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MEMORANDUM FOR RECORD

SUBJECT: Enewetak Atoll Air Sampling

1. Enclosure 1 contains the USAF/MCL report of radiochemical analyses of air (particulate) samples obtained from Enjebi and Lojwa during the aggregate hauling operation in April and May 1977. A detailed analysis of the data reported cannot be made until other factors are known; e.g. exact location of samplers with respect to resuspension sources, wind and rain situation which prevailed, protective actions used such as wetting-down, types of equipment and procedures employed which created the suspension, paths vehicles followed, location of personnel and time spent in the area. Information of this nature was obtained by Capt Day/FCLP, and will be considered in the final report on aggragate hauling which is to be prepared. Some initial observations can be made, however, as follows:

2. Plutonium was definitely resuspended at Enjebi and Lojwa during the aggregate operation. The results are summarized below (in fCi/m^3) to illustrate this point.

Location and Sample Dates	Downwind	Upwind
Enjebi (22-30 Apr)	2.9	0.05
	1.6	<.08
	2.3	.09
	1.9	.03
	1.7	.02
Lojwa (22-30 Apr)	0.67	<0.06
	1.7	.11
	.77	.05
	.68	.11
	.71	<.06
Aggregate Pile (20-21 Apr)	22	0.41
	2	<.7
Enjebi Beach (20 Apr - 8 May)	9.6	16
	11	<0.4
	1.2	<.11
	.44	
	.62	
	.31	
Lojwa (5-7 May 77)	0.96	<.04
	1.2	<.1

For comparison, during the last year and a half, air samples obtained from Johnston Atoll and analyzed by USAF/MCL with techniques the same as used for the Enewetak samples, gave a positive result on only one occasion. The positive sample measured 0.057 fCi/m^3 while all other samples were typically less than about .008 fCi/m^3. The upwind Enewetak samples indicate some Pu is present in the air, but the concentrations are not much greater than fallout Pu background in ground-level air at some locations in the CONUS. It will be interesting to learn whether the higher down-wind levels correlate with vehicular operations or are the result of "natural" wind resuspension.

3. The concentration of resuspended Pu at sampling locations is below permissible limits. According to 10 CFR 20, individuals in a restricted area may not be exposed to airborne Pu at an average concentration greater than 2000 fCi/m^3 while the limits set for unrestricted areas are 60 fCi/m^3. If, however, the Pu is resuspended by vehicles, then higher levels may exist near the vehicles than near the air sample locations. As stated in NUREG-0041, Manual of Respiratory Protection, "Potential errors of 2- to 30-fold have been measured between personal and fixed air samplers; the fixed samplers tend to read lower." Additionally, a study performed at the Savannah River Plant of resuspension caused by a tractor operating in an agricultural experiment, found Pu concentrations were a factor of 5 lower at 30m downwind of the tractor, but a factor of 4 higher at 8m downwind of the tractor.

4. Downwind locations on both Enjebi and Lojwa indicate Pu concentrations in air much greater than found by the AEC Survey in 1972 for Enjebi (0.006 fCi/m^3 and less) and comparable to what was found on Yvonne near the Fig/Quince ground zero (1.8 and 2.6 fCi/m^3). The differences could be caused by sampler location, mechanical activities associated with the aggregate operation, or because of differing weather conditions which prevailed during the two measurement periods.

5. The air sample data can be used to determine resuspension factors. Assuming the average Pu concentration for Enjebi is 15.4 pCi/g (based on AEC Survey data) for the top 15 cm of soil, with a proportionate amount in the top 1 cm, and a soil density of 1.5 g/cm^3, then the "surface" concentration is 0.23 uCi/m^2. (One cm depth is recommended by EPA in their draft guidelines for use as a resuspension depth.) For an assumed average concentration of 2.2 pCi/g for Lojwa, the surface concentration is 0.033 uCi/m^2. With these surface concentrations and the down-wind Pu concentrations, resuspension factors are as follows:

Enjebi	22 Apr	$1.3 \times 10^{-8} m^{-1}$
	26 Apr	$0.7 \times 10^{-8} m^{-1}$
	28 Apr	$1.0 \times 10^{-8} m^{-1}$
	29 Apr	$0.8 \times 10^{-8} m^{-1}$
	30 Apr	$0.7 \times 10^{-8} m^{-1}$
	20 Apr	$9.6 \times 10^{-8} m^{-1}$
	21 Apr	$<0.8 \times 10^{-8} m^{-1}$
Enjebi Beach	21 Apr	$4.3 \times 10^{-8} m^{-1}$
		[illegible]
		[illegible]
	8 May	$.1 \times 10^{-8} m^{-1}$

Lojwa	22 Apr	$2.0 \times 10^{-8} m^{-1}$
	26 Apr	$5.2 \times 10^{-8} m^{-1}$
	28 Apr	$2.3 \times 10^{-8} m^{-1}$
	29 Apr	$2.1 \times 10^{-8} m^{-1}$
	30 Apr	$2.2 \times 10^{-8} m^{-1}$
	5 May	$3.6 \times 10^{-8} m^{-1}$
	6 May	$7.3 \times 10^{-8} m^{-1}$
	7 May	$2.9 \times 10^{-8} m^{-1}$

These resuspension factors are reasonable, but higher than generally assumed for aged Pu deposits; namely, on the order of $10^{-9} m^{-1}$.

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