DOE F 1325.8
(7-74)

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U.S. DEPARTMENT OF ENERGY

memorandum

H7

DATE December 16, 1982

REPLY TO ATTN OF EP-32

SUBJECT Meeting on DOE/EP Northern Marshalls Survey - Majuro Atoll, December 8-9, 1982

TO James De Francis, CP-2

Per your instructions, I attended the subject meeting. Ed Patterson had informed me that he had given Roger Ray the responsibility to act as the agency spokesman and to answer questions. I was to be an observer. A copy of annotated notes taken during the meeting and a list of attendees are attached. No representative from the Trust Territory attended the meeting.

The Marshallese/English book prepared for presentation of the survey and the UCRL technical report on the survey results were well received in Majuro. During the formal briefing on the book and in the question and answer sessions that followed, a number of requests were heard for additional information. Other than agreeing to provide available radiological data and to pass along those requests that should be directed to the Department of Defense and to the Government of the Marshall Islands, no new commitments for additional work by DOE were made. The earlier agreement to provide the Northern Marshalls survey results to the populations of the surveyed atolls and islands was reaffirmed. The responses to technical questions by Dr. Bair (health effects and risks), and by Dr. Robison (data collection, analysis, and dose assessment) were very precise and tailored to the audience. Roger Ray was very effective in responding to questions on the purpose and findings of the survey and in keeping the participants on the intended subject.

There was one aspect of the meeting in Majuro that I found very disturbing. This involves agency policy on radiation protection in the Marshalls. The past policy has been to view DOE's responsibilities in the Marshalls as limited in scope and directed primarily toward providing radiological advice and assistance to the Department of the Interior and to the High Commissioner of the Trust Territory of the Pacific Islands, advice that has been thoroughly coordinated within this agency. This advice has emphasized, as a U.S. Government position, application of Federal and International radiation protection standards in decisions on radiation exposure issues in the Marshalls for which the U.S. Government is responsible. This position has been reviewed and accepted in numerous congressional hearings in which DOE has assisted DOI and the Department of Defense in obtaining approval of their radiation protection plans and programs. The Environmental Protection Agency, EPA, has informed DOI that U.S. standards do apply to U.S. activities in the Marshalls. In his answers to questions regarding radiation safety and the restrictions that DOI has urged the Marshallese to follow on use of food from certain islands at Rongelap and Enewetak that have higher contamination levels, Roger Ray's statements were not compatible with past policy. Advice was given directly to the Marshallese representatives that changed and, in the perception of some, voided past restrictions. To my knowledge, these changes were not coordinated with anyone in EP, GC, CP, OHER, or with DOI. Some of the Marshallese at the meeting appeared surprised, confused, and skeptical of Roger's statements that food from Enjebi

EP files

[redacted]

Island and from the northern islands at Rongelap could be eaten with certain qualifications, and that the people should make their own judgments based upon cancer risk estimates and upon the need for the food. The representatives at the meeting recognized that this advice was new and inconsistent with the unqualified restrictions they have been urged to follow for many years. It was stated that they preferred instead advice that was clear and free of qualifications that would require them to make a judgment on whether they should eat the food. Though the Marshallese were polite, and it is not their way to give offense, even so, some of their statements to Roger at this point were obviously sarcastic even when filtered through the interpreter. There was an embarrassing moment when Roger asked the Marshallese to help him explain the advice he had given to them.

Rather than relax current restrictions on use of coconut crabs from the northern islands at Rongelap Atoll and on all food from Enjebi Island at Enewetak Atoll, the restrictions need to be strengthened. Body burden measurements by the Brookhaven National Laboratory, BNL, during the past year at both atolls have indicated increased levels of Cs-137 in some individuals who have been eating food from restricted locations. BNL's reports are attached. The restriction at Rongelap needs to be increased to include all foods from the northern islands. Body burdens for females less than eleven years of age at Rongelap had increased 82% at the time of the last measurement in July 1982. Adult male burdens were up 56%. Doses are expected to continue to increase to 250 mRem/yr. Relaxing restrictions will likely cause doses to go even higher. In the past in Operational Safety, we have considered it vital that DOE's health protection policy and the implementation of this policy in the Marshalls should provide a uniform degree of protection from atoll to atoll and should be consistent with protection provided in the U.S. Because of the uncertainties associated with dose predictions, DOE's criteria for cleanup of Enewetak that was approved by EPA and by Congress, specified 250 mRem/yr (not 500 mRem/yr), and 4,000 mRem/30 yr (not 5,000 mRem/30 yr). I urge that these lower criteria should apply anywhere in the Marshalls where decisions are to be made based on dose predictions. I would be happy to discuss this further if you wish.

On several occasions in after-hour discussions during the trip, Roger and I disagreed on how questions on radiological safety should be handled. This is only a continuation of a difference of opinion between DOE headquarters safety staff and NV staff (at the greatest intensity between Roger and myself) that began many years ago when NV became involved in Enewetak cleanup. This disagreement has intensified as DP and NV have taken steps to take over EP programs and responsibilities in the Marshalls. My view is that this new approach to radiation protection will be difficult for this agency to explain and defend in the future. It may seem curious to others why a shift in programmatic responsibilities within DOE causes a shift in radiation protection policy and practice in the Marshalls? I wonder about this myself. I expect that the Bikinians will quickly recognize the implications of this new DOE advice. A logical extension of Roger's advice is that the Bikinians should make their own decision on whether to return to Bikini Atoll. Doses for Bikini Island residents could be 10 times the U.S. standard. Such residents may not meet the standards for radiation workers, and this population includes pregnant women and infants.

I anticipate that once Roger's advice is passed along to the Marshallese people and their leaders and legal counsel, there will be many additional questions on why DOE's recommendations have changed. At the next opportunity for Marshallese to appear before a congressional hearing or a DOI budget review, they will likely raise this issue if not before that time. DOE will need to develp a coordinated position with DOI and EPA on this new advice.

Tommy F. McCraw

Tommy McCraw
Office of Operational Safety
Environmental Protection, Safety,
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3 Attachments

cc w/attachments:
D. E. Patterson, EP-32
B. Wachholz, EP-32
B. Siebert, DP-3.1
J. Thiessen, ER-71
A. Fingeret, GC-23
J. Rudolph, DP-224
M. Crosland, GC-34

Enclosure 1

Tommy McCraw
December 8-9, 1982

Annotated Notes
(Not Verbatim Transcript)

Meeting at Majuro - Report on Northern Marshalls Survey*

DOE Spokesman - Roger Ray, NVO
Interpreter - Alice Buck
Technical Advisors - Dr. William Bair, PNL
Dr. William Robison, LLNL
Observer - Tommy McCraw, DOE HQ

Wednesday, December 8

Ray - Introduction. Will visit later each atoll to present same information to each population.

Q - Is there information on other atolls?

Ray - Yes, other places surveyed starting in 1950's.

Q - Request Wotje info.

Ray - OK.

Q - What number is safe?

Bair - No safe or unsafe.

Q - Is there no zero radiation?

Bair - Radiation is everywhere.

Ray - Talked about natural radioactivity.

Q - Are all numbers safe?

Q - Is the 4 at Bikini safe?

Bair - Explained about ranges of radiation levels using 1 2 3 & 4 (numbers used to compare atolls in book).

Q - How can you say that 4 is safe? Does this mean Bikini can be viewed as safe?

Ray - Ranges of 1 2 3 & 4 were explained. Questions will be answered as we go through the briefing.

Q - Does natural radiation cause disease?

*The meeting taped by Dr. Bair. See attached list of attendees.

Bair - No good answer. Some scientists think so—other say no.

Q - How deep does radioactivity go in soil?

Robison - Down to water table. To 160 cm.

Q - What about radioactivity in flesh and bone of fish?

Robison -We have studied both.

Q - Is thyroid cancer the result of damaged cells?

Bair - Yes.

Q - Is the operation different for thyroid cancer or noncancer tumors?

Bair - No differences in operation for thyroid cancer. One couldn't know if either was caused by radiation.

Q - Are there more birth defects in Marshalls than elsewhere?

Bair - Saw report that says MI not different than other areas.

Q - I have seen report on many medical problems in MI. (Report not identified.) Why don't we make such a study?

Bair - I assume such data on the past incidence of disease are being collected by the health agency in the MI Government. This report deals with predicted health effects in future.

Q - Shouldn't birth defect info have been included in the report?

Bair - Expect no excess birth defects in Marshalls. There are no human population data showing increased birth defects from radiation exposure—even in Hiroshima and Nagasaki. Only animals data have shown this.

Q - Can we bring in slides of injuries from those exposed?

Ray - OK.

Q - Is there difference between bombs in Japan and in Marshalls.

Ray - Yes.

Q - Is radiation the same from all bombs?

Ray - Yes.

Q - Can we have copy of tape?

Ray - Yes.

Q - How come some places are off limits—last sentence on p. 27.

Bair - Large doses to animals can cause cancer and birth defects. We have not seen cancer and birth defects at low dose levels like in the Marshalls. No effects on plants or animals seen.

Q - My question hasn't been answered. If small amounts of radiation in MI, is it not safe everywhere? There is confusion about statement on lack of effects on plants and animals.

(Note: I don't think the question on restrictions was ever answered to Muller's satisfaction and it certainly was not to my own).

Q - On Rongelap slide - How many cancers have appeared since testing of bombs?

Bair - Don't know.

Q - What about predicted numbers of cancer cases less than one? What does this mean?

Bair - At 0.3, if the population was 3 times as large, one would predict about 1 additional case.

Q - Could you make an estimate on the past based on all measurements of Rongelap. Doctors have been visiting Rongelap for many years.

Bair - Estimates could be made for the past. This report concerns future exposures. BNL is working on a thyroid report that considers past exposures.

Ray - Data not as good for the past—but cancer estimates could be made for the past.

Q - Whole book is concerning the coming generation. Info is about time not of interest to us. Picture is for the future that looks clean. Past doses are more of interest to us.

Ray - This report is not the whole story. Book was for future decision, not about the past.

Q - If I live on higher level islands at Rongelap—would I be safe?

Ray - Main is 5 to 6 times Rongelap Island. Risk would be six times higher.

Q - What other islands at Rongelap have this high dose.

Robison - Main, then Kabelle, Eniaetok, and Mellu.

(Note: The summary tables of doses and risks that Dr. Bair brought to Honolulu were handed out. Copy attached.)

Q - What about standards for these numbers?

Ray - Responded with very general statement.

(Note: The questions on standards were not addressed here in any meaningful way. No clear statement was made of whether standards should be used to determine what is acceptable.)

Thursday, December 9

Ray - Introduction. Pleased to have this report reviewed by anyone else you choose.

Q - Referring to supplement paper (i.e., the summary tables)—what is the meaning of the numbers on Utirik and Mejit? Why weren't Mejit people moved when Utirik people were moved?

Ray - The move for Utirik was based upon a situation at a much earlier time. (Note: This was 1954 just after the Bravo test.)

Robison - Initially, more short lived radionuclides on Utirik. This radioactivity disappeared fast. Now the long lived items are decaying.

Q - Why was not a single diet used? BNL diet is deficient in amount of coconut eaten.

Q - Did one diet come from Ujelang?

Robison - Yes. The Brookhaven diet gives higher doses than the Ujelang diet.

Q - I feel all diets in the Northern Marshalls should be same. Why are Ujelang and BNL diets so different?

Robison - Amount of imported food varies from atoll to atoll. Applied both diets to all atolls. BNL diet done by Jan Nidue of BNL who lived at

Rongelap while he studied the diet there.

Q - Is supplement (summary tables) accurate?

Robison - Yes, it uses the BNL diet which gives highest doses.

Ray - The differences between Mejit and Utirik numbers are very small.

Q - How would you know if a person who died on Utirik a month ago of cancer was caused by radiation?

Q - How do you know if persons died of cancer in the Marshalls?

Ray - Examination by medical doctor would show this.

Q - We have no medical doctors on atolls. How can you say how many will die of cancer?

Ray - There are predictions for future.

Q - Are these based upon past experience?

Ray - Yes. but not in MI.

Q - I would say these don't apply in MI.

Ray - These are based upon all experience. We don't have historical records on what has occurred in past in MI. Predictions are based upon all experience.

Q - DOE vessel is in MI—could collect this information.

Ray - With short time/small population in MI, we couldn't improve on risk estimates.

Q - You have examined MI people for 20+ years, isn't that long enough?

Ray - The high exposure group at Rongelap has been studied (high dose over short time).

Q - Hasn't there been enough evidence so that U.S. could announce that Mejit has had a higher fallout than Utirik? Utirik is being paid but not Mejit.

Robison - Mejit soil contamination is lower radioactivity than Utirik. It is the diet information that makes Mejit look higher in the Tables.

See page B-3 in UCRL report Part 4 and compare soils.

Q - Is this book made in 1978. Supplement foods only started later than that on Utirik?

Ray - Said first calculations were for Enewetak. Didn't feel we could say what diet would be used if Ujelang people went to Enewetak. Mitchell agreed to do study at Ujelang. Study done for Ujelang people by their counsel.

Q - Assumptions were made on diet by Mitchell—I do not trust that man and would not use his diet. This has caused confusion. Mitchell is a lawyer, not a scientist.

Ray - Pritchard actually did survey, also a lawyer. We were told that the Mitchell diet was not good and should not be used in this study. This is why Nidue and Creaghead did the Rongelap diet study., Nidu lived there about 6 months.

Q - Nidue at Utirik only 3 days?

Ray - He lived a number of months at Rongelap.

Q - Is the figure 75 the results of Mitchell diet and I can tell my people it's no good?

Ray - No, the Nidue diet was used.

Q - We did not have supplemental food at Utirik in '78.

Brown - There was some U.S.D.A. food in the school lunch program at Mejit.

Ray - Suggested that if the diets for Utirik and Mejit are not correct, information that is correct could be provided and we would make another calculation.

Q - The wheeling came to Mejit in '78. You can say with accuracy what will happen in the next 30 years? You can say better than what happened during the time slot since the bomb tests?

Ray - The survey was intended to predict the future since 1978.

Q - You got soil ect. that contains what has happened in past, yet you don't say about the past.

Ray - Some conclusion could be drawn on what happened earlier.

Q - I feel confused but will go on. Regarding the diet at Mejit and food grown there, will there be harm for using food from our atoll?

Robison - Mejit doses are no higher than the rest of the world and may be lower.

Q - Will we have harm?

Bair - Should not have harm. Mejit is 100 mRem for highest dose. The standard all over world would allow 500.

Q - Your name please? Bair gave his name.

Q - Loma Linda and Wheeling surveys done. Man and woman spent one week. Had only book, pencil, and camera. We asked for medical exam and they said no. Asked for what they knew about our plants and animals - they said no. They asked about animals we used for food. We fed them our food - they left. How can you accept their diet?

Ray - The Loma Linda group was to help Interior (DOI) plan future health care. We do not depend on anything they did in their report.

Q - Wasn't Loma Linda used in this survey?

Ray - No.

Q - For thyroid operations, why is such a large incision needed?

Bair - Same surgery is used as in U.S.

Q - Benign or malignant—is there same incision?

Ray - Some tumors large and small, benign or cancer.

Bair - Expect more benign then cancerous thyroids.

Q - Would want doctors from U.S. and Japan.

Q - Hysterectomy now small incision. Why no advance such as this with thyroid?

Q - Is incidence of diabetic and thyroid cancer in MI the same as Yap?

Ray - Don't know.

Q - Isn't our diet something a doctor should be talking about?

Ray - Did not consider diet as related to disease—just radioactivity intake.

Q - You're not a doctor. How can you say about the effects of our diet?

Bair - I have studied radioactivity in animals for 30 years and know that animal data can be applied to humans.

Q - I understand you do tests with animals?

Bair - True.

Q - (Cowan) From 1978 forward is the subject of this report. How does this account for past doses?

Ray - Results from the survey can guide any future decisions. There is knowledge of the past. There are extensive reports. A principle of radiation protection is the ALAP principle.

Q - Life-time doses are what is important for predicting effects.

Ray - Exposures of past are separate from exposure of future.

Q - (Muller) Four atolls have primary contamination. Why study others?

Ray - Others have been studied before. Our survey activity will some day end. By that time we should have all information needed. Some survey techniques were developed at Bikini and Enewetak that did not exist before. It made good sense to look at a number of atolls if we brought the ship out for Bikini. This study versified that the choices of atolls to study were good choices.

Q - The map shows other atolls contaminated?

Ray - Yes, and the amount is shown in the survey report.

Q - Does this indicate all atolls are within safe standards for eating food?

Ray - Do not normally use term safe or not safe. The risks are shown in the report.

Q - If the amount in the MI is the same as the rest of the world, shouldn't we have free use of these atolls? This is double talk.

Ray - Except for Bikini Island, all places meet the standards. To keep doses down, it is good to do certain things like restricting food on the northern islands at Rongelap.

Q - Yesterday (you) seemed to be saying something different. At least this time you've separated out Bikini Island.

Q - What about Runit and Enjebi Islands at Enewetak?

Ray - Runit is an exception. As to Enjebi, the dose expectations have been reported earlier. The doses for Enjebi are close to the standards. (Note: This is not correct. Annual dose for Enjebi ranges from 2 to 4 times the standard).

Q - We're hungry. Can we eat breadfruit from Enjebi?

Ray - Yes you can. If there are substitutes you should use them.

Q - I'm glad to know we can use food from Enjebi. We have no choice - we have no other source of breadfruit. I'm glad to know we can use these—have had storm damage at Enewetak.

Robison - The breadfruit was planted for another purpose.

Q - We need a supplement report on where in each island or atoll to have planted and used locally grown foods.

Q - We have been given extensive data but no recommendations.

Robison - Except for Bikini Island and the Nortehrn Islands at Rongelap, you can use any amount of food from any atoll.

Q - No. 4 on this map—you have said is OK everywhere. Is this true?

Robison - No. 4 designates a range. Levels can be different in this range.

Ray - On Enjebi, because of storm and lack of food, we cannot say not to use food from Enjebi—but please do not destroy 8 years of work.

Q - (Ismale John) I remind you, DOE did body counts at Enewetak. Some increase in body counts occurred in people who eat food from Enjebi. Now you say Enjebi food is OK?

Ray - Elevated burdens don't mean a problem—used as example a doctor

putting someone on a diet and weighing them periodically. (Note: This was a very confusing and misleading analogy).

Q - (Mathusala) In short, we see number of yearly radiation for Wotho is 30. Is this a single year or more than one year radiation?

Ray - This is for highest perosn in one year. So, if I understand, one can get 30 each year?

Ray - 30 is the highest year. The level will be slightly less in the next year and the next. It will not be 900 in 30 years.

Q - On soil, plants, and foods, in '46 the tests began and particles came to our atoll. One staple is arrowroot. We had plenty in Wotho. Now we are told that radioactive materials affect the soil. How do they affect the soil?

Ray - There are no effects on the soil itself. Radioactivity in the soil doesn't effect the health of the soil.

Q - We do not have arrowroot in our soil. Have stalk but no root. Utirik and Likiup and all northwest atolls have the same problem.

Bair - I am not aware of any information indicating that radioactivity in soil harms plants. You need to contact an agricultural expert. Maybe the problem is with nutrients in soil, not with radioacativty.

Q - I repeat, the tests begain in '46. The arrowroot problem began then.

Robison - One would need hundreds and hundreds of times more radioacativity to cause a problem like this from fallout.

Q - We still have this condition.

Ray - We too wonder about the cause.

Q - Why did people test bombs before the effects on us were known? We wish you had known before you did this.

Ray - It is hard to explain President Truman's decision. The U.S. was attempting to deal with serious threats in the world. Much study would be required to judge whether this was the best or ideal place to do these

tests. The leadership of the free world did not feel they had time to evaluate this—the world would have been in more trouble.

Lunch

(Note: Ray to get something in writing on the Enjebi food use question).

Q - DOE is responsible for understanding radiation. For the chart on p. 12, since you study this, why did your survey delay so long after some radioactivity has disappeared?

Ray - Surveys were made since the first test in '46. In areas where most material fell, surveys were made most frequent such as Bikini, Enewetak, Rongelap, and Utirik. This survey was to once and for all summarize all information whether or not there are any effects. Until recently, we did not have the technology to do such a survey.

Q - Yesterday, a statement was made that if we lived on an island and ate food, this would be OK. What if some non-residents eat the food?

Ray - Infrequent use would be no problem. But as I told Ismale John, continuous use should not be made of Enjebi food. Except for Bikini Island, north Rongelap, and Enjebi, all food can be used.

Q - We've had natural radiation. You've brought more radiation to our land. Are we less immune than you because it's your product?

Bair - Radiation is the same for all. We are not more or less immune or sensitive.

Q - Page 52, Ailuk. That island is place where birds gather. Last April about one-tenth of the vegetation remained and many birds died. Don't know why. Eneja Island?

Ray - This was not caused by radiation - no explanation.

Q - (Rongelap) Is the northern part hazardous?

Ray - We have said that foods from the North have radioactivity considerable higher. If there is a choice, recommend no use.

Q - Explain what foods we should steer away from?

Robison - Breadfruit, pandanus, coconut and coconut crab, papaya, and bananas. The dose is shown in the book. The average is below the standard. Will have more radioactivity in the body if these foods are used. Suggest not to use them if there is a choice.

Q - (Balos) I feel this explanation is confusing. Just saying this means to us that use of this food is OK. The added clause is confusing. It would be better if it is clear these foods should not be used.

Ray - If there is a choice, in the long run, you would be better off using food from southern islands. It's a matter of how much. We need help to explain this. (Note: This is confusing and is Roger's old argument, i.e., the standards are not relevant. One should cite the risks, and urge that the people themselves decide what risk to accept. Also that the U.S. should likewise accept this along with any consequences. The implication here is that the standards are more for protecting the U.S. then the people.)

Q - (Balos) Is this recommended—if no southern food, then northern foods are OK and there is no harm?

Ray - This is for a temporary solution to a food shortage: The people should not be fearful of eating some food from the northern islands.

Q - I'd still like to cite examples. The northern islands have more birds and crabs. If we ate one bird and one crab per day would this be OK?

Ray - There is no yes or no. As the portions of northern islands diet increases, the dose increases. Our jet flights were cited as an example where visitors get more radiation exposure flying to Majuro. We can not say there is no increased risk for us.

Q - It's unfortunate about your increased radiation from flying, but this is not exactly the same. You are here by choice. We rather not have had our islands contaminated.

Ray - The answer is somewhere in between.

Robison - Radiation practice is that 500 is acceptable, but if there is a

practical way to reduce the radiation, we should do that. The practical way is not to use northern foods.

Q - How does Rongelap get up to 2,500 if its radiation is decreasing?

Robison - This adds up year by year. The yearly amount is decreasing.

Q - Yesterday it was stated that for Rongelap, where someone lived in the north, 3 would die?

Ray - If all lived on Naen and all food came from Naen, we would predict 3 additional cancer deaths.

Q - The color of Rongelap is only 1 down in the color code from the northern islands.

Biar - Less than 1 person will die over 30 years for Rongelap Island.

Q - What about fish at Rongelap - any problems?

Robison - No problem with fish in any lagoon or in the ocean anywhere in MI. Levels less than elsewhere.

Q - What about clams?

Robison - Some is true with clams and shellfish.

Q - I think it would please me if you would say don't use, or its OK to use, food from northern islands at Rongelap.

Ray - Cited lung cancer issue and cigarette, and the risk in air crashes. Our choice has been to describe the risk for you to use in making your own choice. We do not want to be rule makers. We hope to describe this so you can make your own judgments.

Q - Before the 1978 survey, we had a clear statement not to eat crabs from north at Rongelap. Is what you are saying different than before?

Ray - We want to inform people but not to tell them what to do. You should control your own lives.

(Note: Oscar deBrum explained in Marshallese.)

Note: My impression at this point is that the representatives from Rongelap made more sense than we did and they knew this. They appeared

conservative—we sounded less so.

Q - Our people have a counsel and other doctors or advisors. We are sometimes asked by other experts and when our answers are given we are told DOE is deceiving you and misleading you.

Ray - We encourage a second opinion. We are open, and the report is in the open. We are fallible. You can have them get their own samples and advise you.

(Note: I am grateful the Bikinians were not here to press further on this point. The obvious logical extension of this kind of guidance is that the Bikinians could resettle Bikini Island if they decide to do so based on this judgment that they have no other alternative place to live. It was clear to the MI representatives that the restrictions have been changed, but they don't understand why.)

Q - Out of 30,000 expect 2 thyroid problems - saw this in the book. We've had 500 in the Marshalls?

Bair - Will look up expected incidence to present later.

Q - What can be done for prior years? Any help or compensation, for those whose concern is the past?

Ray - There are numerous publications. Negotiations have been underway for many months between our Governments.

Q - Is there radioactivity from missile testing?

Ray - No significant amounts of radioactaive materials are involved in these launches. This is a DOD/Army responsibility.

Q - No radioactivity in missiles?

Ray - There is no significant introductions of radioactivity into the lagoon at Kwajalein.

Q - Can't you answer? Shouldn't you know about this and can't you answer my question?

Ray - I can say with high confidence there are no atomic weapons involved.

Q - Plutonium was named yesterday. Is there any plutonium in the missiles? Is there any radioactivity in the missiles that go into the Kwajalein lagoon?

Ray - I don't know what is in each missile, but will convey this question and try to get an early answer.

Q - In A10 and 11, the data comes from the Wheeling survey?

Robison - Yes.

Q - For Mejit, turtles and turtle eggs—we did not see any gathered during the visit to our atoll.

Robison - We didn't get turtles and eggs everywhere. An average for all values seen in MI was developed and used to complete the diet where these items were not found.

On earlier thyroid question

Bair - Expect 6 thyroid cancers in 30,000 thyroids. For 239 exposed Marshallese there have been quite a few thyroid cancers, like 7 as of 1977.

Q - In our records have 460 thyroid abnormalities.

Bair - There are many thyroid abnormalities but few cancers.

Q - There were 460 thyroid operations in the MI. In Japanese records for an earlier time, there were fewer abnormalities seen.

Bair - When you look for abnormalities, you will find more.

Q - 1 versus 6 out of 30,000? In '79 on Utirik, 310 persons, they had nine thyroid operations. Some not at Utirik at the time of fallout. Why is this?

Bair - I can't answer. Nodules appear in many populations.

Q - I observe that radiation at Rongelap is 400, Mejit is 100, both higher than Utirik, yet we've had 9 operations. What can we expect in 30 years?

Ray - Don't have the answer here. Maybe in a later session.

Q - Hypertension in women and an up serge in diabetes and cataracts has occurred in the MI. What causes or has caused this?

Ray - To the extent that this is something the U.S. can do, we will confer with MI medical experts.

Q - A benign thyroid condition develops from what? What is the difference with thyroid cancer?

Ray - Don't have an answer for this.

Q - (Balos) The report says that there is contamination of all islands surveyed—some more than others?

Ray - That is correct.

Q - Radionuclides in soil and plants and animals—it is present in them?

Ray - That is correct.

Q - In some atolls with higher levels, the people will have higher levels? People will continually absorb these?

Ray - This is correct. I emphasize that for most places there levels are very small and not different from other places.

Q - If there were no tests in Marshalls, there would have been lower?

Ray - That is true.

Q - I requested that Wotje be surveyed yesterday. If Wotje is surveyed, I would like Tongi surveyed.

Ray - Agreed to provide Wotje data from earlier surveys and to show why Wotje doesn't need a separate survey.

Q - Give data also for Tongi?

Ray - OK.

Q - Page 22 picture shows not just thyroid affected. We would like a doctor that can advise on all parts of the body.

Ray - Emphasis has been on the thyroid. But, DOE's medical program looks at all illness, though primarily at those effects most likely associated with radiation.

Q - Rongelap and Utirik representatives requested that since some thyroid surgery was performed for those not exposed, can they be compensated?

Ray - Treatment of non-radiation illness has been the subject of continuing discussions with MI medical and health experts. We will raise this issue with them.

Ray - We want to continue with this exchange and welcome your questions. Your questions will help us in preparing for the visit to your atolls.

DOE MEETING 12/8/82 MAJURO

Sen. Ishmael John	-	Enewetak
Sen. Calep Rantak	-	Ujae
Sen. Ataji Balos	-	Kwajalein
Sen. Donald Matthew	-	Utirik
Minister Jeton Anjain	-	Rongelap
Minister Tom Kijiner	-	Likiep
Sen. Tokwa Tomeing	-	Wotje
Sen. Katip Mack	-	Arno
Mayor Jabwe Jorju	-	Rongelap
Mayor Necheld Leem	-	Ailuk
Mayor Elden Juda	-	Utrik
Sen. Report Emmius	-	Mejit
Mayor Aneo Keju	-	Mejit
Sen. Mwejor Mathusala	-	Wotho
Oscar deBrum	-	RepMar
Phil Muller	-	RepMar
Suzanne Cowan	-	RepMar

DOE:

Roger Ray
Dr. William Robison
Tom McCraw
Harry Brown
Dr. William Bair
Mrs. Alice Buck
Reynold deBrum

The amount of radiation a person might receive at each atoll (in Millirem):

	Largest Amount of Radiation A Person Might Receive in One Year	The Highest Average Amount of Radiation People Might Receive in the Next 30 Years	
		In Any Part of the Body	In Just the Bone Marrow
Wotho	30	200	230
Ailinginae	270	1700	2100
Rongelap	400	2500	3300
Rongrik	270	1800	2100
Likiep	75	530	580
Taka	20	140	170
Jemo	50	330	390
Utrik	75	490	590
Bikar	210	520	1800
Ailuk	90	650	680
Mejit	100	710	730
Ujelang	20	130	150

If people live on these 12 atolls they will receive radiation from past atomic bomb tests. The additional numbers of those who might die from cancer or be born with defects from this radiation in the next 30 years are listed under A and B:

	Population in 1980	A Deaths from Cancer	B Birth Defects
Wotho	76	0.002 - 0.01	0.0002 - 0.003
Ailinginae	100	0.03 - 0.2	0.002 - 0.03
Rongelap	233	0.1 - 0.6	0.007 - 0.1
Rongrik	100	0.03 - 0.2	0.002 - 0.03
Likiep	487	0.03 - 0.2	0.003 - 0.05
Taka	100	0.003 - 0.01	0.0002 - 0.002
Jemo	100	0.005 - 0.03	0.0004 - 0.006
Utrik	328	0.02 - 0.2	0.002 - 0.03
Bikar	100	0.02 - 0.2	0.0006 - 0.009
Ailuk	420	0.04 - 0.2	0.003 - 0.05
Mejit	329	0.03 - 0.2	0.003 - 0.04
Ujelang	100	0.002 - 0.01	0.0002 - 0.002

Enclosure 2

DOE MEETING 12/8/82 MAJURO

Sen. Ishmael John	-	Enewetak
Sen. Calep Rantak	-	Ujae
Sen. Ataji Balos	-	Kwajalein
Sen. Donald Matthew	-	Utirik
Minister Jeton Anjain	-	Rongelap
Minister Tom Kijiner	-	Likiep
Sen. Tokwa Tomeing	-	Wotje
Sen. Katip Mack	-	Arno
Mayor Jabwe Jorju	-	Rongelap
Mayor Necheld Leem	-	Ailuk
Mayor Elden Juda	-	Utrik
Sen. Report Emmius	-	Mejit
Mayor Aneo Keju	-	Mejit
Sen. Mwejor Mathusala	-	Wotho
Oscar deBrum	-	RepMar
Phil Muller	-	RepMar
Suzanne Cowan	-	RepMar

DOE:

Roger Ray
Dr. William Robison
Tom McCraw
Harry Brown
Dr. William Bair
Mrs. Alice Buck
Reynold deBrum

Enclosure 3
(1 of 2 parts)

BROOKHAVEN NATIONAL LABORATORY
ASSOCIATED UNIVERSITIES, INC.
Upton, Long Island, New York 11973

Safety & Environmental Protection Division

(516) 282-2503
FTS 666-

May 28, 1982

Mr. Tom F. McCraw
DOE Office of Operational Safety
Washington, DC 20545

Dear Tom:

Enclosed are the results of the January 1982 field trip mission to Enewetak Atoll. A preliminary summary was presented to Bruce Wachholz and Roger Ray during the January 22, 1982 ship users meeting in Honolulu. Final review of the data has not substantially altered the information given them.

The whole-body counting data includes body-burden results for ^{207}Bi, ^{60}Co, ^{137}Cs and potassium. Results were reported if they exceeded 3 x 10^{-4} μCi. This value is the point that the one standard deviation due to counting statistics is approximately equal to the result. Persons have been included in groups based on their age as of January 1982. The age printed in the report is the individual's reported age at time of the last whole-body count.

If you have any qustions concerning the report, please contact Ed Lessard or myself.

Sincerely,

Robert Miltenberger

Robert Miltenberger

RM/lh

cc: A. P. Hull
E. T. Lessard
C. B. Meinhold
B. Wachholz

TABLE #1, Continued

POPULATION	ISLAND	YEAR	SIZE	^{60}Co (nCi)	SIZE	^{207}Bi (nCi)	SIZE	^{137}Cs (nCi)	SIZE	POTASSIUM (g)
Juvenile Male	Enewetak	1982	8	0.42 ± 0.091	11	0.44 ± 0.13	39	1.1 ± 0.49	39	48 ± 10
	Enewetak	1981	6	0.52 ± 0.16	--	----------	44	1.5 ± 1.3	44	46 ± 9.8
	Japtan	1980	4	0.40 ± 0.19	--	----------	7	2.6 ± 0.88	7	46 ± 6.7
	Ujelang	1980			--	----------	41	5.6 ± 2.1	41	47 ± 9.6
Juvenile Female	Enewetak	1982	5	0.42 ± 0.01	16	0.42 ± 0.084	53	1.1 ± 0.41	53	48 ± 9.1
	Enewetak	1981	8	0.47 ± 0.25	--	----------	51	1.4 ± 0.93	51	43 ± 7.9
	Japtan	1980	3	0.47 ± 0.20	--	----------	7	2.6 ± 1.4	7	41 ± 8.1
	Ujelang	1980			--	----------	39	5.2 ± 1.9	39	45 ± 8.4

TABLE #1

POPULATION MEAN BODY BURDENS

POPULATION	ISLAND	YEAR	SIZE	^{60}Co (nCi)	SIZE	^{207}Bi (nCi)	SIZE	^{137}Cs (nCi)	SIZE	POTASSIUM (g)
Adult Male	Enewetak	1982	71	0.65 ± 0.25	94	0.76 ± 0.71	129	19 ± 23	129	165 ± 23
	Enewetak	1981	55	0.66 ± 0.26	1	12	110	11 ± 6.1	110	150 ± 22
	Japtan	1980	44	0.56 ± 0.22	--	----------	17	11 ± 4.2	17	170 ± 32
	Enewetak	1980			--	----------	38	13 ± 7.2	38	169 ± 17
	Ujelang	1980			--	----------	75	19 ± 7.2	75	171 ± 25
Adult Female	Enewetak	1982	69	0.63 ± 0.21	75	0.59 ± 0.30	115	5.5 ± 3.8	115	108 ± 16
	Enewetak	1981	48	0.62 ± 0.26	--	----------	105	6.8 ± 3.7	105	103 ± 15
	Japtan	1980	53	0.60 ± 0.20	--	----------	20	8.9 ± 3.8	20	113 ± 26
	Ujelang	1980			--	----------	93	15 ± 5.7	93	105 ± 17
Adolescent Male	Enewetak	1982	--	----------	28	0.49 ± 0.14	44	2.5 ± 1.2	44	77 ± 22
	Enewetak	1981	1	0.53	--	----------	40	2.6 ± 1.4	40	73 ± 22
	Japtan	1980	--	----------	--	----------	1	5.4	1	84
	Ujelang	1980	--	----------	--	----------	36	9.7 ± 3.4	36	78 ± 24
Adolescent Females	Enewetak	1982	9	0.42 ± 0.11	14	0.51 ± 0.16	20	2.4 ± 1.1	20	85 ± 23
	Enewetak	1981	16	0.54 ± 0.20	--	----------	26	3.1 ± 2.2	26	77 ± 19
	Japtan	1980	10	0.54 ± 0.19	--	----------	7	6.0 ± 2.3	7	78 ± 11
	Ujelang	1980			--	----------	21	8.8 ± 2.8	21	71 ± 18

system are somewhat closer than when two different systems are used. Most of the error associated with these results is due to re-positioning of the individual.

Table 7 presents results for all individuals who have ever participated in the Enewetak-Ujelang whole-body counting program. The data are ordered alphabetically by first name and grouped by age and sex. The age reported in this table is the age of the time of the last whole-body count. A person has been included in a specific subgroup based on the age as of January 1982.

In summary, the most important finding to date was the increase in ^{137}Cs body burdens for members of the adult male population subgroup. The coconut samples and the interviews will provide additional information to further define dietary habits and assist in predicting ^{137}Cs body burdens for future field trips.

The information obtained from these interviews is presented in Table 2. Table 3 lists all individuals whose ^{137}Cs body burden exceeded 75% of the maximum observed ^{137}Cs body burden in 1981.

From the interviews it was determined that individuals traveled to Enjebi Island usually once per month, ate coconut meat and drank coconut milk from the LLNL garden. The trips, usually two to three days in length, were made to collect birds and eggs and were made by members of the population with an age distribution as listed in Table 4. Food from the LLNL garden was consumed during the visit and occasionally coconuts were gathered and brought back to the southern islands. While the absolute quantities of food consumed on each trip, as listed in Table 3, are subject to substantial variation, these estimates may be helpful in determining reasonable upper and lower limits of consumption for coconut meat and milk.

The Marshallese were advised in the closeout meeting that a trip to Enjebi to collect birds and eggs was an acceptable practice but consumption of food products grown in the LLNL garden would increase their ^{137}Cs body burden. They were further informed that this exposure to radiation did not present a health problem but the loss of data would hamper the LLNL efforts to study the environment of the northern islands. Since this would affect future use of the northern islands, the Marshallese promised to refrain from eating LLNL garden food products.

Information provided during the private interviews led to the collection of three coconut samples from the LLNL garden. Gamma spectroscopy results conducted on the entire coconut (husk, shell, meat and fluid) are reported in Table 5. These coconuts have been shipped to Bill Robison for detailed analysis. If these ^{137}Cs activity concentrations are representative of future coconut activity concentrations, then one could expect to observe ^{137}Cs body burden of 4-7 μCi for individuals ingesting the Robison diet and residing on Enjebi Island.

Table 6 presents quality assurance replicate results. Identification numbers with an asterisk indicate that the replicate count was not performed on the same whole-body counting system as the first count. The means and standard deviations reported at the bottom of the page represent results for the total program and results grouped by the method of replicate counting. The average capability to reproduce a body burden with either whole-body counting system is $\pm$ 7%. The 2 sigma counting error associated with most results in Table 6 is $\pm$ 5-10%. Replicate counting results from the same

subgroup at a constant level in prior years. Because this level is at or near the system MDL it is a conservative estimate of the mean body burden of the population.

The nuclide ^{207}Bi has been detected in the Enewetak people in 1981 and again in 1982 at levels that substantially exceed the system MDL. In 1981, one individual was determined to have a ^{207}Bi body burden of 12 nCi. This year the highest value was 6.3 nCi. In the adult male population 15 individuals had body burdens in excess of 1 nCi while in adult females 6 individuals had body burdens exceeding 1 nCi. These data indicate that ^{207}Bi is being incorporated into the diet of the population in increasingly larger quantities each year.

Discussions with Bill Robison and Vic Noshkin on January 22, 1982 indicate that the ^{207}Bi and possibly ^{60}Co result are reasonable estimates of the population mean body burden. According to Dr. Noshkin, activity concentrations in Enewetak fish for ^{207}Bi, ^{60}Co and ^{137}Cs are 1 pCi/g, 1 pCi/g and 0.8 pCi/g respectively. Using an average residence interval of two years, these activity concentrations, the Robison diet (UCRL 53066 p 40) and the retention functions for ^{207}Bi (NUREG/CR-0150-V-2) and ^{60}Co (ORNL/NUREG/TM-190), the predicted body burden for ^{207}Bi falls into the range of 0.24-0.70 nCi and the predicted body burden for ^{60}Co falls into the range of 3.5 - 10.4 nCi. These estimates are highly dependent on the retention function and the assumed dietary patterns. Further discussions with Drs. Robison and Noshkin revealed that the presence of ^{207}Bi and ^{60}Co may also be enhanced for the Marshallese if they eat the entire fish since ^{207}Bi and ^{60}Co are present at higher concentrations in the fish intestinal content and liver. Drs. Noskin and Robison also stated that there were detectable quantities of transuranic elements in the non-edible parts of the fish and that LLNL dose projections do not assume that the entire fish is ingested. This dietary question will be investigated on the next field trip to Enewetak Atoll.

The rise in the adult male ^{137}Cs body burdens was investigated while the field team was at Enewetak Atoll. Comparison of the first 20 adult male results with past body-burden histories indicated that some individuals were exceeding prior levels. Individuals whose current ^{137}Cs body burden exceeded 75% of the maximum ^{137}Cs body burden observed in their population subgroup during 1981 were interviewed privately following the whole-body count in an effort to determine recent changes in living pattern or dietary habits.

JANUARY 1982 BIOASSAY FIELD TRIP TO ENEWETAK ATOLL

From January 9, 1982 to January 16, 1982, members from the Marshall Islands Radiological Safety Program at Brookhaven National Laboratory conducted the third annual bioassay mission to Enewetak Atoll. The purpose of this mission was to define current body burdens of ^{137}Cs, ^{60}Co, ^{207}Bi, ^{90}Sr and ^{239}Pu in the population that currently resides on Enewetak Atoll. During this time, 399 Marshallese were whole body counted; 24-hour urine samples were collected from 310 individuals and consecutive daily urine and fecal samples were obtained from 10 adult males. Participation in the whole-body counting urine and fecal sampling programs was voluntary and restricted to individuals five years of age and older. Greater than 95% of the population participated in the whole body counting, program and approximately 75% of the population provided the requested urine and fecal samples. This report summarizes the results to date. Data obtained from the analysis of urine and fecal samples will be reported under separate cover.

Table 1 is a summary of the population average body burdens for ^{137}Cs, ^{60}Co, ^{207}Bi and potassium. The reported error represents the one sigma standard deviation associated with the mean for each population subgroup. The mean potassium body burden for the adult males has returned to the level determined in the baseline study of 1980. This is important since it may reflect a change in diet or living pattern. All other mean potassium body burdens have remained constant since 1980.

The mean adult male ^{137}Cs body burden has risen to the level observed at Ujelang Atoll in 1980 and represents a factor of two change in the mean body burden during the past year. Individual results have risen to a high of 0.14 μCi in January 1982 in contrast to 0.026 μCi in 1981. This change in the mean adult male ^{137}Cs body burden is associated with consumption of food grown at Enjebi Island. The ^{137}Cs body burden in all other population subgroups has remained the same or declined slightly.

The nuclides ^{207}Bi and ^{60}Co were detected in members of the sample population at levels that are at or near the minimum detection limit (MDL) for the radionuclide (0.6 nCi). Results were reported even if less than 0.6 nCi provided that the one sigma standard deviation due to counting statistics did not exceed the result. This reporting technique will tend to provide less precise information on an individual but will better describe population trends. The nuclide ^{60}Co has been detected in members of each population

subgroup at a constant level in prior years. Because this level is at or near the system MDL it is a conservative estimate of the mean body burden of the population.

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In summary, the most important finding to date was the increase in ^{137}Cs body burdens for members of the adult male population subgroup. The coconut samples and the interviews will provide additional information to further define dietary habits and assist in predicting ^{137}Cs body burdens for future field trips.

TABLE #1

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POPULATION	ISLAND	YEAR	SIZE	^{60}Co (nCi)	SIZE	^{207}Bi (nCi)	SIZE	^{137}Cs (nCi)	SIZE	POTASSIUM (g)
Adult Male	Enewetak	1982	71	0.65 ± 0.25	94	0.76 ± 0.71	129	19 ± 23	129	165 ± 23
	Enewetak	1981	55	0.66 ± 0.26	1	12	110	11 ± 6.1	110	150 ± 22
	Japtan	1980	44	0.56 ± 0.22	--	----------	17	11 ± 4.2	17	170 ± 32
	Enewetak	1980			--	----------	38	13 ± 7.2	38	169 ± 17
	Ujelang	1980			--	----------	75	19 ± 7.2	75	171 ± 25
Adult Female	Enewetak	1982	69	0.63 ± 0.21	75	0.59 ± 0.30	115	5.5 ± 3.8	115	108 ± 16
	Enewetak	1981	48	0.62 ± 0.26	--	----------	105	6.8 ± 3.7	105	103 ± 15
	Japtan	1980	53	0.60 ± 0.20	--	----------	20	8.9 ± 3.8	20	113 ± 26
	Ujelang	1980			--	----------	93	15 ± 5.7	93	105 ± 17
Adolescent Male	Enewetak	1982	--	----------	28	0.49 ± 0.14	44	2.5 ± 1.2	44	77 ± 22
	Enewetak	1981	1	0.53	--	----------	40	2.6 ± 1.4	40	73 ± 22
	Japtan	1980	--	----------	--	----------	1	5.4	1	84
	Ujelang	1980	--	----------	--	----------	36	9.7 ± 3.4	36	78 ± 24
Adolescent Females	Enewetak	1982	9	0.42 ± 0.11	14	0.51 ± 0.16	20	2.4 ± 1.1	20	85 ± 23
	Enewetak	1981	16	0.54 ± 0.20	--	----------	26	3.1 ± 2.2	26	77 ± 19
	Japtan	1980	10	0.54 ± 0.19	--	----------	7	6.0 ± 2.3	7	78 ± 11
	Ujelang	1980			--	----------	21	8.8 ± 2.8	21	71 ± 18

TABLE #1, Continued

POPULATION	ISLAND	YEAR	SIZE	^{60}Co (nCi)	SIZE	^{207}Bi (nCi)	SIZE	^{137}Cs (nCi)	SIZE	POTASSIUM (g)
Juvenile Male	Enewetak	1982	8	0.42 ± 0.091	11	0.44 ± 0.13	39	1.1 ± 0.49	39	48 ± 10
	Enewetak	1981	6	0.52 ± 0.16	--	----------	44	1.5 ± 1.3	44	46 ± 9.8
	Japtan	1980	4	0.40 ± 0.19	--	----------	7	2.6 ± 0.88	7	46 ± 6.7
	Ujelang	1980			--	----------	41	5.6 ± 2.1	41	47 ± 9.6
Juvenile Female	Enewetak	1982	5	0.42 ± 0.01	16	0.42 ± 0.084	53	1.1 ± 0.41	53	48 ± 9.1
	Enewetak	1981	8	0.47 ± 0.25	--	----------	51	1.4 ± 0.93	51	43 ± 7.9
	Japtan	1980	3	0.47 ± 0.20	--	----------	7	2.6 ± 1.4	7	41 ± 8.1
	Ujelang	1980			--	----------	39	5.2 ± 1.9	39	45 ± 8.4

TABLE #2

DIETARY AND TRAVEL INFORMATION OBTAINED FROM PRIVATE INTERVIEWS

ID #	1982 ^{137}Cs BODY BURDEN (nCi)	TRIPS TO ENJEBI					NUMBER OF COCONUTS INGESTED PER TRIP		OTHER FOOD INGESTED
		AUG	SEPT	OCT	NOV	DEC	MEAT	MILK	
1035	20	X	-	-	-	-	None	2	None
1035	20	-	-	-	-	X	None	5	None
1173	23	-	-	-	-	X	None	7	None
2196	16	-	-	-	X	-	Unknown	Unknown	None
2064	27	-	-	-	-	X	5	5	None
2080	27	-	-	-	-	X	4	4	None
1026	19	-	-	-	X	-	1	1	None
	18	-	-	-	-	X	4	4	None
1348	76	-	-	-	X	-	10	10	None
1340	26	-	-	-	-	X	None	None	Eggs & Turn
1056	120	-	-	X	X	X	3	3	None
2152	136	-	-	-	X	X	1	1	None
1094	106	-	-	-	-	X	10	10	None
1192	73	-	X	X	X	X	Unknown	Unknown	None
2143	46	X	-	-	-	-	1	0	None
1226	43	(7 trips prior to Oct)			X	X	Unknown	Unknown	None
2147	30	Dates Unknown					1	3	None
1045	34	-	-	X	-	-	5	0	None
1045	34	-	-	-	X	-	0	5	None
1348	76	-	-	-	-	X	10	10	None

TABLE #3

LIST OF INDIVIDUALS WHOSE ^{137}Cs BODY BURDEN EXCEEDED 75% OF 1981 RESULTS

ID #	SEX	AGE	1982 ^{137}Cs BODY BURDEN nCi	ID #	SEX	AGE	1982 ^{137}Cs BODY BURDEN nCi
2041	M	29	40	1173	M	41	23
1156	M	37	26	2182	F	22	25
2227	M	27	23	2064	M	47	28
2079	M	28	90	1097	M	23	23
1007	M	41	25	1220	M	31	31
1059	M	29	39	2080	M	21	27
1308	M	23	83	1239	M	26	88
1112	M	33	73	1229	M	49	24
2074	M	38	44	1181	M	29	45
2097	M	25	42	2263	M	21	31
2071	M	20	32	2050	M	46	38
1054	M	33	35	1340	F	20	26
1004	M	46	37	1047	M	56	20
1078	M	26	33	1348	M	21	76
2117	M	35	22	1035	M	27	20
1056	M	22	120				
2152	M	29	136				
2141	M	28	24				
1094	M	34	106				
2143	M	26	46				
1266	M	26	43				
2147	M	31	30				
1045	M	28	34				

TABLE # 4

AGE DISTRIBUTION OF POPULATION TRAVELING TO ENJEBI

AGE GROUP	NUMBER OF INDIVIDUALS
20-29	23
30-39	8
40-49	6
Over 50	1

TABLE #5

^{137}Cs IN COCONUTS COLLECTED FROM LLNL GARDEN

SAMPLE #	MASS (g)	^{137}Cs ACTIVITY (μCi)	^{137}Cs CONE (μCi/g)
1	472	0.078	1.6×10^{-4}
2	841	0.054	6.4×10^{-5}
3	1193	0.12	1.0×10^{-4}
Ave	835	0.083	1.1×10^{-4}

TABLE #6

QUALITY ASSURRANCE REPLICATE RESULTS

ID #	^{137}Cs (nCi)	POTASSIUM (g)	RATIO 1st ^{137}Cs/2nd ^{137}Cs	RATIO 1st K/2nd K
1302	3.9	100	1.1	0.93
	3.5	108		
2206*	14	175	1.0	0.89
	14	197		
1234*	7.7	186	1.04	0.99
	7.4	187		
2173	2.0	58		
	1.9	52	1.05	1.1
2153	5.6	98	0.90	0.91
	6.2	108		
2185*	1.3	41	0.72	0.75
	1.8	55		
1093*	8.1	147	0.89	0.84
	9.1	175		
2136	3.9	80	0.85	1.05
	4.6	76		
1173*	26	152	1.13	0.96
	23	159		
1035*	22	167	1.1	0.86
	20	194		
2235*	4.5	104	1.25	0.94
	3.6	111		
2222*	10	117	1.0	0.91
	10	128		
2050*	38	187	1.27	1.03
	30	181		

TABLE #6, Continued

ID #	^{137}Cs (nCi)	POTASSIUM (g)	RATIO 1st ^{137}Cs/2nd ^{137}Cs	RATIO 1st K/2nd K
2228*	25	195	1.09	0.99
	23	196		
2046*	18	170	1.06	0.99
	17	172		
1070*	11	190	1.0	1.02
	11	187		
1303	4.8	109	1.0	1.08
	4.8	101		
1079	3.6	102	1.03	1.02
	3.5	100		
1134	14	176	1.17	0.99
	12	177		
1142	2.0	119	0.83	1.02
	2.4	117		
PROGRAM SUMMARY				
N			20	20
$\bar{X}$			1.0	0.96
σ			0.14	0.09
STANDARD ERROR			0.03	0.02
REPLICATE COUNTED ON SAME SYSTEM				
N			8	8
$\bar{X}$			0.99	1.01
σ			0.12	0.07
STANDARD ERROR			0.05	0.03
REPLICATE COUNTED ON DIFFERENT SYSTEM				
N			12	12
$\bar{X}$			1.05	0.93
σ			0.15	0.08
STANDARD ERROR			0.04	0.03

Enclosure 3
(2 of 2 parts)

BROOKHAVEN NATIONAL LABORATORY
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Safety & Environmental Protection Division

(516) 282-4250
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November 8, 1982

Mr. Roger Ray
Deputy for Pacific Operations
Department of Energy
Nevada Operations Office
P.O. Box 14100
Las Vegas, NV 89114

Dear Roger:

I am enclosing the July 1982 Field Trip Report and a computer printout of individual body-burden data. The report is a summary of our activities and a commentary on the grouped data resulting from the July bioassay mission.

The computer printout is a compilation of historical and up-to-date direct whole-body counting data on the Rongelap people. The individual data are arranged alphabetically and grouped according to sex and age. This report and printout document recent results of the Marshall Islands Radiological Safety Program.

If you have any questions, please do not hesitate to call.

Sincerely,

Edward T Lessard

Edward T. Lessard
Program Director
Marshall Islands Radiological
Safety Program

ETL/cc

cc: B. Adams
J. W. Baum
C. B. Meinhold
T. McCraw

JULY 1982 FIELD TRIP REPORT

Brookhaven National Laboratory has continuously monitored the radiological status of persons inhabiting areas in the Marshall Islands which were contaminated by fallout from Pacific nuclear testing. As part of this monitoring a whole-body counting, urine, breast milk, and fecal sampling program was performed during July 1982. Biossay data were obtained (see Table One) from the residents of Rongelap Atoll, the former residents of Bikini Atoll and from unaffected individuals at Majuro Atoll who volunteered to be part of a comparison population. Effective dose equivalent assessments for inhabitants of this region are to be made based on these data and prior measurements.

The attached computer printout forms contain the directly measured body-burden data for Cs-137, K 39-41, Co-60 and Bi-207 obtained in July 1982. Historic body burdens of gamma-emitting nuclides are also included. Participants in the whole-body counting program included persons above five years of age. Gamma emitters were detected by using a chair-geometry whole-body counter, a computer-based multichannel analyzer, and a Sodium Iodide detector. The spectra from the whole-body counting measurements were stored on magnetic disks and are retained at the Laboratory. A complete body-burden history was given to each person after verification of the current whole-body count. Whole-body counting results from this trip have been verified and were entered into the computerized body-burden data base. The tables showing individual body burdens were generated from this data base. Replicate counting, point-source counting, background measurements and other quality control measures were made to ensure proper calibration of the system, and to facilitate the interpretation of spectra.

The average adult male Rongelap body-burden for Cs-137 rose 56% from 6.7KBq (0.18 μCi) to 10KBq (0.28 μCi) during the interval July 1981 to June 1982. The mean adult female Cs-137 body burden increased 11% from 6.9KBq (0.19 μCi) to 7.1KBq (0.21 μCi); the male adolescent body burden remained at 6.3KBq (0.17 μCi); the female adolescent body burden decreased 15% from 9.3KBq (0.25 μCi) to 8.1KBq (0.22 μCi); for male children it increased 9% from 4.0KBq (0.11 μCi) to 4.4KBq (0.12 μCi) and for female childen it increased 82% from 3.5KBq (0.093 μCi) to 6.3KBq (0.17 μCi). Overall, the population exhibited a 1.8% per month rise in Cs-137 body burden during the July 1981 to June 1982 interval. This follows an apparently constant body burden (0.0% per month rise) of Cs-137 during the previous twenty four month interval, August 1979 to August 1981 and a constant declining body burden from the early 1960's until 1979 (see Graph One). This recent increase may have resulted from the relaxing of restrictions to the northern islands of Rongelap Atoll as a source of coconuts and coconut crabs. A summary of the Rongelap Atoll residents' June 1982 average Cs-137 body burden is given in Table Two.

The effective dose equivalent rate on July 10, 1982 from gamma emitters was estimated for various average body masses (see Table Three) for persons residing at Rongelap Atoll. These body masses represent the mean body mass of the adult, adolescent, and juvenile groups. The nuclide Cs-137 contributes the greatest portion of the total effective dose equivalent rate. The effective dose equivalent rate from Co-60 and Bi-207 was estimated to be less than 5×10^{-6} Sv a^{-1} (0.5 mrem per year) and was based on the minimum detection limit of the direct whole-body counting system. The net (natural background subtracted) external effective dose-equivalent rate is also reported in Table

Three. These data were collected during the August 1981 Field trip to Rongelap and have been modified to accurately reflect the typical living pattern of the population at Rongelap Atoll.

The effective dose-equivalent rate from internal Cs-137 increases as body mass decreases (see Table Three). This occurs because the increase in specific activity which results when body mass decreases more than offsets the decline in the amount of photon energy absorbed by the body. This effect, is most pronounced in the infant. Studying the diet of the infant and measuring Cs-137 activity in breast milk will provide information to determine the dose equivalent for persons too young to participate in the personnel monitoring program. Recent results for current and previously collected breast milk samples are summarized in Table Four. The consistent ratio between activity in breast milk and body burden will allow assessment of infant's Cs-137 dose equivalent based on historic body-burden data for the mother.

An assessment of the 1982 annual committed effective dose equivalent at Rongelap Atoll is given for the average adult in Table Five. The activity intake data for Sr-90, Fe-55, and Co-60 were based on extropolation of prior body-burden and urine anlayses data, and a mathematical model describing the declining continuous intake pattern which was exhibited in the Rongelap population prior to 1981. Bi-207 activity was below our minimum detection limits, thus, the impact on total committed effective dose equivalent is insignificant. The intake for Cs-137 was based on the 1981 and 1982 field measurements and a mathematical model for increasing continuous intake. The total effective dose equivalent of 6.1×10^{-4} Sv (61 mrem) for the calendar year 1982 is less than the 5×10^{-3} Sv (500 mrem) annual limit recommended by the International Commission on Radiological Protection (ICRP Publication 26)

for individual members of the general public. The highest individual adult committed effective dose equivalent (ID #1180) was estimated to be 1.4×10^{-3} Sv (140 mrem) during the calendar year 1982.

The validity of the Pu-239,240 data used to estimate the body burden at Rongelap Atoll in 1973 had been considered previously by an ad hoc committee of the Energy Research and Development Agency. The committee concluded that, because of the possibility of contamination of the urine and fecal samples, the data were uncertain. To determine the extent of sample contamination and to estimate a background level of Pu in these samples, urine and fecal samples were collected during the July 1982 field trip from two groups of persons not living on contaminated atolls. The former Bikinians provided samples for these studies as did some current residents of Majuro Atoll. Collections at Rongelap will provide an estimate of body burden during 1981 and 1982 and allow assessment of the effective dose equivalent since rehabitation of the atoll in 1957. The long mean residence time of Pu-239,240 in the body will allow for assessment of effective dose equivalent to the former Bikini residents while living at Bikini Atoll based on the analysis of recently collected samples.

The Cs-137 body burden of the former Bikini Atoll residents is now statistically indistinguishable from the comparison population values obtained at Majuro Atoll (see Table Two). The former Bikini residents have the lowest Cs-137 population body burden (see Graph Two) out of the four atoll populations currently under study. The increasing Cs-137 body burdens at Rongelap, Utirik and Enewetak imply that local phenomena influenced the elevation of Cs-137 in the diet. The observed decline in the former Bikinian body burdens was anticipated based on the value for the long-term biological turnover rate constant for Cs-137.

The elevation of Cs-137 in the Rongelap population indicates increased use of the northern islands and the potential body burden from this source may be anticipated to rise over the next several years. At Rongelap Atoll, the northern island Naen is some 20 to 30 times more contaminated with Cs-137 relative to the inhabited southern island, Rongelap. The mean exposure rate at Naen Island is currently similar to that observed at Rongelap Island shortly after rehabitation in 1957. Assuming the unlikely event of heavy dependence on the northern islands for food, one might anticipate the adult mean body burdens rising to about 18KBq (0.5 μCi) over the next year or so. A maximum of 53KBq (1.5 μCi) might be anticipated in any single indiviudal. It is more probable that the eastern, southern and northeastern islands will continue to be used for food production and if the northern islands are included, the overall result may be an increase in the adult mean body burden to perhaps 11KBq (0.3 μCi). These estimates on the future adult body burdens of Cs-137 are based on extrapolation of direct body burden measurements. This method is not very accurate beyond about a year after the last measurement and is subject to variation which is directly related to the daily intake of radioactive material.

Tables Six and Seven contain quality control results related to the precision and accuracy of the whole-body counting system. The accuracy of the whole-body count for Cs-137 was estimated to be about plus or minus 10% based on point source counting. The precision was within plus or minus 10% based on replicate counts. Whole body counts for Cs-137 above the minimum detection limit and for K39-41 were used to estimate precision (see Table Seven). The comparison between results from system one or system two was also determined

to be within plus or minus 10%. Variation in accuracy was largely due to the variation in the positioning of the point source relative to the standard geometry used for the computer analysis. Variation in background also affected the measurements.

Table One

July 1982 Survey Summary

Description	Number of Samples	Analyses	Status
Whole Body Counts	329	Gamma scans for fission and activation products, and naturally occuring nuclides.	Results enclosed
Urine Samples	237	Gamma scans same as above, radiochemical analyses for Pu-239,240.	Results in approximately one year
Fecal Samples	14	Gamma scans and radiochemical analyses same as above.	Results in approximately one year
Milk Samples	3	Gamma scans, radiochemical and elemental analyses	Results enclosed

Table Two

July 1982 Field Trip Results - Average Cs-137 and K39-41 Whole-Body Counting Data

Population Grouping	Age Group	Sex	Number Group	Body Burden Mean ± 1 S.E.		
				Cs-137 (Bq)	Cs-137 (μCi)	K39-41 (g)
Rongelap	≥16	M	29	$1.0\times10^{4}\pm1.0\times10^{3}$	$2.8\times10^{-1}\pm2.7\times10^{-2}$	$1.3\times10^{2}\pm5.4\times10^{0}$
Rongelap	≥16	F	18	$7.8\times10^{3}\pm9.3\times10^{2}$	$2.1\times10^{-1}\pm2.5\times10^{-2}$	$8.5\times10^{1}\pm6.6\times10^{0}$
Rongelap	11-15	M	12	$6.3\times10^{3}\pm9.6\times10^{2}$	$1.7\times10^{-1}\pm2.6\times10^{-2}$	$7.5\times10^{1}\pm3.5\times10^{0}$
Rongelap	11-15	F	7	$8.1\times10^{3}\pm1.7\times10^{3}$	$2.2\times10^{-1}\pm4.6\times10^{-2}$	$8.4\times10^{1}\pm7.2\times10^{0}$
Rongelap	<11	M	16	$4.4\times10^{3}\pm7.4\times10^{2}$	$1.2\times10^{-1}\pm2.0\times10^{-2}$	$5.1\times10^{1}\pm2.3\times10^{0}$
Rongelap	<11	F	9	$6.3\times10^{3}\pm1.1\times10^{3}$	$1.7\times10^{-1}\pm3.1\times10^{-2}$	$5.2\times10^{1}\pm4.2\times10^{0}$
Former Bikinian	≥16	M	77	$2.1\times10^{2}\pm1.3\times10^{1}$	$5.8\times10^{-3}\pm3.5\times10^{-4}$	$1.5\times10^{2}\pm3.0\times10^{0}$
Former Bikinian	≥16	F	42	$1.3\times10^{2}\pm1.9\times10^{1}$	$3.5\times10^{-3}\pm5.0\times10^{-4}$	$1.2\times10^{2}\pm3.6\times10^{0}$
Former Bikinian	11-15	M	9	$5.6\times10^{1}\pm6.7\times10^{0}$	$1.5\times10^{-3}\pm1.8\times10^{-4}$	$1.2\times10^{2}\pm9.0\times10^{0}$
Former Bikinian	11-15	F	8	$6.7\times10^{1}\pm9.6\times10^{0}$	$1.8\times10^{-3}\pm2.6\times10^{-4}$	$1.0\times10^{2}\pm1.4\times10^{1}$
Former Bikinian	<11	M	15	$4.1\times10^{1}\pm7.4\times10^{0}$	$1.1\times10^{-3}\pm2.0\times10^{-4}$	$6.2\times10^{1}\pm3.9\times10^{0}$
Former Bikinian	<11	F	17	$4.1\times10^{1}\pm6.3\times10^{0}$	$1.1\times10^{-3}\pm1.7\times10^{-4}$	$5.5\times10^{1}\pm4.1\times10^{0}$
Comparison Majuro	≥16	M	11	$1.6\times10^{2}\pm3.6\times10^{1}$	$4.2\times10^{-3}\pm9.6\times10^{-4}$	$1.6\times10^{2}\pm6.0\times10^{0}$
Comparison Majuro	≥16	F	6	$1.1\times10^{2}\pm1.6\times10^{1}$	$3.1\times10^{-3}\pm4.4\times10^{-4}$	$1.0\times10^{2}\pm5.5\times10^{0}$
Comparison Majuro	11-15	M	9	$5.9\times10^{1}\pm1.6\times10^{1}$	$1.6\times10^{-3}\pm4.2\times10^{-4}$	$7.0\times10^{1}\pm4.7\times10^{0}$
Comparison Majuro	11-15	F	11	$4.8\times10^{1}\pm9.3\times10^{1}$	$1.3\times10^{-3}\pm2.5\times10^{-4}$	$6.7\times10^{1}\pm4.8\times10^{0}$
Comparison Majuro	<11	M	13	$4.1\times10^{1}\pm7.4\times10^{0}$	$1.1\times10^{-3}\pm2.0\times10^{-4}$	$5.2\times10^{1}\pm4.1\times10^{0}$
Comparison Majuro	<11	F	8	$4.1\times10^{1}\pm7.4\times10^{0}$	$1.1\times10^{-3}\pm2.0\times10^{-4}$	$5.5\times10^{1}\pm5.7\times10^{0}$
Former Rongelap at Jabor	10-68	M&F	9	$5.6\times10^{1}\pm1.1\times10^{1}$	$1.5\times10^{-3}\pm3.0\times10^{-4}$	$9.4\times10^{1}\pm7.3\times10^{0}$
Former Rongelap at Majuro	39-68	M&F	3	$1.1\times10^{3}\pm7.0\times10^{2}$	$2.9\times10^{-2}\pm1.9\times10^{-2}$	$1.5\times10^{2}\pm3.1\times10^{1}$

Table Three

Estimate of Mean Effective Dose Equivalent Rate From Photon Emitters at Rongelap Atoll

Man-Made Source of Irradiation	Male Effective Dose-Equivalent Rate On July 10, 1982 - Sv y^{-1} (mrem y^{-1})			Female Effective Dose-Equivalent Rate On July 10, 1982 - Sv y^{-1} (mrem y^{-1})		
	67 Kg	34 Kg	22 Kg	59 Kg	38 Kg	22 Kg
Internal Cs-137	3.8×10^{-4} (38)	4.2×10^{-4} (42)	4.0×10^{-4} (40)	3.2×10^{-4} (32)	4.9×10^{-4} (49)	5.7×10^{-4} (57)
Internal Co-60	$<5 \times 10^{-6}$ (<0.5)	$<5 \times 10^{-6}$ (<0.5)	$<5 \times 10^{-6}$ (<0.5)	$<5 \times 10^{-6}$ (<0.5)	$<5 \times 10^{-6}$ (<0.5)	$<5 \times 10^{-6}$ (<0.5)
Internal Bi-207	$<5 \times 10^{-6}$ (<0.5)	$<5 \times 10^{-6}$ (<0.5)	$<5 \times 10^{-6}$ (<0.5)	$<5 \times 10^{-6}$ (<0.5)	$<5 \times 10^{-6}$ (<0.5)	$<5 \times 10^{-6}$ (<0.5)
Net External Exposure	1.5×10^{-4} (15)	1.5×10^{-4} (15)	1.5×10^{-4} (15)	1.5×10^{-4} (15)	1.5×10^{-4} (15)	1.5×10^{-4} (15)

Table Four

Breast Milk ^{137}Cs Results From 1981 & 1982 Field Trips

Sample ID	Volume ml	Collection Date	1st ^{137}Cs Result µCi/ml	2nd ^{137}Cs Result µCi/ml	Result µCi/ml	^{137}Cs Body Burden µCi	Ratio Breast Milk to Body Burden ml^{-1}
5044	10	7/81	6.9×10^{-7} ±13%	5.4×10^{-7} ±19%	6.2×10^{-7}	0.251	2.4×10^{-6}
911	10	7/81	4.4×10^{-7} ±19%	4.1×10^{-7} ±21%	4.3×10^{-7}	0.17	2.5×10^{-6}
92	10	7/81	1.2×10^{-6} ±10%	1.1×10^{-6} ±11%	1.2×10^{-6}	0.23	5.2×10^{-6}
5057	10	7/81	4.55×10^{-7} ±18%	4.6×10^{-7} ±22%	4.6×10^{-6}	0.13	3.5×10^{-6}
2316	10	7/81	3.1×10^{-7} ±36%	2.7×10^{-7} ±28%	2.9×10^{-7}	0.077	3.8×10^{-6}
5035	5	7/81	< MDL	4.6×10^{-7} ±13%	4.6×10^{-7}	0.092	5.0×10^{-6}
5025	10	7/81	2.9×10^{-7} ±25%	2.4×10^{-7} ±23%	2.7×10^{-7}	0.084	3.2×10^{-6}
1044	10	7/81	4.2×10^{-7} ±18%	3.3×10^{-7} ±23%	3.8×10^{-7}	0.094	4.0×10^{-6}
5037	10	7/81	< MDL	2.5×10^{-7} ±41%	2.5×10^{-7}	0.072	3.5×10^{-6}
3532	10	7/81	1.3×10^{-7} ±56%	< MDL	1.3×10^{-7}	0.075	1.7×10^{-6}
5034	5	7/81	< MDL	< MDL	< MDL	0.010	-
6062	15	7/82	< MDL	< MDL	< MDL	0.0042	-
6151	7	7/82	< MDL	< MDL	< MDL	0.0015	
None	9.5	7/82	< MDL	< MDL	< MDL	No data	-

MDL = 2.6×10^{-6} µCi

1 µCi = 3.7×10^{4}

Table Five

Estimate of Total Annual Committed Effective Dose

Equivalent At Rongelap Atoll During 1982

Man-Made Source of Radiation	Adult Average Activity Intake During 1982 Bq (μCi)	Adult Average Committed Effective Dose Equivalent Sv (mrem)	Adult Average Body Burden Estimate January 1, 1982 Bq (μCi)	Adult Average Body Burden Estimate December 31, 1982 Bq (μCi)
Internal Cs-137	3.3×10^{4} (8.9×10^{-1})	4.5×10^{-4} (4.5×10^{1})	7.4×10^{3} (2.0×10^{-1})	1.1×10^{4} (3.0×10^{-1})
Internal Sr-90	1.6×10^{2} (4.2×10^{-3})	5.6×10^{-6} (5.6×10^{-3})	9.4×10^{1} (2.6×10^{-3})	8.9×10^{1} (2.4×10^{-3})
Internal Fe-55	1.4×10^{3} (3.8×10^{-2})	2.2×10^{-7} (2.2×10^{-2})	8.6×10^{2} (2.3×10^{-2})	6.7×10^{2} (1.8×10^{-2})
Internal Co-60	3.8×10^{-5} (1.0×10^{-9})	2.7×10^{-13} (2.7×10^{-8})	4.2×10^{-2} (1.1×10^{-6})	2.7×10^{-2} (7.3×10^{-7})
Internal Bi-207	ID	$<5.10^{-6}$ (<0.5)	$<7.4\times10^{1}$ ($<2.0\times10^{-3}$)	$<7.4\times10^{1}$ ($<2.0\times10^{-3}$)
Internal Pu 239,240	ID	ID	ID	ID
Net External Exposure	-	1.5×10^{-4} (15)	-	-
Total Man-Made	-	6.1×10^{-4} (61)	-	-

ID = Insufficient Data

Table Six

July 1982 Quality Control Point Source Counting

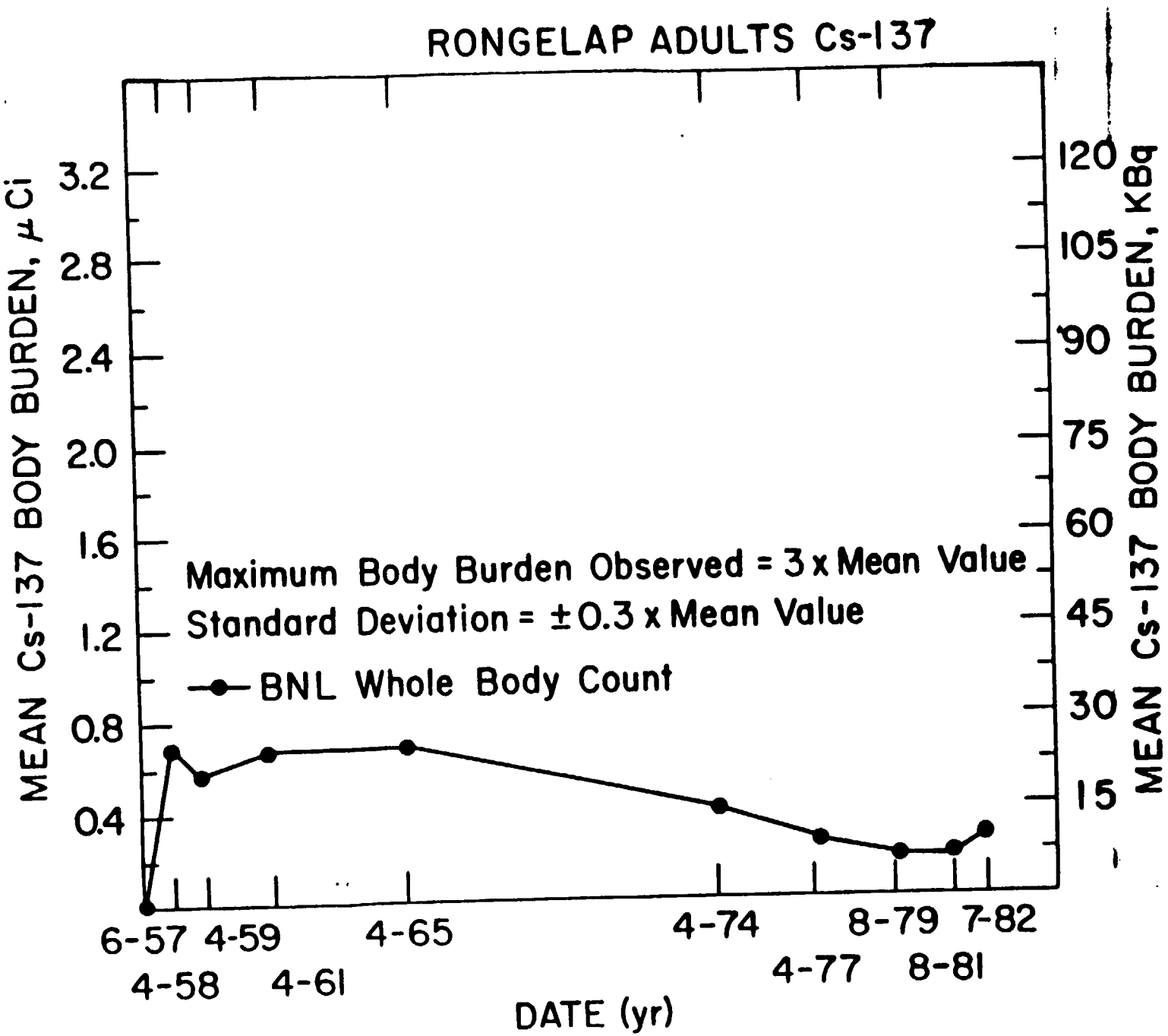
Date	Time	System No.	Activity μCi±1σ
7-04-82	1632	1	$9.9\pm1.7\times10^{-2}$
7-05-82	0838	1	$9.8\pm1.6\times10^{-2}$
7-07-82	1200	1	$10\pm1.6\times10^{-2}$
7-07-82	1715	1	$8.8\pm6.6\times10^{-3}$
7-08-82	0830	1	$9.5\pm1.6\times10^{-2}$
7-08-82	1302	1	$10\pm1.6\times10^{-2}$
7-11-82	0845	1	$9.1\pm1.5\times10^{-2}$
7-11-82	2030	1	$9.8\pm1.5\times10^{-2}$
7-12-82	2030	1	$9.7\pm1.5\times10^{-2}$
7-13-82	1104	1	$9.4\pm1.5\times10^{-2}$
7-14-82	0829	1	$8.7\pm1.5\times10^{-2}$
7-16-82	0810	1	$9.5\pm1.5\times10^{-2}$
7-04-82	1500	2	$10\pm6.3\times10^{-3}$
7-05-82	1000	2	$10\pm6.0\times10^{-3}$
7-07-82	0851	2	$8.2\pm1.4\times10^{-2}$
7-07-82	1725	2	$8.4\pm6.4\times10^{-3}$
7-08-82	0759	2	$9.3\pm1.5\times10^{-2}$
7-08-82	1020	2	$9.1\pm1.5\times10^{-2}$
7-08-82	1305	2	$9.1\pm1.5\times10^{-2}$
7-08-82	1440	2	$9.2\pm1.5\times10^{-2}$
7-11-82	0855	2	$9.1\pm1.5\times10^{-2}$
7-11-82	2000	2	$8.3\pm1.4\times10^{-2}$
7-12-82	2000	2	$8.6\pm1.5\times10^{-2}$
7-13-82	1010	2	$8.8\pm1.5\times10^{-2}$
7-14-82	0830	2	$8.8\pm2.1\times10^{-2}$
7-15-82	0845	2	$8.9\pm1.5\times10^{-2}$
7-16-82	0815	2	$8.7\pm1.5\times10^{-2}$
Mean ± Mean σ			$9.2\pm1.4\times10^{-2}$
Standard Error			11%

Table Seven

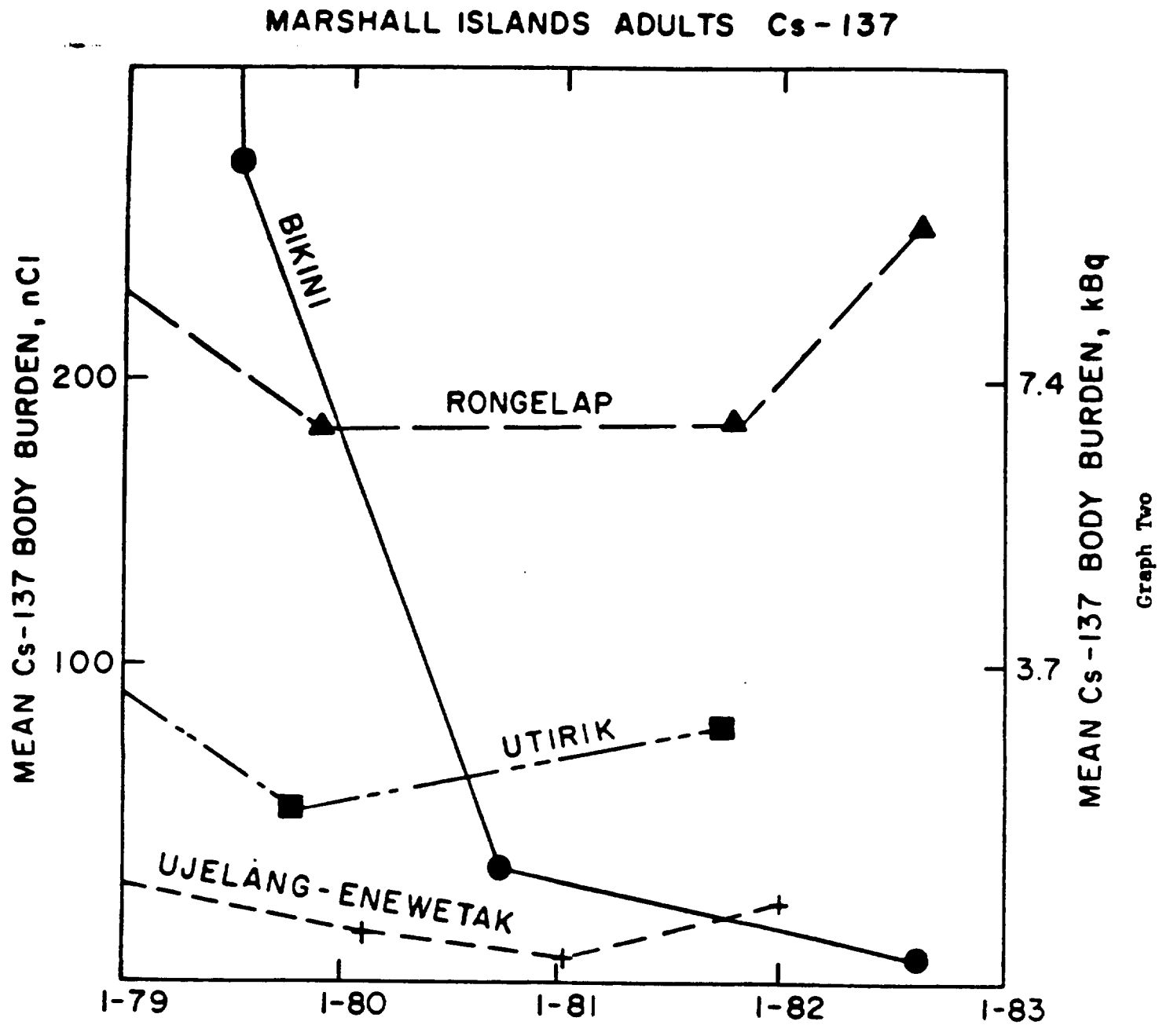
July 1982 Quality Control Replicate Counting

Name	Date	System No.	Ratio 1st ^{137}Cs/2nd ^{137}Cs	Ratio 1st K/2nd K
M.T. Ryan	7-5-82	1	MDL	1.1
M.T. Ryan	7-5-82	2	MDL	
S.V. Musolino	7-5-82	1	MDL	1.04
S.V. Musolino	7-5-82	1		
S.V. Musolino	7-5-82	1	MDL	1.01
S.V. Musolino	7-5-82	2		
E.T. Lessard	7-7-82	1	MDL	1.06
E.T. Lessard	7-15-82	2		
A. Leviticus	7-11-82	1	0.907	1.02
A. Leviticus	7-11-82	1		
J. Harper	7-12-82	1	MDL	0.99
J. Harper	7-13-82	1		
M.T. Ryan	7-5-82	1	MDL	1.03
M.T. Ryan	7-12-82	1		
E. Jibas	7-11-82	2	1.1	0.94
E. Jibas	7-11-82	2		
Winnie	7-7- 2	1	1.0	0.86
Winnie	7-7-82	2		
Randy	7-7-82	1	1.0	0.987
Randy	7-7-82	2		
Mean			1.0	1.0
Standard Deviation			7.9%	6.7%

MDL = Minimum Detection Limit


RONGELAP ADULTS Cs-137
MEAN Cs-137 BODY BURDEN, μCi
MEAN Cs-137 BODY BURDEN, KBq
3.2
2.8
2.4
2.0
1.6
1.2
0.8
0.4
120
105
90
75
60
45
30
15
Maximum Body Burden Observed = 3 x Mean Value
Standard Deviation = ±0.3 x Mean Value
BNL Whole Body Count
6-57
4-58
4-59
4-61
4-65
4-74
4-77
8-79
8-81
7-82
DATE (yr)

Graph One


MARSHALL ISLANDS ADULTS Cs-137
MEAN Cs-137 BODY BURDEN, nCi
MEAN Cs-137 BODY BURDEN, kBq
200
100
7.4
3.7
BIKINI
RONGELAP
UTIRIK
UJELANG-ENEWETAK
1-79
1-80
1-81
1-82
1-83

Graph Two

Department of Energy
Nevada Operations Office
P.O. Box 14100
Las Vegas, NV 89114-4100

January 26, 1983

Mr. James DeFrancis
Principal Deputy Assistant Secretary, CP-2
U.S. Department of Energy
Washington, D.C.

Dear Jim:

I refer to a memorandum to you from Tom McCraw dated December 16, 1982:

> Meeting on DOE/EP Northern Marshalls Survey - Majuro Atoll,
> December 8-9, 1982

Since I was not on distribution for this memorandum it was almost a month after it was issued before it came to my attention. Before responding to it I felt it necessary to have at hand the verbatim transcript (from tape) which was then in preparation. I now have that transcript and have had a chance to review Mr. McCraw's impressions and recollections. Preparation for our meeting last week and for my travel to the Pacific today, however, have kept me from developing a detailed response--something which I most assuredly intend to do.

What I ask at this time is that you reserve judgement upon the Majuro meetings until you can be presented with a factual account and an analysis-in-context of what actually was said.

I can tell you at this time that, after a careful reading of the transcript, there is no substantive change that I would make in my statements or those of Drs. Bair and Robison. Nor do I believe that either of these latter two would substantially change any statement of theirs or mine. Mr. McCraw made no substantive statements. We neither made nor advocated any change in Department policy, nor do I acknowledge that I made statements "not compatible with past policy," as alleged. As to the alleged confusion on the part of our Marshallese hosts I would say that if there were not some confusion it would suggest that we were not communicating effectively. I have never yet attended a public meeting on radiation matters where the complexity of the subject did not evoke some degree of confusion and concern. I will, however, offer two direct quotes from the transcript, the first from a member of the parliament (addressed to me):

Note: This ... in context ... does.

> "I really feel that we can now ask things that we want to know and feel comfortable, we want to build on this relationship of sharing information with each other. What we know we tell you, what you know you tell us. What we don't know we admit to that, on both sides, so I am really thankful for the opportunity to ask this of you and if you don't know the answer would you convey it where it should go, be our voice in asking."

and the second from the closing remarks of the Chief Secretary:

> "On behalf of the President who is not here or the Acting President, I ought to express our extreme graditude and sincere thanks for the teams coming, presenting us with this information from the study made and your report at this time to this group. Especially grateful for this kind of setting we are able to sit down face to face, discuss these matters, raise questions and get answers or at least have them raised so the answers can be forthcoming eventually in the future. We are encouraged by such a gathering and are grateful to have had this."

I conscientiously believe that the Majuro meetings of December 8-9 were constructive, honest, consistent with DOE and overall U.S. Government policy and well received by the Republic of the Marshall Islands. As party leader, I have a responsibility to provide a complete and factual record of that expedition. That is in preparation, and I am quite willing to have our actions judged on that record.

Sincerely,

Roger Ray

Roger Ray, Deputy for
Pacific Operations

cc:
D. E. Patterson, USDOE, (EP-32) GTN
B. Wachholz, USDOE, (EP-32) GTN
B. Siebert, USDOE, (DP-3.1) GTN
J. Thiessen, USDOE, (ER-71) GTN
A. Fingeret, USDOE, (GC-23) FORSTL
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