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A PORTION OF:

NRDL RAD-SAFE SUPPORT FOR OPERATION REDWING

R

September 24, 1956

From: L. A. Carter

To: J. E. Law, U.S. Naval Radiological  
Defense Laboratory,  
San Francisco 24, California

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RG 181 AGENCY/NRDL

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NRDL SUPPORT - Rad-Safe For  
Operation Redwing

CLASSIFICATION CANCELLED \*  
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*J. Diaz* 2/20/91  
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DOE MA-225, 7-31-90

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Chapter III - Bikini Operations

On June 16, 1956, the 2.10 monitoring force at Bikini Atoll consisted of the following personnel:

- Health Physicist
- Health Physicist (TRFD to YAG on 7-13-56)
- HM 2 (TRFD to LST-611, 7-6-56)
- HM 2
- Civilian Monitor
- HM 1
- Civilian Monitor
- Civilian Monitor

C. (Event Number 3) Howko 7-11-56

1. Project 2.61

No surveys were made for project 2.61.

**PRIVACY ACT MATERIAL REMOVED**

2. Project 2.62

Howko

accompanied a party to the YFME 29 to recover samples from the forward tower. The background was 80  $\mu$ r/hr at 3'. Max. reading on samples 20  $\mu$ rad/hr incl. 12  $\mu$ r/hr.

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accompanied a party to How (N) to recover samples from the tower and the chan cone. The background at How (N) was 80  $\mu$ r/hr at 3'. The sample from the collector read 200  $\mu$ rad/hr incl. 20  $\mu$ r/hr @ 2".

accompanied personnel to How (N) to monitor the standard pattern. The background was 55  $\mu$ r/hr @ 3'. On the evening of N day, a heavy rain fell.

N + 1

assisted in recovery of samples from the rafts. The readings were as follows:

Raft #1	Bkg. 18 mrad/hr incl 6 mr/hr	Sample - Bkg.
Raft #2	" 18 " " " 12 "	Sample - 40 incl 8
Raft #3	" 40 " " " 18 "	sample - Bkg

and party recovered samples from the aft tower of the YFNB 29. The background was 6 mr/hr at 3', and the samples read up to 16 mrad/hr incl 6 mr/hr @ 2". The party then recovered the samples from the YFNB 13 with a background of 30 mr/hr at 3', and a maximum sample reading of 15 mr/hr incl 70 mr/hr @ 2".

assisted in recovery of chan cone samples on Charlie and George, the readings as follows:

Charlie: Background - 1000 mrad/hr incl 480 mr/hr @ 3'  
Ground - 1800 mrad/hr incl 600 mr/hr max. @ 6"  
George: Background - 520 mr/hr incl 350 mr/hr @ 3'  
Ground - 1200 mrad/hr incl 300 mr/hr @ 6"

The Charlie samples read up to 10 mr/hr, and the George samples 100 mr/hr incl 10 mr/hr.

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then monitored a party rearming the chan cone on HOW (N). The background was 30 mrad/hr incl. 20 mr/hr @ 3'. The ground read 10 mrad/hr incl. 20 mr/hr @ 6".

N + 2

assisted in rearming the YFNB 29 towers. The background was 6 mr/hr at 3', and the main deck aft read 30 mrad/hr incl. 6 mr/hr at 3".

assisted in rearming the HOW(N) tower, and monitored the standard pattern. The background in the tower was 18 mrad/hr incl. 6 mr/hr at 3'. The maximum contamination level in the tower was 500 mrad/hr incl. 100 mr/hr at 2". The standard pattern read as follows:

Sta 1 - 15 mr/hr	7 - 15 mr/hr	a - 6 mr/hr
2 - 14 "	8 - 10 "	b - 12 "
3 - 14 "	9 - 11 "	c - 10 "
4 - 12 "	10 - 11 "	d - 12 "
5 - 13 "	11 - 10 "	e - 13 "
6 - 14 "	12 - 10 "	f - 13 "

N + 3

assisted in rearming YFNB 13. The maximum background existed on the main deck (aft) - 70 mrad/hr incl. 20 mr/hr at 3'. The maximum contamination level was observed at the oil tanks on the stern - 850 mrad/hr incl. 50 mr/hr @ 3".

SWISS samples were received at the recovery tent. The maximum reading on the samples was 22 mrad/hr incl. 7 mr/hr @ 2".

The chan cones were reamed on HCM, Charlie, and George. The readings were as follows:

	<u>Background</u>	<u>Ground</u>
HCM	10 mr/hr @ 3'	15 mr/hr @ 3"
Charlie	250 mr/hr @ 3'	280 mr/hr @ 3"
George	110 mr/hr @ 3'	130 mr/hr @ 3"

3. Project 8.1

Project 8.1 had been completed.

[REDACTED]

During this period the sample recovery center was monitored by Zwicker.

This was a comparatively clean shot and no difficulties were experienced.

D. (Event Number 4) Tewa 7-21-56

1. Project 2.61

No surveys were made for project 2.61. **PRIVACY ACT MATERIAL REMOVED**

2. Project 2.63

T day

Assisted in early recovery of samples from YWB 13 at 1330 hours. The copter had read 3 r/hr at 3', 4.1 r/hr @ 3". The aft washdown station read 2.2 r/hr @ 3', and the forward washdown station read 2 r/hr @ 3'. The stay time was 20 minutes. Samples read as follows:

54 - 2 r/hr @ 3"	58 - 2.6 r/hr @ 3"
55 - 2.2 r/hr @ 3"	59 - 2.0 r/hr @ 3"
54A - 1.2 r/hr @ 3"	59A - 2.3 r/hr @ 3"
56 - 2.4 r/hr @ 3"	60 - 2.4 r/hr @ 3"
57 - 1.1 r/hr @ 3"	

The copter then departed for HCV (2) to make the early recovery and monitor the standard pattern. The arrival time was 1356 hrs., and the stay time was 15 minutes. The samples read as follows:

62 - 220 nr/hr @ 3"	65 - 260 nr/hr @ 3"
61 - 240 " "	66 - 210 " "
63 - 260 " "	67 - 210 " "
64 - 120 " "	

The standard pattern read as follows:

1 - 220 nr/hr @ 3"	1 - 240 nr/hr @ 3"
2 - 200 " "	1 - 260 " "
3 - 200 " "	9 - 240 " "
4 - 200 " "	11 - 210 " "
5 - 200 " "	12 - 240 " "
6 - 200 " "	

On returning to Wan, personnel in party were found to have at least 250 nr/hr on the shoes, and about 20 nr/hr on the hands. Shoes

covers and canvas gloves were worn but were inadequate because of the large amount of water on the YFMB 13. Hands were reduced to permissible levels with soap and water. ██████████ had performed this recovery dressed in Getoks under his shoe covers. His feet were grossly contaminated necessitating chemical decontamination by TU7 Personnel. By abrasion mainly, his feet were reduced to permissible levels by 1800 hours. Shoes worn by the party read up to 5 rads/hr incl. 1.4 r/hr @ 3" at 1800 hrs. On T + 2, the shoes were still greater than 20 mr/hr @ 3".

At 1615 hrs., ██████████ accompanied a party to HCN (N) to monitor the standard pattern; stay time 15 minutes. Readings were as follows:

1 - 220 mr/hr @ 3'	7 - 200 mr/hr @ 3'	a - 190 mr/hr @ 3'
2 - 210 " "	8 - 160 " "	b - 150 " "
3 - 220 " "	9 - 190 " "	c - 160 " "
4 - 190 " "	10 - 180 " "	
5 - 180 " "	11 - 140 " "	
6 - 210 " "	12 - 220 " "	

Background was 2000 mrad/hr incl. 200 mr/hr @ 3'. The ground was contaminated to 1000 mrad/hr incl. 100 mr/hr @ 3".

All the above samples were surveyed by ██████████ at the sample recovery center at Man, and the Readings were as shown below:

YFMB-13

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E 54/4037A	620 mrad/hr, incl. 400 mr/hr
55/4136A	1000 " " 800 "
55A/4051	360 " " 84 "
56/4012A	1010 " " 1020 "
57/1C	460 " " 120 "
58/4036A	1010 " " 1020 "
59/4122A	200 " " 300 "
59A/4047	190 " " 85 "
60/4038A	480 " " 300 "

[REDACTED]

HOW(N)

F 61/4169A	92	mrad/hr, incl.	60	mr/hr
62/4172A	100	"	"	74 "
63/4131A	104	"	"	84 "
64/1C	90	"	"	32 "
65/4096A	58	"	"	48 "
66/4040A	100	"	"	80 "
67/4193A	26	"	"	76 "
Fb 5/4078	100	"	"	100 "
Fb 10/4077	90	"	"	74 "
NS2 Funnel & Hose	50	"	"	14 "
Bottle	16	"	"	4 "

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HOW

Fb 6/4114	100	mrad/hr, incl.	100	mr/hr
7/4117	100	"	"	94 "
8/404	62	"	"	54 "
9/4154	72	"	"	62 "
12/4213	44	"	"	38 "

I + 1

and party monitored the standard pattern at HOW (N) at 1015 hrs., with a stay time of 15 minutes. Ground samples were recovered reading at 90 mr/hr @ 2". The pattern read as follows:

1 - 65 mr/hr @ 3'	7 - 91 mr/hr @ 3'	a - 81 mr/hr @ 3'
2 - 66 " " "	8 - 75 " " "	b - 84 " " "
3 - 91 " " "	9 - 79 " " "	c - 79 " " "
4 - 88 " " "	10 - 82 " " "	d - 79 " " "
5 - 90 " " "	11 - 71 " " "	e - 82 " " "
6 - 110 " " "	12 - 89 " " "	f - 78 " " "

The ground samples, when received at the recovery center @ Nan, read as follows:

FB 3/4076	20	mrad/hr, incl.	18	mr/hr
FB 4/4050	22	"	"	20 "
FB 2/4072	24	"	"	20 "
FB 1/4113	32	"	"	18 "
FB 11/4149	20	"	"	18 "

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**PRIVACY ACT MATERIAL REMOVED**

accompanied a party to the rafts to recover samples from the Chan Canal. Readings obtained were as follows:

Raft 1 - 50	mrad/hr, incl.	20	mr/hr @ 3'	
	120	mrad/hr, incl.	30	mr/hr @ 3'
Bottle, Hose & Funnel		3	mr/hr @ 2"	
Decege received during recovery		1.6	mr.	

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Raft 2 - > 10 mrad/hr, incl. 6 R/hr @ 3'  
 ----- > 10 mrad/hr, incl. 8 R/hr @ 3'  
 Bottle, Hose & Funnel 45 mr/hr @ 2'  
 Dosage received during recovery 500 mr.

Raft 3 - 6 rad/hr, incl. 200 mr/hr @ 3'  
 8 rad/hr, incl. 300 mr/hr @ 3'  
 Dottle, Hose & Funnel 12 mr/hr  
 Dosage received during recovery 17 mr.

The skiffs were recovered on T + 1 and T + 2, monitored by

Results were as follows:

Sta #	Skiff #	Deck & Fittings	Film Pack	mrad/hr/mr/hr					Inside Skiff
				Toad	Funnel	Sample	Hose		
9	19	10/0	0	0	0	0	0	0	
1	17	120/10	-/5	-	1/1	1/1	-/1	6/6	
2	5	200/14	0/3	0	3/1	2/2	1/1	6/2	
16	8	3000/200 (After Decon. 320/30)	-/82	-	300/38	14/7	-/5	28/14	
11	7	3800/380 (After Decon. 1500/160)	-/450	-	230/32	42/6	160/98	84/54	
5	6	3000/320 (After Decon. 1000/110)	-/200	-	110/16	15/6	32/8	-	
13	12	36/14	-/10	-	26/5	33/6	-/4	-	
3	1	12/1	0	0	0	0	0	0	
15	21	64/10	-/5	-	2/2	4/2	-/2	20/0	
5	15	8/0	-/1	0	0	0	0	0	

T + 1  
 T + 2

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20	2	1200/80	-/32	-	160/12	74/70	-/22	-
19	23	720/140 (After Decon. 420/92)	-/10	-	58/10	42/22	-/16	60/32
18	24	140/140 (After Decon., 260/14)	-/58	-	150/34	100/80	-/2	80/50
1	22	740/160 (After Decon. 540/100)	-/30	-	32/10	90/16	-/10	60/36

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Sta #	Skiff #	Deck & Fittings	Film Pack	Mrad/hr			Hose	Inside Skiff
				Toad	Funnel	Sample		
14	2	580/120 (After Decon. 400/90)	-/100	-	75/16	48/32	20/8	20/14
10	10	800/200 (After Decon. 300/84)	-/140	-	100/18	28/56	-/8	80/40
12	16	140/38	-/30	-	-	12/8	-/6	-

2 + 2

assisted a party in the rollup of HCN (1) tower, and monitored the standard pattern. The background in the tower was 40 mr/hr @ 3', 200 mr/hr at 2". The standard pattern read as follows:

1 - 30	my/m @ 3'	7 - 34	my/m @ 3'	a - 32	my/m @ 3'
2 - 36	"	8 - 30	"	b - 32	"
3 - 30	"	9 - 30	"	c - 28	"
4 - 36	"	10 - 32	"	d - 32	"
5 - 34	"	11 - 28	"	e - 32	"
6 - 30	"	12 - 32	"	f - 32	"

John monitored a party during the recovery of samples from YFNB-29, 0910 to 0915 hrs. Readings were as follows:

- John pad @ center of deck - 2 R/hr @ 3', 1 R/hr @ 2"
- Deck aft - 1.2 R/hr @ 3'
- Deck fwd. - 1.2 R/hr @ 3'
- Blg. in fwd. tower - 600 mr/hr @ 3'
- Blg. in aft tower - 1.1 R/hr @ 3'
- Fwd. tower samples - Max. 1.8 R/hr @ 2"
- Aft tower samples - Max. 5.0 R/hr @ 2" (except for "whim" sample)

On receipt at the sample recovery center, the samples read as follows:

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Sample #	Mrad/hr, incl	incl	mr/hr	Sample #	Mrad/hr, incl	incl	mr/hr
60	140	380		6-22	400	200	
61	150	100		6-23	300	200	
62	150	100		6-24	300	200	
70	600	600		75	1500	1000	
71	200	200		76	1500	800	
72	1000	1000		77	2000	1500	
73	500	300		78	200	200	
74	400	300		79	1500	1500	
75	600	600		80	1000	1000	
8-31	400	200		81	1000	900	



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A "whim" sample was discovered which read 50 R/hr at approximately 4". This sample, consisting of coral sand from the ~~\_\_\_\_\_~~<sup>AFT</sup> tower, had been collected without the knowledge of the monitor. An investigation showed that one member of the party had carried this small container in his hand

30 to 60 seconds. The direct reading Dosimeters read as follows:

- 2000 mr
- g - 600 mr
- 400 mr
- 500 mr

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Dosimeter had received about 1500 mr from the source which was roughly 10 inches from the dosimeter. Mission badges were processed immediately with the following results:

- 2030 mr
- 1550 mr
- 6500 mr
- 565 mr

It was felt that Mason had probably exceeded his allowable hand dose, and the recommendation was made to project personnel that he be removed from necessary operations. This recommendation was not well received by project personnel, but was ultimately enforced.

**PRIVACY ACT MATERIAL REMOVED**

Smith monitored a party recovering samples from ~~\_\_\_\_\_~~ at 1725 hrs.

Readings were obtained as follows:

- Main Deck - ave. 25 mr/hr @ 3', Max. 33 mr/hr @ 3'
- Copter Pad - ave. 25 mr/hr @ 3', Max. 33 mr/hr @ 3'
- Tower - ave. 30 mr/hr @ 3'

SAN DIEGO TRG

Fig 3  
Mason assisted a party in performing Rollup work on ~~\_\_\_\_\_~~-13. The background on deck was 12 mr/hr at 3', and the background in the tower was 30 mr/hr at 3'. Tools of water on deck read 10 mr/hr @ 3'



[REDACTED]

Carter monitored the recovery of Chan cone samples from George and Charlie.

Stay time on George - 3 minutes  
 Bkg at cone 1400 mr/hr @ 3'  
 Ground contamination up to 1600 mr/hr @ 3"

Stay time on Charlie - 2 minutes  
 Bkg at cone 9 R/hr @ 3'  
 Ground contamination up to 11 R/hr @ 3"

Chan cone samples processed at the Nan Recovery Center read as follows:

	<u>George</u>	<u>Charlie</u>
Bottle	60 mr/hr	150 mr/hr
Hose	5 mr/hr	10 mrad/hr incl. 5 mr/hr
Funnel	8 mrad/hr incl. 4 mr/hr	50 mrad/hr incl. 10 mr/hr

Sample	Bottle	Hose	Funnel
AA	12 mrad/hr incl. 6 mr/hr	4 mrad/hr incl. 1 mr/hr	---
BB	110 " " 200 "	10 " " 5 "	300 mrad/hr incl. 20 mr/hr
CC	110 " " 100 "	13 " " 4 "	18 " " 18 "
DD	110 " " 60 "	4 " " 2 "	28 " " 4 "
EE	30 " " 24 "	20 " " 6 "	28 " " 10 "
FF	30 " " 28 "	78 " " 30 "	94 " " 14 "
GG	10 " " 10 "	30 " " 10 "	96 " " 12 "

Rollup

Miller assisted in the Rollup of YFNB-29. The following readings were taken:

Main Deck	700 mrad/hr incl. 60 mr/hr	@ 3'
Main Deck	600 " " 150 "	@ 3"
Exterior Deckhouse	20 " " 20 "	@ 3'
Walkways	180 " " 60 "	@ 3'
Ventilation Covers	10,000 " " 4000 "	@ 3"
Top of Deckhouse	150 " " 40 "	@ 3'
Upper End	70 " " 20 "	@ 3'
Mid Inst. Room	10 " " 10 "	@ 3'
Mid Tower	40 " " 30 "	@ 3'
Mid Collector	200 " " 40 "	@ 3"
Mid Tower	120 " " 50 "	@ 3'
Mid Collectors	300 " " 100 "	@ 3"

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Miller surveyed the standard pattern at KCM (N) at 0835. Readings were as follows:

1 - 21 mr/hr @ 3'	7 - 23 mr/hr @ 3'	a - 15 mr/hr @ 3'
2 - 21 " "	8 - 16 " "	b - 17 " "
3 - 22 " "	9 - 15 " "	c - 15 " "
4 - 20 " "	10 - 19 " "	d - 21 " "
5 - 20 " "	11 - 16 " "	e - 21 " "
6 - 25 " "	12 - 18 " "	f - 20 " "

3. Project 2.8

On T + 2, Lyriker assisted project 2.8 personnel in recovering samples from YND-29. The following readings were obtained:

Copter Pad	- 2 R/hr
Blg at work	- 200 to 1000 mr/hr
Sample Box 1	- 200 mr/hr @ 2"
" " 2	- 120 " "
" " 3	- 80 " "
" " 4	- 600 " "
" " 5	- 80 " "

4. Project 2.1

Project 2.1 had been completed.

Secondary Fallout

At the request of Evan G. D. Jr., periodic background readings were taken on New Island during the time of Nevada + 1. The readings obtained are given below:

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	<u>Date</u>	<u>Weather</u>	<u>Mr/hr Background</u>
7-11-56	1700	Clear	0.4
	1730	Clear	0.2
	2100	Clear	0.3
	2135	Clear to Rain	0.2
	2300	Rain to Clear	3.0
	2323	Clear to Rain	2.5
7-12-56	0100	Rain	9.5
	0130	Rain	10.0
	0300	Drizzle	8.5
	0340	Drizzle	7.0
	0340	"	5.5
	0340	"	1.0
	1330	Clear	1.1 (2)
	1345	Clear	2.5
	1450	Clear	2.5
	1600	Clear	1.1
	1900	Clear	1.1
	2030	Clear	1.1
	2130	Clear	1.2
	2200	Clear	1.3
	2300	Clear	1.7
	2400	Clear	1.0

**PRIVACY ACT MATERIAL REMOVED**

<u>Time</u>	<u>Weather</u>	<u>Kr/hr Background</u>
7-13-56 0100	Clear	2.0
0200	Clear	1.8
0300	Clear	1.8
0400	Clear	1.8
0500	Clear	1.2
0600	Clear	1.0
0700	Clear	1.1
0800	Clear	0.5

Readings taken after Tewa gave no indication of secondary fallout during the period Tewa through Tewa + 2.

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Operations were completed and personnel left Bikini on dates shown:

July 26 to Elser  
July 22 to Elser  
July 26 to "  
July 26 to "  
July 26 to "  
July 26 to "

**PRIVACY ACT MATERIAL REMOVED**

[REDACTED]

## Chapter VI - Conclusions and Recommendations

### A. Training Program

1. Although three weeks is not enough time to adequately train a monitor, the men performed surprisingly well in the field. In comparison with typical army monitors, our trainees, whether in 2.10 or TU7 were well trained. They obviously had not absorbed the details that were presented at the school, but had a good understanding of the principles of contamination and radiation dose control.
2. Less time should be taken up in the training course with detailed explanations of techniques which will be used by only one or two people. More time should be given to the fundamental principles. Several monitors<sup>stated</sup> that much of the detailed lecture material only served to confuse them. Although I personally enjoyed the T.I. two-week course, I believe that it is of very little value to a monitor. More time should be spent on contamination control. I feel that this is an area in which we were very weak. Most of our troubles at Bikini were the result of poor, or rather nonexistent contamination control. **SAN BRUNO FRC**

### B. Reducing Rad-Safe

1. TU7 personnel and officers could not cope with the contamination resulting from Tewa. The decontamination facility almost completely broke down because of lack of adequate preparation and supplies, and a very poor traffic flow pattern.

The protective clothing provided was inadequate for work on wet, contaminated decks. Had rubber gloves and boots been provided, almost all of our Hand and Shoe contamination would have been avoided.

~~REDACTED~~

At the completion of the tests, a large proportion of the survey instruments were faulty. Most of our survey instruments were serviced by the ~~Bureau of~~ <sup>Bing Ding</sup> Electronic Technicians. Without their help, we would not have had sufficient instruments to perform the work.

The 2.10 group on Bikini performed its function with practically no confusion or delay. I am actually surprised that a group of men with such diverse backgrounds can be made to work together so well in so short a time.

The primary obstacle to the successful completion of Project 2.10's mission was not within the group. It was a reluctance on the part of project 2.63 leaders on Bikini to accept our recommendations, if such acceptance would delay or disrupt the 2.63 work schedule. To be quite frank, I was disappointed in the attitude of the 2.63 project leaders toward radiological protection.

2. A major improvement could be made in the Rad-Safe program, by including more personnel having field radiation control experience, within the TU7 group.

The 2.10 group at Bikini was satisfactory from the point of view of types and numbers of personnel.

### C. Photodosimetry

1. We had no experience with the NRDL film badge at Bikini. The TU7 mission badge readings appeared to be low. On two occasions, I received about 100 mr on ROW (R), but the mission badges were read as zero. Considering the processing difficulties however, this is probably to be expected.

[REDACTED]

On several occasions, TU7 personnel dosage records were found to be in error. Addition was the problem here.

did an excellent job of keeping project leaders informed of the radiation status of their people.

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2. The film badge used in the Redwing operation appeared to be satisfactory, and I have nothing specific to offer with regard to possible improvement.

**PRIVACY ACT MATERIAL REMOVED**