Chapter 7: Groundwater Management Program

The purpose of the Savannah River Site (SRS) groundwater management program is to protect, monitor, remediate, and use groundwater. With this focus, the program accomplishes the following:

- Ensures future groundwater contamination does not occur
- Monitors groundwater to identify areas of contamination
- Remediates groundwater contamination as needed
- Conserves groundwater

2023 Highlights

Drinking Water Standards—In 2023 there were no exceedances of drinking water standards (measured by maximum contaminant levels [MCLs] or regional screening levels [RSLs]) in SRS boundary wells near A/M Area. These wells are the closest to the Site boundary and would indicate whether contamination was getting offsite.

Groundwater Contaminant Removal—SRS removed 9,238 pounds (lbs) of volatile organic compounds (VOCs) from groundwater and the vadose zone. The Site also prevented 24.7 curies (Ci) of tritium from reaching SRS streams.

Offsite Groundwater Monitoring (Georgia)—Since 2001, tritium has been detected at low concentrations (less 1 picocurie/milliliter [pCi/mL]) in only a few offsite wells, which is well below the MCL for tritium (20 pCi/mL). Most of the groundwater sampling has resulted in no detections of tritium. This data supports the conclusions of a U.S. Geological Survey (USGS) that indicate there is no mechanism by which groundwater could flow under the Savannah River and contaminate Georgia wells (Cherry 2006).

7.1 INTRODUCTION

Previous missions and operations at the Savannah River Site (SRS) have released chemicals and radionuclides into the soil and thus contaminated the groundwater around hazardous waste management facilities and waste disposal sites. Because of these past releases, SRS operates extensive groundwater monitoring and groundwater remediation programs.

The SRS groundwater monitoring program requires regular well sampling to monitor for groundwater contaminants. Well monitoring meets the sampling requirements in agreements established through the Federal Facility Agreement (FFA) for the Savannah River Site (FFA 1993) and in the Resource Conservation and Recovery Act (RCRA) permit for SRS. Well monitoring ensures the Site is providing quality data to compare to South Carolina Department of Health and Environmental Control (SCDHEC) and U.S. Environmental Protection Agency (EPA) drinking water quality standards. SRS uses SCDHEC-certified laboratories audited by the U.S. Department of Energy to analyze groundwater samples using EPA methods or equivalents.

The monitoring data show that most of the contaminated groundwater plumes are in the central area of SRS, and none extends beyond the SRS boundary. Groundwater contamination at SRS is limited primarily to the Upper Three Runs/Steed Pond Aquifers and the Gordon/Lost Lake Aquifers (Figure 7-1). SRS submits summaries of groundwater data to regulatory agencies and, if necessary, remediates or removes the contamination. *Appendix E: Groundwater Management Program Supplemental Information* lists the documents reporting groundwater monitoring data that SRS submits to the regulatory agencies.

SRS uses several technologies to remediate groundwater that exceeds the maximum contaminant levels (MCLs) or regional screening levels (RSLs). Remediation includes closing and remediating waste units to reduce the potential for contaminants to reach groundwater, actively treating contaminated water, and employing passive and natural remedies.

Groundwater remediation at SRS focuses on volatile organic compounds (VOCs), low groundwater pH, metals, and tritium. VOCs in groundwater, mainly trichloroethylene (TCE) and tetrachloroethylene (PCE), originate from their use as degreasing agents in industrial work at SRS. Tritium in groundwater is a byproduct of nuclear materials production at SRS. Corrective measures at SRS range from active treatment, such as using oxidants to destroy the VOCs in place, to passive or enhanced measures, such as monitored natural attenuation and phytoremediation (using trees and plants to remove or break down contaminants). These practices are removing VOCs from the groundwater and effectively reducing tritium releases from groundwater into SRS streams and the Savannah River.

Chapter 7—Key Terms

Aquifer *is an underground water supply found in porous rock, sand, gravel, and other materials.*

Attenuation *is a reduction of groundwater contaminants over time due to naturally occurring physical, chemical, and biological processes.*

Confining unit *is the opposite of an aquifer. It is a layer of rock or clay that limits groundwater movement in and out of an aquifer.*

Contaminants of concern *are contaminants identified in the risk assessment that are found at a waste unit and pose an unacceptable risk to human health and the environment.*

Groundwater *is water found underground in cracks and pore spaces in soil, sand, and rocks.*

Maximum contaminant level (MCL) *is the highest level of a contaminant allowed in drinking water.*

Plume *is a volume of contaminated water originating at a waste source (for example, a hazardous waste disposal site). It extends downward and outward from the waste source.*

Recharge *occurs when water from the surface travels down into the subsurface, replenishing the groundwater.*

Regional screening level (RSL) *is the risk-based concentration derived from standardized equations, combining exposure assumptions with toxicity data.*

Remediation *cleans up sites contaminated with waste from historical activities.*

Surface water *is water found above ground (for example, streams, lakes, wetlands, reservoirs, and oceans).*

Vadose zone *is the subsurface layer below the land surface and above the water table. The vadose zone has a low water content compared to saturated zones; therefore, it is also referred to as being unsaturated.*

Waste unit *is an area that is, or may be, posing a threat to human health or the environment. It ranges in size from a few square feet to tens of acres and includes basins, pits, piles, burial grounds, landfills, tank farms, disposal facilities, process facilities, and contaminated groundwater.*

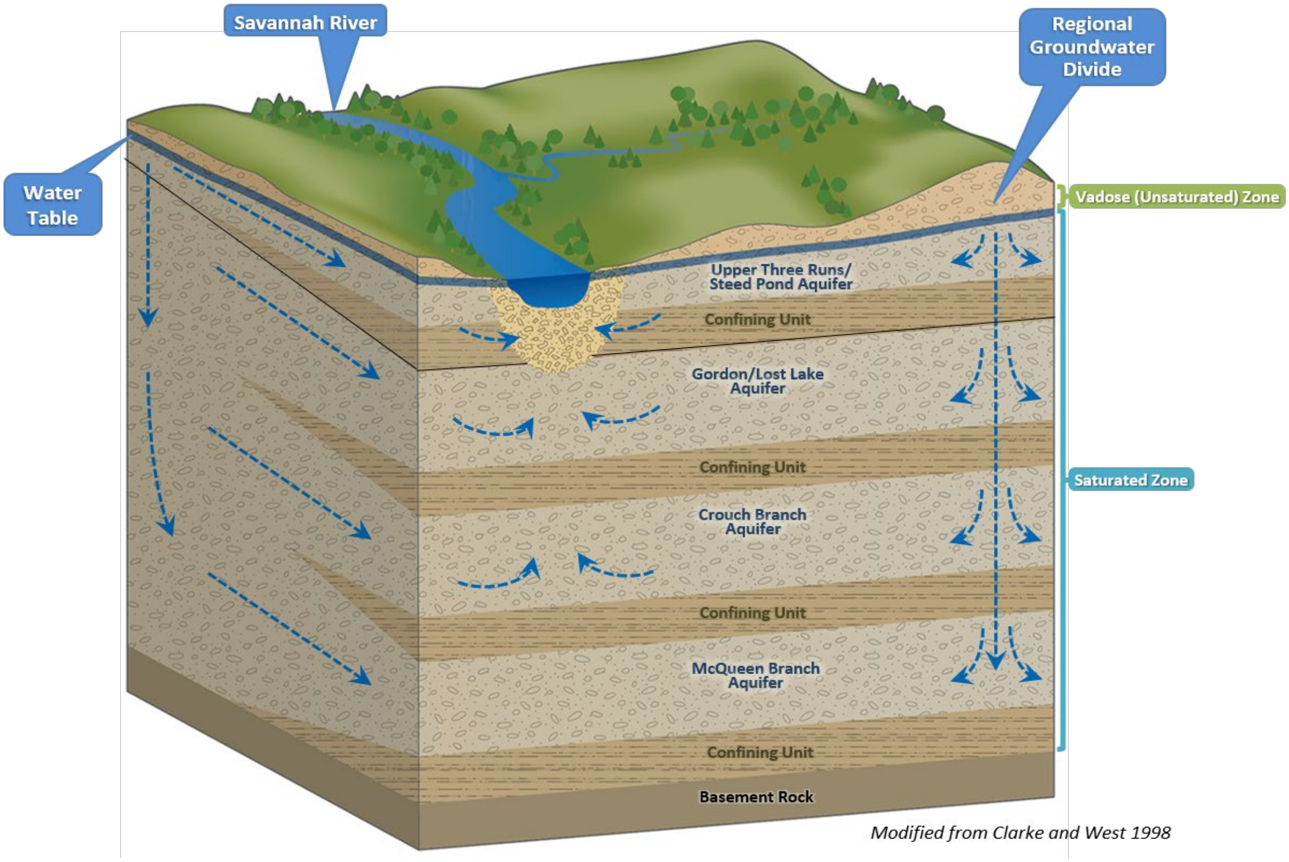

Figure 7-1 Groundwater at SRS

7.2 GROUNDWATER AT SRS

The groundwater flow system at SRS consists of four major aquifers separated by confining units:

- Upper Three Runs/Steed Pond
- Gordon/Lost Lake
- Crouch Branch
- McQueen Branch

Groundwater flow in recharge areas generally migrates downward and laterally. It eventually flows into the Savannah River and its tributaries or migrates into the deeper regional flow system. Figure 7-1 presents a three-dimensional block diagram of these units at SRS and the generalized groundwater flow patterns within those units. Water moving from the ground's surface into the aquifers can carry contamination along with it, resulting in underground plumes of contaminated water (Figure 7-2).

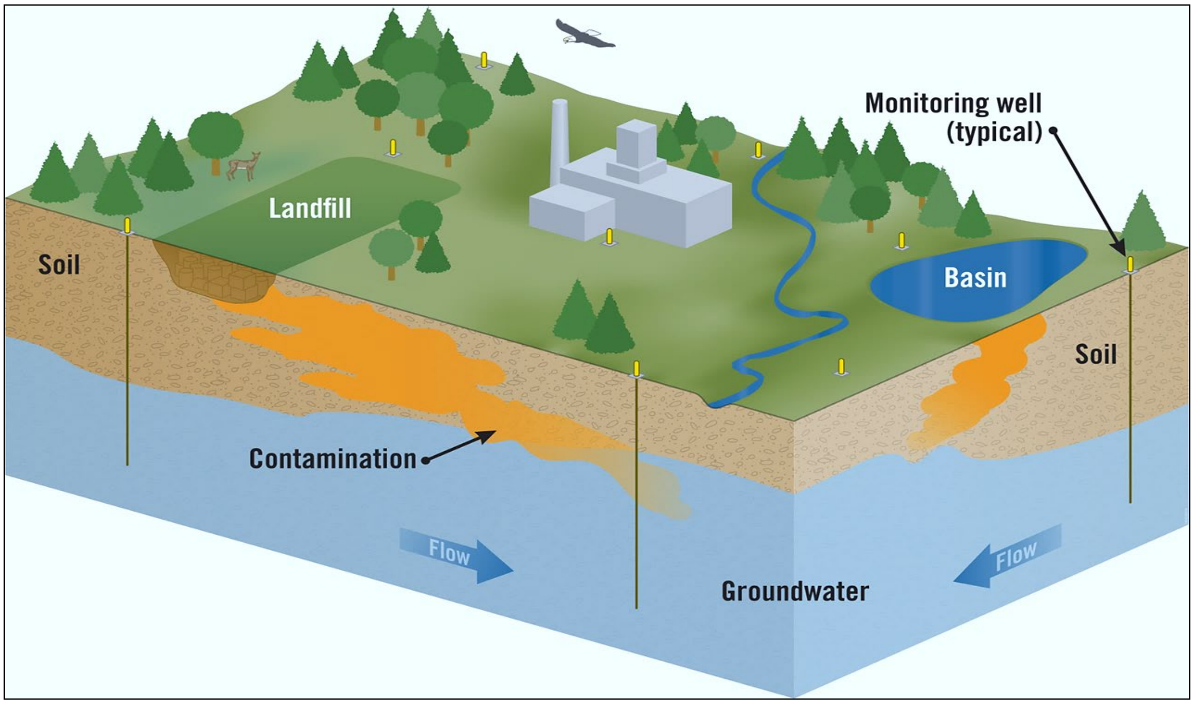

Figure 7-2 How Contamination Gets to Soil and Groundwater

7.3 GROUNDWATER MANAGEMENT PROGRAM AT SRS

SRS has designed and implemented a groundwater management program to prevent new releases to groundwater and to remediate contaminated groundwater to meet federal and state laws and regulations, DOE Orders, and SRS policies and procedures. It accomplishes the following:

- Protects groundwater
- Monitors groundwater
- Remediates contaminated groundwater
- Conserves groundwater

7.3.1 Protecting SRS Groundwater

SRS groundwater management focuses on preventing and monitoring groundwater contamination, protecting the public and environment from contamination, and preserving groundwater quality for future use. SRS protects groundwater by

- Preventing or controlling groundwater contamination sources from construction sites, hazardous waste management facilities, and waste units
- Monitoring groundwater and surface water to detect contaminants
- Reducing contaminants through a groundwater cleanup program

7.3.2 Monitoring SRS Groundwater

The purpose of monitoring groundwater is to observe and evaluate changes in the groundwater quality over time and to establish, as accurately as possible, the baseline quality of the groundwater occurring naturally in the aquifers. The SRS groundwater monitoring program includes two primary components: groundwater contaminant source monitoring and groundwater surveillance monitoring. SRS evaluates groundwater monitoring data frequently to identify whether new groundwater contamination exists or whether it should modify the current monitoring program.

Monitoring the groundwater around SRS facilities, waste disposal sites, and associated streams is the best way to detect and track contaminant migration. Figure 7-3 shows the groundwater plumes associated with SRS. Through careful monitoring and analysis, SRS implements appropriate remedial or corrective actions.

SRS uses groundwater monitoring data to determine the effects of Site operations on groundwater quality. The program supports the following critical activities:

- Complying with environmental regulations and DOE directives
- Evaluating the status of groundwater plumes
- Evaluating potential impacts from activities planned near or within the footprint of the groundwater plume
- Enhancing groundwater remediation through basic and applied research projects

Increasing national attention to “emerging contaminants” or contaminants of emerging concern (CEC) can prompt a call for action from federal, state, and local governments. Increased monitoring and detections of unregulated substances can lead the EPA to identify solutions to address these substances that may present a risk to human health or the environment. As a result of discussions with the EPA and SCDHEC, SRS adds emerging contaminants to analyte lists when historical or process knowledge indicates that a contaminant could be of concern. 1,4-Dioxane is one of the previously emerging contaminants that SRS monitors regularly in conjunction with VOC plumes.

Other CECs include per- and polyfluoroalkyl substances (PFAS). PFAS are a family of man-made chemicals that have been manufactured and used worldwide since the 1940s. They are present in various items such as cookware, stain repellants, food packaging, and firefighting foam. Chapter 9, *Per- and Polyfluoroalkyl (PFAS) Substances*, provides more information on PFAS. In 2019, SRS began assessing the past and present use of PFAS at the Site. Groundwater sampling of PFAS was initiated in D Area due to known use of firefighting foam at a former firefighting

The Emulsified Zero Valent Iron Field Scale Pilot Study Will Determine if the Innovative Technology Will be Successful in Removing Solvents from a Plume in A/M Area.

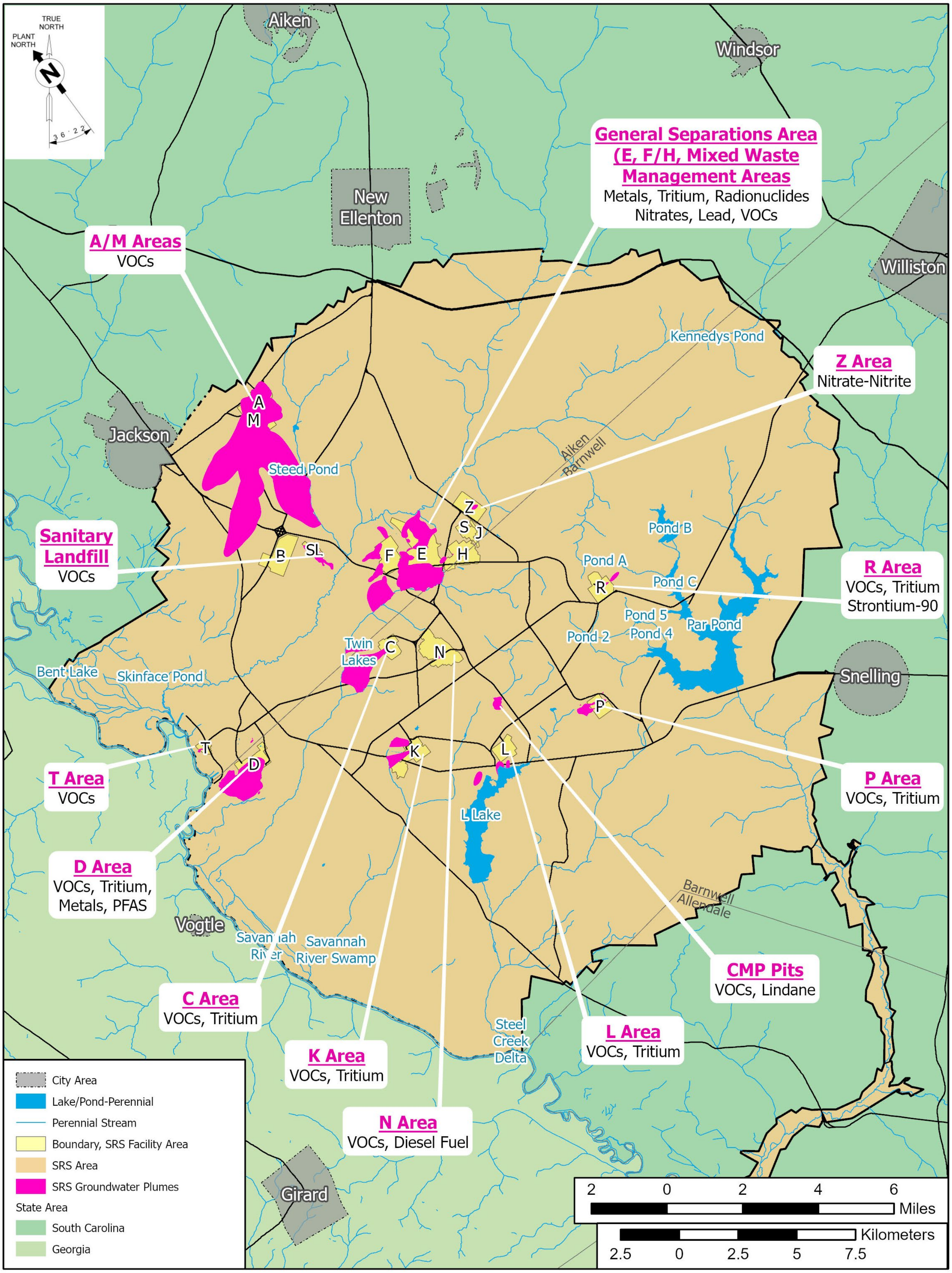

Figure 7-3 Groundwater Plumes at SRS

training area. Sampling has continued into 2023. Results from 2023 groundwater sampling range from <1 nanogram/liter (ng/L) up to 2,100 ng/L, which are similar to previous results. These results from D Area indicate that current PFAS concentrations are related to historical use of firefighting foams. SRS is committed to understanding the full nature and extent of PFAS contamination at SRS. The SRS groundwater monitoring program ensures that there is no cross contamination in samples due to the presence of PFAS in many consumer products. The EPA, SCDHEC, and the Interstate Technology Regulatory Council webpages have information on the current state of knowledge and regulatory status of PFAS.

7.3.2.1 Groundwater Surveillance Monitoring

Surveillance monitoring at SRS focuses on collecting and analyzing data to characterize the groundwater flow and determine the presence or absence of contaminants. Characterization at SRS includes the following activities:

- Collecting soil and groundwater samples to determine the extent of contamination
- Obtaining geologic soil cores or seismic profiles to better determine aquifer and confining unit physical and geochemical properties
- Installing wells to periodically collect water-level measurements and groundwater samples
- Developing maps to interpret groundwater flow, and visualize the extent of horizontal and vertical contamination
- Performing calculations based on water elevation data to estimate groundwater velocities
- Using groundwater modeling to understand future SRS groundwater movement—and specifically contaminant movement—near facilities, individual waste units, and at the Site boundary
- Characterizing regional surface water flow to assess contaminant risk to perennial streams, which receive groundwater flow

7.3.2.2 2023 Groundwater Surveillance Results Summary

SRS uses more than 150 wells to monitor a significant plume beneath A/M Area. Some of these monitoring wells lie within a half-mile of the northwestern boundary of SRS. The direction of groundwater flow in the area is parallel to the Site boundary; however, the flow direction of groundwater can fluctuate. Because of this, SRS concentrates on the groundwater results from the wells along the Site boundary, as well as those between A/M Area and the nearest population center, Jackson, South Carolina (SRNS 2024a). The data show no exceedances of drinking water standards (MCLs or RSLs) in SRS boundary wells near A/M Area. Additionally, no detectable contamination exists in most of these SRS boundary wells.

Although most SRS-contaminated groundwater plumes do not approach the Site boundary, contaminated groundwater discharge potentially affects Site streams that migrate offsite. SRS monitors and evaluates groundwater contamination that discharges into Site streams and remediates it as appropriate. In conjunction with stream monitoring, as discussed in Chapter 5, *Radiological Environmental Monitoring Program*, Section 5.4.3, *SRS Stream Sampling and Monitoring*, SRS conducts extensive monitoring near SRS waste units and operating facilities, regardless of their proximity to the boundary. *Savannah River Site Groundwater Management Strategy and Implementation Plan* (SRNS 2020) details groundwater monitoring and conditions at individual sites.

Table 7-1 identifies the typical contaminants of concern (COCs) found in SRS groundwater and their significance. These COCs are a result of historical SRS operations that released chemicals and radionuclides into the soil and groundwater near hazardous waste management facilities and waste disposal sites. Table 7-2 presents a general summary of the most common contaminants found in groundwater at SRS facility areas, based on 2023 monitoring data, and compares the maximum concentrations to the appropriate drinking water standards. This table also shows the major COCs in the groundwater beneath SRS, including common degreasers (TCE and PCE) and radionuclides (tritium, gross alpha, and nonvolatile beta emitters).

Table 7-1 Typical Contaminants of Concern at SRS

Contaminants	Sources	Limits, Exposure Pathways, and Health Effects
Gross Alpha	Alpha radiation emits positively charged particles from radioactive decay of certain elements including uranium, thorium, and radium. Alpha radiation in drinking water can be in the form of dissolved minerals or a gas (radon).	The maximum contaminant level (MCL) is 15 pCi/L. An alpha particle cannot penetrate a piece of paper or human skin. It causes increased risk of cancer through ingestion or inhalation.
Nonvolatile Beta	Beta decay commonly occurs among neutron-rich fission byproducts produced in nuclear reactors.	MCL is 4 mrem/yr. It causes increased risk of cancer through ingestion, inhalation, or dermal exposure.
Tritium	Radioactive isotope of hydrogen with a half-life of 12.3 years. It emits a very weak beta particle and behaves like water.	MCL is 20 pCi/mL. It primarily enters the body when people swallow tritiated water. It causes increased risk of cancer through ingestion, inhalation, or dermal exposure.
Trichloroethylene (TCE) and Tetrachloroethylene (PCE)	Volatile organic compounds (VOCs) used primarily to remove grease from fabricated metal parts.	MCL is 5 µg/L. It causes increased risk of cancer through ingestion, inhalation, or dermal exposure.
Vinyl Chloride	VOC formed as a degradation product of TCE/PCE.	MCL is 2 µg/L. It causes increased risk of cancer through ingestion, inhalation, or dermal exposure.
1,4-Dioxane[a]	Synthetic industrial chemical used as a stabilizer for VOCs to reduce degradation.	The regional screening level (RSL) for tap water is 0.46 µg/L. The EPA has classified it as a probable human carcinogen. It has potential acute and chronic health effects.
Per- and Polyfluoroalkyl Substances (PFAS)[a]	Constituent in firefighting foams and in consumer products such as cookware, packaging, and stain repellants.	U.S. Environmental Protection Agency (EPA) Drinking Water Lifetime Health Advisory Limit (nonenforceable) is 70 ng/L. Current scientific research suggests that exposure to certain PFAS may lead to adverse health outcomes.

[a] Substance identified by the EPA as a contaminant of emerging concern

Table 7-2 Summary of the Maximum Contaminant Concentrations for Major Areas within SRS

Location	Major Contaminant	Units	2023 Max Concentration	Well	MCL/RSL	Likely Stream Endpoints
A/M Area	1,4-Dioxane	µg/L	280	MCB037C	6.1[a]	Upper Three Runs
	Beryllium	µg/L	2.97	MSB 40C	4	
	Chloroethene (Vinyl Chloride)	µg/L	2.42	MSB 107CC	2	
	Gross Alpha	pCi/L	14.7	MSB 04BR	15	
	Nonvolatile Beta	pCi/L	31.3	MSB 64C	50[b]	
	Tetrachloroethylene (PCE)	µg/L	69,800	MSB 04BR	5	
	Trichloroethylene (TCE)	µg/L	51,500	MSB 36B	5	
C Area	Chloroethene (Vinyl Chloride)	µg/L	149	CRP 50B	2	Fourmile Branch
	Tetrachloroethylene (PCE)	µg/L	6.39	CRP 5C	5	
	Trichloroethylene (TCE)	µg/L	2,510	CRP 20CU	5	
	Tritium	pCi/mL	997	CRW024C	20	
CMP Pits (G Area)	1,4-Dioxane	µg/L	250	CMP 35D	0.46[a]	Pen Branch
	Chloroethene (Vinyl Chloride)	µg/L	1.1	CMP 11B	2	
	Lindane	µg/L	7.7	CMP 35D	0.2	
	Tetrachloroethylene (PCE)	µg/L	2,600	CMP 35D	5	
	Trichloroethylene (TCE)	µg/L	1,400	CMP 35D	5	
D Area	1,4-Dioxane	µg/L	3.2	DOB 16	6.1[a]	Savannah River
	Aluminum	µg/L	151,000	DCB 22A	20,000	
	Arsenic	µg/L	58	DWP 008	10	
	Beryllium	µg/L	125	DCB 21B	4	
	Chloroethene (Vinyl Chloride)	µg/L	10	DOB 15	2	
	Iron	µg/L	241,000	DCB 87A	14,000	
	Manganese	µg/L	18,400	DCB 87A	430	
	Mercury	µg/L	7	DCB 85A	2	
	Nickel	µg/L	531	DCB 22A	390	
	Perflurornonanoic acid (PFNA)	ng/L	2,100	DCB 62	59	
	Perfluorooctane sulfonic acid (PFOS)	ng/L	350	DRW 1	40	
	Perflouroroctanoic acid (PFOA)	ng/L	140	DCB 78	60	
	Tetrachloroethylene (PCE)	µg/L	6.41	DCB 45C	5	
	Trichloroethylene (TCE)	µg/L	92.1	DCB 62	5	
	Tritium	pCi/mL	125	DCB 26AR	20	
E Area (MWMF)	1,4-Dioxane	µg/L	520	BSW 6C3	6.1[a]	Upper Three Runs/Fourmile Branch
	Gross Alpha	pCi/mL	26.6	BGO 43CR	15	
	Nonvolatile Beta	pCi/mL	20	BGO 30D	50[b]	
	Trichloroethylene (TCE)	µg/L	337	HSB120C	5	
	Tritium	pCi/mL	5,740	SWP 01C	20	
F Area	Gross Alpha	pCi/L	1,530	FGW005C	15	Fourmile Branch
	Nonvolatile Beta	pCi/L	665,000	FGW005C	50[b]	
	Strontium-90	pCi/L	522,000	FGW005C	8	
	Technetium-99	pCi/L	1,090	FTF-28	50[c]	
	Trichlorethylene	µg/L	17.9	FBP 43DL	5	
	Tritium	pCi/mL	127	FGW005C	20	
F-Area HWMF	Gross Alpha	pCi/L	259	FSB 94DR	15	Fourmile Branch
	Nonvolatile Beta	pCi/L	447	FSB 94C	50[b]	
	Strontium-90	pCi/L	181	FSB 78C	8	
	Trichlorethylene (TCE)	µg/L	12.7	FSB 78C	5	
	Tritium	pCi/mL	796	FSB 78C	20	

Table 7-2 Summary of the Maximum Contaminant Concentrations for Major Areas within SRS (continued)

Location	Major Contaminant	Units	2023 Max Concentration	Well	MCL/RSL	Likely Stream Endpoints
F-Area Tank Farm	Gross Alpha	pCi/L	15	FTF 31	15	Fourmile Branch/Upper Three Runs
	Nonvolatile Beta	pCi/L	603	FTF 28	50[b]	
	Strontium-90	pCi/L	14.1	FTF 28	8	
	Technetium-99	pCi/L	1,284	FTF 28	50[c]	
H Area	Nonvolatile Beta	pCi/L	73.73	HAA 14D	50[b]	Upper Three Runs/Fourmile Branch
	Tritium	pCi/mL	34.8	HAA 12C	20	
H-Area HWMF	Gross Alpha	pCi/L	54.7	HSB 102D	15	Fourmile Branch
	Nonvolatile Beta	pCi/L	667	HSB 102D	50[b]	
	Strontium-90	pCi/L	318	HSB 102D	8	
	Trichloroethylene (TCE)	µg/L	328	HSB 120C	5	
	Tritium	pCi/mL	2,330	HSB120C	20	
H-Area Tank Farm	Nonvolatile Beta	pCi/L	34.6	HAA 14D	50[b]	Fourmile Branch/ Upper Runs
	Tritium	pCi/mL	34.8	HAA 12C	20	
K Area	Tetrachloroethylene (PCE)	µg/L	7.14	KDB 9	5	Indian Grave Branch
	Trichloroethylene (TCE)	µg/L	2.95	KRP 9	5	
	Tritium	pCi/mL	616	KRB 19D	20	
L Area	Tetrachloroethylene (PCE)	µg/L	61.6	LSW 25DL	5	Steel Creek
	Trichloroethylene (TCE)	µg/L	2.95	LSW025DL	5	
	Tritium	pCi/mL	377	LSW 25DL	20	
P Area	cis-1,2-Dichloroethylene	µg/L	720	P003L	5	Steel Creek/ Lower Three Runs
	Tetrachloroethylene (PCE)	µg/L	131	PAO003DU	5	
	Trichloroethylene (TCE)	µg/L	6,420	PGW 26C	5	
	Tritium	pCi/mL	8,910	PSB 02B	20	
R Area	Strontium-90[d]	pCi/L	167	RSE 10	8	Lower Three Runs
	Trichloroethylene (TCE)	µg/L	24.8	RAG008B	5	
	Tritium	pCi/mL	866	RDB 03D	20	
Sanitary Landfill	1,4-Dioxane	µg/L	130	LFW 62C	6.1[a]	Upper Three Runs
	Chloroethene (Vinyl Chloride)	µg/L	23	LFW 21	2	
	Trichloroethylene	µg/L	3.9	LFW 32	5	
TNX	Trichloroethylene	µg/L	14.5	TRW 2	5	Savannah River
Z Area	Nitrate-Nitrate as Nitrogen	mg/L	10.9	ZBG002D	10	Upper Three Runs
	Nonvolatile Beta	pCi/L	101	ZBG002D	50[b]	
	Technetium-99	pCi/L	148	ZBG002D	50[c]	

Notes:

MWMF is the Mixed Waste Management Facility; HWMF is the Hazardous Waste Management Facility; TNX is the 678-T facilities; CMP is the Chemicals, Metals, and Pesticides Pits; PFAS is Per- and Polyfluoroalkyl Substances; MCL is maximum contaminant level; RSL is regional screening level.

µg = micrograms

[a] The 1,4-Dioxane standard is a Resource Conservation Recovery Act-permitted Groundwater Protection Standard.

[b] The MCL for nonvolatile beta activity (pCi/L or pCi/mL) equivalent to 4 mrem/yr varies according to which specific beta emitters are present in the sample. At SRS, this value equates to 50 pCi/L.

[c] The MCL for technetium-99 is the sum of beta dose <4 mrem/yr and technetium-99 < 900 pCi/L.

[d] At R Area, strontium-90 is sampled every two years. It was last sampled in 2022.

Since the early 1990s, SRS has directed considerable effort to assessing the likelihood of flow beneath the Savannah River from South Carolina to Georgia. A groundwater model developed by the U.S. Geological Survey (USGS) indicates there is no mechanism by which groundwater could flow under the Savannah River and contaminate Georgia wells (Cherry 2006). SRS continues to monitor for tritium in groundwater wells in Georgia (Figure 7-4) by collecting samples annually during the second half of the year. Since 1999, detections

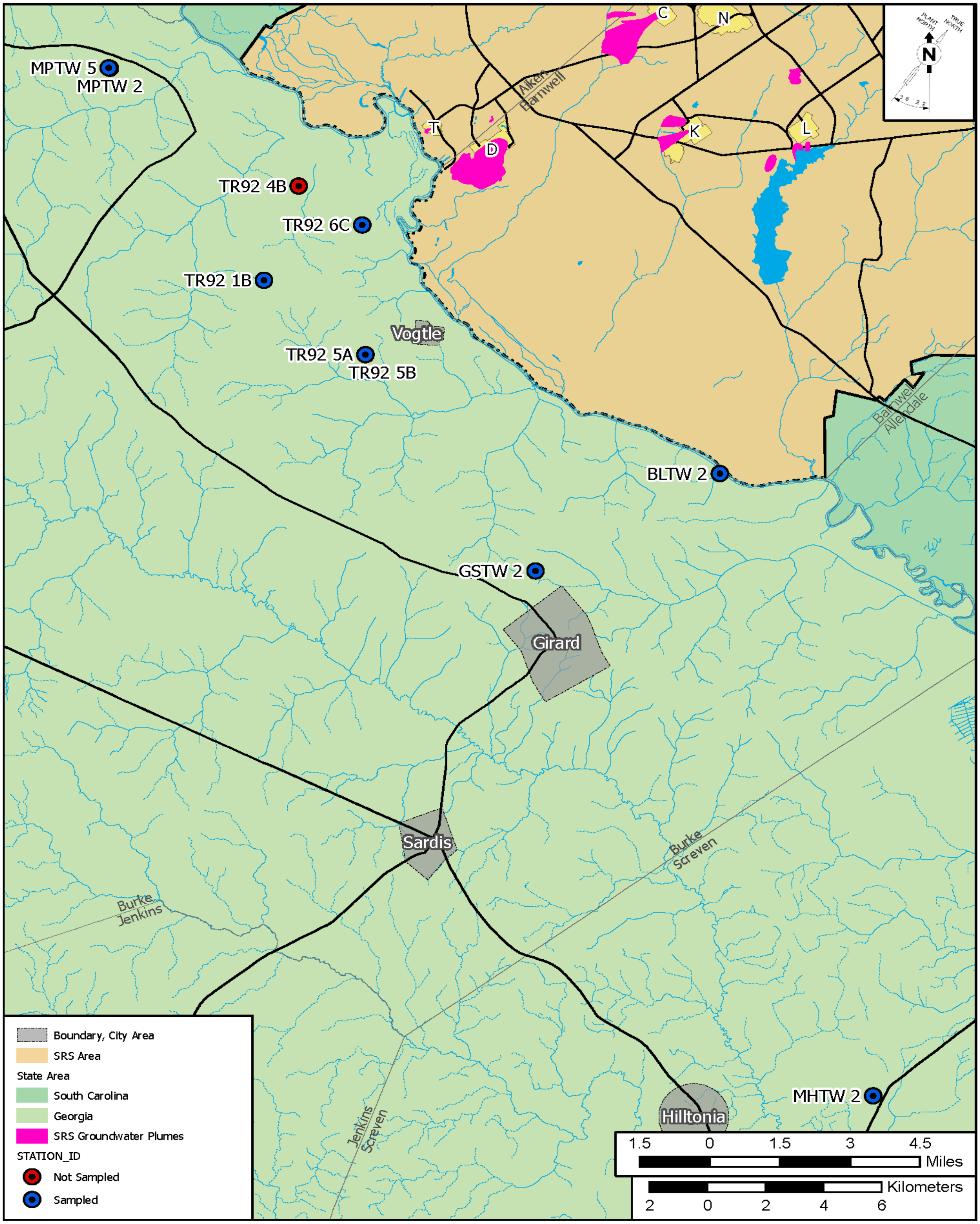

Figure 7-4 Locations of Tritium Monitoring Wells in Burke and Screven Counties, Georgia

of tritium in these Georgia offsite wells have been below 1.5 pCi/mL (1,500 pCi/L), which substantiates the results of the USGS groundwater model. As a comparison, the MCL, or drinking water standard, for tritium is 20 pCi/mL (20,000 pCi/L). For 2023, tritium was not detected in any of the groundwater collected at the nine locations sampled. One location was not sampled due to inaccessibility.

7.3.3 Remediating SRS Groundwater

SRS's environmental remediation program has been in place for more than 20 years. The Federal Facility Agreement (FFA) for the Savannah River Site (FFA 1993) specifies that RCRA and the Comprehensive Environmental Response, Compensation, and Liability Act regulate the processes of remediating and monitoring contaminated groundwater. Remediation focuses on removing mass, reducing contaminant levels, and reducing the exposure of humans and the environment to contaminants that exceed either the MCLs or RSLs. Table 7-2 identifies the MCLs and RSLs for the primary contaminants of concern in SRS groundwater.

For each remediation project, SRS determines the degree of contamination in the groundwater. After this evaluation, SRS and the regulatory agencies decide upon a strategy for remediating the groundwater.

SRS Field Work Includes Preparing Soil Cores and Collecting Soil Samples for Characterization.

SRS often applies remedial actions to the groundwater contamination source. For instance, SRS widely uses soil vapor extraction, a technology that extracts contaminated soil vapor from the vadose (unsaturated) zone to remove VOCs. This technology minimizes the VOCs that will reach the water table. Recently, SRS has emphasized converting soil vapor extraction systems requiring permanent electrical power to passive systems using solar power or barometric pumping.

SRS implements several groundwater remedial technologies. These technologies manage the rate the contaminants move and reduce the risk of contaminant exposure to human health and ecological receptors. Forty-one remediation systems are currently operating. In 2023, SRS removed 9,238 pounds (lbs) of VOCs from the groundwater and the vadose zone (SRNS 2024b). The amount of VOCs removed from the groundwater in 2023 is approximately 29% less than in 2022 due to an average reduction of 100 hours of operational time per month because of maintenance and equipment repairs and declining concentrations in the water being treated. Although mass removal rates will vary annually and generally decline over time as less mass is available for removal, SRS is dedicated to continuing to remediate contaminated groundwater.

SRS has worked for more than 20 years to reduce the tritium flux to Fourmile Branch. Since 2000, SRS has reduced the tritium flux to Fourmile Branch by almost 70% using groundwater remedial technologies (subsurface barriers and water capture with phytoirrigation). The Mixed Waste Management Facility (MWMF) Phytoremediation Project has the largest reductions of the technologies currently in use on the Site. In 2023, the MWMF Phytoremediation Project prevented 24.7 Ci of tritium from reaching SRS streams.

A/M Area is SRS's largest groundwater plume (Figure 7-3). The earliest identified contamination in the A/M-Area plume is associated with the M-Area and Metallurgical Laboratory Hazardous Waste Management Facility (HWMF), located in the general proximity of the "M" shown in Figure 7-3. Remediation at these two facilities began in 1983, when SRS pumped groundwater from wells to an above-ground treatment system, followed by soil vapor extraction, and then by thermal treatment. Figure 7-5 shows that as of 2023, these technologies have removed 1.62 million lbs of solvent, consisting of TCE and PCE (SRNS 2024a).

Overall, the size, shape, and volume of most SRS groundwater plumes are not significantly increasing because most of the contaminant sources have remediation systems in place. The *Savannah River Site Groundwater Management Strategy and Implementation Plan* (SRNS 2020) contains details concerning groundwater monitoring and conditions at individual sites.

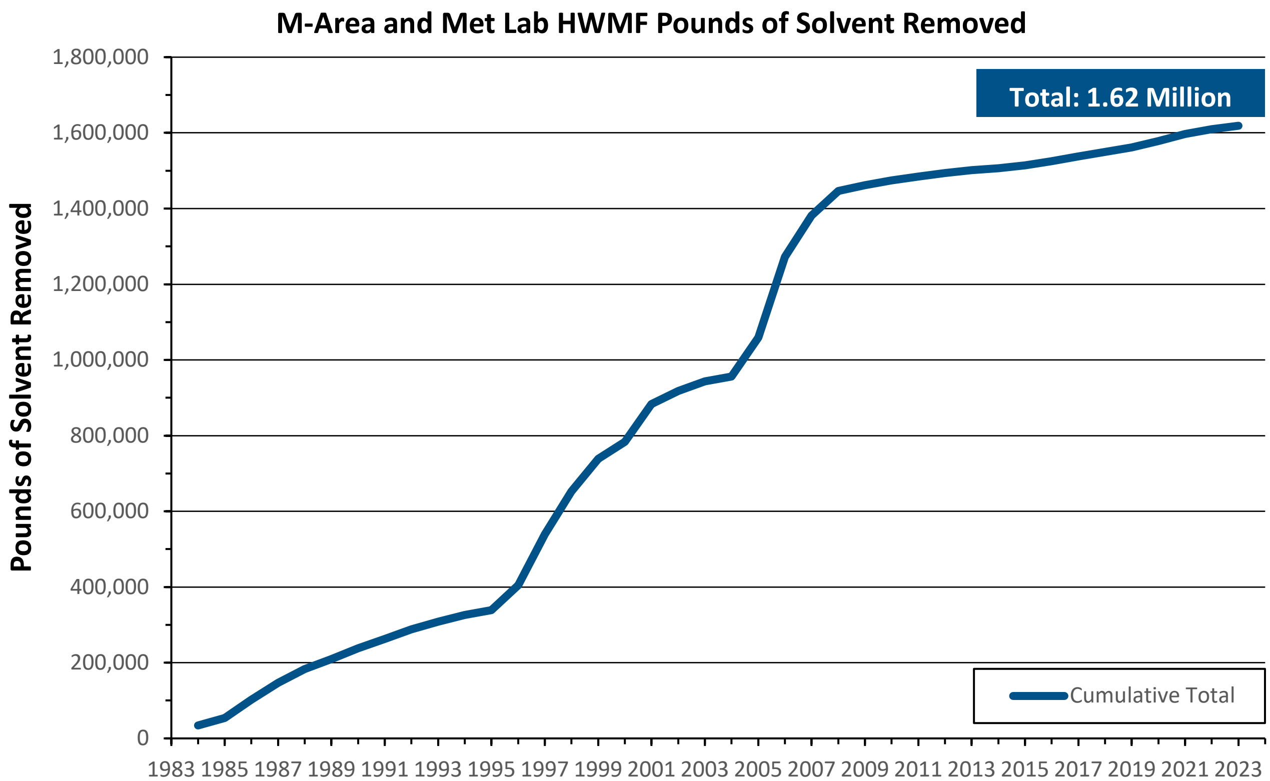

Figure 7-5 Solvent Removed from A/M-Area Groundwater Plume

7.3.4 Conserving SRS Groundwater

As in the past, SRS continues to report its drinking and process water use to SCDHEC. In 2023, SRS used 2.60 million gallons of water per day. Information on SRS water conservation is in Chapter 2, *Environmental Management System*.

SRS manages its own drinking and process water supply from groundwater beneath the Site. Approximately 40 production wells in widely scattered locations across the Site supply SRS domestic and process water systems. Eight of these wells are domestic water systems that supply drinking water. The other 32 wells provide water for all SRS facility operations. The 2023 *SRS Environmental Report* webpage contains a map of SRS domestic water systems under the *Environmental Maps* heading.

The A-Area domestic water system now supplies treated water to most Site areas. The system consists of a treatment plant, distribution piping, elevated storage tanks, and a well network. The wells range in capacity from 200 to 1,500 gallons per minute. Remote facilities, such as field laboratories, barricades, and pump houses, use small drinking water systems and bottled water. SRS domestic water systems meet state and federal drinking water quality standards. SCDHEC samples the systems quarterly for chemical analyses. Monitoring the A-Area water system for bacteria occurs monthly. SCDHEC performs sanitary surveys every two years on the A-Area system and inspects the smaller systems every three years. All 2023 water samples complied with SCDHEC and EPA water quality standards. Information on compliance activities associated with the SRS drinking water system is in Chapter 3, *Compliance Summary*, Section 3.3.7.2, *Safe Drinking Water Act (SDWA);* Chapter 4, *Nonradiological Environmental Monitoring Program,* Section 4.3.2, *Onsite Drinking Water Monitoring;* and Chapter 5, *Radiological Environmental Monitoring Program*, Section 5.4.8, *Drinking Water Monitoring.*

A, F, H, and S Areas have process water systems to meet SRS demands for boiler feedwater, equipment cooling water, facility washdown water, and makeup water. SRS uses the makeup water for cooling towers, fire storage tanks, chilled-water-piping loops, and Site test facilities. Process water wells ranging in capacity from 100 to 1,500 gallons per minute supply water to these systems. In K Area, L Area, and Z Area, the domestic water system supplies the process water system. At some locations, the process water wells pump to ground-level storage tanks, where SRS implements corrosion control measures. At other locations, the wells directly pressurize the process water distribution piping system without supplemental treatment.