MAJ C K
File

QUARTERLY OPERATIONAL SUMMARY - ENGINEERING DIVISION - 3D QTR FY 78

400652

1. Narrative Summary.

a. This quarter represented the transition period from the orginal JTG Staff to the "middle year" group. Building on the solid base provided by the orginal staff the new staff focused on the full scale production phase, i.e. move contaminated soil to Runit (Yvonne) for encryptment.

b. Both base camps were fully completed and operational. The Runit complex was also made ready and the tremie operation started on 17 Jun 78. By the end of the quarter, 1223 cubic yards of slurry had been deposited in Cactus Crater.

c. During the quarter, off atoll meetings and conferences shaped and refined the mission of the task group. The 3 - 4 May 1978 Conference held at Washington, D. C. and attended by the Operations Officer of the JTG resulted in the refined tasking that influenced planning activities of the JTG. The conference resulted in changing the goals for soil clean up as shown below:

ISLAND USE	ORIGINAL CRITERIA	NEW CRITERIA
Residence	40	40
Agriculture	100	80
Picnic	400	160

The conference also seriously considered changing use of Enjebi (Janet) from Agriculture to Residence. To that end, soil removal started on Enjebi (Janet) on 27 June 1978, even though it currently meets the standard as an Agriculture island. Priority of soil removal as stated in FCDNA tasking message dated 15 May 78, was Aomon (Sally) to 80 pico curies per gram and Enjebi (Janet) toward 40 pico curies per gram with no goal stated. No other islands were mentioned.

d. Pilot soil removal project developed the detailed procedures to be followed for the production phase. The procedure is briefly outlined below:

(1) Following the fine survey (normally a 25 meter grid) the area to have soil removed is recommended by DOE/ERSP. This area is marked on the ground by USAE Survey Team.

(2) Vegetation in the area is removed and stockpiled by using a 2½ CY scoop loader with a 4 in 1 bucket to limit the amount of soil removed with the vegetation. The vegetation is allowed to dry and then burned.

(3) The soil is removed in 6" to 8" lifts by using a dozer to move soil to stockpile at the edge of area.

(4) Scoop loader loads soil on dump truck.

(5) The dump trucks move to beach area stockpile site.

(6) The dump trucks load on boats for over water transport, stockpile soil at beach area stockpile or dump load in bulk haul boats.

J3 JTG FILE DRAFTER DIV CHIEF

5005143

1585

(7) Survey points are reestablished.

(8) The in-situ van again obtains readings.

(9) The DOE/ERSP again calculate the concentrations of surface concentrations of surface contamination and recommends areas for future removal.

(10) The process is iterative until standards are met.

e. Much of the time of the operations section was spent in developing ways to maximize the amount of soil and debris that could be moved with current assets. The concept of a side by side self propelled causeway evolved in an effort to eliminate the slow off loading of debris by crane mounted on the YC barge. The dump trucks could dump directly off the side of the causeway. Work started but was not completed. By the end of the quarter it became obvious that priority of effort must go to soil removal and that 20 ton dump trucks should no longer be used to haul debris. Efforts to complete the side by side causeway were suspended. The concept of bulk haul of debris with LCM 8 was implemented by covering the deck and sides with timber to protect the boat. This more than doubled the debris hauled per trip. The concept of bulk haul of soil using LCM 8 and LCU was implemented with one LCM 8 during the quarter. The initial concept of converting the LCM 8 was not successful due to difficulties in decontamination. Revised scheme was highly successful. The original scheme to convert the LCU for bulk haul was modified based on lessons learned with the LCM 8. The conversion of the LCU was complete at the end of the quarter. Bulk haul with LCU was scheduled to begin 7 July 1978.

f. The major change in operational priorities developed during the quarter was the recognition that soil removal must receive priority of assets and debris dumping in the lagoon would be allowed to strech out over a longer period.

2. Problem.

Development of plans for inovative techniques was done with limited input from other elements of the JTG.

a. Explanation. The best example of this problem was the initial conversion of LCM 8 for bulk haul of contaminated soil. RadCon division was not in on the planning.

b. Corrective action taken. All interested parties are brought in for planning sessions.

c. Lesson learned. Relearned the age old maxim that no staff section can work in isolation.

2 Apr 80

Premise: The Government of the Marshall Islands resolves that the People of Enewetak may not resettle Enewetak Atoll because of unacceptable risks from residual radioactivity and contamination.

Response: The Enewetak Radiological cleanup has been accomplished to a degree which will allow for safe habitation of the atoll within the restrictions specified by the United States in the Environmental Impact Statement and accepted by the People of Enewetak prior to the beginning of the radiological cleanup. Generally, the resettlement of Enewetak Atoll will only be constrained to the extent that expected dose from radiation will be limited to levels comparable to natural background radiation in many parts of the world. The restrictions on habitation provide for: (1) dwellings only on southern islands of the atoll; (2) no deliberate cultivation of food on any northern island except for coconuts on ten specific northern islands; (3) no consumption of coconut crabs or use of well water from any northern island; and, (4) no visits to one northern island (Runit). Thus, the lifestyle to be followed by resettlers is predominantly oriented toward the southern islands where radioactivity is least abundant. The restricted lifestyle is not without some increase in radiation dose and its associated risk; however, the risks are considered to be quite small. Every person, including the people of Enewetak, receive some radiation dose due to natural radiation, and this would have occurred at Enewetak even if there had been no nuclear weapons testing program. The US National Council on Radiation Protection and Measurements (NCRP) has estimated dose equivalent rates to man in the US as follows: 0.055 rem per year to the whole body from exposure to natural radiation external to the body, and 0.115 rem per year to bone from exposure to natural radioactivty in the body as well as radiation external to the body. These "natural" dose rate equivalents are also reasonable estimates for background radiation at Enewetak Atoll, exclusive of the man-made radiation.

As presented in the EIS, the residual radioactivity throughout the atoll is predicted to cause the peak dose equivalent rate of the average resettler on the atoll to increase by 0.020 rem per year to the whole body and 0.185 rem per year to bone. About 40 percent of each estimated rate is attributed to the consumption of coconuts grown on the northern islands. However, a recent reevaluation of the Enewetak diet indicates that coconut consumption is considerably less than previously assumed. Accordingly, the dose rates above may be overestimated. Nevertheless, based on the cumulative "natural" and "residual radioactivity" dose rates, persons following the planned lifestyle for Enewetak may receive up to not more than three times the dose they would otherwise receive from nature.

The NCRP recommends the dose equivalent rate to <u>whole body</u> for the population (US) as a whole from all sources of radiation other than natural radiation and radiation from the healing arts shall not exceed

1587

a yearly average of 0.170 rem per person. The predicted dose equivalent rate of 0.020 rem per year is nearly a factor of ten below this recommended limit. The NCRP also recommends a whole body dose equivalent limit of 0.5 rem in any one year, in addition to natural radiation and medical and dental exposures, for any individual making up the population. An individual with maximum exposure at Enewetak is not expected to receive more than three times the dose equivalent rate for the average person (0.020 rem per year); accordingly, the NCRP whole body dose equivalent limit for an individual is as unlikely to be exceeded as is the limit for the population as a whole.

With respect to organs other than the whole body, the NCRP does not explicitly recommend dose limits for members of the public not occupationally exposed. The International Commission on Radiological Protection (ICRP) has in the past, however, recommended that annual dose rates to specific organs be limited to one-tenth of the corresponding annual occupational maximum permissible doses. Similar guides appear in international standards for the design and operation of radiation sources. The NCRP recommends 15 rem per year as a maximum permissible dose equivalent to bone for occupationally exposed individuals. A derived dose equivalent limit to bone for an individual not occupationally exposed then is 1.5 rem per year, exclusive of dose from medical exposures and natural radiation. An individual with maximum exposure at Enewetak is not expected to receive more than 0.6 rem per year to bone (three times the dose equivalent rate for the average person); accordingly, the presumed limit for dose to bone will not be exceeded.

The estimated doses to people abiding by the post-Cleanup lifestyle assume no contribution from exposure to radioactive debris. A major endeavor of the cleanup was to locate, monitor and remove debris to assure that no radioactive debris was left to produce unexpected doses. The debris search included extensive vegetation clearance and extended to underwater searches by scuba divers. An indication of the diligence given to this effort is the fact that some 16,000 rounds of ordnance residual from World War II were removed. This ordnance had gone unnoticed by thousands of persons who utilized the atoll during the nuclear weapons test period. Radioactive debris found was made unavailable by sealing it in concrete on the quarantined island. It is now considered almost impossible for any residual debris at Enewetak to distort the predicted low doses.

Expectations are that the restrictions to apply at Enewetak can be lifted in the future as the major amount of radioactivity currently present disappears through radiodecay and weathering. The presence of transuranic elements in Enewetak soil, especially the very long-lived alpha radiation emitters of plutonium and americium, was considered as a possible deterrent to the eventual lifting of all restrictions. The inhalation of air containing transuranic elements resuspended from the

ground is considered to be the principal pathway for receiving dose from these elements. (However, less than 0.001 rem in 30 years to lung is predicted by this pathway for the planned Enewetak lifestyle.) To minimize this dose pathway and to allow for unlimited use of Enewetak Atoll in the future, the cleanup concentrated on the removal of high concentrations of transuranic elements present in soil. The excised soil was encrypted along with the radioactive debris on the quarantined island. Transuranic elements at Enewetak will not contribute significantly to any dose resettlers receive, and residual levels are now sufficiently low that more extensive use of the atoll is foreseeable in the future.

Bikini Atoll was a second site of nuclear weapons testing and it was resettled in the early 1970's. Dose estimation methods available at that time were not as valid as methods available in planning the Enewetak resettlement. Recent assessments revealed that the Bikinians were receiving radiation doses which, if continued, might cause permissible limits to be exceeded. To avoid that possibility, the Bikinians were relocated from their atoll. Although Bikini and Enewetak Atolls are equivalent in most respects, they differ significantly in regards to radioactivity and the lifestyle practiced. At Bikini Atoll, the residence island is over 100 times more contaminated with significant radioactivity from nuclear weapons tests than any of the islands to serve as residence in the lifestyle planned for Enewetak Atoll. Additionally, the Bikini residence island is the principal source of domestic food and it contains about 10 times more radioactivity than do the northern "coconut islands" at Enewetak Atoll. Accordingly, if the People of Enewetak abide by the reasonable restrictions to which they have agreed, it is not likely that they will receive radiation doses in excess of recognizable limits or suffer any additional relocations.

3 Apr 80

Premise: The Government of the Marshall Islands resolves that the People of Enewetak may not resettle Enewetak Atoll because of unacceptable risks from radioactivity.

Response: The Enewetak Cleanup has been accomplished to a degree which will allow for safe habitation of the atoll within the restrictions specified by the United States in the Environmental Impact Statement on Cleanup, Rehabilitation and Resettlement of Enewetak Atoll (EIS) and accepted by the People of Enewetak prior to the beginning of the Cleanup. The resettlement of Enewetak Atoll is to be restricted to the extent that expected dose to people from radiation will be limited to low levels. The restrictions on resettlement require: (1) dwellings only on southern islands of the atoll; (2) no deliberate cultivation of food on any northern island except for coconuts on ten specific northern islands; (3) no consumption of coconut crabs or use of well water from any northern island; and, (4) no visits to quarantined northern island (Runit). Thus, the lifestyle to be followed by resettlers is predominantly oriented toward the southern islands where radioactivity is least abundant. The restricted lifestyle is not without some increase in radiation dose and risk or adverse health effect; however, the risk is considered to be very small.

Every person, including the people of Enewetak, receive some radiation dose due to natural radiation, and this would have applied at Enewetak even if there had been no nuclear weapons testing program. The US National Council on Radiation Protection and Measurements (NCRP) has estimated "natural" dose equivalent rates to the average man in the US as follows: 0.055 rem per year to the whole body from exposure to natural radiation external to the body, and 0.115 rem per year to bone from exposure to natural radioactivty in the body as well as radiation external to the body. These "natural" dose equivalent rates are also reasonable estimates of dose from natural radiation at Enewetak Atoll.

As presented in the EIS, the man-made radioactivity throughout the atoll is predicted to cause peak dose equivalent rates to the average resettler of about 0.020 rem per year to the whole body and 0.185 rem per year to bone. These peak rates will occur several years after resettlement and will continuously diminish in subsequent years. About 40 percent of each estimated rate is attributed to the consumption of coconuts grown on the northern islands. However, a recent reevaluation of the Enewetak diet indicates that coconut consumption is considerably less than previously assumed. Accordingly, the dose rates above may be overestimated. Thus the cumulative dose to average persons following the planned lifestyle for Enewetak from natural and man-made radioactivity will be within about a factor of three of the dose they, or average persons in the US, would receive from nature alone.

The NCRP recommends the dose equivalent rate to <u>whole body</u> for the population (US) as a whole from all sources of radiation other than natural radiation and radiation from the healing arts shall not exceed

1590

a yearly average of 0.170 rem per person. The predicted dose equivalent dose rate of 0.020 rem per year is nearly a factor of ten below this recommended limit. The NCRP also recommends a whole body dose equivalent limit of 0.5 rem in any one year, in addition to natural radiation and medical and dental exposures, for any individual making up the population. An individual with maximum exposure at Enewetak is not expected to receive more than three times the average dose equivalent rate (0.020 rem per year); accordingly, the NCRP limit for an individual is as unlikely to be exceeded as is the limit for the population as a whole.

With respect to organs other than the whole body, the NCRP does not explicitly recommend dose limits for members of the public not occupationally exposed. The International Commission on Radiological Protection (ICRP) has in the past, however, recommended that annual dose rates to specific organs be limited on one-tenth of the corresponding annual occupational maximum permissible doses. Similar guides appear in international standards for the design and operation of radiation sources. The NCRP recommends 15 rem per year as a maximum permissible dose equivalent to bone for occupationally exposed individuals. A derived dose equivalent limit to bone for an individual not occupationally exposed then is 1.5 rem per year, exclusive of dose from medical exposures and natural radiation. The individual with maximum exposure at Enewetak is not expected to receive more than 0.6 rem per year to bone (three times the average rate); accordingly, the presumed limit for dose to bone will not be exceeded.

The estimated doses to people abiding by the post-Cleanup lifestyle assume no contribution from exposure to radioactive debris. A major endeavor of the cleanup was to locate, monitor and remove debris to assure that no radioactive debris was left to produce unexpected doses. The debris search included extensive vegetation clearance and extended to underwater searches by scuba divers. An indication of the diligence given to this effort is the fact that some 16,000 rounds of ordnance residual from World War II were removed. This ordnance had gone unnoticed by thousands of persons who utilized the atoll during the nuclear weapons test period. Radioactive debris found was made unavailable by sealing it in concrete on the quarantined island. It is now considered almost impossible for any residual debris at Enewetak to distort the predicted low doses.

Expectations are that the restrictions to apply at Enewetak can be lifted in the future as the major amount of radioactivity currently present disappears through radiodecay and weathering. The presence of transuranic elements in Enewetak soil, especially the very long-lived alpha radiation emitters of plutonium and americium, was considered as a possible deterrent to the eventual lifting of all restrictions since the inhalation of air containing transuranic elements resuspended from the

ground is considered to be the principal pathway for receiving dose from these elements. (Less than 0.001 rem in 30 years to lung is predicted by the pathway for the planned Enewetak lifestyle.) To minimize this dose pathway and to allow for unlimited use of Enewetak Atoll in the future, the cleanup concentrated on the removal of high concentrations of transuranic elements present in soil. The excised soil was encrypted along with the radioactive debris on the quarantined island. Transuranic elements at Enewetak will not contribute significantly to any dose resettlers receive, and residual levels are now sufficiently low that more extensive use of the atoll is foreseeable in the future.

Bikini Atoll was a second site of nuclear weapons testing and it was resettled in the early 1970's. Dose estimation methods available at that time were not as valid as methods available in planning the Enewetak resettlement. Recent assessments revealed that the Bikinians were receiving radiation doses which, if continued, might cause permissible limits to be exceeded. To avoid that possibility, the Bikinians were relocated from their atoll. Although Bikini and Enewetak Atolls are equivalent in most respects, they differ significantly in regards to radioactivity and the lifestyle authorized. At Bikini Atoll, the residence island is over 100 times more contaminated with significant radioactivity from nuclear weapons tests than any of the islands to serve as residence in the lifestyle planned for Enewetak Atoll. Additionally, the Bikini residence island is the principal source of domestic food and it contains about 10 times more radioactivity than do the northern 'coconut islands' at Enewetak Atoll. Accordingly, if the People of Enewetak abide by the reasonable restrictions to which they have agreed, it is not likely that they will receive radiation doses in excess of recognizable limits or suffer any additional relocations.