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Testimony
before the Committee on Resources and
the Committee on International Relations Subcommittee on Asia and the Pacific

"The United States Nuclear Legacy in the Marshall Islands:
Consideration of Issues Relating to the Changed Circumstances Petition"

Wednesday, May 25th, 2005

# Statement of James H. Plasman
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***Jurisdiction of the Nuclear Claims Tribunal***

The Section 177 Agreement attempts to resolve the outstanding claims of the people of the Marshall Islands for damages resulting from the Nuclear Testing Program conducted by the U.S. in the Marshall Islands from 1946 to 1958. The Section 177 Agreement states that it is the full settlement of all claims of the people of the Marshall Islands arising out of the Nuclear Testing Program. At the same time, the agreement includes important elements that provide for an ongoing review of its terms to insure the interests of both parties are satisfied. Because there was not a full understanding of the consequences of the testing program at the time of the agreement, the parties agreed to the establishment of an independent body, the Nuclear Claims Tribunal, to assess and determine claims based on or arising out of the testing program. As mutually agreed between the Governments of the United States and the Marshall Islands, the jurisdiction of the Tribunal is "to render final determination upon all claims past, present and future, of the Government, citizens and nationals of the Marshall Islands which are based on, arise out of , or are in any way related to the Nuclear Testing Program. . ." Notably, this jurisdiction is not limited to claims from the northernmost atolls where the testing occurred, but covers "all claims."

In addition, as mutually agreed between the two governments, the Tribunal's jurisdiction is not artificially limited by an amount which the Tribunal may award in rendering "final determinations" of claims resulting from the Nuclear Testing Program. Article II, Section 6(c) provides for "$45.75 million to be made available to the Claims Tribunal for whole or partial payment of monetary awards made by the Claims Tribunal pursuant to Article IV of this Agreement." Further, Article II, Section 7(c) provides that "Commencing on the fifteenth anniversary of the effective date of this Agreement, not less than 75 percent of Annual Proceeds shall be available for disbursement in whole or partial payment of monetary awards made by the Claims Tribunal in subsequent years." Clearly there is provision made for awards above and beyond the $45.75 million, and further, there is no limitation on the amount which the Tribunal may award. The Tribunal's jurisdiction is to render final determination on all claims arising out the testing program. It is not limited by any cap.

At the time the agreement was negotiated and came into effect, both the full effects of radiation on the health of the Marshallese people and the geographic extent of radioactive fallout and residual contamination were not understood. Much has been learned about the health consequences of radioactive fallout during the 22 years since the Section 177 Agreement became effective.

***The Effects and Levels of Radiation in the Marshall Islands***

The 177 Agreement states (in Article VIII) that:

> "The Government of the United States has concluded that:
>
> (a) The Northern Marshall Islands Radiological Survey and related environmental studies conducted by the Government of the United States represent the best effort of that Government accurately to evaluate and describe radiological conditions in the Marshall Islands; and
>
> (b) The Northern Marshall Islands Radiological survey and related environmental studies have been made available to the Government of the Marshall Islands and can be used for the evaluation of the food chain and environment and estimating radiation-related health consequences of residing in the Northern Marshall Islands after 1978."

One of the ways in which the results of the Northern Marshall Islands Radiological survey was made available to people in the Marshall Islands was through a bilingual (Marshallese/English) book published by the United States Department of Energy in November 1982 and titled "The Meaning of Radiation for Those Atolls in the Northern Part of the Marshall Islands That Were Surveyed in 1978." The Introduction of that book states that "This book explains the results of the 1978 measurements for the following atolls: Rongelap, Utrik, Taka, Bikar, Rongrik, Ailinginae, Likiep, Ailuk, Jemo, Mejit, Wotho and Ujelang." It also notes that "The reason scientists chose these atolls to study was because it is possible they were in the path the winds blew during some of the tests, and also because some information had been achieved previously about the radioactive atoms on some of these atolls."

The book describes radioactive fallout, the ways people can "receive radiation," and the ways that radiation could cause harm. It also provides some information specific to each individual atoll, including scientists' estimates as to "the largest amount of radiation a person might receive in one year from radioactive atoms that came from the U.S. bomb tests" and "the highest average amount of radiation people might receive in the coming 30 years." The book gives scientists' estimates, based on a certain number of people who might live and eat local food only from a specific atoll or island, as to the number of people who "may die from cancers caused by things other than radiation from the atomic bomb tests" (i.e. baseline cancers) and the number that "may die in the future from cancers caused by radiation received in the coming 30 years from the atomic bomb tests" (i.e. excess cancers).

The numbers presented in the book by atoll are set out in Attachment 1.

Thus, based on the "best effort" estimates presented in this book, the negotiators of the Section 177 Agreement could expect that within an assumed population of 2,473 people living and eating local food only from these 12 atolls, an upper limit total of two cancer deaths would result from radiation received in the coming 30 years from the atomic bomb tests.

Radiation exposures received from living in and eating local food from an atoll during the 1980s and after would be considered "chronic" in nature. As such, they were routinely dismissed by U.S. officials, both during and after the settlement negotiations, as having no consequence. For

example, even people who lived and ate local food at Rongelap and Utrik for 30 or more years beginning in the 1950s were referred to officially as “unexposed” if they had not been on Rongelap or Utrik at the time of the BRAVO thermonuclear test on March 1, 1954. This practice continued despite the constantly accumulating chronic exposures that they were receiving as a result of living in and eating food from an environment characterized by medical experts under contract to the Atomic Energy Commission as containing levels of radioactive contamination “higher than those found in other inhabited locations in the world.” [BNL March 1957 Medical Survey of Rongelap and Utrik People Three Years After Exposure to Radioactive Fallout]

In fact, however, the only people officially recognized by the U.S. as “exposed” were those who had been physically present on Rongelap, Ailinginae or Utrik when BRAVO was detonated. The basis for the distinction was the “acute” doses --- whether external or internal in nature --- that they had received. It is generally agreed that for most people living in the Marshall Islands during the testing period, “acute” doses are many times higher than the chronic doses, accounting for more than 90% of the total dose to an individual or population.

The effects of such acute exposures, even at relatively low levels, can take decades to manifest. However, the 1982 DOE book gives no estimates as to the number of cancers or other illnesses that may be attributed to acute radiation exposures received during the testing period at any of the atolls in the Marshall Islands.

After the Section 177 Agreement came into effect, new scientific understanding of radiation health risks continued to develop and emerge. The 1990 report of the National Academy of Sciences Committee on the Biological Effects of Ionizing Radiation (BEIR V) documents that there are “Well demonstrated late effects” of low-dose radiation exposure which “include the induction of cancer” and that new data developed since the completion of the 1980 BEIR III report show that “The cancer risk estimates derived with the preferred models used in this report are about 3 times larger for solid cancers ... and 4 times larger for leukemia than the risk estimates presented in the BEIR III report.”

In 1994, a study conducted by the Radiation Effects Research Foundation presented for the first time comprehensive data on the incidence of solid cancer among A-bomb survivors, expanding the knowledge of the range of health effects of exposure to radiation. (Cancer Incidence in Atomic Bomb Survivors, Radiation Research Society.)

Also, during the 1990s, a new understanding developed regarding the level and extent of the exposures in the Marshall Islands. Reports such as Radioactive Debris from Operation Castle, Islands of the Mid-Pacific, (Breslin, A. J.; Cassidy, M. E.; New York: U.S. Atomic Energy Commission, New York Operations Office, Health and Safety Laboratory; NYO-4623; 1955) declassified in 1994 from its previously Secret status, documents significant doses at virtually every atoll during the 1954 series of tests. A comparison study provided to staff members of this Committee in April 2004 documents that even the atoll with lowest average individual external radiation dose in the Marshall Islands exceeded the average dose to the populations living in the six counties closest to the Nevada Test Site during the respective periods of atmospheric testing.

Indeed, the full impact of exposures throughout the Marshall Islands has yet to be determined. A new measure of the anticipated late effects of those exposures was made available to the Marshall Islands just last month with the release of a recent study by the National Cancer Institute. (Estimation of the Baseline Number of Cancers Among Marshallese and the Number of Cancers Attributable to Exposure to Fallout from Nuclear Weapons Testing Conducted in the Marshall Islands, Prepared for Senate Committee on Energy and Natural Resources, September 2004.) While acknowledging (at page 2) that "To date, there has not been an epidemiologic study of the Marshallese to estimate the total numbers of cancers and other serious illnesses resulting from exposure to radioactive fallout," the NCI states that "It is possible, however, to develop estimates of the number of baseline cancers and radiation related cancers based on estimated doses."

The NCI study estimates that, primarily as a result of past exposures, 532 radiation related cancers may be expected to occur among the 1954 Marshall Islands population of 13,940.

Included in those 532 excess cancers are 297 estimated to occur among people from atolls other than the four specifically provided for in the Section 177 Agreement (per Table 3 at page 20 of the study). NCI estimates 70 radiation related cancers among people who lived in the southern atolls that were not included in the 1978 radiological survey, as well as an unspecified number among people who lived at Wotje (indicated as an "Other northern atoll" in Table 3 but not included in the 1978 survey).

Tables 2a and 2b of the NCI study indicate that of the 532 expected radiation related cancers, only 243 are estimated to have occurred during the 1946-2003 time period while 289 are estimated to occur in 2004 and later.

The estimated 532 excess cancers, attributable to radiation created by the nuclear testing program, are in addition to an estimated 5,600 cancers "expected to occur in the absence of exposure to radioactive fallout from tests conducted in the Marshall Islands" (page 14).

***Radiogenic Illnesses Other Than Cancer***

Although NCI says that it is possible to develop estimates of the number of cancers, it acknowledges that "estimation of diseases other than cancer is more problematic." Accordingly, the study does not address other non-malignant health conditions which are known to result from exposure to radiation. The thyroid gland is especially sensitive to radiation, particularly radioactive iodine, which was a large component of the fallout which spread over the Marshall Islands. It is also a difficult radionuclide to gauge because of the short half lives of its various isotopes. Even in small amounts, radioactive iodine can cause extensive damage in children.

While there has never been a systematic medical surveillance program of the entire Marshall Islands, a high prevalence of thyroid disease was documented in populations at 12 atolls that were thought not to have received significant fallout from BRAVO. (Hamilton, T. E.; van Belle, G.; LoGerfo, J. P.; "Thyroid Neoplasia in Marshall Islanders Exposed to Nuclear Fallout," Journal of the American Medical Association, 258:629-636; 1987) Eight of those twelve atolls (Wotje, Maloelap, Lae, Ujae, Kwajalein, Jaluit, Ebon and Mili) were not included in the 1978

northern islands survey, leading the investigators to state that "These findings suggest that the geographic extent of radioiodine exposure from the 1954 BRAVO test was much broader than previously assumed."

The former Chief of the Clinical Epidemiology Branch of the National Cancer Institute called those findings "astonishing" and, in a paper prepared for the Tribunal, stated that "these tumors may be regarded in effect as a biological dosimeter that indicates unmeasured fallout of thyroid-damaging radioiodines in a similar mixture to those on Rongelap." [Radiation Effects Among the Marshallese, Robert W. Miller, MD, December 15, 1989].

In 1998, the CDC estimated that approximately 6.3 billion curies of Iodine-131 had been released to the atmosphere as a result of nuclear testing in the Marshall Islands. That amount is 42 times the 150 million curies released from events at the Nevada Test Site, 157 times the 40 million curies released during the Chernobyl accident, and more than 8,500 times the 739,000 curies released as a result of Hanford operations.

A subsequent calculation of the amount of I-131 released by the nuclear tests in the Marshall Islands notes that the CDC value of 6.3 billion curies "appears too low by at least 32% and possibly by as much as 42%." (Simon, Steven; "To Mr. Oscar deBrum, Information update and comment," August 23, 1999 personal e-mail). Based on Dr. Simon's calculations, "A better estimate is between 7.9 and 8.5 billion curies. Thus, the release of I-131 in the Marshalls was closer to 53 times (or as high as 57 times) greater than that released at the NTS rather than 42 times as stated."

The 1987 Hamilton study noted mean latency periods for thyroid nodules of 13 years for Rongelap children and 25 years for Utrik children and stated that "Since latent periods at least as long as 34 years are thought to exist in other populations exposed to thyroid irradiation, it will be necessary to continue close follow-up of this population."

Unfortunately, recognition of the effects of the exposures on the thyroid was greatly delayed. As recalled in late 1994 by Dr. Victor Bond, a longtime member of the BNL medical teams that routinely examined the people of Rongelap and Utrik, "And quite frankly, I'm still a little embarassed about the thyroid. [T]he dogma at the time was that the thyroid was a radio-resistant organ.... [I]t turned out they had ... very large doses of iodine ... to the thyroid." [page 589 of Advisory Committee on Human Radiation Experiments Final Report dated October 1995]

Dr. Eugene Cronkite, another longtime member of the teams, noted in 1994 that "there was nothing in the medical literature ... to predict that one would have a relatively high incidence of thyroid disorders." [page 589 of Advisory Committee on Human Radiation Experiments Final Report dated October 1995]

"Nine years after the accident, a 12-year-old Rongelap girl was found to have developed a nodule in her thyroid gland. Within the next 3 years, 15 of the 22 Rongelap people who had been under age 10 years at the time of exposure had developed thyroid lesions. At that time, the first thyroid nodule in an exposed Rongelap adult appeared and in 1969, 15 years after the accident, the first thyroid nodule appeared among the exposed people of Utirik. It has become

evident that thyroid abnormalities – which include benign and malignant thyroid tumors and thyroid failure – are the major late effects of the radiation received by the exposed Marshallese." [Radiation effects in the Marshall Islands; Jacob Robbins, William H. Adams; Radiation and the Thyroid: Proceedings of the 27th Annual Meeting of the Japanese Nuclear Medicine Society, Nagasaki, Japan October 1-3, 1987; published by Excerpta Medica 1989, page 16]

The same paper reports (beginning at page 16) that "The first thyroid abnormality to appear in the exposed Marshallese people was radiation-induced thyroid atrophy, resulting in profound growth failure in two boys. However, the etiology was not recognized until after thyroid nodules began to appear. The reason was that the diagnosis of hypothyroidism, at that time based on PBI measurement, was obscured by an elevated iodoprotein level, later found to be prevalent in the Marshall Islands (2, 3, 11). Subsequent surveys by TSH measurement and TSH response to TRH, in addition to routine measurement of thyroid hormone levels, revealed 12 cases of subclinical thyroid hypofunction (12) that could not be attributed to prior thyroid surgery. A high proportion of the Rongelap people who were aged under 10 years when exposed had the most marked TSH elevations, which probably favored the development of thyroid nodules (4). Although the finding of hypothyroidism was surprising at first, reevaluation of the thyroid absorbed radiation dose by Lessard et al (1) now shows that the exposure was in a range known to be capable of causing thyroid failure."

And (beginning at page 21): "Relevance of the Marshall Islands Experience - The information collected on the Marshallese people constitutes an important body of data relating to the late effects of radiation absorbed by the thyroid gland. It shows convincingly that the induction of thyroid nodules and thyroid cancer is a major cause of late morbidity. Although it give us some idea of the risk coefficient for internal radiation, the magnitude is uncertain owing to the lack of precise data about radionuclide intake, and because of the small population involved."

"From the Marshallese experience it is clear that, in any future accident involving radioiodines, the use of oral stable iodine to suppress radioiodine uptake by the thyroid, particularly in children and pregnant women, should be considered." From "Late Radiation Effects in Marshall Islanders Exposed to Fallout 28 Years Ago," by Robert A. Conard, M.D., in *Radiation Carcinogenesis: Epidemiology and Biological Significance,* Raven Press, NY, 1984, p. 67.

Benign thyroid conditions account for more than 1,000 of the 2,097 personal injury awards made by the Nuclear Claims Tribunal. A 1985 study estimated the rate of radiation induced thyroid nodules would be two to three times the rate of thyroid cancer *(*H. Maxon, S. Thomas, C. Buncher, S. Book and V. Hertzberg. Thyroid effects. In: *Health Effects Model for Nuclear Power Plant Accident Consequence Analysis. Part II: Scientific Basis for Health Effects Models,* pp. 181-226 (J.S. Evans, D.W. Moeller and D.W. Cooper, eds.) NUREG/CR-4214, U.S. Nuclear Regulatory Commission, Washington, D.C., 1985*)* The NCI study estimates an excess 262 radiation induced thyroid cancers, suggesting that 524 to 786 radiation induced thyroid nodules would occur.

Inadequate medical monitoring has prevented early treatment in many cases and has also precluded the diagnosis of many diseases. Nevertheless, it became increasingly apparent that the health consequences of the U.S. nuclear weapons testing program in the Marshall Islands have

been much greater than could have been foreseen in the 1980s.

These studies indicate that there is a relationship between the level of exposure and latency period. It took nine years after BRAVO to recognize the thyroid effects in Rongelap. The scientific understanding of the full effects of radiation on the thyroid and other health effects continues to develop.

***A Presumptive Approach***

The Tribunal, in determining personal injury damages resulting from the testing program, found guidance in similar US programs. At the time of consideration of the Tribunal personal injury program, the Veterans Administration had two programs for radiation affected veterans. The initial program utilized by the VA was a non-presumptive program that utilized a form of "probability of causation"based in part on the radiation dose received by the veteran to determine service-connected disability. In 1988, a statutory program was enacted which granted a presumption of service connection for veterans who developed cancer from a list of statutorily determined radiogenic conditions.

Later, in 1990, the Radiation Exposure Compensation Act was enacted, which provided compensation to various groups of radiation exposure victims in the U.S., including the "Downwinders," individuals who resided during the testing period in certain counties downwind of the nuclear tests in Nevada. For these Downwinders who developed a condition on the statutory list of radiogenic conditions, it was presumed their condition resulted from the nuclear tests and they were eligible for an award of $50,000, or $75,000 if they were "on-site."

The Tribunal ascertained early on that there was insufficient evidence of individual doses to provide a basis for application of a "probability of causation" analysis and, based upon the U.S. VA and Downwinder precedent, adopted a presumptive program that required residence in the Marshall Islands and development of a radiogenic disease determined by regulation. In examining the Downwinders compensation program, the Tribunal found compelling comparisons to justify the presumptive approach. In both cases, the affected populations were unknowing victims of the fallout from the testing program. In both cases, there was little effort made to monitor exposures to the population at large. Although the Marshall Islands was geographically somewhat larger than the area covered by the Downwinders program, the total yield of the nuclear tests in the Marshall Islands was almost 100 times greater than that in Nevada. A comparison of estimated doses for Downwinders and Marshall Islanders indicates that the atoll in the Marshall Islands with the *lowest* average dose was comparable to the *average* dose of the Downwinders.

The most recently adopted compensatory program for radiation related injuries in the U.S. is the Energy Employee Occupational Injury Compensation Program. This program, designed to compensate Department of Energy workers exposed to radiation in weapons development facilities, adopted a probability of causation approach which awarded compensation to workers who were able to show that it was probable their medical condition was the result of their exposure to radiation. However, even in this context, where there was careful monitoring of worker exposures, there were special provisions made for workers for whom there was

inadequate information to develop a dose reconstruction and for whom there was a reasonable likelihood of harm. Such workers may be recognized as a "Special Exposure Cohort" for whom causation would be presumed without reference to level of exposure, if they developed a listed radiogenic condition.

The reality is that a radiation induced cancer has no specific indicator to separate it from cancers generally. The U.S. has recognized that reality when there is insufficient information to provide a probability of causation analysis of the origin of a radiation related condition, it is appropriate to adopt a presumptive approach compensating all radiogenic cancers where there is a reasonable possibility of harm, and accept the likelihood that there will be an element of over-inclusiveness in compensation. The NCT has adopted that philosophy as well. The over-inclusiveness of such compensation must be accepted as a necessary part of compensation for such injuries. The NCI study clearly indicates there are injuries which have yet to be compensated. Failure to compensate those injuries indicates that the level of compensation for personal injuries is manifestly inadequate.

Another element of our compensatory programs is the level of compensation for awards. The Tribunal has adopted a scaled approach, with awards ranging from $12,500 for certain benign conditions, to $125,000 for the most serious cancers, while the U.S. programs tend to be lump sum awards, ranging from $50,000 for Downwinders ($75,000 if "on-site") to $150,000 for Department of Energy employees. It should be acknowledged that awards of this nature tend to be smaller than awards in fully adjudicated legal actions. It could be argued that both U.S. and the Tribunal programs significantly under compensate awardees. If, for instance, the award levels were based on the value of a statistical life, as utilized by regulatory agencies for cost-benefit analysis, the award levels would be much higher. For instance, it has been reported ("Valuation of Human Health and Welfare Effects of Criteria Pollutants" Appendix H, The Benefits and Costs of the Clean Air Act, 1990 to 2010, EPA, 1997) that while values differ from program to program, the mean value of a statistical life for regulatory purposes is $4.8 million. Under such a valuation, total compensation to date by the Tribunal for personal injuries, even based solely on the NCI estimate of 532 cancers caused by radiation exposure from the nuclear testing program, is far from adequate compensation for the injuries suffered by the people of the Marshall Islands.

Article IV, Section 3 of the Section 177 Agreement, entitled "Governing Law," directs that "In determining any legal issue, the Claims Tribunal may have reference to the laws of the Marshall Islands, including traditional law, to international law and, in the absence of domestic or international law, to the laws of the United States."

The Tribunal's approach to compensating personal injuries, as part of its responsibility to determine all claims arising out of the Nuclear Testing Program is a reasonable one, firmly based on the U.S. experience in addressing radiation related injury. The use of a presumption of causation rather than a probability of causation analysis is reasonable in light of the absence of individual exposure information, as is done in similar U.S. programs. The extension of the presumption of exposure throughout the nation is reasonable in light of the evidence of exposure outside the Four Atolls, evidence which was not known at the effective date of the Section 177 Agreement and which has been reinforced most recently the by National Cancer Institute report

on cancer in the Marshall Islands.

***Determination of Property Claims***

The Nuclear Claims Tribunal has approached claims involving damage to property as opposed to personal injury. Unlike the administrative scheme created by the Tribunal to address personal injury claims, property claims have been dealt with on an adjudicatory basis to date by consolidating the various individual property claims within each atoll and addressing these claims in the form of a class action. The Tribunal has heard testimony from expert witnesses on behalf of claimants as well as from the Defender of the Fund in reaching its decisions.

Although it would be inappropriate to comment on the Tribunal's decisions, the Four Atolls have submitted a statement on these issues and the Congressional Research Service Report and former Attorney General Thornburgh's report likewise deals with issues related to the property claims heard by the Tribunal.

In accordance with Article IV, Section 3 of the Section 177 Agreement, the Tribunal has referred to the laws of the United States in making its decisions in the absence of applicable Marshall Islands law or international law. In fact, in virtually every aspect of the Tribunal's decisions in property claims, the Tribunal has substantially, if not totally relied on established U.S. laws and precedents.

***Conclusion***

The Tribunal was not limited to a specific sum in determining damages under the Section 177 Agreement, but was charged with making a final determination of all claims, past, present and future based on, arising out of or in any way related to the Nuclear Testing Program. The level of these damages was not known and could not have been known at the time the Section 177 Agreement came into effect. Based upon the NCI study it is clear that exposures during the testing program have had and will continue to have a long lasting impact on the health of the Marshallese people. The U.S. has accepted responsibility for the damages from the Nuclear Testing Program under the terms of the Section 177 Agreement. Our understanding of the extent of and effects of the radiation from the testing program continues to develop in ways that were not known and could not have been known at the effective date of the Agreement. The determinations of the Tribunal have shown damages far in excess of those contemplated under the Agreement, rendering it manifestly inadequate. More than $15 million is owed on personal injury awards and nearly $1.1 billion remains unpaid on property damage awards. Due in large part to the failure of the Nuclear Claims fund to meet its expected performance goal, the value of the Fund has eroded from the original $150 million provided by the U.S. under the 177 Agreement in late 1986 to less than $3.5 million today. The "Changed Circumstances" provisions of the Section 177 Agreement may not require the Congress to *make additional funding available* to the Marshallese victims of the testing program, but it is clear that there remain significant unaddressed and uncompensated damages that were not and could not have been known at the time of the Agreement.

Attachment 1

Atoll by Atoll Analysis of Radiation Caused Cancer

| Atoll | Number of People | No. Baseline Cancers | No. of Excess Cancers |
|---|---|---|---|
| Wotho | 76 | 3 | 0.002 to 0.01 |
| Ailinginae | 100 | 5 | 0.03 to 0.2 |
| Rongelap | 233 | 10 | 0.1 to 0.6 |
| Rongrik | 100 | 5 | 0.03 to 0.2 |
| Likiep | 487 | 20 | 0.03 to 0.2 |
| Taka | 100 | 5 | 0.002 to 0.01 |
| Jemo | 100 | 5 | 0.005 to 0.03 |
| Utrik | 328 | 15 | 0.02 to 0.2 |
| Bikar | 100 | 5 | 0.02 to 0.2 |
| Ailuk | 420 | 20 | 0.04 to 0.2 |
| Mejit | 329 | 15 | 0.03 to 0.2 |
| Ujelang | 100 | 5 | 0.002 to 0.01 |
| | 2,473 | 113 | 0.311 to 2.06 |

Source: DOE, "The Meaning of Radiation for Those Atolls in the Northern Part of the Marshall Islands That Were Surveyed in 1978." (1982)

**Attachment 2**

**Marshall Islands Nuclear Claims Tribunal**
**Summary of Personal Injury Awards by Medical Condition as of 5/17/05**

| | | |
|---|---|---|
| 1. | Leukemia (other than chronic lymphocytic leukemia) | 53 |
| 2. | Cancer of the thyroid | |
| | a. if recurrent or requires multiple surgical and/or ablation | 32 |
| | b. if non-recurrent or does not require multiple treatment | 103 |
| 3. | Cancer of the breast | |
| | a. if recurrent or requires mastectomy | 40 |
| | b. if not recurrent or requires lumpectomy | 62 |
| 4. | Cancer of the pharynx | 26 |
| 5. | Cancer of the esophagus | 7 |
| 6. | Cancer of the stomach | 35 |
| 7. | Cancer of the small intestine | 4 |
| 8. | Cancer of the pancreas | 25 |
| 9. | Multiple myeloma | 5 |
| 10. | Lymphomas (except Hodgkin's disease) | 59 |
| 11. | Cancer of the bile ducts | 4 |
| 12. | Cancer of the gall bladder | 0 |
| 13. | Cancer of the liver (except if cirrhosis or hepatitis B is indicated) | 38 |
| 14. | Cancer of the colon | 29 |
| 15. | Cancer of the urinary tract, including the bladder, renal pelves, ureter and urethra | 10 |
| 16. | Tumors of the salivary gland | |
| | a. if malignant | 6 |
| | b. if benign and requiring surgery | 26 |
| | c. if benign and not requiring surgery | 4 |
| 17. | Non-malignant thyroid nodular disease (unless limited to occult nodules) | |
| | a. if requiring total thyroidectomy | 19 |
| | b. if requiring partial thyroidectomy | 249 |
| | c. if not requiring thyroidectomy | 729 |
| 18. | Cancer of the ovary | 57 |
| 19. | Unexplained hypothyroidism | 20 |
| 20. | Severe growth retardation due to thyroid damage | 2 |
| 21. | Unexplained bone marrow failure | 6 |
| 22. | Meningioma | 17 |
| 23. | Radiation sickness diagnosed between June 30, 1946 and August 18, 1958, inclusive | 72 |
| 24. | Beta burns diagnosed between June 30, 1946 and August 18, 1958, inclusive | 72 |
| 25. | Severe mental retardation (provided born between May and September 1954, inclusive, and mother was present on Rongelap or Utirik Atolls at any time in March 1954) | 0 |
| 26. | Unexplained hyperparathyroidism | 1 |
| 27. | Tumors of the parathyroid gland | |
| | a. if malignant | 0 |
| | b. if benign and requiring surgery | 5 |
| | c. if benign and not requiring surgery | 1 |
| 28. | Bronchial cancer (including cancer of the lung and pulmonary system) | 223 |
| 29. | Tumors of the brain, including schwannomas, but not other benign neural tumors | 14 |
| 30. | Cancer of the central nervous system | 0 |
| 31. | Cancer of the kidney | 14 |
| 32. | Cancer of the rectum | 20 |
| 33. | Cancer of the cecum | 3 |
| 34. | Non-melanoma skin cancer in individuals who were diagnosed as having suffered beta burns under number 24 above | 1 |
| 35. | Cancer of the bone | 8 |
| 36. | Autoimmune thyroiditis | 3 |

Total number of compensable conditions (diagnosed in 1,936 individuals) = 2,103
Total amount of compensation awarded is $87,111,250, of which $15,515,427 remains unpaid