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Safety & Environmental Protection Division

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July 23, 1979

Dr. Bruce Wacholz
ASEV
U. S. Department of Energy
Washington, DC 20545

Dear Bruce:

In accordance with your recent request, the following projection of the BNL Marshall Islands Radiological Safety Program (MIRSP) is submitted for your consideration.

Program Description

I. Personnel Monitoring

Our highest priority activity for the present and foreseeable future is the measurement or estimation of doses and dose commitments incurred by the residents of the Pacific Islands which were immediately affected by fallout from U.S. atmospheric tests. We expect to accomplish this by programs of routine in vivo counting and urine bioassay, and by periodic monitoring of external radiation exposure rates. Records will be maintained of doses and dose commitments to individuals and of average dosimetric data for each island's population in order to demonstrate trends and to aid in the prediction of future doses. Individual dosimetry data will also be made available to DOE for ultimate dissemination to the affected individuals.

II. Diet and Living Pattern Study

Experience has demonstrated that the most needed and least understood parameter in predicting population doses and trends is the local diet. In light of our observations of diet patterns at over 10 resident islands in the Marshalls, it is clear that there are significant differences in the diet from one location to another, and that dietary patterns are changing from year to year. Most of our future field trip plans will include observations of diet patterns and interviews with typical resident families in order to develop a dietary information data base which will be factored into predictive dose assessments in the Marshalls.

III. Environmental Monitoring

The Northern Marshall Islands Radiological Survey ("13 Atoll Survey") is expected to rigorously characterize the individual radionuclides in the terrestrial and marine environments. As a result of this survey and more

pressing needs in personnel monitoring areas and to de-emphasize environmental monitoring in our program. We expect to continue a small effort devoted to the sampling of soil and food chair-related terrestrial biota and measurements of external radiation at standarized sites to record the decline in environmental radioactivity. We also expect to re-establish our continuous air sampling programs at Bikini, Rongelap, Utirik and Kwajalein following necessary equipment repairs.

Objectives

The primary objective of the program is the definition of doses and dose commitments to people living on contaminated islands in the Northern Marshalls. This will be accomplished by the direct measurement of internal gamma emitters through in vivo counting and by urine bioassay for $^{90}Sr/^{90}Y$ and transuranic nuclides, as well as for gamma emitters. Urine bioassay data will be used initially to measure excretion rates for all radionuclides of interest, and then to estimate body burdens for specific radionuclides by incorporating the excretion rate data into accepted metabolic models for those nuclides. As an independent check on the results of the diet pattern studies, excretion rate and body burden data will also be used to estimate radionuclide intake rates. Body burden, intake rate and excretion rate data will also be used to quantify dose commitments for internal emitters. The external dose components will be estimated by incorporating external exposure rate data for a given atoll into an empirically determined living pattern model.

At this point, our personnel monitoring efforts are focused on the relocated Bikinians, for whom we expect to have individual and population dosimetric information essentially completed by the end of FY 1979. It is expected that the results of this effort will be reported directly to OES and published in the journal HEALTH PHYSICS. Preprints of all publications will also be sent to all other interested parties within DOE and its contractors. We also expect to follow the decline of body burdens among the Bikinians for at least another year.

Similar personnel monitoring efforts are currently underway for the residents of Utirik and Rongelap. We also anticipate an opportunity to determine "baseline" radionuclide body burdens for the Enewetakese currently residing at Ujelang. To these ends, a personnel monitoring field trip is planned for August-September 1979.

Our program will require an average of about two field trips per year. At this time, space limitations on the Liktanur II appear to limit joint field trips with BNL Medical. However, it would be highly desirable to arrange this in the near future. Such joint trips would minimize costs to DOE and perhaps more importantly minimize the disruptive sociological impact of field trip visits on the people of the Northern Marshalls.

Progress to Date

The focus of the MIRSP was on environmental monitoring from the inception of the program in 1974 until 1977. In the spring of 1975 the Brookhaven field survey team performed an extensive external radiation survey of Bikini Island which laid the ground work for a "high resolution" survey by LLL, EPA, University of Washington and BNL in July 1975. The purpose of this latter survey was to determine acceptable locations for a proposed second round of housing construction at Bikini by DOI/TT. In the fall 1975 we participated as collaborators in the University of Washington, LRE's Pacific Basin Study to establish ambient background levels for external radiation and terrestrial and marine biota in Micronesia.

In 1976 we continued our environmental monitoring efforts at Utirik, Rongelap, and Bikini and began to assume responsibility for urine bioassay for Marshallese medical subjects. This had previously been handled by BNL Medical and HASL.

The emphasis of our program over the past two years has been on personnel monitoring; the most significant accomplishment being the demonstration of rapidly increasing ^{137}Cs body burdens among the Bikinians. Follow-up personnel monitoring for relocated Bikini residents has dominated our program activities thus far in 1979.

The following list of publications will serve to illustrate our program activities to date:

"Marshall Islands Radiological Follow-up", BNL 20767, Proceedings of the Ninth Midyear Topical Symposium of the Health Physics Society (1976).

"Radiological Analyses of Marshall Islands Environmental Samples: 1974-1976", BNL 50796 (1977).

"External Radiation Survey and Dose Predictions for Rongelap, Utirik, Rongerik, Ailuk and Wotje Atolls", BNL 50797 (1977).

"Dosimetric Results for the Bikini Population", to be published in Health Physics (1979).

"Whole Body Counting Results from 1974 to 1978 at Bikini Atoll", to be published in Health Physics (1979).

"Dietary Radioactivity Intake from Bioassay Data: A Model Applies to ^{137}Cs Intake by Bikini Residents" co-authored with R. Miltenberger, et al., to be published in Health Physics (1979).

Anticipated Future Directions

I. Proposed Options and Implications

We feel that personnel monitoring and dosimetry efforts in the Marshalls should continue as long as significant doses (with respect to FRC guidelines) are credible. The changing political climate, socioeconomic factors, and living patterns in the Marshall Islands make long-range predictions of doses unfeasible at this time; but even if such predictions were possible, it would still be necessary to verify them with actual dosimetry.

The area of greatest uncertainty at this point is over the future habitation of Bikini Atoll. Our personnel monitoring efforts for the past year have been concentrated on internal dosimetry for the Bikinians, and we expect to follow the decline in ^{137}Cs and ^{90}Sr body burdens for at least another year. If, however, the Bikini people are allowed to return to their atoll, we will have to redouble our dosimetry activities in their behalf. Follow-up studies with the relocated Bikinians are complicated by the fact that they are now dispersed over several atolls in the Marshalls (although most live at either Kili Island or Majuro Atoll). One set of options then is whether we have an indefinitely continuing dosimetry program for returning Bikini residents, a short-term (~1 year) follow-up program for relocated Bikinians, or both. If the Bikinians return in the near future, we could conceivably have an additional field trip or an extended field trip requirement to cover both the returnees and those relocated Bikinians who may choose not to return again. The assumption is that the Ejit Island group at Majuro has arrived at a good compromise and may wish (if given the choice) to remain on Ejit rather than avail themselves of a possible offer to return to Bikini where they still might face an uncertain future.

Another "direction" is with respect to the return of the Enewetakese. As previously mentioned, we hope to visit Ujelang later this year to obtain baseline whole body counts and urine bioassay samples. Once the people return to Enewetak, we anticipate a need for annual personnel monitoring visits initially until patterns of radionuclide body burdens are well enough established to be predictable. Concomitant with these visits, we would also institute a periodic assessment of diet and living patterns, and an environmental monitoring program.

We have also been asked by OES to attempt to associate radionuclide body burdens among the Bikinians, with radioactivity concentrations in food crops from their family land holdings (watos). The assumption is that a family obtains its food primarily from the family wato. If such an association exists, then dose mitigating measures can be suggested for family groups with the highest exposure potential. Such a study would also be useful at Enewetak, once it is reinhabited.

A substantial body of data exists in the Medical Department and S&EP Division at BNL on the values of various anatomical parameters for Marshallese adults and children (e.g., body weight and height as a functional sex and age). Also, the recent Bikini experience has afforded us an opportunity to make direct measurements of excretion rate constants for ^{137}Cs and $^{90}Sr/^{90}Y$, and possibly for transuranic nuclides. We expect to compile these data into an information base for a Marshallese "Reference Man, Woman and Child", which will be useful in predictive dosimetry efforts.

In our discussion with Dr. Pratt, BNL Medical Department, we have agreed on the need to establish a "control" atoll against which medical and radiological findings on contaminated atolls may be referenced. If this proposal is approved by DOE, we would establish routine personnel and environmental monitoring programs at the control atoll in a cooperative venture with the BNL Medical Department.

II. Manpower

Our present staff consists of three scientific or professional staff members and two technical support persons dedicated to the MIRSP. This staffing level often leaves us overextended in attempting to meet our present commitments. We expect to add two additional personnel in FY 1980; but we envision the need for at least one additional staff member to assist in the program expansion to include Enewetak, and with the proposed "control" atoll project.

III. Time Factors and Decision Points

The extension of MIRSP activities to Enewetak was anticipated, and sufficient funds are included in the FY 1980 presidential budget to include field trips and related efforts there. The critical decision point relates to the possibility of a return of some Bikinians to Eneu Island. If this occurs during the next fiscal year, our program activities would almost certainly need to be expanded to include Bikini before the end of the fiscal year. Funds were not included in the FY 1980 budget to cover this possibility, and manpower would be somewhat overextended at the anticipated 1980 staffing level. The establishment of a joint medical/ radiological "control" atoll would require at least six months of advance planning and budgeting.

Cost Estimates

The following table lists the current budget and projections through FY 1982 for the MIRSP, as presently committed. It includes the addition of Enewetak to the program in FY 1980, but does not include cost estimates for possible monitoring coverage at Bikini, or for the proposed "control" atoll. We estimate that these additions would require supplemental funds of ~$50K and ~$80K respectively, and the authorization to add another professional staff member.

	FY79	FY80	FY81	FY82
Salaries				
Scientific-	24.6	93	102	109
Professional-	43.2			
Other-	22.0	73	80	86
Direct Distributed Labor/Contributed Technical Services-	4.0	13	14	15
Burden-	2.0	4	5	5
Purchased Materials-	46.6	51	57	61
Stores-	9.9	10	11	12
Travel-	40.4	42	47	50
Communications-	.7	1	1	1
Purchased Services	4.6	5	6	7
Allocated Services	2.0	6	7	7
Subtotal	200	298	330	353
Overhead	81	122	135	145
TOTAL	281	420	465	498

Please call me on FTS 666-4250 or -4207 if you need further information.

Sincerely yours,

N. A. Greenhouse
Project Manager
BNL MIRSP

NAG/jwe

cc: G. Dix
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