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MEMORANDUM

To: File
From: Edward Cumming ERC
Subject: Technical Basis Document for Background Sr-90 in Soil, Rev. 1

Date: June 22, 1998
File: RP 98-72

Reference

1. Memorandum RPG 98-011, Rev. 1, C.B. Martel to E.M. Heath, "Background Strontium-90 Concentration in Soil," dated June 18, 1998.

2. Memorandum RPG 98-011, C.B. Martel to E.M. Heath, "Background Strontium-90 Concentration in Soil," dated May 29, 1998.

3. Procedure AP-8800, Rev. 2, "Final Status Survey Organization, Training and Technical Basis Documents."

This memorandum, along with the attached DE&S memorandum (Reference 1), constitutes a Technical Basis Document (TBD) for background concentrations of Strontium-90 in soils surrounding the Yankee Nuclear Power Station. The attached DE&S memorandum is a revision to the original DE&S memorandum (Reference 2), and contains corrections to several typographical errors. Preparation and review have been done in accordance with the TBD requirements of Procedure AP-8800 (Reference 3).

cc: FSS TBD File
RP File
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MEMORANDUM

DE&S - BOLTON

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To	E. M. Heath	**Date**	June 18, 1998
		Group #	RPG 98-011 Rev. 1
From	C. B. Martel	**W.O.#**	00468.00.0004.16.00000
Subject	Background Strontium-90 Concentration in Soil	**I.M.S.#**	A13.01.08 RT 07.C02.018
		File #	SR90BAC1.WPD

Reference

1. YRC-1180, "Background Concentrations of Cesium-137 in Soil and Sediment to Support YNPS," 2/98

2. YRC-1179, "Yankee Rowe Site-Specific Derived Concentration Guideline Values for Residual Radioactivity in Soil," 3/98

3. YAEL Procedure 368, "Determination of Strontium-89, 90 in Environmental Media via Cerenkov Counting," Rev. 4, 7/7/97.

4. YNPS License Termination Plan, Appendix A, "Final Status Survey Plan for Site Release," Rev. 1, 5/97

5. NUREG-5849, "Manual for Conducting Radiological Surveys in Support of License Termination," USNRC, 3/92

Purpose and Background

The purpose of this memo is to present a background concentration value for Strontium-90 in soils related to decommissioning work at the Yankee Nuclear Power Station (YNPS). This value is specifically for use in support of the Final Status Survey at the YNPS. Like Cesium-137, Strontium-90 is a radionuclide that is present in background, and which was also produced and released to the environment by operations at YNPS. A background value for Cesium-137 is the subject of another report (Reference 1) entitled, "Background Concentrations in Soil and Sediment to Support the Yankee Nuclear Power Station Decommissioning Project."

The Strontium-90 value presented is calculated based on guidance in NUREG-5849 and is intended as input to help establish that radioactivity release limits are met for any residual radioactive materials remaining on-site after decommissioning. This regulatory guidance establishes a method to determine values for the background level of a given radionuclide by averaging results of sample analyses and establishing with 95% certainty, that the calculated background level for a radionuclide is correct.

The number of samples required to provide a valid average value is determined by a statistical procedure. For a given number of samples collected, a mean radionuclide concentration value is valid if the 95% upper level bound of variations in individual analyses results are less than 10% of the Guideline Value (GLV) used for Final Status Survey.

Methodology

Soil samples that were analyzed for Strontium-90 were selected from those previously collected and analyzed for Cesium-137, as described in Reference 1. The rationale for the location from which the soil samples were obtained, the method used to collect the soil, and its preparation for analysis, is presented in Reference 1. Strontium analyses were performed on 30 soil samples selected from four background reference locations. Selection was made to assure that samples were representative of each background area.

For Strontium analyses the process for soil sample preparation was different from that done for samples analyzed for Cesium-137. Aliquots of soil were taken from those samples which had been dried and homogenized by the Duke Engineering & Services Laboratory for the Cesium-137 analyses. The aliquots of soil were processed and analyzed according to Reference 3. The 95% upper level bound on the average concentration was calculated as described in Section 5.2.3 of Reference 4, using Equation 5-4.

Results and Conclusions

Results of the analyses are presented in the attached Table. The average Strontium-90 concentration for the 30 samples is 0.274 ± 0.310 pCi/gm. The GLV for Strontium-90 that will be applied to the Final Status Survey at YNPS is 5.7 pCi/gm (Reference 2). The 95% upper bound on the average concentration is 6.8% of the GLV, which is less than the 10% prescribed by NUREG-5849 (Reference 5) for significance. Therefore, no further soil samples are required to further refine this value since the variations in background are not significant and need not be determined.

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Attachment

c:
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Strontium-90 Concentration in Background Soils at YNPS

Sample No.	Sr-90 Concentration (pCi/gm)
TS-01A	0.235
TS-11A	-0.09
TS-12A	-0.018
TS-14A	0.31
TS-15A	-0.049
TS-16A	0.244
TS-20A	0.326
TS-01B	-0.18
TS-11B	0.069
TS-12B	-0.02
TS-15B	-0.146
TS-16B	0.188
TS-17B	0.684
TS-18B	0.23
TS-13B	-0.02
TS-20B	-0.002
TS-11C	0.624
TS-16C	0.072
TS-17C	-0.003
TS-14C	0.496
TS-18C	0.857
TS-12C	0.371
TS-13C	0.413
TS-20C	0.464
TS-1D	0.952
TS-11D	0.75
TS-13D	0.849
TS-14D	0.173
TS-15D	0.148
TS-16D	0.506
Ave	0.274
SD	0.310
95% level upper bound	0.390

.120

TS-13A = 1.2 pCi/g

Cs^{137} (pCi/g)

1.2 ← TS-02D = 1.1 pCi/g

1.4 ← TS-03D = 1.1 pCi/g

← TS-04 D = .94 pCi/g

1.2

→ Cs^{137} = 1.07 pCi/g

TS-21D = 1.1 pCi/g Sr-90

(Cs^{137} = 1.4 pCi/g)