Northumberland County
Household Water Quality Program
Northumberland Cooperative Extension

Roger Gruben

Mailing Address:
150 Jordan Ln, Kilmarnock, VA 22482

Sample Address:
150 Jordan Ln, Kilmarnock, VA 22482

Water Treatment: No Response

Sample ID: **22651**

Date of Sample: **10/6/2021**

Sample Location: outdoor spigot - before treatment

Water Source: Drilled_Well

Test (units)	Water Quality Sample Results	Maximum Recommended Level or Range
Iron (mg/L)	0.148	0.3
Manganese (mg/L)	0.007	0.05
Arsenic (mg/L)	ND	0.01
Hardness (mg/L)	5.5	180
Sulfate (mg/L)	28.9	250
Fluoride (mg/L)	4.19**	2
Total Dissolved Solids (mg/L)	622**	500
pH	8.8**	6.5 to 8.5
Sodium (mg/L)	245.8**	20
Nitrate-N (mg/L)	ND	10
Total Coliform Bacteria Data:		
Presence/Absence	ABSENT	ABSENT
Most Probable Number Count (MPN/100mL)	ND	
E. coli Bacteria Data:		
Presence/Absence	ABSENT	ABSENT
Most Probable Number Count (MPN/100mL)	ND	
First Draw Data:		
Copper (mg/L)	0.385	1.3
Lead (mg/L)	0.053**	0.015
Flush Data:		
Copper (mg/L)	0.026	1.3
Lead (mg/L)	0.003	0.015

**Measured value exceeds recommendation for household water; ND indicates not detected (below the instrument detection limit)

For more information, contact your local Cooperative Extension Office or Erin Ling with the Virginia Household Water Quality Program:

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Analysis coordinated by Water Quality Laboratory, Dept. of Biological Systems Engineering, Virginia Tech, Blacksburg, VA. The information provided is for the exclusive use of the homeowner and should not be used as official documentation of water quality. This material is based upon work supported by the U.S. Department of Agriculture, Extension Service.

Interpretation Sheet

Sample ID: 22651

Contaminant Levels: The Environmental Protection Agency (EPA) sets either a Maximum Contaminant Level (MCL) or a Secondary Maximum Contaminant Level (SMCL) for each contaminant. Maximum Contaminant Levels are set to protect the public health from contaminants in water. These legally enforceable national standards apply to public drinking water systems, but serve as a guide for private systems. Secondary Maximum Contaminant Levels are concentration limits for nuisance contaminants. No regulations are enforced for private water systems, such as wells and springs; these standards are useful guidelines for individual water supplies.
Units: Contaminants in your water test are reported in milligrams per liter (mg/l). One mg/l is equal to 1 part per million (ppm). To visualize this, about 4 drops of ink in a 55 gallon barrel of water results in an "ink concentration" of 1 ppm or mg/l.

Flouride (MCL=4 mg/L; SMCL=2mg/L)
Small concentrations of fluoride are considered to be beneficial in preventing tooth decay, while moderate amounts can cause brownish discoloration of teeth, and high fluoride concentrations can lead to tooth and bone damage. For these reasons, the EPA has set a Secondary Maximum Contaminant Level of 2 mg/L and a Maximum Contaminant Level of 4 mg/L.

Total Dissolved Solids (SMCL=500 mg/L)
Total dissolved solids (TDS) is a measure of all the dissolved substances in water, including salts and other ions. High concentrations of dissolved solids may cause adverse taste effects. TDS levels may be affected by sodium and hardness levels. The EPA SMCL is 500 mg/l for total dissolved solids.

pH (SMCL=6.5 to 8.5)
The pH of water indicates whether it is acidic (below 7.0) or alkaline (above 7.0). Acidic water can cause corrosion of pipes, which may lead to leaching of toxic metals, such as copper or lead, from plumbing systems. The life of plumbing systems may be shortened due to corrosion, requiring expensive repair or replacement. The use of plastic pipes approved by the National Sanitation Foundation (NSF) throughout the water distribution system lessens the concern of metal leaching. Water with a pH below 6.5 is acidic enough to require treatment. Alkaline water with a pH above 8.5 is rarely found naturally, and may indicate contamination by alkaline industrial wastes.

Sodium (Recommend <20 mg/L)
Moderate quantities of sodium in drinking water are not considered harmful as long as they are factored into the recommended daily sodium intake from food (1,500-2,000 mg per day). Excessive sodium has been linked to high blood pressure, heart and kidney diseases. For those on low-sodium diets, both the American Heart Association and EPA suggest 20 mg/l as a maximum level for sodium in drinking water. Contact your physician with questions. Water softening by ion exchange increases sodium levels in water. Reduce sodium in drinking water by softening only the hot water or bypassing drinking water lines.

Lead (MCL=0 mg/L; HAL=0.015 mg/L)
Lead rarely occurs naturally in water; it usually is leached into household water from plumbing or pipe materials. Lead can cause irreversible damage to the brain, kidneys, nervous system, and blood cells. It is a cumulative poison, meaning that it will accumulate in the body until it reaches toxic levels. Young children are most susceptible: mental and physical development can be irreversibly stunted by lead poisoning. Lead may be found in household drinking water in homes built prior to 1986 with lead solder, or in newer homes with “lead-free” brass components, which could contain up to 8% lead until January 2014. There is no safe level of exposure to lead. The MCL goal is 0 mg/L, and the Health Action Level (HAL) is 0.015 mg/L. According to recent guidance from EPA, if lead is present above 0.005 mg/L in your drinking water, the results warrant follow-up, especially if children are consuming the water. Addressing the corrosiveness (acidity) of your water by installing an acid neutralizing filter may help prevent lead leaching. Alternatively, consider installing an activated carbon filtration or reverse osmosis unit designed to remove lead at the faucet where drinking and cooking water is obtained. If lead in the flushed sample decreases significantly, another option is to flush pipes for at least 1 minute to remove water with higher lead concentrations before drinking or cooking, and always drink and cook with cold water. Contact your doctor if concerned.

Virginia Household Water Quality Program
Supplemental Report: Mass Spectrometry Results

Sample ID: 22651-Gruben (outdoor spigot - before treatment) **Sample Date:** 10/6/2021

Constituent	First Draw Results (mg/L) [1]	Flush Results (mg/L) [1]	Recommended Limit (mg/L)	Limit Type
Lead	**0.053**	0.003	0.015	Action Level [2]
Copper	0.385	0.026	1.3	Action Level [2]
Arsenic	*ND*	*ND*	0.01	MCL [3]
Barium		0.014	2	MCL [3]
Chromium	0.002	*ND*	0.1	MCL [3]
Cadmium	*ND*	*ND*	0.005	MCL [3]
Uranium		*ND*	0.03	MCL [3]
Selenium	*ND*	*ND*	0.05	MCL [3]
Iron	**1.056**	0.148	0.3	SMCL [4]
Manganese	0.021	0.007	0.05	SMCL [4]
Aluminum	**0.545**	0.071	0.2	SMCL [4]
Zinc	0.312	0.040	5	SMCL [4]
Silver		*ND*	0.1	SMCL [4]
Sulfate		28.944	250	SMCL [4]
Chloride		1.097	250	SMCL [4]
Sodium		**245.802**	20	Guidance Level [5]
Strontium		0.037	1.5	HRL [6]
Cobalt		*ND*	0.07	HRL [7]
Vanadium		*ND*	0.021	HRL [7]
Molybdenum		0.007	0.04	Life-time HA [8]
Nickel	0.002	*ND*	0.1	Life-time HA [8]
Calcium		1.368	--	Hardness [9]
Magnesium		0.503	--	Hardness [9]
Titanium		0.005	--	n/a [10]
Tin	0.009	*ND*	--	n/a [10]
Silicon		6.300	--	n/a [10]
Potassium		6.718	--	n/a [10]
Phosphorus		0.234	--	n/a [10]

[1] Results obtained via inductively coupled mass spectrometry (ICP-MS); "ND" indicates result is below detection limit of 0.001 mg/L
[2] Limit based on "action level" for public water systems in Lead and Copper Rule (40 CFR Part 141 Subpart I)
[3] Maximum Contaminant Level (MCL) established by National Primary Drinking Water Regulations (40 CFR Part 141 Subpart G)
[4] Secondary Maximum Contaminant Level (SMCL) established by National Secondary Drinking Water Regulations (40 CFR Part 143)
[5] Limit based on U.S. EPA's "guidance level" for individuals restricted to a 500 mg per day dietary sodium intake (EPA 822-R-03-006)
[6] Limit based on "health reference level" established by U.S. EPA in Preliminary Regulatory Determinations 3 (EPA-HQ-OW-2012-0155)
[7] Limit based on "health reference level" established by Agency for Toxic Substances and Disease Registry (EPA 815-R-16-003)
[8] Limit based on "life-time health advisory" established by U.S. EPA Health Advisory Program (EPA 822-S-12-001)
[9] Individual concentrations of calcium & magnesium are used to calculate hardness; See main report for hardness results
[10] Insufficient information is readily available on the effects of contaminant in drinking water

Analysis coordinated by Water Quality Laboratory, Dept. of Biological Systems Engineering, Virginia Tech, Blacksburg, VA. The information provided is for the exclusive use of the homeowner and should not be used as official documentation of water quality. This material is based on upon work supported by the U.S. Department of Agriculture, Extension Service.

Virginia Household Water Quality Program
Supplemental Report: Contaminant Information for Mass Spec Results

Table 1 - MCL: The U.S. Environmental Protection Agency (EPA) established Maximum Contaminant Levels (MCL) to protect the public against drinking water contaminants that present a risk to human health. No regulations are enforced for private water systems, such as wells and springs; these standards are useful guidelines for individual water supplies. Source: EPA MCL Chart (EPA 816-F-09-004)

Contaminant	Health Effects	Source
Lead	Infants and children: Delays in physical or mental development; children could show slight deficits in attention span and learning abilities. Adults: Kidney problems; high blood pressure	Corrosion of household plumbing systems; erosion of natural deposits
Copper	Short term exposure: Gastrointestinal distress. Long term exposure: Liver or kidney damage	Corrosion of household plumbing systems; erosion of natural deposits
Arsenic	Skin damage or problems with circulatory systems, and may have increased risk of getting cancer	Erosion of natural deposits; runoff from orchards, runoff from glass and electronicsproduction wastes
Barium	Increase in blood pressure	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits
Chromium	Allergic dermatitis	Discharge from steel and pulp mills; erosion of natural deposits
Cadmium	Kidney damage	Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints
Uranium	Increased risk of cancer, kidney toxicity	Erosion of natural deposits
Selenium	Hair or fingernail loss; numbness in fingers or toes; circulatory problems	Discharge from petroleum refineries; erosion of natural deposits; discharge from mines

Table 2 - SMCL: EPA established Secondary Maximum Contaminant Levels (SMCL) to serve as guidelines to assist public water systems in managing drinking water aesthetic considerations, such as taste, color, and odor. These contaminants are not considered to present a risk to human health at the SMCL. Sources: EPA SMCL Table (epa.gov), ATSDR Toxicological Profile reports (2003-2012), WHO Guidelines for Drinking Water Quality (2011 ed.)

Contaminant	Nuisance Effects	Source
Iron	Rusty color; sediment; metallic taste; reddish or orange staining	Corrosion of household plumbing systems; erosion of natural deposits
Manganese	Black to brown color; black staining; bitter metallic taste	Erosion of natural deposits
Aluminum	Colored water	Erosion of natural deposits; treatment coagulants
Zinc	Metallic taste	Corrosion of household plumbing systems; erosion of natural deposits
Silver	Skin discoloration; graying of the white part of the eye	Erosion of natural deposits
Sulfate	Salty taste	Erosion of natural deposits; atmospheric deposition
Chloride	Salty taste	Erosion of natural deposits; fertilizers; salt water intrusion; de-icing salts

Table 3 - Guidance & Health Advisories: EPA has not established MCL or SMCL limits for drinking water contaminants in the table below. Non-enforceable health guidance information is available from the EPA's Health Advisory Program, the U.S. Department of Health & Human Services (DHHS), and the World Health Organization (WHO). Sources: EPA HA Table (EPA 822-S-12-001), ATSDR Toxicological Profile reports (2003-2005), WHO (2011 ed.), US Federal Register (40 CFR Part 141, 2014-24582)

Contaminant	Description
Nickel	Nickel is found in natural deposits and household plumbing systems. Oral exposure to high nickel levels in humans is rare, though animal studies have shown harmful effects on several organs, immune system, reproduction, and development. The EPA recommends a limit of 0.1 mg/L (life-time dosage), while the WHO's guideline value is 0.07 mg/L for nickel-sensitive individuals.
Sodium	Moderate quantities of sodium in drinking water are not considered harmful as long as they are factored into the recommended daily sodium intake from food (1,500-2,000 mg per day). Excessive sodium has been linked to high blood pressure, heart and kidney diseases. For those on low-sodium diets, both the American Heart Association and EPA suggest 20 mg/L as a maximum level for sodium in drinking water.
Strontium	Strontium is found in natural deposits and can affect skeletal development, resulting in decreased bone calcification. EPA calculated a non-cancer health reference level of 1.5 mg/L .
Cobalt	Stable cobalt (non-radioactive) is found in natural deposits and is part of the essential vitamin B12. Cobalt is possibly carcinogenic to humans. High levels of cobalt can damage the kidneys, liver, and heart. DHHS has established a health reference level of 0.07 mg/L .
Vanadium	Vanadium is found in 65 types of minerals and widely distributed in natural deposits, including fossil fuels. Potential health effects of oral exposure to vanadium include stomach cramps and nausea. Vanadium is possibly carcinogenic to humans. DHHS has established a health reference level of 0.021 mg/L .
Molybdenum	Molybdenum is found in natural deposits and is used in metal alloys and some fertilizers. Excessive molybdenum consumption may lead to an increase in uric acid in the body. The EPA recommends a limit of 0.04 mg/L (life-time dosage), while the WHO's guideline value is 0.07 mg/L .