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U.S. Department of Energy
Oak Ridge Field Office
P.O. Box 2001
Oak Ridge, Tennessee 37831-8723

Attention: David G. Adler, Site Manager
Former Sites Restoration Division

Subject: Hazard Assessment for Residual Contamination at the Former Associate Aircraft Site (AAS)

Dear Mr. Adler:

Based on sample results obtained at AAS, uranium-238 concentrations above the site specific criteria (35 pCi/g) were found in a small sub-slab area in Section 1 of the former AAS building. The sample results of the location indicated radioactive contamination at a maximum concentration of 134 pCi/g. This is well below the derived guidelines for this site and equates to a dose of 4.154 mrem/yr for current and likely future use of the site. The vertical and areal extent of contamination was established for the location by additional sampling.

The enclosed Hazard Assessment (HA) was prepared under my direction or supervision in accordance with a system designed to ensure that the information submitted was properly gathered and evaluated. To the best of my knowledge and belief, they are true, accurate, and complete.

Based on this HA and the additional cost that would be entailed (≈$260,000), no additional characterization or remediation is planned for this isolated area of contaminated soil in Section 1. Mike Murray (ORNL) has reviewed the HA and has given IVC concurrence.

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Please forward the enclosed submittal letter to A. Williams for concurrence.

It is requested that DOE-HQ provide approval of this Hazard Assessment by May 12, prior to completion of work at the Associate Aircraft site. If you have any questions, contact me at (615) 576-1710.

Sincerely,

Janice S. Allison
for

G. L. Palau
Project Manager - FUSRAP

BWJ:kt:HAZMEMO

Concurrence: B. Johnson @ BWJ
J. Wood JW
M. Kaye JM

ACTION REQ'D ☑ YES | | NO DUE DATE 5/06
RESPONSE TO CHRON NO. _____
☐ FFA ☐ Permit ☐ Milestone ☐ Ock ☐ CCN ☐ CAR ☐ Mid-Yr ☐ Yr-End ☐ Periodic Rpt

United States Government

memorandum

Department of Energy
Oak Ridge Operations Office

DATE: May 8, 1995

REPLY TO
ATTN OF: EW-93:Adler

SUBJECT: HAZARD ASSESSMENT FOR RESIDUAL CONTAMINATION AT THE FORMER ASSOCIATE AIRCRAFT SITE (AAS)

TO: Dr. W. A. Williams, Trevion II Building, Department of Energy, Washington, D.C. 20585-0002, EM-421

Uranium-238 concentrations above the site specific criteria (35 pCi/g) were found in the soil in a small sub-slab area of the former AAS building. The sample results of the location indicated a maximum concentration of 134 pCi/g. This is well below the derived guidelines for the site and equates to a dose of 4.154 mrem/yr for current and likely future use of the site.

Based on this HA and the additional cost that would be entailed (≈$260,000), no additional characterization or remediation is planned for this isolated area of contaminated soil in Section 1. Mike Murray Oak Ridge National Laboratory has reviewed the HA and has given IVC concurrence.

Please review the enclosed Hazard Assessment and provide your approval by May 12, 1995. The remediation of the site is in the final stages is currently scheduled for May 15, 1995.

David G. Adler, Site Manager
Former Sites Restoration Division

Enclosure

ASSOCIATE AIRCRAFT SITE HAZARD ASSESSMENT FOR IDENTIFIED SOIL CONTAMINATION

1.0 PURPOSE

To determine the hazard associated with the localized sub-slab contamination found at the Associate Aircraft Site (AAS) in Fairfield, Ohio under a portion of the former AAS building (see figure 1). This assessment leads to the conclusion that the potential dose from the residual soil contamination is well below the current or likely use guideline, as proposed in 10 CFR 834.

2.0 INITIAL DERIVATION OF CLEANUP GUIDELINES

The Environmental Assessment Division of Argonne National Laboratory published *Derivation of Guidelines for Uranium Residual Radioactive Material in Soil at the Former Associate Aircraft Tool and Manufacturing Company Site, Fairfield, Ohio* in January 1995 (Reference 1). This work was sponsored and approved by the U.S. DOE, Office of Environmental Restoration.

The Associate Aircraft site has been identified for remedial action under the U.S. DOE's Formerly Utilized Sites Remedial Action Program (FUSRAP). Uranium guidelines were derived on the basis of the requirement that following remedial action, the 50-year committed effective dose equivalent to a hypothetical individual living or working in the immediate vicinity of the site should not exceed (1) 30 mrem/yr for the current-use and likely future-use scenarios or (2) 100 mrem/yr for less likely future-use scenarios (Yu et al. 1993).

The DOE residual radioactive material guideline computer code, RESRAD (version 5.41), which implements the methodology described in the DOE manual for establishing residual radioactive material guidelines, was used in the evaluation.

Three scenarios were considered in which it was assumed that the site would be used without radiological restrictions for a period of 1,000 years following remedial action. The three scenarios varied with regard to the type of site use, time spent at the site by the exposed individual, and sources of food consumed. The evaluation indicated that the EPA dose limit of 30 mrem/yr would not be exceeded for uranium (including U-234, U-235, and U-238) within 1,000 years provided that the soil concentration of total uranium at the site did not exceed 970 pCi/g for scenario 1 (industrial worker: current use scenario) or 280 pCi/g for scenario 2 (resident: municipal water supply, a likely future-use scenario). The DOE dose limit of 100 mrem/yr (DOE Order 5400.5) would not be exceeded at the site if the uranium concentration of the soil did not exceed 790 pCi/g for scenario 3 (subsistence farmer: on-site well water, a plausible but unlikely future-use scenario).

The uranium guidelines derived in the analysis applied to the total activity concentration of uranium isotopes (i.e., U-238, U-234, and U-235 present in their natural activity concentration of 1:1:0.046). In setting the actual uranium guidelines to be used at the Associate Aircraft site, DOE applied the as-low-as-reasonably-achievable (ALARA) policy to the decision-making process. After these considerations the actual uranium guideline used for residual radioactivity in soil was 35 pCi/g (1/8th of the most conservative derived guideline).

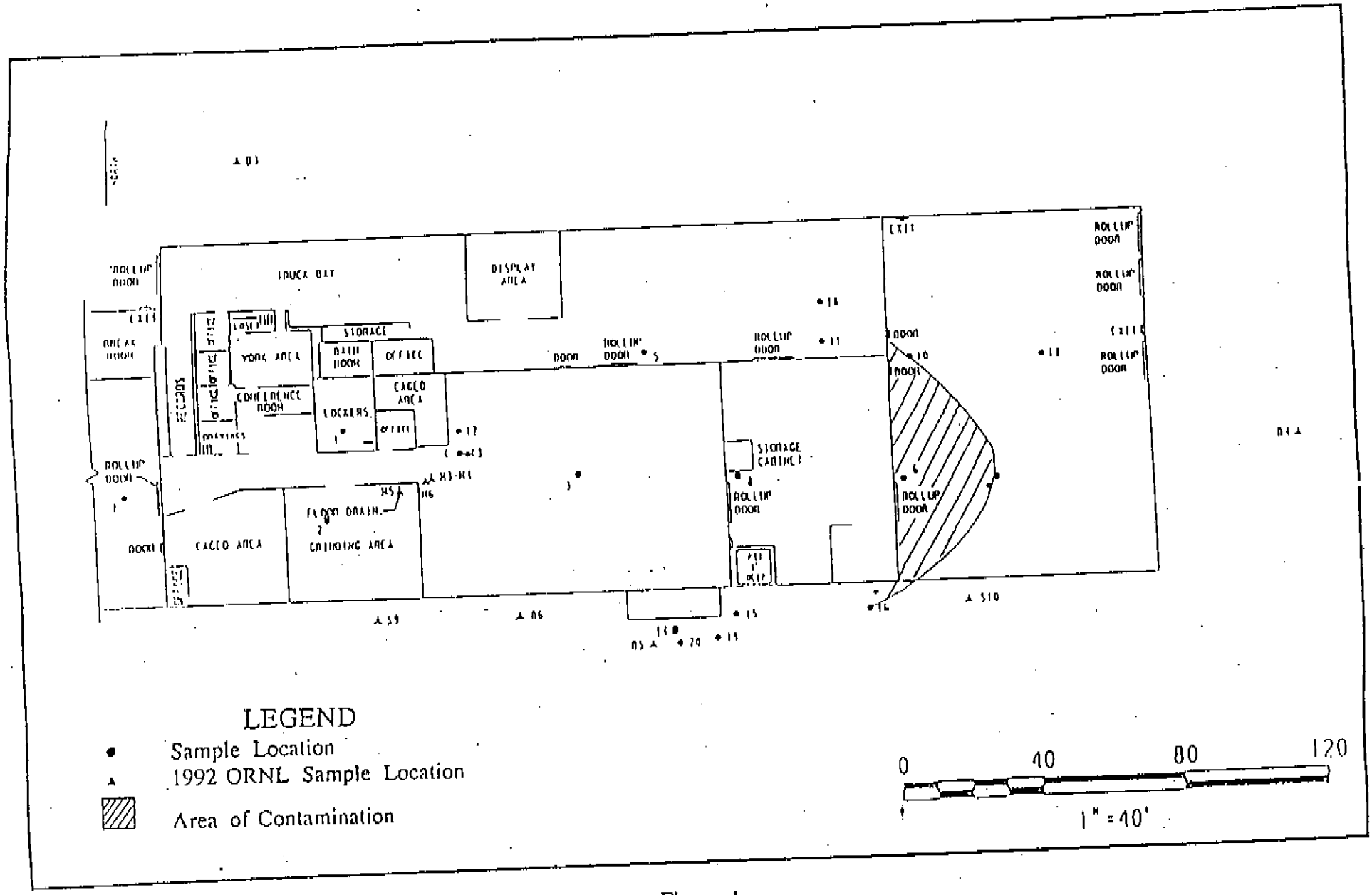

Figure 1
Former Associate Aircraft Site

3.0 HAZARD DETERMINATION FOR RESIDUAL SOIL CONTAMINATION AT AAS

In December 1994 and February 1995, 111 samples were collected from 15 locations inside the former AAS building, and 34 samples were collected from 13 locations outside the building. These locations were selected to further delineate boundaries (both vertical and horizontal) of contamination identified in the ORNL report. Figure 1 shows interior and exterior sampling locations.

Based on the results obtained, uranium-238 concentrations above the site specific criteria (35pCi/g) were found at locations 1, 4 and 6. Uranium-238 concentrations from the sampling locations in these areas are presented in Table 2. The radioactive contamination detected at locations 4 and 6 were delineated in a second phase of sampling by placement of sample locations 10, 9 and 16 for location 6, and additional sample locations 12 and 13 for location 4. Vertical and areal extent of contamination has thereby been established for these locations. The areas around location 1 and 4 were adjacent to a radioactively contaminated expansion joint and have since been remediated. Therefore this hazard assessment applies to the area in the proximity location 6.

The sample results of location 6 indicate radioactive contamination at a maximum concentration of 134 pCi/g. Table 1 summarizes the results of the sampling at location 6, 9, 10, and 16.

Table 1 - Sampling Results

Borehole	Depth (ft)	Field Counts (cpm)*	U-238 (pCi/g)**
6	0 - 1	40	< 2.3
	1 - 2	40	< 2.4
	3 - 4	1400	134
	4 - 5	60	5.8
	5 - 6	50	< 5.0
	6 - 7	50	< 1.9
	7 - 8	50	< 2.5
9	0 - 1	45	< 1.7
	1 - 2	45	< 1.3
	2 - 3	50	< 1.5
	3 - 4	50	< 1.3
	4 - 5	50	< 2.6
	5 - 6	45	< 3.8
	6 - 7	45	< 2.9
	7 - 8	45	< 1.9
	8 - 9	45	< 2.7
	9 - 10	50	< 4.4
	10 - 11	50	< 1.7
	11 - 12	45	< 2.2
10	0 - 1	42	.44
	1 - 2	42	< 1.4
	3 - 4	44	< 2.0
	4 - 5	55	.63
	5 - 6	52	1.8
	6 - 7	52	.40
	7 - 8	70	.47
	8 - 9	70	< 1.5
	9 - 11	54	< 1.4
16	0 - 1	58	.84
	1 - 2	41	.60
	2 - 3	55	< 1.3
	3 - 4	50	< 1.2

* Measured with HP 210 or HP 260 field radiation detection instrument

** Measured with Gamma Spectroscopy radiation detection instrument

3.1 CALCULATIONS

Using the derived maximum dose/source ratios (see Attachment A), calculations were performed for all three scenarios. Based on the calculations, utilizing RESRAD, it has been determined that this material represents a minimal hazard. The results of the calculations are shown in Table 2 below.

Table 2
Maximum Annual Dose From Residual Radioactive Contamination at the Former Associate Aircraft Site

Scenario #	Dose/Source Ratio x Soil Activity Conc= (mrem/yr)/(pCi/g)		(pCi/g)		Dose (mrem/yr)
1[a]	3.1×10^{-2}	x	134	=	4.154
2[b]	1.1×10^{-1}	x	134	=	14.74
3[c]	1.3×10^{-1}	x	134	=	17.42

a-Industrial worker: no consumption of water or foods obtained on the site.
b-Resident: water used for drinking, household purposes, and irrigation was assumed to be from uncontaminated municipal sources.
c-Subsistence farmer-water used for drinking, household purposes, livestock watering, and irrigation was assumed to be from an on-site well.

3.2 SUMMARY OF RESULTS

Scenario 1 - The results of the RESRAD calculations determined that in scenario 1 an industrial worker would receive an annual exposure of 4.154 mrem/yr due to the residual contamination on the site.

Scenario 2 - The results of the RESRAD calculations determined that in scenario 2 a resident would receive an annual exposure of 14.74 mrem/yr due to the residual contamination on the site.

Scenario 3 - The results of the RESRAD calculations determined that in scenario 3 a subsistence farmer would receive an annual exposure of 17.42 mrem/yr due to the residual contamination on the site.

All of the calculated values are below the 30 mrem/yr for current or likely land use, as proposed in 10 CFR 834. Furthermore, the calculations only allowed for a shielding factor of 30% for the attenuation of external gamma radiation in scenario 1, in reality the shielding provided would provide much greater than 30% shielding. In scenarios 2 and 3, it is likely that large amounts of the contaminated soil would be removed in preparing the site for residential or farming use. The initial dose/source ratios were determined on a large homogeneously contaminated area. For a small, isolated area of contamination, such as the area in question (see figure 1), the annual dose would be even less due to the smaller amount of contact possible (Yu et al. 1993). Therefore, the calculated annual doses are very conservative.

4.0 CONCLUSION

The calculations performed for this assessment lead to the conclusion that the potential dose from residual radioactive contamination for in all three scenarios is well below the 30 mrem/yr current or likely land use guideline, as proposed in 10 CFR 834. All scenarios use conservative assumptions and address all credible pathways. Furthermore, scenario 1 is most likely at this site, consideration of scenarios 2 and 3 provide additional evidence of the minimal hazard.

Results of these calculations show that supplemental limits are warranted for the area of location 6. Leaving the residual contamination in place does not pose a potential present or future exposure risk, and the cost (≈$260,000) and time involved in remediation and restoration of this area is high relative to the long-term benefits that would result.

5.0 REFERENCES

1. Yu, C., et al., 1995, *Derivation of Guidelines for Uranium Residual Radioactive Material in Soil at the Former Associate Aircraft Tool and Manufacturing Company Site, Fairfield, Ohio,* ANL/EAD/LD-2, Argonne National Laboratory, Argonne, Ill., Jan.

2. Yu, C., et al., 1993, *Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD; Version 5.0,* ANL/EAD/LD-2, Argonne National Laboratory, Argonne, Ill., Sept.

3. Spieker, A.M., 1965, *Hydrogeologic Aspects of an Analog Model Study of the Fairfield-New Baltimore Area, Ohio,* Doctoral Thesis, Stanford University, Stanford, Calif.

4. Orlandini, K.A., 1994, personal communication from Orlandini (Environmental Research Division) to C. Yu (Environmental Assessment Division), Argonne National Laboratory, Argonne, Ill., Dec. 19.