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JUN 10 2020

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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
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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 2019, SEMS Number: 25

In accordance with the terms of the Federal Facility Agreement, the U. S. Department of Energy (DOE) is submitting this letter report for your review. Please review the subject letter report and provide your comments 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 Program Manager, Mr. Phillip Prater, at (803) 952-9333.

Sincerely,

A handwritten signature in black ink, appearing to read "B. Hennessey".

Brian T. Hennessey
SRS Remedial Project Manager
Infrastructure and Area Completion Division

IACD-20-161

JUN 10 2020

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Mr. Jon Richards

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cc:

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R. H. Pope, EPA-Atlanta

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M. McRae, TechLaw, Inc.

Groundwater Mixing Zone Sampling Summary Report for the R-Area Reactor Seepage Basins/108-4R Overflow Basin Operable Unit 2019

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 (USDOE), dated April 1, 2020 [SRNS-OS-2020-00179]).

Sampling optimizations that were developed and approved by the USEPA and the South Carolina Department of Health and Environmental Control (SCDHEC) in the *2012/2013 Groundwater Mixing Zone Report for the R-Area Reactor Seepage Basins/108-4R Overflow Basin Operable Unit (U)* (SRNS-RP-2014-00318, Revision 0, June 2014) were implemented in 2014. 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. These sampling optimizations were originally documented 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). This is the second data summary letter since the optimizations were implemented and presents the data collected during the fourth quarter of 2019 (4Q2019).

Groundwater Monitoring

There was a total of eighteen wells sampled during 4Q2019, all of which were analyzed for strontium-90 (Sr-90); and one well (RSE 26DL) was also analyzed for americium-241 (Am-241). This includes the five added upper aquifer zone (UAZ) wells but removes RSD 10 and all six (6) of the Middle Aquifer Zone (MAZ) and Lower Aquifer Zone (LAZ) wells, per the optimized network agreed to in the 2012/2013 Groundwater Mixing Zone Report for the R-Area Reactor

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Seepage Basins/108-4R Overflow Basin OU. One plume/intermediate well, RSE 10, has frequently been dry. Because of the unreliability of this well, SRS, 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 water during the 2019 sampling event and therefore RSE 10DU was not sampled. The monitoring network is shown in Figure 1. Table 1 presents all analytical data collected during this reporting period. The next sampling event will occur in 4Q2021, followed by a full report submitted in June 2022.

Sampling and Analysis Issues

Turbidity of water exceeded the recommended maximum value of 15 Nephelometric Turbidity Unit (NTU) at two wells: plume/intermediate well RSE 10 (31.2 NTU) and boundary compliance well RPC 4DU (15.2 NTU). Sr-90 concentrations at well RSE 10 was detected at 264 pCi/L in 2017 and 135 pCi/L in 2019. Turbidity at well RSE 10 also decreased during the 4Q2019 sampling event from 827 NTU to 31.2 NTU. Due to this significant drop in turbidity and Sr-90 concentration well RSE 10 will be redeveloped prior to the next sampling event. Well RPC 4DU had an estimated quantity of 1.42 pCi/L in 2017 and was non-detect in 2019. Turbidity in this well increased from 10.4 NTU to 15.2 NTU. Therefore, it is concluded that the slightly elevated turbidity did not significantly affect data quality at well RPC 4DU.

Water Elevations

Water levels on average have risen by 0.5 ft since the last sampling event in 4Q2017. The general increase observed is consistent with the above average levels of precipitation over the last two years. Sampling event water elevations are shown in Table 1. A potentiometric surface of the A horizon in the UAZ is shown in Figure 2.

RRSB OU Strontium-90

The network of sixteen GWMZ compliance monitoring wells and three auxiliary wells are analyzed biennially for Sr-90. Table 1 lists the results for the sampling completed in 4Q2019. There were no mixing zone concentration limit (MZCL) exceedances of Sr-90 in plume/intermediate wells in 4Q2019. Well RSE 10 had the highest observed concentration of 135 pCi/L; this is significantly below the MZCL of 2,244 pCi/L for this well. There were no maximum contaminant level (MCL) exceedances in the Transmissive Zone (TZ) wells within the UAZ or any boundary wells in 4Q2019. Therefore, per the agreed optimization, the six MAZ and LAZ monitoring wells were not sampled this period. Sr-90 was detected as an estimated value below the estimated quantitation limit in one boundary well in the A horizon (RSP 4D). This was the first detection of Sr-90 in this well. The reported concentration is significantly less than the Sr-90 MCL of 8 pCi/L. Both auxiliary wells (RPC 11DU and RSE 1A) screened in the A horizon showed

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an increase in concentrations in 4Q2019. However, the concentrations were below historical values. Auxiliary wells are monitored for information only.

RRSB OU Americium-241

In a comment on the 2012/2013 Report (SRNS-RP-2014-00318, Revision 0, June 2014), USEPA concluded that the analysis of Am-241 should continue at auxiliary well RSE 26DL. The continuation resulted from the unexpected detection of Am-241 in well RSE 26DL in the first quarter of 2013. In the response to the comment, the optimization was refined as follows:

SRS will analyze groundwater samples from well RSE 26DL for Am-241 during the next three sampling events, starting with the fourth quarter 2015 (4Q2015) event. If Am-241 is detected in any sample, monitoring for Am-241 will continue at well RSE 26DL in future sampling events. If Am-241 is not detected in the next three sample events, future sampling will be for Sr-90 only

Am-241 was not detected in this auxiliary well during this sampling period. This is the third consecutive sampling event that Am-241 was non-detect in this well and analysis of Am-241 will be discontinued.

Conclusions

The following conclusions were made based on the 2019 monitoring of the RRSB OU:

- There were no MZCL exceedances of Sr-90 in plume/intermediate wells.
- There were no MCL exceedances of Sr-90 in plume boundary wells.
- Am-241 was not detected in the auxiliary well RSE 26DL for the third sampling event and analysis will be discontinued.
- Recorded water level measurements increased in most wells reflecting an increased rainfall total over the last two years.
- The 4Q2019 data indicated that the remedy is functioning as intended and continues to be effective.

Table 1. RRSB Mixing Zone Monitoring Results, Fourth Quarter 2019 (4Q2019)

RRSB Mixing Zone Monitoring Results, Fourth Quarter 2019 (4Q19)			Field Data										R-Area Groundwater Compliance Monitoring Constituents												
			SAMPLE COLLECTION DATE	PH	TURBIDITY	WATER TEMPERATURE	DEPTH TO WATER	SAMPLING EVENT WATER ELEVATION	VOLUME PURGED	SPECIFIC CONDUCTANCE	Constituent	FIELD CONDITIONS	Radionuclides												
													MAY-month-year	pH	NTU	degC	ft	ft	gal	uS/cm	Unit	MZCL for RSE 10	MCL	AMERICIUM-241	STRONTIUM-90
																								pCvL	pCvL
Station	Well Use	Aquifer Zone			15																				
RPC 11DU	Auxiliary	A UAZ UTRAU	08-Oct-2019	5.3	10.2	25.1	9.43	284.21	3	39		No Comments	NS				18.9								
RSE 1A	Auxiliary	A UAZ UTRAU	09-Oct-2019	5.2	0.8	24.6	25.30	278.9	1	44		No Comments	NS				14.5								
												SPL					16.6								
RSE 26DL	Auxiliary	TZ UAZ UTRAU	09-Oct-2019	5.1	0.9	23.9	28.80	279.4	1	24		No Comments	<EQL (0.41)	<EQL (1.04)											
												LD	<EQL (0.336)												
												SPL	<EQL (0.1188)				0.884								
												LD, SPL	<EQL (0.1634)				1.316								
RPC 3DL	Boundary MCL	TZ UAZ UTRAU	07-Oct-2019	5.2	0.3	20.9	41.39	267.02	30	34		No Comments	NS				EQL (1.27)								
RPC 4DU	Boundary MCL	A UAZ UTRAU	07-Oct-2019	4.9	1.5	21.8	23.60	278.69	14	55		X, 2	NS				EQL (1.25)								
RPC 5DL	Boundary MCL	TZ UAZ UTRAU	07-Oct-2019	6	3.5	23	36.23	268.37	28	26		No Comments	NS				EQL (1.25)								
RPC 5DU	Boundary MCL	A UAZ UTRAU	07-Oct-2019	5.2	1.3	25.9	32.82	271.78	14	31		No Comments	NS				EQL (1.04)								
RSE027C	Boundary MCL	MAZ UTRAU	NS	NS	NS	NS	NS	NS	NS	NS		No Comments	NS				NS								
RSE028B	Boundary MCL	LAZ UTRAU	NS	NS	NS	NS	NS	NS	NS	NS		No Comments	NS				NS								
RSE029D	Boundary MCL	TZ UAZ UTRAU	07-Oct-2019	5.1	2.8	19.4	25.55	264.66	2	15		No Comments	NS				EQL (1.25)								
RSE030C	Boundary MCL	MAZ TC	NS	NS	NS	NS	NS	NS	NS	NS		No Comments	NS				NS								
RSE031B	Boundary MCL	LAZ UTRAU	NS	NS	NS	NS	NS	NS	NS	NS		No Comments	NS				NS								
RSE032D	Boundary MCL	A UAZ UTRAU	07-Oct-2019	5	3.2	19.4	24.98	276.95	2	28		No Comments	NS				EQL (1.34)								
												LD					EQL (1.3)								
RSE033D	Boundary MCL	TZ UAZ UTRAU	07-Oct-2019	4.7	3.1	19.5	25.79	276.67	3	26		No Comments	NS				EQL (0.927)								
RSE034D	Boundary MCL	A UAZ UTRAU	07-Oct-2019	5	0.2	19	30.80	274.64	2	23		No Comments	NS				EQL (1.05)								
RSE035D	Boundary MCL	TZ UAZ UTRAU	09-Oct-2019	5.1	1.5	19.3	39.60	268.12	2	20		No Comments	NS				EQL (1.17)								
RSE036C	Boundary MCL	MAZ TC	NS	NS	NS	NS	NS	NS	NS	NS		No Comments	NS				NS								
RSE037D	Boundary MCL	A UAZ UTRAU	09-Oct-2019	4.8	1	19	25.40	267.98	2	29		No Comments	NS				EQL (0.955)								
												LD					EQL (1.3)								

Table 1. RRSB Mixing Zone Monitoring Results, Fourth Quarter 2019 (4Q2019) (Continued/end)

RRSB Mixing Zone Monitoring Results, Fourth Quarter 2019 (4Q19)			Field Data										R-Area Groundwater Compliance Monitoring Constituents	
													Radionuclides	
			SAMPLE COLLECTION DATE	PH	TURBIDITY	WATER TEMPERATURE	DEPTH TO WATER	SAMPLING EVENT WATER ELEVATION	VOLUME PURGED	SPECIFIC CONDUCTANCE	Constituent	FIELD CONDITIONS	AMERICIUM-241	STRONTIUM-90
			Day-month-year	pH	NTU	degC	ft	ft	gal	uS/cm	Unit		pCi/L	pCi/L
Station	Well Use	Aquifer Zone			IS						MZCL for RSE 10	MZCL for RSD002DU	MCL	
RSE03XB	Boundary MCL	LAZ UTRAU	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
RSP 4D	Boundary MCL	A UAZ UTRAU	09-Oct-2019	4.5	1.4	22.7	21.70	278.92	5	35	No Comments	NS	[1.19]	
RSD002DL	Plume/Intermediate	TZ UAZ UTRAU	07-Oct-2019	4.5	1	21.2	30.00	274.97	2	23	No Comments	NS	<EQL (0.919)	
RSD002DU	Plume/Intermediate	A UAZ UTRAU	07-Oct-2019	4.6	9.5	22.6	27.60	277.37	2	42	No Comments	NS	<EQL (0.747)	
RSE 10	Plume/Intermediate	A UAZ UTRAU	08-Oct-2019	5.5	3.2	24.6	28.63	278.46	7	64	No Comments	NS	135	
RSE 10DU	Plume/Intermediate	A UAZ UTRAU	NS	NS	NS	NS	NS	NS	NS	NS	No Comments	NS	NS	
RSE010DL	Plume/Intermediate	TZ UAZ UTRAU	07-Oct-2019	5.2	2.1	22.3	34.80	272.39	1	18	No Comments	NS	<EQL (1.24)	

Explanation

- [J] EPA Functional Guideline Code of 'J' was applied to the result, indicating an estimated quantity.
- <EQL (0.919) Constituent was below detection. The sample-specific Estimated Quantitation Limit is in parentheses.
- [RE] Result exceeds applicable limit.
- [RE] For wells with MZCLs, result exceeds MCL but is below applicable MZCL.
- [RE] Result Rejected.
- [RE] Result is less than the applicable limit and without EPA Functional Guideline qualifiers.
- NS Requested to be sampled but was not. See comments as to why not.
- Blue Text Not a required sample analysis.

- LD Laboratory duplicate
- SPL Split sample
- N Well went dry during purging; samples collected after well recovered; measurements obtained
- 2 Sampled after recovery

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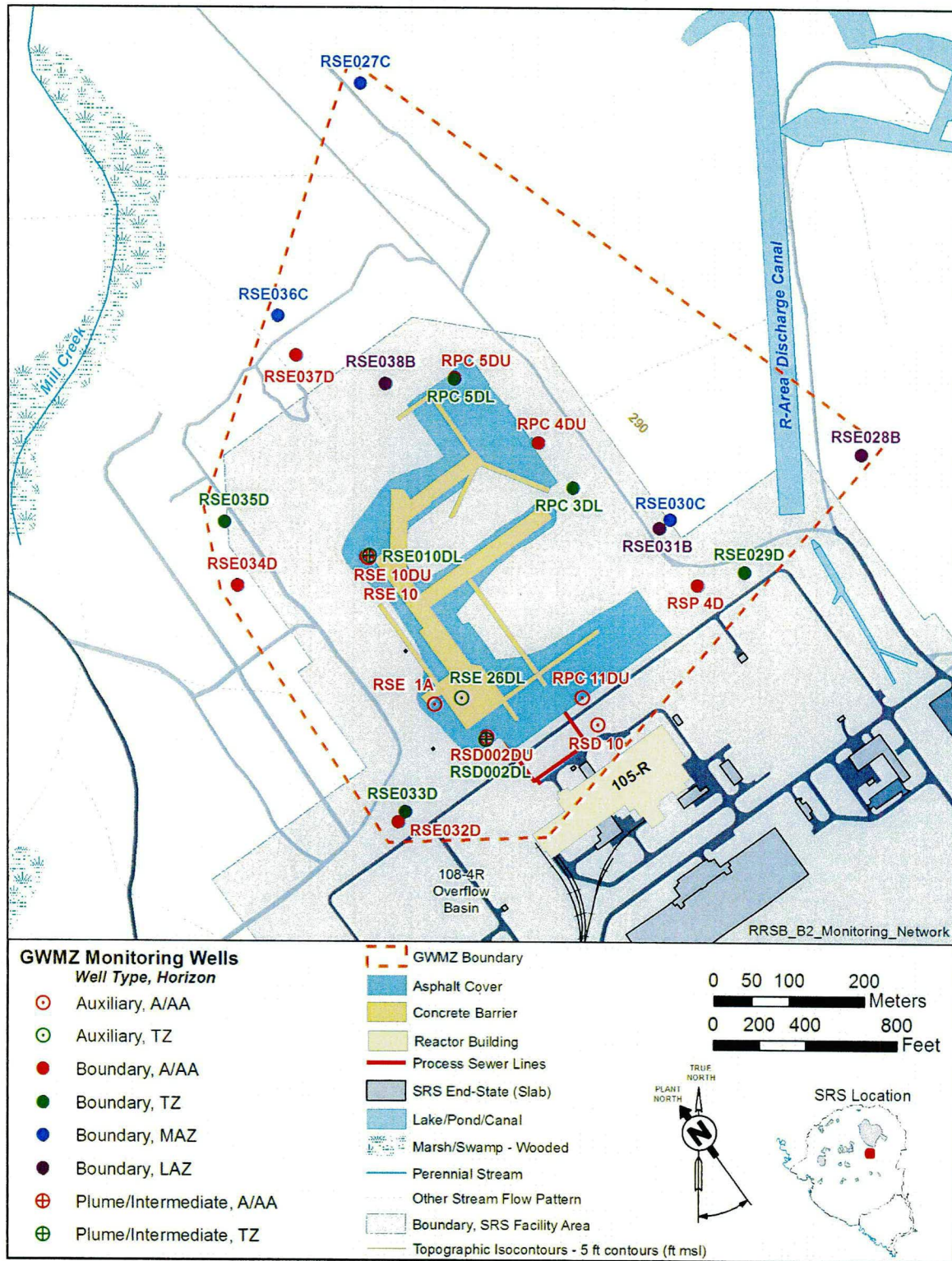


Figure 1. Groundwater Mixing Zone Boundary and Monitoring Well Network

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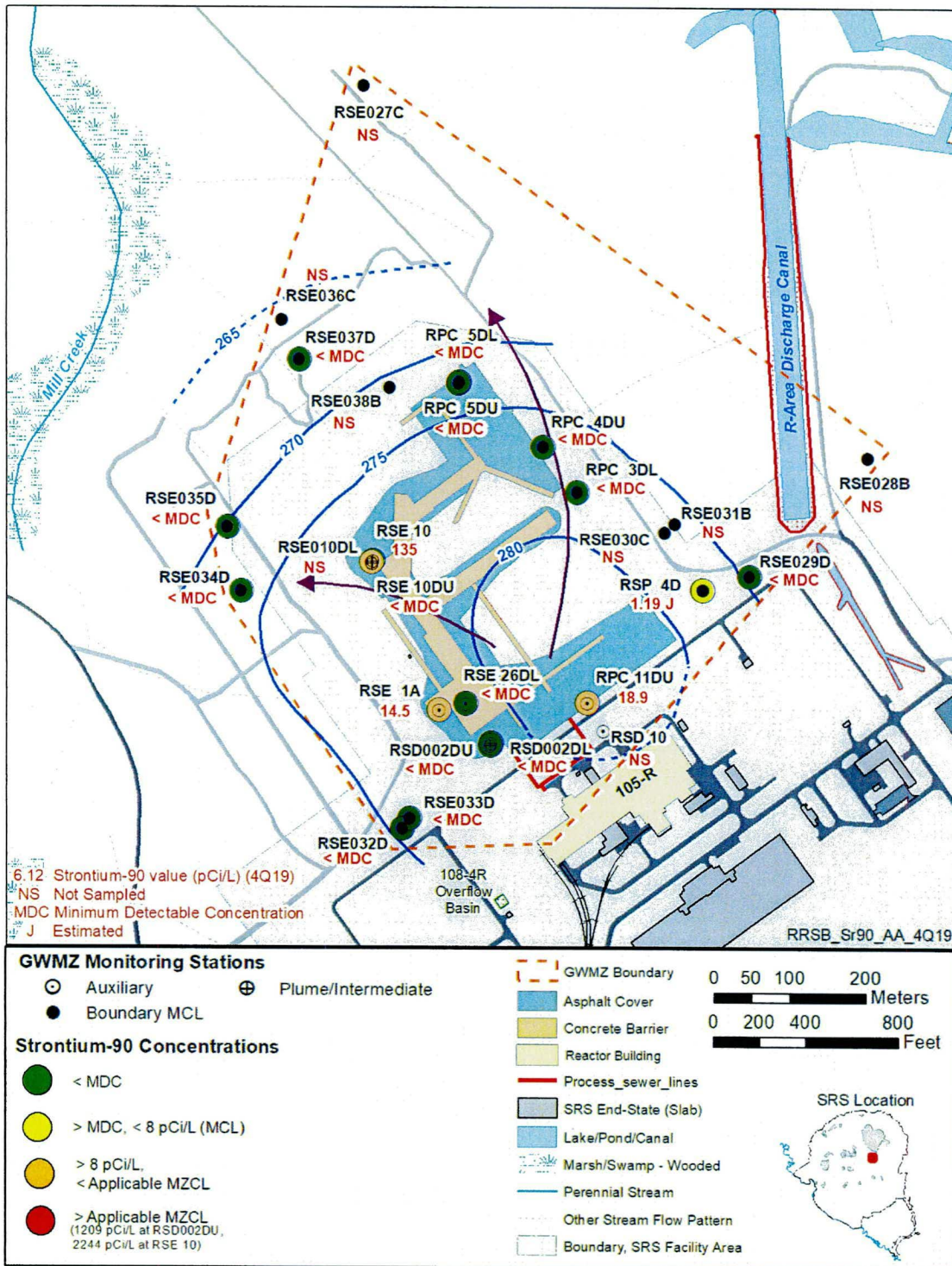


Figure 2. Strontium-90 Concentration with Potentiometric Surface in the A Horizon of the UAZ in 2019