GODDARD SPACE FLIGHT CENTER
WALLOPS FLIGHT FACILITY
MAIN BASE WATERWORKS
PWSID #3001500
2021 Annual Drinking Water Quality Report (2020 data)

This Annual Drinking Water Quality Report, referred to as the *"Consumer Confidence Report,"* provides information about drinking water quality on NASA Wallops Flight Facility's (WFF) Main Base during calendar year 2020.

Drinking water must meet Federal and State standards as administered by the U.S. Environmental Protection Agency (EPA) and the Virginia Department of Health (VDH).

The information presented in this report documents how NASA WFF's drinking water meets all EPA and state Primary and Secondary drinking water quality standards.

If you have questions about this report or wish to obtain additional information about any aspect of WFF's drinking water, please contact:

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General Information

The sources of all drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. Source water for WFF's Main Base comes from groundwater pumped from deep onsite wells. Contaminants that may be present in all source water include:

(1) Microbial contaminants, such as viruses or bacteria, which may come from sewage treatment plants, septic tanks, agricultural livestock, and wildlife.
(2) Inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
(3) Pesticides and herbicides, which may come from a variety of sources including agriculture, urban storm water runoff, and residential uses.
(4) Organic chemical contaminants, including synthetic and volatile organic chemicals, which are byproducts of industrial processes and petroleum production, and from fueling stations, urban storm water runoff, fire fighter training, and failing septic systems.
(5) Radioactive contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities.

As water travels over the ground surface or through the soil, it dissolves naturally occurring minerals. Water can also pick up substances resulting from the presence of animal or human activities. Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons, such as those with cancer undergoing chemotherapy, patients who have undergone organ transplants, those with HIV/AIDS, or other immune system disorders, the elderly, and infants can be particularly at risk of infections. These individuals should seek advice from their health care provider about local drinking water.

The EPA and the Centers for Disease Control and Prevention (CDCP) guidelines on appropriate means to lessen the risk of infection by microbial contaminants, including *Cryptosporidium*, are available from the **Safe Drinking Water Hotline at (800)-426-4791**.

To ensure safe tap water, EPA and VDH enacted regulations that limit the concentrations of certain contaminants in water provided by public water systems. At WFF, the water is monitored for contaminants according to these regulations. The U.S. Food and Drug Administration regulations establish limits for contaminants in bottled water that must provide the same protections.

Is WFF water treated? (Yes, by chlorination)

Groundwater sources are not required to be chlorinated unless:

(1) There is a potential source of microbial contamination,
(2) There is a failure to meet the bacteriological quality standards, or
(3) The groundwater supply is under the direct influence of surface water.

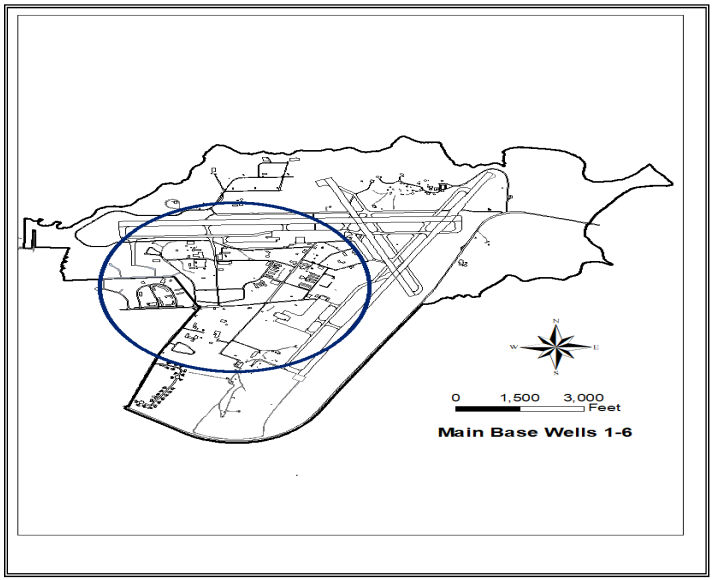
Although not a requirement, WFF chooses to treat its groundwater supply by chlorination. Since WFF utilizes chlorination as a treatment technique, the VDH requires that WFF maintain a minimum residual chlorine level of 0.29 mg/L at the entry point of its distribution system at all times to attenuate bacteria and viruses. The WFF ground storage tank is equipped with an aeration system that reduces the levels of by-products of chlorination (TTHM and HAA5) in the finished water.

Sources of WFF Main Base Drinking Water

The Main Base Waterworks water system has historically received its water from five groundwater wells located on the Main Base.
Well #1 – 260 feet deep
Well #2 –150 feet deep*
Well #3 – 253 feet deep.
Well #4 –265 feet deep
Well #5 –260 feet deep**
**Well #2 was taken out of service in April 2017.*
***Well #5 was taken out of service in February 2019.*

WFF has received VDH approval to construct a new well (Well #6) to help compensate for the two wells taken out of service in recent years. Well #6 is expected to be operational in 2022.

VDH conducted a Source Water Assessment of the WFF Waterworks in 2019. At that time, all wells evaluated were determined to be of low susceptibility to contamination using the criteria developed by VDH in its approved Source Water Assessment Program. Well #2 was out of service and not evaluated. The report consists of maps showing the Source Water Assessment area, an inventory of Land Use Activity Sites in Zone 1, a Susceptibility Explanation Chart, and Definitions of Key Terms. A copy of the report can be obtained by contacting the VDH Southeast Virginia Field Office (757-683-2000). Additional information on how you can help conserve water and protect your water supply can be found at the EPA website: http://www.epa.gov/sourcewaterprotection



MAIN BASE WATERWORKS Water Quality Report

Drinking Water Monitoring

WFF drinking water is routinely tested at the entry point and at representative points in the distribution system to ensure it complies with permit requirements, in accordance with Federal and State regulations. The table below includes regulated contaminants that have had some measurable level of detection within the past 5 years (January 2016 through December 2020). Many other contaminants (both regulated and unregulated) have been tested for and were not present, were below the laboratory equipment detection limits, or were below Health Advisory limits.

Several regulated contaminants are monitored less than once per year because the concentrations of these contaminants do not change frequently. Therefore, data for some contaminants shown in the table below is more than one year old.

KEY TERMS: *We've defined these water-quality terms, unique to the water industry, to help you better understand test results.*
90th percentile- The concentration of a contaminant that 90% of all sample results are at, or below.
AL (Action Level**)** - The concentration of a contaminant, if exceeded, triggers treatment or actions that a water system must take (i.e. repeat testing)
DL (Detected Level**)** - The concentration of analyte observed in water sample during testing.
HAA5 (Haloacetic Acids) - The sum of the five haloacetic acids that are regulated by EPA. Haloacetic Acids form in drinking water after the addition of chlorine as disinfection byproducts.
J – Estimated value
LHA – Lifetime Health Advisory
MCL (Maximum Contaminant Level**)** - The highest level of a contaminant that is allowable in drinking water. MCLs are set as close to the MCLGs (see definition below) as feasible by using the best available treatment technology.
MCLG (Maximum Contaminant Level Goal) - The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety set by EPA.
MRDL (Maximum Residual Disinfectant Level) - The highest level of a disinfectant allowed in the drinking water. There is conclusive evidence that addition of a disinfectant is necessary for control of microbial contaminants.
MRDLG (Maximum Residual Disinfectant Level Goal) - The level of a drinking water disinfectant below which there is no known or expected health risk. MRDLGs do not reflect the benefits of use of disinfectants to control microbes.
NA - Not Applicable
NC - No Criteria
ND (Not Detected**)** - The contaminant concentration in the sample was below the detection limit.
pCI/L – Measurement of radioactive particles in picocuries per liter, measurement of radioactivity
PFAS (Per or Poly-flouroalkyl substances) - Manmade compounds used extensively in a wide variety of consumer products and are also components of firefighting foams.
PFOA - Perfluorooctanoic acid
PFOS - Perfluorooctane sulfonic acid
PFHpA - Perfluoroheptanoic acid
PFHxS - Perfluorohexane sulfonic acid
PFHxA - Perfluorohexanoic acid
ppb (parts per billion**)** - Concentration in parts per billion, or micrograms per liter (ug/L); this is equivalent to a single penny in ten million dollars.
ppm (parts per million**)** - Concentration in parts per million, or milligrams per liter (mg/L); this is equivalent to a single penny in ten thousand dollars.
ppt (parts per trillion) - Concentration in parts per trillion, or nanograms per liter (ng/L), equivalent to one penny in ten billion dollars.
Source of Substance - Explains the typical natural or manmade origins of the contaminant.
TT (Treatment Technique) - An enforceable procedure or level of technological performance which public water systems must follow to ensure control of a contaminant.
TTHM (Total Trihalomethanes) - The sum of the four constituent compounds that form in drinking water by reactions of chlorine with natural organic material, creating disinfection byproducts.

Water Quality Data Summary

Regulated Contaminant (Units)	Goal (MCLG)	Max. Allowed (MCL)	No. of Samples Indicating Presence of Bacteria	Violation	Date	Sources of Substance
Total Coliform Bacteria	0	0 positive monthly sample	0	No	CY 2020	Naturally present in the environment
E. coli	0	0 positive monthly samples	0	No	CY 2020	Human and animal fecal waste

Regulated Contaminant (Units)	Goal (MCLG)	Max. Allowed (MCL or AL)	Detected Level (DL)	Range of Levels Tested	No. of Exceedances	Violation	Date	Sources of Substance
Chlorine, Cl_2 (ppm)	4 MRDL	4 MRDLG	0.98	0.00-1.75	0	No	CY 2020	Water additive to control microbes
TTHM (ppb)	0	80 (MCL)	66	61-66	0	No	CY 2020	By-product of drinking water chlorination
HAA5 (ppb)	0	60 (MCL)	35	6.9-35	0	No	CY 2020	By-product of drinking water chlorination
Copper, Cu (ppm)	1.3	1.3 (AL)	0.504 [A]	0.045-**1.350**	1	No	CY 2020	Corrosion of plumbing systems; Erosion of natural deposits;
Lead, Pb (ppb)	0	15 (AL)	47.9 [B]	ND-**75.6**	4	Yes	CY 2020	Corrosion of plumbing systems; Erosion of natural deposits
Beta particles (pCi/L)	0	50 [D]	11.7	NA	0	No	CY 2020	Decay of natural and man-made deposits
Combined Radium (226 + 228) (pCi/L)	0	5 (MCL)	0.2	NA	0	No	CY 2020	Erosion of natural deposits

Unregulated Contaminant (Units)	Goal	Detected Level (DL)	Date	Sources of Substance
Sodium (ppm)	NA	14.1 [C]	CY 2019	Erosion of natural deposits widely distributed in nature, discharge from softeners, human or animal waste disposal, leachate from landfill or seawater intrusion

Table Footnotes

All results reported in the table above are for samples taken in 2016-2020. Samples taken in 2020 are part of required four-quarter or annual running averages.

[A] Although one sample exceeded the copper action limit, the 90th percentile value for the entire waterworks is below the action level.

[B] WFF did not pass the 90th percentile value for the entire waterworks for lead because the 90th percentile lead concentration is above the action level.

[C] There is presently no established standard for sodium in drinking water. For individuals on a very low sodium diet (500 mg/day), EPA recommends that drinking water sodium should not exceed 20 mg/L. The World Health Organization has established a drinking water guideline of 200 mg of sodium/L on the basis of esthetic considerations (i.e. taste).

[D] The MCL for beta particles is 4 mrem/year. EPA considers 50 pCi/L to be the level of concern for beta particles".

MAIN BASE WATERWORKS Water Quality Report

Additional Health Information:

Certain contaminants (such as arsenic, *Cryptosporidium*, **lead**, nitrate, radon, **TTHM or PFAS**, when present in drinking water, may be of special concern to some consumers.

Lead (Pb):

EPA and VDH regulations require 90% of all sample concentrations, referred to as the "90th percentile," to be below the 15 ppb lead action level. For example, the 90th percentile sample concentration for 10 samples is the 2nd highest sample concentration.

WFF sampled drinking water for lead in ten buildings in August 2020. As shown in the Water Quality Summary Table column entitled *Range of Levels Detected*, concentrations in the 10 samples ranged from non-detected to 75.6 ppb. Four of the ten samples contained lead concentrations above the 15 ppb action limit (24.0 ppb, 33.4 ppb, 47.9 ppb, and 75.6 ppb). Therefore, the action level was exceeded in the 90th percentile sample (2nd highest result of 47.9 ppb). Because lead levels were elevated above the action level, the monitoring frequency for 2021 has increased from once a year to twice a year. The most recent notice with all results can be found at:
https://code200-external.gsfc.nasa.gov/250-WFF/program-areas-drinking-water

Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. WFF is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing. Water standing in metal pipes for several hours presents an increased risk of metals leaching into drinking water.

WFF implements several measures to mitigate lead levels in the drinking water system. Starting in 2005, WFF began adding small amounts of zinc orthophosphate (ZNOP) to the water distribution system. ZNOP works by forming a protective lining inside pipes and plumbing fixtures to prevent metals such as lead and copper from leaching into water inside the pipes. ZNOP is VDH approved, recognized as safe by the Food and Drug Administration, and is certified for use in drinking water treatment by the National Sanitation Foundation. WFF maintains filters on drinking water fountains and kitchen faucets to remove or minimize metals, including lead and copper. WFF also conducts routine flushing of water distribution lines. Additional information regarding lead and copper in WFF's drinking water has been distributed in notices to all employees and the documents have also been posted in all WFF buildings.

The following information is provided in compliance with 40 CFR141.154(d)(2) and 12VAC5-590-545.D.5. According to EPA and VDH, long-term exposure to elevated levels of lead in drinking water can cause serious health risks, especially for pregnant women and young children. Infants and children who drink water containing lead above the action level over a long period of time could experience delays in their physical or mental development. Children could show deficits in attention span and learning abilities. Adults who drink this water over many years could develop kidney problems or high blood pressure.

You can minimize these risks by flushing your tap until the water becomes cold and reaches a steady temperature before using it for drinking or cooking. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at:
http://water.epa.gov/drink/info/lead/index.cfm

Total Trihalomethanes (TTHM):
TTHM are by-products of drinking water chlorination. TTHM dissipate rapidly in open containers exposed to air. According to VDH, some people who drink water containing elevated TTHM over many years have a slightly increased risk of experiencing problems with their livers, kidneys, or central nervous systems, and may have an increased risk for certain cancers.

Per- and Polyfluoroalkyl Substances (PFAS):
In 2016, the EPA issued updated Lifetime Health Advisory (LHA) level guidelines of 70 parts per trillion (ppt) for two PFAS compounds, PFOS and PFOA, in drinking water because of potential adverse health concerns. NASA, in collaboration with local, state, and federal agencies, immediately began monitoring the facility's groundwater and drinking water wells, along with the Town of Chincoteague's drinking water wells located on NASA property. NASA has continued monitoring the drinking water for these compounds since 2017.

For additional information on PFAS, visit EPA's dedicated website: https://www.epa.gov/pfas

For past Wallops Information Sheets on PFAS testing, please see: https://www.nasa.gov/content/information-on-wallops-pfas-testing.

The table below summarizes PFAS sampling performed at the entry point in 2020. Fourteen other PFAS compounds, including PFOS, were monitored but not detected in 2020. No PFAS compounds were detected above the EPA LHA.

2020 PFAS Water Quality Data Summary

Unregulated Contaminant (units)	Lifetime Health Advisory (LHA)[A]	Range of Levels Tested
PFOA (ppt)	70	ND – 0.72 J
PFOS (ppt)	70	ND – 3.3
PFHpA (ppt)	NC	ND – 1.6 J
PFHxA (ppt)	NC	1.6 J - 2.4

Table Footnotes
Levels noted with a 'J' are estimated by the laboratory. Although they were detected, the estimated concentration is below the analytical method quantitation limit.

[A] The EPA drinking water LHA of 70 ng/L applies to PFOA and PFOS, individually or combined concentration of both compounds.

MAIN BASE WATERWORKS Water Quality Report

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