

UNITED STATES ATOMIC ENERGY COMMISSION

DIVISION OF BIOLOGY & MEDICINE

HISTORIAN'S OFFICE
INVENTORY CONTROL

In the Matter Of:

Job

3365

CONFERENCE ON ~~LONG TERM SURVEYS~~

Folder

18

AND STUDIES OF ~~MARSHALL ISLANDS~~

No. *24225*
Div. *B.M.*

3380
748



Place - Washington, D. C.

Date - July 12-13, 1954

Pages 1-245

CLASSIFICATION CANCELLED

ALDERSON REPORTING COMPANY

Official Reporters

BY AUTHORITY OF TOPIC 1111 CGW-4

BY Jane Gray DATE 6/23/81

BY William Brown DATE 6-23-81

Telephones: NATIONAL 1120-1121

DELETED VERSION ONLY

NON-CCRP

US DOE ARCHIVES
326 US ATOMIC ENERGY COMMISSION

RG

Collection

DIV OF BIO & MED

Box

3365

Folder

Conf. on Long Term Surveys & Studies of Marshall Islands
1954

ASSOCIATES IN PRINCIPAL CITIES

Department of Energy
Historian's Office
ARCHIVES

ORGANIZATION & MANAGEMENT

UNITED STATES ATOMIC ENERGY COMMISSION

DIVISION OF BIOLOGY & MEDICINE

CONFERENCE ON LONG TERM SURVEYS
AND STUDIES OF MARSHALL ISLANDS.

Room 1201,
Temporary 3 Building,
Washington, D. C.
Monday and Tuesday, July 12-13, 1954

The Conference convened at 9:00 o'clock a.m.,
Dr. John Bugher, Division of Biology & Medicine, Chairman.

PRESENT:

- DR. JOHN BUGHER
- DR. C. L. DUNHAM
- DR. G. DUNNING
- DR. W. CLAUS
- CDR. E. P. CRONKITE
- CDR. R. A. CONARD
- MR. GEORGE IMIRIE
- CDR. H. ETTER
- DR. V. P. BOND
- MR. H. HECHTER
- DR. C. SONDHAUS
- LT. R. SHARP
- LT. COL. L. E. BROWNING
- MR. P. HARRIS
- MR. S. H. COHN
- MR. J. HARLEY
- LT. SHULMAN
- CAPT. YARBROUGH, MC, USN
- CAPT. ENGLISH, USN
- LT. CHAPMAN, USN
- LT. LOONEY, USN.
- MAJ. HANSEN.



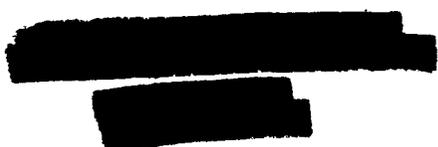
CLASSIFICATION CANCELLED
OR CHANGED TO _____
BY _____
L. _____ DATE _____

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office

ARCHIVES



P R O C E E D I N G S

DR. BUGHER: It falls to me to start things off.

First of all, according to our records, everybody is Q cleared except one gentleman who in the short time we could not put through a special clearance. On the other hand, while we have to observe the technicalities of the situation, AEC would not have them communicated restricted data. So we may have to observe a certain silly routine at times. I don't think actually we get into much in the way of restricted data. Among the military we can discuss restricted data anyway. We may have to observe that minor formality since there was not time to arrange a special clearance.

As far as the purpose of the conference, which you all know, I would repeat that our major purpose is to assist in bringing together all the pertinent data and executing the necessary analyses of that data of the study of the persons who were injured by the fallout of the March 1 shot among the Marshall Islanders. That includes also certain task force personnel who were exposed at that time.

The situation of course is a unique one as far as past history is concerned, because we have no similar episode previously in which whole body gamma radiation combined with extensive skin contamination has been observed in a large group of people resulting from mixed fission products. The only other group of people were involved in the same

Alderson Reporting Company
Washington, D. C.

ARC

1 detonation, the crew of the Japanese fishing craft, which
 2 was about 50 miles north and somewhat west of Rongelap Atoll,
 3 and was caught in the fallout, apparently being to the
 4 north of the main line of concentration.

5 So that although these people do not come into
 6 this particular discussion to any great extent, it appears
 7 that the Japanese had somewhat of the same magnitude of whole
 8 body exposure as the Rongelap people did, but with somewhat
 9 more skin lesion as a result of a longer period of contact
 10 with the skin surface, due to poor washing, fundamentally.

11 The larger group of people are those with whom
 12 the special medical team dealt. This report, which is
 13 being evolved, will be an extremely important one from the
 14 standpoint of the medical information and will be a guide
 15 unquestionably in many of the military considerations of the
 16 effect of radioactive fallout material.

17 There is another large element in the picture
 18 and that concerns the international relationships which have
 19 been thrown into considerable focus by this event. During
 20 the last three days of last week, I had to sit with the
 21 United States Delegation at the UN because this matter is
 22 now a subject of rather violent and acrimonious discussion
 23 in the Trusteeship Council. The United States under the
 24 trusteeship agreement of 1947 holds the Pacific Islands in
 25 trust, among them being the Marshall Islands. That mandate

Alderson Reporting Company
 Washington, D. C.

ARC

1 is administered by a special trusteeship organization,
 2 actually under the Department of Interior now. It was
 3 formerly under the Navy. As such, it is responsible to
 4 the United Nations and under the original terms, the United
 5 States held the right to withdraw such lands as might be
 6 necessary for strategic and security purposes, but beyond
 7 that, to administer the whole area for the benefit of the
 8 people concerned.

9 Bikini, of course, was separated from the islands
 10 of free access before the trusteeship agreement was reached.
 11 Eniwetok was separated about that time. But in view of the
 12 commitments that the United States entered into voluntarily
 13 at that time, there was unanimous approval of the trusteeship
 14 by the United Nations Trusteeship Council.

15 Now we find that this is being used as one of the
 16 weapons in the war of maneuver. The Marshall Islands
 17 petition, which was sent in by a group, particularly
 18 at Majuro, is used as a club now to establish a case that
 19 the United States has been false to its obligations as a
 20 trustee; that it has deliberately destroyed lands belonging
 21 to the people governed; that it has injured them in a series
 22 of experiments where, quoting various Congressmen and high
 23 American officials, we documented that not only did the
 24 meteorologists find themselves unable to predict anything,
 25 but the scientists were unable to anticipate what would happen,

Alderson Reporting Company
 Washington, D. C.

ARC

1 being greatly astonished by the results of what they had put
2 together.

3 This is the theme being pushed by the Communist
4 group particularly, largely comprised of the Soviet Union,
5 India and Syria at the present time, in an attempt to get a
6 resolution adopted which is condemnatory of the conduct by
7 the United States of the trusteeship of the Pacific islands.

8 One of the strong points in this situation is that
9 in fact nobody did die, and all the people have apparently
10 recovered very satisfactorily. Movie films are available in
11 New York showing the relocation of the Rongelap people on
12 Madro Atoll in a very beautiful setting in which the new
13 houses are located, the people obviously happy and healthy.
14 The Uterik people also shun returning to their homes. So
15 far I think that film has not been shown because there was
16 an agenda wrangle immediately which would defer this film
17 showing until later in these hearings.

18 So that is the atmosphere which exists in the UN
19 in which this whole thing is being used as a diplomatic
20 weapon. We are fortunate, indeed, that the prompt response
21 of the medical groups concerned was so effective in insuring
22 the medical care of these people, and that the whole thing
23 has turned out so happily, as far as the welfare of these
24 people is concerned, apart from the human concern that one
25 does not like to be responsible for injury to anyone.

Alderson Reporting Company
Washington, D. C.

ARC

1 There is a very significant international issue
2 involved here, with the fundamental argument concerning the
3 rights of the trustees.

4 So that is somewhat the atmosphere in which we are
5 working, and one of the reasons why it is important to get
6 this report, not only in the very best scholarly form that
7 we can achieve, but also to do so in a minimum of time.
8 Eventually I hope we can also declassify the report, so as
9 to have it published as a piece of medical literature with
10 much medical importance to Civil Defense, to people
11 interested in radiation injury, and a lot of other things.
12 So I think we will realize that everybody in the government
13 concerned with this problem is really very grateful to the
14 group that carried on this investigation so effectively and
15 achieved a very high order of scientific cooperation which
16 existed throughout the program. Everyone who was asked to do
17 something did so with very good will and enthusiasm, and
18 turned in the very best job he could. There was no
19 scrambling for position or notoriety in any way. I think it
20 was one of the most satisfactory efforts that anyone could
21 wish for.

22 You realize, of course, that the study and the
23 report which you will produce is only the beginning; that the
24 report which is in progress of preparation is only Chapter 1
25 of a larger volume whose termination cannot yet be foreseen.

Alderson Reporting Company
Washington, D. C.

ARC

1 In other words, these studies will have to continue for
 2 an indefinite number of years. We hope that even after
 3 several years, that we will see pretty much the same group
 4 of people still interested in this problem, and actively
 5 working on it.

Alderson Reporting Company
 Washington, D. C.

6 We will some time later get to the means by which
 7 we hope to carry on the program and to get on with the studies
 8 through the succeeding years. Despite the fact that everybody
 9 has recovered now, and looks hale and hearty, naturally we
 10 have certain reservations about what may happen in the course
 11 of 15 to 20 years with skin areas, which have been affected
 12 by as much radiation injury as occurred here, and whether
 13 or not we will find spermocele carcinoma, one of the long
 14 term sequelae of the lesions. I do not know. It is a
 15 matter of speculation. But obviously it is one of the things
 16 that may give concern.

17 Captain Yarbrough, have you any additional comments
 18 that you care to make at this time before we get every body
 19 to work?

20 CAPTAIN YARBROUGH: I have nothing particularly,
 21 Dr. Bugher, except that this particular incident has
 22 brought to light the fact that it is quite difficult to keep
 23 together personnel in the form of a unit that can be quickly
 24 activated and transported to distant places for studies of
 25 this kind. I am sure that all people in the military at this

ARC

1 time realize that there is a critical situation with regard
2 to personnel, more critical perhaps among medical personnel.

3 This was a subject of considerable discussion at NRDL
4 some two weeks ago, where we have made some effort to at least
5 keep track of personnel so technically trained that with
6 some degree of efficiency in the matter of time that we can
7 pull together some of the units again.

Alderson Reporting Company
Washington, D. C.

8 Essentially we have realized that this is a rather
9 mountainous problem. I don't know how far we would get
10 with it, but we intend to continue efforts to at least keep
11 locators on these people where we can requisition them, or
12 request that their services be loaned for solution of such
13 happenings as the recent Marshalese incident.

14 DR. BUGHER: Thank you very much. We have a plan
15 to split the various people up into study groups, and give
16 them about an hour and a half to get their facts and figures
17 in order, and then return to the meeting. We are just a
18 little bit behind time, but we will try to make it as
19 quick as we can. In other words, if you can cut a little
20 bit under the hour and a half, that is to the good.

21 Did everybody get these agendas or did nobody get
22 an agenda? I am afraid I am the culprit here. Then one
23 group is to consider the estimate of external dose, with
24 Gordon Dunning as group leader, Sharp and Sondhaus to work
25 with him. You will probably want to get off in some quiet

ARC

1 place if you can find it, and see what you have.

2 Then for the hemologic findings, the dermatological
3 evidence, and the general clinical studies, Bond as group
4 leader, Conard, Cronkite, Browning, Dunham and Hechter as
5 members of the group. That group will need a little larger
6 room, I take it.

7 The third group for the nature of the fallout,
8 internal deposition, urinary excretion, body burden of the
9 long term hazard, we had Merrill Eisenbud as group leader,
10 but I have not seen him. He is not here. I understand he
11 is on vacation. Walter, would you act as group leader for that
12 discussion?

13 DR. CLAUS: All right, I will try.

14 DR. BUGHER: Harris, Cohn, Harley and Imirie to
15 join in that.

16 The rest of us -- if there are any "rest" -- I
17 believe there are some more left unattached -- can discuss
18 as informally as they wish these matters.

19 Now, as to location, I would suggest that perhaps
20 Bond make use of my office for his group.

21 DR. CLAUS: I think perhaps we can use my office.

22 DR. BUGHER: Gordon Dunning and that smaller
23 group could use Dr. Dunham's corner. Then we will break up
24 for that individual group work until 10:45.

25 (Thereupon at 9:45 a.m., a recess was taken until

Alderson Reporting Company
Washington, D. C.

ARC

1 11:15 a.m.)

2 DR. BUGHER: Dr. Dunning, are you ready to report
3 on your group on the dosage problem?

4 DR. DUNNING: Yes, we are.

5 ESTIMATE OF EXTERNAL DOSE (SURFACE AND WHOLE BODY)

6 DR. BUGHER: Would you care to come up here where
7 you have a blackboard and chalk?

8 DR. DUNNING: No, I don't think so. I would like
9 to call on Dr. Sondhaus to present some of his ideas here
10 first, and then I will try to summarize the committee's
11 findings after we get through with all the "ifs" and "buts",
12 and "whereases", and we will try to come up with specific
13 numbers.

14 DR. BUGHER: That is what we want.

15 DR. SONHAUS: What we have considered in NRDL were
16 several points concerning the data on the external doses.
17 The first question was the calibration of instruments used.
18 We have quite a bit of conflicting data to some extent. We
19 chose for the most reliable that of the RAD SAF SCOVEY
20 group on the 8th of March. This was done with more
21 adequately calibrated instruments, and we have data on the
22 performance of the T-1-B.

23 The second question was the energy distribution
24 of the fallout gamma radiation, and its effect on the meter
25 response. Concerning this, we have some spectral

Alderson Reporting Company
Washington, D. C.

ARC

1 distribution data, which was taken from fallout samples. On
2 this we performed a calculation which takes into account
3 the degradation of the energy due to scattering in the air,
4 due to the distribution of such fallout on an infinite plane.

5 The next question was the rate of decay of the
6 fallout mixture. Here again there is a certain amount of
7 experimental data which seems to indicate that two exponents
8 should be used over the period of time in which we are
9 interested, namely, a .8 or .9 exponent during the first four
10 hours to four days, and from four days until 25 days, roughly
11 an exponent of about 1.6 seemed to fit the combination of
12 the Neptunian and fission product combination.

13 The best estimates of the dose rate at the time of
14 evacuation were computed, using these factors, and the time
15 of arrival of the fallout, and the duration of the fallout
16 with the remaining questions considered. Since there is
17 very little accurate data, except in the case of Rongerik for
18 the time of fallout, the best estimates possible were made,
19 and doses were calculated on the basis of either a very short
20 fallout or the longest possible fallout that could be assumed
21 to have taken place consistent with the time of commencement
22 and the dose rates which were read at later times by the
23 survey instruments.

24 Based on these considerations, we have several sets
25 of doses which are in substantial agreement with Mr. Sharp

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office

ARCHIVED

1 and Dr. Dunning, and I think I will leave that for him to
2 summarize.

3 There are minor differences in the approaches and
4 also the numerical values of the parameters, but these do not
5 seem to lead to any sharply different values. I think that
6 is all I have to say.

7 DR. DUNNING: As the group can appreciate, there
8 is a great deal of uncertainty in trying to estimate the
9 numbers. Different instruments were used by different people
10 at different times, and different places. Some instruments
11 were calibrated recently before use, some were not. In
12 addition to the actual surveys taken, of course, theoretical
13 computations were made, such as the ratio of formation of
14 Neptunium and fission products for this particular device,
15 being of the order of .8, for example, and then trying to
16 estimate what the relative dose rates would be at different
17 times after detonation and trying to come up with an
18 integrated dose for the times of interest.

19 In the case of Rongelap natives, the fifth or sixth
20 hour after the fallout to the time of evacuation, there was
21 still some uncertainty as to the exact time of initial
22 fallout, even uncertainty as to Neptunium contribution,
23 uncertainty as to where the people were. We had different
24 dose rate readings at different parts of the island. Where
25 were the natives? How long did they stay there? Different

Alderson Reporting Company
Washington, D. C.

ARC

1 dose rate readings inside and outside, but in the case of
2 natives that was not so important, because in the huts the
3 dose rate readings are almost as high as outside.

4 In the metal shacks for the Air Weather people
5 at Rongerik, this was not so. We have such phenomena as people
6 lying on their mats for their sleeping at night, the fallout
7 material blowing into the huts, thoroughly covering the huts.
8 The uncertainty of the contribution of the soft gamma.
9 As you know, most of these measurements are taken by such
10 instruments as the T-1-B or T-39, where they have essentially
11 a cutoff value of some 70 to 80 CEV. You are missing your
12 soft gammas and your beta.

Alderson Reporting Company
Washington, D. C.

13 Then I think there is one phenomenon that was
14 not discussed very much, but which may be important.
15 Unfortunately we cannot evaluate it. We have experienced
16 this phenomenon in the Nevada test, for example, in Shot
17 No. 9, in the Upshot-Knothole series. When you plotted out
18 the dose rate readings with time, you get a definite hump.
19 In that case the area under the curve was not too great or
20 significant. But out in the Pacific, where you certainly had
21 a relatively high concentration of activity in the air,
22 lasting for probably many hours, you might have a
23 significant contribution from sky shine that has not and
24 probably never can be accurately evaluated. This will not
25 show up in any of our dose rate readings.

ARC

1 I told you we are going to have a lot of "ifs"
2 and "ands" but we are still going to come up with numbers
3 in the end.

4 So taking all these values, the values arrived at
5 theoretically, values taken by the survey team, using the
6 various exponents and so forth, it would appear that the
7 best estimate we can make for the Rongelap natives was about
8 150 r. This is whole body gamma. This does not include
9 soft gammas, nor the betas. At ^{Ailinginae} Elinkani, the data are less
10 firm, but be that as it may, our estimate is about half, or
11 in other words, about 75. Utirik, again, is less firm than
12 Rongelap, but we are not quite so concerned that it is less
13 firm inasmuch as it would appear that the value is about 15 r.
14 In other words, we are not concerned in terms of any
15 biological hazard.

16 For the Air Weather people on Rongerik, again
17 we have a whole series of survey data, as well as the film
18 badges. After going overall the survey data taken by
19 various instruments at various times and different
20 people, and what have you, it would appear that the firmest
21 data is to go to the film badges. As you know, some of these
22 film badges were in an ice box and some were carried. But
23 for most of the personnel, the film badges were between 40
24 and 50 r. For one film badge, representing three Army
25 personnel on the north end of the island, their film badge

Alderson Reporting Company
Washington, D. C.

ARC

1 read 98 r. However, in checking with their actual movement,
 2 it would appear that these three Army personnel did not
 3 remain there all of the time. In fact, they were back at
 4 the other end of the Island and inside the metal buildings
 5 for an appreciable amount of time. Therefore, the 98 r
 6 probably represents the upper limit of our estimate.

7 I would like to give you very firm figures, but I
 8 think you can appreciate the problem, that this is about as
 9 firm as you can get. In fact, maybe we already have
 10 stuck our necks out too far.

11 DR. BUGHER: Do you have any estimate of the range
 12 here within which the dose probably falls? In other words,
 13 anything that would resemble a standard error?

14 DR. DUNNING: I was afraid you would ask that.
 15 Frankly, I don't. As Dr. Sondhaus has indicated, they came
 16 up with a range. I have deliberately not put one in, because
 17 I was afraid people would read into that an implication of
 18 a standard deviation. I just don't think the data are firm
 19 enough.

20 To make the matter still worse, on this agenda, we
 21 give an estimate of surface dose. This is getting into the
 22 problem among other things of beta-gamma ratio, which is,
 23 of course, exceedingly difficult to evaluate.

24 If I may just mention, we have some very limited
 25 data on the Japanese fishermen, where we have some material

Alderson Reporting Company
 Washington, D. C.

ARC

1 taken from aboard the ship. I repeat it is very limited.
2 But be that as it may, making certain assumptions, it would
3 appear that if the fallout material were to remain in contact
4 with the skin of the Japanese fishermen for one hour, that
5 something of the order of 10,000 REPS would have been
6 delivered to a depth of 7 milligrams per square centimeter.
7 And if it remained longer than one hour,, which it probably
8 did in ~~the~~ case of the fishermen, on up.

9 In the case of the natives, we don't even have
10 that much data to go on. The fact that the natives were
11 lying down during the evening of March 1, probably contributed
12 to exposing a larger surface of the body to the soft gammas
13 and betas. But to come up with any firm number as these
14 natives received so many REPS, we felt we were unable to do so.
15 The data would certainly strongly support the conclusion
16 that these lesions were due to radiation. Of that there seems
17 to be little doubt. But exact doses I just cannot say.

18 DR. BOND: Can you give us any estimate off the
19 amount of gamma below KV cutoff?

20 DR. DUNNING: Yes. Dr. Sondhaus, will you tell us
21 that?

22 DR. SONDHAUS: Yes. I would like to say that the
23 estimates we have do include the contribution of gamma
24 below 100 KV in the initial spectrum which we have.
25 Approximately 8 per cent occurred below 80 KV. When you

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

Alderson Reporting Company
Washington, D. C.

1 translate this into terms of dose, including the effect
 2 of scattered soft radiation from the higher energy lines in
 3 the spectrum, the percentage of the dose is still in the
 4 neighborhood of 16 or 17 per cent. The T-1-B cutoff, I
 5 have approximated as best I could with data which were taken
 6 in our laboratory, both recently and a couple of years ago.
 7 The sensitivity falls down quite strongly at a range of
 8 60-50 KV. But even making a generous estimate of the
 9 correction factor, that must be applied to a dose in this
 10 energy region, the overall correction factor for the T-1-B
 11 seems to be close enough to unity within the limits of the
 12 error we can specify here.

13 The reading of the instrument, I think, could be
 14 accepted as being accurate. Since the proportion of the dose
 15 in this region is small, I do not think that we need to consider
 16 that it departed materially from the total doses estimates
 17 we have here. The total dose would appear to have resulted from
 18 three general ranges of energy. One in the 100 KV to 200 KV
 19 region of about 17 per cent. The majority of the dose in
 20 the 600 to 800 KV region of perhaps 50 per cent. And about
 21 15 to 20 per cent in the 1.5-1.6 KV region, with the balance
 22 of the dose spread out between these three humps. So that the
 23 exposure could probably be treated as a composite of an
 24 exposure to each of three separate radiation energies.

ARC

25 DR. DUNNING: Let me ask you again for the benefit

Department of Energy
Historian's Office
ARCHIVES

1 of the group, this material that you used in this experiment
2 was taken from where?

3 DR. SONDHAUS: The material for this spectrum
4 determination was a cloud sample which was flown back to
5 the laboratory, and the spectrum taken at four days.
6 Naturally this is subject to a great deal of question as to
7 whether the fractionation was the same in this portio n
8 of the cloud as it was on Rongelap, for example. Also, there
9 were other samples taken on some of the rafts which were at
10 various distances out from the lagoon. I think the furthest
11 one was not more than 50 miles away. We don't have any
12 direct spectrum determination on Rongelap soil samples as
13 far as I know at this point. There are some, but this was
14 the first spectrum taken at the laboratory.

15 DR. DUNNING: I wanted to bring that out. We did
16 discuss it in our meeting. I think we must realize that we
17 are talking about cloud sample data, and not the actual fallout.
18 What the difference would be, I am not prepared to say. I
19 think this should be remembered.

20 Also, the lower value of exponent of .8 to .9
21 was from material close in at the Bikini Lagoon. This may
22 not be the same found at 150 miles away. This is a throwup.

23 DR. BOND: What was the calculated value of dose
24 for the Americans? What was the dose calculated in the same
25 manner as for Rongelap?

Alderson Reporting Company
Washington, D. C.

ARC

1 DR. DUNNING: As I recall it ran between 60 and 76
2 from the survey team readings. As I say, after considering
3 so many factors, one, that most of these readings are taken
4 nine days later, and when you start extrapolating back, if
5 your exponent is off, you can be off quite a bit. Other
6 things, how long the people stayed there, et cetera. It
7 seemed that the film badges worn by personnel, and there
8 were three, might be as close as one might hope to come.

9 DR. BUGHER: Do you think, Gordon, that the
10 relationship between the film badge figure, which we are
11 accepting for the Air Weather Service people, and the
12 calculated dose which was mentioned here would also hold
13 for the actual dose that would be shown by film badges, and
14 that calculated for the Rongelap people?

15 DR. DUNNING: I thought of that, Dr. Bugher. I
16 don't have the firm answer. I would like to point out this,
17 however, that the Air Weather personnel had metal barracks,
18 and they were indoors an appreciable amount of time before
19 evacuation. The attenuation of these metal barracks -- if you
20 will just be patient here for a moment -- here is one with a
21 factor of two, and so forth. So one might expect that the
22 film badges would show less than the calculated.

23 DR. BUGHER: So the calculated figure here of
24 60 and 75 did not include a factor for the buildings?

25 DR. DUNNING: No, it does not. I think that is

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 about the best we can do.

2 CDR. CONARD: Do you have any data at all on the
3 beta spectrum?

4 DR. DUNNING: I don't. Do you?

5 DR. SONDHAUS: Not on the beta spectrum. I think
6 we might be able to make some estimates.

7 CDR. CONARD: That would be nice to know from the
8 point of view of skin lesions.

9 DR. SONDHAUS: About 80 per cent of the fallout
10 was Neptunium-uranium; in four days we could make some
11 estimates on that basis even though we do not have a
12 complete spectrum.

13 CDR. CONARD: Anything you could give us on that
14 would be helpful.

15 DR. SONDHAUS: Surely.

16 DR. BUGHER: It might be pertinent also, since you
17 mentioned the figure of 10 REP to skin from an hour's
18 contact, to give the assumptions on which that was based
19 with respect to the amount of material on the skin, that is,
20 the thickness, and so forth. It is probably true that the
21 estimate there was a much heavier deposition than actually
22 occurred.

23 DR. DUNNING: If you recall, I tried to be very
24 cautious and indicate that the estimates were based on very
25 limited data, and on some very shakey assumptions, you

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 might say. One assumption is that the fallout occurred in
2 the third hour after detonation. The second, and probably
3 one of the most important, that this material was spread out
4 to provide a thickness of .01 of a gram per square centimeter
5 about 40 micron thickness. Here is one that is wide open.
6 The rest of the assumptions, I think, are not too far off.

7 DR. BUGHER: That was also based on the activity
8 from John Harley's figure.

9 DR. DUNNING: Yes, sir, there is another very
10 important assumption that would have to be looked at closely.
11 That is the specific activity was 3.1 times 10 to the 8th
12 disintegrations per minute per gram on April 7.

13 Then it was just a matter of extrapolating -- I
14 say just a matter -- back again, assuming 1.2, and then you
15 come up with a specific activity on the third hour after
16 detonation. Then with the assumption of so much material
17 deposited, and using Rossi's calculations as to self absorp-
18 tion in the skin, we come up with the calculations as to the
19 dose that 7 milli grams per square centimeter below the surface.

20 DR. BUGHER: What was the activity per gram on that
21 basis?

22 DR. DUNNING: 3.5 times to the 11th. I believe
23 this is the figure we want. If you accept 1.2, that is about
24 the answer. That is in terms of disintegrations per
25 minute per gram.

Alderson Reporting Company
Washington, D. C.

ARC

1 DR. BUGHER: That helps. Then we have from the
 2 Japanese biophysicists by chance from Osaki who got on that
 3 ship on the 16th, 16 days afterwards, and his estimate was
 4 a half curie per gram from the materials he scraped up. He
 5 had first access to it, and he scraped some up and took it
 6 home. That information never appeared in Tokyo. He included
 7 it in a memorandum, you will recall, in an addendum to a
 8 letter his wife wrote to President Eisenhower. That is where
 9 we got our information. That seemed to check in pretty well
 10 considering the uncertainty of exponent, and the variation
 11 of instrument, and everything in a factor of two.

12 MR. IMIRIE: What would be the calculated hard
 13 gamma dose? In other words, of this 10,000 REP, how much
 14 would be equivalent to a T-1-B reading?

15 DR. DUNNING: You tell me, and I will pin a medal
 16 on you. That is a \$64 question, and I am sure you know it is
 17 a question. Beta-gamma, you just can't come up with a
 18 number as you well know. Is it beta-gamma ratio in terms
 19 of function of time after detonation, and what you are
 20 interested in is the dose delivered to the 7 milligrams per
 21 square centimeter below the surface, and how can you make
 22 this relationship? As you know in the Greenhouse work, they
 23 found a beta-gamma of 157 to 1.

24 This does not represent the dose of roentgens.

25 Mathematical calculations would indicate something like 130

Alderson Reporting Company
 Washington, D. C.

ARC

Department of Energy
 Historian's Office
 ARCHIVES

1 to 1, but again we don't know. I suspect it is lower than
2 that. How much lower, I am not prepared to say.

3 DR. BUGHER: Does that represent what you have been
4 able to squeeze out?

5 DR. DUNNING: That is all we could get out of
6 that lemon.

7 DR. BUGHER: That is very helpful. It is always
8 startling to find out what gaps in the physical measurements
9 seem always to exist, even after maximal efforts have been
10 expended. No matter how much we have, we always want more,
11 and wish we had something additional to what we do have.

12 I don't know whether anybody did a complete beta-
13 gamma ratio curve for any standard instrument through this
14 period.

15 DR. DUNNING: No one did that I know of.

16 DR. BUGHER: We will have to recruit the Marshallese
17 to do some of these things. Thank you very much, Dr.
18 Dunning. It is good to see some figures here together with
19 a discussion with the universities which are involved in them
20 so that we all remain aware of the inherent area of what I
21 call disagreement, which would not represent disagreement at
22 all, but simply a range of estimate from the data that we
23 do have.

24 Are there any further questions or comments on this
25 side of the story?

Alderson Reporting Company
Washington, D. C.

ARC

1 (No response.)

2 DR. BUGHER: I think we all seem to be disposed
3 to accept the estimate of 150 roentgens for the average
4 dose for the Rongelap people, with some uncertainty as to
5 that. The uncertainty is not specified, but I should think
6 it might very well be of the order of 25 roentgens up or down.

7 DR. SONDHAUS: I should like to add one thing, Dr.
8 Bugher. In conjunction with considering a figure for the
9 dose under these field conditions, we should bear in mind
10 that this quite possibly needs to be interpreted in terms
11 of the geometry of the exposure. That is to say, that when
12 a laboratory experiment is performed on an animal, perhaps
13 with the dose being divided between both sides of the
14 animals with a bilateral exposure or something of this sort,
15 the depth dose characteristic is quite different than in a
16 uniform 360 degree exposure, such as an individual would
17 receive while standing on an infinite plane. We have begun
18 some preliminary estimates of this at the laboratory by
19 trying to simulate a 360 degree exposure with a cylindrical
20 phantom. The first figures are rough, but one might be
21 led to the conclusion that perhaps a 40 per cent increase
22 in the dose in terms of a laboratory exposure would result
23 from the same skin dose, but with the radiation from all
24 directions. That is, the exit dose would certainly be the
25 same as the entry dose in this case, and the volume dose

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 might be put in terms of a higher figure, differing by about
2 this much. I am not prepared to say anything more than this
3 right now. I do believe the point should be made that the
4 figure, say, of 150 does not necessarily imply the same
5 biological effect as 150 r divided equally between both sides
6 of an experimental animal. This should be taken into
7 consideration.

8 DR. BUGHER: Are we not talking about roentgens at
9 least 5 centimeters in here when you speak of the whole body
10 dose of 150 rather than superficial area?

11 MR. HARRIS: It is air dose.

12 DR. SONDHAUS: We have taken the readings of an
13 instrument in air and integrated with them. So what we are
14 specifying here is an air dose to which an individual was
15 exposed.

16 DR. BUGHER: You are not calling it as a whole body
17 exposure.

18 DR. SONDHAUS: That is right.

19 DR. BOND: It is usually expressed as a whole body
20 dose. It is a dose in the air given to the whole body.

21 DR. BUGHER: Has the committee any estimate of
22 dose at 5 centimeters or 10 centimeters or any figure?

23 DR. BOND: It is under investigation, but it has not
24 been completed. It is being worked on at two laboratories.

25 DR. SONDHAUS: The 5 centimeter dose will certainly

Alderson Reporting Company
Washington, D. C.

ARC

1 differ between these two cases if you normalize to the same
2 air dose between the laboratory exposure and the field
3 exposure.

4 DR. BUGHER: Do you think with your gamma spectro-
5 metry you will come out with some sort of estimate here?

6 DR. SONDHAUS: That is quite possible, I think.

7 DR. BUGHER: That is the essential thing. We are
8 not only uncertain as to 150 r; we do not say that the
9 individual's bone marrow or organs or spleens got such
10 radiation; is that right? How long do you think it is going
11 to be before we do come out with a pretty firm estimate?

12 DR. BOND: I think before the final report, Dr.
13 Bugher, we are working with it on our x-ray machines, and
14 the cobalt source that is ideal for solving this problem, and
15 it will probably be solved before the final report is in.

16 DR. BUGHER: Obviously it is a very important
17 figure to have, and as precise as may be possible. That is
18 a very helpful comment.

19 Are there any other comments or questions to ask
20 of this committee? If not, we pass to the second group
21 report by Dr. Bond on the clinical aspects which include the
22 hematologic things, as well.

23 HEMATOLOGIC, SKIN, AND GENERAL CLINICAL STUDY

24 DR. BOND: I think perhaps we had less uncertainties
25 in our material than the dose group. Obviously the dosage

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 problem is of tremendous importance to us in an effort to
2 correlate what we saw with physical estimates of dose.
3 I think we will simply enumerate the major conclusions that
4 we wish to draw from this study. If there are comments, I
5 would like to have them at the time, so please interrupt.

6 I think as far as systemic effects are concerned,
7 the only symptoms that could be ascribed unequivocally to
8 radiation was the early appearance of mild subjective
9 symptoms. This was nausea that appeared to a large degree
10 in the Rongelap people, and with considerably less degree in
11 Ilinkela, and not at all in the Uterik or American groups.

12 These people were treated identically. They did
13 not know, so to speak, the correct answers to the questions
14 that were put to them. Different interrogators obtained the
15 same results, so we feel that this is a real thing, and
16 probably ascribable to radiation.

17 Aside from this, there were no other clearcut
18 constitutional symptoms ascribeable to radiation. There was
19 no diarrhea or other classical symptoms of whole body radiation
20 damage. The instance of cold diarrhea and so forth was
21 equal in the different exposure groups.

22 There is one possible exception to this statement.
23 Abnormal menses were observed in two women in the Rongelap
24 group. Whether this can be ascribed to radiation is a
25 considerable question.

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 An additional point is that it was impossible for
 2 the observers to distinguish among the various groups with
 3 regard to the activities, that is, the spontaneous activities
 4 they carried on. That is, apparently they played and engaged
 5 in the same amount of activity throughout the period of
 6 observation.

7 So much for the constitutional symptoms. As far
 8 as the skin lesions are concerned in these people, there was
 9 early appearance of itching of the skin, itching and burning,
 10 and here again a very large instance in the higher exposure
 11 group, less in the lower exposure groups. There were no
 12 further symptoms until the development of the lesions which
 13 I will go into in a moment.

14 The question has been brought up as to whether
 15 these are beta lesions or chemical burns. I don't think we
 16 need to dwell on that except to state that it is the very
 17 definite feeling that there is no possibility that they are
 18 chemical burns, and they were due to exposure to ionizing
 19 radiation.

20 The second large point we would like to make is that
 21 these were contact burns and were not derived from a field
 22 of radiation. It was only in areas where there was actual
 23 contact of the fallout material with the skins that the
 24 lesions developed or in areas where there was a chance for
 25 the fallout material to be directly in contact with the skin.

Alderson Reporting Company
 Washington, D. C.

ARC

Department of Energy
 Historian's Office
 ARCHIVES

1 This is borne out by the fact that in general where clothing
2 covered the body, even a light dress in the case of the
3 women, burns did not appear. It is also borne out histo-
4 logically by the fact that there are islands of normal tissue
5 in between the several affected tissue, indicating the
6 particular nature of the deposited material, and the fact
7 that it was deposited material that was responsible for the
8 burn.

9 One thing that is not clearly worked out, and I
10 don't know how to explain this. Apparently there is some
11 discrepancy or difficulty explaining the order of appearance
12 of lesions. Generally speaking, the lower the dose, of beta
13 radiation, the later the lesions would appear.

14 This in general was not entirely the case with
15 these individuals. The feet, for instance, showed very
16 severe beta lesions. The surface of the anacubicle foci,
17 the anterior surface of the neck, showed beta lesions.
18 The scalp and the feet where the skin presumably is thicker
19 sometimes lesions appeared later, and were more severe than
20 in the case of the areas with thinner skin.

21 Also the order of appearance of these lesions
22 in general was different from some reports in the literature.
23 Also this was apparently a monophasic response as we got
24 a single appearance on approximately the 14th day. There
25 was no evidence of erythema or other skin damage. This

Alderson Reporting Company
Washington, D. C.

ARC

Department of
Historian's Office
ARCHIVED

1 differs from previous reports in the literature, but may
2 be at variance. This may be explicable on the basis that
3 these people did have dark skins, and the darkness of the
4 skin obscured the early response.

5 With regard to the severity of the lesions in terms
6 of incapacity to the individuals, the lesions in some of
7 these individuals were painful and of sufficient severity
8 that under all ordinary circumstances, these individuals
9 would be admitted probably to the sick list.

10 It was the clinical impression in general that
11 these lesions were quite superficial in nature. We are
12 unable to determine whether the explanation for this is on
13 the basis of the total dose received or whether it may be
14 due to the energy of radiation, that is, with lower energy
15 betas one might expect more superficial lesions.

16 In general the severity of the lesions observed
17 correlated well with the amount of fallout presumably
18 encountered by the individuals. That is the Rongelap people
19 had the most severe lesions, the Ilinkila with less fallout
20 and less total dose had the same type of lesions, but less
21 severe, and generally later in appearance, and healed more
22 rapidly.

23 With regard to the loss of hair, again this
24 apparently occurred in areas where material was actually
25 deposited on the scalp. It was spotty in nature, and

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 presumably was not the result of a field of gamma radiation.
2 As I say, it was associated with actual material deposited
3 at the site. It is difficult to arrive at a dose biologically,
4 that might have caused this. However, the figure has been set
5 at the upper limit occurs and recovery is possible, is
6 approximately 700 r since the hair did grow in on the
7 individuals later. We can presume that the upper limit
8 might have been of the order of 700 r.

9 I think it is worthy of note to state that in
10 general the lesions required no special treatment of any
11 kind. No so-called specifics were used. Healing in
12 essentially all cases was entirely satisfactory. Also, even
13 in the most severe cases of skin damage, there was no systemic
14 manifestations that could be attributed to the skin damage.

15 With regard to the prognosis of the skin lesions,
16 here again it is essentially almost anybody's guess. There
17 are a number of opinions on this. I think it is fair to
18 say that clinically with fairly large doses of radiation
19 that recovery has been apparently complete, and that we can
20 be optimistic probably about the ultimate fate of these
21 skin lesions. However, because of data in the literature
22 indicating later breakdown in these lesions, and carcinogenic
23 changes, it is necessary that we retain a guarded prognosis
24 and an attitude of watchful waiting.

25 With regard to the skin lesions, I would like to

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 mention the nail pigmentation. I think most of you are
2 familiar with that. That appeared at the base of the nail,
3 a bluish discoloration. Apparently this was an aberration
4 of pigmentation. I think it has been reported only once
5 in literature in a single individual.

6 With regard to the hematological findings in these
7 individuals, here we see no justification throughout in
8 treating the individuals other than as roots exposed to the
9 same dose of radiation. There is no physical basis upon
10 which to segregate them. Even in the case of the Army boys,
11 it appears that their activities are not too different from
12 the remainder of the Air Force boys, so these were treated
13 as a group as with the other exposure groups on the various
14 islands.

15 A word as to the controls that were used for the
16 hematological studies. They are, I think, at least as good
17 and probably considerably better than most clinical studies
18 of this nature. That is, the control groups were matched
19 with respect to age and sex to the actual exposure groups.
20 So that while we must recognize that strict comparisons are
21 not valid, as we cannot state definitely that they are
22 homogeneous samples of the same population, still we feel
23 it is an excellent control group, and will serve very
24 adequately as a guide.

25 For the control for the native groups, we went to

Alderson Reporting Company
Washington, D. C.

ARC

1 Majuro and obtained a very large control group, as I say,
2 comparable in age and sex to the exposure group. For the
3 Americans we obtained a group of Americans that had been in
4 the mid-Pacific for a period of at least two months, and at
5 least to that extent were comparable to the Rongerik Americans
6 who were out there approximately two months when exposed.

7 The control populations -- the controls for the
8 Natives were broken down as regards to age and sex. They did
9 show a difference in response as a function of age. In
10 general as far as the leukocyte-lymphocyte count is concerned,
11 the children below five were different than those above five.
12 With respect to platelets, individuals below 15 were
13 significantly different than those above 15. So they have
14 been broken down into these age groups, and I will speak only
15 of the adults unless I specify children.

16 In the large exposure group in the Rongelap, there
17 is no question as to the definite change in the hematologic
18 picture. They did fall and remained at a fairly low level
19 for a period of weeks, and there are indications that they were
20 returning towards normal when the group studies were
21 completed.

22 The change in total white count was reflected in
23 both the leukocyte counts and lymphocyte counts. The
24 lymphocyte counts fell immediately to a level of 2,000 cells
25 and remained throughout the duration of study, and no evidence

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 of return to normal when the study was completed. The
 2 neutrophils fell initially. They fluctuated considerably.
 3 Apparently they were returning to normal toward the end of
 4 the study.

5 The platelet counts in the Rongelap group showed
 6 a very definite decrease. I do not have slides of this, but
 7 I think it is quite evident from the graph, and you can see
 8 the general trend. Certainly there is a marked fall from
 9 the normal values. They reached a low on approximately the
 10 28th day, and returned to a value of roughly half way between
 11 that low and normal, and perhaps were returning to normal
 12 at the completion of the study.

13 I might say in passing that in general the platelet
 14 count at least showed a more regular response than did the
 15 leukocyte count. The curve is very smooth. It shows a
 16 definite low and return to normal, while the white count was
 17 prone to fluctuate as a function of time.

18 The hematologic findings in the Ilingula group
 19 paralleled almost exactly those in the Rongelap group.
 20 However, the severity of the changes was not so severe. The
 21 time trends, however, were the same.

22 With regard to the Americans, looking at the white
 23 count, the lymphocyte count or the neutrophil count, one
 24 would be very hard put to say that they had been exposed to
 25 radiation. The counts are lower than normal, but here again

Alderson Reporting Company
 Washington, D. C.

ARC

Department of Energy
 Historian's Office
 ARCHIVES

1 we get into the control business, and it is difficult to
 2 evaluate the extent of fall. However, if we look at the plate-
 3 let count in that group, here again we get what appears to be
 4 a very definite fall with a low reached at the same time as in
 5 the exposed native population, and a return towards normal
 6 towards the completion of the study.

7 A word with regard to children versus adults.

8 In the Rongelap people, I think with all end points -- all
 9 hematological end points, -- the children seemed to show a
 10 more marked response than did the adults. That is on the
 11 basis of absolute count. That is, we take the counts
 12 per cubic millimeter, and the children's counts were lower
 13 than adults. However, if we take these on the basis of
 14 per cent of control, this makes a considerable difference,
 15 particularly in terms of the lymphocyte count. If we take
 16 it in terms of per cent of control, the children were markedly
 17 more affected than the adults, which in terms of absolute
 18 counts they were more affected, but not nearly to the same
 19 degree.

20 With respect to the time trends in hematology in
 21 general, they were markedly different than is observed in
 22 the laboratory with large animals. The fall to the lowest
 23 point for both the myeloid elements and the platelets was later
 24 than seemed with animals, and its return towards normal was
 25 later than has seemed with animals.

Alderson Reporting Company
 Washington, D. C.

ARC

Department of Energy
 Historian's Office
 ANCH-100

Alderson Reporting Company
Washington, D. C.

1 On looking over carefully previous data from the
 2 Japanese and accidents that have occurred at Los Alamos
 3 and Argonne, it appears that perhaps this has been observed
 4 before, although not emphasized. Actually the data previous
 5 to this has in general been composed of very small exposure
 6 groups even in the Japanes, while the total exposure group
 7 followed may have been in the hundreds. Actually the counts
 8 at a given time were done on a very few individuals, as low
 9 as two out of the group. So it is difficult to make an
 10 accurate comparison between the two exposure groups.

11 In the case of the Argonne accidents, we have to
 12 comparw our data with one or two individuals from a comparable
 13 dose range.

14 We attempted to make some correlations between
 15 skin lesions, depilation, and various parameters derived
 16 from the blood counts. All efforts in this respect were not
 17 fruitful. We were unable to evolve any correlation at all
 18 between hematological changes or skin or depilation changes.

19 One final note on the hematology. The time trends,
 20 as has been pointed out, are essentially identical to that
 21 of an individual exposed at Argonne National Laboratory, who
 22 received an estimated 190 REP of radiation. The prognosis
 23 for this individual to date has been excellent, and we hope
 24 that this may be an indication that with these individuals
 25 also the prognosis will be excellent.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 I think those are the main points, Dr. Bugher.

2 DR. BUGHER: Thank you, Dr. Bond. Are there further
3 comments?

4 MAJ. HANSEN: Did any Americans show they had any
5 beta burns?

6 DR. BOND: This depends on who looked at them.
7 I think the consensus would be to the effect that the
8 lesions seen are not inconsistent with beta lesions.

9 DR. DUNNING: Did I understand you to say that
10 these were superficial on the natives?

11 DR. BOND: This is the impression clinically,
12 that they were superficial. It was like a sunburn with
13 superficial layers peeled off. There is no evidence of deep
14 involvement, and they healed rapidly.

15 DR. DUNNING: Even those on the feet?

16 DR. BOND: No, I should not say that. This was
17 most of the lesions. There were occasional lesions that
18 were deep. This occurred on the feet and occurred on the
19 back of the ear of one individual, but as a whole, the
20 lesions were superficial with these few exceptions. This is
21 not clear as to whether it is a function of total dose or
22 energy that is responsible for this. A very thick skin at the
23 heel would probably give you quite a different result than
24 a very thin skin at areas where the skin is more superficial.
25 We have no way of knowing how much material was deposited on

Alderson Reporting Company
Washington, D. C.

ARC

1 the feet as opposed to a greater surface.

2 MR. HARRIS: I don't know whether you looked at
3 the pathology, but did anybody make a note of possibly at
4 what level there was fibroplastic proliferation beneath the
5 surface on these individuals? It appears to me that a good
6 index of the energy of the situation, and we assume here
7 this is a 100 kilowatt average energy beta ray which is
8 doing most of the burning, from what I have seen of burns
9 using strontium and various high energy beta rays, the level
10 of fibroplastic proliferation is sharply cut off with
11 strontium. That cutoff point agrees in general with the
12 range of the electron from strontium. So that this might be
13 something to look at if it was in these specimens.

14 CDR. CRONKITE: Essentially there is no detecting
15 a histologic change between three German octavos, depending
16 on what part of the body you are at. Greater than 50 MU
17 is very little detectable.

18 MR. HARRIS: I am not thinking of the depth down
19 to which, but the closeness to which you come. Essentially
20 with strontium what you find is the burn area, and below
21 the burn area is a very thin area of disturbed reparative
22 action that you will get fibroplastic proliferation up to
23 the depths from this point, but below that point which is
24 slightly below the burn itself, you will not have it. The
25 total depth below the surface of the skin appeared to be

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 roughly dependent upon the range of the beta ray. This could
2 be checked experimentally if somebody wanted to know something
3 else.

4 CDR. CONARD: Most of the damage histologically
5 occurred in the papillary area.

6 MR. HARRIS: But there was no reparative action
7 coming from the bottom.

8 CDR. CRONKITE: There was no fibroplastic
9 proliferation in any that I looked at.

10 DR. DUNNING: I think the work at Western Reserve
11 pretty well shows that. In case of sulfur 35, if my memory
12 serves me right, he had to deliver something like 100,000
13 REP surface dose in order to get a lesion, and then they were
14 superficial and healed after a few weeks with no persistent
15 dermatitis.

16 DR. BUGHER: I saw in some of Gene's intermediate
17 biopsies, not the latest one, the amount of histological
18 change in the basal layers was of remarkable content. The
19 amount of response below the base of the membrane was almost
20 negligible. So I presume we are talking about a very large
21 beta dose to the basal layers of the epithelium and the soft
22 gamma dose.

23 MR. HARRIS: What was the depth?

24 CDR. CONARD: Somewhere between 1,000 and 2,000
25 microns.

Alderson Reporting Company
Washington, D. C.

ARC

1 CDR. CRONKITE: It was located on the scalp, where
2 they lost their hair.

3 MR. HARRIS: I was interested in this 700 r.
4 That is how much of what energy at what?

5 CDR. CONARD: That is medium hard x-ray.

6 DR. BOND: That is another thing; what is the
7 depilation dose?

8 MR. HARRIS: How about the children that they
9 depilate all the time for fungus infection. How much is
10 that? You ordinarily use a soft x-ray.

11 DR. BOND: Yes, with divided doses.

12 CDR. CONARD: Two to three hundred r usually.

13 MR. HARRIS: That is measured in hair. You could
14 have a relatively small soft x-ray or gamma dose in the
15 hair follicles, whereas you could have a terrific high skin
16 dose so far as REPs of beta rays are concerned.

17 DR. BOND: We had a conference with radiologists
18 and this question was asked: What is the depilation dose,
19 and the estimate computed ranged from 300 to 1200 r.

20 CDR. CRONKITE: There is one point which I think
21 Dr. Bond deliberately left out, and all of us wanted to,
22 but has to be considered to a certain extent, and that is,
23 how serious are the hematologic changes as observed here?
24 I think it is my personal opinion that these people were
25 on the borderline of getting into serious trouble, particularly
as far as platelets are concerned. I don't think we can

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historical Office
ANNEX 10

1 make a really good estimate of the severity and the
2 potential danger, but I am confident in my own mind with
3 the counts to have fallen lower, there would have been a
4 serious question.

5 DR. BUGHER: Yes. It is undoubtedly fortunate
6 they were not cocoanut hunting in the northern islands on
7 that date, too. I notice here one of the earlier things
8 mentioned was itching and burning of the skin. The Japanese
9 fishermen complained of that, and also very maked burning
10 of the eyes, actually beginning while the fallout was still
11 visibly coming down. How did you interpret that sort of
12 symptology here?

13 DR. BOND: You mean in terms of whether it was
14 chemical?

15 DR. BUGHER: Yes.

16 DR. BOND: We discussed that. Do you want to
17 comment on it?

18 CDR. CONARD: I think certainly the fact that the
19 chemical itritating material was on the skin might have
20 played some part in the initial symptology. But as far as
21 production of lesions are concerned, I think it is pretty
22 definite they are radiation lesions, and not chemical in
23 nature. There were quite a few that did report the burning
24 of the eyes, but not nearly so large a number that reported
25 general itching of the skin.

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVED

1 DR. BUGHER: These people did bathe rather promptly.

2 CDR. CONARD: Some of them did, but the majority of
3 de-
4 them did not bathe until they were/contaminated on the
5 destroyers on the way back to Rongelap.

6 DR. BUGHER: The Japanese mostly bathe in teacups
7 or rice bowls, and their immediate symptoms tended to be
8 rather severe. They continued. So that those who went to
9 sleep had some trouble getting their eyelids open. They
10 were pretty well stuck together.

11 CDR. CONARD: We had no reports of that kind.

12 DR. BUGHER: It would bear on how much of the
13 calcium oxide had been passed through a hydrated phase to
14 carbonate. The carbonate in itself would not be irritating
15 in the slightest.

16 DR. DUNNING: Wouldn't the time between the exposure
17 and the onset of the burns be so great to speak against them
18 being chemical burns?

19 CDR. CONARD: Yes.

20 DR. BUGHER: The lesions appearing two two weeks
21 later are purely beta rays. I am thinking of the immediate
22 events. The Japanese fishermen were considerably closer
23 to the detonation site than the Rongelap people. At least,
24 if they were where they said they were, they were decidedly
25 closer.

DR. BOND: Dr. Bugher, when Dr. Zsuzuki was in

Alderson Reporting Company
Washington, D. C.

ARC

Department of 25
Historian's Office
ARCHIVES

1 California, he reported that two of those patients had
2 bleeding, and two had microscopic hematuria. Do you have
3 any data on that?

4 DR. BUGHER: We know nothing more than we gave us.
5 He got that information mostly by radiotelephone after he
6 reached Washington. That was the last he had.

7 DR. DUNHAM: I had a point on the chemical burns
8 to the eyes and the Japanese fishermen did not develop
9 late burning lesions whereas they did develop very early
10 burns. So I think that points pretty definitely to the eyes
11 in the Japanese probably being on a chemical basis, whereas
12 the native group had a mild transient itching or burning.

13 DR. BUGHER: One about the sac being continuously
14 bathed tends to clean itself of material that falls in. I
15 think there are some other differences, too, between the
16 Japanese experience, as we know it at least, which is subject
17 to considerable uncertainty, and the subsequent experience
18 of these people, probably relating to the different environment.

19 If there are no further questions or comments on
20 the clinical side, we will turn to the further information
21 on the problem of the internal deposition of materials,
22 urinary excretion, and these matters that Dr. Claus and his
23 contingent have considered.

Alderson Reporting Company
Washington, D. C.

ARC

Department of Health
Historian's Office
ARCHIVES

1 NATURE OF FALLOUT, INTERNAL DEPOSITION,
2 URINARY EXCRETION, BODY BURDEN, AND
3 LONG TERM HAZARD.

4 DR. CLAUS: I approach this report with some
5 trepidation, because as you know, I was shanghaied into this
6 group this morning. It is not often, though, that the
7 shanghaied member of the crew gets to be skipper right away.
8 I was impressed by the apparently large amount of data
9 available on this subject, and as the discussion flew back
10 and forth, I attempted to make a few notes of things which
11 were perhaps appropriate for this report.

12 The conferees came so well prepared so that the
13 data can apparently go directly into a report that I don't
14 believe it is quite either practical or worthwhile to attempt
15 to summarize the whole business at this time.

16 What I have tried to say here, if it happens to
17 be in error, I hope my conferees will correct me immediately.

18 DR. BUGHER: They will.

19 DR. CLAUS: As to the nature of the fallout, it is
20 pretty well agreed that the fallout on the islands consisted
21 of large particles with radioactivity plated out on
22 calcium carbonate. In the islands, there, at least there
23 appeared to be no real evidence of lime burns. It was
24 interesting that some people observed in the dark room a
25 transient type of phosphorescence, but rather than ascribe
that to any extraordinarily high degree of radioactivity, it

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 is believed that this probably arose from microorganisms
2 which happened to be in the seawater at the time.

3 There was an extremely high content of Neptunium
4 in the activity. Two thirds was mentioned, and a few minutes
5 ago as much as 80 per cent of the activity at the beginning
6 being in the form of Neptunium. Consequently, most of the
7 burns were probably due to soft betas, most likely from the
8 Neptunium.

9 NRDL observed that most of the activity was
10 concentrated on the smaller particles with approximately an
11 equal distribution of hard and medium gamma components, a
12 small amount of soft components.

13 At New York, the laboratory observed as much as 18
14 per cent of ruthinium in this activity. That would be 18 per
15 cent of the fission products, I would judge, because between
16 Neptunium and 18 per cent of ruthinium, there would not be
17 much of anything left.

18 NRDL has observed activity in the fish caught in
19 the Rongelap lagoon, and at 116 days there was 35 per cent
20 of total beta activity in the fish as ruthinium.

21 I might put a few of these figures on the board.
22 There were 2.7 microcuries of beta activity to fish of two
23 to three pounds, and 6.4 microcuries of gamma in the same
24 fish. This was approximately equally distributed among the
25 viscera, the skeleton, the flesh.

Alderson Reporting Company
Washington, D. C.

ARC

Department of
Historical
ARCHIVES

1 Strontium 89 was found to be quite high in cocoanuts
2 or in the juice or sap or whatever they call it. My first
3 thought was the strontium 89 was absorbed through the
4 fronds, but as it was pointed out, that the material appeared
5 in the sap, it seems there was an extremely high uptake of
6 strontium through the roots.

7 NRDL has also made observations in chickens, pigs,
8 fish and so on, and this material is available for the
9 published report. As of this moment, I don't have any notes
10 here on that.

11 For the content of humans, urine samples were taken
12 in March of the Rongelap natives, Americans in March and
13 April, Japanese in April, and these samples were pooled and
14 alpha, beta and gamma breakdowns were observed at Los Alamos
15 on the pooled samples.

16 The alpha activities, it is rather interesting to
17 note, that there was no uranium or polonium observable,
18 and of the plutonium, the body content is interpreted to be
19 1.6 times 10 to the minus 2 micrograms, or .7 d per m per
20 24 hour sample which in the business is taken to be
21 insignificant, as far as body content is concerned.

22 Gamma studies were made with the counter. This is
23 putting the urine samples in the counter. This Orme counter
24 is a counter prepared as a liquid scintillation counter in
25 which the total arm can be placed. In other words, it is a

Alderson Reporting Company
Washington, D. C.

ARC

1 small version of the counter in use at Los Alamos now
2 for studying the content of a whole man. With the 100
3 channel analyzer, peaks were found at about 50 KV, 100 KV,
4 1945, 210. Most of these, I understand, are not identified.

5 MR. HARRIS: This is just gamma spectrum stuff, and
6 this is not extremely good sensitivity in high energy gamma
7 rays. There were essential peaks that we could not identify.
8 This was 145 kilovolt peak and a 210 kilovolt peak. The rest
9 fell in line pretty well.

10 DR. CLAUS: The one at 360 kilovolts, a strong one
11 which is iodine 131, one of about 500 as ruthinium, and there
12 are others presumably related to the barium-lithium units.
13 In addition to the fact they were able to observe iodine as a
14 gamma activity. It was a volatile component which could
15 be distilled off and observed directly.

16 I think I might now make a table. These were
17 the natives, and these were the Americans.

18 Iodine 131 worked out to .56 microcuries and 17.5
19 microcuries for the Americans. In this equivalent -- would
20 you explain that?

21 MR. HARRIS: The I-131 equivalent at the time of
22 fallout is meant the total amount of all the iodine isotopes
23 plus the small contributions from the tellurium mothers
24 weighted for the beta activities, and put in terms of
25 equivalent I-131. Those are millicuries, Walter.

Alderson Reporting Company
Washington, D. C.

ARC

1 DR. CLAUS: That is right.

2 I should not have drawn my line back so soon,
3 because these calculate back to a dose of 150 REP to the
4 thyroid and 50 REP for the Americans. These can be calculated
5 back in terms of fissions. I will not put these figures on
6 the board at the moment. In terms of the fissions to
7 which the natives must have been exposed, in order to come up
8 with these particular burdens, Strontium 89, 2.2 microcuries
9 for the natives, and 0.4 for the Americans. Barium 140,
10 0.34 microcuries for the natives, and 0.27 for the Americans.

11 Calcium 45, 0.19 for the natives, and 0.04 for the
12 Americans.

13 Ruthinium 103, the short lived one, 0.028 for the
14 natives, and 0.015 for the Americans.

15 I mentioned the fact that these could be interpreted
16 in terms of fissions to which the people were exposed. If
17 you average them out, it amounts to three times 10 to the
18 13th for the natives and 9 times 10 to the 12th for the
19 Americans. It is Payne's idea that the best way to interpret
20 these doses is to go back to fissions as a common denominator
21 from which you can make a lot of other calculations. I think
22 one might take a look at this, though.

23 When you add all these up, you find you have even
24 less than 3 microcuries, and interpreted as the very worst,
25 strontium 89, still you have very slightly over a permissible

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 body burden as presently interpreted in terms of very
2 conservative terms. So that from this point of view, at
3 least, it certainly does not look like this is anything very
4 serious in any of the natives.

5 These are all short lived materials, of course,
6 and I don't know how one might immediately interpret in
7 terms of strontium 90 which they might have picked up. The
8 dose to the thyroid is sizeable, but still relatively small
9 compared to what we usually think of as the dangerous dose
10 to the thyroid.

11 So that from the information that we have presently
12 available, I would not be inclined to believe that the
13 present body burden is one we need bother much about. The
14 external doses to which they have already been exposed are
15 much more serious in terms of our usual concepts of radiation
16 hazard than the body burdens which they now carry.

17 DR. BUGHER: Those are very nice figures.

18 DR. DUNNING: I think there is another point that
19 bears repeating here, that not only is this saying the
20 equivalent of 3 microcuries of strontium 89, but that, too,
21 is based on the assumptions that you have equilibrium
22 conditions. In this you have a one shot affair and with
23 an expected half life of 53 days, this makes an even more
24 conservative picture.

25 DR. BUGHER: On a one shot basis, this is probably

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 not more than one per cent.

2 DR. CLAUS: Do you want to talk about your concept?

3 MR. COHN: Yes. Our findings are a little different
4 perhaps due to the different approach we took. While these
5 figures on the board represent amounts of body burdens
6 calculated on the basis of I-131, assuming various assumptions,
7 our approach was a little different, in that we derived our
8 estimated body burden extrapolating from animal data. What
9 we did briefly was to sacrifice two pigs from the island
10 after getting a very accurate control of their urinary
11 excretion for 24 hours at 81 days. Then we did a complete
12 radiochemical analysis on all the separate tissues of this
13 pig, and also on the urine.

14 At the same time we did a complete analysis of a
15 human sample taken at just about this time, and extrapolating
16 from the pig data to the human, we come out with values of
17 total body burden of beta of .33 microcuries at 81 days.
18 If we extrapolate this back to 30 days after irradiation,
19 this is a considerably difficult thing to do. Most
20 extrapolations are based on animal studies, particularly
21 Hamilton's work in which a constant falloff of activity is
22 assumed. We know that this is not the case.

23 The only evidence that I know of in human strontium
24 inhalation probably is one case at Brookhaven. We based
25 our data on the rate of excretion of this inhaled strontium

Alderson Reporting Company
Washington, D. C.

ARC

1 90. While using their figures for biological half life of
2 this period of 81 days extrapolating back to 30, we come out
3 with a body burden of 1.4 microcuries at 30 days.

4 Barium comes out .7, Lanthanum is .7. The
5 remainder of the activity, the rare earth group, comes out .4.
6 Strontium, barium, and the rare earth group together
7 constitute about 75 per cent of the total beta activity.

8 We found no evidence of calcium 45.

9 If you want to extrapolate this back to one day --
10 and this is a very difficult thing to do -- we decided the
11 best way to do this would be to use the human radium data.
12 Strontium is known to fall off at the same slope at a lower
13 level. We have not calculated it for one day, but it will
14 give a value quite a bit higher.

15 MR. HARRIS: No, I don't think so. I think if ~~to~~
16 30 day level of strontium, taking in per cent of the total
17 amount in the body of the dose given, it may come up about
18 the same as the number which we took back to one day.

19 MR. COHN: We will have to check this further.

20 MR. HARRIS: This can be checked. As I recollect,
21 this puts us in much better agreement than we were before.

22 MR. COHN: The half life of strontium in the first
23 three days is quite tremendous. It has a biological half
24 life of about 4 days. You have to be careful in extrapolating
25 back. Since we have no sample earlier than 16 days, we have

Alderson Reporting Company
Washington, D. C.

ARC

1 to be quite cautious.

2 One other point. You mentioned that since this
3 is pretty close to tolerance that we don't think it is too
4 important. I think we have to be very careful. While we
5 may be close to tolerance or a little over, we have a complex
6 situation in which we have not only the internal dose of all
7 these separate emitters added up to close to tolerance, but
8 which have what we think was close to a tolerance external
9 dose. I think the effects are more than just additive.
10 Certainly it does not affect the acute situation. We did
11 individual studies on individuals separately for many days.
12 We tried to correlate our excretion in the urine with various
13 levels of blood picture curves, the platelets, and white
14 cells, and we could not find any correlation. In general,
15 and I think we all agree on this, the internal body burden is
16 roughly proportional to the external dose that was calculated
17 for each group.

18 The Rongelap are the highest. The Ilingina have
19 received half the external, and they are pretty close.
20 Their mean excretion is pretty close to a half of the Rongelap.
21 The American group -- I am not sure what the external dose is
22 now -- the internal dose is pretty close to a fourth of the
23 Rongelap. I think we agree on that now.

24 MR. HARRIS: This shows a little less than a third
25 and assuming all errors I would assign a sigma of about two to

Alderson Reporting Company
Washington, D. C.

ARC

1 this one over here, and a sigma of 6 to that one over there.

2 MR. COHN: I even go further. The individual
3 variations within each group are great. Some show
4 practically none, and some show 3,000 count per 24 hours.
5 Most of this activity is due to adjusting. This is especially
6 borne out in the animal data in which we find the highest
7 amount of activity. GI system and liver and very little
8 activity in the lungs. As pinpointed out, it is not too
9 likely that due to the large size of the particle, 6 to 200
10 microns, that a great deal of inhalation would have occurred.

Alderson Reporting Company
Washington, D. C.

11 DR. BUGHER: It is very clear that these quite
12 different approaches have given results that are not too
13 different, and the results are remarkably close.

14 MR. HARRIS: One other thing that I did not put
15 on the slip of paper is that so far in our findings in the
16 Japanese we have had some trouble with the strontium method
17 on those. But the activities found in beta activity at
18 these late times indicate that the Japanese were very
19 similar to the Rongelap natives in the amount of internal
20 exposure, and a similar number might be postulated as the
21 native number for exposure to numbers of fish.

ARC

22 DR. BUGHER: As I recall, you put a lot of
23 emphasis on the plutonium excretion measurements, did you
24 not, using that as one of the approaches to the body burden
25 story from the excretion rate of plutonium in the urine?

Department of Energy
Historian's Office
ARCHIVES

1 MR. HARRIS: The values were so low that although
2 we have better human information on excretion at various
3 times, the amounts we found in the urine were so low that
4 there is no significance attached to these numbers. We
5 tried it with small volumes of urine and large volumes of
6 urine, trying to go as high as three liters of a pool sample
7 but this does not work because the residual that you get
8 and the troubles you have with self absorption in counting
9 these, using the larger volume, negates your result.

10 Especially in this highly concentrated urine --
11 this is very interesting as a sidelight -- in the standard
12 procedure at Los Alamos in these urines that they use daily on
13 all personnel, at the end of the system there is practical
14 ignition of the residue takes place, and a great flame shoots
15 out and pieces of glass break up and fall in.

16 On the natives this was really something to see
17 because of the concentration they had. This plutonium
18 number you cannot depend on. If we take what is known about
19 the amount of plutonium made in this particular device, the
20 university is still too great to use plutonium to come out
21 with the number of fissions.

22 DR. BUGHER: I take it you did not ascribe those
23 pyrotechnical displays to radioactivity. The Japanese did.

24 MR. COHN: There were a couple of other interesting
25 items that I might bring up. One concerns the internal

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historical Office
ARCHIVES

Alderson Reporting Company
Washington, D. C.

1 decontamination study we did out in the field. We took
2 a small group of the Rongelap natives with the high internal
3 gamma contamination, and treated these with calcium EDTA,
4 given orally one gram per 25 pounds of body weight. I think
5 it is significant to note that we did get some effect,
6 approximately a doubling of the daily 24 hour excretion. This,
7 while not very significant in terms of the total body burden be
8 cause that means increasing from .1 per cent to .2 per cent
9 for 24 hours is fairly interesting. It might point the way
10 to further experiments along this line of preferably giving
11 the material other than orally, which is the poorest way to
12 administer.

13 Another observation on the animals, which I think
14 is interesting, a number of the hens started laying eggs
15 about two weeks after we brought them back to NRDL. Most
16 interesting, the shell of the egg ran as high as 60,000 d per
17 m per shell, which was roughly four times the urinary
18 excretion at this time. The albumin also contained a large
19 amount of activity, and the yolk the least amount of activity.

20 Also we were interested in fertility studies of
21 these animals that we brought back. So far we have mated
22 the roosters and the hens from Rongelap, and my latest
23 report tells me that 50 per cent of the eggs are fertilized.
24 We have gone into the business, and they are being incubated
25 right now. It will be most interesting to study what the

ARC

Department of Energy
Historical Office
1953

1 transfer from the mother to the eggs is, and what the
2 biological effects of such material would be.

3 DR. BUGHER: Yes, indeed. I hope you continue
4 those operations.

5 DR. DUNHAM: What fission products were increased
6 as far as excretion rate is concerned from the EDTA?
7 Obviously it was not all.

8 MR. COHN: We don't know. We know from previous
9 animal experiments it was not strontium.

10 CAPT. ENGLISH: How many days after exposure was
11 this study?

12 MR. COHN: This was the 21st of April, 51 days
13 after; a considerably long time to expect much result.

14 DR. BUGHER: Were you getting strontium in the egg
15 shells?

16 MR. COHN: Yes, we have a chemical analysis of the
17 whole egg, as well as the tissues of all the animals.

18 DR. CLAUS: The shells were formed how long after
19 the exposure?

20 MR. COHN: These are animals in our laboratory.
21 45 days after.

22 DR. CLAUS: They expected everything to be pretty
23 well out of the soft tissues by that time.

24 MR. COHN: Yes, approximately 80 to 90 per cent
25 of the activity is in the skeleton system.

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

DR. CLAUS: Indicating a very high turnover of the calcium like substances in the skeleton in the production of egg shells.

MR. COHN: Yes. The hen has the unusual ability to concentrate the alkali earth that no other animal has in this particular physiological situation. We hope the animals would continue at this high level and perhaps decontaminate themselves. But they reach a peak and fall off at a very low level. The eggs are quite normal in every respect in weight, size, and so forth.

DR. BUGHER: This is a new slant on the means of decontaminating strontium. Are there other comments or questions here?

We have run a little bit overtime. We have come out on the schedule. Let us see if we can reassemble at two.

(Thereupon at 12:50 p.m., a recess was taken until 2:00 p.m., the same day.)

Alderson Reporting Company
Washington, D. C.

ARC

AFTERNOON SESSION

2:00 P.M.

1
2 DR. BUGHER: Now we go on to a general discussion
3 of the material which was presented before lunch, and I think
4 it might be perhaps wise to take some of the things up in
5 more or less the recorded order in which they were presented,
6 that is, considerations of dose, and so on, were touched on
7 somewhat.

8 Gene, did you have any suggestions in mind here as
9 to the general direction of our discussion along these lines?

10 CDR. CRONKITE: There is one general thing that I
11 don't think was realistically approached this morning, and
12 that is, would anyone venture to make an estimate of the
13 prognosis as far as the individuals are concerned, both from
14 the external exposures that they received, and the internal
15 exposures separately, and then the probable effect of the
16 combination. It was alluded to, but just what is the
17 situation as far as these individuals are concerned? I
18 certainly do not know.

19 DR. BUGHER: That is a short discussion. Our
20 desire is to get somewhat more extended comment from other
21 members of the group.

22 MR. COHN: One source of infirmation on this point
23 may perhaps come out of the animal studies. We brought back
24 something like 66 animals, and the animals in general
25 have about ten times the internal body burden of the radio

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 isotopes, and they have about 50 per cent, or 100 per cent
2 more external dose due to the longer time they stayed on
3 the animal. If anything does show up, it will be more
4 likely to show up sooner in the animals, and would perhaps
5 give us some idea of the prognosis for the humans over a
6 longer period of time.

7 DR. BUGHER: What are the animals that you do have
8 surviving other than the chickens?

9 MR. COHN: 40 chickens, 6 pigs left, 3 from Rongelap
10 and 3 from Uterik. The pigs had practically all internally
11 and only about 6 r internall.

12 We also have a cat, three ducks, and I think that is
13 the substance.

14 DR. BUGHER: Have any of them shown signs of illness?

15 MR. COHN: Six of the hens have died so far
16 spontaneously, cause of death unknown. On autopsy, we
17 can find nothing. There was a slight hemorrhage in the
18 lung of one of the chickens. Nothing that we can ascribe to
19 radiation per se.

20 The three pigs that we have left are growing quite
21 tremendously on good feed that they are getting. There are
22 no symptoms that we can observe as far as temperature,
23 weight gain and general appearance.

24 DR. BUGHER: Did they show blood changes
25 comparable to humans?

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historical Office
ARCHIVES

1 MR. COHN: That is hard to determine. Their
 2 white cell and platelets fell. Chicken hematology is bizarre,
 3 to put it mildly. They have practically no platelets, for
 4 example.

5 We have done pathology on the chickens that died
 6 or were sacrificed. We sacrificed four or five pigs so far,
 7 and we were not able to say anything likely about any
 8 pathological changes. We do have radio-audiographs on the
 9 animals which might be particularly interesting here. This
 10 is a radio-audiograph of the tibia of one of the young pigs.
 11 The bone morphologically does not appear to be normal. There
 12 is parveculi extending through the shaft which is abnormal
 13 in a mammalian bone. There is a thickening here which
 14 probably indicates a failure of an osteoabsorption and
 15 periosteal-aberration. The particular thing about this bone
 16 is that there are two areas of dense concentration of the
 17 trabecula which corresponds on the radio-audiograph to two
 18 separate regions of high concentrations of radioactive
 19 material. It was the opinion of Dr. Norris, who did this
 20 particular audiograph, that these indicate two separate
 21 and distinct exposures to fallout material.

22 There is a lot of discussion on this, and it is
 23 pretty hard to come to a definite conclusion because we,
 24 one, don't have controls on these animals, and second, there
 25 were quite severe dietary changes in the animals from the

Alderson Reporting Company
 Washington, D. C.

ARC

Department of
 Historical

1 time we collected them and brought them back. There may
2 also be a finding of some disease which we don't know.

3 DR. BUGHER: Doesn't your bone section show two
4 zones of more compact trabeculae?

5 MR. COHN: Yes. I don't know whether you can see
6 it, but the arrows indicate that.

7 DR. BUGHER: Aren't those the two regions of
8 strontium concentration, too?

9 MR. COHN: I don't know whether it is strontium.
10 It is mostly like strontium and barium.

11 DR. BUGHER: And the alteration of the bone
12 construction itself would not be a finding of exposure.

13 MR. COHN: Functionally they appear quite normal.
14 There were two independent pathologists that came to this
15 conclusion.

16 In another pig, which is presumably a simile of
17 this one, we don't find this double layer again. Mostly you
18 have concentration here, and then you can see a light area
19 which corresponds to the growth after the animals were removed
20 from the island, and then the deposit in the still growing
21 animal.

22 In the mother of these animals, the sow, we get
23 the deposition here, and what looks like an indication of
24 perhaps a second deposition in here. You can see this
25 better in another audiograph.

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historical Office
ARCHIVES

1 This is a baby chick that was just born maybe a
 2 week or so after the detonation, and here you have an
 3 abnormal morphological picture. In the audiograph you get
 4 a concentration of radioactive material in the diaphysis
 5 here and practically nothing on the ends where the bone has
 6 grown subsequent to the removal of the animal from the island.

7 Here you have the bone marrow which would presume
 8 to be abnormal and perhaps due to the deposition of active
 9 material here, due to radiation -- and this is another chicken
 10 bone here again, looking abnormally morphological.

11 You have the same thing in a chicken bone. We
 12 have trabecular tissue extending down through the bone quite
 13 a way, which/you do not find normally. This would normally be
 14 reabsorbed here. These are two separate animals.

15 You note there is not the same concentration in each
 16 animal, presumably depending on the dietary pattern. We
 17 have similar audiographs for a number of the other animals
 18 also. The picture of iodine in the thyroid is typical of
 19 the iodine diffusion.

20 DR. BUGHER: Could you make an estimate of the
 21 iodine dose?

22 MR. COHN: Yes. About 15 microcuries was the
 23 estimate calculated back to exposure time. It is considerably
 24 more than the humans.

25 MR. HARRIS: 15 microcuries where?

Alderson Reporting Company
 Washington, D. C.

ARC

Department of Energy
 Historian's Office
 ARCHIVES

1 MR. COHN: This is in the bone and not the body.

2 MR. HARRIS: 50 microcuries in the thyroid?

3 MR. COHN: Yes.

4 MR. HARRIS: This refers to in humans in reverse
5 to total body of 56 microcuries, of I-131.

6 DR. BUGHER: Swallowed and absorbed. Is that assuming
7 100 per cent absorption?

8 MR. HARRIS: It assumes 100 per cent of the
9 ingested material.

10 LT. LOONEY: There are a few interesting comments.
11 We have been making studies in Bethesda , who have had
12 thorium, and it is very interesting to see that this
13 thickening of the shaft is something that we have noticed
14 with other minor changes in these people. Over 50 per
15 cent of some 17 that we have studied had that. In some radium
16 patients -- would you like to go into that at this time?

17 DR. BUGHER: Yes.

18 LT. LOONEY: I have recently gone over all the
19 clinical data on the luminous dial workers, some 80 patients,
20 30 of which were studied at Boston, and 50 at the Argonne
21 National Laboratory in Chicago. In relation to this, some
22 10 per cent of these people developed bone tumors 20 or 30
23 years after the administration of radium, and this luminous
24 dial material. Some patients which had less than one micro-
25 gram of radium had severe bone changes or tumor formation,

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVED

1 or others with 10 or 15 micrograms had relatively little
2 changes. This is a factor of 10 or 15, which must be taken
3 into consideration as far as permissible levels are
4 concerned.

5 The other thing is that the excretion studies done
6 by Norris in Chicago, there was a finding of 2/1000ths to
7 16/1000ths of one per cent of the radium excreted per day.
8 This is a factor of four to eight when you estimate permissible
9 body burdens of radium compared to the more accurate
10 estimates by measurements.

11 So when we talk in terms of permissible levels, I
12 think it is very important as far as the humans are concerned
13 to keep these factors in consideration, that there is a
14 marked biological variation, and also a marked biological
15 elimination of these elements. Since these elements are in
16 the near permissible range, I think these people are extremely
17 important from a long term study, because we know away above
18 this we are going to get tumors and away below we are not
19 going to worry. This is the range which we are interested in.

20 I think these people are extremely important from
21 a long term study in that respect. I am not familiar with
22 all the radio elements there that are of biological and
23 physical half lives. I think Tomorrow I will take the
24 information and refer it to the studies of the people with
25 the late effects, if that is agreeable.

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 DR. BUGHER: If one divides the prognostic problem
2 into the immediate and ultimate prognosis, I think the
3 immediate problem has already given its own answer. The
4 fact that except for two people who are still in the hospital
5 -- old people, -- and one woman ready to deliver, all of the
6 Rongelap people went happily off to their new location.
7 There are no ill effects so far as the immediate situation
8 is concerned. So that the immediate prognosis time has
9 already given the answer to that.

10 The ultimate long term prognosis problem I think
11 would concern itself with two broad aspects. One of the
12 internal emitter question, particularly in the skeleton,
13 which bears on what you were speaking of, and the other is
14 the possibly very much delayed skin neoplasia which would
15 not be expected, I should think, to appear in less than 15 year
16 or maybe more, if it appears at all.

17 Have you any opinions on those? What do you think
18 in your own mind is likely to occur to these people in the
19 next 25 years or so?

20 LT. LOONEY: The thing that we have noted as far
21 as the relationship of radio element deposition to the
22 formation of neoplasia from radium patients was this, that
23 in most all of these characteristic of the histological
24 findings was the formation of an atypical osseous tissue, which
25 was a bone formation, and this was not usual in the areas

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Contract No. E-1190
ARCHIVED

1 of greatest radio element deposition. In fact, we could
 2 make very real correlation between radio element deposition
 3 and histopathological.

4 A few patients that we were able to do extensive
 5 pathological studies on, we could find that there are many
 6 areas -- not many, but in some areas -- in which the
 7 transition from this formation from atypicalosseous tissue
 8 and the fiber sarcomas was awfully hard to differentiate.
 9 Dr. Lipscott at Chicago has reviewed this and some of his
 10 work with plutonium in rats. The feeling is that the most
 11 likely place for the formation of these tumors around these
 12 areas of atypicalosseous formation, most of the tumors have
 13 developed, on the ends of the long bones in the cancerous
 14 bones. All of this is supportive evidence that these
 15 conclusions are probably correct.

16 I think this ultimately gets down to what causes
 17 cancer. Is it one cell from the irradiation in these
 18 small areas in which you have the proliferation of this
 19 tissue become malignant? There is a smoldering of this for
 20 years, and then suddenly there is a turnover, and then it
 21 seems to spread throughout the skeleton or even multiple
 22 tumor formation throughout the skeleton.

23 As far as permissible levels are concerned, we have
 24 to interpret that in terms of this pathological finding in
 25 these people. It is to set a level with this marked

Alderson Reporting Company
 Washington, D. C.

ARC

Department of Energy
 Historical Office
 10/1/50

67

1 biological variation, and I think you have to watch these
2 individual people, and to see what percentage of these
3 people develop tumors as compared to a controlled group.

4 DR. BUGHER: Yes, that will be done. Do you have
5 any feeling yourself for the probabilities involved here in
6 this group? Would you expect any bone sarcoma to be
7 encountered in this Rongelap group? We have 84 people, is it
8 not?

9 DR. BOND: 82.

10 LT. LOONEY: I would certainly like to have a
11 chance to go over this data much more than I have at the
12 present time before I would stick my neck out so to speak
13 on this. But I do think that certainly with this close
14 permissible level, that these people are extremely important
15 to see if there is an increase in incident of neoplasia in
16 this people. I don't know too much about the distribution
17 of these various elements. Most of it is bone. Chances are
18 your bone tumors are the most likely thing to occur. I
19 would not want to hazard a guess.

20 MR. COHN: There is one point that has not been
21 brought out, and that I think should be stressed, is that
22 strontium 89 has a considerably shorter half life than radium,
23 but there are a number of short life fission products that
24 would have had to be present in high concentrations for an
25 early interval which we don't pick up after 30 days. The

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historical Office
AUG 1968

1 problem then is what is the effect of a large dose over a
2 short period of time to the bone or bone marrow in this
3 early interval, that is, in terms of possible carcinogenic
4 effects later. This is a problem that has not been explored
5 to any extent at all. Animals are certainly not humans,
6 but certainly that we should consider.

7 DR. CLAUS: You would not expect these other
8 substances to be present in the bone?

9 MR. COHN: Yes, there are a number of other bone
10 seekers, I have a list of 15, that are present in high enough
11 fission yield, but due to the fact that the half life is
12 so short, after 30 days we do not pick them up. But they
13 were radiating this bone during the interval.

14 DR. CLAUS: Would you hazard any guess how much
15 there is of that, compared to this?

16 MR. COHN: It could be calculated.

17 DR. CLAUS: If there is any likely tumor
18 formation from this stuff, and an equivalent amount of small
19 quantity in the bone for the short periods of time that these
20 are there, we are in a bad way as far as our permissible
21 levels are concerned, because this is just a little bit
22 over what we claim to be a permissible level of strontium
23 89 for a lifetime.

24 MR. COHN: Yes.

25 DR. CLAUS: This is for a relatively short time, and

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 we are going all out by saying you can give very sizeable
2 overdoses for a relatively short time without doing any more
3 damage than if you spread it out. So if any of our
4 concepts to date on which we are basing our permissible dose
5 levels are correct, then there is absolutely no chance, or
6 at least an awfully small chance of anything developing from
7 these levels.

8 MR. COHN: I don't think there has been any study
9 made of high intensities and short exposures.

10 DR. CLAUS: These are not high intensities.

11 MR. COHN: Relatively high intensities. There are
12 12 other products that are bone seekers, in high fission
13 yield, that would have to be present based on the present
14 strontium and barium, for example.

15 DR. BUGHER: What are some that you would have in
16 mind?

17 MR. COHN: Tellurium, lithium 103, 106, cerium 101
18 and 144, zirconium 195, which we find in fish, praseodymium
19 143, yttrium 141, barium 140, and lanthanum 141, and iodine
20 147.

21 DR. BUGHER: The 106 ruthenium has a year half life

22 MR. COHN: No, that is only 19 days, I believe.

23 Oh, one year. I am sorry. All of these are fairly long
24 lived, anywhere from 10 to 60 days, and they are all
25 present in a fission abundance of from 3 to 6 per cent.

Alderson Reporting Company
Washington, D. C.

ARC

Alderson Reporting Company
Washington, D. C.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

DR. BUGHER: Are most of those excreted rather rapidly?

MR. COHN: Zirconium, cerium, praseodymium are concentrated in the bone to some extent. I think in this case their half life is probably much shorter than their excretion rates. That would be the determining factor.

DR. BUGHER: It is obviously unlikely that we will ever know more quantitatively what is in these people than we know now; in other words, we cannot really acquire any more knowledge by deferring consideration of anything because we really have in our hands now all the evidence that there is.

CDR. CRONKITE: Does the exposure to 150 to 200 r in relatively a short time change tolerance concepts? Does this influence the tolerance concept? Has anybody done any animal experimentation where you crack them with a couple of hundred r and see if your same tolerance levels will hold up?

DR. BUGHER: The main point there, I think, is that our tolerance levels are below that for which experimental results can be demonstrated. In other words, one has to go much higher levels of the material. There have been experiments on such things. At the moment I can't recall the results except that they tend to be additive, rather than otherwise.

ARC

1 Walter, do you happen to know of any?

2 DR. CLAUS: No, I don't know what you are referring
3 to there. All of the permissible levels with the exception
4 of those that are tied in to radium, radium, plutonium,
5 strontium, are based on a calculated dose to the critical
6 organ of .3 of a REP per week. So I think that is probably
7 small enough in comparison with a couple of hundred r dosage
8 you might give so they could be neglected. If you are dealing
9 with radium plutonium, you may have a little different
10 problem on your hand, because those are based on actual
11 experience, rather than calculated levels. But even there I
12 think the doses do not exceed the .3 REP per week. They
13 differ with that level very much.

14 DR. BUGHER: Dr. Dunham, I will explain what the
15 question is here. In view of the rather small level of
16 individual isotopes in bone and so on, whether the whole
17 body exposure of 150 r which has been brought out this morning
18 is not quite saying what that is to, and whether that would
19 affect the concept of permissible limit, essentially, in
20 regard to the expectations of biological accidents and
21 unfavorable results in the bone from the concomitant gamma
22 ray exposure.

23 I said as far as the experimental side is
24 concerned, since the permissible limits are themselves levels
25 at which one would expect such things anyway, that it is

Alderson Reporting Company
Washington, D. C.

ARC

1 rather hopeless experimenting in that level. One would
2 have to go many, many fold up in the concentrations of
3 isotopes, and there I thought the effects were essentially
4 additive.

5 Do you happen to remember any of the experimental
6 data?

7 DR. DUNHAM: I know of no experimental data
8 that is comparable to this situation.

9 DR. BUGHER: No, nothing comparable to this.
10 Exposure levels of 1,000 microcuries of strontium with
11 animals also given x-ray.

12 DR. DUNHAM: I know of no such class data. The
13 closest would be Fridell's work, where you were concentrating
14 the effects in different organ systems. He has also given
15 some whole body radiation. That matter might be re-looked
16 at in this light.

17 DR. BUGHER: It is pertinent here.

18 DR. CLAUS: I think you could extrapolate from
19 Fridell's work if he has not actually done it, and say if
20 you give an animal enough internal emitter so that he is
21 pretty close to the borderline, and then you add x-ray on
22 top of that, you will get more than an additive effect,
23 because the effect due to one isotope is partially
24 compensated by other organs in the body. Whereas if you
25 inactivate these other organs, then you will meet more than

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
SERIES

1 an additive effect. Those are for very high levels. I
2 don't think they are applicable to this situation at all.

3 DR. DUNHAM: Those are at levels sufficient to
4 knock the bone marrow out.

5 DR. BOND: Those are very high levels. They are
6 approaching total body lethal doses.

7 DR. DUNHAM: I was just searching my mind for some
8 data.

9 DR. BUGHER: I think the answer is negative with
10 regard to the question of whether or not this amount of
11 material in the bone has any effect whatever on the
12 general radiological manifestations of the dose that these
13 people got.

14 LT. SHULMAN: How about the other way around.
15 The total body radiation, and then the local deposits.
16 Perhaps the 200 r received at that spot plus the local
17 deposits may give different local changes than those
18 calculations based on local radiation.

19 CDR. CRONKITE: In the children where the bone is
20 growing it gets concentrated in a relatively small area,
21 so as they continue to grow, if this were an adult, it would
22 have been distributed relatively throughout the bone.

23 MR. COHN: It still concentrates in a factor of
24 ten in the adult.

25 CDR. CRONKITE: But it stays concentrated in one

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 area in the child. Does this give a significantly higher
2 dose to those areas so that you may have a different set of
3 standards or think of it as different for a child than an
4 adult?

5 DR. BUGHER: If you are asking personally, I don't
6 think so. I think in considering permissible dose, we have
7 oftentimes thought of the bone marrow being much more static
8 than it is, rather than regarding it as essentially fluid
9 tissue of a slow flow rate. The probability is that the
10 regularities of concentration are not as important as
11 we have assumed in computation. Usually a factor of five
12 gets in the picture for irregularities, and nonuniform distri-
13 bution of the material with respect to bone marrow. But
14 certainly bone marrow cell structure is a highly mobile one
15 in terms of comparative bone cells, for example; so it is
16 quite possible that we over-emphasized the fact of non-
17 uniformity, and such experiments as we have had in regard
18 to skin activities would seem to indicate that the non-
19 uniform situation is actually less of a problem than the
20 uniform distribution of the same amount of material.

21 LT. SHULMAN: Is there sufficient data to know
22 whether the local bone dose in children could be suspected
23 of giving abnormal growth? Do the levels they probably
24 have come close to the levels that do give abnormal
25 development, such as in the chickens? That is abnormal

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 development, and they are only ten times lower. Over the
2 longer period of time that the development takes place,
3 children may be the individuals to observe in order to find
4 that out.

5 DR. BUGHER: There may be a corollary to the
6 question, and that would be whether or not the blood changes
7 in the children were not related to the perhaps greater
8 quantitative bone marrow dose. Does anybody have a comment
9 on the question of growth disturbance in children, resulting
10 from these exposures?

11 MR. COHN: We broke down each one of the groups
12 into various age groups. Below five years old, from
13 six to 15 and 15 and over. We find in the children we have
14 a lower mean emitter excreted. What this means is hard to
15 say. It is not likely that they took up less contamination
16 than the adults did. They ate as much, and so forth. It
17 would therefore leave you with the idea that the material
18 they do take up is fixed more firmly in the bone so that a
19 lower ratio perhaps is found in the urine. In general,
20 more actively growing and proliferating tissue is more
21 radio sensitive. You would expect to find more change in
22 the children than in the adults.

23 DR. DUNHAM: A youngster two or three years old
24 does not eat as much as an adult. A teen-ager will eat more.

25 MR. COHN: We analyzed all the food and most of

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 the contamination was in the water and in the sap of the
2 coconut tree. There were very high levels of contamination.
3 The fish was the other high source. Whether it is because
4 they drink less water, it is hard to think that they took
5 in less contaminating material than the adults.

6 DR. DUNHAM: I think it is hard to believe that
7 they took more.

8 MR. COHN: Judging by my own children, they eat
9 more than I do, although probably less at a time.

10 DR. BUGHER: I think one can say something about
11 the effect of the general whole body exposure, and the expected
12 growth rates. In Hiroshima the exposed children to the
13 bomb within 1500 meters did show some apparent retardation
14 of growth for a few years, but then in the last two years
15 they picked up and apparently equal to the controls. Those
16 were levels which were a mixed grill. Some had levels
17 sufficient to give radiation sickness and some aplasia, and
18 others in the same areas had no recognizable radiation
19 symptoms at all. So it is a statistical comparison. The
20 difference has been lost now between those two groups.

21 MR. COHN: That is from external radiation.

22 CDR. CONARD: No internal there.

23 MR. COHN: That is right.

24 LT. LOONEY: Sir, in regard to the changes as
25 far as children are concerned, I remember one of our radium

Alderson Reporting Company
Washington, D. C.

ARC

1 patients who was working as a luminous dial worker at 15
 2 had areas of increased intensity around epiphyseal areas
 3 of the long bones. This, with other data, would suggest
 4 that we were not too sure whether these developed years
 5 later or developed with deposition.

6 Gross audio-radiographs were made, and they did have
 7 a concentration of radium in the epiphyseal area. The big
 8 trouble with the radium data is that we don't have a roentgen
 9 grosser so that we can tell these developments of the roentgen-
 10 ographic lesions, we see in the people 20 or 30 years from
 11 now. It would seem that these lesions develop years later.

12 As I say, in this one case which ingested radio-
 13 active materials at 15 died at 40, and she had these areas
 14 of concentration in the epiphyseal areas. From other
 15 studies, it would seem that radium is eliminated from the
 16 more accessible parts of the skeleton.

17 DR. BUGHER: Does anybody else have a different
 18 thought in regard to the skeletal prognosis here with this
 19 amount of material?

20 I think the skin prognosis is one which has a
 21 considerable uncertainty as well, and also equally perhaps
 22 important. I have to skip over to a Commission meeting, so
 23 I would like to ask Dr. Dunham to serve as Chairman for a
 24 while until I get back. You can go on with this prognostic
 25 side from the skin. I think also there should be some

Alderson Reporting Company
 Washington, D. C.

ARC

Department of Energy
 Historian's Office
 ARCHIVES

1 further consideration of not the skeleton, as such, but
 2 the hematopoietic system with regard to the long term
 3 prognosis, and what we think the problems of leukemia
 4 may be in these people, and particularly with skin carcinoma.
 5 Leukemia from our Japanese experience would be something of
 6 importance much sooner than skin neoplasia, if the latter
 7 occurs at all. If you will excuse me, I will go.

8 DR. DUNHAM: Who wishes to make a contribution on
 9 this point? Vic, do you have any further comments you wish
 10 to make on the prognostications as far as the skin goes, and
 11 the late development of malignant change?

12 DR. BOND: I would like to ask a question. It
 13 was the opinion of David Wood, and others, that looked at
 14 the slide, that in addition to late carcinogenic changes, we
 15 might expect later breakdown of the skin in a period of
 16 months, rather than years.

17 DR. DUNHAM: In other words, you feel that it is
 18 too early to prognosticate?

19 DR. BOND: To really prognosticate. I don't wish
 20 to imply that there is definite evidence for this.

21 DR. DUNHAM: No.

22 DR. BOND: It is a foregone conclusion that it
 23 will occur. However, they saw changes in the manner of the
 24 regeneration of the epithelium which led them to believe
 25 that there are possibilities that this may occur. This is

Alderson Reporting Company
 Washington, D. C.

ARC

Department of Energy
 Historical Office
 ARCHIVES

1 strictly from animal data, and not from human data. Do you
2 have any further on that?

3 CDR. CONARD: The lesions as they were when we
4 last saw them showed no signs of development of true
5 chronic radio dermatitis. That is, the usual signs of
6 atrophy and so forth that you normally observe in chronic
7 radio dermatitis were not apparent. There were some other
8 changes. Hyperkeratosis was developing, and some overgrowth
9 of the epithelium forming papule structures which Dr. Wood
10 seemed to think might account for the large peel like
11 appearance of the skins which we noted as a later development,
12 along with hyperpigmentation of the skin. Whether these
13 changes have any significance to prognosis, I really don't
14 know. I think that when Dr. Wood comes through with his final
15 report on histopathology, he may give us some more evidence
16 of his ideas in that direction.

17 DR. DUNHAM: It is really a little early, because
18 we don't know how normal this skin will get. If it gets
19 more normal than it is now, then I think there are grave
20 doubts as to optimistic prognosis. If it gets more
21 normal in the next six months or so, then I think one can get
22 very optimistic again. I believe radiation damage that
23 leads eventually to malignant degeneration, the tissues
24 themselves do not pass through a thoroughly normal appearing
25 stage microscopically ever.

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 MR. HARRIS: I would like to prognosticate that
2 for at least six years there would be nothing because in none
3 of the cases of Los Alamos beta ray burns, there has been
4 nothing in six years.

5 DR. BOND: What do the skins look like now?

6 MR. HARRIS: They are in much different shape than
7 what the natives are. They are still breaking down. A couple
8 of fellows still have to go back to St. Louis once in a
9 while for a little more plastic repair. Other than that,
10 they are in fair shape. You don't have the usual skin. It
11 has the appearance of a cigarette paper type of thing. All
12 of the fat beneath the skin is gone, and will never come
13 back apparently.

14 DR. BOND: When you say nothing will happen, what
15 do you mean?

16 MR. HARRIS: You cannot say that on this basis
17 these people will not have any carcinogenic indications.

18 DR. DUNHAM: You have to give them at least 20 years.

19 MR. HARRIS: I think probably you might be able to
20 give them 20 years on the basis of the fact that the Los
21 Alamos people who have had this exposure, who have had
22 superimposed exposures on the same skin for the last six
23 years at least as high as tolerance, and probably higher than
24 tolerance in some cases.

25 CDR. CONARD: They had 4 to 17 thousand REPs or

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

81

1 something like that.

2 MR. HARRIS: They had maybe 20,000 REP of high
3 energy beta.

4 DR. DUNHAM: It was full thickness damage.

5 CDR. CONARD: A fission product material?

6 MR. HARRIS: Yes, sir. It was filter papers that
7 they picked up with their hands. There was a small amount
8 of Neptunium. I would guess it was only a small proportion
9 of the total. You can get this number very easily by
10 comparing it on the Nevada explosions, and if you compare
11 with any sort of a standard Nevada explosion, you will come
12 out with the number of Neptunium which would be the same that
13 they had.

14 CDR. CONARD: As near as I can understand,
15 practically all skin malignancies develop on top of a
16 well recognized breakdown of the skin, chronic dermatitis
17 or the usual chronic changes that occur after radiation. A
18 vast majority of these people have shown no signs of
19 developing chronic dermatitis or atrophic changes. There
20 are a few, one or two. One or two of the foot lesions show
21 some evidence of scarring and atrophy, and the persistent
22 ear lesions.

23 DR. DUNHAM: You would give them all at least 20
24 years?

25 DR. BOND: That is for malignancy.

Alderson Reporting Company
Washington, D. C.

ARC

1 CDR. CONARD: If they don't develop any chronic
2 radio dermatitis within the next five or six years, I would
3 say the prognosis is excellent that they won't have any.

4 DR. DUNHAM: At least some of their lesions are
5 going to be exposed very heavily to an added insult in the
6 way of ultraviolet.

7 CDR. CONARD: Trauma, too.

8 MR. HARRIS: Isn't the humidity a little high out
9 there for having as high an ultraviolet exposure as where you
10 do get ultraviolet carcinoma? In the west, for example,
11 where there is low humidity. If the humidity is so high in
12 the climate that the percentage of ultraviolet is high.

13 DR. DUNHAM: It is awfully common to sea folk in
14 general. It certainly cuts down what it would be being at
15 the equator or close to it. Still plenty gets through.

16 CDR. CONARD: There is a great deal more of it,
17 too, due to the long days.

18 DR. DUNHAM: All year around. It is not just
19 seasonal.

20 CDR. CRONKITE: The thing that bothers me is
21 what Dr. Bugher had to say this morning. The establishment
22 so far as is known of what could be expected from the stand-
23 point of prognosis with time intervals becomes acutely
24 important because there are a group of individuals who are
25 going to have to go out from time to time. It is going to be

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 one big chore to go out at regular intervals. If there is
2 no hazard to expect under 20 years, I think we ought to
3 seriously start thinking about these followup trips. Is it
4 even necessary to go back four times in this coming year?

5 Being one of the individuals involved, perhaps I
6 have a personal bias in it. But just as we are talking here
7 from the standpoint of prognosis, nobody yet has come up with
8 anything that means anything to me, except that somebody
9 ought to watch them.

10 DR. DUNHAM: I think what we have been talking about
11 in these last two discussions are something that would only
12 happen in 15 or 20 years. I have not been as close to the
13 planning as you have for the immediate followups. But it is
14 my understanding, or at least I would think that the
15 philosophy behind the coming followups was to follow the
16 blood count back to normal, to find out whether it is
17 back to normal, say, next August or fall. In other words,
18 complete the study of the acute phase, and then after that,
19 if you can develop a reasonable rapport with the trust
20 territory physician, there should not have to be an awful
21 lot of expeditions.

22 CDR. CRONKITE: I was thinking not only in terms
23 of the long term prognosis, but the prognosis for the
24 immediate future, because someone is committed to making a
25 trip in August, and again a few months thereafter, in order

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historical Office
ARCHIVES

84

1 to collect more information in order to be in a better
2 position to plan. But to get any information now that anyone
3 has collected for planning purposes would be of tremendous
4 importance to the people that have to go out there.

5 DR. DUNHAM: The other thing is the matter of
6 leukemia which John asked to have some discussion on.

7 DR. BOND: May I ask something before we get
8 into that aspect of it? The general question as to the
9 findings seen in general are commensurate with the dose esti-
10 mates we found this morning. 150 r is a ticklish problem.

11 DR. DUNHAM: It may be 175, if it was 150 r measured
12 in the air with a different kind of field, is that right?

13 DR. BOND: This may or may not be.

14 DR. DUNHAM: I believe that. Do you doubt that?
15 Noting the figure of 150 r, but the fact that there would be
16 a difference in comparable effect.

17 DR. BOND: I want to get into that in a minute.
18 This is the problem. Say 150 r and from considerations of
19 dose rates, say this was given over a period of at least
20 hours and probably days, as opposed to the usual single
21 exposure which you would predict would give less effect for
22 the given total dose. Also, there is a possibility that
23 some of these individuals were inside structures and did not
24 get the same total dose that was calculated for the island.
25 These things would tend to make you suspect that the effect

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 should be less than what you would anticipate for 150 r.

2 I would like to know if this perturbs anyone?

3 I have talked to a number of people that it has perturbed.

4 In other words, the findings observed are not commensurate

5 with the calculated dose. Are they or aren't they? Is it

6 necessary to go to something like this depth dose business

7 to explain this? Do we have to go to something like

8 combined effects to explain it. Or is everybody happy with

9 the findings of 150 or 175 r?

10 DR. DUNHAM: Gene, you studied this longer than

11 anybody in the room. Is there any change in the blood picture

12 as you saw in those animals as you would have guesstimated on

13 the 28th of February last, as coming from roughly 150 or

14 175 r total body exposure?

15 CDR. CRONKITE: One has to make the assumption on

16 the basis of this data that was collected that either man

17 behaves differently from what we thought he ought to behave

18 on the basis of large animal experience in the laboratory

19 and with fission spectrums from atomic bombs based on Green-

20 house work, or there is some weird combination of radiation

21 effects that we are not at all aware of to make this

22 difference.

23 It is a very real difference in the time sequence

24 in the platelets in these human beings that occur as has

25 been observed in any laboratory animal.

Alderson Reporting Company
Washington, D. C.

ARC

Alderson Reporting Company
Washington, D. C.

1 DR. DUNHAM: Is there any comparable data on large
2 animals?

3 CDR. CRONKITE: Yes, we have 150 r dogs in a large
4 group. They hit the minimum around 12 to 13 days, and are
5 beginning to recover at about the time these people are getting
6 the minimum values. It is an entirely different picture.
7 I don't know how to interpret these things. It may be
8 that the life span of human cells is entirely different from
9 laboratory animals that we are dealing with, or there is
10 some other weird radiological factor that comes in of
11 additivity that prolongs the effect of radiation. I am
12 confused on it.

13 DR. DUNHAM: It seemed to me in our little
14 discussion this morning we talked about somebody reviewing
15 the Japanese data, and if it looked as though in those
16 that survived there was the prolonged effect. In the two
17 Argonne cases there was prolonged effect.

18 CDR. CRONKITE: The bad effect on Japanese data
19 is that those who survived the first blood count were taken
20 in the third and fourth week after exposure. We don't
21 know what they were doing before that. The Japanese dying
22 probably received super-lethal doses of radiation, the
23 behavior is the same as that of a dog receiving super-lethal
24 dose of radiation. Then there is this hiatus of three or
25 four weeks where you have to guess what that looks like.

ARC

Department of Energy
Historical Office
August 1953

1 From Argonne there is this one case of a man that
 2 was exposed to platelets and leukocytes who hit the low
 3 values at about the same time as the men of this large group
 4 did. I rather expected that people would be concerned about
 5 these differences in the time. Is that what a single dose
 6 of radiation would do to a man or isn't it?

7 DR. DUNHAM: We don't have any evidence to the
 8 contrary, do we, in man?

9 DR. BOND: May I ask Col. Browning and perhaps
 10 Commander Etter on this point: Was this actually observed,
 11 and does this surprise them? Is it 150 r anticipated or
 12 are there difficulties?

13 COL. BROWNING: I have those records, and I will get
 14 them up tonight, where people have been given 150 r in one
 15 dose. But if my memory is not wrong on this, it did go
 16 down earlier. This was with one MEV stuff.

17 DR. BOND: How about the clinical picture?

18 COL. BROWNING: These people were not well, of course,
 19 when they received it, which was the reason that we were
 20 justified in using those amounts. But they showed very
 21 little in the way of radiation sickness, just about
 22 comparable to the natives. But the blood did go down earlier
 23 with the whites and platelets, as I recall it. I will bring
 24 that stuff in tomorrow.

25 DR. DUNHAM: Did they follow through for six and

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

77

1 eight week periods?

2 COL. BROWNING: Yes, some of them for six months
3 and a year.

4 CDR. CRONKITE: This data, if it is available, we
5 ought to get hold of it for comparative purposes. I have
6 never seen it.

7 COL. BROWNING: I will bring it in for you.

8 CDR. ETTER: What is it?

9 COL. BROWNING: It is the therapy units, one at
10 Baylor and one at Sloan Kettering. This was a little bit of
11 everything, including leukemia.

12 DR. DUNHAM: Commander Etter, have you anything to
13 add to that at this point?

14 CDR. ETTER: No. I think what is bothering
15 Vic a bit is that in setting up figures for so-called
16 operational implications in atomic warfare, we in the past
17 have pretty much considered it to be 100 r probably at the
18 very low limit of any signs or symptoms appearing with
19 probably a thought that a group of troops receiving 100 r
20 could go on with their normal duties. This makes you wonder
21 if the 150 r is going to result in this type of thing,
22 whether or not our figures for operational purposes might not
23 be a bit on the high side, rather than the low side, and we
24 would have to come down a bit on this thing. I think that is
25 what Vic is getting at.

Alderson Reporting Company
Washington, D. C.

ARC

Department of
Historian's
ADDRESS

1 COL. BROWNING: Harry, if we can get any
2 information here from the physicists about the energy, it does
3 not make us feel too bad. We are quite happy with our 150 r
4 if this is correct. But if this is the very low energy stuff
5 then we have not gained a bit of assurance from it.

6 CDR. ETTER: If 150 will do this over a period of
7 a matter of 36 hours, doesn't this mean 150 delivered in a
8 matter of a minute or so should not have given a much more
9 acute picture, which means that 150 may be much too high
10 for practical purposes in our operational structure?

11 COL. BROWNING: Yes.

12 DR. DUNHAM: How much did these people get the
13 first 12 hours, Gordon?

14 DR. DUNNING: I don't know whether I can quickly
15 answer that.

16 DR. DUNHAM: I think this is important in this
17 consideration. What they got in the first 12 hours is not
18 going to affect much more difference than three or four
19 minutes.

20 CDR. ETTER: I picked the 36 hour figure because
21 of the evacuation.

22 DR. BOND: They got only 30 f.

23 CDR. CONARD: I thought the curve was so steep.

24 DR. BOND: They didn't start their exposure until
25 the plus 6 hours, at which time you are not on the step

Alderson Reporting Company
Washington, D. C.

ARC

1 portion of the curve any more, but pretty much on the flat
2 portion. So the dose rate was not changing as rapidly as you
3 might suspect.

4 DR. DUNHAM: You would guess they got about one
5 fifth of their dose in the first 12 hours.

6 DR. BOND: That is right.

7 DR. SONDHAAUS: This depends very strongly on
8 whether you assume the fallout was along one or short one.
9 If you assume that the fallout was quick, that the dose
10 built up to a high rate very quickly, then the first 12
11 hour dose would certainly be appreciably more than if the
12 fallout was slow and only reached its peak after 12 hours.

13 In either case, I don't think even in the maximum
14 case you can allow for more than about 30 per cent of the
15 total dose in the first 12 hours for the 51 hour exposure.
16 However, in the case of the Rongerik exposure, where the
17 evacuation was at 28-1/2 hours, I think the first 12 hours
18 would probably give as much as half the total dose. These
19 are guesses. They are more than a guess out of thin air,
20 but they are still not a great deal more than that.

21 DR. DUNHAM: Harry, I stand completely corrected
22 on that point.

23 CDR. ETTER: How long was the fallout actually
24 observed by the natives?

25 CDR. CONARD: About 10 o'clock at night.

Alderson Reporting Company
Washington, D. C.

ARC

1 DR. DUNHAM: About several hours.

2 DR. DUNNING: But that doesn't mean you have
3 equal quantities of radioactivity coming down.

4 CDR. CONARD: No.

5 DR. BOND: I think the important thing is that
6 they didn't receive 90 per cent of their dose over a few
7 hours. It was a relatively slow dosage.

8 COL. BROWNING: Harry's point is well taken. If
9 they became nauseated at 50 or 60 r, perhaps, and they may
10 well have done so from these figures, then we are going to
11 do some thinking about this. But the clinical data we
12 have doesn't seem to indicate that this happened.

13 DR. SONDHAUS: I think it might be added that Dr.
14 Dunning's point about the sky shine is important here. We
15 may not be taking that into consideration at all. All these
16 calculations are entirely on the basis of fallout. If there
17 was sky shine in addition this would have to be handled
18 separately.

19 CDR. CONARD: Can you give us any idea as to what
20 the additive dose would be from sky shine?

21 DR. DUNNING: I am sorry. By looking up the date,
22 I can give you some estimate from the Nevada test, but how
23 you would extrapolate this to out in the Pacific, I don't
24 know.

25 DR. DUNHAM: What sort of orders of magnitude are

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 we talking about?

2 DR. DUNNING: We don't know.

3 MR. HARRIS: Were you talking about a cloud of
4 radiation? Is that what you mean? Or do you mean reflected
5 radiation from the atmosphere?

6 DR. DUNNING: The actual cloud.

7 MR. HARRIS: This has been simply covered by Parker.
8 This is the opposite of the Clark Gable problem of big ears
9 on both sides.

10 DR. DUNNING: You can figure out that r per hour
11 is 10 times to the third, times the energy of your emission,
12 if you want to do it mathematically. That still doesn't
13 give you the answer what happened out there.

14 MR. HARRIS: You could take some numbers if they
15 are any good, which said so many fissions to which they
16 were exposed.

17 DR. DUNHAM: I think the thing that baffles we
18 poor medicos is the lack of certainty on this whole matter
19 of dose, and the time during which the dose was given, in
20 order to try to give any intelligent interpretation. I
21 think you really brought it up when you said that.

22 CDR. CRONKITE: My point is as far as writing the
23 report is to completely leave out all concepts of dose.

24 Say people were exposed to radiation and this is what happened.

25 As soon as you put a dose down there, people are going to use it

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historical Office
ACRONYM

1 DR. DUNHAM: With things as indefinite as they
2 appear at this point, it will be more misleading than useful.

3 DR. BOND: It will never be more definite.

4 DR. DUNHAM: I am afraid not with this particular
5 group of exposures.

6 DR. BOND: I didn't ask that question to get at the
7 operational aspect.

8 DR. DUNHAM: No, but it is an important one to get
9 out in the open and get it over.

10 DR. DUNNING: Dr. Dunham, I don't think we should
11 be too awfully pessimistic. Take the Rongerik people. They
12 had film badges out there, and they actually read between 40
13 and 50 r. If you make the same kind of assumptions and the
14 same kind of calculations for Rongerik as we did for Rongelap,
15 I say this morning it was 60 to 75 from memory, and looking
16 at it this noon, I find it is 75. Our calculations using
17 the same kind of assumptions at Rongerik, says 75, and film
18 badges said 40 to 50. We know that they were indoors a good
19 share of the time. To me this gives us a pretty good notion
20 that we are not at somebody else's ball park.

21 DR. DUNHAM: This is fine from what happens from
22 fallout. The thing that is bothering some of the people
23 who are trying to use this material are in terms of other
24 types of situations where exposure might occur in a
25 matter of minutes from an external single source as opposed to

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVED

1 this sort of situation. I think it is important that we
2 find out right now that you are not going to be able to
3 jump from much of this data to this other situation that
4 Harry has to work about, and Gene, too. It does not seem
5 comparable to acute exposure.

6 DR. BOND: I thought it was necessary to postulate
7 the combination. In other words, can we explain everything
8 we saw on the effects of giving dosages as we know them now,
9 or are these inconsistent with present knowledge.

10 DR. DUNHAM: Who has in hand the burros situation?
11 That is the only thing that is comparable. Do you recall what
12 course the blood picture took?

13 CDR. CRONKITE: Higher doses. It was similar
14 to single dose given to dogs.

15 DR. DUNHAM: I was wondering whether they showed
16 the prolonged curve at the lower doses.

17 LT. LOONEY: There is one thing in going over all
18 the available information on the use of radium and radon.
19 I can look this up tonight and go over the hematological
20 responses, but I remember there is a wide variation in some
21 of the German literature following the internal use of
22 radium and radon. This might throw some light or more
23 confusion. I will give you a report on this tomorrow. I do
24 remember one case that they said they got an increase in the
25 red count of something like one million, and I remember

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 trying to make some sense out of the hematological response
2 that we did find many bizarre responses to the internal use.
3 This might throw some light on the question.

4 DR. DUNHAM: Any further comments on that point or
5 shall we move on to leukemia? The reason I mentioned
6 leukemia before is because we were talking about operational
7 problems, and if that is going to occur, it will occur in
8 four or five years.

9 On the other hand, and I think there is general
10 agreement, these people got no more than 200 r total body
11 exposure, whether it was given over a period of 24 to 36
12 hours, it is most unlikely perhaps that there is going to be
13 a problem. Who wishes to comment on that?

14 CDR. CRONKITE: These numbers up here are very
15 nice, but is anybody willing to say what that would mean to
16 the bone marrow over a period of 20 to 30 years in REP?

17 MR. HARRIS: Almost nothing.

18 CDR. CRONKITE: I would agree with you that one
19 would not anticipate any leukemia at all in so far as the
20 adults are concerned. What will happen to the children is
21 highly questionable.

22 DR. DUNHAM: How often should there be blood counts
23 done on these people after everybody is satisfied the initial
24 phase is over? I gather we are all agreed that it was not
25 over at the time Project 4.1 came home, is that right?

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historical Office
ARCHIVED

1 CDR. CRONKITE: That is correct.

2 DR. DUNHAM: They will be predicated on what
3 turns up the next time or two out of course. Say two years
4 after the initial exposure, from then on, how often would be
5 useful?

6 CDR. CRONKITE: I don't know. Once a year perhaps.

7 DR. DUNHAM: Does anybody believe that leukemia
8 will be an important sequalla among these people?

9 (No response.)

10 DR. DUNHAM: A bunch of optimists.

11 LT. SHULMAN: Is there any experimental animal
12 that more closely approximates humans, like some of the
13 primates, about which radiation exposure data is known?

14 DR. DUNHAM: No data on leukemia in the primates
15 yet.

16 LT. SHULMAN: As far as dose and blood count change.
17 I don't know whether it has been studied in a chimpanzee.

18 CDR. CRONKITE: The chimpanzee has been studied,
19 and the rhesus monkey, and the monkey behaves exactly like
20 the dog.

21 LT. SHULMAN: That only proves dogs are closer to
22 man than we think.

23 DR. DUNHAM: Are there any other sequallae that
24 might be anticipated, or should be at least looked for?
25 Cataracts have not been mentioned.

Alderson Reporting Company
Washington, D. C.

ARC

1 MR. HARRIS: We have done some work in the last
 2 few years on mice given single doses of radiation extending
 3 from 12-1/2 roentgens on up to 5 and 6 hundred, and those
 4 mice were kept and examined periodically for a period of two
 5 years. We have done this with x-rays as a control for
 6 neutron experimentation. We are in the process of pulling it
 7 all together at the present time. In my recollection of the
 8 last time I looked at this data to try to pull something out
 9 of it, the formation of not true cataracts, but detectable
 10 lens aberrations in the region of the posterior pole of the
 11 lens probably in most cases is non-vision disturbing if we
 12 knew what was vision disturbing in mice.

13 There is a definite correlation with the formation
 14 of these opacities, and the dose that the animals had. To
 15 the best of my recollection this correlation with opacity
 16 is better, and the incidence of opacity formation is higher
 17 than is the incidence of leukemia in animals. Therefore, it
 18 might be reasonable to continue some studies on these
 19 people for the detection of these lens aberrations and even
 20 before you would think of looking for leukemia.

21 As far as leukemia in the animals was concerned,
 22 it is going to be awfully difficult to analyze statistically
 23 because/a fair leukemia incidence in the normal population
 24 of this mouse. The same way with other types of carcinoma.
 25 I do remember that there is a shift in incidence of leukemia

Alderson Reporting Company
 Washington, D. C.

ARC

1 and carcinoma as you go to higher doses. For instace,
2 at the higher doses you will find much more leukemia than
3 carcinoma, because of the time of onset, and the animals die
4 before they are old enough to get carcinoma.

5 At the lower doses I would guess -- this may not
6 be the right number -- I would find there is a positive
7 index for leukemia production in doses above 100 roentgens or
8 so many. I am not sure that this will be forthcoming when
9 this is written up.

10 CDR. CONARD: What was the threshold dose for
11 opacities?

12 MR. HARRIS: At half the year -- these are not non-
13 vision disturbing capacities -- is in the neighborhood of
14 50 r for x-ray.

15 CDR. ETTER: Were those mice carefully screened
16 beforehand for any lens aberrations?

17 MR. HARRIS: Yes, they were. The way they were
18 run, this was an experiment in which we attempted to
19 eliminate all bias. All items were coded singly. The
20 observers over the period of two years never knew what
21 animal they had hold of. We think it is pretty good statisti-
22 ally on that basis. There is a fair percentage of visible
23 aberrations in control animals as you put the data back
24 together again off the card files.

25 The threshold, if you wish to call it that, or the

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historical Office
ADONIS

1 50 per cent incident level of these opacities was at 50 r
 2 at the half year. This continues to go down in total dose
 3 at a year, a year and a half and two years.

4 DR. DUNHAM: It was my understanding that the
 5 macaques at Austin, Texas, have failed to show any opacities,
 6 many of whom must have gotten more than 100 r a year after I
 7 heard about it.

8 MR. HARRIS: I talked to the monkey man, and they
 9 are now getting opacities that were exposed to 14 NEV neutrons.

10 DR. BOND: Isn't the threshold for cataracts in mice
 11 usually lower than for other animals? Wouldn't more suitable
 12 data be the Japanese data?

13 MR. HARRIS: This is a definitive cataract you
 14 are talking about. What I am talking about is a smallest
 15 detectable opacity. When you take mice, then for a true vision
 16 disturbing situation in mice, which is really to squeeze the
 17 mouse behind the neck and his eyes pop out, and he looks
 18 sideways, and you can see it. This is certainly a vision
 19 disturbing situation, and the threshold there is similar to
 20 that found in Japan, or the incidence level is similar to what
 21 has been found. It was stated about 500 REM equivalent
 22 and it runs that way for mature cataracts in mice.

23 DR. DUNHAM: These are presumably going to be
 24 gamma ray cataracts, if due to anything.

25 MR. HARRIS: I will have x-ray cataracts and gamma

Alderson Reporting Company
 Washington, D. C.

ARC

Department of Energy
 Historical Office
 ARROWNES

1 cataracts and thermoneutron cataracts. The opacity
2 incidence in x-ray animals and the opacity incidence in
3 4 MEV gamma animals is about the same level, 50 per cent
4 incidence. It is almost exactly the same level, although
5 the lethality of MEV is much less for the 4 MEV animals.
6 This would be out if it would do you all any good in figuring
7 out what you are going to look at these people later.

8 DR. DUNHAM: What was the gamma threshold in rabbits?

9 MR. HARRIS: X-ray threshold in rabbits for what
10 is called a mature cataract, not threshold but 50 per cent
11 level, was at around 500 roentgens.

12 DR. DUNHAM: What was the threshold for opacities?

13 MR. HARRIS: They were not looking for those.

14 DR. DUNHAM: Certainly that leaves it such that we
15 are going to have to look, probably the sooner the better
16 that somebody can get out there and look, and establish a
17 base line on these people, the better.

18 CDR. CRONKITE: Somebody has looked. We got a long
19 involved report a few days ago.

20 DR. DUNHAM: This I didn't know.

21 CDR. CRONKITE: We just received it. I had not
22 known it had been done either. It is something you initiated.

23 MAJ. HANSEN: I think it actually started with the
24 return of the Air Weather personnel, and the other American
25 personnel to Tripler at which time we asked Col. Lowry, who

Alderson Reporting Company
Washington, D. C.

ARC

1 is the chief at Tripler to evaluate all these people to
2 establish a back line. Dr. Bugher came through at that time
3 and went over such records as we had, and then went over
4 with Col. Brennan and talked to Col. Lowry, and I believe
5 he had a trip set up to go to Japan to look at some of the
6 Hiroshima and Nagasaki people, and was asked to stop by and
7 look at these folks at that time. I am sure that is where
8 it began.

9 DR. DUNHAM: Fine. What does the report indicate?

10 CDR. CRONKITE: I will bring it down tomorrow. It
11 is about an inch thick.

12 DR. DUNHAM: Did he find that much?

13 CDR. CRONKITE: There were three macular
14 degenerations. There were a fair number of things observed,
15 but whether they have any connection to radiation is somewhat
16 questionable.

17 DR. DUNHAM: Not much in the lens itself?

18 CDR. CRONKITE: No, not more than would be consistent
19 with some of the older individuals.

20 DR. DUNHAM: And he examined the entire group?

21 CDR. CRONKITE: Yes.

22 DR. DUNHAM: This is fine.

23 CDR. CRONKITE: With a very nice clinical record
24 on each one of them.

25 MAJ. HANSEN: I might point out that in each and

Alderson Reporting Company
Washington, D. C.

ARC

1 every American, he found some anticular opacities, but
2 which he felt were congenital or at least non-significant
3 from a radiation point of view.

4 DR. DUNHAM: It would be awfully soon to be getting
5 significance.

6 MAJ. HANSEN: Yes. One of the Air Force personnel
7 did have an anticular opacity. This is down, and points out
8 the value of having this. Dr. Lowry was perfectly willing
9 to state that he didn't feel that it could be due to the
10 radiation, but at the same time it may bring up a problem in
11 the future.

12 CDR. ETTER: In that connection, Lesinsky has
13 screened all the affected crew members, and he has found an
14 18 per cent incidence in what he calls the normal opacities,
15 which he contends cannot be distinguished from those which
16 might be due to radiation. Out of his group he discarded
17 two individuals who showed marked lens changes, both of whom
18 had received heavy radiation in adolescence for acne. That is
19 something that must be considered in their past history.

20 MR. HARRIS: The incidence of congenital opacity
21 in mice happens to be in the neighborhood of 18 per cent also.

22 DR. DUNHAM: Are there any other possible ultimate
23 effects? How about aging? Is this population group large
24 enough to even begin to think about it?

25 CDR. CRONKITE: I don't think it is conceivable to

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

102

1 do any kind of population study on that because in the first
2 place, you don't know how old anybody is, except the ones born
3 since the American occupation. It would be impossible to set
4 up a population study.

5 DR. DUNHAM: Should there be any special looking for
6 cardiovascular disease, and setting up comparable groups
7 between the Ureriksand Rongelaps?

8 CDR. CRONKITE: I don't know anything about it
9 myself.

10 DR. DUNHAM: Does anybody wish to make a statement
11 because this sort of thing has got to be ironed out because
12 there are always kibitzers on the side as to why you didn't
13 run a lipogenic index on this thing.

14 DR. DUNNING: Dr. Dunham, I seem to be alone here,
15 but the thought came to mind of trying to jibe up the doses
16 and present condition. As I recall, the events out there,
17 the fallout was heavy enough so that it made their drinking
18 water very visibly murky. They continued to drink this
19 until finally stopped by their local leader. These are
20 questions, not statements. Could there be anything there
21 that would cause them to be nauseated as they claimed they
22 were after the first day? I am trying to jibe up the idea of
23 their physical condition and the estimated dosage.

24 Secondly, remember when Dr. Zsuzuki was here, he
25 made a strong point that he felt the poor condition of the

Alderson Reporting Company
Washington, D. C.

ARC

1 fishermen was due to so greatly their extensive beta burns.
2 Did those natives have enough burns, or would that be
3 sufficient to have any effect?

4 In other words, did we have something here in
5 addition to whole body gamma that might account for some of
6 these physical conditions? I don't know. These are both
7 questions. I would like to repeat also that the estimates
8 were without any estimates of contribution of soft gamma to
9 beta. I said that this morning, and I say it again, as
10 well as the sky shine.

11 DR. DUNHAM: As far as the Japanese fishermen, I
12 don't think the natives have lesions comparable to one or
13 two of the fishermen whose scalp was a mass of exudation,
14 from the photograph.

15 CDR. CONARD: I think it was more extensive than
16 anything in the natives.

17 DR. DUNHAM: This man's scalp was just a mass of
18 gunk. Certainly I think Ray would go along that there was
19 nothing unusual in the way of systemic symptoms that could
20 be related to the second effect of skin burns.

21 LT. SHULMAN: I think you might look at it as a
22 local sunburn.

23 DR. HARRIS: Could you possibly conclude this
24 apparently self limiting nausea that these individuals had,
25 and they had some, did they not very early, could be due to

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 a local radiation effect? After all, these people got a
2 fair number of REP to skin. There is no reason why they
3 didn't get a fair number of REP to the lining of the gut
4 in the same situation.

5 DR. BOND: Why should they get the same amount of
6 REP to the gut lining?

7 MR. HARRIS: I mean just from drinking this water
8 they had.

9 DR. DUNHAM: They were not great water drinkers.
10 We know that.

11 MR. HARRIS: I know. I doubt whether it is
12 correlatable, but it is an excuse.

13 LT. SHULMAN: Do you get nausea if you drink
14 radioactive tracer doses?

15 MR. HARRIS: I don't know. It would seem to me
16 that even if they didn't absorb too much, they might have
17 gotten a fair number of REP to the lining of the gut which
18 is rather sensitive to radiation.

19 CDR. ETTER: But isn't this very comparatively
20 mild nausea, which they got earlier, consistent with the
21 marked amount you got later on from a statistical standpoint?
22 If they got this much blood depression, should you not expect
23 them to have some nausea to start with?

24 MR. HARRIS: I don't know.

COL. BROWNING: These cases I was mentioning had

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 the same thing. They got down to 10,000 platelets, and
2 1,000 white count, and they don't have any nausea.

3 DR. DUNHAM: I think there is more the chance that
4 nausea was chemical rather than radiological.

5 CDR. CONARD: There is a big psychic element in
6 evaluating nausea and vomiting. The water was turned yellow
7 and they were told it was poisoned, and they got immediately
8 sick if they were told the water was poisoned.

9 DR. DUNHAM: Why were they told that they were
10 poisoned?

11 CDR. CONARD: Because the water turned yellow.

12 CDR. CRONKITE: It was because they were getting
13 sick.

14 CDR. CONARD: Either way, or both.

15 LT. SHULMAN: I have some observations on fertility.
16 Are those to be included?

17 DR. DUNHAM: Dr. Shulman raises the question of
18 observations on fertility. Does anybody wish to make a
19 comment on that?

20 CDR. CRONKITE: My feeling toward it is very simple.
21 We should not attempt to do any studies for fertility
22 for obvious psychological reasons for natives themselves. It
23 becomes a fairly personal thing for getting specimens of
24 semen and prying into these things. It is difficult enough
25 to get a specimen of urine, and feces, let alone inducing

Alderson Reporting Company
Washington, D. C.

ARC

1 masturbation on a large scale of Marshallese.

2 DR. DUNHAM: If properly induced. You don't know
3 who the fathers are. You are dealing with a group where
4 there is no control. You would have to use the Uterikans
5 as control.

6 MR. IMIRIE: You could only use the control years
7 since 1945, because before that it was Japanese.

8 DR. DUNHAM: And up to 1950 there was no
9 penicillin to clear up the gonorrhoea and keep the tubes open.

10 CDR. CRONKITE: In terms of birth per unit of time
11 or anything like that, I think it would be meaningful,
12 because the Navy cured the gonorrhoea, and all the women
13 are now fertile, as amply demonstrated.

14 DR. DUNHAM: Furthermore, the data in Japan
15 suggests that as far as live births and so on are concerned,
16 there are pretty good data on that. A lot of it where
17 large numbers of people studied both control and irradiated
18 population, and there is apparently no difference. There
19 has been a general drop in birth rate in Hiroshima and
20 Nagasaki, but it is the same in the control population as
21 in the radiated. This group which has undoubtedly received
22 all of them, something less than 200 r, I don't think you
23 would expect to find a thing on overall birth rate. As Gene
24 pointed out, it is not practical to do sperm counts and
25 that sort of thing.

Alderson Reporting Company
Washington, D. C.

ARC

1 CDR. CRONKITE: I would like to ask Capt. English
 2 whether levels of radiation such as these children
 3 received possibly were a little increased to the dental
 4 germinal layer due to soft component, would there be any
 5 reason to examine these people by, say, yourself, or somebody
 6 else familiar with the radiation effects on growing teeth.

7 CAPT. ENGLISH: Judging from work we have done
 8 with swine and rodents, I don't believe this is a sufficient
 9 dose that you can expect to find enough change in the
 10 developing teeth, after they reach maturity, that you
 11 would find any changes. With swine, we were usually up in
 12 doses of 400 r before we found anything that was very
 13 pertinent, and with rodents on their continually developing
 14 incisor teeth, you get up in the nature of 1,000 r, actually
 15 we used 1500 r, in order to get the stoppage of enamel
 16 incidence. With the rodents it is a very marked change,
 17 and you would not have to go that far for record purposes as
 18 a minimum change.

19 I would strongly suspect that 150 r would not
 20 show you anything. Particularly would you have the trouble
 21 of having a group whose nutritional conditions and health
 22 conditions in general are so varied that even if there were
 23 some minimal changes, you could not pinpoint it down to
 24 radiation changes, because hyperplasia can occur from numerous
 25 things.

Alderson Reporting Company
 Washington, D. C.

ARC

Department of Energy
 Historian's Office
 2011-03-03

1 I would not want to spend the time to do it myself
2 in this range. However, I would like to have a selection of
3 extracted teeth, not to point as far as the health of the
4 population is concerned, but to see if there were enough
5 deposited materials to make radio audiographs.

6 CDR. CRONKITE: If somebody were to collect teeth
7 that had fallen, you would like to have them?

8 CAPT. ENGLISH: Yes, we would like to make
9 sections of those.

10 MAJ. HANSEN: May I interject here that I was
11 going to bring this up. Among the Americans we were
12 fortunate to secure a few teeth that were extracted and save
13 them. These were sectioned and are on nuclear plates. Dr.
14 Reed at National Cancer Institute is doing this. His report
15 should be through in another week or so. We have also been
16 running control teeth. I had felt that this was a good move
17 and remembered that these natives do have quite a few
18 extractable teeth. If there are any taken out, I know the
19 people at National Cancer Institute would be very glad to
20 run the radio audiograph. Whether you would like to use
21 control teeth from natives from other atolls or control
22 teeth from around here, I think that could be arranged. He
23 feels very sure that he can detect any level of activity at
24 all. He has found some in the control already that is
25 within normal limits, of course.

Alderson Reporting Company
Washington, D. C.

ARC

1 MR. IMIRIE: I made one observation here talking
 2 about dose. That is, we have talked about 150 r and yet
 3 Gene Cronkite has brought up the fact that the blood
 4 picture did not follow what he expected it to follow. You
 5 would not expect a large number of people to have nausea at
 6 150 r. So many things are in disagreement with what you
 7 would expect from a dose of 150 r. We know on top of this
 8 there was a large dose of beta radiation. How much no one
 9 knows, and probably will never find out. I doubt if there
 10 is actually any laboratory animal experiments that have
 11 subjected a person to what would be equivalent of 150 r and
 12 superimposed on this a large factor of very high energies.

13 Isn't it reasonable to assume that if some of the
 14 other strange things have happened, such as the blood
 15 picture changing late, and so on, that some of the other
 16 things, like dental situation, and leukemia and carcinoma, and
 17 so on, where based on present experience, we would not think
 18 it would happen, that it may turn out to happen? Therefore,
 19 I think these people should be watched very closely. This
 20 is a unique situation that has never come into being before,
 21 and you don't have any animal comparison.

22 CDR. CONARD: There have been studies of animal
 23 changes in the blood of animals from beta radiation. There
 24 are no significant changes.

25 MR. IMIRIE: How about the two together, hard gamma

Alderson Reporting Company
 Washington, D. C.

ARC

1 and superimposed soft gamma and beta on top? This is a
2 unique situation.

3 LT. SHULMAN: In thinking about getting specimens,
4 they do have an autopsy room at Majuro, and if somebody
5 were to die from other causes, it might be worthwhile at least
6 letting the physician there know what specimens you would
7 be interested in.

8 DR. DUNHAM: I think this is very important.

9 LT. LOONEY: There is one suggestion with regard
10 to teeth in autopsy, since we do know there is a marked
11 variation in urinary excretion, we might be able to tie the
12 teeth analysis into the people with autopsies and get a
13 complete termination and indirectly work around to total
14 body burden from urinary excretion. Maybe you could tie
15 this down for future information, although it would not help
16 the Marshall Islands.

17 DR. DUNHAM: Gene, you seem to be about to say
18 something.

19 CDR. CRONKITE: I was thinking that when Vic or I
20 or somebody else out there knows ahead of time of the various
21 things that might be done, and everybody is willing and
22 agreed to do them, it is fine, but if suddenly on the spur
23 of the moment, you find yourself out there with dispatches
24 coming in that everybody is putting on their afterthoughts on
25 it, I personally would dispatch it up. You can't do it. I

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 am hoping that the people will get their thoughts on the
 2 record. Something like cremation would be a good idea.
 3 How in the world with the people's burial habits, how can
 4 you sell them on the idea of getting their bodies embalmed
 5 and cremated.

6 MR. IMIRIE: Don't they bury very quickly, the
 7 same day, I believe?

8 CDR. CRONKITE: Within six hours, usually.

9 DR. DUNHAM: Is there any further discussion of
 10 the data with relation to prognosis?

11 CDR. CONARD: One thing we might look for is
 12 possible premature graying of the hair.

13 DR. DUNHAM: I notice we are scheduled for a coffee
 14 break. If the coffee does not materialize any better than
 15 it did this morning, I wonder if it may not be smarter to
 16 go on to Item 5. I have no idea when Dr. Bugher will be back
 17 I prefer he chair that particular discussion, but the chances
 18 of him being back by five I don't think are awfully good.

19 CDR. CRONKITE: I would like to make a suggestion.
 20 I know Capt. Kelleme was unable to come today. He is
 21 particularly interested in Section 5. I know Dr. Bugher is
 22 also. Perhaps it could be postponed until tomorrow.

23 DR. DUNHAM: It is quite agreeable to me. Is there
 24 anything to lift from tomorrow's agenda to shorten that?
 25 I suspect not.

Alderson Reporting Company
 Washington, D. C.

ARC

Department of Energy
 Historian's Office
 ARCHIVED

1 CDR. CRONKITE: I would like to move to knock off
2 early today.

3 DR. DUNHAM: And work late tomorrow?

4 CDR. CRONKITE: And if one has to work late, to
5 work late tomorrow.

6 DR. DUNHAM: Let me check when Dr. Bugher is to
7 come back.

8 (Brief recess.)

9 DR. BUGHER: I take it that the group thinks that
10 there might very well be certain things resulting over the
11 years with these people, particularly the Rongelap group.
12 I presume that you would expect an actuarial contraction of
13 life span as an expression of the radiation exposure.
14 Whether one can appreciate that at all would depend upon
15 good actuarial statistics of the Marshall Islanders of a
16 sufficiently large population. That may not in fact exist.
17 But it is reasonable that even with numbers that small, some
18 difference may be shown. I don't know whether that was your
19 consensus or not. It is something naturally to watch.

20 What was the opinion about leukemia?

21 CDR. CRONKITE: That was unlikely.

22 DR. BUGHER: On account of the small number of people

23 CDR. CRONKITE: The small number of people, and at
24 that dose exposure, the incidence would be extremely low,
25 based on the Japanese experience to date.

Alderson Reporting Company
Washington, D. C.

ARC

1 DR. BUGHER: The chance of getting a case of
2 leukemia in 100, those people must be of the order of one
3 in 100,000, or something of that order. If you had 100
4 times that probability, the chances of getting it in any one
5 of 100 people would be quite small. So even if the leukemia
6 rate were very much increased, you would not expect more than
7 one case, probably, and if you had one case, you would not
8 know whether to attribute it to radiation or not. I think
9 I would agree with that.

10 What has been the feeling of the probability of
11 skin carcinoma?

12 CDR. CRONKITE: Almost unlikely. There would be
13 probably very little due to the absence of the deeper effects,
14 there are no continuing ulcerations and the likelihood of
15 neoplasia is considered to be rather remote. However, the
16 fact of the rather continuous exposure of ultraviolet may
17 increase the incidence somewhat.

18 DR. BUGHER: You would expect that to be much more
19 likely to be recognized than leukemia, I take it.

20 CDR. CRONKITE: Yes. It would be more likely, but
21 still probably would not be a major consideration.

22 DR. BUGHER: I don't know what the frequency of
23 cutaneous carcinoma among these Micronesians is.

24 CDR. CRONKITE: I asked about that when we were
25 out there, and I was led to believe that of what grossly one

Alderson Reporting Company
Washington, D. C.

ARC

1 would consider carcinoma of the skin would be infrequent.
2 They did have some lesions like the one I think you saw on
3 a man that was there that is a very indolent type of ulcera-
4 tion, presumably cancerous. They have a lot of internal
5 cancer, but relatively speaking, very little of the skin.
6 They only last year started vital statistics in the Marshall
7 Islands.

8 DR. BUGHER: The population numbers are so small
9 that it makes it difficult to reach good actuarial
10 conclusions unless the differences are really huge. I should
11 think that the probability of skin carcinoma should be fairly
12 appreciable, and in people living to their fifties or sixties
13 we may see quite a number of cases. That is merely my
14 personal reaction to that. I asked Dr. Zsuzuki when he was
15 here what he thought about that, and he discounted it
16 completely and thought there was nothing at all of any
17 interest there.

18 I rather had the impression he had enough worries
19 now, and he was not going to cultivate any more. I was
20 rather intrigued at his negative response to that, because
21 that was one thing that seemed to me to be more likely
22 recognized from all the changes which might exist from that
23 level of exposure.

24 CDR. CONARD: I think a lot depends on how the
25 skins look in the near future, and whether we have any further

Alderson Reporting Company
Washington, D. C.

ARC

1 breakdowns of the epidermis.

2 DR. BUGHER: Yes, that will be a component there.

3 I suppose now we come mainly to the mechanics of
4 getting this material into a single report. Gene, I think
5 inevitably the leadoff on that falls to you.

6 CDR. CRONKITE: Dr. Bugher, I wonder if it would
7 be permissible to postpone that until tomorrow. Captain
8 Kellem was unable to come down and he mentioned that is one
9 thing he is interested in seeing what conclusions you come to.

10 DR. BUGHER: Would you like to take that up the
11 first thing in the morning?

12 CDR. CRONKITE: Yes, if it were feasible.

13 DR. BUGHER: That is perfectly all right.

14 Obviously we want a report which is complete and lucid, and
15 which has all the pertinent data. If we can eliminate
16 restricted data in this report, I think it would be desirable.

17 DR. BOND: Can you tell us, Dr. Bugher, what aspects
18 of the report are restricted now?

19 DR. BUGHER: When we come to matters that are of
20 trouble, if we can declassify it in almost the form it is
21 with possibly the deletion of small sections, it would make
22 it much more convenient, and will cut down the time delay.
23 The things that we would have to hold as classified would be
24 such things as the composition of the material with respect
25 to Neptunium, any question of fission capture ratios of

Alderson Reporting Company
Washington, D. C.

ARC

1 neutrons, information which would suggest the content of
 2 normal uranium of the device, isotope ratios of the short
 3 half life ones that particularly give information on the
 4 type of device, and anything that might lead to any more
 5 clear estimate of yield than has been given.

6 I am aware that the Congress itself compromised
 7 the yield, that is, members of the Joint Committee in
 8 statements to the press. So that cannot be regarded as a
 9 sensitive piece of information as it was. But that is the
 10 sort of thing that would bear on the questions of design,
 11 efficiency, proportion of energy released by fission as
 12 against thermonuclear reaction, and that sort of thing.

13 I don't think that inhibits one from giving the
 14 isotope analyses in urine, the estimate of body burden, and
 15 the computations of number of fissions ingested, for
 16 example, per person, the sort of thing we have on the board
 17 here. While it is classified now, I think we can declassify
 18 it without too much restraint.

19 CDR. CRONKITE: I don't think there would be any
 20 difficulty in writing the report with no restricted data in
 21 it. After listening to the discussion on dosimetry today,
 22 I have more or less made up my mind -- I don't know what I
 23 will be able to talk the other people into it or not -- to
 24 summarize dose in one table as the best estimate and the
 25 statement of the uncertainties connected with it, and then

Alderson Reporting Company
 Washington, D. C.

ARC

1 the people that are interested in dose to ask them to write
2 a separate addendum amplifying the uncertainties.

3 DR. BUGHER: Yes.

4 CDR. CRONKITE: Then we get away completely from
5 the Neptunium, and the unfortunate statements in the first
6 report of talking about tritium and lithium and one thing and
7 another, and our ignorance of whether they were important or
8 not.

9 DR. BUGHER: Yes, I think that is a good point.
10 When it comes to the proportions of isotopes in fission
11 products in the fallout material with respect to those
12 that are of medical importance, we have essentially released
13 that information to the Japanese in the following form,
14 that is, we have told them that the pattern of those
15 substances followed the bimodal efficient curve for uranium
16 235 for fast neutron fission with respect to the modal
17 regions, not with respect to the other. We gave them this
18 information, that while we were not saying that what we were
19 dealing with there was a fission reaction completely, that
20 they could use those parts of the published curves and it
21 would give them approximately the relative amounts of those
22 isotopes, such as strontium, cesium, barium, lanthanum,
23 that appeared to be in the material that fell out.

24 So that much of the statement is already essentially
25 public knowledge, because if we have given it to the Japanese,

Alderson Reporting Company
Washington, D. C.

ARC

1 we have given it to everyone. Consequently, it gives us
2 no difficulty in dealing with those quantities. The approach
3 there has been that the longer lived isotopes, the ones that
4 were important after ten days, are no longer capable of giving
5 sensitive information or information in any sensitive area.
6 Since it is accessible to anybody who wants to put out flypaper
7 and do his analyses, it is inherently data that cannot be
8 classified, or at least will give us no trouble in
9 declassifying.

10 I see, therefore, no real difficulty in dealing
11 with the internal emitters here. In fact, I can see some
12 intelligence advantage to introducing the plutonium business.
13 It would perhaps throw foreign intelligence services off the
14 beam somewhat to introduce the problem of some degree of
15 plutonium ingestion at a very low level. It might or might
16 not. I don't think it presents a difficulty.

17 The Neptunium matter, if it were brought in,
18 would be much more pertinent. But as you indicated, it is
19 not necessary really to go into a detailed discussion.
20 How the gamma spectrum got that way, the best you can do is
21 to give an estimate of what it must have been.

22 To some extent we have to make a report to the
23 United Nations, presumably ahead of the general public
24 distribution. I think it will make quite an impressive
25 document in that environment, too. So it may be that when

Alderson Reporting Company
Washington, D. C.

ARC

1 we come to that sort of thing, we have to produce it in
2 essentially the form that it will be published.

3 CDR. CRONKITE: Could you say what sort of a time
4 factor you have in mind with respect to the United Nations?

5 DR. BUGHER: It is the same old story. The faster we
6 do it, the better, consistent with quality. This is some-
7 thing we don't want to do any job on that five years from
8 now you look back and say, why didn't they take a little more
9 time and put a little polish on this or that paragraph. So
10 we want really a first class job. The sooner it is
11 available, the better off I think we are.

12 CDR. CRONKITE: Apropos of that, I am very pleased
13 that the preliminary report is secret restricted data, but
14 after re-reading it, I wish there were a lot of things
15 that were not said or said better.

16 DR. BUGHER: It serves its purpose as a draft.
17 Do you want to make it top secret now?

18 CDR. CRONKITE: Yes, I would go to top secret.
19 Under the conditions, and where it was written, it is not
20 so bad, but it looks bad in Washington now.

21 DR. BUGHER: As a rush draft, it is a very commend-
22 able job, and it is the kickoff point for a more complete
23 version. I have read it, and there are spots that you want
24 to change naturally, and some deletions undoubtedly, but
25 it is a pretty solid story. So those are the essential things.

Alderson Reporting Company
Washington, D. C.

ARC

1 I think we can get good help in AFSWAP, and all other
2 places, in clearing it with reasonable speed.

3 CDR. CRONKITE: There is one thing I want to bring
4 up again tomorrow when Captain Kellem is present. When there
5 is urgency on the report, there becomes a real problem of
6 discussing with AFSWAP to have just plain stenographic help.
7 It has become an acute problem. AFSWAP doesn't know whether
8 they can supply anybody. In the present status of the
9 classification of the material, you have to have not only
10 stenographic help, but the cleared stenographic help. The
11 Institute is not in a position to do things on a rush basis.
12 It will take a matter of weeks and months to go through MRI
13 at the present time.

14 DR. BUGHER: How many people do you need for that?

15 CDR. CRONKITE: One person out there for a month
16 or six weeks could solve the problem.

17 DR. BUGHER: Do you think it would be acceptable
18 to Captain Kellem if you people recruited the person at our
19 expense?

20 CDR. CRONKITE: I think that will probably be
21 acceptable, but I would prefer to defer that until Captain
22 Kellem hears about it.

23 DR. BUGHER: We don't have enough reserve now. We
24 are short on secretarial help. So it will be a case of
25 temporary employment of somebody who is cleared and who has

Alderson Reporting Company
Washington, D. C.

ARC

1 all the other attributes that you need for this. An ability
2 to type I suppose is one of them.

3 CDR. CRONKITE: The ability and not the classification

4 DR. BUGHER: I am sure we can straighten that out.
5 I presume you are in the same situation?

6 CAPTAIN YARBROUGH: Worse than ever.

7 DR. BUGHER: Are there any other points you would
8 like to bring up now? If not, I think we can postpone this
9 item for the morning and adjourn this afternoon. If there
10 any point which it would be wise to bring up now?

11 If not, we are just about on schedule, and gained
12 three minutes.

13 (Thereupon at 4:27 p.m., a recess was taken until
14 Tuesday, July 13, 1954, at 9:00 a.m.)

Alderson Reporting Company
Washington, D. C.

ARC

SECOND DAY

TUESDAY, JULY 13, 1954

9:00 A.M.

DR. BUGHER: Let us come to order, please.

We are glad to have Captain Kellum with us this morning, which enables us to take up the topic which was deferred yesterday until he could join us. That is the mechanical problem of getting out a single report, and how to divide up the work to the extent that it has to be divided

As far as I am concerned, I look to Commander Cronkite, so in that regard I think it is a good idea to ask him to give us what his ideas and suggestions are for getting out the final report.

CDR. CRONKITE: I have been giving this problem considerable thought. I don't know that I have an adequate explanation or solution to the problem. As I understand from your comments yesterday, Dr. Bugher, in addition to the report, we are obligated to make to AFSWAP, to Colonel Browning and the field commanders, a report that would definitely have to be unclassified for the United Nations. Is that correct?

DR. BUGHER: That is what we will come to. I thought the final report preferably should be in a form which is easy to declassify. Perhaps it might then be declassified and either in its full form or with some

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
A 11 113

1 deletions to be in good shape to be used as a UN report, as
2 well as for publication.

3 CDR. CRONKITE: Did I also understand that the
4 report for the United Nations was to take precedence over
5 the report for the task force?

6 DR. BUGHER: No. At least I don't think so. We
7 are obligated here since this is a part of the task force
8 program, to make the official report through the task force
9 channels. You remember I talked to Dr. Graves, and he is
10 agreeable to making these shortcuts which would speed up this
11 thing, but in the long run he wants to naturally see the
12 report in the regular way, too. I don't think we are asked
13 to make a report to the UN prior to the routing of the formal
14 report through the proper channels.

15 If we have to make such a report to the UN, and I
16 am sure our delegation at the UN will not be at all bashful
17 about telling us if they think they will profit by it, then
18 we would have to do a quick job on our special report and
19 clear that quickly for that purpose. But as of now, I don't
20 think that we need to do that.

21 CDR. CRONKITE: Since I have had ample time to go
22 over the preliminary report we wrote out in Quadjæin, and
23 each time I read it I realize what an unwieldy document it
24 is and how difficult it is to go through from chapter to
25 chapter to make any sense. I am not apologizing for it,

Alderson Reporting Company
Washington, D. C.

ARC

1 because it was written in the field. It is still a pretty
2 good report. It has a lot of inherent defects that should
3 be corrected. I have the

4 I think the first I would like to see done is to
5 take the section which is now Chapter 2 on the dosimetric
6 considerations, and have that drastically reduced. I would
7 like to have Dr. Sondhaus, Mr. Sharp, and Dr. Dunning try
8 to make some very short statement that would be acceptable
9 to everybody, and preferably of no classified information;
10 then in addition to make a separate addendum that would not
11 be in the same volume that would go into all the material
12 that is inevitably secret restricted data.

13 I think in this way it would improve the report
14 for the average biological and medical reader so as not to
15 have to wade through all the "ifs" and "ors" and "buts" and
16 come out at the end as to whether or not there was a dose or
17 not from a physical standpoint.

18 The next is the section on excretion and body
19 burden which represents a tremendous amount of work. It is
20 always a difficult thing to go through and understand. I
21 would like to give that the same sort of treatment of cutting
22 it down for our final report to a very short version,
23 emphasizing the status or the significance of the excretion
24 of the material, a statement on probably body burden, and
25 leave out for this report all of the extensive animal data;

Alderson Reporting Company
Washington, D. C.

ARC

1 then to ask the respective individuals from Los Alamos, New
2 York Operations Office, and NRDL, to submit rather complete
3 addenda to the basic report where they can go into all of
4 these imponderables that we discussed yesterday.

5 Then so far as the clinical and hematologic and
6 estimates of the prognosis, and perhaps a discussion of
7 future handling of this type of incident, I think we should
8 go into more detail, and it would be primarily up to Dr.
9 Bond, Conard and myself, and the others, to get this down
10 in rather intimate detail.

11 I would like to see, if at all possible, the
12 parts on dosimetry and the part on the excretion and
13 deposition in the individuals, and our part of it, in firm
14 form before the 1st of August. I think the addenda will
15 come along as people can do it, perhaps before the first of
16 the year.

17 Histomatology of the skin I think should be in
18 detail whenever Dr. Wood is able to complete it, and be
19 incorporated with Dr. Conard's section in the report. I
20 think that takes care of my attitude towards the final report
21 itself. It will contain no restricted data. I don't think
22 it will contain any military classified data.

23 COL. BROWNING: No. When you sent that paper over
24 the first time, there were a very few mentions in there of
25 material that was really classified as far as we were

Alderson Reporting Company
Washington, D. C.

ARC

1 concerned. We are more concerned at the present time with
2 the timing of the release of this classified or unclassified
3 document for obvious reasons. I think it should be done, but
4 I would like to wait until some of our friends get through
5 insulting us before we give them more information to insult us
6 with.

7 DR. BUGHER: If we wait until our friends get
8 through insulting us, we will wait a long, long time. I think
9 our point of view on these matters that we meet our obligations
10 and what is or is not said or done by other nations does not
11 cut too much of a figure in that. When we are asked for favors
12 by other nations, we expect to be at least couched in
13 reasonably printable language. I think the time on this
14 report as far as release is concerned should be based on our
15 considerations and advantage in complying with our
16 obligations.

17 COL. BROWNING: Yes, sir. I would like to say
18 perhaps one or two things about this report. Personally I
19 would like to see it in one huge volume. As I recall from
20 my medical school days, there was nothing that upset me more
21 than to be referred to five other books any time when I tried
22 to find a particular mention. However, I realize that
23 this will be a continuing thing and must be a series of
24 reports, rather than one, for some years to come. There
25 will be no way to cut it off sharp, and say this is the final

Alderson Reporting Company
Washington, D. C.

ARC

1 report. There will always be something coming in. For
2 example, you mentioned the skin studies.

3 CDR. CRONKITE: I see no reason why the addenda
4 cannot all be put into one volume. We can give you a final
5 report as I outlined it within a matter of a few weeks.
6 To get a final report, particularly as far as the excretion
7 and the animal stuff is concerned, is a long period of time.
8 I have not had an opportunity to discuss with Dr. Cohn and
9 Dr. Sondhaus and the others, and Dr. Harley, what their
10 attitude would be towards what I have just proposed.

11 DR. BUGHER: We can hear from them now.

12 MR. COHN: I think I would go along with the
13 suggestion. I think I would perhaps want to include some
14 of the animal studies which are pertinent to our understanding
15 of the human picture, rather than really discuss the
16 human picture, and leave off all this auxiliary information
17 which I think is quite important. I don't think we can in a
18 matter of two weeks get a complete report out on all the
19 work we have been doing. I think I would go along with
20 having the various other laboratories who are connected with
21 this project submit a detailed report of all the work they
22 have been doing at a later time. Perhaps to integrate our
23 conclusions as of now we could do our first report. I would
24 go along with that.

25 COL. BROWNING: It might be a little more fair to

Alderson Reporting Company
Washington, D. C.

ARC

1 a lot of these laboratories which have taken on this work to
 2 submit the reports as more or less their own work, rather than
 3 to throw it into this large one. I thought of this a couple
 4 of times in looking through the material that we have gotten
 5 from many other sources.

6 DR. BOND: Do these come out as general reports
 7 or reports from the institute? Would the Los Alamos report
 8 constitute an addendum report?

9 COL. BROWNING: I don't know that much about it.
 10 WT-90, one of the old ones, has just been released now in
 11 the same identical form of the special report of the
 12 laboratory which did the work. So there is no reason why this
 13 could not be done. But it would certainly be valuable to
 14 have all these in such form that they could be added to the
 15 rest of the report.

16 CDR. CRONKITE: One thing I forgot, Dr. Bugher,
 17 if it were acceptable to the people concerned, I would like
 18 strictly from the standpoint of it being easier for me to
 19 have Mr. Sharp get the stuff together on the dose. He is
 20 geographically in the same place I am. Dr. Cohn at NRDL is
 21 in direct contact with Bond. I think it would be easier
 22 for them to take the major responsibility of writing that
 23 part of the report. I have not discussed it with them. I
 24 don't know whether they are willing to accept the
 25 responsibility of doing it. I think it would expedite

Alderson Reporting Company
 Washington, D. C.

ARC

1 completion.

2 DR. BUGHER: I daresay there is no difficulty of
3 doing the various pieces according to the way that seems to
4 be most effective.

5 DR. SONDHAUS: I think it would be inevitable that
6 these addenda would include classified material. It is too
7 unwieldy to have an unclassified report with a classified
8 appendix.

9 DR. BOND: The whole thing would be declassified
10 and you could detatch the classified.

11 CDR. CRONKITE: You could separate it and say
12 pages 1 through 20, retype and send through for declassifica-
13 tion. What is wrong now, every other page we have a little
14 bit of secret and restricted data on it. That is about all
15 I have to say about the report, except for how much pressure is
16 there from the standpoint of time so far as AFSWAP is
17 concerned, and so far as you are concerned? This becomes
18 rather critical.

19 DR. BUGHER: I think our point of view is as I
20 expressed yesterday, that we would like to have this Part 1,
21 as you call it, of the report soon, but we also want it of
22 top quality. If one could accomplish both of those things
23 by the first part of August, that would be fine. It certainly
24 would be extremely helpful. We don't want to delay. We
25 don't want to sacrifice quality of presentation, either, nor

Alderson Reporting Company
Washington, D. C.

ARC

1 the quality of the reproductions of the illustrations. In
2 other words, this report is one of the few which will
3 receive a very critical international look, and we want it to
4 be altogether to the credit of the United States, not only in
5 the scientific content, but in its format and actual
6 appearance. Those are the considerations as I see them.

7 Col. Browning, do you have some additional
8 considerations from your point of view?

9 COL. BROWNING: No, sir, because in essence we
10 have access to most of the information at any rate, and as
11 far as our headquarters is concerned, we can always use the
12 raw data. However, we are no less anxious than the rest of
13 the group to have the thin put out in such form that it can
14 be made available to the general medical profession. Our
15 stand is not the old hidebound school type. We think this
16 should be out so it can be used.

17 DR. BOND: There is a practical consideration here
18 if we have the colored metal plates in the report.

19 CDR. CONARD: It will take considerable time on
20 those, I am afraid.

21 DR. BUGHER: How much?

22 CDR. CONARD: I don't really know.

23 CDR. CRONKITE: It will be about six to eight weeks
24 if we can contract locally. If we have to do it through Los
25 Alamos, Lord only knows how long it will take.

Alderson Reporting Company
Washington, D. C.

ARC

1 DR. BUGHER: Captain Kellum, how does this plan
2 sound to you?

3 CAPT. KELLUM: This sounds all right, sir. I
4 would like to make two or three remarks in a general way to
5 support one or two suggestions that I have a feeling are
6 acceptable from things that have already been said.

7 Like all other laboratories we are under the
8 necessity of justifying our existence budgetwise, and one
9 measure of our productivity is the reports of our scientists
10 either in our own format or in the form of reprints. I remember
11 some years ago when this business first started. I was new
12 at the Institute. I found that roughly a quarter of the
13 total effort of the Institute was not recorded anywhere.
14 This went into the Bikini reports, and this was in no sense
15 a criticism of anybody. It was just the way the thing went, and
16 people had not thought about these matters. Since then,
17 there has been more consideration given to what Col. Browning
18 just mentioned, and that is getting the reports in a form
19 that they can appear from the laboratory as well as an AEC
20 report. This I appreciate very much, and I would like to
21 put in a plea for further consideration of that.

22 The other item that bothers us a little bit, we
23 don't mind dropping everything to get these people under way
24 when there is an emergency to do it, but preparing reports
25 is a bit of a burden for us because we are relatively a

Alderson Reporting Company
Washington, D. C.

ARC

1 small activity. The clerical force is kept at a minimum
 2 because we are anxious to use our civil service and military
 3 ceilings to best advantage, and probably invest more in
 4 scientific personnel and technicians than we should.
 5 The result is that when we come back with a big push to get
 6 a large report out in first class shape, we are in a
 7 difficult position without a little additional qualified help.

8 I would illustrate what I mean by the comment that
 9 the individual on our staff who is best qualified to carry
 10 the burden of getting this report on paper is currently
 11 fulfilling the functions of chief clerk for the whole
 12 establishment. We obviously can't take her off that job,
 13 because there is not anybody else to do it. I would put in
 14 a plea for some consideration of assistance in this field.

15 DR. BUGHER: I am sure that can be arranged. Cdr.
 16 Cronkite mentioned yesterday the sheer burden of detailed
 17 labor which is involved. There is one place we can assist,
 18 I think.

19 CAPT. KELLUM: I might say we are not looking at
 20 the money balance on this. We have been well supported by
 21 our own budget, and by funds made available for these
 22 occasions. It is the civil service ceilings that get us.

23 DR. BUGHER: Captain Yarbrough, do you have any
 24 comments on this?

25 CAPT. YARBROUGH: I have no comments on this

Alderson Reporting Company
 Washington, D. C.

ARC

1 particular subject. I do want to say something later when
2 it is posed on the further study, about the utilization of
3 personnel. We are encumbered with ceilings, as anybody
4 else, and as far as furnishing secretarial or clerical
5 help, we are more or less handcuffed by much maligned
6 ceilings.

7 DR. BUGHER: Are there other comments or suggestions
8 with regard to this plan of information? This seems to be a ve
9 sensible one. This seems to develop a compact straightforward
10 hardhitting report which carries all of the solid
11 information and the results of computations and is accompanied
12 by an addendum which may be more voluminous than the first
13 section which will include in it all of the classified
14 material, data, prolonged discussions, and so on, which then
15 could be made available to those who are interested and feel
16 the need of going more critically and minutely into all of
17 the background data.

18 The No. 1 section would be the base report from
19 which special reports might be prepared, and that itself
20 should probably be in pretty much a form which would be ready
21 for publication on being finally declassified and made
22 available for that purpose.

23 I am sure if something occurs to anyone, we would
24 be very pleased to have additional suggestions. But it seems
25 to me that it is a very logical way of going at it.

Alderson Reporting Company
Washington, D. C.

ARC

1 You, then, Gene, make assignments of division of
2 labor. There has been no objection to any of those
3 suggestions. I take it they are generally agreeable?

4 MR. HARRIS: I can't say this is an objection, but
5 as far as we are concerned out there, we will go ahead
6 and write a report that will come out as a Los Alamos
7 document of some sort. I personally don't like to write very
8 much, so I would be very glad to give you all the data that
9 I happen to have available, and you might write as much as you
10 wish about it.

11 As far as the addendum goes, we can offer you an
12 entire report that you can include as an addendum if you wish
13 to use it, and then you can discuss it at length if you wish
14 to do it. But as far as we are concerned, we will discuss
15 it once, and then forget about it, because we haven't got time
16 to go over and over it.

17 DR. BUGHER: I think your addendum idea incorporates
18 all the special reports.

19 MR. HARRIS: Would this be satisfactory as far as
20 what little we have done? You can take the whole report
21 and include it as an addendum.

22 CDR. CRONKITE: It is perfectly adequate as far as
23 I am concerned. My main thing is to get the gist of your
24 data in Dr. Cohn's hands so he can put up something in
25 that section of the report.

Alderson Reporting Company
Washington, D. C.

ARC

Alderson Reporting Company
Washington, D. C.

ARC

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

MR. HARLEY: One problem on this excretion data and so on is that so far no one has taken all the data and put it together as far as I know. You have looked at your data, and we have looked at ours, and everybody has looked at theirs.

MR. HARRIS: I understand this is Ken's job to do. I think this is fine.

MR. HARLEY: Somewhere he has got to get this before he can do his quick job.

MR. HARRIS: As I say, you are welcome to it. As long as I can get it out through the various machinery of the mailing system at Los Alamos, you can have it.

MR. COHN: You will have that for afterwards or something that we can use right now. If it is a question of two weeks or something, I don't know whether we can wait until we get to the front office or not. We have to have some time to analyze the data before we write it. This is a problem.

DR. BUGHER: I think that is something you can resolve among yourselves.

CDR. CRONKITE: I want to bring a question up that may not be quite appropriate, but I have just been reflecting on the thing. All of us have understood that under the regulations of operating things in connection with the task force, that the first obligation is a report to

Department of Energy
Historical File
ARCHIVES

1 the test director, and then afterwards you put out your own
2 reports. If Los Alamos can diverge from that, I think the
3 rest of us have been getting a rather dirty deal. Why a
4 report from Los Alamos and not a report to the test director?

5 MR. HARRIS: Because we were using a few facilities
6 of the test group but we were only using them in a logistical
7 line. As far as we were concerned, we were not members of any
8 particular project or any other group at Eniwetok. We were
9 operating out of our own laboratory, not as a part of J
10 Division or any of the test groups.

11 CDR. CRONKITE: Just because I am a little concerned
12 about it, I have heard many times from Dr. Graves that this
13 is exactly what should never happen.

14 DR. BUGHER: I think from our point of view that
15 all those concerned in the study were operating as a part of
16 the joint task force. The program was set up under that,
17 and there could be no other participation. I don't think,
18 Payne, as I would see it, that your point of view would
19 hold here.

20 MR. HARRIS: The thing about it was that we went
21 out to get these samples, and we had no knowledge of this
22 whatsoever. We did not know that there was such a project
23 established until arriving at Quadjalein. We had no
24 knowledge of this even from our own place.

25 DR. BUGHER: Tom Shipman had knowledge of it from

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Washington Office
ARCHIVES

1 me over the telephone.

2 MR. HARRIS: I didn't know it.

3 DR. BUGHER: There was no uncertainty there.

4 MR. HARRIS: Whatever way you want to handle it is
5 all right. As far as the Los Alamos report is concerned,
6 it is an ordinary Los Alamos document. There have been many,
7 many reports which have shown up as WT reports from tests,
8 but also came out as Los Alamos documents before or
9 simultaneously with the appearance of a test report. That
10 is what I mean by a Los Alamos report.

11 DR. BUGHER: This is precisely the same as the
12 chemical samples on cloud samples done at Los Alamos, or
13 anything that has to do with Operation Castle. It is a
14 Castle report.

15 CDR. CRONKITE: I am sorry for bringing the subject
16 up, Dr. Bugher.

17 DR. BUGHER: That is purely a matter of channels
18 of transmittal. I think there is no question about the
19 character of the project, and where it belongs in the scheme
20 of the task force, as all of the material is a part of the
21 Castle operation under a definite title. That was the
22 decision of the commander of the task force and scientific
23 director, Dr. Graves. We concurred in that.

24 MR. HARRIS: Then this brings up another point of
25 holding up the release of a report. Doesn't this have to go

Alderson Reporting Company
Washington, D. C.

ARC

Doc. of 2025
Historian's Office
ARRANGED

1 through the test director, or somebody like that?

2 DR. BUGHER: That is right.

3 MR. HARRIS: It goes through there before there
4 can be made any sort of release publicly of this sort of
5 thing?

6 DR. BUGHER: That is right.

7 MR. HARRIS: This essentially throws it into the
8 Los Alamos declassification system, is that right?

9 DR. BUGHER: That is correct. The only thing that
10 has been done which is somewhat irregular, you might say, is
11 to reach an understanding with Dr. Graves that certain short
12 cuts will be made at this end in order to get the material
13 in shape more quickly. But having done that, the document
14 still clears through the established channels. There is an
15 attempt here to gain time, for example, on illustrations.
16 Normally those would be done out of Los Alamos.

17 MR. HARRIS: Don't you think if you talk to Al about
18 this, he would be very sympathetic towards this procedure
19 and it might be that he would speed up such things as
20 declassification of plates, and so on?

21 DR. BUGHER: He will try to, yes. Ralph Smith
22 is also quite aware of these things. There is every effort
23 in prospect to accelerate the thing within the framework of
24 the task force. But it doesn't mean cutting corners and
25 missing the intersection here.

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Washington, D. C.
20540

1 DR. BOND: How soon can the data be made
2 available?

3 MR. HARRIS: I can make it available mainly by just
4 summarizing everything, like I have now. This is the work of
5 a day, and putting it in a letter form and sending it. That
6 is all. My holdup is this: If I don't put it in a letter
7 form and send it out that way, then it bypasses the
8 classification people at Los Alamos, and they might come back
9 at me for bypassing them on this sort of information.

10 DR. BOND: Would it be possible to get that at a
11 very early date? I think the point is that Dr. Cohn is
12 to do the job of primarily integrating the data, and without
13 your part, he cannot proceed.

14 MR. HARRIS: All I have to do is write it in the
15 form of a letter, and I can do this immediately when I get
16 back.

17 DR. BUGHER: I think that covers that problem, and
18 undoubtedly from time to time we will have some minor
19 difficulties, but there should be no trouble in resolving them.
20 The general procedures, I think, of the task force are quite
21 clear. Is that enough, then, Gene, on the mechanics of this?

22 CDR. CRONKITE: I have nothing else. It seems
23 quite satisfactory.

24 MR. COHN: One more thing, Payne. If you are
25 going to have a summary, you will probably have to have more

Alderson Reporting Company
Washington, D. C.

ARC

1 than that. We will probably need your raw data.

2 MR. HARRIS: We can talk about this later. There
3 is no use taking up time here.

4 DR. BUGHER: Now we will turn to the long term
5 medical care and study problem. I see I am listed for that.
6 I will tell you what we have done.

7 OUTLINE OF EXISTING PLANS FOR LONG TERM
8 MEDICAL CARE AND STUDY.

9 The situation which arises, of course, is unique
10 inasmuch as this gets into fields of responsibility and
11 authority where the lines are not automatically sharp and
12 clear, and where we have the problem of groups with authority
13 without capability; other groups with capability and without
14 authority, a situation which involves us inevitably with
15 other countries to some extent.

16 Then you have the immediate problem of following
17 a relatively small group of people who are not familiar
18 with and do not understand any of these things that I have
19 mentioned previously.

20 To meet all of these things we have by fairly
21 general agreement made certain arbitrary decisions in the hope
22 that they are based on logic, but they have certain degrees
23 of arbitrariness, as you realize.

24 In the first place, these people are not United
25 States citizens. The territory on which they reside is not

Alderson Reporting Company
Washington, D. C.

ARC

Department of War
Historical Office
ARCHIVED

146

1 American territory. The United States under the United
 2 Nations Trusteeship Agreement is the governing authority. It
 3 does not have sovereignty. That is one aspect.

4 The governing authority has an administrative
 5 organization under this trusteeship agreement. That
 6 administrative organization has its home base as far as
 7 Washington is concerned in the Department of Interior after
 8 the transition from Navy to Interior for that function.
 9 The central office of the administrator of the trust
 10 territories is presently at Honolulu, and will probably be
 11 moved either to Guam or Truk within a few months, the idea
 12 being to make it more central. But at least that is the
 13 administrative centers.

14 They have various district centers and administrators
 15 and that is the administrative framework which exists. It
 16 has seemed to us that any departure from that administrative
 17 pattern would run at once into the questions of legality and
 18 even more importantly from the practical standpoint it would
 19 lead to confusion. Therefore, it seemed very important that
 20 the Marshal Islanders themselves, as they look at things,
 21 would see only one agency. That is the one they always deal
 22 with, namely, the Office of the High Commissioner for the
 23 Trust Territories.

24 There we have the example of authority without the
 25 capability. The High Commissioner does not have the scientific

Alderson Reporting Company
 Washington, D. C.

ARC

Department of Energy
 Historian's Office
 ARCHIVED

1 staff, he does not have the logistic resources which would
2 enable that organization to do any of the things that must
3 be done here.

4 In the area of medical responsibility, the Atomic
5 Energy Commission has accepted the responsibility for
6 continuing studies indefinitely in the same way that we have
7 the responsibility for the studies in Japan. The Commission
8 has resources scientifically of varying character, but not
9 all of them, and does not have in itself the necessary logistic
10 support in the Pacific Area.

Alderson Reporting Company
Washington, D. C.

11 So here again agreement first with CincPac that the
12 Navy would undertake to support as necessary the question
13 of transport, supplies and so on; in so far as possible
14 certain of those activities have been charged to, and the
15 costs recovered from, Joint Task Force 7. But this organiza-
16 tion, of course, is one that terminates after a time and is
17 succeeded by another one. So that it is clearly recognized
18 that the task force could only be economically responsible
19 for a short period of time, and later on the question of cost
20 might have to be resolved in some other way in regard to
21 logistics. However, that is something that is more of a
22 minor problem.

ARC

23 We should also recognize that when it comes to a
24 question of performance, the capability rests in various
25 places. It has been our thought that as far as is possible,

1 the same group of people who have done the basic study should
 2 continue with interval surveys and detailed studies of these
 3 people over the succeeding years.

4 We realize that faces will change. Some of you will
 5 go to other posts, and some may go to other appointments
 6 entirely. But as far as possible we would like to see a
 7 continuity of interests here, and participation.

8 The routine, I might say, normal medical care of
 9 these people will be assumed by the trust territory. For
 10 example, the people at Majuro and the Rongelap people will
 11 be looked at and watched over as far as their daily ills are
 12 concerned by the medical people there, and would have the
 13 services of a hospital. When they go back to their home atoll,
 14 it may be necessary to set up some sort of a special station
 15 there which would make it possible to carry on a dispensary
 16 service on a considerably more elaborate basis than they had
 17 before, which was nearly nothing, and also to furnish a base
 18 of operations for the teams that would presumably go out
 19 at intervals, the intervals perhaps getting a little
 20 longer as time goes on.

21 This latter type of thing could also be carried
 22 on through the trust territory administration. Our job is to
 23 see that it is done, and that the facilities are provided.
 24 Where the High Commissioner gets his facilities is
 25 something between him and the rest of us, actually. But as

Alderson Reporting Company
 Washington, D. C.

ARC

1 far as the people are concerned that is an activity of
2 the Commissioner. I think there will be no difficulty
3 about any of those things.

4 The project itself has been one of joint participa-
5 tion. The Navy, of course, has contributed very heavily
6 here in the matter of personnel and time and thought, and
7 it is simply a simple testimony to the fact that the people
8 who have been interested and working in these fields have
9 predominantly been in the two Naval Research Institutions.

10 Those are some of the factors in the pattern of
11 responsibility and organization. Our objective is to maintain
12 a smoothly working situation so that the continuing medical
13 studies can go on indefinitely, I think.

14 The discussions yesterday on prognosis emphasized
15 especially the long term end results which can only be
16 appreciated by following these people over many years.

17 In a letter to Admiral Pugh, which has come to
18 the various persons concerned, I outlined the background of
19 the problem, the way it was handled, the results to date,
20 and itemized the objectives of continuing investigation as
21 I think we all pretty much agree at the present time should
22 be kept in mind. These are as listed here.

23 I am talking now of these interval examinations.
24 A complete physical examination and interval history.
25 Second, hematological studies, including quantitative

Alderson Reporting Company
Washington, D. C.

ARC

1 examinations, such as hematocrite, white blood cell count,
2 differential count, platelet enumeration and bone marrow
3 studies.

4 Three, special investigation employing both color
5 and black and white photograph, as well as skin biopsy if
6 the latter are indicated.

7 Four, ophthalmological studies with special reference
8 to the lens. This will obviously come in with a little time
9 to fit in with the studies in Japan.

10 Five, special growth studies of children, including
11 attention to the development of dentition. I believe that
12 was mentioned yesterday.

13 Six, the progress of pregnancies, and the status
14 of newborn infants. I don't think much comment is required
15 there except that essentially it be a documentation of
16 nothing happening in all likelihood.

17 Seven, quantitative studies of internally
18 deposited radioisotopes by means of urinary excretion measure-
19 ments, external radiological measurement and localization,
20 together with such radiography as may be useful. That is a
21 euphemistic way of saying if people die, we want full
22 autopsies.

23 Eight, environmental surveys of the affected islands
24 and atolls and appropriate examination of the animals left on
25 the contaminated islands. In other words, the project needs

Alderson Reporting Company
Washington, D. C.

ARC

1 to be pretty much of a rounded one, and include the
2 continuing environmental study as well as the continued
3 medical study of the people themselves.

4 Now, our feeling was, too, that various groups of
5 people have special interests and would like to have sample
6 material of various kinds. As far as possible, the groups
7 concerned with the interval study should attempt to provide
8 those samples. If the Department of Agriculture wants a soil
9 sample, we should provide it. There is very little real
10 difficulty about matters of that sort.

Alderson Reporting Company
Washington, D. C.

11 It is assumed, then, that the financial
12 responsibility for these studies and investigations is assumed
13 by the Division of Biology and Medicine of the AEC, and we
14 work out the details as we go along as far as how we do that
15 is concerned.

16 I believe the general objectives and so on from
17 the position of the Surgeon General of the Navy have been
18 agreeable. CincPac and Admiral Persley has given it an
19 unreserved backing for this project. The administration of
20 the trust territory is quite happy at the rather simple and
21 straightforward relations through their organization. I think
22 they feel that it bolsters them and strengthens their
23 standing in their administrative responsibility, rather than
24 diffusing it.

ARC

25 I think as we see it those are the main objectives.

Department of Energy
Washington Office
ARCHIVE

1 There will undoubtedly be problems arising that will have to
2 be resolved from time to time. The main thing is that
3 we keep a project going in continuity more or less
4 independently of the individual task forces that come and go.
5 Of course, it would be somewhat associated with each and
6 every one. Those are the general thoughts, Captain Kellum, I ha
7 on that part of it. I would like to have your comments, and
8 Captain Yarbrough's, on the general project.

9 CAPTAIN KELLUM: I think I am not in a position to
10 speak for the Bureau, but from our own point of view, we are,
11 of course, very much appreciative of the opportunity of
12 participation and look forward to continuing our participation
13 and support.

14 I can't miss this opportunity to comment briefly
15 on the general spirit of good will which has prevailed
16 through all of these successive operations, and which has
17 made possible the smooth cooperation of representatives from
18 many different agencies with what appear to be first rate
19 results.

20 DR. BUGHER: Thank you. Captain Yarbrough.

21 CAPT. YARBROUGH: I would like to echo Capt. Kellum's
22 comments on the affability of the relationships in this
23 particular endeavor. In fact, I would like to go a little
24 further and say that I think that it presents an opportunity
25 for our naval participants perhaps to solve some of our
problems.

Alderson Reporting Company
Washington, D. C.

ARC

1 Particularly I refer to the military, where there
2 is the ever-present problem of affecting continuity for our
3 research career people. We are always presented with the
4 requirements of certain of our bureaus to comply with military
5 regulations with regard to rotation of personnel. More
6 specifically I refer to the fact that we get a good scientist,
7 we give him a job while he is in uniform, he gets going on a
8 job, and when he is beginning to be productive, along comes
9 the necessity of transferring him someplace else, probably
10 where he cannot proceed with the same line of work.

11 Therefore, I feel that this perhaps is an
12 opportunity when we re-visit the scene of this accident, I
13 suppose is the proper term, that perhaps we can effect a
14 change of orders for these people where they will be in a
15 sea duty status. Although the time might not be comparable
16 to the requirements of certain bureaus, I believe merely the
17 change from shore duty status to sea duty status will
18 satisfy the regulations of particularly the Bureau of Naval
19 Personnel.

20 Secondly, I feel it is an opportunity to further
21 another desire of ours, which is to somewhat follow the
22 thinking expressed by Dr. Bugher in the way of continuity
23 in that we like to keep together people in a unit who are
24 capable of performing such tasks as this. We do not like to
25 get them scattered over the face of the naval concentrations.

Alderson Reporting Company
Washington, D. C.

ARC

1 Perhaps we could use this so to somewhat keep up with
2 these people and keep them in a group that can be sent out
3 to do -- I don't like to say the word "crash" studies --
4 but do a rather complete study on a crash basis, which is
5 perhaps better phraseology.

6 I think those are most of my thoughts at the
7 moment, except I think the most logical next consideration
8 should be the matter of intervals. What is the interval that
9 we should pursue in making this study.

10 DR. BUGHER: Thank you, Captain.

11 Col. Browning, the AFSWAP participation falls on
12 your shoulders. Have you comments on this general plan?

13 COL. BROWNING: The conduct of this further study
14 quite obviously falls within the purview of the AEC, not
15 only by fiat, but because you are particularly well set up
16 to do this sort of thing. To carry on a continuing study
17 that none of the services by themselves or as a group could
18 possibly manage, in other words. You are the most
19 appropriate agency also because of your various laboratories to
20 collate this information and make a continuous study of it.

21 Our interest in this, of course, is, one, that
22 we get the information that comes out of this, such stuff as
23 is operational and material that we can use, and we have
24 another interest at this which is perhaps a bit at variance
25 with what Capt. Kellum and Eapt. Yarbrough mentioned, in that

Alderson Reporting Company
Washington, D. C.

ARC

Department of
Historical
ARCHIVES

1 we have responsibility to all three services, to try to
2 continue an interest in all services in this business, and
3 not look merely to one.

4 With all due respect to the work that Navy has done,
5 and certainly they did everything they possibly could in this
6 study, our feeling would be that we would like to inter-
7 digitate one or two officers of the other services, certainly
8 qualified people, and not use this as a training situation,
9 and to interest people in this who perhaps now feel that
10 they have been arbitrarily shoved aside in this.

11 As I say, this is a continuing problem that we have.
12 We do feel that all three services must have the capability
13 of carrying on their own studies and their own work within
14 their own services.

15 DR. BUGHER: It would be a helpful point if you
16 would get available or have kept available in the Army, for
17 example, some of the people who have now years of background
18 and special training in this field. It would be a very
19 substantial contribution towards keeping that capability
20 alive.

21 COL. BROWNING: Yes. I am fully sympathetic with
22 the Captain's problem here, because I realize that the Navy
23 has had this situation for some time, and that they are
24 fighting it. As a consequence, I have kept myself out of
25 their side of the thing, other than to give them a little

Alderson Reporting Company
Washington, D. C.

ARC

1 moral support.

2 However, on the Army and Air Force side, this has
3 devolved in our fight, and we are having exactly the same
4 problem with the personnel officers, who insist on training
5 a radiological officer into Lower Slobovia to replace a
6 general medical officer in Ward I with complete disregard to
7 the fact that he is not doing his primary function.

8 In the three years he is there, he loses all contact
9 and much interest in the field. We have spent a lot of time
10 and taken a lot of the services' time in training these
11 people, only to lose them. We have found in this regard that
12 the AFSWAP training course is a good stepping stone into
13 radiological residencies, and we have lost over 50 per cent
14 of our people in this because they do achieve a certain
15 amount of permanence by doing it.

16 CAPT. YARBROUGH: I think you answered a question
17 I was about to ask. Are you speaking for the Air Force also?

18 MAJ. HANSEN: We have lost many people. Almost
19 everybody that has gone into the program has gone into
20 specialty training from this program.

21 COL. BROWNING: Dr. Cronkite, at the end of the
22 operation, sent a letter through channels concerning his
23 feelings on keeping these teams together. As usually happens
24 this went through several offices, and arrived at our place
25 for some sort of answer. I have been working on this now, and

Alderson Reporting Company
Washington, D. C.

ARC

Department of Defense
Historical Files
ARCHIVED

1 coordinating it in advance, and it should be coming through
2 shortly. It will be our recommendation to know more on
3 this situation, and will just about cover the things you
4 mentioned, Capt. Yarbrough. It perhaps will help you in
5 establishing your position. We do feel, one, that all three
6 services should at least have on paper some sort of list of
7 people who can be made available on short notice in the
8 event any such accident as this occurs.

9 Again we are not trying to get into the individual
10 services and tell them what to do in this, but to in effect
11 give them the benefit of our experiences recently and
12 indicate some of the ways in which this could be better
13 expedited.

14 Of course, we also have a little personal interest
15 in this, because these three lists will help us in the
16 event of an inter-service type of thing forming into an
17 interservice team.

18 CAPT. YARBROUGH: It is perhaps obvious that I am
19 gathering some ammunition for another submission, particularly
20 to the Military Coordinating Committee on Medical Research,
21 where our ultimate aim is to combat the current imposed ratios
22 by getting a recommendation out of Mr. Quarles, and perhaps
23 out of Dr. Berry, that our billets for research people should
24 be exempted from the currently imposed ratios.

25 DR. DUNHAM: May I make a comment here, although

1 this is something in my direct interest. Dr. Bugher will
2 be back in a few minutes.

3 I hope you people in this battle, as it were, for
4 keeping some of these highly trained people more or less
5 together and certainly available, are keeping in mind the
6 importance of the enlisted personnel, and not just officers.
7 Watching Gene's team out there, it was obvious that it was
8 the fact that the enlisted personnel had worked together
9 before -- boys from Hunter's Point and MRI that really made
10 the thing click, with all due respect to Gene and the officers
11 involved. They knew each other and worked well together
12 right from the very beginning. This is something that is
13 very important to bear in mind in this consideration.

14 CAPT. YARBROUGH: Particularly I think the isotope
15 technicians are getting scattered to the four winds, where
16 people who have spent time and money in training are now in
17 Lower Slobovia or somewhere else.

18 CAPT. KELLUM: Dr. Dunham, may I make one brief
19 comment in passing? I think we all recognize the fact that
20 this last team that went out that was mostly Navy was
21 largely fortuitous. There is no disposition on the
22 part of our outfit to try to corral leadership in this field.

23 As a matter of fact, and this is what I really
24 want to say, from our point of view at Bethesda, we would
25 welcome, if there is any point in it, from time to time
the assignment there on duty of people from the Army and

Alderson Reporting Company
Washington, D. C.

ARC

1 Air Force. I think there is good precedent for that, and if
2 there is an occasion for that kind of thing, we would welcome
3 it.

4 DR. DUNHAM: I am sure when Col. Browning made
5 the statement that some of the other services felt they had
6 been shouldered aside, he is aware, as I am aware, that they
7 were not.

8 COL. BROWNING: No, I don't mean on this
9 particular incident.

10 DR. DUNHAM: As I recall, you made great efforts
11 personally.

12 COL. BROWNING: This goes back to the same
13 situation. On each occasion, it would have necessitated
14 the complete dropping of a particular function. I realize
15 that the Navy also had this problem, and they were willing
16 to do so. Because of the time basis on which this thing
17 came, it was not possible to make all the representations
18 that were necessary to get these people involved in this
19 thing. By doing this in advance, we feel that some provisions
20 can be made to have understudies. I can speak with some
21 sympathy for the Captain's statement here, because I spent
22 two years at NRDL, and I look back on it as a very
23 interesting and very instructive period.

24 We again would like to see this occur. This is
25 another one of our recommendations. But we can do no more

Alderson Reporting Company
Washington, D. C.

ARC

1 than recommend and as often or not, it is only from our
2 position that we can make these recommendations.

3 DR. DUNHAM: Well, good. These are generalizations.
4 I think everybody is agreed as to what must be in the
5 future. There is a matter of the return trip out there
6 coming up fairly soon. I think perhaps this is the point in
7 the discussion to get down to specifics. I understand there
8 is actually an existing plan for Dr. Bond to go out with a
9 group. Do we consider this an accomplished plan?

10 CDR. CRONKITE: May I interject a comment? Dr.
11 Bond and I made sort of a gentlemen's agreement with each
12 other providing that it was acceptable to everyone else, that
13 we would share the responsibility in alternating in
14 going out there in the first few trips. I would like to twist
15 Dr. Bond's arm a little bit to take the first one going out.
16 I think from here on he should be the one, if he is to be
17 responsible, that is able to select the people that will go
18 with him, and what of the various things that are proposed
19 they would be able to do. It becomes a rather acute problem
20 of a few people for a long time, or relatively large number
21 of people going out for a short time.

22 DR. DUNHAM: We would appreciate your comments,
23 both Dr. Bond's and yours, Gene, as to which is the most
24 feasible, and also useful approach to the problem. What do
25 you mean by a short time, and a long time?

Alderson Reporting Company
Washington, D. C.

ARC

1 CDR. CRONKITE: I frankly don't know. My personal
2 inclination would be to perhaps take more people out with the
3 idea of doing the work in the shortest period of time possible
4 so that there will be less disruption of the ordinary
5 activities at home.

6 DR. BOND: May I bring up this point here. Dr.
7 Burleys had or included in his list of objectives resurveys
8 of the islands.

9 DR. DUNHAM: Yes.

10 DR. BOND: The individuals who are most interested
11 now are located on Majuro. The islands themselves,
12 Uterik, and so forth, are some five or six hundred nautical
13 miles away. I wonder because of the geographic setup
14 and the attendant logistics difficulties, whether it would
15 not be proper to consider these as two essentially separate
16 projects that might be coordinated.

17 DR. DUNHAM: It seems to me so.

18 DR. BOND: I would like to know whether we are
19 including that in the discussion or whether we are
20 discussing the return at this time.

21 DR. DUNHAM: Before we make the decision on that
22 I would like Dr. Dunning to make a comment about what he is
23 aware of in the way of plans for resurveys and any suggestion
24 he might have as to how best to accomplish that.

25 DR. DUNNING: I am not aware of any definite plans

Alderson Reporting Company
Washington, D. C.

ARC

Department of Defense
Historical Files
ARCHIVES

1 for resurvey.

2 DR. DUNHAM: Is Donaldson's group going out there?
3 There is no point in having two or three different outfits
4 picking up soil samples, flowers and cocoanuts.

5 DR. DUNNING: It would appear to me that the purposes
6 of this study and for the objectives for which the team is
7 going out there that it would be of secondary interest at
8 most to notice what the levels are at the islands now and in
9 the future. In other words, we have all the data right now
10 that is going to be of direct interest for determining dose
11 and so forth.

12 DR. BOND: I was thinking more of the internal
13 considerations rather than the external.

14 DR. DUNHAM: When it is safe for them to go back
15 or is it safe?

16 DR. BOND: Along that line, I would like to state
17 that the individuals at NRDL in the chemical technology
18 division, of course, are interested in the general problem
19 of contamination and decontamination. Here we have a situation
20 in which an area that has vegetation that is used as food
21 stuff has been contaminated, and these individuals at NRDL
22 are very much interested in sampling these materials as a
23 function of time after detonation to determine the
24 distribution of it. How much of it gets into the edible
25 vegetation there, and this sort of thing.

Alderson Reporting Company
Washington, D. C.

ARC

1 We are interested in the sampling and conducting
2 radiochemical analysis. They are actively interested in
3 making a survey. They are not completely aware, nor am I
4 completely aware, of what has been planned or what is to be
5 done on this score.

6 I would like to put in at this time that if there
7 are no specific plans, and if it were desirable and
8 acceptable that there is a group there that would be
9 interested in taking the primary responsibility for doing that.

10 DR. DUNHAM: As this particular resurvey has medical
11 implications, I would appreciate your comments as to when
12 is the best time to make it, and also how often it should be
13 done. I suspect not very often, but there certainly will have
14 to be done at least one survey done well in advance of
15 the first guestimate as to when the Rongelap natives can go
16 back to Rongelap.

17 DR. BOND: The present plan is that the initial
18 survey can be conducted as the survey of the people out
19 there, and depending on what is found at that time, a date
20 could be set for another resurvey, tentatively six months.

21 DR. DUNHAM: In other words, there would be two
22 resurveys before they go back to their atoll?

23 DR. BOND: Yes.

24 DR. DUNNING: By whom?

25 DR. BOND: Here is a group that is interested in

Alderson Reporting Company
Washington, D. C.

ARC

1 doing it. I might elaborate a little bit. They are
 2 radiochemists primarily. However, in conducting the survey
 3 they would want very much to have the cooperation of such
 4 people as Donaldson, perhaps individuals in the trust
 5 territories, and individuals who have worked with the uptake
 6 of radioactive materials in plans, to assure that proper
 7 sampling is conducted, and that they do get the proper
 8 vegetation, and so forth, so that their results are meaningful.

9 As I say, this group would be interested in taking
 10 the responsibility for seeing that the resurvey is properly
 11 accomplished.

12 DR. DUNNING: Dr. Dunham, it seems to me that the
 13 sensible way to go about this is to find out what plans are
 14 in the making. I am sure I don't know all the plans of the
 15 Donaldson group and NRDL, and the carryover from Task Force 7.
 16 We should find out what is in the wind. Again I am not sure
 17 as to where we stand, shall I say, legally. But it would
 18 appear to me again that we need a central agency for someone
 19 to get this thing coordinated. It is just that. It is not
 20 the idea of giving commands, but of coordinating the efforts
 21 just the same as this whole medical team going out. Perhaps
 22 we need another similar program on the physical side of it.

23 DR. DUNHAM: Dr. Bugher, we are currently discussing
 24 the matter of resurveys of the natives and islands. Dr. Bond
 25 has made the suggestion that the two not be considered as

Alderson Reporting Company
 Washington, D. C.

ARC

1 identical efforts necessarily, because the natives are down
 2 at Majuro, and have an entirely different logistic setup
 3 as opposed to returning to the islands.

4 The discussion has gone so far as to Dr. Bond
 5 offering and urging that the NRDL group be permitted to be
 6 the group to resurvey the islands, perhaps in September
 7 and again in March, with a thorough survey of the plants,
 8 soils and food supplies.

9 The question immediately comes up, what other plans
 10 are in the making or actually under way for resurveys of
 11 those islands from a radiological safety standpoint, and the
 12 standpoint of the food chain possibly being contaminated.

13 Is Donaldson's group going to do anything there
 14 that would overlap or duplicate such a proposal?

15 DR. BUGHER: Yes. The existing things, I think,
 16 are these. The marine biological side of it is immediately
 17 in Donaldson's hands. In that capacity he reports to this
 18 Division. However, his work does tie in with some other
 19 aspects of the Pacific Science Board and fans out in various
 20 ways, even including the University of Hawaii.

21 The main responsibility there for the marine
 22 biological situation is in Donaldson's hands, particularly
 23 with reference to the fish.

24 We have also on Eniwetok the small biological
 25 station which we have set up which is available not only

Alderson Reporting Company
 Washington, D. C.

ARC

1 to government organizations, but to university marine
2 biologists who may want to spend time studying some aspects
3 of the coral atoll. Some of these studies, at least, should
4 bear on the environmental thing.

5 We have in the Division a large program which is
6 purely environmental contamination studies which we carry
7 under the name of Gabriel. The scope of that program is
8 worldwide. The problem of the biological setup of the
9 contaminated islands is clearly likewise germane to that
10 program. That brings us into close cooperation with the
11 Department of Agriculture, because some of the outstanding
12 skills in soil composition, soil analysis, and so on, lie
13 there. We have an extensive cooperating program there.

14 We also have a very elaborate setup for analysis
15 for longer lived isotopes. It is set up in three places, the
16 New York Health and Safety Laboratory, the Columbia University
17 project, and one in Chicago. So that the environmental
18 aspects here are quite broad. Any group that does the inter-
19 mittent surveys will have to plan that it will be not
20 only wrking for itself, for its own interests, but also
21 a service group for various other outfits who likewise have
22 very pertinent interests here, and have available skills and
23 resources which perhaps would not be entirely available to
24 any one particular group.

25 You all had that problem confronting you with

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 Quadjalein's operation when Cdr. Cronkite began to feel
 2 that he was the chief dispenser of urine for the whole Pacific
 3 area and even suggested a different code name for the
 4 operation, the name of one of the more popular and decorative
 5 woods in the Marshall Islands, which I thought was a very
 6 nice name. The species known as the Pisonia Jiant. However,
 7 we work it for the actual handling for the immediate
 8 environmental survey, that group is going to have to do a
 9 lot of specimen collecting for other people who are interested.

10 Our general feeling is that whatever group has a
 11 legitimate interest and capability we should get the material
 12 for them and expect from them a report of results to go
 13 into the hopper here. That is the way it has been working.

14 DR. DUNHAM: I might interject one remark here
 15 that just occurred to me, Dr. Bugher. Are we to consider
 16 indefinitely that these surveys have to go through the task
 17 force report channels, or is there a cutoff point when they
 18 become sort of on their own?

19 DR. BUGHER: The cutoff point is when Task Force 7
 20 is no longer active. What is that situation, Colonel?

21 COL. BROWNING: As far as I know, Task Force 7
 22 will go out of existence some time this summer. It should be
 23 some time during July, as the last guess on that.

24 DR. DUNNING: The last I knew, Admiral Bunson was
 25 taking over at the end of July.

Alderson Reporting Company
 Washington, D. C.

ARC

1 DR. BUGHER: The real problem that the authority
2 outside Eniwetok and Bikini lies in the trust territories
3 administration. He is the one that in a sense puts on us
4 the requirements to satisfy his needs. So we all in a certain
5 sense become a service facility to him.

6 In practice actually he recognizes that the capabil-
7 ity for planning and all that lies in this general group of
8 agencies and people. If he finds that he can't answer all
9 the questions that are asked him, he may ask us to do some
10 things that we may not have thought of. But generally
11 speaking, that is our line of authority and our general
12 responsibility.

13 The point you raise is a good one, especially the
14 situation while the people of Rongelap are down on Majuro
15 Atoll, and it may therefore be practical and convenient to
16 submit the thing, particularly during this period. Is
17 that what you had in mind?

18 DR. DUNHAM: That is what Dr. Bond was suggesting.

19 DR. DUNNING: Let me ask Dr. Bond in the light of
20 what Dr. Bugher has just said, would you still give the
21 same expression of interest and willingness?

22 DR. BOND: I believe so. Of course, they are
23 interested in obtaining the samples and doing radiochemical
24 analyses on them, and following the uptake material into the
25 edible plants. They are willing to do this obviously on

Alderson Reporting Company
Washington, D. C.

ARC

1 samples that someone else collects or they are willing to go
2 out and collect the samples, and have stated they would be
3 quite willing to collect additional samples for other
4 interested agencies.

5 DR. DUNNING: I am wondering then if one possibility
6 might be that NRDL actually do the shovel work and someone act
7 as coordinating agency to see what the needs of the other
8 people might be?

9 DR. BOND: This may be. Who would that be likely
10 to be?

11 CAPT. YARBROUGH: I think NRDL has gone a little
12 further than Dr. Bond is indicating, in that this morning
13 we have a proposal formulated, and there are quite a
14 few specific items in it, where they wish to have it in the
15 form of a project. Inasmuch as I will have to give an
16 answer one way or another to this proposal, it would be
17 very interesting to get the consensus of opinion here.

18 They are proposing that it be done at the same
19 time as the biomedical portion. They propose that USNRDL
20 carry out these studies in fiscal 1955 at the 2.6 investiga-
21 tion or man year level. The estimated cost of this will be
22 some astronomical figure of \$42,000. Since it is envisioned
23 the program outlined may continue over a period of several
24 years, it is suggested that while the laboratory will
25 probably be supported by BuMed and/or BuShips, it may be

Alderson Reporting Company
Washington, D. C.

ARC

Copy made of [unclear]
[unclear]
[unclear]

1 desirable to seek funds from USAEC to finance collective
2 samples in the field. As indicated above, there is an
3 early schedule to begin followup medical studies with
4 which the proposed project should be coordinated. It is
5 therefore requested that subject proposal be reviewed, and
6 if it is acceptable, that approval be given at an early date
7 so that prosecution of the program can be effectively carried
8 out.

9 Incidentally, their details are of the opinion
10 that surveys will be required at six months intervals.

11 DR. BUGHER: Yes. I think the first year it would
12 probably be ordinarily at least in part. I think six months
13 intervals seem reasonable for the first couple of years
14 anyway.

15 CDR. ETTER: After having read that proposal
16 that Captain Yarbrought has just briefed, I would like to
17 suggest that the action by BuMed be that it be forwarded
18 and readdressed other than it is now to the AEC for their
19 comments since I think certainly your group should be
20 coordinating group for all studies of any type which are
21 going to be done under this long term program. I don't think
22 that any individual laboratory or activity should take too
23 much unilateral planning here, except to get things moving.
24 All these proposals should be coordinated through your
25 office.

Alderson Reporting Company
Washington, D. C.

ARC

1 DR. BUGHER: I think it would be presumed that in
2 a program of this kind as suggested in NRDL the resources
3 of the various other agencies and services would be also
4 available. I mentioned the marine biological field. That
5 is an area where ONR has a very considerable interest.

6 This marine biological station at Eniwetok has developed,
7 and while it is AEC financed, ONR has a very real interest
8 in it, and has given quite a boost in the way of transport
9 and sponsoring of conferences in this general area, and in
10 various other ways.

11 So we do have joint interests. We inevitably
12 bring in the Applied Fisheries Laboratory at Seattle,
13 which is an AEC setup. We bring in the Hanford interests
14 in the fresh water biology somewhat -- not so much, of course
15 -- but they are a closely related group of people who
16 work there. We have a program on tuna fish biology and
17 fission product uptake at Coeoanut Island at Hawaii under
18 the University of Hawaii. The fish program ties in likewise
19 with the Fish and Wildlife service, Dr. Setty, stationed
20 at Honolulu, and the Fish and Wildlife Service here in
21 Washington.

22 Furthermore, we have a program on Atlantic Ocean
23 tuna fish at Beaufort, North Carolina, and cooperative work
24 with the Scripps Institution which likewise begins to tie
25 in with some naval interests. All of these things are

Alderson Reporting Company
Washington, D. C.

ARC

Department of
Historical Records
ADMINISTRATIVE

1 going on and they have to all come together, which means
2 that various persons are interested in coming into the
3 environment of the islands for various reasons and various
4 groups need specimen material.

5 The particular group immediately responsible for
6 conducting the surveys and maintaining the records has to
7 meet the requirements of all the other associated people,
8 and likewise consult with them on program needs and specimen
9 needs and techniques. I think as mentioned here it does not
10 stand alone as you might say, a free floating program, but
11 rather one that operates closely with a number of other
12 programs and there is no sharp point at which the interests
13 end for one and begin for the other.

14 I think the NRDL people are quite aware of that
15 and probably would make it then more interesting and of
16 more advantage to them. We would presume that the coordinating
17 side of this would continue here because we already are
18 deeply involved in the whole problem of marine biology in
19 the Pacific area.

20 I have not mentioned a program of sampling of
21 corals over the entire Pacific area, which is in motion now,
22 with the objective of doing quantitative strontium 90
23 analysis to see if we can in that way get an integrated
24 sample of ocean currents by static sampling. I don't know
25 whether it will work out or not, but we want to give it a try.

Alderson Reporting Company
Washington, D. C.

ARC

1 CDR. CRONKITE: Dr. Bugher, I would like to make
2 a general proposal in view of all this information that
3 has come to light here, that there be a clearcut separation
4 of these long term problems into two facets: One a medical
5 and one a biological and physical. It seems from the medical
6 standpoint people that are involved are willing and will
7 continue to carry the ball on that. They would not be the
8 right ones to carry on the sample collection and any planning
9 for the work to be done in the field for the continuing
10 biological-physical work. I think we are in a position to
11 assure that the medical side is done and not in a position
12 to be of much assistance or assure that the biological and
13 physical work will be done.

14 DR. BUGHER: You think you can keep them sharply
15 separated, particularly after we put the Rongelap people
16 back on their atoll?

17 CDR. CRONKITE: Perhaps at a later date it might
18 be logistically practical to merge the two. At the present
19 time one concern is transportation and time involved for
20 doing these various things, and that would involve an
21 inordinate period of time for the medical group for the
22 sample collection for the other people.

23 DR. BOND: It is quite a distance between the two
24 locations and the logistics problem is great. The type of
25 equipment and personnel required are entirely different.

Alderson Reporting Company
Washington, D. C.

ARC

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

DR. DUNHAM: I think the wishes of CincPac should be considered here, too, because it might be simpler for them to treat such an expedition as a unit, even if one unit went one place, and another another place, and were separate from the others on down. I don't think they should be completely isolated activities at this point.

CDR. CRONKITE: I didn't express myself well. If the group doing the medical work are also to do the sampling, you run into the problem of air transportation out there, which is very limited. The regulations under which they operate of not being airborne before it is light and to leave the lagoons at a time so they can be back before sundown, which gives you about three to four hours work in an area, so there will have to be repeated trips. I can visualize and I don't think it is unrealistic, say a month at Majuro with all the complications so that the same people would be out there for two months, if they are both doing the same thing. I think it is a terrific slice into trying to carry on work at home, too. Whereas if the group went out to do the sample collection, perhaps at the same time as the ones doing the medical study, everybody could get their work done within a period of three to four weeks.

CDR. ETTER: I don't think there have been any proposals for the same group to do both things. This is not NRDL's proposal at the present time. They propose an

Alderson Reporting Company
Washington, D. C.

ARC

1 additional group above and beyond to be separate individuals.
 2 That is the way it now stands.

3 (Brief recess.)

4 DR. BUGHER: We will start again. In view of the
 5 recommendations as to separating the environmental studies
 6 from the medical studies, we agreed at this end to have
 7 considered Item 7 to have been disposed of, and we will
 8 make arrangements for environmental surveys and sample
 9 collections as a separate program from the medical program,
 10 but the actual timing will depend appreciably on the conveni-
 11 ence of the Commander of Quadjain. Particularly after the
 12 Rongelap people are back home, it might be more convenient
 13 for his point to take the whole thing up and dump them
 14 for a couple of weeks or a month and come back and pick them
 15 up again, and get rid of both groups at the same time.

16 Would that be agreeable all the way around? We
 17 are very favorably disposed towards the NRDL group conducting
 18 the actual survey and sample collection. We can work that
 19 out here with Captain Yarbrough and the others who are
 20 available as to what specific form that would take.

21 I think perhaps that is enough time, then, for
 22 that subject, unless somebody would like to add to it.

23 MR. HARLEY: Dr. Bugher, I have a question. Will
 24 someone like Lyle Alexander be brought into this work for
 25 assistance?

Alderson Reporting Company
 Washington, D. C.

ARC

1 DR. BUGHER: Yes, that is where one of our
2 functions come in. Alexander in particular is the soil
3 expert for the Department of Agriculture, and who is extremely
4 familiar with all the problems right from, you might say, a
5 tour out in Nevada, on to the soil collections in Pakistan.
6 So this would be one other facet of his interest. We would
7 certainly want him to come into the picture.

8 Actually the Commissioner of the Trust Territory
9 has in mind a small agricultural experiment station on one
10 of the nearby atolls, perhaps somewhat different than the
11 usual agricultural experimental station, but we get
12 involved in that, too, in some respects. We are supporting it.

13 That will be the function of this office, that is,
14 to make sure that all the elements necessary to a complete
15 survey be provided, and that the necessary samples are
16 arranged for, and that they are adequately documented.

17 We will of course presume that the interests will
18 go considerably beyond what the NRDL might itself regard as its
19 legitimate and proper interests. Such matters as the ioniza-
20 tion of soil constituents is important to us. It might not
21 be important to NRDL. They may be interested in radioactive
22 components only.

23 We are very much tangled up with the problems of
24 calcium movements in coral atoll and the crystalline forms
25 in which the calcium salts are found. The equilibrium

Alderson Reporting Company
Washington, D. C.

ARC

Alderson Reporting Company
Washington, D. C.

1 reactions which enter into the growth of coral by which
 2 some of the calcium comes from sea water, and apparently
 3 a certain amount is recycled from old coral deposits, As far
 4 as I know, we do not have a measure of that. We think we can
 5 get it now from some of these environmental studies, that is,
 6 a quantitative estimate of the various equilibria that come
 7 into the growth of coral, how much new calcium from sea water
 8 passes by and how much is previously established calcium.

9 All things of that sort which are important to
 10 marine biologists might not be important to the NRDL program.
 11 All of these things have to be put together.

12 I think that is generally agreeable from your point
 13 of view, Capt. Yarbrough?

14 CAPT. YARBROUGH: Yes, sir.

15 DR. BUGHER: So at this point, let us go back
 16 to item 6 with regard to comments relative to specific studies.
 17 I read a list of eight broad items that we have suggested
 18 to Admiral Pugh, as the sort of thing to visualize in a
 19 continuing investigation. I should not think, for example,
 20 that item 1 needs any further comment.

21 CDR. ETTER: That is right.

22 DR. BUGHER: That is standard practice in a thorough
 23 medical setup.

24 On No. 2, the hematological studies, have you
 25 any further comments to make?

ARC

1 CDR. CRONKITE: I have one comment on that.
2 The regular routine stuff is that you can't do a lot of bone
3 marrow aspirations on your people. You soon have
4 lost your rapport unless there is a good reason to do it.
5 I think they have to be done but I will be frank I do not
6 know when they ought to be done, and when would be the best
7 time to start doing it. I would like very much the advice
8 of somebody who studied the changes in Japan, such as Valentine
9 and Lawrence and Maloney, to get the appropriate time when
10 to first do it.

Alderson Reporting Company
Washington, D. C.

11 DR. BUGHER: The Japanese have done bone marrow
12 biopsies on their fishermen. I have seen the sections of
13 some of those, and they are quite interesting. The bone
14 marrows apparently are continuing to show a persistent
15 depression even though the blood counts themselves were moving
16 upward. That was a few weeks back. In that case the bone
17 marrow studies done early are in themselves quite interesting.

18 CDR. CRONKITE: Could that material be made
19 available?

20 DR. BUGHER: I can't promise what we can get available
21 from those people. They say yes, with the greatest pleasure.
22 We don't have it, but we will try to get the material.
23 Part of it is an element of barter, too. We trade something
24 that we have for something we want from them.

ARC

25 CDR. CRONKITE: We did not do bone marrow aspirations

1 out there. We gave that serious thought and decided not to
2 do it in view of considerations. There were so many children
3 present, and it is a rather unpleasant procedure.

4 DR. BUGHER: Have you thought much of the possibility
5 of tagging procedures to measure red blood cell formation
6 rates?

7 CDR. CRONKITE: We thought about it.

8 DR. BOND: We thought about it, and thought it could
9 be done, but wondered what the value of the program would be
10 and whether we were justified in doing it.

11 CDR. CRONKITE: The problem of a questionable
12 nutritional status and various things that can interfere with
13 the iron uptake that would be unconnected with the exposure
14 to radiation and the difficulty to get a truly unbiased random
15 sample of normals for comparison. I don't know whether it
16 ought to be done or not.

17 DR. BUGHER: Have you any committ?

18 DR. DUNHAM: No, I think as far as the nutritional
19 status is concerned, when you left them it was not bad. I
20 don't know what has happæd since when they are over on this
21 other island. Are they still going to eat in the style
22 in which they were eatingat Quadjalein?

23 CDR. CRONKITE: I hope not. They will be so
24 obese that we will never get any blood out of them.

25 DR. DUNHAM: I think if it is not controlled, it

Alderson Reporting Company
Washington, D. C.

ARC

1 will not be meaningful. If it is controlled, it is more
2 significant than bone marrow biopsies as far as the red cell
3 cycle is concerned.

4 DR. BUGHER: Are there any other comments in regard
5 to the hematological studies, and things that should be done?
6 If not, then the dermatological side. The skin studies mentioned
7 included biopsies if the latter are indicated. That is an
8 evasive case.

9 CDR. CONARD: There are certain cases that have more
10 severe lesions I think should have further biopsies,
11 particularly the ones we previously biopsied. It would be
12 interesting to follow them and see what later biopsies show.

13 DR. BUGHER: You can probably find the old lesion by
14 the scar of the first biopsy.

15 CDR. CONARD: We know exactly where it is. We
16 have the color pictures which we intend to take back
17 further, and take further color pictures.

18 DR. BUGHER: So you think in terms of objective
19 photographic record with time here combined with some
20 histological work. I think probably the histology would be
21 the important thing here, even though there is no grossly
22 visible change.

23 CDR. CONARD: Yes, sir.

24 DR. BUGHER: Are there other comments?

25 If not, what is your feeling about the ocular

Alderson Reporting Company
Washington, D. C.

ARC

1 studies? They are mentioned here because the lens changes
2 in Japan were not really fully anticipated when the original
3 plan there was set up. It was only after the lens changes from
4 the cyclotron workers became more important that it was
5 realized that there might be something in Japan, and Dr. Cogan
6 conducted such a survey and found in fact that was the case.

7 CDR. CRONKITE: Col. Lowry made the initial survey.
8 I do not know him personally, but he presumably is a highly
9 qualified Army ophthalmologist. I imagine for the initial
10 survey that would be entirely satisfactory. The problem
11 comes up, when should it be repeated, and who should repeat it.
12 There are no qualified ophthalmologists in the group out
13 there originally. At one time Dr. Sinsky was mentioned as
14 the desirable individual to do it. Is he available now?

15 DR. BUGHER: He can be obtained, I am sure. Col.
16 Lowry did the first survey. One of the problems here is
17 not only a technical one of minute examination, but also the
18 maintenance of a continuing record which somebody else can
19 look at and interpret. Sinsky did it in Japan finally by
20 getting an artist to help him, and he painted pictures of
21 what he saw. Those pictures are over at the Armed Forces,
22 and they make a very fine record. This is probably what we
23 can do in this case.

24 DR. DUNHAM: We can use cameras. There are
25 cameras available for taking lenses that were developed in

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historical Office
ARCHIVE

1 the National Research Council Cataract Committee. There is
2 one floating around in this country now, and I am sure it
3 could be borrowed any time resurvey is indicated.

4 CDR. CRONKITE: The original examination was an
5 ophthalmatopic examination.

6 CDR. ETTER: Sinsky contends that it is only through
7 a slit lamp that you can pick up the early changes.

8 DR. BUGHER: There is no question.

9 MR. HARRIS: Since this interpretation is so
10 important here, might it be reasonable that on a succeeding
11 examination if Sinsky did it, that Lowy and Sinsky go
12 together and do it, so that he would have Lowry's background
13 from a previous examination? Perhaps this would not mean a
14 necessary resurvey immediately. In other words, you could
15 hold off a year or so.

16 DR. BUGHER: Yes, that makes very good sense to me.

17 CDR. CRONKITE: The general consensus is to delay
18 the further ophthalmoscopic survey for a few months.

19 DR. BUGHER: There is the point here that the
20 base examination has been made.

21 DR. DUNHAM: There is some question as to whether
22 it was made by the slit lamp or not.

23 CDR. CRONKITE: Lt. Sharp was there at the time
24 and says it was.

25 DR. BUGHER: Before it was done, we understood it

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy

Historical Office

87-117-10

196

1 would be done that way, so that clears that up. If that
 2 has been thoroughly done, perhaps another look in six months
 3 might be adequate, then. Is that what you had in mind about
 4 that time interval? Within the first year?

5 Mr. Harris. Yes, that is what I was thinking.
 6 This would be one before their return to their home atoll
 7 if that year business holds.

8 DR. DUNHAM: I would urge a photographic record
 9 if possible of these observations.

10 MR. HARRIS: Yes.

11 DR. BUGHER: That ophthalmologic camera is good if
 12 it is used properly. It gives a picture of the anterior
 13 portion of the lens, at least.

14 Now, what do you feel about the question of growth
 15 studies of children, and there is also mentioned dental
 16 development. One of the things that was mentioned that
 17 was noticed in Japan was a temporary disturbance of growth
 18 rate, but also there have been some interesting dental
 19 anomalies which appeared in young people who were irradiated
 20 while they had their primary dentition. In other words, that
 21 is babies or the first years of life. They have shown some
 22 rather interesting dental changes apparently resulting from
 23 some degree of damage to the tooth buds of the permanent
 24 dentition.

25 CDR. CONARD: What sort of doses were involved there?

Alderson Reporting Company
Washington, D. C.

ARC

1 DR. BUGHER: Of the order of probably 100 or 200 r,
2 something of that sort.

3 DR. DUNHAM: Captain English discussed this with us
4 yesterday, I believe. He was not expecting to find much
5 but wished to have any teeth that came out spontaneously
6 or pulled made available. In other words, he didn't believe
7 that it would be worthwhile to take a special trip out
8 there to study all the children. Wasn't that the idea?

9 CDR. CRONKITE: That is right. He discussed
10 this with Commander Loce, who has had a wealth of experience in
11 dental studies of native populations in the Pacific. He did not
12 consider the matter of dental changes, and those that were
13 in utero at the time. But all that were born at this level
14 of radiation and in view of the extreme difficulty natives
15 have in their dental growth, he did not think that it would
16 be possible to get anything out of it. I do not recall him
17 saying anything about the study of the babies. There are six
18 babies involved, I believe.

19 DR. DUNHAM: He did wish to make radio audiographs
20 of any material that became available.

21 CDR. CRONKITE: Yes, and the group at NIH are
22 interested in that also.

23 CDR. CONARD: Particularly in the insidious
24 teeth in the children.

25 DR. BUGHER: The administration of the trust
territory has more or less a peripatetic dentist who would

1 be very glad to help in this sort of thing of collecting
2 teeth in the intervals when nobody is around.

3 Then pregnancies and status of newborn infants.

4 Certainly the chance of picking up much of anything
5 significant is probably small in that. I daresay the occurrence
6 of pregnancy and the inevitably correlated birth dates are
7 not going to have much relationship to the time of visits of
8 the special medical group. So the chances of being able to
9 study these things on the part of the survey teams are
10 not going to be too good. However, the resident physicians
11 can carry out, I think, quite a lot of observations you might
12 want them to make in the interval.

13 Now, on the quantitative studies of internally
14 deposited radio isotopes by excretion measurements, radiography
15 and localization, we include here autoradiography and
16 autopsy work, I think that might merit some additional
17 discussion. I think, Dr. Looney, some of the things you were
18 mentioning really could be brought out here, if you care to
19 develop them.

20 LT. LOONEY: Yes, sir. In the studies of radium
21 patients that we made we found that the most consistent
22 and probably the most valuable clinical finding was the small
23 changes roentgenographically, and as mentioned yesterday,
24 those were primarily the result of a formation of atypical-
25 osseous tissue. It was found that similar changes were

Alderson Reporting Company
Washington, D. C.

ARC

1 present in bone following yttrium, plutonium, strontium,
2 radium. These were similar.

3 We were able to pick these up from the clinical
4 standpoint by areas of increased density which usually
5 occurred at the cancellous bones at the end of the long
6 bones. We were able to correlate this with the amount of
7 retained radium, and it was a more reliable clinical
8 indicator than any other findings that we found.

9 The other important thing is that in the tumors that
10 developed in these people, most all of them developed at the
11 ends of the long bones and a roentgenographic study of the
12 long bones gives a base line for any future changes, and
13 also a study for any changes in symptoms which might be
14 pre-cancerous.

15 All these radium patients follow a rather fixed
16 pattern, namely, that about 15 years after the deposition of
17 the radio element symptoms occurred. Then later symptoms will
18 occur and were consistent at the point where the chamber
19 develops. This is accompanied by areas of density. This is
20 a very important aspect as far as the long term study, as
21 far as the internal emitters are concerned.

22 I know you are interested in radiation as far as
23 x-rays are concerned. I looked up the data from Brookhaven
24 on a 40 to 80 KV machine, and found that taking for instance,
25 a survey of atypical fibula, this would give you a .12
roentgens to this part. Taking a book on burns, the tibia,

Alderson Reporting Company
Washington, D. C.

ARC

Alderson Reporting Company
Washington, D. C.

1 That is another point I would like to bring up
 2 of the technique which we used at Argonne of taking audio
 3 radiographs, and from this to use as a guide for the
 4 detailed ones. We were able to take whole sections of bone
 5 and from this take x-rays and also audio radiographs, and
 6 then in the critical areas, take biopsy material from this
 7 to study detailed audio radiographs in which we could
 8 simultaneously study radio element deposition and histopatho-
 9 logical changes.

10 This was a simple and satisfactory method of study.
 11 Since strontium is probably your biggest trouble from
 12 long life, I would suspect that this would get a similar
 13 distribution, and also a similar change. I think another
 14 important thing that this may answer is this: We don't know
 15 from the radium study at what time these changes develop.
 16 We have an idea it is five or ten years following deposition,
 17 but with the shorter half lived material, the calcium that
 18 was gotten in here, these changes may develop earlier, and
 19 the malignancies might develop earlier. But this would be
 20 one step ahead of the game if we had this base line study.
 21 I think it is a very important thing to incorporate in a
 22 study of this type.

ARC

23 DR. BOND: May I ask how many individuals would
 24 you wish to x-ray? Would this be the entire group or children
 25 specifically?

1 LT. LOONEY: I think you might stagger this and
2 maybe take ten or fifteen, depending on the facilities and
3 the situation. That would be my suggestion, to start out
4 with ten or fifteen, and see how we came out, and to try
5 to get a control set up, and maybe the following year get
6 ten or fifteen more. This survey should probably be, one, one,
7 three, five, ten, fifteen and twenty years, with any
8 repeat x-rays if patients should develop symptoms or anything
9 suggestive of malignancy, and take a biopsy as well as an
10 x-ray.

11 The base line is one, three, five, ten and
12 fifteen, or something like that. I don't think they need
13 to be made as often as the studies if you are going to make
14 them annually. I would say that probably an x-ray of the tibia
15 and fibula, the radius and ulna, and the x-ray of the pelvis.
16 We know from the radium studies that these are the places
17 that would most likely have these changes, if there are any
18 changes.

19 We could omit the pelvis. This gives you one
20 roentgen of irradiation to an area. I don't know what the
21 approximate radiation in terms of whole body radiation this
22 would be. The external radiation is very small.

23 DR. DUDLEY: I wonder if it has been discussed here
24 what the level dose is from the internal emitters from
25 quantitative terms? I put together the two microcuries of

Alderson Reporting Company
Washington, D. C.

ARC

Copy to: [unclear]
[unclear]
[unclear]

1 strontium and that gives an infinitive dose of less than one
2 breadth.

3 DR. BUGHER: It has been discussed in the sense of
4 extremely small inasmuch as the total activity is probably
5 much less than tolerance when you think of that over a long
6 period of time. That is the catch here, I think, and if you
7 x-ray a bone, you are going to give more of a dose probably
8 in the course of the examination than the internally deposited
9 isotope is going to be able to give, which makes it
10 difficult to arrange a series of examinations to allow for
11 that factor.

12 LT. LOONEY: Sir, in regard to the x-rays according
13 to the Brookhaven group, 60 to 70 per cent of the radiation
14 will be expended in the first three centimeters, and 8 per cent
15 at 8. So the radiation of the bone would be very small.

16 Another thing I would like to emphasize here is
17 the marked variation that we found in the radium patients when
18 estimating body burden from urinary excretion. We found a
19 factor of eight. This was long range. I would certain
20 expect a much greater range from the estimation of the total
21 body burden from urinary excretion.

22 One of the things is that we can work out the most
23 practical and sensible means of handling situations of this
24 sort in the future by this method. Going over this work
25 with Dr. Cohn, the likelihood of malignancies developing

Alderson Reporting Company
Washington, D. C.

ARC

1 here are small. But there are many other factors
2 that as a clinician I would not be satisfied with the
3 estimates and the assumptions made here. I think the final
4 proof is the evaluation of these people, and knowing what
5 the situation is after ten or fifteen years.

6 DR. BUGHER: Gene, do you have any thoughts as
7 to how to carry out this sort of program? For example, is
8 Quadjalein itself equipped with these facilities?

9 CDR. CONARD: You were speaking of later studies
10 on Rongelap?

11 DR. BUGHER: I was thinking of that.

12 CDR. CRONKITE: They have a good equipment at
13 Quadjalein as we have here. It is a first class naval
14 dispensary.

15 DR. BUGHER: So it would be a matter of bringing a
16 few people over.

17 CDR. CRONKITE: Yes.

18 DR. BOND: It could be done right at Majuro.

19 DR. BUGHER: Down there it is a question of a
20 launch ride. It is only about five miles from Majuro Island.
21 It is a natural excursion.

22 CDR. CONARD: Is it accessible by air?

23 DR. BUGHER: No, it is a separate island.

ARC

24 MR. HARRIS: It would be nice to put some of these
25 people under a human counter.

1 DR. BUGHER: Yes.

2 LT. LOONEY: We considered taking a scintillation
3 counter out there. I didn't bring this up. I do think your
4 suggestion is a very excellent one. If the logistics permit,
5 it should be done.

6 MR. HARRIS: If you did such a thing as this,
7 the time to do it would be probably during the time of
8 testing out there when they were hauling out all sorts of
9 heavy equipment. The human counter weighs approximately ten
10 tons. That is the Los Alamos human counter. You can split
11 this up a little bit by draining, but that is also quite a
12 load.

13 DR. BUGHER: There are some drawbacks to it.

14 MR. HARRIS: However, the arm counter, something
15 like that, which weighs 3,000 pounds, might be feasible to
16 do in this case.

17 LT. LOONEY: We have a very sensitive scintillation
18 counter we have been using on thorium patients which would
19 certainly be adaptable to the situation if this is something
20 that should be done. I think that body surface trying to
21 correlate external measurements with any roentgenographic
22 changes or radiochemical findings in the skeleton would be
23 interesting and probably helpful, and give us full information
24 to try to correlate all this as to the best practical means
25 of evaluating people in the future.

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 DR. BUGHER: You may get an answer there on trying
2 to distinguish between background and the individual counts.
3 Some of the Air Weather Service people who were on Rongerik
4 would be fine. In other words, they have much lower levels
5 so if one could recognize anything on them, then you would
6 know it would pay off to haul the equipment out.

7 MR. HARRIS: It had been calculated. I think as
8 far as the Air Weather Service personnel, it was calculated
9 on the basis of urinary excretion. You might be able to
10 see this beyond the natural K-40 background. This would be
11 entirely in the nature of an experiment if it was done,
12 and not come into routine medical situations as far as I can
13 see.

14 MR. HARLEY: Where could you make the measurements
15 that the background from the fallout would not be too much
16 for you ?

17 CDR. CONARD: I don't think Majuro got any fallout.

18 MR. HARRIS: Our background at Los Alamos is higher
19 than it is at Quadjalein.

20 MR. HARLEY: Majuro got a pretty good sock.

21 MR. HARRIS: You could not carry any such thing
22 farther than Quadjalein. This is designed to take care of
23 high backgrounds. Ten tons, it has to be.

24 DR. BUGHER: The question of autopsy is again
25 going to be something which will have to be arranged with the

Alderson Reporting Company
Washington, D. C.

ARC

1 local medical personnel. I do not know how difficult it is
2 to get autopsies of the Marshallese.

3 CDR. CRONKITE: They have done autopsies at
4 Majuro. They have to be done immediately. Their custom is
5 to bury people within six hours after death.

6 DR. BUGHER: So almost certainly you are going to
7 have to reach an understanding with the medical officer to do
8 an autopsy and collect the material you wish, and preserve it
9 in the manner which you desire to have it preserved for ship-
10 ment to you. The chances of special teams ever having an
11 opportunity to do an autopsy are not too good.

12 CDR. CRONKITE: These were made originally by
13 the commander, and after the decision to move to Majuro was
14 made. It is not clear to me whether anybody talked to Dr.
15 Kirk at Majuro, whether they are aware of the necessity for
16 doing autopsies.

17 DR. BUGHER: I think they are vaguely aware of it,
18 but as far as specific needs are concerned, I am sure
19 that has not been communicated. That is one of the things
20 that could be done. I think they are willing to do anything
21 that is asked of them, if they are able to do it, and will
22 follow the suggestions quite enthusiastically. I don't know
23 of any specific request having been passed to them, other
24 than that they should give the general medical care to people
25 that under the other plan would have been forthcoming from

Alderson Reporting Company
Washington, D. C.

ARC

1 the medical officer at Quadjalein. I am sure they will do
2 these other things, too, if you will just outline to them what
3 is desired.

4 CDR. CRONKITE: Would that be done by the first team
5 that goes out there, or should this be carried down through
6 the trust territory, so that everybody is aware of the need?

7 DR. BUGHER: I think it probably might be a good
8 thing to prepare that in a set of written instructions of
9 things that are needed, and we transmit that through the
10 trust territory administrator so that in case somebody should
11 die, before the team gets out there, that the opportunity to
12 get materials would not have been lost.

13 Are there other comments along the lines of these
14 topics?

15 CDR. CONARD: In addition to that, I think that
16 it would be nice to have good rapport there on the
17 observation of skin and any other changes.

18 DR. BUGHER: Yes, I think we assume all through
19 here that everything that is done is done by the cooperation
20 with the trust territory people, just as the movement of
21 the people, for example, has been done as far as form is
22 concerned, under the general supervision of the trust
23 territory officer. He is the one that the people themselves
24 look to, not only during times of special studies, but in the
25 interim. In that sense, we are simply backing up their

1 people in carrying out these various things. So I think you
2 will find to whatever extent is useful trust territory
3 administrative people are available at all times.

4 Are there any other comments or questions here?

5 If not, we have a subsidiary topic called institutional and
6 individual responsibilities. Have we covered that sufficiently
7 or do you wish more comment on that?

8 CDR. CRONKITE: There was a statement earlier when
9 you were out, Dr. Bugher, of the desire of the Army and Air
10 Force to have people participate in this followup. If these
11 people could be designated so that they could be split up
12 between the team that Dr. Bond takes and the one that I take,
13 it would be most helpful in our planning.

14 DR. BUGHER: Yes.

15 CDR. CRONKITE: I would like to also extent it
16 not only to the matter of officers, but to enlisted technical
17 personnel, so that no one laboratory gets hit too badly at
18 any one time.

19 DR. BUGHER: I think Col. Browning would undoubtedly
20 keep various groups in the picture. For example, Col. Brennan
21 and other groups interested in these lines. There are
22 various others, some of whom have been scattered a bit, but I
23 think could be recovered on special assignment on things of
24 this sort. So that in a way what we get concerned with are
25 individuals who may have special competence and interest

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Office
195

1 here, and that involves any institution with which they may
2 be associated with at the time. Fundamentally it is the same
3 old problem of people who are competent and interested,
4 wherever they may be, if they could be made available.

5 The question on Uterik. The environmental studies
6 will have to be done at all three atolls. These teams
7 naturally should pay some attention to the Uterik people, but
8 I presume the proportion of attention will be pretty much
9 along the line of proportion that they got in the beginning
10 which was not very much. In other words, just an overall
11 surveillance to make sure nothing odd is developing.

12 DR. DUNHAM: Should they be reviewed this year at all,
13 that is, the Uterik people?

14 CDR. CRONKITE: Practically speaking, I think not.
15 From an academic standpoint, probably yes. My general
16 thinking along these lines was that since they had perhaps a
17 teth of the exposure that the Rongelap people did, if nothing
18 is showing up in the Rongelap people, there is relatively
19 little reason for even academic purposes to study the Uterik
20 people. If something does occur in the Rongelaps, then we
21 should take a look for both straight medical care and academic
22 reasons at the Uterik people.

23 DR. BUGHER: They obviously should be visited by
24 the special team at least as a social call, if nothing else.

25 DR. DUNNING: What do you wear on an occasion like

1 that?

2 CDR. CRONKITE: Mr. Eisenbud expressed an interest
3 before I left Quadjalein in having urine samples from the
4 Uterik people. When I do not know, or what intervals he
5 desires.

6 MR. HARLEY: Are they back now?

7 DR. BUGHER: They are back on their own atoll at
8 the present time.

9 MR. HARLEY: We would like to get a set of samples
10 before this project gets going, if we can. We were thinking
11 of dealing through the trust territory people perhaps to get
12 a sample certainly in August, and then perhaps another
13 sample when you get out there on the study, if that is
14 possible. I think the urine sampling can be done without any
15 of our personnel there.

16 DR. BUGHER: They are accustomed to it now.

17 MR. HARLEY: Yes.

18 DR. BUGHER: At least the Rongelap people are. So
19 I think that is probably the balance of the thing.

20 Administrative and logistic support we have already
21 discussed. Those are administrative problems which we have
22 to solve among the group here, really. I think that has been
23 already pretty well clarified.

24 Now, the transportation, air and surface. Air is
25 MATS, I presume, and surface transportation again comes to

1 Commander, Naval Station, Quadjalein, I believe, for
2 probably all of it, unless this 10 or 11 ton piece of
3 equipment, and things of that sort, have to go out. That would
4 be a surface transportation problem.

5 MR. HARRIS: I was wondering if you had at all
6 considered the possibility of getting some of your logistic
7 support from the Eniwetok field office, and their prime
8 contractor.

9 DR. BUGHER: Yes, we have. We may very well wind
10 up with a launch over at Rongelap for environmental surveys
11 and continuing studies of various kinds. But at the present
12 moment, we have not approached the field office with any such
13 request. I think in a way we have to wait until the need is
14 a little more clear than it is now before we make a specific
15 request.

16 MR. HARRIS: I was particularly thinking from the
17 point of view of the people who are doing the environmental
18 studies if they could take an LCU or something of that sort
19 from Eniwetok to Rongelap, and work off it. They could
20 perhaps cut down their time of stay from maybe a month down
21 to a week or something of this sort.

22 DR. BUGHER: Particularly between test series there
23 is not too much difficulty in getting such equipment. The
24 question is housing and messing here. That is something
25 I presume the teams have to solve for themselves.

Alderson Reporting Company
Washington, D. C.

1 CDR. CONARD: Accomodations on Majuro are very
 2 limited. Before we ate with the Air Force weather group
 3 there. They were kind enough to feed us. But their
 4 facilities are extremely limited. I think we really should
 5 have some concrete arrangements made before we go this time.

6 DR. BOND: On that, NRDL says it will not be too
 7 difficult to contract with the trust territory on a setup where
 8 we can do this to have them house us and feed us, and we
 9 can provide any additional food they might require, and
 10 also provide them with additional personnel they might require
 11 for the preparation of the food. This could be accomplished
 12 very easily on our working level provided the overall
 13 situation were taken care of at the higher level.

14 DR. BUGHER: There will be abundant supplies of
 15 fish and cocoanuts.

16 CDR. CONARD: And we could take some C rations
 17 along.

18 DR. BUGHER: I think those matter we could very well
 19 ask the trust territory administrator to see what he can
 20 provide, and when they reach the limit of their resources
 21 we can supplement them. It is almost as quick to build a
 22 thatched hut as it is a tent, and much more comfortable.

23 CDR. CONARD: The housing is not so much of a
 24 prblem as feeding. They were unable to take care of our
 25 small group in feeding us. The housing was no particular

ARC

SEARCHED
 INDEXED
 SERIALIZED

1 problem.

2 DR. BUGHER: That is one of those things to be
3 worked out as you go along, I think.

4 CDR. CRONKITE: I think what is more of concern to
5 Dr. Bond and me is who is going to take the administrative
6 responsibility of seeing that all these things are arranged
7 sufficiently far in advance so that we don't get into a bind
8 when we arrive. It is going to take quite a lot of doing.

9 DR. BUGHER: In the first place, you will get into
10 a bind when you arrive almost inevitably, that is, it always
11 works out that way. We will undertake to clear through here
12 a request for what you need as far as you can foresee it,
13 and with AFSWAP, and the Navy to get all the arrangements
14 made ahead of you.

15 DR. BOND: Is it permissible to correspond with
16 the doctor on Majuro in informal correspondence?

17 DR. BUGHER: I think it should be with copies in
18 here so we know what has been done. When it comes to
19 something that is specifically asked of the trust territory
20 people, then we should go through a formal route. I mean by
21 trust territory administration. If you want food, services,
22 and things of that sort, then we should put that to the
23 Commissioner himself. It almost always works out in the end
24 that it is the Navy that does it.

25 CAPT. YARBROUGH: I just wonder in that respect
if perhaps some advance information to CincPac could not

1 be furnished? They are the ones that can effect detailed
2 arrangements for messing. They will ask the Air Force
3 facilities, do you have sufficient rations and personnel to
4 feed so many people. If you don't, Commander, Quadjalein
5 will probably be directed fo furnish the same.

6 DR. BUGHER: That is right. Our procedure has
7 been all the time that CincPac is always informed of whatever
8 is going on. We have operated right along on that basis.

9 CAPT. YARBROUGH: But also as usually happens, the
10 quality of such depends entirely on the diligence of the
11 individual who is addressed to get these things dom. I was
12 a little disappointed that Clark is leaving, because the
13 suceeding man won't be familiar with the visiting group.
14 Admiral Clark may have briefed his successor. I think
15 perhaps it might help if in addition to what CincPac directs
16 that personal correspondence to Commander, Quadjalein might
17 help out a great deal.

18 DR. BUGHER: Yes. Does that help? We will attempt,
19 then, to make these arrangements through the various channels.
20 In other words, we can act here as a clearing house. That
21 means we will work with AFEWAP , with BuMed, with CincPac,
22 with the Commissioner of the Trust Territory, whatever
23 channel is appropriate for that particular problem.

24 The AEC field office gets called on, too, for help
25 here. If we have to hade additional housing, for example,

Alderson Reporting Company
Washington, D. C.

ARC

1 for the venture to Rongelap, we will have it put up. Those
 2 things I believe we can take care of as need arises and
 3 really should not be any source of worry to the group here.

4 DR. BOND: Will it be appropriate for us to supply you
 5 with a list of requirements, dates, and so forth?

6 DR. BUGHER: Yes, I think so.

7 DR. BOND: And what is required you will handle
 8 from that point?

9 DR. BUGHER: Yes, we will put it in the various
 10 places where it needs to be.

11 CAPT. YARBROUGH: The first figure you need is
 12 how many people are going, and how long you are going to stay.

13 DR. BOND: May we discuss that for just a moment? Is
 14 there any opinion on the number of people that should go. I
 15 think we started that discussion earlier, and got sidetracked
 16 into something else. The facilities on the island would
 17 accomodate not more than 15 people without considerable
 18 difficulty. I personally feel we can probably get along
 19 with less than 15. Does anyone have any specific opinion as
 20 to the number that should go?

21 DR. BUGHER: I hope it would be less than 15. The
 22 mere compact group, the more smoothly operating it would be,
 23 and less of a strain on whatever locality it comes to rest in.
 24 Every time you add a man, you add a bed, you add a chair and
 25 table, and piece of roof, and the capital outlay of course

Alderson Reporting Company
 Washington, D. C.

ARC

1 becomes progressively greater.

2 DR. BOND: The point I was thinking of is whether
3 to take more and stay a shorter time, or take less and stay
4 a longer time.

5 DR. BUGHER: My point of view is that the fewer
6 people, the longer time is the more productive sort of thing.

7 DR. BOND: Then we will compromise on it.

8 CAPT. YARBROUGH: What will you settle on, say 12, 13

9 DR. BOND: We can leave it at 10 or 12, and we
10 can supply in the next few days the specific names. As a
11 matter of fact, we can do it pretty well right now.

12 CAPT. YARBROUGH: I think if you can quote something
13 like not more than 12 people --

14 DR. BOND: I think that is a reasonable figure, not
15 more than 12 people.

16 DR. BUGHER: Is there any other aspect you would
17 like to bring up in that connection?

18 CDR. CONARD: Do you think these arrangements
19 could be completed by around the middle of August or some
20 where thereabouts?

21 DR. BUGHER: I don't see why not. We are going to
22 have a double problem a bit. That is, one for the medical
23 people, another one for the environmental people, and the latter
24 may need either a landing craft for a week or ten days, or
25 it might need that plus a temporary camp. We will see where

1 we come out there.

2 That seems to cover the Item C, integration of
3 visits between Marshallese, trust territory, DOD, AEC, and
4 CincPac. All visits which involve Marshall Islands
5 people and area, that is, the territory outside of Eniwetok
6 and Bikini should be cleared through the High Commissioner
7 of the Trust Territory. It will be up to him then to inform
8 his people as to when and who is coming, and what is expected
9 of his people. He will do that with a great deal of
10 enthusiasm, because he feels very strongly that the work of
11 this group has fundamentally greatly benefited the conduct
12 of the administration of the whole trust territory. It has
13 put the United States Government in a firm position of a
14 humanitarian interest in people, and in their welfare, which
15 is worth more than any amount of words. So we can anticipate
16 no reluctance on the part of the trust territory
17 administration to advance these studies in any way that they
18 possibly can.

19 All visits likewise informed to CincPac. In other
20 words, these plans with the trust territory likewise should
21 be communicated to CincPac. The various other groups here
22 which are concerned, also, that is, AFEWAP, in general, is the
23 channel for the information of the services as to what is
24 going on. Entry to Bikini and Eniwetok will be cleared
25 also from here through Santa Fe Operations Office, and the

Alderson Reporting Company
Washington, D. C.

ARC

1 Eniwetok field station.

2 Is there any other thing that you can think of in
3 regard to routine information of channels?

4 DR. DUNHAM: No.

5 DR. BUGHER: Are there any other comments on those
6 things? What do you think, Col. Browning, in regard to these
7 information channels? Have we missed anything that we should
8 do or have we suggested doing anything we should not do?

9 COL. BROWNING: No, sir, I don't know of anything.

10 I would like you to put in a plug here for a very firm
11 commitment through trust as to the housing and messing
12 because it takes a long time to get extra food out there.
13 If you send 13 people, it is 40 miles a day, and it is not
14 quite that easy for them to provide it. This ought to be
15 well established in advance. If you leave it on the local
16 level, the local officers, whether naval or whatnot,
17 are very hesitant on stepping on the trust toes, and rightly
18 so. They are not in a position to do many of the things that
19 they might do on a stateside base. Anything that can be done
20 in the way of administration earlier will help to get things
21 done in better fashion.

22 I would suggest in that respect, too, that a rather
23 firm agenda be supplied to the trust so that they will know
24 who will be where under what circumstances, and leave us
25 enough slack in it so that there can be made local adjustments.

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 But again this ought to be done well in advance.

2 DR. BUGHER: Yes, there are two ways of laying down
3 supplies at Majuro. One is through Qudjalein Naval Station
4 and another way is essentially privately through the Island
5 Trading Company, which is due to fade out this fall. But it
6 still exists and is looking for business. I think the point
7 you make would hold equally true there. Unless there is
8 planning well ahead, it will be snafu at that end. So these
9 requirements will have to be drawn up rather rapidly and
10 everybody should be informed about them completely.

11 COL. BROWNING: I have a rather large map of the
12 Majuro area, and it looks as though that particular island
13 is about two nautical miles right across the lagoon to Church.
14 I meant to ask you this before. Is that settlement down on
15 the end of the lagoon?

16 CDR. CONARD: The island with the church on it?

17 COL. BROWNING: Yes. The map shows a church, a
18 couple of radio towers.

19 CDR. CONARD: That is at the opposite end of the
20 lagoon, as I remember. The main island is the extreme
21 southern end of the lagoon. There are a series of islands
22 there that are connected by causeways. I was asking Dr.
23 Bugher whether this island was accessible by road, but
24 apparently it is a separate island.

25 DR. BUGHER: My understanding is that it is not.

Alderson Reporting Company
Washington, D. C.

ARC

1 From a landing on Majuro to the launch landing to this
 2 settlement would be five miles. But that is hearsay as far as
 3 I am concerned.

4 CDR. CONARD: I don't remember this particular island.

5 DR. BUGHER: This was not inhabited previously.

6 COL. BROWNING: The chances are that they have some
 7 sort of water transportation set up at the present time.

8 DR. BUGHER: Yes, they have two launches there, I
 9 believe. The trust people seem to have no worry about that
 10 transportation link there. When we get back to the Rongelap-
 11 Uterik atolls, then they are in trouble, and they really
 12 can't move without the Navy moving them.

13 Are there other points that occur to you? Does
 14 that seem to be adequately covered?

15 CAPT. KELLUM: Yes, it seems to be well covered.

16 DR. BUGHER: The project officer and reports.
 17 Whoever is the project officer is to be responsible for the
 18 compilation of the report of that visit. Is that your thinking,
 19 Gene?

20 CDR. CRONKITE: The main thing I would like to
 21 clarify is what is the report channel? To whom does one report?

22 DR. BUGHER: To the Division of Biology & Medicine.

23 CDR. CRONKITE: It is not a task force report that
 24 goes through the WT channel?

25 DR. BUGHER: The task force has terminated, or will

Alderson Reporting Company
 Washington, D. C.

ARC

Department of the Navy
 Historian's Office
 ARCHIVES

1 be pretty soon now. So it is a continuing study outside of
 2 the original task force responsibility. These reports, however,
 3 will go into AFSWAP. They will go to the then existing task
 4 force so that all the various people who have and will be
 5 concerned with operations there will have this material
 6 available to them. But that would be handled in the normal
 7 way in which AFSWAP takes care of these things.

8 The report itself would come here. We would
 9 arrange duplication at Oak Ridge through the customary
 10 procedure. The main job would be to get the report produced.
 11 After that, the reproduction is not difficult. For example,
 12 when Vic has this next special trip, then the report will
 13 come via NRDL into -- what is the channel there? To you?

14 CAPT. YARBROUGH: Via BuMed to BuShips.

15 DR. BUGHER: And then here to us. If it is from
 16 MNRI, it will come from your office.

17 CAPT. KELLUM: Yes.

18 DR. BUGHER: Depending on where the team is based.

19 Any service that we can render in helping the thing that
 20 is something we will be glad to do, whatever it may be.
 21 In that sort of function, we are simply trying to help and
 22 not as a matter of authority and command, but naturally expect
 23 everybody to give a lift whenever you can. We come to the
 24 natural adjournment time for luncheon, I take it.

25 After luncheon, I think we should discuss a little
 more some of the things which we should do in the course of

Alderson Reporting Company
 Washington, D. C.

ARC

Department of Energy
 Historian's Office
 ARCHIVES

Alderson Reporting Company
Washington, D. C.

ARC

1 the environmental surveys, and go on to some of the other
2 special things which are mentioned here, before we adjourn at
3 the end of the afternoon. So in that case, we are only three
4 minutes behind.

5 (Thereupon at 12:33 p.m., a recess was taken until
6 1:30 p.m., the same day.)

7 -----

8
9 AFTERNOON SESSION 1:30 P.M.

10 DR. BUGHER: Let us take up some of these considera-
11 tions of the survey which will aid the group that eventually
12 has to do it.

13 Attention is called to accomodation for air and
14 ground surveys, the distribution material in domestic animals
15 and natural foodstuffs, and a long term metabolic study of
16 the fission products in those animals and in the flora,
17 which would of course involve radio chemical studies.

18 I think perhaps John Harley might have some thoughts
19 with regard to the air and ground surveys, and whether an air
20 survey would be helpful at the present time or next year
21 or whether it should be entirely a ground operation on
22 these atolls which would actually be all three atolls,
23 Rongelap, Rongerik and Uterik.

24 MR. HARLEY: Our feeling on it has been that at
25 least the preliminary survey should be by air, because so

Department of Energy
Washington, D. C.
JAN 1954

1 far at least under a given set of circumstances, you should
2 be able to get good correlation, as we do.

3 Gordon might not always agree, but when we looked
4 at such places as our estimate of dose, the Rongelap, which
5 is of the order of 200 r and so on, I don't think that you are
6 far off. Therefore, as the first step in a survey, I think
7 it would be done by air. I don't think it should be limited
8 completely to these particular atolls. I don't know how much we
9 can do about it now, but on the last shot, for example, we
10 found rather intensive fractionation of material, when the
11 separation between spots was only a little over 100 miles.

12 I think the decay rate was more than doubled at
13 the farther out location. We would like to get more data of
14 that sort for that purpose. After preliminary aerial survey,
15 you might be able to decide where to take your ground samples.

16 DR. BUGHER: Would people in the New York laboratory
17 be willing to do it?

18 MR. HARLEY: We would be very willing to loan out
19 the instruments.

20 DR. BUGHER: Yes, I know that. There is a question
21 of uniformity of procedure here. It took quite a lot of
22 beat-up before the cooperation which was necessary between
23 the flight crew and the radiological mapping people had been
24 established.

25 MR. HARLEY: I think you were speaking of the work

Alderson Reporting Company
Washington, D. C.

ARC

1 on the last couple of shots, were you not?

2 DR. BUGHER: I was thinking of the flight surveys
3 out of Quadjalein, which were carried on during Castle.
4 It took quite a background of experience which was built up
5 during Ivy, which was drawn on to guide that.

6 Again, it would be in an aircraft out from
7 Quadjalein. I suppose a P-2-V. One would like to get one of
8 the crews that had previously done this sort of thing.

9 CDR. CRONKITE: I think the P-2-V squadron was
10 relieved after the operation. It was only there for security
11 purposes.

12 DR. BUGHER: It was to leave in toto?

13 CDR. CRONKITE: Yes. Admiral Clark mentioned that
14 one time. They were only there for the security of the group.

15 DR. BUGHER: Not even a Piper Cub left, I suppose.

16 MR. HARLEY: I have no doubt that somebody would
17 go out, but as far as supplying a full crew, I think that
18 they would prefer not to if they could. That is, to send out
19 a man who is a combination maintenance man and so on, if
20 anything went wrong.

21 DR. DUNNING: Dr. Bugher, I am wondering at the
22 moment what purpose these aerial surveys might serve. We
23 are pretty well agreed that we are going to make ground
24 surveys at the three atolls of immediate interest. Possibly
25 we might want to make air surveys of some of the more distant

Alderson Reporting Company
Washington, D. C.

ARC

1 atolls. Again I don't know for what purpose.

2 MR. HARLEY: It was under the impression that you
3 would be making ground surveys only at three islands, and
4 not three complete atolls.

5 DR. BUGHER: Three atolls.

6 MR. HARLEY: Three complete atolls.

7 DR. BUGHER: Yes. I think the ground survey would
8 have to make the whole survey circuit of each of the atolls
9 here. You see, a monitor getting off one end and plotting
10 at the other end of the island. I guess he would be picked
11 up by launch. But I can see miles and miles of footwork
12 in prospect for somebody.

13 DR. DUNNING: I think that was my point, that
14 since we are going to send in ground surveys into the areas
15 of major interest, we have a pretty good notion what the
16 levels are going to be in the more distant areas, and that
17 is rather low.

18 DR. BUGHER: I was going to ask that question.
19 What do you expect?

20 DR. DUNNING: I don't have the data here with me,
21 but I can dig it up in a hurry. They will be low certainly
22 in terms of any health hazard. They will be so low in fact
23 that I begin to wonder whether the accuracy of the air survey
24 is worth the effort. In other words, why do you want to go
25 down and make an aerial survey on these distant atolls?

Alderson Reporting Company
Washington, D. C.

ARC

1 MR. HARLEY: I will ask the question in reverse.
2 Why do you want to make a ground survey on the unoccupied islands
3 of these atolls?

4 DR. DUNNING: If we wanted to make a survey, we would
5 be dealing with relatively small numbers. I mean the radiation
6 levels would be relatively low.

7 DR. BUGHER: A few MR per island.

8 DR. DUNNING: Therefore, I am wondering how much
9 confidence we can place in an aerial survey. To repeat your
10 question, why go in on the ground? I didn't say to go in. I
11 think this is perhaps a point for discussion, but if you
12 want in with a ground survey ostensibly it would be to measure
13 the low levels for scientific reasons and not health. You
14 are dealing with such low levels of radiation, that is why I
15 was wondering if the aerial survey would do the job.

16 DR. BUGHER: If one could substitute the aerial
17 survey for footwork, let us say, in the expanse of the
18 northern island of Rongelap, then make the ground survey as
19 a number of spot checks, that would cut down the labor, I
20 suppose, very materially.

21 DR. DUNNING: I was hoping that the ground survey
22 teams would go into the northern islands of the Rongelap
23 Atoll. Those are of the most interest.

24 DR. BUGHER: We have a pro and a con on this. Does
25 anybody have additional comments?

Alderson Reporting Company
Washington, D. C.

ARC

Alderson Reporting Company
Washington, D. C.

1 MR. IMIRIE: There is one thing that comes to my
2 mind, Dr. Bugher, and I have talked to Merrill Eisenbud about
3 it, Harley and Dr. Dunning; there has been a question from
4 every survey group that went out as to what readings were at
5 various points. Of course, we all know what happened on
6 these readings. In some cases there were uncalibrated instances
7 and in other cases they were two feet from the ground or three
8 feet from the ground or near the water or under a "hot". It is
9 true that is where the people were. But in addition to that,
10 there was an aerial survey taken which indicated a little
11 higher r than most of the ground surveys. The aerial survey
12 would tend to integrate the average dose on the entire island
13 as compared to searching out hot spots and cold spots. If
14 for nothing else, it would give an inter-comparison of
15 one island between another island or one atoll against another
16 atoll on an average integrated basis.

17 Further than that, two readings of aerial survey
18 might prove out or disprove the centimeter which was used.

19 MR. HARLEY: We have data here, for example, on
20 Rongelap taken at 32 hours, one with a T-1-B, and the other
21 with the scintillator or from the air, and the difference
22 between was essentially nothing. It is less than 5 per cent.

23 DR. DUNNING: Yes, but I was out there, and the
24 first comparisons I made were between the air and the ground
25 and differed by a factor as high as four. I have the raw

ARC

1 data here somewhere. Later, Al came up with a new
2 correction factor. That brought the two readings in line.
3 By two readings I mean ground and air. So I think one has
4 to take a pretty close look at the data to see how valid these
5 readings are. Maybe before the operation was over with,
6 maybe he got this correction factor down a little better.

7 MR. HARLEY: There was a little difficulty out
8 there at the beginning. I think it was merely a misunderstanding
9 of Al's. The reason I am pretty sure there was a misunder-
10 standing, even after talking with him, is that he was getting
11 the difference using the centimeter on the ground and the
12 air in the height conversion factors. We spent a lot of time
13 out there after the whole crew was around in re-doing our
14 conversion factors.

15 DR. DUNNING: Understand, I am not taking a strong
16 stand against aerial surveys. They were most valuable and
17 especially in the early times after a shot, when we were
18 pulling our hair wondering what was going on out there. I am
19 not sure, but that it should be done. I am just raising the
20 points that came to us out there, and again say just what
21 purpose are we trying to serve by these additional surveys.

22 MR. HARLEY: My feeling still is that you probably
23 would pick Rongelap Island for your ground surveys and stick
24 to the air for the others, rather than trotting all over
25 under that hot sun. At the same time, of course, you would

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 be able to get your cross checks from one to the other.

2 CDR. CONARD: Do these surveys give us any better ideas
3 as to what the original dose was by extrapolating back?

4 DR. BUGHER: There would not be decay, and the decay
5 with time has become more complicated by the weathering
6 factors which come in.

7 DR. DUNNING: I doubt there would be any additional
8 data that would turn up at this stage of the game that
9 would influence our thinking on the original estimation. We
10 were concerned in terms of the decay constants between
11 the six hour and the fiftieth hour, which might well be a
12 different decay than it is now.

13 MR. HARLEY: Your change in total dose would be
14 slight, no matter what the decay rate was, after the
15 first few days, because almost all your total dose is in
16 the first few hours anyway.

17 DR. BUGHER: There is somewhat of a question as to
18 how to get the most information with the least work here.
19 Payne, do you have a thought here?

20 MR. HARRIS: When I read this, I personally could
21 not see any particular reason for doing air surveys unless
22 it was to continue attempting to calibrate between good
23 round readings and air readings to get a calibration factor.
24 I question whether this is necessary to go to Rongelap in
25 the Pacific to do this. Could not this be continued in

Nevada in the next series of operations?

Alderson Reporting Company
Washington, D. C.

ARC

1 Other than that, as far as an adjunct to environ-
 2 mental studies, again I do not see where an air survey applies
 3 to this. My feeling about environmental studies is that if
 4 you are going to measure the activity in a cocoanut, you want
 5 a survey made at the point that cocoanut is picked up off the
 6 island, or close to it, and not from the air. So what surveys
 7 were made on other islands than Rongelap, if you got samples
 8 from those other islands, you would still need the ground
 9 survey there in order to correlate in your final analysis
 10 of the data. In other words, an air survey on an island
 11 which was going to be used for sampling ground I can't see as
 12 accurate at all.

13 MR. HARLEY: If you are going to be on the ground,
 14 you might as well take a ground survey.

15 MR. HARRIS: Yes. The only way you can get samples
 16 is to be on the ground, and take the survey right there.

17 MR. HARLEY: If you are not going to take samples,
 18 then the question is, should you take an aerial survey or
 19 should you go in and take a ground survey?

20 DR. BOND: Are these surveys of areas already
 21 surveyed?

22 MR. HARLEY: Yes.

23 DR. DUNNING: About the only thing you can
 24 accomplish is to tell CincPac and other people that the

25 activity on these atolls has gone down so much. That is the

Alderson Reporting Company
 Washington, D. C.

ARC

Department of
 Environment's Office
 ACTIVITIES

1 only reason I can think of at the moment, and then aerial
2 surveys would be called for.

3 DR. BUGHER: Another point of view, the only area
4 where the strontium 90 component would be enough of
5 consequence is probably in the northern island of Rongelap.
6 That takes pretty detailed and careful ground sampling of
7 soil, plants, and the animals and so on.

8 DR. DUNNING: It might be of interest to this
9 group that according to the calculations there is about half
10 of microcurie of strontium 90 per square foot up there on
11 one of the islands, and I am very anxious to see how close
12 these theoretical figures become because this is getting up
13 in there, shall I say.

14 DR. BOND: Which island is that?

15 DR. DUNNING: N-a-e-n I believe is the proper
16 spelling.

17 MR. HARRIS: If you collect enough, you might be
18 able to sell it for isotope uses.

19 DR. DUNNING: Yes.

20 MR. HARLEY: Or make your own batteries.

21 DR. BUGHER: One other aspect of the aerial survey
22 is one reason why I asked John if somebody from the New York
23 lab would be running it, is that if it is done at all, the
24 calibrations have to be done very carefully and at rather
25 exhaustively, and the whole thing carefully controlled, or

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

Alderson Reporting Company
Washington, D. C.

1 else the results are not those which would command confidence
2 and therefore of limited use. It is not something that you
3 just send out an instrument to somebody on Quadjalein, and
4 tell him to stick it in a plane and fly it over the atolls and
5 send back the record.

6 MR. HARLEY: I would like to add, although I
7 don't defend the comparative reliability of instruments, that
8 people tend to have a great deal of faith in something like a
9 T-1-B, and drag that out and make a measurement and come
10 back and that is the fact. Whereas, ourselves, because we
11 recognize that they are not particularly stable, we don't
12 have quite so much faith. I think that the same calibration
13 business has to apply to everything that is used out there.

14 DR. BUGHER: That is very true.

15 MR. HARLEY: We made a check on energy dependence
16 out there. Actually we had it made here at the Bureau of
17 Standards, afterwards, as you know. There is quite a
18 difference between the scintillation unit and, say, the T-1-B.
19 We found actually that the T-1-B cuts off higher than people
20 seem to think, closer to 100 kilovolts, whereas the
21 scintillation is sensitive down close to 40.

22 DR. BUGHER: Yes.

ARC

23 MR. HARLEY: So we have to consider calibration
24 and energy where both sets of instruments are used.

DR. BUGHER: That is correct. The standardd

Department of Energy
Washington Office
AD-111-105

1 calibration of the T-1-B has been with cobalt 60. I
 2 believe the two instruments calibrated that way, they do
 3 agree. When you get into the large component of soft gamma,
 4 the centimeter gives a higher reading by a factor of two or
 5 so, I thought, early in this fall. It is something that
 6 is of that order, anyway.

7 I think that is a subject perhaps we ought to give
 8 a little more consideration to, as to whether the airborne
 9 survey would pay in view of the fact that we want ground soil
 10 samples and plant samples from almost the circumference of
 11 these atolls, which means ground survey anyway, as well as
 12 sampling. Whether the additional effort which would be
 13 required to get a good area survey into operation would pay
 14 is the question. I think perhaps we could discuss this
 15 somewhat more later.

16 Does anyone have a strong feeling one way or
 17 another here? We heard the pros and cons.; I don't believe
 18 there really is much more to say. I am just estimating what
 19 is the easiest way of getting the necessary data. We do
 20 want to document all the islands by one means or another on
 21 each atoll.

22 Let us turn to the question of internal hazard.
 23 Domestic animals and natural foodstuffs were suggested. On
 24 Rongelap I think you could say that the domestic animals
 25 that were there are no longer there.

Alderson Reporting Company
 Washington, D. C.

ARC

Department of Energy
 Environmental Office
 10/1/53

1 CDR. CRONKITE: Rongelap Island, they were not
2 there, but there were quite a few hundred chickens on the
3 northern island.

4 DR. BUGHER: To the very far north.

5 CDR. CRONKITE: Yes.

6 DR. BUGHER: Do you expect to find any surviving
7 chickens?

8 CDR. CRONKITE: They were supposed to be there.
9 Whether they are alive, nobody ever got up there. Which
10 island did you get to?

11 LT. CHAPMAN: Aniola. That is about five miles
12 north of Rongelap.

13 CDR. CRONKITE: You didn't get any there?

14 LT. CHAPMAN: There are no chickens there. They are
15 farther north.

16 DR. BUGHER: The farther north you go, the less
17 likelihood there will be of a surviving chicken. What was
18 the estimated total dose on the far north?

19 DR. DUNNING: The infinity dose was 7,800 roentgens.

20 CDR. CRONKITE: Chickens won't survive 1,000 r.

21 MR. HARRIS: Are there any rats left out there?

22 DR. BOND: I didn't see any at Rongelap.

23 DR. BUGHER: I think you have to assume that all
24 the vertebrate population in the northern islands would be gone
25 or not there any more. Chickens and pigs will be put back on

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historical Office
ARCHIVES

1 Rongelap when people return. They have been put back on
 2 Uterik now. So the domestic animal supply is going to be
 3 practically speaking animals introduced after the environment
 4 has become acceptable for human habitation. Can you get much
 5 out of that or not? That depends on how much low level
 6 studies one wishes to do over a period of time. It would
 7 certainly appear to be worthwhile to have a certain number
 8 of domestic animals with the idea of sacrificing them after
 9 a time, or lease accumulating bones after a year or so
 10 from the standpoint of their uptake of fission products.

Alderson Reporting Company
 Washington, D. C.

11 DR. BOND: Dr. Bugher, along that line, wouldn't it
 12 be as good or better to return material to the most active
 13 areas? I am not interested in determining how much the
 14 animals pick up from the environment. If we know what we
 15 gave them and how much they took up, we would have valuable
 16 information.

17 MR. HARRIS: Might it be reasonable to suggest
 18 that some domestic animals be put back on the islands on
 19 Rongelap itself, when you go out the next time, and those
 20 animals could be left during this interim which might
 21 possibly give you an idea of what the translocation range is
 22 before the natives come back.

ARC

23 DR. BOND: That again is for animals, and will
 24 be eating different food from the human.

Department of Energy
 Historical Office
 RG22615

25 MR. HARRIS: I am not thinking of extrapolating

1 to human beings. These people will introduce animals when
2 they get back there. There may be a concentration of certain
3 isotopes, such as strontium 90, for instance, in these
4 animals or in the meat parts of these animals, which would
5 be subsequently eaten by the natives. If you put animals
6 back, immediately you would get an idea at measurable levels
7 of what this translocation rate might be. Remembering that
8 people are going to eat these animals later on.

9 CDR. CONARD: They won't eat the bones.

10 DR. BUGHER: What about taking Rongelap soil
11 somewhere else and doing studies?

12 DR. BOND: If you are going to do that, you should
13 know what you gave them, and not turn them loose at random.

14 It seems it is a pretty haphazard thing of putting
15 animals there to see if they do or do not take up the
16 material.

17 DR. BUGHER: The sort of thing you are speaking of
18 is a matter of past record. It is not the haphazard
19 situation that you are really interested in.

20 DR. ROBERTSON: I don't think it is a matter of pas
21 record. Things have been given in more or less purified
22 chemical form, but I don't think they have been mixed with
23 anything that would compare with Rongelap.

24 MR. HARRIS: Isn't the haphazard normal in this case

DR. BUGHER: That is the normal.

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
ARCHIVES

1 MR. HARRIS: This is what you are interested in.
2 I am interested from the point of view of the natives and
3 getting a practical experiment, rather than a laboratory
4 experiment out of it.

5 DR. ROBERTSON: Are we asking for both?

6 MR. HARRIS: Personally I am not interested in
7 either one of them, but I am suggesting that be done.

8 DR. BUGHER: It goes to what you are trying to
9 establish. If you are trying to document the environment
10 and what a pig, let us say, at Los Angeles, let us say, might
11 do with respect to that material thrown into its food supply,
12 is a matter of rather remote relevance to the island
13 situation. We have such studies that were made of mixed
14 fission product from weapons tests, not necessarily from that
15 atoll. We did have 500 pounds returned, some to Beltsville and
16 some to Los Angeles and Hanford. We have a lot of work in
17 Nevada which is concerned precisely with that, and the uptake
18 from the soils contaminated with fission product outfall.

19 CDR. CONARD: I think if you put some dogs on the
20 animal, they would be more comparable to the human situation.
21 They are quite as dirty as pigs and chickens in their eating
22 habits.

23 DR. DUNHAM: But if you leave them there alone.

24 CDR. CONARD: I mean after they go back.

25 DR. BOND: It has been quite a problem of getting

Alderson Reporting Company
Washington, D. C.

ARC

Alderson Reporting Company
Washington, D. C.

1 the animals out there, and having to keep them alive for
2 a stated period of time. There is no one on the island, no
3 water supply and no natural food supply, It is not an easy
4 problem.

5 DR. BUGHER: Unless an investigatbn or experiment
6 really is relevant to the main issues of giving us sound
7 information on the character of the environemtn, I don't
8 think we should undertake it. Just putting a few dogs on
9 the island when there are no people there is a fairly major
10 venture. Those dogs will run about \$5,000 each by the time
11 you get them on the island. Then you ask the question, what
12 do you get out of the venture, and I tink you would come to
13 the conclusion that you would not get very much, that would
14 be descriptive of the island.

15 DR. DUNHAM: What would you expect to get from the
16 data that would be important to the data of NRDL?

17 MR. HARRIS: I don't know. In one edible part you
18 might find some concentration. This would be in the liver,
19 for instance. I assume these people eat the livers of their
20 chickens. According to the NRDL data, at least in the case
21 of the fish, there is a fair concentration in the fleshy
22 parts of the fish that are eaten. I really don't know. This
23 was just a suggestion that I thought might have some
24 application in/real long range thing, which is Operation Gabriel

ARC

25 DR. BUGHER: Yes.

Department of Energy
Administrative Office
ARCHIVES

1 MR. HARRIS: Then this might have some long range
2 applications as far as Operation Gabriel is concerned.

3 DR. BUGHER: In this consideration, how do you feel
4 about simply taking specimens at intervals as the islands are
5 visited from their pigs, from their chickens and dogs, and
6 from the people as they die, too, if you can possibly get
7 the material, without making a special planned location of
8 experimental animals? That is our Gabriel program which is
9 essentially an empirical one, soil, plants, and animals,
10 and locations of fission products. That costs almost nothing,
11 then, in terms of manpower and time.

12 Wild animals might have been mentioned here. It
13 is really implied in the fauna. The shell fish and crabs.
14 Some of these islands have high populations of crabs, or did.
15 I don't know what the situation would be now. It has always
16 been an impressive thing that at Eniwetok, certain of the
17 islands are favored localities for particular species of
18 crabs. You find large populations of particular species on a
19 particular island. I believe that holds true on the other
20 atolls generally.

21 CDR. CONARD: Are these edible crabs you are speaking
22 of?

23 DR. BUGHER: Yes, I presume they are.

24 CDR. CONARD: I have seen a lot of crabs there,
25 but I wouldn't eat them, probably.

Alderson Reporting Company
Washington, D. C.

ARC

1 DR. BUGHER: It depends on how hungry you are.
2 Is the big cocoanut crab eaten?

3 CDR. CRONKITE: They didn't list that crab, as I
4 recall, in their list of items that they used. They at
5 practically everything other than that.

6 DR. BUGHER: There must be some reason for that. In
7 the surveys, specimen material of these various indigenous
8 fauna would be desired to these various groups concerned with
9 these analyses.

10 Under natural foodstuffs, do we mean the plants or
11 the plants and fish?

12 CDR. CRONKITE: All of it.

13 DR. BUGHER: Specimens have been taken of cocoanuts,
14 I believe.

15 MR. COHN: Cocoanuts, bannanas, papayas. I think,
16 however, at the time the specimens were taken, it was too
17 early to expect any incorporation of the fission products into
18 the plant material itself. However, it will be desirable to
19 study this at later intervals. That material does get into
20 plants. We have pretty good indications of it in the
21 fact that there is very high activity in the sap of the cocoa-
22 nut tree. This is bound to be incorporated into the fruit
23 some time later.

24 DR. BUGHER: You had cocoanut samples, too.

25 MR. COHN: There was no activity found in the edible

1 portions of any fruit.

2 DR. BUGHER: That is interesting. I had the
3 impression that the cocoanuts also were showing activity.
4 But the sap of the palm did, is that correct?

5 MR. COHN: Yes.

6 CDR. CRONKITE: Is there any possibility that those
7 samples could have gotten mixed up? There was one sample of
8 juguru that was sitting out in the open, and there were
9 other samples that were taken from the palm.

10 MR. COHN: We have three samples from Rongelap
11 and three from Uterik, and they are all pretty consistent.
12 The Uterik samples are one third of the activity of the
13 Rongelap.

14 LT. CHAPMAN: In each instance there were two
15 samples of material that had been exposed for five or six
16 weeks, and one sample from Rongelap and one from Uterik which
17 was collected fresh, and they were labeled.

18 DR. BUGHER: No question of contamination from
19 the container or anything.

20 LT. CHAPMAN: No, sir.

21 CDR. CONARD: Only in the one sample there was no
22 question of contamination.

23 LT. CHAPMAN: No, we took our own containers.

24 MR. COHN: The activity was of the level of one
25 microcurie per liter, and that is away above the external

1 contamination.

2 MR. HARLEY: We ran some of those, and the
3 interesting feature to me was that on the two islands the
4 water sample and the cocoanut sample were almost identical.
5 It was just about the same activity.

6 MR. IMIRIE: That is just what I got, too.

7 CDR. CRONKITE: Dr. Bugher, there is a point that
8 comes up almost you might say in experimental design that
9 where the method by which the sample is collected is so
10 important in the interpretation of the results, I just have
11 a strong feeling that people that are doing it in the
12 laboratory or someone that is working with them should do the
13 collection. I presume that this juguru did have radioactive
14 material in it, but if it were collected in the way in which
15 the natives ordinarily collected it, I think it would be
16 difficult to prove that it was coming from the external surface
17 of the palm, rather than incorporating into the sap.

18 MR. HARLEY: You could tell that from the radio
19 chemical studies.

20 MR. HARRIS: This is so hard. It is so much
21 easier to have somebody there on the spot who is doing the
22 actual collection, and who goes back to the laboratory
23 and sits down and tells everybody in the laboratory what has
24 been done. I think you might run into the same thing on the
25 fish. Dr. Donaldson and those people from the fisheries

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Washington Office
RESERVES

1 lab, will certainly collected plenty of fish, because they
2 always do, but the ones who are doing the project, like Vic's
3 group at NRDL, who are going to do this project, I presume,
4 they should have somebody there at the time these fish are
5 collected, and they should have a representative sample of
6 the fish collected to take back and do their own analyses on.
7 You can't take analyses from another laboratory and correlate
8 them with those from a previous laboratory, and make a lot of
9 sense. It is so much easier to have somebody there out of
10 the operating group at the time of collection.

11 DR. BOND: This is precisely the reason why the
12 people want to go to the field and collect the samples. They
13 will then be well aware from where the sample is being
14 derived.

15 Also, the reason why they wanted a more easier
16 method of collecting that could be accomplished by air as
17 accomplished previously, there was a continuous rush,
18 continuous routing by the pilots to get back.

19 DR. BUGHER: You can't do good sample collecting
20 under those circumstances. I don't think there is any
21 argument there.

22 In regard to the plant samples, I think it will
23 be recalled that this type of information is extremely
24 interesting to plant physiologists, and bears very much on
25 the concept of how contamination moves in plants, particularly

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Washington, D. C.
20540

1 those supplying edible things. This very matter of finding
 2 materials in the sap of the palm and less or little in the
 3 cocconut at that time, is a very significant thing, and points
 4 to the critical character of the sample collection. It has
 5 to be done very carefully, and with regard to rather a great
 6 variety of interests which other people may have in the
 7 material.

8 Are there any other comments?

9 CDR. CRONKITE: I recall in the survey group, Col.
 10 Byers was following the general philosophy on plant life
 11 that the initial ones would be where most of the naturation
 12 of the fruit had taken place prior to the fallout. Then
 13 somebody was going to take the initiative to investigate what
 14 is the normal life cycle of a cocconut, and these various
 15 edible things, and then base the subsequent sample
 16 collection so as to get some that are maturing and some
 17 that are completely matured, and get a third or fourth
 18 generation of fruit. It seems that the whole sample
 19 collection will fall down unless it is tied into the life
 20 cycle of the fruit.

21 DR. BUGHER: You are speaking of the life cycle
 22 of the particular piece of cocconut you have on your hand
 23 or the cycle of the fruiting of the palm? With the cocconut
 24 it is a continuous process practically. Some are mature
 25 as others are just coming on in the infleureseence. That

Alderson Reporting Company
 Washington, D. C.

ARC

1 becomes a matter of description more of the specimen at the
2 time of collection, then.

3 Byer's group did take various specimens. Where
4 did they go -- to NRDL?

5 MR. COHN: Yes.

6 DR. BUGHER: Are those still in process?

7 MR. COHN: These have been thoroughly analyzed.

8 These are the results just mentioned.

9 DR. BUGHER: There you got a whole cocoanut which
10 was then opened in the laboratory.

11 MR. COHN: Yes.

12 DR. BUGHER: So you control the matter of how
13 the material you analyzed was actually taken with reference
14 to external contamination. Did you get much of anything from
15 the cocoanut milk?

16 MR. COHN: No, very little activity in the cocoanut.
17 In the pandana was the only case where there was any
18 internal activity, and here the question is possibly contamina-
19 tion by washing. The foods were all washed externally, and the
20 external wash was analyzed radiochemically. The pandana
21 has a rough core, something like pineapple, and there is a
22 possibility that the material was washed into it. But outside
23 of this, there was no activity.

24 MR. HARLEY: It is very hard to determine how to
25 clean a pandana.

Alderson Reporting Company
Washington, D. C.

ARC

Energy
Office
230

Alderson Reporting Company
Washington, D. C.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

MR. COHN: Yes.

DR. BUGHER: Do we need further comment on this phase of the matter? Dudley is here. You have heard this discussion. Do you have some thoughts in regard to the types of samples which should be forthcoming here, and the way they should be handled?

DR. DUDLEY: I think perhaps one should give some consideration to the isotope mainly interested in, which is mainly strontium, but perhaps not exclusively that. One would I think try to collect samples which conceivably would have considerable concentration of that. For example, I believe at Hanford they find comparatively little concentration in fruit. In the tomatos they find much more in the leaves. I think one should bear in mind the element one is interested in, and what type of plant is likely to concentrate. I think everything should be tied back in case of plants back to the soil.

MR. HARLEY: As far as we are concerned, you would have to have corresponding soil and plant. I think everybody is probably in the same boat. If you are thinking of uptake studies, that is what you would want.

DR. BUGHER: One of the complicating things here is that if you take a cocoanut palm, the degree of absorption from the leaf surface is something that I have no idea about. Maybe you have some data on it. But assuming that it does

ARC

Department of
Energy
Archives

1 occur, then the material of the palm sap and that which
2 comes into the fruiting bodies may be derived either from
3 leaf surface contamination or by way of the roots from the
4 soil. The palm frond is rather persistent, surviving
5 for two or three years before it gets old, and then
6 eventually dies and falls off. The contamination, therefore,
7 of the frond may persist as a factor in the situation for a
8 considerable length of time. There may be a discrepancy
9 between the soil levels and the apparent uptake in the fruit.
10 There is where I think more precise plant physiologist, the
11 one who knows a lot about palms, comes to the fore, that is,
12 in guiding us somewhat on what vegetation specimens one
13 might take to advantage. It makes a big difference on which
14 palm frond you take.

15 CDR. CONARD: One thing that might be interesting
16 to do that is not a great deal of trouble is to take
17 leaf radio audiographs before the leaves get wilted. It
18 is very simple to put them between film and enclose them in
19 paper.

20 DR. BUGHER: That would be a very good guide.
21 It is an easy technique and thoroughly reliable in its
22 application. Obviously, then, the group taking the
23 environmental specimens will need to keep in close touch
24 with a number of other groups and organizations on the
25 sample collection project.

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Office
ARCHIVES

1 Now, we have a topic here of radiochemical
2 studies, the extent to which radio chemistry should enter
3 this environmental analytical picture. John Harley, that
4 seems to be very squarely in your area of interest.

5 MR. HARLEY: There are a lot of other people
6 involved in that, too. We have been doing some work on
7 things that I am not sure are entirely useful, such as this
8 fractionation -- geographical fractionation of material --
9 and that is certainly something that we would continue.
10 In other words, our initial work was all on strontium. We
11 now find that we can use cerium moderately well as a long
12 term base line similarly to what they use molly for in
13 short term studies. That seems to be fairly constant.

14 I think perhaps after some of us can talk this
15 out a bit, it is going to be very-necessary to decide what is
16 run in these different places so we can use the results from
17 one laboratory to another. Certainly I think something like
18 cerium might always be valuable for us in our comparisons.

19 We know pretty definitely that we may have the
20 ruthinium problem here, and it certainly is present in high
21 percentages. If what the British say is correct, we will
22 be wanting to get a lot of information on that.

23 We have found that relations are not such that we
24 can get all the information we would like. Therefore, we
25 frequently have to scratch around with other people to work

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Washington, D.C. 20545
OFFICE OF
OPERATIONS

1 up procedures that they should be running rather constantly.

2 For example, we had to work out completely new
3 ruthinium procedures to handle many of the types of samples
4 we have. I think Payne was mentioning that they were taking
5 other methods and trying to adapt them. I think sometimes
6 we have to exchange experiences again in these wider fields
7 just as we have gone through in the strontium procedure.

8 DR. BUGHER: Yes.

9 MR. HARLEY: We have done an awful lot of our
10 work on these initial samples on just mixed fission products
11 in trying to collect total activity. I don't know how many
12 other people are doing that sort of work. We use it as a
13 rough guide for a lot of things. If so, we would like to
14 get together with them, too. I think it is going to require
15 a certain amount of coordination or the final report is not
16 going to mean too much. We have to decide both what we do
17 as a general procedure, and more or less how we do it.
18 Then individual labs may want to run half a dozen other things
19 but that is up to them. I think for general procedures we
20 are going to have to get together. You are thinking then
21 in terms of strontium, cerium and ruthinium as specific
22 isotopes.

23 What we would run on any sample now probably
24 would be strontium, cerium, ruthinium, some of them still
25 require barium because it is not all gone yet, and in

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Washington Office
10/1/56

1 addition total rare earths and zirconium. With those you
 2 can generally come up with a pretty fair percentage. But
 3 you see when we send you a strontium result and a cerium
 4 result, right away you say what is the rest of it. So somehow
 5 we want to get some sort of a total figure that will
 6 represent more or less what the activity is.

7 DR. BUGHER: The total activity.

8 MR. COHN: We have been doing strontium, barium
 9 and the rare earth group. On the fish we have broken it
 10 down a little further and try to do individual isotope
 11 analysis on zirconium and ruthenium.

12 Further than this we have not gone because of the
 13 difficulty of doing a large number of samples. It is quite
 14 a tedious procedure. Strontium, barium and rare earth
 15 group in most of our samples accounted for 70 to 80 per cent
 16 of the beta activity.

17 DR. BUGHER: How about plutonium in the soil?

18 MR. HARLEY: We have not run any yet. We have
 19 plans to. I don't know about Payne.

20 MR. COHN: We have plutonium outside of the fruit,
 21 coconuts, papayas of the order of 10 to the fourth
 22 micrograms of plutonium.

23 DR. BUGHER: On a fruit, I take it.

24 MR. COHN: Yes. We have also measurements of
 25 plutonium on thatch taken from the top of the native huts,

Alderson Reporting Company
 Washington, D. C.

ARC

Department of Energy
 Health, Safety & Environment
 Archives

1 on grass and soil, running about 10 to the third micrograms.
2 That is at a fairly early interval.

3 MR. HARRIS: You might think of plutonium as one
4 that you could follow. One thing I have thought of that
5 would worry me a little bit would be the fact that in
6 order for a long range application of this to Gebriel, it
7 means a fairly long time study in which, due to leaching
8 in transportation, some of the samples are going to go down
9 in activity relatively fast. Plutonium, however, is one thing
10 that you can follow for a long period of time, much longer
11 than you can some of these others, because of its decay
12 rate, and its longer half life.

13 Another thing that you might think of is this:
14 Do you have numbers on the coral as concentration of uranium,
15 and this sort of thing? Do you have those numbers?

16 MR. HARLEY: We have a couple of them analyzed
17 but we managed to sneak away a few museum pieces.

18 MR. HARRIS: There are numbers available on
19 that area for blanks on alpha emitters in the coral, and
20 these can be gotten if you need them.

21 Here is another thing. In some cases, you might
22 be looking at an alpha, which might turn out to be uranium
23 or thorium, if it was put on an alpha spectrum analyzer. At
24 low levels where you get high grass location rates or
25 high leaching rates, you might run down very soon to the point

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historical Office
ARCHIVED

1 where you would need to know what these backgrounds were.

2 MR. COHN: I think I better throw one correction
3 in here. I said ten to the fourth. Those figures are ten
4 to the minus fourth, and ten to the minus third.

5 MR. HARRIS: That is what I was thinking, that the
6 whole island was going to go critical here.

7 DR. BUGHER: That is a lot of material, isn't it?

8 MR. HARLEY: That is per gram --

9 MR. COHN: In the thatch that is five times ten
10 to the minus third per three gram sample. Soil is about one
11 times ten to the minus third for a one gram sample of soil.

12 MR. HARRIS: Now you are getting down to the places
13 close to the background already, and you will have to take
14 sooner or later such as the natural blank alpha activity.
15 They are available. The places to get them are from the
16 radiochemical group at Los Alamos, who has to analyze this
17 all the time. This has been done out there. There are
18 other interesting things that might be of interest here.

19 For instance, among this coral that fell down on
20 the island was an added amount of uranium which was set up
21 alongside the experimental device to be able to subtract
22 out the coral blank. ~~DELETED~~

23 ~~DELETED~~

24 ~~DELETED~~

25 ~~DELETED~~

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Washington Office
RECEIVED

1 [REDACTED] DELETED

2 [REDACTED] DELETED

3 [REDACTED] DELETED

4 [REDACTED] DELETED

5 [REDACTED] Various matters like this may have to be
 6 taken into consideration. You put so much there that the
 7 concentration is so much higher than the coral blank that
 8 when you add the coral blank into this mass the ^{error} /~~is~~ introduced
 9 by adding the coral is very small and you can use the
 10 concentration that you find as a fraction of how much was
 11 set there.

12 DR. BUGHER: That is what they call keeping
 13 environment simple and untouched.

14 MR. HARLEY: Considered as a tracer.

15 MR. HARRIS: It was a tracer, yes.

16 DR. BUGHER: That is very helpful. I think
 17 perhaps if any of you have some thoughts from time to time
 18 on these things -- that is an important element which I
 19 missed entirely before, I don't know anything about the extra
 20 uranium being added to the blank situation -- I think all of
 21 us could very well spend a little time thinking a bit about
 22 things that are needed in this picture, things which should
 23 be analyzed for, the limitations, and if you have a thought
 24 like that, send it in and we will be glad to circulate it.

25 MR. HARRIS: These are things that come up and I just

Alderson Reporting Company
 Washington, D. C.

ARC

Department of Energy
 Office
 DIVISION

1 happened to think of this one that occurred. You can also
2 get such things as how much plutonium was made in the
3 device during the detonation. This knowledge you will
4 probably have some use for.

5 DR. BUGHER: We have that, yes.

6 MR. HARRIS: I don't think this can go into
7 this unclassified report.

8 DR. BUGHER: No.

9 ~~DELETED~~

10 ~~DELETED~~ You can use
11 some of these numbers and come up with some better estimates.
12 The majority of this information I am certain can be made
13 available again by an on the spot situation by people who
14 are doing this going to the radiochemical people at Los Alamos

15 MR. HARLEY: One other point along that line. We
16 found if you run a sample and find out it has five per cent
17 of strontium 89, everyone says how does that compare with
18 Hunter's curves. Is the data on fast fission readily
19 available now? We have been working through Biology and
20 Medicine, and have not been able to get it out of anyone yet.

21 MR. HARRIS: You mean the mass yield ratio and this
22 sort of thing? Yes, I think that material is all essentially
23 unclassified. The things you would be interested in, such
24 things as ratio of uranium to 237 of course would not be. The
25 majority of that is unclassified. I asked at one time a

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Washington, D. C.
ARCHIVES

1 couple of years ago about this situation as far as it
 2 pertained between ordinary 25 and 49. The best guess that
 3 Rod Spence was able to give was that the original curves
 4 which were made from U 235 should hold well for plutonium.
 5 I think that information is available somewhere to you and
 6 probably on an unclassified basis.

7 DR. DUDLEY: I am wondering if the discussion here
 8 of plutonium implies that there is to be a fairly serious
 9 study of plutonium from the point of view of Gabriel?
 10 Is this implied?

11 DR. BUGHER: Yes, it brings it in.

12 MR. HARLEY: That was considered definitely as part
 13 of it.

14 DR. BUGHER: Yes. In contrast to the situation
 15 before, where we had such small amounts that it did not
 16 really significantly come into the picture. Now with this
 17 very large amount of capture, it certainly is something we
 18 will have to go into.

19 DR. DUDLEY: The calculations relative to thermo
 20 nuclear weapons would not be different from the strontium
 21 to plutonium ratios than the original calculations for
 22 straight fission weapons?

23 MR. HARRIS: I think maybe they would be because
 24 of the presence in supers now of a fair amount of normal
 25 uranium which is much higher than the relative amount is

Alderson Reporting Company
 Washington, D. C.

ARC

Department of Energy
 Executive Office
 BIRMINGHAM

1 an ordinary fission weapon.

2

3

DELETED

4

5

6

7

MR. HARRIS: You mean half as much captured? I don't know. I haven't got specific figures on it but you could get these from radio chemists.

8

9

10

DR. BUGHER: You are speaking about captured fission ratio?

11

12

MR. HARRIS: What was that again?

13

14

15

16

17

18

DELETED

19

20

21

DELETED

22

23

ARC

24

25

DR. DUDLEY: This would change the ratios by per cent and not orders of magnitude?

Alderson Reporting Company
Washington, D. C.

1 MR. HARRIS: That would change it in that case in
2 orders of magnitude.

3 DR. BUGHER: I think the ratio here is not far
4 from one. The figure we have been using is .9. You
5 mentioned .8 yesterday.

6 DR. DUNNING: I did.

7
8
9
10 DELETED

11
12
13 DR. DUDLEY: I was thinking of the comparative
14 hazard of the quantity of strontium and quantity of plutonium
15 produced. Has it been suggested that the hazard may be
16 comparable?

17 MR. HARLEY: My first calculations were that on
18 an internal deposition basis, they would be about equal.

19 DR. BUGHER: That is something we have to keep in
20 mind, and reconsider from time to time. I think that
21 has been a very helpful discussion. We are coming near the
22 time of compulsory adjournment.

23 If I can very compactly summarize what we have
24 covered, we have reviewed the background and the data
25 obtained from the first study of these people. We have

Alderson Reporting Company
Washington, D. C.

ARC

1 pretty well agreed that the type of study which was made
2 in the acute phase will need to be continued for an
3 indefinite time, but with a changing emphasis from what
4 might be called acute problems to the long term effects
5 which are particularly likely to manifest themselves in
6 such things as shortening of life, the occurrence of tumors,
7 both superficially and deep, and in bone changes, which may
8 be of a minor nature. I think the expectation is that the
9 long range results of the exposure of these people are not
10 likely to be at all spectacular. One would have to look
11 carefully and use rather critical statistical judgments in
12 all likelihood to be able to say that anything will have
13 occurred strictly due to the radiation. It points to the
14 necessity of conducting continued studies in a very
15 meticulous manner with precise recording of observations
16 and data which will permit the type of statistical considera-
17 tion that may be necessary.

18 We have agreed that the medical studies need not
19 be tightly bound to the environmental studies; that two
20 more or less separate groups can do these two things. I
21 think, though, we all concede that everybody is interested
22 in what everybody else is doing in this study and it doesn't
23 mean that cross information won't be freely flowing. It looks
24 as though the NRDL group probably should be called on for
25 the first medical study of the Rongelap people, and also

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Washington's Office
CHANGES

1 the first environmental study and specimen collection.

2 The minutes here of this conference will give
3 suggestions as to the types of materials to be collected
4 and precautions with respect to collecting them. I think
5 we will be able to further advise the collecting group about
6 types of material to be sampled and precautions to be
7 exercised in caring for it, and the places in which some of
8 these specimens should go for further analytical study.

9 We may well find that two or even three groups
10 are interested in analyzing for the same thing. Especially
11 in these low level things I don't believe there is any
12 objection to that. If we talk about strontium 90, we may want
13 to send around to each of the participating laboratories a
14 standard ash, which we do have, containing strontium 90.
15 It has been useful in checking strontium 90 analysis in
16 one place as against at another.

17 I think as to the organizational matters we have
18 really covered that. This Division will attempt to be
19 a coordinating center and work with the services, with the
20 trust territory administration, and many of the problems
21 we encounter we will have to ask for help from one or the
22 other of the various services that have special facilities.

23 Some points are left somewhat undecided. For
24 example, whether or not to use aerial survey techniques and
25 the extent of ground survey. I think we will need to

Alderson Reporting Company
Washington, D. C.

ARC

1 discuss those a little more extensively.

2 Capt. Yarbrough, can you think of anything which
3 should be added here?

4 CAPT. YARBROUGH: No, sir, at the moment I have
5 nothing to add.

6 DR. BUGHER: We will have plenty of detailed
7 problems and we can solve those as they come up. We hope
8 that the work on the report now goes along expeditiously,
9 and we will all try to do our best in helping the people who
10 have to turn out the report to get their job done. We expect
11 two sections. Section 1 will come a little before Section 2,
12 I presume, being a little less bulky. Do you have any
13 further comment, Gene?

14 CDR. CRONKITE: No. I think it has been most
15 gratifying to get clear in everybody's mind what the
16 administrative machinery is and we shall now try to deluge
17 you through our channels for a lot of things for you to
18 integrate in the very near future.

19 DR. BUGHER: It will be a single integral, I
20 hope, and not a double.

21 We appreciate very much your all giving your time
22 to this program. I hope you realize that our statements of
23 appreciation are really very much understated.

24 As far as the whole conduct of this program is
25 concerned, that is true.

Incidentally, the Russian resolution yesterday

Alderson Reporting Company
Washington, D. C.

ARC

Department of Energy
Historian's Office
2025

1 was rejected by the Committee on Petitions, the Russian vote
2 being the only one in favor of it. So at least as it stands
3 in the UN, the United States doesn't stand condemned as
4 having been derelict in its duty.

5 There will be another set of resolutions coming
6 up for consideration tomorrow.

7 MR. HARRIS: One thing you have forgotten. This
8 name on the conference thing is rather long. I would like
9 to propose a name for this project. Could you call this
10 SBCC, the Super Bomb Casualty Commission?

11 DR. BUGHER: Very good. Thank you.

12 We appreciate all these things that result in
13 shortened labor.

14 (Thereupon at 3:10 p.m., the conference was
15 concluded.)

Alderson Reporting Company
Washington, D. C.

ARC