Portland Water Bureau

Triannual Water Quality Analysis
November 2016

Bull Run Water
The Portland Water Bureau supplies water to over 950,000 people in the Portland metropolitan area. The primary water source is the protected Bull Run watershed 26 miles east of Portland. The water from Bull Run is low in dissolved minerals and meets or exceeds all drinking water quality standards as measured at the entry point to the distribution system.

Water Treatment
Chlorine is used as the primary raw water disinfectant. The chlorine concentration entering the distribution system is adjusted seasonally to account for changes in water quality. Since September 2014, the target chlorine concentration has ranged from 2.2 to 2.5 parts per million (ppm). Once primary disinfection is complete, ammonium hydroxide (aqueous ammonia) is added to the chlorinated water. Ammonia reacts with chlorine to form a long-lasting chloramine disinfectant residual. Chlorine and ammonia are used in a ratio of approximately 4.9 to 1 by weight. At the end of the disinfection process, sodium hydroxide (NaOH) is added to the water at a dose of 3 to 5 ppm to raise the pH of the water to approximately 8.0 pH units. The addition of NaOH helps prevent corrosion of system piping and household plumbing, which in turn reduces the amount of lead, copper and other metals that can leach into the water from pipes, solder joints and plumbing fixtures.

Water Quality Standards
The U.S. Environmental Protection Agency (EPA) and the Oregon Health Authority-Drinking Water Services (OHA-DWS) set water quality standards for public water supplies.

Primary standards are set by federal and state regulations to protect public health, and are usually given as Maximum Contaminant Levels (MCLs). Lead and copper have action levels which cannot be exceeded at selected water customers' taps.

Secondary standards are federal and state guidelines set to assure aesthetic water quality and are given as Secondary Maximum Contaminant Levels (SMCLs). The secondary standards apply to substances that may affect water taste, odor, or color; may stain sinks, bathtubs, or laundry; or may interfere with treatment processes.

About This Report
This report presents analytical results for Portland's water to those needing technical data on water quality. The report covers results for treated Bull Run water from December 2015 through November 2016, emphasizing results from **November 15, 2016**.

Please feel free to provide feedback on the report; contact information is provided at the bottom of the report. Additional background information is available in the annual Water Quality Report, delivered to Portland customers in early June and posted at www.portlandoregon.gov/water/waterqualityreport.

Most analytical results in this document are reported in parts per million (ppm), which is equivalent to milligrams per liter (mg/L). One ppm corresponds to one penny in $10,000. When other units are used, they are displayed adjacent to the analytical results.

Many substances were either present at levels below the reporting limits of the prescribed method or were not detected. These results are shown as less than the Method Reporting Limit (<MRL). The MRL is the lowest concentration that can be reliably reported for the test method.

Abbreviations:

<	Less Than
MRL	Method Reporting Limit
ppm	Parts per Million (equivalent to Milligrams per Liter [mg/L])
MCL	Maximum Contaminant Level
SMCL	Secondary Maximum Contaminant Level
--	No Sample Result
N/A	Not Applicable

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Treated Bull Run Water

Samples of treated water were collected at the outlet of the Lusted Hill Treatment Facility on **November 15, 2016.**

Physical characteristics include temperature, pH, specific conductance, color, and solids. Results are reported in ppm unless otherwise noted.

Physical Characteristics	12-Month Range	Nov. 15, 2016	MRL*	EPA Standard
Secondary Contaminants				**SMCL**
pH, Field (Standard pH Units)	7.7 – 8.4	7.9	0.1	6.5 – 8.5
Total Dissolved Solids (TDS)	25 - 40	25	5	500
Color (Color Units)	5 - 7	7	5	15
Hardness (as $CaCO_3$)	6.1 – 8.4	7.3	0.3/0.5	250**
Unregulated Characteristics				
Specific Conductance (µmhos/cm @25°C)	27.2 – 33.9	33.3	0.1/1	Not regulated
Water Temperature, Field (°C)	4.7 – 16.9	10.8	0.1	Not regulated
Total Suspended Solids (TSS)	<0.5	<0.5	0.5	Not regulated
Total Solids (TS @180°C)	25 - 40	25	5	Not regulated
Turbidity (Nephelometric Turbidity Units; NTU)	<0.30 – 2.83	0.35	0.05/0.30	Not regulated at this point in system

***** MRLs may vary over time. Thus, more than one MRL is listed for some analytes.

******The SMCL for hardness is a secondary standard set by the State of Oregon; there is no secondary standard set by the EPA.

Nutrients are chemicals that plants and bacteria need to grow. All results are reported in ppm.

Nutrients	Past 12 Months	Nov. 15, 2016	MRL	EPA Standard
Primary Contaminants				**MCL**
Nitrate Nitrogen (NO_3^- as N)	<0.010 – 0.049	0.049	0.010	10
Nitrite Nitrogen (NO_2^- as N)	<0.005	<0.005	0.005	1
Unregulated Nutrients				
Ammonia Nitrogen, Free (NH_3 as N)	0.013 – 0.044	0.040	0.01	Not regulated
Ammonia Nitrogen, Total (NH_3 as N)	0.37 – 0.53	0.49	0.01	Not regulated
Nitrogen, Organic (N)	<0.05	<0.05	0.05	Not regulated
Nitrogen, Total (N)	0.32 – 0.40	0.40	0.05	Not regulated
Phosphorus, Reactive (PO_4^{3-} as P)	<0.003	<0.003	0.003	Not regulated
Phosphorus, Total (P)	<0.01	<0.01	0.01	Not regulated
Silica (SiO_2 as Si)	3.8 – 4.5	4.2	1.0	Not regulated
Total Organic Carbon (TOC as C)	0.77 – 1.4	1.4	0.30	Not regulated

Anions and cations are negative and positive ions, respectively. When water flows over or through soil and rocks, minerals may dissolve into the water where they form anions and cations. All results are reported in ppm.

Anions and Cations	12-Month Range	Nov. 15, 2016	MRL	EPA Standard
Primary Contaminants				**MCL**
Cyanide (CN^-)	<0.01	<0.01	0.01	0.2
Fluoride (F^-)	<0.025	<0.025	0.025	4.0
Secondary Contaminants				**SMCL**
Bromide (Br^-)	<0.01	<0.01	0.01	Not regulated
Chloride (Cl^-)	2.9 – 3.5	3.5	0.25	250
Fluoride (F^-)	<0.025	<0.025	0.025	2.0
Sulfate (SO_4^{2-})	0.37 – 0.43	0.43	0.25	250
Unregulated Anions and Cations				
Total Alkalinity (as $CaCO_3$)	6.9 - 13	8.8	1.0	Not regulated
Hydroxide Alkalinity (OH^- as $CaCO_3$)	<0.1	<0.1	0.1	Not regulated
Carbonate Alkalinity (CO_3^{2-} as $CaCO_3$)	<0.1	<0.1	0.1	Not regulated
Bicarbonate Alkalinity (HCO_3^- as $CaCO_3$)	8.0 - 10	8.8	0.1	Not regulated
Carbon Dioxide, Free (CO_2)	0.4 – 1.1	0.64	0.1	Not regulated
Carbon Dioxide, Total (CO_2)	7.4 - 10	8.4	0.1	Not regulated
Calcium (Ca^{2+})	1.5 – 2.1	1.8	0.05	Not regulated
Magnesium (Mg^{2+})	0.58 – 0.78	0.69	0.05	Not regulated
Potassium (K^+)	0.18 – 0.24	0.23	0.10	Not regulated
Sodium (Na^+)	3.36 – 3.70	3.70	0.20	Not regulated

Treated Bull Run Water (cont.)

Metals are a group of similar elements that occur naturally in the earth's crust. Many have potential health effects at low concentrations and are considered primary contaminants by the EPA. Some metals, such as iron, are not generally considered harmful to health at low concentrations but can cause nuisance effects, such as discolored water. These are considered secondary contaminants. All results are reported in ppm.

Metals*	12-Month Range	Nov. 15, 2016	MRL	EPA Standard
Primary Contaminants				**MCL**
Antimony (Sb)	<0.00050	<0.00050	0.00050	0.006
Arsenic (As)	<0.00050	<0.00050	0.00050	0.010
Barium (Ba)	0.00077 – 0.00102	0.00099	0.00050	2
Beryllium (Be)	<0.00050	<0.00050	0.00050	0.004
Cadmium (Cd)	<0.00050	<0.00050	0.00050	0.005
Chromium (Cr)	<0.00050	<0.00050	0.00050	0.1
Copper (Cu)	<0.00050 – 0.00073	0.00073	0.00050	Treatment technique**
Lead (Pb)	<0.00005	<0.00005	0.00005	Treatment technique**
Mercury (Hg)	<0.0001	<0.0001	0.00010	0.002
Selenium (Se)	<0.0025	<0.0025	0.0025	0.05
Thallium (Tl)	<0.00050	<0.00050	0.00050	0.002
Secondary Contaminants				**SMCL**
Aluminum (Al)	0.0125 – 0.0346	0.0346	0/0010	0.05 – 0.2
Copper (Cu)	<0.00050 – 0.00073	0.00073	0.00050	1
Iron (Fe)	0.0186 – 0.0492	0.0490	0.0050	0.3
Manganese (Mn)	0.00167 – 0.00711	0.00521	0.00050	0.05
Silver (Ag)	<0.00050	<0.00050	0.00050	0.1
Zinc (Zn)	<0.00050	<0.00050	0.00050	5
Unregulated Metals				
Molybdenum (Mo)	<0.00050	<0.00050	0.00050	Not regulated
Nickel (Ni)	<0.00050	<0.00050	0.00050	Not regulated
Vanadium (V)	<0.00050	<0.00050	0.00050	Not regulated

*All metals results represent the total concentration rather than constituent parts, such as the dissolved fraction or components with specific valences.
**Instead of an MCL, EPA requires a treatment technique to address copper and lead above their respective action levels of 1.3 and 0.015 mg/L in drinking water, as measured at the point of use.

Volatile Organic Chemicals (VOCs) include solvents, disinfection by-products, and industrial and commercial products. The test measures the concentration of 60 VOCs, of which 21 are regulated and have state and federal MCLs.

Contaminants	12-Month Range	Nov. 15, 2016	MRL	EPA Standard
Primary Contaminants				**MCL**
58 Volatile Organic Chemicals	All <MRL	Not Analyzed*	0.0005 – 0.002**	Various for 21 regulated**
Bromodichloromethane***	<0.00050 – 0.00065	0.00060	0.00050	0.080 mg/L for Total Trihalomethanes
Chloroform***	0.00727 – 0.0240	0.0130	0.00050	0.080 mg/L for Total Trihalomethanes

*VOCs in surface water are typically analyzed once a year, in April.
**Each individual chemical compound has its own MRL and/or MCL values.
***Bromodichloromethane and chloroform are the most commonly occurring trihalomethane disinfection by-products. Disinfection by-products are formed when naturally occurring organic and inorganic materials in the water react with chlorine and other disinfectants.

Would you like to access the Triannual Water Quality Report electronically?

Contact Randy Albright by email at randy.albright@portlandoregon.gov to be added to the electronic mailing list for the Triannual Water Quality report, which is compiled three times a year. For more information about Portland's drinking water, visit www.portlandoregon.gov/water. Click the What We Do link for detailed information on water quality reports, state and federal drinking water regulations, treatment, sources, and more. The web site includes a wealth of historical information, reference material, and updates on current issues.