

Preliminary Report on Radionuclide Levels in Samples from Eneu Island
and the Eneu Test Plot, Bikini Atoll

May 1, 1978

The abstracted programs and preliminary results described below were initiated and are continuing with support from the Division of Biomedical and Environmental Research, Department of Energy.

The Eneu test plot was established in August-September of 1977. The subsistence crops planted at this time were: Pandanus, breadfruit, papaya, banana, sweet potato, squash and watermelon. In addition to these subsistence crops, coconuts are now plentiful on the trees planted on Eneu in 1972.

In August and November of 1977, coconuts were collected for analysis from a number of trees along with associated soil samples. The preliminary results for ^{137}Cs concentrations in these samples are attached. Data for ^{90}Sr , $^{239+240}\text{Pu}$ and ^{241}Am concentrations will not be available before mid-summer 1978.

In November of 1977, the squash and watermelon planted during August in the test garden were available for sampling. The collections have been processed and are presently being analyzed for specific radionuclides. ^{137}Cs concentration data should be available for these samples this summer and the ^{90}Sr , $^{239+240}\text{Am}$ concentration data will hopefully be available this fall.

The breadfruit and Pandanus fruit were planted as root stock and will not produce fruit for several years. When the test garden was started in

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August 1977, however, three breadfruit trees (10-15 feet in height) were transplanted to Eneu from Bikini Islands. If these trees survive, breadfruit will be available to sample soon. We will confirm this possibility during our May 1978 trip to Bikini Atoll.

The concentration of ^{137}Cs in Eneu coconut (data attached) is higher than predicted using the limited data bank from Enewetak and is higher than the concentrations used in the dose assessment of Bikini Atoll (Dose Assessment at Bikini Atoll, W. L. Robison, W. A. Phillips and C.S. Colsher - UCRL 51879 Part 5, 1977). These recent data are preliminary and additional results from both Bikini and Eneu Islands will be available in the near future. We will then reassess the concentration data, the concentration ratio data and the resulting dose predictions for Eneu Island.

The results of our radiochemical analyses of ground and cistern water from Bikini and Eneu Islands collected in 1975 have been published (Noshkin, Robison, Wong and Eagle, "Evaluation of the Radiological Quality of the Water on Bikini and Eneu Islands in 1975" UCRL 51879 Part 4). The water from the wells and cisterns at Bikini and Eneu Islands has been resampled for analyses twice during 1977. Our available radionuclide concentration data for Eneu ground and cistern water is shown in the attached table. In addition to continuing our assessment of radionuclide concentrations in the water, during November 1977, coliform bacteria counts were measured in the water from several cisterns and groundwater sites. The results of this latter analyses and recommendations were submitted to Dr. William Burr of DBER in December 1977 (see letter attached).

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Two new groundwater well sites, FWR 5 and FWR 6, were established on Eneu Island during January 1977. The groundwater at these locations has low salinities and is of acceptable chemical quality but ^{90}Sr concentrations at FWR 5 exceeds the recommended EPA guideline of 8 pCi/l. FWR 4 is the main skimming well supplying groundwater for use on Eneu at the present time. The groundwater from this well is chemically acceptable for household and drinking purposes. The concentrations of ^{137}Cs , ^{90}Sr and $^{239+240}\text{Pu}$ in the water, however, have been variable since 1975 and during January 1977, the ^{90}Sr concentration was found to exceed the recommended EPA guideline of 8 pCi/l. The radionuclide concentrations in the groundwater at FWR 4 do not appear to change systematically. ^{137}Cs concentrations decreased between 6/75 and 1/77, while ^{90}Sr and $^{239+240}\text{Pu}$ concentrations increased. Between 1/77 and 11/77, both ^{137}Cs and $^{239+240}\text{Pu}$ essentially doubled in concentration. We are attempting to correlate these changes in concentration with fresh water recharge from rainfall, groundwater residence times and other hydrological features.

The two cisterns attached to the old mess hall are presently the only aboveground storage facilities for rainwater on Eneu Island. The water in the cisterns is, of course, chemically acceptable for drinking and contains levels of ^{137}Cs and ^{90}Sr lower than cisterns water samples collected from Bikini Island. The ^{90}Sr concentration in the Eneu cistern water is similar to the average levels reported for New York tap water (0.30 pCi/l) during 1977 (Environmental Measurements Laboratory Report, EML-339, April 1978).

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Consumption of the cistern water would result in lower 10, 30, 50 and 70 year integral doses than those computed for the consumption of Bikini cistern water in UCRL-51879, Part 5. The average concentrations in the water at FWR 4 will result in a slightly lower dose from ^{137}Cs and $^{239+240}\text{Pu}$ and a higher ^{90}Sr dose than computed for consumption of Bikini Island cistern water in UCRL-51879 Part 5.

A number of the reef fish, mullet, were collected for radionuclide analysis from six different islands of Bikini Atoll, including Eneu, during 1977. Concentrations of specific radionuclides have been determined in the fish flesh, bones, skin, viscera, reproductive organs, gills and stomach contents. The radionuclide concentrations are used to compute the radiological exposure to individuals from ingestion of marine foods. Mullet from Bikini have higher ^{137}Cs levels associated with muscle tissue than average values found for Enewetak Atoll fish. The mean ^{60}Co levels in muscle tissue of fish from both Atolls is similar and the highest concentrations are associated with reproductive organs. Plutonium concentrations in mullet from Bikini differ from those at Enewetak but the average concentration factor for plutonium in fish muscle is similar at both Atolls. The concentrations of specific radionuclides in mullet tissue vary greatly from island to island within the Atoll and the radionuclide concentrations in the fish caught off Eneu fall between the lowest and highest values detected in mullet at Bikini Atoll. Updated doses from consumption of marine foods at Bikini is in progress.

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Preliminary Data from the Eneu Island

Coconut Tree NO.	Mean ¹³⁷ Cs Coconut Meat Concentration pCi/g Dry Weight	Concentration Ratio Coconut Meat pCi/g Coco Meat/pCi/g Soil	Concentration Ratio Coco Milk pCi/g Coco Milk/pCi/g Soil)
1	86	21	8.8
2	22	--	7.1
5	40	6.2	7.1
6	41	12	4.8
9 (Ripe)	32	7.2	3.5
9 (Green)	36	8.2	4.9
10	97	14	5.1
11	23	3.4	1.2
12	12	29	10
13	32	8.7	2.7
14	49	20	6.2
15	51	6.0	2.5
16	45	4.1	1.3

Mean ¹³⁷Cs Coco Meat Concentration = 44 pCi/g dry wt. or 22 pCi/g wet wt.

Mean ¹³⁷Cs Concentration Ratio Coco Meat = 11.5 $\left(\frac{\text{pCi/g dry Coco Meat}}{\text{pCi/g dry Soil}}\right)$

Mean ¹³⁷Cs Concentration Ratio Coco Meat = 5.8 $\left(\frac{\text{pCi/g wet Coco Meat}}{\text{pCi/g dry Soil}}\right)$

Mean ¹³⁷Cs Concentration Ratio Coco Milk = 4.6 $\left(\frac{\text{pCi/g wet weight Milk}}{\text{pCi/g dry Soil}}\right)$

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Eneu Groundwater

Radionuclide Concentrations

10⁴ pCi/l *20 pCi/l* *500 pCi/l*

Well (6/75)	Soluble (pCi/l)			Particulate (pCi/l)		
	¹³⁷ Cs	⁹⁰ Sr	²³⁹⁺²⁴⁰ Pu	¹³⁷ Cs	⁹⁰ Sr	²³⁹⁺²⁴⁰ Pu
FWR 1	35	71	.0035	1.17	0.81	.0095
2	69	66	.023	0.95		.0084
3	32	1.3	.0007	0.59	0.03	.0014
4	1.1	3.4	.00085	0.57	0.11	.00067

Well (1/77)

FWR 1	9.7	8.9	.018
2	10.6	3.9	.0023
3	16.1	4.2	.0019
4	0.4	9.5	.0013
5	13	33	.0062
6	2.3	3.4	.0040

Well (11/77)

FWR 1	37.0		.0011	0.56		.0018
2	19.8		.0023	0.17		.0014
4	0.81		.0029	0.09		.0009
5	18.2		.0013	0.42		.0168
6	45.2		.0036	0.65		.0004

Eneu Cistern (attached to old mess hall)

1/77

N. Cistern	lost	0.49	.0025
S. Cistern	lost	0.23	.0009

11/77

S. Cistern	0.21	.0165
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