BENEFITS of DEEP OPEN WATER RESERVOIRS

Deep open water reservoirs provide many public health advantages.

- Gases that are natural (radon) and those that are part of the disinfection process (chloroform), two suspected carcinogens, are able to escape into the air before entering the household.

- Oxygenation from the fountain and waterfall action at the inlet provide additional disinfection similar to ozone. The resulting increased water surface area allows oxygen to diffuse close to the anaerobic organisms, thus providing disinfection.

- Dissolved oxygen in open air reservoirs allows aerobic bacteria to further break down organic compounds.

- Unlike free chlorine, the chloramine we use is a stable disinfectant. It will remain active in water for many days. Aeration, and the boiling of water are not effective in removing chloramine. Chloramine is quite stable after sunlight exposure, and decay is negligible. Conversely, ultraviolet light may deplete the free chlorine in the water. (1)(2)

- Sunlight and open air provide control of microbial growth by allowing the natural oxygen exchange process in the water to continue.

- Sunlight breaks down n-Nitrosodimethylamine (NDMA), a byproduct of chloramine disinfection and a suspected carcinogen (1)

- Sunlight inhibits chloramine residual breakdown from nitrification bacteria and subsequent formation of nitrate and nitrite. The increase in nitrification episodes associated with covering previously uncovered reservoirs within chioraminated systems was not discussed or provided for in the Long Term 2 Enhanced Surface Treatment Water Rule literature.(3) Increased levels of nitrate and nitrite can result in blood, gastric, and other serious health disorders.(4)

Permanent **burial and floating covers may not provide a true public health benefit.**

- Covers and liners are made of chlorosulphonated polyethylene, a petrochemical. Long term petrochemical leaching effect is unknown. These covers will shrink, crack, and deteriorate over time. The subsequent breakdown byproducts will be consumed. Animals will contaminate the surface. They may breach

the barrier through pressure equalizing vents to nest, and drown. This debris will find its way into the drinking water.

- Biofilm will develop under the cover surface. Algae will likely develop around the perimeter, and off flavors and odors can be expected.

- Covered reservoirs do not vent disinfection by-products.

- Any contamination to drinking water systems can occur downstream from the reservoir and provide a catastrophic occurrence through backflow into the uncontrolled distribution system. Monitored open reservoirs can quickly contain any deliberate action

- Properly maintained open municipal reservoirs pose no more risk than any river, lake, or watershed reservoir contamination

- Bird wires, current chlorination treatment at the outlet, added security, and public access hours will provide the acceptable protection we need.

RADON

Radon primarily from the wellfield has been found in our drinking water at various levels. (5) Radon ~s a gas formed from radioactive decay of soil and rock material. It is odorless and colorless and easily transfers from water to air. A storage tank left open to the atmosphere will lose all radon through diffusion into the air and natural decay. (6)

Once radon in water supplies reaches customers, it may produce human exposure via two methods: inhalation and direct digestion. Radon in water transfers into the air during showers, flushing toilets, washing dishes and washing clothes. The aerosols tend to deposit into the lungs where they release radiation that has been shown to increase the likelihood of lung cancer. Radon is second only to smoking in causing lung cancer in the United States, contributing to approximately 20,000 deaths per year. Radon can also reach other body tissues through ingestion resulting in radiation exposure to the internal organs. Ingestion of radon is believed to increase the risk of stomach cancer. (6)(7)

Current data from the Oregon Department of Health Services show more than 25% of the homes tested in Multnomah County exceed the action level of 4 pCi/ liter, mainly due to geological conditions. A 1,000 sq. foot house with 4 pCi *I* liter

of radon has nearly 2 million radon atoms in the air decaying every minute. (8) One single radon atom *I* alpha particle can begin the cancer process when inhaled. (9) Homes in the zip codes 97210-97213 in north and northeast Portland are especially at risk, and there are many more in other areas of the city. (10)

In the spring of 2001 three Portland Public Schools were closed for monitoring high levels of radon. Kelly, Whitaker, and Gregory Heights schools in northeast Portland were all affected. (11) Student health and safety were put at risk. Superior public health conditions exist through our open reservoirs, We do not need to add radon to all community areas through our drinking water system.

The EPA has established methods for the treatment and removal of radon from drinking water. Seven of the eight methods recommend aeration of the drinking water. The eighth uses activated charcoal. (6)(12)

Disinfectant Byproducts

While disinfectants are effective in controlling microorganisms, they react with natural organic and inorganic matter in source water and distribution systems to form unwanted disinfectant byproducts. Chlorine treatment of drinking water is necessary to prevent diseases that can be a major cause of illness.

TRIHALOMETHANES

Trihalomethanes are disinfectant by-products regulated by the EPA. These are generated during the disinfection process and are required to be kept at very low levels. These include the following chemicals:

1 .Chloroform - formed during the breakdown of chlorine -containing compounds, and may be found in small amounts in drinking water. Chloroform evaporates quickly when exposed to the air. People may ingest and inhale chloroform through drinking water, preparing food, laundry, or bathing. Chloroform is suspected of causing cancer.
(13)(14)

2. Bromoform - formed as a by-product when chlorine is added to drinking water to kill microorganisms. It is soluble in water and readily evaporates into air. It can be broken down by sunlight. Bromoform may enter through your skin while bathing. It may be inhaled during cooking, doing dishes, or bathing. In humans exposure can affect the central nervous system. In animals it has been linked to cancer, and is a probable human carcinogen. (14)(15)

3. Dibromochloromethane - another by-product formed by adding chlorine to

drinking water systems. It is soluble in water and readily evaporates into the air. It is also broken down by sunlight. It can be inhaled during bathing, cooking, or other household activities. EPA classifies it as a possible human carcinogen. (14)

4.Bromodichloromethane- a by-product of the chlorine added to drinking water for disinfection, reacting with organic material. It is also water soluble, but will evaporate when exposed to air. It is broken down by sunlight. Exposure can be through skin while bathing. It also occurs by inhalation from cooking, bathing, laundry etc. The U.S. Department of Health and Human Services has determined bromodichloromethane is reasonably anticipated to be carcinogenic. (14)

Summary: Deep open water reservoirs have been wrongly portrayed as not supporting public health benefits for our drinking water, when just the opposite is true. The sunshine and open water venting of gaseous chemicals reflect the natural

functioning of a healthy water system. We do not live in a sterile world and the open reservoirs expose us to nothing more than we are already subjected to in everyday living.

Covering or burying the reservoirs will eliminate the natural radon and trihalomethane gas removal process we currently enjoy in our drinking water system. Covering or burying our reservoirs will give radon and the trihalomethanes only one place to vent: homes, schools, and businesses.

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Member, Water Quality Advisory Committee, 1996-2000.

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