| ROUTING AND TRANSMITTAL SLIP | | ACTION |
|---|---|---|
| 1 TO<br>Dr. Richard O. Gilbert<br>Battelle Pacific Northwest Laboratory<br>Box 999 | INITIALS<br>DATE | CIRCULATE<br>COORDINATION |
| 2 Math Building, Room 1201<br>Richland, Washington 99352 | INITIALS<br>DATE | FILE<br>INFORMATION |
| 3 | INITIALS<br>DATE | NOTE AND RETURN<br>PER CONVERSATION |
| 4 | INITIALS<br>DATE | SEE ME<br>SIGNATURE |

REMARKS

409803

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| FCDNA/FCLS | 23 Nov 76 |
| | PHONE 264-6487 |

OPTIONAL FORM 41
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REPOSITORY P.N.L.

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Reviewed by [signature] Date 4/29/92

FCLS-H 23 November 1976

MEMORANDUM FOR RECORD

SUBJECT: Determination of Pu in Enewetak Soil by Alpha Particle Counting

REFERRENCE: Memorandum for Record, 27 Oct 76, Same Subject

1. Ref 1 reported interim results of a study to compare alpha particle count rates of Enewetak soil samples with their total specific alpha particle activity as determined by radiochemistry and reported in NVO-140. A reasonably good correlation was determined for 11 of 13 samples investigated. Since alpha particle count rates for the two "outliers" was reproducible, and their Pu content appeared too large, both samples were reanalyzed for Pu at USAF/MCL by radiochemistry. Results are as follows:

| SAMPLE NUMBER | NVO-140 Pu CONC (pCi/g) | REVISED Pu CONC (pCi/g) | NVO-140 Am CONC (pCi/g) | TOTAL SPECIFIC α ACTIVITY |
|---|---|---|---|---|
| 5116 | 399 | 278 | 19.00 | 297.0 |
| 5196 | 532 | 65 | 9.65 | 74.7 |

2. Enclosure 1 tabulates the net alpha particle count rates and total specific activities for all 13 samples. The average count rate per unit specific activity was determined both as the ratio of the means, $\beta_1$, and the mean of the ratios, $\beta_2$:

$$\beta_1 \pm SE = 0.0196 \pm 0.0019 \quad \text{Relative SE} = 9.8\%$$

$$\beta_2 \pm SE = 0.0302 \pm 0.0075 \quad \text{Relative SE} = 24.8\%$$

A linear regression yielded the relationship:

$$Y(c/min) = 0.433 + 0.0169\ X(pCi/g)$$

with a coefficient of determination, $r^2 = 0.9525$. This curve is plotted in enclosure 2 as a broken line. All data points are shown in enclosure 2 within circles, and the solid line is a plot of $Y = \beta_1 X$.

3. Alpha particle counting (without chemistry) continues to look suitable as a rapid method for estimating the concentration of transuranics in Enewetak soil at concentration levels of interest to Cleanup. A possible explanation for the high Pu concentrations reported in NVO-140 for samples 5116 and 5196 is that (≈10g) aliquots contained "hot particles" and the

aliquots were not representative of the entire (≈1000g) ball-milled sample. This explanation suggests that alpha particle counting (without chemistry) might also be used as a simple independent check of radiochemical analyses whenever small aliquots of large environmental samples are analyzed for transuranics.

E. T. Bramlitt

2 Encl
as

E. T. BRAMLITT
Health Physicist

Alpha Particle Counting of Enewetak Soil Samples

| SAMPLE NUMBER | Y NET α COUNT RATE (C/MIN) | X TOTAL α SPECIFIC ACTIVITY (pCi/g) | Y/X cpm/(pCi/g) |
|---|---|---|---|
| 3892 | 1.0 | 46.3 | .022 |
| 3746 | 0.8 | 27.9 | .029 |
| 3777 | 1.0 | 44.7 | .022 |
| 3894 | 0.0 | 12.2 | .000 |
| 3896 | 2.2 | 91.2 | .024 |
| 3754 | 1.0 | 18.8 | .053 |
| 5200 | 0.3 | 2.59 | .116 |
| 5115 | 5.8 | 313.0 | .019 |
| 5114 | 7.0 | 338.0 | .021 |
| 5113 | 7.5 | 384.0 | .020 |
| 5116 | 4.2 | 297.0 | .014 |
| 5119 | 7.7 | 462.0 | .017 |
| 5196 | 2.8 | 74.7 | .037 |

FIG. 1. Net alpha particle count rate versus total alpha particle specific activity.