



Supplemental Water Quality Data: December 2022

(Formerly called Triannual Water Quality Analysis)

About Portland's Water

Portland uses surface water from the Bull Run Watershed as its primary source year-round. Groundwater from the Columbia South Shore Well Field is an important secondary source, which is used when the surface water supply is limited or temporarily unavailable. The groundwater system is typically operated annually for several weeks in late summer in a blending mode with surface water to ensure all equipment is in good working order. In 2022, in addition to the August maintenance operation, the groundwater system was also operated in an emergency mode for operations continuity from February 8 to 11, for seasonal supply augmentation from October 13 to November 3, in an emergency mode during a turbidity event in the watershed from November 5 to 21, and in an emergency mode due to difficulties restarting surface water treatment following the turbidity event from November 22 to 23. Details of these 2022 groundwater operations can be found in the appendix at the end of this report. More information is available on our [About Portland's Water System page](#). Dates that we have used groundwater in the past are listed on our [Groundwater Use page](#).

Surface water treatment is a three-step process which currently consists of:

1. **Chlorine (Cl₂)** is added as a disinfectant to inactivate microorganisms such as bacteria, *Giardia*, and viruses, which could otherwise make people sick. The target chlorine level at the entry point to the distribution system varies seasonally, ranging between 2.2 and 2.5 parts per million (ppm).
2. **Ammonia (NH₃)** is added to stabilize the chlorine and form a longer-lasting chloramine disinfectant in the distribution system piping.
3. **Soda ash (Na₂CO₃) and carbon dioxide (CO₂)** are added for corrosion control. This increases the pH and the total alkalinity of the water and reduces leaching of metals from piping materials. Currently, the targets for pH and total alkalinity in finished surface water are 8.8 pH units and 27 ppm alkalinity as CaCO₃, respectively.

Groundwater is also treated by chloramination (chlorine plus ammonia), but pH adjustment for groundwater is achieved using sodium hydroxide (NaOH) rather than soda ash and carbon dioxide. Groundwater has naturally higher alkalinity than surface water and alkalinity adjustment is not necessary for groundwater.

The Portland Water Bureau is currently working on designing and constructing a new filtration plant for the Bull Run surface water supply. Find out more on our [Bull Run Projects page](#).

About This Report

The Portland Water Bureau releases drinking water test results three times per year for users who need water quality data beyond what is provided in our annual water quality report. Data in this report includes the most recent test results from both water sources, the surface water source in the Bull Run Watershed and our groundwater source in the Columbia South Shore Well Field.

Bull Run samples are collected at the Lusted Hill Treatment Facility outlet, which is the entry point to the distribution system. This location is typically sampled three times per year in April, August, and November (December in 2022). The data tables below contain results from the most recent sampling event on **December 6, 2022**, as well as the range of results for the past 12 months (January 1, 2022, through December 31, 2022).

Groundwater samples are collected at the Groundwater Pump Station outlet, which is the entry point to the distribution system. This location is typically sampled once per year in August unless more extensive use of groundwater occurs during the year. The data tables below contain results from the most recent sampling event on **November 16, 2022**, as well as the range of results from the past 3 years (January 1, 2020, through December 31, 2022).

Find this data and additional test results on our [Drinking Water Test Results page](#).

Have questions about water quality or this report? Contact our Water Quality Line at or 503-823-7525 or WBWaterLine@portlandoregon.gov.

Have feedback on this report or want to be added to our email distribution list? Email Randy Albright at randy.albright@portlandoregon.gov.

A list of definitions and abbreviations can be found after the data tables.

Data for Treated Bull Run Water

Physical Characteristics

Physical characteristics include temperature, pH, specific conductance, color, and solids.

Physical characteristic	12/6/22 results	12-month range	Standard limit	Standard type	Units
Color	16	5 – 16	15	Secondary	Color Units
Hardness (as CaCO ₃)	7.1	5.7 – 7.2	250	Secondary (Oregon)	ppm
Hardness (in grains per gallon)	0.42	0.33 – 0.42	-	None in these units	Grains per US gallon
pH, Field	8.9	7.8 – 9.1	6.5 – 8.5	Secondary	Standard pH Units
Specific Conductance	72.7	28.9 -72.7	-	None	µmhos/cm @25°C
Temperature	6.6	3.9 – 18.3	-	None	degrees Celsius
Total Dissolved Solids (TDS)	48	22 – 48	500	Secondary	ppm
Total Suspended Solids (TSS)	1.1	<0.5 – 1.7	-	None	ppm
Total Solids (TS @180°C)	53	25 – 53	-	None	ppm
Turbidity	1.8	0.20 – 2.65	5	Other – see notes	Nephelometric Turbidity Units (NTU)

Nutrients

Nutrients are naturally occurring organic and inorganic substances that microorganisms and plants need to grow.

Nutrient (chemical compound)	12/6/22 results	12-month range	Standard limit	Standard type	Units
Ammonia Nitrogen, Free (NH ₃ as N)	0.065	<0.010 – 0.076	-	None	ppm
Ammonia Nitrogen, Total (NH ₃ as N)	0.54	0.41 – 0.56	-	None	ppm
Nitrate Nitrogen (NO ₃ ⁻ as N)	0.078	<0.010 – 0.078	10	Primary	ppm
Nitrite Nitrogen (NO ₂ ⁻ as N)	0.007	<0.005 – 0.007	1	Primary	ppm
Nitrogen, Organic (N)	<0.05	<0.05	-	None	ppm
Nitrogen, Total (N)	0.54	0.34 – 0.54	-	None	ppm
Phosphorus, Reactive (PO ₄ ³⁻ as P)	0.005	<0.003 – 0.005	-	None	ppm
Phosphorus, Total (P)	<0.01	<0.01	-	None	ppm
Silica (SiO ₂ as Si)	4.0	3.8 – 4.3	-	None	ppm
Total Organic Carbon (TOC as C)	1.8	0.87 – 1.8	-	None	ppm

Anions and Cations

Anions (negatively charged ions) and cations (positively charged ions) enter the water when it flows over or through soil and rocks, dissolving minerals into the water.

Anions and cations (chemical compound)	12/6/22 results	12-month range	Standard limit	Standard type	Units
Alkalinity, Bicarbonate (HCO ₃ ⁻ as CaCO ₃)	27	8.4 – 27	-	None	ppm
Alkalinity, Carbonate (CO ₃ ²⁻ as CaCO ₃)	0.6	<0.1 – 0.8	-	None	ppm
Alkalinity, Hydroxide (OH ⁻ as CaCO ₃)	0.1	<0.1 – 0.2	-	None	ppm
Alkalinity, Total (as CaCO ₃)	28	3.4 – 34	-	None	ppm
Calcium (Ca ²⁺)	1.6	1.4 – 1.7	-	None	ppm
Carbon Dioxide, Free (CO ₂)	0.22	0.16 – 0.42	-	None	ppm
Carbon Dioxide, Total (CO ₂)	24	7.8 – 24	-	None	ppm
Chloride (Cl ⁻)	3.2	2.6 – 3.2	250	Secondary	ppm
Cyanide (CN ⁻)	Not Tested	<0.005	0.2	Primary	ppm
Fluoride (F ⁻)	<0.025	<0.025	4.0 / 2.0	Primary / Secondary	ppm
Magnesium (Mg ²⁺)	0.72	0.55 – 0.72	-	None	ppm
Potassium (K ⁺)	0.23	0.16 – 0.23	-	None	ppm
Sodium (Na ⁺)	13	3.4 – 13	-	None	ppm
Sulfate (SO ₄ ²⁻)	0.46	0.38. – 0.46	250	Secondary	ppm

Metals

Metals are a group of similar elements that occur naturally in the Earth's crust. The following results are for the total metal concentration in treated water. Note that lead and copper are regulated at the customer tap; see the Annual Water Quality report for regulatory data for customer taps.

Metal (atomic symbol)	12/6/22 results	12-month range	Standard limit	Standard type	Units
Aluminum (Al)	0.10400	0.02440 – 0.10400	0.05 – 0.2	Secondary	ppm
Antimony (Sb)	<0.00050	<0.00050	0.006	Primary	ppm
Arsenic (As)	<0.00050	<0.00050	0.010	Primary	ppm
Barium (Ba)	0.00123	0.00074 – 0.00123	2	Primary	ppm
Beryllium (Be)	<0.00050	<0.00050	0.004	Primary	ppm
Cadmium (Cd)	<0.00050	<0.00050	0.005	Primary	ppm
Chromium (Cr)	<0.00050	<0.00050	0.1	Primary	ppm
Copper (Cu)	0.00065	<0.00050 – 0.00065	1.3	Other – see notes	ppm
Iron (Fe)	0.1010	0.0158 – 0.1010	0.3	Secondary	ppm
Lead (Pb)	<0.00005	<0.00005	0.015	Other – see notes	ppm
Manganese (Mn)	0.00543	0.00121 – 0.01060	0.05	Secondary	ppm
Mercury (Hg)	Not Tested	<0.00010	0.002	Primary	ppm
Nickel (Ni)	<0.00050	<0.00050	-	None	ppm
Selenium (Se)	<0.0025	<0.0025	0.05	Primary	ppm
Silver (Ag)	<0.00050	<0.00050	0.1	Secondary	ppm
Thallium (Tl)	<0.00050	<0.00050	0.002	Primary	ppm
Zinc (Zn)	<0.0020	<0.0020	5	Secondary	ppm

Volatile Organic Chemicals (VOCs)

Volatile Organic Chemicals (VOCs) include solvents, disinfection by-products, and industrial and commercial products. The test measures the concentration of 60 individual VOCs. Of those, Portland commonly detects only bromodichloromethane and chloroform in treated surface water. These two VOCs are part of a group of VOCs called trihalomethanes. Trihalomethanes are disinfection by-products, which form when naturally occurring organic and inorganic materials in the water react with chlorine or other disinfectants.

Volatile Organic Chemical	12/6/22 results	12-month range	Standard limit	Standard type	Units
Bromodichloromethane	Not Tested	<0.00050 – 0.00084	0.080	Other – see notes	ppm
Chloroform	Not Tested	0.00681 – 0.01360	0.080	Other – see notes	ppm
58 additional Volatile Organic Chemicals	Not Tested	All <MRL	Depends on Compound	21 – Primary 37 – None	ppm

Data for Treated Groundwater

Physical Characteristics

Physical characteristics include temperature, pH, specific conductance, color, and solids.

Physical characteristic	11/16/22 results	3-year range	Standard limit	Standard type	Units
Color	<5	<5 – 6	15	Secondary	Color Units
Hardness (as CaCO ₃)	67	52 – 92	250	Secondary (Oregon)	ppm
Hardness (in grains per gallon)	3.92	3.03 – 5.38	-	None in these units	Grains per US gallon
pH, Field	8.3	8.1 – 8.5	6.5 – 8.5	Secondary	Standard pH Units
Specific Conductance	Not Tested	166 – 237	-	None	µmhos/cm @25°C
Temperature	10.7	9.4 – 19.8	-	None	degrees Celsius
Total Dissolved Solids (TDS)	130	130 – 150	500	Secondary	ppm
Total Suspended Solids (TSS)	<0.5	<0.5 – 0.5	-	None	ppm
Total Solids (TS @180°C)	130	130 – 160	-	None	ppm
Turbidity	<0.30	<0.05 – 2.4	-	see notes	Nephelometric Turbidity Units (NTU)

Nutrients

Nutrients are naturally occurring organic and inorganic substances that microorganisms and plants need to grow.

Nutrient (chemical compound)	11/16/22 results	3-year range	Standard limit	Standard type	Units
Ammonia Nitrogen, Free (NH ₃ as N)	0.062	0.01 – 0.3	-	None	ppm
Ammonia Nitrogen, Total (NH ₃ as N)	0.56	0.37 – 0.56	-	None	ppm
Nitrate Nitrogen (NO ₃ ⁻ as N)	0.056	0.052 – 0.3	10	Primary	ppm
Nitrite Nitrogen (NO ₂ ⁻ as N)	<0.005	<0.005 – 0.005	1	Primary	ppm
Phosphorus, Reactive (PO ₄ ³⁻ as P)	0.13	0.11 – 0.13	-	None	ppm
Phosphorus, Total (P)	0.12	0.10 – 0.12	-	None	ppm
Silica (SiO ₂ as Si)	19.8	18.2 – 19.8	-	None	ppm
Total Organic Carbon (TOC as C)	<0.30	<0.30	-	None	ppm

Anions and Cations

Anions (negatively charged ions) and cations (positively charged ions) enter the water when it flows over or through soil and rocks, dissolving minerals into the water.

Anions and cations (chemical compound)	11/16/22 results	3-year range	Standard limit	Standard type	Units
Alkalinity, Bicarbonate (HCO ₃ ⁻ as CaCO ₃)	85	78 - 100	-	None	ppm
Alkalinity, Carbonate (CO ₃ ²⁻ as CaCO ₃)	1.3	0.7 – 1.5	-	None	ppm
Alkalinity, Hydroxide (OH ⁻ as CaCO ₃)	<0.1	<0.1	-	None	ppm
Alkalinity, Total (as CaCO ₃)	86	79 – 115	-	None	ppm
Calcium (Ca ²⁺)	16	14 – 17	-	None	ppm
Chloride (Cl ⁻)	2.7	2.5 – 4.1	250	Secondary	ppm
Cyanide (CN ⁻)	Not Tested	<0.005	0.2	Primary	ppm
Fluoride (F ⁻)	0.14	0.14 – 0.17	4.0 / 2.0	Primary / Secondary	ppm
Magnesium (Mg ²⁺)	6.9	6.6 – 7.9	-	None	ppm
Potassium (K ⁺)	2.4	2.4 – 2.7	-	None	ppm
Sodium (Na ⁺)	Not Tested	12 – 15	-	None	ppm
Sulfate (SO ₄ ²⁻)	3.8	3.8 – 5.5	250	Secondary	ppm

Metals

Metals are a group of similar elements that occur naturally in the earth's crust. The following results are for the total metal concentration in treated water. Note that lead and copper are regulated at the customer tap; see the Annual Water Quality report for regulatory data for customer taps.

Metal (atomic symbol)	11/16/22 results	3-year range	Standard limit	Standard type	Units
Aluminum (Al)	0.00262	0.00251 – 0.00475	0.05 – 0.2	Secondary	ppm
Antimony (Sb)	<0.00050	<0.00050	0.006	Primary	ppm
Arsenic (As)	<0.00050	<0.00050 – 0.00105	0.010	Primary	ppm
Barium (Ba)	0.01070	0.00818 – 0.01070	2	Primary	ppm
Beryllium (Be)	<0.00050	<0.00050	0.004	Primary	ppm
Cadmium (Cd)	<0.00050	<0.00050	0.005	Primary	ppm
Chromium (Cr)	<0.00050	<0.00050	0.1	Primary	ppm
Copper (Cu)	<0.00050	<0.00050	1.3	Other – see notes	ppm
Iron (Fe)	0.0180	0.0106 – 0.0388	0.3	Secondary	ppm
Lead (Pb)	<0.00005	<0.00005 – 0.00015	0.015	Other – see notes	ppm
Manganese (Mn)	0.0303	0.0178 – 0.0319	0.05	Secondary	ppm
Mercury (Hg)	<0.00010	<0.00010	0.002	Primary	ppm
Nickel (Ni)	<0.00050	<0.00050	-	None	ppm
Selenium (Se)	<0.0025	<0.0025	0.05	Primary	ppm
Silver (Ag)	<0.00050	<0.00050	0.1	Secondary	ppm
Thallium (Tl)	<0.00050	<0.00050	0.002	Primary	ppm
Vanadium (V)	0.00214	0.00180 – 0.00396	-	None	ppm
Zinc (Zn)	<0.0020	<0.0020	5	Secondary	ppm

Volatile Organic Chemicals (VOCs)

Volatile Organic Chemicals (VOCs) include solvents, disinfection by-products, and industrial and commercial products. The test measures the concentration of 60 individual VOCs. Of those, Portland commonly detects only chloroform in treated groundwater. Chloroform is part of a group of VOCs called trihalomethanes. Trihalomethanes are disinfection by-products and form when naturally occurring organic and inorganic materials in the water react with chlorine or other disinfectants.

Volatile Organic Chemical	11/16/22 results	3-year range	Standard limit	Standard type	Units
Bromodichloromethane	Not Tested	<0.00050 – 0.00050	0.080	Other – see notes	ppm
Chloroform	Not Tested	<0.00050 – 0.00066	0.080	Other – see notes	ppm
58 additional Volatile Organic Chemicals	Not Tested	All <MRL	Depends on Compound	21 – Primary 37 – None	ppm

Notes

Drinking Water Standards

Regulatory standards (or limits) for substances in drinking water are set by the United States Environmental Protection Agency (EPA) and the State of Oregon Health Authority (OHA). Naturally occurring or anthropogenic substances that have an established drinking water standard based on health risk or aesthetic characteristics are called regulated contaminants. Unregulated substances do not have a drinking water standard, but the EPA may consider setting a standard for them in the future.

There are four types of standards referred to in this report:

- **Primary** standards are set for contaminants that have potential health effects. These standards are usually given as Maximum Contaminant Levels (MCLs) intended to protect public health. Water systems are required to test for most substances with primary standards at the entry point to the distribution system and report any detections in their annual water quality report. Exceptions to the compliance location for primary standards are listed below under 'Other'.
- **Secondary** standards are set for contaminants that can have aesthetic water quality impact. These are not generally considered harmful to health at low concentrations. These standards 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. Water systems are not required to test for these substances but can use the SMCLs as guidance for aesthetic considerations.
- **Other:** Compliance with primary drinking water standards for turbidity, lead and copper, and trihalomethane VOCs are determined at different points in the water system.
 - Turbidity in unfiltered surface water or groundwater under the direct influence of surface water is regulated at the raw water intake rather than at the entry point to the distribution system. PWB's groundwater system has not been determined to be under the direct influence of surface water, and therefore no turbidity standards apply to the groundwater system.
 - Lead and copper are regulated at customer taps, rather than at the entry point to the distribution system.
 - Trihalomethane VOCs are regulated as the sum of results for a group of four trihalomethane compounds (Total Trihalomethanes), in the distribution system rather than at the entry point to the distribution system.
- **None:** Not all substances found in water have a regulatory standard. Water systems are not required to test for unregulated substances. Portland provides data for these substances in this report since their presence in water may impact some users.

Definitions and Abbreviations Used in Data Tables

Method Reporting Limit (MRL)

The method reporting limit (MRL) is the lowest concentration of a substance that can be reliably reported for the test method. In the data tables, substances that had results below the MRL have a less than symbol (<) in front of the numerical MRL. For VOCs, <MRL is used when many individual VOCs that have different MRLs are grouped together.

Parts per Million (ppm)

Water providers use ppm to describe a small amount of a substance within the water. In time measurement, one part per million is about 32 seconds out of one year. Parts per million (ppm) is equivalent to milligrams per liter (mg/L).

Appendix – 2022 Groundwater Use

Dates of Operation	Reason for Operation	Total GW pumped for supply, MG	Maximum Flow Rate, MGD	Blend Percentage
February 8 - 11, 2022	Emergency Use, Ops Continuity	236	77	100
August 2 - 24, 2022	GW System Maintenance	295	43	9
Oct. 13 - Nov. 3, 2022	Seasonal Supply Augmentation	899	57	47
November 5 - 21, 2022	Emergency Use, Turbidity Event	1281	85	100
November 22 – 23, 2022	Emergency use, Treatment Issue	36	53	41

Notes: MG = Millions of Gallons; MGD = Millions of Gallons per Day