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U.S. DEPARTMENT OF ENERGY LETTER OF TRANSMITTAL

DATE: January 14, 1999

ATTENTION: Branden Doster and Bill Hernlund

RE: Southeast Drainage Post Remediation Risk Evaluation

TO:

Missouri Department of Natural Resources

7295 Highway 94 South

St. Charles, MO 63304

WE ARE SENDING YOU X Attached Under separate cover via _____ the following items:

COPIES	DATE	NO.	DESCRIPTION
1			Southeast Drainage Post Remediation Risk Evaluation

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ATTACHMENT: POST-CLEANUP RISK ASSESSMENT FOR THE SOUTHEAST DRAINAGE

This attachment presents the results of the post-cleanup risk assessment performed for the Southeast drainage. The purpose of the assessment was to determine the amount of risk reduction achieved by the removal action.

Risk calculations were performed using the same methodology as used in the EE/CA (DOE 1996). Risks were estimated for the current hunter and future child scenarios. The exposure routes evaluated include incidental ingestion of sediment and external irradiation. Risk reduction achieved at specific locations is presented in Table 1. Risk estimates for the child scenario for all locations targeted in the EE/CA are shown. Seventeen additional locations were also cleaned up in the lower portion of Segment C and upper portion of Segment D because these locations were determined to be accessible during the planning stages of the removal action. These additional locations are indicated with an asterisk (*). Exposure point concentrations used to calculate potential post-cleanup risks were those obtained after removal was completed. Post-cleanup concentrations for each radionuclide at the various locations are shown in Table 1. At locations where more than one sample was taken, the data for each radionuclide were averaged.

Table 1. Location Specific Risk Estimates for the Child Scenario

	Exposure Point Concentration (pCi/g)				Cumulative Risk	
Location ID	Ra-226	Ra-228	Th-230	U-238	Baseline*	Post-Cleanup
001	12	1.7	4.7	38	9×10^{-5}	1×10^{-5}
005	4.7	2.9	23	11	2×10^{-4}	7×10^{-6}
012	1.7	1.1	2.2	ND	4×10^{-5}	2×10^{-6}
025	15	1.3	21	74	3×10^{-4}	3×10^{-5}
027*	23	6.6	15	27	2×10^{-5}	2×10^{-5}
028	11	ND	3.2	3.7	3×10^{-5}	1×10^{-5}
055	4.3	0.99	5.6	8.8	2×10^{-5}	5×10^{-6}
058	5	1.2	2.9	5.0	5×10^{-5}	5×10^{-6}
059	4.9	ND	46	10	5×10^{-5}	6×10^{-6}
060	120	17	2,500	79	5×10^{-5}	2×10^{-4}
061	27	0.99	18	70	8×10^{-5}	3×10^{-5}
062	1.3	1.1	1.3	ND	1×10^{-5}	2×10^{-6}
063	11	ND	3.2	6.1	5×10^{-5}	1×10^{-5}
064	2.9	1.3	4.7	10	2×10^{-5}	4×10^{-6}
065	12	2.6	29	30	6×10^{-5}	2×10^{-5}
066*	10	1.5	70	16	5×10^{-5}	1×10^{-5}
067*	1.5	1.2	1.3	ND	3×10^{-5}	2×10^{-6}
068*	1.5	1.2	1.3	2.1	9×10^{-5}	2×10^{-6}
072	11	1.8	16	18	1×10^{-5}	1×10^{-5}
092	5.4	1.5	38	80	2×10^{-5}	9×10^{-5}

	Exposure Point Concentration (pCi/g)				Cumulative Risk	
Location ID	Ra-226	Ra-228	Th-230	U-238	Baseline[a]	Post-Cleanup
093	1.9	1.2	0.76	76	2×10^{-5}	5×10^{-6}
094	3.8	1.2	8.9	17	1×10^{-3}	5×10^{-5}
098	2.5	1.1	3.7	2.5	3×10^{-4}	3×10^{-6}
099	2.5	1.2	2.5	3.0	5×10^{-5}	3×10^{-6}
101	89	6.8	1,900	19	2×10^{-4}	1×10^{-4}
102.1	1.4	1.4	1.6	ND	9×10^{-5}	2×10^{-6}
102	2.8	1.3	6.4	9.9	2×10^{-5}	4×10^{-6}
103	1.3	0.77	1.5	ND	4×10^{-5}	2×10^{-6}
104	4.1	1.1	9.4	11	1×10^{-4}	6×10^{-6}
105	16	0.82	3.4	29	3×10^{-5}	1×10^{-5}
106	1.3	1.3	1.3	ND	6×10^{-6}	2×10^{-6}
107*	34	1.8	45	40	4×10^{-5}	3×10^{-5}
108.1*	7.1	0.98	3.3	9.6	3×10^{-5}	7×10^{-6}
108*	5.3	1.1	4.7	11	2×10^{-5}	5×10^{-6}
110*	4.3	1.1	2.9	24	3×10^{-5}	5×10^{-6}
110.1*	1.8	ND	2.1	5.6	1×10^{-5}	3×10^{-6}
111*	4.6	1.2	22	29	4×10^{-5}	9×10^{-6}
112*	11	ND	10	9.1	1×10^{-4}	1×10^{-5}
113*	36	0.96	11	11	6×10^{-5}	3×10^{-5}
114*	2.7	1.0	2.0	6.1	2×10^{-5}	3×10^{-6}
115*	4.6	0.93	7.3	7.3	5×10^{-5}	5×10^{-6}
116*	2.2	1.4	1.8	5.3	2×10^{-5}	3×10^{-6}
117*	9.4	1.6	12	10	9×10^{-5}	9×10^{-6}
118*	17	6.7	60	70	2×10^{-5}	2×10^{-6}
119	1.5	0.99	0.69	11	2×10^{-5}	2×10^{-5}
120	8.8	0.62	2.4	ND	1×10^{-4}	8×10^{-6}
121	15	1.1	7.8	11	2×10^{-5}	1×10^{-5}
122	1.7	1.4	1.1	2.7	3×10^{-5}	2×10^{-6}
123	5.0	1.1	7.1	3.8	5×10^{-5}	5×10^{-6}
124	6.7	1.6	12	9.4	1×10^{-4}	7×10^{-6}
132	65	ND	120	15	1×10^{-4}	6×10^{-5}
141	2.1	0.92	4.9	2.9	5×10^{-5}	2×10^{-6}
149	10	1.4	18	34	2×10^{-5}	1×10^{-5}
153	7.3	1.2	3.5	6.4	9×10^{-6}	7×10^{-6}
154	5.1	1.7	8.6	8.3	5×10^{-6}	5×10^{-6}

a Based on pre-removal data as presented in the EE/CA (DOE 1996).

Additional calculations were also performed to show risk reduction achieved for each segment. Exposure point concentrations for sediment were calculated for each exposure unit (i.e., segment) by using the one-tailed 95% upper confidence limit of the arithmetic average (UCL) or the maximum, whichever was lower (per EPA guidance). Post-cleanup data for each segment were aggregated with data from locations in each segment that were not targeted for cleanup. (Note that some locations that were not targeted for cleanup because they are not accessible have contaminant concentrations that exceed risk-based cleanup criteria). At locations where more than one sample was

collected, the data were averaged to obtain a representative concentrations for that location prior to aggregating the data for each segment. A summary of the data used in the risk calculations is presented in Table 2.

Table 2: Summary of Residual Contamination in the Southeast Drainage

Radionuclide	Radionuclide Concentration (pCi/g)							
	Segment A		Segment B		Segment C		Segment D	
	Range	UCL	Range	UCL	Range	UCL	Range	UCL
Radium-226	1.3-39	23	1.2-110	40	1.1-36	12	1.1-120	19
Radium-228	0.64-5.0	2.3	0.74-6.8	2.7	0.77-6.6	2.0	0.62-86	7.4
Thorium-230	0.20-38	18	0.27-1,900	370	1.3-45	12	0.69-2,500	180
Uranium-238	11-200	77	2.5-59	30	1.3-74	22	2.0-200	34

Results of the post-cleanup risk calculations for each segment are presented in Table 3. For comparison purposes, baseline risk calculations are also shown. Significant risk reduction (i.e., 40% or higher) was achieved for each segment with the highest amount of reduction observed in Segment C (i.e., 90%). The added risk reduction achieved in Segment C from removal of 14 additional locations not originally targeted in the EE/CA reduced the residual risk from 4×10^{-5} to 1×10^{-5}. Additional removal of three locations in Segment D did not result in further risk reduction in this segment.

Table 3: Estimated Risk Reduction from Exposure to Sediment

Segment	Hunter		Child	
	Baseline	Post-Cleanup	Baseline	Post-Cleanup
A	1×10^{-5}	5×10^{-6}	5×10^{-5}	2×10^{-5}
B	2×10^{-5}	1×10^{-5}	1×10^{-4}	5×10^{-5}
C	2×10^{-5}	3×10^{-6}	9×10^{-5}	1×10^{-5}
D	1×10^{-5}	5×10^{-6}	5×10^{-5}	3×10^{-5}