Appendix C: Nonradiological Environmental Monitoring Program Supplemental Information

Appendix Table C-1 River and Stream Water Quality Results Summary

SRS collected monthly water quality samples at 5 Savannah River and 10 stream locations in 2021, totaling 180 samples per analyte or 3,780 records. Locations sampled are as follows: Savannah River locations (RM-118.8, RM-129.1, RM-141.5 and RM 150.4 [Vogtle discharge]), and SRS Stream locations (FM-2B, FM-6, FMC-2, L3R-2, PB-3, SC-4, TB-5, and U3R-4). The control location for the river samples is RM-161.0. The control locations for the stream samples are TC-1 and U3R-1A.

The table compares all results to South Carolina Freshwater Quality Standards (unless otherwise noted) and shows the average and maximum values of each analyte for the river and stream samples. Locations exceeding standards are shown in **red** text. Field duplicates are not included in the generation of these tables.

DL-Detection Limit
DO-Dissolved Oxygen
TOC-Total Organic Carbon
TSS-Total Suspended Solids

Notes:

1. The DO value in the maximum column is a minimum value because the South Carolina Freshwater Quality Standard is based on a minimum value.
2. The pH value in the average column is a minimum value because the South Carolina Freshwater Quality Standard includes minimum and maximum limits.

Four River Locations Plus One Control

Analyte	SC Freshwater Quality Std.	Unit	No. of Results Outside Std.	No. of Results > DL	Control RM 161.0 Avg.[a]	Control RM 161.0 Max.[b]	Highest River Location	Highest River Location Avg.[a]	Highest River Location	Highest River Location Max.[b]	Comments
DO [c]	min. 4.0	mg/L	0 of 60		9.3	8.1	RM-129.1	8.6	RM-129.1	7.6	All samples met std.
pH [d]	6.0-8.5	SU	8 of 60		**5.6**	6.8	RM-150.4	**5.5**	RM-129.1	8.0	All maximums met std.
Temperature	< 5° F (2.8° C) above nat. cond. and not > 90° F (32.2° C)	° C	0 of 60		16.8	23.1	RM-118.8	19.2	RM-118.8	29.5	All samples met std.
Aluminum	87 [e]	µg/L	59 of 60	60 of 60	**216**	**557**	RM-118.8	**297**	RM-150.4	**630**	
Beryllium	4 [f]	µg/L	0 of 60	0 of 60	< DL	< DL	< DL	< DL	< DL	< DL	All samples met std.
Cadmium	0.25	µg/L	0 of 60	3 of 60	0.05	0.05	RM-118.8	0.06	RM-118.8	0.13	All samples met std.
Chromium	11	µg/L	1 of 60	34 of 60	1	4	RM-150.4	2	RM-150.4	**15**	All averages met std.
Copper	2.9	µg/L	0 of 60	60 of 60	1.2	1.5	RM-118.8	1.2	RM-129.1	1.7	All samples met std.
Hardness (total)	none	mg/L	no std.	60 of 60	17	26	RM-129.1	20	RM-118.8	32	
Iron	1,000 [g]	µg/L	1 of 60	60 of 60	389	776	RM-118.8	600	RM-118.8	**1,010**	All averages met std.
Lead	0.54	µg/L	0 of 60	60 of 60	0.24	0.47	RM-118.8	0.28	RM-150.4	0.49	All samples met std.
Manganese	none	µg/L	no std.	60 of 60	79	204	RM-118.8	77	RM-150.4	169	
Mercury	0.91	µg/L	1 of 60	7 of 60	0.02	0.06	RM-118.8	0.33	RM-118.8	**3.74**	All averages met std.
Nickel	16	µg/L	0 of 60	15 of 60	1	2	RM-150.4	1	RM-150.4	2	All samples met std.
Nitrate-Nitrogen	1 [h]	mg/L	1 of 60	60 of 60	0.2	0.3	RM-141.5	0.3	RM-141.5	**1.5**	All averages met std.
Nitrite-Nitrogen	1 [h]	mg/L	0 of 60	54 of 60	0.01	0.02	RM-141.5	0.01	RM-118.8	0.02	All samples met std.
Thallium	0.24 [f]	µg/L	0 of 60	1 of 60	< DL	< DL	RM-118.	0.05	RM-118.8	0.051	All samples met std.
TOC	none	mg/L	no std.	60 of 60	2.8	3.4	RM-129.1	3.7	RM-129.1	8.0	
Phosphorus	0.06	mg/L	48 of 60	51 of 60	**0.10**	**0.20**	RM-150.4	**0.11**	RM-150.4	**0.26**	
TSS	none	mg/L	no std.	59 of 60	5	10	RM-118.8	8	RM-118.8 & RM-129.1	12	
Zinc	37	µg/L	0 of 60	50 of 60	3	5	RM-150.4	4	RM-141.5	17	All samples met std.

Eight Stream Locations Plus Two Controls

					Control TC-1		Control U3R-1A		Highest Stream Location				
Analyte	**SC Freshwater Quality Std.**	**Unit**	**No. of Results Outside Std.**	**Number of Results > DL**	**Avg.[a]**	**Max.[b]**	**Avg.[a]**	**Max.[b]**		**Avg.**		**Max.[b]**	**Comments**
DO [c]	min. 4.0	mg/L	4 of 120		9.2	7.0	8.8	7.3	FMC-2	6.0	FMC-2	**1.1**	All averages met std.
pH [d]	6.0-8.5	SU	31 of 120		**5.7**	7.4	**4.8**	7.4	TB-5	**5.2**	TB-5	7.5	All maximums met std.
Temperature	< 5° F (2.8° C) above nat. cond. and not > 90° F (32.2° C)	° C	0 of 120		17	24	18	22	SC-4	20	L3R-2	28	All samples met std.
Aluminum	87 [e]	µg/L	89 of 120	119 of 120	**212**	**915**	**206**	**830**	PB-3	**233**	FM-2B	**736**	
Beryllium	4 [f]	µg/L	0 of 120	2 of 120	< DL	< DL	< DL	< DL	U3R-4	0.1	U3R-4	0.1	All samples met std.
Cadmium	0.25	µg/L	1 of 120	3 of 120	< DL	< DL	< DL	< DL	TB-5	0.08	TB-5	**0.45**	All averages met std.
Chromium	11	µg/L	0 of 120	47 of 120	1.0	3.2	1.0	3.2	FM-6	1.3	L3R-2	5.1	All samples met std.
Copper	2.9	µg/L	2 of 120	51 of 120	0.6	0.6	0.7	1.8	FMC-2	1.8	FMC-2	**10.5**	All averages met std.
Hardness (total)	none	mg/L	no std.	79 of 120	10	18	< DL	< DL	L3R-2	35	L3R-2	44	
Iron	1,000 [g]	µg/L	31 of 120	120 of 120	420	821	432	692	FMC-2	**4,153**	FMC-2	**19,400**	
Lead	0.54	µg/L	10 of 120	119 of 120	0.26	**0.85**	0.29	**0.75**	FM-2B	0.42	FM-2B	**2.93**	All averages met std.
Manganese	none	µg/L	no std.	120 of 120	18	55	11	19	FMC-2	170	FMC-2	522	
Mercury	0.91	µg/L	0 of 120	10 of 120	< DL	< DL	0.02	0.03	SC-4	0.02	SC-4	0.05	All samples met std.
Nickel	16	µg/L	0 of 120	71 of 120	1	1	1	2	TB-5	5	TB-5	10	All samples met std.
Nitrate-Nitrogen	1 [h]	mg/L	0 of 120	119 of 120	0.1	0.1	0.4	0.4	FM-6	0.6	FM-6	0.9	All samples met std.
Nitrite-Nitrogen	1 [h]	mg/L	0 of 120	19 of 120	0.003	0.009	0.003	0.012	FMC-2	0.004	FMC-2	0.014	All samples met std.
Thallium	0.24 [f]	µg/L	0 of 120	2 of 120	< DL	< DL	< DL	< DL	FMC-2	0.06	FMC-2	0.1	All samples met std.
TOC	none	mg/L	no std.	118 of 120	3	4	2	4	FMC-2	7	FMC-2	15	

					Control TC-1		Control U3R-1A		Highest Stream Location				
Analyte	**SC Freshwater Quality Std.**	**Unit**	**No. of Results Outside Std.**	**Number of Results > DL**	**Avg.[a]**	**Max.[b]**	**Avg.[a]**	**Max.[b]**		**Avg.**		**Max.[b]**	**Comments**
Phosphorus	0.06	mg/L	50 of 120	57 of 120	0.04	**0.14**	0.02	**0.07**	FM-6	**0.14**	FM-6	**0.43**	
TSS	none	mg/L	no std.	116 of 120	6	13	6	14	FMC-2	13	FMC-2	68	
Zinc	37	µg/L	1 of 120	101 of 120	2	4	5	16	FMC-2	7	FM-6	**41**	All averages met std.

Note:
The following pesticides, herbicides, and PCBs were sampled semiannually in 2021: Aldrin, Aroclor 1016, Aroclor 1221, Aroclor 1232, Aroclor 1242, Aroclor 1248, Aroclor 1254, Aroclor 1260, alpha-BHC, beta-BHC, delta-BHC, gamma-BHC (Lindane), Chlordane, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, Dieldrin, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin aldehyde, Heptachlor, Heptachlor epoxide, Toxaphene, 2,4-D and 2,4,5-TP (Silvex). 810 analytical records were reviewed. All results were < DL.

[a] When results fell below the detection limit, the detection limit value was used to determine average.
[b] Maximum detected value
[c] Min. (versus Max.) value reported
[d] Min. (versus Avg.) value reported
[e] EPA Region 4 Ecological Risk Assessment Supplemental Guidance, March 2018 Update
[f] Standard from Human Health vs. Freshwater Aquatic Life (which has no standard)
[g] EPA National Recommended Water Quality Criteria - Aquatic Life
[h] Per SCDHEC Environmental Surveillance and Oversight Program 2020 Data Report (CR-004111 11/21)

Appendix Table C-2 Summary of Nonradiological Results for Sediments Collected from the Savannah River, SRS Streams, and Stormwater Basins

SRS collected annual sediment samples at 25 locations in 2021: 8 Savannah River, 14 stream, and 3 stormwater basins, totaling 400 analytes. Locations sampled are as follows: Savannah River locations (BDC RM, RM 118.7, RM 129, RM 150.2, RM 150.4 [Vogtle discharge], RM 157.2, and SC RM), SRS stream locations (BDC, FMC @ Rd A, L3R-2, McQB at MO, McQB below Z Basin, Meyers Branch, PB @ Rd A, SC-4, U3R @ USFS Rd 2-1, U3R off Rd 4, U3R-3, and U3R-4), and SRS stormwater sasin locations (E-004, E-05, and E-06). The control location for the river samples is RM 161.0. The control locations for the stream and stormwater basin sediment samples are TC-1 and U3R-1A.

The table compares all results to EPA Region 4 Refinement Screening Values (RSVs) for sediment and shows the maximum value of each analyte for the river, stream, and stormwater basin samples. Locations exceeding RSVs are shown in **red** text.

River Sediment Results

Seven River Locations Plus One Control

Analyte	No. of Detected Results	Control RM 161.0 (mg/kg)	Location of Maximum Result	Maximum Conc. (mg/kg)	EPA Region 4 RSV for Sediment (mg/kg)	No. of Results > RSV	Comments
Aluminum	8 of 8	13,000	RM 118.7	30,000	58,000	0	All samples met std.
Antimony	0 of 8	< DL	All < DL	All < DL	25	0	All samples met std.
Arsenic	8 of 8	2	RM 157.2	4	33	0	All samples met std.
Barium	8 of 8	**84**	RM 157.2	**240**	60	8	
Cadmium	0 of 8	< DL	All < DL	All < DL	5	0	All samples met std.
Chromium	8 of 8	17	RM 118.7 & RM 157.2	32	111	0	All samples met std.
Copper	8 of 8	10	RM 118.7	17	149	0	All samples met std.
Iron	8 of 8	14,000	RM 118.7	28,000	40,000	0	All samples met std.
Lead	8 of 8	9	RM 157.2	21	128	0	All samples met std.
Manganese	8 of 8	**1,300**	RM 118.7	**1,900**	1,100	7	
Mercury	0 of 8	< DL	All < DL	All < DL	1.1	0	All samples met std.
Nickel	8 of 8	7.2	RM 157.2	21.0	48.6	0	All samples met std.
Selenium	0 of 8	< DL	All < DL	All < DL	2.9	0	All samples met std.
Silver	0 of 8	< DL	All < DL	All < DL	2.2	0	All samples met std.
Uranium	0 of 8	< DL	All < DL	All < DL	1,000	0	All samples met std.
Zinc	8 of 8	32	RM 157.2	110	459	0	All samples met std.

Stream Sediment Results

12 Stream Locations Plus 2 Controls

Analyte	No. of Detected Results	Control TC-1 (mg/kg)	Control U3R-1A (mg/kg)	Location of Maximum Result	Maximum Conc. (mg/kg)	EPA Region 4 RSV for Sediment (mg/kg)	No. of Results > RSV	Comments
Aluminum	14 of 14	2,900	22,000	BDC	27,000	58,000	0	All samples met std.
Antimony	0 of 14	< DL	< DL	All < DL	All < DL	25	0	All samples met std.
Arsenic	8 of 14	< DL	4	U3R-3	3	33	0	All samples met std.
Barium	14 of 14	42	**210**	U3R-3	**110**	60	6	
Cadmium	3 of 14	< DL	< DL	PB @ Rd A	0.4	5	0	All samples met std.
Chromium	14 of 14	5	34	BDC	27	111	0	All samples met std.
Copper	14 of 14	2	16	BDC	11	149	0	All samples met std.
Iron	14 of 14	2,200	15,000	BDC	13,000	40,000	0	All samples met std.
Lead	14 of 14	5	34	BDC	13	128	0	All samples met std.
Manganese	14 of 14	100	82	PB @ Rd A	514	1,100	0	All samples met std.
Mercury	4 of 14	< DL	< DL	PB @ Rd A	0.6	1.1	0	All samples met std.
Nickel	11 of 14	< DL	16.0	U3R-3	11.0	48.6	0	All samples met std.
Selenium	1 of 14	< DL	< DL	SC-4	0.7	2.9	0	All samples met std.
Silver	0 of 14	< DL	< DL	All < DL	All < DL	2.2	0	All samples met std.
Uranium	2 of 14	< DL	< DL	L3R-2	4.0	1,000	0	All samples met std.
Zinc	14 of 14	11	45	U3R-3	35	459	0	All samples met std.

Stormwater Basin Sediment Results

Three Basin Locations Plus Two Controls

Analyte	Number of Detected Results	Control TC-1 (mg/kg)	Control U3R-1A (mg/kg)	Location of Maximum Result	Maximum Conc. (mg/kg)	EPA Region 4 RSV for Sediment (mg/kg)	Number of Results > RSV	Comments
Aluminum	5 of 5	2,900	22,000	E-004	39,000	58,000	0	All samples met std.
Antimony	0 of 5	< DL	< DL	All < DL	All < DL	25	0	All samples met std.
Arsenic	4 of 5	< DL	4	E-004	9	33	0	All samples met std.
Barium	5 of 5	42	**210**	E-004	45	60	1	
Cadmium	0 of 5	< DL	< DL	All < DL	All < DL	5	0	All samples met std.
Chromium	5 of 5	5	34	E-004	49	111	0	All samples met std.
Copper	5 of 5	2	16	E-004	16	149	0	All samples met std.
Iron	5 of 5	2,200	15,000	E-004	40,000	40,000	0	All samples met std.
Lead	5 of 5	5	34	E-06	23	128	0	All samples met std.
Manganese	5 of 5	100	82	E-06	140	1,100	0	All samples met std.
Mercury	0 of 5	< DL	< DL	All < DL	All < DL	1.1	0	All samples met std.
Nickel	4 of 5	< DL	16.0	E-05	12.0	48.6	0	All samples met std.
Selenium	0 of 5	< DL	< DL	All < DL	All < DL	2.9	0	All samples met std.
Silver	0 of 5	< DL	< DL	All < DL	All < DL	2.2	0	All samples met std.
Uranium	0 of 5	< DL	< DL	All < DL	All < DL	1,000	0	All samples met std.
Zinc	5 of 5	11	45	E-004	64	459	0	All samples met std.

Appendix Table C-3 Summary of Detected Metal Results for Freshwater Fish Tissue Collected from the Savannah River

All antimony, arsenic, copper, manganese, and nickel results were not detected; therefore, they were not reported in this table.

Analyte	Number of Detected Values (above the MDC)	Number of Estimated Values (above the MDC, below the SQL)	Maximum Detected Concentration (µg/g)	SQL (µg/g)	MDC (µg/g)	Fish Type with Maximum Concentration	Location of Maximum Concentration
Cadmium	1	3	1.04	0.547	0.055	Panfish	Steel Creek Mouth
Chromium	1	81	1.95	0.771	0.077	Catfish	Lower Three Runs Creek Mouth
Mercury	80	89	0.795	0.2	0.02	Catfish	Upper Three Runs Creek Mouth
Zinc	168	1	20.2	1.2	0.12	Catfish	Augusta Lock and Dam

Note:
169 freshwater tissue samples were collected and analyzed for metals and mercury.

Appendix Table C-4 Summary of Detected Metal Results for Saltwater Fish Tissue Collected from the Savannah River between River Miles 0–8, Near Savannah, Georgia

Antimony, arsenic, cadmium, chromium, copper, lead, manganese, mercury, and nickel results were not detected; therefore, they were not reported in this table.

All results are for mullet.

Analyte	Number of Detected Values (above the MDC)	Number of Estimated Values (above the MDC, below the SQL)	Maximum Detected Concentration (µg/g)	SQL (µg/g)	MDC (µg/g)
Zinc	7	0	4.67	1.41	0.141

Note:
Seven saltwater tissue samples were collected and analyzed for metals and mercury.