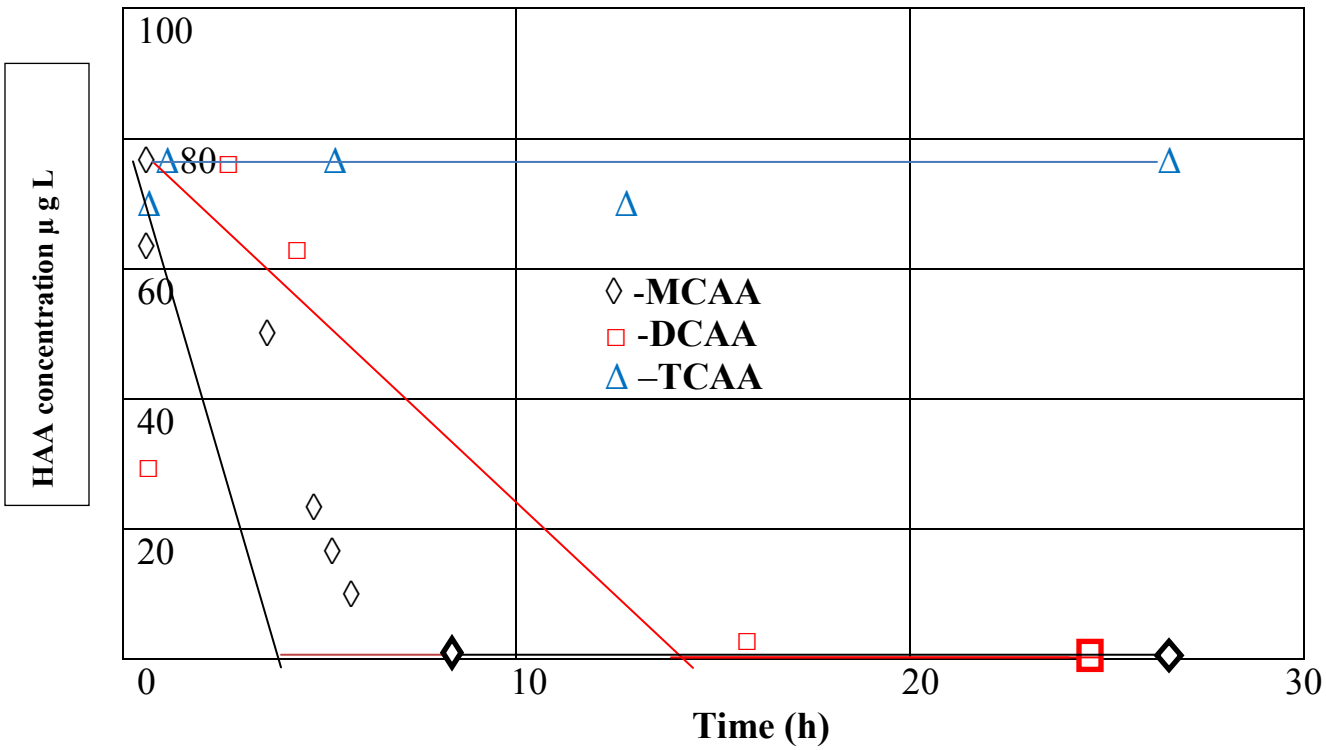


Biofilm from poorly maintained distribution system, i.e., Portland Water Bureau, can increase HAA from continuous chlorine reaction in water pipes

Aerobic Microbial Degradation of Haloacetic Acids - HAA's



HAA Biodegradation by Selected Isolates-R2A DR8 Pseudomonas Tap Water



HAA Biodegradation - R2A-DR11 Aquabacrterium sp. Tap Water
Isolation of HAA degrading bacteria from drinking water using complex media (Ref. 41)

C. Other Disinfection Chemicals – Higher vs. Lower Use

EPA Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage2DBP)
The Bull Run drinking water system was designed by highly accomplished engineers who incorporated the brilliant scientific and public health principles established within fundamental laws of chemistry and physics. As a continued reminder our Bull Run drinking water system was designed with **three critical public health barriers**:

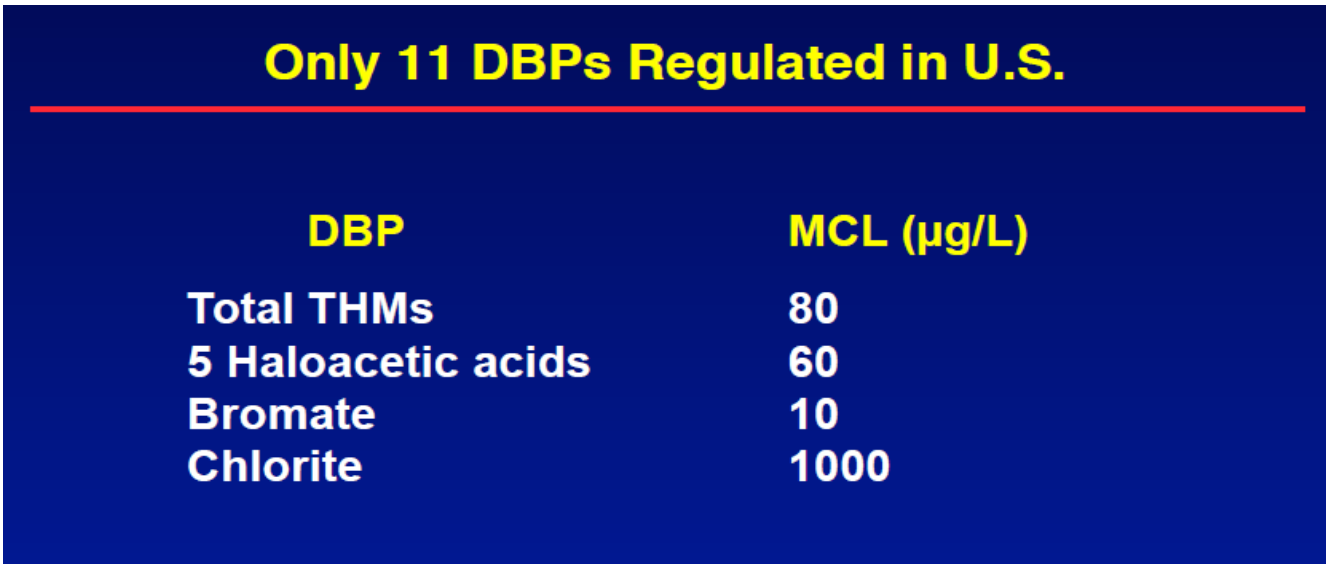
- Portland is truly fortunate to have the federally protected closed to human entry Bull Run Management Unit as our first public health ***barrier***, providing safe drinking water free of municipal, industrial, and agricultural sewage exposure that are the primary sources of US surface drinking water contamination.

- The second ***barrier*** is simple chlorine/ammonia as a disinfection process that provides protection against waterborne disease causing microorganisms.

- Portland's open reservoirs provide a crucial third ***barrier*** by removing unwanted gases, chemicals, and disinfection byproducts (DBP) using natural sustainable aerobic processes before entering our major distribution system. Open reservoir removal of toxic and carcinogenic chemical DBP take place through the following processes:
  -Volatilization efficiency -Biodegradation-microbial
  -Aerobic activity/oxygenation -Photolysis/sunlight -Water agitation

We Need Open Reservoirs to Address the Environmental Chemical Challenges of the Future

The **EPA Stage 2 Disinfectant Byproduct Rule** is intended to reduce potential cancer, reproductive, and developmental health risks from disinfection byproducts which form when disinfectants are used to control microbial pathogens. Our open reservoirs not only currently meet EPA LT2 needs but are also needed to enhance the removal of the EPA regulated trihalomethanes (TTHM), haloacetic acids (HAA_5), as well as other toxic chemicals before these can enter our homes, schools, and workplaces. Natural aerobic atmospheric volatilization of gases and biodegradation of DBP chemicals from open reservoirs diminish the related potential health risks and can provide more efficient public health protection than covered reservoirs can offer. Long-term EPA drinking water standards do not include children but are based on 70 kg /+154 lb. ***adults***. Further DBP chemical removal enhanced by our open reservoirs is needed to decrease public health risk for children, pets, as well as adults.



Toxic and carcinogenic disinfection byproducts regulated by EPA Stage 2DBP

List of EPA's 11 regulated DBP's – sampled only 4 times / year

Total Tri Halo Methanes (TTHM's)

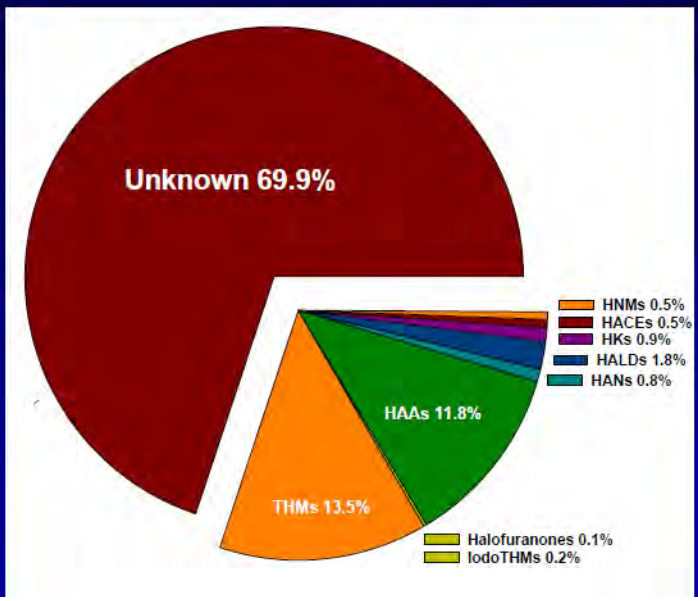
- Chloroform – most prevalent
- Bromoform
- Bromodichloromethane
- Dibromochloromethane

Halacetic acids (HAA's)

- Monochloro
- Dichloro
- Trichloro
- Monobromo
- Dibromo
- Bromine-
- Chlorite-

In addition, many disinfectant byproducts are not known or well-studied. Open reservoirs can reduce/remove many toxic and carcinogenic chemicals before being inhaled, ingested, and absorbed through skin exposures.

But, more than 50% still not known….



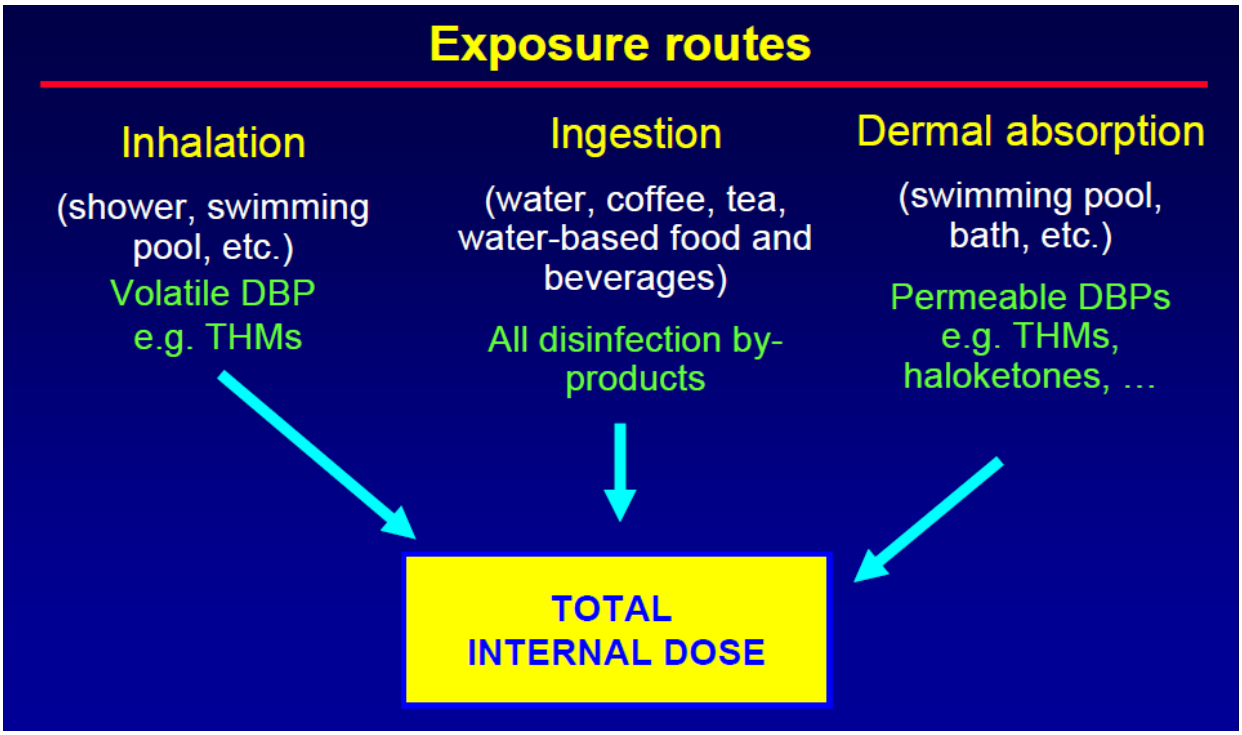
(US EPA)

>600 DBPs Identified

Halogenated DBPs
- Halomethanes
- Haloacids
- Haloaldehydes
- Haloketones
- Halonitriles
- Haloamides
- Halonitromethanes
- Halofuranones (e.g., MX)
- Oxyhalides (e.g., bromate)
- Many others

Non-halogenated DBPs
- Nitrosamines
- Aldehydes
- Ketones
- Carboxylic acids
- Others

(US EPA)

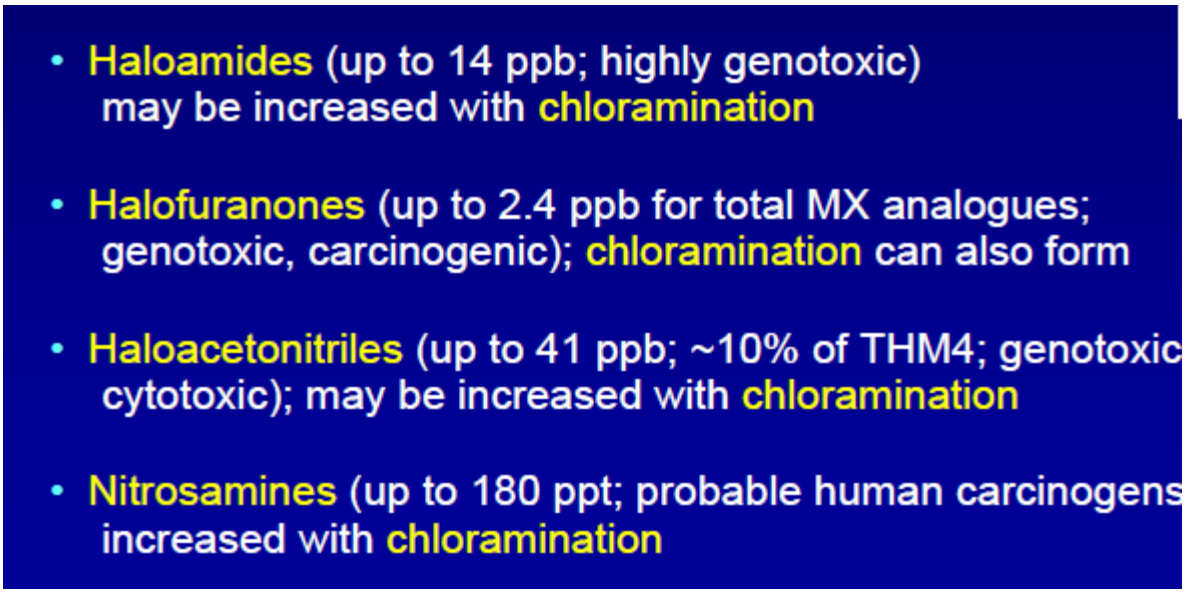


(US EPA)

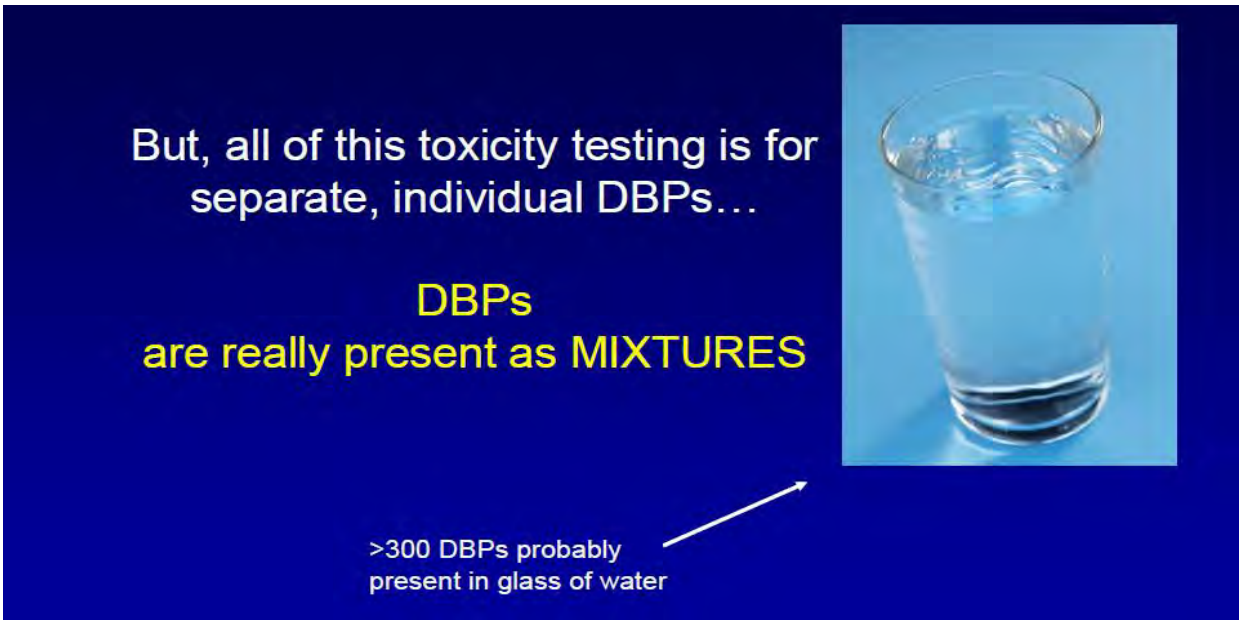
Route of exposure is important….

- Can get 2X exposure from 10 min shower compared to drinking 2L of tap water (inhalation)
- Some DBPs dermally absorbed
- Evidence of increased bladder cancer with swimming in indoor pools (inhalation, dermal): Villanueva et al., *Am. J. Epidemiol*. 2007, *165*, 148-156.

(US EPA)



Emerging Chloramination Disinfection By-Products (US EPA)



(US EPA)

D. Nitrification – Presence vs. Absence

Nitrification is a microbial process by which reduced nitrogen compounds (primarily ammonia) are sequentially oxidized (broken down) to nitrite and nitrate. Ammonia can be present in drinking water through either naturally-occurring processes or through the addition of ammonia to the already present chlorine, during the secondary disinfection process to form chloramines. Drinking water chloramines provide the greatest source of nitrogen which under certain conditions can be used to produce the nitrites/nitrates eventually leading to nitrosamines.

Ultraviolet light depletes free chlorine, whereas chloramines seem to be quite stable in sunlight. Although monochloramine can degrade *slowly* when exposed to the atmosphere at varying rates depending on the amount of sunlight, wind, and temperature, the nitrifiers (bacteria) are very sensitive to near UV, visual, and fluorescent light. Consequently, nitrification episodes in distribution systems occur in the dark (in covered reservoirs, pipelines, taps, etc.) Because of exposure to sunlight, nitrification has not been generated in open reservoirs. (Refs. 42-44)

The nitrification process is primarily accomplished by two groups of autotrophic (self feeding) nitrifying bacteria.

Step 1- Nitrosomonas sp. oxidizing ammonia → nitrite

$$NH_3 + O_2 \rightarrow NO_2^- + 3H^+ + 2e^-$$

Step 2- Nitrobacter sp. oxidizing nitrite → nitrate

$$NO_2 + H_2O \rightarrow NO_3^- + 2H^+ + 2e^-$$

The two groups of bacteria commonly found in aquatic environments can break down ammonia into nitrite and nitrate. The presence of nitrite in a water supply is undesirable because of health concerns such as methemoglobinemia where nitrogen replaces oxygen in red blood cells. Nitrite can also accelerate the decomposition of monchloramine and interfere with chlorine and chlorine residual measurements.

Increased chlorine demand and decay change the disinfectant residual (concentration levels) as it travels through the distribution system as monochloramine. Ammonia concentrations naturally increase as the chlorine concentration decreases through this process***. Sunlight in open reservoirs inhibits nitrification bacteria from oxidizing ammonia to nitrite and nitrate***. Application of chlorine at the reservoir outlet binds to the ammonia efficiently and cost-effectively increasing chloramine residual downstream in the distribution system. ***The absence of sunlight and the dark environment in closed and covered reservoirs allows microbial nitrification activity to continue oxidizing ammonia into unwanted nitrite and nitrate, etc***. Nitrification issues have been documented in Los Angeles covered reservoirs such as Garvey and Orange County.

N-nitrosodimethylamine (NDMA) important nitrogenous chemical reaction-

Nitrate → nitrite → nitrosamines

Chlorine and chloramine can react with organic nitrogen material that can contain precursors to NDMA. NDMA is routinely detected in drinking water utilities. NDMA detection may vary during seasonal changes due to differences in organic material levels. Water quality data from surface water sampling demonstrated that NDMA is significantly broken down in surface water due to ultraviolet degradation from exposure to sunlight. Based on the data, a half-life of 2.2 hours in surface water was estimated for NDMA.

Photo degradation (sunlight) is the main process for removing NDMA from the aquatic environment, yet NDMA can persist in the absence of sunlight such as in a closed and covered reservoir. From a covered reservoir the toxic NDMA continues on into the drinking water distribution system to be consumed in our homes, schools and businesses. (Refs. 45-46)

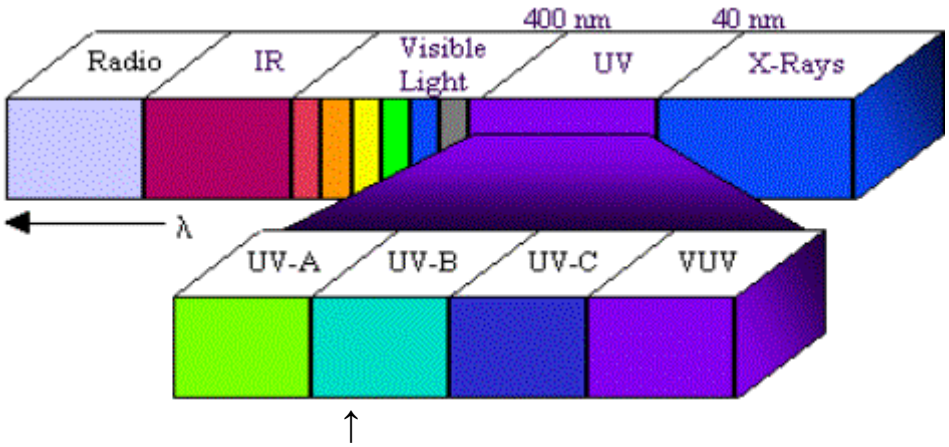
N-Nitrosodimethylamine (NDMA) is a member of a family of extremely potent carcinogens, the *N* – nitrosamines. Their cancer potencies are much higher than those of THM's. Concerns about NDMA mainly focused on the presence of NDMA in foods and drinking water. NDMA has produced liver tumors and parenchymal cell tumors when administered orally**. NDMA acts as a transplacental carcinogen and has been found in breast milk**. NDMA can be inhaled, and absorbed through the skin. Increases in lung, liver, and kidney tumors have been observed after inhalation exposure. NDMA is structurally related to known carcinogens and can be mutagenic in microorganisms. (Refs. 47-50)

"Blue Baby"syndrome from nitrification of drinking water. Nitrate poisoning where red blood cells have decreased oxygen, resulting in *methemoglobinemia*

E. Oxygenation – Absence vs. Presence

Oxygen introduced at the open reservoirs' fountains and waterfall inlets saturates the water and provides many public health benefits. Oxygenation provides a secure environment for helpful aerobic bacteria, reduces unwanted anaerobic bacteria, and provides a natural source for disinfection precursors such as oxides and peroxides. Oxygen enriched water naturally enhances aerobic bacteria metabolism, yielding a superior efficiency in chemical biodegradation than anaerobic bacteria metabolism found in covered reservoirs. Closed and covered reservoirs do not provide these advantages.

F. Light Disinfection – Broad Spectrum Sunlight



Natural broad spectrum sunlight benefits in open reservoirs. The many wavelengths of natural sun light provide well established disinfection properties that artificial UV used in drinking water treatment cannot. Arrow at UV-B shows the artificial UV radiation 254 nm wavelength used for drinking water facilities. The single wavelength 254 nm provides significantly less energy to break down microorganisms than does natural sunlight.

Natural disinfection from sunlight is well known. Sunlight is among the most potent abiotic factors in the inactivation or killing of bacteria and other microorganisms in water. Sunlight imparts a broad and effective spectrum of photon wavelength exposures that include: gamma, x-ray, ultraviolet, visual, infrared. Sunlight photolytically (breaks apart) reacts with and disrupts microorganism chemical structures. Additionally our open reservoirs incorporate efficient oxygenation of water at the fountains and the inlet waterfalls, synergistically enhancing microbial disinfection. This is achieved when sunlight photons react with oxygen-based molecules forming free radicals and oxides such as peroxide. These chemicals also react with microbial structures providing a sustainable and natural disinfection effect. Covered and closed reservoirs cannot provide the natural disinfection benefits of sunlight.

The condition of oocysts is very important in determining the risk of infection. Oocysts are exposed to many conditions in the environment that can reduce their infectivity before entering the distribution system. The length of time post shedding, water temperature, and the amount of

ultraviolet UV exposure from sunlight can effectively reduce oocyst infectivity. Although oocysts are considered environmentally resistant they exhibit considerable loss of infectivity as environmental temperature increases. Above 50^0F loss of infectivity increases. In addition, surface waters are exposed to natural UV irradiation in sunlight which may damage oocyst DNA therefore inhibiting DNA replication and reducing infectivity. Due to specific gravity influences, many organisms such as Cryptosporoidium, Giardia, etc., exist at the top of the water column surface where UV sunlight can easily render them harmless. (Refs. 51-53)

G. Public Health Record of Closed Reservoirs

From 1949-1969 the American Water Works Association, American Public Health Association, and U.S. Public Health Service proposed covering reservoirs ***even though there were no historical or current public health problems with open reservoirs.*** While these organizations were covering reservoirs for alleged public health reasons, closed reservoirs were being built and maintained with materials such as ***lead-based paints and petroleum-based coatings*** on the interior of these reservoirs. As early as 1904 lead-based paints were recognized as toxic. Since the 1920's *benzene*, a component of petroleum-based coatings, has been known to cause cancer. Thus, these materials have been widely known and recognized for decades as toxic and carcinogenic while in direct contact with drinking water. These toxic and carcinogenic chemicals can still be found and used with closed reservoir structures placing drinking water and public health at risk. (Ref. 54)

Although the covered reservoir storage facility is normally an enclosed structure, numerous access points can become entry points for debris and contaminants. Consumer deaths from closed reservoirs are historically well-documented from these points of entry.

These contaminant pathways include roof top access hatches, sidewall joints, vent and overflow piping, roof cracks, and workmanship inconsistencies.

The most common problems reported from inspectors in covered reservoirs:

- No bug screens on vents and overflows
- Cathodic systems not adjusted or operating properly
- Unlocked access hatches
- Presence of lead paint (interior and exterior) and the presence of unapproved paints

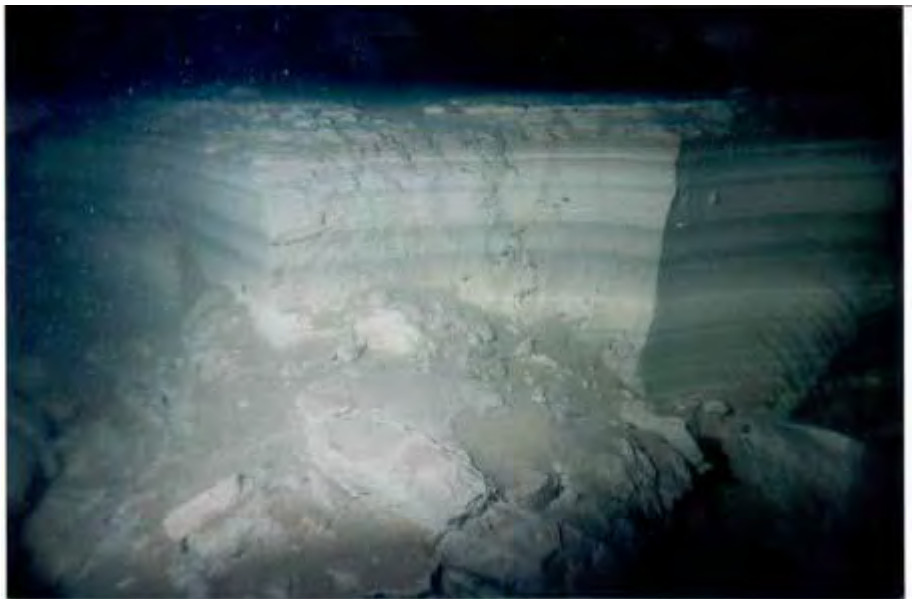
Common coating problems reported by tank inspectors relating to water quality:

- Chemical leaching from incompletely cured coating
- Corrosion product buildup from excessive interior corrosion
- Turbidity events from bottom sediments
- Unknown chemical leaching from non-approved coatings and lead leaching from lead-based interior coatings

Points of public health concern:

- Disinfectant decay – nitrification facilitation from dark environment
- Chemical contaminants – toxic and carcinogenic coatings

- DBP retention – lack of atmospheric volatility
- DBP retention – lack of sunlight
- Tastes and odors – anaerobic flora metabolites
- Sedimentation / biofilm – less-frequent cleaning schedule +5 years
- Microbial contaminants – known source of many consumer deaths
- Roof leakage and contamination cement seams (Seattle)
- Roof leakage and benzene from rubberized asphalt degrading (Seattle)
- Accumulation of toxic filtration media remaining in seldom-cleaned tanks



Unhealthy accumulation of post-filter media in drinking water: aluminum sulfate (alum) in seldom-cleaned covered reservoir. (Ref. 58)

Microbial case studies

Covered reservoir storage facilities have been identified in microbial drinking waterborne disease deaths and outbreaks:

- In 1993 Salmonella typhimurium was identified in a Gideon, Missouri, outbreak from bird contamination in a covered municipal water storage tank. Pigeon droppings from the roof area carried into the openings of a closed tank were identified as the etiological agent. Seven persons died, and hundreds became ill.

- Also in 1993, a Campylobacter jejuni outbreak in Minnesota from a drinking water storage tower. Fecal coliform were also found.

- In 2008, Salmonella typhimurium caused another death and hundreds of illnesses from a covered drinking water reservoir in Alamosa, Colorado. Contaminants identified from bird access unobserved in covered reservoir.

Covered Alamosa, Colorado reservoir where Salmonella bacteria from prolonged bird roosting exposures were not visible or detected, causing illness and death

Concerns from Questionable Water Engineering Judgment Decisions: Past and Current Covered Reservoir Surfaces Coated with Toxic Materials

Coating materials are used to prevent hydrostatic (water) moisture migration in concrete tanks, pH changes, and corrosion of steel storage tanks. Coatings used in finished water storage facilities were selected because of their structure protection and ease of application. The common use of coal tars, greases, waxes, and lead paints as interior tank coatings was accepted by engineers. These products contributed significant toxic chemical exposure to the drinking water. Grease coatings can differ in their composition from vegetable to petroleum and can provide food for bacteria resulting in disinfection problems along with taste and odor issues in finished water.

Toxic chemical case studies:

- Petroleum grease applied in 1925 in a Florida storage tank interior caused odor, taste, disinfectant, and slime problems. In 1988 the grease was reapplied. The grease was removed in 1996 and a polyamide epoxy was applied.

- East Bay Municipal Utility District used hot-mopped coal tar as their interior coating material for tanks through the 1960's. Hot-mopped coal tar is still seen today in operating water tanks at other utilities.

- Structural and building designs continue to be problematic in closed and covered reservoirs. Cracks in the ceiling of the new 2009 Seattle reservoirs can allow for intrusions of contaminated water and be problematic, regardless of the rubberized asphalt

barrier replacement. The new toxic and carcinogenic material placed over cracks in the reservoir ceiling is a petroleum based asphalt/benzene material. Microorganisms can break down the petroleum-based carbon substrate releasing benzene and other toxins into reservoir ceiling cracks and water.

There are newer coating applications such as aluminum, polyurethane, and chlorinated rubber. Leaching of organic contaminants from flat steel panels can occur with various coatings including vinyl, chlorinated rubber, epoxy, asphalt, and coal tar, etc. Coal tar coating and lining can still be found, and is used in California as a coating material. Elevated levels of alkyl benzenes and polycyclic aromatic hydrocarbons (PAH's) have been reported in coal tar bituminous coatings. In tanks that remain in use, organics can be leached into drinking water, especially if there is not enough curing time after coating application.

Additional closed reservoir chemical problems occur from reduced disinfectant residual and sedimentation. Debris can enter any closed reservoir system. Cleaning schedules in closed reservoirs are recommended to be ~5 years. A case study of three elevated tanks in Brookfield, Wisconsin, documented cleaning intervals of 15 years for one closed reservoir, and 7-year cleaning intervals for the other two closed reservoir tanks. Sediment of 28 inches was found in the 15-year tank and 4-12 inches of sediment in the other two tanks. Extremely high bacteria counts were found in all tanks. (Refs. 55-58)

Deceased rat on layers of sediment in a covered reservoir. Common entry points for rodents, cats, and birds in covered reservoirs are hatch or access openings, vent pipes, structural cracks, and overflow pipes. (Ref. 58)

H. Public Health Record of Portland's Open Reservoirs and Bull Run Watershed

Provided below are recent and supportive open reservoir engineering assessments and scientifically supported answers for the community's understanding of the public health benefits of open reservoirs.

Condition of open reservoirs at Mt. Tabor Park – 2009 Report
The Mt. Tabor Park Reservoirs' structures and buildings are considered nationally significant as part of an early design for a city's open water storage system. The system is historically significant for its initial construction and subsequent additions involving monumental civic undertakings, for the exemplification of early concrete engineering construction technology, and for its architectural design. As recognition of their historic significance, the buildings, structures, and site were nominated to the National Register of Historic Places and received designation as the Mt. Tabor Park Reservoirs Historic District on January 15, 2004. Generally, those features within the district boundary that date from the initial construction in 1894 through construction and additions dating to 1951 are considered historic contributing.

As viewed from a historic resource perspective, the Mt. Tabor Park Reservoirs Historic District are, for the most part, in good condition. The structures and buildings were carefully designed and were built for durability and low maintenance. Those considerations have allowed the structures to age gracefully. The facilities are currently used on a daily basis.

Very few original construction components have been lost or removed. There have been minor modifications to the facilities to allow continued operation. In many cases, these alterations, such as new electronic measuring or pipe controls, supplement the historic resources instead of replacing them. The most significant deterioration is found at the oldest facility, Reservoir No. 1, where the decorative concrete finishes on the site wall and gate house are deteriorated. Some components have been recently renovated, such as painting of the wrought iron fencing assembly located around Reservoirs No. 1 and No. 5. Other components, such as roofing, are currently in serviceable condition but will need to be replaced shortly. Still other features may be advised to be replaced for restoration purposes. (Ref. 59)

The general summary of the facilities being in good condition reflects the strong construction and engineering principles of 100 years ago. Attending to deferred maintenance and some cosmetic intervention of our open reservoirs will provide many more years of reliable safe and healthy drinking water for all.

History
The City of Portland has five open reservoirs for drinking water. Three of the reservoirs are located at Mt. Tabor Park and two are located in Washington Park. Reservoir 1 at Mt. Tabor Park and Reservoirs 3 and 4 at Washington Park were all completed in 1894. Reservoirs 5 and 6 at Mt. Tabor Park were completed in 1911. All of the reservoirs are of concrete construction and reflected the best thinking of the 1890's and early 1900's from an advanced engineering perspective and from the perspective of managing a public water supply. The engineering and construction principles of our open reservoirs were ahead of their time using advanced technologies that provide safe and healthy drinking water for us today. Ernest Ransome provided specialized cold twisted metal rebar rods and innovative reinforced concrete to build the open reservoirs that have lasted over a century and will last decades longer when properly maintained.

Ernest Ransome's engineering skills that were applied to our open reservoirs are further recognized from innovative construction in the San Francisco Bay area. Ransome's two experimental buildings at Stanford University survived the 1906 San Francisco earthquake essentially without damage while the university's newer, conventional brick structures literally crumbled around them. The published analysis of Ransome's two buildings by fellow engineer John B. Leonard did much to advance the safety of buildings in post-1906 San Francisco and nationwide.

The movement to covered reservoirs came after 1946 when new jobs were needed for returning veterans. The U.S. Public Health Service and American Public Health Association made the recommendation for covered reservoirs based on health benefits that contradict earlier acknowledgements of open reservoir health benefits. (Dr. M. J. Rosenau, 1902 Harvard School of Public Health).

Covered reservoirs have security and contamination issues. Open reservoirs are cleaned 2x/year. Covered reservoirs have not provided the public health benefits open reservoirs provide. Covered

reservoirs are cleaned every five (5) years or longer allowing for sedimentation, increased disinfectant demand and disinfectant byproduct formation, and microbial issues.

> "Although the storage facility is normally an enclosed (covered) structure, numerous access points can become entry points for debris and contaminants. These pathways may include roof top access hatches and appurtenances, sidewall joints, vent and overflow piping." (EPA) (Ref. 55)

> "Microbial contamination from birds or insects is a major water quality problem in storage tanks (covered reservoirs). One tank inspection firm that inspects 60 to 75 tanks each year in Missouri and southern Illinois reports that 20 to 25 percent of tanks inspected have serious sanitary defects; and eighty to ninety percent of these tanks have various minor flaws that could lead to sanitary problems (Zelch 2002). Most of these sanitary defects stem from design problems with roof hatch systems and vents that do not provide a watertight seal. Older cathodic protection systems of the hanging type also did not provide a tight seal. When standing inside the tank, daylight can be seen around these fixtures. The gaps allow spiders, bird droppings, and other contaminants to enter the tank. (Zelch 2002) reports a trend of positive total coliform bacteria occurrences in the fall due to water turnover in tanks. Colder water enters a tank containing warm water, causing the water in the tank to turn over. The warm water that has aged in the tank all summer is discharged to the system and is often suspected as the cause of total coliform occurrences." (EPA) (Ref. 55)

The premise of covered reservoirs reducing risk has proven to be widely unfounded. Toxic and carcinogenic materials have been widely used in and on covered reservoirs. These materials are NOT used on open reservoirs.

Portland open reservoirs have not had any deaths or public health outbreaks from chemicals or microorganisms. One alleged outbreak of waterborne Giardia illness in Portland took place in 1954. However, "failure to isolate *G. lamblia* from suspect water strongly influenced investigators to reject drinking water as the possible vehicle of infection." (Ref. 60)

Water samples from the Oregon Health Authority remain within EPA standards. Viruses, Cryptosporidium, and Giardia have not been identified in Portland's open reservoirs. Algae are not a public health issue in our open reservoirs and are limited in growth from the nitrogen and phosphorous fertilizers originating from the Columbia South Shore Well field water. Bull Run water has minimal levels because there is no agricultural chemical exposure.

V. CONCLUSION

KGW News: ***"So will a closed system prevent future boil alerts?"***

David G. Shaff, Portland Water Bureau Administrator: ***"It can still happen."***

–May 25, 2014

The public health benefits of open reservoirs at Mt. Tabor Park and Washington Park are profound. Citizens of Portland have adopted and agreed to the EPA Administrators' "LT2 Rule" position: "Science will determine the ultimate outcome" and "We're just trying to get at the public health impacts and if there's a better way to do that we'll be wide open to it" of our open reservoirs. This has been historically illustrated by the City of Portland's Open Reservoir Independent Review Panel 2004 majority vote that supported retaining the open reservoirs. **The open reservoirs provide a complex ecological tapestry of benefits showing many levels of scientific interactions that must occur to retain the public health of our community.** Sunlight, water aeration, and oxygen-loving microorganisms create an ecosystem that keeps our drinking water safe and healthy.

The Portland Water Bureau just this month placed the third of three "boil water" alerts allegedly based on the bacterium Escherichia coli, blaming it on the open reservoirs. Because of a decade-long record of water distribution system deferred maintenance water quality concerns – as acknowledged by City of Portland Auditor reports – and along with a consistent breach of acceptable microbiological water sampling protocol, there can be no expectation the reservoirs are a true source of contamination. The ongoing deferred maintenance problems – cross-connection, backflow, low pressure zones, flushing taking place upstream in SE Portland, pipe breaks, biofilm and sediment build up. etc. – are more likely to have been the source of the alleged contamination event, not the open reservoirs.

Example of water pipeline biofilm & sediment accumulation from years of Portland Water Bureau deferred maintenance and system neglect as source of alleged contamination resulting in "boil-water" notice on May 23, 2014

Additionally the PWB water sampling process has no scientific basis and breaches acceptable microbiological “aseptic technique” protocol. Probability of water contamination when sampling without gloves as a barrier is extremely high and unacceptable, leading to rejection of water sample results. Hand sanitizers are not appropriate in public use situations because they do not remove dirt and organic material that can hide contaminants. (CDC 2002)

Unacceptable water sampling procedure used by the Portland Water Bureau. Sample should be rejected as there is high contamination risk due to no gloves as barrier and water stream splash

EPA water sampling procedure using gloves as contaminant barrier and controlled flow

During the last century open reservoirs throughout the United States have provided a long and well documented history of safe drinking water. Microbiological scientists in the 1800's and 1900's such as Louis Pasteur and physician John Snow furthered the understanding of healthy drinking water by unraveling the relationship between identifiable microorganisms and disease. They determined that separation of fresh drinking water from water filled with sewage is important for public health.

One of the many Bull Run system benefits is providing safe drinking water free of sewage in contrast to the previous Portland source, the increasingly contaminated Willamette River. Consistent with our open reservoirs, scientists of the 19th and early 20th centuries recognized the many benefits of sunlight in promoting public health. European scientists discovered by chance that sunlight could kill bacteria. Media grown without sunlight exposure became cloudy from organism growth, while media grown with sunlight remained clear because of organism mortality. Later experiments from the 1900's confirmed that the presence of oxygen as well as sunlight is critical to this destructive microbial process. Soon it was accepted by the scientific community: "sunlight and fresh air are the enemies of disease".

A decade of experience under the 1986 Safe Drinking Water Act revealed several areas where responsible, science-based flexibilities and a better prioritization of effort could improve protection of public health compared to the one-size-fits-all approach of the 1986 statute. (EPA 1996) As an example 1996 SDWA, Portland's open reservoirs' existence is not to be based on a "one size fits all" EPA regulation, but on their historical public health value and recognition of future chemical and microbial challenges they have successfully overcome for more than 100 years.

The central reason for maintaining Portland's open reservoirs is that they are best for public health. There is a recognized scientific need to reduce/eliminate environmental toxic and carcinogenic chemicals that have no place in drinking water. **Portland can already meet EPA microbiological standards without the corollary health hazards resulting from covered reservoirs.**

Citizens of Portland and other local Bull Run customers are addressing their concerns about added exposures of toxic and carcinogenic chemicals in their drinking water. EPA regulates 11 disinfection byproducts and now has identified +600 more chemicals present in drinking water that are of concern but are not regulated.

The open reservoirs provide the most important and critical public health benefit of the Bull Run water system. Open reservoirs ***act as a stop sign and thus a barrier to toxic and carcinogenic chemicals*** that would otherwise enter the distribution system ending up in our homes, schools, and work places. We have seen the negative air quality outcome when closed drinking water systems allow toxic aerosol gases such as radon and chloroform exposures into everyday living situations. The shower/bath induced chloroform places the household health at risk because EPA long term toxin standards are not based on children or pregnancy exposures, only adults. There is no safe level of radon and its radioactive progeny exposure in the household air and water.

Covered reservoirs cannot efficiently provide the chemical mitigation public health process of open reservoirs because they are significantly anaerobic (without oxygen), principally enclosed, and in an environment without sunlight. Because of their public health and toxic chemical mitigation shortcomings, ***covered reservoirs act like an express lane for contaminants on their way to the distribution system and into indoor plumbing systems. For the benefit of public health and continued commitment by the City of Portland to the Precautionary Principle, the open reservoirs must be retained and maintained as they are today with the addition of improved security measures.***

While all Americans now carry many synthetic chemicals in their bodies, women often have higher levels of many toxic substances than do men. Some of these chemicals, such as chloroform, have been found in maternal blood, placental tissue, and breast milk samples from pregnant women and mothers who recently gave birth. Thus, chemical contaminants are being passed on to the next generation, both prenatally and during breastfeeding. Some chemicals (e.g., radon) indirectly increase cancer risk because they can be influenced by the effect of carcinogens. Children of all ages are considerably more vulnerable than adults to increased cancer risk and other adverse effects from virtually all harmful environmental exposures. In addition, some toxics have adverse effects not only on those that can be exposed directly (including *in utero*), but on the offspring of exposed individuals.

The Portland Utility Review Board (PURB) in July 2002 voted unanimously to pursue an EPA Waiver from the Long Term 2 Enhanced Surface Water Treatment Rule. That voted position remains in force today. The Portland City Council and Portland Water Bureau to date have not followed up on that mandate. ***Council has only asked EPA "if a waiver was available?" without providing EPA with properly documented scientific evidence or reasoning. Nor has the City of Portland made a formal waiver request.***

"Science will determine ultimate outcome" has been clearly and consistently stated by the EPA regarding case-by-case application of the "LT2 Rule." Yet the Portland City Council and the Portland Water Bureau have generally ignored the primary scientific public health benefits of open reservoirs as barriers to distribution system toxic chemical contamination. Scientifically supported public health benefit examples could have been easily presented to the Oregon Health Authority (OHA) such as: sunlight UV (AWWARF 3021), nitrification mitigation (EPA 2002), and gas volatilization (radon).

The City of Portland needs to restart the process of working transparently and in good faith with Oregon's Congressional delegation, the Oregon Health Authority, the Governor's Office, and citizens of Portland familiar with the science and advocacy administrative experience in keeping the reservoirs open. The scientific information and principles outlined in this document are intended to provide the foundation for that effort.

Portland's open reservoirs utilize the principles of chemistry, physics, and microbiology to support a safe and healthy drinking water outcome that covered reservoirs cannot meet. Contemporary science is building on the new way of thinking that reduction and elimination of drinking water environmental chemical exposure is the new future of open reservoirs to provide the best outcomes for drinking water and public health.

A. Final Thought

Joe Meyer of KBOO Radio on May 10, 2011, interviewed Dr. Gary Oxman, highly-respected Multnomah County Public Health Director (retired 2013), about Portland's open reservoirs

Q. **What about Portland's current water?**
Dr. Oxman: "I think Portland's water is superb. We have a wonderful water source in Bull Run watershed. Well designed system and responsibly run system and we have excellent water."

Q. **Are there any known public health issues today?**
Dr. Oxman: "No there really aren't. If you are talking, are there diseases caused by our water – environmental diseases, chemical diseases, bacterial diseases, microbial diseases – no we have not been aware of or detected any diseases or sign of illness associated with our water system."

Q**. If Portland does cover reservoirs will you expect fewer illnesses?**
Dr. Oxman: "We are not detecting any illnesses associated with water in Portland. *No I would not expect we would get fewer illnesses after covering reservoirs.*" (emphasis added)

Q. **Anything else to say?**
Dr. Oxman: "Great drinking water system here in Portland. Levels of citizen involvement that we have in the debates, of what the directions are a very positive thing. What we need to do as a community is to come together and debate the issues honestly, debate them openly, a lot of different factors that will influence the decisions that our policy makers will make. Council and other elected officials, and I think we need to be an active part of that process, part of the gift we can give to future generations here in Portland."

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VII. APPENDICES

Appendix 1

Excerpts from City of Portland Auditor's Reports re: Portland Water Bureau

Documenting neglected maintenance and poor management that risk public health and unnecessarily increase costs

For complete copies of these reports see: City of Portland Auditor, Audit Report Index by year – http://www.portlandonline.com/Auditor/Index.cfm?c=27096

1.1 "Portland's Water Distribution System: Maintenance Program Needs Improvement"
Office of the City Auditor, Portland, Oregon, August 2004 – Report #299

"Water mains are flushed and replaced infrequently, valves receive minimal exercising and maintenance, and meters are repaired and replaced slowly. In addition, the backlog of needed repairs has grown. Although water quality and reliability have not yet been adversely affected, we believe continued decline in the maintenance of the water distribution system assets could negatively affect water service performance in the future."

"The Bureau lacks a clear and comprehensive maintenance plan, complete and reliable information on the nature and condition of its assets, and adequate methods to organize and schedule maintenance work."

"The AWWA indicates that periodic flushing of main water lines is needed to remove bacteriological growth, sediment, and corrosion, to improve flow, and to introduce fresh water with higher chlorine residual. The most effective form of flushing is unidirectional flushing, which entails comprehensive flushing of large areas of pipe in order to systematically cleanse the pipes of debris. The Bureau's ability to perform unidirectional flushing is also hampered because the Bureau does not regularly exercise and maintain valves and does not have a complete and accurate inventory of valve status and location."

"The feet of mains replaced dropped from 46,500 to 9,800 feet, a 79 percent decline. If main replacement continues at the same rate as the past five years, it will take the Bureau over 400 years to replace all the City's 2,000 miles of water mains."

"Fire hydrants, water meters, water valves being paved over and all being neglected by Portland Water Bureau maintenance"

"A recently completed analysis of outstanding work orders by Construction and Support supervisors indicates the work order backlog may currently represent in excess of 26,000 hours of needed repairs and maintenance."

1.2 "Spending utility ratepayer money: Not always linked to services, decision process inconsistent"
Office of the City Auditor, Portland, Oregon, March 2011 – Report #398

"The City of Portland operates water and sewer utilities, and is required by City Charter to spend ratepayer money from water and sewer operations on these utilities. Recent concerns about the use of utility ratepayer money for non-utility purposes led us to conduct this audit. Our objectives were to determine whether utility ratepayer money is used for non-utility purposes, and whether the decision making process and uses of ratepayer money are transparent to the public. The audit scope included utility ratepayer money spent by the Bureau of Environmental Services (which operates the sewer system) and the Water Bureau."

"Most City spending of ratepayer money was both related to providing a utility service and approved through the complete public budget process. However, we identified other examples where this was not the case. We found that ratepayer money spent by the City falls into three categories:

1. Ratepayer money spent for purposes directly linked to providing water and sewer services that also followed the City's complete fi nancial planning and budget process.
2. Ratepayer money spent for purposes not directly linked to providing water and sewer services, but followed the City's complete financial planning and budget process.
3. Ratepayer money spent for purposes not directly linked to providing water and sewer services, and did not follow the City's complete financial planning and budget process."

"The items to consider when making decisions regarding the spending of ratepayer money are whether the utility charges are just and equitable and based on reasonable cost-of-service principles, whether the revenue is spent on utility service related purposes, and whether the utility system is operated in an efficient and effective manner."

1.3 "Portland Water Bureau: Further advances in asset management would benefit ratepayers"
Office of the City Auditor, Portland, Oregon, June 2012 – Report #405

"Water users depend on Portland Water Bureau assets – pipelines, pump stations, tanks, and other equipment that supply homes and businesses with clean water. These physical assets are valued at $7 billion. The Bureau supplies ~100 million gallons of water a day. Asset failures such as pipe breaks could result in health emergencies and significant repair costs."

"City policy requires bureaus to maintain assets in good working order to minimize future costs of maintaining and replacing them, especially to avoid costly deferred maintenance."

We found that the Bureau has developed an overarching data management strategy, but has not yet implemented key tasks to meet general Bureau needs nor to meet specialized asset management needs. For many years the Bureau has known about its data limitations. These limitations impact the data quality used for decision-making, and the efficiency of its business processes."

“Improving data management depends on leadership, dedicated technical resources, and assigning responsibility for making data management improvements.”

“We found that although the Bureau has defined its service levels, it is not using essential service levels systematically in budgeting.”

“The Bureau has not gotten agreement from representative customers that the identified service levels are appropriate for decision making. In addition, many of its 27 defined service levels do not clearly express which service is delivered, and some are not clear about what is actually measured.”

“Without plans decisions are made on a case by case basis by individual managers and the Bureau may not perform asset maintenance repair and replacement at the best times to save costs.”

“We also found that even when the Bureau had plans for asset groups, the extent of implementing the plans was unclear. Plans were partly implemented, but lacked elements needed for accountability.”

“City of Portland Auditor’s Office recommends that Commissioner in Charge direct the Portland Water Bureau to:

- Deploy resources, formalize leadership, and develop accountability structures to implement a data management approach that meets the Bureau’s asset management needs.

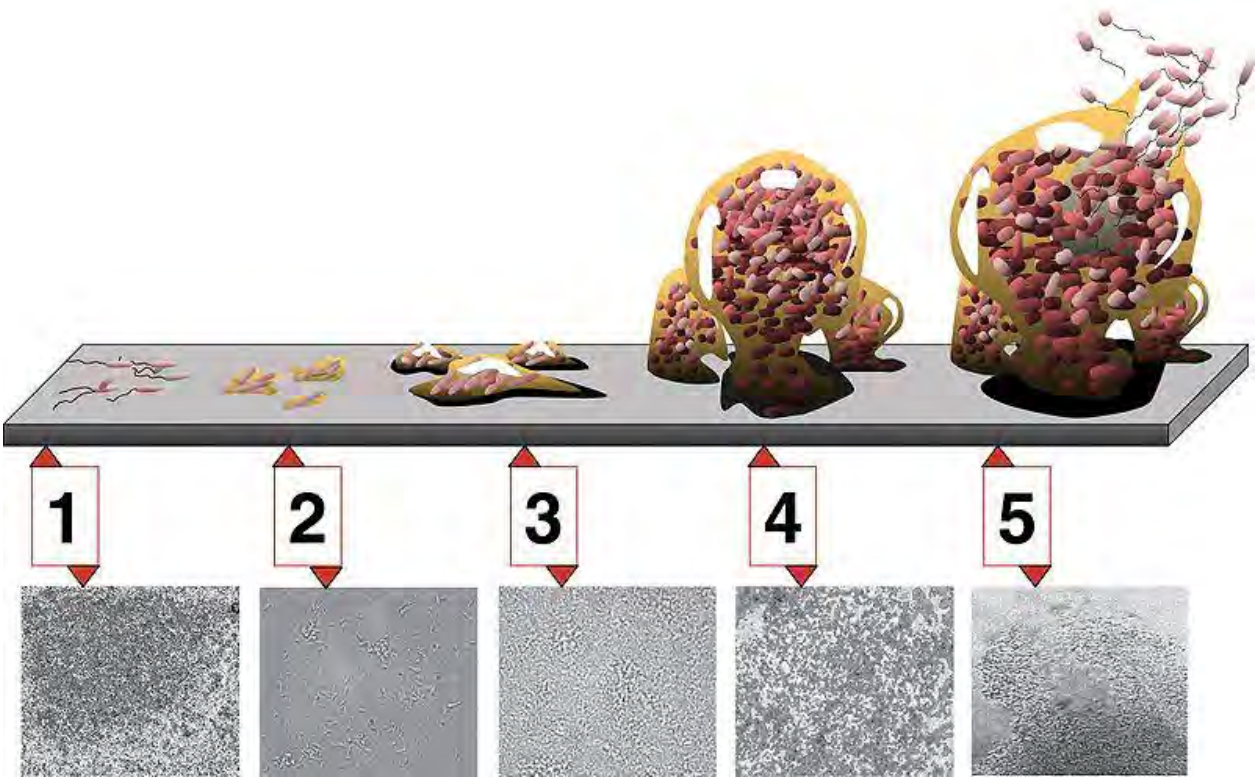
- Identify and clarify the essential required service levels, obtain confirmation from representative customers so that required service levels can be more useful in decisions about resource allocation, and apply service levels as budget criteria.

- Document management decisions and directions for action in Asset Management Plans to increase accountability and the likelihood of implementing the plans to benefit customers. Consider an overall asset management plan or other means of clarifying management policy and providing guidance for decision making.

- Incorporate an accountability framework throughout the Bureau to increase the likelihood of successfully meeting its objectives.”

Appendix 2

Portland Water Bureau Deferred Maintenance Leads to Biofilm Buildup and Puts Public Health At Risk



Process of water pipe biofilm development: 1. Attachment – 2. Permanent Attachment – 3. Maturation1 – 4. Maturation2 – 5. Dispersal of Microbes into Water System

✓ **What is biofilm in a drinking water pipe?**

Biofilm is a thin coating containing biologically active agents such as a slimy film of bacteria sticking to a surface of a structure. Biofilm has the consistency of an egg white. Some microorganisms may be primary pathogens that cause disease in healthy individuals or may be opportunistic that may affect immunocompromised individuals. (1) (2)

✓ **How does water pipe biofilm impact water quality?**

Biofilms can negatively impact water quality by increasing in size as a result of neglected water system maintenance. Colonies of biofilm bacteria continue to grow giving them protection from disinfectants such as chlorine and ammonia. Construction projects or changes in water pressure during a fire event can result in pieces of biofilm breaking off and contaminating the water system. Biofilms can also retain sediments harboring disease causing microorganisms adding to health risks if pipes are not scheduled for proper maintenance.

✓ **How does biofilm get into pipes and stay there?**

Biofilm microorganisms are present and found everywhere in a water system from the watershed to the faucet. They are part of a natural ecosystem and food chain structure except when water pipes are not properly managed.

✓ **Why do we want it removed routinely?**

Once microbial colonization of the pipe surface begins, the biofilm grows between a combination of cell division and recruitment. The microorganisms multiply and begin to draw other microorganisms into biofilm. We want to manage the biofilm volume and public health risk by routine flushing so biofilm build up does not interfere with water flow, microorganism build up, and disinfectant breakdown. City of Portland Auditor reports indicate Portland Water Bureau does not currently meet industry standards for distribution system maintenance. (3)

✓ **How does pipeline biofilm impact relate to covered reservoirs?**

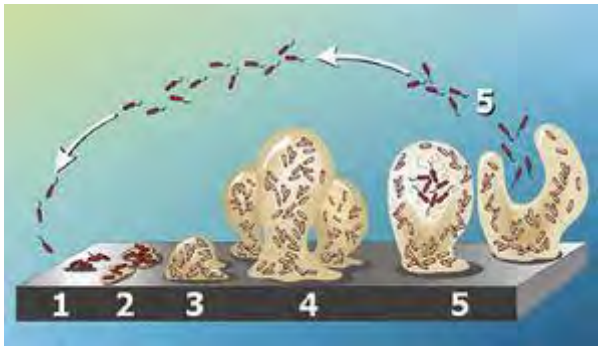
Poorly maintained water systems like Portland's have natural buildup of biofilm. As the biofilm increases because of prolonged PWB deferred maintenance chlorine demand increases leading to chloramine break down resulting in free ammonia. The free ammonia then begins to be metabolized by nitrifying bacteria leading to nitrification. Drinking water chloramine nitrification episodes in distribution systems occur in the dark (**in covered reservoirs, pipelines, taps, etc**.) leading to unwanted nitrate, nitrites, and NDMA toxic and carcinogenic chemicals. (4)

✓ **How does pipeline biofilm relate to open reservoirs**?

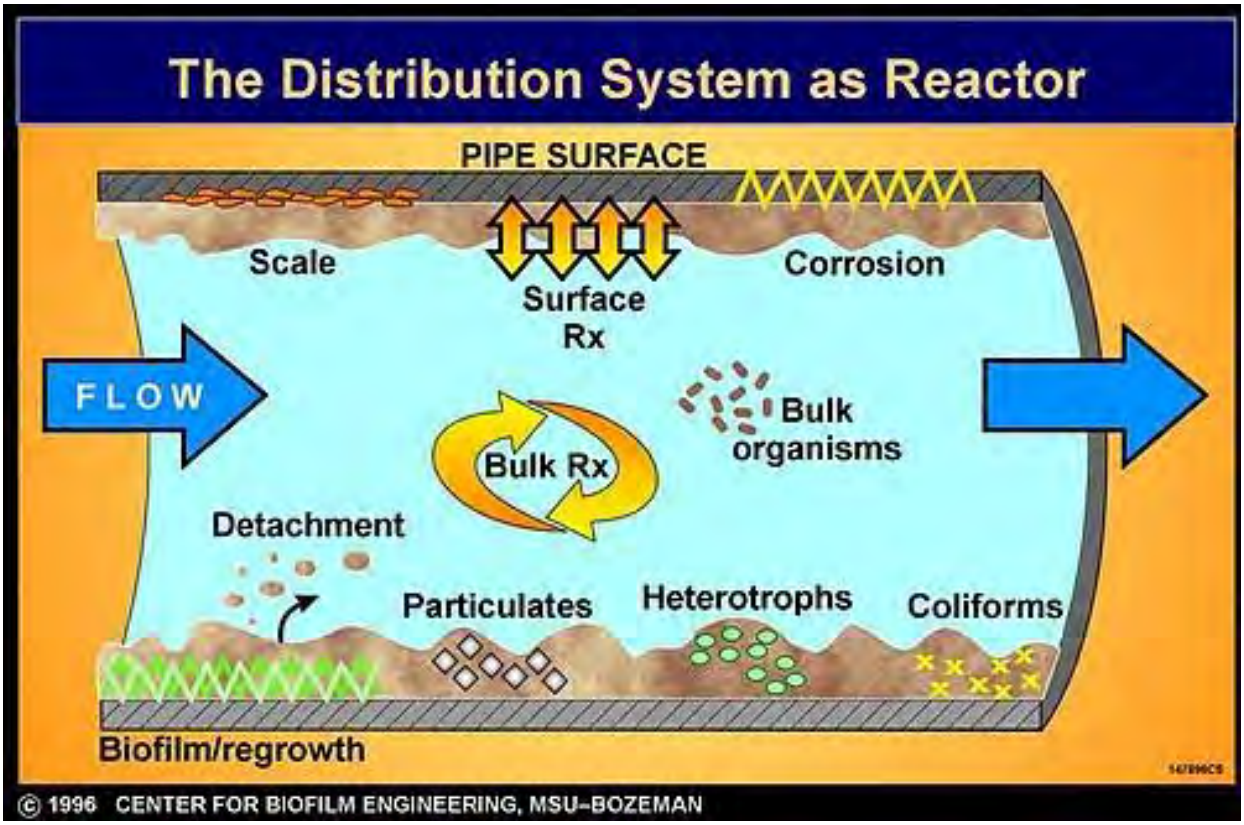
Because the open reservoirs have sunshine exposure that inhibits the bacterial nitrification process there is no relationship to the covered reservoir public health deficiencies. The sunshine also helps break down the unwanted toxic and carcinogenic chemicals; nitrates, nitrites, and NDMA that were generated in the dark pipes.

Notes:

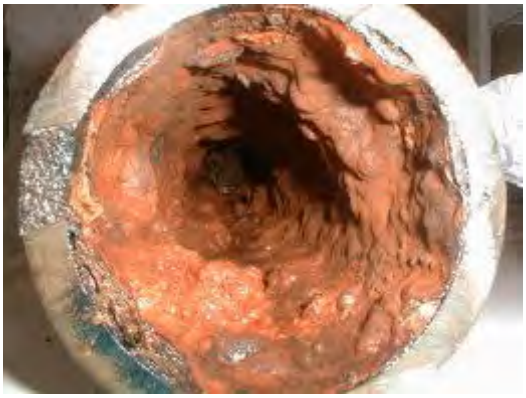
1. Farlex Medical Dictionary, 2014
2. EPA, Health Risks from Microbial Growth and Biofilms, 2002
3. City of Portland Auditor, Portland Water Bureau Reports
4. EPA, Nitrification, 2002



Expansion of biofilm bacteria throughout unmaintained pipe system



Biofilm build up harbors disease causing microrganisms as was seen in the Fall 2013 fecal contamination event throughout the Portland drinking water system. The news story was reported by journalist Carla Castaño, KOIN 6 CBS. Illustration shows biofilm bacteria and other microorganism build up and sediment buildup on inside of water distribution system pipes



Appearance of biofilm buildup in water distribution pipes due to neglected flushing

Neglected pipe. Portland Water Bureau maintenance management has been below industry standards for more than a decade. Biofilm slime can exert a great demand for chlorine which further puts water quality and public health at risk.

Scheduled routine flushing of system can remove microorganisms. Above is an example of properly maintained water pipe that has been routinely flushed.

Appendix 3

News Report: Portland's Covered Reservoir Construction, ca. 2012–Present

Carla Castaño, journalist from KOIN 6 News, reported in February 2014 that the Powell Butte Reservoir has more than 1,000 cracks leaking thousands of gallons of water each day. Using emails from the Portland Water Bureau obtained through a public information request, KOIN 6 also learned the reservoir is four months behind schedule

Excerpts from the KOIN 6 News broadcast, "Powell Butte Reservoir failing leak tests" – Feb. 26, 2014 – http://koin.com/2014/02/26/powell-butte-reservoir-failing-leak-tests/

"It appears our reservoir leaking is increasing. We are at roughly 200,000 gallons per 24-hour day in the east and 80,000 gallons per day in the west," project manager Jim Hall wrote in one email. Hall agreed to speak with KOIN 6 News — until he spoke with the Portland Water Bureau."

"PWB has requested that all interview requests be coordinated through Tim Hall of the P-W-B," he wrote Wednesday."

"[Official PWB spokesman Tim] Hall spoke briefly with KOIN 6 News, but declined an interview. He released this statement:"

" 'Working with our contractor to find and seal these hair-width cracks is a normal and expected activity, and one of the final steps before the reservoir is put into service.' "

"Design and engineering groups who worked on reservoirs in this area told KOIN 6 News 1,200 cracks sounds like a high number and could be a design flaw. However, they also declined on-camera interviews."

"PWB said they are not over budget on the project and said they were behind schedule due to the unexpected rain."

"The Portland Water Bureau plans to have this reservoir online by March."

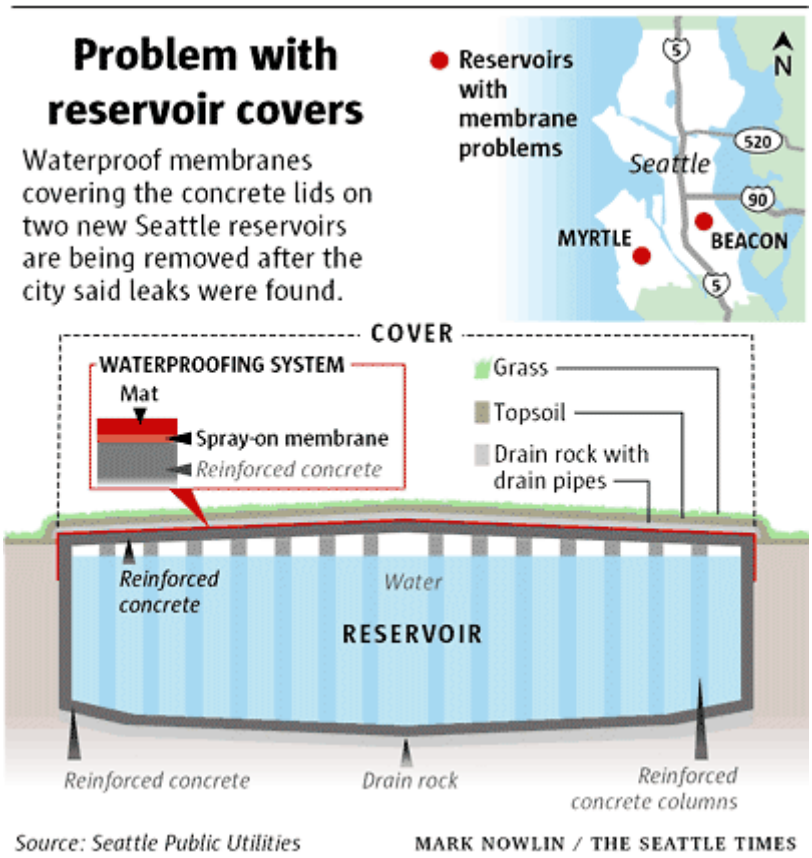
Appendix 4

News Reports: Seattle Covered Reservoirs, ca. 2009–Present

Construction concerns from poor planning and workmanship

4.1 "Major do-over for two Seattle reservoirs" – July 17, 2009
http://seattletimes.com/html/localnews/2009485902_reservoir17m.html

"As Carlos Balansay stood inside the cavernous new underground reservoir that would soon hold 50 million gallons of drinking water, the last thing the construction manager expected to see was water, dripping from a roof that was supposed to be watertight. The drops, first detected last August, have triggered a massive do-over project involving the removal of waterproof coating applied to Beacon Hill's new covered reservoir. A second new reservoir, in West Seattle, had the same orange coating applied to its concrete cover, and it, too, is being blasted off with pressure washers."



–Water proof membranes were removed and replaced with rubberized asphalt, a petrochemical that contains toxic and carcinogenic chemicals such as benzene.
–Microorganisms over time begin to biodegrade petrochemicals into smaller components that can enter drinking water through cracks.

4.2 "Hundreds of waterproofing leaks found at Myrtle, Beacon Reservoirs; 'membranes' now being dug up and redone" – July 13, 2009
http://westseattleblog.com/2009/07/wsb-exclusive-hundreds-of-waterproofing-leaks-found-at-myrtle-beacon-reservoirs-membranes-now-being-dug-up-and-redone/

"West Seattle Blog has learned that Seattle Public Utilities has ordered waterproofing work dug up and redone at two newly covered city reservoirs — Myrtle Reservoir here in West Seattle (photo) and Beacon Hill Reservoir — because of hundreds of leaks discovered in the 'membranes' applied to both projects."

4.3 "Questions over whether 4 buried reservoirs can withstand quake" – Nov. 16, 2012
http://seattletimes.com/html/localnews/2019692615_reservoirs16m.html

"Four years after discovering leaks in what were supposed to be waterproof reservoir covers, the city is investigating whether four new underground reservoirs were adequately built to withstand earthquakes."

Appendix 5

Correcting the Record: Annotated Portland Water Bureau documents

5.1 Excerpt from Portland Water Bureau Letter to the Oregon Health Authority RE: Public Health Risk Evaluation, Feb. 10, 2012

The established standard for all EPA drinking water utility decisions for years has been: "Science will determine the ultimate outcome." It is the benchmark for administering a waiver from the EPA "LT2 Rule". Yet in the case of Portland Water Bureau communications to the Oregon Health Authority to retain the open reservoirs, the relevant scientific approach to chemistry and microbiology has been consistently omitted or misstated.

In one such letter to the OHA, PWB was ostensibly making the case for the safe and reliable public health record of Portland's open reservoirs. Yet in a closing summary the PWB contradicts itself and undermines its own case with an incorrect disclaimer about the testing method used to detect microorganisms in the water samples.

Independent verification shows that AWWARF staff used a rigorous, inclusive testing method (EPA 1623 HV 1000) along with HCT 8 cell cultures during Portland's year-long "American Water Works Association Research Foundation 3021 Study" (AWWARF 3021) from 2008-09. The "HV 1000" modification of EPA's 1623 testing protocol refers to high-volume (1000-liter) samples that provide a *more* accurate assessment than standard 1623 testing. Therefore the disclaimer, shown in bold in the excerpt below, is erroneous.

Portland's AWWARF 3021 sponsored study verified zero (0) Cryptosporidium over a year-long testing period. Additionally, NO Cryptosporidium oocysts and Giardia oocysts were detected in any samples taken in 1994/1995 from Reservoir 6 and Reservoir 4 (PWB 1/28/10).

Excerpt from the PWB's 2/10/12 letter to OHA, with misleading disclaimer highlighted in bold:

> The current observable risk to public health is low. This conclusion is supported by the following:
>
> • No waterborne disease outbreaks in PWB's service area since inspections began – One criterion for maintaining a water supplier's unfiltered status is evidence that the water source "has not been the source of a waterborne disease outbreak." This criterion has been verified each year by the State of Oregon Drinking Water Program for the Bull Run source since 1991, the effective date of the Surface Water Treatment Rule.
>
> • A disease surveillance system sensitive enough to identify outbreaks – Oregon's disease surveillance, investigation, and reporting system has been used as a benchmark of excellence for foodborne outbreaks. The protocols, structures and reporting that make Oregon well-known for foodborne investigations are identical to those used for waterborne illness. Despite the challenges inherent in cryptosporidiosis surveillance, the systems in Oregon are sensitive enough to identify local outbreaks. For example, a 1998 outbreak was traced to a swimming pool in Multnomah

County. No cryptosporidiosis outbreaks in Multnomah County have ever been attributed to PWB drinking water as a source.

• Expert opinion is that the water system presents a low risk for cryptosporidiosis – A 2011 public health expert panel 10 examined the available data on cryptosporidiosis within the service area. The panel concluded that the data show no indication of an endemic disease burden due to Cryptosporidium from the water system and that no cryptosporidiosis outbreaks have ever been attributed to the Portland water supply.

• Record of safe operations – Because there is no sewage exposure in Bull Run, Portland has an outstanding record of safe operations. Yearly watershed inspections conducted by the State of Oregon since 1992 have also rated the water supply system as being in good operating condition. To ensure the continued safety of the system, many water quality parameters are monitored at the source and throughout the distribution system far more frequently than is mandated by law. In the event of a total coliform or E. coli detection, PWB has a rigorous response plan that includes a plan for notification, protocols for actions at the reservoir and in the distribution system, record-keeping, and follow-up actions.

• Water quality data collected from two of Portland's uncovered reservoirs indicated no presence of pathogenic Cryptosporidium – 36 water samples totaling 7,000 liters were collected from Reservoirs 4 and 5 between June 2008 and April 2009 as part of Water Research Foundation study 3021. **The testing method employed was not EPA Method 1623 and was instead designed to detect only the presence of infectious Cryptosporidium.** (emphasis added) Zero infectious oocysts were detected in the 36 samples.

5.2 Transcript of Very Important Letter from Friends of the Reservoirs to Portland City Council, Jan. 17, 2010

Mayor Sam Adams and City Commissioners
1120 SW Fifth Ave.
Portland, Oregon 97204-1926

RE: SDWA Open Reservoir Alternative Compliance

Dear Mayor Sam Adams and City Commissioners,

On December 16, 2009 EPA replied [1] to Commissioner Leonard's November 2009 request for clarification regarding the reservoir Variance application process. In this reply the EPA contends that the Variance provided for by Congress within the Safe Drinking Water Act (SDWA) is not available for the open reservoirs.

Ten months ago in March 2009 EPA responded in the same manner to New York City, another city seeking to retain their large Hillview open reservoir. New York was not deterred by EPA's response [2] and New York's legal team advised the Portland Water Bureau that the EPA's interpretation of the variance applicability is in fact wrong. We agree EPA is wrong.The SDWA clearly authorizes EPA to grant a variance from the LT2 "cover or treat" Cryptosporidium " treatment technique" requirement.

New York's Department of Environmental Quality spent more than a year compiling data, 161 pages, to support the retention of its Hillview reservoir. Unfortunately, during that same period of time the Portland Water Bureau focused a majority of its resources on developing and implementing fast-tracked reservoir burial projects, doing so without any public involvement.

New York City's extensive undeterred efforts to preserve their open reservoir provide a clear blueprint for action by the City of Portland. The community expectation is that the City makes a serious effort to secure the available SWDA reservoir variance, an effort evidenced in part by a Water Bureau work product. A single late-date letter to the EPA regarding a reservoir variance is not enough.

The Friends of the Reservoirs offer the following advice:

- Stop approving consultant contracts. The plan filed with the EPA in March 2009 gives YOU, City Council the power to alter the plan or the pace at which it is implemented. As noted in the fine print, the reservoir burial plan is contingent upon City Council approval of individual projects; it can be renegotiated with the EPA if the City Council does not approve the current schedule for any particular project within it.

- Require the Portland Water Bureau to prepare a detailed report documenting relevant scientific data in support of a reservoir variance.

- Seek an extension or deferral from the EPA from the burial projects. Community stakeholders have long recommended this action for both the open reservoirs and the source water requirement.

- Engage the assistance of the City Attorney and/or outside counsel Foley Hoag.

- Seek further assistance from Senator Jeff Merkley who has demonstrated his support for retention of the open reservoirs.

- Submit the data to the EPA or state of Oregon if the state has assumed Primacy for the regulation; in 2006 the state legislature unanimously approved and the Governor signed into law a state provision for variances with the full knowledge that Portland would be seeking such a variance for its open reservoirs.

- Do not rule out legislation. The opportunity for further Congressional intervention is not only possible but also likely in light of the acknowledged flaws with EPA's source water variance plan [3].

The American Water Works Association Research Foundation 3021 study preliminary report addresses the flaws of EPA's LT2. This report is discussed in the Friends of the Reservoirs September 2, 2009 letter to City Council.

In an internal EPA memo (3/31/09) addressing the reservoir applicable SDWA variance provision EPA's legal counsel states "The alternative treatment technique is available but not approvable because the only alternative EPA is aware of is a risk mitigation plan … (emphasis added)" EPA states that it wants to be consistent in its denial. Scientific data is an "approvable" way of demonstrating that our open reservoirs pose no greater risk to public health than covering or additionally treating [4].

The goal of the rule is to reduce disease incidence associated with Cryptosporidium and other disease-causing microorganisms in drinking water through "treatment techniques".

Scientific data from the recent American Water Works Association Research Association Foundation study AWWARF 3021 testing large volumes of water at the outlets of Portland's open reservoirs demonstrated that there are zero infectious Cryptosporidium in our open reservoirs. Burying, covering, or additionally treating the open reservoirs will not reduce the level of infectious Crptosporidium to below Zero. Portland's Total Coliform Rule data meets EPA standards. Our reservoirs are not subject to surface water runoff; they are cleaned twice a year.

As Commissioner Saltzman said last July about LT2, "this is a regulation in search of a problem... we should continue to pursue all alternative options beyond a large capital project."

Given the extensive scientific data in support of retaining Portland's open reservoirs, the broad-based community support for retaining our open reservoirs, the exorbitant cost of burial ($403million, $800 million with debt service) and the new public health risks [5] associated with covered reservoirs, it is incumbent on the City to push back and push back hard.

Sincerely,

Floy Jones
On behalf of The Friends of the Reservoirs

Cc Interested parties

[1] On January 12 during a Council session the community was told that a reply from the EPA on a reservoir variance had not been received; then on January 13 the Water Bureau issued a press release advising of the December 16 EPA response indicating that the original letter was somehow lost.

[2] Based on extensive review of water-quality data and other information collected by the Department of Environmental Protection, New York believes they can make the requisite showings required by the variance from the reservoir cover or additionally treat requirement. Portland's data is superior to that of New York. Portland can make the requisite showing that our open reservoirs have not caused Cryptosporidium or other drinking water related disease.

[3] EPA moved the goal post twice on the source water variance plan, which consumed more than 17 months. If EPA refuses to accept the new science that supports genotyping, confirming

whether any oocyst is harmful (dead or alive, "viability of the oocyst), and insists on sampling away from our source water out in the tributaries then further federal intervention will be necessary.

[4] While EPA has documented public health illness and deaths only with buried and covered storage, EPA failed to establish the general level of contamination in buried and covered storage thus EPA cannot factually state that buried and covered storage is more protective than open storage. See EPA white paper
http://www.epa.gov/safewater/disinfection/tcr/pdfs/whitepaper_tcr_storage.pdf

[5] EPA in its own white paper acknowledges that cancer-causing nitrification could be an unintended consequence of its LT2 reservoir requirement. Nitrification occurs in the absence of sunlight in chloraminated systems, see section 3.2 Absence of sunlight, pg.11
http://www.epa.gov/ogwdw000/disinfection/tcr/pdfs/whitepaper_tcr_nitrification.pdf

5.3 Transcript of Letter from Portland Water Bureau to the Oregon Health Authority, Aug. 23, 2011

Mr. David Leland, Program Manager
Oregon Health Authority Drinking Water Program
P.O. Box 14450
Portland, OR 97293-0450

Dear Mr. Leland:

Last Friday in a letter from Administrator Lisa Jackson, the EPA reversed its longstanding refusal to review the requirements of the federal LT2 rule as they pertain to uncovered finished drinking water reservoirs. The reversal came in response to a July 20th request from Senator Chuck Schumer to the agency.

In the letter, the EPA states:

"…as part of the Agency's Final Plan for Periodic Retrospective Review of Regulations, as well as the Safe Drinking Water Act (SDWA), the Agency will review the LT2 rule. In doing so, EPA will reassess and analyze new data and information regarding occurrence, treatment, analytical methods, health effects, and risk from viruses, Giardia, and Cryptosporidium to evaluate whether there are new or additional ways to manage risk while assuring equivalent or improved public health protection."

In light of this significant and unanticipated change in federal drinking water policy, the City requests an indefinite suspension in Portland's uncovered drinking water reservoir compliance schedule during EPA's review of the federal LT2 rule. It is critical to the City to remain in regulatory compliance with the LT2 rule during EPA's review and it therefore seeks written approval from the Oregon Health Authority Drinking Water Program of Portland's request for a suspension of the City's state approved schedule.

While it is uncertain what opportunities for alternative compliance may emerge from EPA's review, the City may choose not to proceed with its current plans for constructing additional storage at Kelly Butte until the implications of EPA's review and any subsequent changes in the federal LT2 rule are known.

Once the EPA's review is complete and Portland is given the opportunity to explore any alternative compliance methods that may become available, the City will propose a detailed amended schedule for compliance with the rule.

Please do not hesitate to contact me to discuss this matter further.

Sincerely,

David. G. Shaff
Administrator

5.4 Q&A: Refutation of Incorrect Portland Water Bureau Positions

Q1. *Why is Portland required to discontinue using the open reservoirs at Mt. Tabor Park and Washington Park?*

PWB Position – In 2006 the Environmental Protection Agency finalized the Long Term 2 Enhanced Surface Water Treatment Rule (LT2). The rule requires that water utilities discontinue the use of open finished water reservoirs or treat the water as it exits the reservoir for Cryptosporidium, Giardia, and viruses.

Correction – Since the 2004 comment period, 2006 final rule, and 2012 LT2 review, the EPA regulation has been challenged by water utilities such as New York City because it is scientifically unsupported. The EPA regulation is currently being reviewed for another two years, yet Portland City Council continues to unnecessarily fast-track closure of the safe and healthy water from the open reservoirs. City Council has replaced one reservoir with a covered reservoir that is poorly engineered and constructed that leaked millions of gallons of water per week. Cryptosporidium, viruses, and Giardia have never been detected in Portland's open reservoirs and water samples for bacteria support the safety of the water supply. Portland City Council has not referenced the public health science provided by citizens and documented in scientific literature in making its decisions about the open reservoirs.

Q2. *What about getting the "waiver" people are talking about?*

PWB Position – There is no such thing as a "waiver." When advocates speak of getting a "waiver" they are talking about legislative action by Congress to amend the federal Safe Drinking Water Act and exempt Portland from the rule which would then have to be signed by the President in order to become law. Commissioner Randy Leonard did ask our Congressional

representatives about the likelihood of obtaining legislative action on behalf of Portland and was told there was no support in Congress for such an amendment.

Correction – The "waiver" option always exists with EPA. It is a simple agreement between the EPA and the water utility. Portland has been under a "waiver" from EPA for decades under the Filtration Avoidance Determination – it is a waiver from filtering in effect today. The current situation regarding a waiver for Portland's open reservoirs is that City Council has never presented the scientific argument and formal request to EPA, as they have been repeatedly asked by advocates to do. If the "waiver" does not exist, then why are the New York City mayor, their Council and Congressional delegation asking for an EPA Waiver to keep their open reservoir? The waiver option definitely exists and is available to Portland if City Council will simply coordinate with the Oregon Health Authority to formally ask EPA for it. A waiver is the only permanent solution – Portland City Council needs to adopt the 2004 decision of Open Reservoir Independent Review Panel's majority vote outlining the well-defined scientific basis, asking for the EPA Waiver we so justifiably deserve.

Q3. *Does covered storage increase risks of gas buildup in the reservoirs?*

PWB Position – No. All reservoirs, covered or uncovered, have an air gap above the water surface that is vented into the atmosphere. For nearly 30 years, almost every customer of the Portland Water Bureau has consumed drinking water that has been stored in a covered reservoir or tank, and the water quality consistently meets or exceeds that of the open reservoirs.

Closed reservoirs, because they continue to have air exchange above the water surface, allow venting to occur. Screened vents in closed reservoirs are sized to ensure adequate air flow through the reservoir to prevent pressurization and also prevent "off-gas" buildup. Air quality has not been a problem at any of the Water Bureau's many closed reservoirs and tanks. The Water Bureau inspects and maintains vents and reservoir access points on a regular basis to prevent intrusions from animals, birds, or humans. Additionally, the State Drinking Water Program performs inspections at these sites every three years.

Correction – Another PWB answer that is false and has little scientific basis. Gas build-up such as methane in covered reservoirs has caused death from inhalation. Because covered reservoirs are so poorly maintained – being cleaned from 5-25 years – anaerobic (oxygen absent) bacteria in sediments and debris generate toxic gases. The open reservoirs acting as a barrier to toxic chemicals provide 100% efficiency and volatilization/vaporization of gases before they enter schools, homes, and businesses. Covered reservoirs cannot provide the same efficiencies in removing gasses. The vents of covered reservoirs are mostly allowing air IN to the reservoir to allow a smooth flow of water to the outlet and not allowing vacuum interference of water flow. Contrast in air efficiencies is shown by Open v. Powell Butte 2 inefficiency. For example: open reservoir at Mt. Tabor 6 is 100% efficient with open air and fountains. Powell Butte 2 at 5 acres ~ 218,000 sq. ft. with small vents at ~ 80 sq. feet opening is ~ .00037% of outside air communication venting footage efficiency.

Because of aeration, the quality of Portland's drinking water is excellent from open reservoirs. Changing to a covered drinking water system quickly degrades water quality with unwanted toxic and carcinogenic chemicals.

Q4. *Is radon an issue in Portland drinking water that will be affected by eliminating open drinking water storage?*

PWB Position – No. Radon is not detectable in Portland's main supply, the Bull Run watershed, which contributes on average over 97% of the total water supply. Radon gas naturally occurs in the western United States from underground rock formations. Portland has detectable amounts of radon it its water system from the Columbia South Shore Well Field which is used for emergency backup and to augment the Bull Run source to provide summer supply and constitutes an average of approximately 3% of the total water supply. However, these amounts do not cause the drinking water to exceed the proposed rule for radon.

Correction – Radon in drinking water at any level is very serious. EPA states "there is no safe level of radon, any exposure poses some risk of cancer."(EPA 2013) Portland receives radioactive radon water from Columbia South Shore Well field every year during maintenance or supplemental needs. CSSW can be used for emergencies at any time. Radon exposure for unknown periods of time can be expected to add public health risk entering homes, schools and work places. Radon in drinking water is not regulated by EPA. PWB does not have to disclose it exists in our water, but it is still there anyway producing radioactive materials we breathe and drink. That is why we need to retain open reservoirs for active ventilation and removal of radon gas before it enters homes, schools, and workplaces. EPA acknowledges radon to be the highest cancer causing risk of any drinking water contaminant. (EPA 1998)

Q5. *What is nitrification, and are closed reservoirs a risk in Portland's system?*

PWB Position – Nitrification is a biochemical process that in excess can interfere with the disinfection process in drinking water systems. The conditions within Portland's open finished drinking water reservoirs are more conducive to causing nitrification than the conditions within closed reservoirs. In Portland's drinking water system, the first step of the nitrification process – decomposition of chloramine disinfectant – is accelerated by loss of chlorine residual as drinking water passes through the open reservoirs. Exposure of chloraminated water over a large surface area to wind and sunlight and airborne pollutants such as pollen, dust, and animal waste has a significant role in this decomposition of the chloramines. Closed water storage facilities (i.e. tanks or covered reservoirs) do typically have the type of bacteria which are capable of feeding on ammonia and contributing to nitrification. However, without significant availability of ammonia from chloramine decomposition, or high temperatures, it is difficult for such bacteria to multiply and interfere with disinfection.

Correction – According to EPA, "consequently, nitrification episodes in distribution systems occur in the dark, i.e., in covered reservoirs, pipelines, taps, etc."(EPA 2002)

Open reservoirs inhibit nitrification, not encourage it; thus the explanation from PWB is far from truthful or accurate. Because PWB has neglected and deferred pipeline system maintenance, buildup of biofilm and sedimentation has increased the chlorine demand part of the chloramine molecule. This leads to ammonia/nitrogen exposures in the dark resulting in nitrification, as EPA has already acknowledged. Sunlight from open reservoirs disrupts the microbial nitrification process seen in the pipes and covered reservoirs. Unwanted nitrogen based chemicals like NDMA, nitrite, nitrate, etc. are also broken down by sunlight.

Q6. *What role does sunlight play in disinfection of drinking water in open reservoirs?*

PWB Position – Exposure to sunlight raises water temperatures and encourages the growth of algae and bacteria, which has been a recurring problem at open reservoirs. Sunlight can also contribute to an increase in disinfection byproducts, loss of chlorine, reduction of pH (which can cause corrosion in home plumbing), increased total coliform production, and taste and odor issues. Additionally, elevated water temperatures in the open reservoirs increases nitrification and growth of total coliforms. In highly controlled settings, processes similar to sunlight are used to provide water treatment; however, natural sunlight is not strong enough to provide demonstrable improvement in water quality. The exposure to sunlight actually has a greater number of negatives than positives. Sunlight is not a controllable treatment method, and cannot not be relied upon to adequately disinfect drinking water.

Correction – Sunlight has been recognized over the centuries as an important and valuable asset to drinking water safety and health referred to as "solar disinfection". The natural disinfection premise of open reservoirs was built on this principle. Algae and bacteria are growth based on the nutrients present such as nitrogen and phosphorous coming up from CSSW, not sunlight. Chloramine is a stronger molecule than chlorine and lasts longer in sunlight. (WHO 2004) Sunlight breaks down disinfection byproducts and other unwanted chemicals. Sunlight adds to the oxygenated water creating oxides for natural microbial control much on the principle of hydrogen peroxides. Algae are naturally present and remove acidic chemicals helping make water pH balanced. PWB's position does not align with fundamental principles of microbiology, physics, or chemistry.

"In addition surface waters are exposed to natural UV irradiation in sunlight which may damage oocyst (Cryptosporidium) DNA thereby inhibiting DNA replication and reducing infectivity." (AWWA RF 3021 2008)

Q7. *Why have waterborne disease outbreaks been associated with closed drinking water reservoirs?*

PWB Position – Portland has never had a disease outbreak caused by its closed storage reservoirs. Closed reservoirs that have had waterborne outbreaks have been in systems that experienced operational or mechanical failures and which have typically been infiltrated by animals. Open reservoirs, on the other hand, with their large water surface areas are much more vulnerable to animals entering, swimming, defecating, or dying in them. It is fairly common for Portland Water Bureau maintenance workers to find dead animals, excrement, and other contaminants in the open reservoirs – this water goes directly to the customers' tap without further treatment. Many of the documented outbreaks associated with closed reservoirs have been tracked to animals that have made their way into closed reservoirs. Animals are able to enter a closed reservoir through a broken or missing screen on its vent or overflow. Due to the screening of vents and overflow piping, evidence of animal access has never been discovered in our closed storage tanks. In Oregon, the State Drinking Water Program reviews the function of vent screens and overflows. The Water Bureau inspects and maintains vent screens and access points to its closed reservoirs and tanks on a monthly basis.

Correction – Portland's open reservoirs have never had a microbiological, chemical, or disease issue resulting in illness or death. Portland Water Bureau has never been able to demonstrate the debris they claim to find has a chain of custody originating from the open reservoirs. All we see is material placed on a tarp in the area outside the open reservoirs. Portland's open reservoirs have never had a negative impact on water quality as shown by no Cryptosporidium, viruses, or Giardia. Water samples for bacteria meet EPA and Oregon Health Authority standards. Covered reservoirs in Portland have had vandalism and dangerous chemicals thrown in them. As an example, the covered reservoir at the top of Mt. Tabor had hydrochloric acid and other debris dropped in it on May 28, 2012. This incident was never reported by Portland Water Bureau to the public.. Other covered reservoirs in Missouri and Colorado have had deaths from bacteria. Unlike the covered reservoirs, other open reservoirs across the United States do not have public health detriments either. Open reservoirs continue to provide safe and healthy drinking water for the citizens of Portland.

Q8. *What about rubberized asphalt coatings leaching into the water on a new reservoir?*

PWB Position – The new reservoirs planned at Powell Butte and Kelly Butte will be built of reinforced concrete. No rubberized asphalt coatings will be placed inside the reservoirs next to the drinking water. However, it is standard practice to apply waterproofing to the exterior of concrete structures of this type.

Correction – Rubberized asphalt is a toxic petrochemical based sealant used on concrete reservoir roofs and elsewhere on the covered reservoirs. As we have seen in the Powell Butte 2 construction, there are problems with hundreds of cracks in the roof and elsewhere. Applying the rubberized asphalt compound becomes a public health problem when it can permeate through cracks in the concrete. The caps are sealed with hot mopped coal tar that is also petrochemical based and has polycyclic aromatic hydrocarbon (PAH) cancer causing component. Rubberized asphalt has a benzene component that may be released through microbial degradation of the petrochemicals, thus reaching the drinking water through the many cracks in concrete.

These toxic component health issues are overlooked or dismissed by those who are decision makers in constructing these poorly planned and developed covered reservoirs. Standard practice in construction has little value to those who are at risk for toxic and carcinogenic chemical health issues. Rubberized asphalt is listed in California Proposition 65 as a cancer causing agent.

Q9. *Wouldn't it be cheaper to maintain the open reservoirs than build covered storage?*

PWB Position – The open reservoirs range from 100 to 117 years old. While they may look fine when full, they are in poor condition. The concrete is deteriorated, with cracks and chunks missing, the lining panels have eroded, and the steel pipes and valves are corroding. In the last 10 years $40 million dollars have been spent on reservoir maintenance, and the costs continue to climb. Perhaps most importantly, the reservoirs and pipes are not structurally sound enough to withstand an earthquake, and would be unusable for water storage at a time when they would be most needed. It has been estimated that the reservoirs would need over $125 million dollars in improvements to seismically reinforce them. This would still not meet the EPA's regulatory requirement to cover them or treat the water exiting them.

Correction – The public health benefits of the open reservoirs far outweigh the minor costs to restore and maintain them. Regular architectural and engineering reports from 1990 to 2009 confirm their condition as good with a small amount of restoration needed. The reservoirs are built soundly and have withstood earthquake activities. We reviewed the earthquake discussion during the 2004 Open Reservoir Independent Review Panel and it was confirmed that earthquakes are not a structural issue. There is no scientific or engineering reason the reservoirs cannot last many decades longer for our public health benefits. The PWB has unnecessarily spent hundreds of millions of dollars more than it would cost to maintain the open reservoirs to build covered reservoirs we do not need because water usage is declining. The engineering of Portland's open reservoirs was ahead if its time and has been shown to remain structurally solid.

Q10. *What was the AwwaRF Project 3021 sampling at Portland's open reservoirs and how does it relate to the requirements of the LT2 rule or a Variance for Open Reservoirs?*

PWB Position – In 2008 and 2009 the Portland Water Bureau participated in the Water Research Foundation (WaterRF) Project 3021, Detection of Infectious Cryptosporidium in Water. The purpose of the WaterRF project was to "examine conventionally filtered surface water for the presence of infectious Cryptosporidium using both cell culture techniques and molecular methods," and "attempt to repeat a recent study that reported a risk of infectious Cryptosporidium in filtered drinking water so that a scientifically sound consensus may be reached."

The Water Bureau's sample volumes ranged from 83.5 liters to 305.6 liters, for a total volume of about 7,000 liters during the study. Eighteen samples were collected approximately twice per month from June 2008 to April 2009. The results of the study were that no infectious Cryptosporidium oocysts were detected in any of the Water Bureau's samples. Additionally, no infectious oocysts were detected for any utility participating in this study.

EPA has indicated that variances are not available for the open reservoir requirements of LT2. Even if a variance to the open reservoir requirements of LT2 were available, the WaterRF study would not be adequate to achieve a variance.

The WaterRF study does not document the absence of Cryptosporidium and other public health risks in the open reservoirs. It simply shows that no infectious oocysts were detected in any of Portland's samples collected on 18 occasions. Given the literature that addresses the potential for direct microbial and chemical contamination and other forms of water quality degradation associated with 5 open finished water reservoirs, the data from the WaterRF study would not be considered convincing evidence for EPA, public health officials, or the scientific community in general.

Furthermore, the WaterRF study would not suffice as an adequate variance application (if one were available) for the following reasons:

1. The Water Bureau's sampling frequency and total number of samples from this study is insufficient compared to what EPA requested for the source water variance.
2. The Water Bureau's sampling location was only from Reservoir 4 (and occasionally from Reservoir 5) and not representative of all open reservoirs.
3. The WaterRF project did not use EPA Method 1623 for analysis. Method 1623 is required for LT2 monitoring.

4. LT2 samples must be analyzed by an EPA approved laboratory. The laboratory in the Texas Agrilife Research center used in the WaterRF study is not an EPA approved laboratory for Cryptosporidium.
5. The WaterRF research project did not sample for Giardia or viruses. The LT2 rule states that public water systems "using uncovered finished water storage facilities must either cover the storage facility or treat the storage facility discharge to achieve inactivation and/or removal of 4-log virus, 3-log Giardia lamblia, and 2-log Cryptosporidium." The open reservoir requirements of the LT2 rule are not solely concerned with Cryptosporidium.

Correction – In 2008 and 2009 the Portland Water Bureau participated in the American Water Works Association Research Foundation (AwwaRF) Project 3021 "Detection of Infectious Cryptosporidium in Water."

The Portland Water Bureau sampled 7000 liters at the outlet of Portland's open reservoirs with zero detects of cryptosporidium while utilizing a sampling method superior to that recommended by the EPA.

The EPA's 1623 HV sampling method has been widely criticized by municipalities and national professional associations because the agency's approved sampling method fails to distinguish between harmless and harmful Cryptosporidium, dead or alive Cryptosporidium, and between infectious and noninfectious varieties.

In a 2008 conference presentation AwwaRF 3021 researchers made this statement regarding the current EPA sampling method, "The detection of non-infectious oocysts or oocysts belonging to a species that is not infectious to humans could cause unwarranted concern for a contaminant that may not be significant public health risk."

Portland was one of 19 utilities participating in the study and, according to the study researchers; all utilities including Portland already meet the goal of the LT2 rule based on the statistically significant sampling. The goal of the LT2 rule is to reduce the level of disease in the community.

Both the Safe Drinking Water Act and Oregon state law provide for a reservoir "treatment technique" variance. It has long been recommended by community stakeholders that the Portland Water Bureau follow NYC's lead with regard to pursuing a reservoirs variance: collect and submit the AwwaRF 3021 cryptosporidium data (zero detects) along with Giardia and other necessary data to the State as part of a reservoir variance application.

Public health officials agree that there will be no measurable public health benefit from additionally "treating or covering" Portland's open reservoirs. The State Drinking Water Program now has primacy over the rule but can only consider a reservoir variance application if one is submitted. The City Council should act to ensure that the PWB applies for such a variance.* (*This statement was obtained from the Friends of the Reservoirs. The documents from the AWWA RF 3021 study have been read and agree with their position.)

"LT2 Rule" Waiver Supporters at Portland City Hall, Earth Day 2011

Adam, Hillary

From: Mark Bartlett <bartlett.m@comcast.net>
Sent: Tuesday, January 13, 2015 8:27 AM
To: Adam, Hillary; Hopkins, Melissa; Carter, Tom; Stephanie Stewart and Mike St Clair; Mark Bartlett; Bacher, Amy; Ashenfelter, Paige (BDS); Eileen Brady
Subject: title issues for the Mt Tabor Park LUR

Follow Up Flag: Follow up
Flag Status: Completed

Hillary,
I saw yesterday in the latest staff report, that Tom had forwarded an e mail in late November which I could not access regarding the City position on creating an easement and the issues around title.

Even if there are no legitimate legal issues of ownership, this does not address my concerns about any use restriction that a donor may have put on the parcels in 1894-1911. That can only be resolved by title searches to confirm, which have not been completed that I know of.

Theresa states that the WB does not know of any.... but how would they unless the research is done.

I'd like to review that e mail and since it was an e mail, could you forward that to me please?

Should I have to make a public records request for this e mail, I will do so or come down to see that, but it is an e mail so I should think that would be required.

I would then like to provide my comments on that to the HLC and for the record since I was unable to gain access before yesterdays hearing.

At yesterdays hearing, I did request that the record be held open for further comments on documents that were new and findings that had not yet been completed so the public could respond to the HLC.

We await our use finding but are subject to the BDS staff scheduling. Of course that will then go to Council for a vote, so it may take some time, especially if BDS cannot schedule us for the EA and DAR appointments to enable us to have our questions addressed.

Thank you,
Mark Bartlett

Adam, Hillary

From: postcards <postcards@hevanet.com>
Sent: Tuesday, January 13, 2015 11:01 AM
To: Adam, Hillary
Subject: No to Shutting off the open water reservoirs

To the Historic Lands Commission, Bureau of Planning and Sustainability, City Council of Portland, and Paul Cienfuegos of Community Rights pdx

January 12, 2015

Subject: Official testimony: Shutting off the open water reservoirs

Note: Please forward to the Historic Lands Commission (can't find the email contact at the BPS website)

Today I attended the meeting of the Historic Districts Commission. Not sure of the exact title of that Commission.

I left early for a number of reasons. One, the meeting was too long – I got two pieces of information about when it was to start – one was 1:15 and other was 1:30. The meeting started almost 15 minutes late, and one of the commission members said he had to leave at 4:30. So it was essentially going to be a 3 hour meeting.

Second reason I left early was that the Opposition speakers were to speak last. The room was filled to standing room only with opposition speakers (before thankfully more chairs were added). The pro-proposal speakers were scheduled before us.

Third, the commission meeting chair did not allow questions of clarification from members of the audience. For example, the speaker for the Office of Planning and Sustainability proposed taking 84 acres of Historic District lands off the rolls of Historic Preservation. He suggested that members of the commission visit the neighborhood where the 84 acres are. He droned on in monotone, never mentioning where these acres were located. One woman called out, “Where is it?” She was

shut down by the commissioners. Finally, I called out, “Where is it?” and the BPS speaker said that it is the Irvington Historic District. Then the meeting chair said the audience was not to speak when there was a discussion between a speaker and the commissioners.

When I left, I took my written testimony, which is below, to the Clerk of the Commission. She told me she would not take my paper until I presented 10 copies to her! She told me there was a copier downstairs where I could purchase copies. This is totally irresponsible of the City to require this, when it is the City’s responsibility to make copies – or scan my copy and email 10 copies, which would save time and paper!

Here is my testimony, which is quoted from the January 7, 2015 Truth-out.org article entitled Deep Questions Arise Over Portland’s Corporate Water Takeover. http://truth-out.org/news/item/28390-deep-questions-arise-over-portland-s-corporate-water-takeover

Quote:

Most troubling are charges of decades of revolving-door cronyism surrounding Joe Glicker, a vice president of CH2M Hill, the company awarded the contracts to build the new covered reservoirs for Portland. Not only was Glicker a former chief engineer of the Portland Water Bureau (PWB), he also worked as a core consultant with the EPA to write the very LT2 rules that now require these massive "emergency" water infrastructure projects. It's a conflict of interest that has local water rights advocates' heads spinning and steaming all at once.

Glicker's hand in crafting the LT2 ruling helped create an unfunded mandate that opened new markets for his company, while blindsiding cash-strapped municipalities across the country.

While the EPA is no stranger to allegations of corrupt corporate influence over water protections, typically the purpose is to gut regulations for industrial polluters, not to invent onerous regulations to serve notorious developers like CH2M Hill.

A dominant international player winning enormous government-contract infrastructure projects, CH2M Hill has also developed an abysmal ethics and safety record. Multiple federal charges to date include mismanagement, kickbacks,

conflict of interest, violation of the Clean Water Act, reprisals against whistleblowers, criminal fraudulence and longstanding engineering lapses.

[There is] cracking and leaking at the new 50-million-gallon Powell Butte buried reservoir. The project, led by CH2M Hill, immediately ran nearly $4 million over budget, exceeding the contract limits.

"It certainly seems questionable that our city continues to award contracts to a corporation that has repeatedly, and on numerous fronts, engaged in criminal activity and wrongdoing at the expense of taxpayers and commonwealths," said local activist Johnny Dwork.

Rights advocates estimate the Portland water projects could cost up to $1 billion over time, raising costs for residents who already pay some of the highest water rates in the country, while degrading the quality and safety of their drinking water.

Signed:

Marian Drake

5800 NE Center Commons Way

Apt. 213

Portland, OR 97213

503-236-1736

Adam, Hillary

From: StevenWaxandKathleenHaley <haleywax@comcast.net>
Sent: Wednesday, January 14, 2015 5:10 PM
To: Heron, Tim; brian@emerick-architects.com; Adam, Hillary; Ashenfelter, Paige (BDS)
Cc: Commissioner Fish
Subject: Water Bureau Mt. Tabor Proposal
Attachments: HLC letter 11415.docx

Follow Up Flag: Follow up
Flag Status: Flagged

Commissioner and Staff-

Thank you for the opportunity to testify at the hearing on Monday January 12, 2015. I have written a brief letter that addresses comments to the Commissioners made by Mr. Heron after close of the public testimony. I request that you receive and distribute the attached letter to all commissioners.

Thank you for your consideration of this matter.

Steven T. Wax

January 14, 2015

Historic Landmarks Commissioners

1900 SW 4th Ave.

Portland, Or. 97201

Dear Chair Emerick and Fellow Commissioners,

Thank you for the opportunity to speak on January 12 at the public hearing on the Portland Water Bureau proposal for construction on the reservoirs in Mt. Tabor Park and on Park land. I submit this follow-up comment for two reasons: 1) to explicitly state, in response to questions from Commissioners during the hearing, my willingness to participate in meetings with decision making representatives of the Water Bureau in an effort to resolve this matter; and, 2) to address comments made by Tim Heron after the testimony portion of your meeting closed.

Mr. Heron's statements to the Commissioners were that your authority to impose conditions on approval of the Water Bureau's proposal is limited. I believe that his statements are inconsistent with applicable law and the scope of your responsibilities.

I will address two of the conditions addressed in the written materials and discussed during the hearing. Both involve plans for the future of the reservoirs. The first involves a condition that water remain in the reservoirs. Leaving aside the specific language, the Water Bureau and citizens are in agreement that such a condition should be imposed. The second condition, proposed by the citizens but opposed by the Water Bureau, would require compliance with the 2009 plan for maintenance and repair of the historic physical plant. As I heard Mr. Heron, he was telling the Commissioners that you could not impose a requirement that the physical historic structures be maintained. Such advice is incorrect as a matter of law and is bad policy.

The applicable law can be found in cases such as *Gould v. Deschutes County*, 216 Or. App. 150 (2007). As Ty Wyman's letter of January 7, 2015, pointed out, in order to carry its burden of proof to sustain approval of its proposed construction, the Water Bureau is required to present a specific mitigation plan for your

approval. Among other things the law requires such "a resource protection plan to ensure that important natural features will be protected and maintained." In the circumstances before you, both a condition with respect to water and a condition on the physical structure are necessary.

The agreed (in principle) condition to keep water in the reservoirs recognizes and fulfills part of this obligation—that the historic use requires the continued presence of water in the reservoirs as it has existed for their entire life. The historic use requires something more—the maintenance of the physical structures that hold and surround the water as they have existed for their entire life. The Bureau's and staffs effort to distinguish between the obligation to maintain the water and the obligation to maintain the structures that house it ignores the legal obligation. It is, moreover, inconsistent to acknowledge the authority to require continued presence of water then say that there is no authority to require that the physical structures of the reservoirs be maintained in their historic condition. If authority exists for one, it exists for the other.

On the practical side, as Commissioners and citizens both stated during the hearing, once the reservoirs are taken off line, they are at substantial risk. The incentive for the Bureau to maintain them diminishes significantly. As was recognized during the hearing, the Bureau's record of maintenance is poor. Thus, the need for a condition that parallels the "keep water" condition and requires that the historic structures be maintained is manifest.

Thank you for your consideration of these views.

Sincerely,

/s/

Steven T. Wax

6110 SE Main St.

Portland, Or. 97215

haleywax@comcast.net

Adam, Hillary

From: Scott Fernandez <scottfernandez.pdx@gmail.com>
Sent: Monday, January 19, 2015 9:33 PM
To: Adam, Hillary; Ashenfelter, Paige (BDS); Scott Fernandez
Subject: Mount Tabor Land Use comment-

Follow Up Flag: Follow up
Flag Status: Flagged

January 19, 2015

Mount Tabor Land Use- open reservoir comments

Comments to Historic Landmark Commission

"All of the open reservoirs are historically significant, and thus are eligible for inclusion in the National Register of Historic Places and for local landmark status." – Open Reservoir Study, Technical Memorandum, Montgomery Watson Harza, 2001. Contracted by PWB

"The reservoirs are historically significant as examples of early engineering, and serve as monuments to the social history of the City's growth and development. They provide an early example of a planned landscape, including the views and vistas into and out of the landscape." -- Open Reservoir Study, Facilities Evaluation, City of Portland, 2001.

No waterborne disease outbreak or water quality incident of public significance has ever been recorded in connection with Portland's open reservoirs. Montgomery Watson Harza. Open Reservoir Study: Phase I Summary Report. City of Portland. January, 2002

All features in good condition. ...a detailed maintenance program could extend the useful life of the open reservoirs to the year 2050. Montgomery Watson Harza. Open Reservoir Study, Draft TM 5.7 Facilities Evaluation, City of Portland. August, 2001.

Today we find ourselves at the crossroads of public health. We can take the safe approach based on the already proven best available science and retain the historic open reservoirs or; disconnect and destroy these living historic treasures leaving us with known toxic and carcinogenic drinking water from covered reservoirs resulting in an adverse community public

health effect. The earliest visionaries and architects of Portland's future system; Ernest Ransome, Isaac Smith, and Portland's public health officials all understood and were well aware in the 1800's the importance of clean, pure drinking water.

- **The fundamental principles of sunlight disinfection are well established**

Sunlight - to break down unwanted chemicals and providing supportive disinfection

Written by esteemed epidemiologist Milton J. Rosenau in 1902: **"Sunlight (direct) is an active germicide. It destroys spores as well as bacteria. The importance of the sun's rays in destroying or preventing the development or growth of microorganisms in nature cannot be overestimated. Even diffused light retards the growth and development of microorganisms, and if strong enough may finally kill them. In water or clear solutions it penetrates some distance. The importance of oxygen in the influence of light upon bacteria is emphasized. Bacteria in light, in the presence of oxygen and water, cause a production of hydrogen peroxide which is well known to have strong disinfection powers."**

--Milton J. Rosenau, M.D., was commissioned as an assistant surgeon in the United States Marine Hospital Service (now the United States Public Health Service) in 1890. In 1899, he was appointed Director of the Hygienic Laboratory of that service. He was instrumental in 1922 in the establishment of the Harvard University School of Public Health and, in 1940, became first dean of the School of Public Health at the University of North Carolina

- **Oxygenation – allowing aerobic bacteria to breakdown unwanted chemicals**

- **Open air exposure- to allow volatilization/vaporization of unwanted chemicals such as radon, chloroform, etc.**

The primary function of these historic open reservoirs is to serve as drinking water reservoirs that have provided safe and healthy water for over 100 years without illness. Those who transacted the land these reservoirs reside on today expected them to serve that purpose in perpetuity with the understanding they were supporting a "healthy water initiative"; removing the contaminated Willamette River as their previous water source.

The open reservoir drinking water utility, national historic recognition and land use principles are all synergistically intertwined as one unit and must be retained as such. Disconnecting and destroying these historically acknowledged open reservoirs will not be invisible to a community expecting the safe and healthy drinking water present in open reservoirs that covered reservoirs cannot provide. The history and future of our open reservoirs as they are today providing safe and healthy drinking water is too important to ignore.

Sincerely,

Scott Fernandez M.Sc. Biology/ microbiology-water chemistry

City of Portland Mayor appointed-

Portland Utility Review Board 2001-2008

Portland Water Quality Advisory Committee 1996-2000

Scott Fernandez

1821 NE 65th

Portland, Oregon 97213

503.282.1894

Adam, Hillary

From: Schwab Mary Ann <e33maschwab@gmail.com>
Sent: Tuesday, January 20, 2015 9:32 AM
To: Schwab Mary Ann
Cc: Johnson Ian; Adam, Hillary; Sallinger Bob
Subject: Southeast Uplift seeks Protection for Mt. Tabor Reservoirs. ... under review by the Historical Land Marks Commission. accepting public written commits prior to noon today: January 21st.

Follow Up Flag: Follow up
Flag Status: Flagged

Attention Concerned Portland Water Rate Payers:

Southeast Uplift seeks Protection for Mt. Tabor Reservoirs -- from being disconnected. Issue is currently under review by the Historical Land Marks Commission. HLMC is accepting public written commits prior to noon today: January 21st. Short of your posting a pro/con comment no-later-than noon today; morning, you will have not voice when this issue is appealed to LUBA. Again, in that this legal communication is "time certain", might I suggest a follow-up telephone call to confirm e-mail were received?

The clock is ticking.

ALSO TIME CERTAIN City Council Agenda, Wednesday, January 23rd, SECOND READING ON ORDINANCE NO. approving $4,800,000 on contracts to start disconnecting the reservoirs. My fear, with so many issues fast tracked -- Scott Fernandez's action alerts regarding radon -- a serious public healths issue -- may have been overlooked by the public. [link: BullRunWaiver.Org] In my humble opinion the Columbia South Shore wells must be disconnected from the Portland's Drinking Water. That well water best be recycled to as a "truck wash" to clean City's Fire and road maintenance trucks, US Mail trucks and vans, commercial trucks. Drinking water is fast becoming more precious than oil so let's not waste a drop cleaning vehicles. So let's join efforts with the Sovereign Nations living along the Columbia river for centuries, Bob Sallinger, and the Riverkeepers... and Scott Fernandez keeping water quality safe for humans and iconic salmon.

Thank you,
mas
(503) 236-3522

Ian Johnson
State Historical Preservation Office
Ian.Johnson@Oregon.gov
1 (503) 986-0678
(Salem)

and

Hillary Adam
Land Use Services, to Historical Resource Review
Hillary.Adam@Portland.Oregon.gov
(503) 823-3581

(Portland)

On Jan 19, 2015, at 10:09 PM, Robert McCullough wrote:

Mary Ann:

Letter is off to the city council. Would you like it to someone else as well?

Robert

On 1/19/2015 10:02 PM, Schwab Mary Ann wrote:

The clock is ticking.

Historic Land Mark Commission, public's written comments closes at noon, on Tuesday, January 21st.
I would like to route a copy of this letter to City Council to their attention. Should there be an appeal it would give SEUL standing with LUBA.

On Wednesday, January 22nd, second reading -- public written comments closes at 4:00 p.m.

Ordinance No. _____TBA
City Council's Agenda Item # 94
Authorize a contract and provide payment for the construction of the Tabor Adjustments Project as an estimated cost of $4,800,000

5. The total estimated construction cost is $4,800,000 with a high level for the confidence rating. [hello not by this private citizen.]

7. Elements of the Tabor Adjustments are the subject of a pending Type III land use review before the Historic Landmarks Commission, which may result in an appeal of the Commission's decision to the City Council. Approval of this ordinance only authorizes the Water Bureau to solicit bids for implementing the work for the Tabor Adjustments (not defined) it does not constitute Council approval of this project or prejudgment of any land use appeals concerning the project that may be filed with the Council.

Please get back to me no later than 9:30 p.m. I am willing to stop by the SEUL office to pick up the letter and deliver it to the 1900 Building, get it stamped into the record.

Your thoughts,
mas

STOP

So what happens when Portland gets their waiver?

Something new to think about... .

Now is the time to disconnect the Columbia South Wells --

1. Water stored in wells can be best used to wash private cars, pickup trucks, US Mail, Portland's Fire Engines, Street Maintenance Truck, Commercial UPS, FedX delivery trucks, Heavy duty Freightliner trucks, etc.
That would stop radon from entering the newly constructed Kelly and Powell Butte water storage tanks.

On Jan 19, 2015, at 8:51 PM, Robert McCullough wrote:

> January 21, 2015
>
> Dear Mayor Hales, and Commissioners Fish, Fritz, Novick and Saltzman
>
> Re: Open Reservoirs Resolution
>
> In 2004 Mayor Katz appointed citizen representatives of the community to the Open Reservoirs Independent Review Panel. After six months of review the Panel voted by majority to retain our open reservoirs at Mount Tabor and Washington Park.
>
> The EPA LT2 drinking water regulation is being reviewed into 2016 so there is time to stop the destruction and disconnecting of our open reservoirs. New York City and other utilities in New York, along with New Jersey are now in discussion with EPA.
>
> The City of Portland has received scientific evidence to support an EPA LT2 waiver. The Board of Directors of SE Uplift requests that the City of Portland invite Senators Merkley and Wyden, along with the rest of the Oregon Congressional delegation, to

work with New York and New Jersey in requesting an open reservoir EPA waiver – stopping the costly and unnecessary removal of the open reservoirs, saving money and keeping our water safe.

Sincerely,

<clip_image002.gif>

Robert McCullough

President

SE Uplift Board of Directors
--
<newlogo.gif> Robert McCullough
Managing Partner
McCullough Research
6123 S.E. Reed College Place
Portland, Oregon 97202
Robert@mresearch.com
www.mresearch.com

503-771-5090 (direct) 503-777-4616 (office) 503-784-3758 (cell)

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<20150121 Open Resevoir Letter.pdf>

--
<newlogo.gif> Robert McCullough
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message sender. Also, we would appreciate your forwarding the message back to us and deleting it from your system. Thank you.

Adam, Hillary

From: Brad Yazzolino <brad@bradyazzolino.com>
Sent: Tuesday, January 20, 2015 10:18 AM
To: Adam, Hillary
Cc: Castleberry, Stacey; Brad Yazzolino
Subject: Comments on LU 14-218444 HR EN - Mt. Tabor Reservoirs Disconnection

Dear Historic Landmarks Commission C/o Hillary Adam, Stacey Castleberry, Ann Bacher,

Here are my January 20th 2015, 10 :17am comments about the ongoing case LU 14-218444 HR EN - Mt. Tabor Reservoirs Disconnection.
The Portland Water Bureau's (PWB) proposal and revisons remain insufficient for the H.L.C to grant an approval for the application. The PWB alone, has the burden of proof
that the historic nature of the resource is fully preserved. Water being present (and in technical fact, drinkable, potable) in the Mt Tabor reservoirs, is inherently part of the historic nature of the this property on the Historic Register, and the presence of water in the historic manner, or it's absence, cannot be left to the whim of Portland City Council, as the Water Bureau has stipulated.

I urge the HLC to deny the LU 14-218444 HR EN application, on the many grounds, including that their application is incomplete, and is an attempt to hurry Portland ratepayers into what will be, and is already, an expensive fiasco. One day from today, in what looks like an attempt to strong arm the Historic Landmark Commission into approving this case, the Portland City Council is further raising the funding for the Mt Tabor disconnect. Item 94 on the City Council agenda for Wed. January 21, 2015 is:
"(94 Authorize a contract and provide payment for the construction of the Tabor Adjustments Project at an estimated cost of $4,800,000 (Second Reading Agenda 74"
Once again, at that meeting, no doubt, dozens (or more) members of the public will eloquently oppose in testimony, .. and NO one, or only one or two eople will testify in favor, exactly as it has been since 2002 when the PWB actively started promoting this unnecessary destuction of Portland's Historic, and proven-safe-for-over-115-years, Mt Tabor reservoirs.
(And exactly as you have seen in the entire case testimony re: LU 14-218444 HR EN)

The PWB application does not accurately declare, indicate, and solidly guarantee that important
historic preservation criteria will be fully met.

The PWB has shown iteslf to be a poor steward of the Historic Mt Tabor and Washington Park Reservoirs, as they have long intended to render them needlessly obsolete.

You, the Historic Landmarks Commission, have the power to slow, delay, and deny, the clumsy false urgency that the Water Bureau exhibits in this application LU 14-218444 HR EN.

Thank you for your thoughtful consideration.

Brad Yazzolino
Portland, OR 97215

brad@bradyazzolino.com

Adam, Hillary

From: Schwab Mary Ann <e33maschwab@gmail.com>
Sent: Tuesday, January 20, 2015 10:34 AM
To: Schwab Mary Ann
Cc: Johnson Ian; Adam, Hillary; Sallinger Bob
Subject: Fwd: Southeast Uplift seeks Protection for Mt. Tabor Reservoirs. ... under review by the Historical Land Marks Commission. accepting public written commits prior to noon today: Tuesday, January 20th.

Whoops, I must slow down to double check calendars -- especially following National Holidays.
This whoooooops, only proved that MAS needs time off. So I am about to pull the plug on my computer. I've done my part, now it is your turn.
By the way, the next person shopping Fred Meyers who stops to tell my husband, "...that we need more people like Mary Ann..." don't be surprised by his response.

Something to think about:

"Never depend upon institutions or government to solve any problem. All social movements are founded by, guided by, motivated and seen through by the passion of individuals."
– Margaret Mead

mas

Begin forwarded message:

From: Schwab Mary Ann <e33maschwab@gmail.com>
Date: January 20, 2015 9:32:02 AM PST
To: Schwab Mary Ann <e33maschwab@gmail.com>
Cc: Johnson Ian <Ian.Johnson@Oregon.gov>, Adam Hillary <Hillary.Adam@portlandoregon.gov>, Sallinger Bob <bsallinger@audubonportland.org>

Subject: Southeast Uplift seeks Protection for Mt. Tabor Reservoirs. ... under review by the Historical Land Marks Commission. accepting public written commits prior to noon today: Tuesday, January 20st.

Attention Concerned Portland Water Rate Payers:

Southeast Uplift seeks Protection for Mt. Tabor Reservoirs -- from being disconnected. Issue is currently under review by the Historical Land Marks Commission. HLMC is accepting public written commits prior to noon today: January 21st. Short of your posting a pro/con comment no-later-than noon today; morning, you will have not voice when this issue is appealed to LUBA. Again, in that this legal communication is "time certain", might I suggest a follow-up telephone call to confirm e-mail were received?

The clock is ticking.

ALSO TIME CERTAIN City Council Agenda, Wednesday, January 22nd, SECOND READING ON ORDINANCE NO. approving $4,800,000 on contracts to start disconnecting the reservoirs. My fear, with so many issues fast tracked -- Scott Fernandez's action alerts regarding radon -- a serious public healths issue -- may have been overlooked by the public. [link: BullRunWaiver.Org] In my humble opinion the Columbia South Shore wells must be disconnected from the Portland's Drinking Water. That well water best be recycled to as a "truck wash" to clean City's Fire and road maintenance trucks, US Mail trucks and vans, commercial trucks. Drinking water is fast becoming more precious than oil so let's not waste a drop cleaning vehicles. So let's join efforts with the Sovereign Nations living along the Columbia river for centuries, Bob Sallinger, and the Riverkeepers... and Scott Fernandez keeping water quality safe for humans and iconic salmon.

Thank you,
mas
(503) 236-3522

Ian Johnson
State Historical Preservation Office
Ian.Johnson@Oregon.gov
1 (503) 986-0678
(Salem)

and

Hillary Adam
Land Use Services, to Historical Resource Review
Hillary.Adam@Portland.Oregon.gov
(503) 823-3581
(Portland)

On Jan 19, 2015, at 10:09 PM, Robert McCullough wrote:

> Mary Ann:
>
> Letter is off to the city council. Would you like it to someone else as well?
>
> Robert
>
> On 1/19/2015 10:02 PM, Schwab Mary Ann wrote:
>
> > The clock is ticking.

Historic Land Mark Commission, public's written comments closes at noon, on Tuesday, January 21st.
I would like to route a copy of this letter to City Council to their attention. Should there be an appeal it would give SEUL standing with LUBA.

On Wednesday, January 22nd, second reading -- public written comments closes at 4:00 p.m.

Ordinance No. _____TBA
City Council's Agenda Item # 94
Authorize a contract and provide payment for the construction of the Tabor Adjustments Project as an estimated cost of $4,800,000

5. The total estimated construction cost is $4,800,000 with a high level for the confidence rating. [hello not by this private citizen.]

7. Elements of the Tabor Adjustments are the subject of a pending Type III land use review before the Historic Landmarks Commission, which may result in an appeal of the Commission's decision to the City Council. Approval of this ordinance only authorizes the Water Bureau to solicit bids for implementing the work for the Tabor Adjustments (not defined) it does not constitute Council approval of this project or prejudgment of any land use appeals concerning the project that may be filed with the Council.

Please get back to me no later than 9:30 p.m. I am willing to stop by the SEUL office to pick up the letter and deliver it to the 1900 Building, get it stamped into the record.

Your thoughts,
mas

STOP

So what happens when Portland gets their waiver?

Something new to think about... .

Now is the time to disconnect the Columbia South Wells --

1. Water stored in wells can be best used to wash private cars, pickup trucks, US Mail, Portland's Fire Engines, Street Maintenance Truck, Commercial UPS, FedX delivery trucks, Heavy duty Freightliner trucks, etc.
That would stop radon from entering the newly constructed Kelly and Powell Butte water storage tanks.

On Jan 19, 2015, at 8:51 PM, Robert McCullough wrote:

January 21, 2015

Dear Mayor Hales, and Commissioners Fish, Fritz, Novick and Saltzman

Re: Open Reservoirs Resolution

In 2004 Mayor Katz appointed citizen representatives of the community to the Open Reservoirs Independent Review Panel. After six months of review the Panel voted by majority to retain our open reservoirs at Mount Tabor and Washington Park.

The EPA LT2 drinking water regulation is being reviewed into 2016 so there is time to stop the destruction and disconnecting of our open reservoirs. New York City and other utilities in New York, along with New Jersey are now in discussion with EPA.

The City of Portland has received scientific evidence to support an EPA LT2 waiver. The Board of Directors of SE Uplift requests that the City of Portland invite Senators Merkley and Wyden, along with the rest of the Oregon Congressional delegation, to work with New York and New Jersey in requesting an open reservoir EPA waiver – stopping the costly and unnecessary removal of the open reservoirs, saving money and keeping our water safe.

Sincerely,

<clip_image002.gif>

Robert McCullough

President

SE Uplift Board of Directors
--
<newlogo.gif> Robert McCullough
Managing Partner
McCullough Research
6123 S.E. Reed College Place
Portland, Oregon 97202
Robert@mresearch.com
www.mresearch.com

503-771-5090 (direct) 503-777-4616 (office) 503-784-3758 (cell)

<20150121 Open Resevoir Letter.pdf>

--
<newlogo.gif> Robert McCullough
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This e-mail message contains confidential, privileged information intended solely for the addressee. Please do not read, copy, or disseminate it unless you are the addressee. If you have received it in error, please call 503-777-4616 and ask to speak with the message sender. Also, we would appreciate your forwarding the message back to us and deleting it from your system. Thank you.

MOUNT·TABOR
NEIGHBORHOOD ASSOCIATION

January 20, 2015
Via email

Attn: Members of the Historic Landmarks Commission and BDS staff
RE: Comments for the record, **case file # LU 14-218444 HR**

Dear Commissioners:

We write today urging you to exercise your authority to do that which the ordinary citizen cannot – that is, to impose conditions that protect Mt. Tabor's historic resources.

The same code nexus that allows the Historic Landmarks Commission to expand the scope of work to include "interpretive materials" equally allows the HLC to expand the scope of work to include *other* preservation tasks. Those preservation tasks are clearly demanded at Tabor, and it is not logical to "interpret" resources we simultaneously allow to crumble around us. Please recognize that the historic structures are the most authentic interpretive materials conceivable for this historic site, and mandate that they get some attention. Maintaining the historic structures themselves is the best possible way to have them function as "a record of their time."

But, in fact, we are not discussing an *expansion* of the scope of work. Rather, this is a basic requirement of the application. The law requires the applicant to provide detailed plans to mitigate adverse effects (for applicable case law, please see attorney Ty Wyman's letter of January 7, and attorney Steve Wax's letter following the January 12 hearing). The mitigation plan submitted with this LUR, however, narrowly addresses only those effects on plants and trees – as if the sweeping vistas of these majestic gatehouses, walls, and fences, together with the deep water they command, play no role at this historic site. Please do not allow the Water Bureau to narrow the scope of your review. The Bureau proposes to make a change of great magnitude at Mt. Tabor – a change that is without parallel in the history of this century-old park – and it came to you without even a commitment to water. No matter how small the Water Bureau tries to make this project sound, the effect of its work is enormous. The mitigation plan should be detailed and appropriately scaled for the resource.

The Historic Landmarks Commission is charged with identifying and prioritizing the needs of historic resources *within* the development process. When presented with needs as obvious as those at Mt. Tabor, the HLC has every right to require appropriate action, based on best practices. You have the legal authority, indeed the obligation, to require written plans. And offering you better documentation is not a high bar for this applicant –the 2009 *Mt. Tabor Reservoirs Historic Structures Report* is already written. The Bureau needs only to formally fold it into this LUR, and commit to completing all of the 5- and 10-year preservation tasks during the disconnection project.

You are being told, on the one hand, that you should bless the Water Bureau's long-standing neglect of these historic structures by approving this application without the legally required proof of proper mitigation planning. But, at the same time, you are being told that you should contradict your approval by writing a letter to City Council in which you ask them to ask the Water Bureau to take care of those very structures. **The law is clear, however – if you are not certain that the plans for proper care are in place, then you cannot approve the application.** Unfortunately, the message you would convey by approving the Bureau's application in its current state would eclipse whatever suggestions might be proffered in a follow-up letter. Even if those suggestions were to be received with some positive lip service, they would have no lasting effect. For more than a decade we have been going to City Council, in large numbers and with compelling arguments, pleading for these historic structures to be taken care of – and to absolutely no avail. The reservoirs are no City Commissioner's pet project, and the simple fact is that City Council will not be moved to this course of action by a letter, no matter how eloquent.

Please make your guidance known inside this decision, not just in a suggestion to Council. We know that the *only* way to cause the Water Bureau to take care of this historic resource is to make the plan for that care an explicit condition of approval of this application. If you do not mandate the adoption of the HSR as a mitigation plan for the disconnection project, then that work will never be done and the historic structures will continue to deteriorate. Future projects can and likely will be so narrowly packaged as to avoid broad public notice and a trip before this Commission; this land-use application – at this moment – is the only opportunity to impose the condition of fulfilling the 2009 *Historic Structures Report*. Impose that condition and, if the Water Bureau finds it objectionable to do what it rightly should have been doing all along, then let the Bureau, if it feels it can, stand up and take this position publicly by appealing the condition.

Finally, and most importantly, please recognize this: **Portland City Council needs the legitimizing effect that a mandate from the land-use process provides, in order to spend ratepayer dollars on preservation work.** Land-use mandates have successfully secured millions of dollars in work meant to honor the history of other sites (at Powell Butte, for instance, the land-use mandates secured ratepayer funding for trail improvements, a brand new 3-bedroom caretaker's house, an interpretive building, and other amenities). The City Council needs a mandate from the Historic Landmarks Commission to safely commit the funding for the historic preservation of the Mt. Tabor reservoirs.

Respectfully,

Stephanie Stewart and John Laursen
On behalf of the Mt. Tabor Neighborhood Association (MTNA)
1121 SE 50th Ave; Portland, OR 97215
stewartstclair@gmail.com

Adam, Hillary

From: Kate & Chris <samsa@pacifier.com>
Sent: Tuesday, January 20, 2015 11:11 AM
To: Adam, Hillary
Subject: Case File #LU 14-218444 HR, Testimony of Katherin Kirkpatrick 1-20-2015
Attachments: Attachment A -- Testimony of Katherin Kirkpatrick 1-20-2015.jpg

January 20, 2015

VIA FACSIMILE (503) 823-5630

Historic Landmarks Commission
c/o Hillary Adam and Stacey Castleberry
1900 S.W. 4th Avenue, Suite 1500
Portland, OR 97201

RE: Case File #LU 14-218444 HR
(City of Portland's Proposal to Disconnect Mt. Tabor Reservoirs 1, 5 and 6)

Dear Historic Landmarks Commission:

Thank you for the opportunity to respond to the issues raised at last Monday's hearing in the above case. Monday's hearing showed that the City's revised proposal has come no closer to meeting the approval criteria applicable to the landmarks. The proposal should be denied.

1. The applicant must prove the landmarks will remain in use, as public works. Yet it has disproven this by proposing the opposite.

The reservoirs' public utility function as Portland's water supply is fundamental to the "historic character" and "form and integrity" that the City's proposal must preserve *(PCC 33.846.060(G)(1) and (9)).* The reservoirs' grandfathered-conditional "Basic Utility" use is fundamental to and inseparable from their status as Historic Places. The City acknowledges as much in its own proposal:

> "…[T]he reservoirs were listed…due to their high integrity and historic significance to the city's water supply and….represent some of the finest examples of intact, still-in-use City Beautiful public works remaining in the nation."
>
> *--Revised staff report, quoting 2004 National Register nomination (emphasis added).*

The City attempted to argue both sides of this issue, first testifying that there was no change in use that would entitle the public to a conditional use hearing, then playing semantics by replacing the word "use" with "function" in its report, then finally admitting to the change in use once it decided upon a new use ("recreational") that might be allowed outright. But even if a new use would not trigger a conditional use hearing, that does not exempt the Water Bureau from the historic resource review required by PCC 33.445.140, nor constitute proof that the new use preserves historic character, form and integrity. The City offered nothing in the way of such proof at Monday's hearing.

Indeed, history suggests the opposite. On 12/1/2014 I provided the Commission with documentation of the applicant's longstanding effort to demolish and/or sell without due process the landmarks and their surrounding parklands. That intent was underscored by Monday's oral testimony by Catherine Howells, whose City-partnered PSU Capstone course teaches aspiring City employees about "the struggle of

removing the open reservoirs in Mount Tabor because of the neighborhood involvement." *(Attachment A, emphasis added.)* As the sole voice in support of the Water Bureau's proposal, Ms. Howells highlighted the Water Bureau's underlying disregard for these historic utilities' character, form and integrity.

When this is viewed in light of the testimony provided by John Laursen of the Mt. Tabor Neighborhood Association regarding the applicant's longstanding failure to carry out the preservational work on which it bases its assertion of future stewardship, it should be clear that the applicant has a systemically ingrained unwillingness to act in these landmarks' interest.

The applicant has the burden of proving *(PCC 33.800.060)* that it can and will meet the approval criteria of preserving the character, form and integrity of these in-use historic Basic Utilities. It has proven the opposite. Its proposal should be denied.

2. The applicant must prove its credibility when in asserting that the proposed changes are temporary and reversible. Yet the Zoning Code and the applicant's testimony prove the opposite.

Please recall that approval hinges upon retention of the landmarks' future use as Basic Utilities:

> "[N]ew construction must be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic resource and its environment would be unimpaired.
>
> --*Portland Zoning Code 33.846.060(G)(9)*

However, the applicant proposes to place the reservoirs' future Basic Utility use in jeopardy by shifting the reservoirs from Basic Utility to purely aesthetic recreational use. This change in use will erode the foundation on which the historic structures currently enjoy conditional use status.

As background, it must be recalled that the open zone does not allow, outright, the reservoirs' historic use as aesthetic municipal utilities; rather, the reservoirs currently enjoy grandfathered conditional use status by virtue of predating the existence of the open space. But once the applicant takes the landmarks out of the Basic Utility use category, this grandfathered conditional use status cannot be guaranteed in the future:

> If a conditional use is discontinued for 3 continuous years, the conditional use rights are lost. If a conditional use ceases operations, even if the structure or materials related to the use remain, the use has been discontinued. Any conditional use proposing to locate at the site after that time must go through a new conditional use review.
>
> --*PCC 33.815.050, "Loss of Conditional Use Status"*

By proposing to change the use of these reservoirs to an aesthetic-only "recreational" use, the City Attorney revealed in her Monday testimony that the proposed work may irreversibly wipe these in-use utilities from the history books even if the drinking water regulations being (erroneously) cited as the reason for the proposed work are revised.

The only way to meet the burden of proof that it will safeguard this future character, form and integrity is for the applicant to outline a concrete plan for the landmarks' continued classification in the Basic Utilities use category (for example, as an emergency backup system). The applicant would also need to demonstrate steps it has taken to achieve regulatory compliance while better preserving the landmarks' integrity (for example, treatment at the outlet). It has done neither.

The applicant has failed to meet its burden of proof regarding its ability and intent to preserve the landmarks' historic character, function and integrity as in-use City Beautiful water supply utilities.

The applicant's proposal should be denied until the applicant has truly worked with the whole community--not just neighborhood associations or stacked-testimony panels--to preserve the reservoirs' historically dual use as both aesthetic and in-use utilities.

Thank you for your consideration,

Katherin Kirkpatrick
1319 SE 53rd Avenue
Portland, OR 97215
(503) 232-8663
samsa@pacifier.com

Also sent via e-mail Hillary.Adam@portlandoregon.gov

Attachment: 1 additional page

PSU Capstone Students Praise "Portland's Water"

The Portland Water Bureau has been providing support for the Portland State University (PSU) Senior Capstone class about the Portland's water system for more than 12 consecutive terms. The course is taught by historian Catherine Howells, whose inimitable passion has made the class very popular. Water Bureau staff lecture throughout each term to provide depth to the class content. These students' comments below sum up the general feelings of the more than 200 students that have taken the course:

"It was interesting learning about the struggle of removing the open reservoirs in Mount Tabor because of the neighborhood involvement. We as the general public lack this kind of information and we make wrong assumptions about institutions like the Water Bureau. The field trip to the Bull Run was the best educational experience I have ever had. It helped me picture the historical facts of the water system in Portland."

"I was transformed from someone who knew nothing about Portland's unique water system to the most knowledgeable person in the room on the subject. This course opened my eyes to something so incredible and special, and its influence has inspired me to think about other ways in which I can learn about the community around me."

Student teams develop conceptual outreach projects to share information about the city's water and the Water Bureau each term. Student creativity knows no bounds as they pore through archives, compare Portland to other cities, and draw on their diverse disciplines to produce projects that vary from architectural renderings of new educational facilities to original, short-form documentaries.

This spring, one student, Christie Milligan, took an artistic approach that has literally struck a chord. She **produced a song** about Portland's water supply. Her fiancée and daughter lent their wonderful singing voices for the song. Christie's song highlights the visionary Bull Run Watershed – the source of Portland's pristine drinking water since 1895. The song has garnered national attention from the American Water Works Association and appeals to all.

The one thing that the Capstone students profess is an appreciation for Water Bureau staff. According to students, this is something for the bureau to be proud of. Staff are modeling career paths for students entering a workforce where many talented people are progressing toward retirement.

In the words of one student: *"Hearing from all the different engineers and the various jobs that they hold was insightful. Even though they all sound stressful, the engineers seemed rewarded and enthusiastic about their careers. I have actually been considering going back to school to get an engineering degree."*

Dick Robbins returns from retirement to give expert watershed tours to PSU students.

CORRECTION: Water Bureau Presenters Offer Expertise at Annual AWWA Conference

Among the presenters at the American Water Works Association Pacific Northwest Section annual conference, last month's Dispatch unintentionally missed Eloise Eccles, Chemical/Environmental Engineer, who presented on "Standardizing the Water Main Disinfection Process - Portland Water Bureau Method." Great job to all our presenters for representing the Portland Water Bureau and providing leadership and learning opportunities for local drinking water professionals.

Adam, Hillary

From: Schwab Mary Ann <e33maschwab@gmail.com>
Sent: Tuesday, January 20, 2015 11:35 AM
To: Moore-Love, Karla
Cc: Hales, Charlie; Novick, Steve; Commissioner Fritz; Commissioner Fish; Commissioner Saltzman
Subject: Wednesday, January 21st: City Council's SECOND READING ON ORDINANCE NO. approving $4,800,000 on construction contracts to start disconnecting the reservoirs.

Mayor Hales and Commissioners, Fish, Fritz, Novick and Saltzman:

By now, I trust you know that Southeast Uplift Board of Directors are seeking Protection for Mt. Tabor Reservoirs -- from being disconnected. And that Mt. Tabor Reservoir Disconnect is currently under review by the Historical Land Marks Commission. HLMC is accepting public written commits prior to noon today: January 21st. Short of your posting a pro/con comment no-later-than noon today; morning, you will have not voice when this issue is appealed to LUBA. Once again, we Portlanders will be compelled to hire a expensive Land Use Attorney to represent our appeal to LUBA. The irony here is that their property taxes pays salaries for the attorney representing the Water Bureau.

ALSO TIME CERTAIN City Council Agenda, Wednesday, January 22nd, SECOND READING ON ORDINANCE NO. approving $4,800,000 on contracts to start Mt. Tabor Adjustments a.k.a Disconnecting the Reservoirs pipes. My fear, with so many issues fast tracked -- Scott Fernandez's action alerts regarding radon -- a serious public healths issue -- may have been overlooked by the public. [link: BullRunWaiver.Org] In my humble opinion the Columbia South Shore wells must be disconnected from the Portland's Drinking Water. That well water best be recycled to as a "truck wash" to clean City's Fire and road maintenance trucks, US Mail trucks and vans, commercial trucks. Drinking water is fast becoming more precious than oil so let's not waste a drop cleaning vehicles. Let's move to efforts with the Sovereign Nations living along the Columbia river for centuries, Bob Sallinger, and the Riverkeepers, Friends of the Reservoir, Southeast Uplift Board of Directors, and Scott Fernandez protecting Bull Run water quality safe for public health as well as the Columbia river water to honor the Treaty of 1855 iconic salmon runs. [Link: http://www.umatilla.nsn.us/treaty.html]

Surely, you are award that currently the EPA LT2 drinking water regulation is being reviewed into 2016 so there is time to stop the destruction and disconnecting of our open reservoirs. New York City and other utilities in New York, along with New Jersey are now in discussion with EPA. I am asking you to VOTE NO vote on Agenda Item #94 today.

Respectfully,

Mary Ann Schwab, Community Advocate
605 SE 38th Avenue
Portland, OR 97214-3203
(503) 263-3522

P.S. Whoops, I must slow down to double check calendars -- especially following three-day National Holiday weekends.
Which only proves that MAS needs to pull the plug on her computer. I've done my part, now it is your turn to listen -- STOP THE CLOCK AND VOTE NO ON AGENDA ITEM #94.

“Never depend upon institutions or government to solve any problem. All social movements are founded by, guided by, motivated and seen through by the passion of

individuals.”
— Margaret Mead

***

Subject: Southeast Uplift seeks Protection for Mt. Tabor Reservoirs. ... under review by the Historical Land Marks Commission. accepting public written commits prior to noon today: Tuesday, January 20st.

Ian Johnson
State Historical Preservation Office
Ian.Johnson@Oregon.gov
1 (503) 986-0678
(Salem)

and

Hillary Adam
Land Use Services, to Historical Resource Review
Hillary.Adam@Portland.Oregon.gov
(503) 823-3581
(Portland)

Adam, Hillary

From: Mark Bartlett <bartlett.m@comcast.net>
Sent: Tuesday, January 20, 2015 11:36 AM
To: Adam, Hillary; Ashenfelter, Paige (BDS); Mark Bartlett; Stephanie Stewart and Mike St Clair
Subject: Comments on the Mt Tabor LUR

Hi,
Given the new information from both sides, I'd like to once again reserve the opportunity to respond once answers and responses are submitted for the public to review.

That would include the BDS / applicant response to the Ty Wyman letter, and that information provided just prior to or at the hearing itself.
Please contact me and the entire mailing list) when they have been posted.

I have for some time requested through e mails and public records requests (Oct 22 and 27) any and all notes from any EA or pre app meeting between the applicant and BDS staff to discuss the use or definitions for this proposal. Both the applicant and BDS have each denied that there were any discussions, so no notes.

Yet we find that the applicant now has provided that they did discuss these issues in order to discover which if any aspects of the application would exceed development standards and require adjustments (Jan 12 response by WB). In order to do so one would have to determine then apply which use was going to be that upon which all else that follows. Certainly that discussion did take place as I anticipated. If there are no notes one has to ask why since this was the critical starting point for this LUR.

Please make those notes from any meeting or discussion on use or definitions for this LUR from that March preapp meetings or any other, publicly available.

The applicant has yet to provide any documentation that the PPR / City parcels on which they will work have no encumbrances. Of course one would have to actually look for and do deed research in order to find them. It is my understanding that BDS requires this documentation prior to accepting any application for processing. The applicant must provide that information in order for the application to be accepted as complete.

I would also like to clarify some language:
LT2 does not require anything more than a plan be submitted, yet the applicant continues to represent that it somehow requires the work described in the proposal. It does not. Repeating this does not make it so. Please correct this error.

I provided the HLC members a site plan from Opsis, which was a part of the master plan approved by Council in 2009. I was a member of that citizen group. That resolution provided that plant production would continue on the upper nursery and long block. There is a historic aspect to the plant production even if not all of it is in the resource area. The proposed work bisects that upper nursery. I provided a photo of that from 2008 showing the plants under production on either side of the gravel road. This has never been addressed.

I asked about how the applicant would secure an easement from PPR or by what means they intended to acquire the right to permanently change that park land on which they will lay their pipe. Any ROW or easement would permanently preclude trees and plantings that are park like from that ROW.
That I see as a change of use to the current existing park use, regardless of whether pipes are allowed by right in the OS zone or not.
That is not the issue. That they are taking land they do not own and changing the use from its existing use is the point.

This is new development not connected to the disconnect so must require an additional CU review. It is new work on Park land and not adjustments on WB land. It is a bypass, not maintenance or upgrade or any other "alteration". It

changes park land use and not WB land. This means there would be 4-5 adjustments required as their proposal exceeds a number of those development standards, which I have enumerated on prior communications.

The applicant represents that a non park use permit would provide any and all legally required access to conduct activities related to the work on land not owned by the WB. If these are the same permits used for weddings and events, how could they provide the legal means to essentially take park land in perpetuity without compensation.

The applicant is a revenue bureau, so simply taking non revenue land without compensation is not allowed as the City attorney recently found in having to reverse the case of the attempted "swap" of McCalls for a small parcel at the Tabor maintenance yard. The public owns this land so it is differentiated from WB land which can be bought or sold to meet its bureau mission. A taking is a taking.

Thank you,
Mark Bartlett

Adam, Hillary

From: Helga Fuller <helgafuller@gmail.com>
Sent: Tuesday, January 20, 2015 11:58 AM
To: Adam, Hillary
Subject: Comment about LU 14-218444 HR EN - Mt. Tabor Reservoirs Disconnection

Follow Up Flag: Follow up
Flag Status: Flagged

I appreciate the careful consideration that is being given to this case by the HLC. I appreciate the efforts to insure that the reservoirs will be treated respectfully. I attended the June 2014 Mt Tabor Land Use meeting and my impression was that some representatives of the Water Bureau, while attempting to appear professional, could not fully hide a vindictive tone when telling the Mt Tabor community that it was possible that the reservoirs would be left empty.

While you must wrestle with the legal details, I have been trying to understand the bigger picture. I have talked with Amanda Fritz and she seems to see the whole Powell Butte construction/Mt Tabor disconnect as an unfortunate expenditure that was not necessary at this time, but would have been some time in the future --- basically the project is okay, but didn't really need to be done at this time. I imagine that she sees the Mt Tabor community as another special interest group whose members are concerned with the finer points of water delivery and aesthetics. She told me that dealing with issues like homelessness is a better use of her time.

So one could ask-- Are those people who have devoted decades of their lives to a volunteer policing of the water bureau just a finicky bunch?

I don't think so. The Mt Tabor reservoirs get many people involved, but the issue is really about large contracting firms shaping our water systems -- from the available scientific literature, to water quality legisation, to the actual physical structure of the system. The water is delivered, but the first priority is contract generation, the second is public service and water quality. I think this order of priorities stays under the radar until there is a clear conflict between profit and public good. This is what erupts repeatedly around the Mt Tabor reservoirs.

This is the same issue that shows itself in the Iraq War. Different contractors, different policy makers -- but the same issue. The specific vision of a small group being executed with public resources. I bring this up also as an example of questionable federal policy.

Maybe this is not true and there is not problem. Maybe it is David Shaff's first priority to provide the healthiest water to Portand citizens, steering clear of any unnecessary costs. Maybe he does have the strong moral fibre and discernment that he needs to recognize and avoid the far reaching undue influence from powerful firms whose only income, and therefore only focus, is government contracts.

Or maybe business interests, science, and legislation are such a hopeless tangle that there is nothing to be done about it.

Many of us wish that more public servants had taken the hard, unpopular road and taken a really careful look at the call for the Iraq war -- and then made a stand against those who manipulated information and pushed war on our country. The fact that so few of them did still gives the war a sort of borrowed legitimacy that continues to hold even now.

You may think it is too dramatic to compare a stand by the members of the Historic Landmark Commision against bad water policy to the stand of US senators against the Iraq war. But you are responsible for keeping track of the bigger picture and safeguarding historic resources against those who wish to disrupt them for questionable or shortsighted goals. So it is your direct responsiblilty to decide if current water bureau policy is driven by long range plans for public good, or by current trends and fads in engineering infrastructure -- which are twisted up with profit margins.

(Amanda Fritz wants to help the homeless. But really, the failure of public servants to safeguard the drain of public funds by profit focused contractors directly affects those in need.)

A good steward of our water might still disconnect the Mt Tabor reservoirs -- but they would do it with a clear explanation of the benefits to the water quality and delivery --- not with lies and media manipulation. The fact that the MTNA feels the need to put every detail into legal records in order to avoid abuse should be an indication that our public servants at the water bureau are not trusted.

I ask you to take the time to research this issue and if you find that the shape and function of our historic water system - with its heart on Mt Tabor -- is being determined by people who do not have the public good as a clear first priority -- then I hope that you will deny their application for changes to the site and recommend to the city council that the fate of the Mt Tabor reservoirs -- and our entire water delivery system -- be placed in more capable and trustworthy hands.

--Helga Fuller
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