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To W. J. Bair

From R. O. Gilbert R. O. Gilbert

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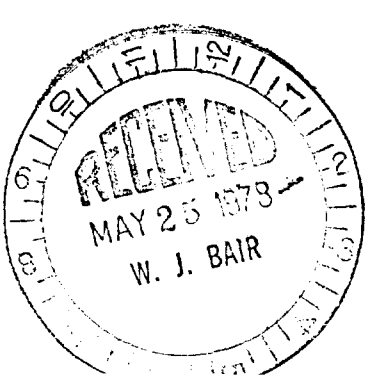
Subject June 7-8, 1978, meeting of Enewetak Advisory Group at LLL

Concerning your memo to the Enewetak Advisory Group dated May 15, 1978, I feel the top priority items are your item numbers 2, 4, 5, 6 and 8, i.e., items relating to work in progress. I would rank your remaining items in the order 11, 1, 7, 3, 9 and 10. Actually the latter items dealing with organizational, charter, and longer range items are very important and I think we should definitely allow time for them by being sufficiently brief in our discussion of items 2, 4, 5, 6 and 8.

If time permits and you feel it advisable, I can briefly summarize the essence of the information I have received from Madaline Barnes and Jodi Giacomini (DRI) concerning soil-IMP ratios, profile data, and statistical procedures; and from Mike Ortiz (Eberline) on the quality assurance data from the Enewetak analytical laboratory. I also expect to receive additional data from Madaline Barnes prior to June 7 that may be of interest to the group. I can also explain why we felt it necessary to send the May 3, 1978, amendment to the April 28 report to Hal Hollister.

Persons you might consider inviting to the meeting are John Tipton (EG&G, FTS 598-0584) for IMP-soil calibration discussion, Mike Ortiz (FTS 474-5511, 345-3461) concerning quality assurance, and Jodi Giacomini (FTS 598-3277) for statistics.



SUMMARY OF APRIL 26, 1978 MEETING AT DOE, LAS VEGAS CONCERNING SOIL-IMP CALIBRATION

Richard O. Gilbert

May 24, 1978

This is a summary of my impressions of the April 26, 1978, meeting that was called to consider two questions:

1. Is the IMP giving sufficiently accurate (unbiased) ^{241}Am readings of surface soil relative to wet chemistry ^{241}Am concentrations?
2. If a problem exists, what is causing the problem?

Approximately a dozen people were present. Paul Dunaway (DOE) acted as chairman. Others in attendance (besides myself) were John Stewart and Frank Markwell (DOE), Madaline Barnes and Jo Jane (Jodi) Giacomini (DRI), John Tipton (EG&G), Al Doles (Eberline) and several others.

The question being discussed was whether IMP ^{241}Am values are underestimating the actual ^{241}Am concentrations in "surface" soil as determined by wet chemistry analysis. At the time of the meeting the evidence that this could be the case, at least for some islands, apparently came from two sources: (1) five new IMP readings taken in a newly scraped area (to a depth of 6") near the GZ of Aomon (Sally). The soil after scraping was described as being "loose" and "well mixed." The five IMP readings were described by Frank Markwell as being low as compared to soil sample Am readings by a factor of 1.5. (2) Scatter plots of $\log_{10}$ soil ^{241}Am versus $\log_{10}$ IMP ^{241}Am for the islands of Olive, Lucy, Alice, Belle, Clara, Vera and Irene indicate that most points lie above the line

$$\log_{10} \text{soil } ^{241}AM = \log_{10} \text{IMP } ^{241}Am,$$

suggesting the IMP is reading low.

If IMP readings are in fact biased low this could mean, of course, that estimates of average total transuranic concentrations in surface soil are also biased low since these averages are based primarily on IMP readings. Hence,

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Am values. It was noted that Janet has been cleared of brush so that brush attenuation of IMP Am readings did not occur. No corrections have been made for brush attenuation to any islands. Such corrections would tend to increase IMP readings. Whether this correction alone would remove the bias in the IMP readings is unknown.

(3) New IMP readings have been taken on Lucy and Alice because the original readings were taken when the IMP was suffering from low and high voltage problems. New IMP readings on Belle are also desirable due to low voltage problems on original IMP survey.

(4) It is my understanding from discussions with Madaline Barnes (statistician, DRI) that Frank Markwell probably computed his factor of 1.5 by taking the average of the five ratios (soil Am/IMP Am). This method of computing an average ratio will usually give a higher result than if one divides the average soil Am concentration by the average IMP Am concentration. Differences between the two methods can be large if the statistical distribution of the individual ratios is highly skewed, e.g., one or two ratios being much higher than the others. In this skewed case, the average of the individual ratios will be influenced greatly by these high values, and to the extent that the high individual ratios are not typical of most of the data, the average ratio so computed will not be representative of the bulk of the ratios.

(5) Other factors that might account for low or variable IMP readings are attenuation due to soil moisture or soil density. Soil moisture conditions at time of IMP readings were, apparently, not recorded. Both wet and dry weights of soil samples are taken, but moisture conditions on the islands change from day to day, and soil samples are not taken in conjunction with most IMP readings. John Tipton expressed the opinion that IMP errors due to soil moisture and density would be on the order of 10 to 15%.

(6) The IMP is calibrated in the field three times a day using a known Am source (100 mCi$\pm$3%) suspended under the IMP detector and moved through a 180° arc. The detector has a lead and cadmium shield at an angle of 50° from the verticle. The IMP calibration assumes a soil density of 1.5 g/cm^3.

(7) The IMP has never been calibrated against a known ^{241}Am concentration in the soil. Everyone present seemed to agree that this should be done. There are, apparently, no pads available with ^{241}Am NBS standard sources for field calibration. Experiments involving extensive soil sampling would be necessary.

(8) Depth control on surface soil samples appears to be rather "sloppy" (my term). A cookie cutter designed to control depth has not been used since sometime in the period October-December. Present procedure is to scoop from soil surface. Only the top "3 cm" surface soil samples are used for cleanup calculations. Samples at 10 and 20 cm depths have been taken at each surface sample location, but only to indicate whether profiles to greater depths are required. (On May 3, 1978, M. Barnes informed me these 10 and 20 cm samples are no longer being taken, on orders from Bruce Church. He also initiated the collection at those depths.) The 10 and 20 cm samples are analyzed by wet chemistry, but utility of data is decreased by the fact that soil from upper layers has sometimes fallen to lower cut levels during sampling operation. Apparently, these 10 and 20 cm cuts are the only profile data that may in some sense be labeled as representative. The profile data supplied to the Advisory Group for the April 26 and 27, 1978, meeting in Denver, CO, were taken in areas

where it was suspected that contamination may be buried. Hence, those data are probably not representative of undisturbed areas. Ms. Barnes has agreed to pull the 10 and 20 cm data together and transmit to me, hopefully in time for our June 5-6 meeting in Livermore. These data, although tainted by the possibility of cross contamination from the soil surface, may be useful for LLL's dose assessment model.

(9) The length of rope used to measure distance from the center of the IMP reading circle to soil sample locations was found to be 1 meter too short. The exact date when this change was made is unknown, but it was expressed at the meeting that the rope should have been at the correct length for the following islands: Janet, Lujor, Irene, Vera, Olive and Aoman. The other islands are open to question. The extent of any bias in the soil-IMP regressions is unknown. Since the rope error would place soil samples closer to the center of the circle than intended, the IMP values may be low relative to soil ^{241}Am. A related problem is that the arrangement and location of soil samples within the IMP sight radius was designed by M. Barnes using incorrect IMP calibration information. Ms. Barnes indicated to me that two of the inner ring soil samples should have been taken in the outer ring to correspond more closely with what the IMP "sees." The net effect on the IMP and soil Am comparisons due to this misplacement of soil samples and the incorrect rope length is apparently unknown.

(10) Different detectors have been used on IMP's at different times. Two detectors had low efficiencies. These are being corrected, but it is not known (by John Tipton) whether these detectors were actually used and if so, whether the IMP data were corrected.

Following lunch, John Tipton, Al Doles and Madaline Barnes were asked to summarize or express any areas of particular concern. John Tipton expressed confidence in the IMP system and felt that, on the whole, it was performing quite well. Al Doles (Eberline) expressed the need to do IMP field calibration studies, and more quality control soil samples (blind spikes) prepared by an

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data are inadequate for that purpose.