

D109

RESPONSE TO QUESTIONS REGARDING THE DOE 1982 RADIATION REPORT

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February 7, 1990 (Revised)

L-18

see L-18a
L-18b

The following is in response to your request of January 12, 1990 to answer questions regarding the Department of Energy (DOE) publication, DOE-1982, "Melelen Radiation Ilo Ailin ko Ituion Ilo Majol, ko Rar Etali Ilo 1978" (The Meaning of Radiation for Those Atolls in the Northern Part of the Marshall Islands That Were Surveyed in 1978).

Before addressing the questions, it might be helpful to explain the relationship of the DOE-1982 publication to the radiological survey of the northern Marshall Islands, which preceded the publication.

The radiological survey was undertaken by Lawrence Livermore National Laboratory under contract to DOE; the results were published as report UCRL-52853, Pt. 4, "The Northern Marshall Islands Radiological Survey: Terrestrial Food Chain and Total Doses," by W.L. Robison et al. and dated September 30, 1982. This report is the official documentation of the results of the radiological survey.

I was asked to work with Mr. John Healy, Los Alamos National Laboratory and Dr. Bruce Wachholz, DOE, to help communicate the technical information documented in this report to the Marshallese government and people so that they might have a better understanding of the radiological conditions in the northern Marshall Islands. The method of communication was to be a booklet, written in Marshallese with an English translation, much like those we had prepared for the people of Enewetak, "Ailin in Enewetak Rainin," and of Bikini "Melelen Radiation Ilo Ailin in Bikini."

It may help readers of the English text to understand that, in these booklets, the Marshallese text is the authentic text. This is noted on page 1 of "The Meaning of Radiation for the Atolls in the Northern Marshall Islands that were Surveyed in 1978": "The Marshallese text is a dynamic-equivalent translation of an original English draft, and the English text is a modified literal translation of the Marshallese text." Since the English text, like all translations, cannot reflect exactly what is said in the original text, the English may, in some places, give a generic rather than precise translation of the Marshallese. This is especially true since Marshallese, in comparison with English, has considerable linguistic and grammatical limitations that inhibit precise, unambiguous communication of scientific and medical concepts.

Question :

- a. It is my understanding that the 1978 survey of nuclear radiation in the northern Marshall Islands was undertaken to characterize the radiological environment of the islands.
- b. Because I was not a participant in the 1978 survey, I was not given information about the general directions advanced by DOE to the survey

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- team.
- c. Since I was not a participant, I was not given information about specific tasks that were to be undertaken. It is my understanding that the results of the survey were to be documented in reports prepared by those performing the survey and published by the contractor organization, Lawrence Livermore National Laboratory.
 - d. I have no personal knowledge of and have no copies of the scope, general directives, work documents, work plans or other documents which discuss the purpose of the survey.
 - e. I do not have information about the total budget for the survey.
 - f. The following are costs incurred by Pacific Northwest Laboratory in the preparation and publication of the DOE-1982 booklet, "The Meaning of Radiation for Those Atolls in the Northern Part of the Marshall Islands That Were Surveyed in 1978":

Question 2

- a. I do not have precise information about when the survey was initiated.
- b. I assume that the survey was completed with the publication of Lawrence Livermore National Laboratory's report, UCRL-52853 Pt 4, September 30, 1982.
- c. I do not know what the Rongelap people were told about the survey prior to their receipt of the DOE-1982 booklet.
- d. Marshallese government officials, including representatives of the Rongelap people, attended a presentation of the information in the Marshallese language in the DOE-1982 booklet in Majuro in December 1982. Also, in the spring of 1983 a DOE team visited Rongelap. I was not a member of that team.
- e. I do not have knowledge about studies, reports, briefings, or other communications given the Rongelap people during the time the study team was engaged in its work.

Question 3

- a. Changes made between the first two books and the DOE-1982 booklet included:
 - (1) Improved description of radioactivity and radiation from atomic bombs and from natural sources.
 - (2) Improved description of transport of radioactive materials from soils to the food chain and to man.
 - (3) A more detailed approach to describing how radiation causes changes in cells which lead to biological effects.
 - (4) Information was omitted that pertained specifically to Enewetak and Bikini, although reference to the first two booklets was included.
 - (5) Information was added describing how the survey was performed by scientists from the Lawrence Livermore National Laboratory.
 - (6) Radiological information was added for all the northern Marshall Islands.
- b. Based on experience with the first two books (including questions and issues raised by discussions with the people from Enewetak and Bikini, their attorneys, and representatives), changes were made to improve communication of information about radiation. Also, information specific to Enewetak and Bikini was omitted, and information specific to all the northern Marshall Islands was added.

- c. In the Enewetak and Bikini books, specific information was given for plutonium and americium because the tests of nuclear weapons on these atolls distributed sufficient quantities of these radionuclides to cause concern that they could contribute significantly to radiation doses that people might receive. According to the survey results published in the Lawrence Livermore National Laboratory Report, UCRL-52853 Pt 4, September 30, 1982, the people living on Rongelap Island might receive an integrated bone marrow dose of 3.3 rem, of which 0.00051 rem was from ingestion and 0.0078 rem was from inhalation. The contribution of americium to the 3.3 rem was 0.0012 rem and 0.0033 rem from ingestion and inhalation, respectively. These radionuclides contribute, therefore, about 0.4% of the total bone marrow dose.
- d. The profiles for plutonium and americium were not included because of their relatively small contributions to total dose in comparison with their contributions on Enewetak and Bikini.

Question 4

- a. I believe the radiation doses in the DOE-1982 booklet included contribution from all the atomic bomb tests, because the Lawrence Livermore National Laboratory survey team measured the total radionuclide contents of soils and foods.
- b. The DOE-1982 booklet did not consider radiation and related effects only from the March 1, 1954 "Bravo" test.
- c. To the best of my knowledge, the DOE-1982 booklet considered all of the bomb tests, including "Bravo."
- d. The baseline used for defining radiation effects was the dose information reported in Lawrence Livermore National Laboratory Report, UCRL-52853 Pt 4, September 30, 1982.

Question 5

- a. The statement in Chapter 1, page 5 refers to the March 1, 1954 "Bravo" test.
- b. The basis for declaring "after" the test was detonated; "the winds changed" was information from DOE officials.
- c. We based this on information provided by DOE officials.
- d. I do not have information about the Atomic Energy Commission's wind reading instruments during the test.
- e. I do not have information about data from wind monitoring during the test.
- f. I do not know if any Government reports provide a basis for concluding that DOE (AEC) was aware, or should have been aware, of wind shifts prior to the detonation of Bravo.
- g. I do not know what the test managers knew or when they knew it.
- h. To the best of my knowledge, the statement contained in paragraph 3 on page 5 is fully and completely accurate.

Question 6

- a. There is no relationship between the approximately 50 millirem from natural sources and the 100 millirem from the bomb tests. They are from independent sources of radiation.
- b. The 400 millirem figure includes only radiation from radionuclides measured in the environment. It is presumed that all of these

radionuclides resulted from weapons tests.

- c. The booklet does not say that the Rongelap people, eating local food only and residing on Rongelap Island are estimated to receive in total, 450 millirem of radiation annually. The booklet does say that the largest amount a Rongelap person would receive in a year eating local food only from Rongelap Island (not grown on other more contaminated islands) in addition to imported food is about 400 millirem from radioactive material deposited by the bomb tests plus an estimated 50 millirem from natural sources and any radiation they might receive from medical tests.
- d. The source of the figure "400 millirem" is from the Lawrence Livermore National Laboratory Report, UCRL-52853 Pt 4, September 30, 1982. On page 40, the maximum, annual bone marrow dose for Rongelap Island is given as 135 millirem. This number was multiplied by 3 to estimate the highest dose any person might receive because the Federal Radiation Council Report No. 1, 1960 suggests using the arbitrary assumption that the majority of individuals do not vary from the average by a factor greater than 3.
- e. The authors of the Lawrence Livermore National Laboratory Report, UCRL-52853 Pt 4, September 30, 1982 developed a figure of 135 millirem. The authors of DOE-1982 booklet multiplied it by 3 to obtain an estimate for the highest dose any person might receive.

Question 7

- a. Based on the data available at the time the booklet was written, the authors assumed a value of 15% for worldwide cancer deaths. The value of 10 deaths in 30 years from non-radiation related cancer among the Rongelap population was estimated by first calculating the estimated number of births and deaths using information from the final draft of the Marshall Islands Five Year Health Plan prepared by the Trust Territories Department of Health Services, Office of Health Planning and the Resources Department. From this Plan, the following were obtained:
 - (1). Rate of increase of the population had been ~3.8% per year
 - (2). Infant death rate ~3.2% per year
 - (3). Overall death rate ~0.54% per year
 - (4). Birth rate is 4.2% per year

Total population at end of 30 years (beginning with 233 people), P_{30} :

$$P_{30} = 233 (1 + 0.038)^{30} = 713$$

Number of Births, B:

$$B = 0.042 \times 233 \int_0^{30} (1.038)^x dx \quad (x = \text{time between 0 and 30})$$

$$B = 541$$

$$\text{Deaths} = 0.034 \times 233 \int_0^{30} (1.038)^x dx = 70$$

Assuming 15% of deaths are due to naturally occurring cancer, 15% of 70 = ~10.

- b. I do not know if DOE has a position on whether non-radiation cancers are

a greater threat and risk to the Rongelap people than radiation-related cancers.

- c. Since, as stated in 7b above, I am not aware of any position held by DOE in this regard, there is no basis for a statement.

Question 8

- a. In the DOE-1982 booklet, estimates were given for the person who in some one year might receive a radiation dose larger than anyone else because his or her dietary practices and metabolism might have led to intakes and retention of radioactive material greater than the average person. The highest average radiation doses received in 30 years given in this booklet are the highest of the 30-year integral whole body dose and the bone marrow dose calculated in the Lawrence Livermore National Laboratory report. For estimates of doses that people might receive, the doses were calculated using two different diets, and the average of these two sets of doses is the basis for the estimates.
- b. There is no distinction in the Marshallese text between "of radiation *people* might receive in the coming 30 years" and "of radiation a *person* might receive in the coming 30 years." The English translation made the distinction using the word *people* for the populated islands and the word *person* for the non-populated islands, but I do not recall the reason for this.
- c. The scientists referred to in the second paragraph are the authors of the Lawrence Livermore National Laboratory Report, UCRL-52853 Pt 4, September 30, 1982.
- d. The scientists are Drs. W. L. Robison, M. L. Mount, W. A. Phillips, C. A. Conrado, M. L. Stuart, and C. E. Stoker, of the Lawrence Livermore National Laboratory.
- e. The specific basis for the estimates cited in the DOE-1982 booklet is taken from the Lawrence Livermore National Laboratory Report, UCRL-52853 Pt 4, September 30, 1982, which in turn is based upon the results of the radiological survey.
- f. The figures presented on page 39 were based on actual calculations and measurements developed by Lawrence Livermore National Laboratory scientists.
- g. The figures presented on page 39 were taken from the Lawrence Livermore National Laboratory Report, UCRL-52853 Pt 4, September 30, 1982.
- h. Although calculated from actual measurements, the figures are estimates because it is not possible to predict precisely the radiation doses any person will receive during the next 30 years.
- i. The *largest amount* pertains to the person who, because of unusual dietary practices and/or metabolism, would be expected to take in and retain more radioactivity than the average person.
- j. The *highest average* pertains to the average dose calculated using the diet that yields the highest dose value.
- k. In the Lawrence Livermore National Laboratory report, *average doses* were calculated using two different diets. The *highest average* dose was used in the DOE-1982 booklet.
- l. The difference between *largest amount* and *highest average* were explained in (i) and (j).
- m. The figure, 400 millirem, applies exclusively to Rongelap Island and the consumption of local food grown only on Rongelap Island plus imported

food as described on pages 29 and 40 in the Lawrence Livermore National Laboratory Report, UCRL-52853 Pt 4, September 30, 1982.

- n. The figures 2500 millirem and 3300 millirem apply exclusively to Rongelap Island and the consumption of local food grown only on Rongelap Island plus imported food as described on pages 29 and 43 in the Lawrence Livermore National Laboratory Report, UCRL-52853 Pt 4, September 30, 1982.

Question 9

- a. Neither I nor the other authors were aware of exposures to plutonium that included high readings.
- b. It was not the purpose of the DOE-1982 booklet to report any medical condition or to report on any past exposures to radiation. We were asked only to communicate information about potential future exposures to radiation.
- c. -
- d. See (a) and (b).
- e. To the best of my recollection, I did not attend a meeting with Brookhaven scientists or medical staff in which the Brookhaven staff reported high doses of plutonium in urine of Rongelap citizens.
- f. We did not have information about plutonium in urine. We were asked to communicate radiation dose information that was reported in the Lawrence Livermore National Laboratory Report, UCRL-52853 Pt 4, September 30, 1982.
- g. I do not know whether or how plutonium in urine data might have been provided to the Rongelap people.

Question 10

- a.b.c. In preparing the DOE-1982 booklet, we did not have estimates of radiation doses for any individual Rongelap citizen. Our task was to communicate information in the Lawrence Livermore National Laboratory Report, UCRL-52853 Pt 4, September 30, 1982 dose estimates projected for the next 30 years.
- d. Neither I nor the other authors of the DOE-1982 booklet prepared dose estimates.
- e. The dose estimates were prepared by the authors of the Lawrence Livermore National Laboratory Report, UCRL-52853 Pt 4, September 30, 1982.
- f. The authors of DOE-1982 booklet prepared the cancer projections using doses from the Lawrence Livermore National Laboratory Report, UCRL-52853 Pt 4, September 30, 1982 and risk factors from the 1982 National Academy of Sciences BEIR III report.
- g. -
- h. The authors of DOE-1982 booklet prepared the health defects at birth projections using doses from the Lawrence Livermore National Laboratory Report, UCRL-52853 Pt 4, September 30, 1982 doses and risk factors from the 1982 National Academy of Sciences BEIR III risk report.
- i. -

Question 11

Some of the values reported in the Lawrence Livermore National Laboratory Report, UCRL-52853 Pt 4, September 30, 1982 exceeded U.S. guidelines. They were included in the DOE-1982 booklet. Examples are on page 39 in reference to Naen, Namen and Melu Islands.

- a. See above.
- b. See above.

Question 12

The Lawrence Livermore National Laboratory report did not calculate separate doses for children and adults.

Question 13

The DOE-1982 booklet made *no* statement about Rongelap or any island in the Marshall Islands being safe or unsafe.

Question 14

- a. Not all radiation issues were addressed in the DOE-1982 booklet.
- b. DOE-1982 booklet did not address radiation doses already received by the Marshallese nor the potential health effects that might result.
- c. The authors of the DOE-1982 booklet were asked only to communicate the results of the 1978 survey, which were reported in the Lawrence Livermore National Laboratory Report, UCRL-52853 Pt 4, September 30, 1982.

Question 15

- a. When the information in DOE-1982 booklet was presented to the Marshallese government officials and representatives from the northern islands at Majuro in December 1982, the representatives from Rongelap expressed concern about past exposures to radiation.
- b. I do not have information about what was done.
- c. In the spring of 1983, DOE officials and scientists from Lawrence Livermore National Laboratory and ~~possibly~~ others visited ~~most~~ of the ^{populates} northern Marshall Islands to explain the DOE-1982 booklet. None of the authors were able to participate.
- d. I do not believe I have any documents, letters, memorandum or other materials which address this matter.

Question 16

- a. I did not perform a detailed assessment of the Kohn Report. I commented only on those points that dealt with the DOE-1982 booklet.
- b. I do not believe Dr. Kohn understood the purpose of the DOE-1982 booklet. His report purported to be a review of the DOE-1982 booklet when, in fact, it appeared to be a review of the work of the Lawrence Livermore National Laboratory team and Report, UCRL-52853 Pt 4, September 30, 1982.
- c. Copies of my letters to Dr. Kohn regarding his report are enclosed.
- d. A copy of my September 10, 1988 letter to Dr Robison is enclosed.

Question 17

I am not aware of anything further that the Committee should know about Rongelap Atoll, the people of that atoll, or the DOE-1982 booklet,

"Melelen Radiation Ilo Ailin ko Ituion Ilo Majol, ko Rar Etali Ilo 1978."

Question 18

I have never withheld any information regarding the preparation of the DOE-1982 booklet. I worked on the booklet in response to a request from the DOE because I was sympathetic to their interest in wanting to communicate technical information to the Marshallese people that the Marshallese might be better prepared to make decisions about the future uses of the islands contaminated by the U.S. weapons tests. While the DOE-1982 booklet was limited in scope and may not have provided all the answers that the Rongelap and other Marshallese wanted, it appears to have succeeded in stimulating their thinking and led them to express their questions and concerns to the world's scientific and political communities.