

9/21/84

DRAFTSTAFF COMMENTS

1. There are three populations in the MI's that have been overexposed. Some doses were very high.
2. US H&S standards apply in the Marshalls.
3. We have underestimated Bikini resettlement doses repeatedly using dose models and at time when it was necessary to have reliable estimates for resettlement decisions. PE staff believe that this experience does not justify statements that DOE has a high degree of confidence in its technical data nor can there be such confidence in exposure predictions using dose models.
4. Dietary restrictions did not work at Bikini Island. It is our view that such restrictions and imported food will also not achieve any significant reduction in the major source of exposure, namely the use of coconuts products, at Eneu Island.
5. PE staff believe that any resettlement of Eneu Island will result again in the Bikini residents exceeding current radiation protection standards. We recommend no resettlement.
6. The failure to continually reinforce the restriction on use of coconut crabs at Rongelap, and the advice that the people should make their own decisions, has brought confusion and higher exposures. PE staff support the recommendation of a total ban on use of any terrestrial food from the northern islands of Rongelap.
7. PE staff do not support the practice of providing risk estimates to the Marshallese for the purpose that these people will be expected to make their own radiation protection judgments and decisions. This is not a valid radiation protection practice.
8. Considering that the Bikini people have already been over exposed, it is even more important to apply a conservative radiation protection standard to plan any future resettlement of Eneu Island. 500 mrem/yr is not acceptable for this purpose. Once in equilibrium with the environment, there will be a chronic exposure on Eneu Island that changes little from year to year. We recommend use of the ICRP-39 100 mrem/yr, for the individuals with the highest exposures.
9. Finally, problems with Pu-239 body burden data could be serious. We do not have reliable estimates of the dose commitments for Pu in these groups. More data is due in December. It is our view that no recommendation or interpretation of radiological conditions in Marshalls can be made until the Pu problem is resolved.

*John Rudolph's Files E.H.*  
*Marshall Islands Bikini*  
*Resettlement*  
*Box 15 of 18*

U.S. DEPARTMENT OF ENERGY  
CORRESPONDENCE CONTROL FORM  
OFFICE OF THE EXECUTIVE SECRETARY

ACTIVITY ADD DO NOT DETACH FROM ORIGINAL CORRESPONDENCE 15:32  
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SPEC INT: \_\_\_\_\_ CONTROL NO: ESB4-008603  
DATE CORR: 07/05/84 DATE RECD: 07/10/84 DATE CNTRL: 07/10/84 DATE DUE: 07/17/84  
LETTER: X MEMO:    TWX:    OTHER:    TO: SECY: X DEP SEC:    UN SEC:    OTHER:   

FROM: CLARK, WILLIAM 0  
DEPARTMENT OF THE INTERIOR

REMARKS:

SUBJ: PUBLIC INFORMATION  
EXTENSION SERVICE  
RELOCATION OF PEOPLE OF BIKINI  
TO ENEU ISLAND

FOR USE BY ACTION OFFICE ONLY			
ACTION REFERRED TO	DATE	RETURN TO	DEL. DATE
1			
2			
3			

ACTION TO: OSE/DEROCCO TYPE ACTION: Prepare final reply SIG OF: S  
CONCURRENCE CP/60  
INFORMATION'S DS OS/GJELDE DS/PEARLMAN PE CP/1 CP/2 MA/29 DD-2 DP/Gilber  
FILE CODE: FDDOI-ESB4008603 CONTROL ANALYST: Nancy Laverty, SOE

ALL DOCUMENTS FOR OSE PRINCIPALS  
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MA-293

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THE SECRETARY OF THE INTERIOR  
WASHINGTON

July 5, 1984

The Honorable Donald P. Hodel  
Secretary of Energy  
Washington, D.C. 20585

Dear Mr. Secretary:

The Compact of Free Association, which the President transmitted to the Congress on March 30, 1984, will provide the means of terminating the United States' trusteeship in the Marshall Islands. In the short time that remains before the termination of the Trusteeship, we are eager to learn your views on the possibilities for the resettlement of the people of Bikini in their home atoll. As you know, the resettlement of Bikini in the 1970's was aborted in August 1978 after monitoring by the Department of Energy revealed higher-than-expected body burdens of Cesium 137. The high counts were seen as resulting from the consumption of foods grown on Bikini. Eneu Island, within Bikini Atoll, was then considered as a relocation site for the community, but on the advice of the Department of Energy, the Department of the Interior decided not to permit a resettlement of Eneu in 1979.

We would like to determine whether we can permit the Bikinians to return to Eneu before the trusteeship ends. When the Congress approves the Compact of Free Association, the Republic of the Marshall Islands will have a full measure of self-government, and will be responsible for decisions regarding a return to Bikini. Recognizing our trust responsibilities, however, we would like to again consider the acceptability of Eneu for resettlement at this time and, if we cannot now support such resettlement, to provide to the Marshall Islands Government the requisite information for its future management of this issue.

The Department of Energy studied the question of relocation to Eneu and set out its findings in a letter dated May 15, 1979, from Assistant Secretary for Environment Ruth C. Clusen (copy enclosed). We would expect, however, that in the five years, some of the uncertainties which then existed might have been resolved, and that at least some improvement might have occurred both in our knowledge and in the conditions which led to earlier recommendations.

The Honorable Donald P. Hodel  
Page 2

It seems likely also that the Bikinians are somewhat more knowledgeable in administrative controls. We believe it is pertinent to note our experience in Rongelap Atoll where we have good evidence, confirmed by DOE's bio-assay program, that diet restrictions are being adhered to.

We would appreciate your advice in these matters and ask you to update the Department of Energy's evaluation and inform us what conditions, if any, should be imposed if the people of Bikini are relocated to Eneu Island in their home atoll.

Sincerely,

A handwritten signature in cursive script, appearing to read "Bill Clark".

William Clark

Enclosure



Department of Energy  
Washington, D.C. 20585

May 15, 1979

Honorable James A. Joseph  
Under Secretary of the Interior  
Washington, D. C. 20240

Dear Mr. Joseph:

I am pleased to reply to your letter of April 12, 1979, regarding the possible return of the Bikini people to Eneu Island.

This response will address both of the issues you raise:

1. Your understanding of previous statements by my staff.
2. More detailed information on estimated dose assessments for people living on Eneu Island, including various assumed living and eating patterns.

With respect to the first point, your understandings are, in general, correct. The more detailed information addressing the second point is included as an enclosure to this letter.

If the guidance of the Federal Radiation Council (FRC) (500 mrem/yr to individuals, and 170 mrem/yr and 5000 mrem/30 yrs to a population) is to be complied with, the people could return to Eneu only if it is assured that adequate imported food would be available to and used by the people for approximately 20 years, that food grown on Bikini Island is not a part of the diet, that residence is restricted to Eneu Island, and that visitation to Bikini Island is effectively controlled.

Since the FRC guides were originally formulated, an Environmental Impact Statement (EIS) was prepared for the resettlement of Enewetak Atoll. In the EIS, recommended criteria which are one-half of the FRC guidance for individuals and 80 percent of the 30-year FRC guidance for population were proposed for evaluating land use options for use in planning the cleanup and rehabilitation of Enewetak Atoll. These criteria were recommended because of uncertainties in estimating future doses to the people at Enewetak Atoll. However, following the return of people to the islands, direct radiation exposure measurements would

be available and compared with the full FRC guidance of 500 mrem/yr to individuals and 5000 mrem/30 yrs to the population. These criteria for Enewetak were reviewed by interested Government agencies; no objections to these criteria were raised. One of the reviewing agencies, the Environmental Protection Agency (EPA), found the criteria acceptable, but considered them to be "... upper limits ..." and that "... any proposed guideline or numerical values for the dose limits are only preliminary guidance and that a cost-benefit analysis must be undertaken to determine whether the projected doses are really as low as readily achievable and practical before proceeding with the relocation project. On the basis of such analysis it may be prudent to lower dose guidelines for this operation."

The degree of uncertainty in estimating doses on Eneu Island is similar to that for Enewetak Atoll. Assuming, therefore, that Enewetak criteria are applicable to other similar situations in the northern Marshall Islands, the dose estimates for return of the Bikini people to Eneu Island would be compared to the Enewetak criteria as described above rather than to the FRC guidance. When this is done, it is found that even with imported food the radiation doses to the people on Eneu would not be expected to be in compliance with the Enewetak criteria for about 20-25 years.

Several basic combinations of residence and food constraints are discussed in the enclosed, and are illustrated and summarized in the attachments to the enclosed. Other considerations also are addressed. If any further refinement of the data changes these estimates in a significant way, we will immediately inform you.

We trust that this is helpful to you in resolving the issue of the acceptability of Eneu Island as a residence island.

Sincerely,

*Ruth C. Cluser*  
Ruth C. Cluser  
Assistant Secretary for Environment

Enclosure

cc: Dr. William Mills, EPA

RADIOLOGICAL IMPLICATION  
FOR RESETTLEMENT OF ENEU ISLAND

SUMMARY

Unless imported food is a substantial and continuing part of the diet of the Eneu population for about 20 years, unless access to Bikini Island can effectively be controlled for several years, and unless access to food from Bikini Island is restricted, it is unlikely that radiation doses to people living on Eneu Island would be in compliance with federal radiation protection guidance.<sup>1</sup> Based upon previous experience and past practices, however, it is doubtful whether imported food will be a significant part of the daily diet. It can also be questioned whether or not access to Bikini Island can be controlled. Therefore, a return to Eneu Island should be delayed for close to 20 years if radiological dose is the only governing factor unless a firm commitment can be made which will guarantee that adequate imported food will be available and used by the people, and that residence can be restricted to Eneu Island. If the Enewetak radiation exposure criteria<sup>2</sup> are to be applied to the Eneu population, it is unlikely that the radiation doses to the people would be in compliance with the criteria for approximately 20 years, even if imported food is available and if mobility is restricted. Under either criteria, a return to Bikini Island would be delayed even longer because of the higher levels of radionuclides in the soil.

<sup>1</sup>The Federal Radiation Council (FRC) recommended exposure limits of 500 mrem/yr to individuals, 170 mrem/yr to average population groups, and 5000 mrem/30 yrs to the average population of the U.S.

<sup>2</sup>Enewetak criteria are one-half of the FRC exposure limit for individuals and 80 percent of the FRC 30-year exposure limit.

BIKINI

BACKGROUND

In August 1978 the residents of Bikini Island left their Atoll because measurements of radionuclides made in April 1978 showed accumulations in the bodies of 13 out of 101 people such that if this level were maintained for one year, it would result in an annual radiation dose equal to or greater than the 500 mrem/yr federal radiation protection criteria for exposure of individuals. The dose rate might have increased further had those people continued to live on Bikini Island. At that time the question was raised about whether or not the Bikini people could relocate on Eniwetok Island. Information then available on the radionuclide content of test plantings of food crops on Eniwetok was inadequate, and there were insufficient samples of coconuts grown on Eniwetok Island to answer the question. In the Congressional Committee hearings<sup>1</sup> held on July 23, 1978, it was agreed that priority would be given to collecting and analyzing available data to update radiation exposure estimates for use by those who are considering whether the Bikini people should return to live on Eniwetok Island. In early 1979, new information was obtained so that dose predictions for residence on Eniwetok Island could, for the first time, be based upon data from analysis of actual food items of the diet grown on the island rather than on theoretical predictions derived from soil concentrations.

RADIATION SOURCES

People living on Eniwetok Island receive radiation exposure from two sources: 1) external irradiation from natural background radiation

<sup>1</sup>Interior and Related Agencies Subcommittee, Committee on Appropriations, House of Representatives.

(which is very low) and from radionuclides remaining in the soil from nuclear tests at Bikini Atoll; 2) internal irradiation from radionuclides deposited in the body as a consequence of eating foods from the island area (including foods grown in the contaminated soil and marine life from the lagoon) and from inhaling airborne radionuclides. Because of the metabolic characteristics of the predominant radionuclides (cesium-137 and strontium-90) at Eniwetok, bone marrow doses are expected to be slightly greater than whole body doses, and will be the limiting exposure.

The external radiation dose rate has been determined from data obtained during a recent serial radiological survey. The external doses to whole body and bone marrow for Eniwetok residents were calculated using measurements of external radiation and estimates of time spent in various areas of the island (e.g., village, island interior, on the lagoon, etc.).

The internal radiation doses were calculated from estimates of the amounts and kinds of food in the diet (with and without imported foods) and from measurements of the radionuclide content of these foods and of drinking water (see Attachments 1, 2, 3, and 4). Levels of radioactivity in food shown in these attachments were obtained from analysis of samples collected on Eniwetok Island, except for pandanus which was not yet available. Since pandanus would be a diet constituent, the contributed dose is calculated from uptake coefficients and soil concentrations of radionuclides. The 30-year dose commitment is calculated assuming only radioactive decay with no reduction from other possible mechanisms.

It is expected that some individuals on Enew Island will receive doses higher or lower than the predicted average dose. This may result from: 1) eating a larger or smaller quantity of food than that shown in the assumed diet, 2) eating more or less of certain foods containing the highest radioactivity levels, and 3) eating foods grown from areas on the island having soil concentrations higher or lower than the average. In this regard it should be noted also that the former "...Federal Radiation Council suggests the use of the arbitrary assumption that the majority of individuals do not vary from the average by a factor greater than three."<sup>4</sup> This factor of three is used in establishing and distinguishing between guidance for the maximum annual dose to the average individual within that population and guidance for the potentially highly exposed individual within that population.<sup>5</sup>

#### FEDERAL GUIDANCE

Radiation Protection Guides for the U.S. were approved by the President and are used by federal agencies in their radiation protection activities. These guides specify the radiation dose that should not

<sup>4</sup>Report No. 1, Background Material for the Development of Radiation Protection Standards, Staff Report of the Federal Radiation Council, U.S. Department of Health, Education and Welfare, May 13, 1960, pg. 27.

<sup>5</sup>The "maximum annual dose" refers to the dose in that year in which the exposure of the average individual is greatest, taking into account the buildup and the removal and decay of radionuclides in the body. The majority of the highly exposed individuals within this population are assumed not to receive an annual exposure more than a factor of three greater.

be exceeded without careful consideration of the reasons for doing so,<sup>6</sup> and that every effort should be made to encourage the maintenance of radiation doses as far below these guides as practicable. To comply with these standards, certain conditions must be met. First, the basic FRC recommendation is "...that the yearly radiation exposure to the whole body of individuals in the general population...should not exceed 0.5 rem."<sup>7</sup> The FRC recognized, however, that exposure of individuals may be difficult to monitor under some circumstances; thus they suggested that the limit to individuals may be met by the use of average limits to the population. Second, therefore, the FRC indicated that "Under certain conditions, such as widespread radioactive contamination of the environment, the only data available may be related to average contamination or exposure levels. Under these circumstances, it is necessary to make assumptions concerning the relationship between average and maximum doses. The Federal Radiation Council suggests the use of the arbitrary assumption that the majority of individuals do not vary from the average by a factor greater than three. Thus, we recommend the use of 0.17 rem for yearly whole-body exposure of average population groups... It is critical that this guide be applied with reason and judgment. Especially, it is noted that the use of the average figure, as a substitute for evidence concerning the dose to individuals, is permissible only when

<sup>6</sup>The Federal Radiation Council, in Report No. 1 (see footnote 4, pp. 26-27), stated that the guidance should not be exceeded unless "...a careful study indicates that the probable benefits will outweigh the potential risk."

<sup>7</sup>See Note 4, p. 26.

there is a probability of appreciable homogeneity concerning the distribution of the dose within the population included in the average."<sup>8</sup> Third, "When the size of the population group under consideration is sufficiently large, consideration must be given to the contribution to the genetically significant population dose. The Federal Radiation Council...recommends the use of the Radiation Protection Guide of 5 rem in 30 years...for limiting the average genetically significant exposure of the total U.S. population. The use of 0.17 rem per capita per year, as described (above) as a technique for assuring that the basic Guide for individual whole body dose is not exceeded, is likely in the immediate future to assure that the gonadal exposure Guide is not exceeded."<sup>9</sup> Therefore, the whole body dose is considered to be the equivalent of the genetically significant dose.

Because of the absence of radiation protection guides specific for the Marshall Islands, criteria were developed from the basic Federal guidance for evaluating land use options for use in planning the cleanup and rehabilitation of Enewetak Atoll.<sup>10</sup> These criteria are presented here since they were developed subsequent to the decision regarding the cleanup and rehabilitation of Bikini Atoll. It was

<sup>8</sup>See Note 4, p. 27.

<sup>9</sup>See Note 4, p. 27.

<sup>10</sup>Cleanup, Rehabilitation, Resettlement of Enewetak Atoll - Marshall Islands, Environmental Impact Statement, Defense Nuclear Agency, April 1975.

recognized that decisions on land use involve consideration of predicted radiation doses which have inherent uncertainties. To make allowance for this, radiation criteria were chosen that are 50% of the annual Federal guidance for individual whole body and bone marrow doses and 80% of the 30-year whole body dose for population exposures. Therefore, the Enewetak criteria limits the dose to the whole body or the bone marrow of individuals to 250 mrem/yr and the dose to the average individual within the population to 4000 mrem/30 yr. (It should be noted that use of a percentage of the FRC values was not an attempt to establish new guidance, but was considered to be a necessary precaution in the application of the FRC values.<sup>11</sup> The adoption of limits for Enewetak equal to one-half the FRC guide for individuals and 80 percent of the FRC guide for 30-year limits is a result "... of the uncertainty concerning dose estimates which depend greatly on the foods people will choose to eat and the way they will choose to live."<sup>12</sup> While dose estimates are to be compared to these percentages of the FRC guides, actual exposure levels monitored after the people return should be compared to the 100 percent values of the FRC guides.<sup>13</sup>)

#### CALCULATED DOSES LIVING IN ENEU

The calculated doses<sup>14</sup> shown below are for three living patterns and for two assumed diets. The diets are based on the recent experience

<sup>11</sup>See footnote 10, Vol. II., Sec. B, p. 111-10.

<sup>12</sup>See footnote 10, Vol. I., Sec. 5, p. 3-7.

<sup>13</sup>See footnote 10, Vol. I., Sec. 5, p. 3-7 and Vol. II., Sec. B, p. 111-11.

<sup>14</sup>All dose estimates are rounded off and are based upon information contained in "An Updated Radiological Dose Assessment of Eneu Island at Bikini Atoll," Robison, W. L. and Phillips, W. A., UCAL-52775, 1979, in draft.

and observations of the scientific teams who have been working on Bikini Atoll.<sup>15</sup>

Calculated Maximum Annual Dose (Average for Population)

(Federal guidance is 170 mrem/yr)

A. People live 100% of the time on Eneu Island.

	<u>With Food Imports</u>	<u>Without Food Imports</u>
Whole Body	120 mrem/yr	210 mrem/yr
Bone Marrow	140 mrem/yr	260 mrem/yr

B. People live 90% of the time on Eneu Island and visit Bikini Island 10% of the time, or 80% of the time is spent on Eneu Island and 20% of the time is spent on Bikini Island, and assuming that no food from Bikini Island is eaten.

	<u>With Food Imports</u>		<u>Without Food Imports</u>	
	<u>90-10</u>	<u>80-20</u>	<u>90-10</u>	<u>80-20</u>
Whole Body	150 mrem/yr	170 mrem/yr	240 mrem/yr	260 mrem/yr
Bone Marrow	170 mrem/yr	190 mrem/yr	280 mrem/yr	300 mrem/yr

NOTE: On attachments 7-8 it is assumed that the maximum exposed individuals would be three times these values as per the FRC guidance.

Calculated 30-Year Dose (Average Whole Body)

(Federal guidance is 5000 mrem/30 yrs)

A. People live 100% of the time on Eneu Island.

<u>With Food Imports</u>	<u>Without Food Imports</u>
2700 mrem	4700 mrem

B. People live 90% of the time on Eneu Island and visit Bikini Island 10% of the time, or 80% of the time is spent on Eneu Island and 20% of the time is spent on Bikini Island, and assuming that no food from Bikini Island is eaten.

	<u>With Food Imports</u>		<u>Without Food Imports</u>	
	<u>90-10</u>	<u>80-20</u>	<u>90-10</u>	<u>80-20</u>
3700 mrem	3700 mrem	5700 mrem	5700 mrem	

NOTE: People who recently lived on Bikini Island already have received a dose of about 1000 mrem. This has not been included in the above estimates.

<sup>15</sup>The dietary parameters are important factors in the calculation of dose estimates, and the diet is continually being refined as additional information becomes available. To the extent that the diet used in this document (Attachment 1) may be refined, or that dietary practices may change, the dose estimate may also change accordingly.

If there is increased utilization of Bikini Island, the projected doses can be estimated by applying the finding that the respective Bikini doses would be about eight to ten times the doses for Eneu residence shown above (maximum annual and 30-year doses).<sup>16</sup>

If return to Eneu and Bikini is delayed, the above dose estimates would be reduced by a factor of two for every 30-year period the return is delayed. This is due to the fact that the radioactivity of the two radionuclides (cesium-137 and strontium-90) that contribute most to whole body and bone marrow doses, decays in the environment with an effective half-time of 30 years.

Attachments 5 and 6 present estimates of the maximum annual whole body and bone marrow doses for the average population if, starting with 1979 as the zero time, a return to live on Eneu Island (the six lower curves) or on Bikini Island (the two highest curves) is delayed. Attachments 7 and 8 present similar information for the individuals receiving the highest doses. Attachment 9 shows the predictions for 30-year doses.

DISCUSSION

The predicted maximum annual whole body and bone marrow doses for the average Eneu Island population in Attachments 5 and 6 can be compared with the 170 mrem/yr federal guidance. If a monitoring program

<sup>16</sup>The basis for this estimate is that the concentrations of radionuclides in the soil and in coconuts on Bikini are about eight to ten times greater than those on Eneu. Therefore, consumption of foods grown on Bikini Island would increase the annual dose rate estimates significantly, the increase depending upon the type and quantity of food eaten. Estimates based upon assumed combinations of Eneu and Bikini foods, and imported foods, other than those included herein, can be provided if needed.

is in place, doses to the highest individuals can be compared with the standard for individuals which is 500  $\mu\text{rem}/\text{yr}$  (see Attachments 7 and 8). Doses for the highest individuals can also be compared with the Enwetak criterion which is 250  $\mu\text{rem}/\text{yr}$ .

Whether annual doses (for the population or for individuals) and 30-year doses for people living on Eniw or Bikini Islands meet or exceed federal guidance and/or the recently developed Enwetak criteria depends upon the amount, kind, and source of local foods that are eaten, the availability of imported foods, the proportion of residence time on Eniw Island and on Bikini Island, and the time interval between now and the date of rehabilitation.

Attachments 3 through 9 illustrate the estimated dose (vertical axis) to the population or to an individual in the population if the people are returned to Eniw or to Bikini in any particular year (horizontal axis, beginning in 1979). Moreover, the attachments illustrate estimated doses for eight separate living patterns as identified on Attachment 3. Federal guidance and Enwetak criteria levels also are indicated. If any particular curve does not go above the guidance or criteria level, a return of the people could be accomplished that year without expecting to exceed the guidance or criteria, providing residence conforms to the conditions upon which the doses are estimated. If a curve goes above the guidance or criteria, the point at which it crosses the guidance or criteria, as read from the horizontal axis, is the approximate number of years that return should be delayed so that the radiation dose would not be expected to exceed the guidance or criteria.

For example, if the Bikinians returned in 1979 to Eniw, if the diet consists of both local and imported foods as shown in Attachment 1, and if they spend no time on and consume no food from Bikini Island, (Attachments 3-9, Curve 1) their predicted maximum annual whole body and bone marrow doses and their 30-year whole body doses (average for the population) would be within the federal guidance of 170  $\mu\text{rem}/\text{yr}$  and 5000  $\mu\text{rem}/30 \text{ yr}$ . Under these same conditions, exposures of the highest individuals would be within the 500  $\mu\text{rem}/\text{yr}$  federal guidance for whole body and bone marrow but would exceed the 250  $\mu\text{rem}/\text{yr}$  Enwetak criterion. Without imported food (Attachments 3-9, Curve 4) both predicted average population and highest individual doses exceed the 170 and 500  $\mu\text{rem}/\text{yr}$  federal guidance, while the 30-year estimate of 4700  $\mu\text{rem}/30 \text{ yr}$  just meets the 5000  $\mu\text{rem}/30 \text{ yr}$  federal guidance but exceeds the 4000  $\mu\text{rem}/30 \text{ yr}$  Enwetak criterion.

Furthermore, it must be recognized that there is a significant degree of uncertainty in the dose estimates because of the need to predict lifestyles of peoples. For most situations it is estimated that these values may be realistic to within a factor of two; under unusual circumstances they may be within a factor of three.<sup>17</sup> These, then, would be the approximate error bands associated with the curves in Attachments 3-9.

A summary comparison of these curves with the federal guidance and with the Enwetak criteria is given in Attachment 10.

<sup>17</sup>Robison, V.L. and Phillips, V.A., "An Updated Radiological Dose Assessment of Eniw Island at Bikini Atoll, UCR-32773, 1979, in draft.

BIKINI

OTHER CONSIDERATIONS

In evaluating radiological conditions on Enew and Bikini Islands, there are certain other factors which should be taken into account:

1. Exposure to any radiation is believed to involve some risk which is proportionally greater as the radiation exposure increases; therefore, any unnecessary radiation exposures should be avoided and all exposures kept as low as is reasonably achievable.
2. The benefits and risks inherent in the Federal guidance are those applicable to persons living outside of restricted access areas in the U.S. under normal peacetime operations.
3. There appear to be difficulties associated with the practicality and reliability of applying administrative controls over long periods of time with the intent to limit exposure.
4. The need to apply a safety factor where there are uncertainties in the predicted dose estimates, resulted in the use of a factor of 2 in applying Federal Guidance to the Enewetak situation.
5. The marketability for coconuts produced from coconuts grown on Bikini and Enew Islands is questionable at the present time.

There are also nonradiological factors which have not been considered. Among these are:

1. The benefits to be derived by the Bikini people in returning to their Atoll according to their own decisions and preferences.
2. Resettlement options at locations other than Bikini Atoll.

Among these are:

1. The benefits to be derived by the Bikini people in returning to their Atoll according to their own decisions and preferences.
2. Resettlement options at locations other than Bikini Atoll.

DIETS

3/21/79

Enew Island and Imported Foods

INTAKE G/DAY

300
20
15
100
-
-
200
50
15
30
805
825
1630

TOTAL

Enew Island EOODS ONLY

INTAKE G/DAY

600
50
75
200
10
5
300
100
25
50
1415

TOTAL

IMPORTED FOODS

FISH	600
DOMESTIC MEAT	50
PAIMANUS FRUIT	75
BREADFRUIT	200
WILD BIRDS	10
BIRD EGGS	5
COCONUT FLUID	300
COCONUT HEAT	100
CLAMS	25
GARDEI FRUITS AND VEGETABLES	50

CONCENTRATION OF PESTS IN SUSCEPTIBLE CROPS AND FISH AT BIKINI ISLAND

Attachment 2

FOOD PRODUCT	NO. OF SAMPLES	AVERAGE CONCENTRATION PCT/6 NET WEIGHT	PRICE OF CONCENTRATION PCT/6 NET WEIGHT
COCONUT FEAT (GREEN)	6	22.7	3.5-10
COCONUT FEAT (IMMEDIATE)	9	16.5	4.0-32
COCONUT FEAT (MATURE)	31	30.9	5.3-117
COCONUT FEAT (SPRINGED, SWEET)	8	27	16-52
ALL COCONUT FEAT	54	27	3.5-117
COCONUT FLUID	28	13.5	1.2-44
BREADFRUIT	2	6.5	5.2-7.8
SQUASH	12	8.5	1.6-20
PAPAYA	18	14	1.6-31
BWANG	3	0.92	0.51-1.3
SWEET POTATO	2	3.6	2.3-5
WATERMELON	17	2.6	0.26-7.2
GARDEN FRUITS AND VEGETABLES (AVERAGE OF SQUASH, PAPAYA, BWANG, SWEET POTATO, WATERMELON)		5.9	
FISH (GILLET)*	6	0.006	
DOMESTIC FEAT		15	

\* FROM V. NELSON  
 • ESTIMATED FROM BIKINI FIG DATA

Attachment 3

CONCENTRATION OF PESTS IN SUSCEPTIBLE CROPS AND FISH AT BIKINI ISLAND

FOOD PRODUCT	NO. OF SAMPLES	AVERAGE CONCENTRATION PCT/6 NET WEIGHT	PRICE OF CONCENTRATION PCT/6 NET WEIGHT
COCONUT FEAT	9	0.021	0.0033 - 0.052
COCONUT FLUID*	-	0.021**	-
BREADFRUIT	2	1.9	0.47 - 3.4
WATERMELON	8	0.031	0.012 - 0.053
SQUASH	6	0.054	0.024 - 0.15
PAPAYA	5	0.29	0.052 - 0.39
SWEET POTATO	1	0.13	-
GARDEN FRUITS AND VEGETABLES (AVERAGE OF WATERMELON, SQUASH, PAPAYA, SWEET POTATO)		0.13	
FISH (GILLET)		0.006	
CLAMS		0.005	
DOMESTIC FEAT		0.011	

\* ASSUMED TO BE THE SAME AS COCONUT FEAT  
 \* FROM V. NELSON AND B. SCHELL  
 \*\* FROM 1975 BIKINI DOSE ASSESSMENT

Attachment 4

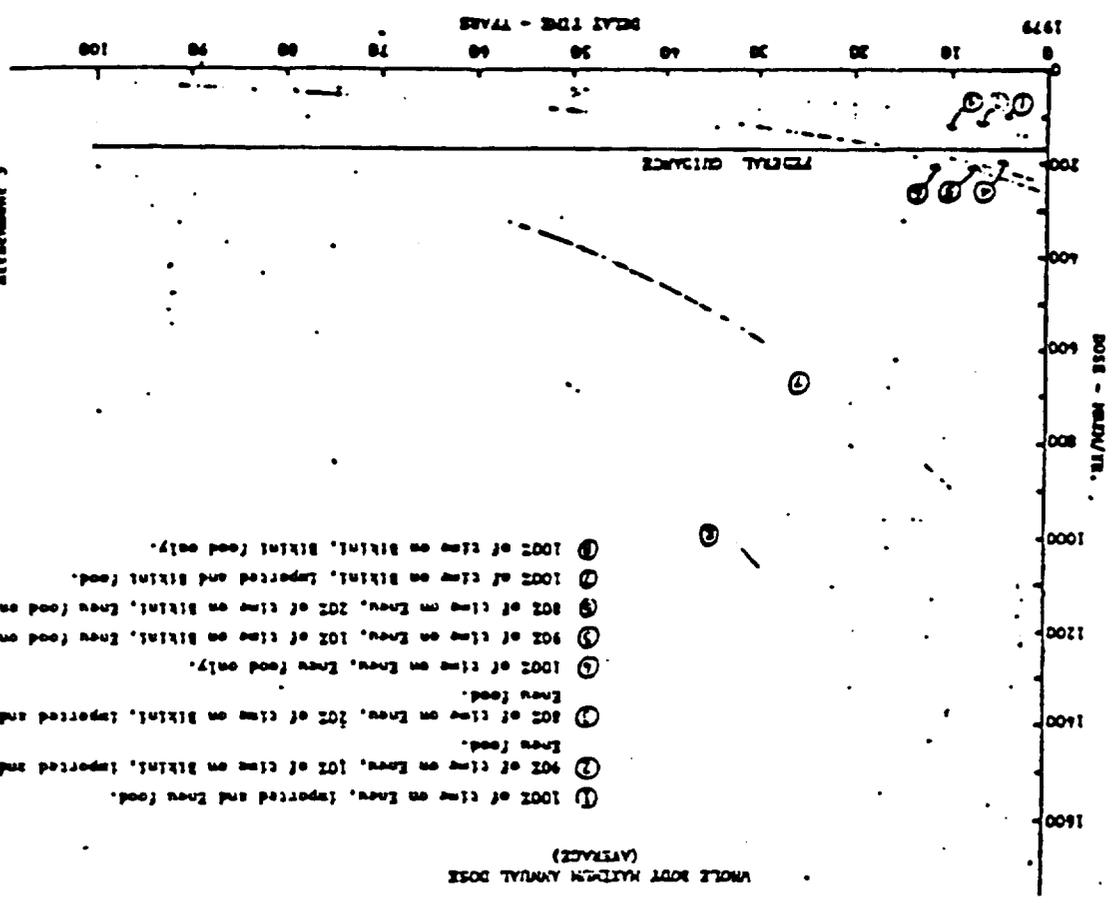
CONCENTRATION OF DDT IN SUBSISTENCE CROPS AND FISH AT EREU ISLAND

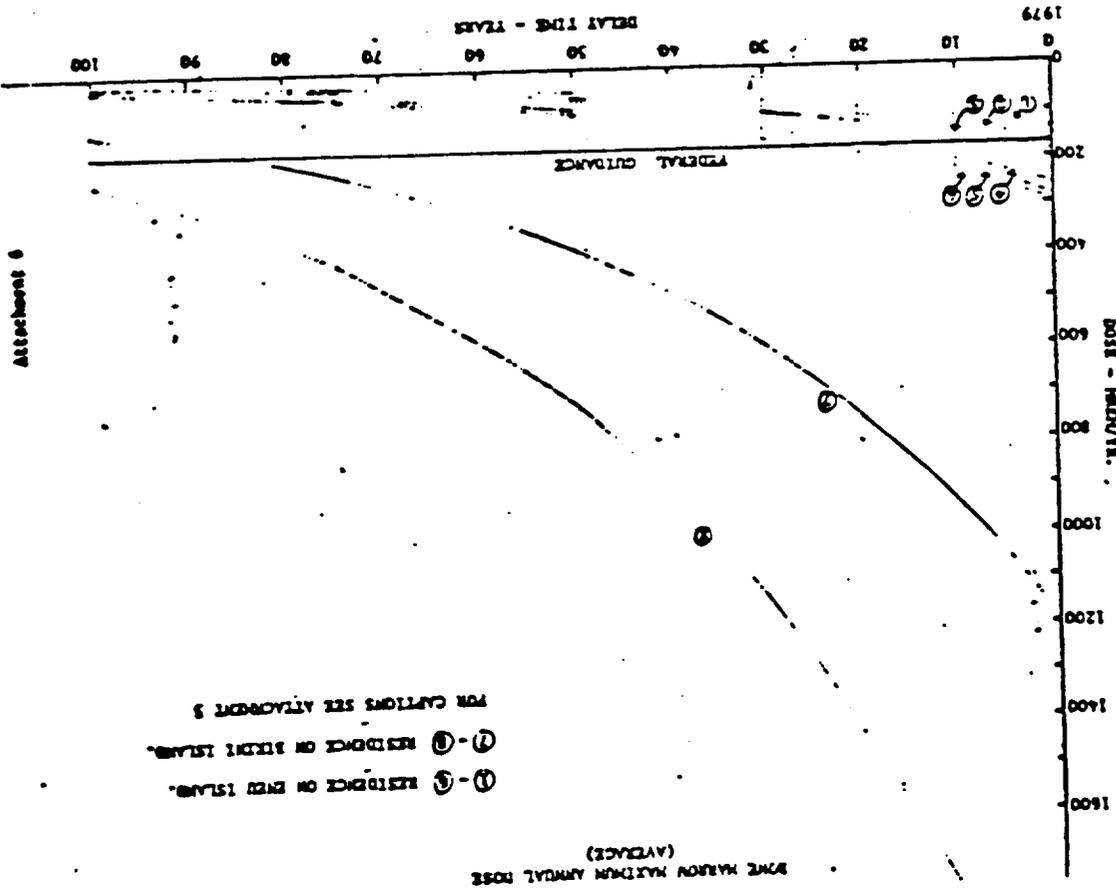
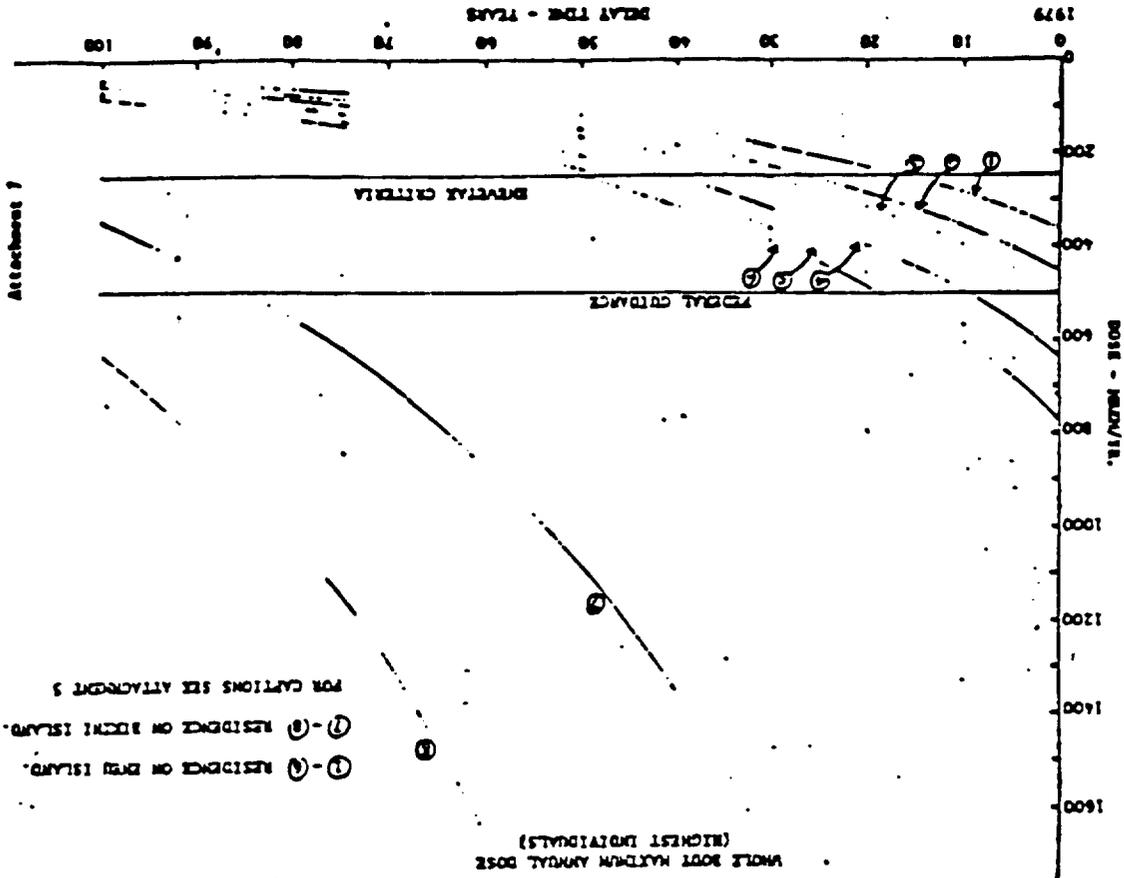
FOOD PRODUCT	NO. OF SAMPLES	AVERAGE CONCENTRATION (PPM)	RANGE OF CONCENTRATION (PPM)
COCONUT FAT	9	$2.8 \times 10^{-5}$	$4.1 \times 10^{-6} - 5.3 \times 10^{-5}$
COCONUT FLUID	-	$2.8 \times 10^{-5}$	-
BREADFRUIT	1	$1.7 \times 10^{-5}$	-
WATER SLOE	8	$1.3 \times 10^{-5}$	$4.4 \times 10^{-6} - 2.0 \times 10^{-5}$
SQUASH	6	$8 \times 10^{-6}$	$3.5 \times 10^{-6} - 1.9 \times 10^{-5}$
PAPAYA	3	$8.3 \times 10^{-6}$	$6.5 \times 10^{-6} - 1.1 \times 10^{-5}$
GARDEN FRUITS AND VEGETABLE (CUCURBITACEAE OF WATER SLOE, SQUASH, PAPAYA)		$9.8 \times 10^{-6}$	
FISH (GILLET)*	6	$1.3 \times 10^{-4}$ †	

\* ASSUMED TO BE THE SAME AS COCONUT FAT

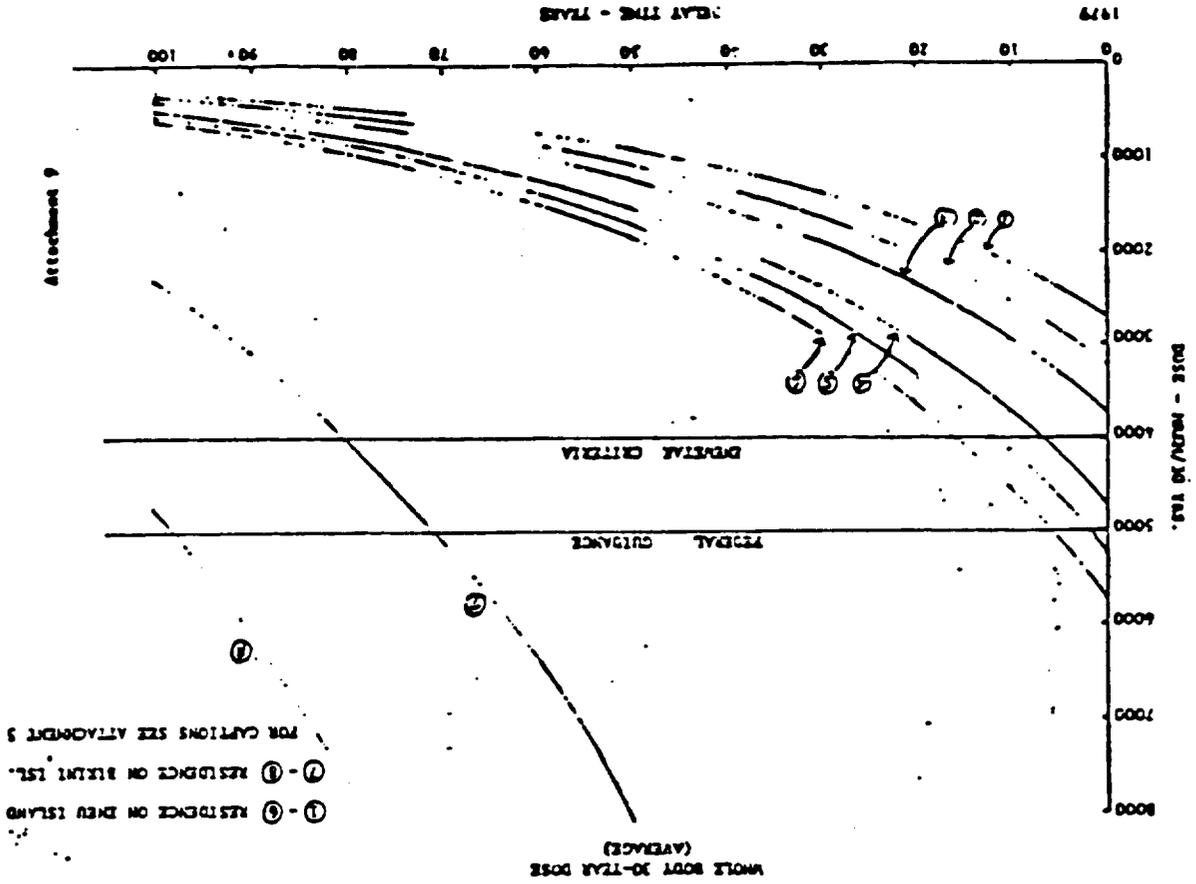
† FROM V. NORSKIN

Attachment 3

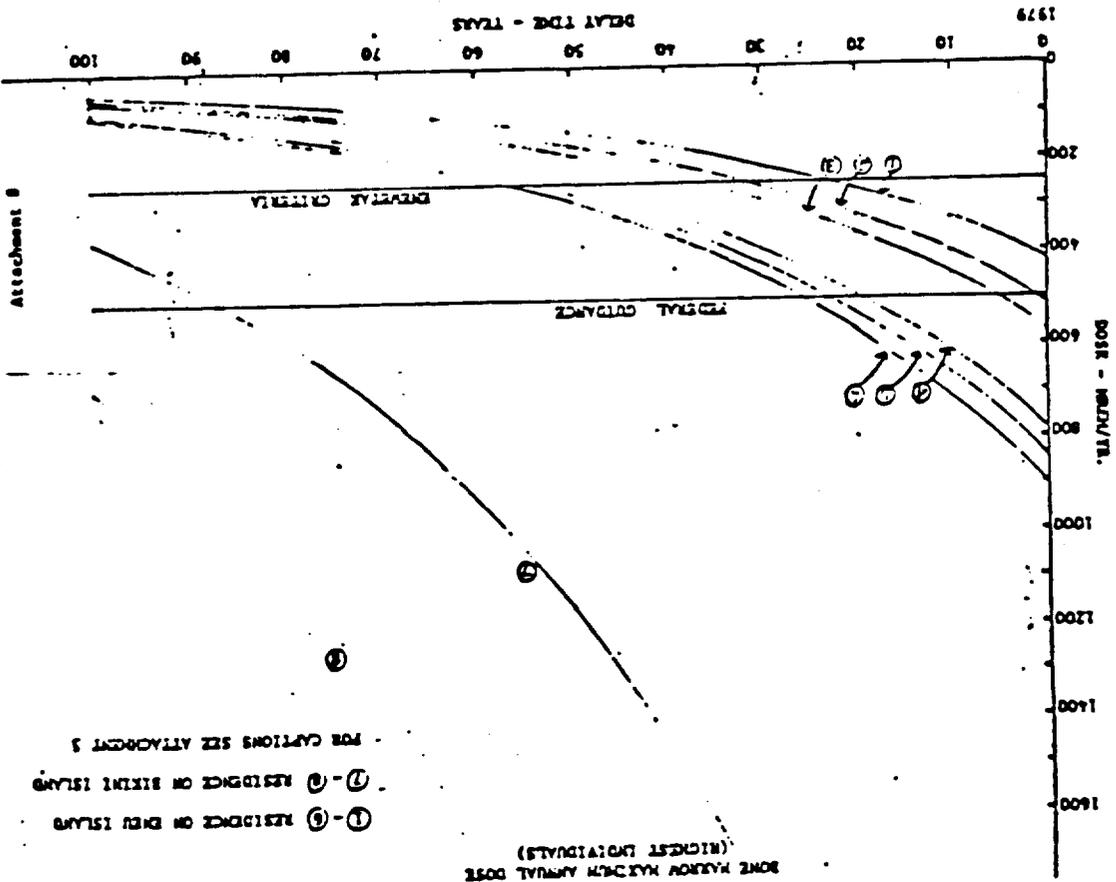




Attachment 9



Attachment 8





Dear Secretary Hodel:

The Compact of Free Association, which the President transmitted to the Congress on March 30, 1984, will provide the means of terminating the United States' trusteeship in the Marshall Islands. In the short time that remains before the termination of the Trusteeship, we are eager to learn your views on the possibilities for the resettlement of the people of Bikini in their home atoll. As you know, the attempted resettlement of Bikini in the 1970's was aborted in August 1978 after monitoring by the Department of Energy revealed higher-than-expected body burdens of cesium 137 resulting from the consumption of foods grown on Bikini. Eneu Island, within Bikini Atoll, was then considered as a relocation site for the community, but on the advice of the Department of Energy, the Department of the Interior decided not to permit a resettlement of Eneu in 1979.

We would like to determine whether we can permit the Bikinians to return to Eneu before the trusteeship ends, and, if not, when the Bikinians can expect to return to Eneu after the Trusteeship ends. When the Congress approves the Compact of Free Association, the Republic of the Marshall Islands will have a full measure of self-government, and will be responsible for decisions regarding a return to Bikini. Recognizing our trust responsibilities, however, we would like to again consider the acceptability of Eneu for resettlement at this time and, if we cannot now support such resettlement, to provide to the Marshall Islands Government the requisite information for its future management of this issue.

The Department of Energy studied the question of relocation to Eneu and set out its findings in a letter dated May 15, 1984, from Assistant Secretary for Environment Ruth C. Clusen (copy enclosed). We would expect, however, that in the five years that have passed since Assistant Secretary Clusen's letter, some of the uncertainties which then existed might have been resolved, and that at least some improvement might have occurred both in our knowledge and in the conditions which led to earlier recommendations.

It seems likely also that the Bikinians are somewhat more knowledgeable in radiation matters than heretofore and can accept responsibility for reasonable administrative controls. We believe it is pertinent to note our experience in Rongelap Atoll where we have good evidence, confirmed by DOE's bio-assay program, that diet restrictions are being adhered to.

We would appreciate your advice in these matters and ask you to update the DOE evaluation and inform us what conditions, if any, should be imposed if the people of Bikini are relocated to Eneu Island in their home atoll.

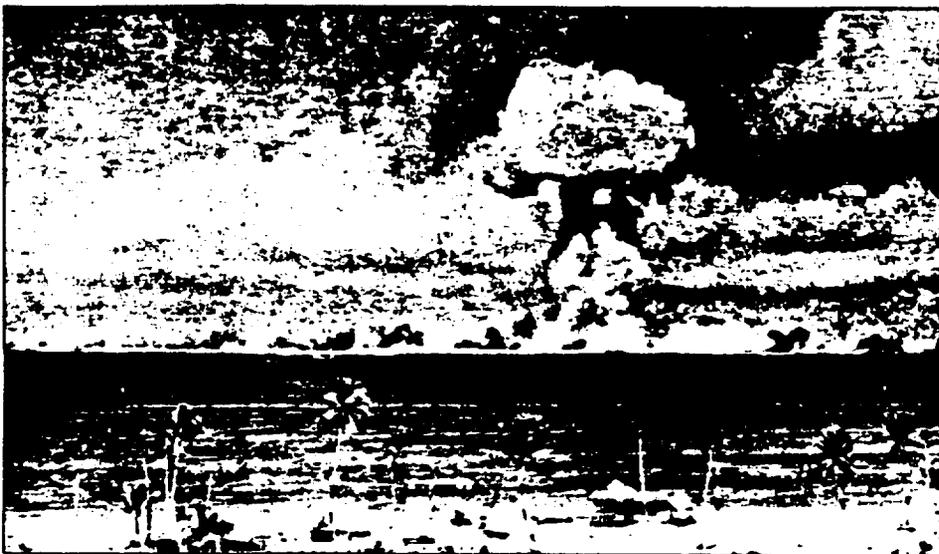
Sincerely,

## The Nuclear Nomads Continue Their Quest

The natives of Bikini atoll have always had trouble getting anyone to take them seriously. "Primitive they are," said The New York Times Magazine in 1946, shortly after the U.S. government evacuated the 167 inhabitants in order to test nuclear weapons on the remote Pacific atoll, "but they love one another and the American visitors who took their home."

Bikini, a part of the Marshall Islands archipelago, was the site of the first nuclear-weapons test open to the news media—the blast was heard on radios in thousands of American homes. It was also the site of the first underwater nuclear explosion, in which a million tons of water were blown photogenically into the air, and the 1954 Bravo shot, America's first—and still its largest—deliverable hydrogen bomb. (It was the sheer va-va-voom of all this that led French fashion designers to name women's skimpy two-piece bathing suits bikinis.)

The natives, meanwhile, had been hustled from one island to another, returned to Bikini with much publicity in the late '60s and, after a decade, re-evacuated when it



The first test shot at Bikini: 'They love the Americans who took their home'

was discovered that the atoll was still contaminated. Last month their celebrated patience finally ran out: they filed suit in a federal district court in Honolulu, demanding that the United States make their home safe for their return.

Between 1946 and 1958, 23 "devices" rocked the atoll, but Bravo alone would have made it uninhabitable. The 15-megaton bomb, 1,000 times as powerful as the

one that destroyed Hiroshima, vaporized a small island and blew a mile-wide hole in the reef; radioactive debris from the 17-mile-high mushroom cloud was deposited on Bikini, the largest islet in the 23-island chain. In 1968 and 1969, the United States finally plowed up Bikini and planted some coconut trees; an Atomic Energy Commission official deemed radioactivity there "less than Denver, Colo.," and a group of

Bikinians moved back. About 125 years too soon, as it turned out. In 1978 they were evacuated again: new tests showed that the water was still too radioactive to drink and the soil yielded contaminated coconuts.

So it was back to Kili, a 230-acre island almost 500 miles to the southeast where most of the exiles ended up by 1948. There, some 600 Bikinians and their descendants occupy about one-sixth of the land they had at home and live mostly on USDA surplus food. On Bikini they were able to fish in the calm lagoon, but Kili's unprotected coast is often battered by 30-foot waves. "This mess has ruined our livelihood," says Sen. HENCHI BALOS, who represents them in the Marshall Islands legislature. "Our young men don't even know how to sail anymore."

**Chicken Feed:** Last year a team of American scientists concluded that an adequate cleanup of Bikini might mean replacing all of its contaminated topsoil to a depth of up to 40 inches. A similar operation was performed in the late '70s on Eniwetok atoll, also in the Marshalls and the site of 43 nuclear tests: the job cost \$105 million, and Bikini could cost \$15 million more. Even this is chicken feed, says Jonathan Weisgall, the Bikinians' American attorney, compared to the \$91 billion he estimates it cost to contaminate the place. Weisgall and a delegation of Bikinians including Senator Balos have appeared before the U.S. Con-



Bikinians on Kili: A lost livelihood

gress to try to shake the money loose. There's considerable support there, but the Reagan administration is dragging its feet. A spokesman for the Interior Department says that the cleanup is being studied by a "working group," but he won't say when the study will be completed. To the Bikinians, it all sounds drearily familiar.

What's new is an administration proposal to end U.S. trusteeship of the Marshall Is-

lands. Under the so-called Compact of Free Association, the United States would still provide financial aid, but it would fall far short of the \$120 million scientists say may be needed to clean up the atoll. In addition, the agreement would constitute "the full settlement of all claims, past, present and future . . . in any way related to the Nuclear Testing Program." The Bikinians suspect their American friends may be trying to wash their hands of the cleanup—and of any future medical claims by people who spent a decade in an environment where, according to U.S. scientists, they "may have ingested the largest amount of radiation of any known population." The plan was approved by a plebiscite in the islands, where Bikinians are overwhelmingly outnumbered by other Marshall Islanders; the U.S. Congress has yet to decide on it.

The stories about the simple, carefree natives in the old newspapers and the unctuous Biblical rhetoric with which American officials persuaded them to leave their home—they were like the "children of Israel," the islands' military governor told them in 1946, "whom the Lord saved from their enemy, and led into the Promised Land"—seem in comically bad taste today. But there's nothing amusing about the long exile of the world's first nuclear nomads.

DAVID GATES with DIANE WEATHERS  
in Washington

NEWSWEEK  
5/11/1982