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Radionuclides of the Savannah River Site Environment: Recent Data and Monitoring Techniques in Support of WAES TTX#3

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Jason Walker (Radiological Air and Soil Surveillance Programs Manager)
Eric Doman (Radiological Surface Water Surveillance Program Manager)
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EXECUTIVE SUMMARY

This report presents a history and recent assessment of Savannah River Site radiological environmental surveillance data for incorporation into Wide Area Environmental Sampling Tabletop Exercise Three. Aggregate data are presented in a summarized fashion that allows for tailored selection by relevance to applicable model/scenario. This report comprises of the following:

- Selection of radionuclides focus on the fission products (cesium-137, strontium-89/90, technetium-99, and iodine-129), activation products (carbon-14), and actinides (uranium-234,-235,-238, neptunium-237, plutonium-238,-239+240, americium-241, and curium-244).
- Sampling locations are categorized by proximity to nuclear activities (onsite, fence line, and approximately 25 miles offsite). Guidance rubrics and information on anthropogenic impacts for all sample sites guide a reader through tailored data selection of specific scenarios.
- Environmental media include ambient air, terrestrial soil, stream and river surface water, and stream and river sediment.
- Maps detailing sampling location demonstrate proximity to nuclear activities for each media type.
- Tabulated sampling method techniques and method detection limits included for each media type.
- Appendices are arranged by sample media type and provide summary statistics organized by each radionuclide for approximately sixteen years (2003 through 2019).
- Appendices also provide a temporal comparison for each measured radionuclide at each sampling location as compared to representative MDCs.
- Excel files with discrete tabular data for each sampling location and sample type are contained as an Addendum to the report.
- In general, due to legacy contamination, onsite concentrations of measured radionuclides are higher than they are at the control and other offsite sampling locations.
- Natural uranium concentrations in offsite soil and sediment are higher than at most of the onsite sampling locations (except those affected by SRS M-Area operations). The higher natural uranium concentrations in the offsite soil and sediment samples may be due differing soil types or to the use of high phosphate fertilizers in the areas of the offsite sampling locations.

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LIST OF ABBREVIATIONS

BGN	Burial Ground North
DOE	Department of Energy
DOECAP	DOE Consolidated Audit Program
EBL	SRS Environmental and Bioassay Laboratory
EC&ACP	Environmental Compliance and Area Completion Project
GFF	Glass fiber particulate filters
GSA	General Separations Area
IAEA	International Atomic Energy Agency
MAPEP	Mixed Analyte Performance Evaluation Program
MDC	Minimum Detectable Concentration
REMP	SRS Radiological Environmental Monitoring Program
SRNL	Savannah River National Laboratory
SRS	Savannah River Site
TTX	Table Top Exercise
USFS-SR	US Forest Service-Savannah River
USGS	US Geological Survey
VEGP	Vogtle Electric Generating Station
WAES	Wide Area Environmental Sampling

1.0 Introduction

1.1 The Need for Environmental Radionuclide Data in Wide Area Environmental Sampling

The Wide Area Environmental Sampling (WAES) project is designed to provide the International Atomic Energy Administration (IAEA) with a framework for identifying whether an environmental sampling program would be able to detect processing of nuclear materials being performed in secret or for proliferation purposes. The WAES program is designed to use commercially available, off-the-shelf samplers and detection methods to provide support in determining the presence or absence of nuclear activities.

A key uncertainty for a successful WAES campaign is quantifying the environmental background of specific radionuclides. The expected background levels must be known in order to determine whether a measurement of radionuclides indicates ongoing nuclear processing activities or their absence. Historical and ongoing processes related to processing nuclear materials for a variety of purposes, including research and medical uses, contribute to the background level of a radionuclide at a given location. Thus, it is possible for the spatial variability of the background to be great over small distances. In particular, the backgrounds in the vicinity of nuclear facilities will be higher than other locations far from these types of facilities. A WAES campaign may be theoretically deployed anywhere in the world, requiring an understanding of what the variations in backgrounds are and how those relate to the presence of nearby facilities.

The historical mission of the Savannah River Site (SRS) in conjunction with a continuous environmental monitoring program undertaken at the SRS provides a database of radionuclide backgrounds which can be assessed as a function of time and distance from the nuclear facilities located at the site. The data taken at SRS can be used to assess potential background levels of radionuclides in the environment, including measurements taken in water, soil, and vegetation. This document details the history and values of historical monitoring of radionuclides in the environment to provide a guide for the WAES program decision-makers in determining whether a feasible campaign can be conducted with useful results.

1.2 Savannah River Site History and Mission

SRS is a US Department of Energy (DOE) facility that was constructed during the early 1950s to produce the basic materials used in the fabrication of nuclear weapons, primarily tritium and plutonium-239, in support of our nation's defense programs. Five reactors were built to produce these materials. Also built were numerous support facilities including two chemical separations plants, a heavy water extraction plant, a nuclear fuel and target fabrication facility, a tritium extraction facility and waste management facilities.

The SRS mission is to support the nation’s nuclear deterrent programs and transforming the Site for future uses. The current main activities at the Site involve tritium processing, treating and processing legacy waste, environmental cleanup and remediation, and protecting and processing special nuclear materials.

1.3 Site Location, Demographics, and Environment

SRS borders the Savannah River and encompasses about 310 square miles in the South Carolina counties of Aiken, Allendale, and Barnwell. SRS is about 12 miles south of Aiken, South Carolina, and 15 miles southeast of Augusta, Georgia (Figure 1-1).

Based on the U.S. Census Bureau’s 2010 data, the population within a 50-mile radius of the center of SRS is about 781,060 people. This translates to an average population density of about 104 people per square mile outside the SRS boundary, with the largest concentration in the Augusta metropolitan area.

1.3.1 Water Resources

Water resources at SRS include the Savannah River, five major streams (Upper Three Runs, Fourmile Branch, Pen Branch, Steel Creek, and Lower Three Runs), and the underlying groundwater. The Savannah River bounds SRS on the southwest for 35 river miles, with most of this boundary a large swamp that is flooded, on average, about 20 percent of the year. The upriver boundary of SRS is about 160 river miles from the Atlantic Ocean. The nearest downriver municipal facility that uses the river as a drinking water source (Beaufort-Jasper Water and Sewer Authority's Purrysburg Water Treatment Plant) is about 90 river miles from the Site. In addition, the Vogtle Electric Generating Plant (VEGP), located across the river from SRS, uses the Savannah River for cooling water. The VEGP is a two unit (pressurized water reactors) nuclear power plant operated by Southern Nuclear. The Savannah River is not currently used for any large-scale irrigation projects downriver of the Site. The groundwater at SRS migrates through the subsurface, primarily discharging into the Site streams, the Savannah River Swamp, and the Savannah River (Wike et al., 2006).

1.3.2 Geology

SRS is located on the southeastern Atlantic Coastal Plain, in an area named the Aiken Plateau. The center of SRS is about 25 miles southeast of the geologic fall line that separates the Coastal Plain from the Piedmont. The Aiken Plateau slopes gently to the southeast and is generally well drained. All major streams on SRS originate onsite, except for Upper Three Runs, which begins above the Site. All onsite streams drain into the Savannah River. The underlying geology consists primarily of coastal plain sands and clays with occasional carbonate sediments. Most SRS surface soils have a sand and loamy sand texture whereas subsoil textures can be classified as sandy loam or sandy clay loam (Wike et al., 2006).

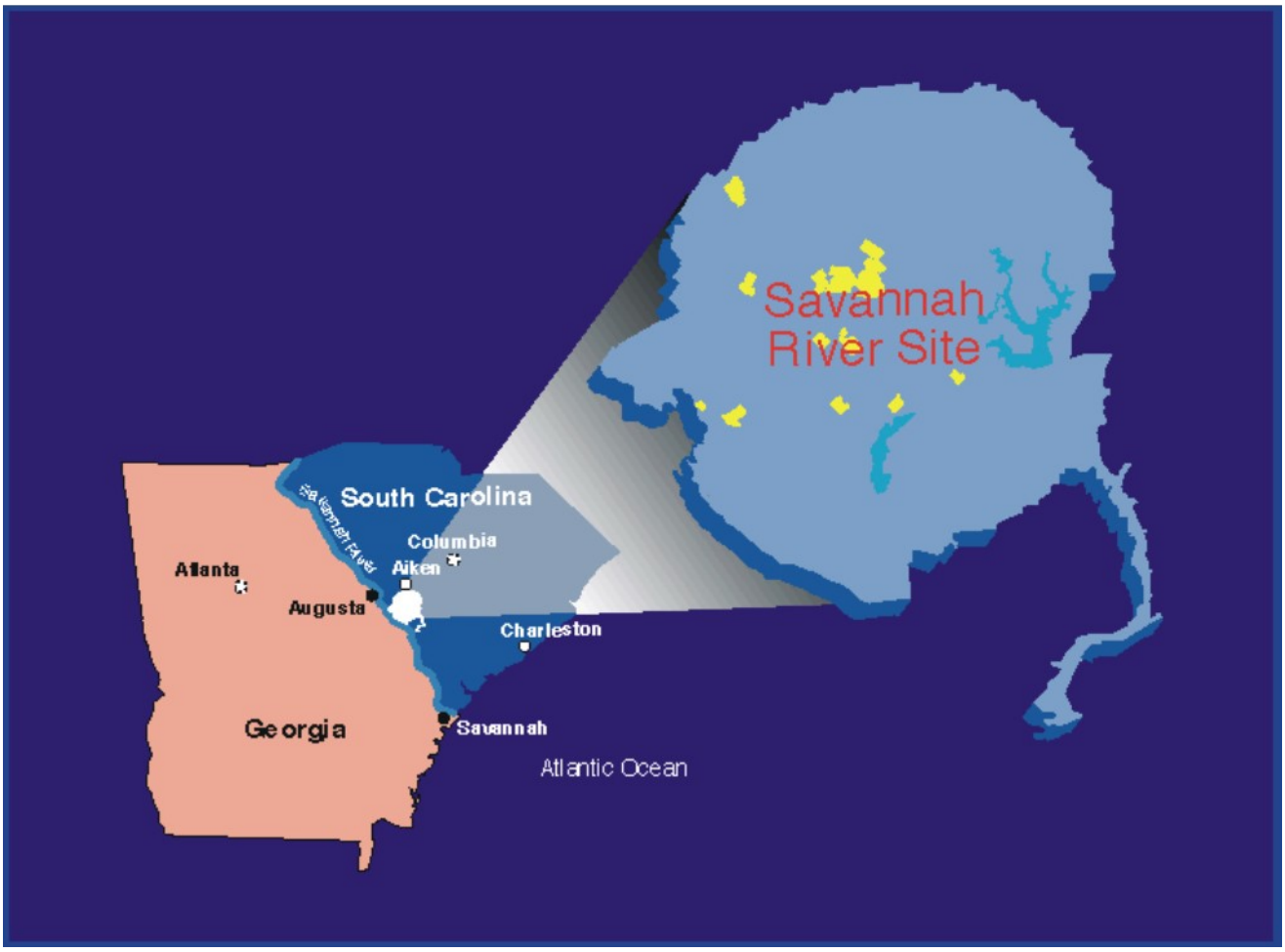

Figure 1-1. The Savannah River Site and Surrounding Area.

1.3.3 Topography

The elevation of SRS ranges from 80 feet above mean sea level (msl) at the Savannah River to about 400 feet above msl in the upper northwest portion of the site (USGS, 1987). The Pleistocene Coastal terraces and the Aiken Plateau comprise two distinct physiographic subregions at SRS (McAllister et al., 1996). The Pleistocene Coastal terraces are below 270 feet above msl in elevation with the lowest terrace constituting the present floodplain along the Savannah River and the higher terraces characterized by gently rolling terrain. The relatively flat Aiken Plateau occurs above 270 feet above msl and is dissected by local streams.

1.3.4 Land and Forest Resources

About 10% of SRS's land is industrial; the remaining 90% consists of natural and managed forests that the US Forest Service-Savannah River (USFS-SR) plants, maintains, and harvests. SRS consists of four major forests: 1) mixed pine-hardwoods, 2) sandhills pine savanna, 3) bottomland hardwoods, and 4) swamp floodplain forests.

2.0 Experimental Procedure

2.1 SRS Radiological Environmental Monitoring Program Overview

The SRS Radiological Environmental Monitoring Program (REMP) monitors radiological contaminants from both air and liquid sources, as well as collects and analyzes environmental samples from numerous locations throughout the Site and the surrounding area. The REMP has two focus areas: 1) effluent monitoring, and 2) environmental surveillance. Figure 2-1 shows the liquid and airborne pathways, as well as the types of media sampled through those pathways.

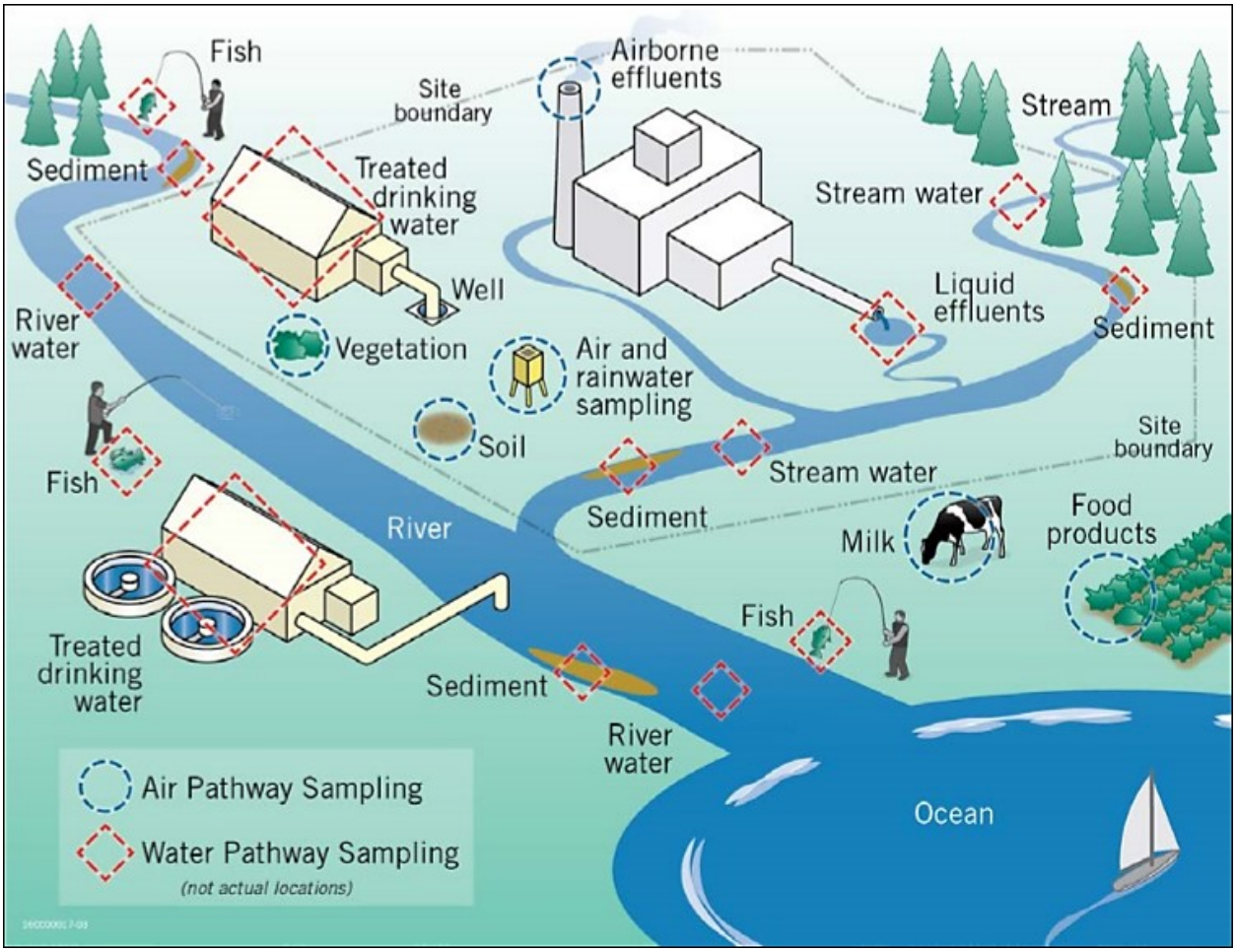

Figure 2-1. Types and Typical Locations of Radiological Sampling.

SRS conducts sampling and analysis of the following media:

- Effluent Air
- Ambient Air
- Rainwater
- Vegetation
- Terrestrial Soil
- Effluent Water
- Surface water (stream, river, and stormwater basins)
- Drinking water

- Stream, basin, and river sediment
- Aquatic food products
- Terrestrial Food products (milk, meat, fruit, nuts, and vegetables)
- Wildlife (deer and wild pigs)

The focus of this report will be on the surveillance of Ambient Air, Terrestrial Soil, Stream and River Surface Water, and Stream and River Sediment. Trending and summary statistics (maximum, minimum, and mean) of available data from 2003 to 2019 are documented and assessed for select 1) fission products (cesium-137, strontrium-89/90, technetium-99, and iodine-129), 2) activation products (carbon-14), and 3) actinides (uranium-234,-235,-238, neptunium-237, plutonium-238,-239+240, americium-241, and curium-244). It should be noted that the SRS reported values for plutonium-239 include plutotonium-240 because the standard analytical methods used (alpha spectroscopy) cannot distinguish between the close alpha energies of these two isotopes.

2.1.1 Environmental Sampling, Typical Aliquot Sizes, and Radioanalytical Methods

The SRS Environmental Monitoring Program (EMP) group within the Environmental Compliance and Area Completion Project (EC&ACP) section maintains the overall responsibility for managing and administering the REMP as required by DOE Order 458.1. EMP personnel perform most of the environmental surveillance sampling for the SRS REMP (SRNS 2019a).

The SRS Environmental and Bioassay Laboratory (EBL) (located onsite in B-Area) performs most of the standard radioanalytical procedures. The analytical methods used for the REMP are consistent with widely accepted standards or guidelines (SRNS 2019b, chapter 8). EBL maintains accreditation through the DOE Consolidated Audit Program (DOECAP). Additionally, EBL participates in the Mixed Analyte Performance Evaluation Program (MAPEP) (SRNS 2019b, chapter 8). Table 2-1 provides the typical aliquot sizes and radioanalytical methods used for the four environmental media and radionuclides that are the focus of this report.

Table 2-1. EBL Methods and Representative Sample Aliquots.

Matrix	Analytical Parameter	Representative Aliquot	Analytical Method
Surveillance Air			
	Cesium-137	1,415 m^3	Gamma spectroscopy (filter paper)
	Iodine-129, iodine-131	1,415 m^3	Gamma spectroscopy (charcoal)
	Strontium-89, 90	1,415 m^3	Gas-flow proportional counting
	Actinides	1,415 m^3	Alpha spectroscopy
Stream/River Water			
	Cesium-137	1 L / 7 L	Gamma spectroscopy
	Iodine-129	1,500 mL / 1,500 mL	Gamma spectroscopy
	Strontium-89,90	1 L / 500 mL	Gas-flow proportional counting
	Actinides	1 L / 500 mL	Alpha spectroscopy
	Technetium-99	500 mL / 500 mL	Liquid scintillation counting
Soil			
	Cesium-137	650 g	Gamma spectroscopy
	Iodine-129	5 g	Gamma spectroscopy
	Strontium-89,90	5 g	Gas-flow proportional counting
	Actinides	5 g	Alpha spectroscopy
Sediment			
	Cesium-137	650 g	Gamma spectroscopy
	Strontium-89,90	5 g	Gas-flow proportional counting
	Actinides	5 g	Alpha spectroscopy

2.1.2 Calculation of Minimum Detectable Concentrations and Summary Statistics

The minimum detectable concentrations (MDCs) reported by EBL for gas-flow, alpha spectroscopy, and liquid scintillation counting are based on Currie's classic equation (Currie, 1968):

$$(k*\sqrt{B}+x)/TREVA$$

Where;

k= 4.65

B = background count

X = 2.71 for LSC

X = 3 for all others

T = count time

R = recovery

E = efficiency

V = sample aliquot

A = branching ratio for particle formation (photon/beta/positron/etc.)

For gamma spectroscopy, the method is modified to account for varying mass attenuation by photon energy.

EBL's MDCs have changed (up and down) over the assessment period (2003 through 2019) because of changes in methods, counting times, and instruments. The SRNL document, *Risk Comparisons of Minimum Detectable Concentrations for Various Environmental Media* (Jannik, 2011), has provided input in identifying and setting EBL's current MDCs for selected environmental media and radionuclides.

In Table 2-2, representative MDCs from 2011 are provided as an example for the four media and the various radionuclides of interest in this report. These representative MDCs are calculated at the 95-percent confidence level using instrument background measurements and typical detector efficiencies, decay times, and counting intervals. Sampling line loss factors are assumed to be 0 percent and chemical recoveries and air filter collection efficiencies are assumed to be 100 percent, unless established historical values are available. The MDCs for actual samples will be different because of variations in the sample preparation, size, and content, and because of variations in the chemical recoveries, line loss factors, counting efficiencies, reagent blanks, decay times, counting times, and instrument backgrounds.

In Appendices A, B, C, and D, summary statistics (mean, min, max) of measured concentrations are provided for each media for the years 2003 through 2019. Also provided is the overall Sigma value for the mean, which is calculated from the sample concentration values. It is the standard deviation of the concentration values divided by the square root of the sample size and is the standard error of the mean for the concentration. This includes the within and between sample variability.

Table 2-2. EBL Representative MDCs for 2011.

	Surveillance Air	Soil/Sediment	Stream Water	River Water
Nuclide	**pCi/m3**	**pCi/g**	**pCi/L**	**pCi/L**
I-129	1.87E-03	N/A	1.06E+00	N/A
I-131	5.19E-03	3.59E-02	5.16E+01	6.78E+00
Cs-137	5.71E-03	3.59E-02	8.21E+00	1.18E+00
Sr-89,90	3.80E-03	2.33E-01	5.27E+00	1.70E+00
Tc-99	N/A	N/A	2.58E+00	2.49E+00
U-234	8.61E-06	2.92E-03	2.49E-02	1.20E-02
U-235	9.28E-06	3.30E-03	8.67E+00	1.40E-02
U-238	8.03E-06	2.72E-03	1.10E-02	1.10E-02
Pu-238	6.29E-06	2.86E-03	2.52E-02	9.20E-03
Pu-239	6.17E-06	2.84E-03	2.46E-02	9.20E-03
Am-241	5.42E-06	3.94E-03	2.19E-02	2.73E-02
Cm-244	4.87E-06	3.48E-03	2.09E-02	9.90E-03

2.2 Atmospheric Surveillance

SRS maintains a network of 14 air sampling stations on and around the Site to monitor the concentration of radioactive materials in ambient air (Figure 2-2). One station (Burial Ground North (BGN)) is located near the center of the SRS General Separations Area (GSA), where most of the Site's radiological operations occur. Ten stations (Allendale Gate, Barnwell Gate, D-Area, Darkhorse, East Talatha, Green Pond, Hwy 21/167, Jackson, Patterson Mill Road, and Talatha Gate) are placed in a ring around the SRS perimeter. Historically, placement on the Site's boundary was designed to ensure that at least one monitoring station was located in each 45-degree sector and additional ones were placed in the more prominent wind directions and in the direction of population centers. A recent evaluation of the effectiveness of these placements was performed and it indicated good agreement between the recommended and actual monitoring station placements (Abbott and Jannik, 2016).

The three offsite air sampling locations are approximately 25 miles from the center of SRS (Figure 2-3). Two of these (Aiken Airport and Augusta Lock and Dam) are located near the largest regional population centers, which are the cities of Aiken, SC and Augusta, GA. The third one (Hwy 301 Bridge) is considered to be the control location and is near RM 118.8 in Screven County, GA.

Radiological concentration data from all 14 SRS Air Surveillance Stations, for the years 2003 to 2019, were used in this assessment.

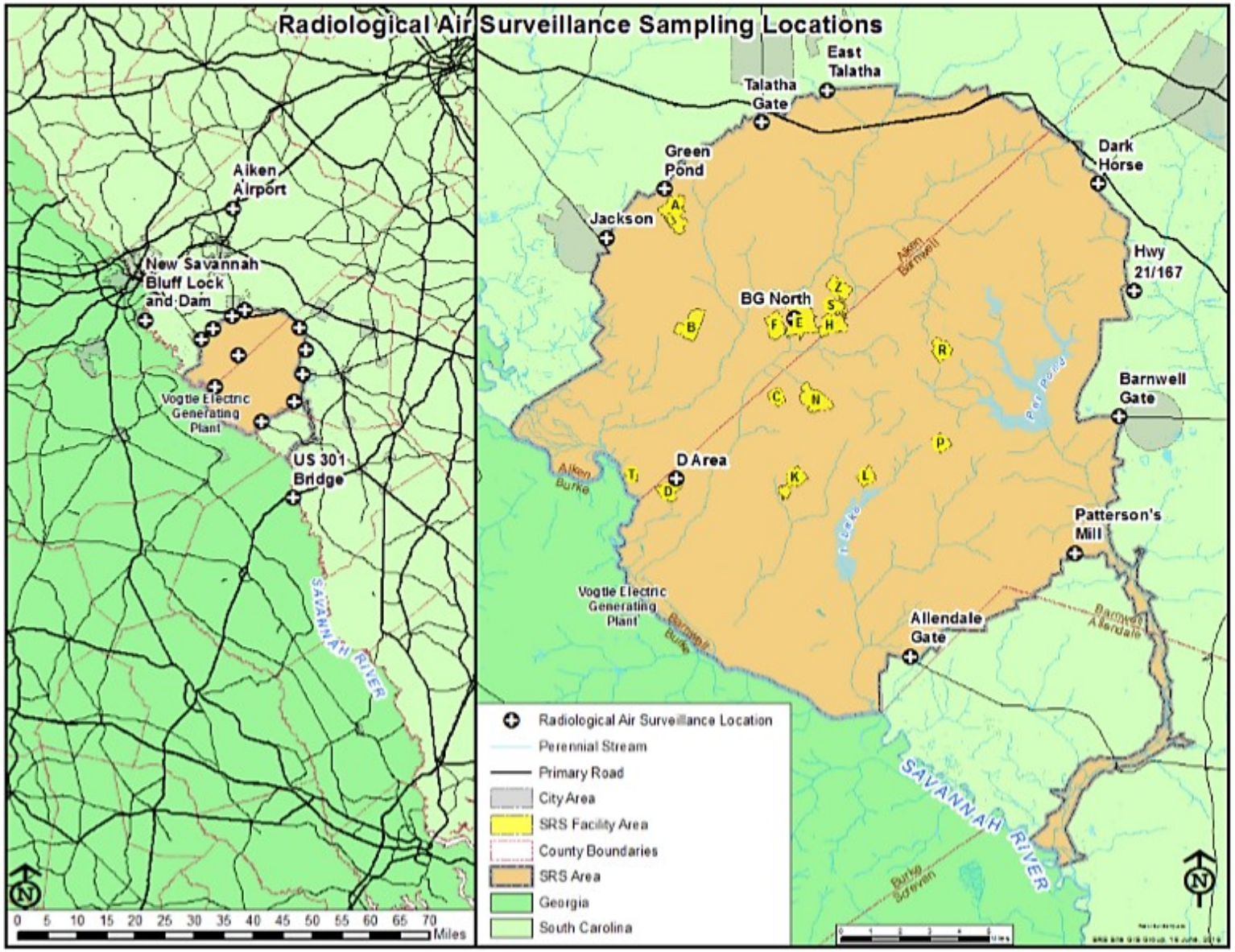

Figure 2-2. SRS Radiological Air Surveillance Sampling Locations.

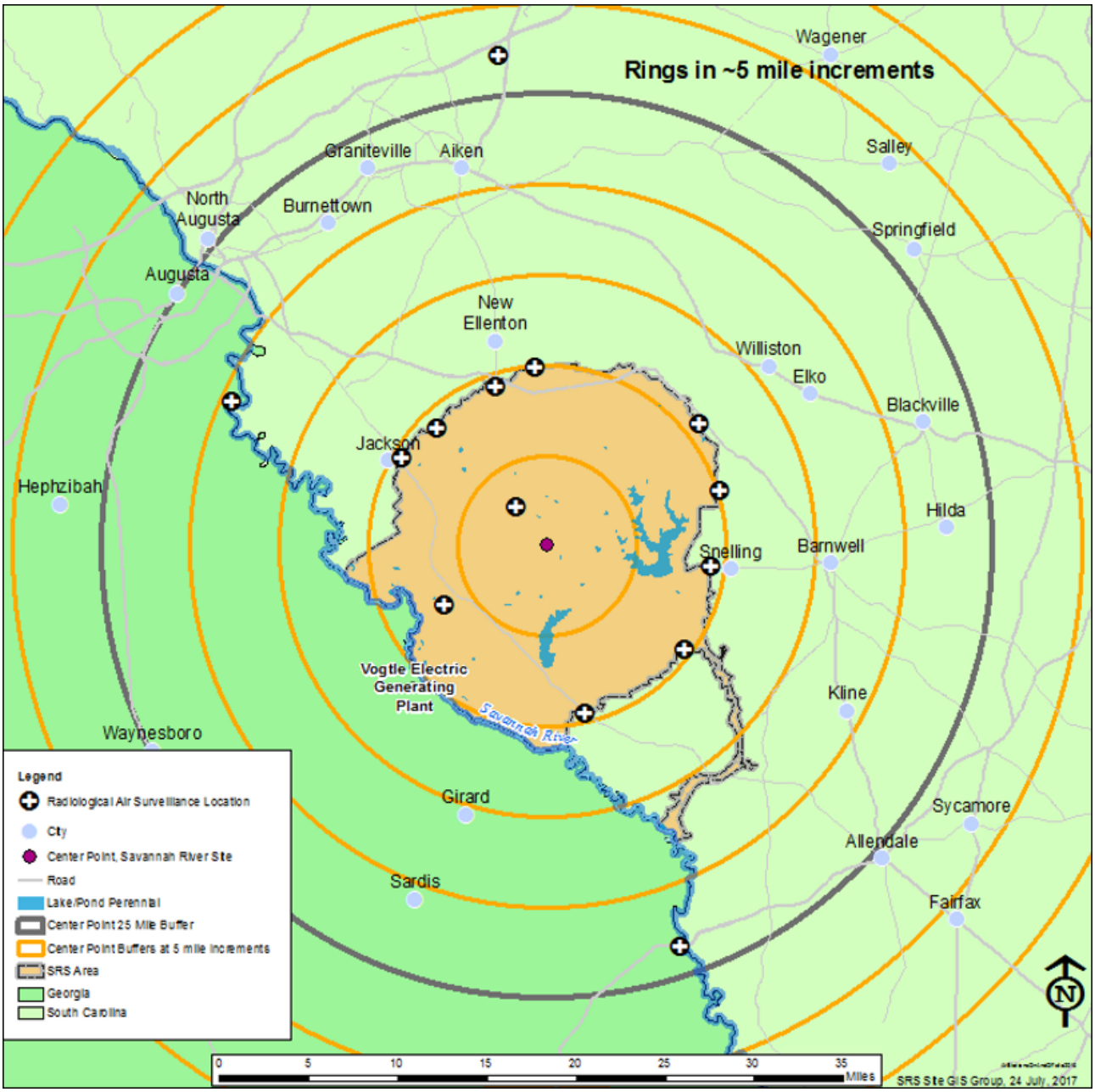

Figure 2-3. Distances to the SRS Air Sampling Locations from the Center of SRS.

Each atmospheric sampling station consists of the following components: glass fiber particulate filters (GFF), charcoal canister, silica gel column, and rainwater collection bottle. As shown in Figure 2-4, air passes through the GFF to collect airborne particulate matter, it then passes through a charcoal canister to collect any radioiodine. The air moves through the system at a rate of approximately 74 liters per minute using a rotary vane pump. Tritium oxide measurements are obtained by collecting air moisture, which is trapped by passing the air through a silica gel column. The air moves through this system at a rate of 150 cubic centimeters per minute. Rainwater is collected using a stainless-steel collection pan to catch the water that then drains through tubing and into a collection bottle (SRNS, 2019a). Figure 2-5 shows pictures of two SRS Air Surveillance Stations.

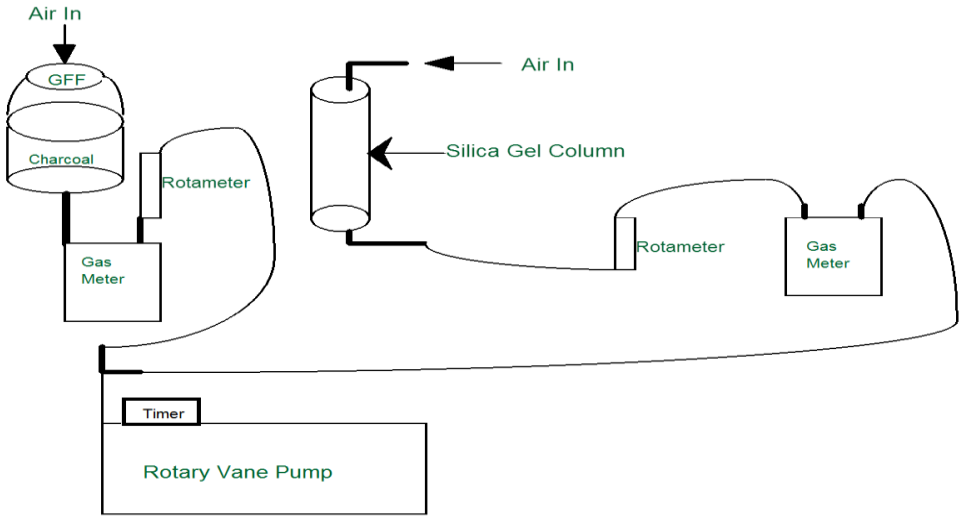

Figure 2-4. Schematic of the SRS Air Surveillance Stations.

Figure 2-5. Talatha Gate (left) and Augusta Lock and Dam (right) Air Surveillance Stations.

2.3 Surface Water Surveillance

The SRS Radiological Surface Water Surveillance Program consists of two divisions: 1) onsite streams and lakes, and 2) the Savannah River (SRNS, 2019a). The objective of the surface water surveillance program is to work with the effluent monitoring program to achieve the following:

- Determine compliance with all applicable environmental quality standards and public dose limits
- Establish background levels and quantify site contributions of radioactive materials in the environment
- Verify the effectiveness of effluent treatment and controls in reducing effluents and emissions
- Accumulate trending information on the buildup and migration of radioactive materials in the environment
- Detect and quantify unplanned releases.

The Surface Water Surveillance Program consists of 39 locations on- and off-site. However, to focus on the main control and indicator locations at SRS, only the 13 surface water sampling locations shown in Table 2-3 were assessed in this report. These locations are shown in Figure 2-6. Upper Three Runs-1A is the normal onsite stream control location. However, it was not sampled for several years due to bridge construction and was replaced by U3R-0 during that time. The VEGP is located on the GA side of the Savannah River, near RM-150. The RM-141.5 sampling location is the established location for the SRS liquid pathway Representative Person, which is used for showing compliance with DOE Order 458.1 dose limits (Stagich, Jannik, and Dixon, 2020).

Table 2-3. SRS Surface Water Sampling Locations Assessed in this Report.

Surface Water Sampling Location	Acronym	Location Description
Upper Three Runs-1A	U3R-1A	Onsite Stream Control
Upper Three Runs-0	U3R-0	Onsite Stream Control
Upper Three Runs-4	U3R-4	Onsite Indicator
Fourmile Branch-6	FM-6	Onsite Indicator
Fourmile Branch-A7	FM-A7	Onsite Indicator (below GSA)
Pen Branch-3	PB-3	Onsite Indicator
Steel Creek-4	SC-4	Onsite Indicator
Lower Three Runs-3	L3R-3	Onsite Indicator
River Mile-161	RM-161	River Control (upriver of SRS)
River Mile-150.4	RM-150.4	River Control (above VEGP)
River Mile-150	RM-150	River Indicator (below VEGP)
River Mile-141.5	RM-141.5	River Indicator (near Steel Creek)
River Mile-118.8	RM-118.8	River Indicator (below all SRS inputs)

For stream surface water, sampling is performed monthly using a time-proportional automatic composite sampling system or by grab sampling. The surface water sampling systems used at SRS are continuous-type, programmable, peristaltic pump, composite-sampling systems (SRNS, 2019a). Pictures of the SRS samplers are shown in Figure 2-7. For the monthly surveillance stream locations, 30 mL aliquots are taken every 135 minutes. The monthly composited samples are typically analyzed for tritium, gross alpha/beta, and gamma emitters. The monthly samples from FM-6 and FM-A7 are also analyzed for carbon-14, strontium-89/90, technetium-99, and iodine-129 and the monthly sample from U3R-4 is also analyzed for uranium isotopes. Annually, the stream surface water surveillance locations are sampled by a grab sample, which is typically analyzed for actinides, strontium-89/90, technetium-99, and iodine-129. The annual samples from FM-6 and FM-A7 are also analyzed for niobium-94, radium-226, and neptunium-237. The composited river surface water locations are sampled and analyzed in a similar manner to the stream

locations, except the river locations are sampled weekly with a 30 mL aliquot taken every 30 minutes. The river locations also have an annual grab sample taken and analyzed for the same radionuclides as the stream locations.

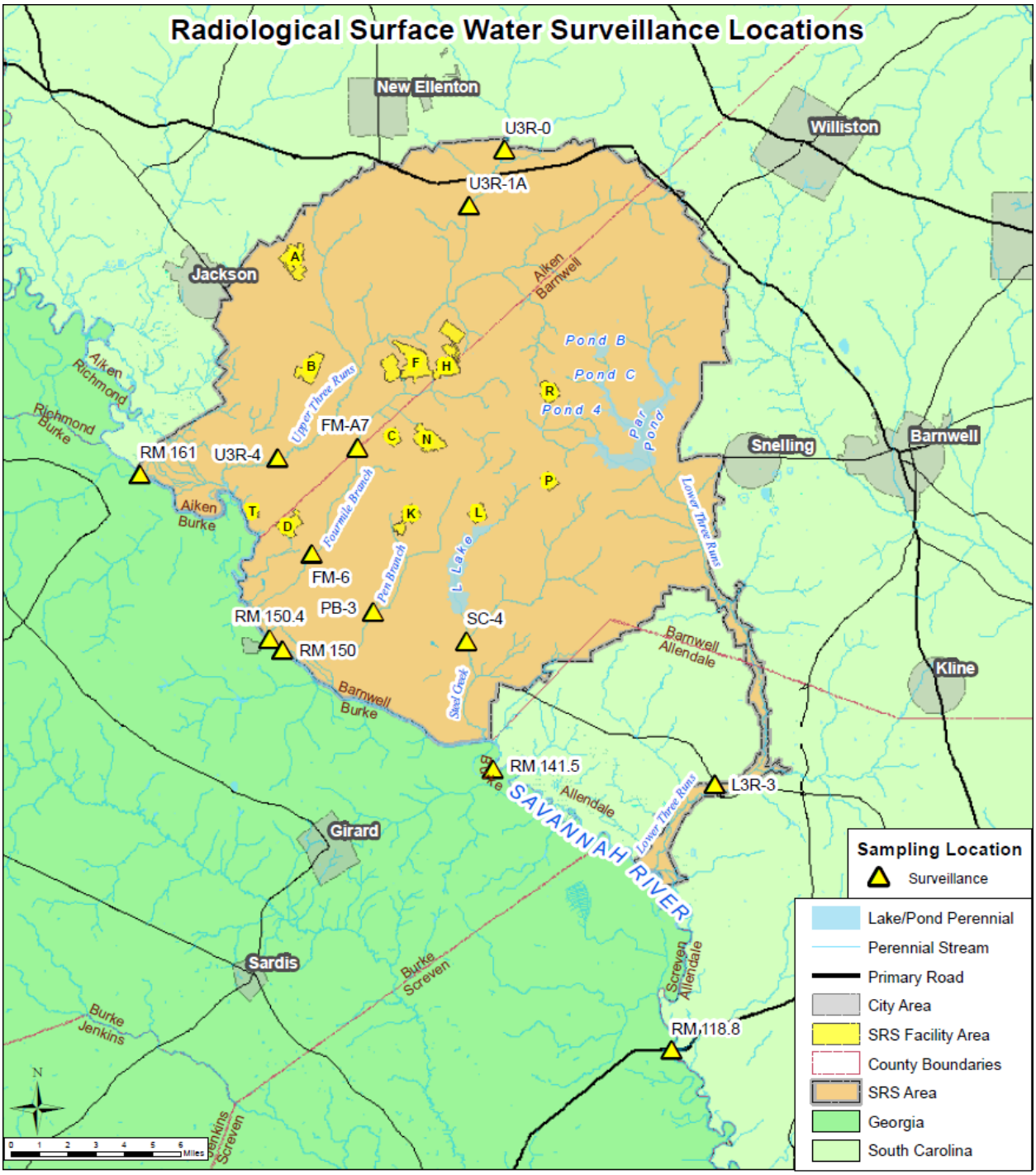

Figure 2-6. SRS Surface Water Sampling Locations Assessed in this Report.

Figure 2-7. SRS Surface Water Sampling Locations Assessed in this Report.

2.4 Soil Surveillance

The SRS soil surveillance program performs two functions:

- Identifies and trends the deposition patterns of radioactive materials to the environment
- Characterizes the concentration of radioactive materials in the environment

In addition to the natural radioactivity in the soil, radioactive materials deposited in the environment come from two sources: previous SRS operations and global fallout. Material is deposited by both dry and wet (rainfall) deposition processes. The soil surveillance program performs long-term trending of contaminant levels in the soil media, rather than quantifying regional concentrations of activity. Direct comparison of data from year to year is not appropriate because of the limited number of samples collected, the heterogeneity of soil type (and the associated geochemistry), and other sampling uncertainties.

Sampling technicians use hand augers, shovels, or other similar devices to collect soil to a depth of 6 inches from uncultivated and undisturbed areas. The technicians hand mix the soil samples to ensure they are homogeneous when the laboratory analyzes them for gross alpha, gross beta, gamma-emitting radionuclides, strontium-89,90, and actinides (including neptunium). Soil samples are collected annually from 5 onsite, 10 perimeter, and 3 offsite locations (SRNS, 2019a). Fourteen of these sites are co-located with the radiological air surveillance location shown in Figure 2-2. Four additional onsite locations (H-Area, F-Area, Z-Area and Burial Ground 646-26E2) were established in and around the GSA. The SRS soil sampling surveillance locations are shown in Figure 2-9.

Figure 2-8. Soil Sampling Technique.

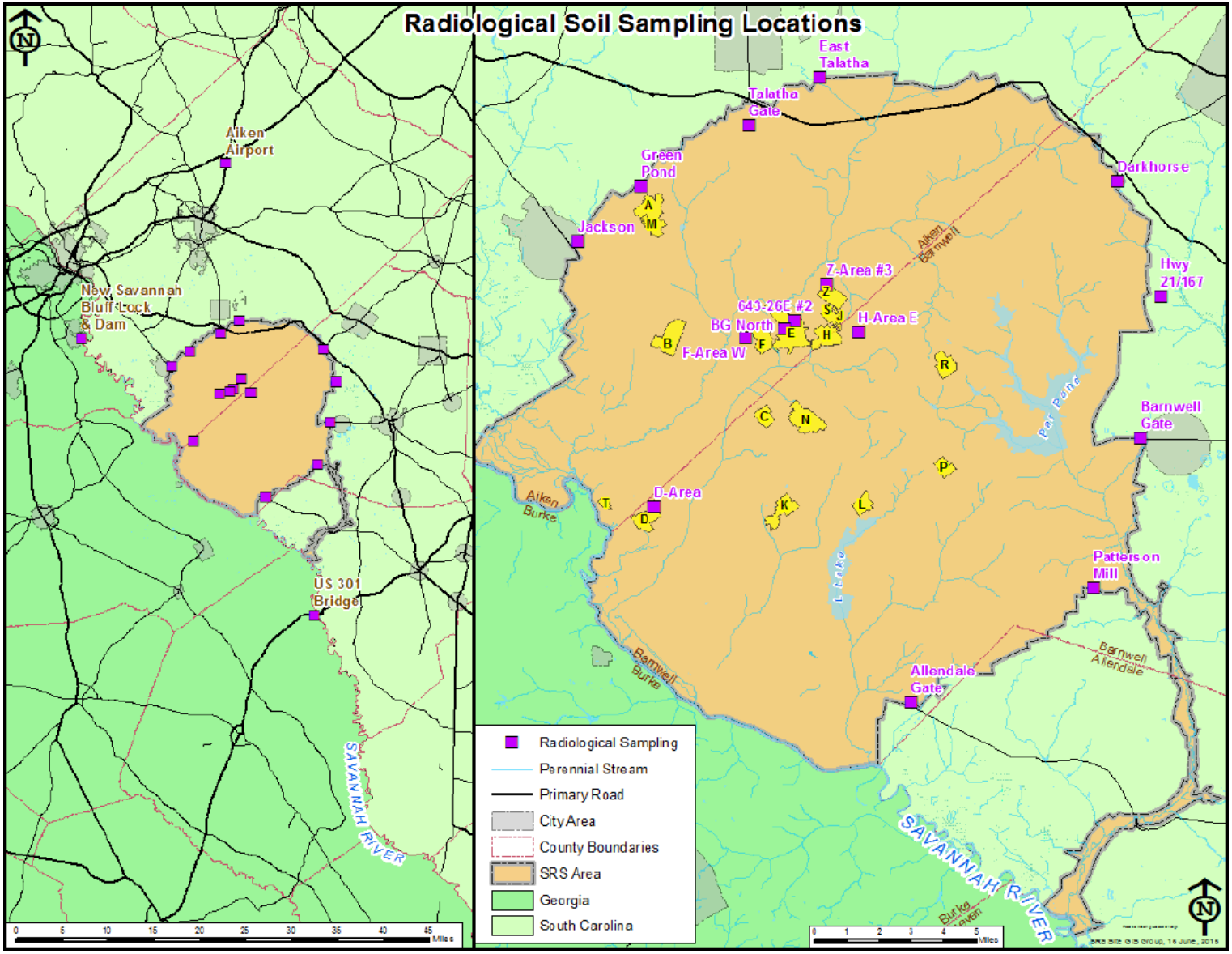

Figure 2-9. SRS Soil Sampling Locations Assessed in this Report.

2.5 Stream and River Sediment Surveillance

The SRS sediment sampling and analysis program provides data to determine the movement, deposition, and accumulation of long-lived radioactive contamination in the Site stream and river systems. Year-to-year differences may be evident because sediment continuously moves and deposits at different locations in the stream and riverbeds (or because of slight variations in sampling locations), but the data obtained can be used to observe long-term environmental trends. Sediment samples are collected annually at locations on- and off-site for radiological surveillance monitoring; samples are collected from site streams and the Savannah River. Sampling technicians collect samples by composite (multiple small samples from in around the specific sampling location), when feasible and safe to do so (Figure 2-10). When collection by composite is not possible, then a single grab sample is collected. The technicians hand mix the sediment samples to ensure they are homogeneous when the laboratory analyzes them for gross alpha, gross beta, gamma-emitting radionuclides, strontium-89,90, and actinides (including neptunium-237) (SRNS, 2019a).

In 2019, SRS collected annual sediment samples at 11 Savannah River locations, 8 basin or pond locations, and 20 onsite streams or swamp discharge. The locations vary slightly from year-to-year, depending on the rotation schedule agreed upon with regulators (SRNS, 2019b). However, to focus on the main control and indicator locations at SRS, only the 13 long-term sediment sampling locations shown in Table 2-4 were assessed in this report. These locations are shown in Figure 2-11.

Table 2-4. SRS Sediment Sampling Locations Assessed in this Report.

Surface Water Sampling Location	Acronym	Location Description
Upper Three Runs-1A,-0	U3R-1A,-0	Onsite Stream Control
Tims Branch-5	TB-5	Onsite Indicator (below M-Area)
Upper Three Runs-Mouth	U3R-Mouth	Onsite Indicator
Fourmile Branch@Swamp	FM@Swamp	Onsite Indicator
Fourmile Branch-A7	FM-A7	Onsite Indicator (below GSA)
Pen Branch@Swamp	PB@Swamp	Onsite Indicator
Steel Creek-4	SC-4	Onsite Indicator
Lower Three Runs-Mouth	L3R-Mouth	Onsite Indicator
River Mile-161	RM-161	River Control (upriver of SRS)
River Mile-150.4	RM-150.4	River Control (above VEGP)
River Mile-150.2	RM-150.2	River Indicator (below VEGP)
River Mile-134	RM-134	River Indicator (below SR-Swamp)
River Mile-118.7	RM-118.7	River Indicator (below all SRS inputs)

Figure 2-10. Sediment Sampling Technique.

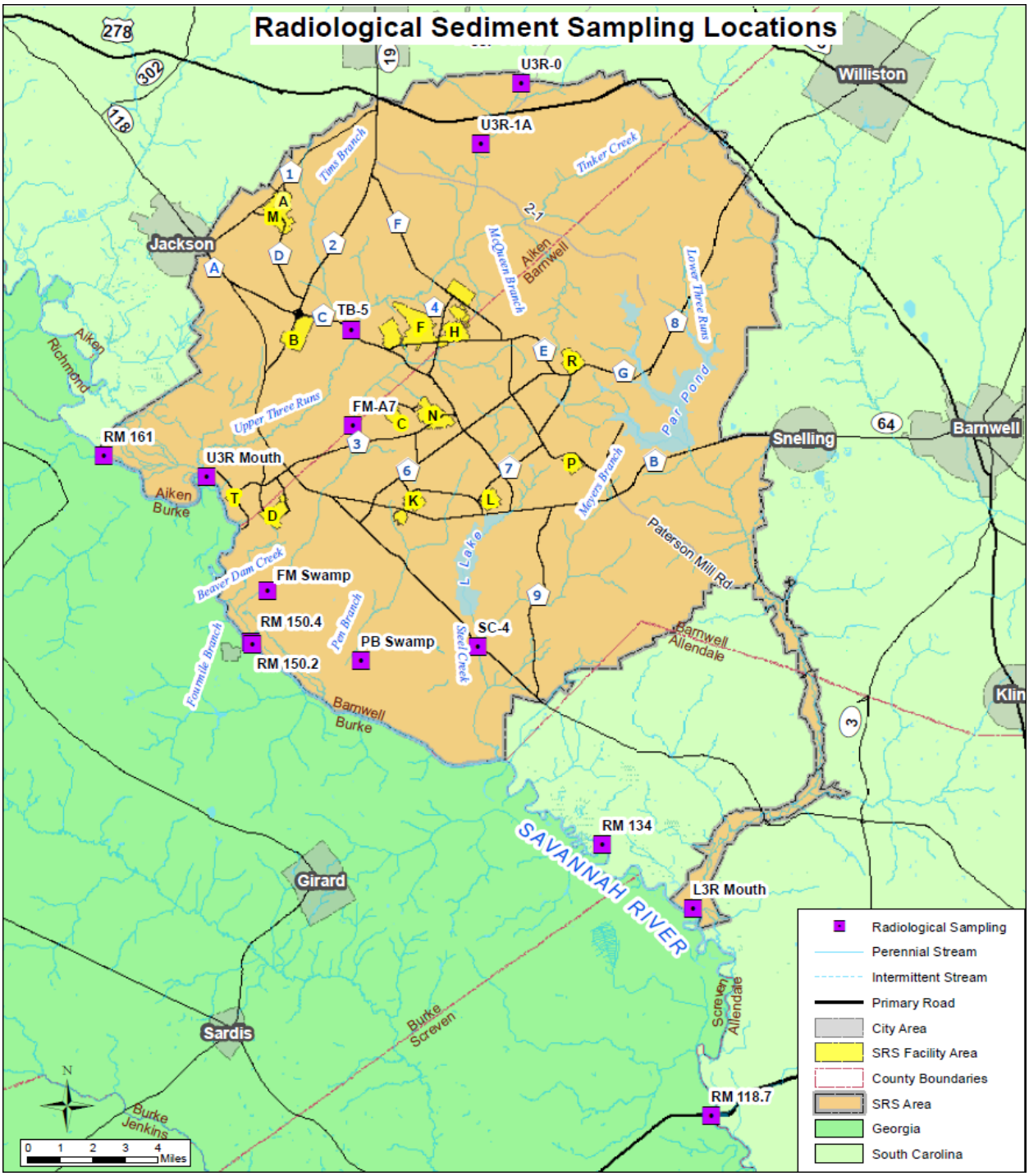

Figure 2-11. SRS Sediment Sampling Locations Assessed in this Report

3.0 Results and Discussion

3.1 SRS Radiological Atmospheric Surveillance

3.1.1 Ambient Air Results

In Appendix A, Table A-1 provides the summary statistics of the measured radionuclide concentrations from 2003 through 2019 for all 14 of the SRS Radiological Environmental Air Surveillance Locations (Figure 2-2). Figure A-1 through Figure A-30 provide graphs that compare the mean concentrations for each measured radionuclide at the BGN, East Talatha, and Hwy 301 sampling locations. The EBL annual representative MDCs are also shown on these graphs.

BGN is the onsite sampling location that is closest to the GSA. Based on an SRS 5-year average meteorological dataset, the East Talatha Site perimeter air sampling location is modeled to have the highest annual average air concentrations. Therefore, it is the established location for the SRS air pathway offsite Representative Person, which is the scenario used for showing compliance with DOE Order 458.1 dose limits (Stagich, Jannik, and Dixon, 2020). The Hwy 301 Bridge air sampling location is assumed to be relatively un-impacted by SRS operations because it is in the SSE direction from the GSA, which (as shown in Figure 3-1) is the least prevalent wind direction based on the current 5-year (2014-2018) meteorological dataset for H-Area (Bell, 2020).

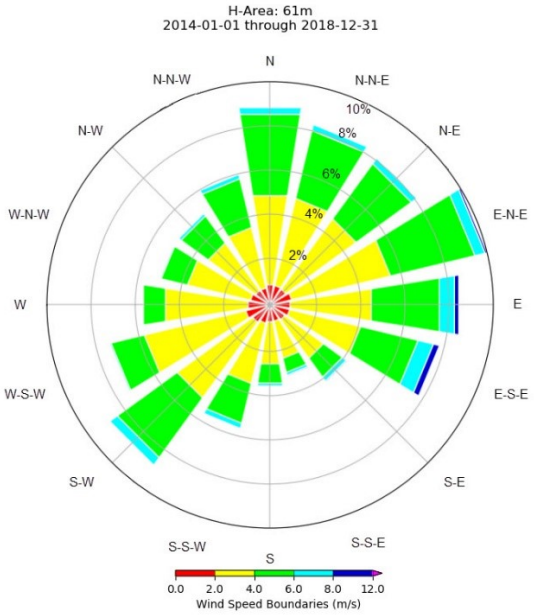

Figure 3-1. 2014-2018 Wind Rose for H-Area (Direction is toward which the wind blows)

3.1.2 Ambient Air Discussion

Radiological atmospheric releases at SRS have reduced dramatically since the early years of operations and have remained low for the past 30-years, mainly because of the shutdown of all site reactors in the 1980's. As an example, Figure 3-2 shows the history of cesium-137 atmospheric releases from SRS, with most of the releases occurring in the first 20-years. The other radionuclides assessed in this report, in general, follow a similar pattern to cesium-137 (Jannik and Hartman, 2016). A total of about 3.84 curies (142 gigabecquerels) of cesium-137 have been released from SRS since 1954, but only about 0.34 curies (12.6 gigabecquerels) have been released since 1990. The relatively large release in 1987 was from an evaporator failure in the High-Level Waste facility in H-Area (Carlton et al., 1992).

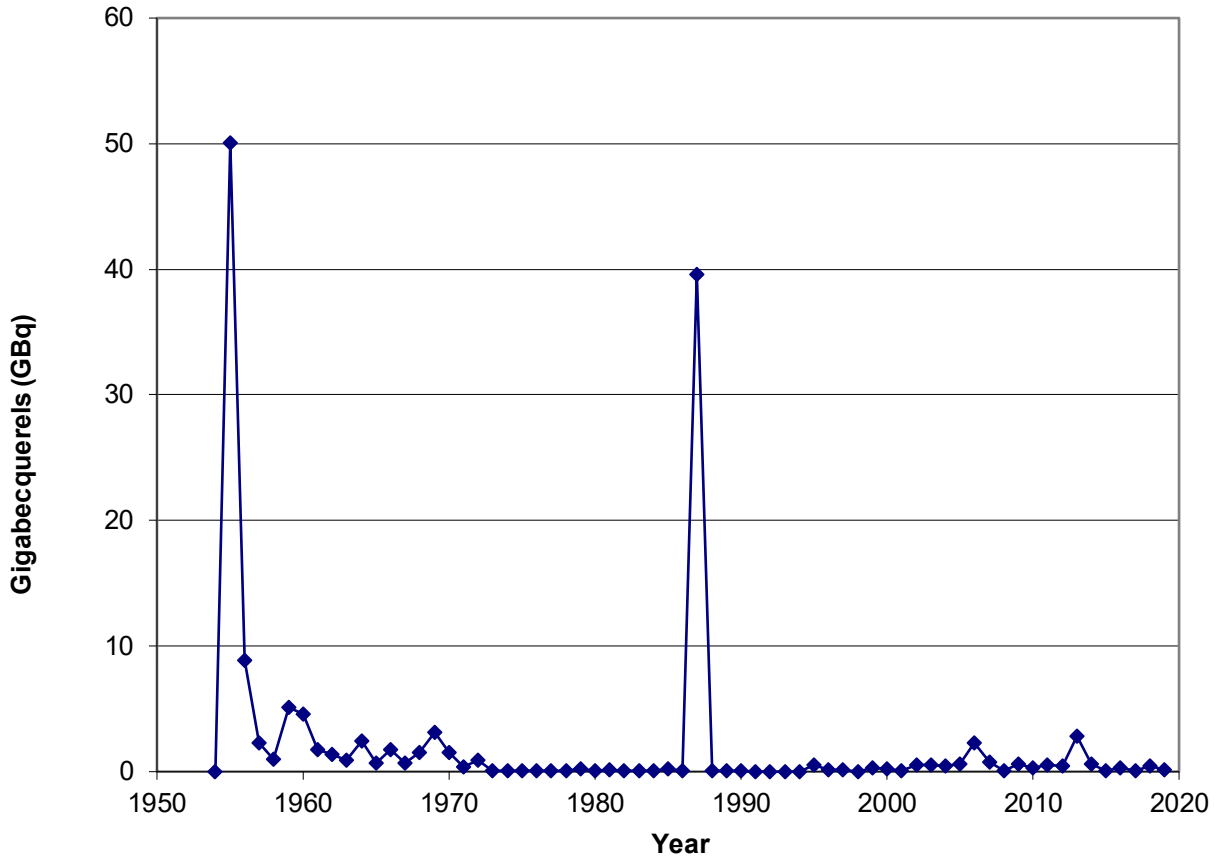

Figure 3-2. Total SRS Atmospheric Releases of Cs-137 (1954-2019).

Because of the relatively low levels of releases from SRS since 1990 and because there is no strongly prevalent wind direction at SRS (Figure 3-1), there are only minor differences in the mean concentrations of radionuclides in the ambient air measured at the 14 air surveillance sampling locations. In Appendix A, Table A-1 provides the summary statistics for the measured radionuclides in air at each sampling location from 2003 through 2019. Most of the data, with the exception of natural uranium, are below the representative MDC values. As shown in Table A-1, the mean concentrations for each radionuclide at each sampling location are similar. However, due to its proximity to the GSA, maximum values at the onsite BGN sampling location are generally higher than the Site perimeter and offsite locations. The annual trending charts (by radionuclide) for the BGN, East Talatha, and Hwy 301 sampling locations are provided in Appendix A Figure A-1 through Figure A-30 and they graphically show the same comparison.

Due to increased actinide emissions in F-Area since late 2016, actinides have been analyzed for the BGN sampling location more frequently instead of the standard annual actinide analysis. Some correlations between actinide releases from F-Area and the measured concentrations at BGN have been observed during this time (SRNS, 2018 and Rivera-Giboyeaux, 2018).

3.2 SRS Radiological Surface Water Surveillance

3.2.1 Surface Water Results

In Appendix B, Table B-1 provides the summary statistics of the measured radionuclide concentrations from 2003 through 2019 for the 13 surface water sampling locations (shown in Table 2-3) that were assessed in this report. Appendix B Figure B-1 through Figure B-57 provide graphs that compare the mean concentrations for each measured radionuclide at the RM-160/161 (River control), RM-118.8 (River indicator), U3R-0/1A (onsite stream control), FM-A7 (onsite indicator closest to GSA), and the FM-6 (onsite indicator) sampling locations (Figure 2-6). The EBL annual representative MDCs are also shown on these graphs.

An important factor in year to year differences in surveillance surface water concentrations is the annual stream/river flow rates, which are directly related to the amount of rainfall in the SRS vicinity. EBL personnel measure flow at (or near) each onsite stream sampling location. SRS determines the Savannah River annual average flow rates using the recorded water elevation at U.S. Geological Survey (USGS) gauging station #02197500, near RM 118.8. Figure 3-3 shows that the average river flow rate from 1954 through 2019 is about 9,900 cubic feet per second (cfs). However, recently, there has been a downward trend in these data, with an average measured flow rate of 8,353 cfs during the past 10 years.

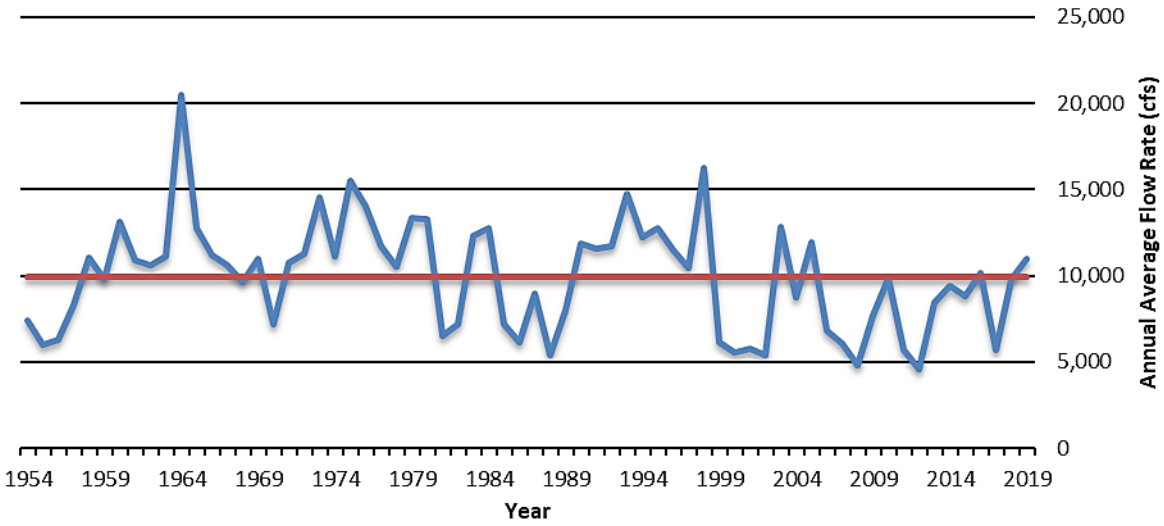

Figure 3-3. Savannah River Annual Average Flow Rates at River Mile 118.8.

(Red line shows the overall average of 9,900 cfs)

3.2.2 Surface Water Discussion

Similar to SRS atmospheric releases, radiological aqueous releases at the Site have reduced dramatically since the early years of operations and have remained low for the past 40-years, mainly due to improvements in operations and because of the shutdown of all site reactors in the 1980's. As an example, Figure 3-4 shows the history of cesium-137 aqueous releases from SRS, with most of the releases occurring in the first 20-years. The other radionuclides assessed in this report, in general, follow a similar pattern to cesium-137 (Jannik and Hartman, 2016). A total of about 610 curies (22,600 gigabecquerels) of cesium-137 have been released from SRS into site surface waters since 1954, but only about 0.37 curies (13.8 gigabecquerels) have been released since 1990. Most of the high releases during the 1960's were caused by failed fuel rods in the reactor areas (Carlton et al., 1992).

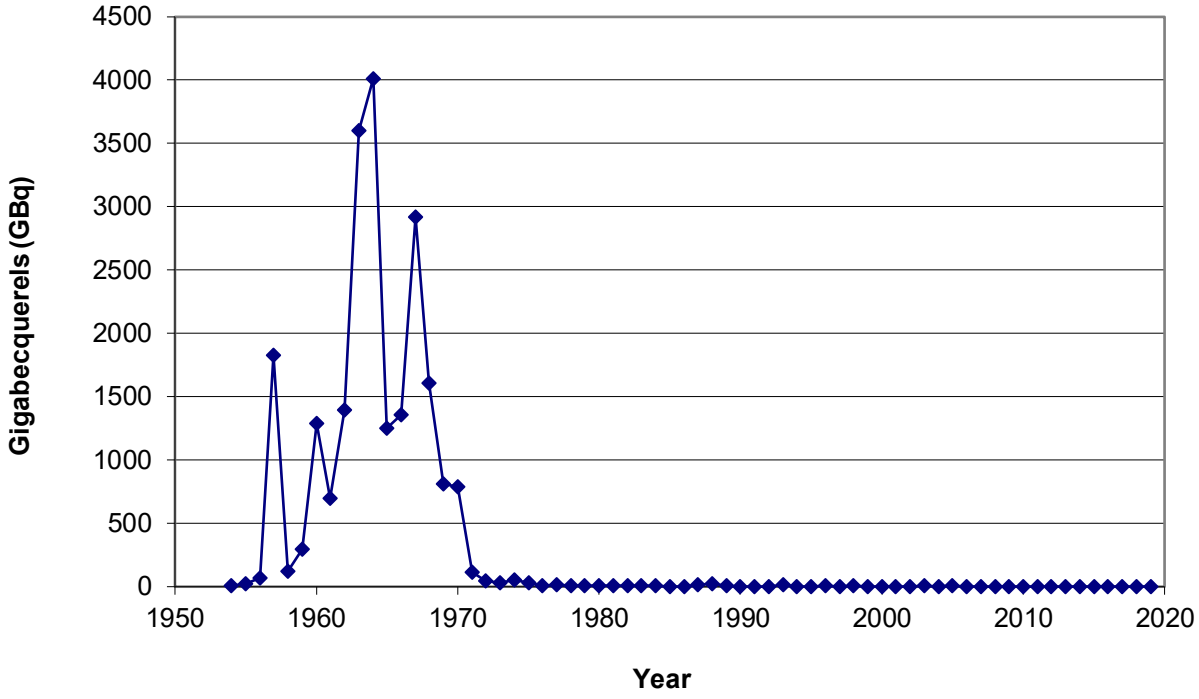

Figure 3-4. Total SRS Aqueous Releases of Cs-137 (1954-2019).

In Appendix B, Table B-1 provides the summary statistics for the measured radionuclides in water at each of the 13 surface water sampling locations from 2003 through 2019. Most of these data, with the exception of natural uranium, are below the representative MDC values for most locations, except for the onsite indicator sampling locations FM-A7 and FM-6, which show a higher number of measurements above the MDC for actinides, strontium-89/90, technetium-99, and iodine-129. As shown in Table B-1, because of their proximity to the GSA, the mean and maximum values at the FM-A7 and FM-6 locations are higher than the other 11 assessed surface water locations.

The annual trending charts (by radionuclide) for the RM-160/161 (River control), RM-118.8 (River indicator), U3R-0/1A (onsite stream control), FM-A7 (onsite indicator closest to GSA), and the FM-6 (onsite indicator) sampling locations are provided in Appendix B, Figure B-1 through Figure B-57 and they graphically show the same comparison. It should be noted that several of the 2003 and 2004 uranium measurements appear to be outliers with very high associated sigma values that greatly affected the mean and overall sigma values. Examples of these datapoints are shown in Appendix B, Figures B-23, -24, -28, -29, -33, and -34. Though suspect, these values were left in the datasets.

3.3 SRS Radiological Soil Surveillance

3.3.1 Soil Results

In Appendix C, Table C-1 provides the summary statistics of the measured radionuclide concentrations from 2003 through 2019 for all 18 of the SRS Radiological Environmental Soil Surveillance Locations (Figure 2-8). Figure C-1 through Figure C-30 provide graphs that compare the mean concentrations for each measured radionuclide at the BGN, East Talatha, and Hwy 301 sampling locations. These are the same onsite indicator, site perimeter, and offsite control locations used for the ambient air surveillance assessment. The EBL annual representative MDCs are also shown on these graphs.

3.3.2 Soil Discussion

Due to relatively wetter weather conditions in the eastern US, the wet deposition of fairly long-lived radionuclides was enhanced in this region of the US during the time of above ground nuclear weapons testing. As shown in Figure 3-5, the deposition density of cesius-137 in the southeast region of the US (including the SRS area) ranges between 4,000 and 6,000 Bq/m^2, with some localized areas receiving even higher deposition (CDC/NCI, 2002). Because of anthropogenic activities such as agriculture and suburban and urban developments, much of this cesium has been dispersed and is no longer bioavailable in the environment. However, at SRS, less than 10 percent of the site has been impacted by industrial activities and the rest has remained as managed forested areas by the US Forest Service since the early 1950's. Because of this protection, a much larger fraction of the Cs-137 deposited on SRS during the 1950's and early 1960's remains bioavailable to higher trophic level animals, such as deer on the site. This phenomenon also is observed at other large protected land areas such as military bases and National/State Forests (Gaines and Novak, 2011).

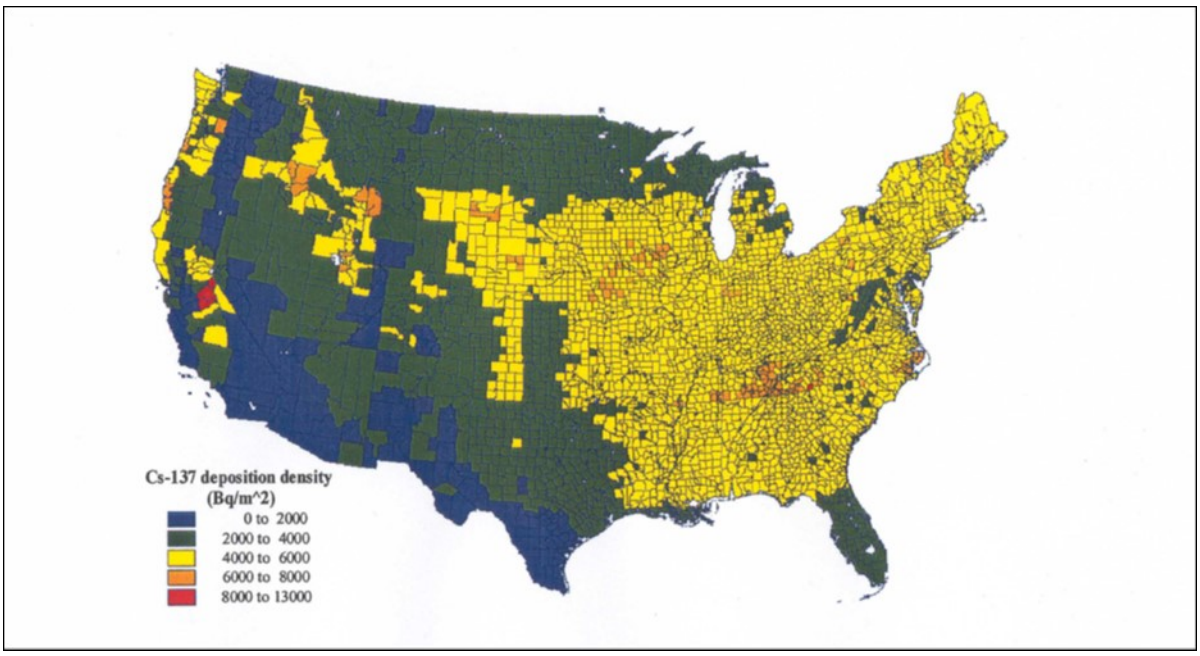

Figure 3-5. Cesium-137 Deposition Density (Bq/m^2) in the United States.

In Appendix C, Table C-1 provides the summary statistics for the annual measurements of radionuclides in soil at each of the 18 soil sampling locations from 2003 through 2019. Most of these data, with the exceptions of strontium-89/90, neptunium-237, and curium-244, are above the representative MDC values for most locations. In general, onsite mean cesium concentrations are higher than the offsite locations. An exception to this is the BG (643-26E2), that may have been impacted by earlier Burial Ground operations or by storm water runoff. Natural uranium concentrations measured in the offsite locations are higher than the SRS perimeter locations. This may be due differing soil types or to the use of high phosphate fertilizers in the areas of the offsite soil sampling locations (Evans et al., 1992).

The annual trending charts (by radionuclide) for the BGN, East Talatha, and Hwy 301 sampling locations are provided in Appendix C, Figure C-1 through Figure C-30, and they graphically show the same comparison.

3.4 SRS Radiological Sediment Surveillance

3.4.1 Sediment Results

In Appendix D, Table D-1 provides the summary statistics of the measured radionuclide concentrations from 2003 through 2019 for the 13 long-term sediment sampling locations shown in Table 2-4. Figure D-1 through Figure D-50 provide graphs that compare the mean concentrations for each measured radionuclide at the RM-161 (river control), RM-118.7 (river indicator), U3R-1A and U3R-0 (stream control), TB-5 (onsite stream indicator), and U3R Mouth (onsite indicator) sediment sampling locations (Figure 2-8). The EBL annual representative MDCs are also shown on these graphs.

3.4.2 Sediment Discussion

As discussed in the Surface Water 3.2, aqueous releases of cesium-137 from the SRS Reactors to site streams were high during the 1960's. Shown in the gamma overflight map of SRS (Figure 3-6), much of this cesium was retained in the clayey soils/sediments of the L3R, SC, PB, and FM site streams. It has been shown that the "effective" half-life (which include both physical decay and environmental dispersion) of cesium-137 in SRS floodplain soil/sediment is about 17 years (Paller, Jannik, and Baker, 2014). So, after 3 effective half-lives since the 1960's releases, about $1/8^{th}$ of the original cesium remains in the stream beds and swamps.

The Fuel Fabrication Facility (M-Area) at SRS made uranium fuel and target assemblies between 1965 and 1988 for use in the production of special nuclear materials. It was estimated that 43.5 metric tonnes of uranium was released into Tims Branch, which is a tributary of U3R (Evans, et al., 1992). Figure 3-7 shows the annual releases of uranium from M-Area. It has been shown that about 83 percent (36.2 metric tonnes) still remains in the wetland areas of Tims Branch (Kaplan et al., 2020).

In Appendix D, Table D-1 provides the summary statistics for the annual measurements of radionuclides in sediment, at each of the 13 sampling locations assessed in this report, from 2003 through 2019. Most of the onsite data, with the exceptions of strontium-89/90, neptunium-237, and curium-244, are above the representative MDC values. However, most of the offsite Savannah River locations had fewer transuranic measurements above the representative MDCs.

In general, because of the legacy contamination in the SRS site streams, onsite mean cesium concentrations are much higher than the offsite locations. Also, in general, the offsite sediment sampling locations on the Georgia side of the Savannah River (RM-150.4, Rm-150.2, and RM-118.7) have higher natural uranium concentrations than the onsite stream locations. Exceptions to these generalities are the onsite U3R locations (U3R-1A (stream control), TB-5 (onsite indicator below M-Area), and U3R Mouth). As noted above, U3R was relatively unimpacted by Reactor and GSA operations, but was impacted by uranium operations in M-Area. As discussed in the Soil Assessment Section 3.3, the higher natural uranium in the offsite Georgia sediment sampling locations and at the U3R-1A stream control location may be due to differing soil types or to the use of high phosphate fertilizers in the areas of the offsite sediment sampling locations (Evans et al., 1992).

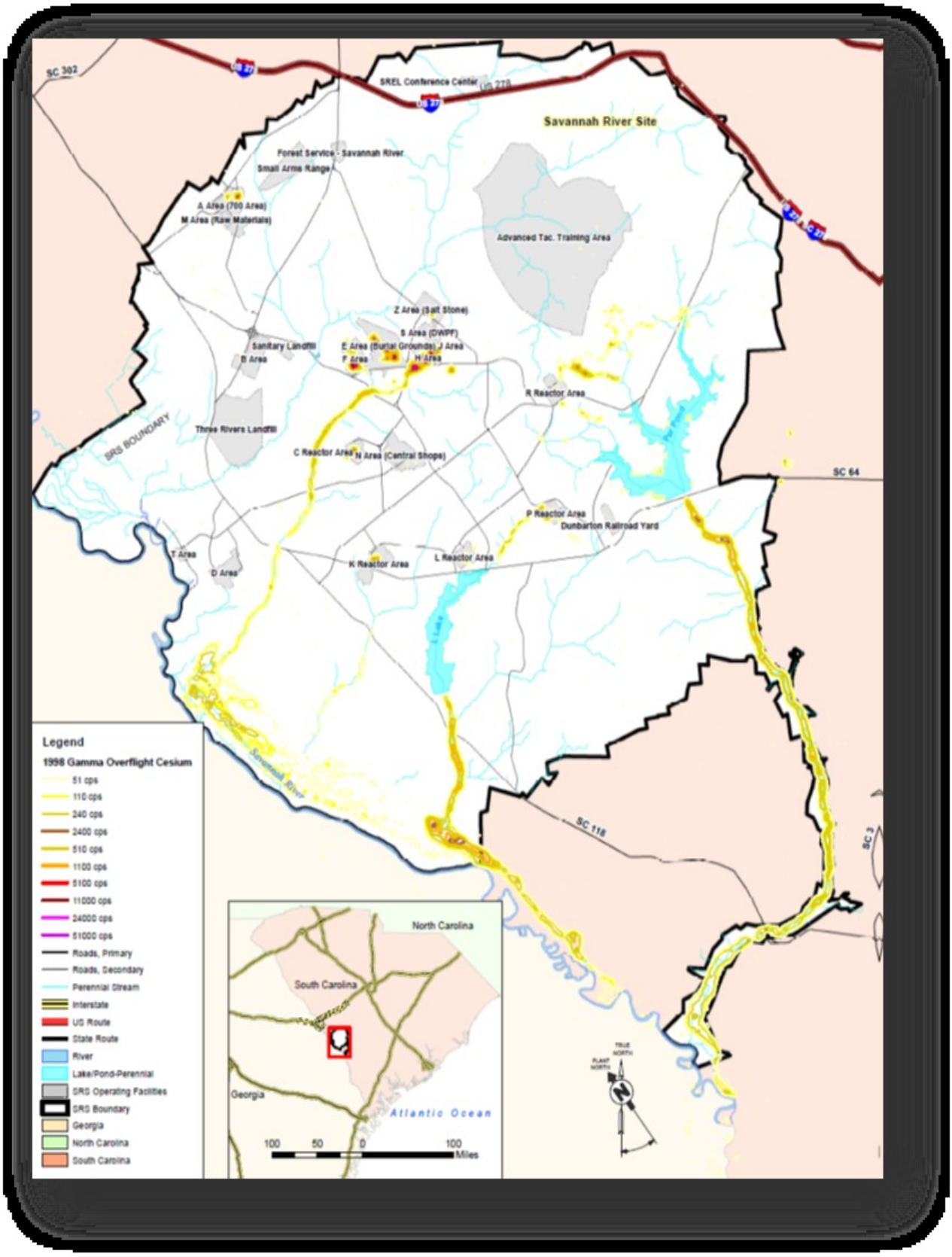

Figure 3-6. SRS Gamma Overflight Cesium Data for 1998.

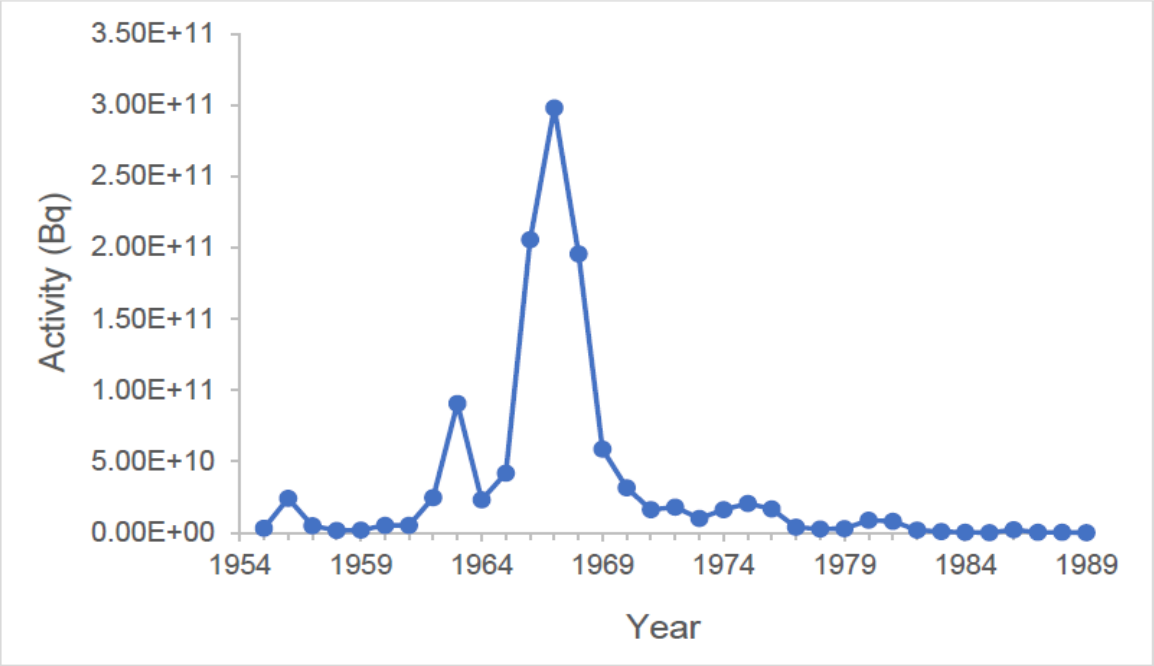

Figure 3-7. Annual Release of Uranium from M-Area.

3.5 Site Selection Guidance Rubrics

Table 3-1 through Table 3-4 provide a guidance rubric for tailored selection of the SRS sites given various WAES scenarios. Each table represents the SRS sampling sites for a given environmental media to include ambient air (Table 3-1), terrestrial soil (Table 3-2), stream and river surface water (Table 3-3), and stream and river sediment (Table 3-4). Dimension one indicates sampling locations categorized by proximity to nuclear activities as offsite (-), site perimeter (0), and onsite (+). Dimension two indicates predominant influence type as natural (-), anthropogenic (0), and nuclear (+).

As an example, a WAES table top exercise (TTX) scenario requirement for utilization of only SRS data at a 25 mile radius offsite to represent "ambient natural background radionuclides with a non-nuclear anthropogenic influence" would choose to include sites with dimension one listed as a (-) and dimension two listed as a (0) for each of the environmental matrices. Another WAES TTX requirement might include utilization of only SRS data to represent specific site perimeter data to represent "ambient natural background radionuclides with de minimus non-nuclear and nuclear anthropogenic influences" would choose to include sites with dimension one listed as a (0) and dimension two listed as a (-) for each of the environmental matrices.

Table 3-1. Site Selection Guidance Rubric for Ambient Air

Location	Dimension 1	Dimension 2
Burial Ground North	+	+
Allendale Gate	0	-
Barnwell Gate	0	0
D-Area	0	+
Darkhorse	0	0
East Talatha	0	+
Green Pond	0	+
Hwy 21/167	0	-
Jackson	0	+
Patterson Mill Road	0	-
Talatha Gate	0	0
Aiken Airport	-	0
Augusta Lock & Dam	-	0
HWY 301 Bridge	-	-

Table 3-2. Site Selection Guidance Rubric for Terrestrial Soil

Location	Dimension 1	Dimension 2
Burial Ground North	+	+
BG (643-26E2)	+	+
F-Area	+	+
H-Area	+	+
Z-Area	+	+
Allendale Gate	0	-
Barnwell Gate	0	0
D-Area	0	+
Darkhorse	0	0
East Talatha	0	+
Green Pond	0	+
Hwy 21/167	0	-
Jackson	0	+
Patterson Mill Road	0	-
Talatha Gate	0	0
Aiken Airport	-	0
Augusta Lock & Dam	-	0
HWY 301 Bridge	-	-

Table 3-3. Site Selection Guidance Rubric for Stream and River Surface Water

Location	Dimension 1	Dimension 2
Lower Three Runs (L3R-3)	+	+
Steel Creek (SC-4)	+	+
Pen Branch (PB-3)	+	+
Fourmile Branch (FM-A7)	+	+
Fourmile Branch (FM-6)	+	+
Upper Three Runs (U3R-4)	+	+
Upper Three Runs (U3R-0)	+	-
Upper Three Runs (U3R-1A)	+	-
RM-160/161 (control)	0	0
RM 150.4 (above Vogtle)	0	0
RM 150 (below Vogtle)	0	+
RM 141.5 (near Steel Creek)	-	+
RM 118.8 (HWY 301 Bridge)	-	+

Table 3-4. Site Selection Guidance Rubric for Stream and River Sediment

Location	Dimension 1	Dimension 2
Lower Three Runs (L3R Mouth)	0	+
Steel Creek (SC-4)	+	+
Pen Branch (PB@Swamp)	+	+
Fourmile Branch (FM-A-7)	+	+
Fourmile Branch (FM@Swamp)	+	+
Upper Three Runs (TB-5)	+	+
Upper Three Runs (U3R Mouth)	+	+
Upper Three Runs (U3R-1A)	+	-
RM-160/161 (control)	0	0
RM 150.4 (above Vogtle)	0	0
RM 150.2 (below Vogtle & FM Mouth)	0	+
RM 134 (below SR Swamp)	-	+
RM 118.8 (HWY 301 Bridge)	-	-

4.0 Conclusions

This report presents a history and assessment of SRS radiological environmental surveillance data for ambient air, terrestrial soil, stream and river surface water, and stream and river sediment. Trending and summary statistics (mean, minimum, and maximum) of available data from 2003 through 2019 are documented and assessed for select 1) fission products (cesium-137, strontrium-89/90, technetium-99, and iodine-129), 2) activation products (carbon-14), and 3) actinides (uranium-234,-235,-238, neptunium-237, plutonium-238,-239, americium-241, and curium-244). Also provided are site selection guidance rubrics for tailored selection of the SRS sampling sites given various WAES scenarios.

In general, due to legacy contamination, onsite concentrations of measured radionuclides are higher than they are at the control and other offsite sampling locations. However, natural uranium concentrations in offsite soil and sediment are higher than at most of the onsite sampling locations (except those affected by SRS M-Area operations). The higher natural uranium concentrations in the offsite soil and sediment samples may be due differing soil types or to the use of high phosphate fertilizers in the areas of the offsite sampling locations.

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Appendix A. Ambient Air

Table A-1. Environmental Air Surveillance Summary (2003-2019)

Location	Nuclide	Sample Number (>MDC)	Mean Concentration (pCi/m^3)	Overall Sigma (pCi/m^3)	Minimum Concentration (pCi/m^3)	Maximum Concentration (pCi/m^3)
Onsite						
Burial Ground North	Cs-137	474 (1)	1.80E-04	9.24E-05	-7.94E-03	9.64E-03
	Sr-89/90	78 (5)	1.63E-04	3.77E-05	-1.39E-04	2.67E-03
	I-129	30 (2)	5.75E-04	2.98E-04	-1.47E-03	6.40E-03
(2011-Fukushima)	I-131	12 (3)	2.90E-02	1.25E-02	-1.77E-02	1.17E-01
	U-234	73 (65)	2.25E-05	1.88E-06	3.69E-06	9.97E-05
	U-235	73 (3)	1.37E-06	2.36E-07	-4.40E-06	7.74E-06
	U-238	73 (64)	1.97E-05	2.16E-06	-2.23E-05	1.39E-04
	Pu-238	72 (7)	4.89E-06	3.92E-06	-3.17E-05	2.79E-04
	Pu-239	72 (9)	5.90E-06	3.03E-06	-1.30E-05	1.77E-04
	Am-241	71 (28)	5.28E-06	5.44E-07	-8.93E-07	2.97E-05
	Cm-244	71 (0)	2.68E-07	2.77E-07	-6.05E-06	1.57E-05
Site Perimeter						
Allendale Gate	Cs-137	472 (0)	1.23E-04	8.24E-05	-8.31E-03	7.90E-03
	Sr-89/90	19 (1)	1.05E-04	5.72E-05	-1.97E-04	9.16E-04
	I-129	29 (2)	4.43E-04	1.91E-04	-1.15E-03	3.84E-03
(2011-Fukushima)	I-131	2 (0)	4.00E-03	3.02E-03	9.73E-04	7.02E-03
	U-234	16 (13)	1.52E-05	1.53E-06	5.32E-06	2.66E-05
	U-235	16 (1)	2.44E-06	1.27E-06	-2.53E-06	1.97E-05
	U-238	16 (11)	1.10E-05	2.24E-06	-7.96E-06	2.74E-05
	Pu-238	17 (1)	4.83E-07	7.10E-07	-3.85E-06	8.22E-06
	Pu-239	17 (0)	4.73E-07	3.25E-07	-3.38E-06	2.52E-06
	Am-241	17 (7)	5.32E-06	7.38E-07	3.45E-07	1.26E-05
	Cm-244	17 (1)	1.25E-06	7.10E-07	-1.71E-07	1.20E-05
Barnwell Gate	Cs-137	473 (0)	1.52E-04	8.72E-05	-8.11E-03	8.25E-03
	Sr-89/90	20 (0)	8.44E-05	3.52E-05	-9.46E-05	4.43E-04
	I-129	30 (1)	5.64E-04	1.36E-04	-1.10E-03	2.68E-03
(2011-Fukushima)	I-131	4 (1)	2.31E-02	1.44E-02	-5.28E-04	6.37E-02
	U-234	17 (13)	1.72E-05	1.87E-06	5.92E-06	3.65E-05
*(removed 1 outlier)	U-235	17 (0)	1.48E-06	5.15E-07	-1.24E-06	7.75E-06
	U-238	17 (11)	1.11E-05	2.77E-06	-2.29E-05	2.84E-05
	Pu-238	18 (2)	9.80E-07	8.02E-07	-4.12E-06	1.14E-05
	Pu-239	18 (1)	2.55E-06	1.55E-06	-3.95E-06	2.67E-05
	Am-241	18 (5)	6.12E-06	1.87E-06	-6.54E-06	2.97E-05
	Cm-244	18 (1)	5.03E-07	2.90E-07	-8.03E-07	4.68E-06
D-Area	Cs-137	474 (1)	2.06E-04	9.31E-05	-6.87E-03	1.34E-02
	Sr-89/90	26 (0)	5.77E-05	2.45E-05	-2.11E-04	3.38E-04
	I-129	30 (1)	7.31E-05	1.31E-04	-1.50E-03	2.78E-03
(2011-Fukushima)	I-131	4 (1)	2.00E-02	1.85E-02	-2.01E-02	6.93E-02
	U-234	23 (21)	2.60E-05	4.77E-06	3.20E-06	1.01E-04
	U-235	23 (3)	2.56E-06	5.48E-07	-1.10E-06	7.34E-06
	U-238	23 (19)	2.46E-05	5.56E-06	-3.13E-06	1.07E-04
	Pu-238	24 (1)	-1.16E-07	5.60E-07	-6.28E-06	9.25E-06
	Pu-239	24 (0)	6.82E-07	2.88E-07	-1.69E-06	3.54E-06
	Am-241	24 (6)	3.80E-06	9.04E-07	-1.37E-06	2.12E-05
	Cm-244	24 (1)	7.54E-07	3.31E-07	-1.27E-06	4.70E-06

Location	Nuclide	Sample Number (>MDC)	Mean Concentration (pCi/m^3)	Overall Sigma (pCi/m^3)	Minimum Concentration (pCi/m^3)	Maximum Concentration (pCi/m^3)
Darkhorse	Cs-137	473 (0)	1.96E-05	7.82E-05	-7.35E-03	5.96E-03
	Sr-89/90	24 (1)	1.15E-04	6.20E-05	-1.54E-04	1.36E-03
	I-129	31 (2)	4.29E-04	2.88E-04	-1.35E-03	7.39E-03
(2011-Fukushima)	I-131	6 (3)	3.85E-02	1.73E-02	-4.49E-05	1.10E-01
	U-234	20 (13)	1.59E-05	1.80E-06	4.29E-06	3.98E-05
	U-235	20 (0)	1.53E-06	5.14E-07	-1.94E-06	6.13E-06
	U-238	20 (13)	1.23E-05	1.52E-06	1.02E-06	2.43E-05
	Pu-238	22 (0)	-1.58E-08	6.42E-07	-1.08E-05	4.37E-06
	Pu-239	22 (1)	1.58E-06	8.92E-07	-2.33E-06	1.86E-05
	Am-241	22 (9)	3.85E-06	1.05E-06	-6.82E-06	1.63E-05
	Cm-244	22 (0)	5.34E-07	7.75E-07	-1.00E-05	1.02E-05
East Talatha	Cs-137	469 (1)	2.52E-04	8.67E-05	-8.02E-03	8.35E-03
	Sr-89/90	20 (2)	6.49E-05	3.72E-05	-2.04E-04	4.07E-04
	I-129	30 (0)	7.76E-05	1.34E-04	-1.52E-03	2.00E-03
(2011-Fukushima)	I-131	4 (2)	2.56E-02	1.92E-02	-1.36E-02	7.61E-02
	U-234	18 (10)	1.51E-05	1.69E-06	4.49E-06	2.85E-05
	U-235	18 (0)	2.23E-06	7.48E-07	-3.14E-06	8.17E-06
	U-238	18 (11)	1.40E-05	2.91E-06	-1.47E-05	3.18E-05
	Pu-238	21 (0)	8.12E-07	7.10E-07	-7.08E-06	1.05E-05
	Pu-239	21 (0)	1.11E-06	4.66E-07	-3.53E-06	6.01E-06
	Am-241	20 (3)	2.01E-04	1.97E-04	-2.81E-06	3.95E-03
	Cm-244	19 (1)	6.35E-07	4.37E-07	-3.55E-06	5.21E-06
Green Pond	Cs-137	473 (0)	3.79E-04	8.07E-05	-6.86E-03	6.79E-03
	Sr-89/90	23 (0)	-1.57E-02	1.58E-02	-3.63E-01	3.98E-04
	I-129	31 (1)	3.75E-04	1.83E-04	-2.20E-03	3.29E-03
(2011-Fukushima)	I-131	6 (3)	4.09E-02	1.48E-02	1.44E-02	1.07E-01
	U-234	18 (13)	1.98E-05	2.66E-06	-7.78E-06	3.46E-05
	U-235	18 (0)	1.54E-06	6.60E-07	-3.75E-06	1.04E-05
	U-238	18 (15)	1.96E-05	2.77E-06	-2.82E-06	3.51E-05
	Pu-238	21 (0)	-2.03E-07	7.93E-07	-1.09E-05	5.31E-06
	Pu-239	21 (0)	1.36E-07	6.41E-07	-1.06E-05	4.18E-06
	Am-241	19 (3)	6.96E-06	2.57E-06	-2.87E-06	4.73E-05
	Cm-244	19 (1)	6.38E-07	4.18E-07	-1.64E-06	5.03E-06
Hwy 21/167	Cs-137	469(2)	3.29E-04	9.39E-05	-7.52E-03	1.67E-02
	Sr-89/90	21 (1)	6.36E-05	4.24E-05	-3.58E-04	5.51E-04
	I-129	30 (3)	3.67E-04	1.77E-04	-9.58E-04	3.12E-03
(2011-Fukushima)	I-131	4 (2)	2.48E-02	1.39E-02	-3.59E-04	6.40E-02
	U-234	18 (14)	1.75E-05	3.08E-06	-2.61E-06	5.44E-05
	U-235	18 (0)	2.81E-06	5.85E-07	-1.33E-06	7.80E-06
	U-238	18 (12)	1.60E-05	2.04E-06	-2.69E-08	2.78E-05
	Pu-238	19 (0)	-3.17E-07	7.38E-07	-8.36E-06	4.83E-06
	Pu-239	19 (0)	6.38E-07	3.81E-07	-3.00E-06	3.37E-06
	Am-241	19 (4)	1.51E-06	1.13E-06	-9.98E-06	7.72E-06
	Cm-244	19 (0)	4.97E-07	5.23E-07	-3.50E-06	6.87E-06

Location	Nuclide	Sample Number (>MDC)	Mean Concentration (pCi/m^3)	Overall Sigma (pCi/m^3)	Minimum Concentration (pCi/m^3)	Maximum Concentration (pCi/m^3)
Jackson	Cs-137	473 (1)	-3.23E-05	7.71E-05	-6.90E-03	4.70E-03
	Sr-89/90	25 (0)	6.76E-05	2.10E-05	-2.14E-04	3.19E-04
	I-129	29 (4)	1.09E-04	2.59E-04	-5.31E-03	2.85E-03
(2011-Fukushima)	I-131	4 (2)	3.06E-02	1.44E-02	-9.00E-03	5.95E-02
	U-234	23 (18)	1.96E-05	2.16E-06	1.17E-06	4.52E-05
	U-235	23 (0)	1.86E-06	5.01E-07	-1.10E-06	6.30E-06
	U-238	23 (18)	1.54E-05	2.71E-06	-1.17E-05	3.98E-05
	Pu-238	24 (0)	1.04E-06	5.05E-07	-4.16E-06	8.87E-06
	Pu-239	24 (0)	1.20E-06	5.21E-07	-5.47E-06	8.78E-06
	Am-241	24 (5)	2.78E-06	5.79E-07	-6.87E-06	7.96E-06
	Cm-244	24 (1)	6.45E-07	4.01E-07	-1.81E-06	8.39E-06
Patterson Mill Road	Cs-137	471 (1)	4.08E-05	9.74E-05	-6.31E-03	2.41E-02
	Sr-89/90	22 (1)	1.77E-04	9.93E-05	-4.68E-04	1.85E-03
	I-129	31 (2)	3.52E-04	2.67E-04	-3.06E-03	5.04E-03
(2011-Fukushima)	I-131	7 (2)	3.95E-02	1.66E-02	-4.13E-04	1.27E-01
	U-234	19 (12)	1.43E-05	1.90E-06	-3.29E-07	3.33E-05
	U-235	19 (0)	7.93E-07	6.14E-07	-7.76E-06	4.96E-06
	U-238	19 (12)	1.11E-05	1.97E-06	-6.44E-06	2.90E-05
	Pu-238	20 (3)	1.19E-05	7.40E-06	-5.89E-06	1.34E-04
	Pu-239	20 (2)	5.10E-06	2.81E-06	-3.15E-06	4.61E-05
	Am-241	20 (4)	6.09E-06	2.13E-06	-2.89E-06	4.28E-05
	Cm-244	20 (2)	1.30E-06	1.05E-06	-5.69E-06	1.92E-05
Talatha Gate	Cs-137	472 (1)	1.81E-04	9.23E-05	-7.23E-03	1.18E-02
	Sr-89/90	20 (1)	-1.51E-05	5.91E-05	-7.93E-04	3.79E-04
	I-129	29 (1)	2.78E-04	1.73E-04	-9.85E-04	3.86E-03
(2011-Fukushima)	I-131	4 (2)	3.57E-02	1.90E-02	3.91E-03	8.94E-02
	U-234	18 (14)	2.36E-05	5.32E-06	1.71E-06	1.01E-04
	U-235	18 (1)	2.53E-06	7.96E-07	-2.33E-06	1.19E-05
	U-238	18 (12)	1.94E-05	5.84E-06	-7.53E-06	1.11E-04
	Pu-238	21 (3)	1.90E-06	1.52E-06	-5.36E-06	2.63E-05
	Pu-239	21 (0)	-3.59E-07	7.24E-07	-8.32E-06	5.47E-06
	Am-241	19 (4)	4.09E-06	1.13E-06	-5.55E-06	1.32E-05
	Cm-244	19 (0)	3.30E-07	5.38E-07	-4.38E-06	6.67E-06
25-Mile Radius						
Aiken Airport	Cs-137	483 (0)	1.19E-04	1.03E-04	-3.11E-02	1.27E-02
	Sr-89/90	20 (0)	1.81E-04	6.91E-05	-8.13E-05	1.32E-03
	I-129	30 (1)	1.05E-04	1.43E-04	-1.87E-03	1.81E-03
(2011-Fukushima)	I-131	4 (2)	3.02E-02	1.37E-02	2.23E-03	6.73E-02
	U-234	18 (12)	1.64E-05	2.28E-06	-9.36E-07	3.74E-05
	U-235	18 (0)	1.31E-06	1.08E-06	-6.89E-06	1.19E-05
	U-238	18 (14)	1.75E-05	2.56E-06	-7.03E-06	3.70E-05
	Pu-238	19 (0)	4.57E-07	7.13E-07	-5.66E-06	5.62E-06
	Pu-239	19 (0)	1.60E-06	1.43E-06	-3.12E-06	2.64E-05
	Am-241	19 (8)	7.51E-06	1.49E-06	-3.49E-07	2.28E-05
	Cm-244	19 (1)	2.18E-06	1.98E-06	-4.49E-06	3.63E-05

Location	Nuclide	Sample Number (>MDC)	Mean Concentration (pCi/m^3)	Overall Sigma (pCi/m^3)	Minimum Concentration (pCi/m^3)	Maximum Concentration (pCi/m^3)
Augusta Lock & Dam	Cs-137	473 (0)	1.97E-05	9.24E-05	-1.20E-02	1.08E-02
	Sr-89/90	20 (0)	8.54E-05	5.73E-05	-3.01E-04	9.72E-04
	I-129	30 (1)	2.36E-04	1.54E-04	-1.97E-03	2.43E-03
(2011-Fukushima)	I-131	4 (1)	1.24E-02	2.19E-02	-4.34E-02	6.31E-02
	U-234	18 (11)	1.48E-05	2.86E-06	-9.16E-06	3.99E-05
	U-235	18 (0)	2.55E-06	1.16E-06	-3.61E-06	1.67E-05
	U-238	18 (11)	1.31E-05	2.61E-06	-1.38E-05	3.24E-05
	Pu-238	19 (1)	2.50E-06	1.92E-06	-5.20E-06	3.34E-05
	Pu-239	19 (0)	5.06E-07	1.19E-06	-6.82E-06	1.93E-05
*removed one outlier	Am-241	18 (1)	4.63E-06	1.13E-06	-1.88E-06	1.81E-05
	Cm-244	18 (0)	-6.43E-07	8.24E-07	-1.18E-05	6.17E-06
HWY 301 Bridge	Cs-137	473 (0)	1.75E-04	8.15E-05	-7.25E-03	9.34E-03
(control location)	Sr-89/90	24 (2)	2.00E-04	4.21E-05	-8.10E-05	7.27E-04
	I-129	31 (2)	3.09E-04	2.07E-04	-1.20E-03	4.55E-03
(2011-Fukushima)	I-131	7 (3)	3.35E-02	1.49E-02	3.05E-03	1.10E-01
	U-234	22 (15)	1.76E-05	2.18E-06	3.23E-06	4.59E-05
	U-235	22 (0)	1.98E-06	4.27E-07	-1.11E-06	6.36E-06
	U-238	22 (16)	1.48E-05	2.26E-06	-8.05E-06	3.60E-05
	Pu-238	23 (0)	1.28E-07	7.42E-07	-8.37E-06	8.92E-06
	Pu-239	23 (0)	2.05E-06	6.89E-07	-1.01E-06	1.19E-05
	Am-241	23 (6)	5.09E-06	1.06E-06	-3.79E-06	1.57E-05
	Cm-244	23 (0)	1.70E-07	3.68E-07	-3.73E-06	4.53E-06

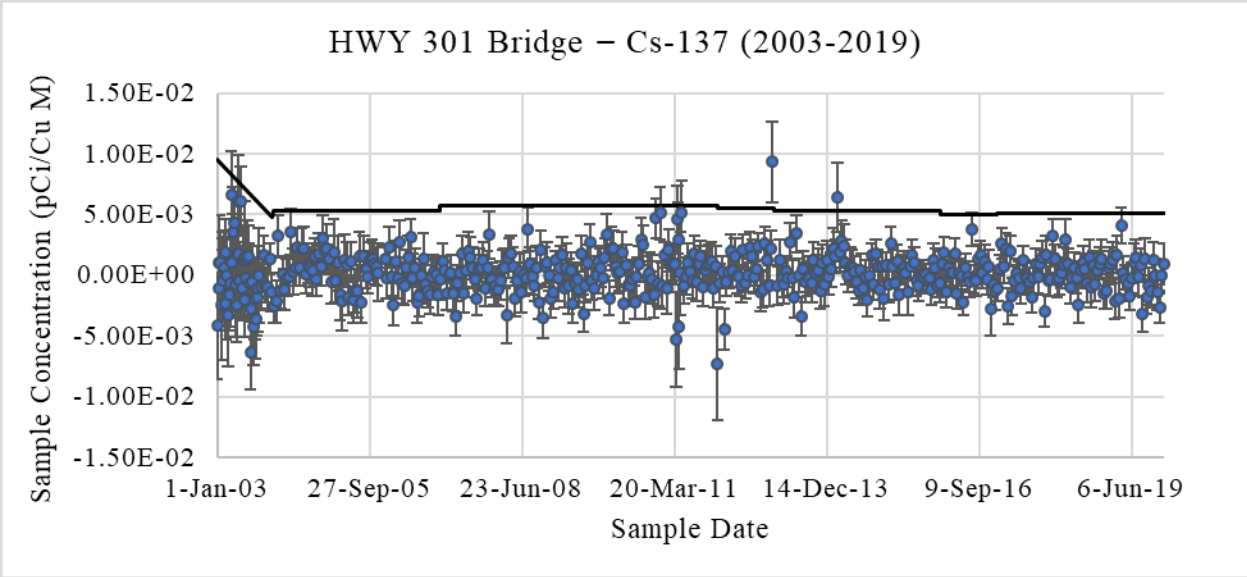

Figure A-1. Twenty-Five Mile Offsite Sampling Location "Hwy 301 Bridge" Cs-137 Air Surveillance 2003-2019. Solid Line indicates MDC.

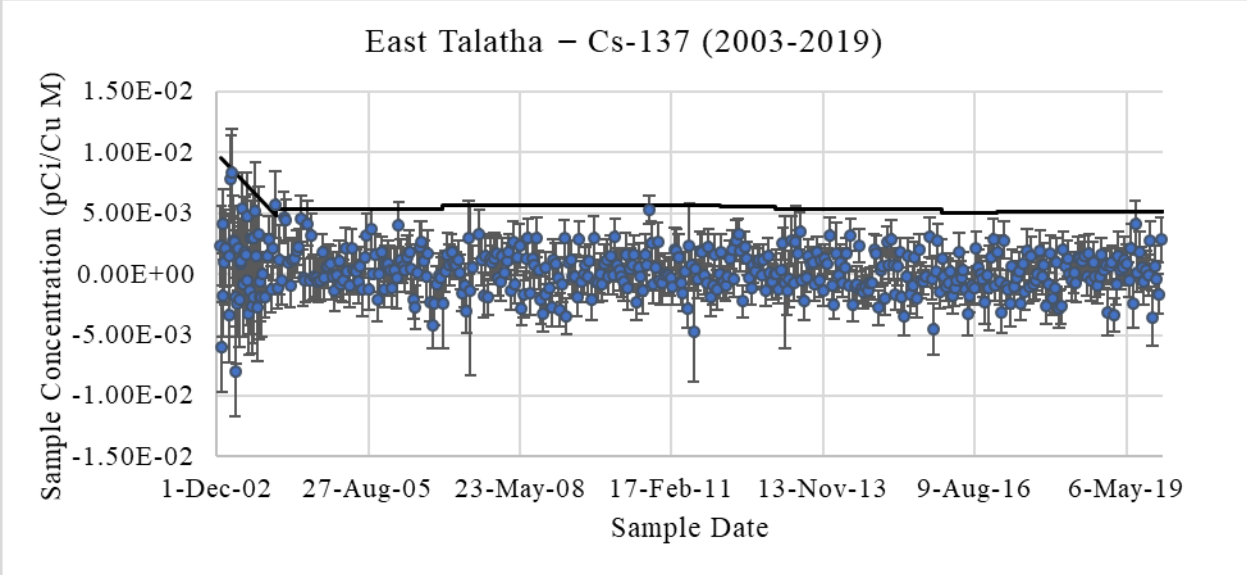

Figure A-2. SRS Perimeter Sampling Location "East Talatha" Cs-137 Air Surveillance 2003-2019. Solid Line indicates MDC.

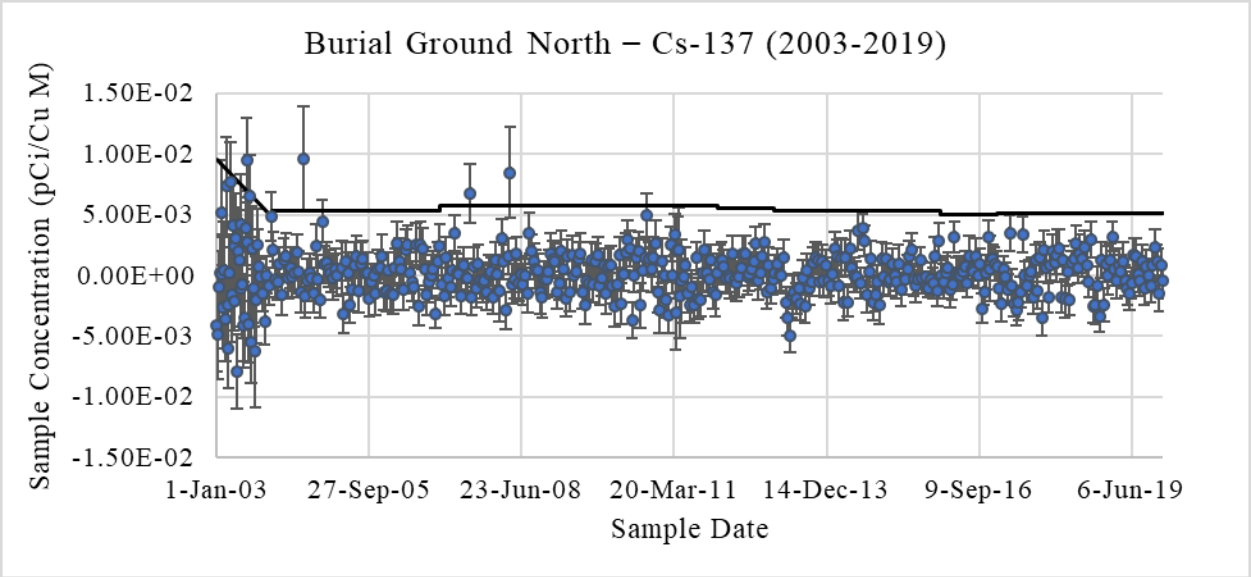

Figure A-3. SRS Onsite Sampling Location "Burial Ground North" Cs-137 Air Surveillance 2003-2019. Solid Line indicates MDC.

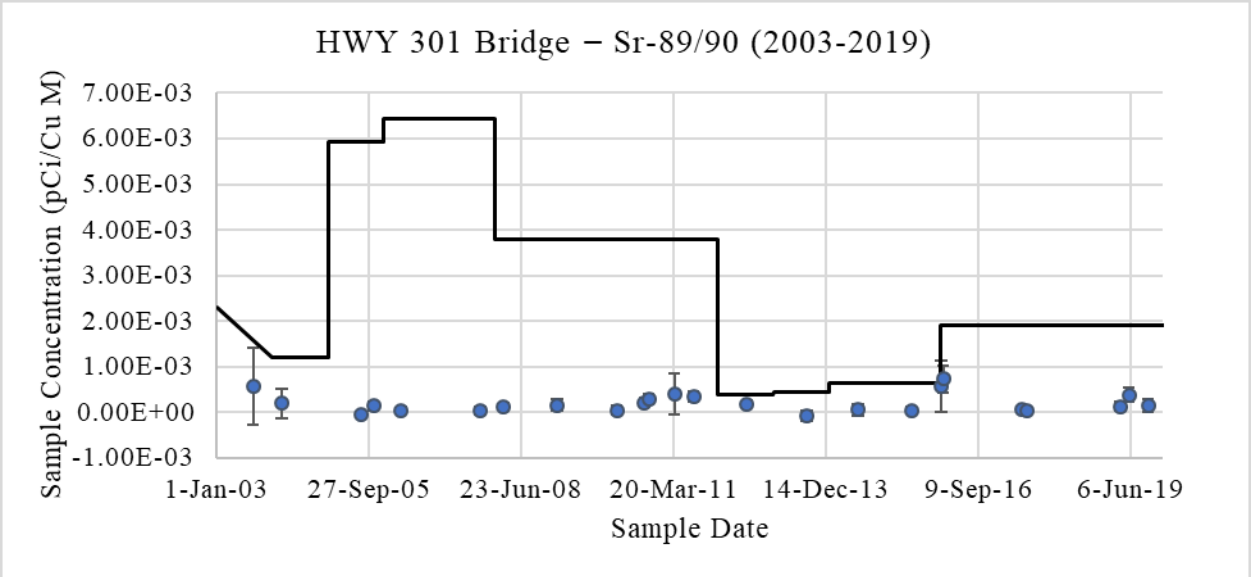

Figure A-4. Twenty-Five Mile Offsite Sampling Location "Hwy 301 Bridge" Sr-89/90 Air Surveillance 2003-2019. Solid Line indicates MDC.

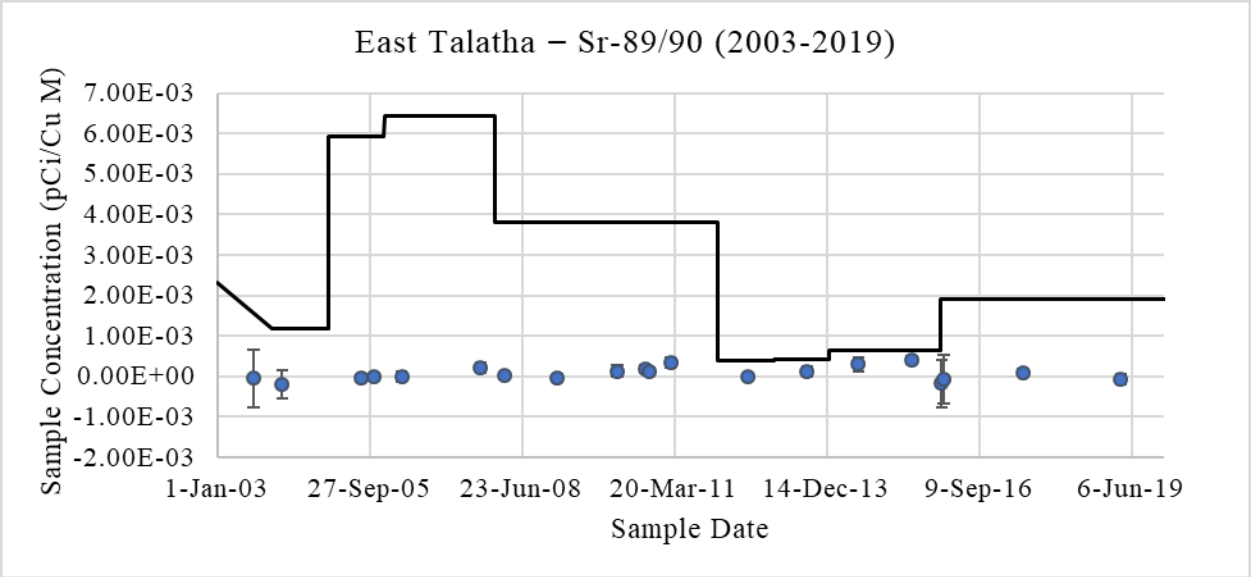

Figure A-5. SRS Perimeter Sampling Location "East Talatha" Sr-89/90 Air Surveillance 2003-2019. Solid Line indicates MDC.

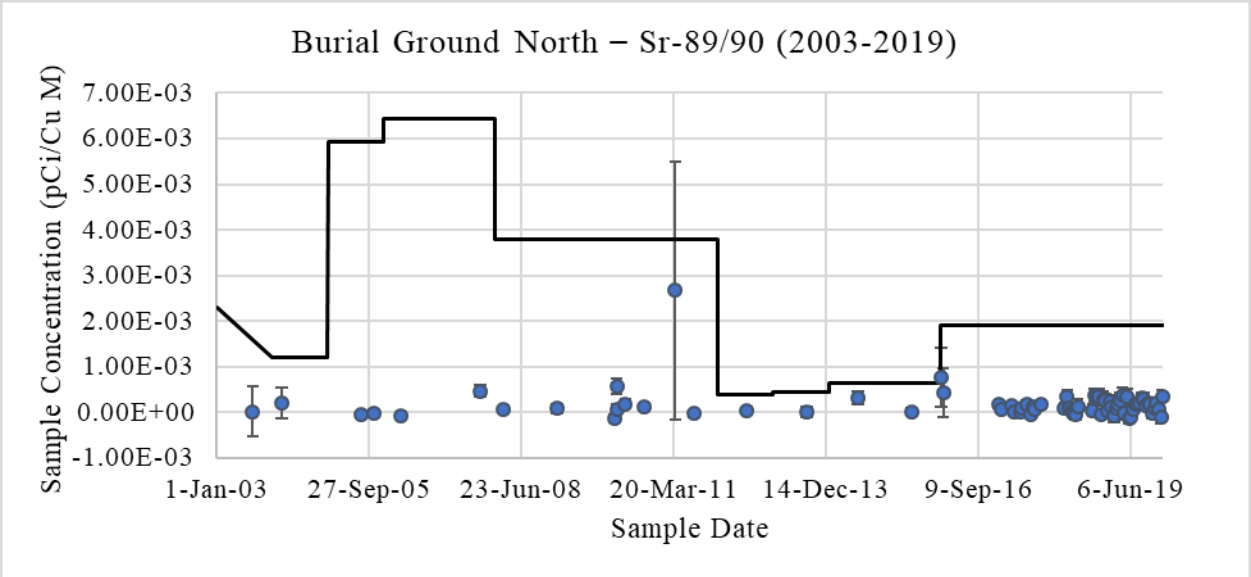

Figure A-6. SRS Onsite Sampling Location "Burial Ground North" Sr-89/90 Air Surveillance 2003-2019. Solid Line indicates MDC.

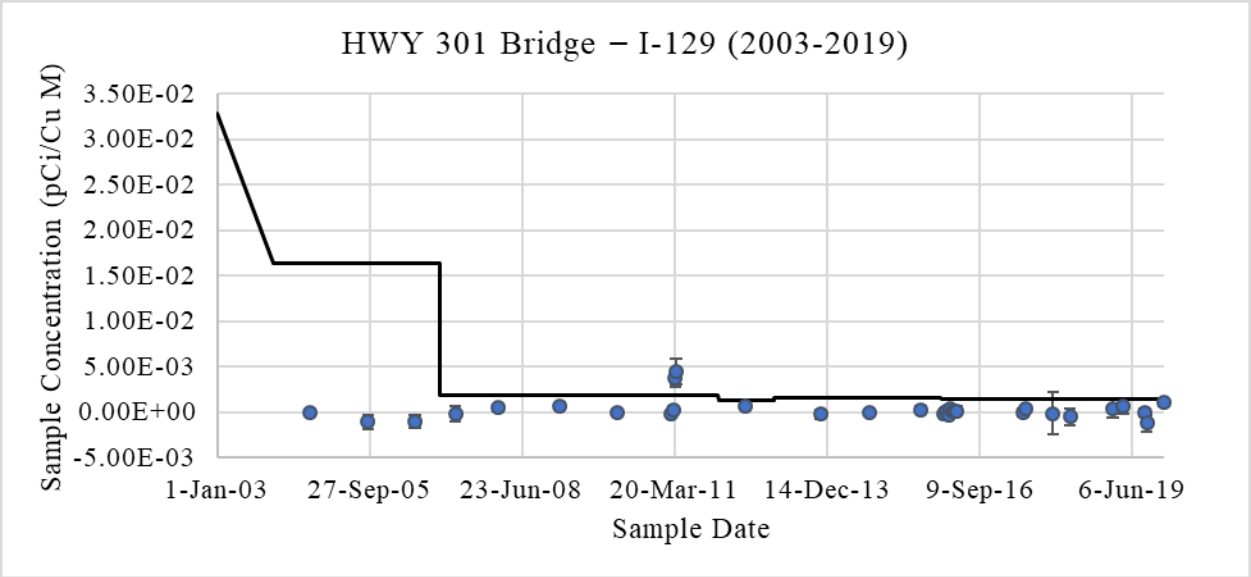

Figure A-7. Twenty-Five Mile Offsite Sampling Location "Hwy 301 Bridge" I-129 Air Surveillance 2003-2019. Solid Line indicates MDC.

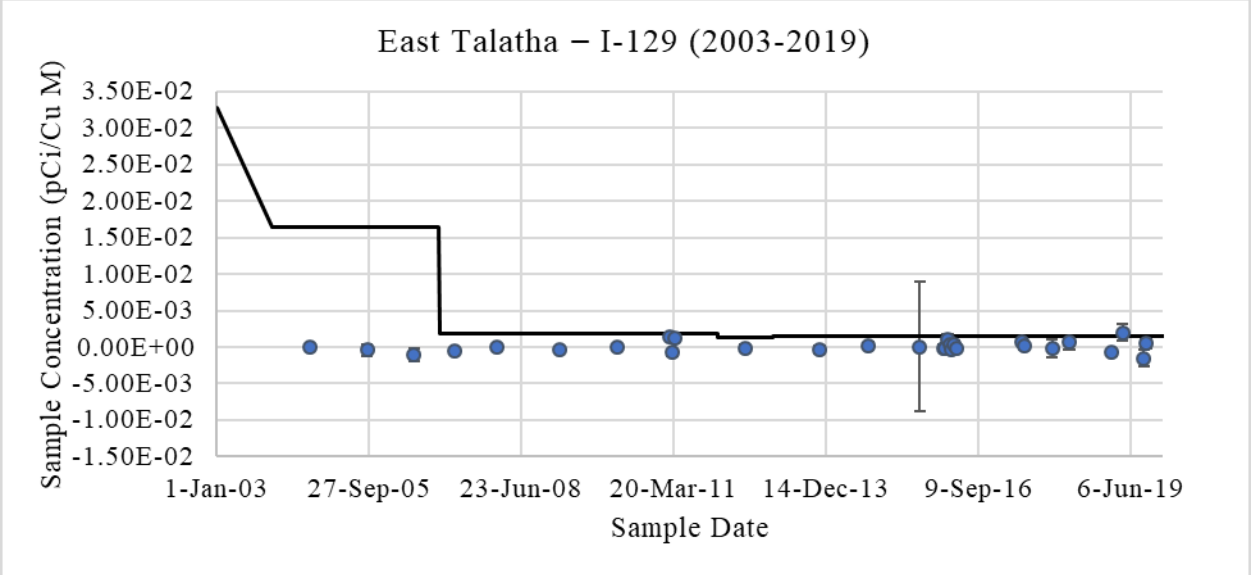

Figure A-8. SRS Perimeter Sampling Location "East Talatha" I-129 Air Surveillance 2003-2019. Solid Line indicates MDC.

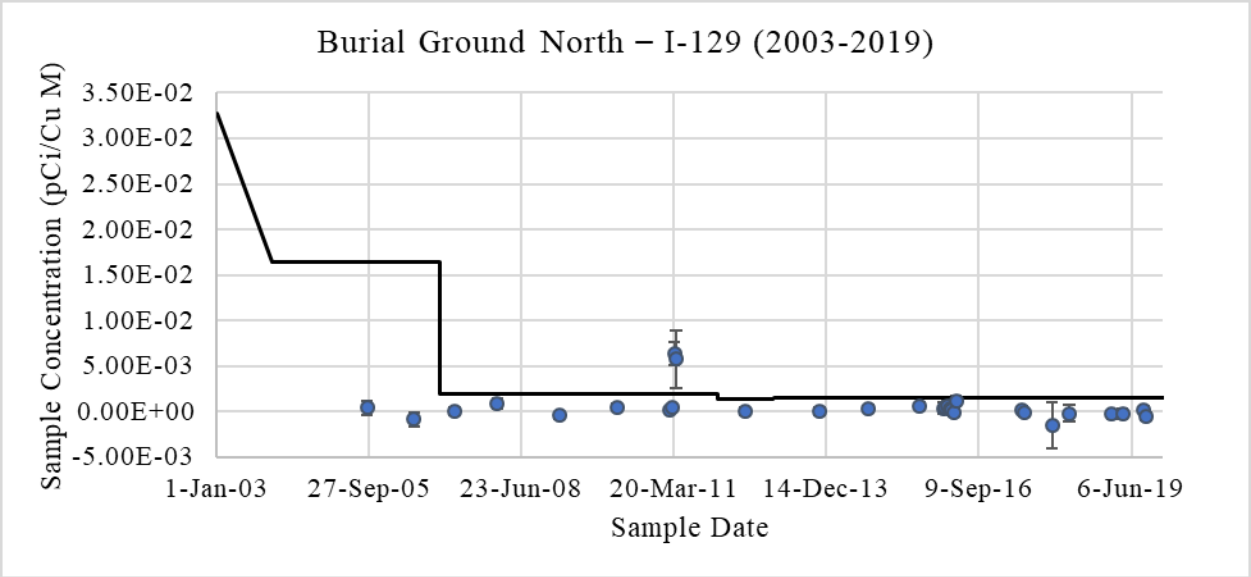

Figure A-9. SRS Onsite Sampling Location "Burial Ground North" I-129 Air Surveillance 2003-2019. Solid Line indicates MDC.

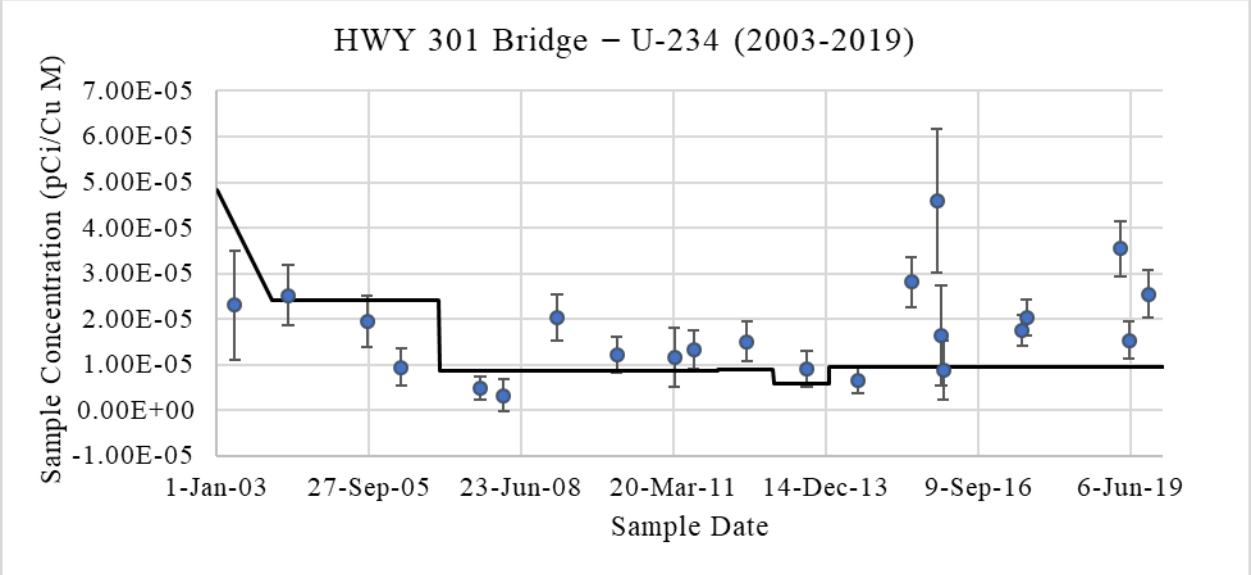

Figure A-10. Twenty-Five Mile Offsite Sampling Location "Hwy 301 Bridge" U-234 Air Surveillance 2003-2019. Solid Line indicates MDC.

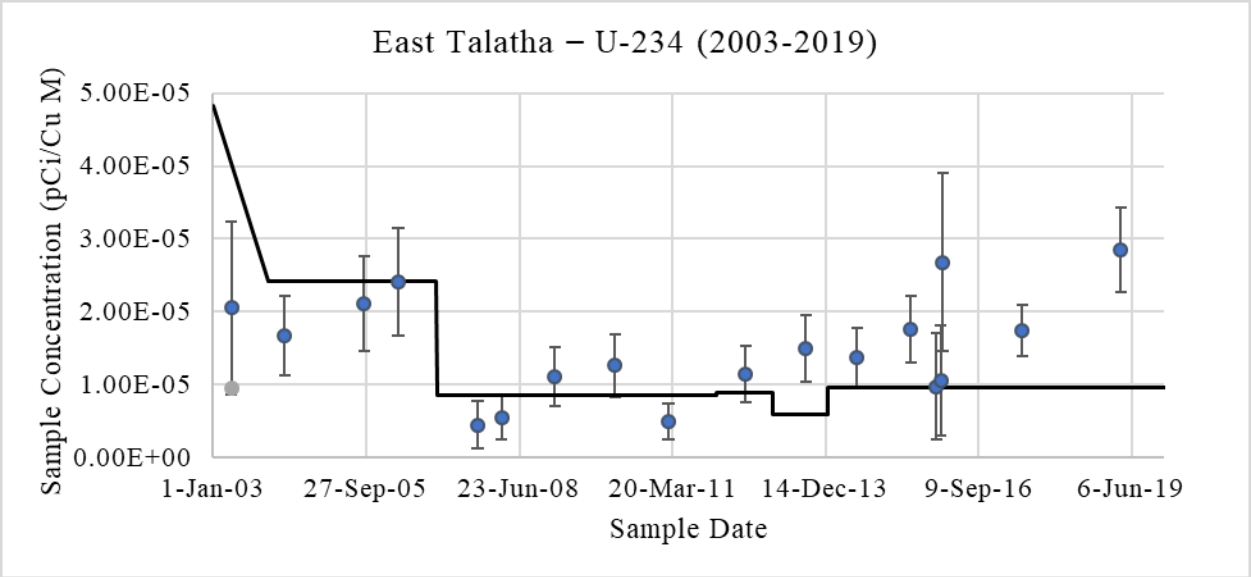

Figure A-11. SRS Perimeter Sampling Location "East Talatha" U-234 Air Surveillance 2003-2019. Solid Line indicates MDC.

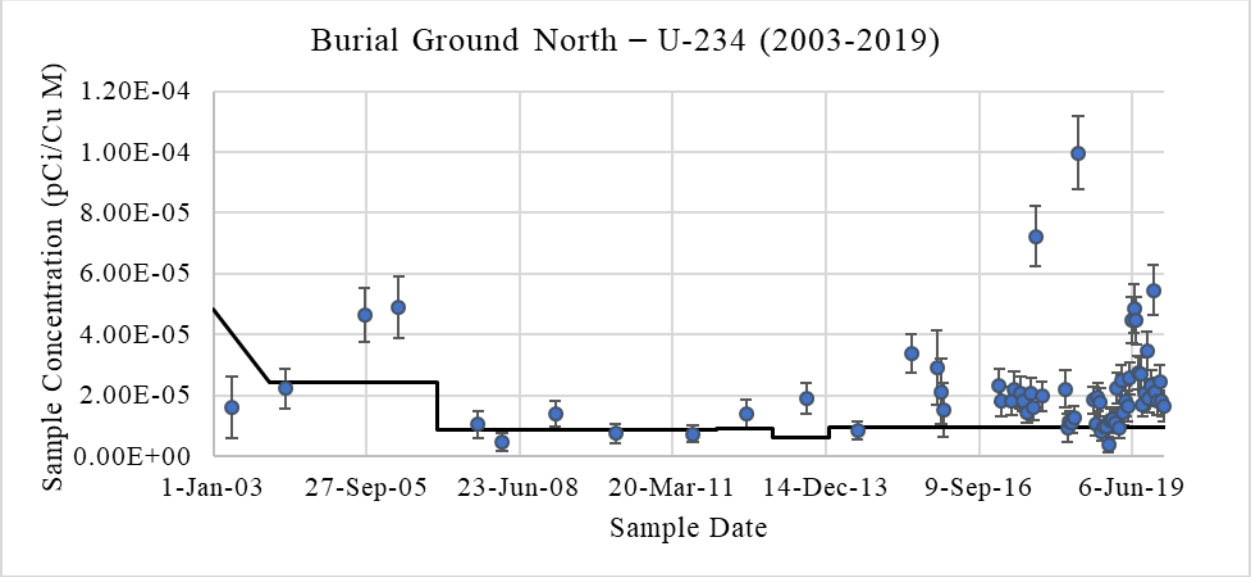

Figure A-12. SRS Onsite Sampling Location "Burial Ground North" U-234 Air Surveillance 2003-2019. Solid Line indicates MDC.

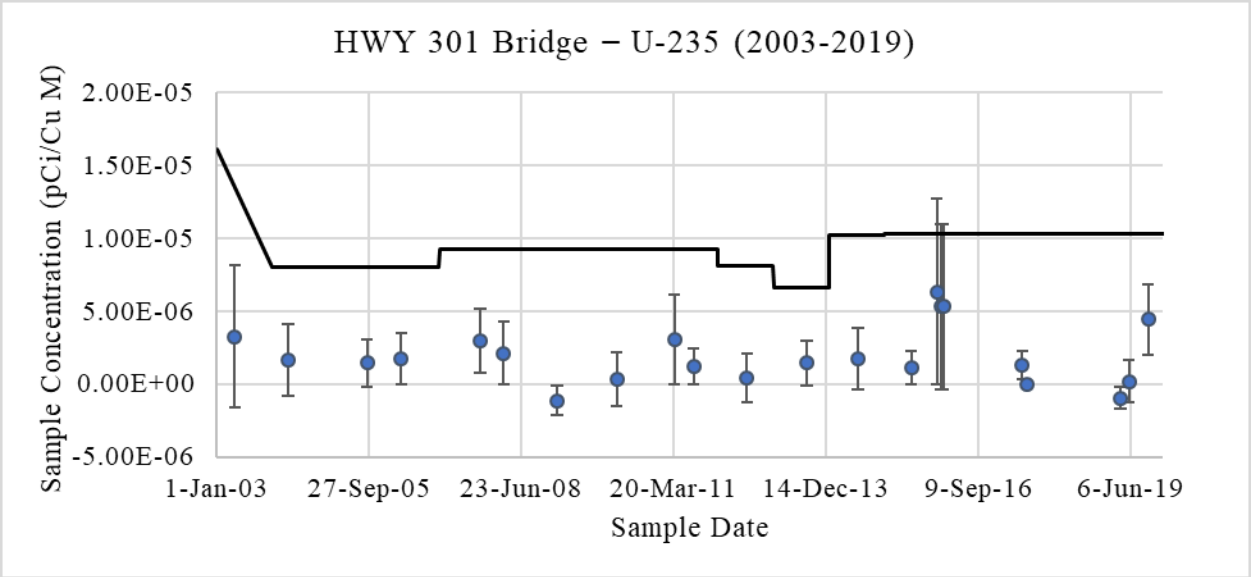

Figure A-13. Twenty-Five Mile Offsite Sampling Location "Hwy 301 Bridge" U-235 Air Surveillance 2003-2019. Solid Line indicates MDC.

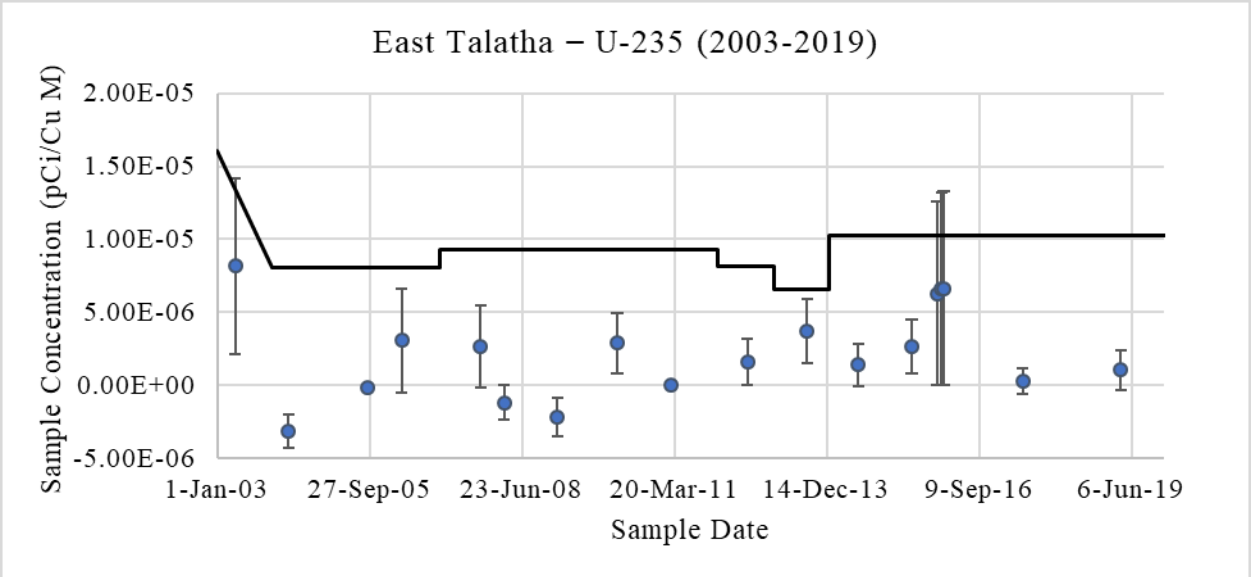

Figure A-14. SRS Perimeter Sampling Location "East Talatha" U-235 Air Surveillance 2003-2019. Solid Line indicates MDC.

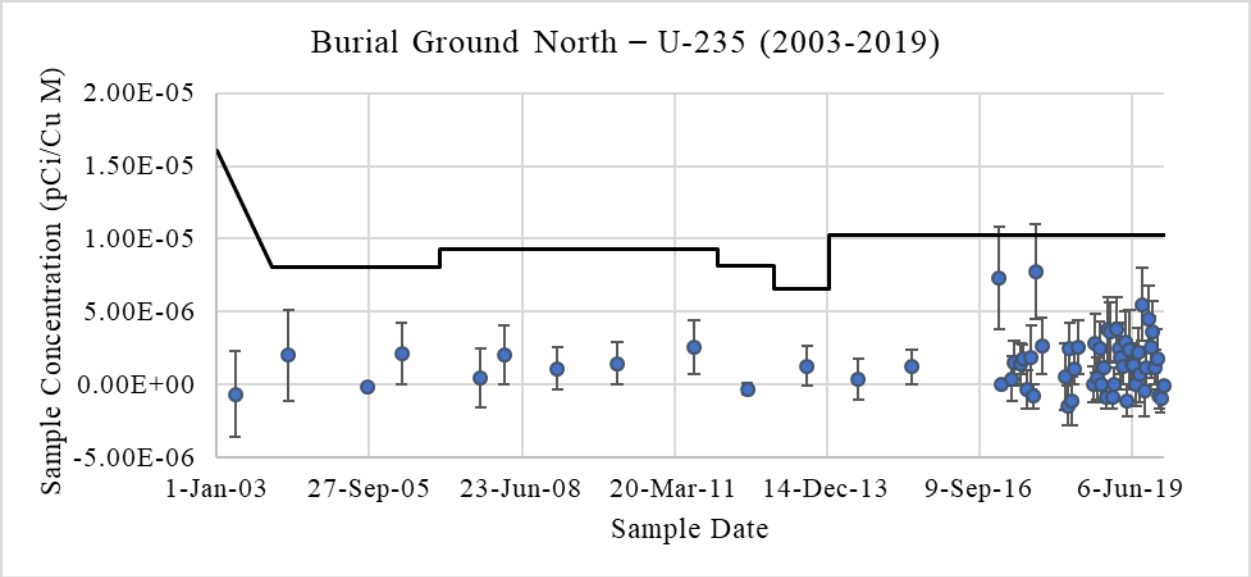

Figure A-15. SRS Onsite Sampling Location "Burial Ground North" U-235 Air Surveillance 2003-2019. Solid Line indicates MDC.

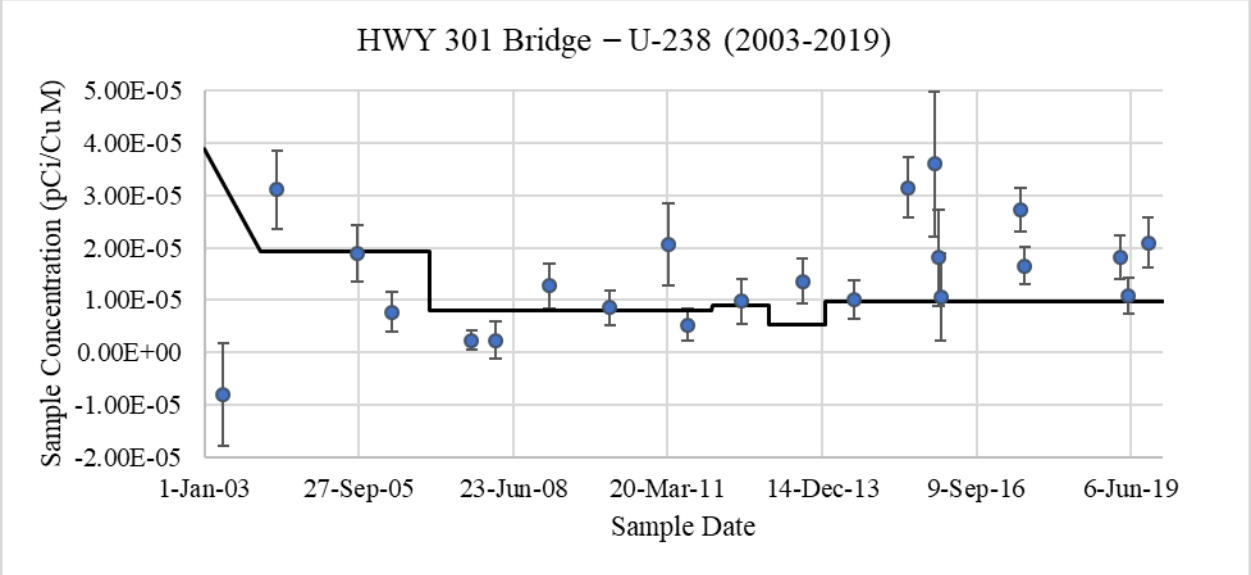

Figure A-16. Twenty-Five Mile Offsite Sampling Location "Hwy 301 Bridge" U-238 Air Surveillance 2003-2019. Solid Line indicates MDC.

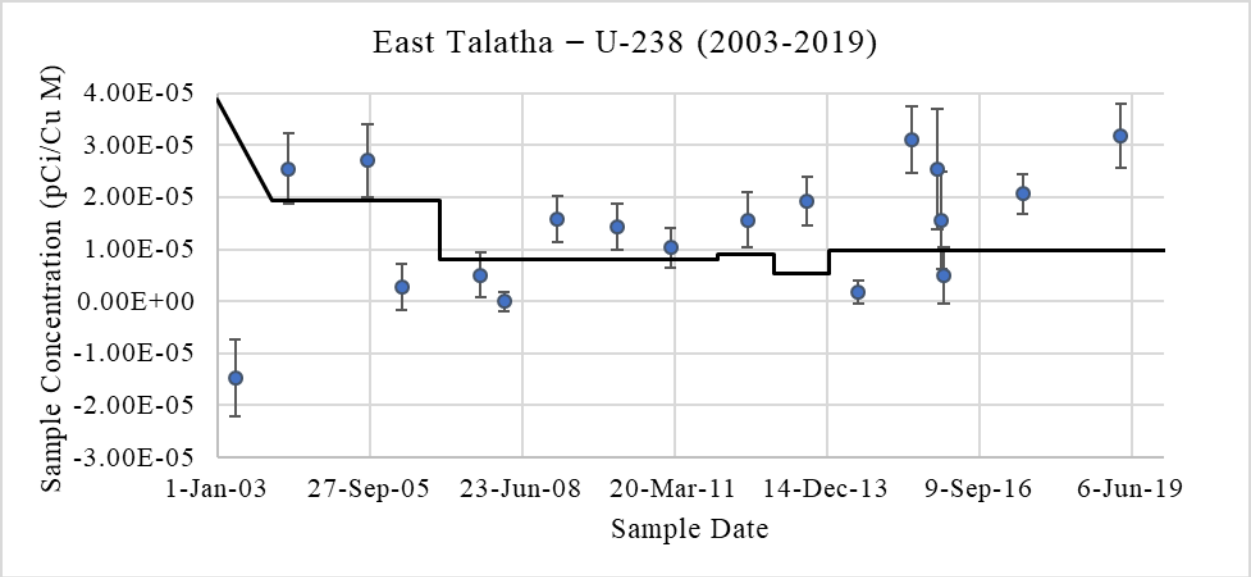

Figure A-17. SRS Perimeter Sampling Location "East Talatha" U-238 Air Surveillance 2003-2019. Solid Line indicates MDC.

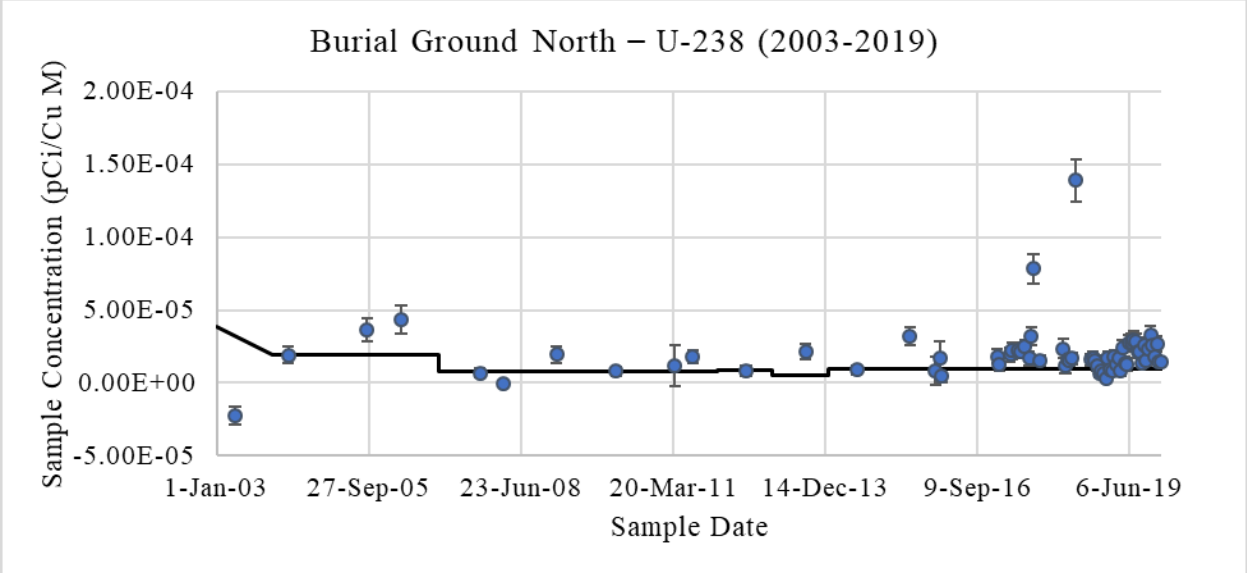

Figure A-18. SRS Onsite Sampling Location "Burial Ground North" U-238 Air Surveillance 2003-2019. Solid Line indicates MDC.

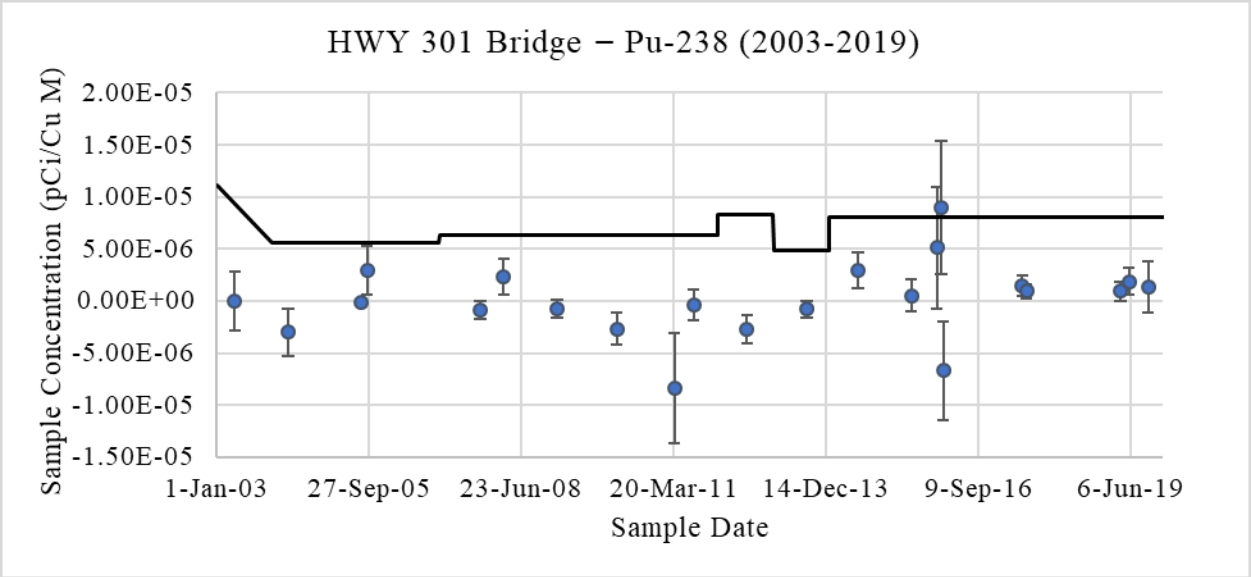

Figure A-19. Twenty-Five Mile Offsite Sampling Location "Hwy 301 Bridge" Pu-238 Air Surveillance 2003-2019. Solid Line indicates MDC.

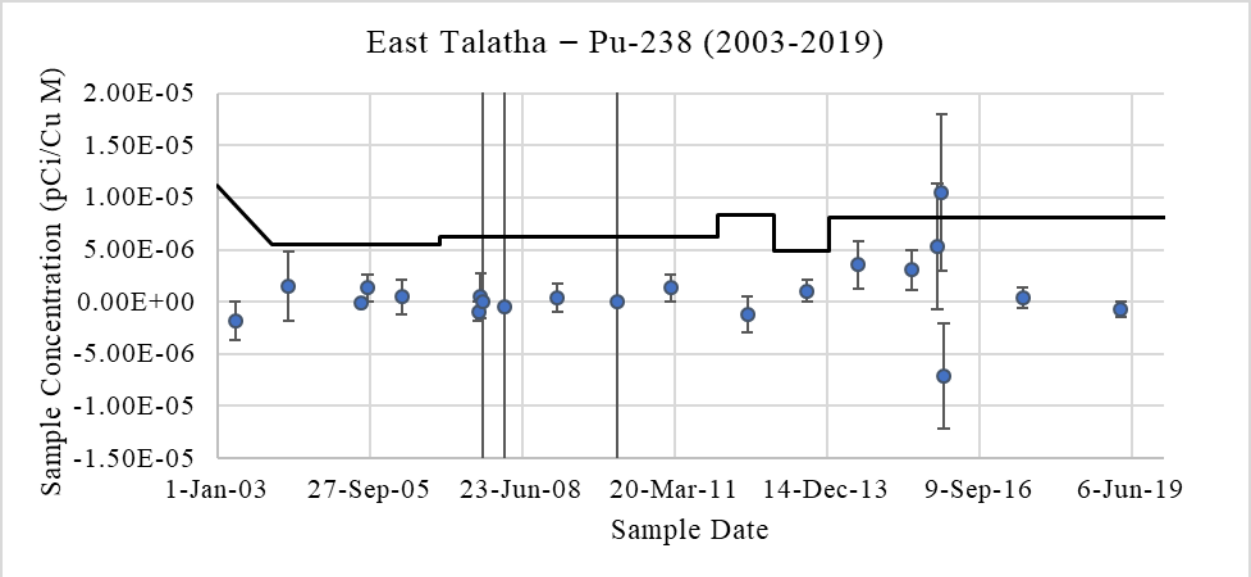

Figure A-20. SRS Perimeter Sampling Location "East Talatha" Pu-238 Air Surveillance 2003-2019. Solid Line indicates MDC.

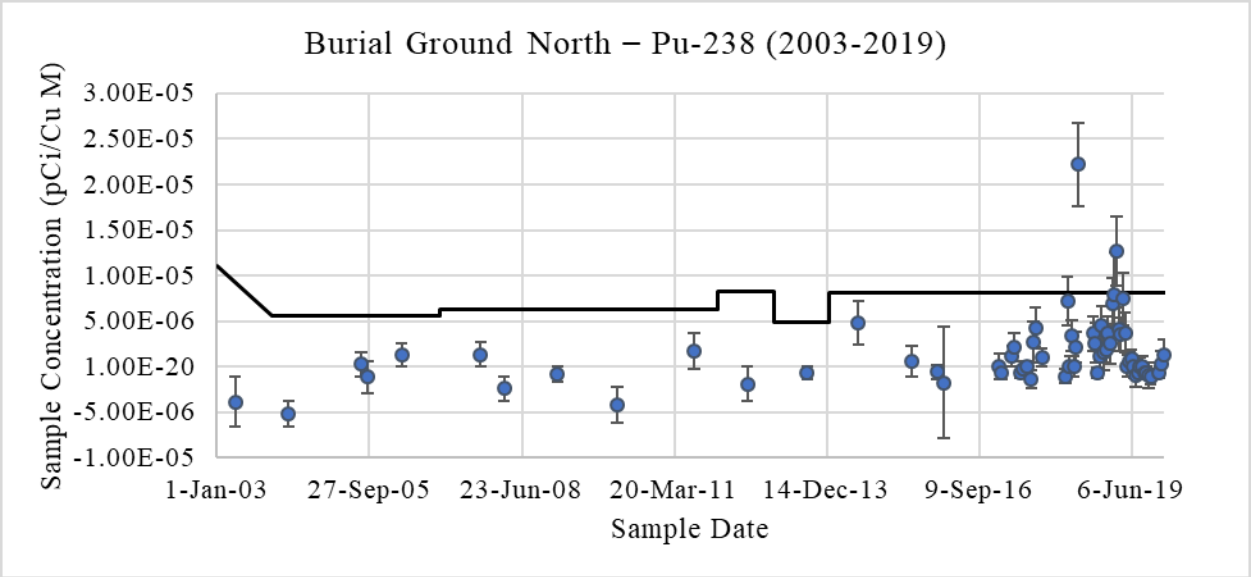

Figure A-21. SRS Onsite Sampling Location "Burial Ground North" Pu-238 Air Surveillance 2003-2019. Solid Line indicates MDC.

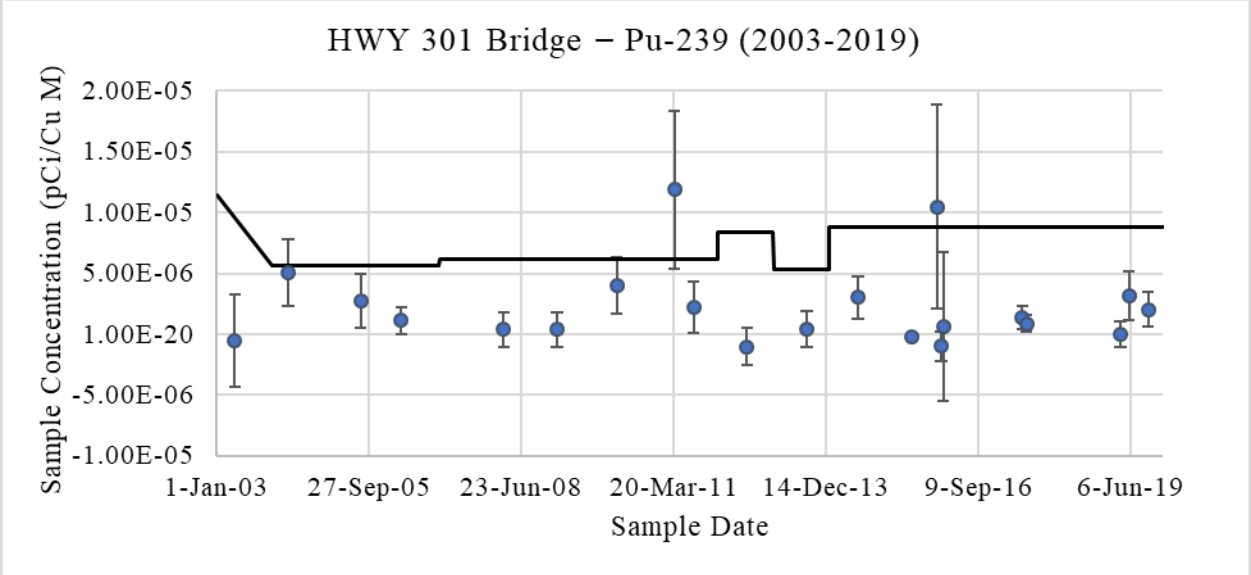

Figure A-22. Twenty-Five Mile Offsite Sampling Location "Hwy 301 Bridge" Pu-239 Air Surveillance 2003-2019. Solid Line indicates MDC.

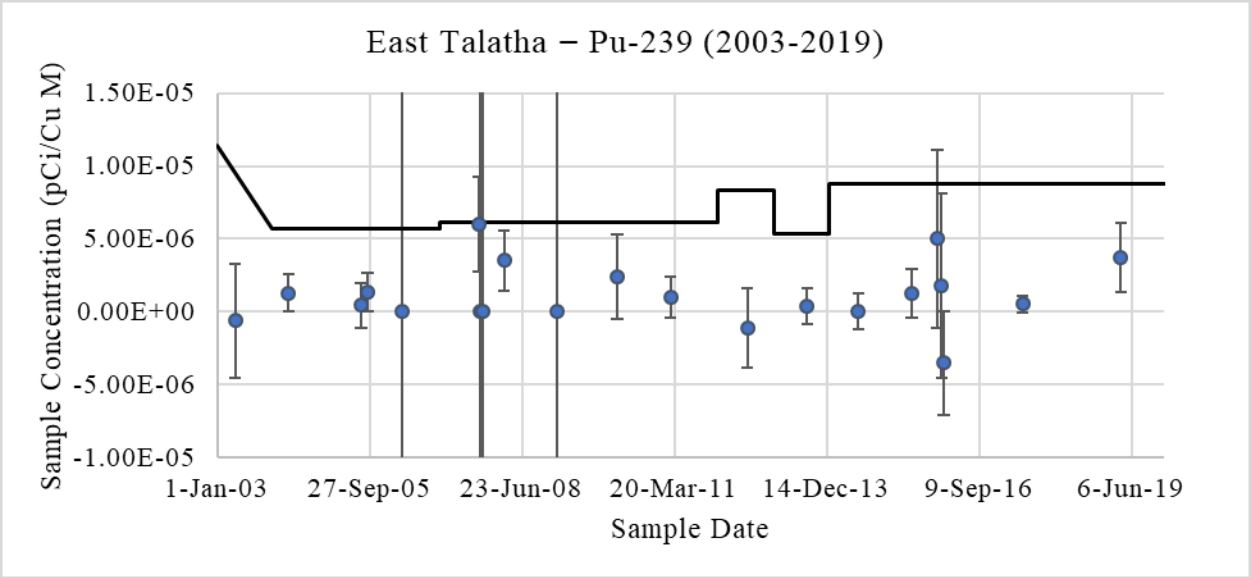

Figure A-23. SRS Perimeter Sampling Location "East Talatha" Pu-239 Air Surveillance 2003-2019. Solid Line indicates MDC.

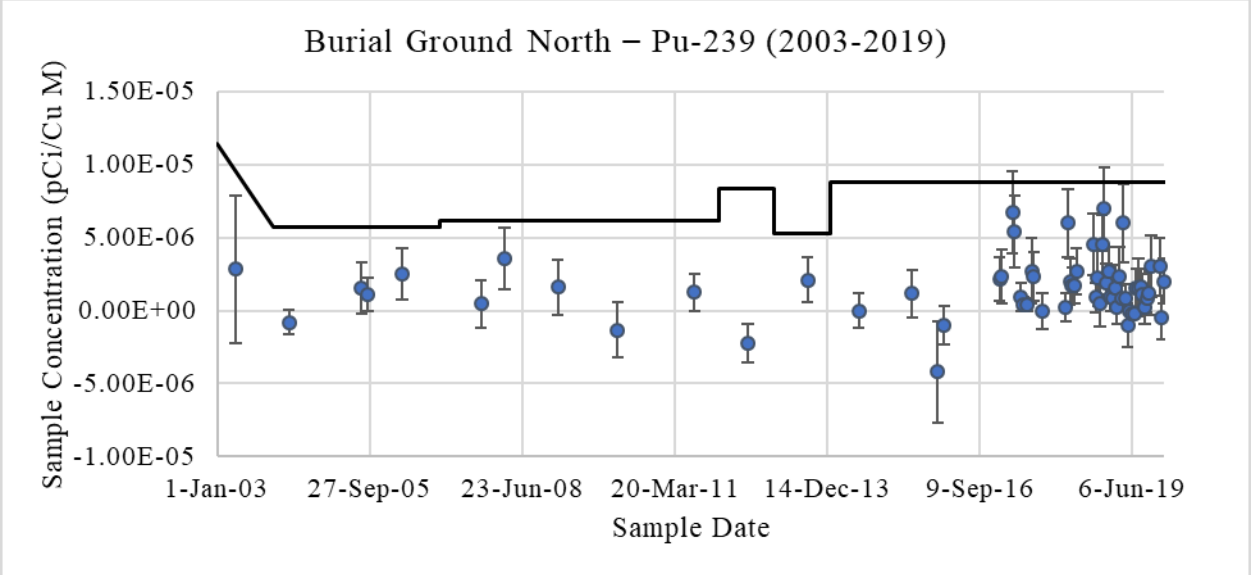

Figure A-24. SRS Onsite Sampling Location "Burial Ground North" Pu-239 Air Surveillance 2003-2019. Solid Line indicates MDC.

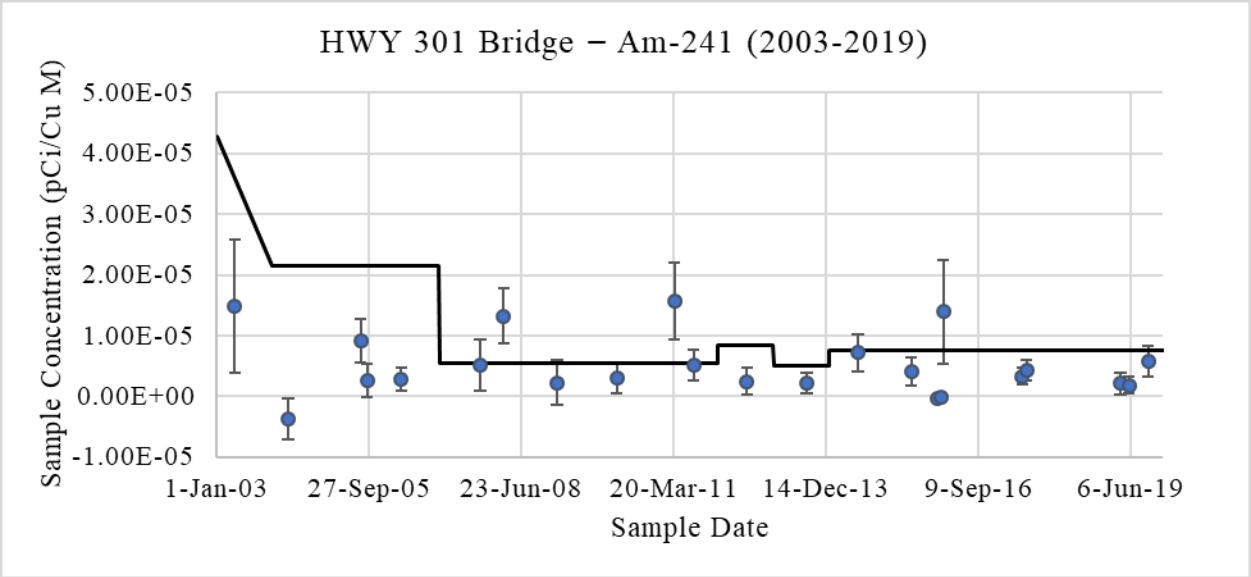

Figure A-25. Twenty-Five Mile Offsite Sampling Location "Hwy 301 Bridge" Am-241 Air Surveillance 2003-2019. Solid Line indicates MDC.

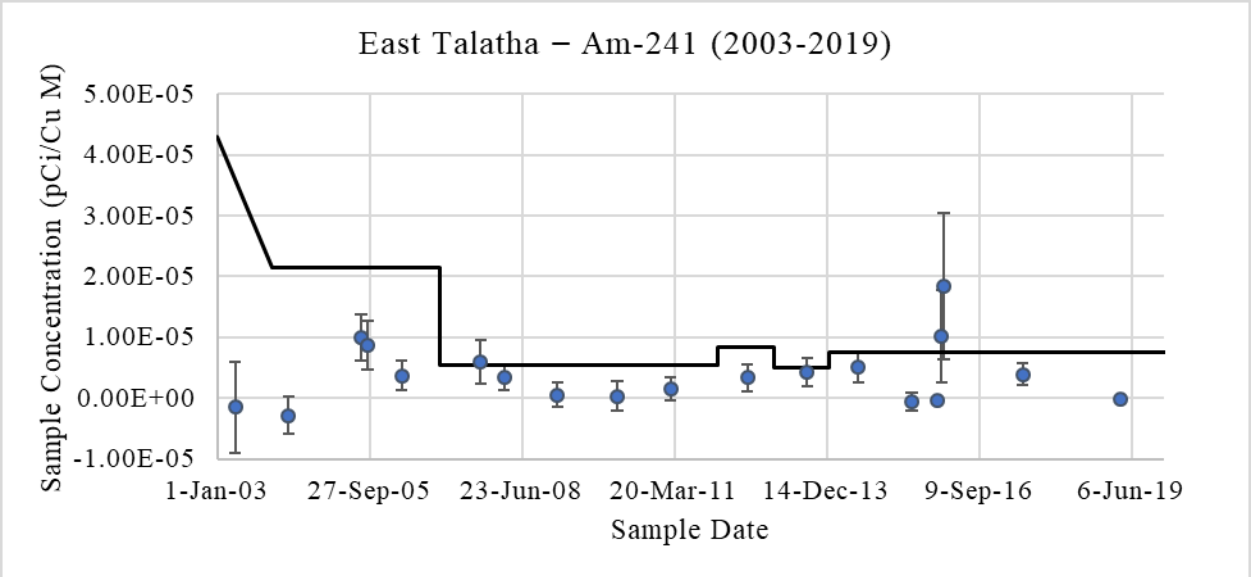

Figure A-26. SRS Perimeter Sampling Location "East Talatha" Am-241 Air Surveillance 2003-2019. Solid Line indicates MDC.

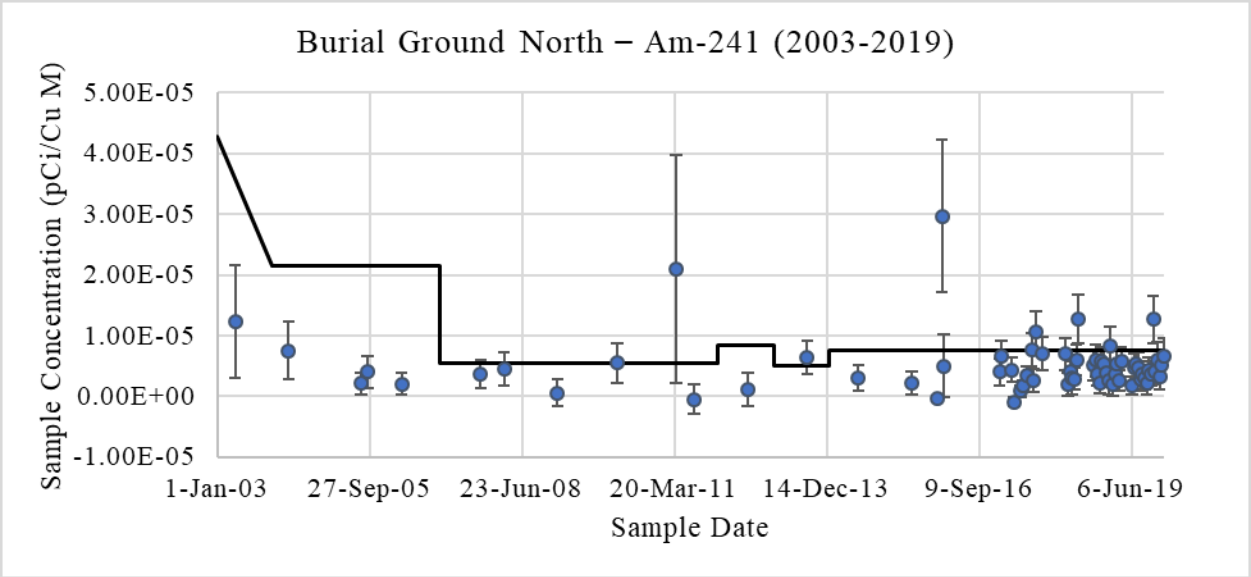

Figure A-27. SRS Onsite Sampling Location "Burial Ground North" Am-241 Air Surveillance 2003-2019. Solid Line indicates MDC.

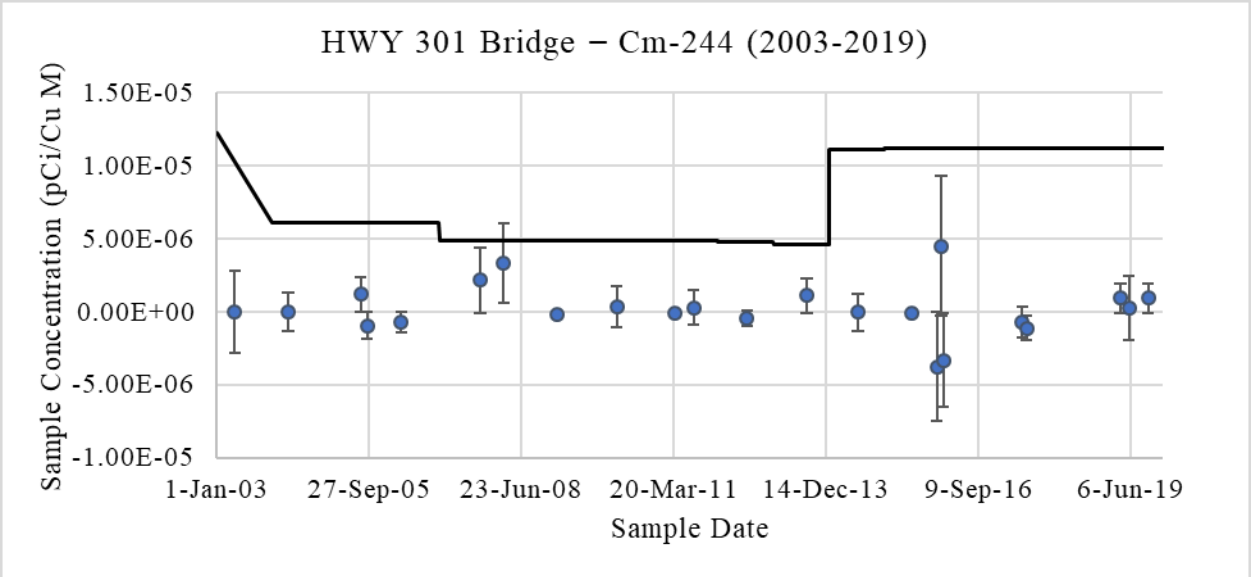

Figure A-28. Twenty-Five Mile Offsite Sampling Location "Hwy 301 Bridge" Cm-244 Air Surveillance 2003-2019. Solid Line indicates MDC.

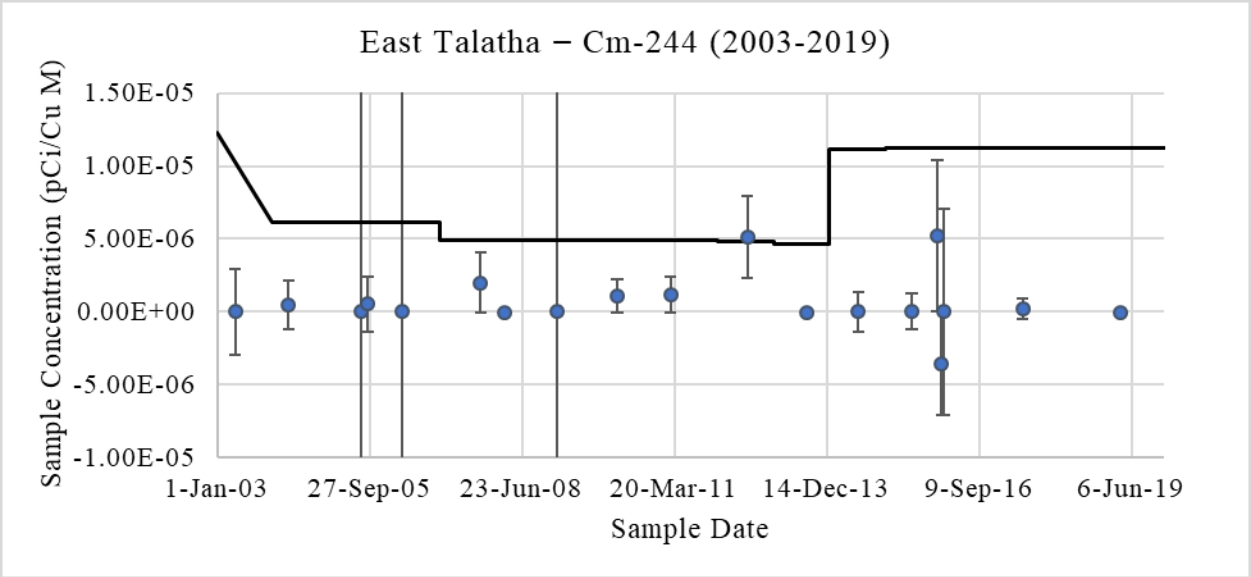

Figure A-29. SRS Perimeter Sampling Location "East Talatha" Cm-244 Air Surveillance 2003-2019. Solid Line indicates MDC.

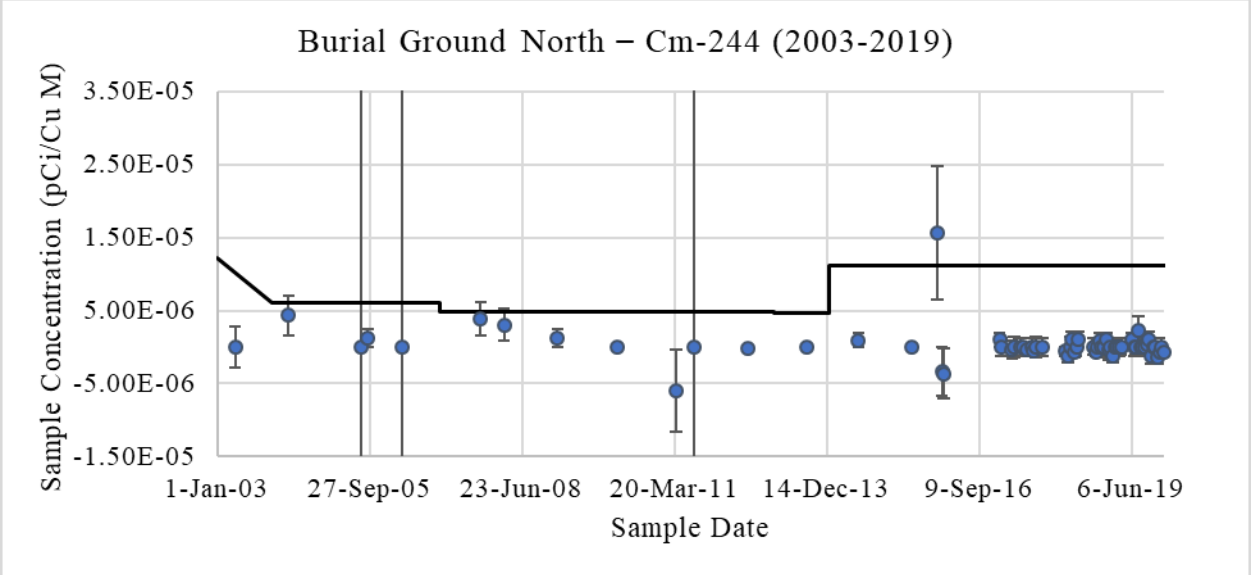

Figure A-30. SRS Onsite Sampling Location "Burial Ground North" Cm-244 Air Surveillance 2003-2019. Solid Line indicates MDC.

Appendix B. Stream and River Surface Water

Table B-1. Environmental Surface Water Surveillance Summary for Years 2003-2019

Location	Nuclide	Sample Number (>MDC)	Mean Concentration (pCi/L)	Overall Sigma (pCi/L)	Minimum Concentration (pCi/L)	Maximum Concentration (pCi/L)
Onsite Streams						
Lower Three Runs	Cs-137	216 (7)	1.99E+00	3.50E-01	-6.25E+00	5.29E+01
(L3R-3)	Sr-89/90	17 (1)	2.68E-01	7.49E-02	-1.26E-01	1.26E+00
	Tc-99	17 (0)	5.95E-01	2.18E-01	-1.44E+00	2.18E+00
	I-129	16 (0)	1.31E-01	1.31E-01	-1.58E+00	7.89E-01
	Np-237	1 (0)	-2.56E-03	N/A		
	U-234	18 (16)	3.08E-02	5.03E-03	1.19E-03	1.02E-01
	U-235	18 (1)	2.76E-03	1.58E-03	-7.27E-03	2.23E-02
	U-238	18 (15)	2.19E-02	3.46E-03	-5.52E-03	6.29E-02
	Pu-238	18 (1)	2.34E-03	8.88E-04	-4.87E-03	9.17E-03
	Pu-239	18 (0)	1.21E-03	8.94E-04	-5.98E-03	8.18E-03
	Am-241	18 (3)	6.96E-03	2.25E-03	-6.99E-03	3.79E-02
	Cm-244	18 (0)	8.84E-04	4.50E-04	-1.19E-03	5.41E-03
Steel Creek	Cs-137	219 (0)	2.43E-01	1.56E-01	-7.56E+00	7.24E+00
(SC-4)	Sr-89/90	17 (0)	2.41E-01	8.86E-02	-8.86E-02	1.32E+00
	Tc-99	17 (1)	9.39E-01	2.85E-01	-4.84E-01	3.93E+00
	I-129	16 (0)	4.15E-02	1.32E-01	-5.76E-01	1.72E+00
	Np-237	1 (0)	1.61E-03	N/A		
	U-234	18 (13)	1.89E-02	3.96E-03	0.00E+00	6.22E-02
	U-235	18 (0)	9.20E-04	1.79E-03	-1.49E-02	2.45E-02
	U-238	18 (8)	1.29E-02	2.21E-03	1.83E-03	4.21E-02
	Pu-238	17 (1)	1.58E-03	1.23E-03	-5.45E-03	1.29E-02
	Pu-239	18 (1)	2.01E-03	1.18E-03	-6.61E-03	1.62E-02
	Am-241	18 (7)	8.17E-03	3.05E-03	-2.67E-03	5.63E-02
	Cm-244	18 (0)	9.46E-04	4.18E-04	-1.09E-03	6.51E-03
Pen Branch	Cs-137	219 (1)	-3.31E-01	1.65E-01	-6.36E+00	9.31E+00
(PB-3)	Sr-89/90	17 (0)	1.23E-01	5.12E-02	-8.21E-02	7.68E-01
	Tc-99	17 (0)	3.29E-01	1.86E-01	-9.65E-01	1.50E+00
	I-129	16 (1)	7.87E-03	2.18E-01	-2.62E+00	1.41E+00
	Np-237	1 (0)	-6.49E-04	N/A		
	U-234	18 (11)	2.26E-02	4.40E-03	4.79E-03	7.57E-02
	U-235	18 (0)	1.65E-03	8.79E-04	-6.56E-03	1.06E-02
	U-238	18 (15)	2.02E-02	2.84E-03	2.25E-03	4.82E-02
	Pu-238	17 (1)	2.41E-03	8.15e-04	-1.30E-03	9.43E-03
	Pu-239	18 (0)	-8.07E-04	8.11E-04	-8.70E-03	5.16E-03
	Am-241	18 (3)	3.70E-03	1.39E-03	-7.02E-03	1.37E-02
	Cm-244	18 (0)	4.42E-04	4.94E-04	-2.24E-03	6.59E-03

Location	Nuclide	Sample Number (>MDC)	Mean Concentration (pCi/L)	Overall Sigma (pCi/L)	Minimum Concentration (pCi/L)	Maximum Concentration (pCi/L)
Fourmile Branch	Cs-137	222 (48)	6.56E+00	8.06E-01	-4.84E+00	1.39E+02
FM-A7	C-14	42 (1)	4.94E-01	8.99E-01	-9.04E+00	1.89E+01
	Sr-89/90	222(221)	5.18E+00	3.03E-01	3.56E-01	2.85E+01
	Tc-99	222(5)	2.53E+00	1.83E-01	-1.45E+00	3.71E+01
	I-129	220(6)	2.81E+00	1.72E-01	-4.80E+00	1.91E+01
	Np-237	4 (2)	1.06E-02	2.16E-03	6.01E-03	1.64E-02
	U-234	17 (17)	1.93E-01	2.22E-02	2.55E-02	3.47E-01
	U-235	17 (6)	1.05E-02	1.85E-03	-1.80E-03	2.40E-02
	U-238	17 (17)	2.36E-01	2.62E-02	5.16E-02	4.34E-01
	Pu-238	17 (13)	3.07E-02	7.39E-03	3.90E-03	1.13E-01
	Pu-239	17 (6)	5.91E-03	1.68E-03	-6.42E-03	2.24E-02
	Am-241	17 (13)	1.69E-02	2.48E-03	3.28E-03	4.63E-02
	Cm-244	17 (14)	1.33E-02	2.79E-03	0.00E+00	5.31E-02
Fourmile Branch	Cs-137	223 (1)	1.73E+00	1.55E-01	-4.97E+00	9.33E+00
(FM-6)	C-14	20 (0)	1.09E+00	1.01E+00	-9.50E+00	1.06E+01
	Sr-89/90	17 (17)	1.68E+00	1.92E-01	7.88E-01	3.88E+00
	Tc-99	17 (5)	1.56E+00	3.29E-01	-7.21E-01	4.81E+00
	I-129	16 (5)	1.03E+00	2.54E-01	-2.78E-01	3.82E+00
	Np-237	3 (0)	4.10E-03	7.19E-04	3.11E-03	5.50E-03
	U-234	18 (17)	6.62E-02	9.40E-03	1.59E-02	1.98E-01
	U-235	18 (0)	3.62E-03	7.93E-04	-2.48E-03	9.34E-03
	U-238	18 (17)	7.61E-02	9.55E-03	1.47E-02	1.83E-01
	Pu-238	18 (4)	6.65E-03	2.39E-03	-2.78E-02	2.00E-02
	Pu-239	18 (0)	1.04E-03	9.07E-04	-8.23E-03	7.25E-03
	Am-241	18 (10)	8.58E-03	1.43E-03	-3.56E-03	1.97E-02
	Cm-244	18 (2)	4.41E-03	8.43E-04	-1.22E-03	1.10E-02
Upper Three Runs	Cs-137	220 (0)	6.06E-02	1.36E-01	-6.77E+00	8.34E+00
(U3R-4)	Sr-89/90	17 (0)	1.42E-01	4.59E-02	-9.39E-02	5.74E-01
	Tc-99	17 (1)	5.55E-01	2.43E-01	-7.57E-01	2.37E+00
	I-129	16 (1)	8.68E-01	6.96E-01	-4.18E-01	1.10E+01
	Np-237	4 (0)	-6.86E-03	7.52E-03	-2.85E-02	5.68E-03
	U-234	93 (92)	2.74E-01	3.75E-02	1.70E-02	2.71E+00
	U-235	93 (26)	1.74E-02	2.39E-03	-5.36E-03	1.86E-01
	U-238	93 (93)	3.06E-01	4.47E-02	2.04E-02	3.38E+00
	Pu-238	18 (1)	2.21E-03	1.01E-03	-6.88E-03	8.29E-03
	Pu-239	18 (0)	1.26E-03	7.26E-04	-4.40E-03	6.02E-03
	Am-241	18 (5)	6.33E-03	2.19E-03	-9.19E-03	3.66E-02
	Cm-244	18 (0)	2.28E-04	4.43E-04	-3.68E-03	4.54E-03

Location	Nuclide	Sample Number (>MDC)	Mean Concentration (pCi/L)	Overall Sigma (pCi/L)	Minimum Concentration (pCi/L)	Maximum Concentration (pCi/L)
Onsite (Control)						
Upper Three Runs	Cs-137	77 (0)	-3.11E-02	2.61E-01	-7.01E+00	4.52E+00
(U3R-0)	Sr-89/90	6 (1)	1.18E-01	1.34E-01	-2.02E-01	5.88E-01
	Tc-99	6 (0)	3.34E-01	6.29E-01	-1.30E+00	2.97E+00
	I-129	6 (1)	1.01E-01	2.68E-01	-5.52E-01	1.23E+00
	Np-237	1 (0)	-2.43E-03	N/A		
	U-234	7 (7)	9.13E-02	3.80E-02	1.63E-02	2.86E-01
	U-235	7 (1)	4.76E-03	2.79E-03	-1.24E-03	2.06E-02
	U-238	7 (7)	1.07E-01	5.51E-02	1.45E-02	4.24E-01
	Pu-238	7 (1)	8.01E-04	2.25E-03	-1.06E-02	7.83E-03
	Pu-239	7 (0)	8.27E-04	1.50E-03	-3.36E-03	7.76E-03
	Am-241	7 (1)	6.34E-03	2.55E-03	-1.64E-03	1.64E-02
	Cm-244	7 (0)	7.98E-04	3.86E-04	0.00E+00	2.33E-03
Upper Three Runs	Cs-137	314 (2)	1.95E-01	1.50E-01	-6.87E+00	2.51E+01
(U3R-1A)	Sr-89/90	14 (0)	3.45E-02	5.70E-02	-2.97E-01	5.26E-01
	Tc-99	14 (0)	2.72E-01	2.30E-01	-8.00E-01	1.68E+00
	I-129	10 (0)	1.49E-01	1.19E-01	-4.85E-01	8.54E-01
	Np-237	1 (0)	2.93E+01	N/A		
	U-234	14 (10)	2.12E-02	3.59E-03	6.76E-04	4.92E-02
	U-235	14 (1)	3.56E-03	1.97E-03	-3.30E-03	2.47E-02
	U-238	14 (9)	2.28E-02	4.51E-03	4.28E-03	7.02E-02
	Pu-238	14 (1)	1.28E-02	9.26E-03	-2.67E-03	1.32E-01
	Pu-239	14 (1)	1.98E-03	9.43E-04	-2.52E-03	1.01E-02
	Am-241	14 (0)	3.75E-03	1.51E-03	-9.27E-03	8.96E-03
	Cm-244	14 (0)	1.34E-04	3.58E-04	-1.75E-03	2.36E-03
Offsite-Savannah River						
RM-160/161	Cs-137	860 (1)	2.87E-02	1.13E-02	-1.02E+00	3.43E+00
(control)	Sr-89/90	17 (0)	3.55E-01	1.37E-01	-3.12E-01	2.15E+00
	Tc-99	17 (0)	6.00E-02	3.12E-01	-3.12E+00	3.08E+00
	I-129	1 (0)	-1.77E-01	N/A		
	Np-237	0 (0)	N/A			
	U-234	17 (10)	-9.20E-03	2.75E-02	-3.91E-01	7.55E-02
	U-235	17 (0)	-2.48E-02	2.43E-02	-4.03E-01	2.34E-02
	U-238	17 (6)	3.08E-02	1.38E-02	-1.56E-02	2.40E-01
	Pu-238	17 (0)	1.72E-02	2.05E-02	-5.04E-02	3.41E-01
	Pu-239	17 (0)	9.53E-04	2.76E-03	-3.59E-02	2.37E-02
	Am-241	17 (3)	3.80E-03	8.57E-03	-1.26E-01	4.18E-02
	Cm-244	17 (0)	-1.36E-03	1.61E-03	-2.65E-02	3.40E-03

Location	Nuclide	Sample Number (>MDC)	Mean Concentration (pCi/L)	Overall Sigma (pCi/L)	Minimum Concentration (pCi/L)	Maximum Concentration (pCi/L)
RM 150.4	Cs-137	892 (1)	5.41E-02	1.57E-02	-5.19E+00	3.03E+00
(above Vogtle)	Sr-89/90	18 (1)	2.39E-01	1.09E-01	-3.44E-01	1.58E+00
	Tc-99	18 (2)	5.85E-01	3.39E-01	-2.09E+00	3.04E+00
	I-129	1 (0)	-3.94E-01	N/A		
	Np-237	0 (0)	N/A			
	U-234	18 (11)	6.36E-02	5.70E-02	-3.91E-01	9.37E-01
	U-235	18 (0)	4.90E-02	4.38E-02	-3.33E-03	7.93E-01
	U-238	18 (10)	2.65E-02	5.83E-03	-1.92E-02	7.79E-02
	Pu-238	17 (0)	-1.02E-03	1.75E-03	-2.47E-02	1.36E-02
	Pu-239	18 (1)	2.15E-02	1.34E-02	-2.71E-03	2.18E-01
	Am-241	18 (6)	3.44E-03	8.50E-03	-1.34E-01	3.25E-02
	Cm-244	18 (0)	-1.89E-03	1.81E-03	-3.14E-02	3.56E-03
RM 150	Cs-137	884 (0)	4.11E-02	1.09E-02	-1.60E+00	1.37E+00
(below Vogtle)	Sr-89/90	18 (0)	2.98E-01	9.07E-02	-3.72E-01	1.11E+00
	Tc-99	18 (0)	3.62E-01	2.22E-01	-1.18E+00	2.02E+00
	I-129	1 (0)	4.13E-01	N/A		
	Np-237	0 (0)	N/A			
	U-234	18 (11)	3.30E-02	2.44E-02	-2.26E-01	3.58E-01
	U-235	18 (0)	2.98E-02	3.63E-02	-1.36E-01	6.33E-01
	U-238	18 (11)	-1.07E-03	2.66E-02	-4.49E-01	6.68E-02
	Pu-238	18 (1)	-1.78E-04	3.57E-03	-5.08E-02	2.23E-02
	Pu-239	18 (1)	2.57E-02	2.13E-02	-1.22E-02	3.79E-01
	Am-241	18 (7)	1.65E-02	9.60E-03	-6.00E-02	1.58E-01
	Cm-244	18 (1)	2.98E-03	3.00E-03	-5.17E-03	5.24E-02
RM 141.5	Cs-137	894 (0)	2.88E-02	1.32E-02	-5.81E+00	1.59E+00
(near Steel Creek)	Sr-89/90	18 (2)	3.59E-01	1.13E-01	-3.80E-01	1.66E+00
	Tc-99	18 (0)	3.63E-01	2.27E-01	-1.10E+00	1.98E+00
	I-129	1 (0)	-1.74E-01	N/A		
	Np-237	0 (0)	N/A			
	U-234	18 (9)	3.43E-02	2.57E-02	-1.83E-01	4.15E-01
	U-235	18 (0)	2.65E-02	2.74E-02	-8.53E-02	4.84E-01
	U-238	18 (9)	6.38E-02	3.64E-02	-2.63E-03	6.74E-01
	Pu-238	18 (0)	-1.33E-03	4.43E-03	-7.17E-02	2.31E-02
	Pu-239	18 (1)	1.36E-02	8.87E-03	-4.53E-03	1.52E-01
	Am-241	18 (6)	3.60E-02	1.69E-02	1.23E-03	2.82E-01
	Cm-244	18 (0)	6.71E-03	4.33E-03	-3.23E-03	5.94E-02

Location	Nuclide	Sample Number (>MDC)	Mean Concentration (pCi/L)	Overall Sigma (pCi/L)	Minimum Concentration (pCi/L)	Maximum Concentration (pCi/L)
RM 118.8	Cs-137	898 (2)	6.26E-02	1.54E-02	-1.89E+00	3.47E+00
(HWY 301 Bridge)	Sr-89/90	18 (0)	6.04E-02	5.98E-02	-3.07E-01	5.31E-01
	Tc-99	18 (0)	3.34E-01	2.49E-01	-1.67E+00	1.91E+00
	I-129	1 (0)	8.65E-01	N/A		
	Np-237	0 (0)	N/A			
	U-234	18 (10)	4.54E-02	1.21E-02	1.10E-03	2.01E-01
	U-235	18 (0)	1.38E-02	1.12E-02	-1.38E-02	2.02E-01
	U-238	18 (11)	4.84E-02	1.27E-02	8.37E-03	2.21E-01
	Pu-238	18 (2)	2.85E-03	4.12E-03	-3.22E-02	5.09E-02
	Pu-239	18 (0)	2.31E-03	2.26E-03	-2.80E-02	1.71E-02
	Am-241	18 (5)	2.58E-03	7.47E-03	-8.43E-02	2.95E-02
	Cm-244	18 (0)	3.74E-03	2.54E-03	-2.31E-03	4.51E-02

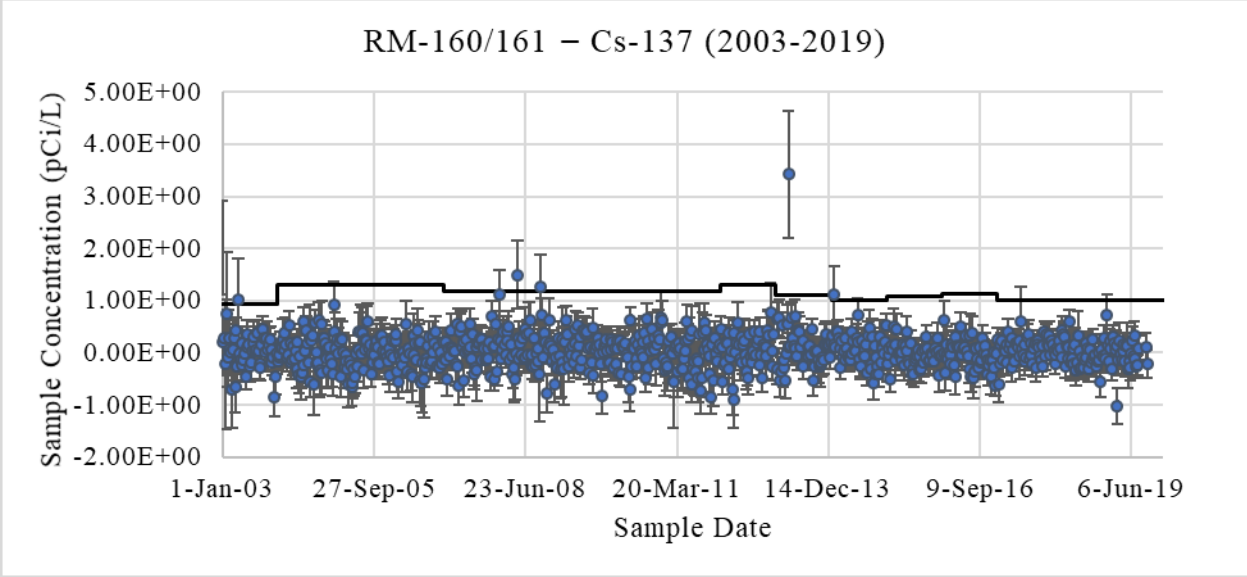

Figure B-1. SRS Offsite Savannah River Sampling Location "RM-160/161" Cs-137 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

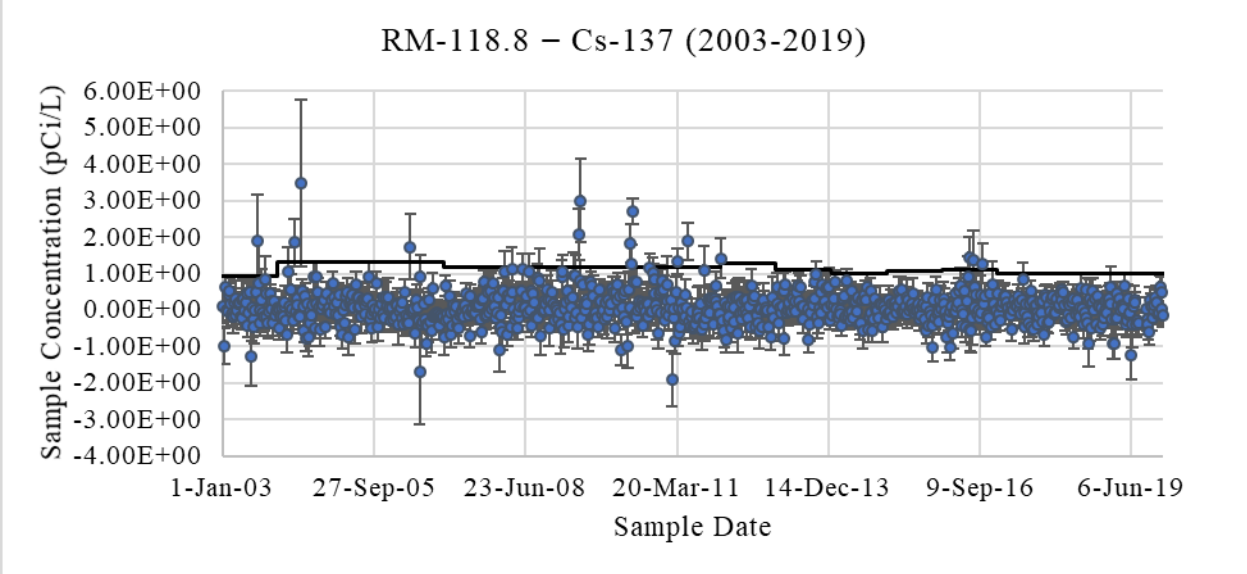

Figure B-2. SRS Offsite Savannah River Sampling Location "RM-118.8" Cs-137 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

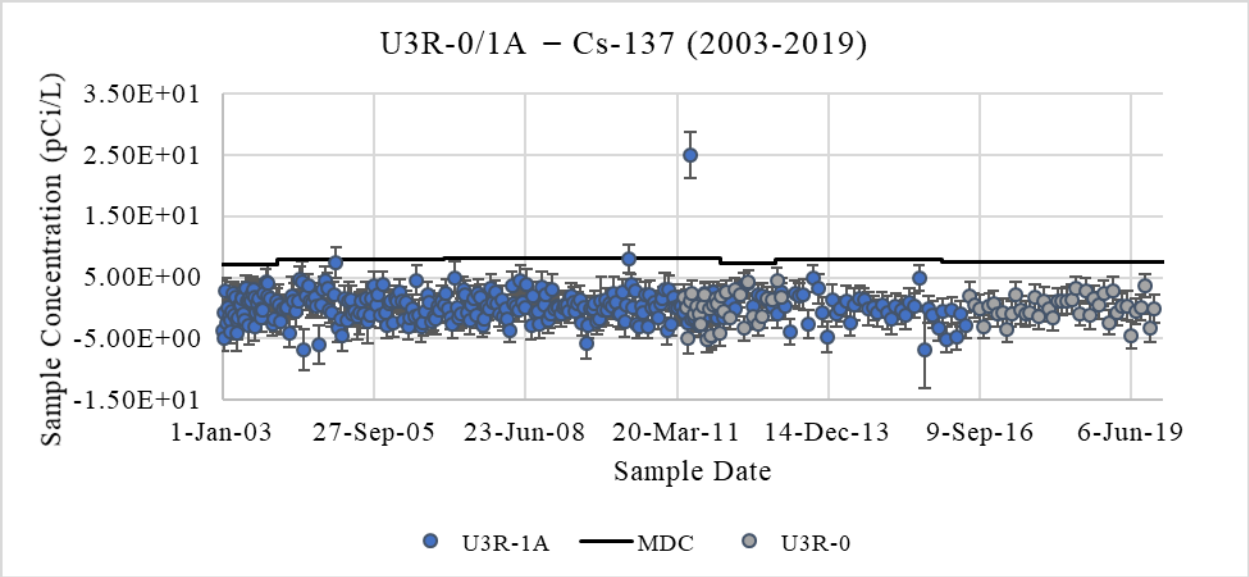

Figure B-3. SRS Onsite Sampling Locations "U3R-0/1A" Cs-137 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

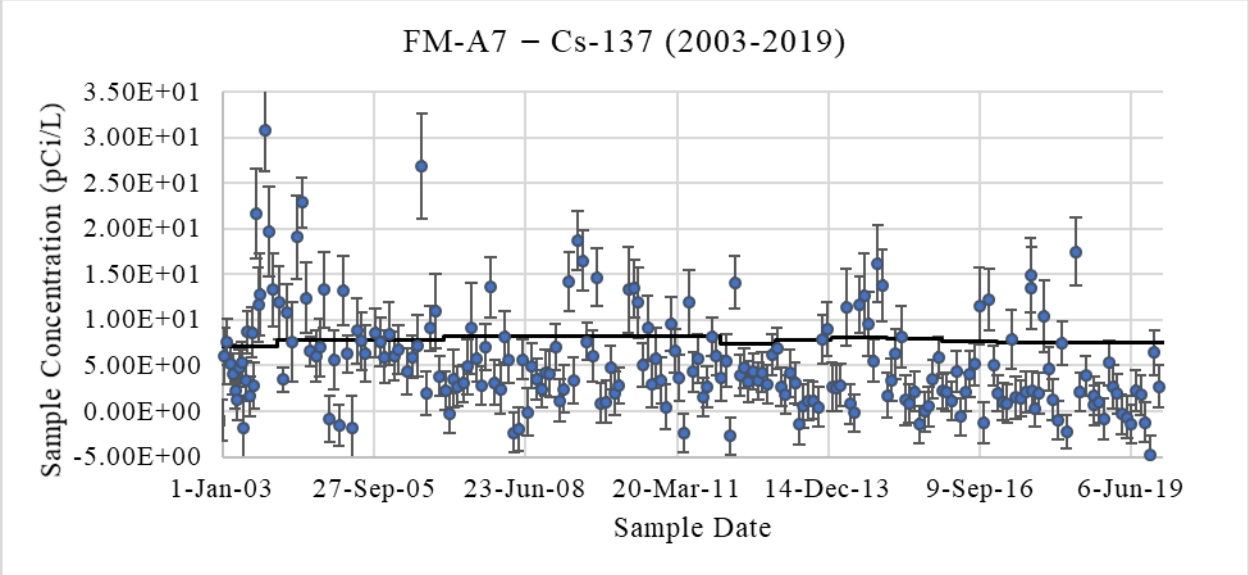

Figure B-4. SRS Onsite Stream Sampling Location "FM-A7" Cs-137 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

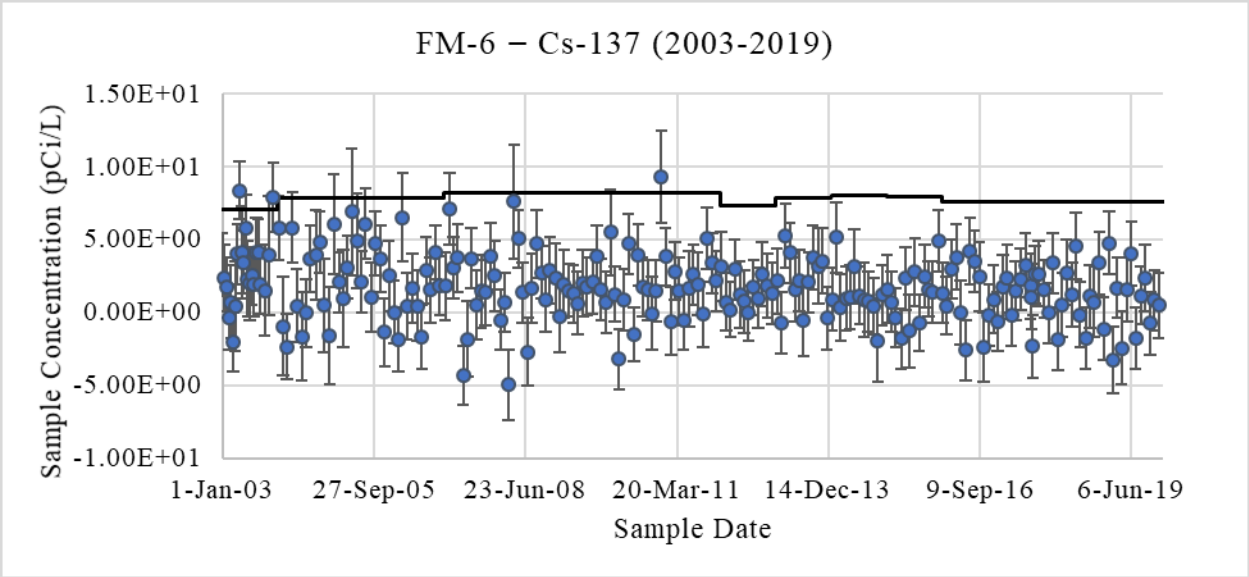

Figure B-5. SRS Onsite Stream Sampling Location "FM-6" Cs-137 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

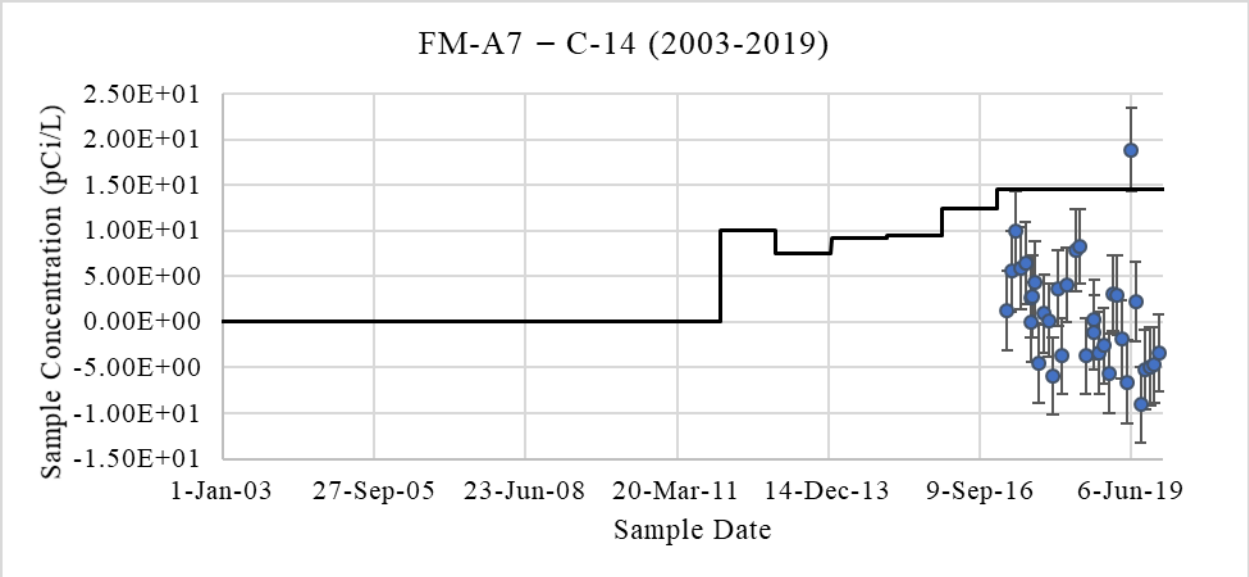

Figure B-6. SRS Onsite Stream Sampling Location "FM-A7" C-14 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

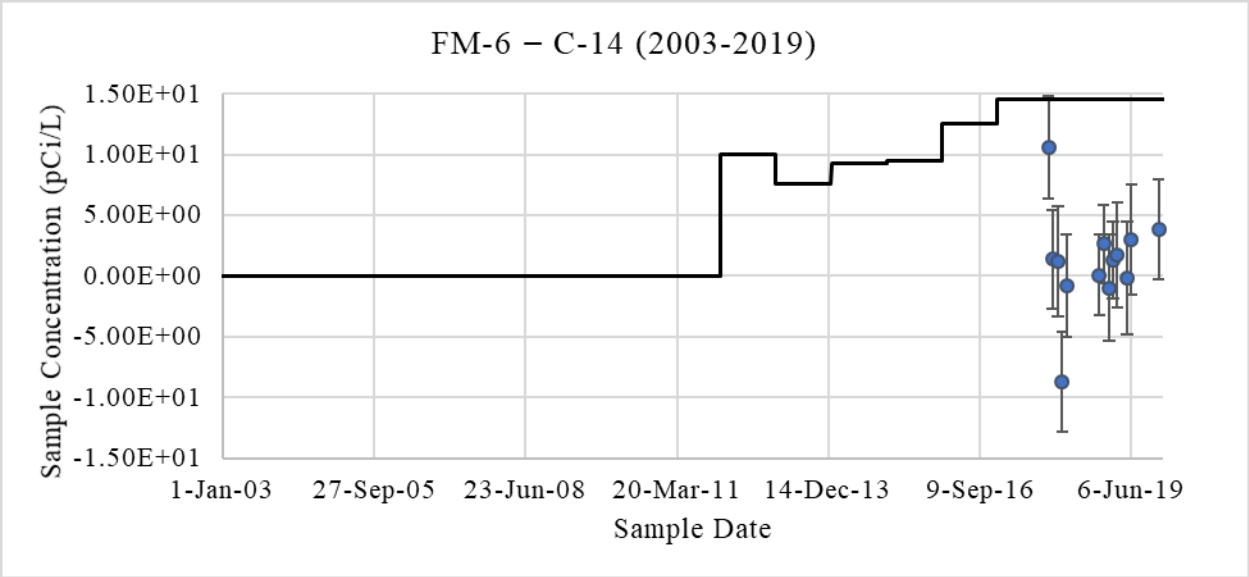

Figure B-7. SRS Onsite Stream Sampling Location "FM-6" C-14 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

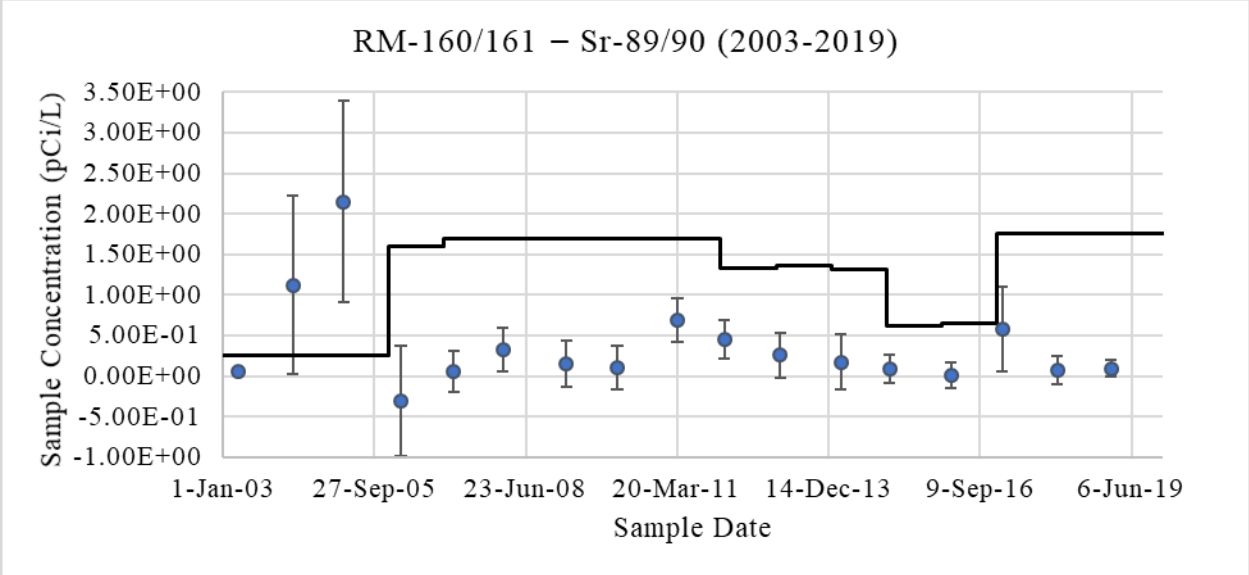

Figure B-8. SRS Offsite Savannah River Sampling Location "RM-160/161" Sr-89/90 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

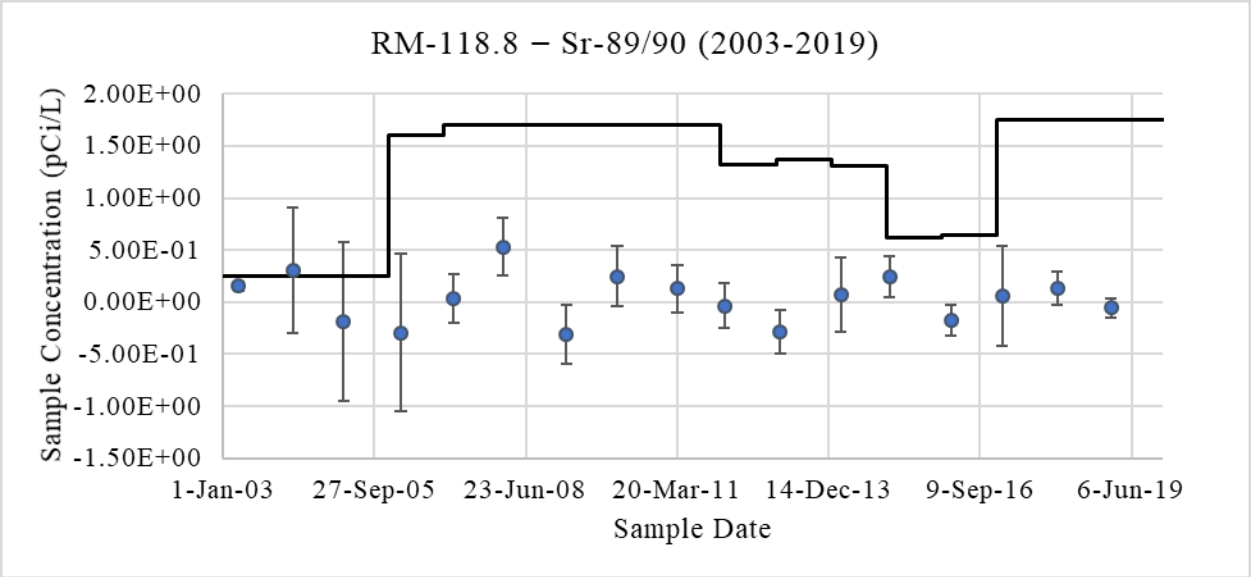

Figure B-9. SRS Offsite Savannah River Sampling Location "RM-118.8" Sr-89/90 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

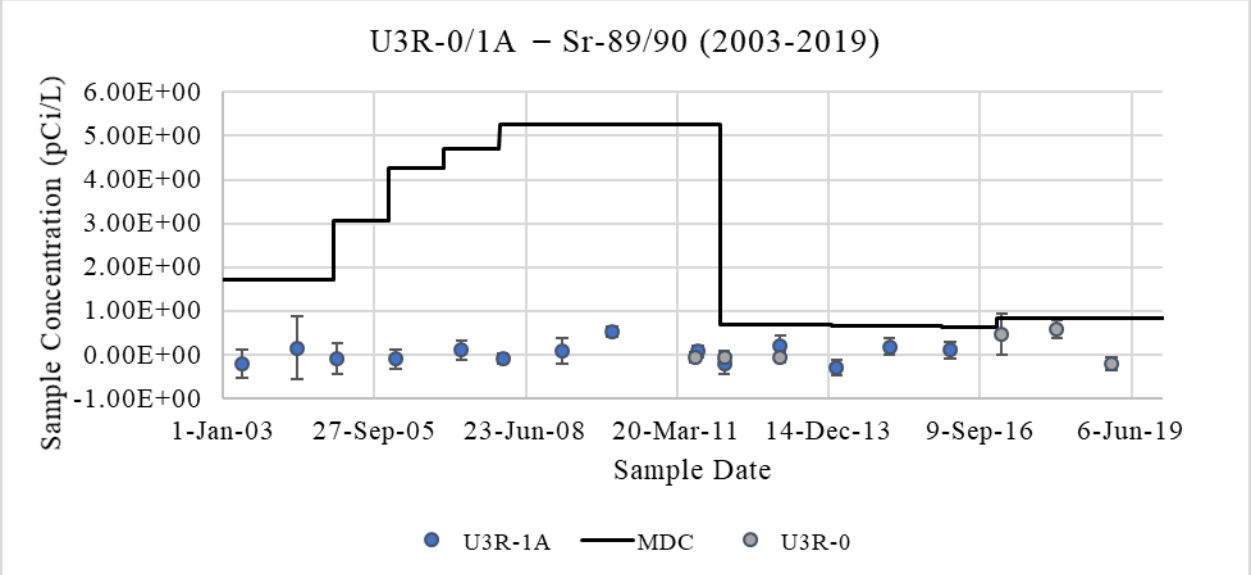

Figure B-10. SRS Onsite Sampling Locations "U3R-0/1A" Sr-89/90 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

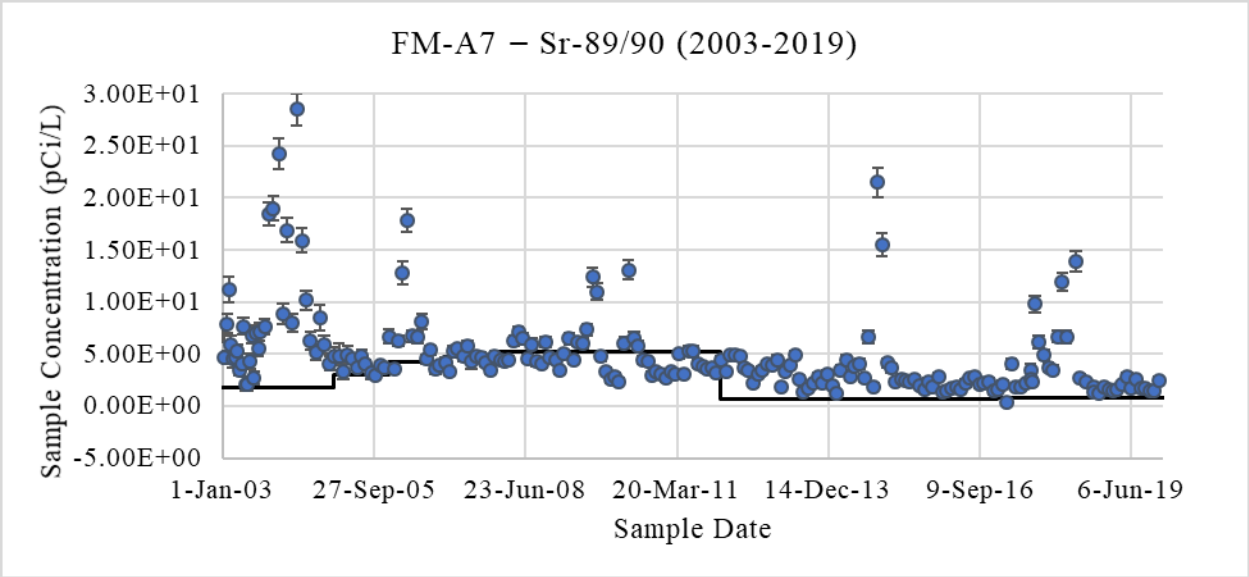

Figure B-11. SRS Onsite Stream Sampling Location "FM-A7" Sr-89/90 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

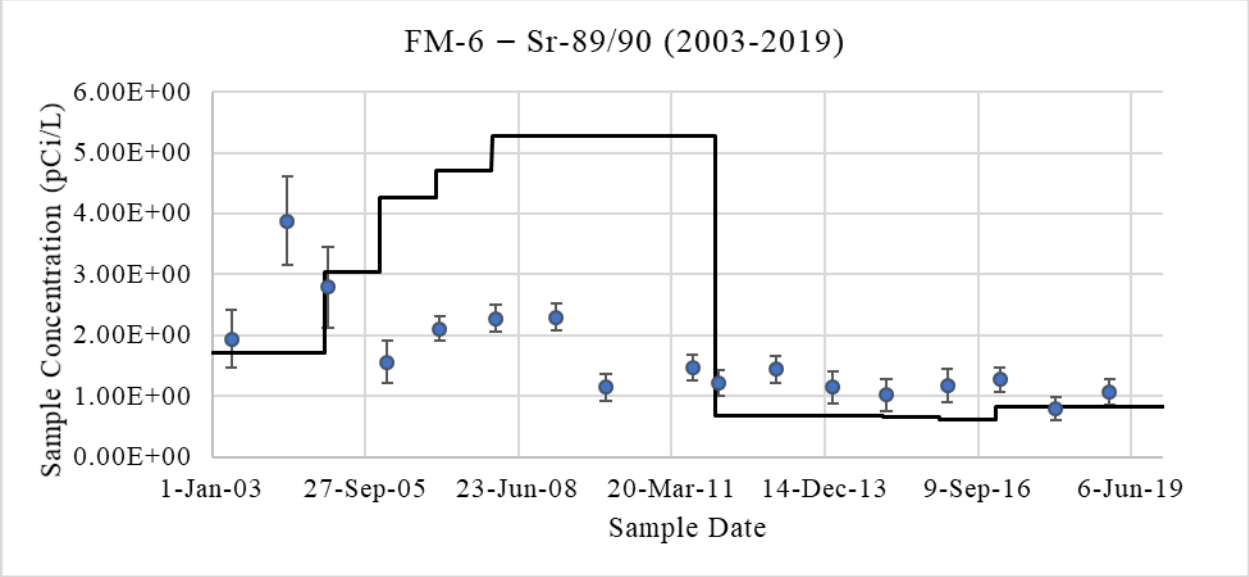

Figure B-12. SRS Onsite Stream Sampling Location "FM-6" Sr-89/90 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

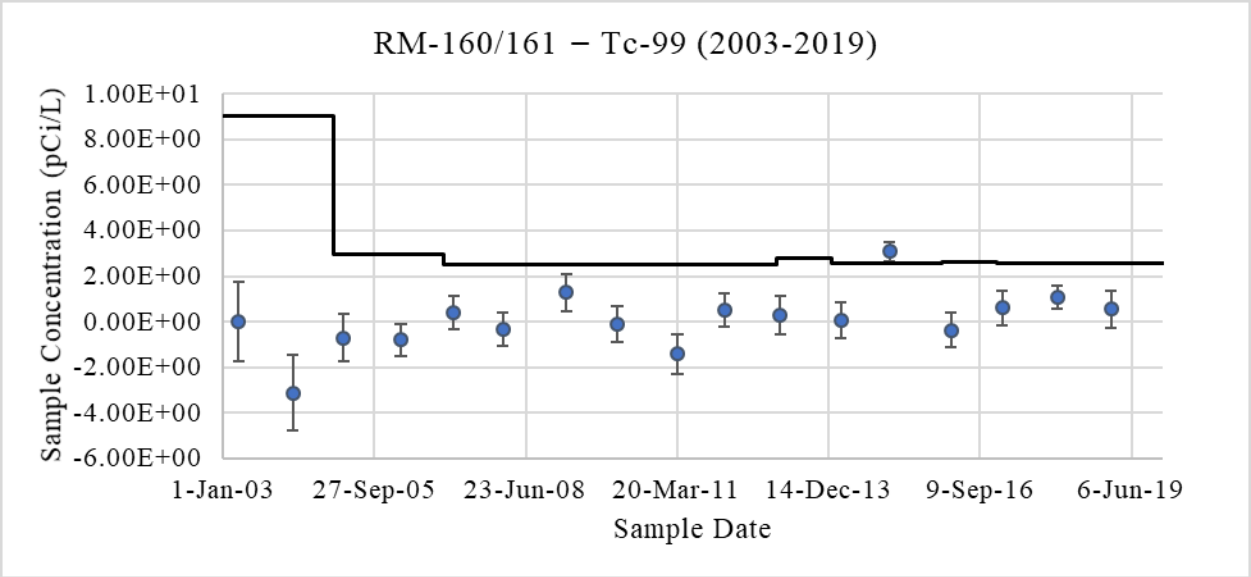

Figure B-13. SRS Offsite Savannah River Sampling Location "RM-160/161" Tc-99 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

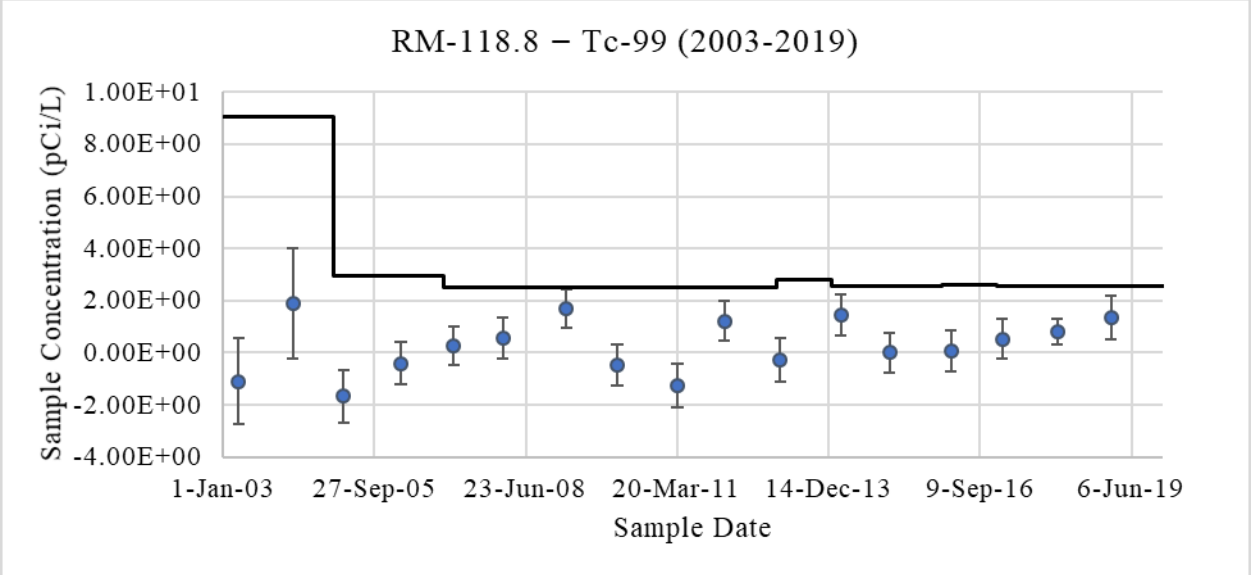

Figure B-14. SRS Offsite Savannah River Sampling Location "RM-118.8" Tc-99 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

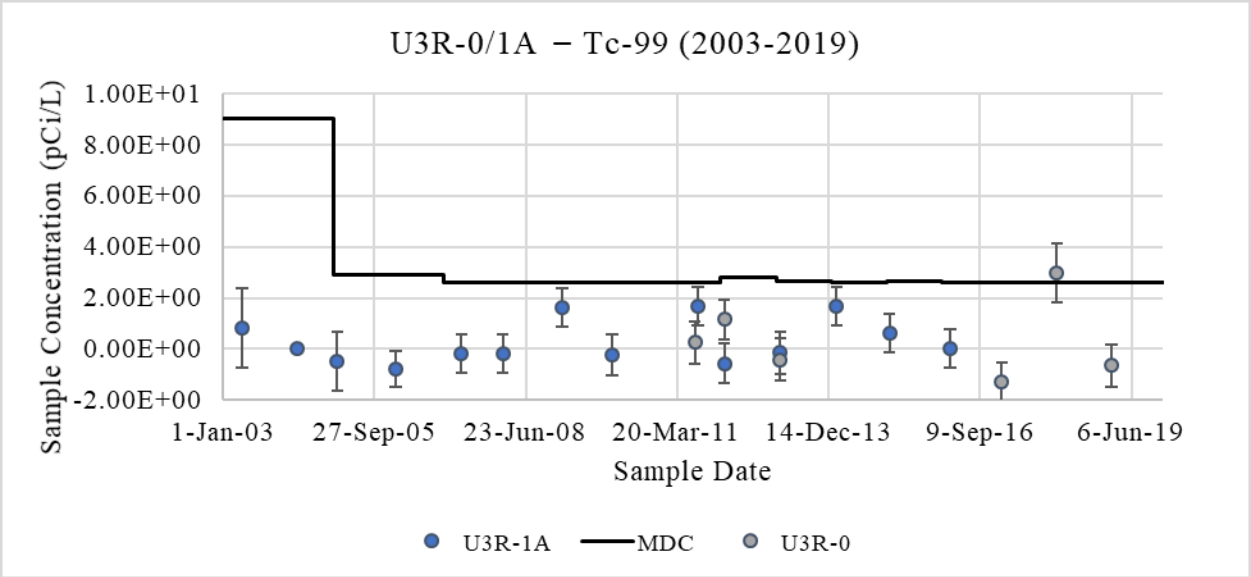

Figure B-15. SRS Onsite Sampling Locations "U3R-0/1A" Tc-99 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

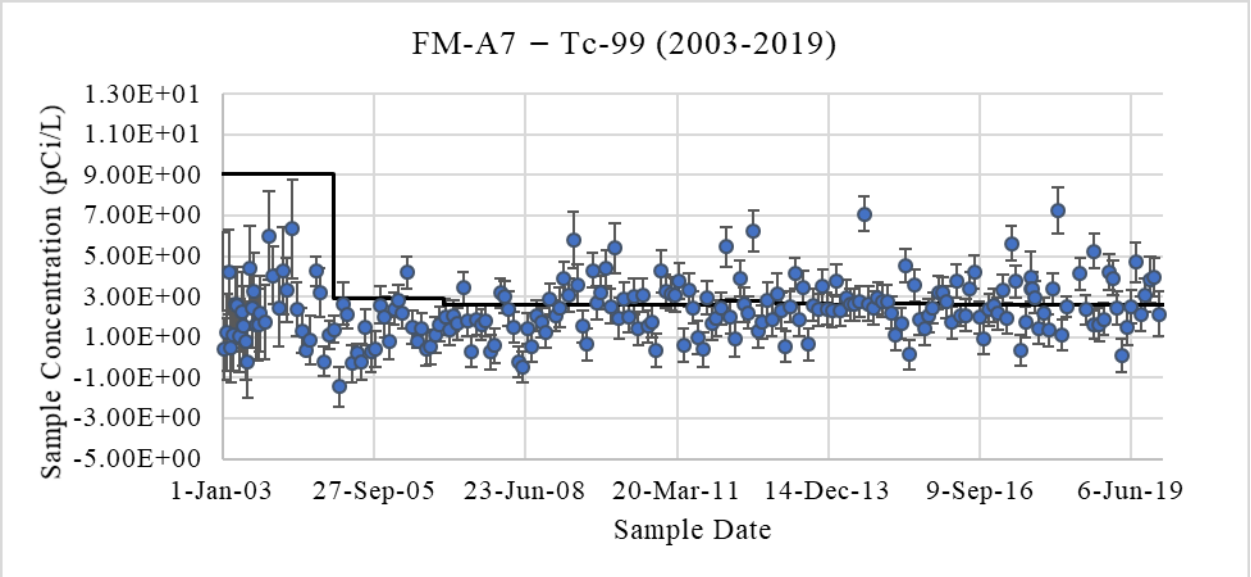

Figure B-16. SRS Onsite Stream Sampling Location "FM-A7" Tc-99 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

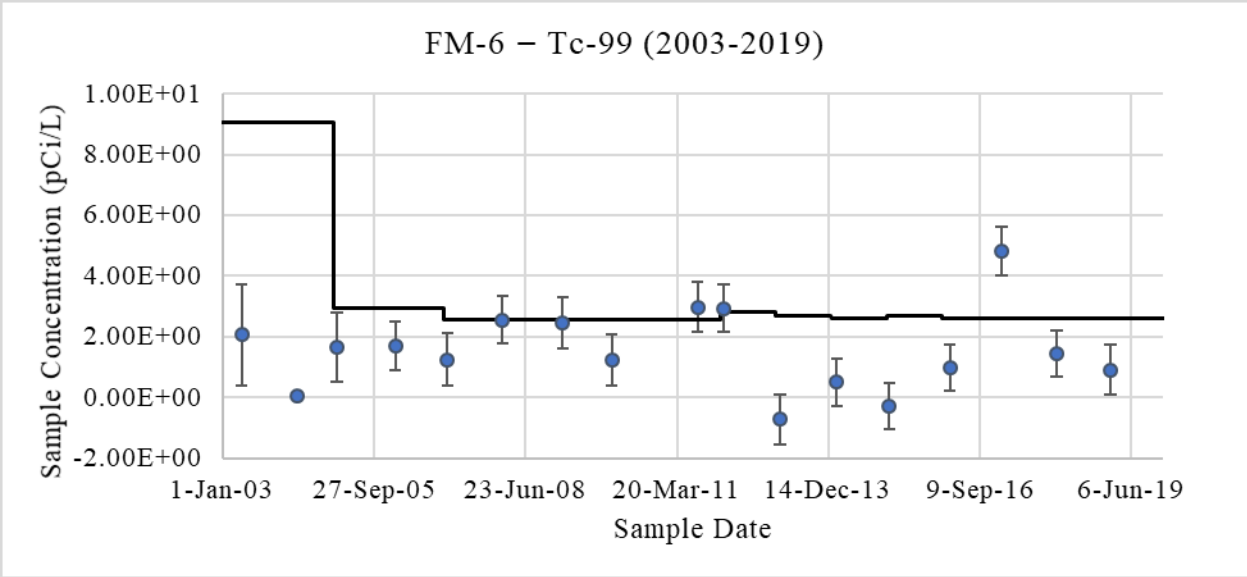

Figure B-17. SRS Onsite Stream Sampling Location "FM-6" Tc-99 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

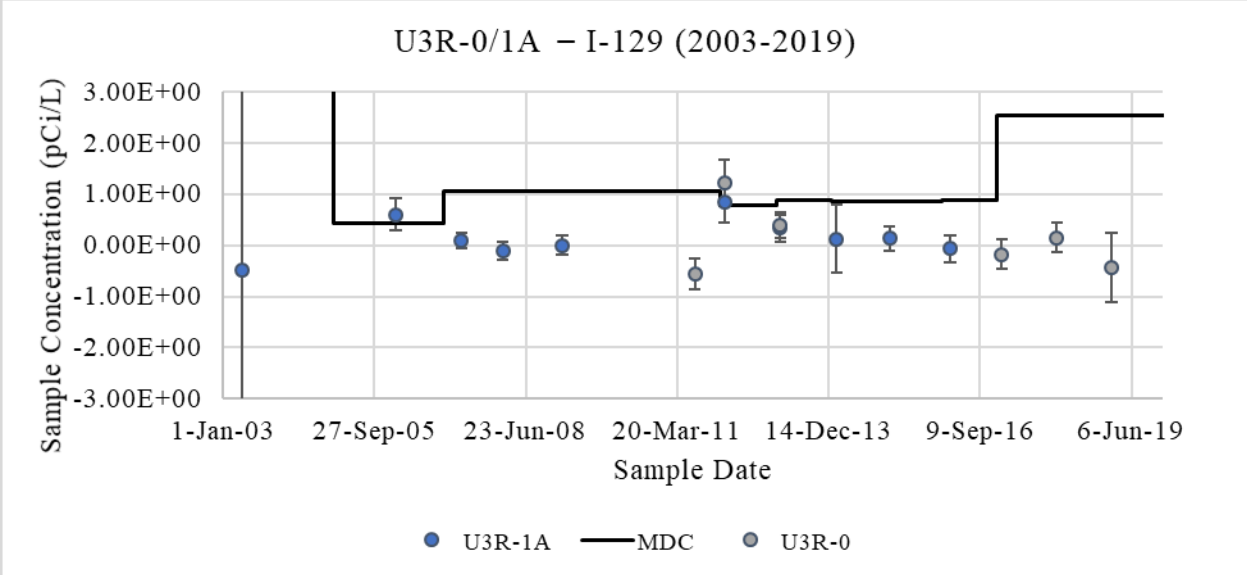

Figure B-18. SRS Onsite Sampling Locations "U3R-0/1A" I-129 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

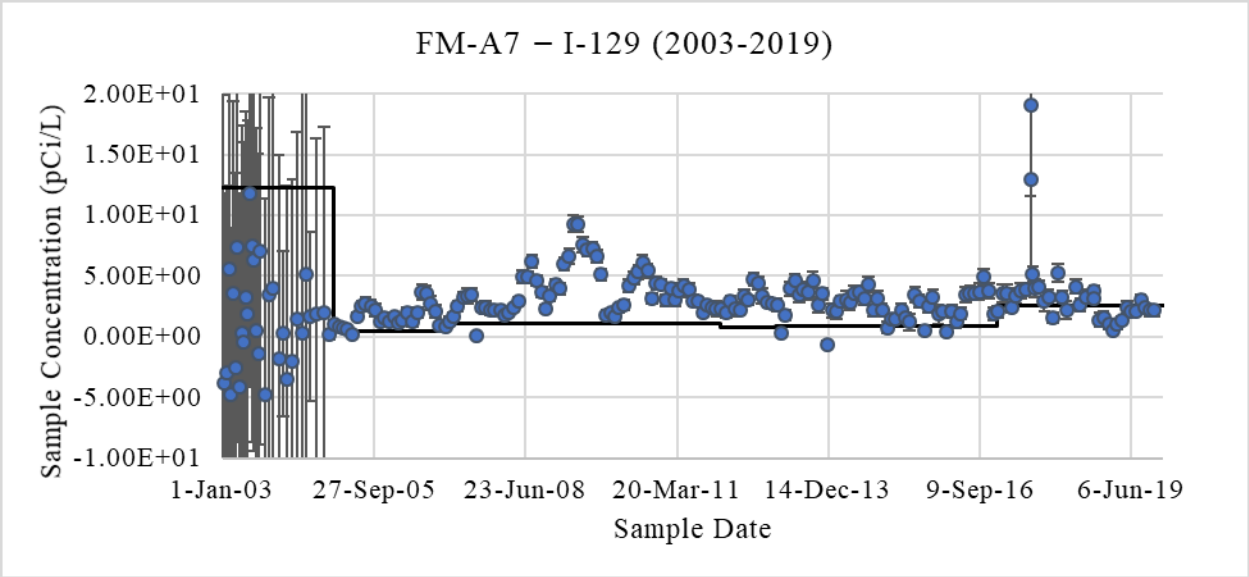

Figure B-19. SRS Onsite Stream Sampling Location "FM-A7" I-129 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

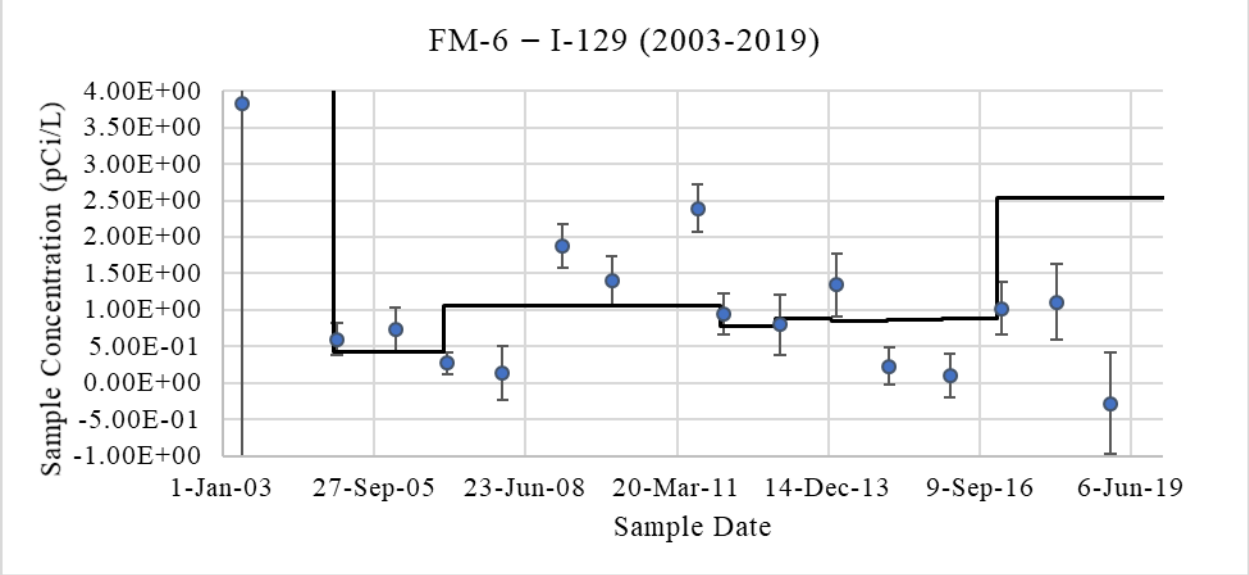

Figure B-20. SRS Onsite Stream Sampling Location "FM-6" I-129 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

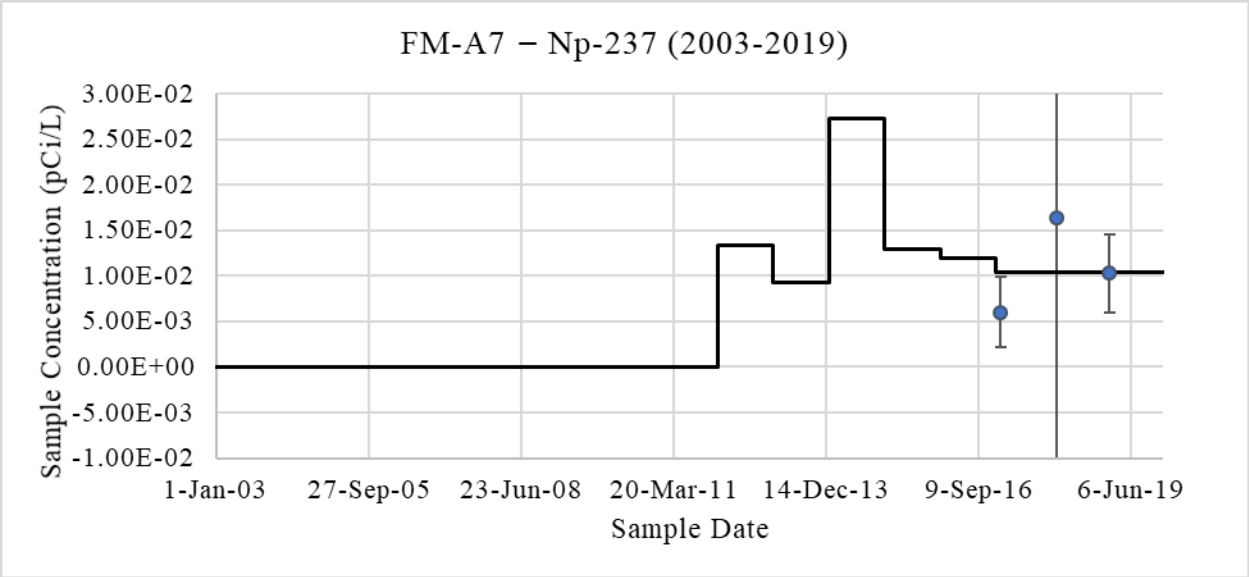

Figure B-21. SRS Onsite Stream Sampling Location "FM-A7" Np-237 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

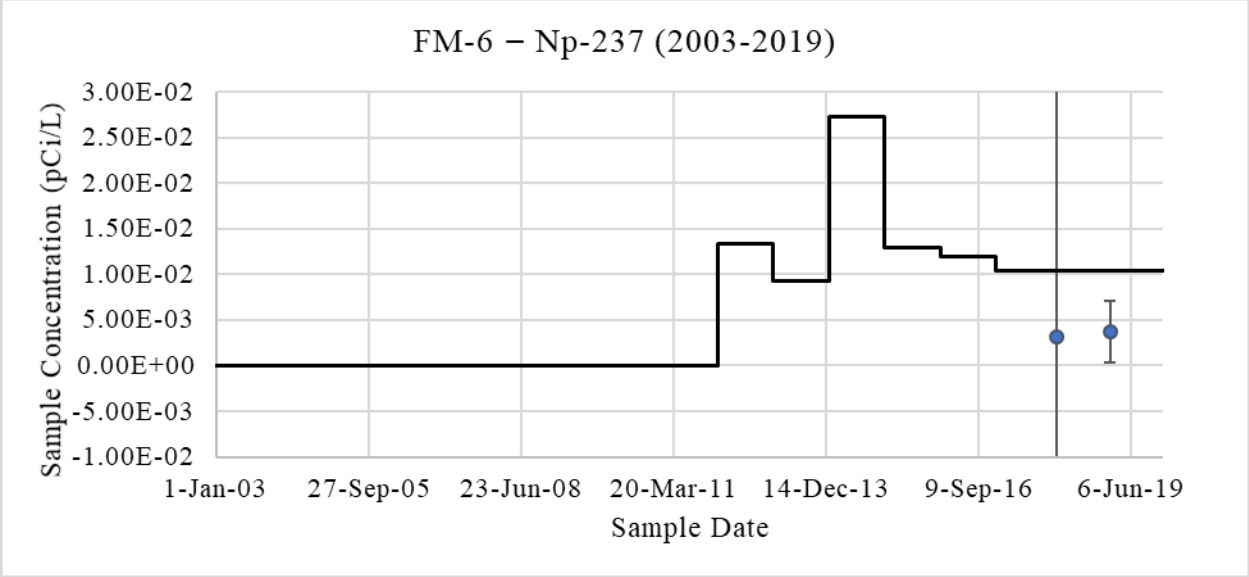

Figure B-22. SRS Onsite Stream Sampling Location "FM-6" Np-237 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

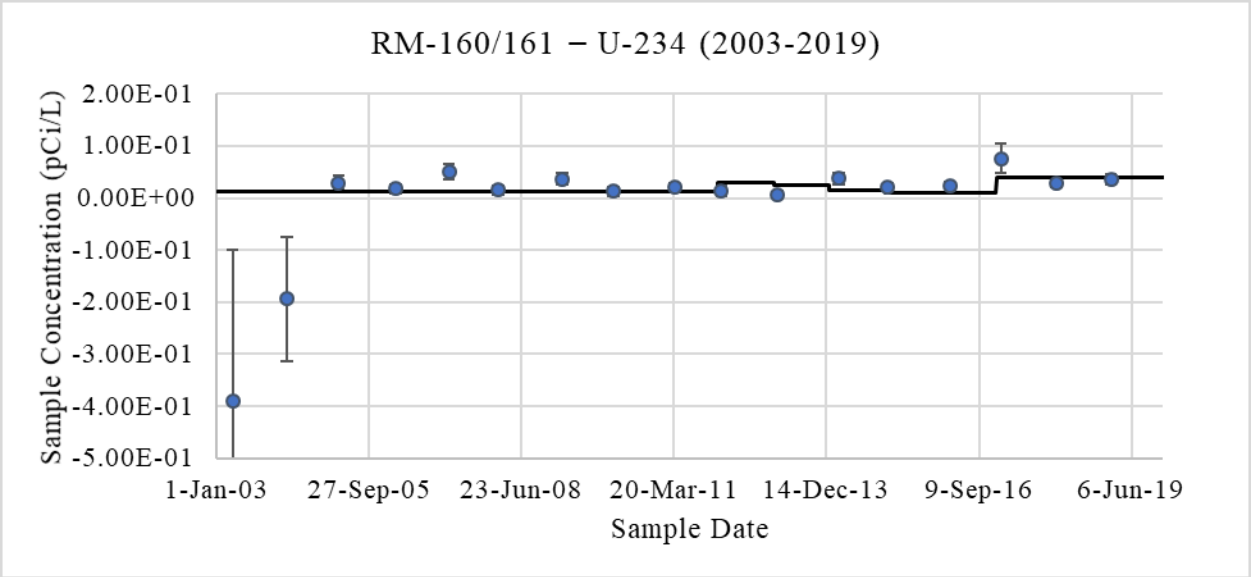

Figure B-23. SRS Offsite Savannah River Sampling Location "RM-160/161" U-234 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

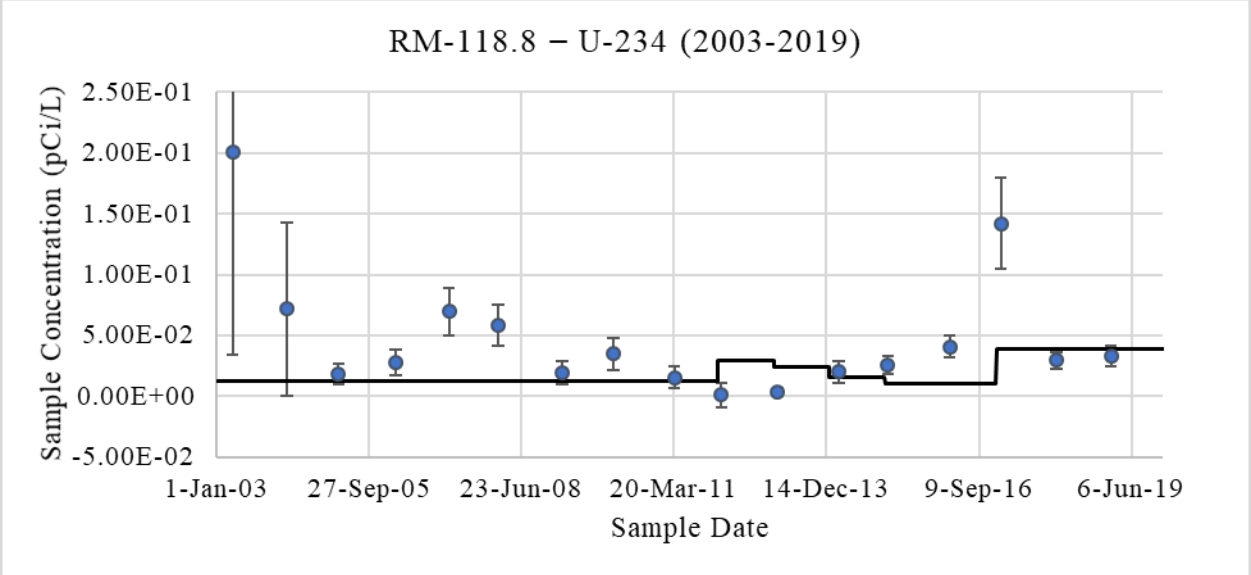

Figure B-24. SRS Offsite Savannah River Sampling Location "RM-118.8" U-234 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

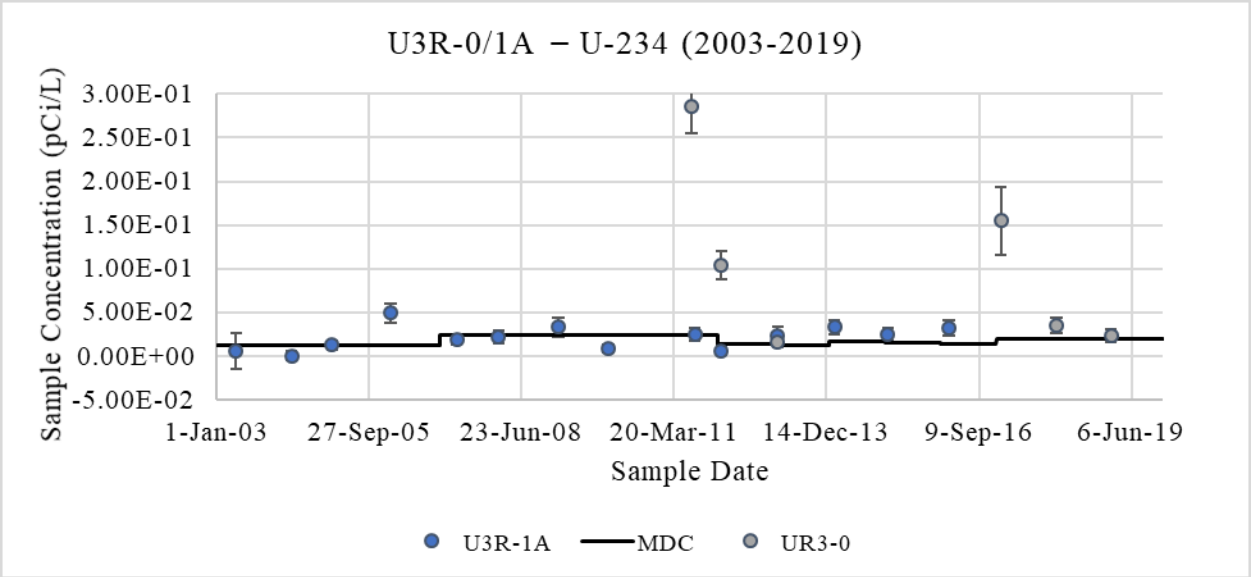

Figure B-25. SRS Onsite Sampling Locations "U3R-0/1A" U-234 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

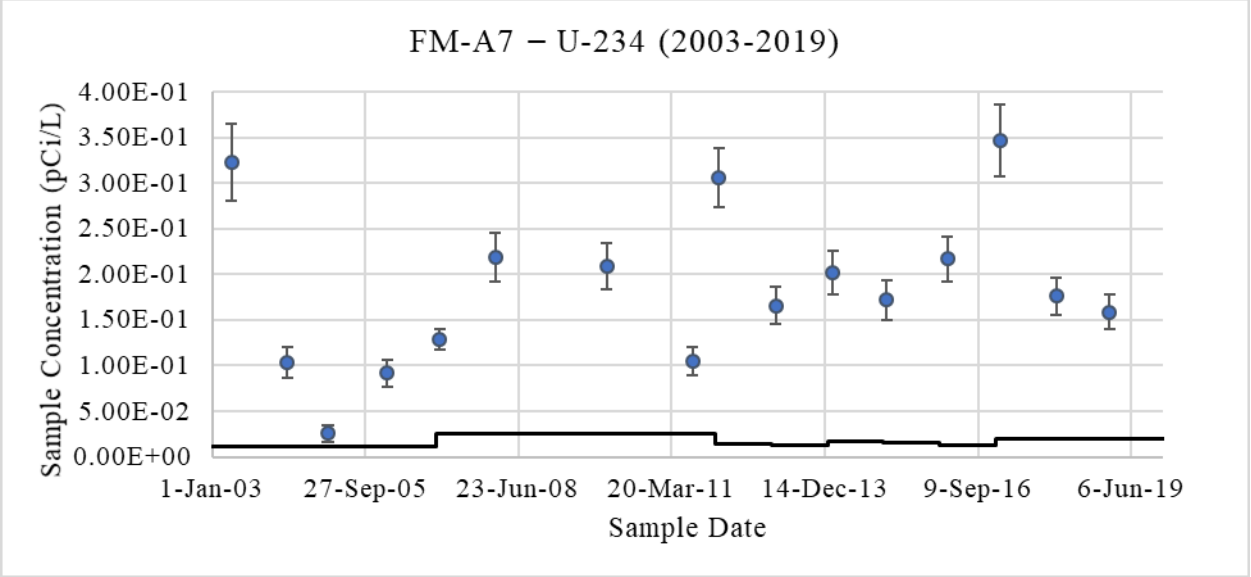

Figure B-26. SRS Onsite Stream Sampling Location "FM-A7" U-234 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

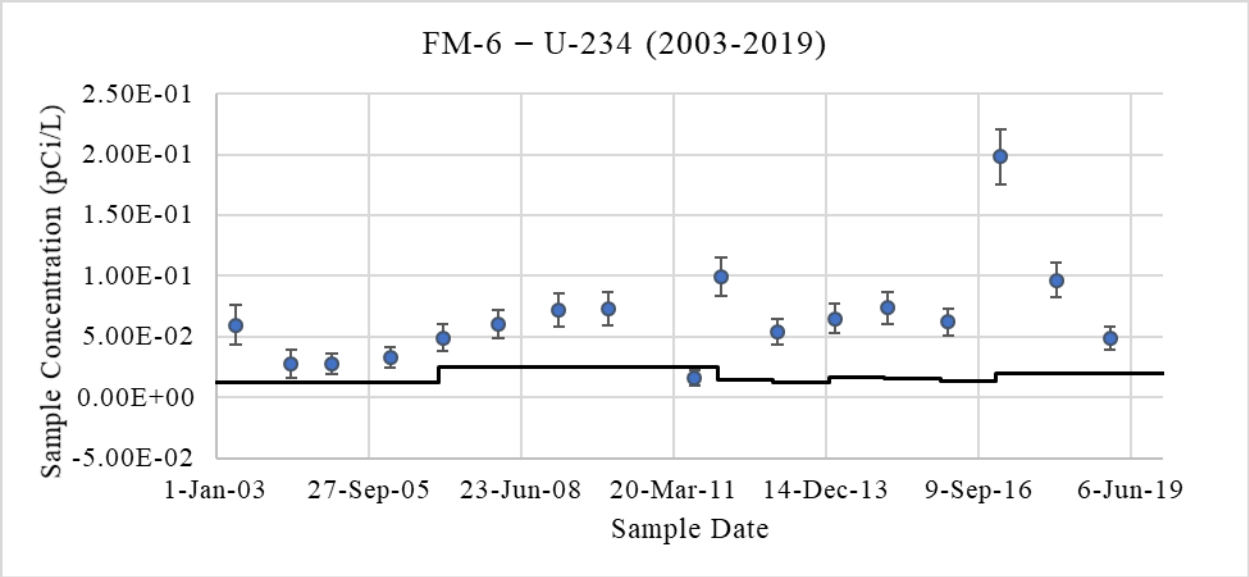

Figure B-27. SRS Onsite Stream Sampling Location "FM-6" U-234 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

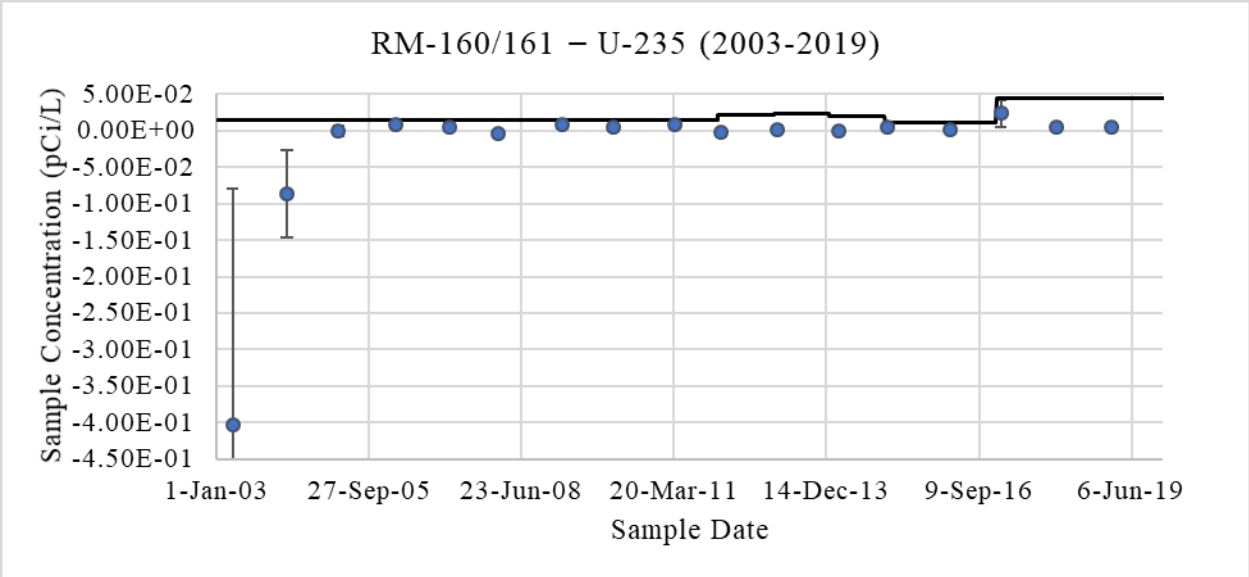

Figure B-28. SRS Offsite Savannah River Sampling Location "RM-160/161" U-235 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

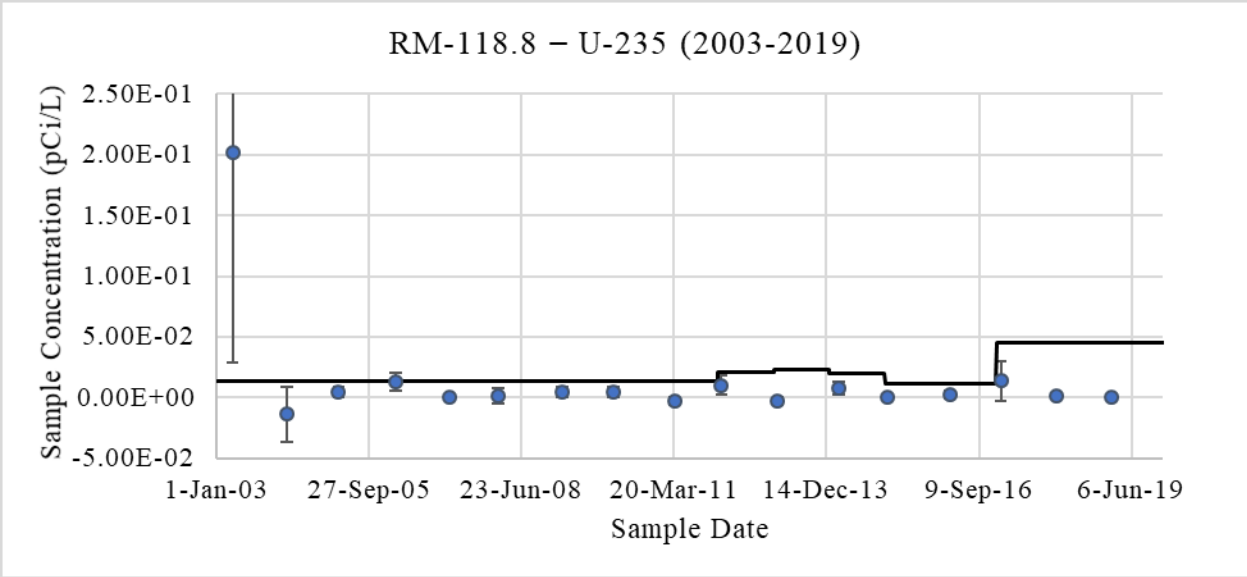

Figure B-29. SRS Offsite Savannah River Sampling Location "RM-118.8" U-235 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

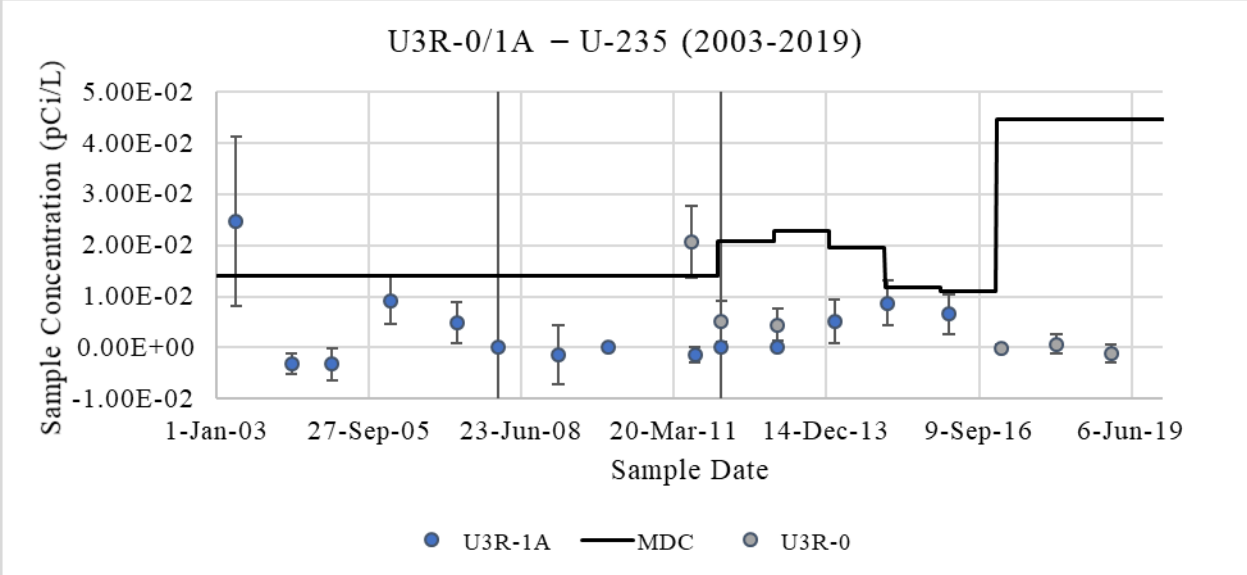

Figure B-30. SRS Onsite Sampling Locations "U3R-0/1A" U-235 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

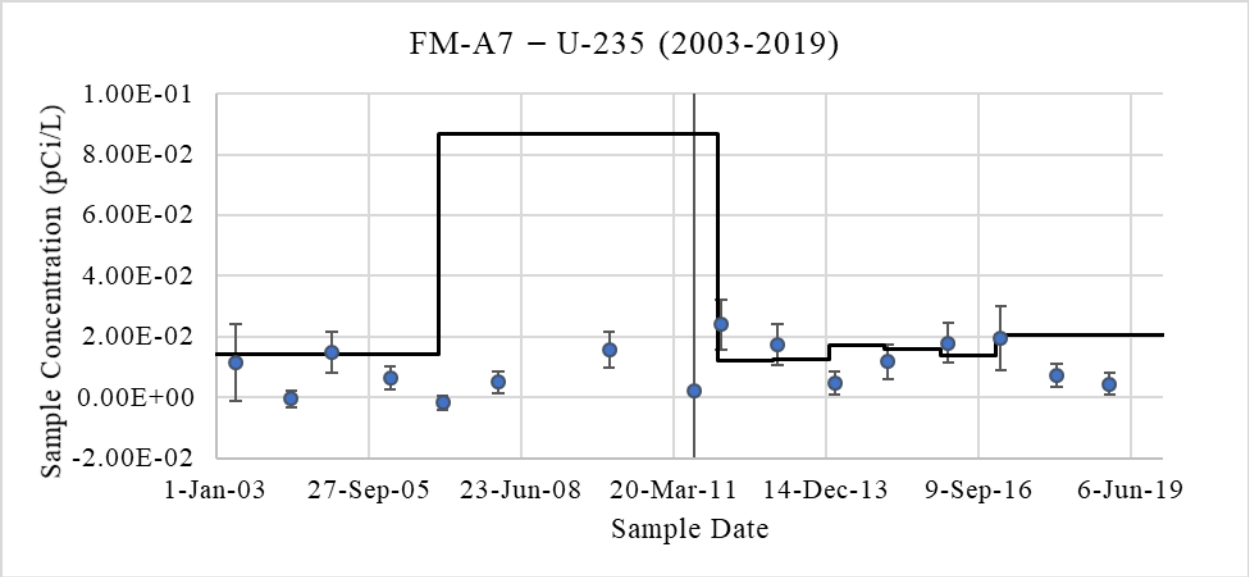

Figure B-31 . SRS Onsite Stream Sampling Location "FM-A7" U-235 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

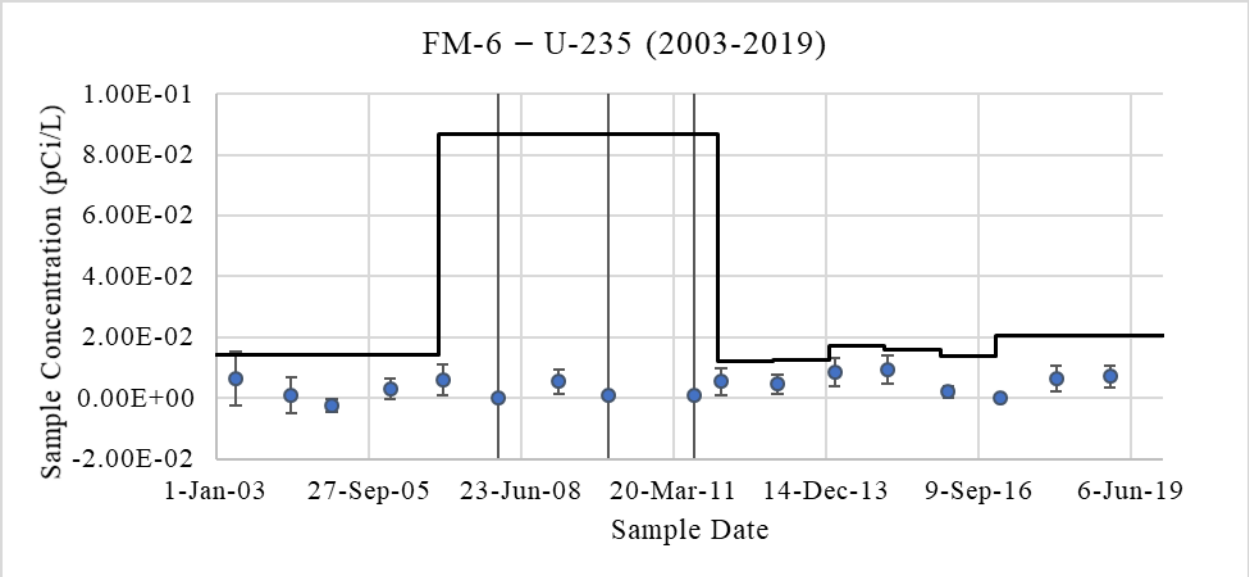

Figure B-32. SRS Onsite Stream Sampling Location "FM-6" U-235 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

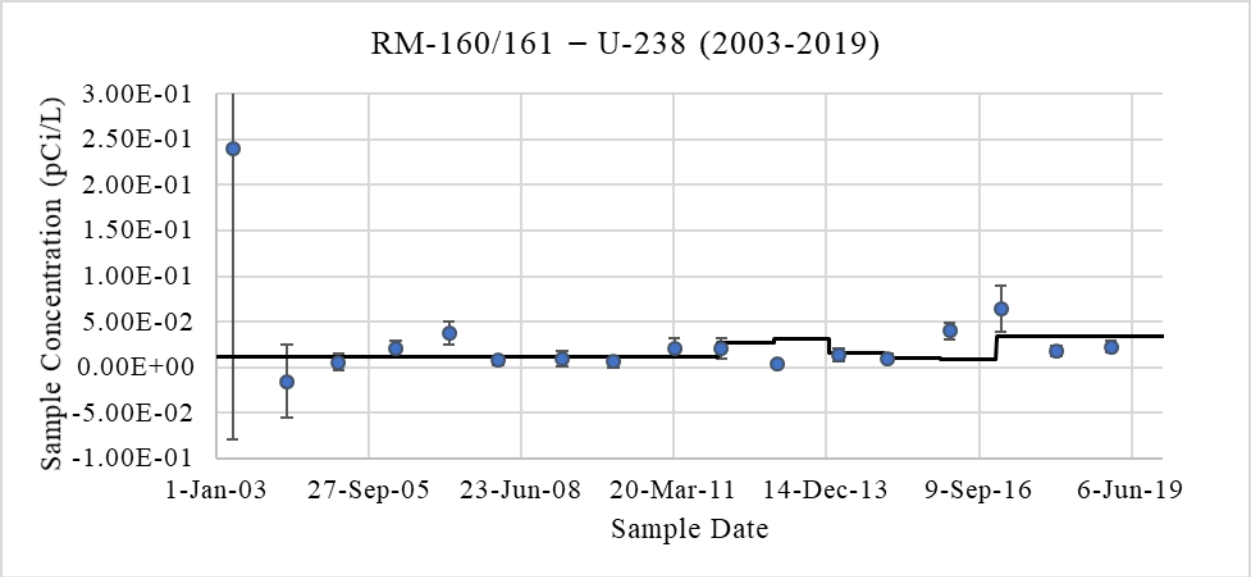

Figure B-33. SRS Offsite Savannah River Sampling Location "RM-160/161" U-238 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

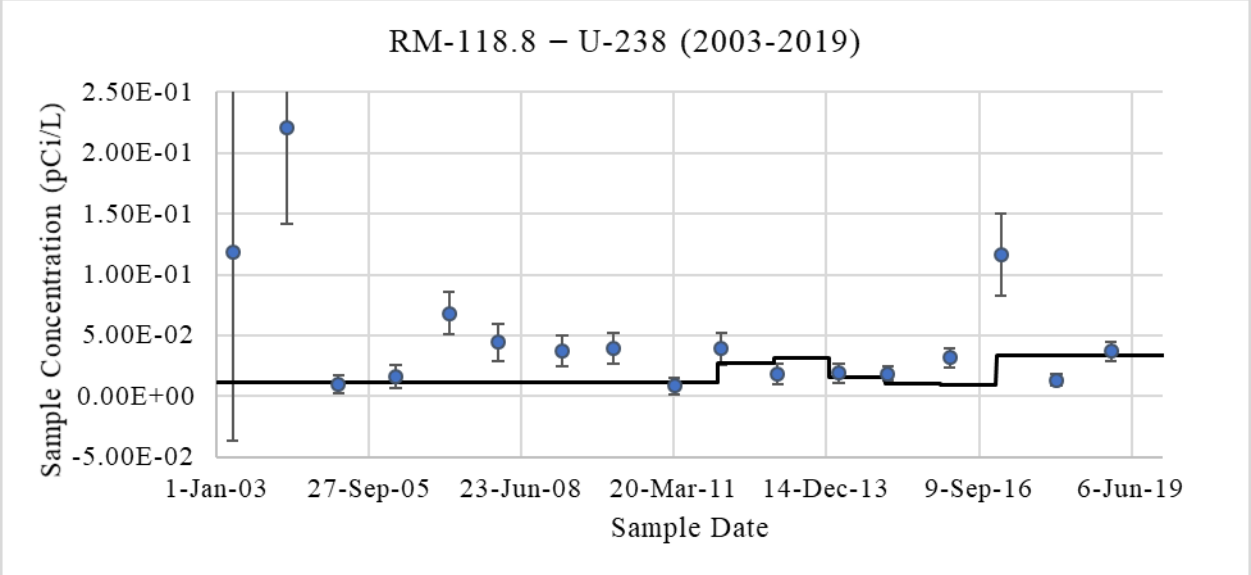

Figure B-34. SRS Offsite Savannah River Sampling Location "RM-118.8" U-238 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

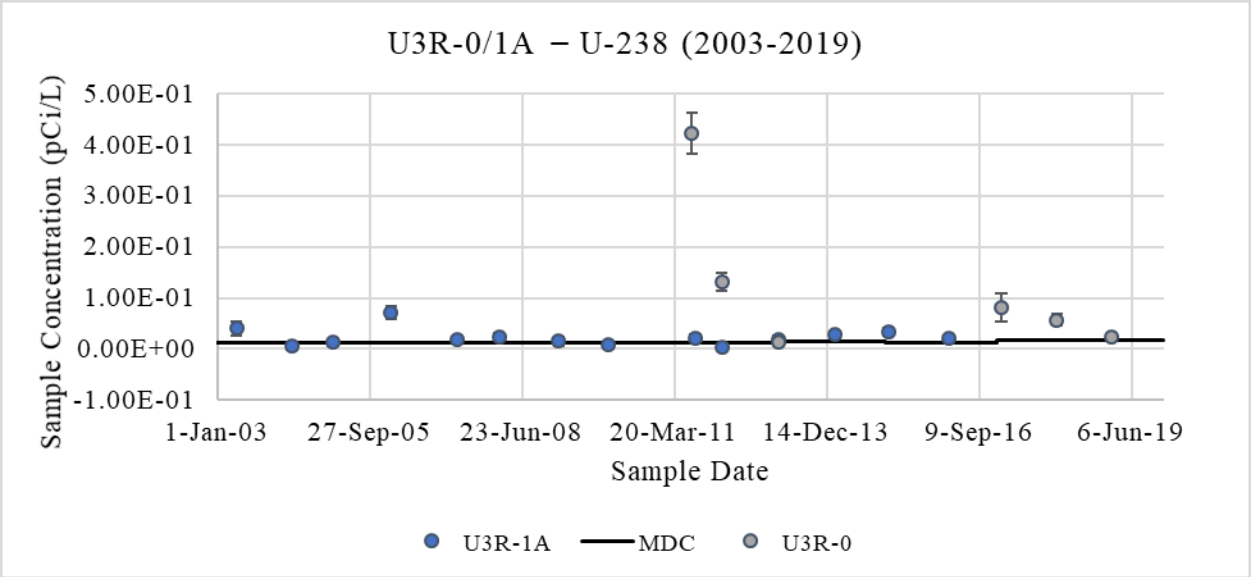

Figure B-35 . SRS Onsite Sampling Locations "U3R-0/1A" U-238 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

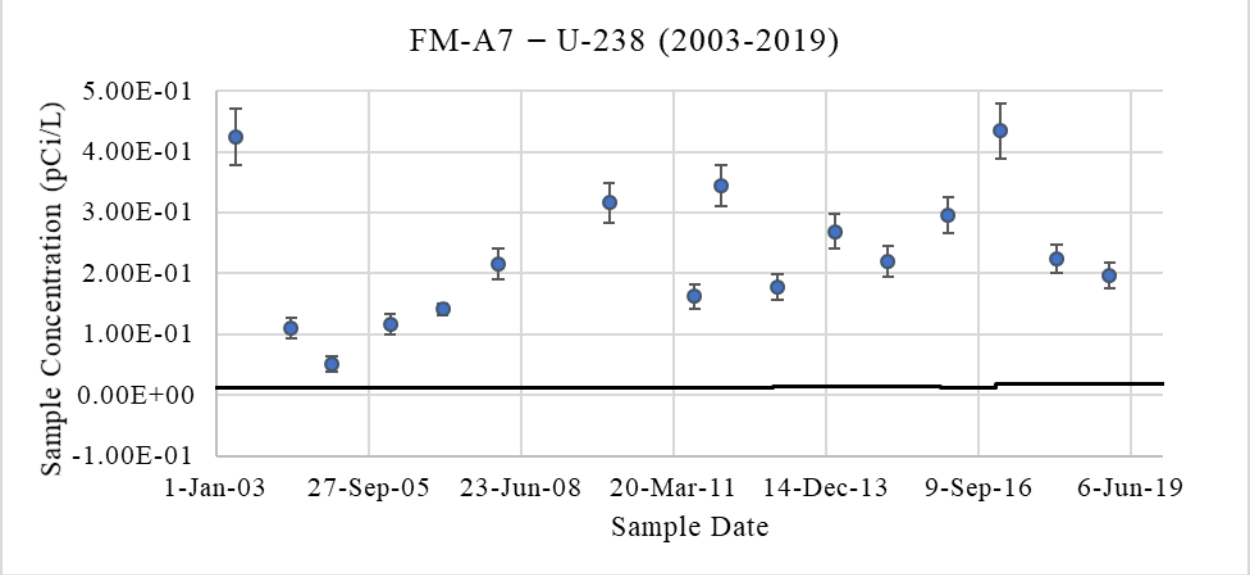

Figure B-36 . SRS Onsite Stream Sampling Location "FM-A7" U-238 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

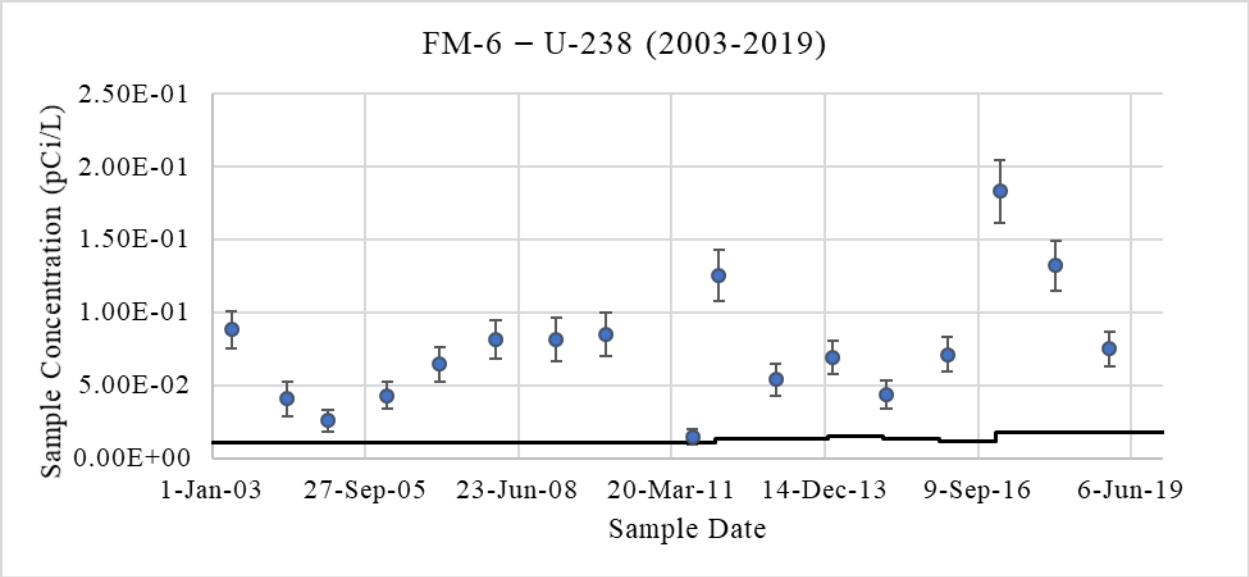

Figure B-37. SRS Onsite Stream Sampling Location "FM-6" U-238 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

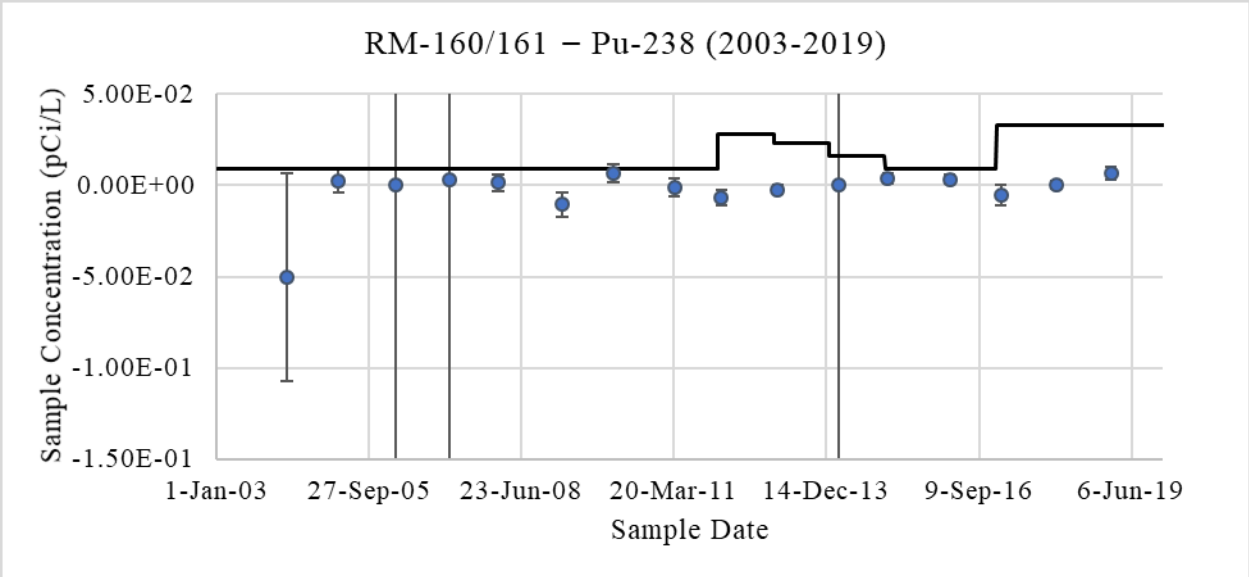

Figure B-38. SRS Offsite Savannah River Sampling Location "RM-160/161" Pu-238 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

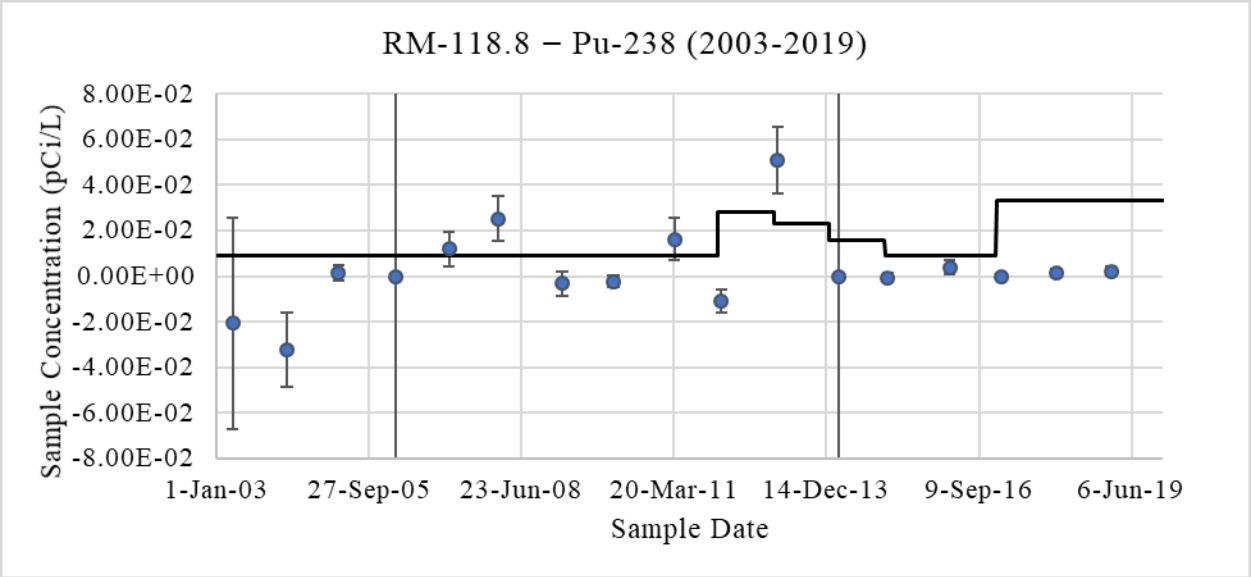

Figure B-39. SRS Offsite Savannah River Sampling Location "RM-118.8" Pu-238 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

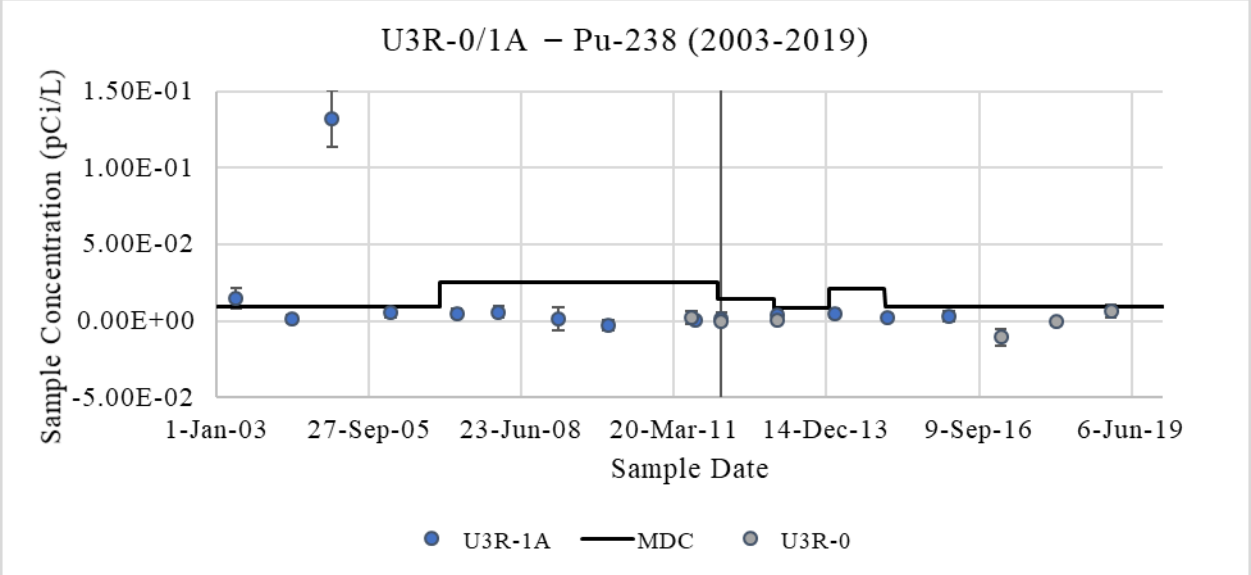

Figure B-40. SRS Onsite Sampling Locations "U3R-0/1A" Pu-238 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

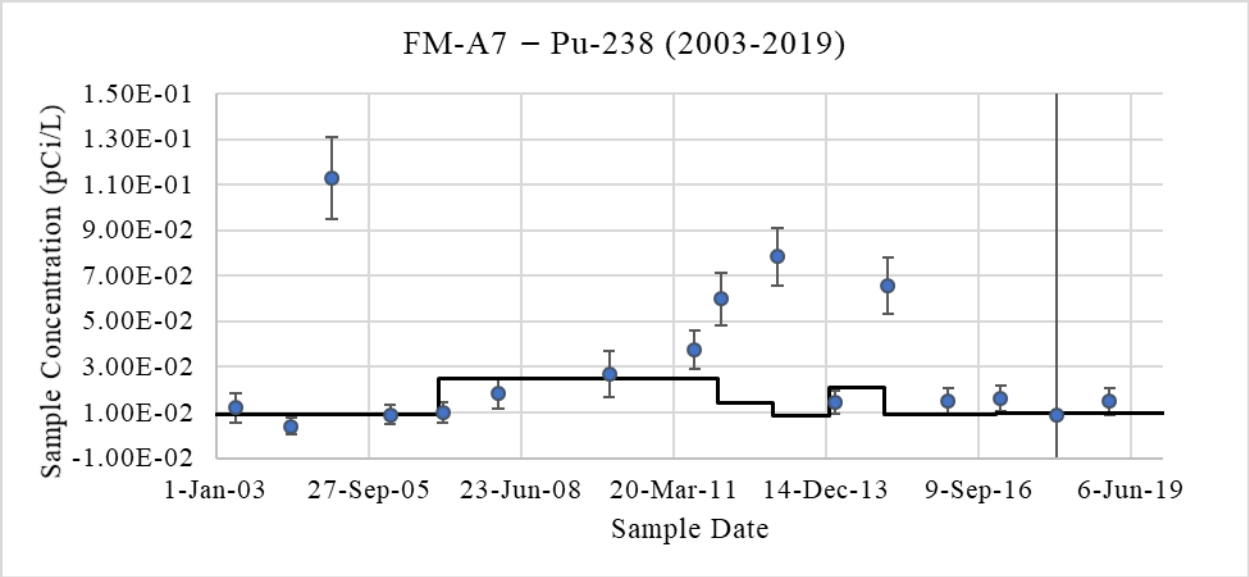

Figure B-41. SRS Onsite Stream Sampling Location "FM-A7" Pu-238 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

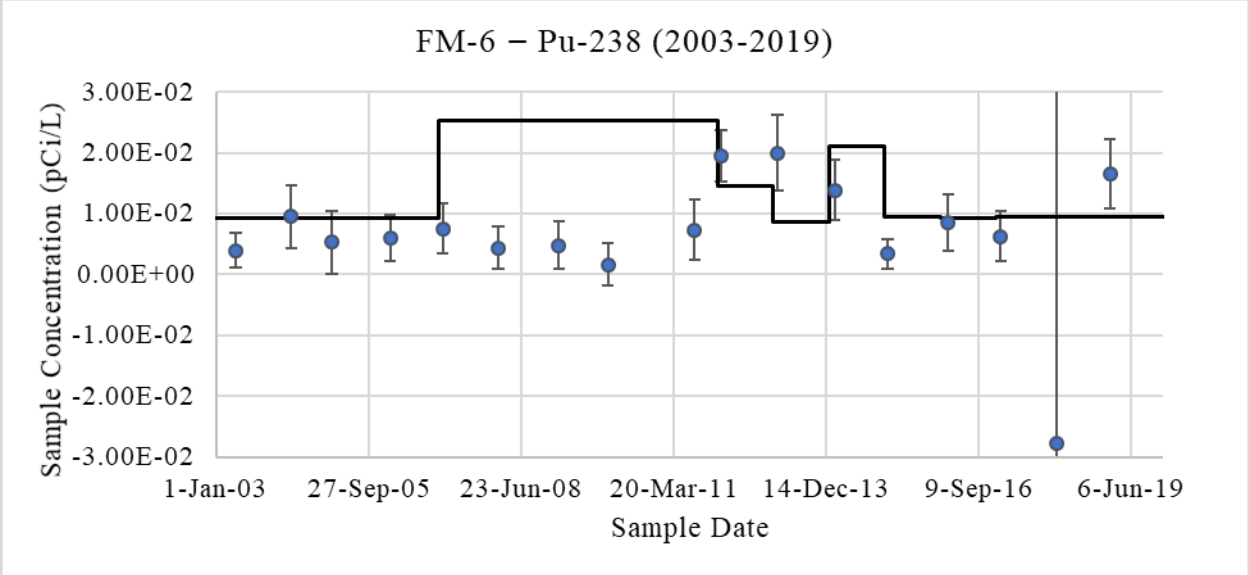

Figure B-42. SRS Onsite Stream Sampling Location "FM-6" Pu-238 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

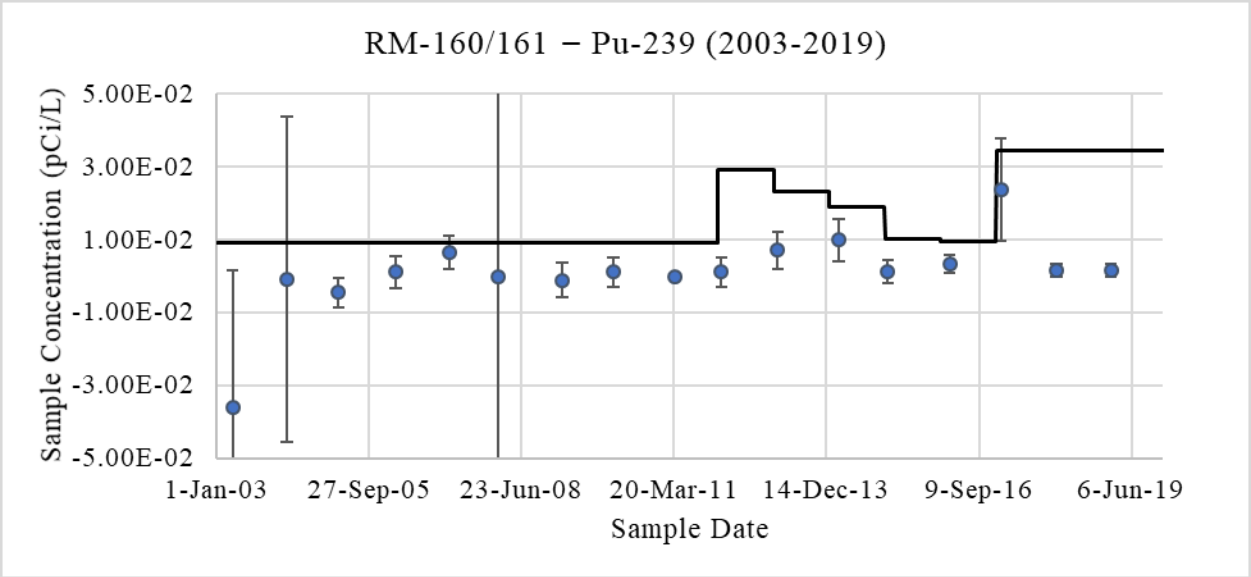

Figure B-43. SRS Offsite Savannah River Sampling Location "RM-160/161" Pu-239 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

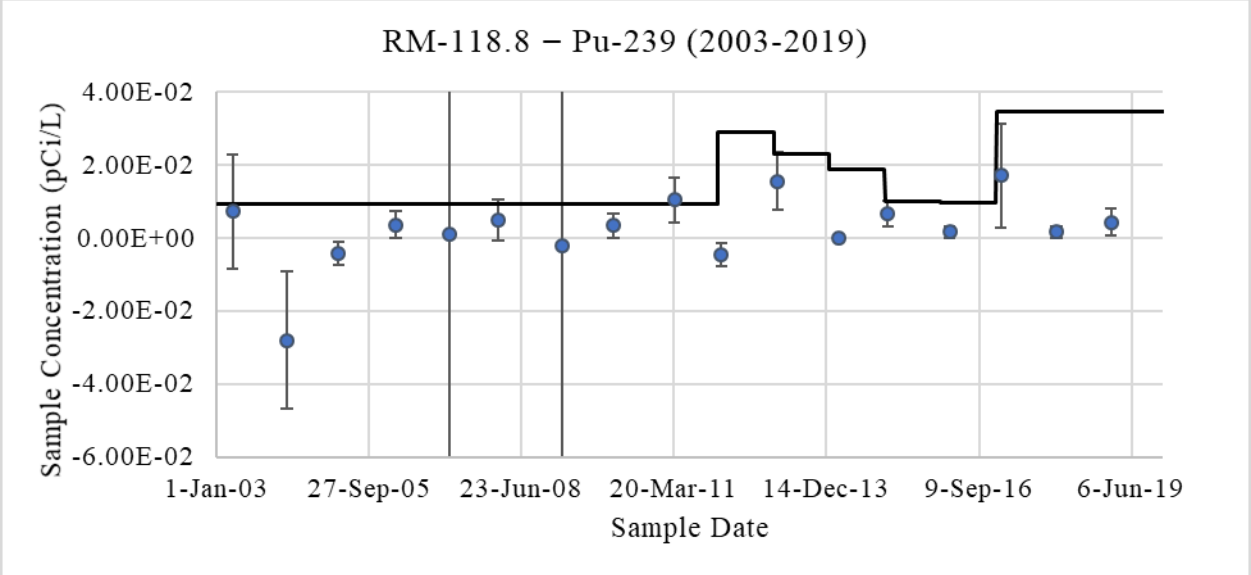

Figure B-44. SRS Offsite Savannah River Sampling Location "RM-118.8" Pu-239 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

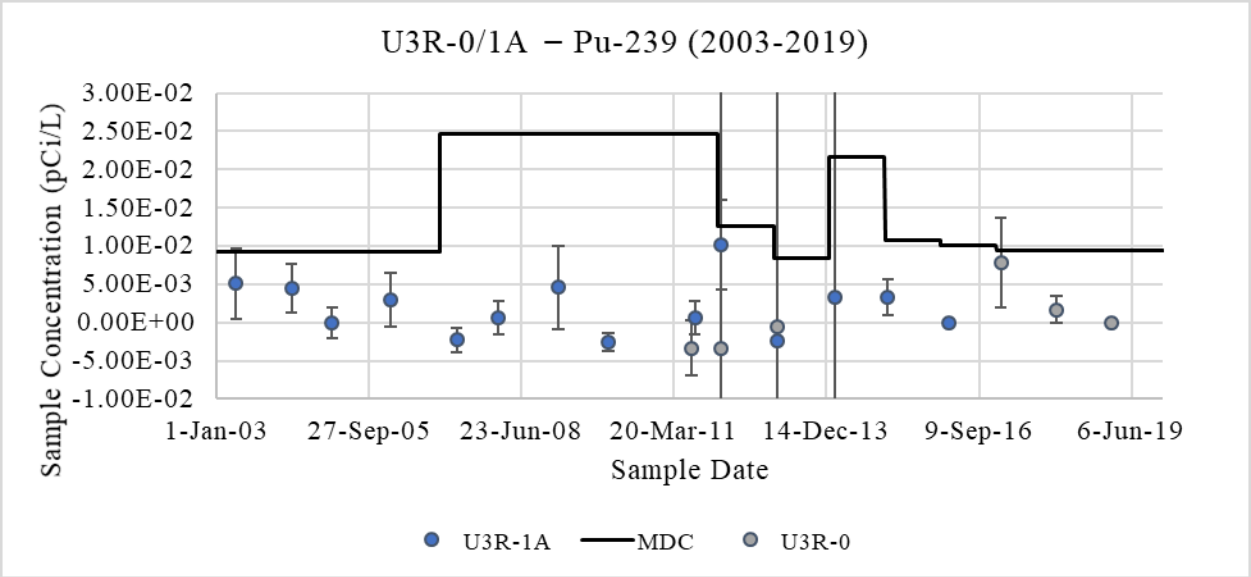

Figure B-45. SRS Onsite Sampling Locations "U3R-0/1A" Pu-239 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

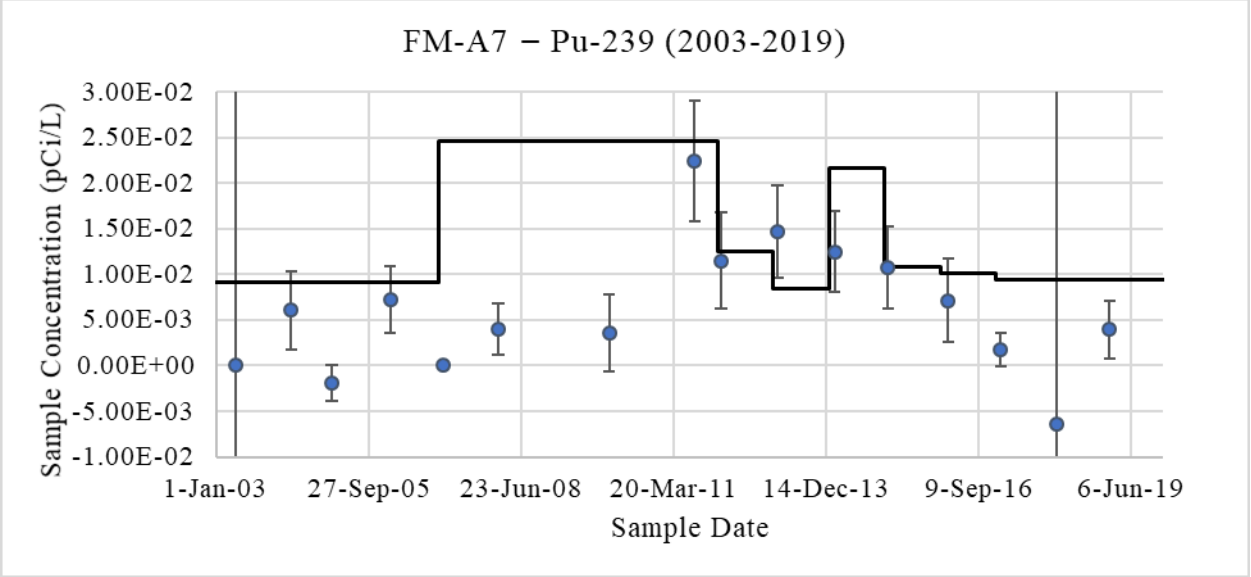

Figure B-46. SRS Onsite Stream Sampling Location "FM-A7" Pu-239 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

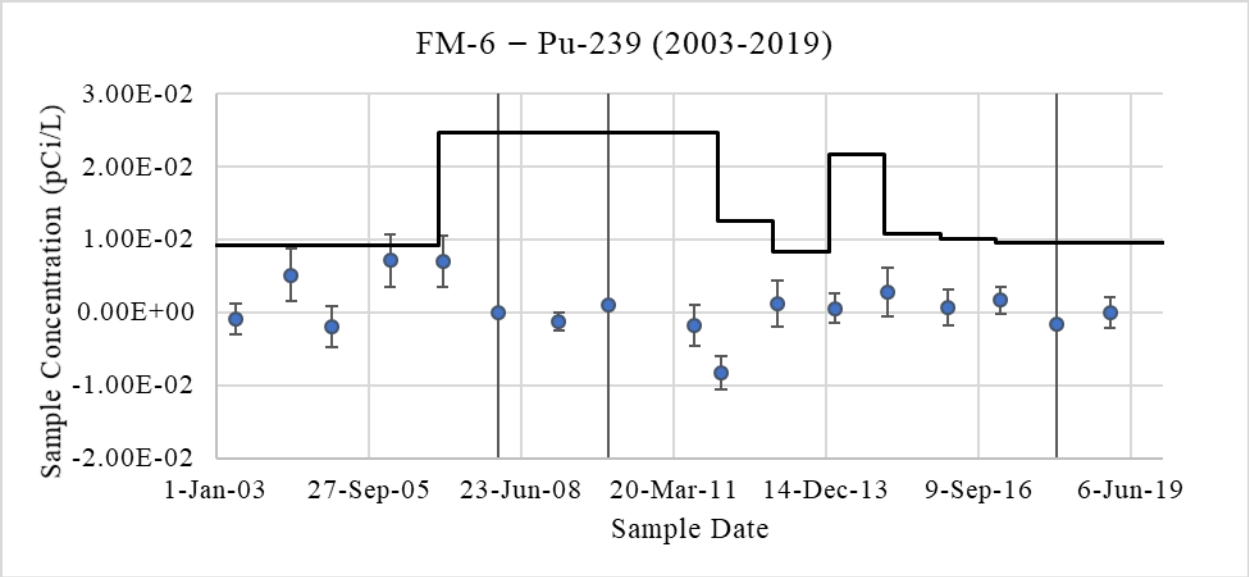

Figure B-47 . SRS Onsite Stream Sampling Location "FM-6" Pu-239 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

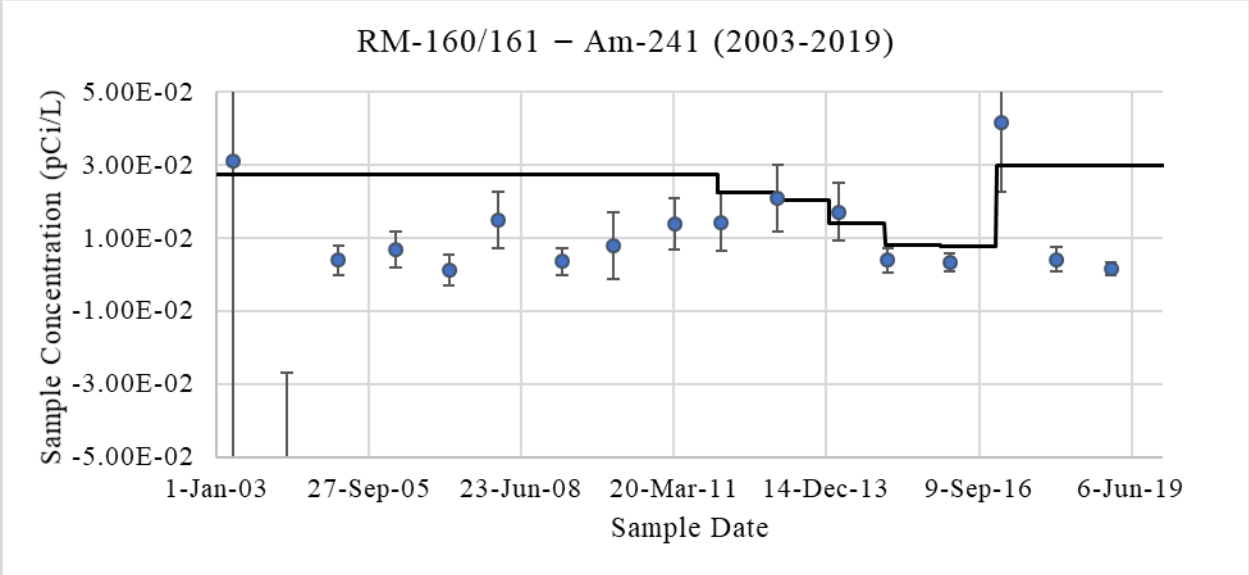

Figure B-48. SRS Offsite Savannah River Sampling Location "RM-160/161" Am-241 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

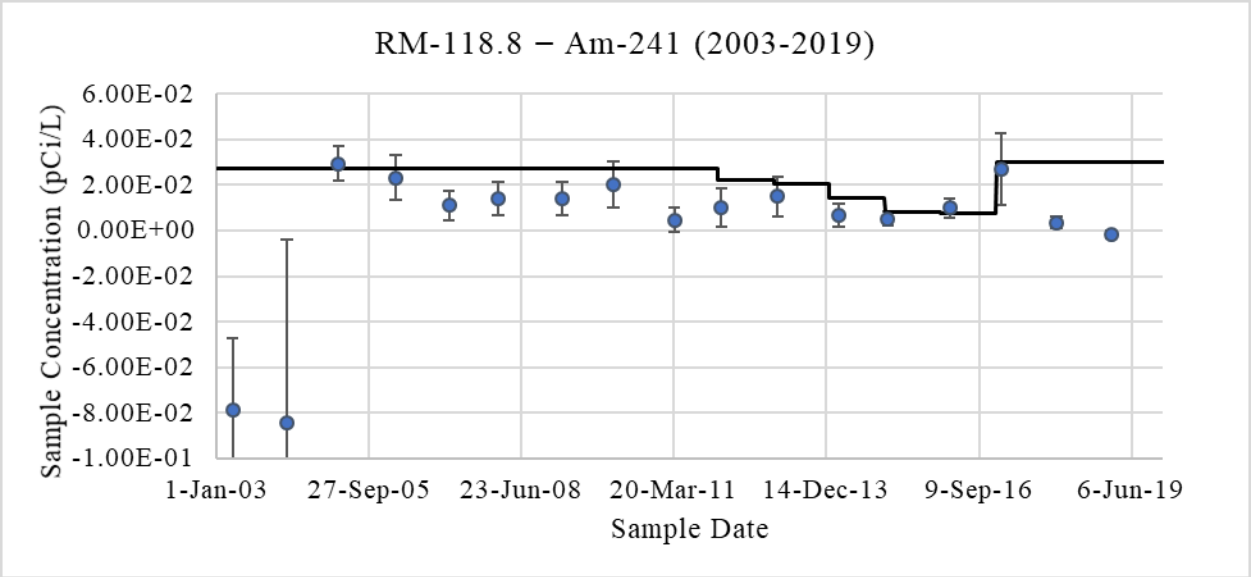

Figure B-49. SRS Offsite Savannah River Sampling Location "RM-118.8" Am-241 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

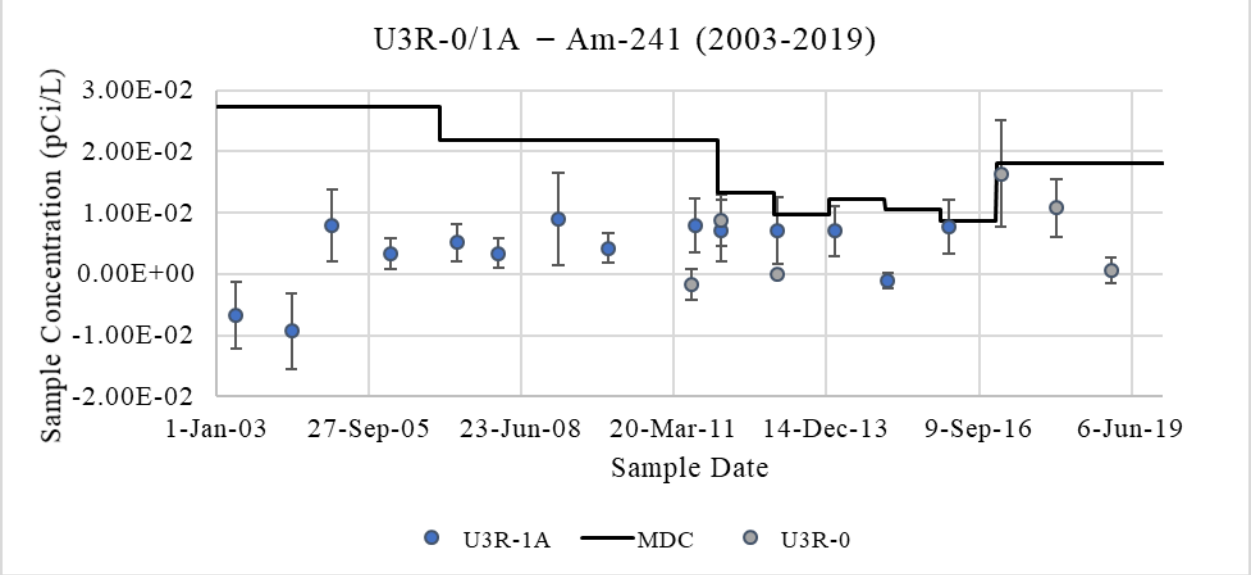

Figure B-50. SRS Onsite Sampling Locations "U3R-0/1A" Am-241 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

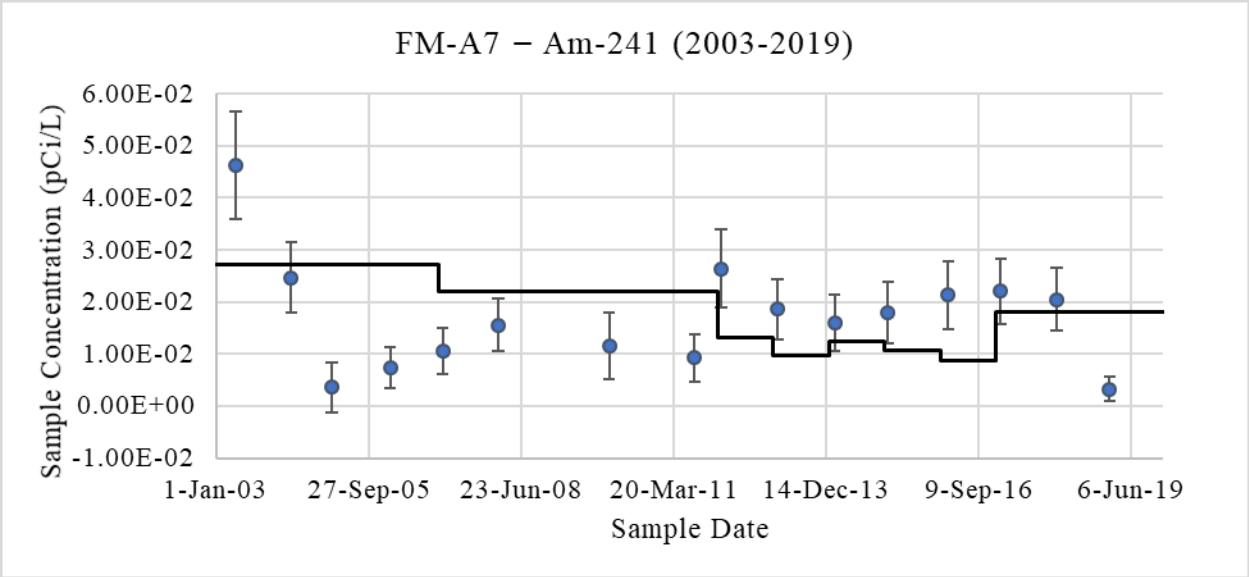

Figure B-51. SRS Onsite Stream Sampling Location "FM-A7" Am-241 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

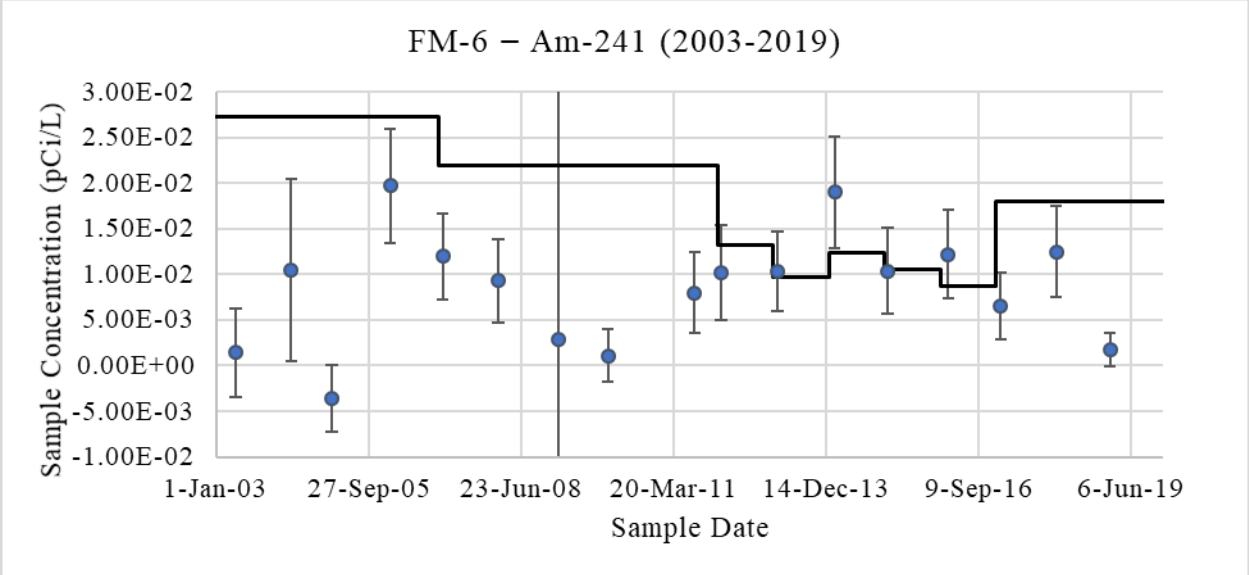

Figure B-52. SRS Onsite Stream Sampling Location "FM-6" Am-241 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

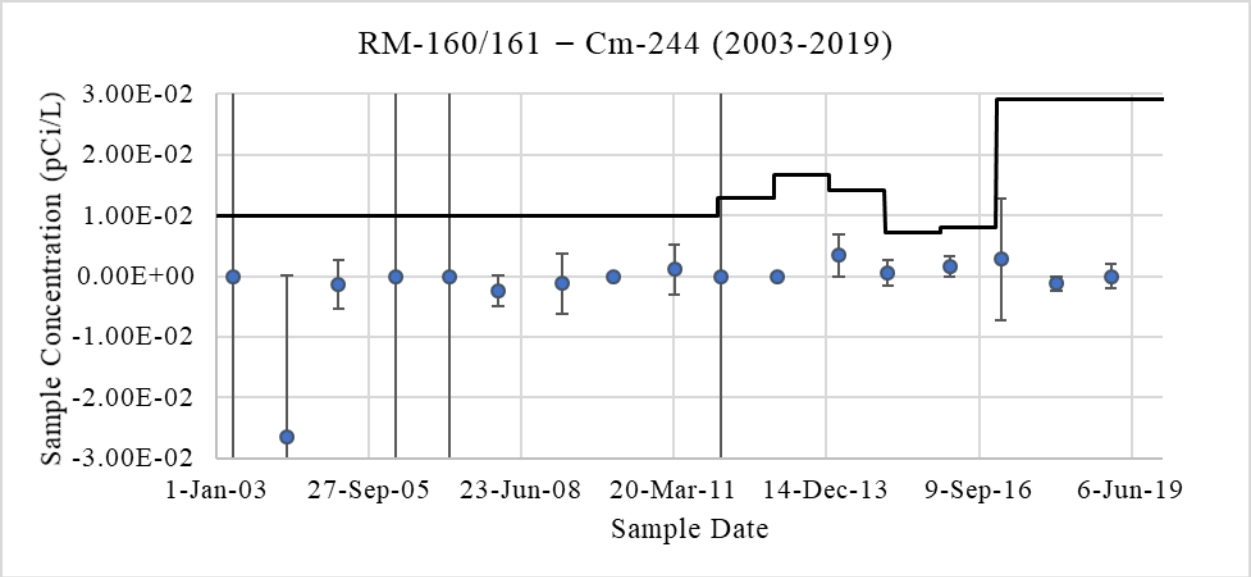

Figure B-53. SRS Offsite Savannah River Sampling Location "RM-160/161" Cm-244 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

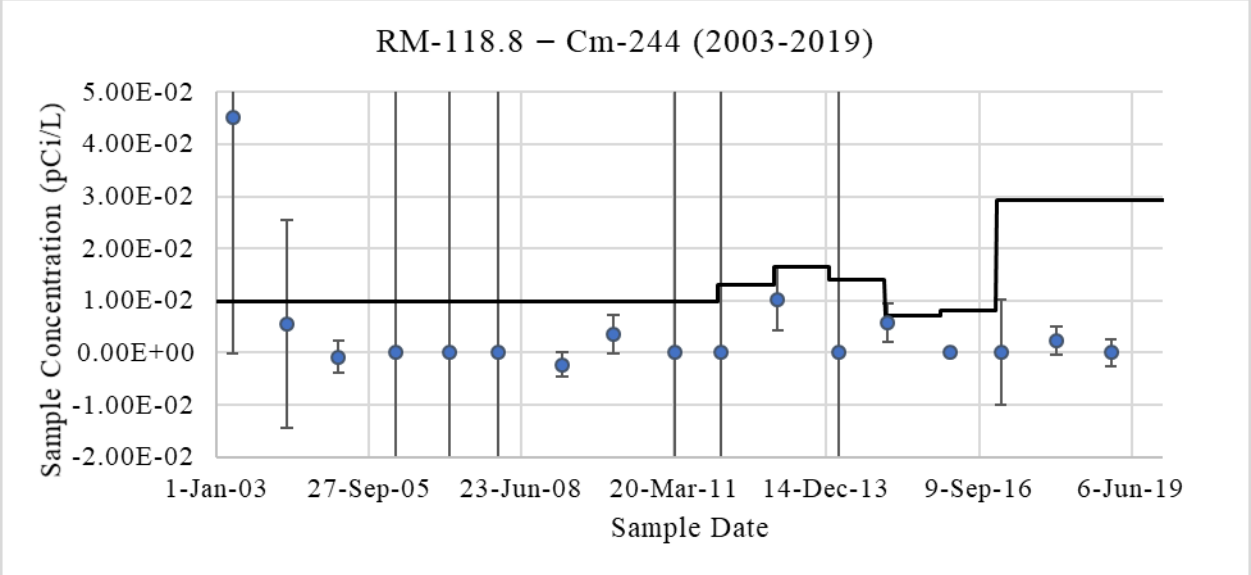

Figure B-54. SRS Offsite Savannah River Sampling Location "RM-118.8" Cm-244 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

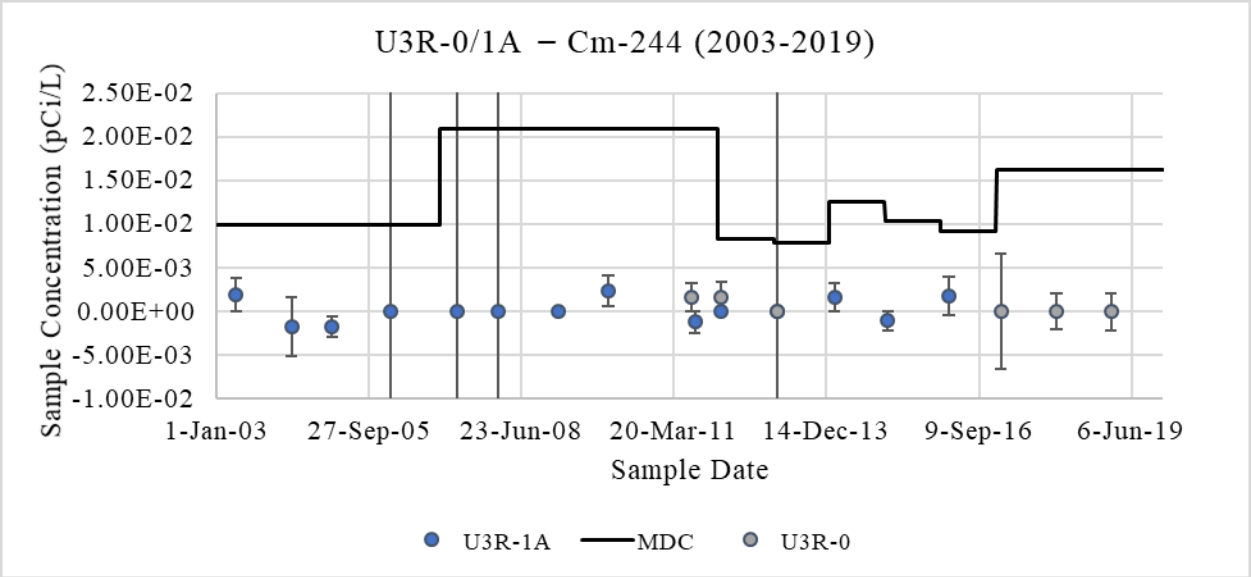

Figure B-55. SRS Onsite Sampling Locations "U3R-0/1A" Cm-244 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

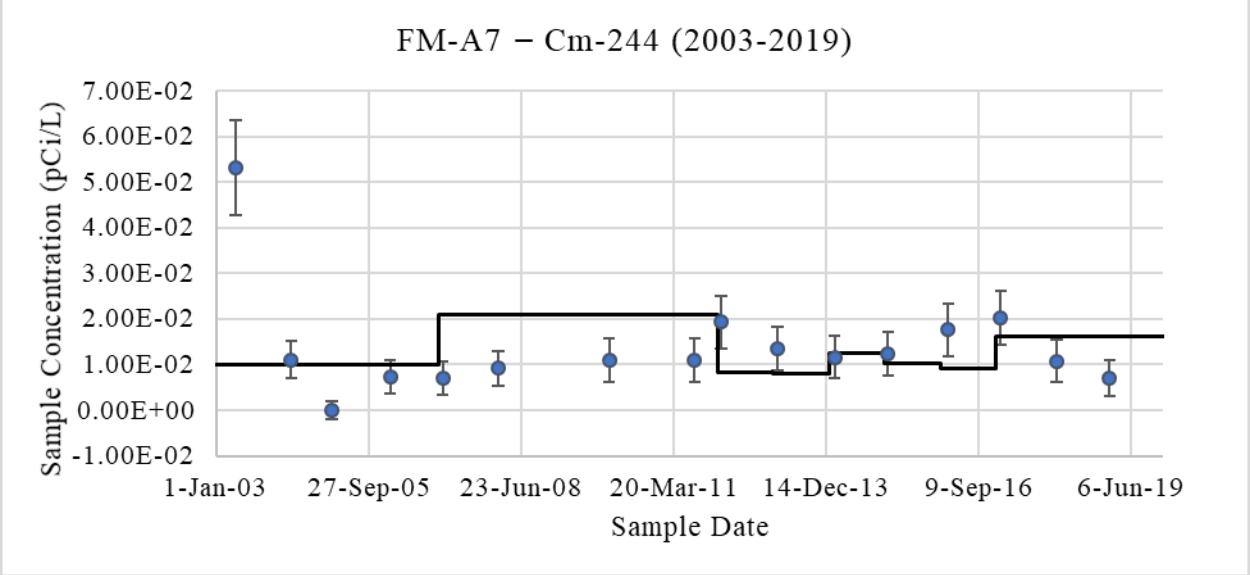

Figure B-56. SRS Onsite Stream Sampling Location "FM-A7" Cm-244 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

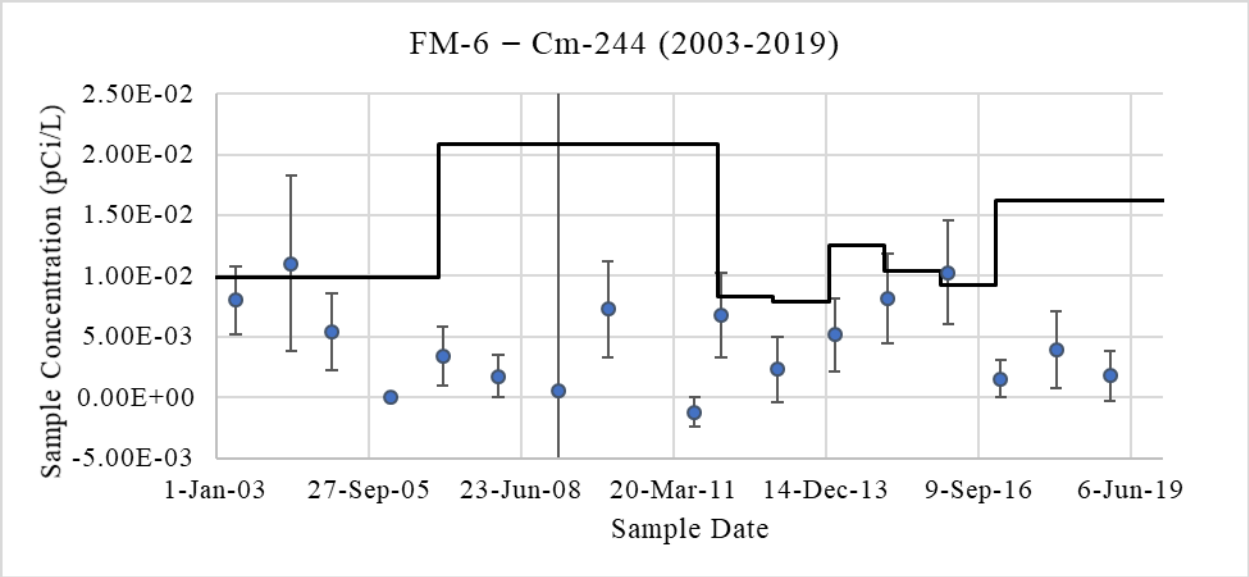

Figure B-57. SRS Onsite Stream Sampling Location "FM-6" Cm-244 Surface Water Surveillance 2003-2019. Solid Line indicates MDC.

Appendix C. Terrestrial Soil

Table C-1. Environmental Terrestrial Soil Surveillance Summary for Years 2003-2019

Location	Nuclide	Sample Number (>MDC)	Mean Concentration (pCi/Kg)	Overall Sigma (pCi/Kg)	Minimum Concentration (pCi/Kg)	Maximum Concentration (pCi/Kg)
Onsite						
Burial Ground North	Cs-137	18 (8)	4.99E+01	9.29E+00	-1.54E+01	1.29E+02
	Sr-89/90	18 (0)	1.78E+01	8.04E+00	-5.01E+01	8.51E+01
	Np-237	12 (0)	-1.38E-01	3.01E-01	-2.47E+00	1.83E+00
	U-234	18 (18)	9.68E+02	1.18E+02	3.47E+02	2.70E+03
	U-235	18 (18)	5.07E+01	6.25E+00	1.85E+01	1.27E+02
	U-238	18 (18)	9.67E+02	1.21E+02	3.43E+02	2.75E+03
	Pu-238	18 (9)	2.45E+00	6.10E-01	0.00E+00	1.00E+01
	Pu-239	18 (17)	1.04E+01	1.67E+00	1.36E+00	2.29E+01
	Am-241	18 (8)	4.00E+00	1.40E+00	2.36E-01	2.40E+01
	Cm-244	18 (4)	2.08E+00	1.41E+00	-1.70E-01	2.57E+01
BG (643-26E2)	Cs-137	18 (0)	-9.75E+00	6.96E+00	-7.12E+01	4.29E+01
	Sr-89/90	18 (0)	3.57E+01	7.43E+00	-1.58E+01	1.08E+02
	Np-237	12 (1)	1.63E+00	1.17E+00	-1.66E+00	1.37E+01
	U-234	18 (18)	1.49E+03	2.22E+02	4.27E+02	3.74E+03
	U-235	18 (18)	7.85E+01	1.07E+01	1.43E+01	1.83E+02
	U-238	18 (18)	1.48E+03	2.21E+02	4.68E+02	3.73E+03
	Pu-238	18 (5)	2.61E+00	1.16E+00	-1.19E+00	1.94E+01
	Pu-239	18 (9)	4.50E+00	1.51E+00	2.32E-01	2.39E+01
	Am-241	18 (6)	1.41E+01	9.19E+00	-1.08E+00	1.62E+02
	Cm-244	18 (5)	2.92E+00	1.58E+00	0.00E+00	2.82E+01
F-Area	Cs-137	18 (17)	1.51E+02	1.96E+01	2.63E+01	3.28E+02
	Sr-89/90	18 (2)	5.63E+01	1.96E+01	-8.75E+01	3.37E+02
	Np-237	12 (1)	9.27E-01	6.97E-01	-2.20E+00	7.95E+00
	U-234	18 (18)	7.06E+02	1.01E+02	1.10E+02	1.63E+03
	U-235	18 (18)	3.50E+01	4.99E+00	5.52E+00	8.97E+01
	U-238	18 (18)	7.01E+02	9.98E+01	1.23E+02	1.64E+03
	Pu-238	18 (18)	3.93E+01	6.23E+00	1.17E+01	1.19E+02
	Pu-239	18 (18)	4.64E+01	6.11E+00	5.48E+00	1.01E+02
	Am-241	18 (15)	7.20E+00	1.25E+00	1.65E+00	2.24E+01
	Cm-244	18 (2)	9.60E-01	1.78E-01	-3.10E-01	2.66E+00
H-Area	Cs-137	18 (16)	1.80E+02	2.48E+01	1.04E+01	4.27E+02
	Sr-89/90	18 (0)	2.52E+01	1.11E+01	-9.57E+01	1.12E+02
	Np-237	12 (0)	2.07E-01	1.97E-01	-5.06E-01	1.84E+00
	U-234	18 (18)	7.21E+02	9.10E+01	1.30E+02	1.71E+03
	U-235	18 (18)	3.57E+01	5.42E+00	7.37E+00	1.09E+02
	U-238	18 (18)	7.54E+02	9.39E+01	1.50E+02	1.69E+03
	Pu-238	18 (13)	7.06E+00	1.16E+00	1.45E+00	1.58E+01
	Pu-239	18 (17)	3.69E+01	1.00E+01	1.82E+00	1.65E+02
	Am-241	18 (9)	3.05E+00	5.67E-01	-6.77E-01	9.45E+00
	Cm-244	18 (2)	6.58E-01	3.15E-01	-9.00E-01	4.23E+00

Location	Nuclide	Sample Number (>MDC)	Mean Concentration (pCi/Kg)	Overall Sigma (pCi/Kg)	Minimum Concentration (pCi/Kg)	Maximum Concentration (pCi/Kg)
Z-Area	Cs-137	18 (17)	1.97E+02	2.57E+01	4.50E+01	3.72E+02
	Sr-89/90	18 (2)	5.34E+01	2.13E+01	-4.75E+01	3.53E+02
	Np-237	12 (1)	5.86E-01	3.12E-01	-3.10E-01	3.82E+00
	U-234	18 (18)	6.67E+02	6.39E+01	1.87E+02	1.06E+03
	U-235	18 (18)	3.58E+01	3.96E+00	1.06E+01	7.08E+01
	U-238	18 (18)	6.45E+02	6.11E+01	2.00E+02	1.04E+03
	Pu-238	18 (16)	4.13E+00	3.86E-01	1.38E+00	7.53E+00
	Pu-239	18 (18)	1.57E+01	2.18E+00	3.85E+00	4.23E+01
	Am-241	18 (13)	4.98E+00	8.97E-01	5.42E-01	1.57E+01
	Cm-244	18 (1)	6.68E-01	1.74E-01	-1.64E-01	2.34E+00
Site Perimeter						
Allendale Gate	Cs-137	17 (13)	1.74E+02	3.45E+01	1.43E+01	5.19E+02
	Sr-89/90	17 (1)	4.79E+01	2.79E+01	-5.48E+01	4.74E+02
	Np-237	12 (1)	6.73E-01	4.80E-01	-6.47E-01	5.61E+00
	U-234	17 (16)	3.69E+02	3.07E+01	1.60E+02	6.84E+02
	U-235	17 (15)	1.88E+01	1.86E+00	8.25E+00	3.21E+01
	U-238	17 (16)	3.68E+02	3.34E+01	1.58E+02	7.51E+02
	Pu-238	16 (2)	1.65E+00	6.20E-01	-1.97E-01	9.91E+00
	Pu-239	16 (12)	6.98E+00	1.30E+00	1.25E+00	1.89E+01
	Am-241	17 (9)	4.65E+00	2.10E+00	-2.52E-01	3.72E+01
	Cm-244	17 (0)	1.82E-01	1.01E-01	-5.29E-01	1.05E+00
Barnwell Gate	Cs-137	15 (14)	2.22E+02	3.52E+01	4.43E+01	5.58E+02
	Sr-89/90	15 (0)	2.14E+01	9.18E+00	-3.84E+01	9.23E+01
	Np-237	11 (0)	-1.68E-01	2.47E-01	-1.68E+00	1.26E+00
	U-234	15 (15)	5.91E+02	6.97E+01	2.81E+01	1.00E+03
	U-235	15 (14)	2.76E+01	3.96E+00	2.00E+00	5.12E+01
	U-238	15 (15)	5.81E+02	6.64E+01	2.62E+01	9.85E+02
	Pu-238	15 (3)	1.17E+00	5.36E-01	-1.08E+00	7.54E+00
	Pu-239	15 (13)	5.91E+00	9.84E-01	6.01E-01	1.35E+01
	Am-241	15 (9)	3.46E+00	5.73E-01	9.57E-01	8.97E+00
	Cm-244	15 (2)	3.94E-01	1.85E-01	-3.42E-01	1.99E+00
D-Area	Cs-137	18 (18)	3.32E+02	4.25E+01	8.18E+01	7.05E+02
	Sr-89/90	18 (1)	5.19E+01	1.20E+01	5.32E+00	2.14E+02
	Np-237	12 (1)	5.18E-01	5.41E-01	-1.11E+00	6.28E+00
	U-234	18 (18)	6.68E+02	8.63E+01	2.33E+02	1.44E+03
	U-235	18 (18)	3.18E+01	3.45E+00	7.39E+00	5.57E+01
	U-238	18 (18)	6.71E+02	8.49E+01	2.19E+02	1.50E+03
	Pu-238	18 (14)	3.10E+00	7.44E-01	-5.66E-01	1.22E+01
	Pu-239	18 (16)	1.19E+01	1.80E+00	8.41E-01	2.90E+01
	Am-241	18 (15)	5.01E+00	9.87E-01	-8.35E-01	1.45E+01
	Cm-244	18 (1)	4.25E-01	2.98E-01	-3.70E-01	5.29E+00

Location	Nuclide	Sample Number (>MDC)	Mean Concentration (pCi/Kg)	Overall Sigma (pCi/Kg)	Minimum Concentration (pCi/Kg)	Maximum Concentration (pCi/Kg)
Darkhorse	Cs-137	18 (18)	2.34E+02	2.23E+01	1.08E+02	4.29E+02
	Sr-89/90	18 (0)	2.77E+01	9.82E+00	-4.23E+01	9.56E+01
	Np-237	12 (0)	3.51E-01	1.28E-01	-2.76E-01	1.14E+00
	U-234	18 (18)	4.88E+02	5.12E+01	3.22E+01	7.60E+02
	U-235	18 (16)	2.24E+01	2.52E+00	7.41E+00	4.82E+01
	U-238	18 (17)	4.94E+02	5.33E+01	1.78E+01	7.91E+02
	Pu-238	18 (3)	1.43E+00	5.30E-01	-1.46E-01	9.37E+00
	Pu-239	18 (17)	1.06E+01	2.05E+00	-4.87E-01	3.89E+01
	Am-241	18 (13)	5.56E+00	1.80E+00	-3.95E-02	3.37E+01
	Cm-244	18 (2)	6.48E-01	2.21E-01	-4.39E-01	3.56E+00
East Talatha	Cs-137	16 (16)	1.75E+02	1.98E+01	5.49E+01	3.17E+02
	Sr-89/90	16 (2)	5.07E+01	2.25E+01	-4.27E+01	3.30E+02
	Np-237	12 (1)	2.89E-01	2.65E-01	-9.74E-01	2.46E+00
	U-234	16 (16)	5.13E+02	6.56E+01	1.04E+02	9.17E+02
	U-235	16 (16)	2.77E+01	4.82E+00	4.91E+00	7.67E+01
	U-238	16 (16)	5.22E+02	6.53E+01	1.05E+02	1.00E+03
	Pu-238	16 (3)	2.36E+00	1.14E+00	-3.35E-01	1.57E+01
	Pu-239	16 (13)	1.01E+01	4.24E+00	1.21E+00	7.25E+01
	Am-241	16 (12)	3.24E+00	5.15E-01	-4.99E-01	7.14E+00
	Cm-244	16 (0)	1.16E-01	9.13E-02	-6.64E-01	7.96E-01
Green Pond	Cs-137	18 (14)	1.67E+02	3.05E+01	6.15E+00	4.36E+02
	Sr-89/90	18 (1)	1.72E+01	1.03E+01	-4.58E+01	9.81E+01
	Np-237	12 (0)	2.53E-01	3.65E-01	-1.31E+00	3.73E+00
	U-234	18 (18)	6.22E+02	6.60E+01	1.14E+02	1.21E+03
	U-235	18 (18)	3.24E+01	3.92E+00	5.95E+00	6.93E+01
	U-238	18 (18)	6.11E+02	6.59E+01	1.05E+02	1.21E+03
	Pu-238	18 (6)	2.00E+00	4.66E-01	0.00E+00	6.68E+00
	Pu-239	18 (14)	6.46E+00	9.91E-01	7.08E-01	1.62E+01
	Am-241	18 (12)	4.98E+00	1.20E+00	7.37E-02	1.89E+01
	Cm-244	18 (3)	9.23E-01	2.80E-01	-8.08E-02	3.45E+00
Hwy 21/167	Cs-137	16 (16)	1.78E+02	2.66E+01	6.47E+01	4.67E+02
	Sr-89/90	16 (0)	3.08E+01	1.11E+01	-4.20E+01	1.21E+02
	Np-237	11 (1)	4.40E-01	7.26E-01	-1.36E+00	7.50E+00
	U-234	16 (16)	6.31E+02	1.25E+02	1.19E+02	2.32E+03
	U-235	16 (16)	3.10E+01	4.87E+00	4.52E+00	7.80E+01
	U-238	16 (16)	5.17E+02	5.41E+01	1.15E+02	8.82E+02
	Pu-238	15 (5)	2.42E+00	1.12E+00	-3.34E+00	1.59E+01
	Pu-239	15 (13)	5.74E+00	9.16E-01	0.00E+00	1.32E+01
	Am-241	16 (11)	3.19E+00	5.36E-01	1.55E-01	8.36E+00
	Cm-244	16 (1)	8.72E-01	7.52E-01	-2.59E-01	1.20E+01

Location	Nuclide	Sample Number (>MDC)	Mean Concentration (pCi/Kg)	Overall Sigma (pCi/Kg)	Minimum Concentration (pCi/Kg)	Maximum Concentration (pCi/Kg)
Jackson	Cs-137	16 (15)	1.76E+02	2.47E+01	1.34E+01	3.71E+02
	Sr-89/90	16 (0)	3.15E+01	1.21E+01	-2.56E+01	1.46E+02
	Np-237	11 (0)	-3.98E-02	1.58E-01	-1.19E+00	1.01E+00
	U-234	16 (16)	5.21E+02	5.29E+01	2.93E+01	7.27E+02
	U-235	16 (14)	2.43E+01	2.77E+00	1.86E+00	4.58E+01
	U-238	16 (16)	5.21E+02	5.36E+01	3.56E+01	8.11E+02
	Pu-238	15 (3)	8.76E-01	2.85E-01	-3.36E-01	3.77E+00
	Pu-239	15 (13)	5.57E+00	7.90E-01	4.77E-02	9.57E+00
	Am-241	16 (11)	5.46E+00	2.04E+00	1.06E+00	3.42E+01
	Cm-244	16 (13)	4.85E+00	1.03E+00	4.64E-01	1.50E+01
Patterson Mill Road	Cs-137	19 (17)	2.36E+02	3.66E+01	2.39E+01	6.23E+02
	Sr-89/90	19 (2)	4.55E+01	2.62E+01	-5.29E+01	4.67E+02
	Np-237	13 (1)	8.65E-01	7.87E-01	-1.12E+00	9.85E+00
	U-234	19 (19)	5.22E+02	4.94E+01	1.25E+02	8.19E+02
	U-235	19 (19)	2.57E+01	2.87E+00	5.42E+00	5.66E+01
	U-238	19 (19)	5.30E+02	4.93E+01	1.26E+02	8.74E+02
	Pu-238	19 (8)	3.14E+00	9.02E-01	-1.04E-02	1.40E+01
	Pu-239	19 (17)	9.41E+00	1.37E+00	1.23E+00	2.19E+01
	Am-241	19 (11)	4.39E+00	1.22E+00	2.09E-01	2.31E+01
	Cm-244	19 (4)	9.60E-01	2.80E-01	-2.74E-01	3.89E+00
Talatha Gate	Cs-137	16 (14)	1.14E+02	2.07E+01	3.13E+01	3.80E+02
	Sr-89/90	16 (1)	3.04E+01	8.70E+00	-1.19E+01	9.54E+01
	Np-237	12 (1)	1.03E+00	6.93E-01	-6.23E-01	8.50E+00
	U-234	16 (16)	6.15E+02	3.82E+01	1.90E+02	8.11E+02
	U-235	16 (16)	3.54E+01	3.43E+00	1.42E+01	6.43E+01
	U-238	16 (16)	6.56E+02	4.07E+01	2.06E+02	8.54E+02
	Pu-238	16 (5)	2.44E+00	9.91E-01	-6.19E-01	1.20E+01
	Pu-239	16 (11)	4.73E+00	9.21E-01	3.41E-01	1.27E+01
	Am-241	16 (10)	2.89E+00	6.08E-01	1.59E-01	9.41E+00
	Cm-244	16 (1)	3.43E-01	1.62E-01	-3.10E-01	2.24E+00
25-Mile Radius						
Aiken Airport	Cs-137	16 (16)	1.91E+02	2.17E+01	4.95E+01	3.30E+02
	Sr-89/90	16 (2)	9.81E+01	5.51E+01	-2.86E+01	8.87E+02
	Np-237	12 (2)	7.68E-01	4.72E-01	-6.20E-01	4.22E+00
	U-234	16 (16)	4.58E+02	8.54E+01	2.06E+01	1.59E+03
	U-235	16 (14)	2.44E+01	5.28E+00	1.02E+00	9.62E+01
	U-238	16 (16)	4.82E+02	1.05E+02	1.64E+01	1.94E+03
	Pu-238	16 (4)	1.95E+01	1.79E+01	-3.98E-01	2.87E+02
	Pu-239	16 (14)	1.83E+01	9.81E+00	7.70E-01	1.64E+02
	Am-241	16 (13)	1.12E+01	7.84E+00	3.04E-01	1.28E+02
	Cm-244	16 (2)	1.13E+01	1.11E+01	-6.86E-02	1.77E+02

Location	Nuclide	Sample Number (>MDC)	Mean Concentration (pCi/Kg)	Overall Sigma (pCi/Kg)	Minimum Concentration (pCi/Kg)	Maximum Concentration (pCi/Kg)
Augusta Lock & Dam	Cs-137	16 (15)	1.57E+02	1.46E+01	3.90E+01	3.14E+02
	Sr-89/90	16 (2)	4.90E+01	1.33E+01	-1.67E+01	1.71E+02
	Np-237	12 (4)	3.28E+00	1.47E+00	-8.15E-01	1.29E+01
	U-234	16 (16)	1.23E+03	1.06E+02	1.15E+02	1.86E+03
	U-235	16 (16)	5.61E+01	5.66E+00	4.92E+00	8.76E+01
	U-238	16 (16)	1.23E+03	1.07E+02	7.16E+01	1.91E+03
	Pu-238	16 (8)	2.51E+01	1.33E+01	-7.04E-01	2.14E+02
	Pu-239	16 (15)	2.12E+01	6.18E+00	1.23E+00	1.01E+02
	Am-241	16 (13)	6.52E+00	2.23E+00	-3.15E-02	3.49E+01
	Cm-244	16 (4)	3.43E+00	2.50E+00	-3.63E-01	4.00E+01
HWY 301 Bridge	Cs-137	19 (15)	1.24E+02	1.86E+01	-2.48E-01	3.23E+02
(control location)	Sr-89/90	19 (1)	5.78E+01	1.23E+01	-3.30E+01	1.90E+02
	Np-237	12 (2)	1.53E+00	7.52E-01	-1.70E-01	9.03E+00
	U-234	19 (19)	1.33E+03	1.18E+02	1.31E+02	2.12E+03
	U-235	19 (19)	6.93E+01	6.09E+00	1.10E+01	1.24E+02
	U-238	19 (19)	1.31E+03	1.17E+02	1.32E+02	2.10E+03
	Pu-238	19 (8)	2.39E+00	7.69E-01	-2.65E-01	1.39E+01
	Pu-239	19 (14)	5.72E+00	8.21E-01	1.41E+00	1.36E+01
	Am-241	18 (10)	3.91E+00	1.38E+00	-1.23E+00	2.13E+01
	Cm-244	18 (0)	4.30E-01	1.31E-01	-5.28E-01	1.51E+00

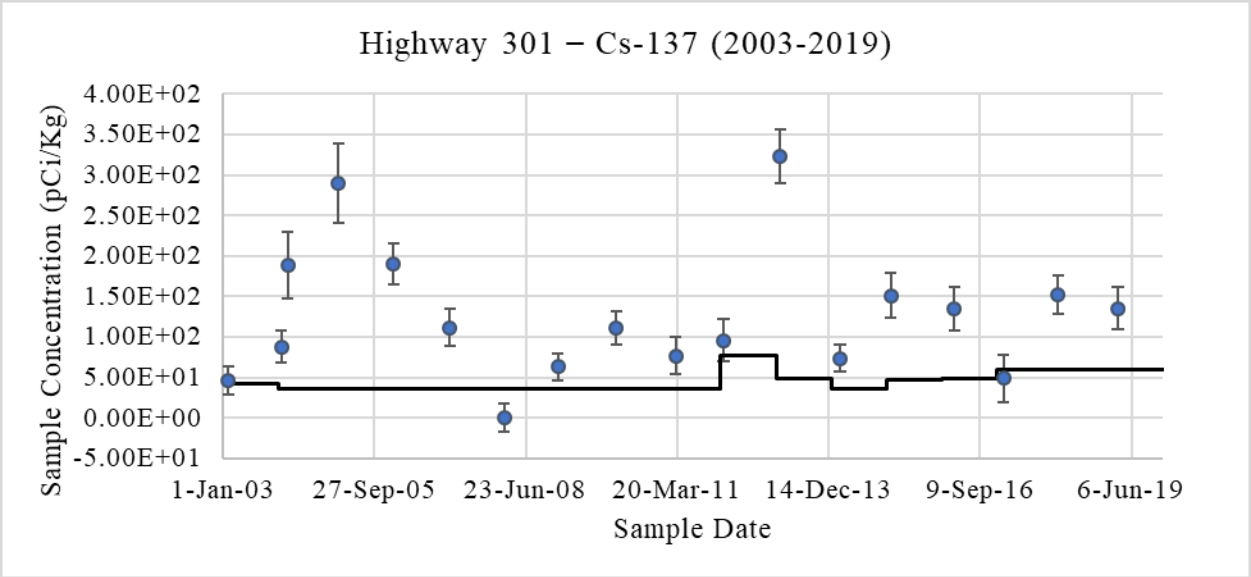

Figure C-1. Twenty-Five Mile Offsite Sampling Location "Highway 301" Cs-137 Soil Surveillance 2003-2019. Solid Line indicates MDC.

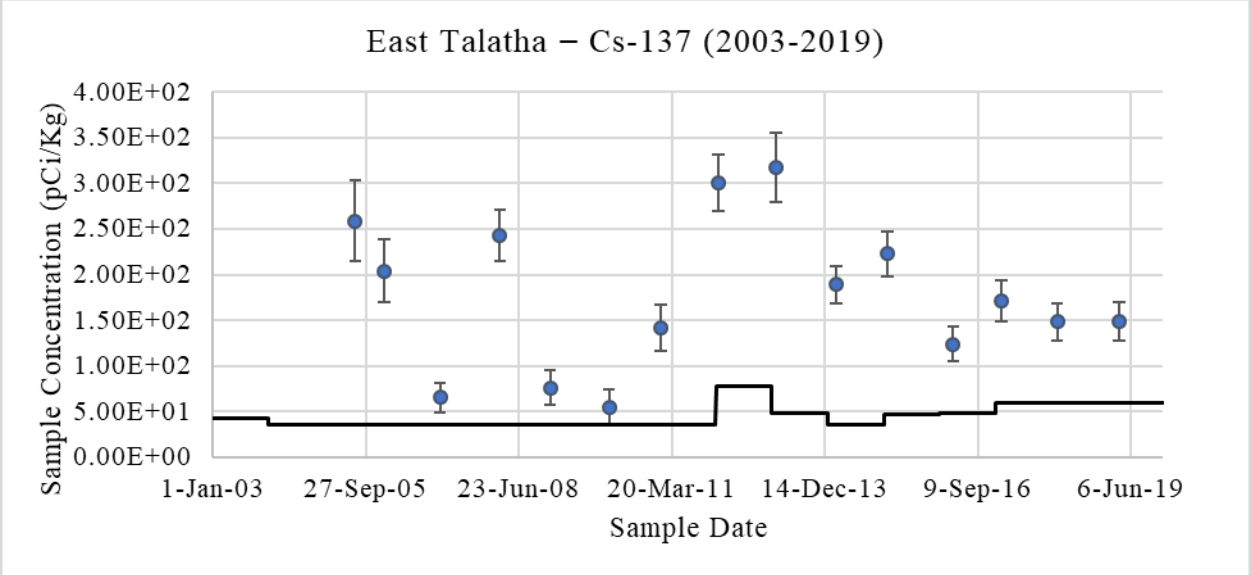

Figure C-2. SRS Perimeter Sampling Location "East Talatha" Cs-137 Soil Surveillance 2003-2019. Solid Line indicates MDC.

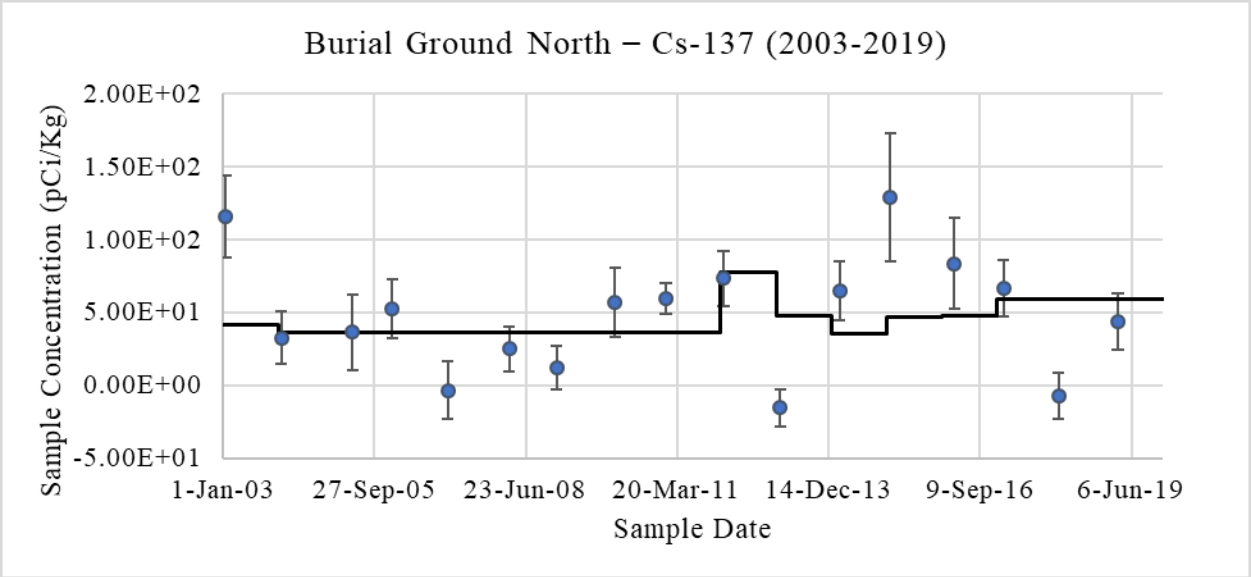

Figure C-3. SRS Onsite Sampling Location "Burial Ground North" Cs-137 Soil Surveillance 2003-2019. Solid Line indicates MDC.

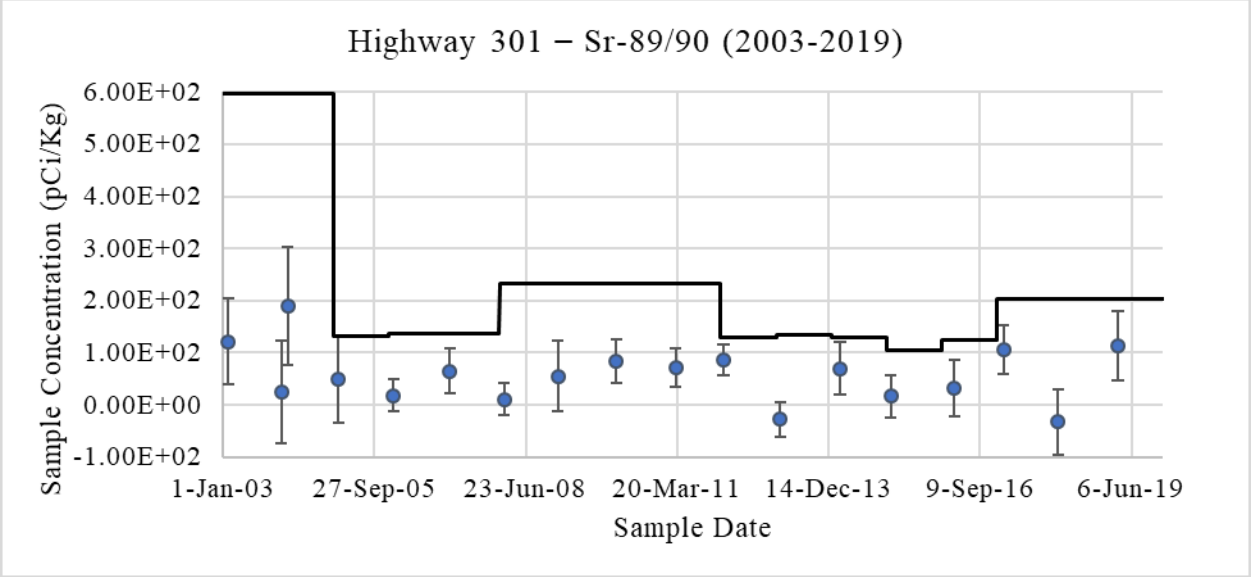

Figure C-4. Twenty-Five Mile Offsite Sampling Location "Highway 301" Sr-89/90 Soil Surveillance 2003-2019. Solid Line indicates MDC.

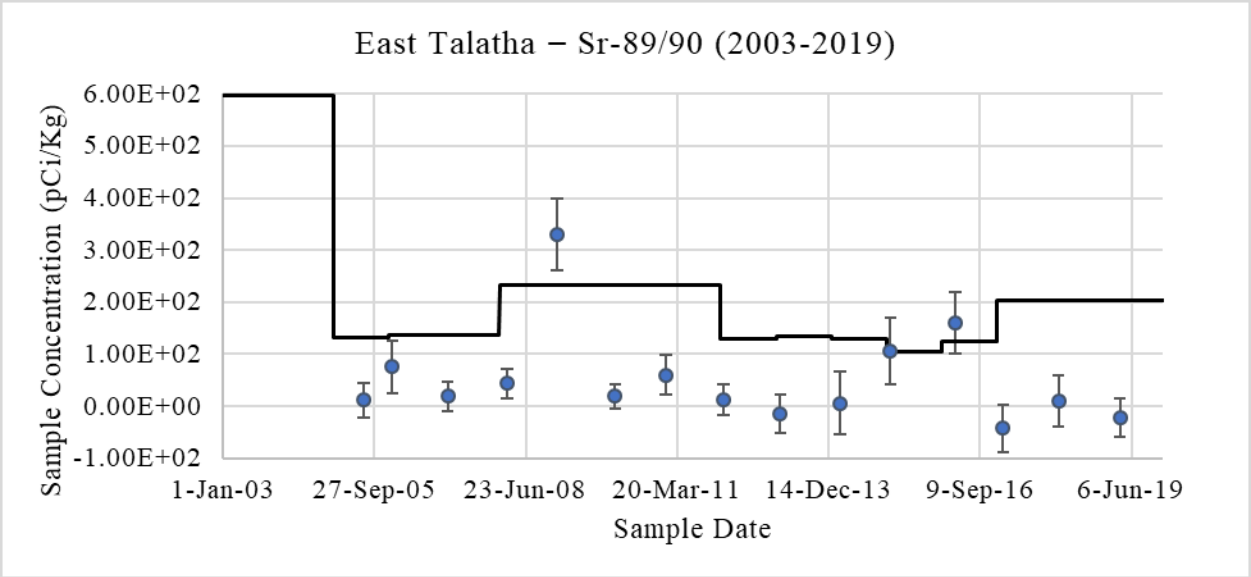

Figure C-5. SRS Perimeter Sampling Location "East Talatha" Sr-89/90 Soil Surveillance 2003-2019. Solid Line indicates MDC.

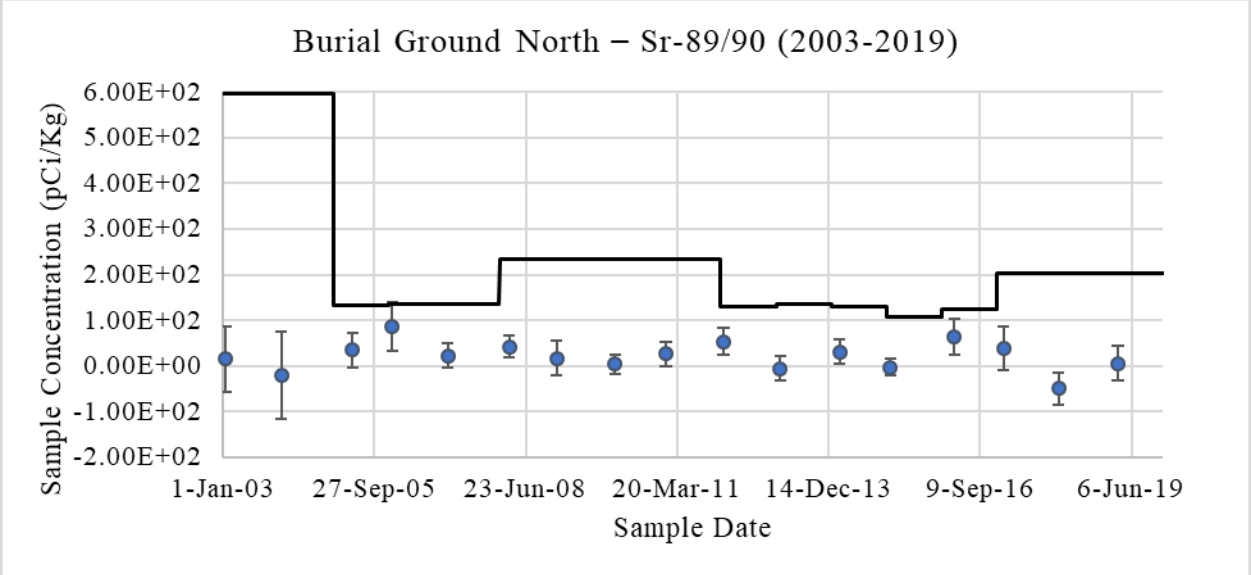

Figure C-6. SRS Onsite Sampling Location "Burial Ground North" Sr-89/90 Soil Surveillance 2003-2019. Solid Line indicates MDC.

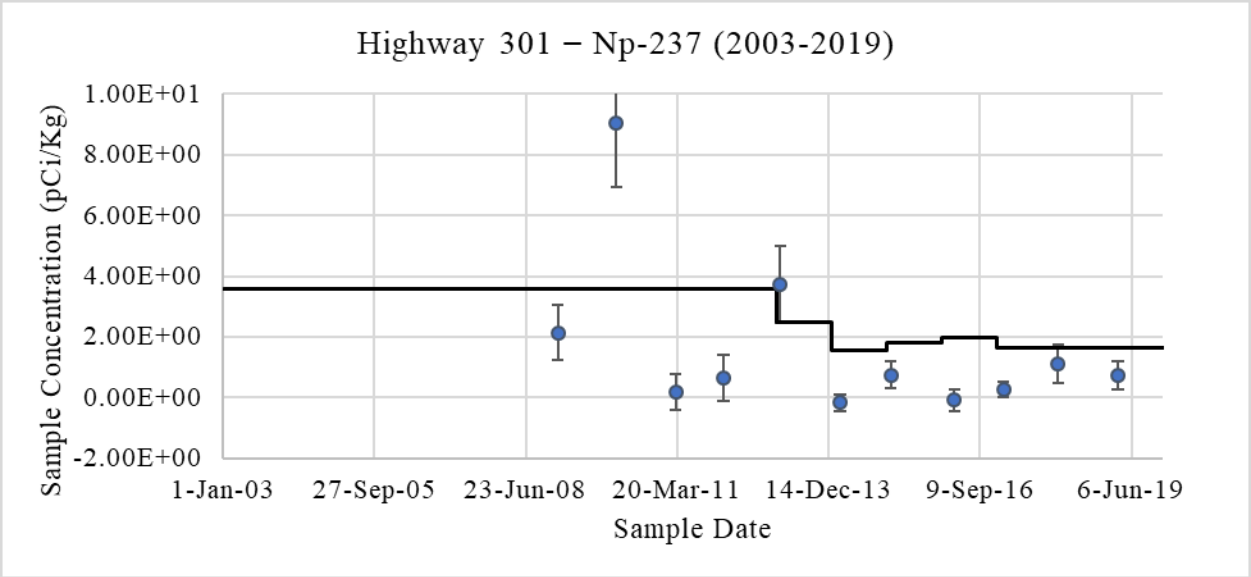

Figure C-7. Twenty-Five Mile Offsite Sampling Location "Highway 301" Np-237 Soil Surveillance 2003-2019. Solid Line indicates MDC.

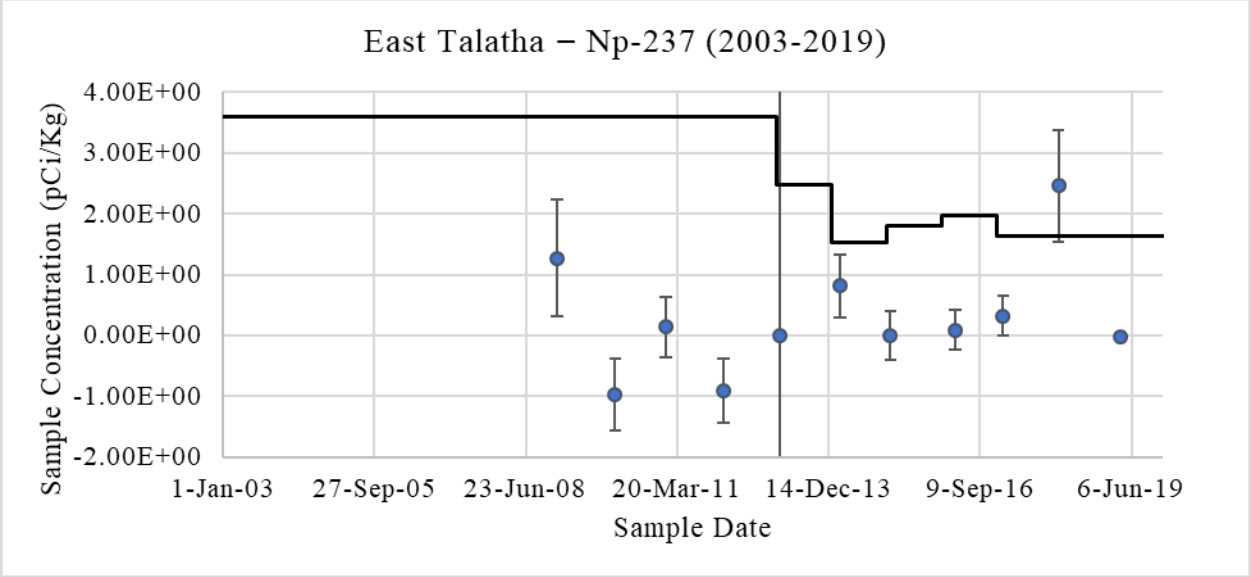

Figure C-8. SRS Perimeter Sampling Location "East Talatha" Np-237 Soil Surveillance 2003-2019. Solid Line indicates MDC.

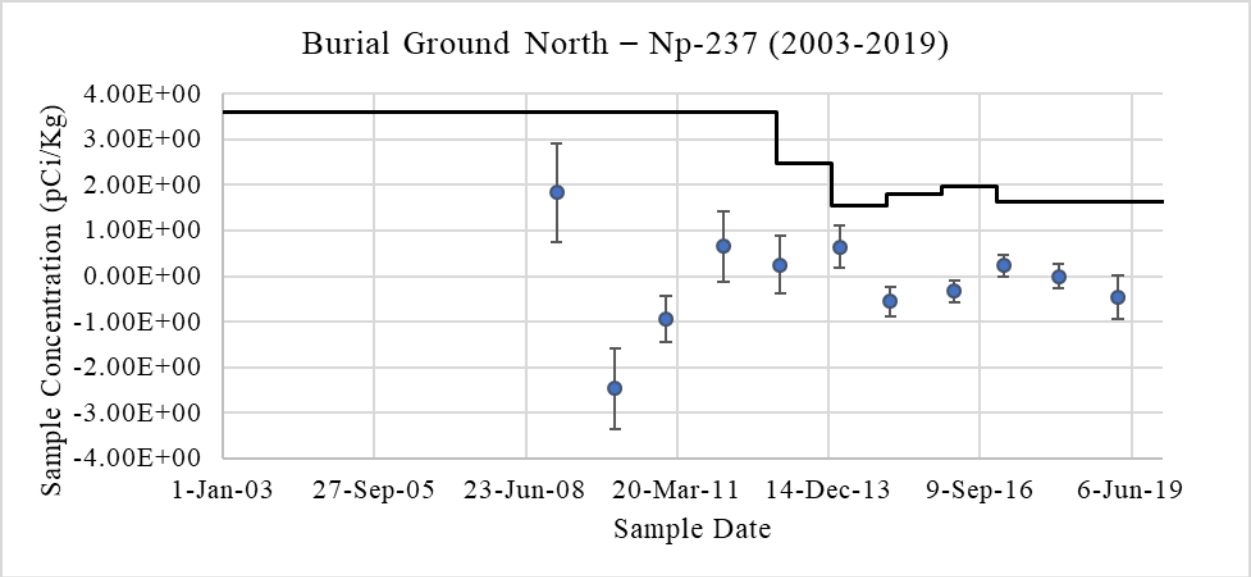

Figure C-9. SRS Onsite Sampling Location "Burial Ground North" Np-237 Soil Surveillance 2003-2019. Solid Line indicates MDC.

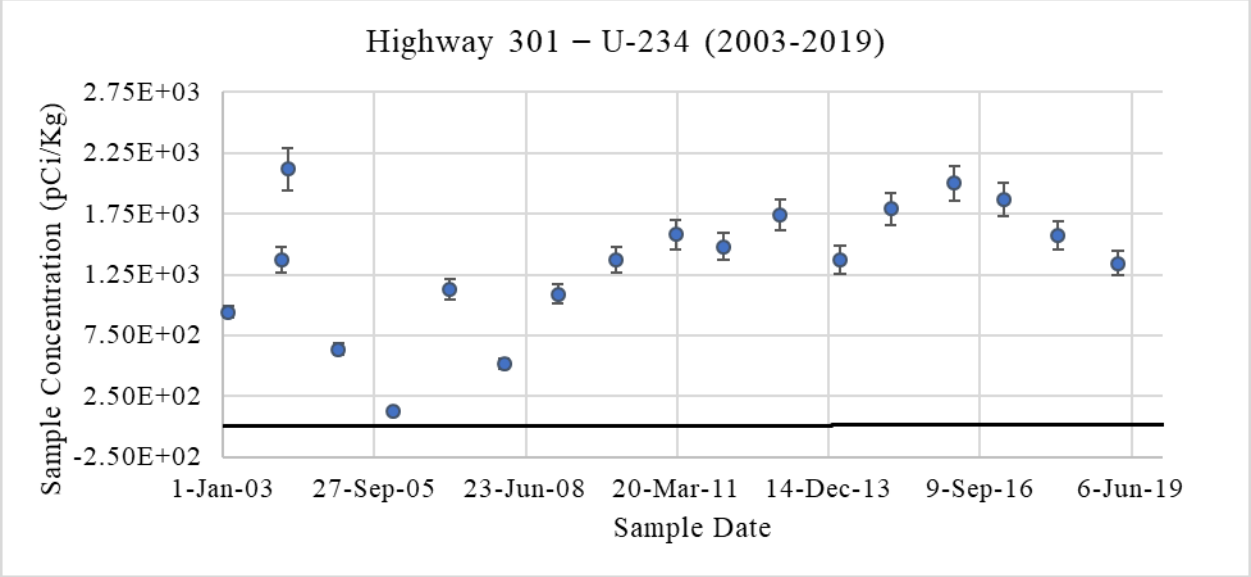

Figure C-10. Twenty-Five Mile Offsite Sampling Location "Highway 301" U-234 Soil Surveillance 2003-2019. Solid Line indicates MDC.

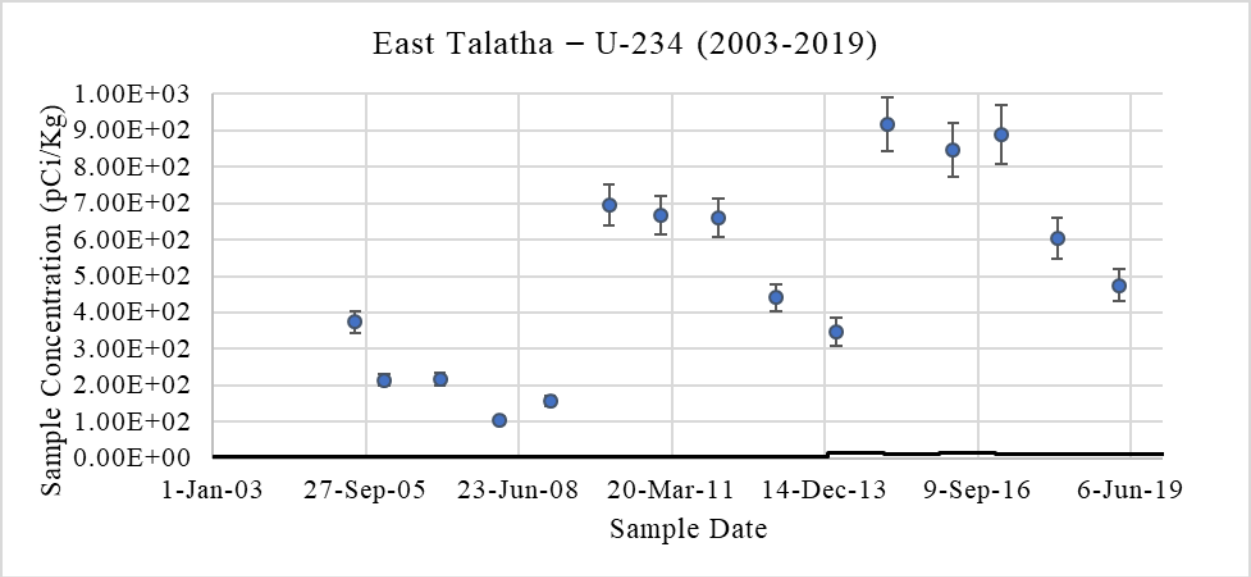

Figure C-11. SRS Perimeter Sampling Location "East Talatha" U-234 Soil Surveillance 2003-2019. Solid Line indicates MDC.

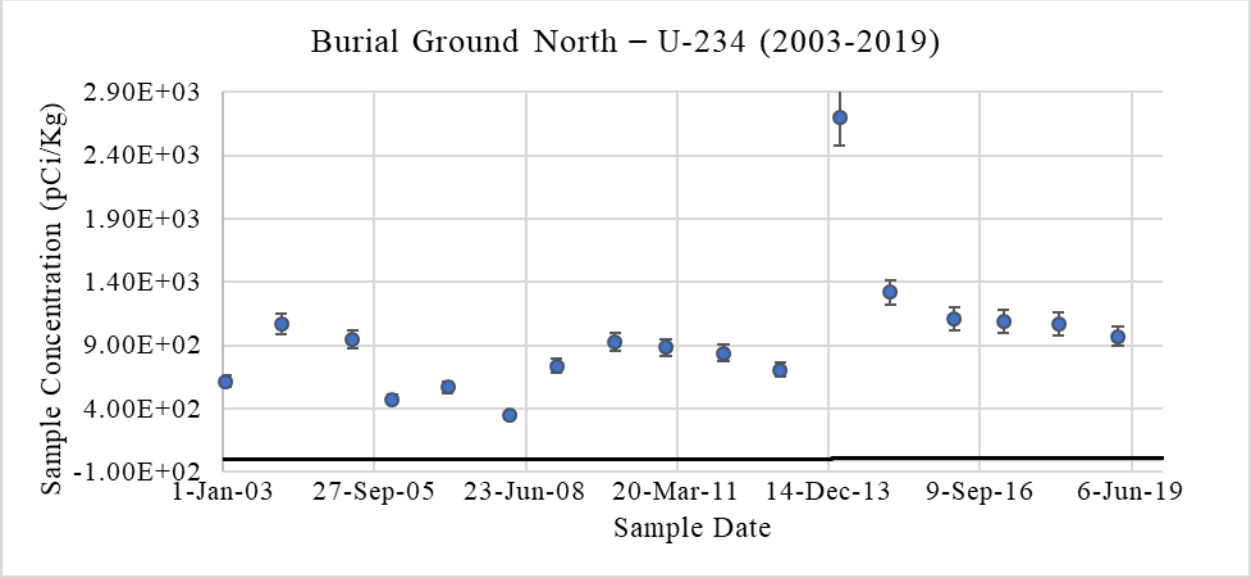

Figure C-12. SRS Onsite Sampling Location "Burial Ground North" U-234 Soil Surveillance 2003-2019. Solid Line indicates MDC.

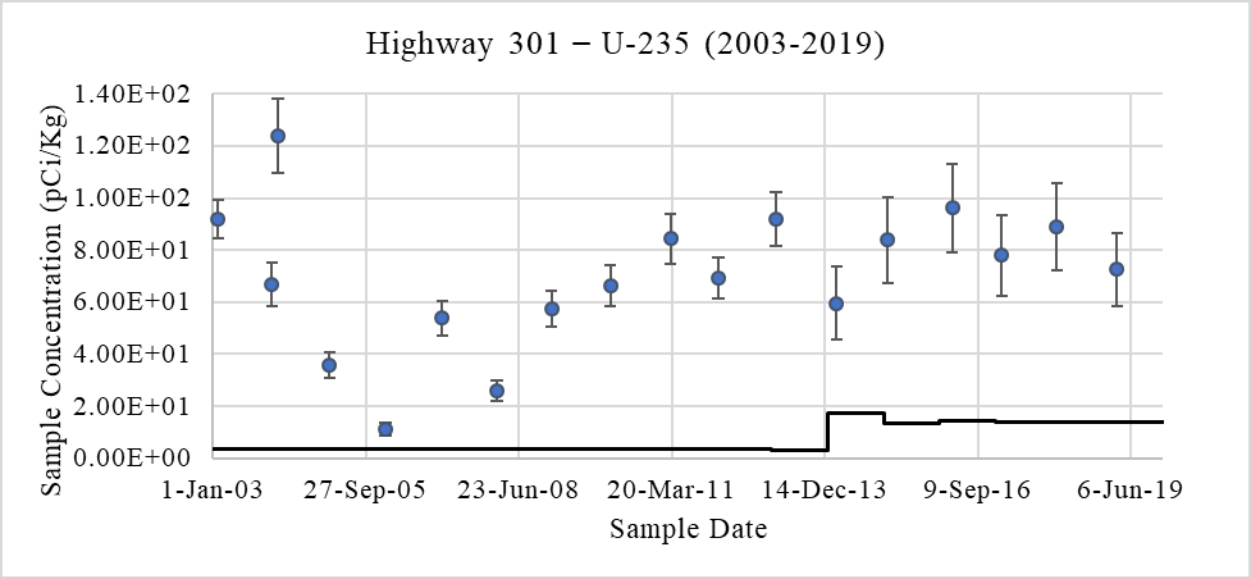

Figure C-13. Twenty-Five Mile Offsite Sampling Location "Highway 301" U-235 Soil Surveillance 2003-2019. Solid Line indicates MDC.

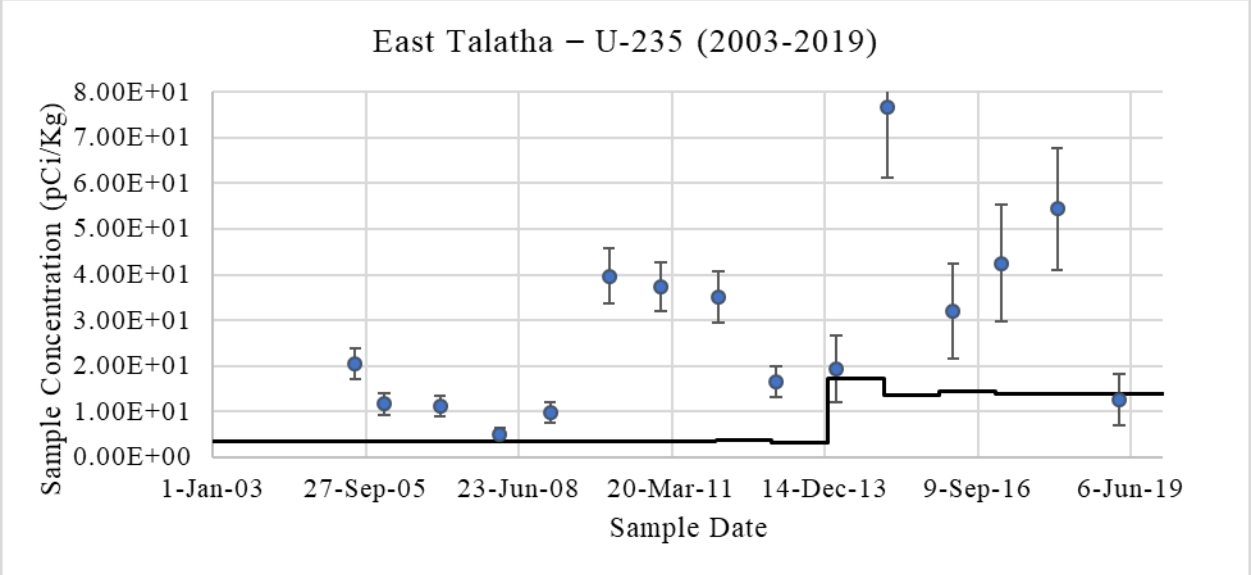

Figure C-14. SRS Perimeter Sampling Location "East Talatha" U-235 Soil Surveillance 2003-2019. Solid Line indicates MDC.

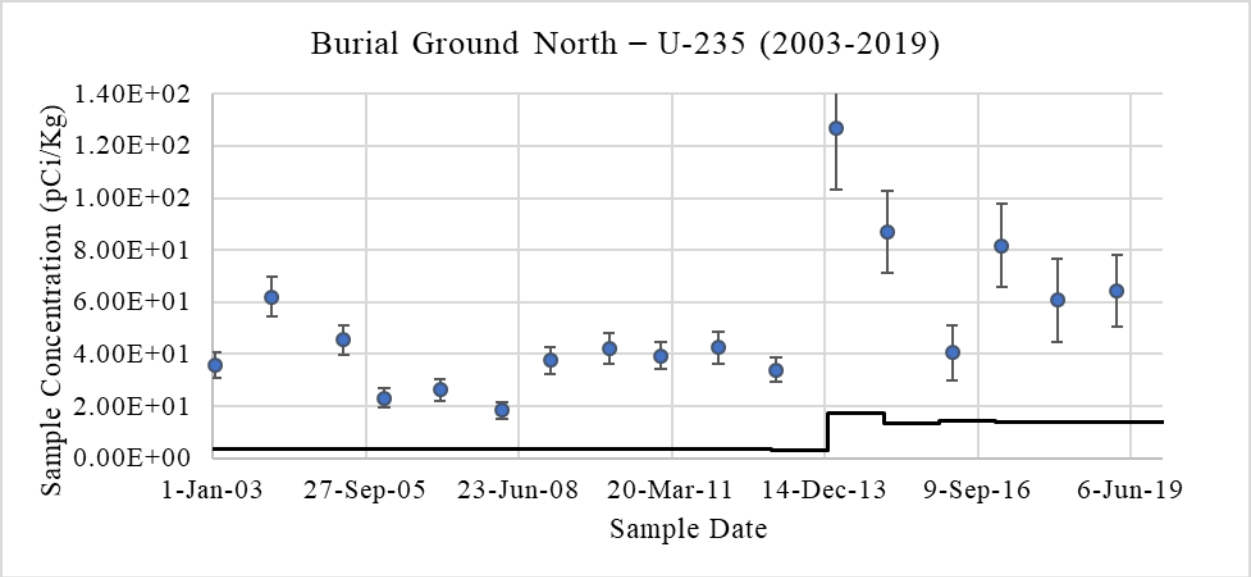

Figure C-15. SRS Onsite Sampling Location "Burial Ground North" U-235 Soil Surveillance 2003-2019. Solid Line indicates MDC.

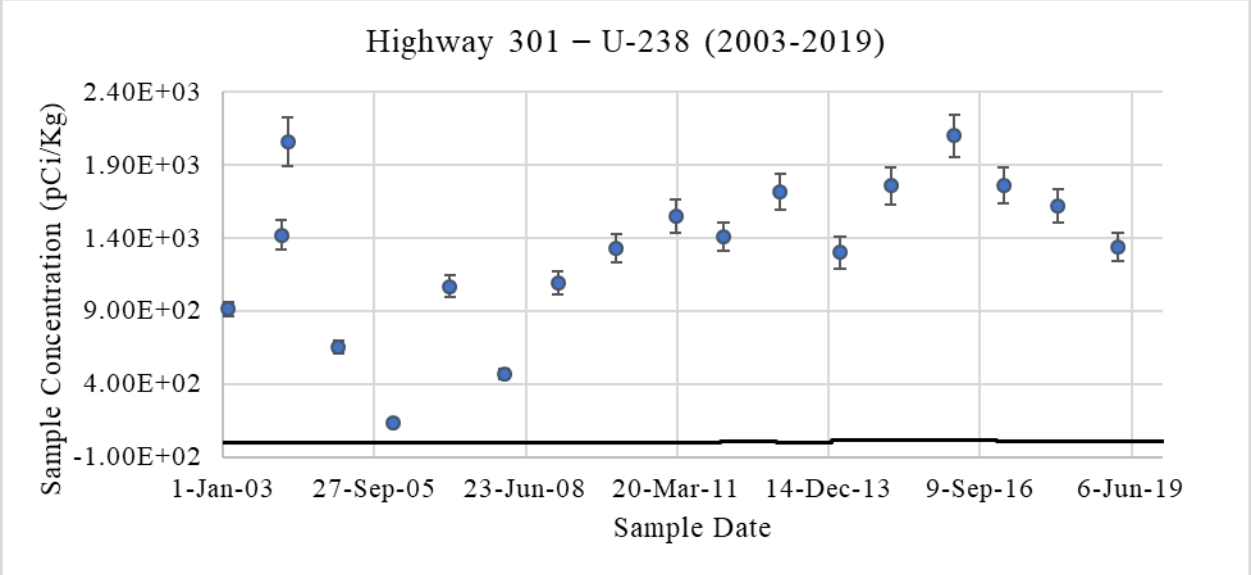

Figure C-16. Twenty-Five Mile Offsite Sampling Location "Highway 301" U-238 Soil Surveillance 2003-2019. Solid Line indicates MDC.

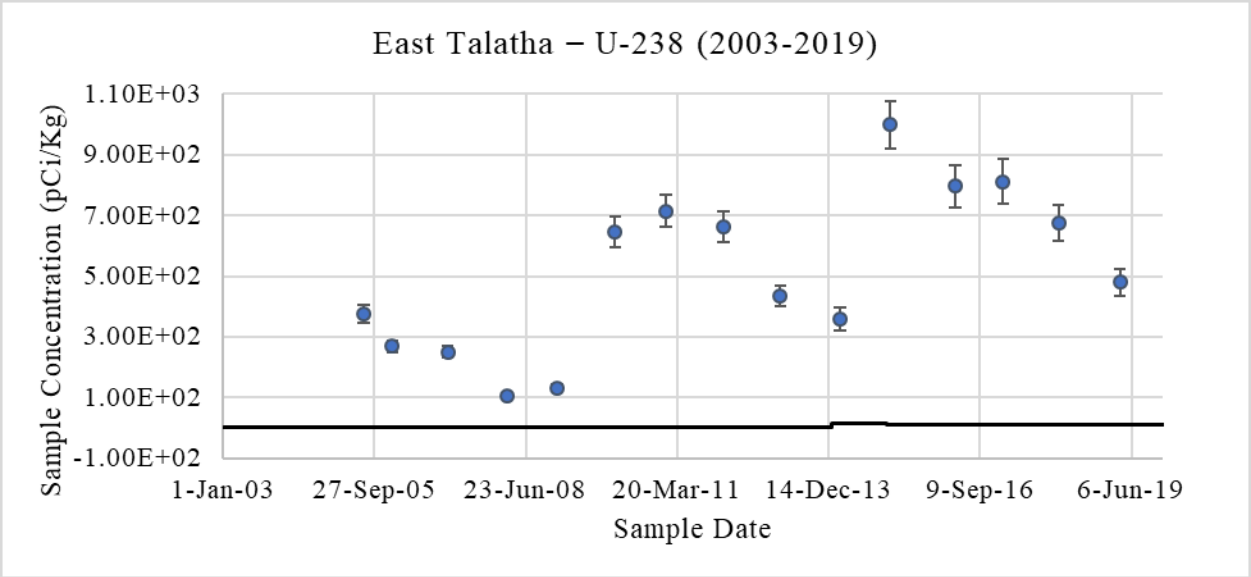

Figure C-17. SRS Perimeter Sampling Location "East Talatha" U-238 Soil Surveillance 2003-2019. Solid Line indicates MDC.

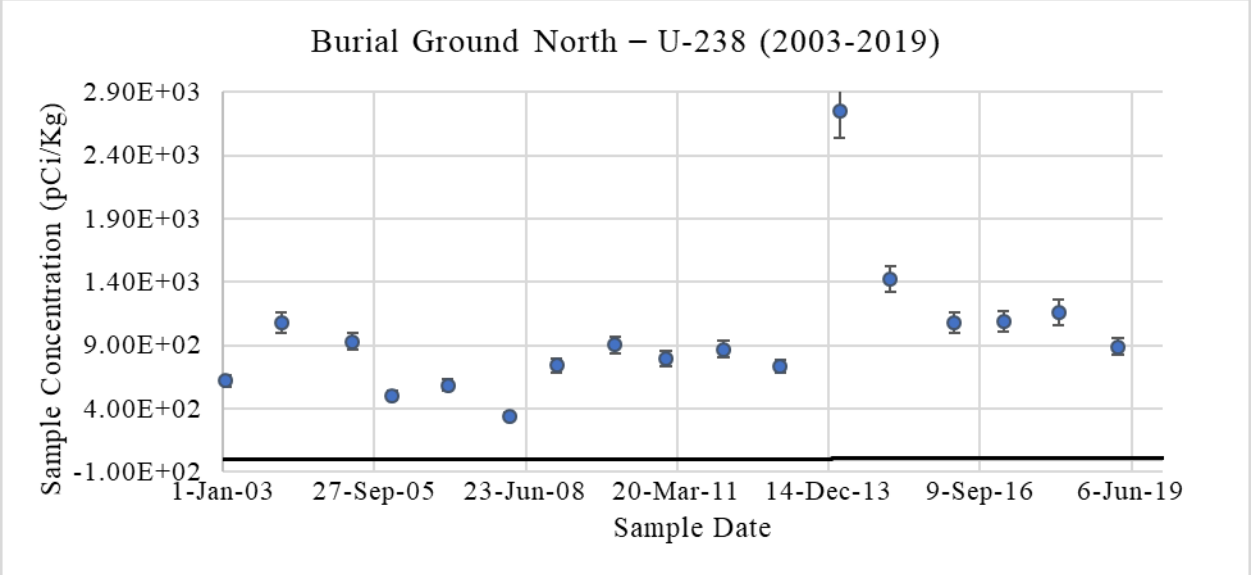

Figure C-18. SRS Onsite Sampling Location "Burial Ground North" U-238 Soil Surveillance 2003-2019. Solid Line indicates MDC.

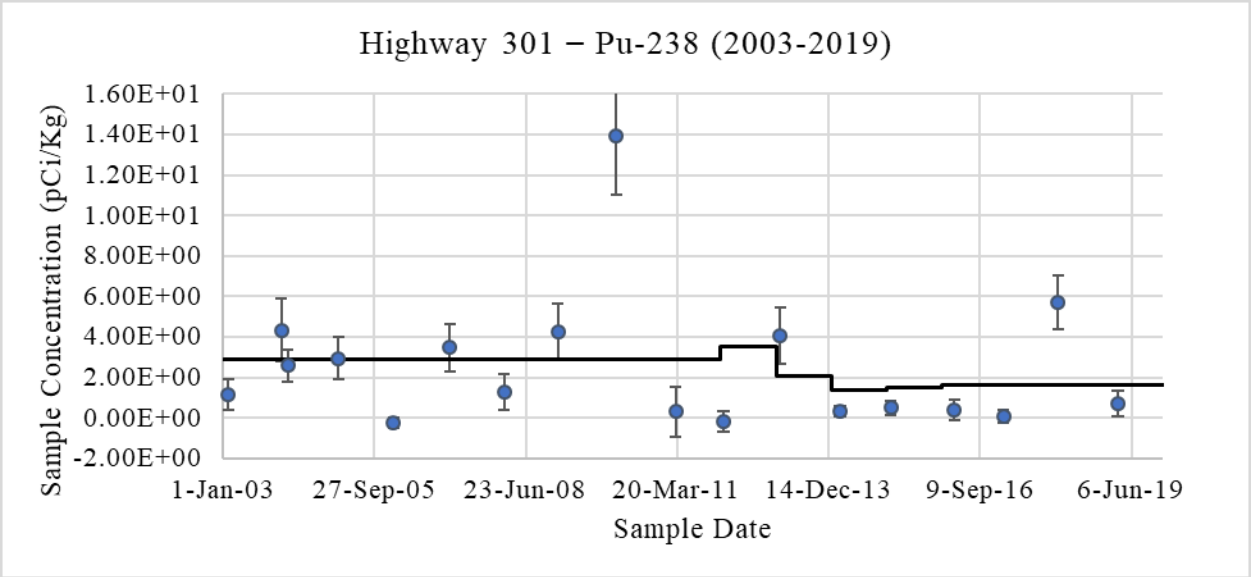

Figure C-19. Twenty-Five Mile Offsite Sampling Location "Highway 301" Pu-238 Soil Surveillance 2003-2019. Solid Line indicates MDC.

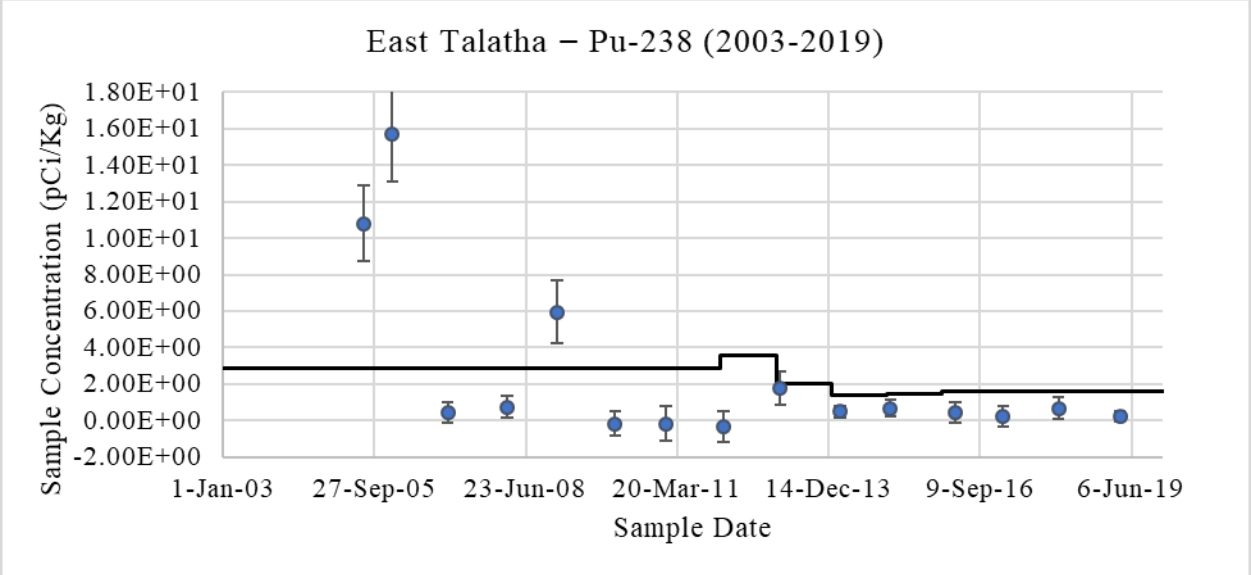

Figure C-20. SRS Perimeter Sampling Location "East Talatha" Pu-238 Soil Surveillance 2003-2019. Solid Line indicates MDC.

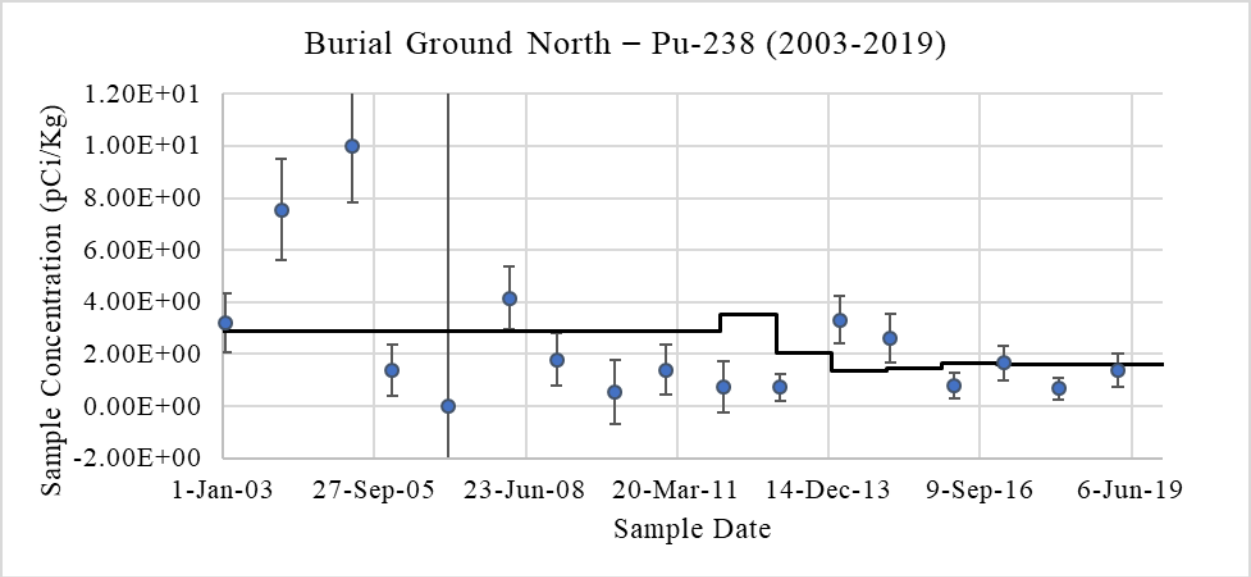

Figure C-21. SRS Onsite Sampling Location "Burial Ground North" Pu-238 Soil Surveillance 2003-2019. Solid Line indicates MDC.

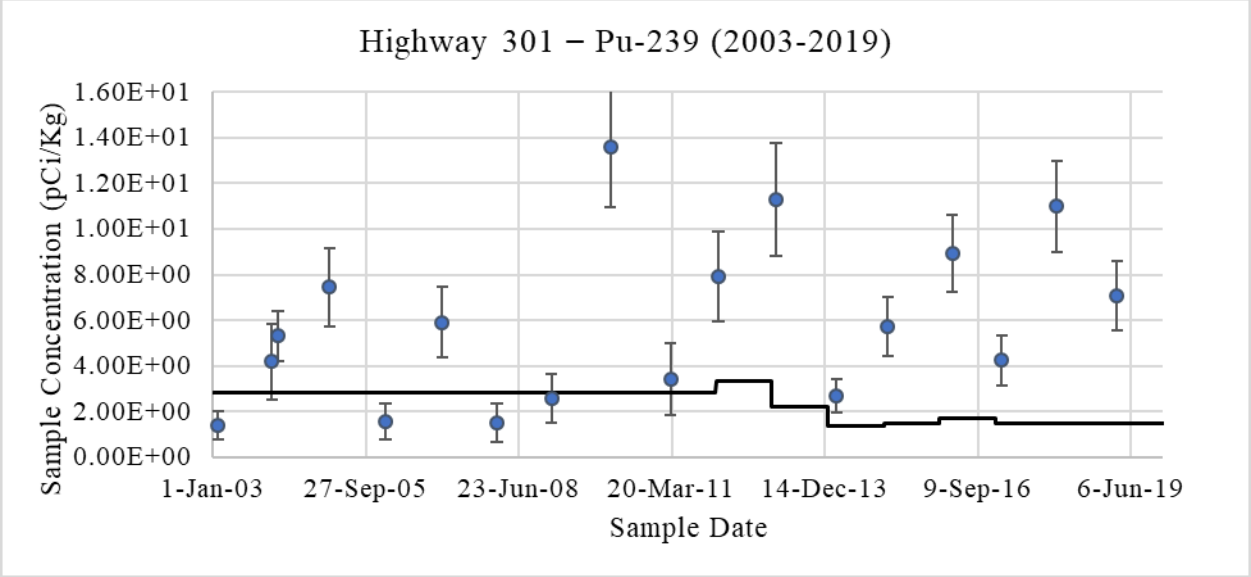

Figure C-22. Twenty-Five Mile Offsite Sampling Location "Highway 301" Pu-239 Soil Surveillance 2003-2019. Solid Line indicates MDC.

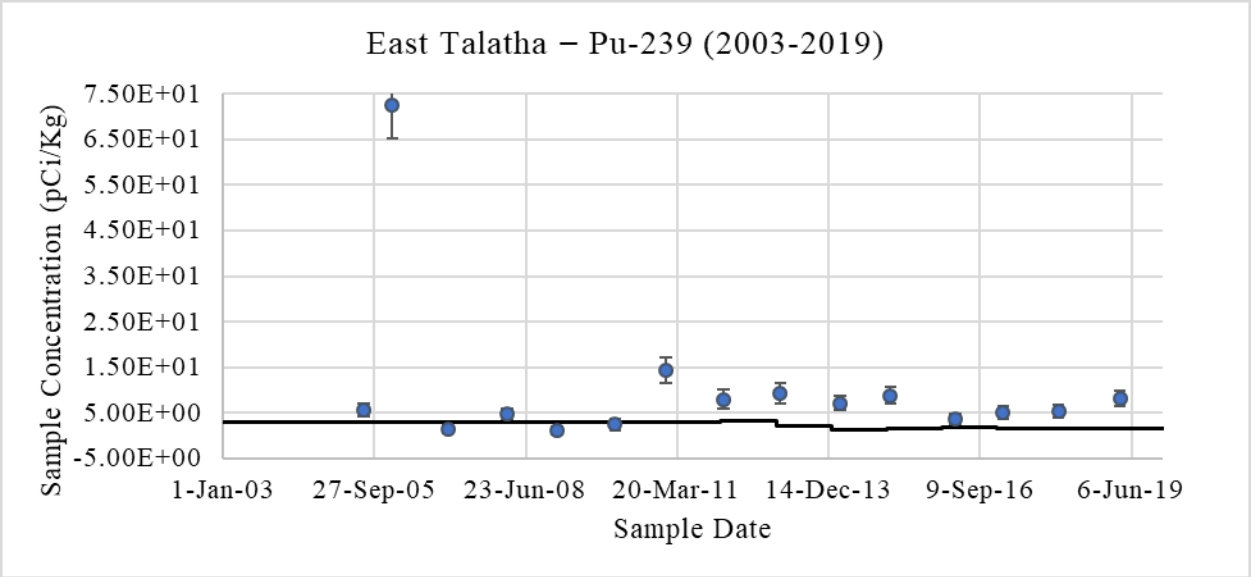

Figure C-23. SRS Perimeter Sampling Location "East Talatha" Pu-239 Soil Surveillance 2003-2019. Solid Line indicates MDC.

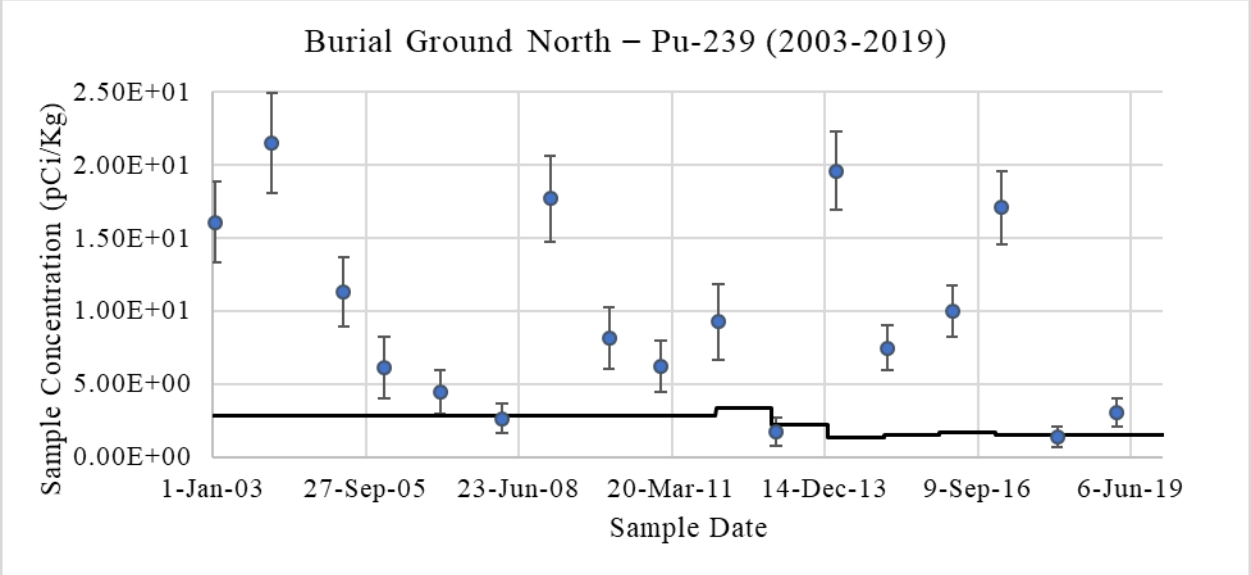

Figure C-24. SRS Onsite Sampling Location "Burial Ground North" Pu-239 Soil Surveillance 2003-2019. Solid Line indicates MDC.

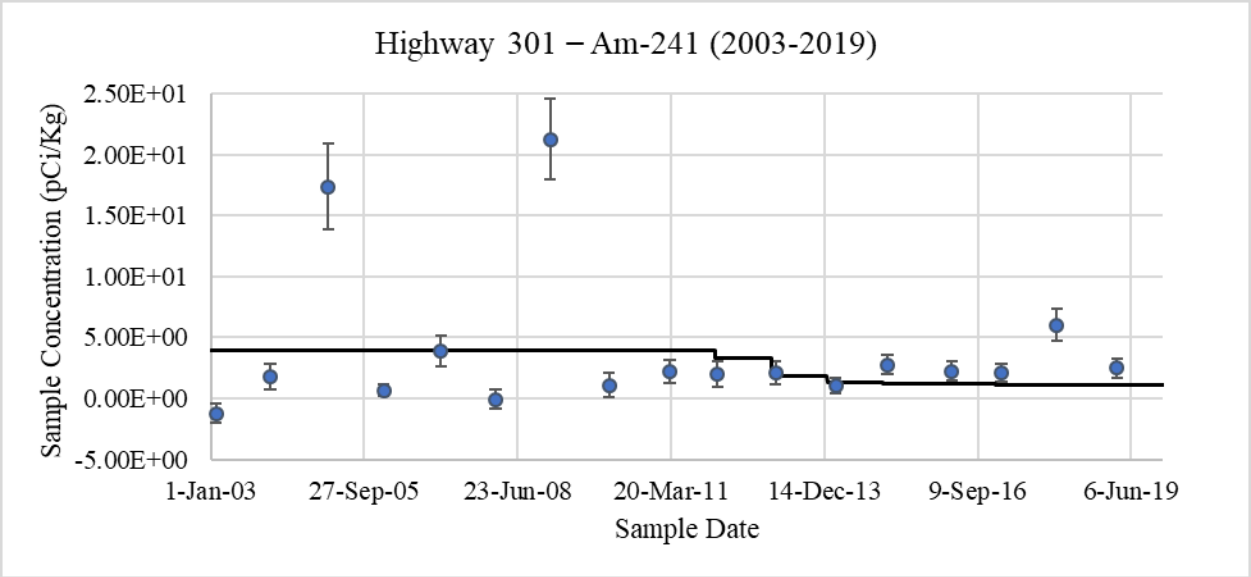

Figure C-25. Twenty-Five Mile Offsite Sampling Location "Highway 301" Am-241 Soil Surveillance 2003-2019. Solid Line indicates MDC.

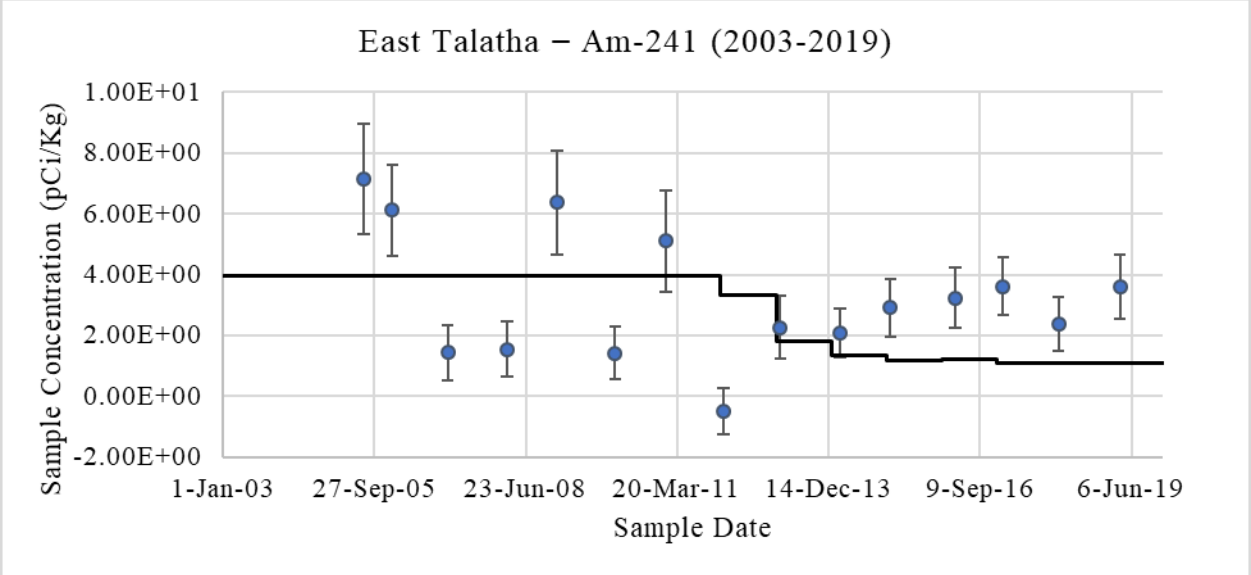

Figure C-26. SRS Perimeter Sampling Location "East Talatha" Am-241 Soil Surveillance 2003-2019. Solid Line indicates MDC.

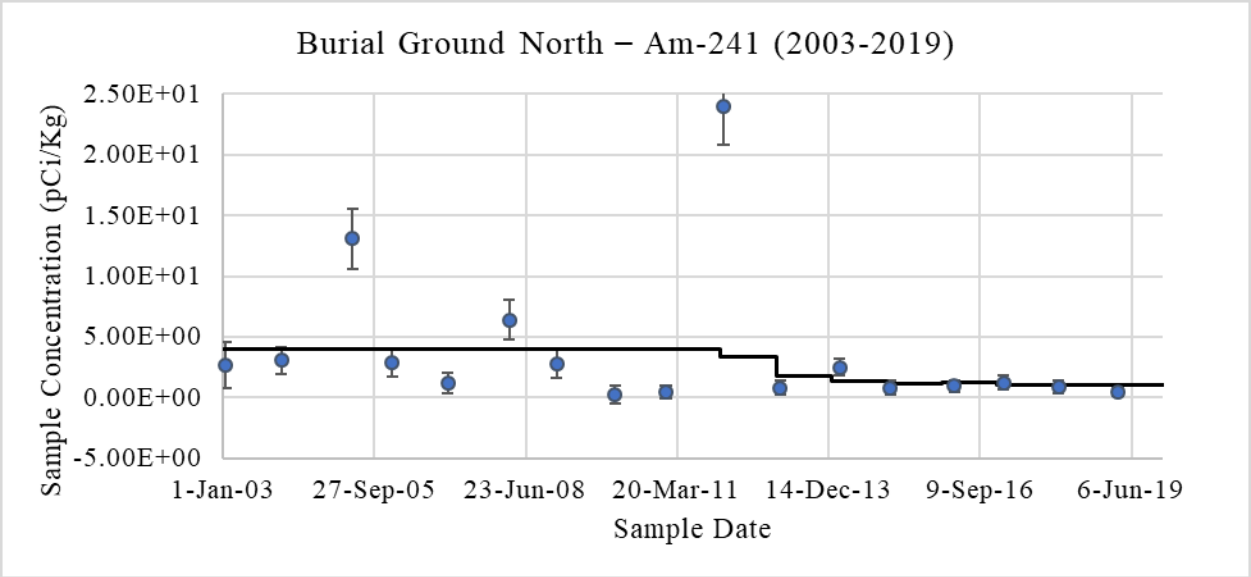

Figure C-27. SRS Onsite Sampling Location "Burial Ground North" Am-241 Soil Surveillance 2003-2019. Solid Line indicates MDC.

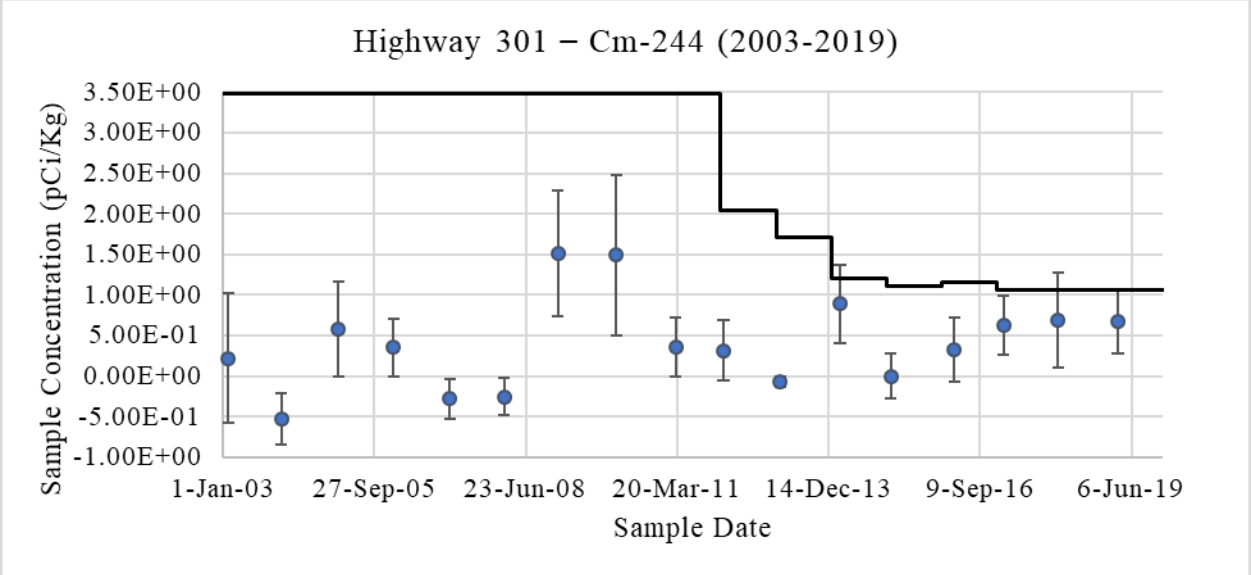

Figure C-28. Twenty-Five Mile Offsite Sampling Location "Highway 301" Cm-244 Soil Surveillance 2003-2019. Solid Line indicates MDC.

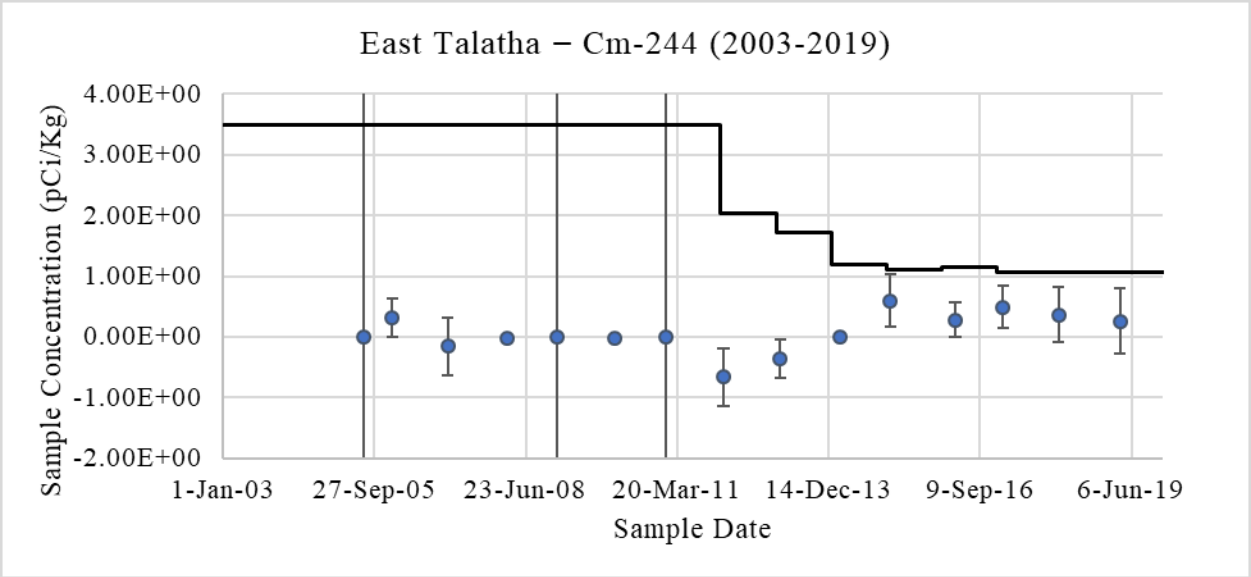

Figure C-29. SRS Perimeter Sampling Location "East Talatha" Cm-244 Soil Surveillance 2003-2019. Solid Line indicates MDC.

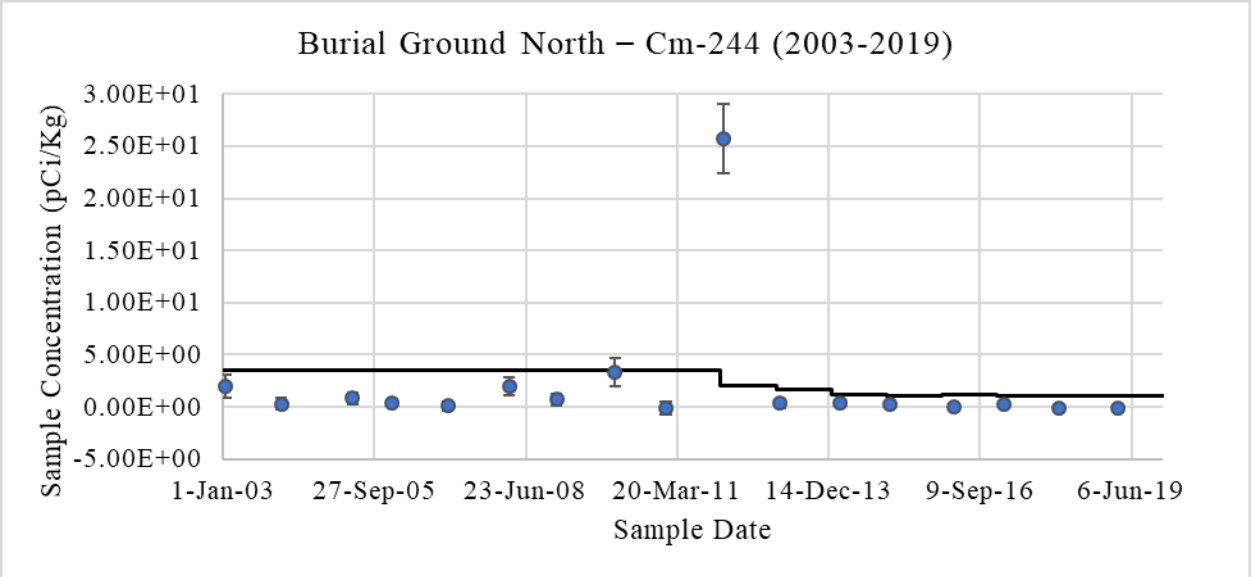

Figure C-30. SRS Onsite Sampling Location "Burial Ground North" Cm-244 Soil Surveillance 2003-2019. Solid Line indicates MDC.

Appendix D. Stream and River Sediment

Table D-1. Environmental Sediment Surveillance Summary for Years 2003-2019

Location	Nuclide	Sample Number (>MDC)	Mean Concentration (pCi/Kg)	Overall Sigma (pCi/Kg)	Minimum Concentration (pCi/Kg)	Maximum Concentration (pCi/Kg)
Onsite Streams						
Lower Three Runs	Cs-137	18 (18)	4.68E+02	6.83E+01	9.36E+01	9.88E+02
(L3R Mouth)	Sr-89/90	18 (0)	3.51E+01	1.07E+01	-3.31E+01	1.44E+02
	Np-237	11 (1)	2.84E-01	4.35E-01	-1.02E+00	4.40E+00
	U-234	18 (18)	8.79E+02	1.16E+02	1.62E+01	1.69E+03
	U-235	18 (18)	4.52E+01	6.27E+00	8.49E-01	8.74E+01
	U-238	18 (18)	8.53E+02	1.12E+02	1.69E+01	1.62E+03
	Pu-238	18 (4)	2.71E+00	1.78E+00	-6.54E-01	3.26E+01
	Pu-239	18 (4)	9.31E-01	1.73E-01	-7.88E-01	2.31E+00
	Am-241	17 (7)	1.56E+00	5.94E-01	-4.91E-01	1.04E+01
	Cm-244	17 (2)	7.79E-01	3.61E-01	-2.70E-01	6.23E+00
Steel Creek	Cs-137	21 (21)	5.79E+03	1.85E+03	2.07E+02	2.73E+04
(SC-4)	Sr-89/90	18 (2)	5.83E+01	1.67E+01	-2.27E+01	2.35E+02
	Np-237	12 (0)	4.79E-01	2.53E-01	-5.78E-01	1.68E+00
	U-234	18 (18)	5.42E+02	7.82E+01	8.56E+01	1.17E+03
	U-235	18 (16)	2.65E+01	3.51E+00	5.64E+00	4.97E+01
	U-238	18 (18)	5.20E+02	7.34E+01	9.00E+01	1.18E+03
	Pu-238	18 (14)	2.37E+01	1.05E+01	7.22E-01	1.88E+02
	Pu-239	18 (16)	1.51E+01	3.82E+00	1.37E+00	4.72E+01
	Am-241	19 (12)	7.40E+00	2.01E+00	-3.42E-01	2.57E+01
	Cm-244	19 (3)	1.30E+00	3.00E-01	-2.47E-02	5.29E+00
Pen Branch	Cs-137	17 (17)	6.02E+03	4.76E+03	5.61E+02	8.22E+04
(PB@Swamp)	Sr-89/90	17 (6)	8.44E+01	1.53E+01	2.49E+00	2.05E+02
	Np-237	11 (0)	4.38E-01	2.89E-01	-7.21E-01	2.45E+00
	U-234	16 (16)	8.54E+02	7.05E+01	2.45E+02	1.15E+03
	U-235	16 (16)	4.28E+01	3.62E+00	1.53E+01	6.19E+01
	U-238	16 (16)	8.46E+02	7.11E+01	2.44E+02	1.26E+03
	Pu-238	16 (10)	1.06E+01	4.42E+00	1.12E-01	6.06E+01
	Pu-239	16 (16)	2.17E+01	3.34E+00	4.22E+00	5.75E+01
	Am-241	15 (14)	1.13E+01	2.42E+00	3.13E+00	3.75E+01
	Cm-244	15 (3)	1.11E+00	4.03E-01	-1.50E+00	5.76E+00
Fourmile Branch	Cs-137	20 (20)	9.36E+03	4.94E+03	1.51E+03	1.02E+05
(FM-A7)	Sr-89/90	19 (16)	3.58E+02	9.65E+01	3.09E+01	1.69E+03
	Np-237	10 (4)	3.21E+00	8.45E-01	4.00E-01	7.65E+00
	U-234	19 (19)	1.04E+03	1.53E+02	2.37E+02	2.80E+03
	U-235	19 (19)	5.94E+01	1.27E+01	1.42E+01	2.58E+02
	U-238	19 (19)	1.19E+03	1.90E+02	2.49E+02	3.44E+03
	Pu-238	19 (19)	1.36E+02	3.43E+01	2.58E+00	6.10E+02
	Pu-239	19 (18)	6.30E+01	1.55E+01	7.35E-01	2.72E+02
	Am-241	18 (17)	7.86E+01	2.58E+01	7.04E-01	4.72E+02
	Cm-244	18 (18)	9.60E+01	3.88E+01	3.06E+00	7.15E+02

Location	Nuclide	Sample Number (>MDC)	Mean Concentration (pCi/Kg)	Overall Sigma (pCi/Kg)	Minimum Concentration (pCi/Kg)	Maximum Concentration (pCi/Kg)
Fourmile Branch	Cs-137	17 (17)	4.77E+03	1.43E+03	1.25E+03	2.59E+04
(FM@Swamp)	Sr-89/90	17 (11)	3.91E+02	1.39E+02	-2.60E+01	2.00E+03
	Np-237	11 (8)	4.28E+00	1.14E+00	-1.64E-01	1.16E+01
	U-234	17 (17)	8.14E+02	1.17E+02	2.49E+02	1.80E+03
	U-235	17 (17)	4.12E+01	5.87E+00	1.15E+01	9.40E+01
	U-238	17 (17)	8.83E+02	1.34E+02	2.68E+02	2.30E+03
	Pu-238	17 (15)	3.63E+01	9.40E+00	5.08E-01	1.38E+02
	Pu-239	17 (16)	2.54E+01	4.46E+00	2.01E+00	6.80E+01
	Am-241	16 (15)	3.04E+01	6.79E+00	1.51E+00	9.49E+01
	Cm-244	16 (13)	2.40E+01	5.55E+00	3.83E-01	6.57E+01
Upper Three Runs	Cs-137	18 (0)	1.11E+00	6.99E+00	-5.69E+01	6.97E+01
(TB-5)	Sr-89/90	17 (1)	5.01E+01	2.19E+01	-2.92E+01	3.62E+02
	Np-237	11 (1)	9.43E-01	6.41E-01	-1.04E+00	6.93E+00
	U-234	17 (17)	3.05E+03	4.68E+02	1.15E+02	6.29E+03
	U-235	17 (17)	1.87E+02	4.45E+01	5.09E+00	8.09E+02
	U-238	17 (17)	3.18E+03	4.84E+02	1.30E+02	6.38E+03
	Pu-238	17 (4)	2.12E+00	1.05E+00	-1.03E+00	1.57E+01
	Pu-239	17 (6)	2.09E+00	5.48E-01	-1.64E-01	6.75E+00
	Am-241	17 (7)	5.70E+00	3.34E+00	-1.33E+00	5.72E+01
	Cm-244	17 (4)	2.14E+00	1.29E+00	-3.33E-02	2.25E+01
Upper Three Runs	Cs-137	17 (11)	1.50E+02	3.24E+01	-5.07E+00	4.10E+02
(U3R Mouth)	Sr-89/90	17 (0)	2.36E+01	1.37E+01	-6.80E+01	1.69E+02
	Np-237	11 (0)	1.51E-01	2.24E-01	-1.10E+00	1.73E+00
	U-234	17 (17)	1.06E+03	1.71E+02	6.26E+01	2.58E+03
	U-235	17 (17)	5.61E+01	9.25E+00	3.37E+00	1.39E+02
	U-238	17 (17)	1.11E+03	1.92E+02	4.95E+01	3.02E+03
	Pu-238	17 (8)	8.89E+00	6.89E+00	-4.02E-01	1.19E+02
	Pu-239	17 (10)	4.21E+00	9.83E-01	-6.01E-01	1.38E+01
	Am-241	15 (8)	1.97E+01	1.60E+01	-1.38E+00	2.43E+02
	Cm-244	15 (3)	6.48E-01	2.35E-01	-3.86E-01	3.20E+00
Onsite (Control)						
Upper Three Runs	Cs-137	15 (9)	1.54E+02	3.73E+01	-1.35E+01	5.37E+02
(U3R-1A,-0)	Sr-89/90	16 (2)	1.20E+02	8.48E+01	-4.12E+01	1.38E+03
	Np-237	10 (3)	2.54E+00	1.74E+00	-5.33E-01	1.74E+01
	U-234	14 (14)	1.29E+03	1.81E+02	5.03E+01	2.47E+03
	U-235	14 (13)	7.16E+01	1.00E+01	2.05E+00	1.25E+02
	U-238	14 (14)	1.39E+03	1.93E+02	5.33E+01	2.52E+03
	Pu-238	16 (6)	1.60E+01	1.22E+01	-5.75E-01	1.98E+02
	Pu-239	16 (14)	6.66E+00	1.31E+00	3.86E-01	1.88E+01
	Am-241	15 (12)	1.07E+01	6.70E+00	1.12E+00	1.04E+02
	Cm-244	15 (1)	5.34E-01	2.85E-01	-6.38E-01	4.22E+00

Location	Nuclide	Sample Number (>MDC)	Mean Concentration (pCi/Kg)	Overall Sigma (pCi/Kg)	Minimum Concentration (pCi/Kg)	Maximum Concentration (pCi/Kg)
Offsite-Savannah River						
RM-160/161	Cs-137	16 (5)	3.92E+01	1.03E+01	-2.42E+01	1.19E+02
(control)	Sr-89/90	16 (2)	2.68E+01	1.39E+01	-7.06E+01	1.41E+02
	Np-237	10 (0)	1.43E-01	1.66E-01	-6.37E-01	1.22E+00
	U-234	15 (15)	8.83E+02	1.36E+02	1.01E+02	1.84E+03
	U-235	15 (15)	4.03E+01	6.00E+00	6.61E+00	9.15E+01
	U-238	15 (15)	8.55E+02	1.29E+02	9.86E+01	1.76E+03
	Pu-238	16 (2)	2.72E+00	1.63E+00	-5.20E-01	2.49E+01
	Pu-239	16 (5)	2.43E+00	1.02E+00	-4.80E-01	1.57E+01
	Am-241	15 (8)	9.32E+00	5.86E+00	-5.11E-01	8.70E+01
	Cm-244	15 (1)	8.10E-01	5.09E-01	-9.65E-01	7.72E+00
RM 150.4	Cs-137	6 (0)	-4.41E+00	5.25E+00	-2.01E+01	1.83E+01
(above Vogtle)	Sr-89/90	6 (0)	3.26E+01	1.31E+01	-1.18E+01	7.26E+01
(2016-2019)	Np-237	5 (0)	7.17E-02	4.14E-01	-1.09E+00	1.05E+00
	U-234	6 (6)	1.62E+03	4.99E+01	1.45E+03	1.78E+03
	U-235	6 (6)	6.37E+01	6.11E+00	4.20E+01	7.94E+01
	U-238	6 (6)	1.56E+03	4.27E+01	1.42E+03	1.72E+03
	Pu-238	5 (0)	5.51E-01	2.16E-01	-1.95E-02	1.14E+00
	Pu-239	5 (0)	3.10E-01	2.35E-01	-5.37E-01	8.05E-01
	Am-241	5 (2)	8.49E-01	4.18E-01	2.16E-02	2.38E+00
	Cm-244	6 (0)	1.64E-01	1.76E-01	-4.46E-01	6.75E-01
RM 150.2	Cs-137	19 (14)	4.40E+02	1.20E+02	5.39E+00	1.80E+03
(below Vogtle)	Sr-89/90	18 (1)	4.12E+01	1.12E+01	-6.30E+01	1.20E+02
(below FM Mouth)	Np-237	12 (1)	4.02E-01	3.95E-01	-1.99E+00	3.01E+00
	U-234	18 (18)	1.02E+03	1.33E+02	1.76E+02	2.09E+03
	U-235	18 (18)	5.02E+01	6.80E+00	7.04E+00	1.05E+02
	U-238	18 (18)	9.86E+02	1.31E+02	1.70E+02	2.02E+03
	Pu-238	18 (7)	2.96E+00	1.18E+00	-5.26E-01	2.17E+01
	Pu-239	18 (2)	2.74E+00	1.45E+00	-1.05E+00	2.47E+01
	Am-241	18 (9)	3.91E+00	1.60E+00	-4.81E-01	2.52E+01
	Cm-244	18 (4)	1.22E+00	4.47E-01	-7.13E-01	8.10E+00
RM 134	Cs-137	17 (17)	2.36E+02	2.44E+01	9.75E+01	5.35E+02
(below SR Swamp)	Sr-89/90	17 (2)	4.47E+01	1.31E+01	-5.37E+01	1.62E+02
	Np-237	10 (0)	-8.99E-02	1.98E-01	-1.33E+00	5.79E-01
	U-234	16 (15)	9.91E+02	1.21E+02	2.02E+00	1.59E+03
	U-235	16 (15)	4.64E+01	6.06E+00	-1.04E-01	8.49E+01
	U-238	16 (16)	9.66E+02	1.18E+02	2.91E+00	1.59E+03
	Pu-238	16 (4)	1.53E+00	7.01E-01	-1.40E-01	1.07E+01
	Pu-239	16 (7)	2.73E+00	1.18E+00	7.10E-02	1.97E+01
	Am-241	15 (7)	2.27E+00	7.25E-01	-3.99E-01	8.97E+00
	Cm-244	15 (3)	7.90E-01	4.33E-01	-9.00E-01	6.54E+00

Location	Nuclide	Sample Number (>MDC)	Mean Concentration (pCi/Kg)	Overall Sigma (pCi/Kg)	Minimum Concentration (pCi/Kg)	Maximum Concentration (pCi/Kg)
RM 118.7	Cs-137	17 (15)	2.22E+02	2.29E+01	2.93E+01	3.67E+02
(HWY 301 Bridge)	Sr-89/90	17 (1)	2.64E+01	1.54E+01	-5.28E+01	2.45E+02
	Np-237	11 (0)	3.65E-01	2.31E-01	-1.14E-01	2.52E+00
	U-234	16 (16)	1.05E+03	1.30E+02	5.37E+00	1.69E+03
	U-235	16 (16)	5.34E+01	6.68E+00	3.03E-01	8.92E+01
	U-238	16 (16)	1.02E+03	1.25E+02	5.82E+00	1.56E+03
	Pu-238	17 (7)	1.58E+01	1.16E+01	-1.51E-01	2.00E+02
	Pu-239	17 (9)	3.01E+00	7.61E-01	1.10E-02	1.27E+01
	Am-241	16 (9)	4.11E+00	1.67E+00	9.61E-02	2.75E+01
	Cm-244	16 (3)	1.40E+00	6.12E-01	-3.59E-01	8.10E+00

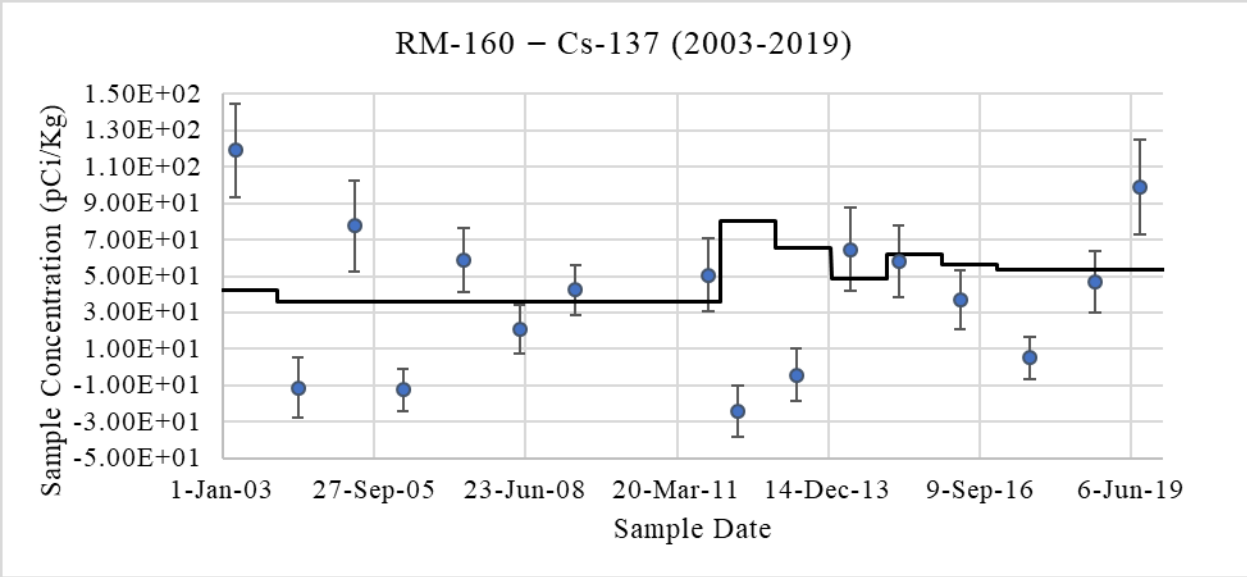

Figure D-1. SRS Offsite Savannah River Sampling Location "RM-160/161" Cs-137 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

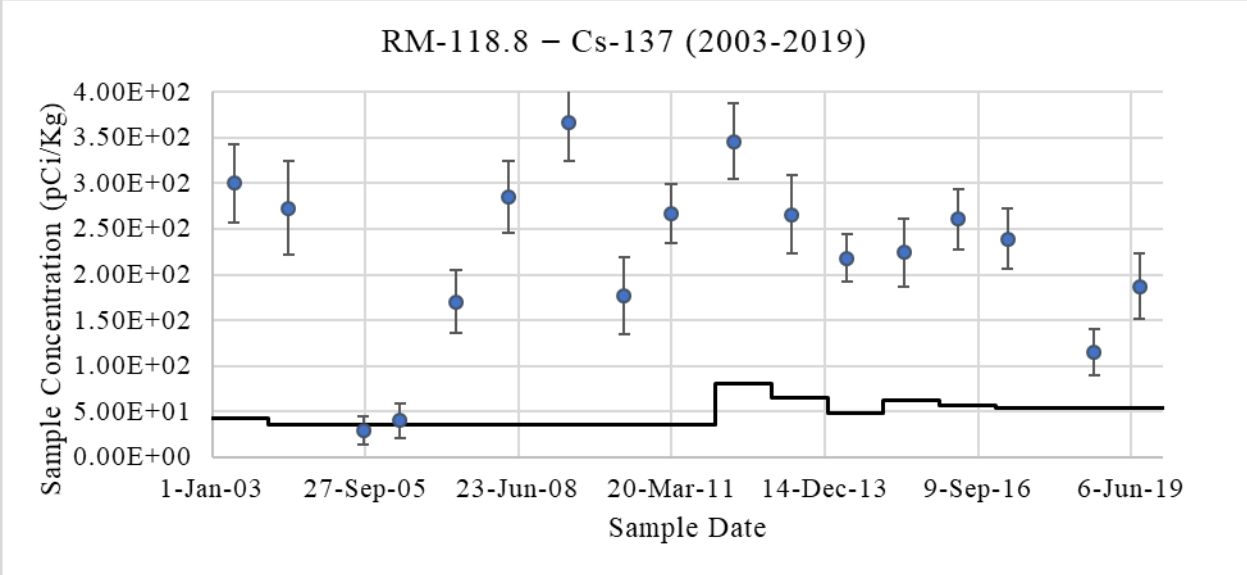

Figure D-2. SRS Offsite Savannah River Sampling Location "RM-118.7" Cs-137 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

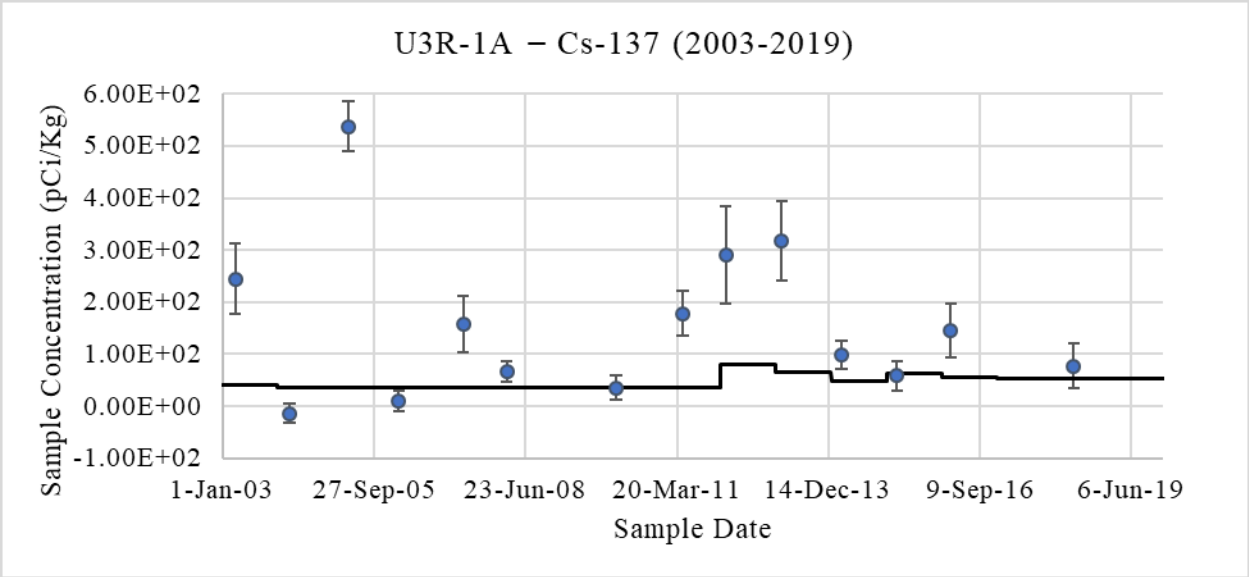

Figure D-3. SRS Onsite Sampling Location "U3R-1A" Cs-137 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

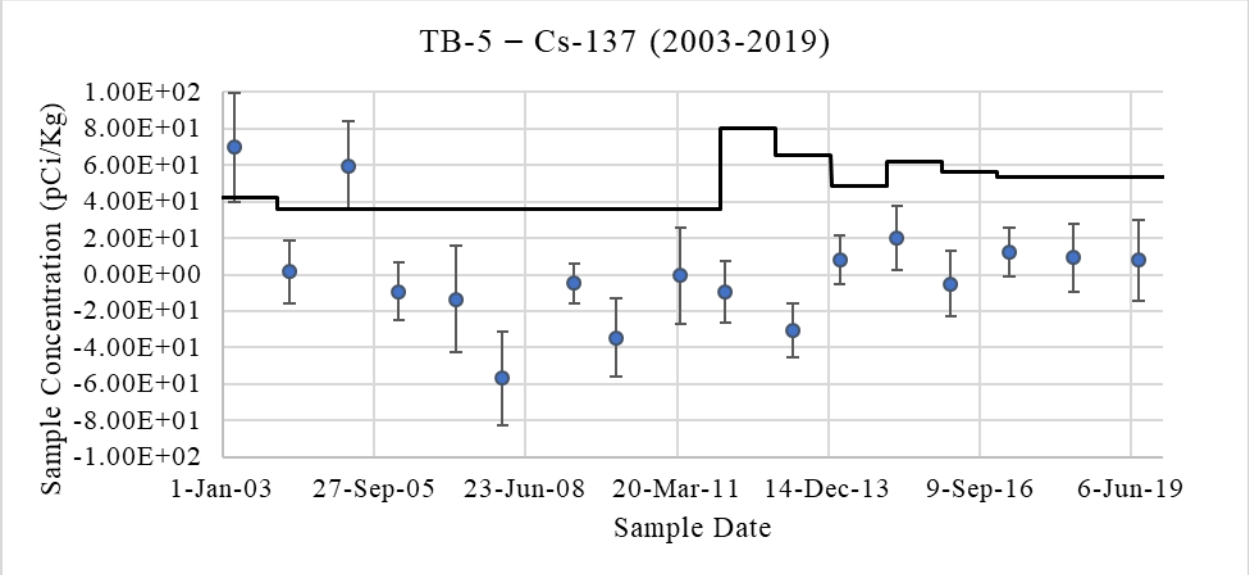

Figure D-4. SRS Onsite Stream Sampling Location "TB-5" Cs-137 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

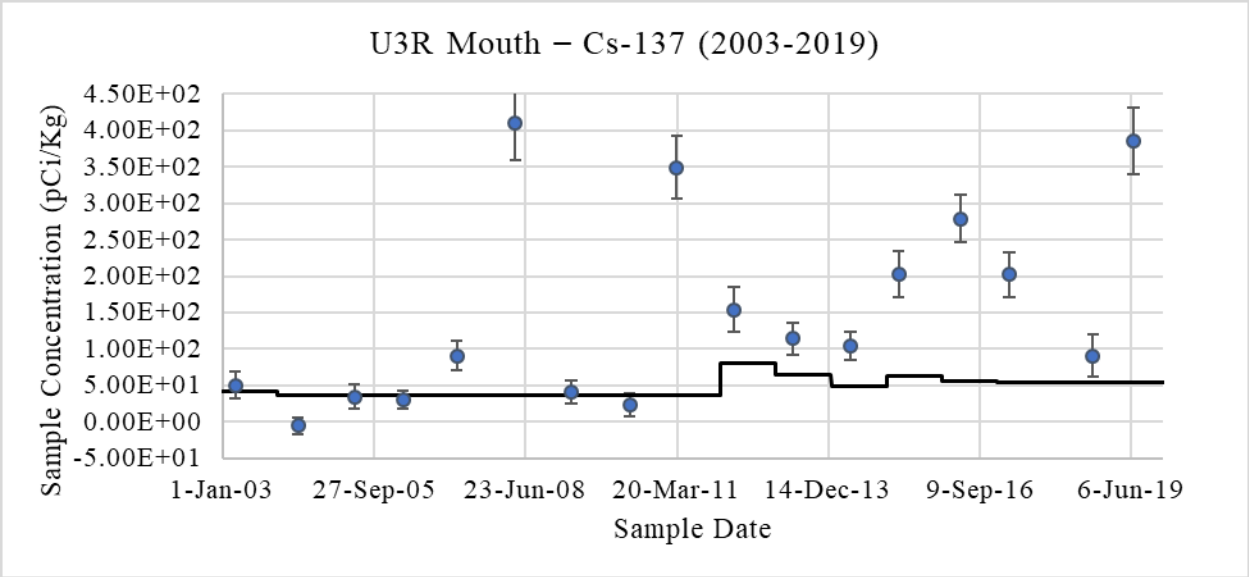

Figure D-5. SRS Onsite Stream Sampling Location "U3R Mouth" Cs-137 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

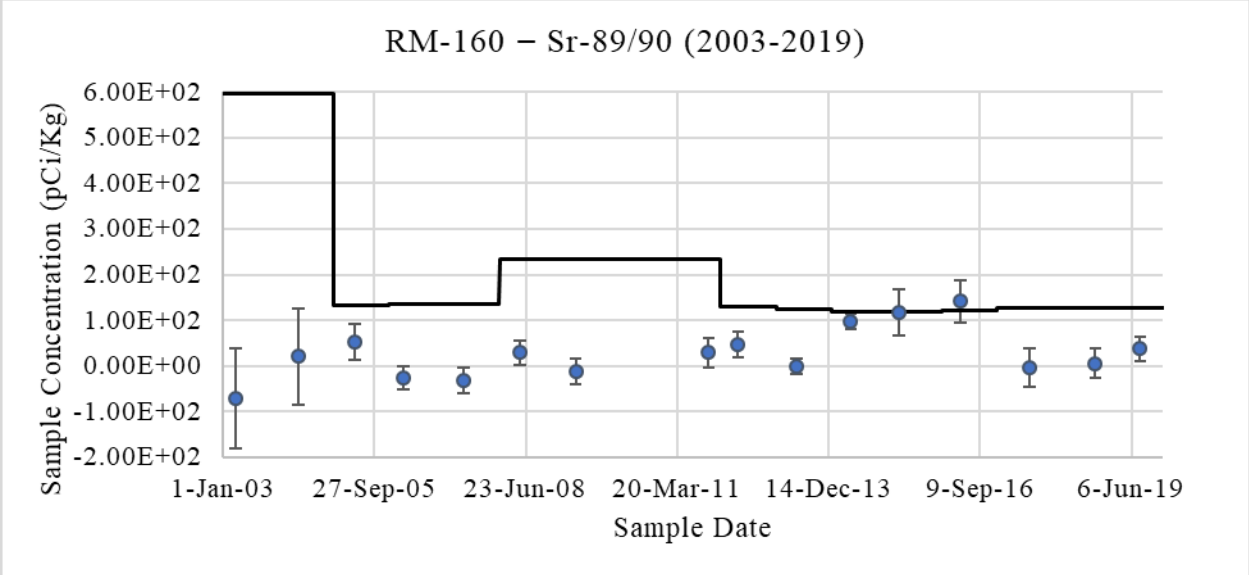

Figure D-6. SRS Offsite Savannah River Sampling Location "RM-160/161" Sr-89/90 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

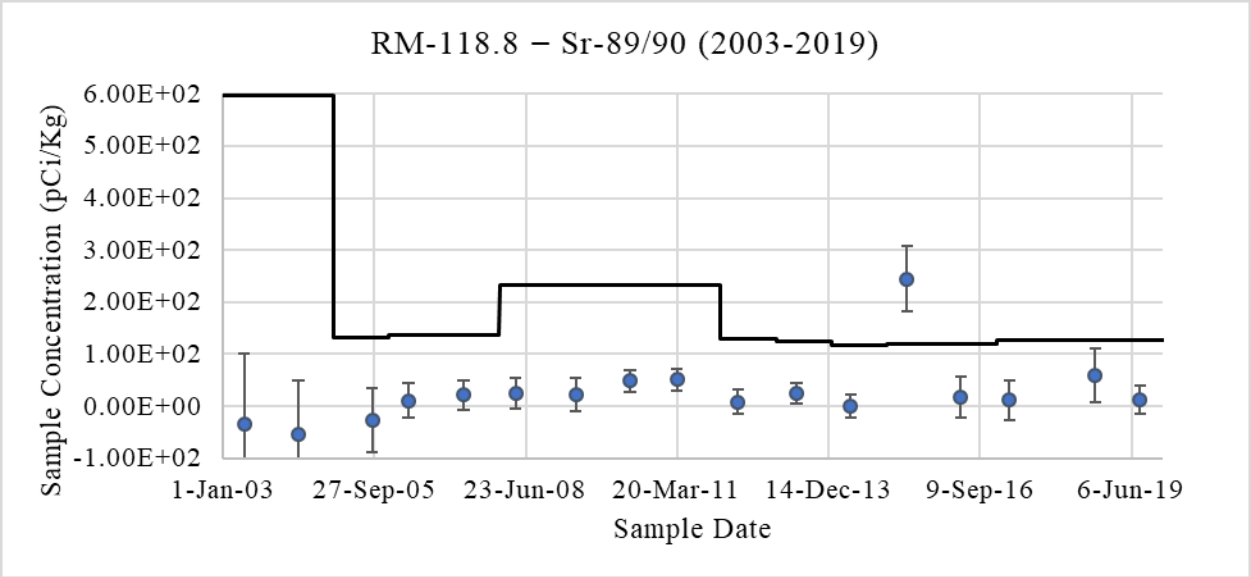

Figure D-7. SRS Offsite Savannah River Sampling Location "RM-118.7" Sr-89/90 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

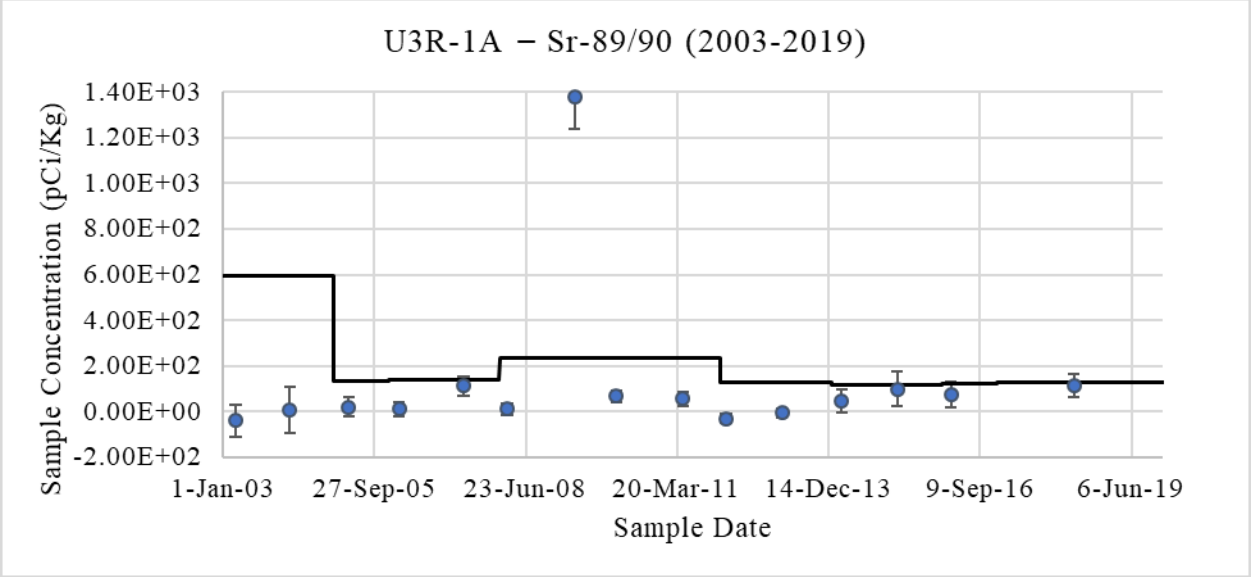

Figure D-8. SRS Onsite Sampling Location "U3R-1A" Sr-89/90 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

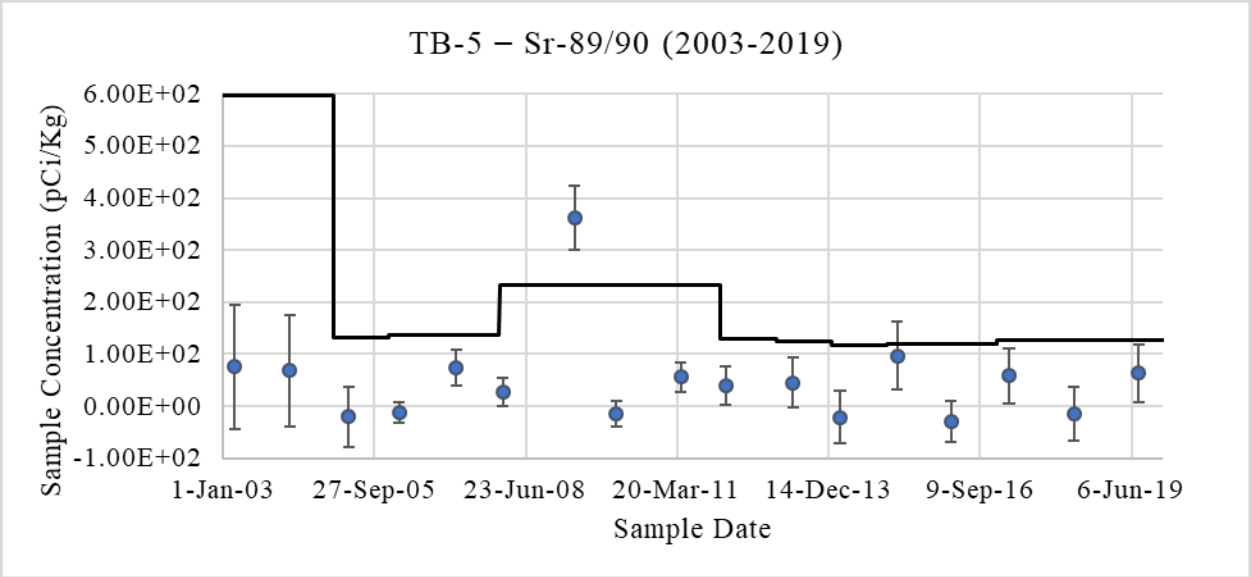

Figure D-9. SRS Onsite Stream Sampling Location "TB-5" Sr-89/90 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

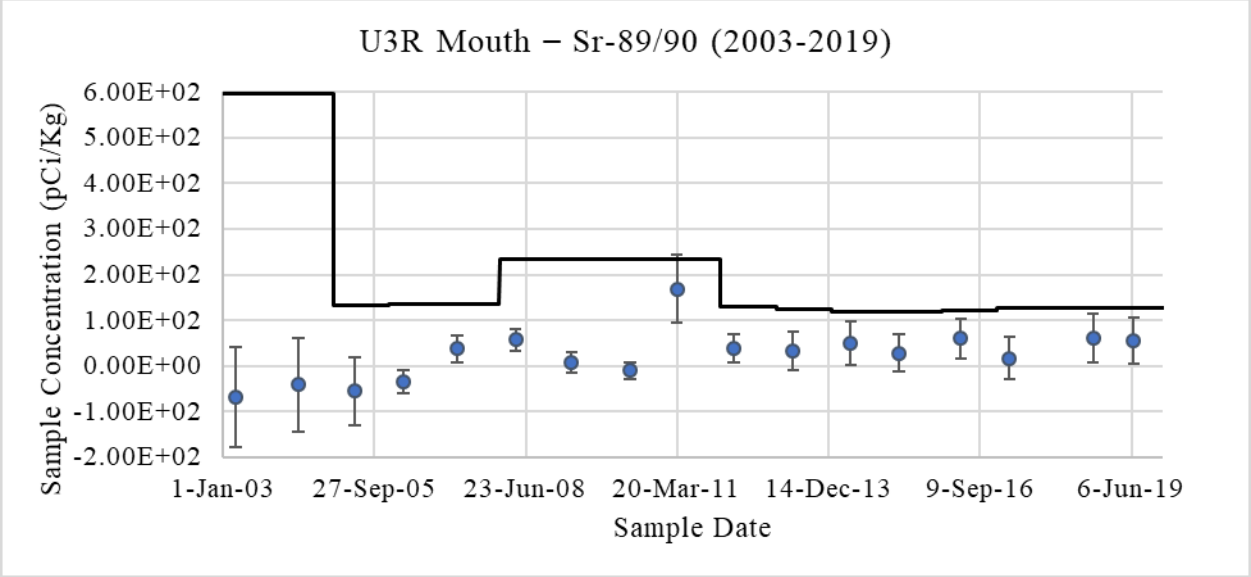

Figure D-10. SRS Onsite Stream Sampling Location "U3R Mouth" Sr-89/90 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

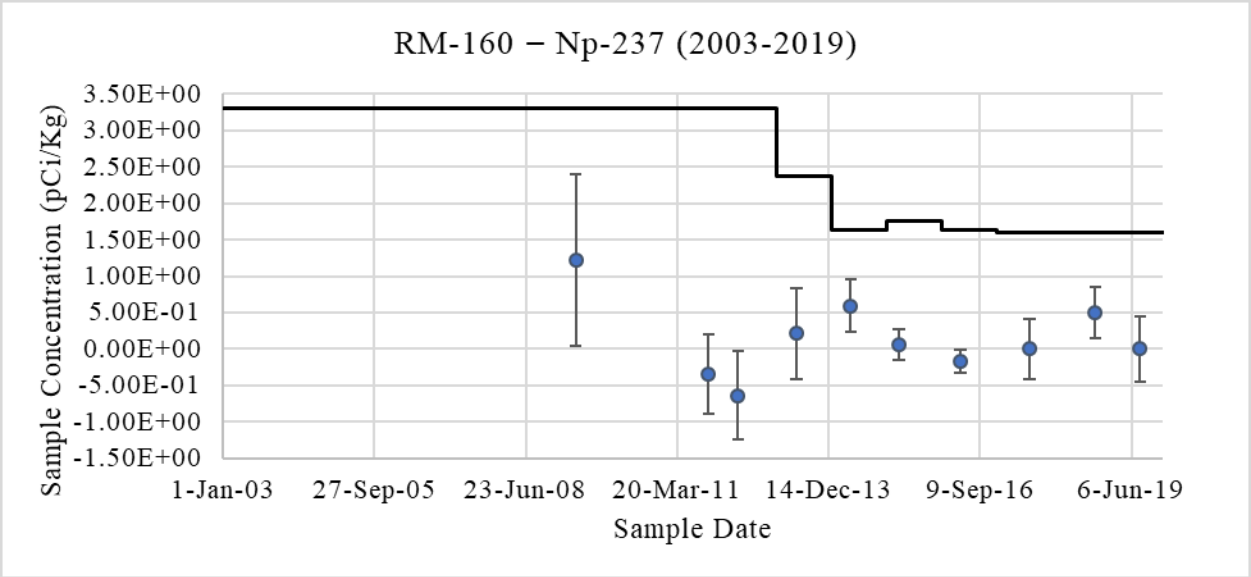

Figure D-11. SRS Offsite Savannah River Sampling Location "RM-160/161" Np-237 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

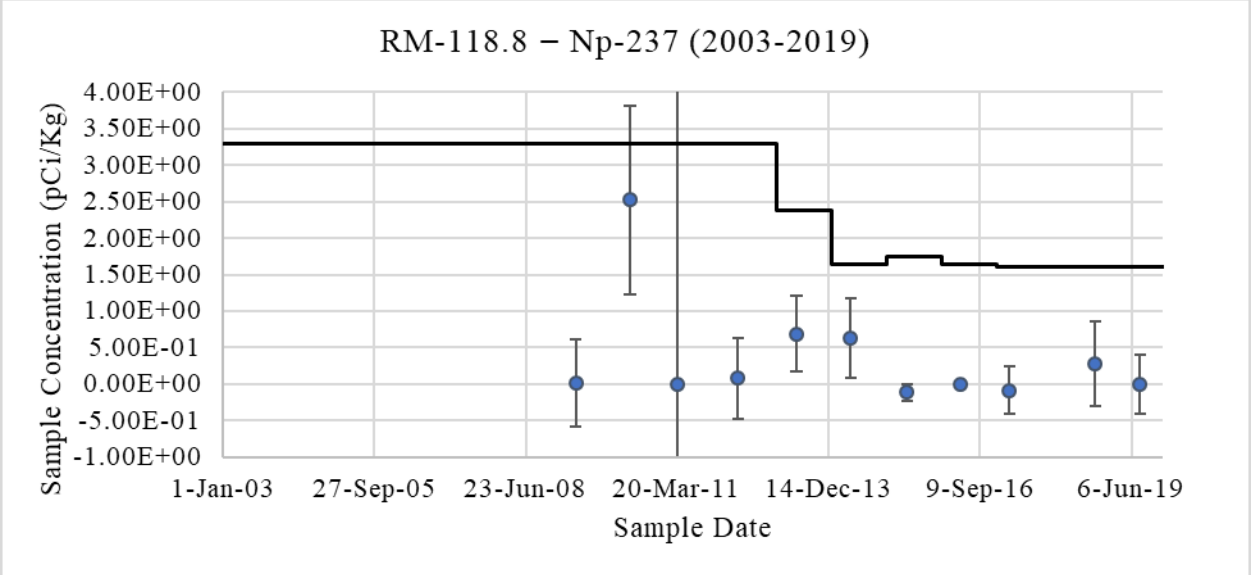

Figure D-12. SRS Offsite Savannah River Sampling Location "RM-118.7" Np-237 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

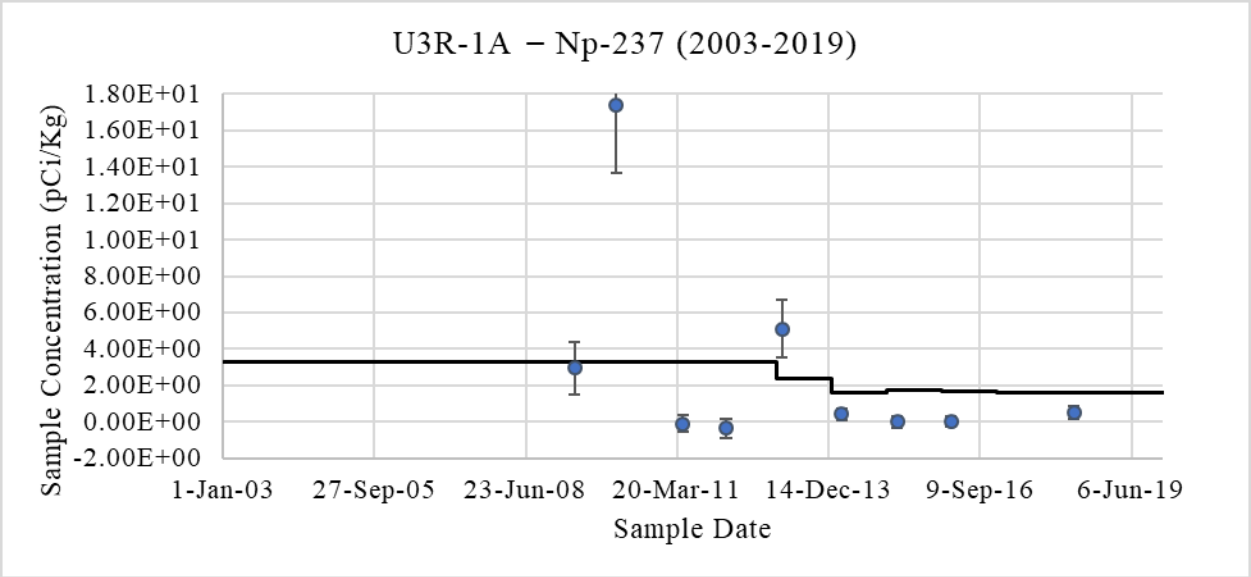

Figure D-13. SRS Onsite Sampling Location "U3R-1A" Np-237 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

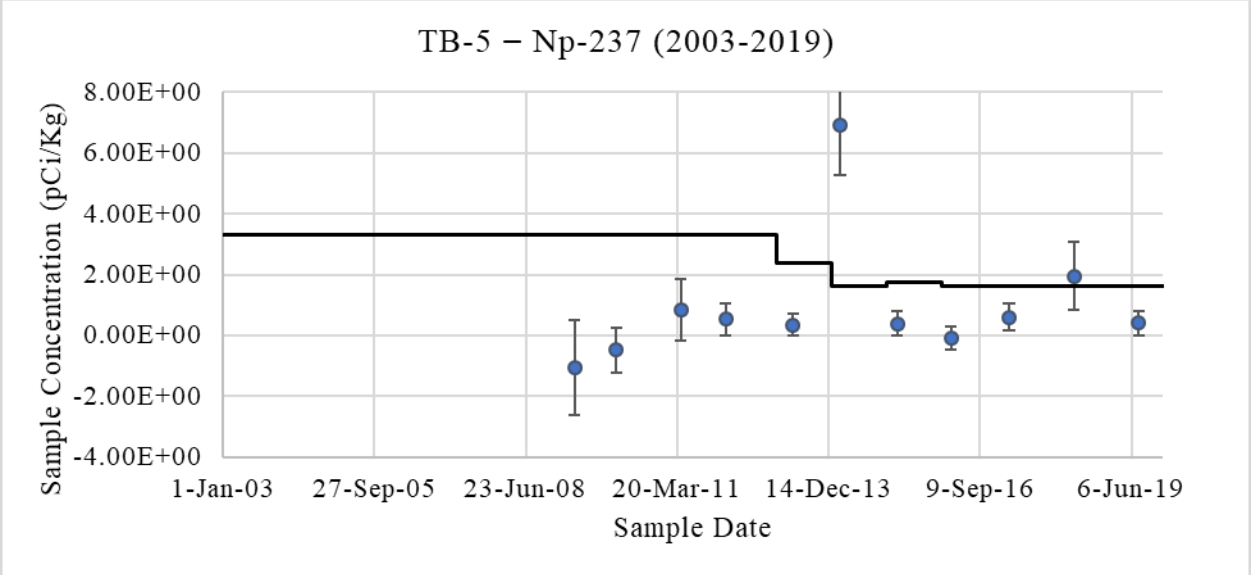

Figure D-14. SRS Onsite Stream Sampling Location "TB-5" Np-237 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

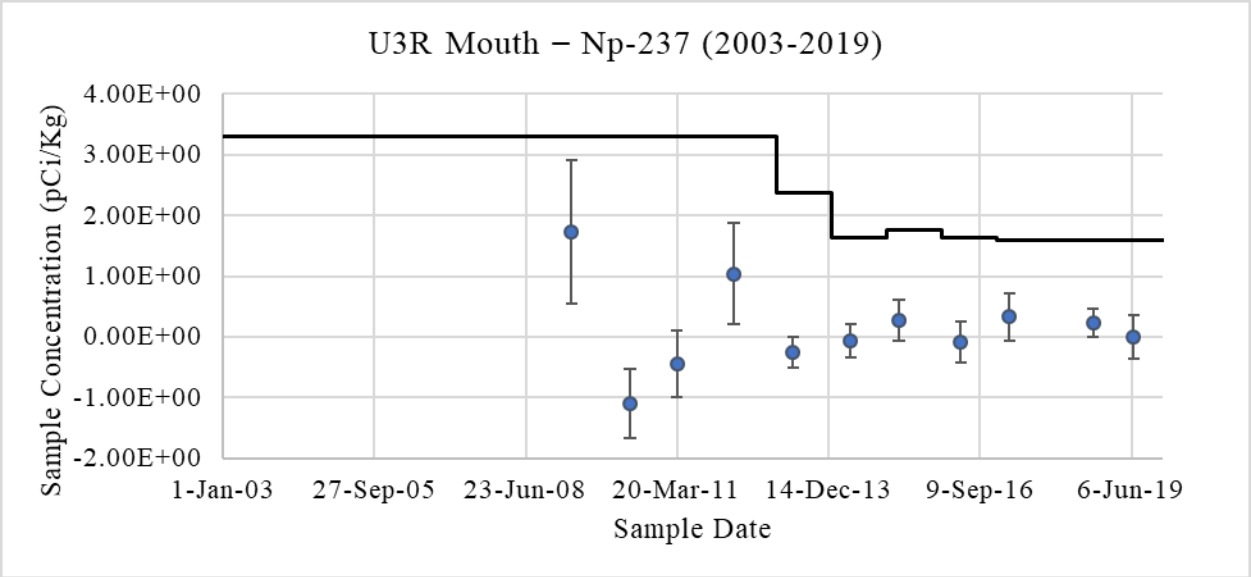

Figure D-15. SRS Onsite Stream Sampling Location "U3R Mouth" Np-237 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

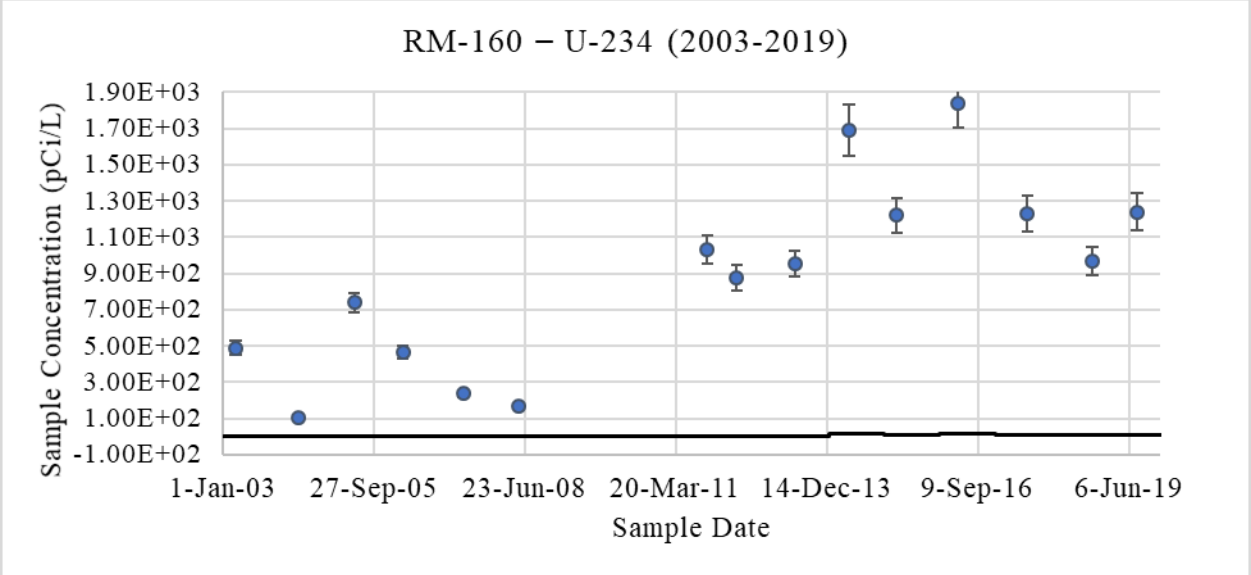

Figure D-16. SRS Offsite Savannah River Sampling Location "RM-160/161" U-234 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

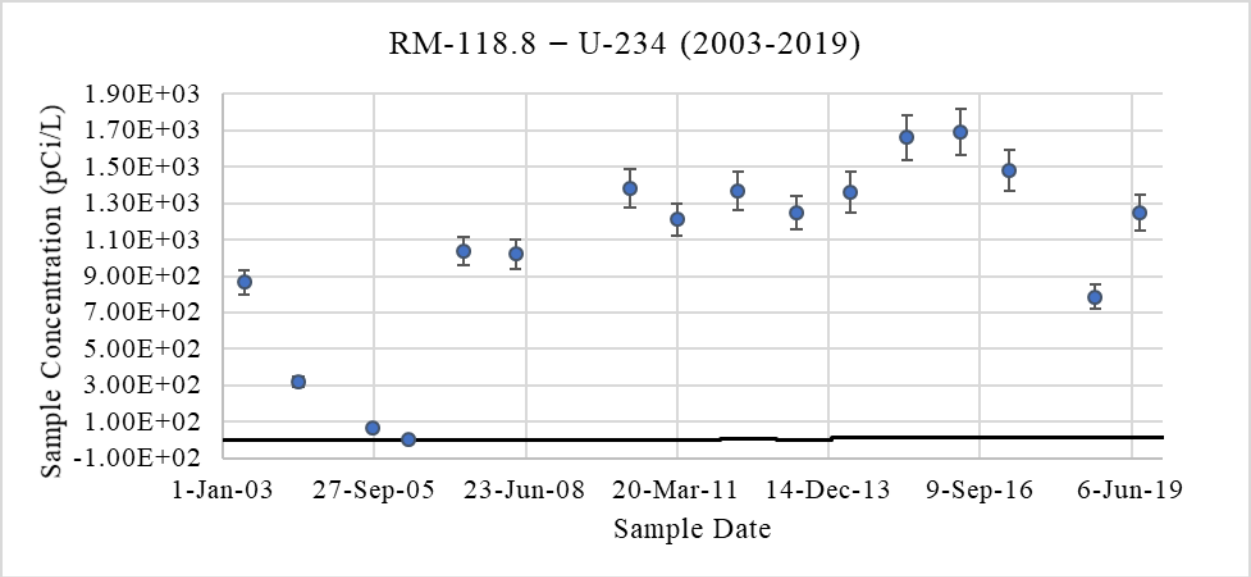

Figure D-17. SRS Offsite Savannah River Sampling Location "RM-118.7" U-234 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

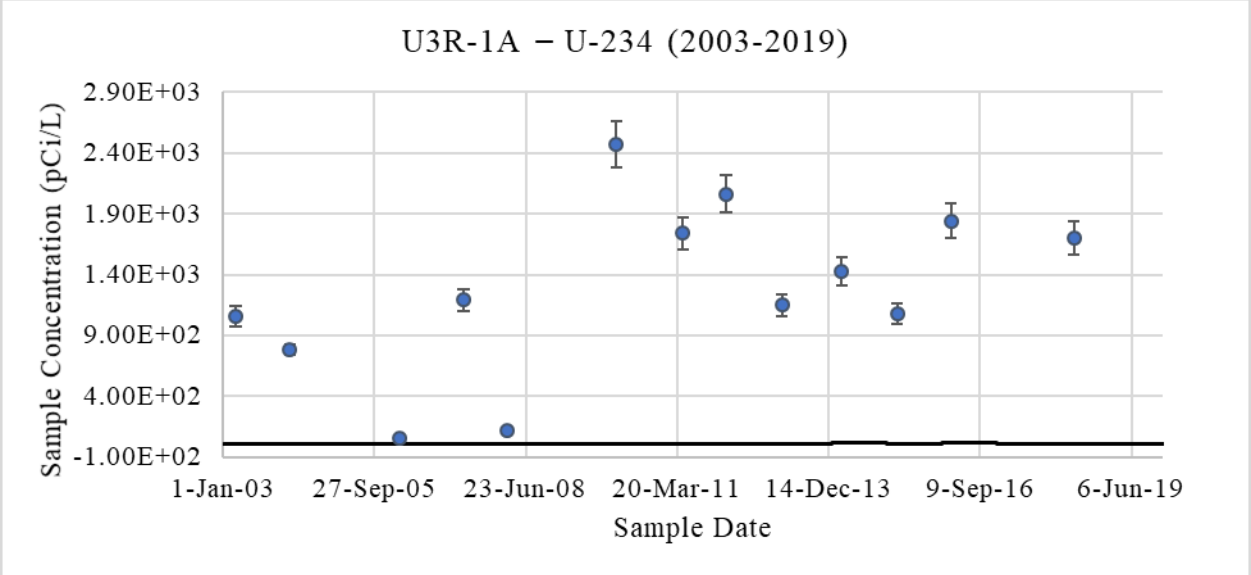

Figure D-18. SRS Onsite Sampling Location "U3R-1A" U-234 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

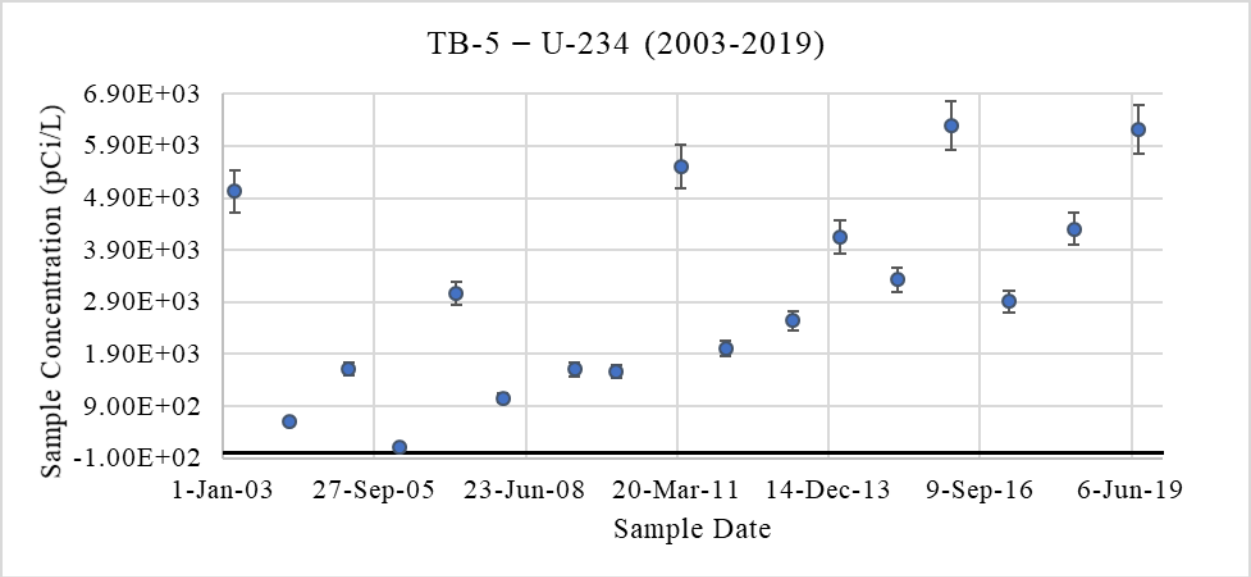

Figure D-19. SRS Onsite Stream Sampling Location "TB-5" U-234 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

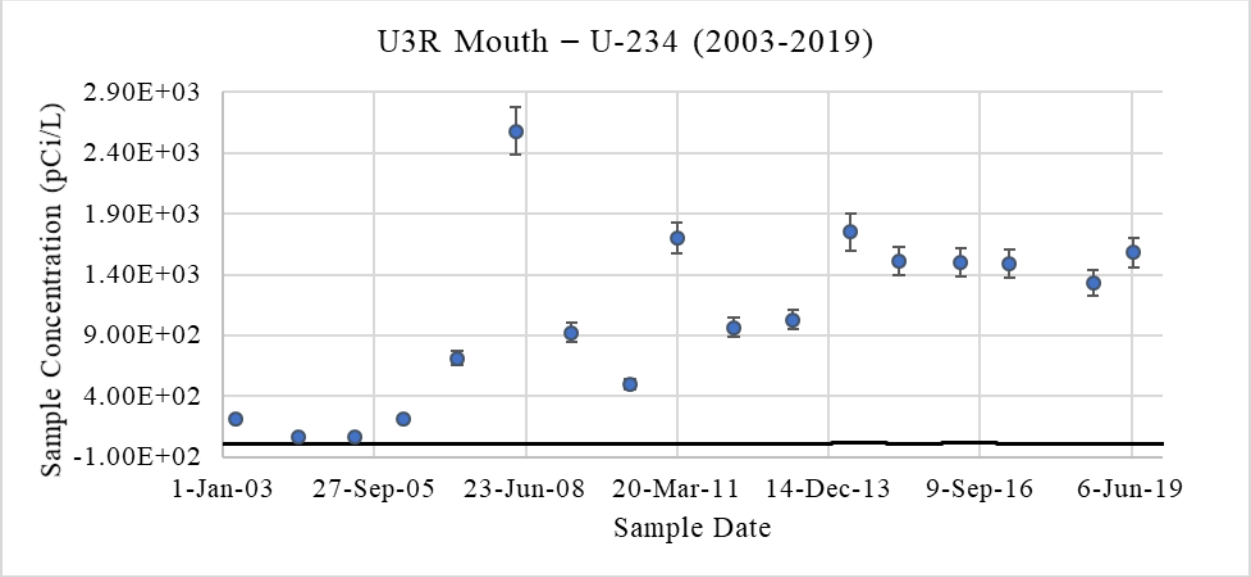

Figure D-20. SRS Onsite Stream Sampling Location "U3R Mouth" U-234 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

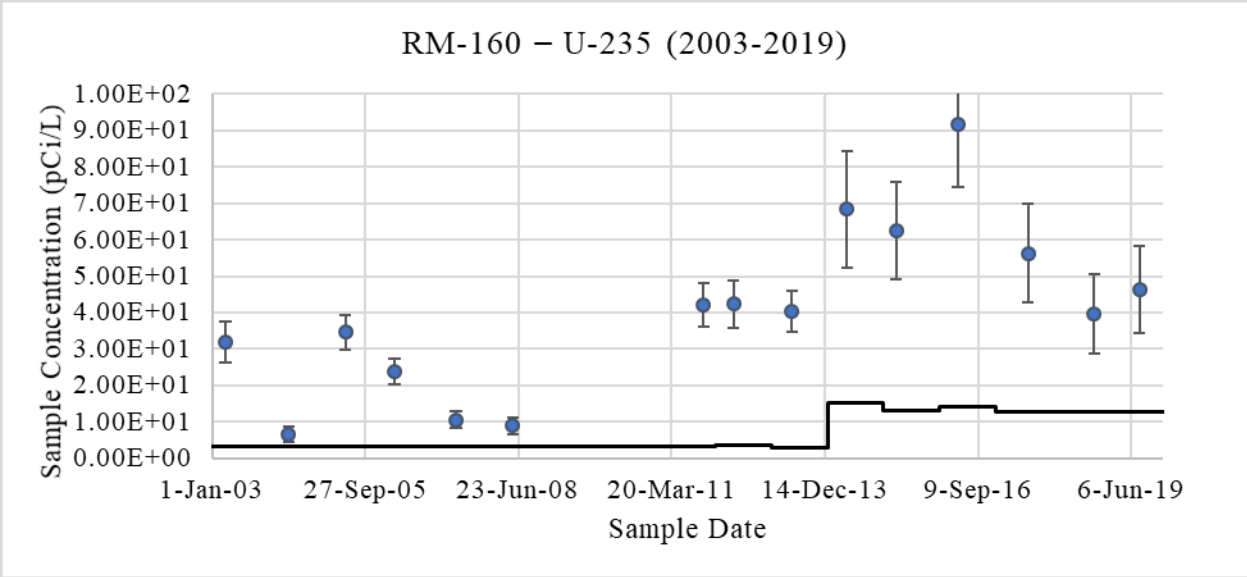

Figure D-21. SRS Offsite Savannah River Sampling Location "RM-160/161" U-235 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

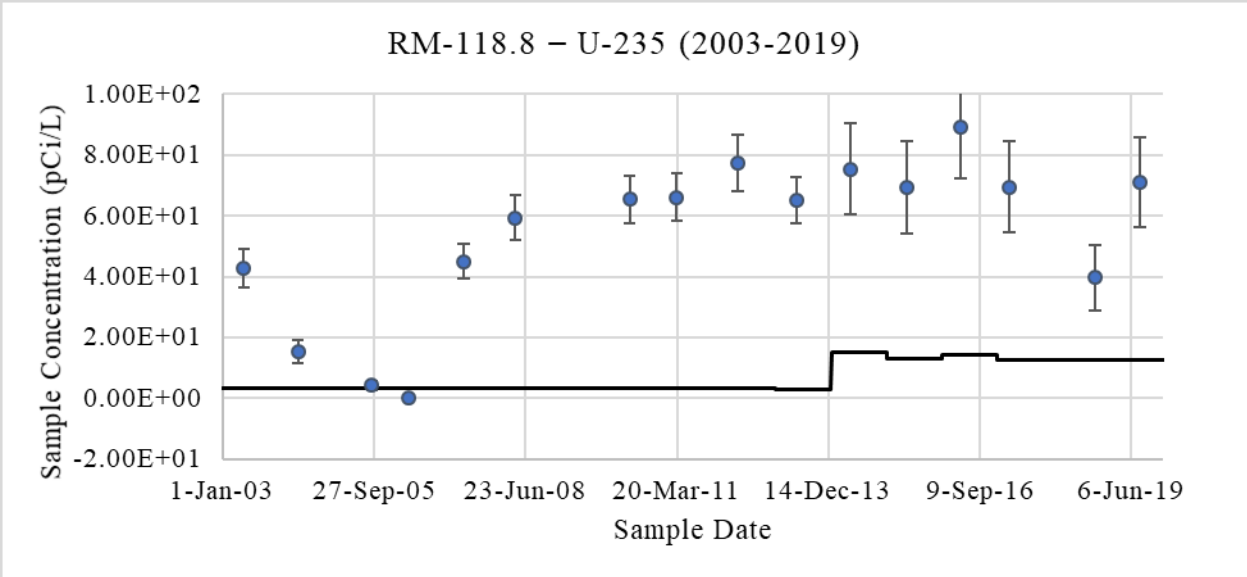

Figure D-22. SRS Offsite Savannah River Sampling Location "RM-118.7" U-235 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

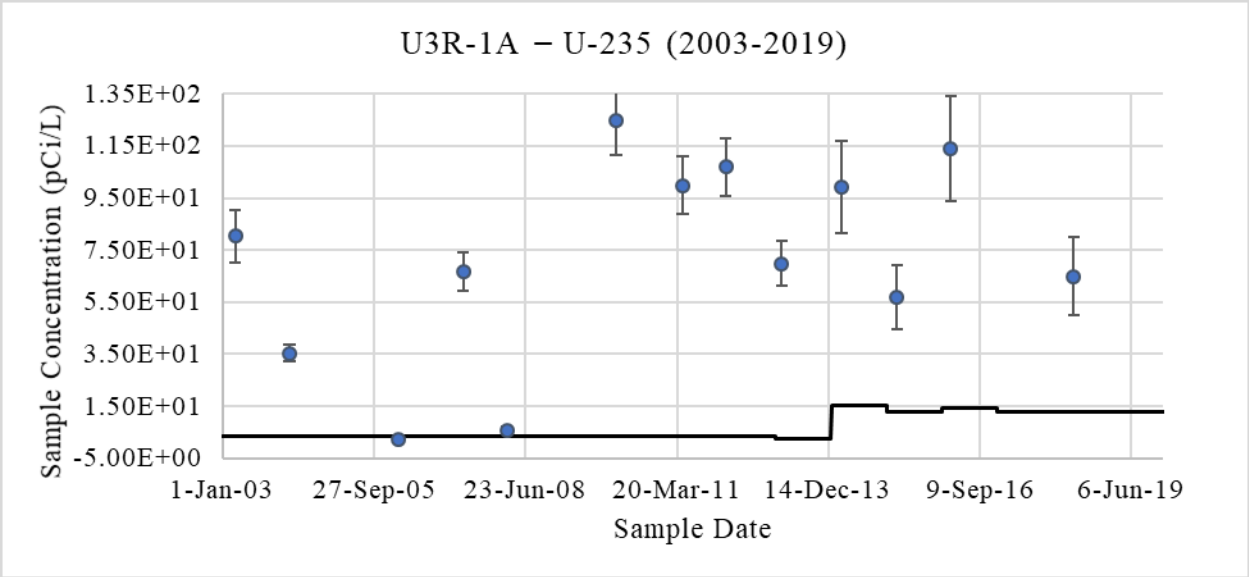

Figure D-23. SRS Onsite Sampling Location "U3R-1A" U-235 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

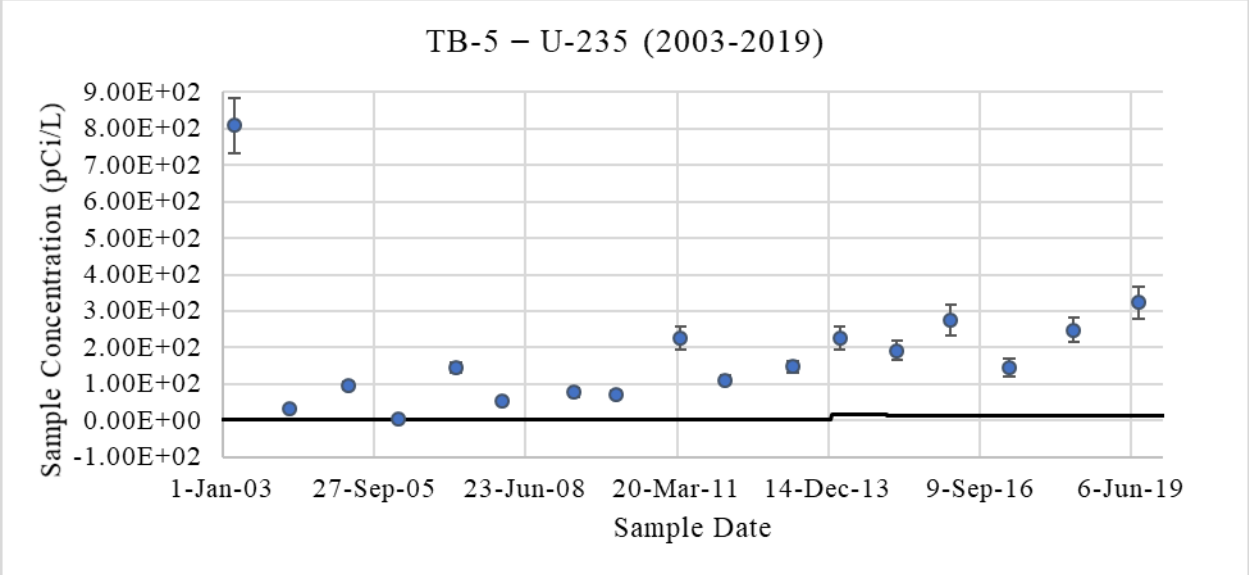

Figure D-24. SRS Onsite Stream Sampling Location "TB-5" U-235 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

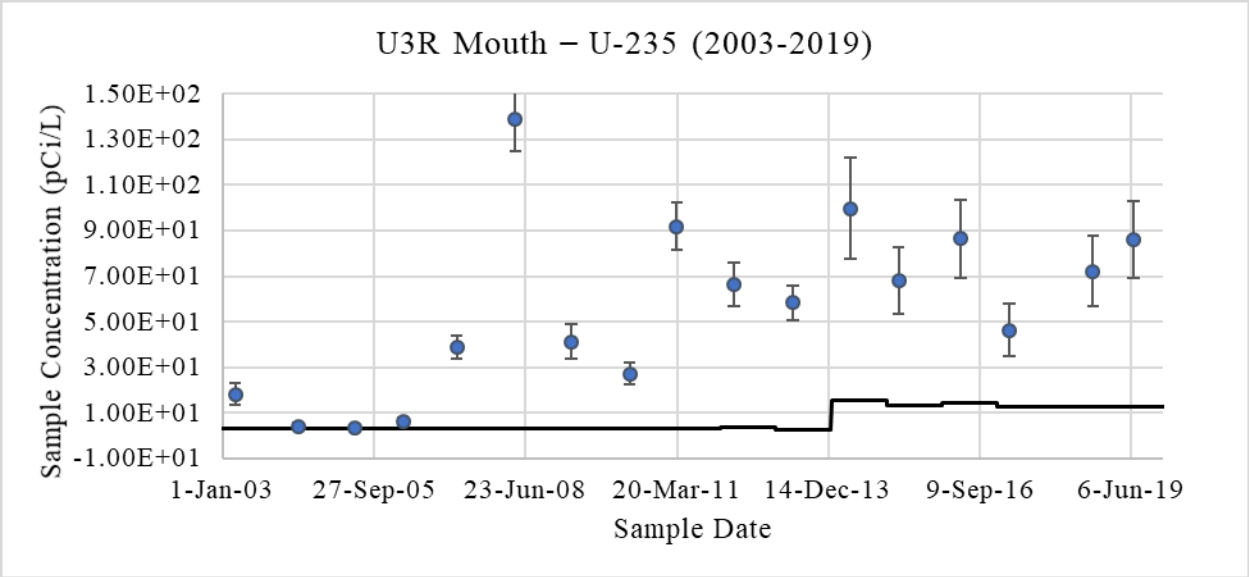

Figure D-25. SRS Onsite Stream Sampling Location "U3R Mouth" U-235 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

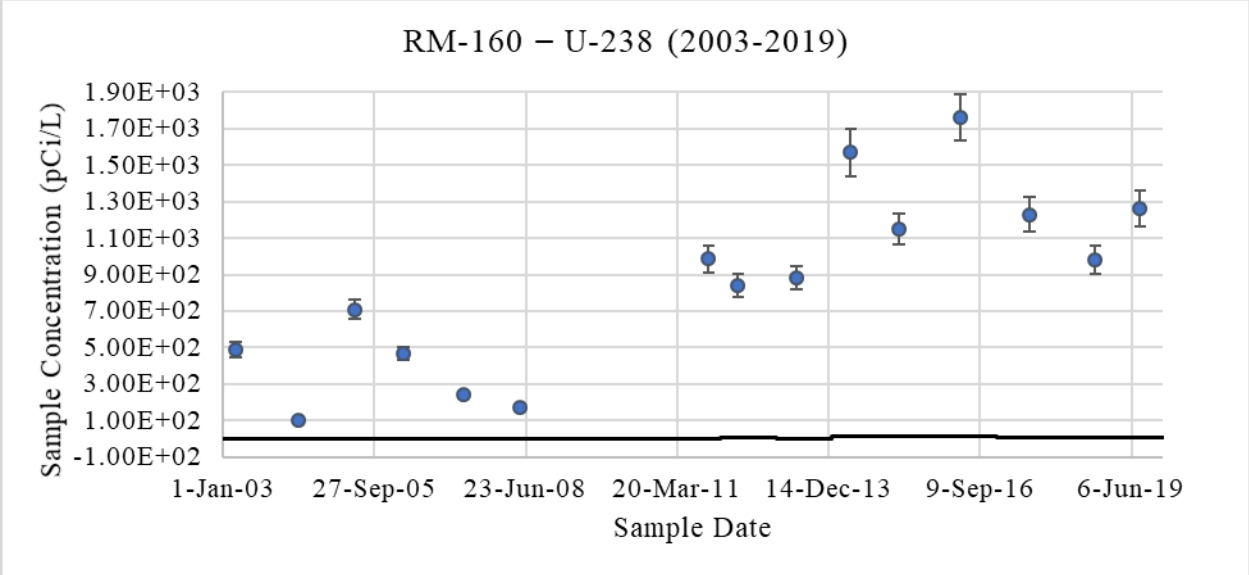

Figure D-26. SRS Offsite Savannah River Sampling Location "RM-160/161" U-238 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

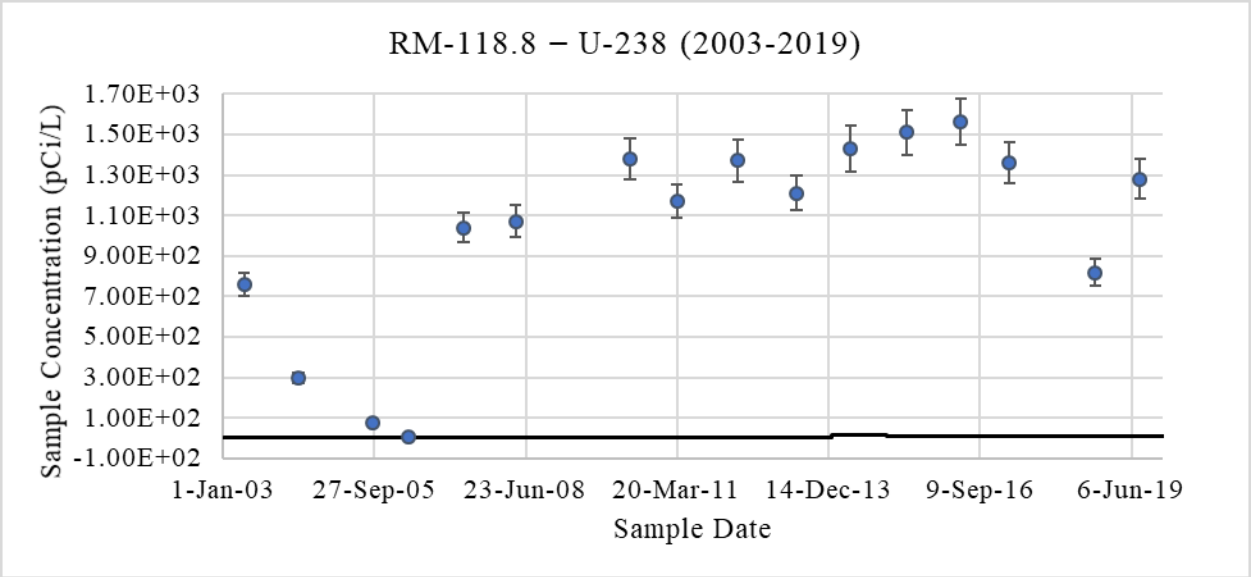

Figure D-27. SRS Offsite Savannah River Sampling Location "RM-118.7" U-238 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

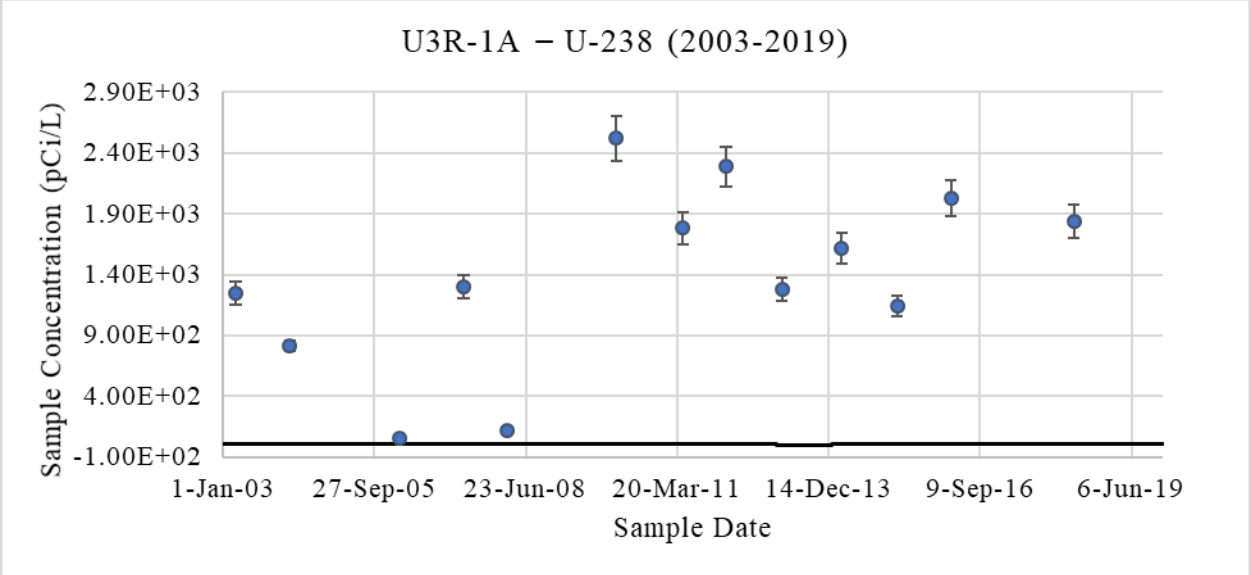

Figure D-28. SRS Onsite Sampling Location "U3R-1A" U-238 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

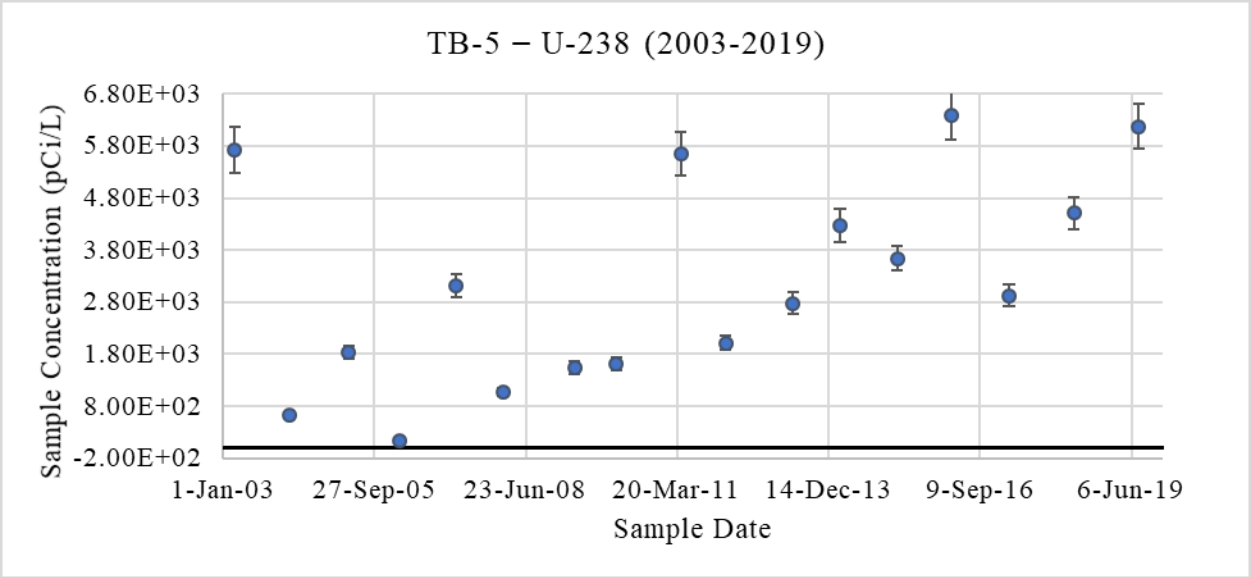

Figure D-29. SRS Onsite Stream Sampling Location "TB-5" U-238 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

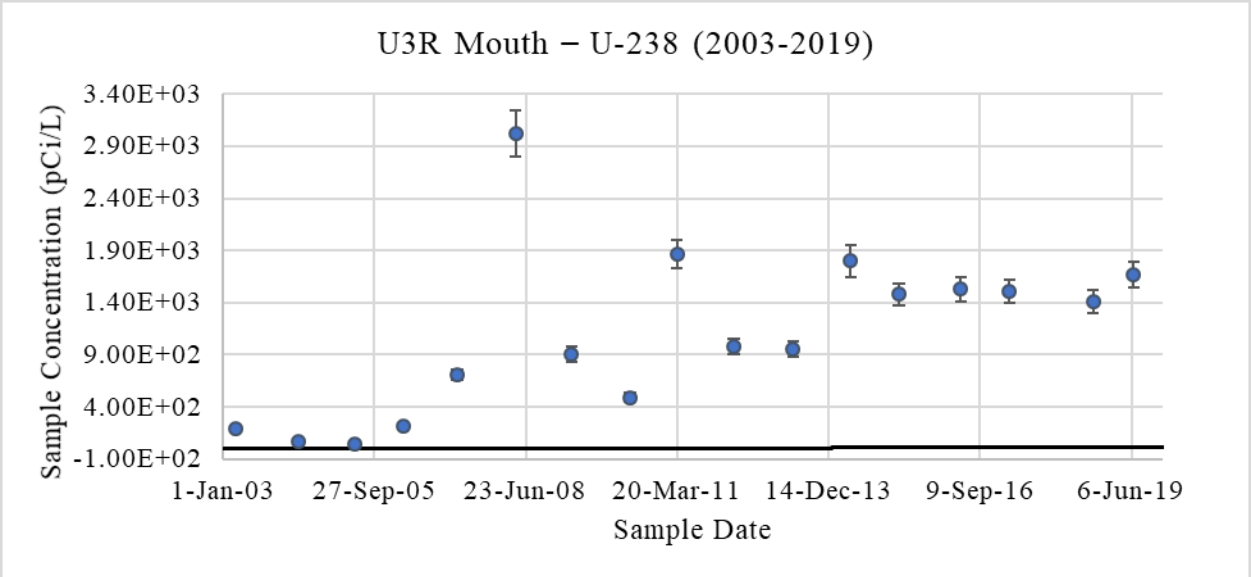

Figure D-30. SRS Onsite Stream Sampling Location "U3R Mouth" U-238 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

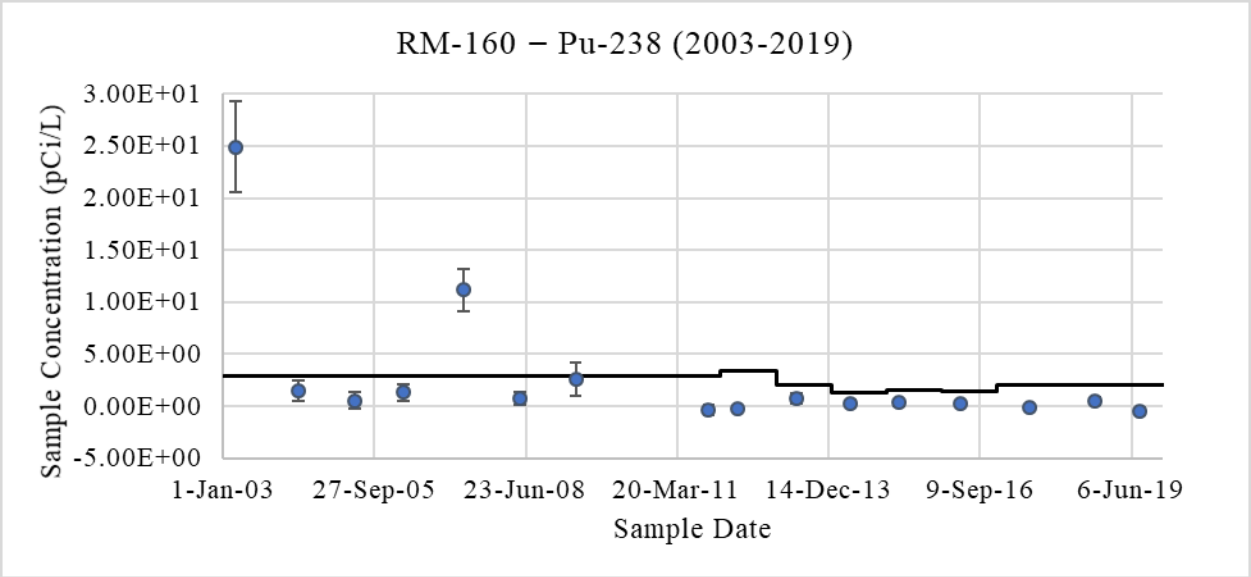

Figure D-31. SRS Offsite Savannah River Sampling Location "RM-160/161" Pu-238 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

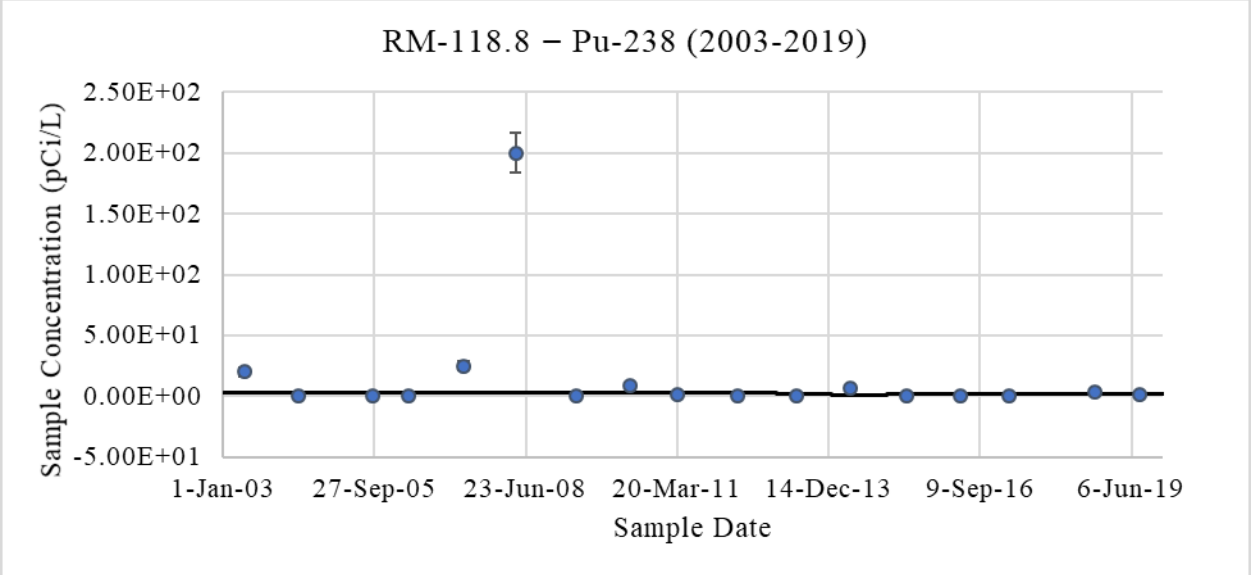

Figure D-32. SRS Offsite Savannah River Sampling Location "RM-118.7" Pu-238 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

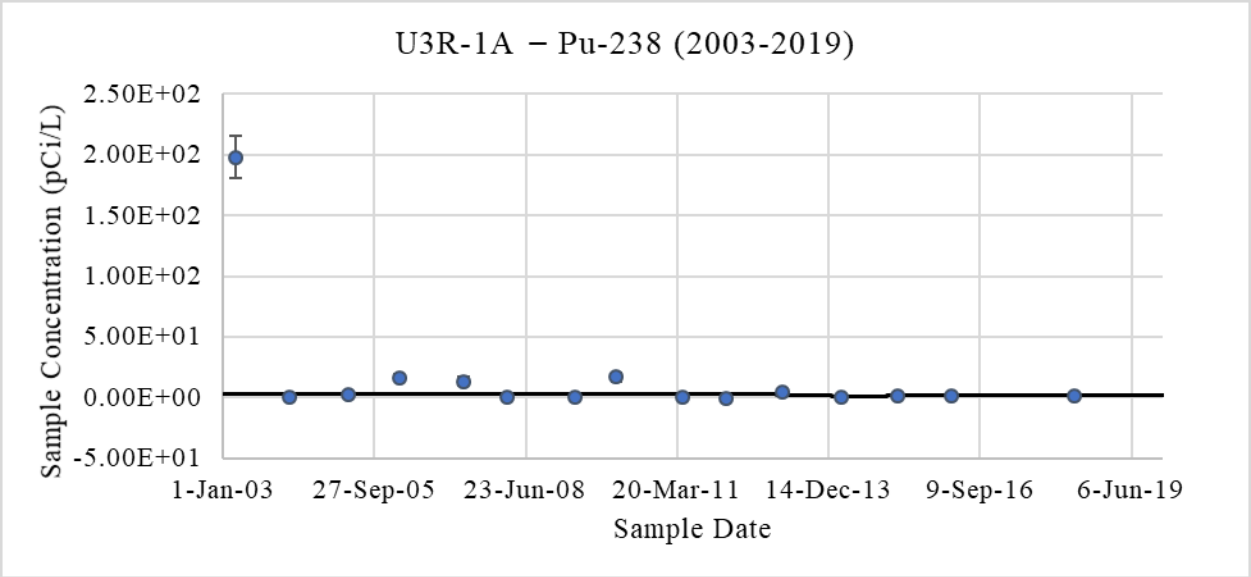

Figure D-33. SRS Onsite Sampling Location "U3R-1A" Pu-238 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

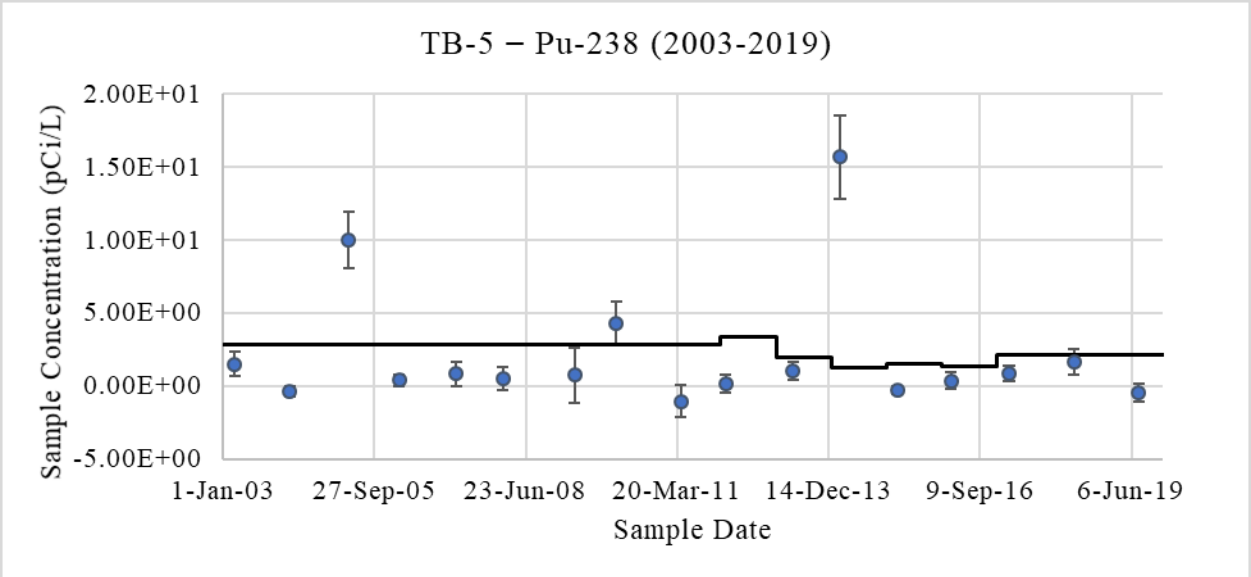

Figure D-34. SRS Onsite Stream Sampling Location "TB-5" Pu-238 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

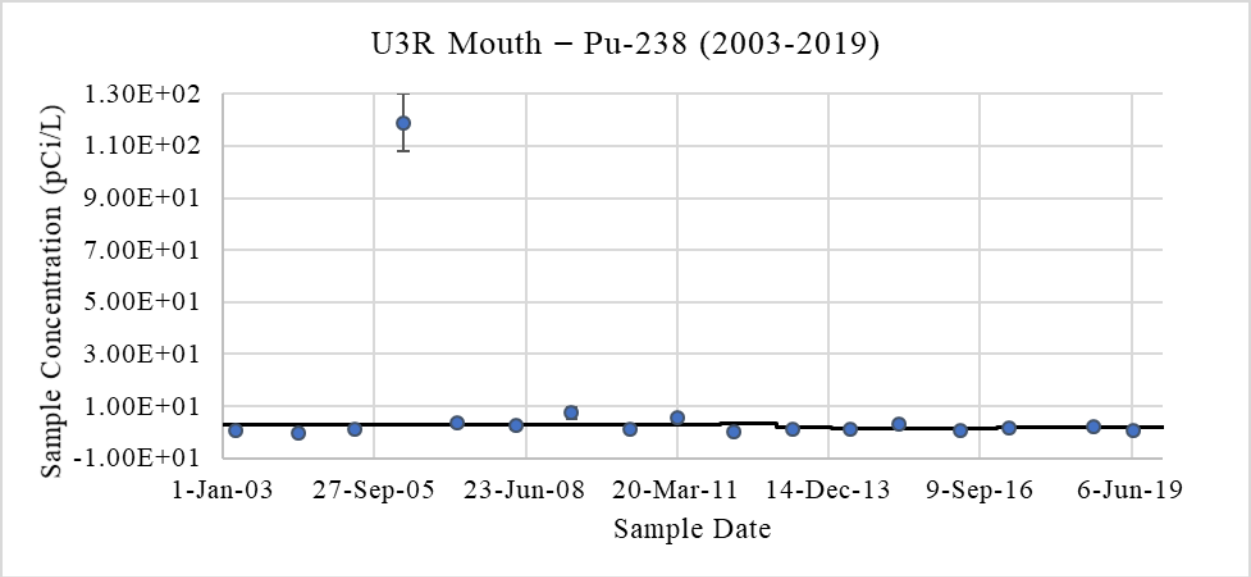

Figure D-35. SRS Onsite Stream Sampling Location "U3R Mouth" Pu-238 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

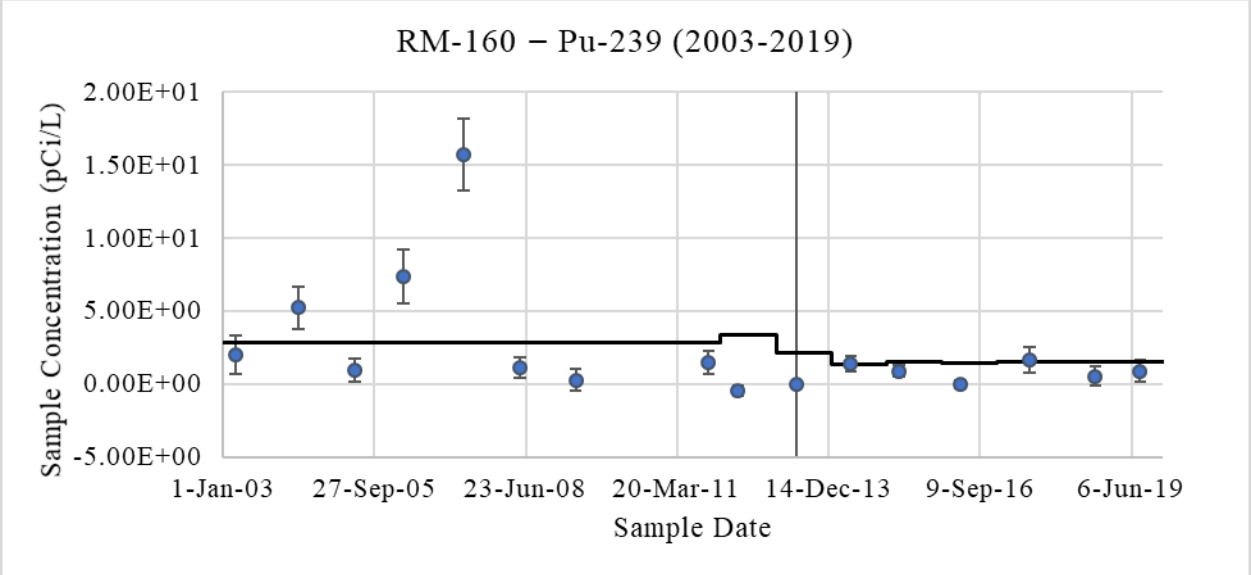

Figure D-36. SRS Offsite Savannah River Sampling Location "RM-160/161" Pu-239 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

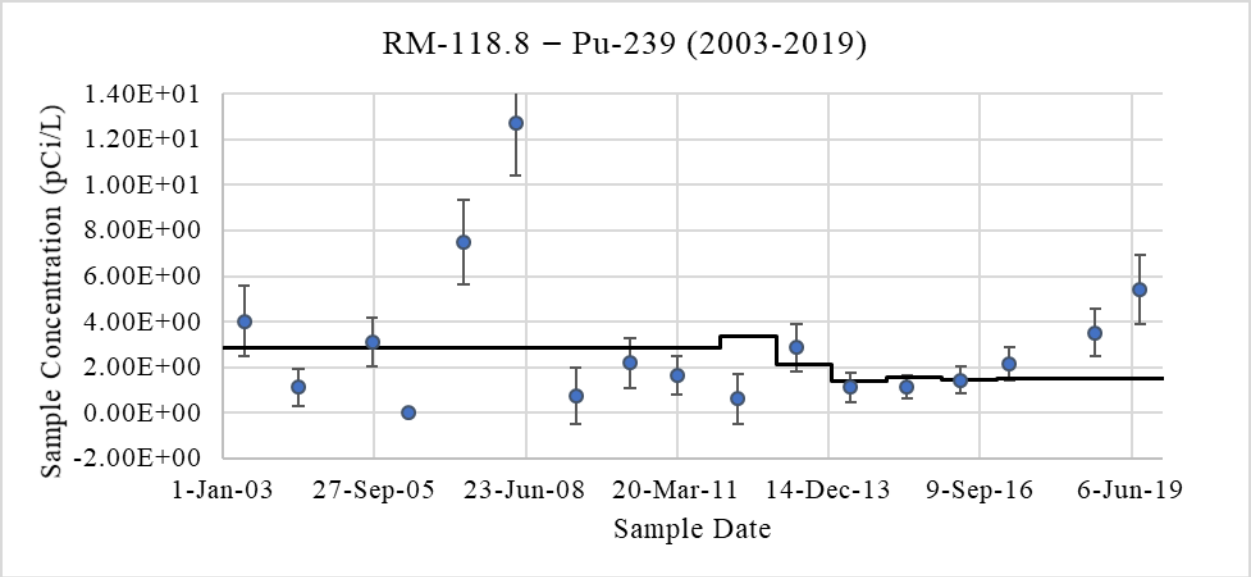

Figure D-37. SRS Offsite Savannah River Sampling Location "RM-118.7" Pu-239 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

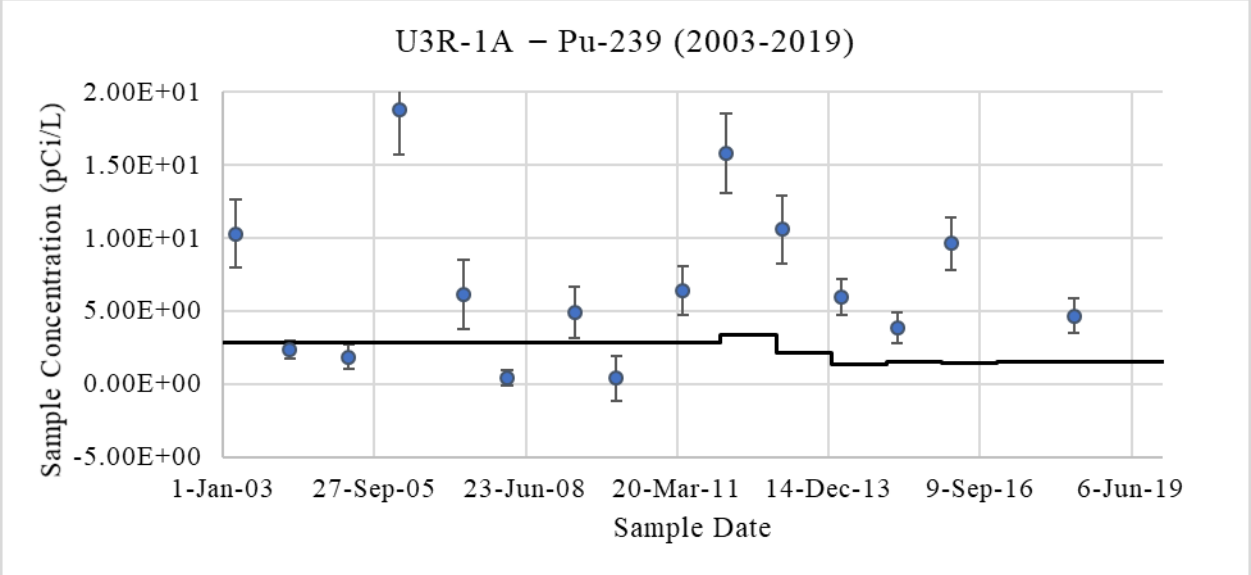

Figure D-38. SRS Onsite Sampling Location "U3R-1A" Pu-239 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

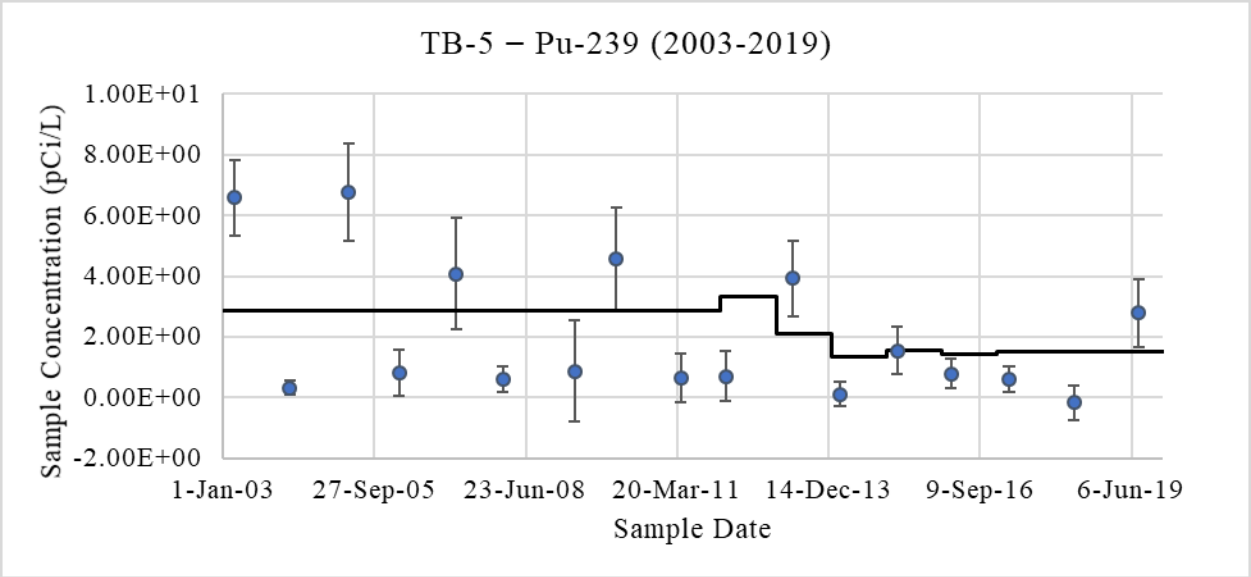

Figure D-39. SRS Onsite Stream Sampling Location "TB-5" Pu-239 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

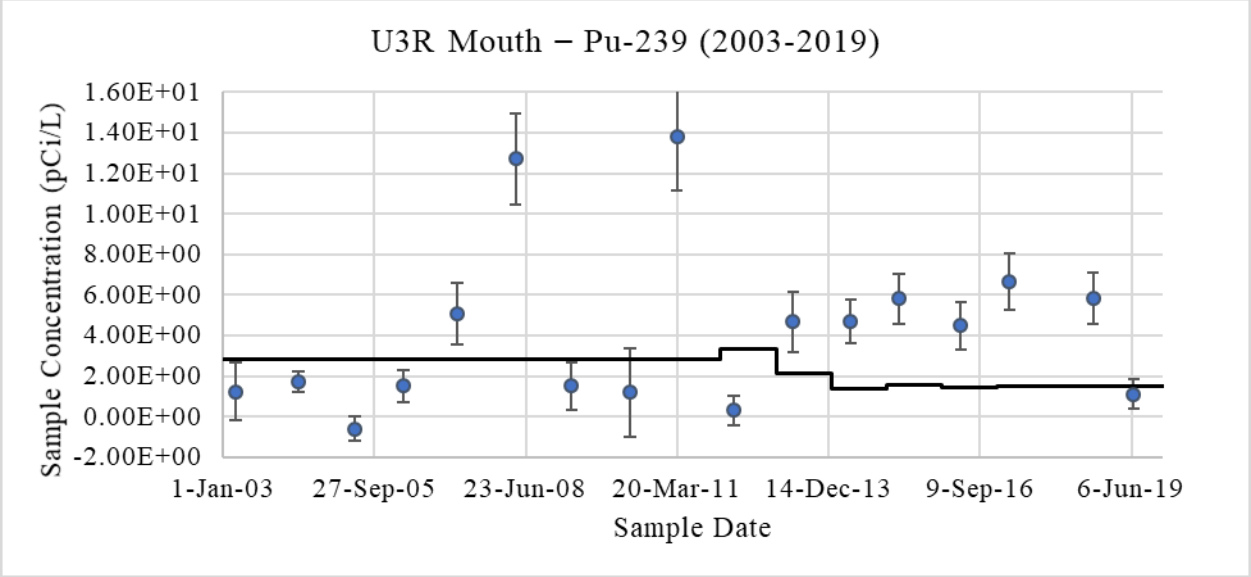

Figure D-40. SRS Onsite Stream Sampling Location "U3R Mouth" Pu-239 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

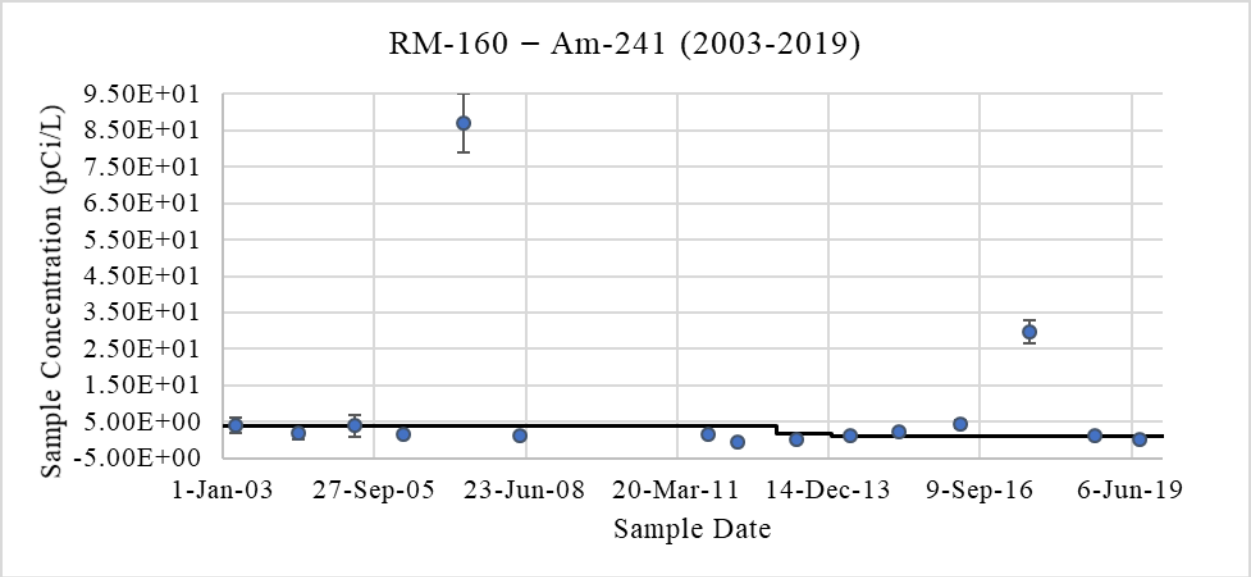

Figure D-41. SRS Offsite Savannah River Sampling Location "RM-160/161" Am-241 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

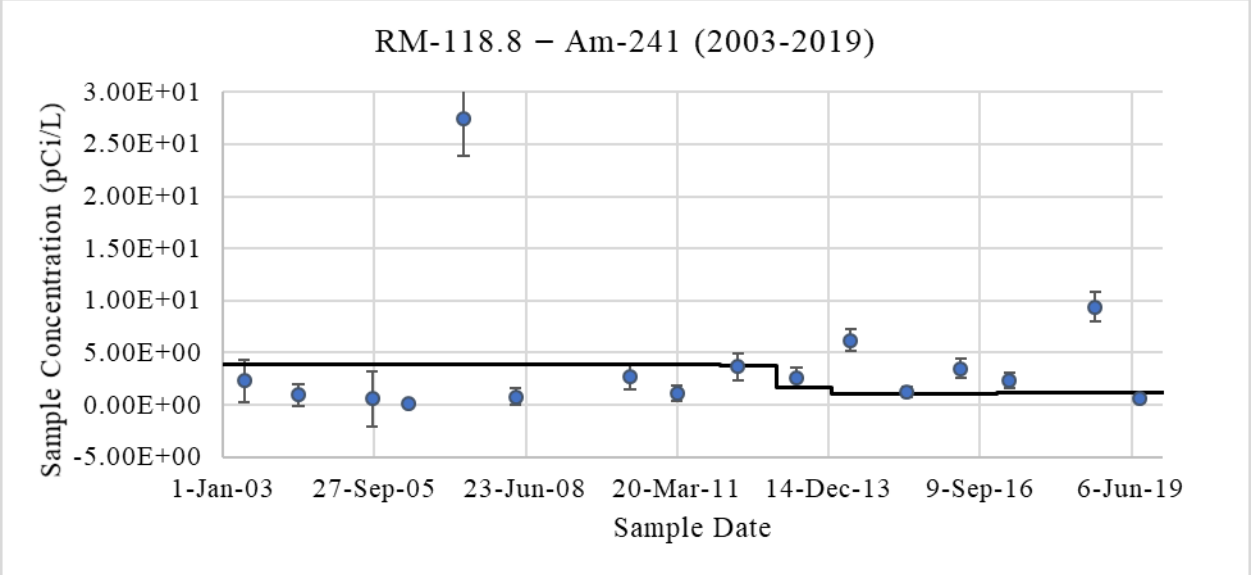

Figure D-42. SRS Offsite Savannah River Sampling Location "RM-118.7" Am-241 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

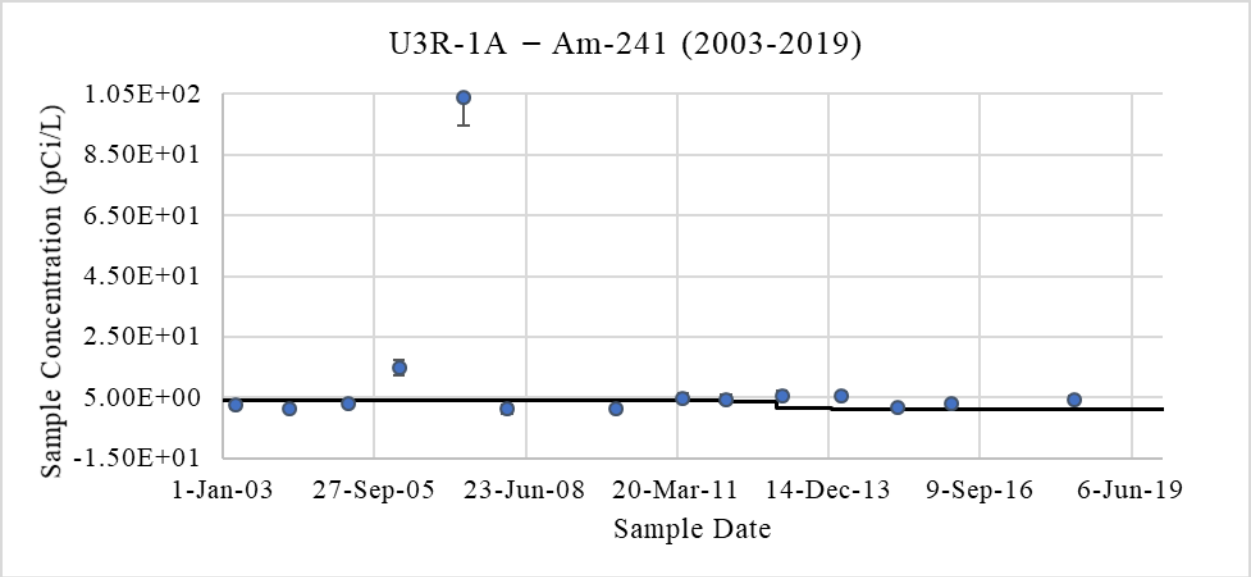

Figure D-43. SRS Onsite Sampling Location "U3R-1A" Am-241 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

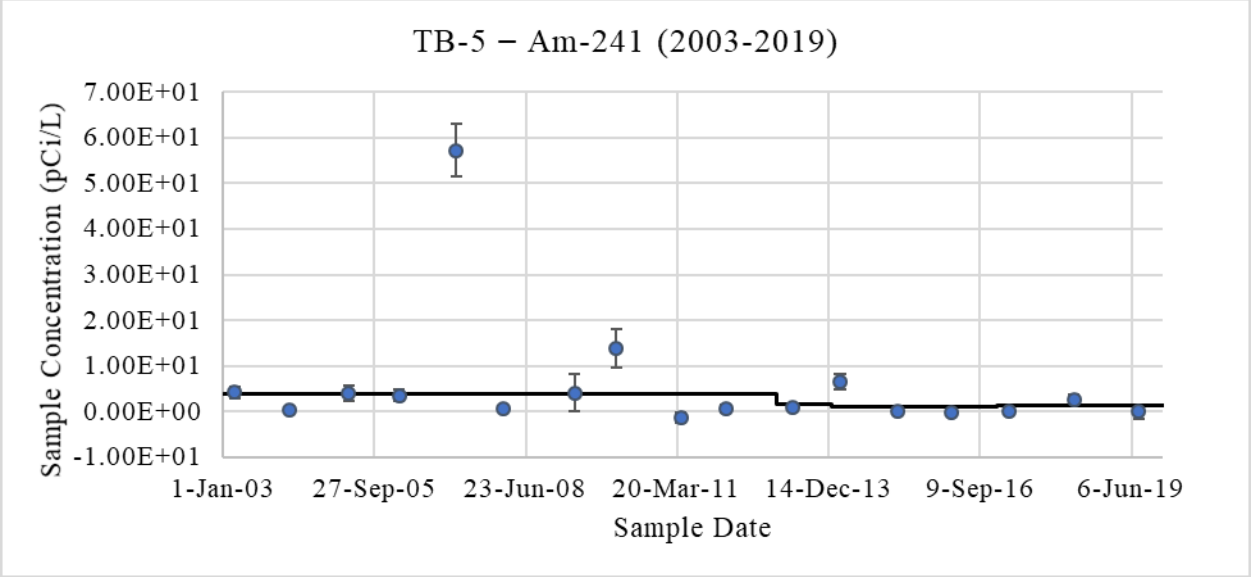

Figure D-44. SRS Onsite Stream Sampling Location "TB-5" Am-241 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

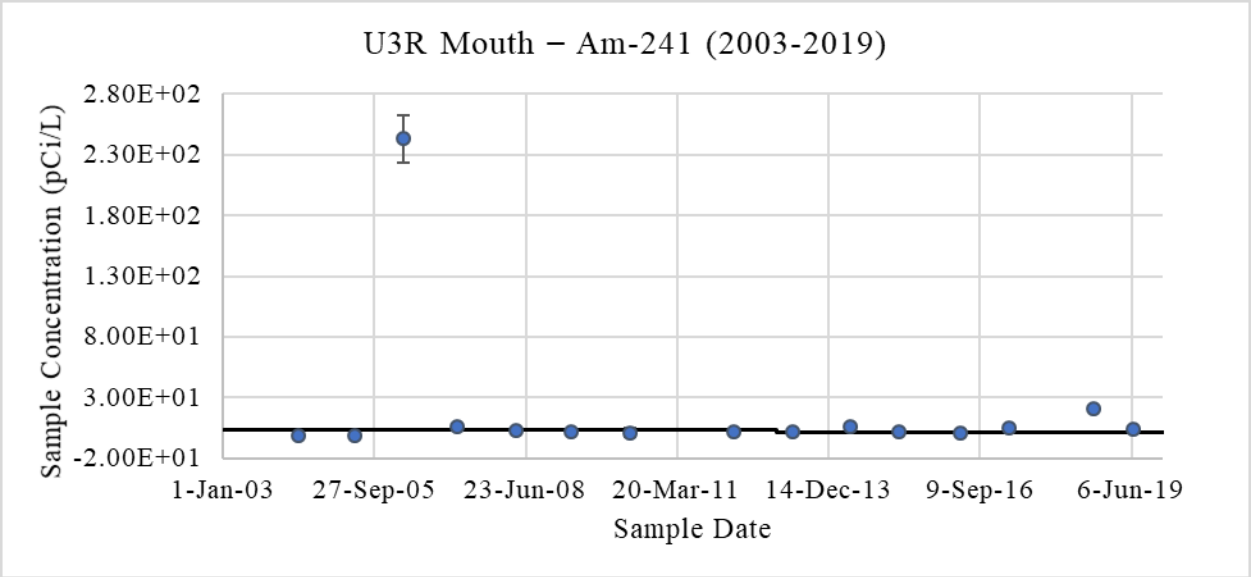

Figure D-45. SRS Onsite Stream Sampling Location "U3R Mouth" Am-241 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

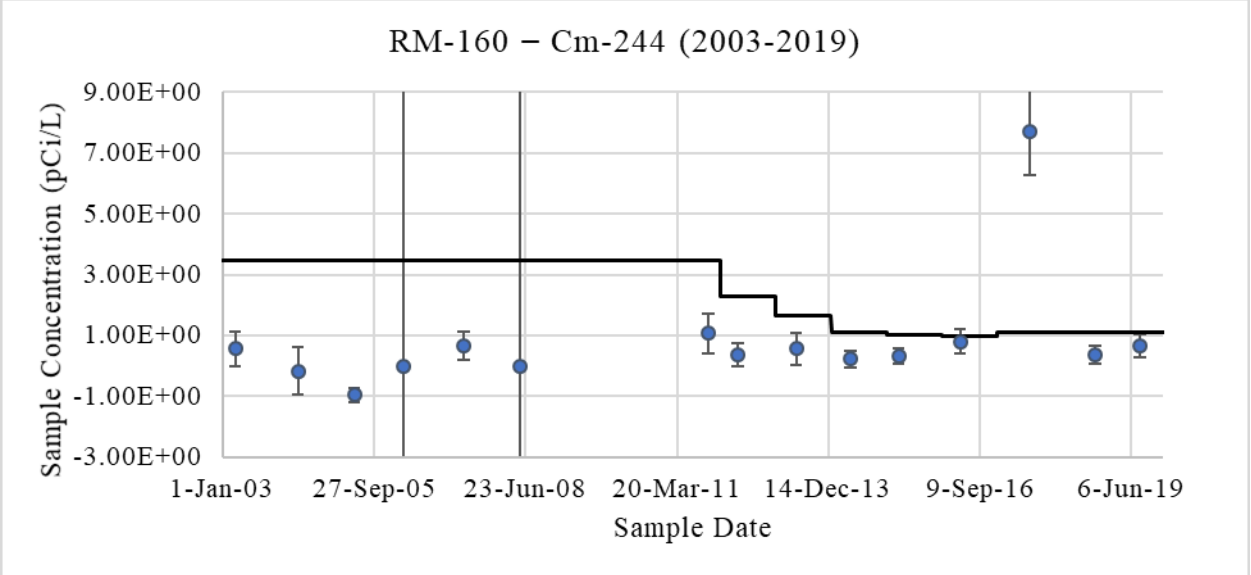

Figure D-46. SRS Offsite Savannah River Sampling Location "RM-160/161" Cm-244 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

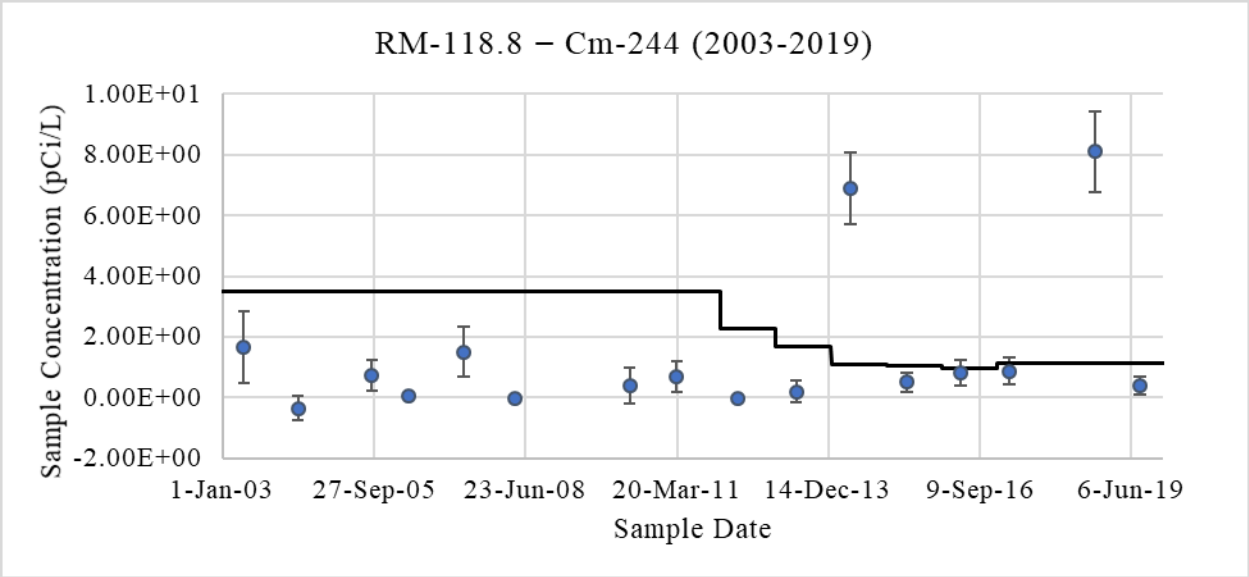

Figure D-47. SRS Offsite Savannah River Sampling Location "RM-118.7" Cm-244 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

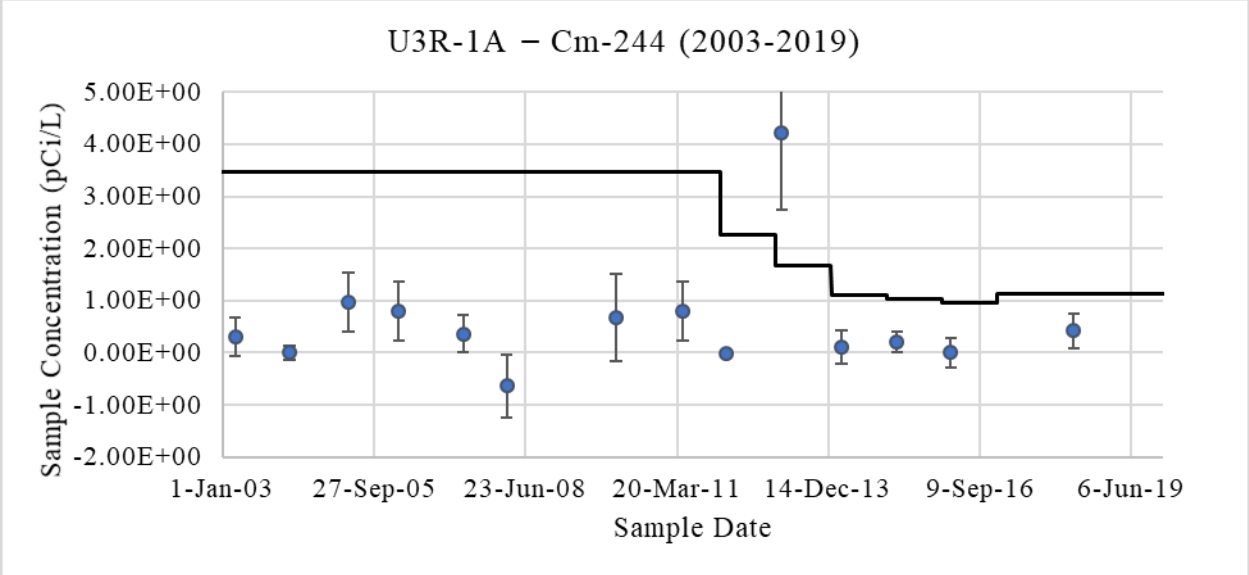

Figure D-48. SRS Onsite Sampling Location "U3R-1A" Cm-244 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

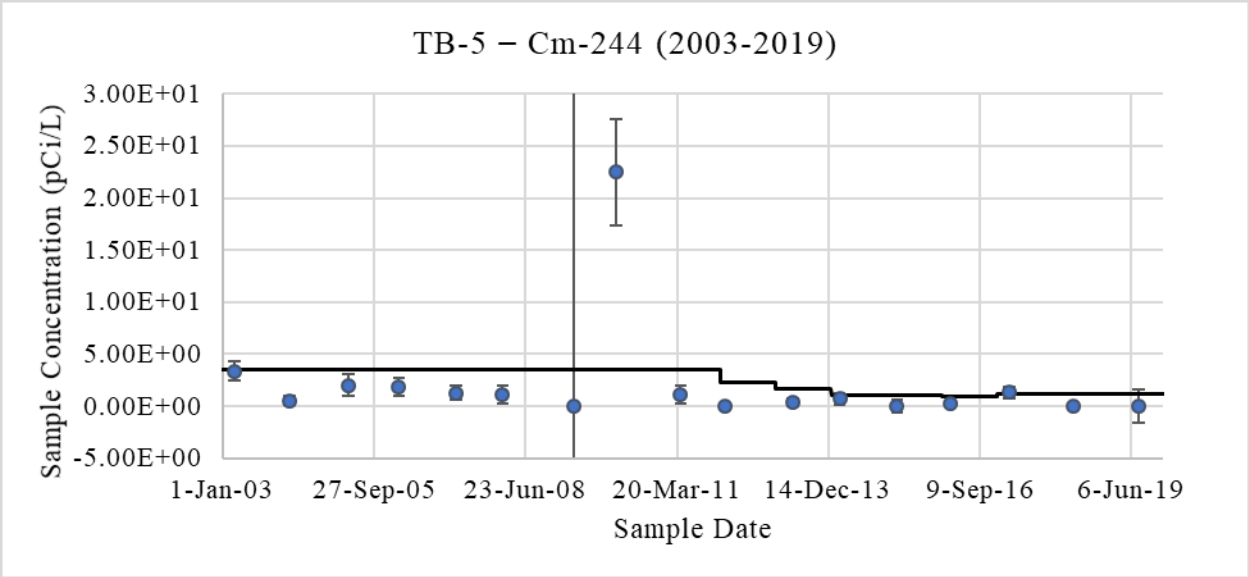

Figure D-49. SRS Onsite Stream Sampling Location "TB-5" Cm-244 Sediment Surveillance 2003-2019. Solid Line indicates MDC.

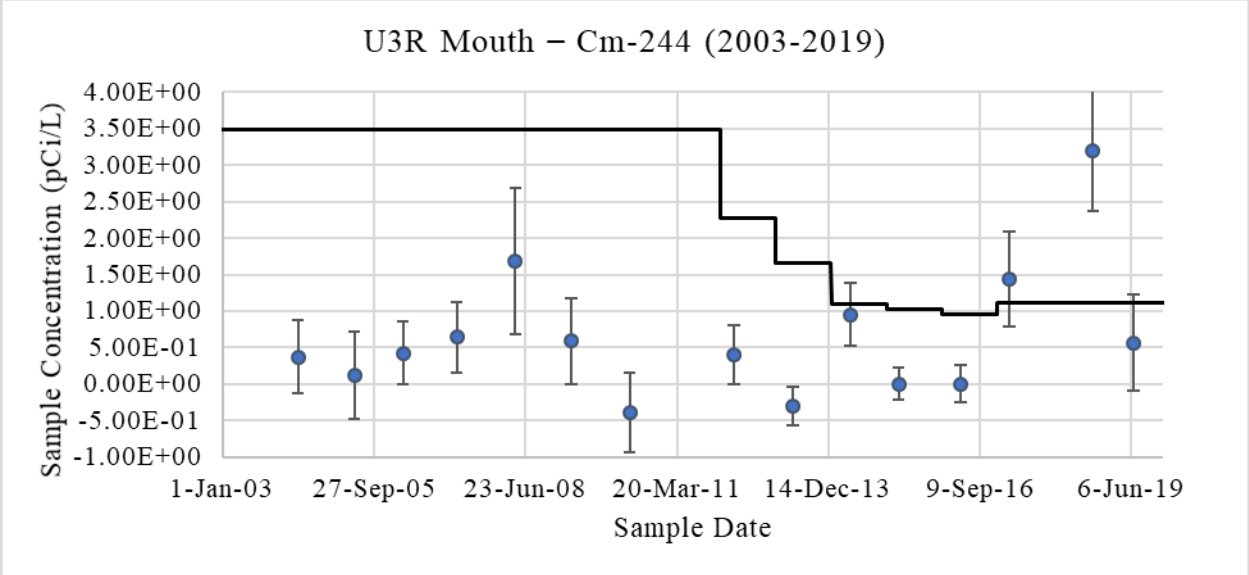

Figure D-50. SRS Onsite Stream Sampling Location "U3R Mouth" Am-241 Sediment Surveillance 2003-2019. Solid Line indicates MDC.