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Savannah River Operations Office
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JUN 2 4 2024

Ms. Susan Fulmer, P. G., Manager
Federal Remediation Section
Division of Site Assessment, Remediation and Revitalization
Bureau of Land and Waste Management
South Carolina Department of Health and Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

Mr. Jon Richards
Savannah River Site Remedial Project Manager
Superfund Division
U. S. Environmental Protection Agency, Region 4
61 Forsyth Street, SW
Atlanta, Georgia 30301

Dear Ms. Fulmer and Mr. Richards:

SUBJECT: Groundwater Mixing Zone Sampling Summary Report for the R-Area Reactor Seepage Basins/108-4R Overflow Basin Operable Unit 2023, SEMS Number: 25

In accordance with the terms of the Federal Facility Agreement (FFA), the U. S. Department of Energy (DOE) is submitting this letter report for your review. Please review the subject letter report and provide your response within one hundred twenty (120) days of receipt.

The effort and time that the South Carolina Department of Health and Environmental Control and the U. S. Environmental Protection Agency have given on the subject operable unit are greatly appreciated. Comments or questions from your staff may be directed to me at (803) 952-8365, or the DOE Operable Unit Manager, Mr. Phillip Prater, at (803) 952-9333.

Sincerely,

AVERY HAMMETT

Digitally signed by AVERY HAMMETT
Date: 2024.06.21 08:44:10 -04'00'

Avery G. Hammett
FFA Project Manager, DOE-Savannah River
Remediation and Deactivation & Decommissioning Division

RDDD-24-141

Groundwater Mixing Zone Sampling Summary Report for the R-Area Reactor Seepage Basins/108-4R Overflow Basin Operable Unit 2023

Introduction

The R-Area Reactor Seepage Basins (RRSB)/108-4R Overflow Basin Operable Unit (OU) is listed as a Resource Conservation and Recovery Act 3004(u) Solid Waste Management Unit/Comprehensive Environmental Response, Compensation, and Liability Act unit in Appendix C of the Federal Facility Agreement for the Savannah River Site (SRS). The seepage basins and associated pipelines (source areas) were addressed through the placement of a reinforced-concrete intruder barrier system. The selected remedy for the groundwater at RRSB is groundwater mixing zone (GWMZ) with land use controls (LUCs), which has been applied since 2007. On April 1, 2020, the U.S. Environmental Protection Agency (USEPA) documented that the remedial action is complete (monitoring systems are installed and operational) for the selected Monitored Natural Attenuation remedy (GWMZ with LUCs) at the RRSB and noted the progress of the remedy towards meeting the remedial goals as documented in the *2017 Groundwater Mixing Zone Report for the R-Area Reactor Seepage Basins/108-4R Overflow Basin Operable Unit (U)* (SRNS-RP-2018-00625, Revision 0, June 2018) (Letter, G. Adams (USEPA) to B. Hennessey (U.S. Department of Energy [USDOE]), dated April 1, 2020 [SRNS-OS-2020-00179]).

Sampling optimizations that were developed and presented in the *2011 Biennial Groundwater Mixing Zone Report for the R-Area Reactor Seepage Basins/108-4R Overflow Operable Unit (U)* (SRNS-RP-2012-00349, Revision 1, March 2013) were approved by the USEPA and the South Carolina Department of Health and Environmental Control (SCDHEC) and implemented in 2014. These sampling optimizations continued in 2023. All LUC boundary and plume/intermediate wells are now sampled biennially instead of annually. Also, full GWMZ reports are now produced every 4th year with a supplemental data summary in letter format submitted every two years in-between the 4-year GWMZ reports. This summary letter presents the data collected during the fourth quarter of 2023 (4Q23).

Groundwater Monitoring

A total of nineteen (19) wells were sampled during the 4Q23, all of which were analyzed for strontium-90 (Sr-90). The monitoring network is shown in Figure 1. Table 1 presents all analytical data collected during this reporting period. One (1) plume/intermediate well, RSE 10, has frequently been dry. Because of the unreliability of this well, USDOE, USEPA, and SCDHEC agreed to use monitoring well RSE 10DU as an alternate plume/intermediate well to be sampled when well RSE 10 is dry. RSE 10 contained sufficient water to obtain a sample during the 2023 sampling event as the data displays in Table 1. RSE 10DU was also sampled as shown on Table 1. The next sampling event will occur in the fourth quarter of 2025, followed by a full report submittal in June 2026.

Sampling and Analysis Issues

No sampling or analysis issues were encountered during the 4Q23 sampling event.

Water Elevations

Water elevations in the upper portion of the Upper Aquifer Zone (UAZ) (A/AA horizon) have risen by an average of 3.75 ft since the last sampling event in the first quarter of 2022 (1Q22). Water elevations in the Transmissive Zone (TZ) of the UAZ have risen an average of 2.68 feet since the 1Q22 sampling event. A potentiometric surface map of the A/AA and TZ horizons for 4Q23 are shown in Figures 2 and 3, respectively. The potentiometric surface is radial in the A/AA and TZ horizons and transitions to a generally eastward dip in the deeper aquifer horizons. Potentiometric heads in the A/AA horizon are generally about 2 feet to 8 feet higher than corresponding heads in the TZ, indicating that flow is generally downward in this groundwater recharge area. Therefore, no groundwater flow direction is drawn. Water elevations are displayed in Table 1.

RRSB OU Strontium-90

The network of sixteen (16) GWMZ compliance monitoring wells and three (3) auxiliary wells are analyzed biennially for Sr-90. Table 1 lists the results for the 4Q23 sampling event. Figure 4 displays the Sr-90 concentrations within the A/AA horizon. No concentrations exceeded the maximum contaminant level (MCL) in the TZ wells; therefore, a concentration map was not drawn.

Per the agreed optimization, the six middle aquifer zone (MAZ) and lower aquifer zone (LAZ) monitoring wells were not sampled this period due to the lack of an MCL exceedance in the TZ wells or any boundary wells in 2023.

There were no mixing zone concentration limit (MZCL) exceedances of Sr-90 in plume/intermediate wells in 2023. Plume/intermediate well RSE 10 had the highest observed concentration of 167 picocuries per liter (pCi/L); this is significantly below the MZCL of 2,244 pCi/L for this well. Sr-90 was also detected in one (1) other plume/intermediate well, RSD 2DL. The reported concentration in this well was significantly less than the Sr-90 MCL of 8 pCi/L. Both wells are screened in the A/AA horizon of the UAZ.

All plume boundary wells were below the Sr-90 MCL of 8 pCi/L in 2023. Sr-90 was detected as an estimated value below the estimated quantitation limit in two (2) plume boundary wells, RSE 10DL and RSE 35D, screened in the TZ of the UAZ.

All auxiliary wells were detected below the Sr-90 MCL of 8 pCi/L in 2023. These wells are sampled in support of the effectiveness monitoring of the closed seepage basin remedy because they are indicators of future groundwater concentrations in other downgradient wells. They are not used as a determining factor for any additional corrective action. Even though auxiliary wells are not compared to MCLs as action levels, groundwater would not be considered clean until all wells have achieved the MCL.

Conclusions

The following conclusions were made based on the 2023 monitoring of the RRSB OU:

- Recorded water level measurements increased in all wells.
- There were no MZCL exceedances of Sr-90 in plume/intermediate wells.
- There were no MCL exceedances of Sr-90 in plume boundary wells.
- The 4Q23 data indicated that the remedy is functioning as intended and continues to be effective.

Recommendations

The remedies for both RRSB OU and R Area Operable Unit (RAOU) are evaluated in the Five-Year Remedy Review Report (5YRRR) for SRS Operable Units with Groundwater Remedies, and the next 5YRRR (Revision 0) is due December 2024. The project team proposes combining both RRSB OU and RAOU into a letter report in August 2026 and a full report due August 2028 to support the December 2029 5YRRR submittal. SRS proposes biennial sampling for the RAOU starting in 2025 to match the RRSB OU sampling schedule and to support a combined letter report for both the RRSB OU and the RAOU due on the proposed date of August 31, 2026. With USDOE, approval, the project team recommends all RAOU monitored natural attenuation (MNA) sampling be conducted biennially to coincide with a combined RRSB OU and RAOU report cycle. RAOU full in-situ decommissioning (ISD) monitoring would continue on a 5-year sampling period starting in 2027 to coincide with the 5YRRR. The proposed schedule is the following:

- 2024: RAOU and RRSB OU 5YRRR;
- 2025: RAOU MNA, RAOU 5 ISD Wells, and RRSB Sampling (4Q25);
- 2026: RAOU and RRSB OU Letter Report (2023-2025 Data);
- 2027: RAOU MNA, RAOU 11 ISD Wells, and RRSB Sampling (4Q27);
- 2028: RAOU and RRSB OU Full Report (2027 Data); and
- 2029: RAOU MNA and RRSB Sampling (4Q29), and 5YRRR.

Table 1. RRSB Mixing Zone Monitoring Results, Fourth Quarter 2023 (4Q23)

RRSB Mixing Zone Monitoring Results, Fourth Quarter 2023 (4Q23)																R-Area Groundwater Compliance Monitoring Constituents	
			Field Data														Radionuclides
			SAMPLE COLLECTION DATE	PH	TURBIDITY	WATER TEMPERATURE	DEPTH TO WATER	SAMPLING EVENT WATER ELEVATION	SYNCHRONOUS MEASUREMENT DATE	SYNCHRONOUS WATER ELEVATION	VOLUME PURGED	PHENOLPHTHALEIN ALKALINITY (AS CACO3)	TOTAL ALKALINITY (AS CACO3)	SPECIFIC CONDUCTANCE	FIELD CONDITIONS	Constituent	STRONTIUM-90
			date-month-year	pH	NTU	degC	ft	ft	date-month-year	ft	gal	mg/L	mg/L	uS/cm		Unit	pCi/L
																MZCL for RSE 10	2244
																MZCL for RSD002DU	1209
Station	Well Use	Aquifer Zone	Limits		85											MCL	8
RPC 11DU	Auxiliary	A/AA_UAZ_UTRAU	09-Oct-2023	6.5	8.3	24.6	5.2	288.44	NS	NS	2	10	38	116	No Comments		7.84
RSE 1A	Auxiliary	A/AA_UAZ_UTRAU	09-Oct-2023	5.3	2.3	25.5	13.39	290.81	NS	NS	1	0	2	73	No Comments		3.97
RSE 26DL	Auxiliary	TZ_UAZ_UTRAU	09-Oct-2023	5	3.6	20.7	25.71	282.49	NS	NS	2	0	1	29	No Comments		[0.732]
RPC 3DL	Boundary MCL	TZ_UAZ_UTRAU	09-Oct-2023	5.3	0.5	19	41.2	267.21	NS	NS	32	0	6	31	No Comments		<EQL (0.896)
RPC 4DU	Boundary MCL	A/AA_UAZ_UTRAU	09-Oct-2023	5.3	8.5	20.5	18.5	283.79	NS	NS	1	0	10	61	No Comments		<EQL (1.37)
RPC 5DL	Boundary MCL	TZ_UAZ_UTRAU	09-Oct-2023	6	3.8	22	35.9	268.7	NS	NS	32	0	24	29	No Comments		<EQL (0.621)
RPC 5DU	Boundary MCL	A/AA_UAZ_UTRAU	09-Oct-2023	5.2	1.2	24.4	31.2	273.4	NS	NS	12	0	6	30	No Comments		<EQL (1.38)
RSE027C	Boundary MCL	MAZ_UTRAU	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	No Comments		NS
RSE028B	Boundary MCL	LAZ_UTRAU	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	No Comments		NS
RSE029D	Boundary MCL	TZ_UAZ_UTRAU	09-Oct-2023	4.7	3.9	18.2	23.08	267.13	NS	NS	2	0	0	15	No Comments		<EQL (1.08)
RSE030C	Boundary MCL	MAZ_TC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	No Comments		NS
RSE031B	Boundary MCL	LAZ_UTRAU	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	No Comments		NS
RSE032D	Boundary MCL	A/AA_UAZ_UTRAU	09-Oct-2023	4.8	1.6	17.5	23.72	278.21	NS	NS	2	0	0	27	No Comments		<EQL (1.21)
RSE033D	Boundary MCL	TZ_UAZ_UTRAU	09-Oct-2023	4.3	0.9	17.2	23.72	278.74	NS	NS	2	0	0	28	No Comments		<EQL (1.37)
RSE034D	Boundary MCL	A/AA_UAZ_UTRAU	09-Oct-2023	5	0.4	14.5	29.22	276.22	NS	NS	2	0	1	25	No Comments		<EQL (1.79)
RSE035D	Boundary MCL	TZ_UAZ_UTRAU	09-Oct-2023	5	1.97	17.4	38.39	269.33	NS	NS	2	0	2	19.4	No Comments		[0.563]
RSE036C	Boundary MCL	MAZ_TC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	No Comments		NS
RSE037D	Boundary MCL	A/AA_UAZ_UTRAU	09-Oct-2023	4.6	1.35	16.6	24.92	268.46	NS	NS	2	0	0	29.9	No Comments		<EQL (0.712)
RSE038B	Boundary MCL	LAZ_UTRAU	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	No Comments		NS
RSP 4D	Boundary MCL	A/AA_UAZ_UTRAU	09-Oct-2023	4.9	1.63	20.1	21.49	279.13	NS	NS	5	0	0	25.5	No Comments		<EQL (0.999)
RSD002DL	Plume/Intermediate	TZ_UAZ_UTRAU	09-Oct-2023	4.9	0.8	21.7	26.05	278.92	NS	NS	2	0	0	25	No Comments		1.22
RSD002DU	Plume/Intermediate	A/AA_UAZ_UTRAU	09-Oct-2023	4.8	12.4	22.2	22.95	282.02	NS	NS	2	0	0	45	No Comments		<EQL (0.948)
RSE 10	Plume/Intermediate	A/AA_UAZ_UTRAU	09-Oct-2023	5.4	0.4	24.8	22.8	284.29	NS	NS	1	0	4	97	No Comments		167
RSE 10DU	Plume/Intermediate	A/AA_UAZ_UTRAU	09-Oct-2023	5	3.9	24.4	24.25	283.25	NS	NS	14	0	1	57	No Comments		<EQL (2.12)
RSE010DL	Plume/Intermediate	TZ_UAZ_UTRAU	09-Oct-2023	5	3	22.7	30.74	276.45	NS	NS	1	0	0	18	No Comments		[0.625]

Activity

Explanation

[##]	EPA Functional Guideline Code of 'J' was applied to the result, indicating an estimated quanity.
<EQL(##)	Constituent was below detection. The sample-specific Estimated Quantitation Limit is in parentheses.
	Result exceeds applicable limit.
	For wells with MZCLs, result exceeds MCL but is below applicable MZCL.
REJ	Result Rejected.
	Result is less than the applicable limit and without EPA Functional Guidline qualifiers.
NS	Requested to be sampled but was not. See comments as to why not.
Blue Text	Not a required sample analysis.

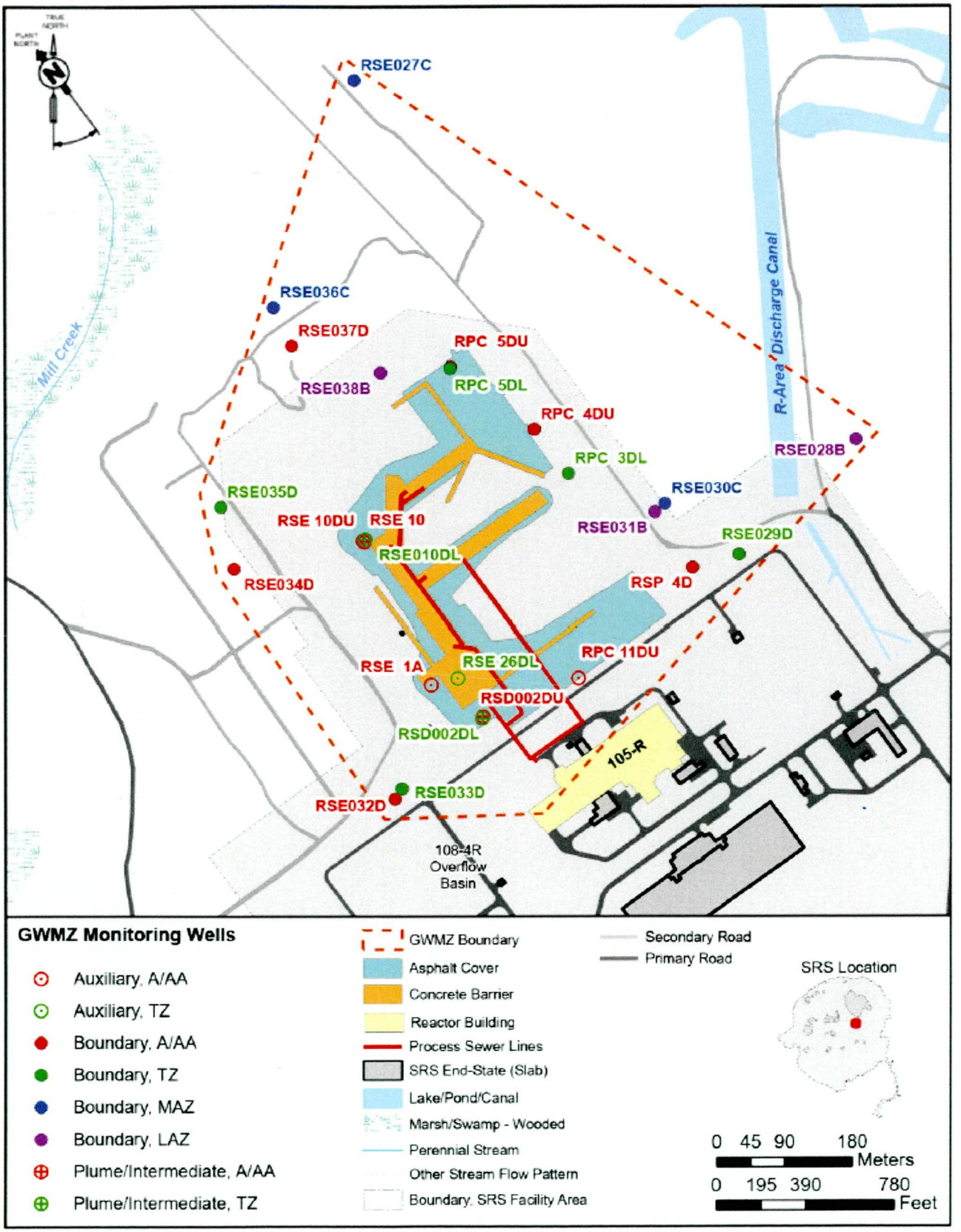

Figure 1. Groundwater Mixing Zone Boundary and Monitoring Well Network

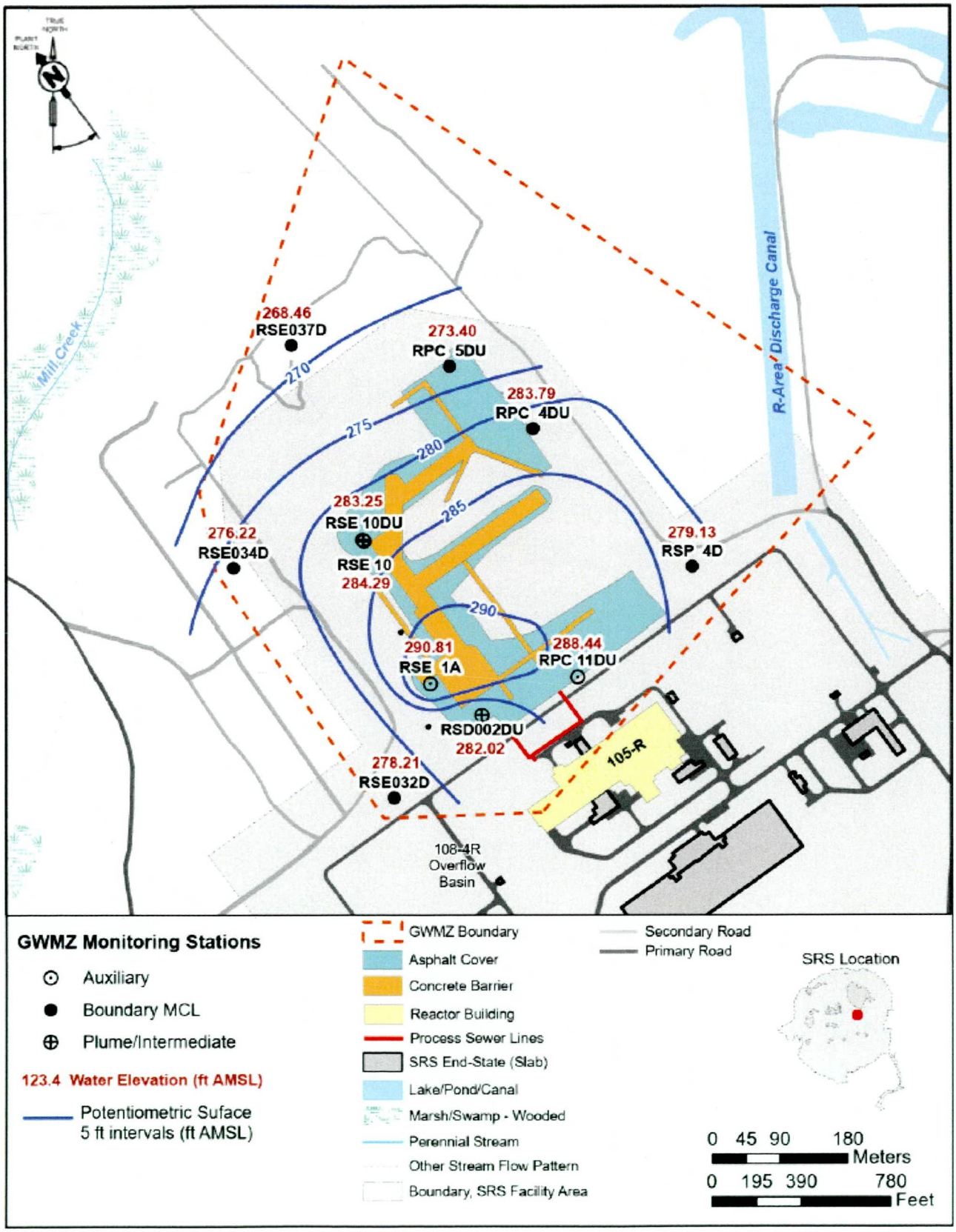

Figure 2. 4Q23 Water Elevations of the A/AA Horizon in the UAZ

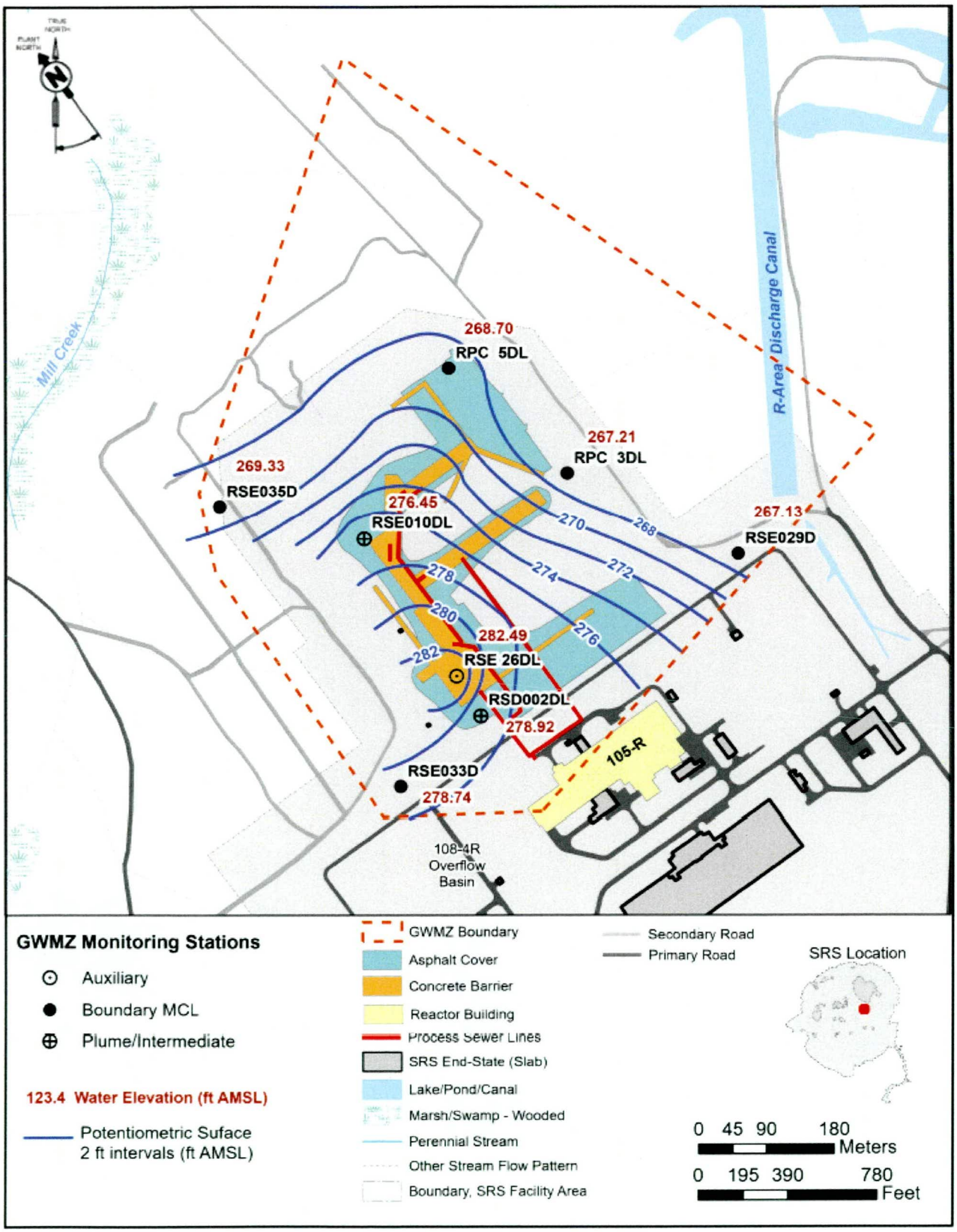

Figure 3. 4Q23 Water Elevations of the TZ in the UAZ

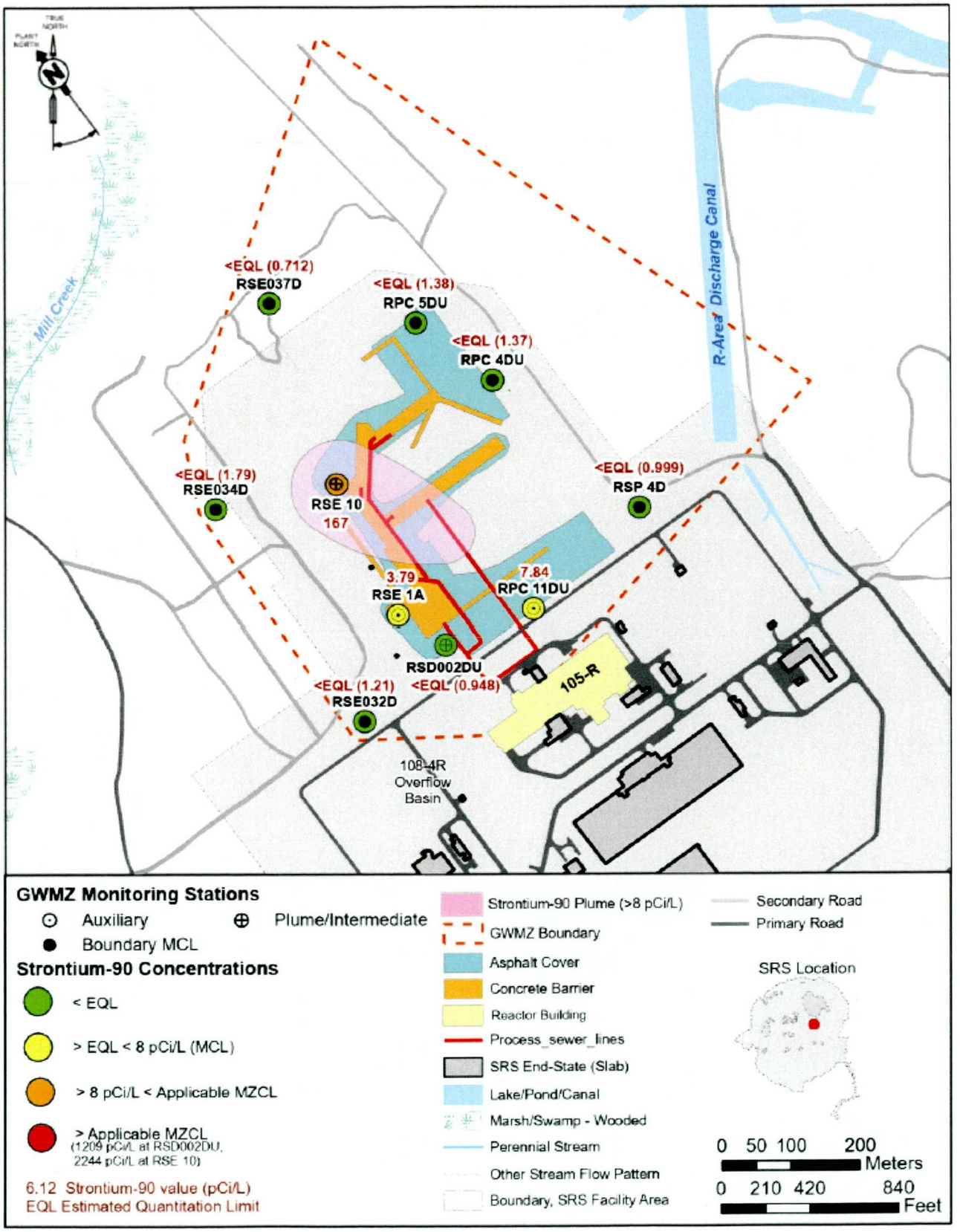

Figure 4. 4Q23 Strontium-90 Concentration Plume Map of the A/AA Horizon in the UAZ

cc:
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