# 2021 Consumer Confidence Report

## Water System Information

Water System Name: **South Fork Estates Mutual Water Co**

Report Date: June 4, 2022

Type of **Water Source**(s) in Use: Ground Water Wells

Name and General Location of Source(s): Well #1, Well #2, Well#3 in South Fork Estates, Three Rivers, Ca 93271

**Drinking Water Source Assessment Information:**

Copies of the summaries of the source water assessments for wells #1 and #2 (prepared by the Tulare County Health Services in December 2002) and for Well #3 (prepared for us in July 2014 by California Rural Water Association) are attached.

**Time and Place of Regularly Scheduled Board Meetings for Public Participation**:

A meeting for all owners is held on the last Saturday of February each year. Owners are notified by mail of the date, time, and location. The Board of Directors meets quarterly or as needed. The date, time, and location may be obtained from any board member, or from the SFEMCW.com

**For More Information, Contact**: Patty Pliskin at 559-561-4709

California State Website for South Fork Estates Mutual Water Company (System No. CA5403113):

<https://sdwis.waterboards.ca.gov/PDWW/JSP/WaterSystemDetail.jsp?tinwsys_is_number=7498&tinwsys_st_code=CA>

## About This Report

We test the drinking water quality for many constituents as required by state and federal regulations. This report shows the results of our monitoring for the period of January 1 to December 31, 2021 and may include earlier monitoring data.

## Importance of This Report Statement in Five Non-English Languages (Spanish, Mandarin, Tagalog, Vietnamese, and Hmong)

Language in Spanish: Este informe contiene información muy importante sobre su agua para beber. Favor de comunicarse South Fork Estates Mutual Water Co a PO Box 597, Three Rivers, CA 93271 or 559-561-7626 para asistirlo en español.

Language in Mandarin: 这份报告含有关于您的饮用水的重要讯息。请用以下地址和电话联系 [Enter Water System Name]以获得中文的帮助: PO Box 597, Three Rivers, CA 93271 or 559-561-7626.

Language in Tagalog: Ang pag-uulat na ito ay naglalaman ng mahalagang impormasyon tungkol sa inyong inuming tubig. Mangyaring makipag-ugnayan sa PO Box 597, Three Rivers, CA 93271 o tumawag sa 559-561-7626 para matulungan sa wikang Tagalog.

Language in Vietnamese: Báo cáo này chứa thông tin quan trọng về nước uống của bạn. Xin vui lòng liên hệ South Fork Estates Mutual Water Co tại PO Box 597, Three Rivers, CA 93271 or 559-561-7626 để được hỗ trợ giúp bằng tiếng Việt.

Language in Hmong: Tsab ntawv no muaj cov ntsiab lus tseem ceeb txog koj cov dej haus. Thov hu rau South Fork Estates Mutual Water Co ntawm PO Box 597, Three Rivers, CA 93271 or 559-561-7626 rau kev pab hauv lus Askiv.

## Terms Used in This Report

| **Term** | **Definition** |
| --- | --- |
| Level 1 Assessment | A Level 1 assessment is a study of the water system to identify potential problems and determine (if possible) why total coliform bacteria have been found in our water system. |
| Level 2 Assessment | A Level 2 assessment is a very detailed study of the water system to identify potential problems and determine (if possible) why an *E. coli* MCL violation has occurred and/or why total coliform bacteria have been found in our water system on multiple occasions. |
| Maximum Contaminant Level (MCL) | The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the PHGs (or MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water. |
| Maximum Contaminant Level Goal (MCLG) | The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency (U.S. EPA). |
| Maximum Residual Disinfectant Level (MRDL) | The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants. |
| Maximum Residual Disinfectant Level Goal (MRDLG) | The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants. |
| Primary Drinking Water Standards (PDWS) | MCLs and MRDLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements. |
| Public Health Goal  (PHG) | The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency. |
| Regulatory Action Level  (AL) | The concentration of a contaminant which, if exceeded, triggers treatment or other requirements that a water system must follow. |
| Secondary Drinking Water Standards (SDWS) | MCLs for contaminants that affect taste, odor, or appearance of the drinking water. Contaminants with SDWSs do not affect the health at the MCL levels. |
| Treatment Technique  (TT) | A required process intended to reduce the level of a contaminant in drinking water. |
| Variances and Exemptions | Permissions from the State Water Resources Control Board (State Board) to exceed an MCL or not comply with a treatment technique under certain conditions. |
| ND | Not detectable at testing limit. |
| ppm | parts per million or milligrams per liter (mg/L) |
| ppb | parts per billion or micrograms per liter (µg/L) |
| ppt | parts per trillion or nanograms per liter (ng/L) |
| ppq | parts per quadrillion or picogram per liter (pg/L) |
| pCi/L | picocuries per liter (a measure of radiation) |

## Sources of Drinking Water and Contaminants that May Be Present in Source Water

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

* Microbial contaminants, such as viruses and bacteria, that may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
* Inorganic contaminants, such as salts and metals, that can be naturally occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
* Pesticides and herbicides, that may come from a variety of sources such as agriculture, urban stormwater runoff, and residential uses.
* Organic chemical contaminants, including synthetic and volatile organic chemicals, that are byproducts of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural application, and septic systems.
* Radioactive contaminants, that can be naturally occurring or be the result of oil and gas production and mining activities.

## Regulation of Drinking Water and Bottled Water Quality

In order to ensure that tap water is safe to drink, the U.S. EPA and the State Board prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. The U.S. Food and Drug Administration regulations and California law also establish limits for contaminants in bottled water that provide the same protection for public health.

## About Your Drinking Water Quality

### Drinking Water Contaminants Detected

Tables 1, 2, 3, 4, 5, 6, and 8 list all the drinking water contaminants that were detected during the most recent sampling for the constituent. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. The State Board allows us to monitor for certain contaminants less than once per year because the concentrations of these contaminants do not change frequently. Some of the data, though representative of the water quality, are more than one year old. Any violation of an AL, MCL, MRDL, or TT is asterisked. Additional information regarding the violation is provided later in this report.

Table 1. Sampling Results Showing the Detection of Coliform Bacteria

Complete if bacteria are detected.

| **Microbiological Contaminants** | **Highest No. of Detections** | **No. of Months in Violation** | **MCL** | **MCLG** | **Typical Source of Bacteria** |
| --- | --- | --- | --- | --- | --- |
| *E. coli* | 2022  0 | 0 | (a) | 0 | Human and animal fecal waste |

(a) Routine and repeat samples are total coliform-positive and either is *E. coli*-positive or system fails to take repeat samples following *E. coli*-positive routine sample or system fails to analyze total coliform-positive repeat sample for *E. coli*.

**Table 1.A. Compliance with Total Coliform MCL between January 1, 2021 and June 30, 2021 (inclusive)**

| **Microbiological Contaminants** | **Highest No. of Detections** | **No. of Months in Violation** | **MCL** | **MCLG** | **Typical Source of Bacteria** |
| --- | --- | --- | --- | --- | --- |
| Total Coliform Bacteria | (In a month)  0 | 0 | 1 positive monthly sample (a) | 0 | Naturally present in the environment |
| Fecal Coliform and *E. coli* | 2022  0 | 0 | 0 | None | Human and animal fecal waste |

(a) For systems collecting fewer than 40 samples per month: two or more positively monthly samples is a violation of the total coliform MCL

Table 2. Sampling Results Showing the Detection of Lead and Copper

Complete if lead or copper is detected in the last sample set.

| **Lead and Copper** | **Sample Date** | **No. of Samples Collected** | **90th Percentile Level Detected** | **No. Sites Exceeding AL** | **AL** | **PHG** | **No. of Schools Requesting Lead Sampling** | **Typical Source of**  **Contaminant** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Lead (ppb) | 09/20/2019 | 5 | 0 | 0 | 15 | 0.2 | 0 | Internal corrosion of household water plumbing systems; discharges from industrial manufacturers; erosion of natural deposits |
| Copper (ppm) | 09/20/2019 | 5 | 0.350 | 0 | 1.3 | 0.3 | Not  applicable | Internal corrosion of household plumbing systems; erosion of natural deposits; leaching from wood preservatives |

**Table 3. Sampling Results for Sodium and Hardness**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Chemical or Constituent (and reporting units)** | **Sample Date** | **Level Detected** | **Range of Detections** | **MCL** | **PHG (MCLG)** | **Typical Source of Contaminant** |
| Sodium (ppm) | 10/22/2021 | 23 | 19-24 | None | None | Salt present in the water and is generally naturally occurring |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Hardness (ppm) | 10/22/2021 | 233 | 220-240 | None | None | Sum of polyvalent cations presents in the water, generally magnesium and calcium, and are usually naturally occurring |

**Table 4. Detection of Contaminants with a Primary Drinking Water Standard**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Chemical or Constituent**  **(and**  **reporting units)** | **Sample Date** | **Level Detected** | **Range of Detections** | **MCL [MRDL]** | **PHG (MCLG) [MRDLG]** | **Typical Source of Contaminant** |
| Turbidity | 10/22/2021 | 0.1 | 0.0-0.32 | TT | NA | Soil Runoff.  Turbidity has no health effects. However, high levels of turbidity can interfere with disinfection and provide a medium for microbial growth. Turbidity may indicate the presence of disease-causing organisms. These organisms include bacteria, viruses, and parasites that can cause symptoms such as nausea, cramps, diarrhea, and associated headaches. |
| Gross Alpha Particle Activity (pCi/L) | 10/22/2021 | 1.33 | 4.86 | 15 pCi/L | (0) | Erosion of natural deposits.  Certain minerals are radioactive and may emit a form of radiation known as alpha radiation. Some people who drink water containing alpha emitters in excess of the MCL over many years may have an increased risk of getting cancer. |
| Combined Radium 226 & 228 (pCi/L) | Multiple sample dates between Feb – Oct  2016 | 0.48 | 0.0636-2.36 | 5 pCi/L | (0) | Erosion of natural deposits.  Some people who drink water containing radium 226 or 228 in excess of the MCL over many years may have an increased risk of getting cancer. |
| Arsenic (ug/L) | 10/22/2021 | 0.73 | ND-2.2 | 10 | 0.004 | Erosion of natural deposits; runoff from orchards; glass and electronics production wastes.  Some people who drink water containing arsenic in excess of the MCL over many years may experience skin damage or circulatory system problems and may have an increased risk of getting cancer. |
| Barium (mg/L) | 10/22/2021 | 153.3 | None Detected – 240 | 1000 |  | Discharge of oil drilling wastes and from metal refineries; erosion of natural deposits.  Some people who drink water containing barium in excess of the MCL over many years may experience an increase in blood pressure. |
| Fluoride (F)  (mg/L) | 10/22/2021 | 0.23 | 0.16-0.38 | 2.0 |  | Erosion of natural deposits; water additive which promotes strong teeth; discharge from fertilizer and aluminum factories.  Some people who drink water containing fluoride in excess of the federal MCL of 4 mg/L over many years may get bone disease, including pain and tenderness of the bones. Children who drink water containing fluoride in excess of the state MCL of 2 mg/L may get mottled teeth. |
| Nitrate (as N)  (mg/L) | 2021: 02/22, 05/18, 08/25, 10/22, 11/02 | 3.5 | 0.0-6.6 | 10 | 10 | Runoff and leaching from fertilizer use; leaching from septic tanks and sewage; erosion of natural deposits.  Infants below the age of six months who drink water containing nitrate in excess of the MCL may quickly become seriously ill and, if untreated, may die because high nitrate levels can interfere with the capacity of the infant’s blood to carry oxygen. Symptoms include shortness of breath and blueness of the skin. High nitrate levels may also affect the oxygen-carrying ability of the blood of pregnant women. |
| Uranium  (pCi/L)  Well #3 | 10/09/2018 | 6.70 |  | 20 | 0.43 | Erosion of natural deposits.  Some people who drink water containing uranium in excess of the MCL over many years may have kidney problems or an increased risk of getting cancer. |
| Uranium  (pCi/L) | 10/23/2015 | 3.7 | 2.4-5.9 | 20 | 0.43 | Erosion of natural deposits.  Some people who drink water containing uranium in excess of the MCL over many years may have kidney problems or an increased risk of getting cancer. |
| Chlorine  (mg/L) | 10/19/2018 | 20.3 | 19-23 | MDRL=4.0 (as Cl2)] | [MRDLG=  4 (as Cl2)] | Drinking water disinfectant added for treatment.  Some people who use water containing chlorine well in excess of the MRDL could experience irritating effects to their eyes and nose. Some people who drink water containing chlorine well in excess of the MRDL could experience stomach discomfort. |

Table 4. Detection of Contaminants with a Secondary Drinking Water Standard

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Chemical or Constituent (and reporting units)** | **Sample Date** | **Level Detected** | **Range of Detections** | **SMCL** | **PHG (MCLG)** | **Typical Source**  **of**  **Contaminant** |
| Chloride | 10/22/2021 | 19 | 17-20 | 500 |  |  |
| Zinc  (mg/l) | 10/09/2018 | 0.83 | 0.66-1.20 | 5.0 | None | Runoff/leaching from natural deposits; industrial wastes |
| Total Dissolved Solids  (mg/l) | 10/09/2018 | 380 | 360-390 | 1,000 | None | Runoff/leaching from natural deposits |
| Specific Conductance  (µS/cm) | 10/09/2018 | 570 | 550-600 | 1600 | None | Substances that form ions when in water; seawater influence. |
| Sulfate  (mg/l) | 10/09/2018 | 23.67 | 17-35 | 500 | None | Runoff/leaching from natural deposits; industrial wastes |

Table 5. Detection of Unregulated Contaminants

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Chemical or Constituent (and reporting units)** | **Sample Date** | **Level Detected** | **Range of Detections** | **Notification Level** | **Health Effects** |
| None |  |  |  |  |  |

### Additional General Information on Drinking Water

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 the water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the U.S. EPA’s Safe Drinking Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. U.S. EPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

Lead-Specific Language: If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. South Fork Estates Mutual Water Company is responsible for providing high quality drinking water but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. [Optional: If you do so, you may wish to collect the flushed water and reuse it for another beneficial purpose, such as watering plants.] If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline (1-800-426-4791) or at <http://www.epa.gov/lead>.

Nitrate in drinking water at levels above 10 mg/L is a health risk for infants of less than six months of age. Such nitrate levels in drinking water can interfere with the capacity of the infant’s blood to carry oxygen, resulting in serious illness; symptoms include shortness of breath and blueness of the skin. Nitrate levels above 10 mg/L may also affect the ability of the blood to carry oxygen in other individuals, such as pregnant women and those with specific enzyme deficiencies. If you are caring for an infant, or you are pregnant, you should ask advice from your health care provider.

This Consumer Confidence Report (CCR) reflects changes in drinking water regulatory requirements during 2021. These revisions add the requirements of the federal Revised Total Coliform Rule, effective since April 1, 2016, to the existing state Total Coliform Rule. The revised rule maintains the purpose to protect public health by ensuring the integrity of the drinking water distribution system and monitoring for the presence of microbials (i.e., total coliform and E. coli bacteria).  The U.S. EPA anticipates greater public health protection as the rule requires water systems that are vulnerable to microbial contamination to identify and fix problems.  Water systems that exceed a specified frequency of total coliform occurrences are required to conduct an assessment to determine if any sanitary defects exist.  If found, these must be corrected by the water system.  The state Revised Total Coliform Rule became effective July 1, 2021.

### Summary Information for Violation of a MCL, MRDL, AL, TT, or Monitoring and Reporting Requirement

Table 7. Violation of a MCL, MRDL, AL, TT or Monitoring Reporting Requirement

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Violation** | **Explanation** | **Duration** | **Actions Taken to Correct Violation** | **Health Effects Language** |
| None | NA | NA | NA | NA |

### For Water Systems Providing Groundwater as a Source of Drinking Water

Table 8. Sampling Results Showing Fecal Indicator-Positive Groundwater Source Samples

| **Microbiological Contaminants (complete if fecal-indicator detected)** | **Total No. of Detections** | **Sample Dates** | **MCL [MRDL]** | **PHG (MCLG) [MRDLG]** | **Typical Source of Contaminant** |
| --- | --- | --- | --- | --- | --- |
| *E. coli* | 2021  0 | [Enter Dates] | 0 | (0) | Human and animal fecal waste |
| Enterococci | 2021  0 | [Enter Dates] | TT | N/A | Human and animal fecal waste |
| Coliphage | 2021  0 | [Enter Dates] | TT | N/A | Human and animal fecal waste |

### For Systems Providing Surface Water as a Source of Drinking Water

South Fork Estates Mutual Water Company does not provide surface water.

### Summary Information for Revised Total Coliform Rule Level 1 and Level 2 Assessment Requirements

South Fork Estates Mutual Water Company did not receive any Level 1 or Level 2 Assessments in 2021.

**SOURCE WATER ASSESSMENT SUMMARY INFORMATION**

For Use with Annual Consumer Confidence Reports

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**SOURCE WATER ASSESSMENT SUMMARY INFORMATION**

Source water assessments were conducted for wells #1 and #2 in December 2002 by the Tulare County Environmental Health Department. The findings were identical.

A source water assessment for well #3 was conducted by the California Rural Water Association in July 2014 when the well was added to our water system.

The Vulnerability Findings of each report are printed below. A copy of each full report can be obtained by contacting:

South Fork Estates Mutual Water Company

P.O. Box 597

Three Rivers, CA 93271

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**Vulnerability Summary [Well #1]**

**California Drinking Water Source Assessment and Protection (DWSAP) Program**

**District Name** LPA Tulare County **District No.** 84 Tulare

**System Name** SOUTH FORK ESTATES **System No.** 5403113

**Source Name** WELL 01 001 **Source No.**  5403113-001

**Completed by** LPA Tulare County **Date** December 2002

A source water assessment was conducted for the **WELL 01**

of the **SOUTH FORK ESTATES** water system in **December 2002**

According to DHS records, this Source is Groundwater. This Assessment was done using the Default Groundwater System Method.

The source is considered most vulnerable to the following activities associated with contaminants detected in the water supply:

Historic gas stations

The source is considered most vulnerable to the following activities not associated with any detected contaminants:

Mining operations - Historic

**Discussion of Vulnerability**

The activities to which the South Fork Estates water system is most vulnerable include historic gas stations with known contaminant plumes, septic systems, and grazing animals. The leaking underground storage tanks have been removed and there has been remediation at the sites.

It is important that septic systems be kept in good repair and pumped regularly. It is also necessary to keep the well site clean and free of weeds and debris to prevent contamination. The cement surface seal needs to be checked for cracks and immediately repaired or sealed.

**Vulnerability Summary [Well #2]**

**California Drinking Water Source Assessment and Protection (DWSAP) Program**

**District Name** LPA Tulare County **District No.** 84 **County** Tulare

**System Name** SOUTH FORK ESTATES **System No.** 5403113

**Source Name** WELL02 **SOURCE No.** 002 **PS Code** 5403113-002

**Completed by** LPA Tulare County **Date** December 2002

According to DHS records, this Source is Groundwater. This Assessment was done using the Default Groundwater System Method.

A source water assessment was conducted for the **WELL 02** of the **SOUTH FORK ESTATES** water system in **December 2002**

The source is considered most vulnerable to the following activities associated with contaminants detected in the water supply: Historic gas stations

The source is considered most vulnerable to the following activities not associated with any detected contaminants:

Mining operations – Historic

**Discussion of Vulnerability**

The activities to which the South Fork Estates water system is most vulnerable include historic gas stations with known contaminant plumes, septic systems, and grazing animals. The leaking underground storage tanks have been removed and there has been remediation at the sites.

It is important that septic systems be kept in good repair and pumped regularly. It is also necessary to keep the well site clean and free of weeds and debris to prevent contamination. The cement surface seal needs to be checked for cracks and immediately repaired or sealed.

**Vulnerability Summary [Well #3]**

**Drinking Water Source Assessment and Protection (DWSAP) Program**

**Assessment by** California Rural Water Association **ID.** VB **County** Tulare

**System Name** SOUTH FORK ESTATES MUTUAL WATER CO **System No.** 5403113

**Source Name** WELL 03 **Source No.** 5403113-003 **PS Code** 5403113-003

**Completed by** Cian Reger **Date** July 2014

**THE FOLLOWING INFORMATION MUST BE INCLUDED IN THE SYSTEM CONSUMER CONFIDENCE REPORT**

A source water assessment was conducted for the **WELL 03** of the **SOUTH FORK ESTATES MUTUAL WATER CO** water system in **July 2014**.

The source is considered most vulnerable to the following activities not associated with any detected contaminants:

Other Animal operations

Septic systems - low density [<1/acre]

**Discussion of Vulnerability**

The system is most vulnerable to other animal operations and low density septic systems.

**DISCUSSION OF CONTINUOUS CHLORINATION**

Most of the following discussion was included in the 2021 Consumer Confidence Report. It is included again this year because the issue has not been resolved.

Our water system has received a directive from the DDW to plan for and implement continuous chlorination. We have not yet implemented the recommendation due to the concerns expressed in this discussion.

As mentioned in the last paragraph of the discussion, we intend to employ a professional consultant to examine our system, address the concerns we have, and to recommend workable solutions. For many reasons we were not able to employ a consultant for this task in 2021. We intend to do so this year

South Fork Estates Mutual Water Company takes these findings and directives seriously. We have not yet implemented this requirement because of concerns that, due to the design of our water system, if continuous chlorination is installed, we will have a significant potential for the formation of “Disinfection By-Products” (DBPs) within the system. As discussed below, the design of the water flow into and out of both our 10,000 gallon holding tank and our 100,000 gallon storage tank inhibits the circulation and turnover of water in each tank. The result is “aging” water.

The following quotes are taken from American Water Works Association (AWWA) manuals “”Water Distribution” (2016 edition) and “Water Operator Field Guide” (second edition).

DBPs “…are formed when chlorine is added to water that contains the necessary types and amounts of natural organic matter….” “At high concentrations, many disinfection by-products are considered a danger to human health.”

“The water age – the amount of time that water resides in the distribution system or storage tanks before being consumed – is of critical importance. Longer water age usually leads to increased formation of DBPs.”

“As temperature increases, DBP formation may increase. Warmer water favors the formation of DBPs, as does summer heat, which bakes the system storage tanks.”

THE DESIGN OF OUR WATER SYSTEM: Our water system was designed and constructed around 1991. It consists of three wells (2 drilled in 1982 and one added in 2012) in close proximity to each other. Co-located with the wells is a “pumping station” consisting of a 10,000 gallon “holding” tank and two booster pumps. (All water quantities are estimates.) The wells and pumping station are at the lowest elevation in our service area

A 100,000 gallon “storage” tank is located at the highest elevation of our system.

Connecting the pumping station and the storage tank is a single primary main consisting of 1150 feet of 6-inch steel pipe at the lowest elevation, and 3,585 feet of 8-inch PVC pipe from the end of the steel pipe to the storage tank. Connected to this primary main are two 6-inch lateral mains (total length of 1,800 feet) that provide water to service connections (lots) on side roads. About half of our current active connections take water from the two lateral mains and the other half take water directly from the primary main. The total capacity of the primary and lateral mains is approximately 13,700 gallons.

WATER FLOW THROUGH OUR SYSTEM: Water flow depends on the operation of pumps, which are controlled by sensors inside each tank. Starting with both tanks full, as water is consumed by users of our system, the water level in the storage tank drops. When about 4,000 gallons has been drawn from the tank, a booster pump at the pumping station is activated and starts pumping water from the holding tank into the primary main. As water enters into the main, the water level in the storage tank rises. When 4,000 gallons has been moved from the primary main into the storage tank, the booster pump shuts off.

WATER FLOW AT THE HOLDING TANK/PUMPING STATION: As the water level in the holding tank drops, the pumps in each well are activated and start pumping water into the holding tank. When both tanks are full, all pumps will be off.

The holding tank has two inlet ports from the three wells (two wells share one inlet port) and one outlet port to the booster pumps. All three ports are on the side of the tank and approximately a foot from the bottom of the tank. Since the inlet and outlet are at the same level, it is possible that when a booster pump and the well pumps are operating at the same time, much if not most of the water entering from the wells immediately exits to the booster pump and the primary main.

WATER FLOW AT THE STORAGE TANK: There is only one port at the storage tank, located on the side of the tank, approximately a foot from the bottom. It serves as the inlet/outlet to the primary main. The first 460 feet of 8-inch main (1,200 gallons capacity) below the tank has no service connections. The next 1,874 feet of 8-inch main (4,890 gal capacity) has 5 of our 33 active service connections. Note that the total capacity of these two segments of main is 6,080 gallons, far more than the 4,000 gallons that are drawn from the storage tank during a pumping cycle.

Assuming that each service connection uses an average of the total water consumption of the water system, (1 of 33 connections = 3%), these five connections would use no more than 15% of total consumption. Of the 4,000 gallons of water that enters the primary main from the storage tank, 1,200 gallons (the amount in the first 460 feet of primary main) cannot be used because there are no service connections. Of the remaining 2,800 gallons of “storage tank water,” only that used by these five connections will be consumed. (This would be 15% of 2,800 gallons = 420 gallons.) Given the distance these service connections are from the storage tank, it is likely less “storage tank water” would be consumed than what is estimated. (Note that 420 gallons is less than 0.5% of the total water estimated to be in the tank.)

WATER STRATIFICATION DUE TO TEMPERATURE. Neither of our two tanks are shaded and are in full sun much of each day. This is particularly true for our storage tank. For most of the year, especially during summer heat, water entering a tank from wells (as with the holding tank) and from buried main (as with the storage tank) probably will be colder than the water already in the tank. Assuming that heat rises (and cold falls), it would be fair to assume that water entering either tank, regardless of the height of the inlet, would tend to move to the floor of the tank.

POSSIBLE SOLUTIONS: There are three general suggestions we have been given for how to deal with possible DBPs. First is to reroute pipes so that water enters each tank from the top. One critique of this suggestion is that temperature stratification could result in the new (colder) water entering at the top to quickly move to the bottom of the tank. And, in the case of the storage tank, the “new water” would likely be mostly “old water” returning to the tank after a pumping cycle.

Second is to install mixers in the tank to circulate the water. A critique is that with the storage tank, if little “new water” enters the tank, we might just be mixing water that already has high amount of DBPs.

Third is to increase the amount of water during each pumping cycle, from 4,000 gallons to 8,000 gallons or more. One critique is that increasing the amount of water we take from the storage tank at any time decreases the value of the purpose of having a storage tank - namely, to have an adequate supply of water available in an emergency. During an era of drought, fire, electrical outages, equipment failure and operator error, this might not be a wise strategy to pursue.

IN SUMMARY: We take this issue seriously. There appear to be no easy solutions. In the meantime, we will continue to attempt to identify and eliminate possible sources of contamination. We intend to locate and employ a competent professional familiar with SBP issues, to assess our system and identify feasible solutions.