

Draft

Marsh
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RADIOLOGICAL IMPLICATION FOR
RESETTLEMENT OF ENEU ISLANDBACKGROUND

In August 1978 the residents of Bikini Island left their Atoll because measurements of radiocesium made in April 1978 showed accumulations in the bodies of 13 out of 101 people, which if maintained for one year, would be equal to or greater than the Federal Radiation Protection Standard of 500 mRem/Yr. At that time, information on the radionuclide content of test plantings of food crops and on a sufficient number of samples of coconuts grown on Eneu Island was not available but would be in early 1979. With this new information, dose predictions for residence on Eneu 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. In the meeting on July 25, 1978, with the Congressional Committee*, it was agreed that priority would be given to collecting and analyzing the available data so a judgement can be made on whether or not the Bikini people can return to live on Eneu Island.

RADIATION SOURCES

The two sources of radiation exposure to people living on Eneu Island will be: external exposures from natural background radiation which is very low and radiation from man-made radionuclides remaining in the soil from nuclear tests at Bikini Atoll; and, internal exposure due to nuclear test radionuclides internally deposited in the body from eating locally grown foods. The external radiation dose rate has been determined from measurements taken by the recent aerial radiological survey.

The average external dose for Eneu residents is calculated using measurements of external radiation and estimates of time spent in various areas of the island.

The average internal radiation dose is calculated using estimates of the amounts and kinds of food in the diet and measurements of the radionuclide content of these foods and of drinking water.

*Interior and Related Agencies Subcommittee, Committee on Appropriations, House of Representatives.

However, it is believed that any individual will not exceed a daily intake, averaged over a year, greater than two times the estimated average daily intake. (See Enclosure 1.)

FEDERAL STANDARDS

To comply with Federal Radiation Standards, certain conditions must be met. First, the average dose to the population should not exceed 170 mRem/Yr. Second, when the dose to individuals is known, the standard is 500 mRem/Yr. To comply with this requirement for Bikini Island residents the monitoring program to measure the dose to individuals was begun five years ago. Third, the dose to bone marrow of individuals should not exceed 500 mRem/Yr. Because of the way certain radionuclides are deposited in the body, bone marrow doses are expected to be higher than whole body doses. Thus, the bone marrow standard for individuals will probably be controlling at Bikini Atoll. Fourth, the average whole body dose over 30 years to the population should not exceed 5,000 mRem.

CALCULATED DOSE

The calculation doses shown below are for two living patterns and for two assumed diets. The diets are based on the recent experience and observations of the scientific teams who have been working on Bikini Atoll.

Calculated Maximum Annual Dose

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 80% of the time on Eneu Island and visit Bikini Island 20% of the time, but assumes no food from Bikini Island is eaten.

| | <u>With Food Imports</u> | <u>Without Food Imports</u> |
|-------------|--------------------------|-----------------------------|
| Whole Body | 170 mRem/Yr. | 260 mRem/Yr. |
| Bone Marrow | 190 mRem/Yr. | 300 mRem/Yr. |

Because of the difference in the amount and kind of food eaten, the dose to some individuals in the population may be two times that shown in the table above. The Federal standard for dose to individuals in the population is 500 mRem/Yr.

Calculated 30-Year Dose

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

| | <u>With Food Imports</u> | <u>Without Food Imports</u> |
|------------|--------------------------|-----------------------------|
| Whole Body | 2,700 mRem | 4,700 mRem |

B. People live 80% of the time on Eneu Island and visit Bikini Island 20% of the time, but assumes no food from Bikini Island is eaten.

| | <u>With Food Imports</u> | <u>Without Food Imports</u> |
|------------|--------------------------|-----------------------------|
| Whole Body | 3,700 mRem | 5,700 mRem |

If people who recently lived on Bikini Island return to live on Eneu, the 30-year dose should be increased by 1,000 mRem.

DISCUSSION

The doses calculated above exceed the provisions in the Federal standard for the 30-year dose of 5,000 mRem depending upon the amount and kind of local or imported foods that are eaten and whether people live all the time on Eneu or spent time elsewhere in the Atoll. Because of differences in the kinds and amounts of food eaten, some individuals would be expected to exceed the annual whole body and bone marrow standards for individuals of 500 mRem/Yr.

The question has been raised how the levels of external radiation and radioactivity in foods on Eneu Island are changing with time. The radioactivity of the two radioelements, Cesium-137 and Strontium-90, that contribute principally to whole body and bone marrow exposures decays to 50% in 30 years, and will decrease again by 50% in another 30 years, etc.

Enclosures 2 and 3 present estimates of the maximum annual whole body and bone marrow doses if, starting with 1979 as the zero time, the return to live on Eneu Island is delayed. Enclosure 3 indicates that if return to Eneu Island is delayed for about

10 years, i.e., 1989, the maximum annual bone marrow dose will be approximately 500 mRem/Yr.

Clearly, the most important factors influencing dose estimates are the source of food eaten by the Eneu residents, the degree to which imported food is available and used, and time spent elsewhere in the Atoll.

In addition to evaluating the radiological conditions on Eneu Island, there are other considerations which must be taken into account in making the decision on whether or not people should return to Eneu now.

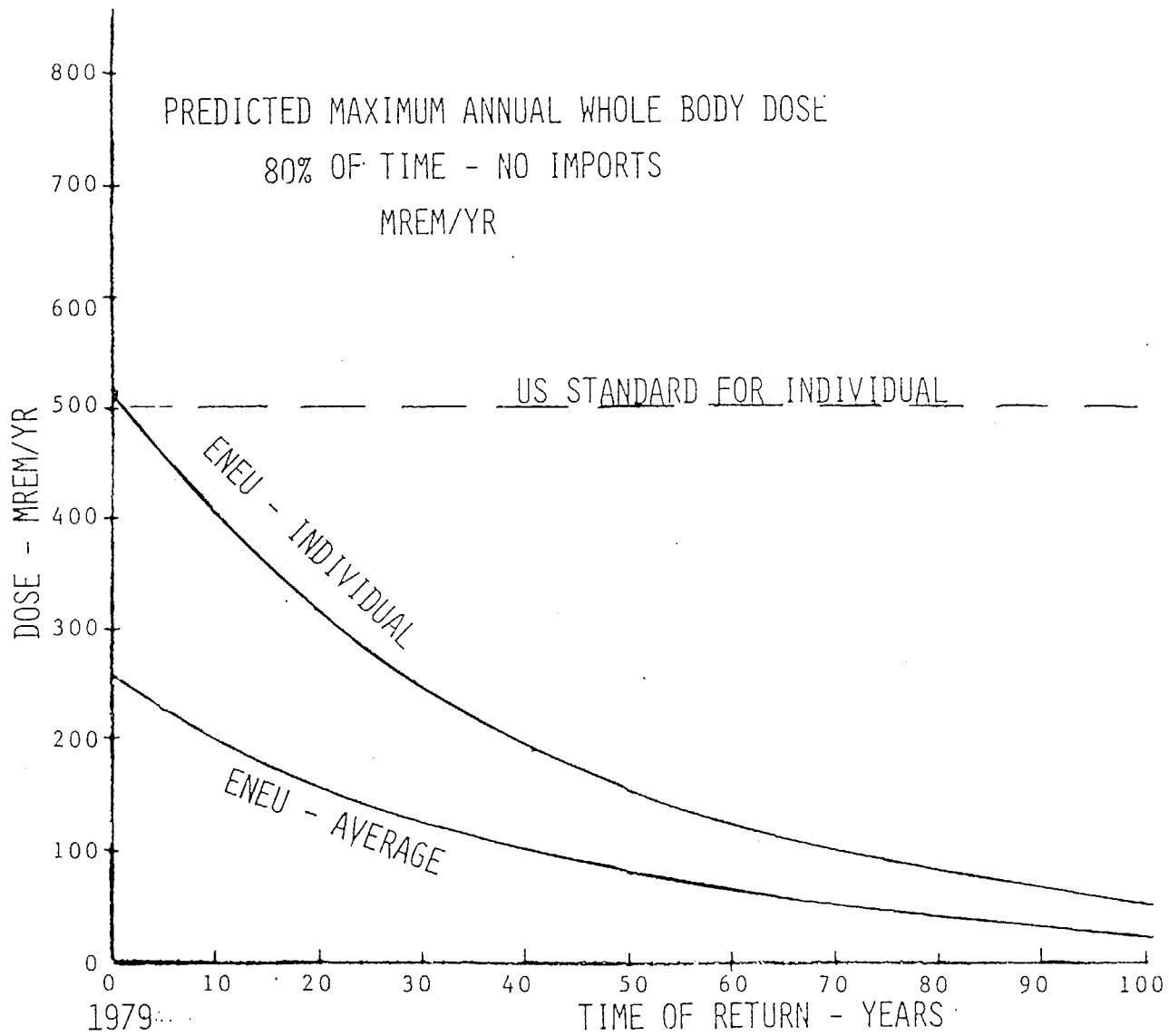
1. Exposure to radiation is believed to involve some risk of ill effects, therefore, unnecessary radiation exposure should be kept as low as is reasonably achievable.
2. The practicality and reliability of applying administrative controls intended to limit exposure.
3. The marketability for copra produced from coconuts grown on Bikini and Eneu Islands.

1
DIETS

3/21/79

| <u>FOOD ITEM</u> | <u>ENEU ISLAND</u> | <u>ENEU ISLAND AND</u> |
|------------------------------|---------------------|------------------------|
| | <u>FOODS ONLY</u> | <u>IMPORTED FOODS</u> |
| | <u>INTAKE G/DAY</u> | <u>INTAKE G/DAY</u> |
| FISH | 600 | 300 |
| DOMESTIC MEAT | 50 | 20 |
| PANDANUS FRUIT | 75 | 15 |
| BREADFRUIT | 200 | 100 |
| WILD BIRDS | 10 | - |
| BIRD EGGS | 5 | - |
| COCONUT FLUID | 300 | 200 |
| COCONUT MEAT | 100 | 50 |
| CLAMS | 25 | 15 |
| GARDEN FRUITS AND VEGETABLES | 50 | 30 |
| | <hr/> | <hr/> |
| TOTAL | 1415 | 805 |
| IMPORTED FOODS | | 610 |
| | | <hr/> |
| | | TOTAL 1415 |

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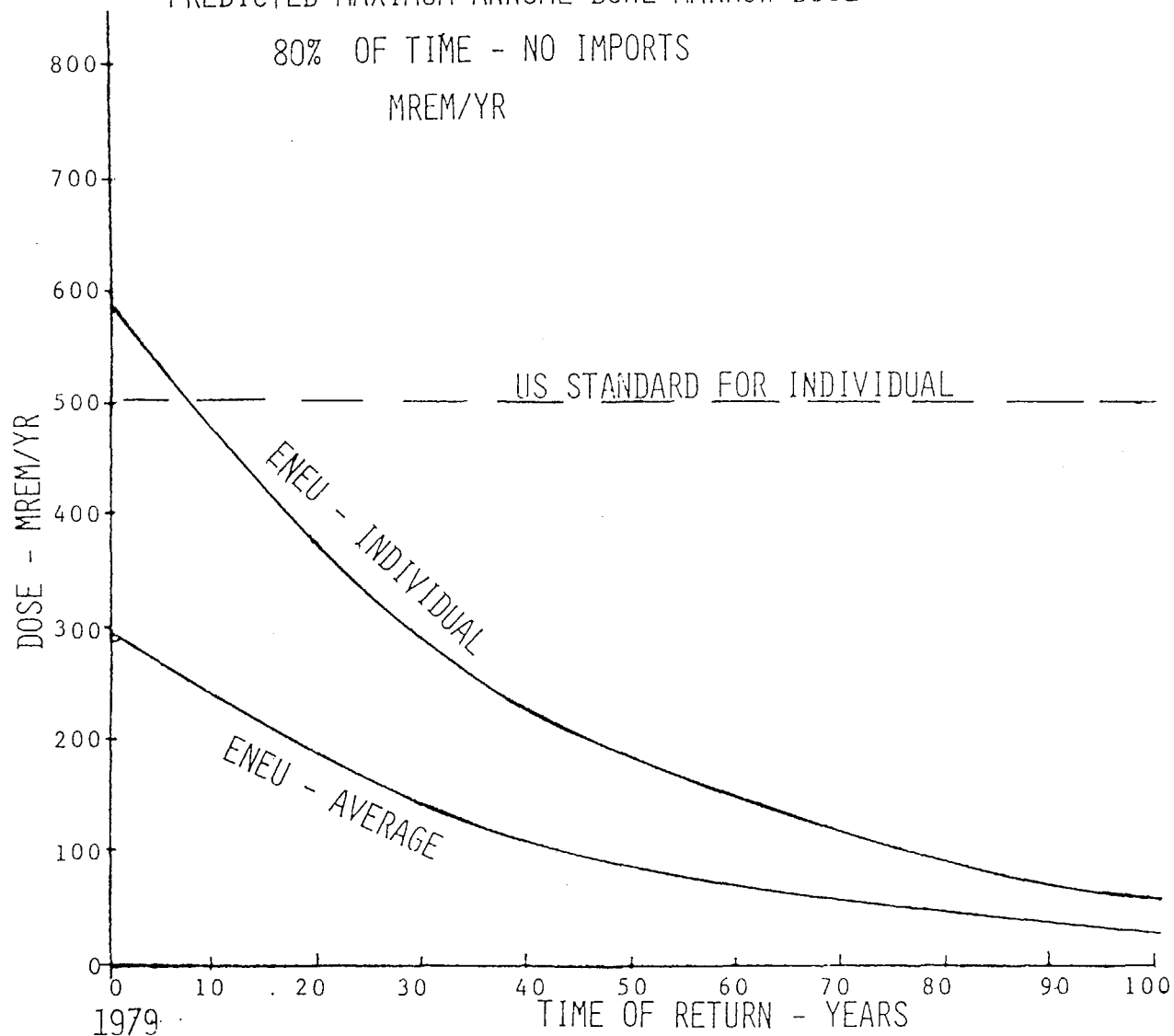


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PREDICTED MAXIMUM ANNUAL BONE MARROW DOSE

80% OF TIME - NO IMPORTS

MREM/YR



1979



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