PALOMARES NUCLEAR WEAPONS ACCIDENT

REVISED DOSE EVALUATION REPORT

Volume III
Appendix C.2 – Repeat Analysis Cases
Appendix C.3 – Contamination Cutoff Cases
Appendix C.4 – Remaining Cases

Date: April 2001

Contract: GS-35F-4813G

Task Order: WFZ578410
T0799BG0031

Prepared For: Radiation Protection Division
Air Force Medical Operations Agency
Bolling AFB, DC 20332-7050

Prepared By: LABAT-ANDERSON INCORPORATED
8000 West Park Drive, Suite 400
McLean, VA 22102

Intakes and estimates of dose were prepared using CINDY Version 1.4 and LUDEP Version 2.05.

Intake was estimated using the Jones excretion model in CINDY and LUDEP.

Inhalation intake was estimated using the ICRP 66 respiratory tract model in LUDEP.

CINDY estimated dose derived using the ICRP 30, Part 4, General Systemic Model and weighting factors; and LUDEP used the recommendations of ICRP 60.

Modeling:

CINDY and LUDEP were used to estimate the intake and dose with the following results:

Model	Intake (pCi)	CEDE (rem/Sv)
CINDY	140,000	43/0.43
LUDEP	383,000	27/0.27

Doses to individual organs and estimation of the effective dose equivalent using CINDY reported the following results:

Organ	Dose Equivalent (rem/Sv)	Weighting Factors	Weighted Organ Dose Equivalent (rem/Sv)
Testes	6.2E+00/6.2E-02	2.5E-01	1.6E+00/1.6E-02
Breast	2.1E-04/2.1E-06	1.5E-01	3.1E-05/3.1E-07
Red Marrow	3.4E+01/3.4E-01	1.2E-01	4.0E+00/4.0E-02
Lung	1.6E+02/1.6E+00	1.2E-01	1.9E+01/1.9E-01
Thyroid	2.0E-04/2.0E-06	3.0E-02	5.9E-06/5.9E-08
Bone Surface	4.4E+02/4.4E+00	3.0E-02	1.3E+01/1.3E-01
Liver	7.8E+01/7.8E-01	6.0E-02	4.7E+00/4.7E-02
Other	7.4E+00/7.4E-02	6.0E-02	4.4E-01/4.4E-03
Lower Large Intestine	1.6E-02/1.6E-04	6.0E-02	9.5E-04/9.5E-06
Upper Large Intestine	5.3E-03/5.3E-05	6.0E-02	3.2E-04/3.2E-06
Small Intestine	1.1E-03/1.1E-05	6.0E-02	6.5E-05/6.5E-07
Effective Dose Equivalent			4.3E+01/4.3E-01

One urine sample was analyzed by gross alpha counting only, and the other was analyzed by both gross alpha counting and alpha spectrometry. For the sample analyzed with both methods, the gross alpha analysis was not included in the modeling since no result was reported and an alpha spectrometry result was available for the same sample. The sample analyzed by gross alpha counting only was not included in the analysis since it was an on-site sample with a result >0.1 pCi, leading to a suspicion of sample contamination. The result was fit using CINDY and the Jones excretion model, to estimate an intake (140,000 pCi), organ doses, and a CEDE (43 rem/0.43 Sv; ICRP-30) as shown above. LUDEP was also used to estimate an intake of 383,000 pCi and a CEDE (ICRP-60) of 27 rem (0.27 Sv).

Conclusion:

Based on the results of intake estimates and dose calculations, this individual received an estimated intake of about 140,000 pCi of ^{239}Pu resulting in a 50-year committed effective dose equivalent of 43 rem (0.43 Sv). That dose is more than the cumulative dose (7 rem) from a lifetime (70 years) of exposure at the current level (0.100 rem) for members of the public. It is less than the working lifetime limit of 50 rem recommended by the National Council on Radiation Protection and Measurements (NCRP). Serious health effects are not associated with that dose level. However, follow-up urine sampling now could be considered to provide additional assessment of the exposure.

Prepared By:

Name: _____

Signature: _____ Date: _____

Peer Reviewed By:

Name: _____

Signature: _____ Date: _____

FEB 21 1966

(b) (6) TERNAL DOSE DATA

NAME (LAST, FIRST, M.I.) (1-20)		SOC. SEC. NO. (21-29)	TYPE SAMPLE (30)	TYPE ANAL. (31-32)
(b) (6)	Tsgt	(b) (6)		GROSS ALPHA

SAMPLE NO. (33-38)	SAMPLE DATE (39-44)	EXPOSURE
66-946	FROM (24hr) ~ 16 Feb '66 TO	DATE 19 Jan 66 TYPE

BASE (57-60)	OCCUPATION (61-62)	REQUESTED BY
~~Fort~~ Ramstein		

DATE RECEIVED	SAMPLE VOLUME	VOLUME ANALYZED	DATE ANALYZED
FEB 21 1966	2200 ml.	200 ml.	

TECHNICIAN (SIGNATURE AND DATE) (b) (6) 9 MAR 1966

URINE	GROSS ALPHA		RADON		FECES/BLOOD	
Counter Number	H		Chamber Number		Counter Number	
Counter Bkg. (cpm)	.14		Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)	51		Counter Eff. (%)		Counter Eff.	
Date/Time – Start	9 MAR 1966		Millivolt – Start		Date/Time – Start	
– Stop			Millivolt – Stop		– Stop	
Total Counts	47		Total Millivots		Total Counts	
Counting Time	55		Total Drift Time		Counting Time	
Gross cpm	85		Gross mv/sec		Gross cpm	
Bkg. Cpm	.14		Bkg. Mv/sec		Bkg. cpm	
Net cpm	.71		Net mv/sec		net cpm	
~~dpm~~ Pci/L	3.14 ± 1.18		curies/mv		dpm	
dpm/24 hr. (69-74)			litter (69-74)		dps/cc	
K 40 Correction					Neutron Dose (rads) (63-68)	
~~Net Cpm~~ Pci/gal	6.91 ± 2.60		D(q) (63-68)		uc/mg (69-74)	
D(q) (63-68)	$t = 28D$	$D_A = 3.26 \times 10^{-2}$ uc		174	D(q) (63-68)	

(b) (6) (b) (6)

RESAMPLE JUL 14 1966 3415

AFSN: (b) (6)

INTERNAL DOSE DATA

NAME (LAST, FIRST, M.I.) (1-20)	SOC. SEC. NO. (21-29)	TYPE SAMPLE (30)	TYPE ANAL. (31-32)
(b) (6) TSgt	(b) (6)	Urine	

SAMPLE NO. (33-38)	SAMPLE DATE (39-44)		EXPOSURE
66-3415	FROM 0600 7 Jun	TO 0559 8 Jun 66	DATE Jan & Feb 66 TYPE

BASE (57-60)	OCCUPATION (61-62)	REQUESTED BY	
Ramstein			

DATE RECEIVED	SAMPLE VOLUME	VOLUME ANALYZED	DATE ANALYZED
14 June 1966	1680 ml	890 ml	

TECHNICIAN (SIGNATURE AND DATE) checked off/mastiff

URINE	236	239		RADON	Gross	FECES/BLOOD	
Counter Number				Chamber Number		Counter Number	
Counter Bkg. (cpm)	3	1		~~Chamb. Bkg. (mv/sec)~~ Count/Sq	C	Counter Bkg.	
Counter Eff. (%)	31.8	31.8	115	Counter Eff. (%)	51	Counter Eff.	
Date/Time – Start	15EP66	1152		Millivolt – Start		Date/Time – Start	
– Stop				Millivolt – Stop		– Stop	
Total Counts	117	4		Total ~~Millivolt-Time~~	55	Total Counts	
Counting Time	100	100		Total ~~Disintegrations~~ cts	118	Counting Time	
Gross cpm				Gross mv/sec		Gross cpm	
Bkg. Cpm				Bkg. ~~Millivolt~~ cts	45 (908)	Bkg. cpm	
Net cpm				Net mv/sec		net cpm	
~~dpm~~ % AEC	106%			curies/mv		dpm	
dpm/24 hr. (69-74)				~~Inner (69-74)~~ % AEC	122%	dps/cc	
K 40 Correction						Neutron Dose (rads) (63-68)	
~~Nat. Beta~~ PC/SPL	0.0949 ±	0.0499		D(q) (63-68)		uc/mg (69-74)	
D(q) (63-68)						D(q) (63-68)	

NAME:	SOCIAL SECURITY NUMBER:	SAMPLE NUMBER:

AIR FORCE BASE

RESULTS OF ANALYSIS

Pci/Spl - 0.0949 ± 0.0499 %Rec - 106 % Previous Results
Total Vol - 1680 ml Body Burden - 0.03 3.14 Pc/l 0.74 BR
Vol Anal'd - 890 ml

☐ Repeat the sample for the following reason:

( ) Significant activity in recently analyzed sample(s)
( ) Data required to establish dose
( ) Improper flask used
( ) Other _____
( ) Suggested sampling schedule _____

SIGNATURE: DATE:

ONE TIME FORM. OBSOLETE AFTER 30 JUN 66. (MCGSCPF, RAG, 4 APR 66) AFLC–WPAFB–APR 66 2500

3415

(b) (6)

1. .094 ± .05 94 ± 50. fi
2. 106
3. 1.68
4. 115
5. 6246
6. 0.03

(b) (6)

Internal Dosimetry Evaluation Form

NAME: (b) (6)	SSN: (b) (6)

MODE OF INTAKE:
☒ Inhalation ☐ Injection
☐ Ingestion ☐ Absorption
☐ Unknown ☐ Not applicable

INTAKE DATE OR PERIOD:
1/20/66 through 2/7/66, onsite
1/29/66

SUMMARY OF EXPOSURE CONDITIONS:
Radionuclides/Respiratory Class/Particle Size: ^{239}Pu/100% Class Y/1 μm AMAD
Date or Period of Evaluated Data: 2 samples, 2/7/66 and 6/1/66
Duration of Exposure: Unknown
Location of Exposure: Camp Wilson, near Palomares, Spain

EVALUATION DATA:

Air Sampling	☐ Attached	☐ In Process	☒ Unavailable
Health Physics Survey Data	☐ Attached	☐ In Process	☒ Unavailable
Bioassay – Urinalysis	☒ Attached	☐ In Process	☐ Unavailable
Fecal	☐ Attached	☐ In Process	☒ Unavailable
Nasal Smears	☐ Attached	☐ In Process	☒ Unavailable
In Vivo	☐ Attached	☐ In Process	☒ Unavailable

Medical Treatment:

Skin Decontamination:	☐ Yes	☒ No	Date: _____
Decorporation:	☐ Yes	☒ No	Agent: _____ Date: _____
Catharsis:	☐ Yes	☒ No	Agent: _____ Date: _____
Surgical excision:	☐ Yes	☒ No	Date: _____

EVALUATION METHODOLOGY:
Assumptions: Acute inhalation intake of ^{239}Pu, 100% Class Y, 1 μm AMAD particle size on 1/29/66

Code/Model used for: Intake Estimate: CINDY, Ver. 1.4/JONES
Dose Estimate: CINDY, Ver. 1.4/ICRP 30, Part 4, General Systemic Model

RESULTS SUMMARY
Estimated Intake Activity (pCi): 130000
50 YR CEDE (rem) : 40 (0.4 Sv)

Organ Dose Equivalent Summary	**50 YR CDE (rem/Sv)**
Bone Surface	410/4.1
Lung	150/1.5
Liver	72/0.72
Red Marrow	31/0.31
Other	6.9/0.069
Testes	5.8/0.058

DOSE ASSESSOR: DATE: _____	**PEER REVIEWER:** DATE: _____
Signature: _____	**Signature:** _____
Print Name: _____	**Print Name:** _____
SSN: _____	**SSN:** _____

RECOMMENDATIONS:
Additional Bioassay Required ☐ Urinalysis ☐ Fecal ☐ In Vivo
Suggested Sampling Frequency: _____
Work Restrictions: N/A

Internal Dosimetry Case Narrative

Identification:

Name: (b) (6)
SSN:

Incidents:

Individual participated on site in response duties resulting from an accident involving three nuclear weapons at Palomares, Spain on January 17, 1966. Individual may have been exposed to weapons materials (primarily plutonium-239) by inhalation and ingestion from contaminated weapon and aircraft debris, lands, and vegetation. Primary activities included search, radiological monitoring, recovery of accident debris, and processing for disposal.

Previous Intake/Dose Assessments:

This assessment applies to Palomares accident activities only. No previous intakes or doses were considered.

Other Information:

None.

Radionuclide(s): ^{239}Pu.

Assumptions/Basis/Data Sources:

Acute inhalation intake of Pu-239; 100% Class Y; 1 μm AMAD particle size on 1/29/66. The date is the midpoint of the period on station from 1/20/66 to 2/7/66.

Inhalation was assumed as the major route of entry because the primary contaminant was created by explosion and fire and deposited in sandy soil and on buildings and plants. Conditions were generally windy and significant activity was underway.

Dose was determined entirely from modeling intake based on the following urinalysis results for this individual. This individual's sample was identified for a follow-up analysis using alpha spectrometry after the initial gross alpha result was reviewed. That is, the initial urine sample for this individual was reprocessed radiochemically for alpha spectrometry. Results of the follow-up alpha spectrometry analysis are reported below and were used in preparing the dose estimate.

Sample	Analysis*	Sample Date	Result (pCi/day)	Error (pCi/day)	Included
66-442	G	2/7/66	1.24	0.950	
66-3267	AS	6/1/66	0.091	0.065	✓
66-3267	G	6/1/66	NR	NR	

* G means gross alpha counting; AS means alpha spectrometry; NR means no result reported.

Intakes and estimates of dose were prepared using CINDY Version 1.4 and LUDEP Version 2.05.

Intake was estimated using the Jones excretion model in CINDY and LUDEP.

Inhalation intake was estimated using the ICRP 66 respiratory tract model in LUDEP.

CINDY estimated dose derived using the ICRP 30, Part 4, General Systemic Model and weighting factors; and LUDEP used the recommendations of ICRP 60.

Modeling:

CINDY and LUDEP were used to estimate the intake and dose with the following results:

Model	Intake (pCi)	CEDE (rem/Sv)
CINDY	130,000	40/0.4
LUDEP	370,000	26/0.26

Doses to individual organs and estimation of the effective dose equivalent using CINDY reported the following results:

Organ	Dose Equivalent (rem/Sv)	Weighting Factors	Weighted Organ Dose Equivalent (rem/Sv)
Testes	5.8E+00/5.8E-02	2.5E-01	1.5E+00/1.5E-02
Breast	1.9E-04/1.9E-06	1.5E-01	2.9E-05/2.9E-07
Red Marrow	3.1E+01/3.1E-01	1.2E-01	3.8E+00/3.8E-02
Lung	1.5E+02/1.5E+00	1.2E-01	1.8E+01/1.8E-01
Thyroid	1.8E-04/1.8E-06	3.0E-02	5.4E-06/5.4E-08
Bone Surface	4.1E+02/4.1E+00	3.0E-02	1.2E+01/1.2E-01
Liver	7.2E+01/7.2E-01	6.0E-02	4.3E+00/4.3E-02
Other	6.9E+00/6.9E-02	6.0E-02	4.1E-01/4.1E-03
Lower Large Intestine	1.5E-02/1.5E-04	6.0E-02	8.9E-04/8.9E-06
Upper Large Intestine	5.0E-03/5.0E-05	6.0E-02	3.0E-04/3.0E-06
Small Intestine	1.0E-03/1.0E-05	6.0E-02	6.1E-05/6.1E-07
Effective Dose Equivalent			4.0E+01/4.0E-01

One urine sample was analyzed by gross alpha counting only, and the other was analyzed by both gross alpha counting and alpha spectrometry. For the sample analyzed with both methods, the gross alpha analysis was not included in the modeling since no result was reported and an alpha spectrometry result was available for the same sample. The sample analyzed by gross alpha counting only was not included in the analysis since it was an on-site sample with a result >0.1 pCi, leading to a suspicion of sample contamination. The result was fit using CINDY and the Jones excretion model, to estimate an intake (130,000 pCi), organ doses, and a CEDE (40 rem/0.4 Sv; ICRP-30) as shown above. LUDEP was also used to estimate an intake of 370,000 pCi and a CEDE (ICRP-60) of 26 rem (0.26 Sv).

Conclusion:

Based on the results of intake estimates and dose calculations, this individual received an estimated intake of about 130,000 pCi of ^{239}Pu resulting in a 50-year committed effective dose equivalent of 40 rem (0.4 Sv). That dose is more than the cumulative dose (7 rem) from a lifetime (70 years) of exposure at the current level (0.100 rem) for members of the public. It is less than the working lifetime limit of 50 rem recommended by the National Council on Radiation Protection and Measurements (NCRP). Serious health effects are not associated with that dose level. However, follow-up urine sampling now could be considered to provide additional assessment of the exposure.

Prepared By:

Name: _____

Signature: _____ Date: _____

Peer Reviewed By:

Name: _____

Signature: _____ Date: _____

[redacted] [redacted]

RESAMPLE JUN 6 1966

AFSN: [redacted]

INTERNAL DOSE DATA

NAME (LAST, FIRST, M.I.) (1-20)	SOC. SEC. NO.	TYPE SAMPLE (30)	TYPE ANAL. (31-32)
[redacted] TSgt	[redacted]	Urine	

SAMPLE NO. (33-38)	SAMPLE DATE (39-44)	EXPOSURE
66-3267	FROM 1 June 66 TO	DATE Jan 66 TYPE

BASE (57-60)	OCCUPATION (61-62)	REQUESTED BY
Toul Rosieres		

DATE RECEIVED	SAMPLE VOLUME	VOLUME ANALYZED	DATE ANALYZED
6 June 1966	1620 ml	1000 ml	23 SEP 1966

TECHNICIAN (SIGNATURE AND DATE)

URINE	236	239	GROSS α
Counter Number			C
Counter Bkg. (cpm) 800	3	1	157 (3861)
Counter Eff. (%)	31.8	31.8	51
Date/Time – Start	23 Sept	23 Sept	19 Sept
– Stop			
Total Counts			79
Counting Time	100	100	55
Gross cpm			
Bkg. Cpm			
Net cpm			
dpm			
dpm/24 hr. (69-74)			
K 40 Correction			
Net Beta			
D(q) (63-68)			

RADON	
Chamber Number	
Cham. Bkg. (mv/sec)	
Counter Eff. (%)	
Millivolt – Start	
Millivolt – Stop	
Total Millivots	
Total Drift Time	
Gross mv/sec	
Bkg. Mv/sec	
Net mv/sec	
curies/mv	
liter (69-74)	
D(q) (63-68)	

FECES/BLOOD	
Counter Number	
Counter Bkg.	
Counter Eff.	
Date/Time – Start	
– Stop	
Total Counts	
Counting Time	
Gross cpm	
Bkg. cpm	
net cpm	
dpm	
dps/cc	
Neutron Dose (rads) (63-68)	
uc/mg (69-74)	
D(q) (63-68)	

82.2% Rec

NAME:	SOCIAL SECURITY NUMBER:	SAMPLE NUMBER:

AIR FORCE BASE

RESULTS OF ANALYSIS pCi/spl – Tot vol – 1620 Vol anal – 1000 % Rec – Body Burden – CONTAM. WITH. PU-238

☐ Repeat the sample for the following reason:

( ) Significant activity in recently analyzed sample (s)
( ) Data required to establish dose
( ) Improper flask used
( ) Other
( ) Suggested sampling schedule

SIGNATURE: DATE:

ONE TIME FORM. OBSOLETE AFTER 30 JUN 66. (MCGSCPF, RAG, 4 APR 66) AFLC—WPAFB—APR 66 2500

3267 91.±65

1. .091 ± .065
2. 84.1
3. 1.62
4. 127
5. 6278
6. 0.03

(b) (6)

(b) (6)

RADIOLOGICAL SAMPLE DATA

[redacted] E OR REQUESTOR'S ID (1–20)	GRADE	AFSN	SOCIAL SECURITY NUMBER	RHL SAMPLE NUMBER 66-3267 B
TYPE SAMPLE (23–32)	OCCUPATION (34–35)	ANALYSIS DESIRED	REQUESTED BY	AIR FORCE BASE (68–71)
DATE RECEIVED (37–42)	DATE ANALYZED (51–56)	DATE COUNTED 5 OCT 66	DATE COLLECTED	EXPOSURE DATE
SAMPLE WEIGHT/VOLUME	WEIGHT/VOLUME ANALYZED 600	TECH (b) (6) [redacted]		
OTHER DATA	Checked off Master List			

ENVIRONMENTAL SAMPLES				
COUNTER & EFFICIENCY				
TOTAL COUNTS & MINUTES				
GROSS CPM				
BKG CPM & MINUTES		Ez 127		
NET CPM				
YIELD				
	236	239		
BIOLOGICAL SAMPLES			RADON	
COUNTER & EFFICIENCY	31.8			
TOTAL COUNTS & MINUTES	48	2		
GROSS CPM				
BKG CPM & MINUTES	1	0		
NET CPM				
YIELD				

Spec = 100

440

SUMMARY OF RESULTS: PCi/sp l = 0.091 ± 0.065 % Rec = 84.1

ToT Vol = 1620

Body Burden =

VOL ANAL = 600

AFLC FORM MAY 66 1165 FC 5400 AFLC–WPAFB–MAY 66 4500

FEB 10 1966

INTERNAL DOSE DATA

(b) (6)	TSgt	SOC. SEC. NO. (21-29) (b) (6)	TYPE SAMPLE (30) Urine	TYPE ANAL. (31-32) GROSS ALPHA
SAMPLE NO. (33-38) 66-442	SAMPLE DATE (39-44) FROM Submitted - 7 Feb'66	TO	EXPOSURE DATE Arrival - 20 Jan'66	TYPE
BASE (57-60) Torrejon - Romeiro, Franco	OCCUPATION (61-62)	REQUESTED BY		
DATE RECEIVED FEB 10 1966	SAMPLE VOLUME 970 ml	VOLUME ANALYZED 200 ml	DATE ANALYZED	
TECHNICIAN (SIGNATURE AND DATE) (b) (6)			11 FEB 1966	

URINE GROSS ALPHA	SSGT.	USAF RADON	FECES/BLOOD
Counter Number C		Chamber Number	Counter Number
Counter Bkg. (cpm) 0.20		Cham. Bkg. (mv/sec)	Counter Bkg.
Counter Eff. (%) 57		Counter Eff. (%)	Counter Eff.
Date/Time – Start		Millivolt – Start	Date/Time – Start
–Stop 11 FEB 1966		Millivolt – Stop	– Stop
Total Counts 27		Total Millivots	Total Counts
Counting Time 55		Total Drift Time	Counting Time
Gross cpm 0.49		Gross mv/sec	Gross cpm
Bkg. Cpm 0.20		Bkg. Mv/sec	Bkg. cpm
Net cpm 0.29		Net mv/sec	net cpm
~~dpm~~ pCi/l 1.28±0.98		curies/mv	dpm
dpm/24 hr. (69-74)		litter (69-74)	dps/cc
K 40 Correction			Neutron Dose (rads) (63-68)
~~Net Beta~~ pCi/24hr/sq 1.24±0.95		D(q) (63-68)	uc/mg (69-74)
D(q) (63-68)			D(q) (63-68)

$D_R = 4.69 \times 10^{-3}$ rad 15 Feb 66

(b) (6)

Internal Dosimetry Evaluation Form

NAME: (b) (6)	SSN: (b) (6)

MODE OF INTAKE:
☒ Inhalation ☐ Injection
☐ Ingestion ☐ Absorption
☐ Unknown ☐ Not applicable

INTAKE DATE OR PERIOD:
2/4/66 through 3/1/66, onsite
2/16/66

SUMMARY OF EXPOSURE CONDITIONS:
Radionuclides/Respiratory Class/Particle Size: ^{239}Pu/100% Class Y/1 μm AMAD
Date or Period of Evaluated Data: 1 sample, 3/1/66
Duration of Exposure: Unknown
Location of Exposure: Camp Wilson, near Palomares, Spain

EVALUATION DATA:

Air Sampling	☐ Attached	☐ In Process	☒ Unavailable
Health Physics Survey Data	☐ Attached	☐ In Process	☒ Unavailable
Bioassay – Urinalysis	☒ Attached	☐ In Process	☐ Unavailable
Fecal	☐ Attached	☐ In Process	☒ Unavailable
Nasal Smears	☐ Attached	☐ In Process	☒ Unavailable
In Vivo	☐ Attached	☐ In Process	☒ Unavailable

Medical Treatment:

Skin Decontamination:	☐ Yes	☒ No	Date: _____
Decorporation:	☐ Yes	☒ No	Agent: _____ Date: _____
Catharsis:	☐ Yes	☒ No	Agent: _____ Date: _____
Surgical excision:	☐ Yes	☒ No	Date: _____

EVALUATION METHODOLOGY:
Assumptions: Acute inhalation intake of ^{239}Pu, 100% Class Y, 1 μm AMAD particle size on 2/16/66

Code/Model used for: Intake Estimate: CINDY, Ver. 1.4/JONES
Dose Estimate: CINDY, Ver. 1.4/ICRP 30, Part 4, General Systemic Model

RESULTS SUMMARY
Estimated Intake Activity (pCi): 270000
50 YR CEDE (rem) : 83 (0.83 Sv)

Organ Dose Equivalent Summary	**50 YR CDE (rem/Sv)**
Bone Surface	840/8.4
Lung	310/3.1
Liver	150/1.5
Red Marrow	65/0.65
Other	14/0.14
Testes	12/0.12

DOSE ASSESSOR: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

PEER REVIEWER: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

RECOMMENDATIONS:
Additional Bioassay Required ☐ Urinalysis ☐ Fecal ☐ In Vivo
Suggested Sampling Frequency: _____
Work Restrictions: N/A

Internal Dosimetry Case Narrative

Identification:

Name: (b) (6)
SSN:

Incidents:

Individual participated on site in response duties resulting from an accident involving three nuclear weapons at Palomares, Spain on January 17, 1966. Individual may have been exposed to weapons materials (primarily plutonium-239) by inhalation and ingestion from contaminated weapon and aircraft debris, lands, and vegetation. Primary activities included search, radiological monitoring, recovery of accident debris, and processing for disposal.

Previous Intake/Dose Assessments:

This assessment applies to Palomares accident activities only. No previous intakes or doses were considered.

Other Information:

None.

Radionuclide(s): ^{239}Pu.

Assumptions/Basis/Data Sources:

Acute inhalation intake of Pu-239; 100% Class Y; 1 μm AMAD particle size on 2/16/66. The date is the midpoint of the period on station from 2/4/66 to 3/1/66.

Inhalation was assumed as the major route of entry because the primary contaminant was created by explosion and fire and deposited in sandy soil and on buildings and plants. Conditions were generally windy and significant activity was underway.

Dose was determined entirely from modeling intake based on the following urinalysis results for this individual. This individual's sample was identified for a follow-up analysis using alpha spectrometry after the initial gross alpha result was reviewed. That is, the initial urine sample for this individual was reprocessed radiochemically for alpha spectrometry. Results of the follow-up alpha spectrometry analysis are reported below and were used in preparing the dose estimate.

Sample	Analysis*	Sample Date	Result (pCi/day)	Error (pCi/day)	Included
66-1855	AS	3/1/66	0.294	0.007	✓
66-1855	G	3/1/66	1.52	0.310	

* G means gross alpha counting; AS means alpha spectrometry.

Intakes and estimates of dose were prepared using CINDY Version 1.4 and LUDEP Version 2.05.

Intake was estimated using the Jones excretion model in CINDY and LUDEP.

Inhalation intake was estimated using the ICRP 66 respiratory tract model in LUDEP.

CINDY estimated dose derived using the ICRP 30, Part 4, General Systemic Model and weighting factors; and LUDEP used the recommendations of ICRP 60.

Modeling:

CINDY and LUDEP were used to estimate the intake and dose with the following results:

Model	Intake (pCi)	CEDE (rem/Sv)
CINDY	270,000	83/0.83
LUDEP	1,270,000	89/0.89

Doses to individual organs and estimation of the effective dose equivalent using CINDY reported the following results:

Organ	Dose Equivalent (rem/Sv)	Weighting Factors	Weighted Organ Dose Equivalent (rem/Sv)
Testes	1.2E+01/1.2E-01	2.5E-01	3.0E+00/3.0E-02
Breast	4.0E-04/4.0E-06	1.5E-01	6.0E-05/6.0E-07
Red Marrow	6.5E+01/6.5E-01	1.2E-01	7.8E+00/7.8E-02
Lung	3.1E+02/3.1E+00	1.2E-01	3.7E+01/3.7E-01
Thyroid	3.8E-04/3.8E-06	3.0E-02	1.1E-05/1.1E-07
Bone Surface	8.4E+02/8.4E+00	3.0E-02	2.5E+01/2.5E-01
Liver	1.5E+02/1.5E+00	6.0E-02	9.0E+00/9.0E-02
Other	1.4E+01/1.4E-01	6.0E-02	8.6E-01/8.6E-03
Lower Large Intestine	3.1E-02/3.1E-04	6.0E-02	1.8E-03/1.8E-05
Upper Large Intestine	1.0E-02/1.0E-04	6.0E-02	6.2E-04/6.2E-06
Small Intestine	2.1E-03/2.1E-05	6.0E-02	1.3E-04/1.3E-06
Effective Dose Equivalent			8.3E+01/8.3E-01

One urine sample was analyzed by gross alpha counting and alpha spectrometry. The gross alpha analysis was not included in the modeling since an alpha spectrometry result was available for the same sample. The result was fit using CINDY and the Jones excretion model, to estimate an intake (270,000 pCi), organ doses, and a CEDE (83 rem/0.83 Sv; ICRP-30) as shown above. LUDEP was also used to estimate an intake of 1,270,000 pCi and a CEDE (ICRP-60) of 89 rem (0.89 Sv).

Conclusion:

Based on the results of intake estimates and dose calculations, this individual received an estimated intake of about 270,000 pCi of ^{239}Pu resulting in a 50-year committed effective dose equivalent of 83 rem (0.83 Sv). That dose is more than the cumulative dose (7 rem) from a lifetime (70 years) of exposure at the current level (0.100 rem) for members of the public. It is more than the working lifetime limit of 50 rem

recommended by the National Council on Radiation Protection and Measurements (NCRP). These dose levels are significant, although they were based on very limited data. However, follow-up urine sampling should be considered to provide additional assessment of the exposure.

Prepared By:

Name: _____

Signature: _____ Date: _____

Peer Reviewed By:

Name: _____

Signature: _____ Date: _____

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AFSN: (b) (6)

INTERNAL DOSE DATA

NAME (LAST, FIRST, M.I.) (1-20)		SOC. SEC. NO. (21-29)	TYPE SAMPLE (30)	TYPE ANAL. (31-32)
(b) (6)	Capt	(b) (6)	Urine	

SAMPLE NO. (33-38)	SAMPLE DATE (39-44)		EXPOSURE	
66-1855	FROM 1 Mar 66	TO	DATE 4 Feb 66	TYPE
BASE (57-60)	OCCUPATION (61-62)	REQUESTED BY		
Toul Rosiers	9124			
DATE RECEIVED	SAMPLE VOLUME	VOLUME ANALYZED	DATE ANALYZED	
28 March 1966	550	550		

TECHNICIAN (SIGNATURE AND DATE)

URINE				RADON		FECES/BLOOD	
Counter Number	D			Chamber Number		Counter Number	
Counter Bkg. (cpm)	2.03 (900)			Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)	.51		t=25	Counter Eff. (%)		Counter Eff.	
Date/Time – Start	13 may 66			Millivolt – Start		Date/Time – Start	
– Stop		Reported value		Millivolt – Stop		– Stop	✓
Total Counts	96	corrected for spike		Total Millivots		Total Counts	
Counting Time	.55	of 0.965 pci/sample		Total Drift Time		Counting Time	
Gross cpm	1.75			Gross mv/sec		Gross cpm	
Bkg. Cpm	0.03			Bkg. Mv/sec		Bkg. cpm	1.10PC
Net cpm	1.72			Net mv/sec		net cpm	NSBB
~~dpm~~ pci/l	2.75 ± 0.57			curies/mv		dpm	
dpm/24 hr. (69-74)				litter (69-74)		dps/cc	
K 40 Correction						Neutron Dose (rads) (63-68)	
~~Net Beta~~ pci/gal	1.52 ± 0.31			D(q) (63-68)		uc/mg (69-74)	
D(q) (63-68)						D(q) (63-68)	

(b)
(6)

(b)
(6)

RADIOLOGICAL SAMPLE DATA

NAME OR REQUESTOR'S ID (1–20)		GRADE	AFSN	SOCIAL SECURITY NUMBER	RHL SAMPLE NUMBER
					66-1855-
TYPE SAMPLE (23–32)	OCCUPATION (34–35)	ANALYSIS DESIRED	REQUESTED BY		AIR FORCE BASE (68–71)
DATE RECEIVED (37–42)	DATE ANALYZED (51–56)	DATE COUNTED	DATE COLLECTED		EXPOSURE DATE
		11 July 66			
SAMPLE WEIGHT/VOLUME		WEIGHT/VOLUME ANALYZED	TECHNICIAN		
OTHER DATA .950					

ENVIRONMENTAL SAMPLES					
COUNTER & EFFICIENCY					
TOTAL COUNTS & MINUTES					
GROSS CPM					
BKG CPM & MINUTES					
NET CPM					
YIELD					
BIOLOGICAL SAMPLES					
COUNTER & EFFICIENCY	spec	236	219	RADON	
TOTAL COUNTS & MINUTES	100	27.3	27.3	2.96	5.57 DPM
GROSS CPM		68	13	0.66	
BKG CPM & MINUTES	500	0.6800	0.13		
NET CPM		0	2 . 0.0013		
YIELD		0.68	0.1287		
				0.294 ± 0.007	
	% Rec	71.58			
SUMMARY OF RESULTS:					

AFLC FORM MAY 66 1165 FC 5400

AFLC–WPAFB–MAY 66 4500

(b) (6)

Internal Dosimetry Evaluation Form

NAME: (b) (6) SSN: (b) (6)

MODE OF INTAKE:
☒ Inhalation ☐ Injection
☐ Ingestion ☐ Absorption
☐ Unknown ☐ Not applicable

INTAKE DATE OR PERIOD:
1/18/66 through 2/7/66, onsite
1/28/66

SUMMARY OF EXPOSURE CONDITIONS:
Radionuclides/Respiratory Class/Particle Size: ^{239}Pu/100% Class Y/1 μm AMAD
Date or Period of Evaluated Data: 2 samples, 2/7/66 and 6/1/66
Duration of Exposure: Unknown
Location of Exposure: Camp Wilson, near Palomares, Spain

EVALUATION DATA:

Air Sampling	☐ Attached	☐ In Process	☒ Unavailable
Health Physics Survey Data	☐ Attached	☐ In Process	☒ Unavailable
Bioassay – Urinalysis	☒ Attached	☐ In Process	☐ Unavailable
Fecal	☐ Attached	☐ In Process	☒ Unavailable
Nasal Smears	☐ Attached	☐ In Process	☒ Unavailable
In Vivo	☐ Attached	☐ In Process	☒ Unavailable

Medical Treatment:

Skin Decontamination:	☐ Yes	☒ No	Date: _____
Decorporation:	☐ Yes	☒ No	Agent: _____ Date: _____
Catharsis:	☐ Yes	☒ No	Agent: _____ Date: _____
Surgical excision:	☐ Yes	☒ No	Date: _____

EVALUATION METHODOLOGY:
Assumptions: Acute inhalation intake of ^{239}Pu, 100% Class Y, 1 μm AMAD particle size on 1/28/66

Code/Model used for: Intake Estimate: CINDY, Ver. 1.4/JONES
Dose Estimate: CINDY, Ver. 1.4/ICRP 30, Part 4, General Systemic Model

RESULTS SUMMARY
Estimated Intake Activity (pCi): 68000
50 YR CEDE (rem) : 21 (0.21 Sv)

Organ Dose Equivalent Summary	**50 YR CDE (rem/Sv)**
Bone Surface	210/2.1
Lung	78/0.78
Liver	38/0.38
Red Marrow	16/0.16
Other	3.6/0.036
Testes	3/0.03

DOSE ASSESSOR: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

PEER REVIEWER: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

RECOMMENDATIONS:
Additional Bioassay Required ☐ Urinalysis ☐ Fecal ☐ In Vivo
Suggested Sampling Frequency: _____
Work Restrictions: N/A

Internal Dosimetry Case Narrative

Identification:

Name: (b) (6)
SSN:

Incidents:

Individual participated on site in response duties resulting from an accident involving three nuclear weapons at Palomares, Spain on January 17, 1966. Individual may have been exposed to weapons materials (primarily plutonium-239) by inhalation and ingestion from contaminated weapon and aircraft debris, lands, and vegetation. Primary activities included search, radiological monitoring, recovery of accident debris, and processing for disposal.

Previous Intake/Dose Assessments:

This assessment applies to Palomares accident activities only. No previous intakes or doses were considered.

Other Information:

None.

Radionuclide(s): ^{239}Pu.

Assumptions/Basis/Data Sources:

Acute inhalation intake of Pu-239; 100% Class Y; 1 μm AMAD particle size on 1/28/66. The date is the midpoint of the period on station from 1/18/66 to 2/7/66.

Inhalation was assumed as the major route of entry because the primary contaminant was created by explosion and fire and deposited in sandy soil and on buildings and plants. Conditions were generally windy and significant activity was underway.

Dose was determined entirely from modeling intake based on the following urinalysis results for this individual. This individual's sample was identified for a follow-up analysis using alpha spectrometry after the initial gross alpha result was reviewed. That is, the initial urine sample for this individual was reprocessed radiochemically for alpha spectrometry. Results of the follow-up alpha spectrometry analysis are reported below and were used in preparing the dose estimate.

Sample	Analysis*	Sample Date	Result (pCi/day)	Error (pCi/day)	Included
66-499	G	2/7/66	1.66	0.700	
66-3271	AS	6/1/66	0.047	0.047	✓
66-3271	G	6/1/66	NR	NR	

* G means gross alpha counting; AS means alpha spectrometry; NR means no result reported.

Intakes and estimates of dose were prepared using CINDY Version 1.4 and LUDEP Version 2.05.

Intake was estimated using the Jones excretion model in CINDY and LUDEP.

Inhalation intake was estimated using the ICRP 66 respiratory tract model in LUDEP.

CINDY estimated dose derived using the ICRP 30, Part 4, General Systemic Model and weighting factors; and LUDEP used the recommendations of ICRP 60.

Modeling:

CINDY and LUDEP were used to estimate the intake and dose with the following results:

Model	Intake (pCi)	CEDE (rem/Sv)
CINDY	68,000	21/0.21
LUDEP	191,000	13/0.13

Doses to individual organs and estimation of the effective dose equivalent using CINDY reported the following results:

Organ	Dose Equivalent (rem/Sv)	Weighting Factors	Weighted Organ Dose Equivalent (rem/Sv)
Testes	3.0E+00/3.0E-02	2.5E-01	7.6E-01/7.6E-03
Breast	1.0E-04/1.0E-06	1.5E-01	1.5E-05/1.5E-07
Red Marrow	1.6E+01/1.6E-01	1.2E-01	2.0E+00/2.0E-02
Lung	7.8E+01/7.8E-01	1.2E-01	9.3E+00/9.3E-02
Thyroid	9.5E-05/9.5E-07	3.0E-02	2.8E-06/2.8E-08
Bone Surface	2.1E+02/2.1E+00	3.0E-02	6.4E+00/6.4E-02
Liver	3.8E+01/3.8E-01	6.0E-02	2.3E+00/2.3E-02
Other	3.6E+00/3.6E-02	6.0E-02	2.2E-01/2.2E-03
Lower Large Intestine	7.7E-03/7.7E-05	6.0E-02	4.6E-04/4.6E-06
Upper Large Intestine	2.6E-03/2.6E-05	6.0E-02	1.6E-04/1.6E-06
Small Intestine	5.3E-04/5.3E-06	6.0E-02	3.2E-05/3.2E-07
Effective Dose Equivalent			2.1E+01/2.1E-01

One urine sample was analyzed by gross alpha counting only, and the other was analyzed by both gross alpha counting and alpha spectrometry. For the sample analyzed with both methods, the gross alpha analysis was not included in the modeling since an alpha spectrometry result was available for the same sample. The sample analyzed by gross alpha counting only was not included in the analysis since it was an on-site sample with a result >0.1 pCi, leading to a suspicion of sample contamination. The result was fit using CINDY and the Jones excretion model, to estimate an intake (68,000 pCi), organ doses, and a CEDE (21 rem/0.21 Sv; ICRP-30) as shown above. LUDEP was also used to estimate an intake of 191,000 pCi and a CEDE (ICRP-60) of 13 rem (0.13 Sv).

Conclusion:

Based on the results of intake estimates and dose calculations, this individual received an estimated intake of about 68,000 pCi of ^{239}Pu resulting in a 50-year committed effective dose equivalent of 21 rem (0.21 Sv). That dose is more than the cumulative dose (7 rem) from a lifetime (70 years) of exposure at the current level (0.100 rem) for members of the public. It is less than half the working lifetime limit of 50 rem recommended by the National Council on Radiation Protection and Measurements (NCRP). Serious health effects are not associated with that dose level.

Prepared By:

Name: _____

Signature: _____ Date: _____

Peer Reviewed By:

Name: _____

Signature: _____ Date: _____

(b) (6) (b) (6)

RESAMPLE JUN 6 1966

AFSN: (b) (6)

INTERNAL DOSE DATA

NAME (LAST, FIRST, M.I.) (1-20)	SOC. SEC. NO. (21-29)	TYPE SAMPLE (30)	TYPE ANAL. (31-32)
(b) (6) A1C	(b) (6)	Urine	

SAMPLE NO. (33-38)	SAMPLE DATE (39-44) FROM	TO	EXPOSURE DATE	TYPE
66-3271	1 June 66		Jan 66	

BASE (57-60)	OCCUPATION (61-62)	REQUESTED BY
Toul Rosieres		

DATE RECEIVED	SAMPLE VOLUME	VOLUME ANALYZED	DATE ANALYZED
6 June 1966	670 ml	370 ml	

TECHNICIAN (SIGNATURE AND DATE)

URINE			Gross α	RADON		FECES/BLOOD	
Counter Number	236	239	F	Chamber Number		Counter Number	
Counter Bkg. (cpm)			425 (38 ll)	Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)	31.8		51	Counter Eff. (%)		Counter Eff.	
Date/Time – Start	24 SEPT 66		19 Sept	Millivolt – Start		Date/Time – Start	
– Stop				Millivolt – Stop		– Stop	
Total Counts			194	Total Millivots		Total Counts	
Counting Time 100	250	1	55	Total Drift Time		Counting Time	
Gross cpm				Gross mv/sec		Gross cpm	
Bkg. Cpm 466	3	1		Bkg. Mv/sec		Bkg. cpm	
Net cpm				Net mv/sec		net cpm	
dpm			%REC	curies/mv		dpm	
dpm/24 hr. (69-74)			=207%	litter (69-74)		dps/cc	
K 40 Correction						Neutron Dose (rads) (63-68)	
Net Beta				D(q) (63-68)		uc/mg (69-74)	
D(q) (63-68)						D(q) (63-68)	

NAME: | SOCIAL SECURITY NUMBER: | SAMPLE NUMBER:

AIR FORCE BASE

RESULTS OF ANALYSIS LABORATORY ACCIDENT "A" SAMPLE 2 SEPT

PC/SPL= %REC.= 237%

TOT. VOL = 670 ML. VOL. ANAL = 370 ML. BODY BURDEN=

☐ Repeat the sample for the following reason:

( ) Significant activity in recently analyzed sample(s)

( ) Data required to establish dose

( ) Improper flask used

( ) Other DO OVER

( ) Suggested sampling schedule TOO MUCH SPIKE

SIGNATURE: DATE:

ONE TIME FORM. OBSOLETE AFTER 30 JUN 66. (MCGSCPF, RAG, 4 APR 66) AFLC–WPAFB–APR 66 2500

(b) (6) [redacted]

RADIOLOGICAL SAMPLE DATA

[redacted] E OR REQUESTOR'S ID (1–20)	GRADE	AFSN	SOCIAL SECURITY NUMBER	RHL SAMPLE NUMBER 66-3271 B
TYPE SAMPLE (23–32)	OCCUPATION (34–35)	ANALYSIS DESIRED	REQUESTED BY	AIR FORCE BASE (68–71)
DATE RECEIVED (37–42)	DATE ANALYZED (51–56)	DATE COUNTED 5 Oct 66	DATE COLLECTED	EXPOSURE DATE
SAMPLE WEIGHT/VOLUME	WEIGHT/VOLUME ANALYZED 300	TECHNICI (b) (6) [redacted]		
OTHER DATA	Checked off			

ENVIRONMENTAL SAMPLES				
COUNTER & EFFICIENCY				
TOTAL COUNTS & MINUTES				
GROSS CPM				
BKG CPM & MINUTES				
NET CPM		t=140		
YIELD				
	236	279	RADON	
BIOLOGICAL SAMPLES				
COUNTER & EFFICIENCY Spec	31.8			
TOTAL COUNTS & MINUTES 100	70	1		
GROSS CPM				
BKG CPM & MINUTES 440	1	0		
NET CPM				
YIELD				
0.047 ±	0.047			

SUMMARY OF RESULTS: Pci/spl – NDA
Tot Vol – 670
Vol Anal – 300

%Rec – 66.9
Body Burden –

AFLC FORM MAY 66 1165 FC 5400

AFLC–WPAFB–MAY 66 4500

FEB 10 1966

INTERNAL DOSE DATA

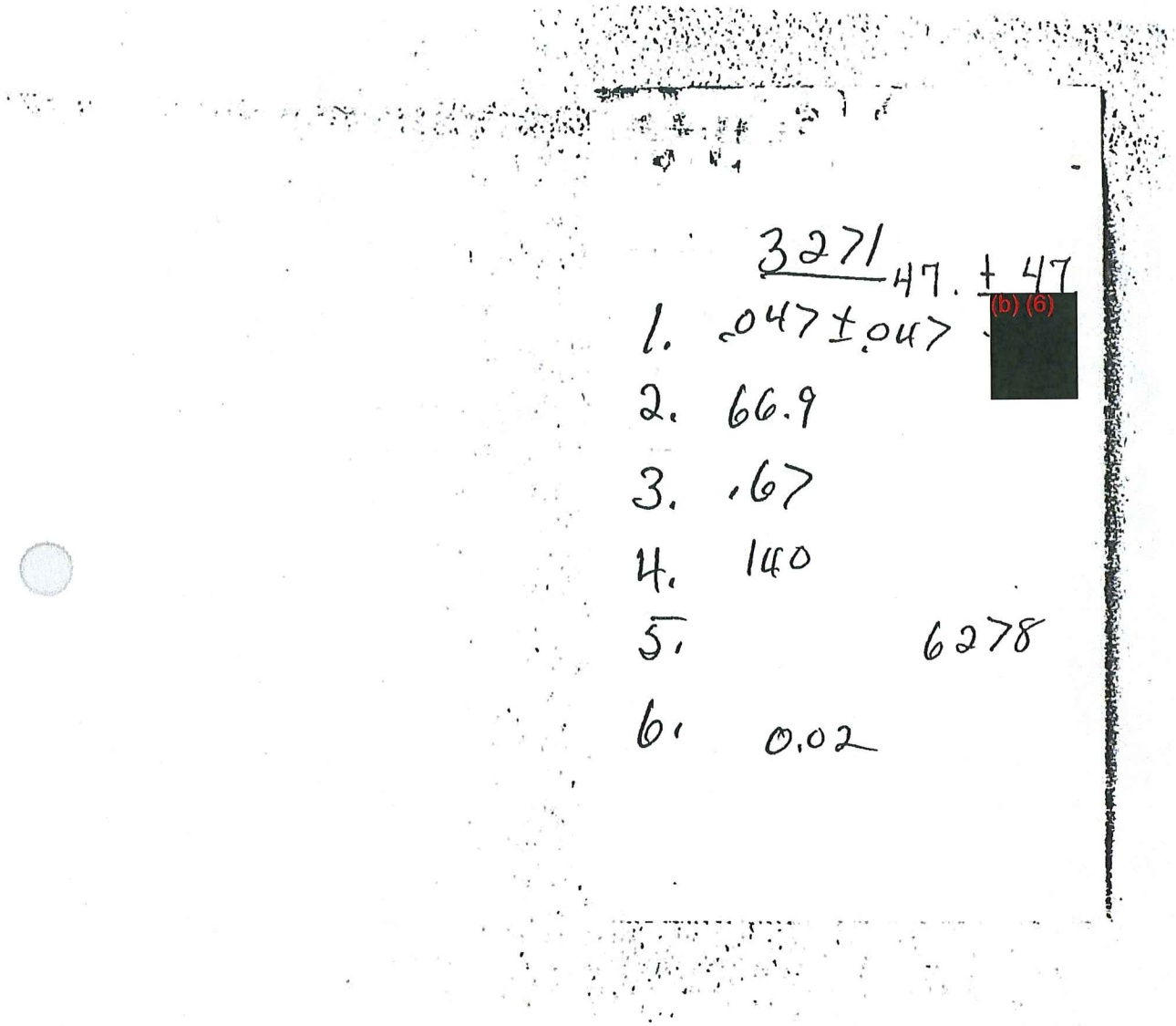
NAME (LAST, FIRST, M.I.) (1-20) (b) (6)	SOC. SEC. NO. (21-29) Alic	TYPE SAMPLE (30) Urine	TYPE ANAL. (31-32) GROSS ALPHA
(b) (6) 66-499	SAMPLE DATE (39-44) FROM 7 Feb TO		EXPOSURE DATE 18 Jan TYPE
BASE (57-60) Taul Rosierre, France	OCCUPATION (61-62)	REQUESTED BY	
DATE RECEIVED FEB 10 1966	SAMPLE VOLUME 560 ml	VOLUME ANALYZED 200 ml	DATE ANALYZED
TECHNICIAN (SIGNATURE AND DATE) (b) (6) SSGT USAF			14 FEB 1966

URINE		RADON		FECES/BLOOD	
Counter Number	NMC A	Chamber Number		Counter Number	
Counter Bkg. (cpm)	0.24	Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)	51	Counter Eff. (%)		Counter Eff.	
Date/Time – Start	14 FEB 1966	Millivolt – Start		Date/Time – Start	
– Stop		Millivolt – Stop		– Stop	
Total Counts	50	Total Millivots		Total Counts	
Counting Time	55	Total Drift Time		Counting Time	
Gross cpm	0.91	Gross mv/sec		Gross cpm	
Bkg. Cpm	0.24	Bkg. Mv/sec		Bkg. cpm	
Net cpm	0.67	Net mv/sec		net cpm	
~~dpm~~ Pci/l	2.96 ± 1.25	curies/mv		dpm	
dpm/24 hr. (69-74)		litter (69-74)		dps/cc	
K 40 Correction				Neutron Dose (rads) (63-68)	
~~Net Bkg~~ Pci/gal	1.66 ± 0.70	D(q) (63-68)		uc/mg (69-74)	
D (q) (63-68)				D(q) (63-68)	

$D_q = 1.15 \times 10^{-2}$ μc 26 Feb 66

(b) (6) [redacted]

(b) (6) [redacted]



3271 47. ± 47

1. .047 ± .047 (b) (6) [redacted]
2. 66.9
3. .67
4. 140
5. 6278
6. 0.02

(b) (6)

(b) (6) (b) (6)

Internal Dosimetry Evaluation Form

NAME: (b) (6) SSN: (b) (6)

MODE OF INTAKE:
☒ Inhalation ☐ Injection
☐ Ingestion ☐ Absorption
☐ Unknown ☐ Not applicable

INTAKE DATE OR PERIOD:
1/20/66 through 2/7/66, onsite
1/29/66

SUMMARY OF EXPOSURE CONDITIONS:
Radionuclides/Respiratory Class/Particle Size: ^{239}Pu/100% Class Y/1 μm AMAD
Date or Period of Evaluated Data: 2 samples, 2/7/66 and 6/1/66
Duration of Exposure: Unknown
Location of Exposure: Camp Wilson, near Palomares, Spain

EVALUATION DATA:

Air Sampling	☐ Attached	☐ In Process	☒ Unavailable
Health Physics Survey Data	☐ Attached	☐ In Process	☒ Unavailable
Bioassay – Urinalysis	☒ Attached	☐ In Process	☐ Unavailable
Fecal	☐ Attached	☐ In Process	☒ Unavailable
Nasal Smears	☐ Attached	☐ In Process	☒ Unavailable
In Vivo	☐ Attached	☐ In Process	☒ Unavailable

Medical Treatment:

Skin Decontamination:	☐ Yes	☒ No	Date: _____
Decorporation:	☐ Yes	☒ No	Agent: _____ Date: _____
Catharsis:	☐ Yes	☒ No	Agent: _____ Date: _____
Surgical excision:	☐ Yes	☒ No	Date: _____

EVALUATION METHODOLOGY:
Assumptions: Acute inhalation intake of ^{239}Pu, 100% Class Y, 1 μm AMAD particle size on 1/29/66

Code/Model used for: Intake Estimate: CINDY, Ver. 1.4/JONES
Dose Estimate: CINDY, Ver. 1.4/ICRP 30, Part 4, General Systemic Model

RESULTS SUMMARY
Estimated Intake Activity (pCi): 210000
50 YR CEDE (rem) : 65 (0.65 Sv)

Organ Dose Equivalent Summary	**50 YR CDE (rem/Sv)**
Bone Surface	650/6.5
Lung	240/2.4
Liver	120/1.2
Red Marrow	51/0.51
Other	11/0.11
Testes	9.4/0.094

DOSE ASSESSOR: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

PEER REVIEWER: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

RECOMMENDATIONS:
Additional Bioassay Required ☐ Urinalysis ☐ Fecal ☐ In Vivo
Suggested Sampling Frequency: _____
Work Restrictions: N/A

Internal Dosimetry Case Narrative

Identification:

Name: (b) (6)
SSN:

Incidents:

Individual participated on site in response duties resulting from an accident involving three nuclear weapons at Palomares, Spain on January 17, 1966. Individual may have been exposed to weapons materials (primarily plutonium-239) by inhalation and ingestion from contaminated weapon and aircraft debris, lands, and vegetation. Primary activities included search, radiological monitoring, recovery of accident debris, and processing for disposal.

Previous Intake/Dose Assessments:

This assessment applies to Palomares accident activities only. No previous intakes or doses were considered.

Other Information:

None.

Radionuclide(s): ^{239}Pu.

Assumptions/Basis/Data Sources:

Acute inhalation intake of Pu-239; 100% Class Y; 1 μm AMAD particle size on 1/29/66. The date is the midpoint of the period on station from 1/20/66 to 2/7/66.

Inhalation was assumed as the major route of entry because the primary contaminant was created by explosion and fire and deposited in sandy soil and on buildings and plants. Conditions were generally windy and significant activity was underway.

Dose was determined entirely from modeling intake based on the following urinalysis results for this individual. This individual's sample was identified for a follow-up analysis using alpha spectrometry after the initial gross alpha result was reviewed. That is, the initial urine sample for this individual was reprocessed radiochemically for alpha spectrometry. Results of the follow-up alpha spectrometry analysis are reported below and were used in preparing the dose estimate.

Sample	Analysis*	Sample Date	Result (pCi/day)	Error (pCi/day)	Included
66-464	G	2/7/66	0.500	0.350	
66-3270	AS	6/1/66	0.146	0.147	✓
66-3270	G	6/1/66	NR	NR	

* G means gross alpha counting; AS means alpha spectrometry.

Intakes and estimates of dose were prepared using CINDY Version 1.4 and LUDEP Version 2.05.

Intake was estimated using the Jones excretion model in CINDY and LUDEP.

Inhalation intake was estimated using the ICRP 66 respiratory tract model in LUDEP.

CINDY estimated dose derived using the ICRP 30, Part 4, General Systemic Model and weighting factors; and LUDEP used the recommendations of ICRP 60.

Modeling:

CINDY and LUDEP were used to estimate the intake and dose with the following results:

Model	Intake (pCi)	CEDE (rem/Sv)
CINDY	210,000	65/0.65
LUDEP	591,000	42/0.42

Doses to individual organs and estimation of the effective dose equivalent using CINDY reported the following results:

Organ	Dose Equivalent (rem/Sv)	Weighting Factors	Weighted Organ Dose Equivalent (rem/Sv)
Testes	9.4E+00/9.4E-02	2.5E-01	2.3E+00/2.3E-02
Breast	3.1E-04/3.1E-06	1.5E-01	4.7E-05/4.7E-05
Red Marrow	5.1E+01/5.1E-01	1.2E-01	6.1E+00/6.1E-02
Lung	2.4E+02/2.4E+00	1.2E-01	2.9E+01/2.9E-01
Thyroid	2.9E-04/2.9E-06	3.0E-02	8.8E-06/8.8E-06
Bone Surface	6.5E+02/6.5E+00	3.0E-02	2.0E+01/2.0E-01
Liver	1.2E+02/1.2E+00	6.0E-02	7.0E+00/7.0E-02
Other	1.1E+01/1.1E-01	6.0E-02	6.7E-01/6.7E-03
Lower Large Intestine	2.4E-02/2.4E-04	6.0E-02	1.4E-03/1.4E-05
Upper Large Intestine	8.0E-03/8.0E-05	6.0E-02	4.8E-04/4.8E-06
Small Intestine	1.6E-03/1.6E-05	6.0E-02	9.8E-07/9.8E-07
Effective Dose Equivalent			6.5E+01/6.5E-01

One urine sample was analyzed by gross alpha counting only, and the other was analyzed by both gross alpha counting and alpha spectrometry. For the sample analyzed with both methods, the gross alpha analysis was not included in the modeling since no result was reported and an alpha spectrometry result was available for the same sample. The sample analyzed by gross alpha counting only was not included in the analysis since it was an on-site sample with a result >0.1 pCi, leading to a suspicion of sample contamination. The result was fit using CINDY and the Jones excretion model, to estimate an intake (210,000 pCi), organ doses, and a CEDE (65 rem/0.65 Sv; ICRP-30) as shown above. LUDEP was also used to estimate an intake of 591,000 pCi and a CEDE (ICRP-60) of 42 rem (0.42 Sv).

Conclusion:

Based on the results of intake estimates and dose calculations, this individual received an estimated intake of about 210,000 pCi of ^{239}Pu resulting in a 50-year committed effective dose equivalent of 65 rem (0.65 Sv). That dose is more than the cumulative dose (7 rem) from a lifetime (70 years) of exposure at the current level (0.100 rem) for members of the public. It is more than the working lifetime limit of 50 rem recommended by the National Council on Radiation Protection and Measurements (NCRP). Serious health effects are not normally associated with these dose levels. However, follow-up urine sampling should be considered to provide additional assessment of the exposure.

Prepared By:

Name: _____

Signature: _____ Date: _____

Peer Reviewed By:

Name: _____

Signature: _____ Date: _____

(b) (6) (b) (6)

RESAMPLE JUN 6 1966

INTERNAL DOSE DATA

AFSN: (b) (6)

NAME (LAST, FIRST, M.I.) (1-20)	SOC. SEC. NO. (21-29)	TYPE SAMPLE (30)	TYPE ANAL. (31-32)
(b) (6) SSgt	(b) (6)	Urine	

SAMPLE NO. (33-38)	SAMPLE DATE (39-44)		EXPOSURE	
	FROM	TO	DATE	TYPE
66-3270	1 June 66		Jan 66	

BASE (57-60)	OCCUPATION (61-62)	REQUESTED BY	
Toul Rosieres			

DATE RECEIVED	SAMPLE VOLUME	VOLUME ANALYZED	DATE ANALYZED
6 June 1966	[redacted]1860	[redacted]1060	

TECHNICIAN (SIGNATURE AND DATE)

URINE				RADON		FECES/BLOOD	
Counter Number				Chamber Number		Counter Number	
Counter Bkg. (cpm)				Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)				Counter Eff. (%)		Counter Eff.	
Date/Time – Start				Millivolt – Start		Date/Time – Start	
– Stop				Millivolt – Stop		– Stop	
Total Counts				Total Millivots		Total Counts	
Counting Time				Total Drift Time		Counting Time	
Gross cpm				Gross mv/sec		Gross cpm	
Bkg. Cpm				Bkg. Mv/sec		Bkg. cpm	
Net cpm				Net mv/sec		net cpm	
dpm				curies/mv		dpm	
dpm/24 hr. (69-74)				litter (69-74)		dps/cc	
K 40 Correction						Neutron Dose (rads) (63-68)	
Net Beta				D(q) (63-68)		uc/mg (69-74)	
D(q) (63-68)						D(q) (63-68)	

Repeat: Recount Gas 608

NAME:	SOCIAL SECURITY NUMBER:	SAMPLE NUMBER:

AIR FORCE BASE

RESULTS OF ANALYSIS

Fal ure - Repeat

☐ Repeat the sample for the following reason:

( ) Significant activity in recently analyzed sample (s)

( ) Data required to establish dose

( ) Improper flask used

( ) Other _____

( ) Suggested sampling schedule _____

SIGNATURE:	DATE:

ONE TIME FORM. OBSOLETE AFTER 30 JUN 66. (MCGSCPF, RAG, 4 APR 66)

AFLC–WPAFB–APR 66 2500

FEB 10 1966

INTERNAL DOSE DATA

NAME (LAST, FIRST, M.I.) (1-20) (b) (6)	SOC. SEC. NO. (21-29) (b) (6)	TYPE SAMPLE (30)	TYPE ANAL. (31-32) GROSS ALPHA
SAMPLE NO. (33-38) 66-464	SAMPLE DATE (39-44) FROM Submittal - 7 Feb '66 TO	EXPOSURE DATE Air - 20 Jan 66 TYPE	
BASE (57-60) Tool - Robins	OCCUPATION (61-62)	REQUESTED BY	
DATE RECEIVED FEB 10 1966	SAMPLE VOLUME 375 ml.	VOLUME ANALYZED 200 ml.	DATE ANALYZED

TECHNICIAN (SIGNATURE AND DATE) WALTER G. EDWARDS SSGT. USAF 11 FEB 1966

URINE	GROSS ALPHA		RADON		FECES/BLOOD	
Counter Number	6		Chamber Number		Counter Number	
Counter Bkg. (cpm)	0.15		Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)	51		Counter Eff. (%)		Counter Eff.	
Date/Time – Start	11 FEB 1966		Millivolt – Start		Date/Time – Start	
– Stop			Millivolt – Stop		– Stop	
Total Counts	25		Total Millivots		Total Counts	
Counting Time	55		Total Drift Time		Counting Time	
Gross cpm	0.45		Gross mv/sec		Gross cpm	
Bkg. Cpm	0.15		Bkg. Mv/sec		Bkg. cpm	
Net cpm	0.30		Net mv/sec		net cpm	
~~dpm~~ pCi/l	1.33±0.92		curies/mv		dpm	
dpm/24 Hr. (69-74)			litter (69-74)		dps/cc	
K 40 Correction					Neutron Dose (rads) (63-68)	
~~Nat Beta~~ pCi/gal	0.50±0.35		D(q) (63-68)		uc/mg (69-74)	
D(q) (63-68)					D(q) (63-68)	

$D_q = 4.88 \times 10^{-3}$ mr

15 Feb 66

[redacted]

RADIOLOGICAL SAMPLE DATA

NAME OR REQUESTOR'S ID (1–20)	GRADE	AFSN	SOCIAL SECURITY NUMBER	RHL SAMPLE NUMBER 66-3270 B
TYPE SAMPLE (23–32)	OCCUPATION (34–35)	ANALYSIS DESIRED	REQUESTED BY	AIR FORCE BASE (68–71)
DATE RECEIVED (37–42)	DATE ANALYZED (51–56)	DATE COUNTED 4 Oct 66	DATE COLLECTED	EXPOSURE DATE
SAMPLE WEIGHT/VOLUME		WEIGHT/VOLUME ANALYZED 400 ml	TECHNICI[redacted]	
OTHER DATA				

checked off master list

ENVIRONMENTAL SAMPLES				
COUNTER & EFFICIENCY				
TOTAL COUNTS & MINUTES				
GROSS CPM				
BKG CPM & MINUTES				
NET CPM				
YIELD		t>140		
BIOLOGICAL SAMPLES	236	239		
COUNTER & EFFICIENCY Inc #4	23.8		RADON	
TOTAL COUNTS & MINUTES 100	48		E-51	
GROSS CPM		1	55-75	
BKG CPM & MINUTES 445	3			
NET CPM		0	935-78	
YIELD				
0.146 ÷ 0.147				
			%Rec = 76.3	

4.65

SUMMARY OF RESULTS:

Pci/spl = NDA
TOT VOL = 1860
VOL ANAL = 400

% Rec = 61.3
Body Burden =

HEAVY ORANGE DEPOSIT

AFLC FORM MAY 66 1165 FC 5400

AFLC–WPAFB–MAY 66 4500

3270

1. .15 ± .15 Pc
2. 61.3
3. 1.86
4. 140
5. 6277
6. 0.06

(b) (6)

(b) (6) (b) (6)

Internal Dosimetry Evaluation Form

NAME: (b) (6) SSN: (b) (6)

MODE OF INTAKE:
☒ Inhalation ☐ Injection
☐ Ingestion ☐ Absorption
☐ Unknown ☐ Not applicable

INTAKE DATE OR PERIOD:
2/5/66 through 2/26/66, onsite
2/15/66

SUMMARY OF EXPOSURE CONDITIONS:
Radionuclides/Respiratory Class/Particle Size: ^{239}Pu/100% Class Y/1 μm AMAD
Date or Period of Evaluated Data: 1 sample, 2/26/66
Duration of Exposure: Unknown
Location of Exposure: Camp Wilson, near Palomares, Spain

EVALUATION DATA:

Air Sampling	☐ Attached	☐ In Process	☒ Unavailable
Health Physics Survey Data	☐ Attached	☐ In Process	☒ Unavailable
Bioassay – Urinalysis	☒ Attached	☐ In Process	☐ Unavailable
Fecal	☐ Attached	☐ In Process	☒ Unavailable
Nasal Smears	☐ Attached	☐ In Process	☒ Unavailable
In Vivo	☐ Attached	☐ In Process	☒ Unavailable

Medical Treatment:

Skin Decontamination:	☐ Yes	☒ No	Date: _____	
Decorporation:	☐ Yes	☒ No	Agent: _____	Date: _____
Catharsis:	☐ Yes	☒ No	Agent: _____	Date: _____
Surgical excision:	☐ Yes	☒ No	Date: _____	

EVALUATION METHODOLOGY:
Assumptions: Acute inhalation intake of ^{239}Pu, 100% Class Y, 1 μm AMAD particle size on 2/15/66

Code/Model used for: Intake Estimate: CINDY, Ver. 1.4/JONES
Dose Estimate: CINDY, Ver. 1.4/ICRP 30, Part 4, General Systemic Model

RESULTS SUMMARY
Estimated Intake Activity (pCi): 7700
50 YR CEDE (rem) : 2.4 (0.024 Sv)

Organ Dose Equivalent Summary	**50 YR CDE (rem/Sv)**
Bone Surface	24/0.24
Lung	8.8/0.088
Liver	4.3/0.043
Red Marrow	1.9/0.019
Other	0.41/0.0041
Testes	0.34/0.0034

DOSE ASSESSOR: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

PEER REVIEWER: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

RECOMMENDATIONS:
Additional Bioassay Required ☐ Urinalysis ☐ Fecal ☐ In Vivo
Suggested Sampling Frequency: _____
Work Restrictions: N/A

Internal Dosimetry Case Narrative

Identification:

Name: (b) (6)
SSN:

Incidents:

Individual participated on site in response duties resulting from an accident involving three nuclear weapons at Palomares, Spain on January 17, 1966. Individual may have been exposed to weapons materials (primarily plutonium-239) by inhalation and ingestion from contaminated weapon and aircraft debris, lands, and vegetation. Primary activities included search, radiological monitoring, recovery of accident debris, and processing for disposal.

Previous Intake/Dose Assessments:

This assessment applies to Palomares accident activities only. No previous intakes or doses were considered.

Other Information:

None.

Radionuclide(s): ^{239}Pu.

Assumptions/Basis/Data Sources:

Acute inhalation intake of Pu-239; 100% Class Y; 1 μm AMAD particle size on 2/15/66. The date is the midpoint of the period on station from 2/5/66 to 2/26/66.

Inhalation was assumed as the major route of entry because the primary contaminant was created by explosion and fire and deposited in sandy soil and on buildings and plants. Conditions were generally windy and significant activity was underway.

Dose was determined entirely from modeling intake based on the following urinalysis results for this individual. This individual's sample was identified for a follow-up analysis using alpha spectrometry after the initial gross alpha result was reviewed. That is, the initial urine sample for this individual was reprocessed radiochemically for alpha spectrometry. Results of the follow-up alpha spectrometry analysis are reported below and were used in preparing the dose estimate.

Sample	Analysis*	Sample Date	Result (pCi/day)	Error (pCi/day)	Included
66-1430	AS	2/26/66	NR	NR	
66-1430	G	2/26/66	ND	ND	✓

* G means gross alpha counting; AS means alpha spectrometry.

Intakes and estimates of dose were prepared using CINDY Version 1.4 and LUDEP Version 2.05.

Intake was estimated using the Jones excretion model in CINDY and LUDEP.

Inhalation intake was estimated using the ICRP 66 respiratory tract model in LUDEP.

CINDY estimated dose derived using the ICRP 30, Part 4, General Systemic Model and weighting factors; and LUDEP used the recommendations of ICRP 60.

Modeling:

CINDY and LUDEP were used to estimate the intake and dose with the following results:

Model	Intake (pCi)	CEDE (rem/Sv)
CINDY	7,700	2.4/0.024
LUDEP	38,300	2.7/0.027

Doses to individual organs and estimation of the effective dose equivalent using CINDY reported the following results:

Organ	Dose Equivalent (rem/Sv)	Weighting Factors	Weighted Organ Dose Equivalent (rem/Sv)
Testes	3.4E-01/3.4E-03	2.5E-01	8.6E-02/8.6E-04
Breast	1.1E-05/1.1E-07	1.5E-01	1.7E-06/1.7E-08
Red Marrow	1.9E+00/1.9E-02	1.2E-01	2.2E-01/2.2E-03
Lung	8.8E+00/8.8E-02	1.2E-01	1.1E+00/1.1E-02
Thyroid	1.1E-05/1.1E-07	3.0E-02	3.2E-07/3.2E-09
Bone Surface	2.4E+01/2.4E-01	3.0E-02	7.2E-01/7.2E-03
Liver	4.3E+00/4.3E-02	6.0E-02	2.6E-01/2.6E-03
Other	4.1E-01/4.1E-03	6.0E-02	2.4E-02/2.4E-04
Lower Large Intestine	8.7E-04/8.7E-06	6.0E-02	5.2E-05/5.2E-07
Upper Large Intestine	2.9E-04/2.9E-06	6.0E-02	1.8E-05/1.8E-07
Small Intestine	6.0E-05/6.0E-07	6.0E-02	3.6E-06/3.6E-08
Effective Dose Equivalent			2.4E+00/2.4E-02

One urine sample was analyzed by gross alpha counting and alpha spectrometry. The alpha spectrometry analysis was not included in the modeling since no result was reported. The gross alpha counting result was reported as No Detectable Activity. A value of 0.009 pCi was used to represent this outcome. The result was fit using CINDY and the Jones excretion model, to estimate an intake (7,700 pCi), organ doses, and a CEDE (2.4 rem/0.024 Sv; ICRP-30) as shown above. LUDEP was also used to estimate an intake of 38,300 pCi and a CEDE (ICRP-60) of 2.7 rem (0.027 Sv).

Conclusion:

Based on the results of intake estimates and dose calculations, this individual received an estimated intake of about 7,700 pCi of ^{239}Pu resulting in a 50-year committed effective dose equivalent of 2.4 rem (0.024 Sv). That dose is less than the cumulative dose (7 rem) from a lifetime (70 years) of exposure at the

current level (0.100 rem) for members of the public. It is far less than the working lifetime limit of 50 rem recommended by the National Council on Radiation Protection and Measurements (NCRP). Serious health effects are not associated with that dose level.

Prepared By:

Name: _____

Signature: _____ Date: _____

Peer Reviewed By:

Name: _____

Signature: _____ Date: _____

MAR 9 1966 A

INTERNAL DOSE DATA

NAME (LAST, FIRST, Mid.) (1-20)	SOC. SEC. NO. (21-29)	TYPE SAMPLE (30)	TYPE ANAL. (31-32)
RESAL. (b) (6)	(b) (6) TSGT.	URINE	GROSS ALPHA

SAMPLE NO. (33-38)	SAMPLE DATE (39-44)		EXPOSURE
66-1430	FROM 26 FEB 66	TO	DATE 5-2-66 TYPE

BASE (57-60)	OCCUPATION (61-62)	REQUESTED BY	
TORREJON	90870		
DATE RECEIVED	**SAMPLE VOLUME**	**VOLUME ANALYZED**	**DATE ANALYZED**
9 MAR 66	780	811	

TECHNICIAN (SIGNATURE AND DATE)

URINE	239	236		RADON		FECES/BLOOD	
Counter Number				Chamber Number		Counter Number	
Counter Bkg. (cpm)				Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)				Counter Eff. (%)		Counter Eff.	
Date/Time – Start	11 MAR 66			Millivolt – Start		Date/Time – Start	
–Stop				Millivolt – Stop		– Stop	
Total Counts	0	11		Total Millivots		Total Counts	
Counting Time	102	100		Total Drift Time		Counting Time	alpha Spect
Gross cpm	0	0.11		Gross mv/sec		Gross cpm	
Bkg. Cpm	0.007	0.004		Bkg. Mv/sec		Bkg. cpm	NDA
Net cpm	0	0.106		Net mv/sec		net cpm	
~~dpm~~ %AEC		49 %		curies/mv		dpm	
dpm/24 hr. (69-74)				litter (69-74)		dps/cc	
K 40 Correction						Neutron Dose (rads) (63-68)	
~~Net Beta~~ PI/SDD						uc/mg (69-74)	
D(q) (63-68)	N.D.A.			D(q) (63-68)		D(q) (63-68)	

(b)
(6)

RADIOLOGICAL SAMPLE DATA

NAME OR REQUESTOR'S ID (1–20)		GRADE	AFSN	SOCIAL SECURITY NUMBER	RHL SAMPLE NUMBER 66-1430
TYPE SAMPLE (23–32)	OCCUPATION (34–35)	ANALYSIS DESIRED	REQUESTED BY		AIR FORCE BASE (68–71)
DATE RECEIVED (37–42)	DATE ANALYZED (51–56)	DATE COUNTED 28 JUL 1966	DATE COLLECTED		EXPOSURE DATE
SAMPLE WEIGHT/VOLUME		WEIGHT/VOLUME ANALYZED	TECHNICIAN		
OTHER DATA 939					

ENVIRONMENTAL SAMPLES					
COUNTER & EFFICIENCY					
TOTAL COUNTS & MINUTES					
GROSS CPM					
BKG CPM & MINUTES					
NET CPM					
YIELD					
BIOLOGICAL SAMPLES		236	235	RADON	
COUNTER & EFFICIENCY	Spec	27.3	27.3	2.11 dpm	
TOTAL COUNTS & MINUTES	100	56	4		
GROSS CPM		0.5600	0.0400		
BKG CPM & MINUTES	500	12 0.0150	8 0.0100		
NET CPM		0.5450	0.0300		
YIELD					
	% Rec	58.04			

SUMMARY OF RESULTS:

AFLC FORM MAY 66 1165 FC 5400 AFLC–WPAFB–MAY 66 4500

(b)
(6)

(b) (6)

(b) (6) (b) (6)

Internal Dosimetry Evaluation Form

NAME: (b) (6) SSN: (b) (6)

MODE OF INTAKE:
☒ Inhalation ☐ Injection
☐ Ingestion ☐ Absorption
☐ Unknown ☐ Not applicable

INTAKE DATE OR PERIOD:
1/18/66 through 1/31/66, onsite
1/24/66

SUMMARY OF EXPOSURE CONDITIONS:
Radionuclides/Respiratory Class/Particle Size: ^{239}Pu/100% Class Y/1 μm AMAD
Date or Period of Evaluated Data: 4 samples, 1/21/66 through 6/2/66
Duration of Exposure: Unknown
Location of Exposure: Camp Wilson, near Palomares, Spain

EVALUATION DATA:

Air Sampling	☐ Attached	☐ In Process	☒ Unavailable
Health Physics Survey Data	☐ Attached	☐ In Process	☒ Unavailable
Bioassay – Urinalysis	☒ Attached	☐ In Process	☐ Unavailable
Fecal	☐ Attached	☐ In Process	☒ Unavailable
Nasal Smears	☐ Attached	☐ In Process	☒ Unavailable
In Vivo	☐ Attached	☐ In Process	☒ Unavailable

Medical Treatment:

Skin Decontamination:	☐ Yes	☒ No	Date: _____
Decorporation:	☐ Yes	☒ No	Agent: _____ Date: _____
Catharsis:	☐ Yes	☒ No	Agent: _____ Date: _____
Surgical excision:	☐ Yes	☒ No	Date: _____

EVALUATION METHODOLOGY:
Assumptions: Acute inhalation intake of ^{239}Pu, 100% Class Y, 1 μm AMAD particle size on 1/24/66

Code/Model used for: Intake Estimate: CINDY, Ver. 1.4/JONES
Dose Estimate: CINDY, Ver. 1.4/ICRP 30, Part 4, General Systemic Model

RESULTS SUMMARY
Estimated Intake Activity (pCi): 240,000
50 YR CEDE (rem) : 74 (0.74 Sv)

Organ Dose Equivalent Summary	**50 YR CDE (rem/Sv)**
Bone Surface	750/7.5
Lung	270/2.7
Liver	130/1.3
Red Marrow	58/0.58
Other	13/0.13
Testes	11/0.11

DOSE ASSESSOR: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

PEER REVIEWER: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

RECOMMENDATIONS:
Additional Bioassay Required ☐ Urinalysis ☐ Fecal ☐ In Vivo
Suggested Sampling Frequency: _____
Work Restrictions: N/A

Internal Dosimetry Case Narrative

Identification:

Name: (b) (6)
SSN:

Incidents:

Individual participated on site in response duties resulting from an accident involving three nuclear weapons at Palomares, Spain on January 17, 1966. Individual may have been exposed to weapons materials (primarily plutonium-239) by inhalation and ingestion from contaminated weapon and aircraft debris, lands, and vegetation. Primary activities included search, radiological monitoring, recovery of accident debris, and processing for disposal.

Previous Intake/Dose Assessments:

This assessment applies to Palomares accident activities only. No previous intakes or doses were considered.

Other Information:

None.

Radionuclide(s): ^{239}Pu.

Assumptions/Basis/Data Sources:

Acute inhalation intake of Pu-239; 100% Class Y; 1 μm AMAD particle size on 1/24/66. The date is the midpoint of the period on station from 1/18/66 to 1/31/66.

Inhalation was assumed as the major route of entry because the primary contaminant was created by explosion and fire and deposited in sandy soil and on buildings and plants. Conditions were generally windy and significant activity was underway.

Dose was determined entirely from modeling intake based on the following urinalysis results for this individual. This individual's sample was identified for a follow-up analysis using alpha spectrometry after the initial gross alpha result was reviewed. That is, the initial urine sample for this individual was reprocessed radiochemically for alpha spectrometry. Results of the follow-up alpha spectrometry analysis are reported below and were used in preparing the dose estimate.

Sample	Analysis*	Sample Date	Result (pCi/day)	Error (pCi/day)	Included
66-267	G	1/21/66	NR	NR	
66-409	G	2/2/66	1.02	0.750	
66-568	G	2/4/66	1.86	0.089	
66-3407	AS	6/2/66	0.168	0.089	✓
66-3407	G	6/2/66	NR	NR	

* G means gross alpha counting; AS means alpha spectrometry.

Intakes and estimates of dose were prepared using CINDY Version 1.4 and LUDEP Version 2.05.

Intake was estimated using the Jones excretion model in CINDY and LUDEP.

Inhalation intake was estimated using the ICRP 66 respiratory tract model in LUDEP.

CINDY estimated dose derived using the ICRP 30, Part 4, General Systemic Model and weighting factors; and LUDEP used the recommendations of ICRP 60.

Modeling:

CINDY and LUDEP were used to estimate the intake and dose with the following results:

Model	Intake (pCi)	CEDE (rem/Sv)
CINDY	240,000	74/0.74
LUDEP	680,000	48/0.48

Doses to individual organs and estimation of the effective dose equivalent using CINDY reported the following results:

Organ	Dose Equivalent (rem/Sv)	Weighting Factors	Weighted Organ Dose Equivalent (rem/Sv)
Testes	1.1E+01/1.1E-01	2.5E-01	2.7E+00/2.7E-02
Breast	3.6E-04/3.6E-06	1.5E-01	5.3E-05/5.3E-07
Red Marrow	5.8E+01/5.8E-01	1.2E-01	6.9E+00/6.9E-02
Lung	2.7E+02/2.7E+00	1.2E-01	3.3E+01/3.3E-01
Thyroid	3.3E-04/3.3E-06	3.0E-02	1.0E-05/1.0E-07
Bone Surface	7.5E+02/7.5E+00	3.0E-02	2.2E+01/2.2E-01
Liver	1.3E+02/1.3E+00	6.0E-02	8.0E+00/8.0E-02
Other	1.3E+01/1.3E-01	6.0E-02	7.6E+00/7.6E-02
Lower Large Intestine	2.7E-02/2.7E-04	6.0E-02	1.6E-03/1.6E-05
Upper Large Intestine	9.1E-03/9.1E-05	6.0E-02	5.5E-04/5.5E-06
Small Intestine	1.9E-03/1.9E-05	6.0E-02	1.1E-04/1.1E-06
Effective Dose Equivalent			7.4E+01/7.4E-01

Three urine samples were analyzed by gross alpha counting only, and the fourth was analyzed by both gross alpha counting and alpha spectrometry. For the sample analyzed with both methods, the gross alpha analysis was not included in the modeling since no result was reported and an alpha spectrometry result was available for the same sample. One of the samples analyzed by gross alpha counting only was not included in the analysis since no result was reported. The other gross alpha results were excluded from the analysis because they did not fit the expected pattern of plutonium excretion and because they may have been contaminated during sample collection on the site. The remaining result was fit using CINDY and the Jones excretion model, to estimate an intake (240,000 pCi), organ doses, and a CEDE (74 rem/0.74 Sv; ICRP-30) as shown above. LUDEP was also used to estimate an intake of 680,000 pCi and a CEDE (ICRP-60) of 48 rem (0.48 Sv).

When all results were included in a separate evaluation, CINDY produced estimated intake and CEDE of 970,000 pCi and 300 rem (3.0 Sv). LUDEP estimated intake and CEDE at 4,100,000 pCi and 290 rem (2.9 Sv).

Conclusion:

Based on the results of intake estimates and dose calculations, this individual received an estimated intake of about 240,000 pCi of ^{239}Pu resulting in a 50-year committed effective dose equivalent of 74 rem (0.74 Sv). That dose is more than the cumulative dose (7 rem) from a lifetime (70 years) of exposure at the current level (0.100 rem) for members of the public. It is more than the working lifetime limit of 50 rem recommended by the National Council on Radiation Protection and Measurements (NCRP). These doses are significant, although they are based in part, on samples collected on-site and potentially contaminated. However, follow-up urine sampling should be considered to provide additional assessment of the exposure.

Prepared By:

Name: _____

Signature: _____ Date: _____

Peer Reviewed By:

Name: _____

Signature: _____ Date: _____

(b) (6) (b) (6)

RESAMPLE JUL 14 1966 3407 Q

AFSN: (b) (6)

INTERNAL DOSE DATA

NAME (LAST, FIRST, MI) (1-20)	SOC. SEC. NO. (21-29)	TYPE SAMPLE (30)	TYPE ANAL. (31-32)
(b) (6) SSGT	(b) (6)	Urine	

SAMPLE NO. (33-38)	SAMPLE DATE (39-44)	EXPOSURE
66-3407	FROM 0600 1 Jun TO 0559 2 Jun 66	DATE Jan 66 TYPE

BASE (57-60)	OCCUPATION (61-62)	REQUESTED BY
Ramstein		

DATE RECEIVED	SAMPLE VOLUME	VOLUME ANALYZED	DATE ANALYZED
14 June 1966	1200 ml	600 ~~Sample~~ ml	

TECHNICIAN (SIGNATURE AND DATE) Spec 2Sgt Chg Rad Safety Master List

URINE	236	239		RADON		FECES/BLOOD
Counter Number				Chamber Number	E	Counter Number
Counter Bkg. (cpm)	3	1	t=178	Cham. Bkg. (mv/sec)		Counter Bkg.
Counter Eff. (%)	31.8	31.8		Counter Eff. (%)	51	Counter Eff.
Date/Time – Start				Millivolt – Start		Date/Time – Start
– Stop				Millivolt – Stop		– Stop
Total Counts	70	4		Total Millivots		Total Counts
Counting Time	100	100		Total ~~Count~~ Time	55	Counting Time
Gross cpm				Gross ~~mv/sec~~ cpm	84	Gross cpm
Bkg. Cpm				Bkg. ~~Mv/sec~~ cpm	34(908)	Bkg. cpm
Net cpm				Net mv/sec		net cpm
~~dpm~~ % Rec	65.2%			curies/mv		dpm
dpm/24 hr. (69-74)				~~Liver (69-74)~~ %REC	86.9	dps/cc
K 40 Correction						Neutron Dose (rads) (63-68)
~~Net Beta~~ Pci/Sml	0.168 ± 0.089			D(q) (63-68)		uc/mg (69-74)
D(q) (63-68)						D(q) (63-68)

NAME:	SOCIAL SECURITY NUMBER:	SAMPLE NUMBER:

AIR FORCE BASE

RESULTS OF ANALYSIS
Pu/Sml – 0.168 ± 0.089
Total Vol – 1200 ml
Vol Analyzed – 600 ml
% Rec – 65.2
Body Burden – 0.06

Previous Results
1.90 pc/l 0.11 BB

☐ Repeat the sample for the following reason:

( ) Significant activity in recently analyzed sample(s)
( ) Data required to establish dose
( ) Improper flask used
( ) Other _____
( ) Suggested sampling schedule _____

SIGNATURE: DATE:

ONE TIME FORM. OBSOLETE AFTER 30 JUN 66. (MCGSCPF, RAG, 4 APR 66) AFLC–WPAFB–APR 66 2500

INTERNAL DOSE DATA

NAME (LAST, FIRST, M.I.) (1-20) (b) (6) [redacted]	SOC. SEC. NO. (21-29)	TYPE SAMPLE (30) URINE	TYPE ANAL. (31-32) GROSS ALPHA
SAMPLE NO. (33-38) (66-267)	SAMPLE DATE (39-44) FROM	TO	EXPOSURE DATE / TYPE
BASE (57-60) TORREJON	OCCUPATION (61-62)	REQUESTED BY	
DATE RECEIVED JAN 25 1966	SAMPLE VOLUME 750 ml	VOLUME ANALYZED 200 ml	DATE ANALYZED
TECHNICIAN (SIGNATURE AND DATE)			

URINE GROSS ALPHA				RADON		FECES/BLOOD	
Counter Number				Chamber Number		Counter Number	
Counter Bkg. (cpm)				Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)				Counter Eff. (%)		Counter Eff.	
Date/Time – Start				Millivolt – Start		Date/Time – Start	
–Stop				Millivolt – Stop		– Stop	
Total Counts				Total Millivots		Total Counts	
Counting Time				Total Drift Time		Counting Time	
Gross cpm				Gross mv/sec		Gross cpm	
Bkg. Cpm				Bkg. Mv/sec		Bkg. cpm	
Net cpm				Net mv/sec		net cpm	
dpm				curies/mv		dpm	
dpm/24 hr. (69-74)				litter (69-74)		dps/cc	
K 40 Correction						Neutron Dose (rads) (63-68)	
Net Beta				D(q) (63-68)		uc/mg (69-74)	
D(q) (63-68)						D(q) (63-68)	

26 Jan 66

[redacted] 3/5d **INTERNAL DOSE DATA**

[redacted]

SAMPLE NO. (33-38)	SAMPLE DATE (39-44)		SOC. SEC. NO.	TYPE SAMPLE (30)	TYPE ANAL. (31-32)
66-409	FROM 1300 1 Feb 66	TO 1300 Z Feb 66	[redacted]	Urine	Pu 239

BASE (57-60)	OCCUPATION (61-62)	REQUESTED BY	EXPOSURE DATE	TYPE
Ramstein AB, Ger.				

DATE RECEIVED	SAMPLE VOLUME	VOLUME ANALYZED	DATE ANALYZED
9 Feb 66	640	200	

TECHNICIAN (SIGNATURE AND DATE) WALTER G. EDWARDS SSGT. USAF 11 FEB 1966

URINE	GROSS ALPHA			RADON		FECES/BLOOD	
Counter Number	D			Chamber Number		Counter Number	
Counter Bkg. (cpm)	0.31			Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)	51			Counter Eff. (%)		Counter Eff.	
Date/Time – Start – Stop	10 FEB 1966			Millivolt – Start		Date/Time – Start	
				Millivolt – Stop		– Stop	
Total Counts	37			Total Millivots		Total Counts	
Counting Time	55			Total Drift Time		Counting Time	
Gross cpm	0.67			Gross mv/sec		Gross cpm	
Bkg. Cpm	0.31			Bkg. Mv/sec		Bkg. cpm	
Net cpm	0.36			Net mv/sec		net cpm	
~~dpm~~ PCi/l	1.59 ± 1.17			curies/mv		dpm	
dpm/24 hr. (69-74)				litter (69-74)		dps/cc	
K 40 Correction						Neutron Dose (rads) (63-68)	
Net Beta PCi/24 hr gal	1.02 ± 0.75					uc/mg (69-74)	
D (q) (63-68)				D(q) (63-68)		D (q) (63-68)	

$D_R = 403 \times 10^{-3} \mu c$ 15 Feb 66

(b) (6) (b) (6)

...86 TAC HOSP. 9 FEB. 66
APO NY 09012

409 #4 (b) (6) (b) (6) SSG.

DET. 0401 7401 EOD SQ.
SSN. (b) (6)

1300 1 FEB — 1300 2 FEB.

1 BOTTLE

TOTAL SAMPLE VOL 640 ML

AMT USED 200 ML
NITRIC ACID 50 ML

(b) (6)

3407
168. ± 20.

1. 0.168 ± .08
2. 65.2
3. 1.2
4. 128
5. 6245
6. 0.06

...mg. mestranol and 2 mg.
A More Physiological Approach to Oral Contraception

(b) (6)

Internal Dosimetry Evaluation Form

NAME: (b) (6)	SSN: (b) (6)

MODE OF INTAKE:
☒ Inhalation ☐ Injection
☐ Ingestion ☐ Absorption
☐ Unknown ☐ Not applicable

INTAKE DATE OR PERIOD:
1/18/66 through 3/1/66, onsite
2/8/66

SUMMARY OF EXPOSURE CONDITIONS:
Radionuclides/Respiratory Class/Particle Size: ^{239}Pu/100% Class Y/1 μm AMAD
Date or Period of Evaluated Data: 1 sample, 3/1/66
Duration of Exposure: Unknown
Location of Exposure: Camp Wilson, near Palomares, Spain

EVALUATION DATA:

Air Sampling	☐ Attached	☐ In Process	☒ Unavailable
Health Physics Survey Data	☐ Attached	☐ In Process	☒ Unavailable
Bioassay – Urinalysis	☒ Attached	☐ In Process	☐ Unavailable
Fecal	☐ Attached	☐ In Process	☒ Unavailable
Nasal Smears	☐ Attached	☐ In Process	☒ Unavailable
In Vivo	☐ Attached	☐ In Process	☒ Unavailable

Medical Treatment:

Skin Decontamination:	☐ Yes	☒ No	Date: _____
Decorporation:	☐ Yes	☒ No	Agent: _____ Date: _____
Catharsis:	☐ Yes	☒ No	Agent: _____ Date: _____
Surgical excision:	☐ Yes	☒ No	Date: _____

EVALUATION METHODOLOGY:
Assumptions: Acute inhalation intake of ^{239}Pu, 100% Class Y, 1 μm AMAD particle size on 2/8/66

Code/Model used for: Intake Estimate: CINDY, Ver. 1.4/JONES
Dose Estimate: CINDY, Ver. 1.4/ICRP 30, Part 4, General Systemic Model

RESULTS SUMMARY
Estimated Intake Activity (pCi): 270000
50 YR CEDE (rem) : 83 (0.83 Sv)

Organ Dose Equivalent Summary	**50 YR CDE (rem/Sv)**
Bone Surface	840/8.4
Lung	310/3.1
Liver	150/1.5
Red Marrow	65/0.65
Other	14/0.14
Testes	12/0.12

DOSE ASSESSOR: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

PEER REVIEWER: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

RECOMMENDATIONS:
Additional Bioassay Required ☐ Urinalysis ☐ Fecal ☐ In Vivo
Suggested Sampling Frequency: _____
Work Restrictions: N/A

Internal Dosimetry Case Narrative

Identification:

Name: (b) (6)
SSN:

Incidents:

Individual participated on site in response duties resulting from an accident involving three nuclear weapons at Palomares, Spain on January 17, 1966. Individual may have been exposed to weapons materials (primarily plutonium-239) by inhalation and ingestion from contaminated weapon and aircraft debris, lands, and vegetation. Primary activities included search, radiological monitoring, recovery of accident debris, and processing for disposal.

Previous Intake/Dose Assessments:

This assessment applies to Palomares accident activities only. No previous intakes or doses were considered.

Other Information:

None.

Radionuclide(s): ^{239}Pu.

Assumptions/Basis/Data Sources:

Acute inhalation intake of Pu-239; 100% Class Y; 1 μm AMAD particle size on 2/8/66. The date is the midpoint of the period on station from 1/18/66 to 3/1/66.

Inhalation was assumed as the major route of entry because the primary contaminant was created by explosion and fire and deposited in sandy soil and on buildings and plants. Conditions were generally windy and significant activity was underway.

Dose was determined entirely from modeling intake based on the following urinalysis results for this individual. This individual's sample was identified for a follow-up analysis using alpha spectrometry after the initial gross alpha result was reviewed. That is, the initial urine sample for this individual was reprocessed radiochemically for alpha spectrometry. Results of the follow-up alpha spectrometry analysis are reported below and were used in preparing the dose estimate.

Sample	Analysis*	Sample Date	Result (pCi/day)	Error (pCi/day)	Included
66-1849	AS	3/1/66	0.259	0.151	✓
66-1849	G	3/1/66	0.924	0.249	

* G means gross alpha counting; AS means alpha spectrometry.

Intakes and estimates of dose were prepared using CINDY Version 1.4 and LUDEP Version 2.05.

Intake was estimated using the Jones excretion model in CINDY and LUDEP.

Inhalation intake was estimated using the ICRP 66 respiratory tract model in LUDEP.

CINDY estimated dose derived using the ICRP 30, Part 4, General Systemic Model and weighting factors; and LUDEP used the recommendations of ICRP 60.

Modeling:

CINDY and LUDEP were used to estimate the intake and dose with the following results:

Model	Intake (pCi)	CEDE (rem/Sv)
CINDY	270,000	83/0.83
LUDEP	1,110,000	78/0.78

Doses to individual organs and estimation of the effective dose equivalent using CINDY reported the following results:

Organ	Dose Equivalent (rem/Sv)	Weighting Factors	Weighted Organ Dose Equivalent (rem/Sv)
Testes	1.2E+01/1.2E-01	2.5E-01	3.0E+00/3.0E-02
Breast	4.0E-04/4.0E-06	1.5E-01	6.0E-05/6.0E-07
Red Marrow	6.5E+01/6.5E-01	1.2E-01	7.8E+00/7.8E-02
Lung	3.1E+02/3.1E+00	1.2E-01	3.7E+01/3.7E-01
Thyroid	3.8E-04/3.8E-06	3.0E-02	1.1E-05/1.1E-07
Bone Surface	8.4E+02/8.4E+00	3.0E-02	2.5E+01/2.5E-01
Liver	1.5E+02/1.5E+00	6.0E-02	9.0E+00/9.0E-02
Other	1.4E+01/1.4E-01	6.0E-02	8.6E-01/8.6E-03
Lower Large Intestine	3.1E-02/3.1E-04	6.0E-02	1.8E-03/1.8E-05
Upper Large Intestine	1.0E-02/1.0E-04	6.0E-02	6.2E-04/6.2E-06
Small Intestine	2.1E-03/2.1E-05	6.0E-02	1.3E-04/1.3E-06
Effective Dose Equivalent			8.3E+01/8.3E-01

One urine sample was analyzed by gross alpha counting and alpha spectrometry. The gross alpha analysis was not included in the modeling since an alpha spectrometry result was available for the same sample. The result was fit using CINDY and the Jones excretion model, to estimate an intake (270,000 pCi), organ doses, and a CEDE (83 rem/0.83 Sv; ICRP-30) as shown above. LUDEP was also used to estimate an intake of 1,110,000 pCi and a CEDE (ICRP-60) of 78 rem (0.78 Sv).

Conclusion:

Based on the results of intake estimates and dose calculations, this individual received an estimated intake of about 270,000 pCi of ^{239}Pu resulting in a 50-year committed effective dose equivalent of 83 rem (0.83 Sv). That dose is more than the cumulative dose (7 rem) from a lifetime (70 years) of exposure at the

current level (0.100 rem) for members of the public. It is more than the working lifetime limit of 50 rem recommended by the National Council on Radiation Protection and Measurements (NCRP). These dose levels are significant although base on only one data point. However, follow-up urine sampling should be considered to provide additional assessment of the exposure.

Prepared By:

Name: _____

Signature: _____ Date: _____

Peer Reviewed By:

Name: _____

Signature: _____ Date: _____

(b) (6)

(b) (6)

X 40

INTERNAL DOSE DATA

AFSN: (b) (6)

NAME (LAST, FIRST, M.I.) (1-20)	SOC. SEC. NO. (21-29)	TYPE SAMPLE (30)	TYPE ANAL. (31-32)
(b) (6) A1C	(b) (6)	Urine	

SAMPLE NO. (33-38)	SAMPLE DATE (39-47)	EXPOSURE DATE	EXPOSURE TYPE
66-1849	FROM 1 Mar 66 TO		

BASE (57-60)	OCCUPATION (61-62)	REQUESTED BY
Moron	17150	

DATE RECEIVED	SAMPLE VOLUME	VOLUME ANALYZED	DATE ANALYZED
28 March 1966	959 ml	9.59 ml	

TECHNICIAN (SIGNATURE AND DATE)

URINE				RADON		FECES/BLOOD	
Counter Number	B			Chamber Number		Counter Number	
Counter Bkg. (cpm)	0.04 (900			Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)	51		to 45	Counter Eff. (%)		Counter Eff.	
Date/Time – Start	13 May 66			Millivolt – Start		Date/Time – Start	
– Stop				Millivolt – Stop		– Stop	V
Total Counts	60	Reported value		Total Millivolts		Total Counts	
Counting Time	55	corrected for Sr/Y		Total Drift Time		Counting Time	
Gross cpm	1.09	of 0.965 pc/sample		Gross mv/sec		Gross cpm	NDA
Bkg. Cpm	0.04			Bkg. Mv/sec		Bkg. cpm	
Net cpm	1.05			Net mv/sec		net cpm	
dpm pci/l	0.964	± 0.260		curies/mv		dpm	
dpm/24 hr. (69-74)				litter (69-74)		dps/cc	
K 40 Correction						Neutron Dose (rads) (63-68)	
Net Beta pci/gm	0.924	± 0.249		D(q) (63-68)		uc/mg (69-74)	
D(q) (63-68)						D(q) (63-68)	

(b) (6)

[redacted]

[redacted]

RADIOLOGICAL SAMPLE DATA

NAME OR REQUESTOR'S ID (1-20)	GRADE	AFSN	SOCIAL SECURITY NUMBER	RHL SAMPLE NUMBER 66-1849
TYPE SAMPLE (23-32)	OCCUPATION (34-35)	ANALYSIS DESIRED	REQUESTED BY	AIR FORCE BASE (66-71)
DATE RECEIVED (37-42)	DATE ANALYZED (51-56)	DATE COUNTED 29 June 66	DATE COLLECTED	EXPOSURE DATE
SAMPLE WEIGHT/VOLUME	WEIGHT/VOLUME ANALYZED	TECHNICIAN		

OTHER DATA .956

ENVIRONMENTAL SAMPLES				
COUNTER & EFFICIENCY				
TOTAL COUNTS & MINUTES				
GROSS CPM				
BKG CPM & MINUTES				
NET CPM				
YIELD				
BIOLOGICAL SAMPLES	236	239	RADON 2.60 dpm	3.09 DPM
COUNTER & EFFICIENCY Spec	27.3	27.3		
TOTAL COUNTS & MINUTES 100	61	11	20.62	
GROSS CPM	0.6100	0.1100		
BKG CPM & MINUTES 800	1 0.0012	8 0.0099		
NET CPM	0.6088	0.1001	0.259 ± 0.151 pC/SPL	
YIELD				
% Rec	63.68			

SUMMARY OF RESULTS:

AFLC FORM MAY 66 1165 FC 8400

AFLC–WPAFB–MAY 66 4500

(b) (6)

(b) (6) (b) (6)

Internal Dosimetry Evaluation Form

NAME: (b) (6)	SSN: (b) (6)

MODE OF INTAKE:
☒ Inhalation ☐ Injection
☐ Ingestion ☐ Absorption
☐ Unknown ☐ Not applicable

INTAKE DATE OR PERIOD:
1/23/66 through 2/9/66, onsite
1/31/66

SUMMARY OF EXPOSURE CONDITIONS:
Radionuclides/Respiratory Class/Particle Size: ^{239}Pu/100% Class Y/1 μm AMAD
Date or Period of Evaluated Data: 2 samples, 2/9/66 and 6/2/66
Duration of Exposure: Unknown
Location of Exposure: Camp Wilson, near Palomares, Spain

EVALUATION DATA:

Air Sampling	☐ Attached	☐ In Process	☒ Unavailable
Health Physics Survey Data	☐ Attached	☐ In Process	☒ Unavailable
Bioassay – Urinalysis	☒ Attached	☐ In Process	☐ Unavailable
Fecal	☐ Attached	☐ In Process	☒ Unavailable
Nasal Smears	☐ Attached	☐ In Process	☒ Unavailable
In Vivo	☐ Attached	☐ In Process	☒ Unavailable

Medical Treatment:

Skin Decontamination:	☐ Yes	☒ No	Date: _____
Decorporation:	☐ Yes	☒ No	Agent: _____ Date: _____
Catharsis:	☐ Yes	☒ No	Agent: _____ Date: _____
Surgical excision:	☐ Yes	☒ No	Date: _____

EVALUATION METHODOLOGY:
Assumptions: Acute inhalation intake of ^{239}Pu, 100% Class Y, 1 μm AMAD particle size on 1/31/66

Code/Model used for: Intake Estimate: CINDY, Ver. 1.4/JONES
Dose Estimate: CINDY, Ver. 1.4/ICRP 30, Part 4, General Systemic Model

RESULTS SUMMARY
Estimated Intake Activity (pCi): 140000
50 YR CEDE (rem) : 43 (0.43 Sv)

Organ Dose Equivalent Summary	**50 YR CDE (rem/Sv)**
Bone Surface	440/4.4
Lung	160/1.6
Liver	78/0.78
Red Marrow –	34/0.34
Other	7.4/0.074
Testes	6.2/0.062

DOSE ASSESSOR: DATE: _____	**PEER REVIEWER:** DATE: _____
Signature: _____	**Signature:** _____
Print Name: _____	**Print Name:** _____
SSN: _____	**SSN:** _____

RECOMMENDATIONS:
Additional Bioassay Required ☐ Urinalysis ☐ Fecal ☐ In Vivo
Suggested Sampling Frequency: _____
Work Restrictions: N/A

Internal Dosimetry Case Narrative

Identification:

Name: (b) (6)
SSN:

Incidents:

Individual participated on site in response duties resulting from an accident involving three nuclear weapons at Palomares, Spain on January 17, 1966. Individual may have been exposed to weapons materials (primarily plutonium-239) by inhalation and ingestion from contaminated weapon and aircraft debris, lands, and vegetation. Primary activities included search, radiological monitoring, recovery of accident debris, and processing for disposal.

Previous Intake/Dose Assessments:

This assessment applies to Palomares accident activities only. No previous intakes or doses were considered.

Other Information:

None.

Radionuclide(s): ^{239}Pu.

Assumptions/Basis/Data Sources:

Acute inhalation intake of Pu-239; 100% Class Y; 1 μm AMAD particle size on 1/31/66. The date is the midpoint of the period on station from 1/23/66 to 2/9/66.

Inhalation was assumed as the major route of entry because the primary contaminant was created by explosion and fire and deposited in sandy soil and on buildings and plants. Conditions were generally windy and significant activity was underway.

Dose was determined entirely from modeling intake based on the following urinalysis results for this individual. This individual's sample was identified for a follow-up analysis using alpha spectrometry after the initial gross alpha result was reviewed. That is, the initial urine sample for this individual was reprocessed radiochemically for alpha spectrometry. Results of the follow-up alpha spectrometry analysis are reported below and were used in preparing the dose estimate.

Sample	Analysis*	Sample Date	Result (pCi/day)	Error (pCi/day)	Included
66-814	G	1/29/66	1.31 (12-hr)	0.510	
66-3401	AS	6/2/66	0.099	0.047	✓
66-3401	G	6/2/66	NR	NR	

* G means gross alpha counting; AS means alpha spectrometry; NR means no result recorded.

Intakes and estimates of dose were prepared using CINDY Version 1.4 and LUDEP Version 2.05.

Intake was estimated using the Jones excretion model in CINDY and LUDEP.

Inhalation intake was estimated using the ICRP 66 respiratory tract model in LUDEP.

CINDY estimated dose derived using the ICRP 30, Part 4, General Systemic Model and weighting factors; and LUDEP used the recommendations of ICRP 60.

Modeling:

CINDY and LUDEP were used to estimate the intake and dose with the following results:

Model	Intake (pCi)	CEDE (rem/Sv)
CINDY	140,000	43/0.43
LUDEP	402,000	28/0.28

Doses to individual organs and estimation of the effective dose equivalent using CINDY reported the following results:

Organ	Dose Equivalent (rem/Sv)	Weighting Factors	Weighted Organ Dose Equivalent (rem/Sv)
Testes	6.2E+00/6.2E-02	2.5E-01	1.6E+00/1.6E-02
Breast	2.1E-04/2.1E-06	1.5E-01	3.1E-05/3.1E-07
Red Marrow	3.4E+01/3.4E-01	1.2E-01	4.0E+00/4.0E-02
Lung	1.6E+02/1.6E+00	1.2E-01	1.9E+01/1.9E-01
Thyroid	2.0E-04/2.0E-06	3.0E-02	5.9E-06/5.9E-08
Bone Surface	4.4E+02/4.4E+00	3.0E-02	1.3E+01/1.3E-01
Liver	7.8E+01/7.8E-01	6.0E-02	4.7E+00/4.7E-02
Other	7.4E+00/7.4E-02	6.0E-02	4.4E-01/4.4E-03
Lower Large Intestine	1.6E-02/1.6E-04	6.0E-02	9.5E-04/9.5E-06
Upper Large Intestine	5.3E-03/5.3E-05	6.0E-02	3.2E-04/3.2E-06
Small Intestine	1.1E-03/1.1E-05	6.0E-02	6.5E-05/6.5E-07
Effective Dose Equivalent			4.3E+01/4.3E-01

One urine sample was analyzed by gross alpha counting only, and the other was analyzed by both gross alpha counting and alpha spectrometry. For the sample analyzed with both methods, the gross alpha analysis was not included in the modeling since no result was reported and an alpha spectrometry result was available for the same sample. The sample analyzed by gross alpha counting only was not included in the analysis since it was an on-site sample with a result >0.1 pCi, leading to a suspicion of sample contamination. The result was fit using CINDY and the Jones excretion model, to estimate an intake (140,000 pCi), organ doses, and a CEDE (43 rem/0.43 Sv; ICRP-30) as shown above. LUDEP was also used to estimate an intake of 402,000 pCi and a CEDE (ICRP-60) of 28 rem (0.28 Sv).

Conclusion:

Based on the results of intake estimates and dose calculations, this individual received an estimated intake of about 140,000 pCi of ^{239}Pu resulting in a 50-year committed effective dose equivalent of 43 rem (0.43 Sv). That dose is more than the cumulative dose (7 rem) from a lifetime (70 years) of exposure at the current level (0.100 rem) for members of the public. It is less than the working lifetime limit of 50 rem recommended by the National Council on Radiation Protection and Measurements (NCRP). Serious health effects are not associated with that dose level. However, follow-up urine sampling now could be considered to provide additional assessment of the exposure.

Prepared By:

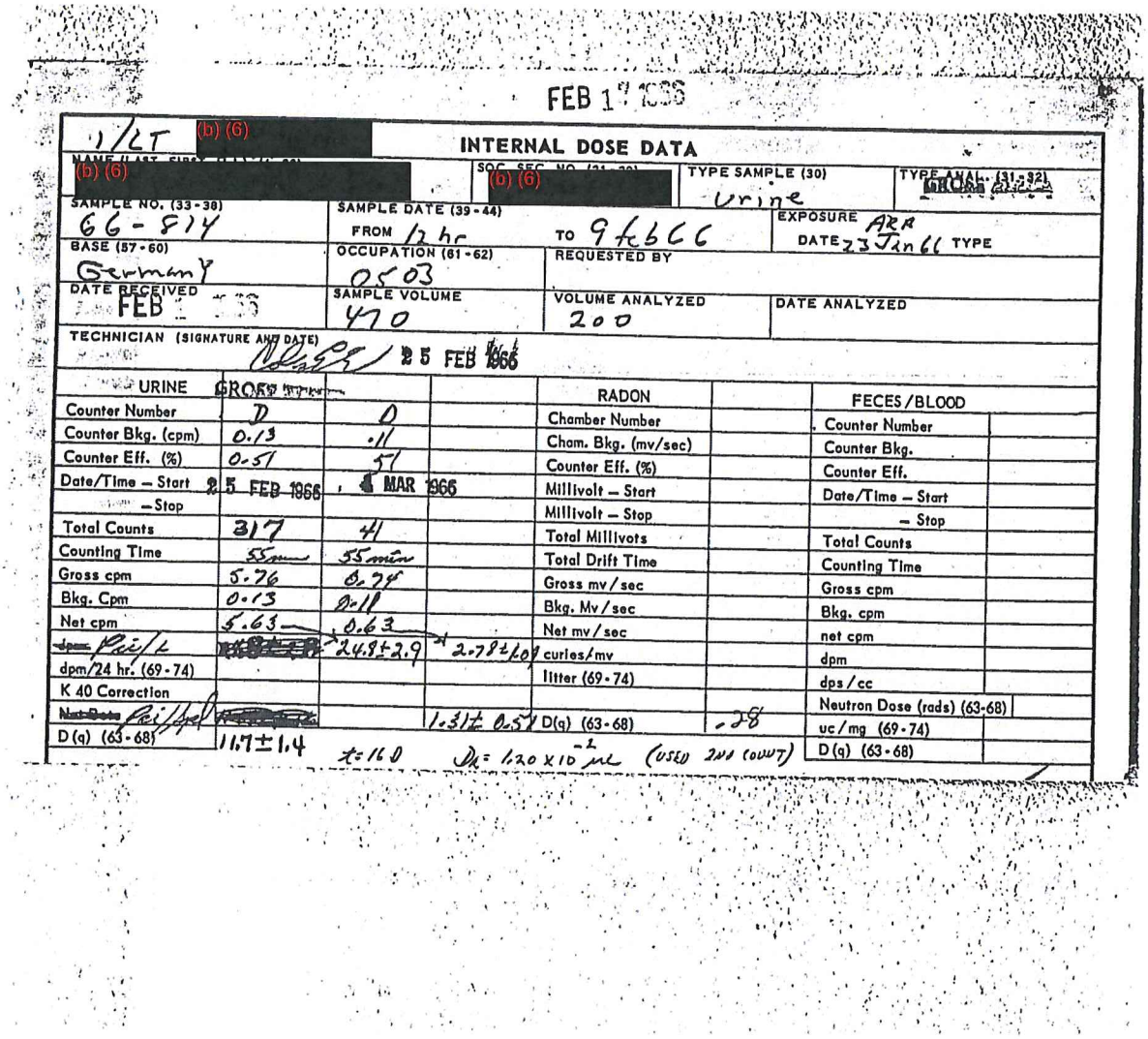
Name: _____

Signature: _____ Date: _____

Peer Reviewed By:

Name: _____

Signature: _____ Date: _____



FEB 1? 1966

INTERNAL DOSE DATA

1/LT [redacted]		TYPE SAMPLE (30): Urine	TYPE ANAL. (31-32): GROSS
[redacted]	SOC. SEC. NO. [redacted]		
SAMPLE NO. (33-38): 66-514	SAMPLE DATE (39-44): FROM 12 hr TO 9 Feb 66		EXPOSURE DATE 23 Jan 66 TYPE ARA
BASE (57-60): Germany	OCCUPATION (61-62): 0503	REQUESTED BY	
DATE RECEIVED: FEB [illegible]	SAMPLE VOLUME: 470	VOLUME ANALYZED: 200	DATE ANALYZED
TECHNICIAN (SIGNATURE AND DATE)	25 FEB 1966		

URINE	GROSS		RADON		FECES/BLOOD	
Counter Number	D	D	Chamber Number		Counter Number	
Counter Bkg. (cpm)	0.13	.11	Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)	0.51	51	Counter Eff. (%)		Counter Eff.	
Date/Time – Start	25 FEB 1966	4 MAR 1966	Millivolt – Start		Date/Time – Start	
– Stop			Millivolt – Stop		– Stop	
Total Counts	317	41	Total Millivots		Total Counts	
Counting Time	55 min	55 min	Total Drift Time		Counting Time	
Gross cpm	5.76	0.74	Gross mv/sec		Gross cpm	
Bkg. Cpm	0.13	0.11	Bkg. Mv/sec		Bkg. cpm	
Net cpm	5.63	0.63	Net mv/sec		net cpm	
~~dpm~~ Pci/L	[redacted]	24.9±2.9	2.78±.07 curies/mv		dpm	
dpm/24 hr. (69-74)			litter (69-74)		dps/cc	
K 40 Correction					Neutron Dose (rads) (63-68)	
~~Net Beta~~ Pci/gal	[redacted]	1.31± 0.54	D(q) (63-68)	.28	uc/mg (69-74)	
D(q) (63-68)	11.7±1.4				D(q) (63-68)	

t=16 0 $D_k = 1.20 \times 10^{-2}$ mc (USED 2ND COUNT)

(b) (6) [redacted]
(b) (6) [redacted]

(b) (6) (b) (6)

ARMY RESAMPLE JUL 14 1966 R

ARMY: (b) (6) INTERNAL DOSE DATA ARMY

(b) (6) 1Lt	SOC. SEC. NO. (21-29)	TYPE SAMPLE (30) Urine	TYPE ANAL. (31-32)
SAMPLE NO. (33-38) 66-3401	SAMPLE DATE (39-44) FROM 2 June 66	TO	EXPOSURE DATE Jan 66 TYPE
BASE (57-60) 229 Signal Co APO NY 09189	OCCUPATION (61-62) Pirmasens	REQUESTED BY	
DATE RECEIVED 14 June 1966	SAMPLE VOLUME 1230 ml	VOLUME ANALYZED 820 ml	DATE ANALYZED

TECHNICIAN (SIGNATURE AND DATE) checked off master list

URINE	236	239		RADON		FECES/BLOOD	
Counter Number				Chamber Number	NMC C5	Counter Number	
Counter Bkg. (cpm)	3	1	980	Cham. Bkg. (mv/sec)	908-45	Counter Bkg.	
Counter Eff. (%)	31.8	31.8		Counter Eff. (%)		Counter Eff.	
Date/Time – Start	1 SEP 66	1350	t=129	Millivolt – Start	55-108	Date/Time – Start	
– Stop				Millivolt – Stop	1.9636	– Stop	
Total Counts	117	5		Total Millivots	0495	Total Counts	
Counting Time	100	100		Total Drift Time	1.9141	Counting Time	
Gross cpm				Gross mv/sec		Gross cpm	
Bkg. Cpm				Bkg. Mv/sec		Bkg. cpm	
Net cpm				Net mv/sec		net cpm	
~~dpm~~ % REC	104%			curies/mv		dpm	
dpm/24 hr. (69-74)				litter (69-74)		dps/cc	
K 40 Correction				% REC	112%	Neutron Dose (rads) (63-68)	
~~Nat Conc~~ PC/SPL	0.0991 ±	0.0465		D(q) (63-68)		uc/mg (69-74)	
D(q) (63-68)						D(q) (63-68)	

NAME: SOCIAL SECURITY NUMBER: SAMPLE NUMBER:

AIR FORCE BASE

RESULTS OF ANALYSIS
Pc/Spl – 0.0991 ± 0.0465
Total Vol – 1230
Vol Analyzed – 820

% Rec – 104%
Body Burden – 0.03

Previous Results
2.78 pc/l
0.28 BB

☐ Repeat the sample for the following reason:
( ) Significant activity in recently analyzed sample(s)
( ) Data required to establish dose
( ) Improper flask used
( ) Other _____
( ) Suggested sampling schedule _____

SIGNATURE: DATE:

ONE TIME FORM. OBSOLETE AFTER 30 JUN 66. (MCGSCPF, RAG, 4 APR 66) AFLC–WPAFB–APR 66 2500

(b) (6)

3401

99 ± 40 fci

1. .099 ± .04
2. .104
3. 1.23
4. 129
5. 6245
6. 0.03

C-Quens®

Sequential folder containing fifteen 80-mcg. tablets of mestranol plus five tablets each combining 80 mcg. mestranol and 2 mg. chlormadinone acetate.

A More Physiological Approach to Oral Contraception

(b) (6)

Internal Dosimetry Evaluation Form

NAME: (b) (6) SSN: (b) (6)

MODE OF INTAKE:
☒ Inhalation ☐ Injection
☐ Ingestion ☐ Absorption
☐ Unknown ☐ Not applicable

INTAKE DATE OR PERIOD:
1/18/66 through 1/29/66, onsite
1/23/66

SUMMARY OF EXPOSURE CONDITIONS:
Radionuclides/Respiratory Class/Particle Size: ^{239}Pu/100% Class Y/1 μm AMAD
Date or Period of Evaluated Data: 2 samples, 1/29/66 and 5/30/66
Duration of Exposure: Unknown
Location of Exposure: Camp Wilson, near Palomares, Spain

EVALUATION DATA:

Air Sampling	☐ Attached	☐ In Process	☒ Unavailable
Health Physics Survey Data	☐ Attached	☐ In Process	☒ Unavailable
Bioassay – Urinalysis	☒ Attached	☐ In Process	☐ Unavailable
Fecal	☐ Attached	☐ In Process	☒ Unavailable
Nasal Smears	☐ Attached	☐ In Process	☒ Unavailable
In Vivo	☐ Attached	☐ In Process	☒ Unavailable

Medical Treatment:

Skin Decontamination:	☐ Yes	☒ No	Date: _____
Decorporation:	☐ Yes	☒ No	Agent: _____ Date: _____
Catharsis:	☐ Yes	☒ No	Agent: _____ Date: _____
Surgical excision:	☐ Yes	☒ No	Date: _____

EVALUATION METHODOLOGY:
Assumptions: Acute inhalation intake of ^{239}Pu, 100% Class Y, 1 μm AMAD particle size on 1/23/66

Code/Model used for: Intake Estimate: CINDY, Ver. 1.4/JONES
Dose Estimate: CINDY, Ver. 1.4/ICRP 30, Part 4, General Systemic Model

RESULTS SUMMARY
Estimated Intake Activity (pCi): 110000
50 YR CEDE (rem) : 34 (0.34 Sv)

Organ Dose Equivalent Summary	**50 YR CDE (rem/Sv)**
Bone Surface	340/3.4
Lung	130/1.3
Liver	61/0.61
Red Marrow	26/0.26
Other	5.8/0.058
Testes	4.9/0.049

DOSE ASSESSOR: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

PEER REVIEWER: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

RECOMMENDATIONS:
Additional Bioassay Required ☐ Urinalysis ☐ Fecal ☐ In Vivo
Suggested Sampling Frequency: _____
Work Restrictions: N/A

Internal Dosimetry Case Narrative

Identification:

Name: (b) (6)
SSN:

Incidents:

Individual participated on site in response duties resulting from an accident involving three nuclear weapons at Palomares, Spain on January 17, 1966. Individual may have been exposed to weapons materials (primarily plutonium-239) by inhalation and ingestion from contaminated weapon and aircraft debris, lands, and vegetation. Primary activities included search, radiological monitoring, recovery of accident debris, and processing for disposal.

Previous Intake/Dose Assessments:

This assessment applies to Palomares accident activities only. No previous intakes or doses were considered.

Other Information:

None.

Radionuclide(s): ^{239}Pu.

Assumptions/Basis/Data Sources:

Acute inhalation intake of Pu-239; 100% Class Y; 1 μm AMAD particle size on 1/23/66. The date is the midpoint of the period on station from 1/18/66 to 1/29/66.

Inhalation was assumed as the major route of entry because the primary contaminant was created by explosion and fire and deposited in sandy soil and on buildings and plants. Conditions were generally windy and significant activity was underway.

Dose was determined entirely from modeling intake based on the following urinalysis results for this individual. This individual's sample was identified for a follow-up analysis using alpha spectrometry after the initial gross alpha result was reviewed. That is, the initial urine sample for this individual was reprocessed radiochemically for alpha spectrometry. Results of the follow-up alpha spectrometry analysis are reported below and were used in preparing the dose estimate.

Sample	Analysis*	Sample Date	Result (pCi/day)	Error (pCi/day)	Included
66-1209	G	1/29/66	6.20	2.18	
66-3400	AS	5/30/66	0.078	0.057	✓
66-3400	G	5/30/66	NR	NR	

* G means gross alpha counting; AS means alpha spectrometry; NR means no result reported.

Intakes and estimates of dose were prepared using CINDY Version 1.4 and LUDEP Version 2.05.

Intake was estimated using the Jones excretion model in CINDY and LUDEP.

Inhalation intake was estimated using the ICRP 66 respiratory tract model in LUDEP.

CINDY estimated dose derived using the ICRP 30, Part 4, General Systemic Model and weighting factors; and LUDEP used the recommendations of ICRP 60.

Modeling:

CINDY and LUDEP were used to estimate the intake and dose with the following results:

Model	Intake (pCi)	CEDE (rem/Sv)
CINDY	110,000	34/0.34
LUDEP	316,000	22/0.22

Doses to individual organs and estimation of the effective dose equivalent using CINDY reported the following results:

Organ	Dose Equivalent (rem/Sv)	Weighting Factors	Weighted Organ Dose Equivalent (rem/Sv)
Testes	4.9E+00/4.9E-02	2.5E-01	1.2E+00/1.2E-02
Breast	1.6E-04/1.6E-06	1.5E-01	2.4E-05/2.4E-07
Red Marrow	2.6E+01/2.6E-01	1.2E-01	3.2E+00/3.2E-02
Lung	1.3E+02/1.3E+00	1.2E-01	1.5E+01/1.5E-01
Thyroid	1.5E-04/1.5E-06	3.0E-02	4.6E-06/4.6E-08
Bone Surface	3.4E+02/3.4E+00	3.0E-02	1.0E+01/1.0E-01
Liver	6.1E+01/6.1E-01	6.0E-02	3.7E+00/3.7E-02
Other	5.8E+00/5.8E-02	6.0E-02	3.5E-01/3.5E-03
Lower Large Intestine	1.2E-02/1.2E-04	6.0E-02	7.5E-04/7.5E-06
Upper Large Intestine	4.2E-03/4.2E-05	6.0E-02	2.5E-04/2.5E-06
Small Intestine	8.6E-04/8.6E-06	6.0E-02	5.1E-05/5.1E-07
Effective Dose Equivalent			3.4E+01/3.4E-01

One urine sample was analyzed by gross alpha counting only, and the other was analyzed by both gross alpha counting and alpha spectrometry. For the sample analyzed with both methods, the gross alpha analysis was not included in the modeling since no result was reported and an alpha spectrometry result was available for the same sample. The sample analyzed by gross alpha counting only was not included in the analysis since it was an on-site sample with a result >0.1 pCi, leading to a suspicion of sample contamination. The result was fit using CINDY and the Jones excretion model, to estimate an intake (110,000 pCi), organ doses, and a CEDE (34 rem/0.34 Sv; ICRP-30) as shown above. LUDEP was also used to estimate an intake of 316,000 pCi and a CEDE (ICRP-60) of 22 rem (0.22 Sv).

Conclusion:

Based on the results of intake estimates and dose calculations, this individual received an estimated intake of about 110,000 pCi of ^{239}Pu resulting in a 50-year committed effective dose equivalent of 34 rem (0.34 Sv). That dose is more than the cumulative dose (7 rem) from a lifetime (70 years) of exposure at the current level (0.100 rem) for members of the public. It is less than the working lifetime limit of 50 rem recommended by the National Council on Radiation Protection and Measurements (NCRP). Serious health effects are not associated with that dose level. However, follow-up urine sampling now could be considered to provide additional assessment of the exposure.

Prepared By:

Name: _____

Signature: _____ Date: _____

Peer Reviewed By:

Name: _____

Signature: _____ Date: _____

Release of this document is restricted under the provisions of the Privacy Act, 5 U.S.C. 552(a). C.2-304

AFSN: (b) (6) [redacted]

INTERNAL DOSE DATA

NAME (LAST, FIRST, M.I.) (1-20)	SOC. SEC. NO. (21-29)	TYPE SAMPLE (30)	TYPE ANAL. (31-32)
(b) (6) [redacted] A1C	(b) (6) [redacted]	Urine	

SAMPLE NO. (33-38)	SAMPLE DATE (39-44)		EXPOSURE DATE	TYPE
66-1209	FROM 29 Jan 66	TO		

BASE (57-60)	OCCUPATION (61-62)	REQUESTED BY
Zaragoza	62250	

DATE RECEIVED	SAMPLE VOLUME	VOLUME ANALYZED	DATE ANALYZED
3 March 1966	980	1000	

TECHNICIAN (SIGNATURE AND DATE)

URINE	239	236		RADON		FECES/BLOOD	
Counter Number				Chamber Number		Counter Number	
Counter Bkg. (cpm)				Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)				Counter Eff. (%)		Counter Eff.	
Date/Time – Start	? May 66			Millivolt – Start		Date/Time – Start	✓
– Stop				Millivolt – Stop		– Stop	
Total Counts	10	3		Total Millivolts		Total Counts	
Counting Time	100	100		Total Drift Time		Counting Time	
Gross cpm	0.10	0.03		Gross mv/sec		Gross cpm alpha	Spect
Bkg. Cpm	0.002	0.004		Bkg. Mv/sec		Bkg. cpm	6.20 pC
Net cpm	0.098	0.026		Net mv/sec		net cpm	0.2188
~~dpm~~ % RKC		12		curies/mv		dpm	
dpm/24 hr. (69-74)				liter (69-74)		dps/cc	
K 40 Correction						Neutron Dose (rads) (63-68)	
~~Net Base~~ pC/SPL	6.20 ± 2.18			D(q) (63-68)		uc/mg (69-74)	
~~D(q) (63-68)~~ pC/L	620 ± 2.18 (6-30) $D_A = 3.58 \times 10^{-2}$ µc					D(q) (63-68)	

AFSN: [redacted]

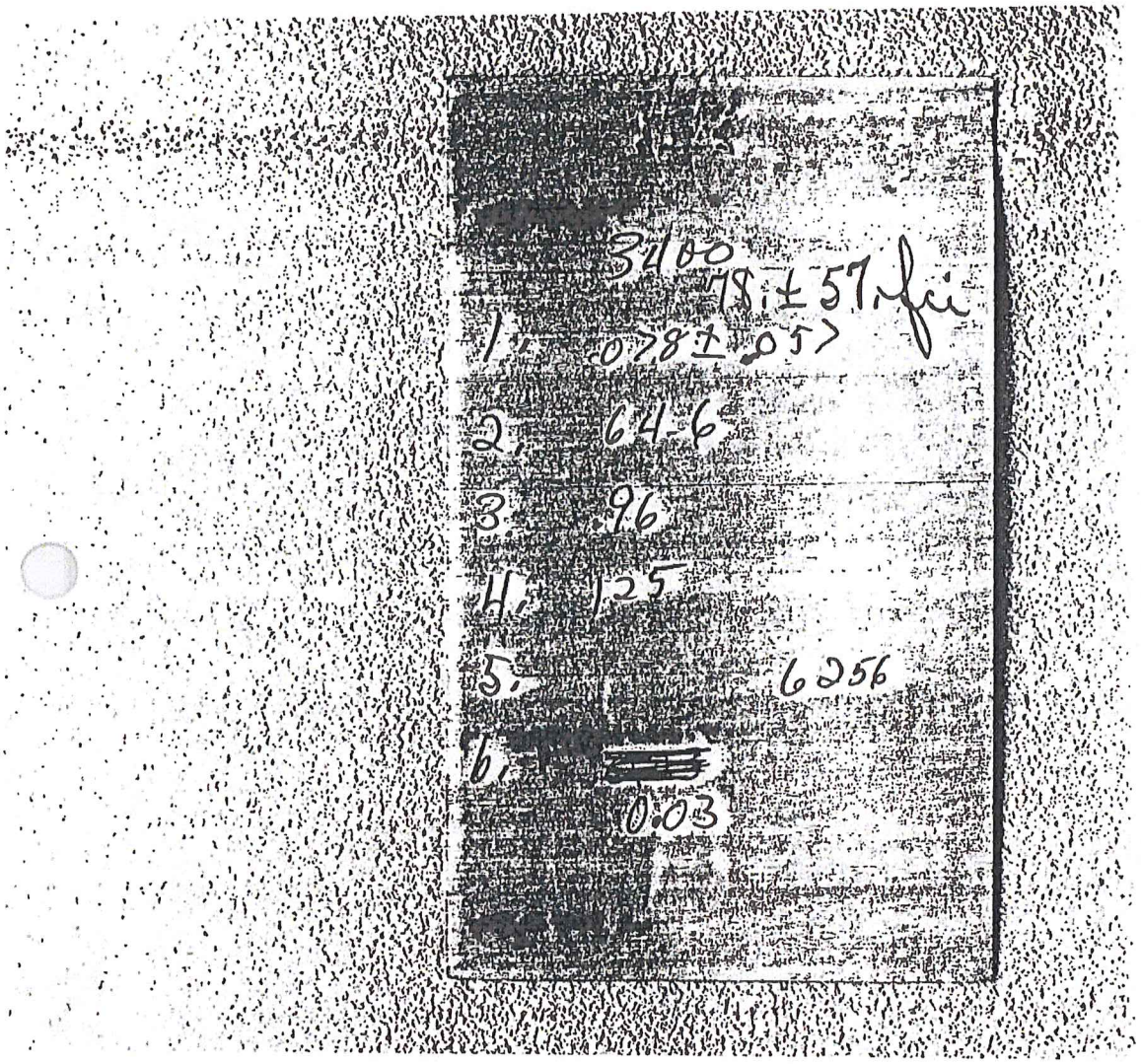
INTERNAL DOSE DATA

NAME (LAST, FIRST, M.I.) (1-20) [redacted] A1C	SOC. SEC. NO. (21-29) [redacted]	TYPE SAMPLE (30) Urine	TYPE ANAL. (31-32)
SAMPLE NO. (33-38) 66-1209	SAMPLE DATE (39-44) FROM 29 Jan 66 TO	EXPOSURE DATE	TYPE
BASE (57-60) Zaragoza	OCCUPATION (61-62) 62250	REQUESTED BY	
DATE RECEIVED 3 March 1966	SAMPLE VOLUME 980	VOLUME ANALYZED 1000	DATE ANALYZED
TECHNICIAN (SIGNATURE AND DATE)			

URINE	239	236	
Counter Number			
Counter Bkg. (cpm)			
Counter Eff. (%)			
Date/Time – Start	Mar 66		
– Stop			
Total Counts	10	3	
Counting Time	100	100	
Gross cpm	0.10	0.03	
Bkg. Cpm	0.002	0.004	
Net cpm	0.098	0.026	
~~dpm~~ %REC		12	
dpm/24 hr. (69-74)			
K 40 Correction			
~~Net Conc~~ PC/SPL	6.20 ±2.18		
~~D(q) (63-68)~~ PC/L	620 ±2.18 (6+30D) $D_A = 3.58 \times 10^{-2}$ μc		

RADON	
Chamber Number	
Cham. Bkg. (mv/sec)	
Counter Eff. (%)	
Millivolt – Start	
Millivolt – Stop	
Total Millivots	
Total Drift Time	
Gross mv/sec	
Bkg. Mv/sec	
Net mv/sec	
curies/mv	
litter (69-74)	
D(q) (63-68)	

FECES/BLOOD	
Counter Number	
Counter Bkg.	
Counter Eff.	
Date/Time – Start	
– Stop	✓
Total Counts	
Counting Time	
Gross cpm	alpha Spect
Bkg. cpm	6.20 PC
net cpm	0.81 BB
dpm	
dps/cc	
Neutron Dose (rads) (63-68)	
uc/mg (69-74)	
D(q) (63-68)	



(b) (6)

(b) (6) (b) (6)

Internal Dosimetry Evaluation Form

NAME: (b) (6) SSN: (b) (6)

MODE OF INTAKE:
☒ Inhalation ☐ Injection
☐ Ingestion ☐ Absorption
☐ Unknown ☐ Not applicable

INTAKE DATE OR PERIOD:
1/18/66 through 2/14/66, onsite
1/31/66

SUMMARY OF EXPOSURE CONDITIONS:
Radionuclides/Respiratory Class/Particle Size: ^{239}Pu/100% Class Y/1 μm AMAD
Date or Period of Evaluated Data: 2 samples, 2/5/66 and 4/8/66
Duration of Exposure: Unknown
Location of Exposure: Camp Wilson, near Palomares, Spain

EVALUATION DATA:

Air Sampling	☐ Attached	☐ In Process	☒ Unavailable
Health Physics Survey Data	☐ Attached	☐ In Process	☒ Unavailable
Bioassay – Urinalysis	☒ Attached	☐ In Process	☐ Unavailable
Fecal	☐ Attached	☐ In Process	☒ Unavailable
Nasal Smears	☒ Attached	☐ In Process	☐ Unavailable
In Vivo	☐ Attached	☐ In Process	☒ Unavailable

Medical Treatment:

Skin Decontamination:	☐ Yes	☒ No	Date: _____
Decorporation:	☐ Yes	☒ No	Agent: _____ Date: _____
Catharsis:	☐ Yes	☒ No	Agent: _____ Date: _____
Surgical excision:	☐ Yes	☒ No	Date: _____

EVALUATION METHODOLOGY:
Assumptions: Acute inhalation intake of ^{239}Pu, 100% Class Y, 1 μm AMAD particle size on 1/31/66

Code/Model used for: Intake Estimate: CINDY, Ver. 1.4/JONES
Dose Estimate: CINDY, Ver. 1.4/ICRP 30, Part 4, General Systemic Model

RESULTS SUMMARY
Estimated Intake Activity (pCi): 28000
50 YR CEDE (rem) : 8.6 (0.086 Sv)

Organ Dose Equivalent Summary	**50 YR CDE (rem/Sv)**
Bone Surface	87/0.87
Lung	32/0.32
Liver	16/0.16
Red Marrow	6.7/0.067
Other	1.5/0.015
Testes	1.2/0.012

DOSE ASSESSOR: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

PEER REVIEWER: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

RECOMMENDATIONS:
Additional Bioassay Required ☐ Urinalysis ☐ Fecal ☐ In Vivo
Suggested Sampling Frequency: _____
Work Restrictions: N/A

Internal Dosimetry Case Narrative

Identification:

Name: (b) (6)
SSN:

Incidents:

Individual participated on site in response duties resulting from an accident involving three nuclear weapons at Palomares, Spain on January 17, 1966. Individual may have been exposed to weapons materials (primarily plutonium-239) by inhalation and ingestion from contaminated weapon and aircraft debris, lands, and vegetation. Primary activities included search, radiological monitoring, recovery of accident debris, and processing for disposal.

Previous Intake/Dose Assessments:

This assessment applies to Palomares accident activities only. No previous intakes or doses were considered.

Other Information:

None.

Radionuclide(s): ^{239}Pu.

Assumptions/Basis/Data Sources:

Acute inhalation intake of Pu-239; 100% Class Y; 1 μm AMAD particle size on 1/31/66. The date is the midpoint of the period on station from 1/18/66 to 2/14/66.

Inhalation was assumed as the major route of entry because the primary contaminant was created by explosion and fire and deposited in sandy soil and on buildings and plants. Conditions were generally windy and significant activity was underway.

Dose was determined entirely from modeling intake based on the following urinalysis results for this individual. This individual's sample was identified for a follow-up analysis using alpha spectrometry after the initial gross alpha result was reviewed. That is, the initial urine sample for this individual was reprocessed radiochemically for alpha spectrometry. Results of the follow-up alpha spectrometry analysis are reported below and were used in preparing the dose estimate.

Sample	Analysis*	Sample Date	Result (pCi/day)	Error (pCi/day)	Included
66-1149	G	2/5/66	ND	ND	✓
66-2871	AS	4/8/66	0.076	0.007	✓
66-2871	G	4/8/66	1.45	0.310	

* G means gross alpha counting; AS means alpha spectrometry.

A nasal swipe (sample #66-1334) was recorded for (b) (6) as being taken on 2/14/66. No result was available.

Intakes and estimates of dose were prepared using CINDY Version 1.4 and LUDEP Version 2.05.

Intake was estimated using the Jones excretion model in CINDY and LUDEP.

Inhalation intake was estimated using the ICRP 66 respiratory tract model in LUDEP.

CINDY estimated dose derived using the ICRP 30, Part 4, General Systemic Model and weighting factors; and LUDEP used the recommendations of ICRP 60.

Modeling:

CINDY and LUDEP were used to estimate the intake and dose with the following results:

Model	Intake (pCi)	CEDE (rem/Sv)
CINDY	28,000	8.6/0.086
LUDEP	42,400	3.0/0.03

Doses to individual organs and estimation of the effective dose equivalent using CINDY reported the following results:

Organ	Dose Equivalent (rem/Sv)	Weighting Factors	Weighted Organ Dose Equivalent (rem/Sv)
Testes	1.2E+00/1.2E-02	2.5E-01	3.1E-01/3.1E-03
Breast	4.1E-05/4.1E-07	1.5E-01	6.2E-06/6.2E-08
Red Marrow	6.7E+00/6.7E-02	1.2E-01	8.1E-01/8.1E-03
Lung	3.2E+01/3.2E-01	1.2E-01	3.8E+00/3.8E-02
Thyroid	3.9E-05/3.9E-07	3.0E-02	1.2E-06/1.2E-08
Bone Surface	8.7E+01/8.7E-01	3.0E-02	2.6E+00/2.6E-02
Liver	1.6E+01/1.6E-01	6.0E-02	9.4E-01/9.4E-03
Other	1.5E+00/1.5E-02	6.0E-02	8.9E-02/8.9E-04
Lower Large Intestine	3.2E-03/3.2E-05	6.0E-02	1.9E-04/1.9E-06
Upper Large Intestine	1.1E-03/1.1E-05	6.0E-02	6.4E-05/6.4E-07
Small Intestine	2.2E-04/2.2E-06	6.0E-02	1.3E-05/1.3E-07
Effective Dose Equivalent			8.6E+00/8.6E-02

One urine sample was analyzed by gross alpha counting, and the other was analyzed by both gross alpha counting and alpha spectrometry. The gross alpha analysis for the second sample was not included in the modeling since an alpha spectrometry result was available for the same sample. The sample result that was analyzed using gross alpha counting only was reported as No Detectable Activity. A value of 0.009 pCi was used to represent this outcome. The results were fit using CINDY and the Jones excretion model, to estimate an intake (28,000 pCi), organ doses, and a CEDE (8.6 rem/0.086 Sv; ICRP-30) as shown above. LUDEP was also used to estimate an intake of 42,400 pCi and a CEDE (ICRP-60) of 3.0 rem (0.03 Sv).

Conclusion:

Based on the results of intake estimates and dose calculations, this individual received an estimated intake of about 28,000 pCi of ^{239}Pu resulting in a 50-year committed effective dose equivalent of 8.6 rem (0.086 Sv). That dose is more than the cumulative dose (7 rem) from a lifetime (70 years) of exposure at the current level (0.100 rem) for members of the public. It is less than half the working lifetime limit of 50 rem recommended by the National Council on Radiation Protection and Measurements (NCRP). Serious health effects are not associated with that dose level.

Prepared By:

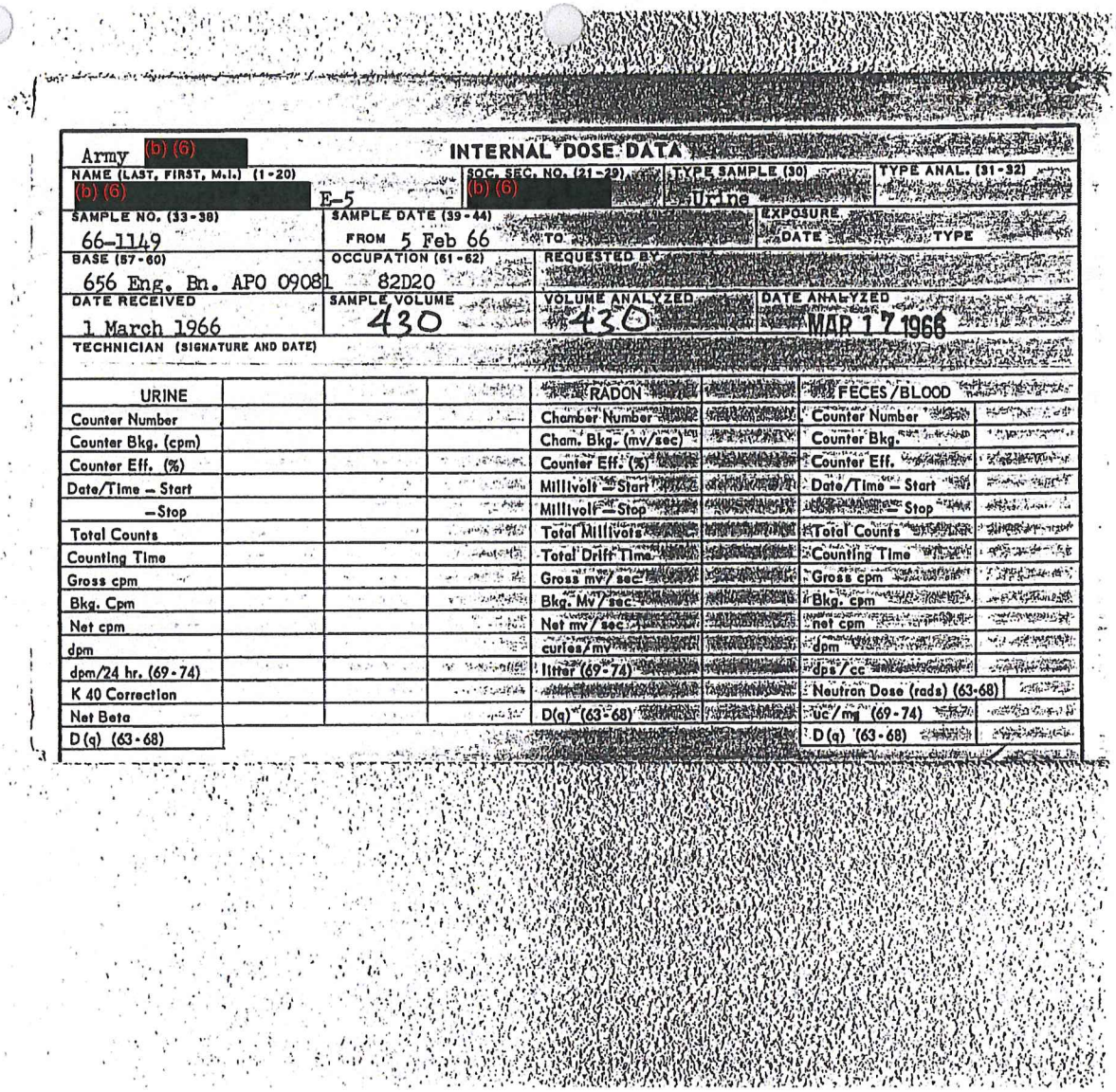
Name: _____

Signature: _____ Date: _____

Peer Reviewed By:

Name: _____

Signature: _____ Date: _____



INTERNAL DOSE DATA

Army (b) (6)			
NAME (LAST, FIRST, M.I.) (1-20) (b) (6)	E-5	SOC. SEC. NO. (21-29) (b) (6)	TYPE SAMPLE (30): Urine; TYPE ANAL. (31-32)
SAMPLE NO. (33-38): 66-1149	SAMPLE DATE (39-44): FROM 5 Feb 66 TO		EXPOSURE DATE / TYPE
BASE (57-60): 656 Eng. Bn. APO 09081	OCCUPATION (61-62): 82D20	REQUESTED BY	
DATE RECEIVED: 1 March 1966	SAMPLE VOLUME: 430	VOLUME ANALYZED: 430	DATE ANALYZED: MAR 17 1966
TECHNICIAN (SIGNATURE AND DATE)			

URINE				RADON		FECES/BLOOD	
Counter Number				Chamber Number		Counter Number	
Counter Bkg. (cpm)				Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)				Counter Eff. (%)		Counter Eff.	
Date/Time – Start				Millivolt – Start		Date/Time – Start	
– Stop				Millivolt – Stop		– Stop	
Total Counts				Total Millivolts		Total Counts	
Counting Time				Total Drift Time		Counting Time	
Gross cpm				Gross mv/sec		Gross cpm	
Bkg. Cpm				Bkg. Mv/sec		Bkg. cpm	
Net cpm				Net mv/sec		net cpm	
dpm				curies/mv		dpm	
dpm/24 hr. (69-74)				liter (69-74)		dps/cc	
K 40 Correction						Neutron Dose (rads) (63-68)	
Net Beta				D(q) (63-68)		uc/ml (69-74)	
D (q) (63-68)						D (q) (63-68)	

(b) (6)

(b) (6)

(b) (6)

(b) (6)

INTERNAL DOSE DATA

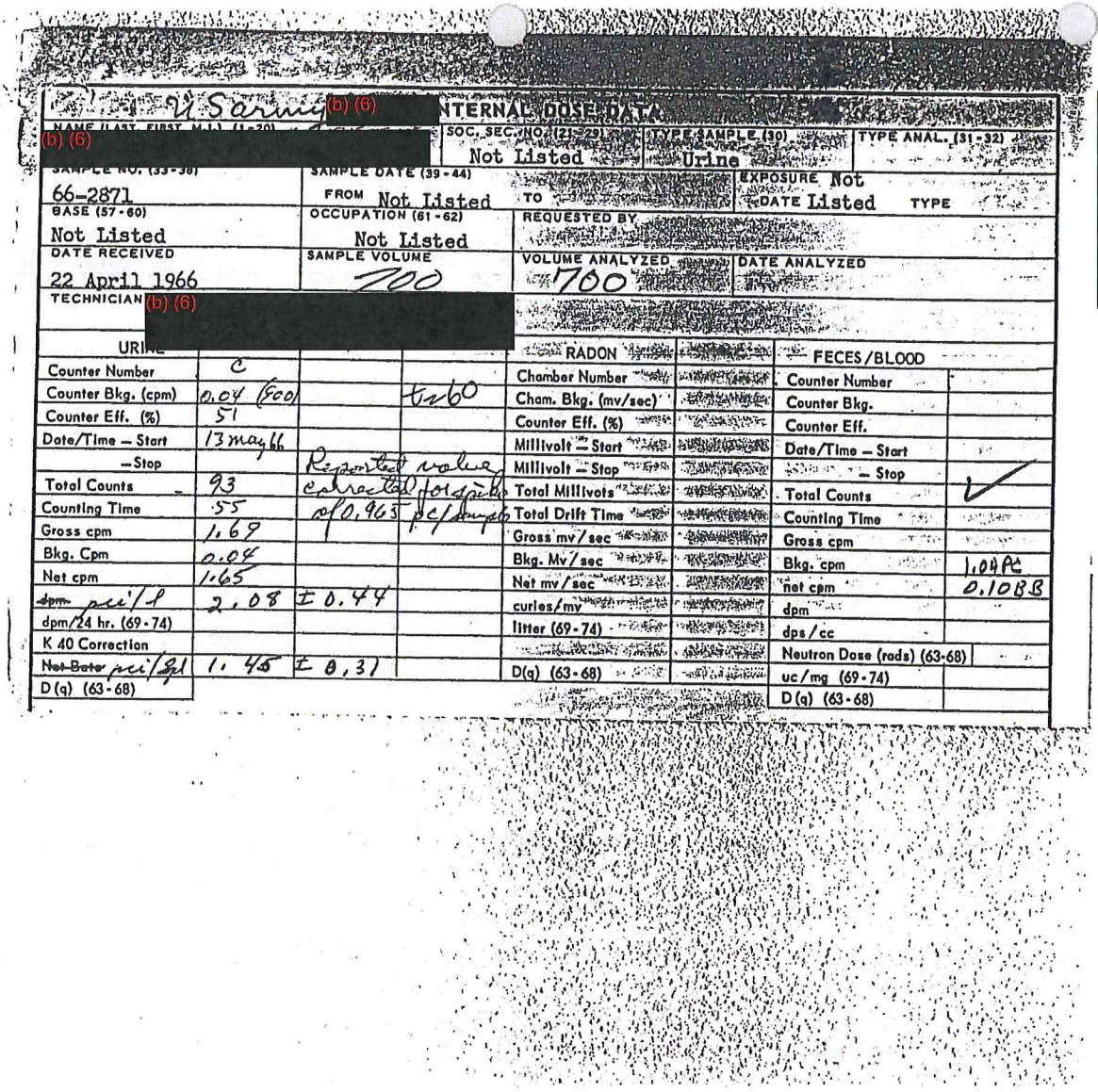
NAME (LAST, FIRST, M.I.) (1-20)	SOC. SEC. NO. (21-29)	TYPE SAMPLE (30)	TYPE ANAL. (31-32)
ARMY, (b) (6)	SP5 E-5	NASAL SWIPE	

SAMPLE NO. (33-38)	SAMPLE DATE (39-44)		EXPOSURE DATE	EXPOSURE TYPE
66-1334	FROM 14 FEB 66	TO		
BASE (57-60)	OCCUPATION (61-62)	REQUESTED BY		
656 ENG. BN. APO 09081				
DATE RECEIVED	SAMPLE VOLUME	VOLUME ANALYZED	DATE ANALYZED	
9 MARCH 1966				

TECHNICIAN (SIGNATURE AND DATE)

URINE				RADON		FECES/BLOOD	
Counter Number	TALARA			Chamber Number		Counter Number	
Counter Bkg. (cpm)				Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)				Counter Eff. (%)		Counter Eff.	
Date/Time – Start	10 MAR 66			Millivolt – Start		Date/Time – Start	
– Stop				Millivolt – Stop		– Stop	
Total Counts	3354			Total Millivots		Total Counts	
Counting Time	20			Total Drift Time		Counting Time	
Gross cpm	168			Gross mv/sec		Gross cpm	
Bkg. Cpm	164			Bkg. Mv/sec		Bkg. cpm	
Net cpm	4 ± 10			Net mv/sec		net cpm	
dpm	NOA			curies/mv		dpm	
dpm/24 hr. (69-74)				litter (69-74)		dps/cc	
K 40 Correction						Neutron Dose (rads) (63-68)	
Net Beta				D(q) (63-68)		uc/mg (69-74)	
D(q) (63-68)						D(q) (63-68)	

(b) (6)



INTERNAL DOSE DATA

NAME (LAST, FIRST, M.I.) (1-20) (b) (6)	SOC. SEC. NO. (21-29) Not Listed	TYPE SAMPLE (30) Urine	TYPE ANAL. (31-32)
SAMPLE NO. (33-38) 66-2871	SAMPLE DATE (39-44) FROM Not Listed	TO	EXPOSURE DATE Not Listed TYPE
BASE (57-60) Not Listed	OCCUPATION (61-62) Not Listed	REQUESTED BY	
DATE RECEIVED 22 April 1966	SAMPLE VOLUME 700	VOLUME ANALYZED 700	DATE ANALYZED
TECHNICIAN (b) (6)			

URINE				RADON		FECES/BLOOD	
Counter Number	C			Chamber Number		Counter Number	
Counter Bkg. (cpm)	0.04 (Eco)		tr60	Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)	51			Counter Eff. (%)		Counter Eff.	
Date/Time – Start	13 may 66			Millivolt – Start		Date/Time – Start	
– Stop		Reported value		Millivolt – Stop		– Stop	✓
Total Counts	93	corrected for		Total Millivolts		Total Counts	
Counting Time	55	of 0.965 pc/sample		Total Drift Time		Counting Time	
Gross cpm	1.69			Gross mv/sec		Gross cpm	
Bkg. Cpm	0.04			Bkg. Mv/sec		Bkg. cpm	1.04 Pc
Net cpm	1.65			Net mv/sec		net cpm	0.10 BB
~~dpm~~ pci/l	2.08	± 0.44		curies/mv		dpm	
dpm/24 hr. (69-74)				litter (69-74)		dps/cc	
K 40 Correction						Neutron Dose (rads) (63-68)	
~~Net Beta~~ pci/gl	1.45	± 0.31		D(q) (63-68)		uc/mg (69-74)	
D(q) (63-68)						D(q) (63-68)	

RADIOLOGICAL SAMPLE DATA

NAME OR REQUESTOR'S ID (1–20)	GRADE	AFSN	SOCIAL SECURITY NUMBER
RHL SAMPLE NUMBER 66-2871			
TYPE SAMPLE (23–32)	OCCUPATION (34–35)	ANALYSIS DESIRED	REQUESTED BY
AIR FORCE BASE (68–71)			
DATE RECEIVED (37–42)	DATE ANALYZED (51–56)	DATE COUNTED 5 July 66	DATE COLLECTED
EXPOSURE DATE			
SAMPLE WEIGHT/VOLUME	WEIGHT/VOLUME ANALYZED	TECHNICIAN	
OTHER DATA .953			

ENVIRONMENTAL SAMPLES					
COUNTER & EFFICIENCY					
TOTAL COUNTS & MINUTES					
GROSS CPM					
BKG CPM & MINUTES					
NET CPM					
YIELD					
BIOLOGICAL SAMPLES		276	239		
COUNTER & EFFICIENCY	Spec	27.3	27.5	RADON	
TOTAL COUNTS & MINUTES	100	92	5	3.53 dpm	3.2 × dpm
GROSS CPM		0.9200	0.0500		
BKG CPM & MINUTES	800	1 0.0013	4 0.0050		
NET CPM		0.9187	0.0450		
YIELD				0.0976 ± 0.007	
	%Rec	96.40			

SUMMARY OF RESULTS:

AFLC FORM MAY 66 1165 FC 8400 AFLC—WPAFB—MAY 66 4500

(b) (6)

Internal Dosimetry Evaluation Form

NAME: (b) (6) SSN: (b) (6)

MODE OF INTAKE:
☒ Inhalation ☐ Injection
☐ Ingestion ☐ Absorption
☐ Unknown ☐ Not applicable

INTAKE DATE OR PERIOD:
1/18/66 through 4/8/66, onsite
2/27/66

SUMMARY OF EXPOSURE CONDITIONS:
Radionuclides/Respiratory Class/Particle Size: ^{239}Pu/100% Class Y/1 μm AMAD
Date or Period of Evaluated Data: 1 sample, 4/8/66
Duration of Exposure: Unknown
Location of Exposure: Camp Wilson, near Palomares, Spain

EVALUATION DATA:

Air Sampling	☐ Attached	☐ In Process	☒ Unavailable
Health Physics Survey Data	☐ Attached	☐ In Process	☒ Unavailable
Bioassay – Urinalysis	☒ Attached	☐ In Process	☐ Unavailable
Fecal	☐ Attached	☐ In Process	☒ Unavailable
Nasal Smears	☐ Attached	☐ In Process	☒ Unavailable
In Vivo	☐ Attached	☐ In Process	☒ Unavailable

Medical Treatment:

Skin Decontamination:	☐ Yes	☒ No	Date: _____
Decorporation:	☐ Yes	☒ No	Agent: _____ Date: _____
Catharsis:	☐ Yes	☒ No	Agent: _____ Date: _____
Surgical excision:	☐ Yes	☒ No	Date: _____

EVALUATION METHODOLOGY:
Assumptions: Acute inhalation intake of ^{239}Pu, 100% Class Y, 1 μm AMAD particle size on 2/27/66

Code/Model used for: Intake Estimate: CINDY, Ver. 1.4/JONES
Dose Estimate: CINDY, Ver. 1.4/ICRP 30, Part 4, General Systemic Model

RESULTS SUMMARY
Estimated Intake Activity (pCi): 95000
50 YR CEDE (rem) : 29 (0.29 Sv)

Organ Dose Equivalent Summary	**50 YR CDE (rem/Sv)**
Bone Surface	300/3
Lung	110/1.1
Liver	53/0.53
Red Marrow	23/0.23
Other	5/0.05
Testes	4.2/0.042

DOSE ASSESSOR: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

PEER REVIEWER: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

RECOMMENDATIONS:
Additional Bioassay Required ☐ Urinalysis ☐ Fecal ☐ In Vivo
Suggested Sampling Frequency: _____
Work Restrictions: N/A

Internal Dosimetry Case Narrative

Identification:

Name: (b) (6)
SSN:

Incidents:

Individual participated on site in response duties resulting from an accident involving three nuclear weapons at Palomares, Spain on January 17, 1966. Individual may have been exposed to weapons materials (primarily plutonium-239) by inhalation and ingestion from contaminated weapon and aircraft debris, lands, and vegetation. Primary activities included search, radiological monitoring, recovery of accident debris, and processing for disposal.

Previous Intake/Dose Assessments:

This assessment applies to Palomares accident activities only. No previous intakes or doses were considered.

Other Information:

None.

Radionuclide(s): ^{239}Pu.

Assumptions/Basis/Data Sources:

Acute inhalation intake of Pu-239; 100% Class Y; 1 μm AMAD particle size on 2/27/66. The date is the midpoint of the period on station from 1/18/66 to 4/8/66.

Inhalation was assumed as the major route of entry because the primary contaminant was created by explosion and fire and deposited in sandy soil and on buildings and plants. Conditions were generally windy and significant activity was underway.

Dose was determined entirely from modeling intake based on the following urinalysis results for this individual. This individual's sample was identified for a follow-up analysis using alpha spectrometry after the initial gross alpha result was reviewed. That is, the initial urine sample for this individual was reprocessed radiochemically for alpha spectrometry. Results of the follow-up alpha spectrometry analysis are reported below and were used in preparing the dose estimate.

Sample	Analysis*	Sample Date	Result (pCi/day)	Error (pCi/day)	Included
66-2861	AS	4/8/66	0.074	0.011	✓
66-2861	G	4/8/66	1.29	0.290	

* G means gross alpha counting; AS means alpha spectrometry.

Intakes and estimates of dose were prepared using CINDY Version 1.4 and LUDEP Version 2.05.

Intake was estimated using the Jones excretion model in CINDY and LUDEP.

Inhalation intake was estimated using the ICRP 66 respiratory tract model in LUDEP.

CINDY estimated dose derived using the ICRP 30, Part 4, General Systemic Model and weighting factors; and LUDEP used the recommendations of ICRP 60.

Modeling:

CINDY and LUDEP were used to estimate the intake and dose with the following results:

Model	Intake (pCi)	CEDE (rem/Sv)
CINDY	95,000	29/0.29
LUDEP	316,000	22/0.22

Doses to individual organs and estimation of the effective dose equivalent using CINDY reported the following results:

Organ	Dose Equivalent (rem/Sv)	Weighting Factors	Weighted Organ Dose Equivalent (rem/Sv)
Testes	4.2E+00/4.2E-02	2.5E-01	1.1E+00/1.1E-02
Breast	1.4E-04/1.4E-06	1.5E-01	2.1E-05/2.1E-07
Red Marrow	2.3E+01/2.3E-01	1.2E-01	2.7E+00/2.7E-02
Lung	1.1E+02/1.1E+00	1.2E-01	1.3E+01/1.3E-01
Thyroid	1.3E-04/1.3E-06	3.0E-02	4.0E-06/4.0E-08
Bone Surface	3.0E+02/3.0E+00	3.0E-02	8.9E+00/8.9E-02
Liver	5.3E+01/5.3E-01	6.0E-02	3.2E+00/3.2E-02
Other	5.0E+00/5.0E-02	6.0E-02	3.0E-01/3.0E-03
Lower Large Intestine	1.1E-02/1.1E-04	6.0E-02	6.5E-04/6.5E-06
Upper Large Intestine	3.6E-03/3.6E-05	6.0E-02	2.2E-04/2.2E-06
Small Intestine	7.4E-04/7.4E-06	6.0E-02	4.4E-05/4.4E-07
Effective Dose Equivalent			2.9E+01/2.9E-01

One urine sample was analyzed by gross alpha counting and alpha spectrometry. The gross alpha analysis was not included in the modeling since an alpha spectrometry result was available for the same sample. The result was fit using CINDY and the Jones excretion model, to estimate an intake (95,000 pCi), organ doses, and a CEDE (29 rem/0.29 Sv; ICRP-30) as shown above. LUDEP was also used to estimate an intake of 316,000 pCi and a CEDE (ICRP-60) of 22 rem (0.22 Sv).

Conclusion:

Based on the results of intake estimates and dose calculations, this individual received an estimated intake of about 95,000 pCi of ^{239}Pu resulting in a 50-year committed effective dose equivalent of 29 rem (0.29 Sv). That dose is more than the cumulative dose (7 rem) from a lifetime (70 years) of exposure at the

current level (0.100 rem) for members of the public. It is less than the working lifetime limit of 50 rem recommended by the National Council on Radiation Protection and Measurements (NCRP). Serious health effects are not associated with that dose level.

Prepared By:

Name: _____

Signature: _____ Date: _____

Peer Reviewed By:

Name: _____

Signature: _____ Date: _____

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INTERNAL DOSE DATA

NAME (LAST, FIRST, M.I.) (1-20) (b) (6) [redacted] SSgt	SOC. SEC. NO. (21-29) (b) (6) [redacted]	TYPE SAMPLE (30) Urine	TYPE ANAL. (31-32)
SAMPLE NO. (33-38) 66-2861	SAMPLE DATE (39-44) FROM 8 Apr 66 TO	EXPOSURE DATE 18 Jan 66 TYPE	
BASE (57-60) Moron	OCCUPATION (61-62) Not Listed	REQUESTED BY	
DATE RECEIVED 22 April 1966	SAMPLE VOLUME 1425	VOLUME ANALYZED 1425	DATE ANALYZED
TECHNICIAN (SIGNATURE AND DATE)			

URINE			
Counter Number	C		
Counter Bkg. (cpm)	0.04 (900)		
Counter Eff. (%)	51		
Date/Time – Start	13 May 66		
– Stop			
Total Counts	83		t=82
Counting Time	55	Reported value corrected	
Gross cpm	1.51	for spike of 0.965 pc	
Bkg. Cpm	0.04	per sample	
Net cpm	1.47		
~~dpm~~ pci/l	0.908	± 0.206	
dpm/24 hr. (69-74)			
K 40 Correction			
~~Net Beta~~ pci/spl	1.29	± 0.29	
D (q) (63-68)			

RADON		
Chamber Number		
Cham. Bkg. (mv/sec)		
Counter Eff. (%)		
Millivolt – Start		
Millivolt – Stop		
Total Millivots		
Total Drift Time		
Gross mv/sec		
Bkg. Mv/sec		
Net mv/sec		
curies/mv		
litter (69-74)		
D(q) (63-68)		

FECES/BLOOD	
Counter Number	
Counter Bkg.	
Counter Eff.	
Date/Time – Start	✓
– Stop	
Total Counts	
Counting Time	
Gross cpm	
Bkg. cpm	0.22 PC
net cpm	NSBB
dpm	
dps/cc	
Neutron Dose (rads) (63-68)	
uc/mg (69-74)	
D(q) (63-68)	

(b)
(6)

(b)
(6)

RADIOLOGICAL SAMPLE DATA

NAME OR REQUESTOR'S ID (1–20)	GRADE	AFSN	SOCIAL SECURITY NUMBER	RHL SAMPLE NUMBER
				66-2961

TYPE SAMPLE (23–32)	OCCUPATION (34–35)	ANALYSIS DESIRED	REQUESTED BY	AIR FORCE BASE (68–71)

DATE RECEIVED (37–42)	DATE ANALYZED (51–56)	DATE COUNTED	DATE COLLECTED	EXPOSURE DATE
		28 June 66		

SAMPLE WEIGHT/VOLUME	WEIGHT/VOLUME ANALYZED	TECHNICIAN

OTHER DATA .956

ENVIRONMENTAL SAMPLES					
COUNTER & EFFICIENCY					
TOTAL COUNTS & MINUTES					
GROSS CPM					
BKG CPM & MINUTES					
NET CPM					
YIELD					
BIOLOGICAL SAMPLES		236	239	RADON	1.88 RPH
COUNTER & EFFICIENCY	Free	27.3	29.3	3.26	±0.69
TOTAL COUNTS & MINUTES	100	85	95	0.0500	
GROSS CPM		0.8500		0.0099	
BKG CPM & MINUTES	800	1 0.0012	8	0.0401	
NET CPM		0.8488		0.074 ± 0.011	
YIELD					
	% Rec	88.79			

SUMMARY OF RESULTS:

[redacted]

AFLC FORM MAY 66 1165 FC 5400 AFLC–WPAFB–MAY 66 4500

(b) (6)

(b) (6) (b) (6)

Internal Dosimetry Evaluation Form

NAME: (b) (6) SSN: (b) (6)

MODE OF INTAKE:
☒ Inhalation ☐ Injection
☐ Ingestion ☐ Absorption
☐ Unknown ☐ Not applicable

INTAKE DATE OR PERIOD:
1/18/66 through 3/4/66, onsite
2/9/66

SUMMARY OF EXPOSURE CONDITIONS:
Radionuclides/Respiratory Class/Particle Size: ^{239}Pu/100% Class Y/1 μm AMAD
Date or Period of Evaluated Data: 1 sample, 4/6/66
Duration of Exposure: Unknown
Location of Exposure: Camp Wilson, near Palomares, Spain

EVALUATION DATA:

Air Sampling	☐ Attached	☐ In Process	☒ Unavailable
Health Physics Survey Data	☐ Attached	☐ In Process	☒ Unavailable
Bioassay – Urinalysis	☒ Attached	☐ In Process	☐ Unavailable
Fecal	☐ Attached	☐ In Process	☒ Unavailable
Nasal Smears	☐ Attached	☐ In Process	☒ Unavailable
In Vivo	☐ Attached	☐ In Process	☒ Unavailable

Medical Treatment:

Skin Decontamination:	☐ Yes	☒ No	Date: _____	
Decorporation:	☐ Yes	☒ No	Agent: _____	Date: _____
Catharsis:	☐ Yes	☒ No	Agent: _____	Date: _____
Surgical excision:	☐ Yes	☒ No	Date: _____	

EVALUATION METHODOLOGY:
Assumptions: Acute inhalation intake of ^{239}Pu, 100% Class Y, 1 μm AMAD particle size on 2/9/66

Code/Model used for: Intake Estimate: CINDY, Ver. 1.4/JONES
Dose Estimate: CINDY, Ver. 1.4/ICRP 30, Part 4, General Systemic Model

RESULTS SUMMARY
Estimated Intake Activity (pCi): 310000
50 YR CEDE (rem) : 95 (0.95 Sv)

Organ Dose Equivalent Summary	**50 YR CDE (rem/Sv)**
Bone Surface	970/9.7
Lung	350/3.5
Liver	170/1.7
Red Marrow	75/0.75
Other	16/0.16
Testes	14/0.14

DOSE ASSESSOR: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

PEER REVIEWER: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

RECOMMENDATIONS:
Additional Bioassay Required ☐ Urinalysis ☐ Fecal ☐ In Vivo
Suggested Sampling Frequency: _____
Work Restrictions: N/A

Internal Dosimetry Case Narrative

Identification:

Name: (b) (6)
SSN:

Incidents:

Individual participated on site in response duties resulting from an accident involving three nuclear weapons at Palomares, Spain on January 17, 1966. Individual may have been exposed to weapons materials (primarily plutonium-239) by inhalation and ingestion from contaminated weapon and aircraft debris, lands, and vegetation. Primary activities included search, radiological monitoring, recovery of accident debris, and processing for disposal.

Previous Intake/Dose Assessments:

This assessment applies to Palomares accident activities only. No previous intakes or doses were considered.

Other Information:

None.

Radionuclide(s): ^{239}Pu.

Assumptions/Basis/Data Sources:

Acute inhalation intake of Pu-239; 100% Class Y; 1 μm AMAD particle size on 2/9/66. The date is the midpoint of the period on station from 1/18/66 to 3/4/66.

Inhalation was assumed as the major route of entry because the primary contaminant was created by explosion and fire and deposited in sandy soil and on buildings and plants. Conditions were generally windy and significant activity was underway.

Dose was determined entirely from modeling intake based on the following urinalysis results for this individual. This individual's sample was identified for a follow-up analysis using alpha spectrometry after the initial gross alpha result was reviewed. That is, the initial urine sample for this individual was reprocessed radiochemically for alpha spectrometry. Results of the follow-up alpha spectrometry analysis are reported below and were used in preparing the dose estimate.

Sample	Analysis*	Sample Date	Result (pCi/day)	Error (pCi/day)	Included
66-2869	AS	4/6/66	0.224	0.007	✓
66-2869	G	4/6/66	1.75	0.340	

* G means gross alpha counting; AS means alpha spectrometry.

Intakes and estimates of dose were prepared using CINDY Version 1.4 and LUDEP Version 2.05.

Intake was estimated using the Jones excretion model in CINDY and LUDEP.

Inhalation intake was estimated using the ICRP 66 respiratory tract model in LUDEP.

CINDY estimated dose derived using the ICRP 30, Part 4, General Systemic Model and weighting factors; and LUDEP used the recommendations of ICRP 60.

Modeling:

CINDY and LUDEP were used to estimate the intake and dose with the following results:

Model	Intake (pCi)	CEDE (rem/Sv)
CINDY	310,000	95/0.95
LUDEP	950,000	67/0.67

Doses to individual organs and estimation of the effective dose equivalent using CINDY reported the following results:

Organ	Dose Equivalent (rem/Sv)	Weighting Factors	Weighted Organ Dose Equivalent (rem/Sv)
Testes	1.4E+01/1.4E-01	2.5E-01	3.5E+00/3.5E-02
Breast	4.6E-04/4.6E-06	1.5E-01	6.9E-05/6.9E-07
Red Marrow	7.5E+01/7.5E-01	1.2E-01	9.0E+00/9.0E-02
Lung	3.5E+02/3.5E+00	1.2E-01	4.2E+01/4.2E-01
Thyroid	4.3E-04/4.3E-06	3.0E-02	1.3E-05/1.3E-07
Bone Surface	9.7E+02/9.7E+00	3.0E-02	2.9E+01/2.9E-01
Liver	1.7E+02/1.7E+00	6.0E-02	1.0E+01/1.0E-01
Other	1.6E+01/1.6E-01	6.0E-02	9.8E-01/9.8E-03
Lower Large Intestine	3.5E-02/3.5E-04	6.0E-02	2.1E-03/2.1E-05
Upper Large Intestine	1.2E-02/1.2E-04	6.0E-02	7.1E-04/7.1E-06
Small Intestine	2.4E-03/2.4E-05	6.0E-02	1.5E-04/1.5E-06
Effective Dose Equivalent			9.5E+01/9.5E-01

One urine sample was analyzed by gross alpha counting and alpha spectrometry. The gross alpha analysis was not included in the modeling since an alpha spectrometry result was available for the same sample. The result was fit using CINDY and the Jones excretion model, to estimate an intake (310,000 pCi), organ doses, and a CEDE (95 rem/0.95 Sv; ICRP-30) as shown above. LUDEP was also used to estimate an intake of 950,000 pCi and a CEDE (ICRP-60) of 67 rem (0.67 Sv).

Conclusion:

Based on the results of intake estimates and dose calculations, this individual received an estimated intake of about 310,000 pCi of ^{239}Pu resulting in a 50-year committed effective dose equivalent of 95 rem (0.95 Sv). That dose is more than the cumulative dose (7 rem) from a lifetime (70 years) of exposure at the

current level (0.100 rem) for members of the public. It is more than the working lifetime limit of 50 rem recommended by the National Council on Radiation Protection and Measurements (NCRP). These dose levels are significant, although they were based on only one sample. However, follow-up urine sampling should be considered to provide additional assessment of the exposure.

Prepared By:

Name: _____

Signature: _____ Date: _____

Peer Reviewed By:

Name: _____

Signature: _____ Date: _____

(b) (6)

(b) (6)

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AFSN: (b) (6)

INTERNAL DOSE DATA

NAME (LAST, FIRST, M.I.) (1-20)	SOC. SEC. NO. (21-29)	TYPE SAMPLE (30)	TYPE ANAL. (31-32)
(b) (6) A2C	(b) (6)	Urine	

SAMPLE NO. (33-38)	SAMPLE DATE (39-44)	EXPOSURE DATE 18 Jan – 4 Mar 66 TYPE
66-2869	FROM 0700 5 Apr TO 0700 6 Apr 66	

BASE (57-60)	OCCUPATION (61-62)	REQUESTED BY
Torrejon	Searcher	

DATE RECEIVED	SAMPLE VOLUME	VOLUME ANALYZED	DATE ANALYZED
22 April 1966	1400	1400	

TECHNICIAN (SIGNATURE AND DATE)

URINE				RADON		FECES/BLOOD	
Counter Number	A			Chamber Number		Counter Number	
Counter Bkg. (cpm)	0.04 (900)		t-33	Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)	51			Counter Eff. (%)		Counter Eff.	
Date/Time – Start	13may66			Millivolt – Start		Date/Time – Start	
– Stop				Millivolt – Stop		– Stop	
Total Counts	111	Reported value		Total Millivolts		Total Counts	✓
Counting Time	55	corrected for spike		Total Drift Time		Counting Time	
Gross cpm	2.02	of 0.965 pc/sample		Gross mv/sec		Gross cpm	
Bkg. Cpm	0.04			Bkg. Mv/sec		Bkg. cpm	0.90 PC
Net cpm	1.98			Net mv/sec		net cpm	0.10 BA
~~dpm~~ pci/l	1.25 ± 0.24			curies/mv		dpm	
dpm/24 hr. (69-74)				litter (69-74)		dps/cc	
K 40 Correction						Neutron Dose (rads) (63-68)	
~~Net Beta~~ pci/Syl	1.75 ± 0.34			D(q) (63-68)		uc/mg (69-74)	
D(q) (63-68)						D(q) (63-68)	

(b) (6)

RADIOLOGICAL SAMPLE DATA

NAME OR REQUESTOR'S ID (1–20)	GRADE	AFSN [redacted]	SOCIAL SECURITY NUMBER [redacted]	RHL SAMPLE NUMBER CC-2869
TYPE SAMPLE (23–32)	OCCUPATION (34–35)	ANALYSIS DESIRED	REQUESTED BY [redacted]	AIR FORCE BASE (68–71)
DATE RECEIVED (37–42)	DATE ANALYZED (51–56)	DATE COUNTED 6 July 66	DATE COLLECTED [redacted]	EXPOSURE DATE
SAMPLE WEIGHT/VOLUME	WEIGHT/VOLUME ANALYZED [redacted]	TECHNICIAN [redacted]		
OTHER DATA .953				

ENVIRONMENTAL SAMPLES				
COUNTER & EFFICIENCY				
TOTAL COUNTS & MINUTES				
GROSS CPM				
BKG CPM & MINUTES				
NET CPM				
YIELD				
BIOLOGICAL SAMPLES	236	239	RADON	
COUNTER & EFFICIENCY SPEC	27.3	27.3	324 dpm	3.88 DPM
TOTAL COUNTS & MINUTES 100	88	13	±0.16	
GROSS CPM	0.8800	0.1300		
BKG CPM & MINUTES 800	1 0.0013	4 0.0050		
NET CPM	0.8787			
YIELD			0.224±0.007	
% Rec	92.20			

SUMMARY OF RESULTS: [redacted]

AFLC FORM MAY 66 1165 FC 5400 AFLC–WPAFB–MAY 66 4500

(b) (6)

Internal Dosimetry Evaluation Form

NAME: (b) (6) SSN: (b) (6)

MODE OF INTAKE:
☒ Inhalation ☐ Injection
☐ Ingestion ☐ Absorption
☐ Unknown ☐ Not applicable

INTAKE DATE OR PERIOD:
1/29/66 through 2/14/66, onsite
2/6/66

SUMMARY OF EXPOSURE CONDITIONS:
Radionuclides/Respiratory Class/Particle Size: ^{239}Pu/100% Class Y/1 μm AMAD
Date or Period of Evaluated Data: 2 samples, 2/14/66 and 4/8/66
Duration of Exposure: Unknown
Location of Exposure: Camp Wilson, near Palomares, Spain

EVALUATION DATA:

Air Sampling	☐ Attached	☐ In Process	☒ Unavailable
Health Physics Survey Data	☐ Attached	☐ In Process	☒ Unavailable
Bioassay – Urinalysis	☒ Attached	☐ In Process	☐ Unavailable
Fecal	☐ Attached	☐ In Process	☒ Unavailable
Nasal Smears	☒ Attached	☐ In Process	☐ Unavailable
In Vivo	☐ Attached	☐ In Process	☒ Unavailable

Medical Treatment:

Skin Decontamination:	☐ Yes	☒ No	Date: _____
Decorporation:	☐ Yes	☒ No	Agent: _____ Date: _____
Catharsis:	☐ Yes	☒ No	Agent: _____ Date: _____
Surgical excision:	☐ Yes	☒ No	Date: _____

EVALUATION METHODOLOGY:
Assumptions: Acute inhalation intake of ^{239}Pu, 100% Class Y, 1 μm AMAD particle size on 2/6/66

Code/Model used for: Intake Estimate: CINDY, Ver. 1.4/JONES
Dose Estimate: CINDY, Ver. 1.4/ICRP 30, Part 4, General Systemic Model

RESULTS SUMMARY
Estimated Intake Activity (pCi): 110000
50 YR CEDE (rem) : 34 (0.34 Sv)

Organ Dose Equivalent Summary	**50 YR CDE (rem/Sv)**
Bone Surface	340/3.4
Lung	130/1.3
Liver	61/0.61
Red Marrow	26/0.26
Other	5.8/0.058
Testes	4.9/0.049

DOSE ASSESSOR: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

PEER REVIEWER: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

RECOMMENDATIONS:
Additional Bioassay Required ☐ Urinalysis ☐ Fecal ☐ In Vivo
Suggested Sampling Frequency: _____
Work Restrictions: N/A

Internal Dosimetry Case Narrative

Identification:

Name: (b) (6)
SSN:

Incidents:

Individual participated on site in response duties resulting from an accident involving three nuclear weapons at Palomares, Spain on January 17, 1966. Individual may have been exposed to weapons materials (primarily plutonium-239) by inhalation and ingestion from contaminated weapon and aircraft debris, lands, and vegetation. Primary activities included search, radiological monitoring, recovery of accident debris, and processing for disposal.

Previous Intake/Dose Assessments:

This assessment applies to Palomares accident activities only. No previous intakes or doses were considered.

Other Information:

None.

Radionuclide(s): ^{239}Pu.

Assumptions/Basis/Data Sources:

Acute inhalation intake of Pu-239; 100% Class Y; 1 μm AMAD particle size on 2/6/66. The date is the midpoint of the period on station from 1/29/66 to 2/14/66.

Inhalation was assumed as the major route of entry because the primary contaminant was created by explosion and fire and deposited in sandy soil and on buildings and plants. Conditions were generally windy and significant activity was underway.

Dose was determined entirely from modeling intake based on the following urinalysis results for this individual. This individual's sample was identified for a follow-up analysis using alpha spectrometry after the initial gross alpha result was reviewed. That is, the initial urine sample for this individual was reprocessed radiochemically for alpha spectrometry. Results of the follow-up alpha spectrometry analysis are reported below and were used in preparing the dose estimate.

Sample	Analysis*	Sample Date	Result (pCi/day)	Error (pCi/day)	Included
66-1147	G	2/14/66	NR	NR	
66-2872	AS	4/8/66	0.076	0.007	✓
66-2872	G	4/8/66	1.66	0.330	

* G means gross alpha counting; AS means alpha spectrometry; NR means no result reported.

A nasal swipe (sample #66-1333) was reported to have been taken for (b) (6) on 2/14/66. No result was available for this sample.

Intakes and estimates of dose were prepared using CINDY Version 1.4 and LUDEP Version 2.05.

Intake was estimated using the Jones excretion model in CINDY and LUDEP.

Inhalation intake was estimated using the ICRP 66 respiratory tract model in LUDEP.

CINDY estimated dose derived using the ICRP 30, Part 4, General Systemic Model and weighting factors; and LUDEP used the recommendations of ICRP 60.

Modeling:

CINDY and LUDEP were used to estimate the intake and dose with the following results:

Model	Intake (pCi)	CEDE (rem/Sv)
CINDY	110,000	34/0.34
LUDEP	321,000	22/0.22

Doses to individual organs and estimation of the effective dose equivalent using CINDY reported the following results:

Organ	Dose Equivalent (rem/Sv)	Weighting Factors	Weighted Organ Dose Equivalent (rem/Sv)
Testes	4.9E+00/4.9E-02	2.5E-01	1.2E+00/1.2E-02
Breast	1.6E-04/1.6E-06	1.5E-01	2.4E-05/2.4E-07
Red Marrow	2.6E+01/2.6E-01	1.2E-01	3.2E+00/3.2E-02
Lung	1.3E+02/1.3E+00	1.2E-01	1.5E+01/1.5E-01
Thyroid	1.5E-04/1.5E-06	3.0E-02	4.6E-06/4.6E-08
Bone Surface	3.4E+02/3.4E+00	3.0E-02	1.0E+01/1.0E-01
Liver	6.1E+01/6.1E-01	6.0E-02	3.7E+00/3.7E-02
Other	5.8E+00/5.8E-02	6.0E-02	3.5E-01/3.5E-03
Lower Large Intestine	1.2E-02/1.2E-04	6.0E-02	7.5E-04/7.5E-06
Upper Large Intestine	4.2E-03/4.2E-05	6.0E-02	2.5E-04/2.5E-06
Small Intestine	8.6E-04/8.6E-06	6.0E-02	5.1E-05/5.1E-07
Effective Dose Equivalent			3.4E+01/3.4E-01

One urine sample was analyzed by gross alpha counting only, and the other was analyzed by both gross alpha counting and alpha spectrometry. For the sample analyzed with both methods, the gross alpha analysis was not included in the modeling since an alpha spectrometry result was available for the same sample. The sample analyzed by gross alpha counting only was not included in the analysis since no result was reported for it. The result was fit using CINDY and the Jones excretion model, to estimate an intake (110,000 pCi), organ doses, and a CEDE (34 rem/0.34 Sv; ICRP-30) as shown above. LUDEP was also used to estimate an intake of 321,000 pCi and a CEDE (ICRP-60) of 22 rem (0.22 Sv).

Conclusion:

Based on the results of intake estimates and dose calculations, this individual received an estimated intake of about 110,000 pCi of ^{239}Pu resulting in a 50-year committed effective dose equivalent of 34 rem (0.34 Sv). That dose is more than the cumulative dose (7 rem) from a lifetime (70 years) of exposure at the current level (0.100 rem) for members of the public. It is less than the working lifetime limit of 50 rem recommended by the National Council on Radiation Protection and Measurements (NCRP). Serious health effects are not associated with that dose level. However, follow-up urine sampling now could be considered to provide additional assessment of the exposure.

Prepared By:

Name: _____

Signature: _____ (b) (6) _____ Date: _____

Peer Reviewed By:

Name: _____

Signature: _____ (b) (6) _____ Date: _____

V Army

27

INTERNAL DOSE DATA

NAME (LAST, FIRST, MID.) [redacted]	SOC. SEC. NO. (21-29)	TYPE SAMPLE (30)	TYPE ANAL. (31-32)
STETSON, RONALD [redacted]	Not Listed	Urine	
SAMPLE NO. (33-38)	SAMPLE DATE (39-44) FROM Not Listed TO	EXPOSURE DATE Not Listed TYPE	
66-2872			
BASE (57-60)	OCCUPATION (61-62)	REQUESTED BY	
Not Listed	Not Listed		
DATE RECEIVED	SAMPLE VOLUME	VOLUME ANALYZED	DATE ANALYZED
22 April 1966	1500	1500	
TECHNICI[redacted]			

URINE			RADON		FECES/BLOOD	
Counter Number	D		Chamber Number		Counter Number	
Counter Bkg. (cpm)	0.03 (900)	± 0.60	Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)	51		Counter Eff. (%)		Counter Eff.	
Date/Time – Start	13 May 66		Millivolt – Start		Date/Time – Start	
– Stop			Millivolt – Stop		– Stop	✓
Total Counts	105	Reported value corrected for spike of 0.965 pc/sample	Total Millivots		Total Counts	
Counting Time	55		Total Drift Time		Counting Time	
Gross cpm	1.91		Gross mv/sec		Gross cpm	
Bkg. Cpm	0.03		Bkg. Mv/sec		Bkg. cpm	0.83 PC
Net cpm	1.88		Net mv/sec		net cpm	0.15 BB
~~dpm~~ pci/l	1.11 ± 0.22		curies/mv		dpm	
dpm/24 hr. (69-74)			litter (69-74)		dps/cc	
K 40 Correction					Neutron Dose (rads) (63-68)	
~~Nat Beta~~ pci/gal	1.66 ± 0.33		D(q) (63-68)		uc/mg (69-74)	
D(q) (63-68)					D(q) (63-68)	

(b) (6)

(b) (6)

RADIOLOGICAL SAMPLE DATA

NAME OR REQUESTOR'S ID (1–20)	GRADE	AFSN	SOCIAL SECURITY NUMBER	RHL SAMPLE NUMBER
				66-2872

TYPE SAMPLE (23–32)	OCCUPATION (34–35)	ANALYSIS DESIRED	REQUESTED BY	AIR FORCE BASE (68–71)

DATE RECEIVED (37–42)	DATE ANALYZED (51–56)	DATE COUNTED 6 July 66	DATE COLLECTED	EXPOSURE DATE

SAMPLE WEIGHT/VOLUME	WEIGHT/VOLUME ANALYZED	TECHNICIAN

OTHER DATA 953

ENVIRONMENTAL SAMPLES						
COUNTER & EFFICIENCY						
TOTAL COUNTS & MINUTES						
GROSS CPM						
BKG CPM & MINUTES						
NET CPM						
YIELD						
BIOLOGICAL SAMPLES					RADON	
COUNTER & EFFICIENCY	Spec	236 27.3		239 27.3	3.57 dpm ±0.17	3.69 DPM
TOTAL COUNTS & MINUTES	100	43		5		
GROSS CPM		0.9300		0.0500		
BKG CPM & MINUTES	800	1 0.0013		4 0.0050		
NET CPM		0.9287		0.0450		
YIELD					0.076 ± 0.007	
	Ba Rec	97.85				

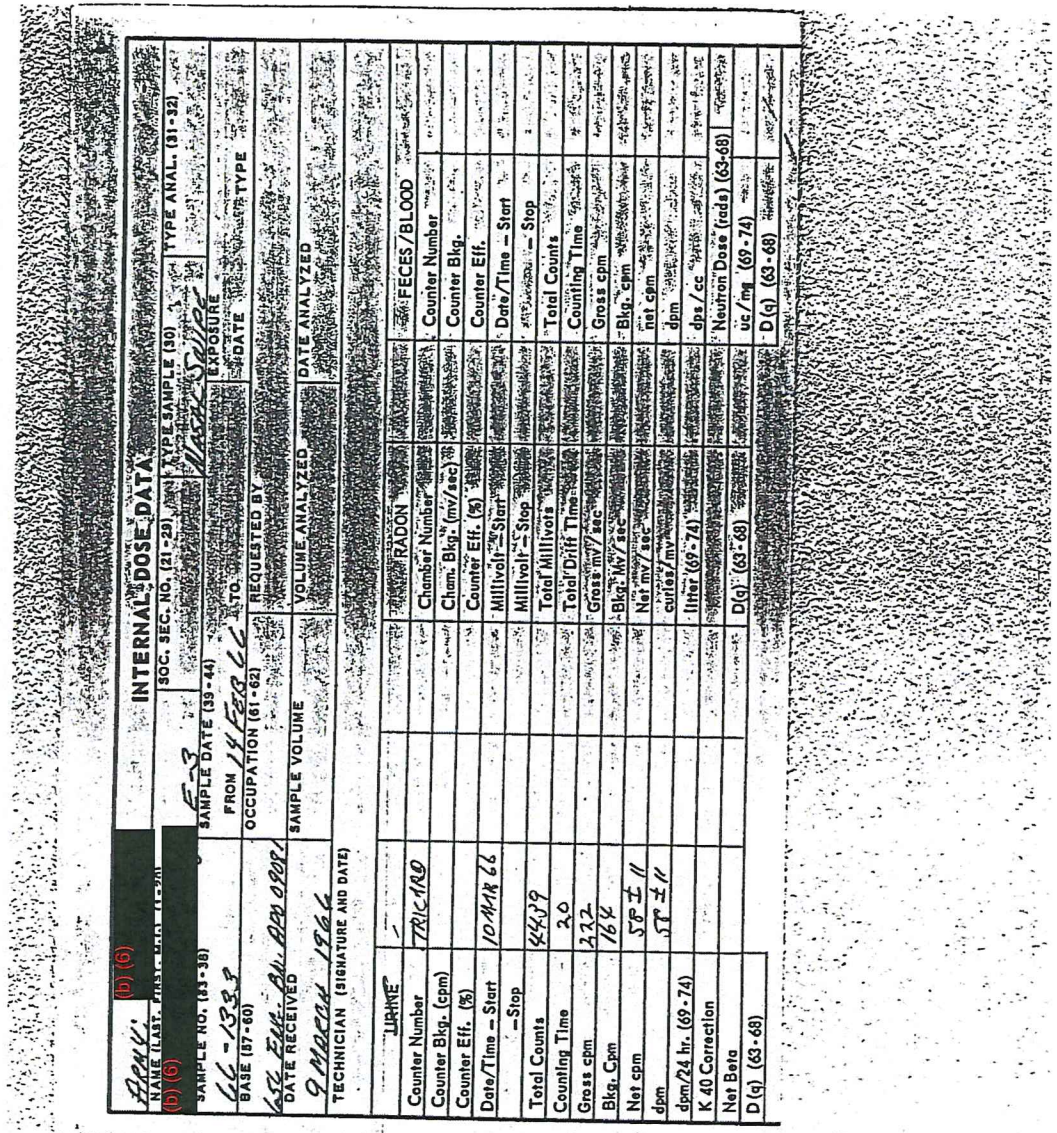
SUMMARY OF RESULTS:

AFLC FORM MAY 66 1165 FC 5400

AFLC–WPAFB–MAY 66 4500

(b) (6)

(b) (6)



INTERNAL DOSE DATA

NAME (LAST, FIRST, MID.) (b) (6) | SOC. SEC. NO. (21-29) | TYPE SAMPLE (30) | TYPE ANAL. (31-32)

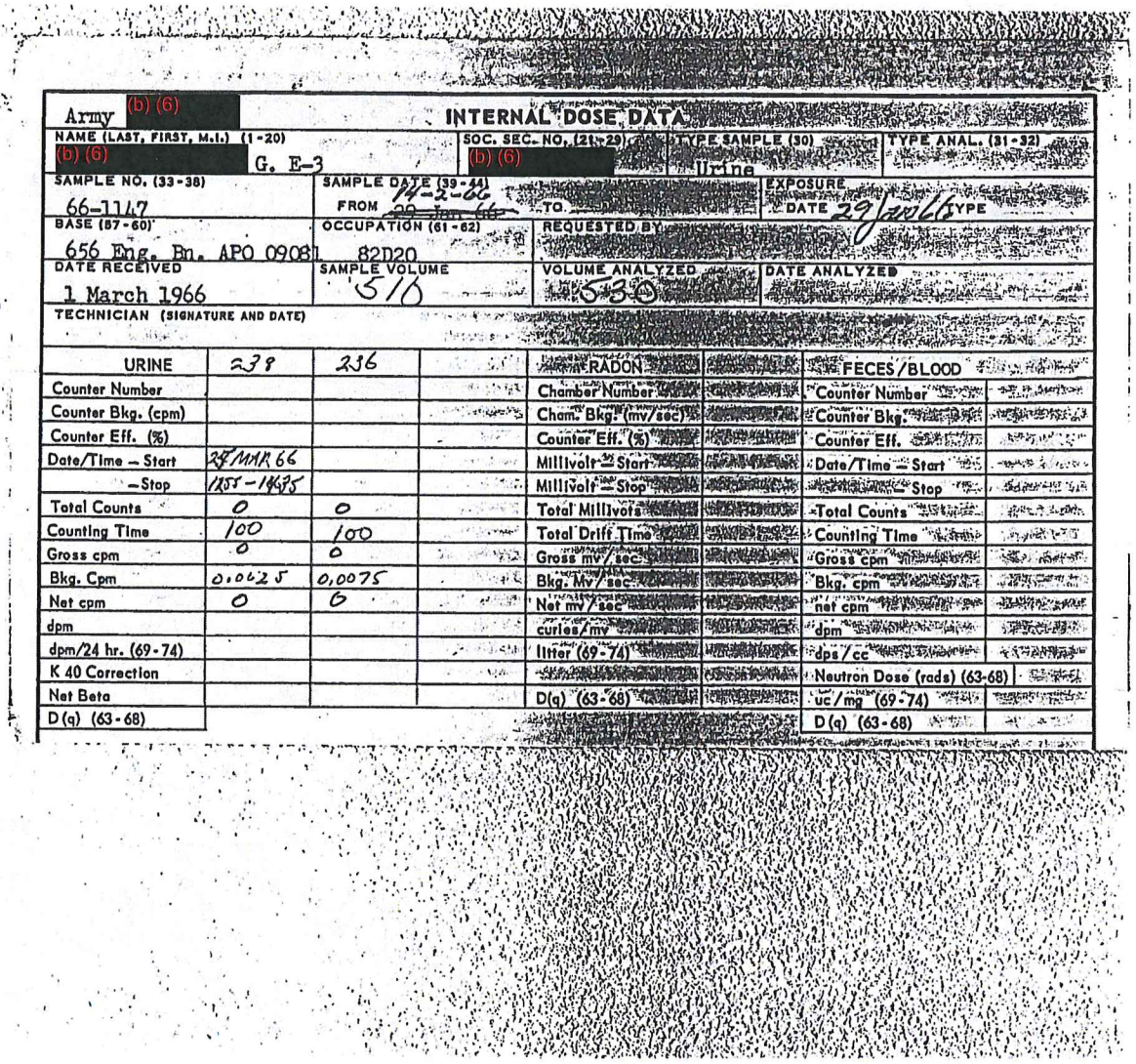
SAMPLE NO. (33-38) | SAMPLE DATE (39-44) | EXPOSURE

BASE (57-60) | OCCUPATION (61-62) | REQUESTED BY | DATE

DATE RECEIVED | SAMPLE VOLUME | VOLUME ANALYZED | DATE ANALYZED

TECHNICIAN (SIGNATURE AND DATE)

Counter Number	TRIC 180	Chamber Number	RADON	Counter Number	FECES/BLOOD
Counter Bkg. (cpm)		Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)		Counter Eff. (%)		Counter Eff.	
Date/Time – Start	10 MAR 66	Millivolt – Start		Date/Time – Start	
– Stop		Millivolt – Stop		– Stop	
Total Counts	4439	Total Millivolts		Total Counts	
Counting Time	20	Total Drift Time		Counting Time	
Gross cpm	222	Gross mv/sec		Gross cpm	
Bkg. Cpm	164	Bkg. mv/sec		Bkg. cpm	
Net cpm	58 ± 11	Net mv/sec		net cpm	
dpm	58 ± 11	curies/mv		dpm	
dpm/24 hr. (69-74)		liter (69-74)		dps/cc	
K 40 Correction				Neutron Dose (rads) (63-68)	
Net Beta		D(q) (63-68)		uc/ml (69-74)	
D(q) (63-68)				D(q) (63-68)	



Army (b) (6)

INTERNAL DOSE DATA

NAME (LAST, FIRST, M.I.) (1-20)	SOC. SEC. NO. (21-29)	TYPE SAMPLE (30)	TYPE ANAL. (31-32)
(b) (6) G. E-3	(b) (6)	Urine	

SAMPLE NO. (33-38)	SAMPLE DATE (39-44) FROM	TO	EXPOSURE DATE	TYPE
66-1147	14-2-66 ~~20 Jan 66~~		29 Jan 66	

BASE (57-60)	OCCUPATION (61-62)	REQUESTED BY
656 Eng. Bn. APO 09081	82D20	

DATE RECEIVED	SAMPLE VOLUME	VOLUME ANALYZED	DATE ANALYZED
1 March 1966	510	530	

TECHNICIAN (SIGNATURE AND DATE)

URINE	238	236		RADON		FECES/BLOOD	
Counter Number				Chamber Number		Counter Number	
Counter Bkg. (cpm)				Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)				Counter Eff. (%)		Counter Eff.	
Date/Time – Start	25 MAR 66			Millivolt – Start		Date/Time – Start	
– Stop	1855 – 1935			Millivolt – Stop		– Stop	
Total Counts	0	0		Total Millivolts		Total Counts	
Counting Time	100	100		Total Drift Time		Counting Time	
Gross cpm	0	0		Gross mv/sec		Gross cpm	
Bkg. Cpm	0.0625	0.0075		Bkg. Mv/sec		Bkg. cpm	
Net cpm	0	0		Net mv/sec		net cpm	
dpm				curies/mv		dpm	
dpm/24 hr. (69-74)				litter (69-74)		dps/cc	
K 40 Correction						Neutron Dose (rads) (63-68)	
Net Beta				D(q) (63-68)		uc/mg (69-74)	
D(q) (63-68)						D(q) (63-68)	

(b) (6)

(b) (6)

Internal Dosimetry Evaluation Form

NAME: (b) (6) SSN: (b) (6)

MODE OF INTAKE:
☒ Inhalation ☐ Injection
☐ Ingestion ☐ Absorption
☐ Unknown ☐ Not applicable

INTAKE DATE OR PERIOD:
2/1/66 through 2/27/66, onsite
2/13/66

SUMMARY OF EXPOSURE CONDITIONS:
Radionuclides/Respiratory Class/Particle Size: ^{239}Pu/100% Class Y/1 μm AMAD
Date or Period of Evaluated Data: 2 samples, 2/27/66 and 2/28/66
Duration of Exposure: Unknown
Location of Exposure: Camp Wilson, near Palomares, Spain

EVALUATION DATA:

Air Sampling	☐ Attached	☐ In Process	☒ Unavailable
Health Physics Survey Data	☐ Attached	☐ In Process	☒ Unavailable
Bioassay – Urinalysis	☒ Attached	☐ In Process	☐ Unavailable
Fecal	☐ Attached	☐ In Process	☒ Unavailable
Nasal Smears	☐ Attached	☐ In Process	☒ Unavailable
In Vivo	☐ Attached	☐ In Process	☒ Unavailable

Medical Treatment:

Skin Decontamination:	☐ Yes	☒ No	Date: _____
Decorporation:	☐ Yes	☒ No	Agent: _____ Date: _____
Catharsis:	☐ Yes	☒ No	Agent: _____ Date: _____
Surgical excision:	☐ Yes	☒ No	Date: _____

EVALUATION METHODOLOGY:
Assumptions: Acute inhalation intake of ^{239}Pu, 100% Class Y, 1 μm AMAD particle size on 2/13/66

Code/Model used for: Intake Estimate: CINDY, Ver. 1.4/JONES
Dose Estimate: CINDY, Ver. 1.4/ICRP 30, Part 4, General Systemic Model

RESULTS SUMMARY
Estimated Intake Activity (pCi): 190000
50 YR CEDE (rem) : 58 (0.58 Sv)

Organ Dose Equivalent Summary	**50 YR CDE (rem/Sv)**
Bone Surface	590/5.9
Lung	220/2.2
Liver	110/1.1
Red Marrow	46/0.46
Other	10/0.1
Testes	8.5/0.085

DOSE ASSESSOR: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

PEER REVIEWER: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

RECOMMENDATIONS:
Additional Bioassay Required ☐ Urinalysis ☐ Fecal ☐ In Vivo
Suggested Sampling Frequency: _____
Work Restrictions: N/A

Internal Dosimetry Case Narrative

Identification:

Name: (b) (6)
SSN:

Incidents:

Individual participated on site in response duties resulting from an accident involving three nuclear weapons at Palomares, Spain on January 17, 1966. Individual may have been exposed to weapons materials (primarily plutonium-239) by inhalation and ingestion from contaminated weapon and aircraft debris, lands, and vegetation. Primary activities included search, radiological monitoring, recovery of accident debris, and processing for disposal.

Previous Intake/Dose Assessments:

This assessment applies to Palomares accident activities only. No previous intakes or doses were considered.

Other Information:

None.

Radionuclide(s): ^{239}Pu.

Assumptions/Basis/Data Sources:

Acute inhalation intake of Pu-239; 100% Class Y; 1 μm AMAD particle size on 2/13/66. The date is the midpoint of the period on station from 2/1/66 to 2/27/66.

Inhalation was assumed as the major route of entry because the primary contaminant was created by explosion and fire and deposited in sandy soil and on buildings and plants. Conditions were generally windy and significant activity was underway.

Dose was determined entirely from modeling intake based on the following urinalysis results for this individual. This individual's sample was identified for a follow-up analysis using alpha spectrometry after the initial gross alpha result was reviewed. That is, the initial urine sample for this individual was reprocessed radiochemically for alpha spectrometry. Results of the follow-up alpha spectrometry analysis are reported below and were used in preparing the dose estimate.

Sample	Analysis*	Sample Date	Result (pCi/day)	Error (pCi/day)	Included
66-3411	AS	2/27/66	0.122	0.045	✓
66-3411	G	2/27/66	NR	NR	
66-1494	AS	2/28/66	0.282	0.116	✓
66-1494	G	2/28/66	1.52	0.310	

* G means gross alpha counting; AS means alpha spectrometry; NR means no result reported.

Intakes and estimates of dose were prepared using CINDY Version 1.4 and LUDEP Version 2.05.

Intake was estimated using the Jones excretion model in CINDY and LUDEP.

Inhalation intake was estimated using the ICRP 66 respiratory tract model in LUDEP.

CINDY estimated dose derived using the ICRP 30, Part 4, General Systemic Model and weighting factors; and LUDEP used the recommendations of ICRP 60.

Modeling:

CINDY and LUDEP were used to estimate the intake and dose with the following results:

Model	Intake (pCi)	CEDE (rem/Sv)
CINDY	190,000	58/0.58
LUDEP	616,000	43/0.43

Doses to individual organs and estimation of the effective dose equivalent using CINDY reported the following results:

Organ	Dose Equivalent (rem/Sv)	Weighting Factors	Weighted Organ Dose Equivalent (rem/Sv)
Testes	8.5E+00/8.5E-02	2.5E-01	2.1E+00/2.1E-02
Breast	2.8E-04/2.8E-06	1.5E-01	4.2E-05/4.2E-07
Red Marrow	4.6E+01/4.6E-01	1.2E-01	5.5E+00/5.5E-02
Lung	2.2E+02/2.2E+00	1.2E-01	2.6E+01/2.6E-01
Thyroid	2.7E-04/2.7E-06	3.0E-02	8.0E-06/8.0E-08
Bone Surface	5.9E+02/5.9E+00	3.0E-02	1.8E+01/1.8E-01
Liver	1.1E+02/1.1E+00	6.0E-02	6.4E+00/6.4E-02
Other	1.0E+01/1.0E-01	6.0E-02	6.0E-01/6.0E-03
Lower Large Intestine	2.2E-02/2.2E-04	6.0E-02	1.3E-03/1.3E-05
Upper Large Intestine	7.2E-03/7.2E-05	6.0E-02	4.3E-04/4.3E-06
Small Intestine	1.5E-03/1.5E-05	6.0E-02	8.9E-05/8.9E-07
Effective Dose Equivalent			5.8E+01/5.8E-01

Two urine samples were analyzed by gross alpha counting and alpha spectrometry. The gross alpha analyses was not included in the modeling since an alpha spectrometry result was available for the each sample. The results were fit using CINDY and the Jones excretion model, to estimate an intake (190,000 pCi), organ doses, and a CEDE (58 rem/0.58 Sv; ICRP-30) as shown above. LUDEP was also used to estimate an intake of 616,000 pCi and a CEDE (ICRP-60) of 43 rem (0.43 Sv).

Conclusion:

Based on the results of intake estimates and dose calculations, this individual received an estimated intake of about 190,000 pCi of ^{239}Pu resulting in a 50-year committed effective dose equivalent of 58 rem (0.58 Sv). That dose is more than the cumulative dose (7 rem) from a lifetime (70 years) of exposure at the

current level (0.100 rem) for members of the public. It is more than the working lifetime limit of 50 rem recommended by the National Council on Radiation Protection and Measurements (NCRP). Serious health effects are not normally associated with these dose levels. However, follow-up urine sampling should be considered to provide additional assessment of the exposure.

Prepared By:

Name: _____

Signature: _____ Date: _____

Peer Reviewed By:

Name: _____

Signature: _____ Date: _____

(b) (6) (b) (6)

RESAMPLE JUL 14 1966 NAVY

Civilian: GS-12 INTERNAL DOSE DATA Not Resample! Each process as resample

(b) (6)	SOC. SEC. NO. (21-29) (b) (6)	TYPE SAMPLE (30) Urine	TYPE ANAL. (31-32)
SAMPLE NO. (33-38) 66-3411	SAMPLE DATE (39-44) FROM 5 June 66 TO		EXPOSURE DATE Feb 66 TYPE
BASE (57-60) US Naval Oceanographic Office	OCCUPATION (61-62)	REQUESTED BY	
DATE RECEIVED 14 June 1966	SAMPLE VOLUME ~1100 ml	VOLUME ANALYZED 490 ml	DATE ANALYZED 16 Sept

T (b) (6) E AND DATE) CAPT 16 Sept t=11D

URINE	236	239		RADON		FECES/BLOOD	
Counter Number	Spec 3 (800)	Spec 6 (800)		Chamber Number	H-57	Counter Number	
Counter Bkg. (cpm)				Cham. Bkg. ~~(uncoat)~~	136	Counter Bkg.	
Counter Eff. (%)	31.8	31.8		~~Counter Eff (%)~~	849 5806	Counter Eff.	
Date/Time – Start				Millivolt – Start		Date/Time – Start	
– Stop				Millivolt – Stop		– Stop	
Total Counts	48	9		Total ~~Millivolts~~ Cts	129	Total Counts	
Counting Time	100	100		Total ~~Date~~ Time	65	Counting Time	
Gross cpm				Gross mv/sec		Gross cpm	
Bkg. Cpm				Bkg. Mv/sec		Bkg. cpm	
Net cpm				Net mv/sec		net cpm	
dpm				curies/mv		dpm	
dpm/24 hr. (69-74)				litter (69-74)		dps/cc	
K 40 Correction						Neutron Dose (rads) (63-68)	
Net Beta				D(q) (63-68)		uc/mg (69-74)	
D(q) (63-68)						D(q) (63-68)	

%Rec = 135.6

NAME: SOCIAL SECURITY NUMBER: SAMPLE NUMBER:

AIR FORCE BASE

RESULTS OF ANALYSIS $P_{Ci}/SPL = 0.122 \pm 0.045$ %REC = 95.6%
TOT. VOL. = 1100
VOL. ANALYZED = 490 BODY BURDEN = 0.043

☐ Repeat the sample for the following reason:
( ) Significant activity in recently analyzed sample (s)
( ) Data required to establish dose
( ) Improper flask used
( ) Other
( ) Suggested sampling schedule

This is a repeat sample but not part of resampling program. (b) (6)
Process as resample

SIGNATURE: DATE:

ONE TIME FORM. OBSOLETE AFTER 30 JUN 66. (MCGSCPF, RAG, 4 APR 66) AFLC–WPAFB–APR 66 2500

(b) (6) [redacted]

(b) (6) [redacted]

MAR 11 1966 MAR 11 1966 15

INTERNAL DOSE DATA

CIVILIAN

NAME (LAST, FIRST, M.I.) (1 - 20): (b) (6) [redacted]

SOC. SEC. NO. (21 - 29):

TYPE SAMPLE (30): URINE

TYPE ANAL. (31 - 32): Pu 239

SAMPLE NO. (33 - 38): 66 - 1494

SAMPLE DATE (39 - 44): FROM 7:00 AM 27 FEB TO 7:00AM 28 FEB 66

EXPOSURE DATE:

EXPOSURE TYPE:

BASE (57 - 60): US Naval Ocean Board

OCCUPATION (61 - 62):

REQUESTED BY:

DATE RECEIVED: 11 MAR 66

SAMPLE VOLUME: 250

VOLUME ANALYZED: 260

DATE ANALYZED:

TECHNICIAN (SIGNATURE AND DATE):

URINE	GROSS ALPHA			RADON		FECES/BLOOD	
Counter Number	C			Chamber Number		Counter Number	
Counter Bkg. (cpm)	0.05 (990)		tc 30	Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)	51			Counter Eff. (%)		Counter Eff.	
Date/Time – Start	12 may 66			Millivolt – Start		Date/Time – Start	
– Stop		Reported value corrected for spike of 0.965 pc/sample		Millivolt – Stop		– Stop	✓
Total Counts	101			Total Millivots		Total Counts	
Counting Time	55			Total Drift Time		Counting Time	
Gross cpm	1.84			Gross mv/sec		Gross cpm	
Bkg. Cpm	0.05			Bkg. Mv/sec		Bkg. cpm	2.18 PC
Net cpm	1.79			Net mv/sec		net cpm	NSBB
~~dpm~~ pci/l	6.06	± 1.24		curies/mv		dpm	
dpm/24 hr. (69 - 74)				litter (69 - 74)		dps/cc	
K 40 Correction						Neutron Dose (rads) (63-68)	
~~Nat Bera~~ pci/gal	1.52	± 0.31		D(q) (63 - 68)		uc/mg (69 - 74)	
D(q) (63/68)						D(q) (63 - 68)	

(b)
(6)

(b)
(6)

RADIOLOGICAL SAMPLE DATA

NAME OR REQUESTOR'S ID (1–20)	GRADE	AFSN	SOCIAL SECURITY NUMBER	RHL SAMPLE NUMBER 66-1494
TYPE SAMPLE (23–32)	OCCUPATION (34–35)	ANALYSIS DESIRED	REQUESTED BY	AIR FORCE BASE (68–71)
DATE RECEIVED (37–42)	DATE ANALYZED (51–56)	DATE COUNTED 22 July 66	DATE COLLECTED	EXPOSURE DATE
SAMPLE WEIGHT/VOLUME	WEIGHT/VOLUME ANALYZED	TECHNICIAN		
OTHER DATA .942				

ENVIRONMENTAL SAMPLES				
COUNTER & EFFICIENCY				
TOTAL COUNTS & MINUTES				
GROSS CPM				
BKG CPM & MINUTES				
NET CPM				
YIELD				
BIOLOGICAL SAMPLES	236	239	RADON	
COUNTER & EFFICIENCY Spec	27.3	27.3	2.93 dpm	3.51 DPM
TOTAL COUNTS & MINUTES 100	68	73	±0.65	
GROSS CPM	0.6800	0.1300		
BKG CPM & MINUTES 800 3	0.0038	6 – 0.0075		
NET CPM	0.6762	0.1225	0.282 ± 0.116	
YIELD				
u/o Rue	71.78			

SUMMARY OF RESULTS:

AFLC FORM MAY 66 1165 FC 5400 AFLC–WPAFB–MAY 66 4500

(b) (6)

3411

1. 0.122 ± .04, 22 ± 40. fci
2. 95.6
3. 1.1
4. 110
5. 6259
6. 0.04

(b) (6)

Internal Dosimetry Evaluation Form

NAME (b) (6) SSN: (b) (6)

MODE OF INTAKE:
☒ Inhalation ☐ Injection
☐ Ingestion ☐ Absorption
☐ Unknown ☐ Not applicable

INTAKE DATE OR PERIOD:
2/5/66 through 2/26/66 on-site
2/16/66

SUMMARY OF EXPOSURE CONDITIONS:
Radionuclides/Respiratory Class/Particle Size: ^{239}Pu/100% Class Y/1 μm AMAD
Date or Period of Evaluated Data: 1 urine sample, 2/26/66
Duration of Exposure: Unknown
Location of Exposure: Camp Wilson, near Palomares, Spain

EVALUATION DATA:

Air Sampling	☐ Attached	☐ In Process	☒ Unavailable
Health Physics Survey Data	☐ Attached	☐ In Process	☒ Unavailable
Bioassay – Urinalysis	☒ Attached	☐ In Process	☐ Unavailable
Fecal	☐ Attached	☐ In Process	☒ Unavailable
Nasal Smears	☐ Attached	☐ In Process	☒ Unavailable
In Vivo	☐ Attached	☐ In Process	☒ Unavailable

Medical Treatment:

Skin Decontamination:	☐ Yes	☒ No	Date: _____
Decorporation:	☐ Yes	☒ No	Agent: _____ Date: _____
Catharsis:	☐ Yes	☒ No	Agent: _____ Date: _____
Surgical excision:	☐ Yes	☒ No	Date: _____

EVALUATION METHODOLOGY:
Assumptions: Acute inhalation intake of ^{239}Pu, 100% Class Y, 1 μm AMAD particle size on 2/15/66

Code/Model used for: Intake Estimate: CINDY, Ver. 1.4/JONES
Dose Estimate: CINDY, Ver. 1.4/ICRP 30, Part 4, General Systemic Model

RESULTS SUMMARY
Estimated Intake Activity (pCi): 140000
50 YR CEDE (rem) : 43 (0.43 Sv)

Organ Dose Equivalent Summary	**50 YR CDE (rem/Sv)**
Bone Surface	440/4.4
Lung	160/1.6
Liver	78/0.78
Red Marrow	34/0.34
Other	7.4/0.074
Testes	6.2/0.062

DOSE ASSESSOR: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

PEER REVIEWER: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

RECOMMENDATIONS:
Additional Bioassay Required ☐ Urinalysis ☐ Fecal ☐ In Vivo
Suggested Sampling Frequency: _____
Work Restrictions: N/A

Internal Dosimetry Case Narrative

Identification:

Name: (b) (6)
SSN:

Incidents:

Individual participated on site in response duties resulting from an accident involving three nuclear weapons at Palomares, Spain on January 17, 1966. Individual may have been exposed to weapons materials (primarily plutonium-239) by inhalation and ingestion from contaminated weapon and aircraft debris, lands, and vegetation. Primary activities included search, radiological monitoring, recovery of accident debris, and processing for disposal.

Previous Intake/Dose Assessments:

This assessment applies to Palomares accident activities only. No previous intakes or doses were considered.

Other Information:

None.

Radionuclide(s): ^{239}Pu.

Assumptions/Basis/Data Sources:

Acute inhalation intake of Pu-239; 100% Class Y; 1 μm AMAD particle size on 2/15/66. The date is the midpoint of the period on station from 2/5/66 to 2/26/66.

Inhalation was assumed as the major route of entry because the primary contaminant was created by explosion and fire and deposited in sandy soil and on buildings and plants. Conditions were generally windy and significant activity was underway.

Dose was determined entirely from modeling intake based on the following urinalysis results for this individual. This individual's sample was identified for a follow-up analysis using alpha spectrometry after the initial gross alpha result was reviewed. That is, the initial urine sample for this individual was reprocessed radiochemically for alpha spectrometry. Results of the follow-up alpha spectrometry analysis are reported below and were used in preparing the dose estimate.

Sample	Analysis*	Sample Date	Result (pCi/day)	Error (pCi/day)	Included
66-1419	AS	2/26/66	0.163	0.024	✓
66-1419	G	2/26/66	0.731	0.216	

* G means gross alpha counting; AS means alpha spectrometry.

Intakes and estimates of dose were prepared using CINDY Version 1.4 and LUDEP Version 2.05.

Intake was estimated using the Jones excretion model in CINDY and LUDEP.

Inhalation intake was estimated using the ICRP 66 respiratory tract model in LUDEP.

CINDY estimated dose derived using the ICRP 30, Part 4, General Systemic Model and weighting factors; and LUDEP used the recommendations of ICRP 60.

Modeling:

CINDY and LUDEP were used to estimate the intake and dose with the following results:

Model	Intake (pCi)	CEDE (rem/Sv)
CINDY	140,000	43/0.43
LUDEP	697,000	49/0.49

Doses to individual organs and estimation of the effective dose equivalent using CINDY reported the following results:

Organ	Dose Equivalent (rem/Sv)	Weighting Factors	Weighted Organ Dose Equivalent (rem/Sv)
Testes	6.2E+00/6.2E-02	2.5E-01	1.6E+00/1.6E-02
Breast	2.1E-04/2.1E-06	1.5E-01	3.1E-05/3.1E-07
Red Marrow	3.4E+01/3.4E-01	1.2E-01	4.0E+00/4.0E-02
Lung	1.6E+02/1.6E+00	1.2E-01	1.9E+01/1.9E-01
Thyroid	2.0E-04/2.0E-06	3.0E-02	5.9E-06/5.9E-08
Bone Surface	4.4E+02/4.4E+00	3.0E-02	1.3E+01/1.3E-01
Liver	7.8E+01/7.8E-01	6.0E-02	4.7E+00/4.7E-02
Other	7.4E+00/7.4E-02	6.0E-02	4.4E-01/4.4E-03
Lower Large Intestine	1.6E-02/1.6E-04	6.0E-02	9.5E-04/9.5E-06
Upper Large Intestine	5.3E-03/5.3E-05	6.0E-02	3.2E-04/3.2E-06
Small Intestine	1.1E-03/1.1E-05	6.0E-02	6.5E-05/6.5E-07
Effective Dose Equivalent			4.3E+01/4.3E-01

One urine sample was analyzed by gross alpha counting and alpha spectrometry. The gross alpha analysis was not included in the modeling since an alpha spectrometry result was available for the same sample. The result was fit using CINDY and the Jones excretion model, to estimate an intake (140,000 pCi), organ doses, and a CEDE (43 rem/0.43 Sv; ICRP-30) as shown above. LUDEP was also used to estimate an intake of 697,000 pCi and a CEDE (ICRP-60) of 49 rem (0.49 Sv).

Conclusion:

Based on the results of intake estimates and dose calculations, this individual received an estimated intake of about 140,000 pCi of ^{239}Pu resulting in a 50-year committed effective dose equivalent of 43 rem (0.43 Sv). That dose is more than the cumulative dose (7 rem) from a lifetime (70 years) of exposure at the

current level (0.100 rem) for members of the public. It is less than the working lifetime limit of 50 rem recommended by the National Council on Radiation Protection and Measurements (NCRP). Serious health effects are not associated with that dose level. However, follow-up urine sampling now could be considered to provide additional assessment of the exposure.

Prepared By:

Name: _____

Signature: _____ Date: _____

Peer Reviewed By:

Name: _____

Signature: _____ Date: _____

MAR 9 1966 X 30

AFSN: [redacted]

INTERNAL DOSE DATA

NAME (LAST, FIRST, M.I.) (1-20) [redacted] SSGT	SOC. SEC. NO. (21-29) [redacted]	TYPE SAMPLE (30) URINE	TYPE ANAL. (31-32) GROSS ALPHA
SAMPLE NO. (33-38) 66-1419	SAMPLE DATE (39-44) FROM 26 FEB 66 TO		EXPOSURE DATE 5 F…
BASE (57-60) MORON	OCCUPATION (61-62) 43171E	REQUESTED BY	
DATE RECEIVED 9 MAR 66	SAMPLE VOLUME 880	VOLUME ANALYZED 915	DATE ANALYZED
TECHNICIAN (SIGNATURE AND DATE)			

URINE				RADON		FECES/BLOOD	
Counter Number	G			Chamber Number		Counter Number	
Counter Bkg. (cpm)	0.03 (990		xc21	Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)	51			Counter Eff. (%)		Counter Eff.	
Date/Time – Start	12 mar 66			Millivolt – Start		Date/Time – Start	
– Stop		Reported value		Millivolt – Stop		– Stop	✓
Total Counts	49	corrected for spike		Total Millivolts		Total Counts	
Counting Time	55	of 0.965 pc/sample		Total Drift Time		Counting Time	
Gross cpm	0.89			Gross mv/sec		Gross cpm	NDA
Bkg. Cpm	0.03			Bkg. Mv/sec		Bkg. cpm	
Net cpm	0.86			Net mv/sec		net cpm	
~~dpm~~ pci/l	0.831	± 0.246		curies/mv		dpm	
dpm/24 hr. (69-74)				liter (69-74)		dps/cc	
K 40 Correction						Neutron Dose (rads) (63-68)	
~~Net Beta~~ pci/sample	0.731	± 0.216		D(q) (63-68)		uc/mg (69-74)	
D(q) (63-68)						D(q) (63-68)	

(b)
(6)

(b)
(6)

RADIOLOGICAL SAMPLE DATA

NAME OR REQUESTOR'S ID (1–20)		GRADE	AFSN	SOCIAL SECURITY NUMBER	RHL SAMPLE NUMBER 66-1419
TYPE SAMPLE (23–32)	OCCUPATION (34–35)	ANALYSIS DESIRED	REQUESTED BY		AIR FORCE BASE (68–71)
DATE RECEIVED (37–42)	DATE ANALYZED (51–56)	DATE COUNTED 27 June 66	DATE COLLECTED		EXPOSURE DATE
SAMPLE WEIGHT/VOLUME		WEIGHT/VOLUME ANALYZED	TECHNICIAN		
OTHER DATA 1958					

ENVIRONMENTAL SAMPLES					
COUNTER & EFFICIENCY					
TOTAL COUNTS & MINUTES					
GROSS CPM					
BKG CPM & MINUTES					
NET CPM					
YIELD					
BIOLOGICAL SAMPLES					
COUNTER & EFFICIENCY	Spec	236	239	RADON	169 dpm
TOTAL COUNTS & MINUTES	100	27.3	27.5	95 dpm	
GROSS CPM		39	5		
BKG CPM & MINUTES	807	0.3900	0.0500	101	
NET CPM	1	0.0012	8 0.0099		
YIELD		0.3888	0.0401		
				0.1635 ± 0.024	AC/SPL
	% Rec	40.58			

SUMMARY OF RESULTS:

AFLC FORM MAY 66 1165 FC 5400 AFLC–WPAFB–MAY 66 4500

(b) (6)

Internal Dosimetry Evaluation Form

NAME: (b) (6) SSN: (b) (6)

MODE OF INTAKE:
☒ Inhalation ☐ Injection
☐ Ingestion ☐ Absorption
☐ Unknown ☐ Not applicable

INTAKE DATE OR PERIOD:
1/27/66 through 3/13/66, onsite
2/18/66

SUMMARY OF EXPOSURE CONDITIONS:
Radionuclides/Respiratory Class/Particle Size: ^{239}Pu/100% Class Y/1 μm AMAD
Date or Period of Evaluated Data: 2 samples, 3/14/66 and 6/5/66
Duration of Exposure: Unknown
Location of Exposure: Camp Wilson, near Palomares, Spain

EVALUATION DATA:

Air Sampling	☐ Attached	☐ In Process	☒ Unavailable
Health Physics Survey Data	☐ Attached	☐ In Process	☒ Unavailable
Bioassay – Urinalysis	☒ Attached	☐ In Process	☐ Unavailable
Fecal	☐ Attached	☐ In Process	☒ Unavailable
Nasal Smears	☐ Attached	☐ In Process	☒ Unavailable
In Vivo	☐ Attached	☐ In Process	☒ Unavailable

Medical Treatment:

Skin Decontamination:	☐ Yes	☒ No	Date: _____
Decorporation:	☐ Yes	☒ No	Agent: _____ Date: _____
Catharsis:	☐ Yes	☒ No	Agent: _____ Date: _____
Surgical excision:	☐ Yes	☒ No	Date: _____

EVALUATION METHODOLOGY:
Assumptions: Acute inhalation intake of ^{239}Pu, 100% Class Y, 1 μm AMAD particle size on 2/18/66

Code/Model used for: Intake Estimate: CINDY, Ver. 1.4/JONES
Dose Estimate: CINDY, Ver. 1.4/ICRP 30, Part 4, General Systemic Model

RESULTS SUMMARY
Estimated Intake Activity (pCi): 140000
50 YR CEDE (rem) : 43 (0.43 Sv)

Organ Dose Equivalent Summary	**50 YR CDE (rem/Sv)**
Bone Surface	440/4.4
Lung	160/1.6
Liver	78/0.78
Red Marrow	34/0.34
Other	7.4/0.074
Testes	6.2/0.062

DOSE ASSESSOR: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

PEER REVIEWER: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

RECOMMENDATIONS:
Additional Bioassay Required ☐ Urinalysis ☐ Fecal ☐ In Vivo
Suggested Sampling Frequency: _____
Work Restrictions: N/A

Internal Dosimetry Case Narrative

Identification:

Name: (b) (6)
SSN:

Incidents:

Individual participated on site in response duties resulting from an accident involving three nuclear weapons at Palomares, Spain on January 17, 1966. Individual may have been exposed to weapons materials (primarily plutonium-239) by inhalation and ingestion from contaminated weapon and aircraft debris, lands, and vegetation. Primary activities included search, radiological monitoring, recovery of accident debris, and processing for disposal.

Previous Intake/Dose Assessments:

This assessment applies to Palomares accident activities only. No previous intakes or doses were considered.

Other Information:

None.

Radionuclide(s): ^{239}Pu.

Assumptions/Basis/Data Sources:

Acute inhalation intake of Pu-239; 100% Class Y; 1 μm AMAD particle size on 2/18/66. The date is the midpoint of the period on station from 1/27/66 to 3/13/66.

Inhalation was assumed as the major route of entry because the primary contaminant was created by explosion and fire and deposited in sandy soil and on buildings and plants. Conditions were generally windy and significant activity was underway.

Dose was determined entirely from modeling intake based on the following urinalysis results for this individual. This individual's sample was identified for a follow-up analysis using alpha spectrometry after the initial gross alpha result was reviewed. That is, the initial urine sample for this individual was reprocessed radiochemically for alpha spectrometry. Results of the follow-up alpha spectrometry analysis are reported below and were used in preparing the dose estimate.

Sample	Analysis*	Sample Date	Result (pCi/day)	Error (pCi/day)	Included
66-2007	G	3/14/66	0.180	0.100	✓
66-3402	AS	6/5/66	0.049	0.037	✓
66-3402	G	6/5/66	NR	NR	

* G means gross alpha counting; AS means alpha spectrometry; NR means no result reported.

Intakes and estimates of dose were prepared using CINDY Version 1.4 and LUDEP Version 2.05.

Intake was estimated using the Jones excretion model in CINDY and LUDEP.

Inhalation intake was estimated using the ICRP 66 respiratory tract model in LUDEP.

CINDY estimated dose derived using the ICRP 30, Part 4, General Systemic Model and weighting factors; and LUDEP used the recommendations of ICRP 60.

Modeling:

CINDY and LUDEP were used to estimate the intake and dose with the following results:

Model	Intake (pCi)	CEDE (rem/Sv)
CINDY	140,000	43/0.43
LUDEP	265,000	19/0.19

Doses to individual organs and estimation of the effective dose equivalent using CINDY reported the following results:

Organ	Dose Equivalent (rem/Sv)	Weighting Factors	Weighted Organ Dose Equivalent (rem/Sv)
Testes	6.2E+00/6.2E-02	2.5E-01	1.6E+00/1.6E-02
Breast	2.1E-04/2.1E-06	1.5E-01	3.1E-05/3.1E-07
Red Marrow	3.4E+01/3.4E-01	1.2E-01	4.0E+00/4.0E-02
Lung	1.6E+02/1.6E+00	1.2E-01	1.9E+01/1.9E-01
Thyroid	2.0E-04/2.0E-06	3.0E-02	5.9E-06/5.9E-08
Bone Surface	4.4E+02/4.4E+00	3.0E-02	1.3E+01/1.3E-01
Liver	7.8E+01/7.8E-01	6.0E-02	4.7E+00/4.7E-02
Other	7.4E+00/7.4E-02	6.0E-02	4.4E-01/4.4E-03
Lower Large Intestine	1.6E-02/1.6E-04	6.0E-02	9.5E-04/9.5E-06
Upper Large Intestine	5.3E-03/5.3E-05	6.0E-02	3.2E-04/3.2E-06
Small Intestine	1.1E-03/1.1E-05	6.0E-02	6.5E-05/6.5E-07
Effective Dose Equivalent			4.3E+01/4.3E-01

One urine sample was analyzed by gross alpha counting only, and the other was analyzed by both gross alpha counting and alpha spectrometry. For the sample analyzed with both methods, the gross alpha analysis was not included in the modeling since no result was reported and an alpha spectrometry result was available for the same sample. The results were fit using CINDY and the Jones excretion model, to estimate an intake (140,000 pCi), organ doses, and a CEDE (43 rem/0.43 Sv; ICRP-30) as shown above. LUDEP was also used to estimate an intake of 265,000 pCi and a CEDE (ICRP-60) of 19 rem (0.19 Sv).

Conclusion:

Based on the results of intake estimates and dose calculations, this individual received an estimated intake of about 140,000 pCi of ^{239}Pu resulting in a 50-year committed effective dose equivalent of 43 rem (0.43 Sv). That dose is more than the cumulative dose (7 rem) from a lifetime (70 years) of exposure at the

current level (0.100 rem) for members of the public. It is less than the working lifetime limit of 50 rem recommended by the National Council on Radiation Protection and Measurements (NCRP). Serious health effects are not associated with that dose level. However, follow-up urine sampling now could be considered to provide additional assessment of the exposure.

Prepared By:

Name: _____

Signature: _____ Date: _____

Peer Reviewed By:

Name: _____

Signature: _____ Date: _____

(b) (6) [redacted]

(b) (6) [redacted]

NAVY RESAMPLE JUL 14 1966 3402

Civilian: GS-12 INTERNAL DOSE DATA NAVY

NAME (LAST, FIRST, M.I.) (1-20)	SOC. SEC. NO. (21-29)	TYPE SAMPLE (30)	TYPE ANAL. (31-32)
(b) (6) [redacted]	(b) (6) [redacted]	Urine	

SAMPLE NO. (33-38)	SAMPLE DATE (39-44)	EXPOSURE
66-3402	FROM 5 June 66 TO	DATE 27 Jan 66 TYPE

BASE (57-60)	OCCUPATION (61-62)	REQUESTED BY
US Naval Oceanographic Office		

DATE RECEIVED	SAMPLE VOLUME	VOLUME ANALYZED	DATE ANALYZED
14 June 1966	1760 ml	1260 ml	

TECHNICIAN (SIGNATURE AND DATE) Checked off Martin List

URINE	23C	23S		RADON		FECES/BLOOD	
Counter Number				Chamber Number	6	Counter Number	
Counter Bkg. (cpm)	3	1		Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)	31.8	31.8		Counter Eff. (%)		Counter Eff.	
Date/Time – Start	25 Sep 66		± 129	Millivolt – Start		Date/Time – Start	
– Stop				Millivolt – Stop		– Stop	
Total Counts	82	2		Total Millivolts		Total Counts	
Counting Time	100	100		Total Beta Time	55	Counting Time	
Gross cpm				Gross [illegible]	83	Gross cpm	
Bkg. Cpm				Bkg. [illegible]	73 (908)	Bkg. cpm	
Net cpm				Net mv/sec		Net cpm	
~~dpm~~ % REC	76.4			curies/mv		dpm	
dpm/24 hr. (69-74)				litter (69-74)		dps/cc	
K 40 Correction				% REC	84.0	Neutron Dose (rads) (63-68)	
~~Net Beta~~ PC/SPL	0.0486 ±	0.0372		D(q) (63-68)		uc/mg (69-74)	
D(q) (63-68)						D(q) (63-68)	

NAME:	SOCIAL SECURITY NUMBER:	SAMPLE NUMBER:

AIR FORCE BASE

RESULTS OF ANALYSIS

PC/SPL = 0.0486 ± 0.0372 %REC = 76.4

TOTAL VOLUME = 1760 BODY BURDEN = 0.00 [illegible]

VOL. ANALYZED = 1260

Previous Results
0.72 pc/l
0.16 BB

☐ Repeat the sample for the following reason:

( ) Significant activity in recently analyzed sample(s) Code Navy

( ) Data required to establish dose

( ) Improper flask used

( ) Other _____

( ) Suggested sampling schedule _____

SIGNATURE: DATE:

ONE TIME FORM. OBSOLETE AFTER 30 JUN 66. (MCGSCPF, RAG, 4 APR 66) AFLC–WPAFB–APR 66 2500

[redacted] 1968

(b) (6)

(b) (6)

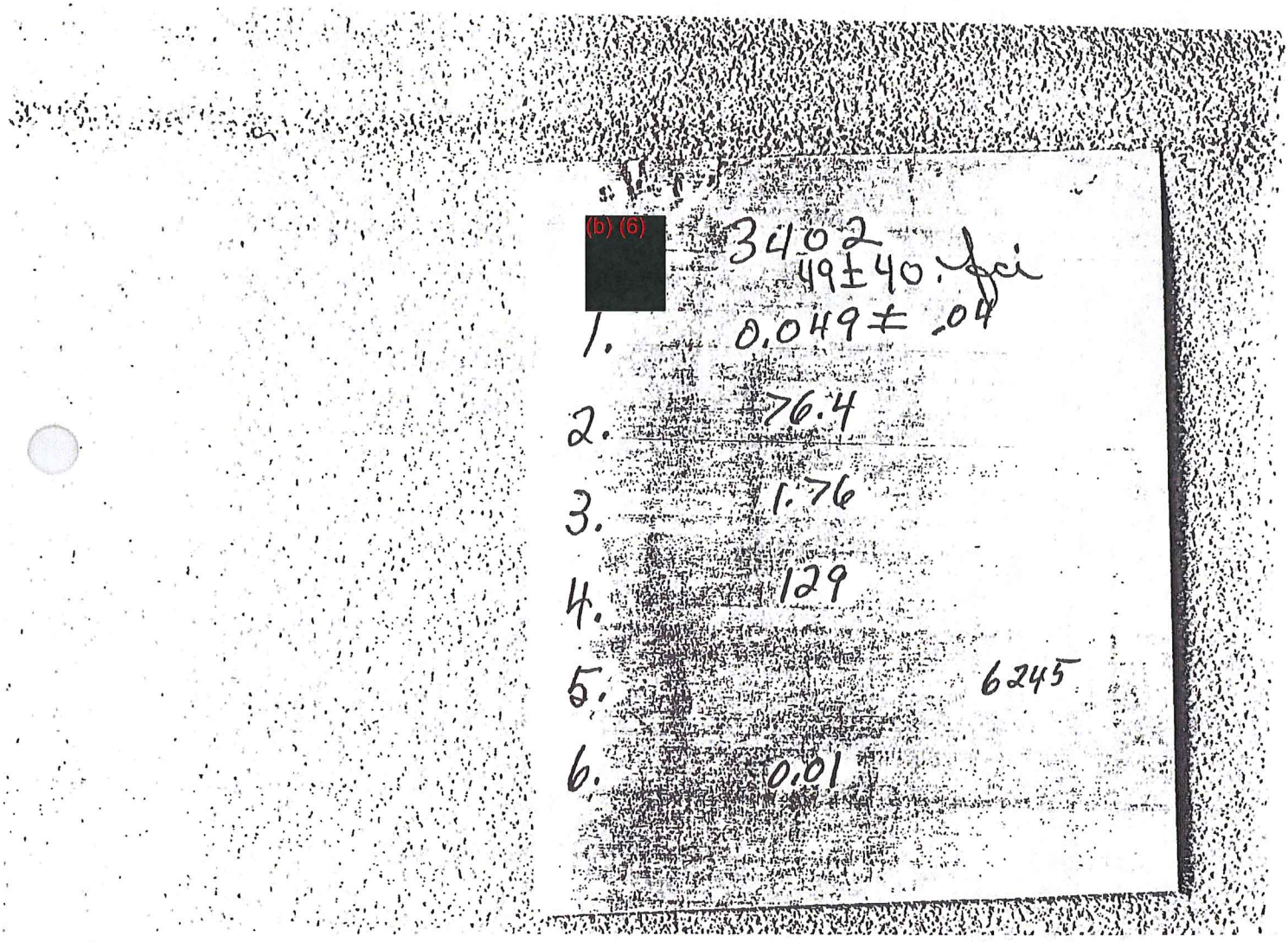
56

INTERNAL DOSE DATA

NAME (LAST, FIRST, M.I.) (1-20) (b) (6)	SOC. SEC. NO. (21-29)	TYPE SAMPLE (30) Urine	TYPE ANAL. (31-32)
SAMPLE NO. (33-38) 66-2007	SAMPLE DATE (39-44) FROM 0700 13 Mar TO 0700 14 Mar 66	EXPOSURE DATE	TYPE
BASE (57-60) US. Naval Oceanographic Office	OCCUPATION (61-62)	REQUESTED BY	
DATE RECEIVED 30 March 1966	SAMPLE VOLUME 250 ml	VOLUME ANALYZED 250 ml	DATE ANALYZED
TECHNICIAN (SIGNATURE AND DATE) SS-t (b) (6)	USAF	11 APR 66	

URINE			RADON	FECES/BLOOD
Counter Number	C		Chamber Number	Counter Number
Counter Bkg. (cpm)	0.07	850 min	Cham. Bkg. (mv/sec)	Counter Bkg.
Counter Eff. (%)	5%		Counter Eff. (%)	Counter Eff.
Date/Time – Start 8 APR 1966			Millivolt – Start	Date/Time – Start
– Stop			Millivolt – Stop	– Stop
Total Counts	25		Total Millivots	Total Counts
Counting Time	100		Total Drift Time	Counting Time
Gross cpm	0.25		Gross mv/sec	Gross cpm
Bkg. Cpm	0.07		Bkg. Mv/sec	Bkg. cpm
Net cpm	0.18		Net mv/sec	net cpm
dpm/24 hr. (69-74)	0.72 ± 0.358		curies/mv	dpm
K 40 Correction	0.72 ± 0.40		litter (69-74)	dps/cc
Net Beta Gi/Sol	0.180 ± 0.010			Neutron Dose (rads) (63-68)
D(q) (63-68)	(ASSUME T=60 D X USED PC/L)		D(q) (63-68)	uc/mg (69-74)
				D(q) (63-68)

$D = 2.0 \times 10^{-3}$ mc


(b) (6)
3402
49±40 fci
1. 0.049 ± .04
2. 76.4
3. 1.76
4. 129
5. 6245
6. 0.01

(b) (6)

(b) (6) (b) (6)

Internal Dosimetry Evaluation Form

NAME: (b) (6) SSN: (b) (6)

MODE OF INTAKE:
☒ Inhalation ☐ Injection
☐ Ingestion ☐ Absorption
☐ Unknown ☐ Not applicable

INTAKE DATE OR PERIOD:
2/4/66 through 2/14/66, onsite
2/9/66

SUMMARY OF EXPOSURE CONDITIONS:
Radionuclides/Respiratory Class/Particle Size: ^{239}Pu/100% Class Y/1 μm AMAD
Date or Period of Evaluated Data: 2 samples, 2/17/66 and 3/5/66
Duration of Exposure: Unknown
Location of Exposure: Camp Wilson, near Palomares, Spain

EVALUATION DATA:

Air Sampling	☐ Attached	☐ In Process	☒ Unavailable
Health Physics Survey Data	☐ Attached	☐ In Process	☒ Unavailable
Bioassay – Urinalysis	☒ Attached	☐ In Process	☐ Unavailable
Fecal	☐ Attached	☐ In Process	☒ Unavailable
Nasal Smears	☒ Attached	☐ In Process	☐ Unavailable
In Vivo	☐ Attached	☐ In Process	☒ Unavailable

Medical Treatment:

Skin Decontamination:	☐ Yes	☒ No	Date: _____
Decorporation:	☐ Yes	☒ No	Agent: _____ Date: _____
Catharsis:	☐ Yes	☒ No	Agent: _____ Date: _____
Surgical excision:	☐ Yes	☒ No	Date: _____

EVALUATION METHODOLOGY:
Assumptions: Acute inhalation intake of ^{239}Pu, 100% Class Y, 1 μm AMAD particle size on 2/9/66

Code/Model used for: Intake Estimate: CINDY, Ver. 1.4/JONES
Dose Estimate: CINDY, Ver. 1.4/ICRP 30, Part 4, General Systemic Model

RESULTS SUMMARY
Estimated Intake Activity (pCi): 120000
50 YR CEDE (rem) : 55 (0.55 Sv)

Organ Dose Equivalent Summary	**50 YR CDE (rem/Sv)**
Bone Surface	370/3.7
Lung	140/1.4
Liver	67/0.67
Red Marrow	29/0.29
Other	6.3/0.063
Testes	5.4/0.054

DOSE ASSESSOR: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

PEER REVIEWER: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

RECOMMENDATIONS:
Additional Bioassay Required ☐ Urinalysis ☐ Fecal ☐ In Vivo
Suggested Sampling Frequency: _____
Work Restrictions: N/A

Internal Dosimetry Case Narrative

Identification:

Name: (b) (6)
SSN:

Incidents:

Individual participated on site in response duties resulting from an accident involving three nuclear weapons at Palomares, Spain on January 17, 1966. Individual may have been exposed to weapons materials (primarily plutonium-239) by inhalation and ingestion from contaminated weapon and aircraft debris, lands, and vegetation. Primary activities included search, radiological monitoring, recovery of accident debris, and processing for disposal.

Previous Intake/Dose Assessments:

This assessment applies to Palomares accident activities only. No previous intakes or doses were considered.

Other Information:

None.

Radionuclide(s): ^{239}Pu.

Assumptions/Basis/Data Sources:

Acute inhalation intake of Pu-239; 100% Class Y; 1 μm AMAD particle size on 2/9/66. The date is the midpoint of the period on station from 2/4/66 to 2/14/66.

Inhalation was assumed as the major route of entry because the primary contaminant was created by explosion and fire and deposited in sandy soil and on buildings and plants. Conditions were generally windy and significant activity was underway.

Dose was determined entirely from modeling intake based on the following urinalysis results for this individual. This individual's sample was identified for a follow-up analysis using alpha spectrometry after the initial gross alpha result was reviewed. That is, the initial urine sample for this individual was reprocessed radiochemically for alpha spectrometry. Results of the follow-up alpha spectrometry analysis are reported below and were used in preparing the dose estimate.

Sample	Analysis*	Sample Date	Result (pCi/day)	Error (pCi/day)	Included
66-1122	G	2/17/66	0.190	0.160	✓
66-1554	AS	3/5/66	0.080	0.016	✓
66-1554	G	3/5/66	1.50	0.330	

* G means gross alpha counting; AS means alpha spectrometry.

A nasal swipe was also reported (sample #66-1656) from (b) (6) on 3/1/66; however, no result was available.

Intakes and estimates of dose were prepared using CINDY Version 1.4 and LUDEP Version 2.05.

Intake was estimated using the Jones excretion model in CINDY and LUDEP.

Inhalation intake was estimated using the ICRP 66 respiratory tract model in LUDEP.

CINDY estimated dose derived using the ICRP 30, Part 4, General Systemic Model and weighting factors; and LUDEP used the recommendations of ICRP 60.

Modeling:

CINDY and LUDEP were used to estimate the intake and dose with the following results:

Model	Intake (pCi)	CEDE (rem/Sv)
CINDY	120,000	37/0.37
LUDEP	348,000	24/0.24

Doses to individual organs and estimation of the effective dose equivalent using CINDY reported the following results:

Organ	Dose Equivalent (rem/Sv)	Weighting Factors	Weighted Organ Dose Equivalent (rem/Sv)
Testes	5.4E+00/5.4E-02	2.5E-01	1.3E+00/1.3E-02
Breast	1.8E-04/1.8E-06	1.5E-01	2.7E-05/2.7E-07
Red Marrow	2.9E+01/2.9E-01	1.2E-01	3.5E+00/3.5E-02
Lung	1.4E+02/1.4E+00	1.2E-01	1.6E+01/1.6E-01
Thyroid	1.7E-04/1.7E-06	3.0E-02	5.0E-06/5.0E-08
Bone Surface	3.7E+02/3.7E+00	3.0E-02	1.1E+01/1.1E-01
Liver	6.7E+01/6.7E-01	6.0E-02	4.0E+00/4.0E-02
Other	6.3E+00/6.3E-02	6.0E-02	3.8E-01/3.8E-03
Lower Large Intestine	1.4E-02/1.4E-04	6.0E-02	8.2E-04/8.2E-06
Upper Large Intestine	4.6E-03/4.6E-05	6.0E-02	2.7E-04/2.7E-06
Small Intestine	9.4E-04/9.4E-06	6.0E-02	5.6E-05/5.6E-07
Effective Dose Equivalent			3.7E+01/3.7E-01

One urine sample was analyzed by gross alpha counting, and the other was analyzed by both gross alpha counting and alpha spectrometry. The gross alpha analysis for the second sample was not included in the modeling since an alpha spectrometry result was available for the same sample. The results were fit using CINDY and the Jones excretion model, to estimate an intake (120,000 pCi), organ doses, and a CEDE (37 rem/0.37 Sv; ICRP-30) as shown above. LUDEP was also used to estimate an intake of 348,000 pCi and a CEDE (ICRP-60) of 24 rem (0.24 Sv).

Conclusion:

Based on the results of intake estimates and dose calculations, this individual received an estimated intake of about 120,000 pCi of ^{239}Pu resulting in a 50-year committed effective dose equivalent of 37 rem (0.37 Sv). That dose is more than the cumulative dose (7 rem) from a lifetime (70 years) of exposure at the current level (0.100 rem) for members of the public. It is less than the working lifetime limit of 50 rem recommended by the National Council on Radiation Protection and Measurements (NCRP). Serious health effects are not associated with that dose level. However, follow-up urine sampling now could be considered to provide additional assessment of the exposure.

Prepared By:

Name: _____

Signature: _____ Date: _____

Peer Reviewed By:

Name: _____

Signature: _____ Date: _____

AFSN: [redacted]

INTERNAL DOSE DATA

NAME (LAST, FIRST, M.I.) (1-20)	SOC. SEC. NO. (21-29)	TYPE SAMPLE (30)	TYPE ANAL. (31-32)
[redacted] SSGT	[redacted]	Urine	GROSS ALPHA

SAMPLE NO. (33-38)	SAMPLE DATE (39-44)	EXPOSURE
66-1122	FROM ~~[illegible]~~ 17 FEB 66 TO	DATE 4 FEB 66 TYPE

BASE (57-60)	OCCUPATION (61-62)	REQUESTED BY
Wheeles	27470	

DATE RECEIVED	SAMPLE VOLUME	VOLUME ANALYZED	DATE ANALYZED
1 March 1966	228	228	MAR 17 1966

TECHNICIAN (SIGNATURE AND DATE) [redacted] 16 MAR 1966

URINE				RADON		FECES/BLOOD	
Counter Number	D			Chamber Number		Counter Number	
Counter Bkg. (cpm)	6			Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)	51			Counter Eff. (%)		Counter Eff.	
Date/Time – Start	16 MAR 1966			Millivolt – Start		Date/Time – Start	
– Stop				Millivolt – Stop		Date/Time – Stop	
Total Counts	18			Total Millivolts		Total Counts	
Counting Time	55			Total Drift Time		Counting Time	
Gross cpm				Gross mv/sec		Gross cpm	
Bkg. Cpm				Bkg. Mv/sec		Bkg. cpm	
Net cpm	-			Net mv/sec		net cpm	
~~dpm~~ pc/L	0.84± 0.69			curies/mv		dpm	
dpm/24 hr. (69-74)				litter (69-74)		dps/cc	
K 40 Correction						Neutron Dose (rads) (63-68)	
~~Net Rate~~ pc/lsd	0.19± 0.16			D(q) (63-68)		uc/mg (69-74)	
D (q) (63-68)						D(q) (63-68)	

t = 13 D D_n = 3.09 x 10⁻³ μc 07

(b) (6)

MAR 16 1966

INTERNAL DOSE DATA

RESA (b) (6) NAME (LAST, FIRST, MI)	SOC. SEC. NO. (21-29) (b) (6)	TYPE SAMPLE (30) URINE	TYPE ANAL. (31-32) P 239
SAMPLE NO. (33-38) 66-1554	SAMPLE DATE (39-44) FROM 0800 4 MAR 66 TO 0800 5 MAR 66	EXPOSURE DATE 4 FEB 66 TYPE 14 FEB 66	
BASE (57-60) WHEELUS	OCCUPATION (61-62)	REQUESTED BY	
DATE RECEIVED 16 MAR 66	SAMPLE VOLUME 1100	VOLUME ANALYZED 1100 cc	DATE ANALYZED

TECHNICIAN (SIGNATURE AND DATE)

GROSS ALPHA

URINE	GROSS ALPHA		RADON		FECES/BLOOD	
Counter Number	D		Chamber Number		Counter Number	
Counter Bkg. (cpm)	0.02 (990)		Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)	51	4219	Counter Eff. (%)		Counter Eff.	
Date/Time – Start	12 may		Millivolt – Start		Date/Time – Start	
– Stop		Reported value	Millivolt – Stop		– Stop	
Total Counts	86	corrected for spike	Total Millivots		Total Counts	
Counting Time	55	of 0.965 pc per	Total Drift Time		Counting Time	
Gross cpm	1.56	sample	Gross mv/sec		Gross cpm	
Bkg. Cpm	0.02		Bkg. Mv/sec		Bkg. cpm	1.57 PC
Net cpm	1.54		Net mv/sec		net cpm	NSBB
~~dpm~~ pci/l	1.37 ± 0.30		curies/mv		dpm	
dpm/24 hr. (69-74)			litter (69-74)		dps/cc	
K 40 Correction					Neutron Dose (rads) (63-68)	
~~Net Beta~~ pci/gal	1.50 ± 0.33		D(q) (63-68)		uc/mg (69-74)	
D(q) (63-68)					D(q) (63-68)	

(b) (6)

[redacted]

RADIOLOGICAL SAMPLE DATA

NAME OR REQUESTOR'S ID (1–20)	GRADE	AFSN	SOCIAL SECURITY NUMBER	RUL SAMPLE NUMBER 66-1554
TYPE SAMPLE (23–32)	OCCUPATION (34–35)	ANALYSIS DESIRED	REQUESTED BY	AIR FORCE BASE (66–71)
DATE RECEIVED (37–42)	DATE ANALYZED (51–56)	DATE COUNTED 27 July 66	DATE COLLECTED	EXPOSURE DATE
SAMPLE WEIGHT/VOLUME	WEIGHT/VOLUME ANALYZED		TECHNICIAN	
OTHER DATA .939				

ENVIRONMENTAL SAMPLES				
COUNTER & EFFICIENCY				
TOTAL COUNTS & MINUTES				
GROSS CPM				
BKG CPM & MINUTES				
NET CPM				
YIELD				
BIOLOGICAL SAMPLES	276	235	RADON	
COUNTER & EFFICIENCY Spec	27.3	27.3	2.25 dpm	3.02 [illegible]
TOTAL COUNTS & MINUTES 100	60		± 0.15	
GROSS CPM	0.6000	0.0400		
BKG CPM & MINUTES 800	12 0.0150	9 0.0100		
NET CPM	0.5850	0.0300		
YIELD			0.2080 ± 0.016	
% Rec	62.30			

SUMMARY OF RESULTS:

AFLC FORM MAY 66 1165 FC 8400 AFLC—WPAFB—MAY 66 4500

[redacted]

(b) (6)

Internal Dosimetry Evaluation Form

NAME: (b) (6)	SSN: NA

MODE OF INTAKE:
☒ Inhalation ☐ Injection
☐ Ingestion ☐ Absorption
☐ Unknown ☐ Not applicable

INTAKE DATE OR PERIOD:
2/5/66 through 2/26/66, onsite
2/15/66

SUMMARY OF EXPOSURE CONDITIONS:
Radionuclides/Respiratory Class/Particle Size: ^{239}Pu/100% Class Y/1 μm AMAD
Date or Period of Evaluated Data: 1 sample, 2/26/66
Duration of Exposure: Unknown
Location of Exposure: Camp Wilson, near Palomares, Spain

EVALUATION DATA:

Air Sampling	☐ Attached	☐ In Process	☒ Unavailable
Health Physics Survey Data	☐ Attached	☐ In Process	☒ Unavailable
Bioassay – Urinalysis	☒ Attached	☐ In Process	☐ Unavailable
Fecal	☐ Attached	☐ In Process	☒ Unavailable
Nasal Smears	☐ Attached	☐ In Process	☒ Unavailable
In Vivo	☐ Attached	☐ In Process	☒ Unavailable

Medical Treatment:

Skin Decontamination:	☐ Yes	☒ No	Date: _____
Decorporation:	☐ Yes	☒ No	Agent: _____ Date: _____
Catharsis:	☐ Yes	☒ No	Agent: _____ Date: _____
Surgical excision:	☐ Yes	☒ No	Date: _____

EVALUATION METHODOLOGY:
Assumptions: Acute inhalation intake of ^{239}Pu, 100% Class Y, 1 μm AMAD particle size on 2/15/66

Code/Model used for: Intake Estimate: CINDY, Ver. 1.4/JONES
Dose Estimate: CINDY, Ver. 1.4/ICRP 30, Part 4, General Systemic Model

RESULTS SUMMARY
Estimated Intake Activity (pCi): 185000
50 YR CEDE (rem) : 55 (0.55 Sv)

Organ Dose Equivalent Summary	**50 YR CDE (rem/Sv)**
Bone Surface	560/5.6
Lung	210/2.1
Liver	100/1
Red Marrow	43/0.43
Other	9.5/0.095
Testes	8/0.08

DOSE ASSESSOR: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

PEER REVIEWER: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

RECOMMENDATIONS:
Additional Bioassay Required ☐ Urinalysis ☐ Fecal ☐ In Vivo
Suggested Sampling Frequency: _____
Work Restrictions: N/A

Internal Dosimetry Case Narrative

Identification:

Name: (b) (6)
SSN: NA

Incidents:

Individual participated on site in response duties resulting from an accident involving three nuclear weapons at Palomares, Spain on January 17, 1966. Individual may have been exposed to weapons materials (primarily plutonium-239) by inhalation and ingestion from contaminated weapon and aircraft debris, lands, and vegetation. Primary activities included search, radiological monitoring, recovery of accident debris, and processing for disposal.

Previous Intake/Dose Assessments:

This assessment applies to Palomares accident activities only. No previous intakes or doses were considered.

Other Information:

None.

Radionuclide(s): ^{239}Pu.

Assumptions/Basis/Data Sources:

Acute inhalation intake of Pu-239; 100% Class Y; 1 μm AMAD particle size on 2/15/66. The date is the midpoint of the period on station from 2/5/66 to 2/26/66.

Inhalation was assumed as the major route of entry because the primary contaminant was created by explosion and fire and deposited in sandy soil and on buildings and plants. Conditions were generally windy and significant activity was underway.

Dose was determined entirely from modeling intake based on the following urinalysis results for this individual. This individual's sample was identified for a follow-up analysis using alpha spectrometry after the initial gross alpha result was reviewed. That is, the initial urine sample for this individual was reprocessed radiochemically for alpha spectrometry. Results of the follow-up alpha spectrometry analysis are reported below and were used in preparing the dose estimate.

Sample	Analysis*	Sample Date	Result (pCi/day)	Error (pCi/day)	Included
66-1438	AS	2/26/66	0.208	0.086	✓
66-1438	G	2/26/66	1.51	0.310	

* G means gross alpha counting; AS means alpha spectrometry.

Intakes and estimates of dose were prepared using CINDY Version 1.4 and LUDEP Version 2.05.

Intake was estimated using the Jones excretion model in CINDY and LUDEP.

Inhalation intake was estimated using the ICRP 66 respiratory tract model in LUDEP.

CINDY estimated dose derived using the ICRP 30, Part 4, General Systemic Model and weighting factors; and LUDEP used the recommendations of ICRP 60.

Modeling:

CINDY and LUDEP were used to estimate the intake and dose with the following results:

Model	Intake (pCi)	CEDE (rem/Sv)
CINDY	185,000	55/0.55
LUDEP	888,000	62/0.62

Doses to individual organs and estimation of the effective dose equivalent using CINDY reported the following results:

Organ	Dose Equivalent (rem/Sv)	Weighting Factors	Weighted Organ Dose Equivalent (rem/Sv)
Testes	8.0E+00/8.0E-02	2.5E-01	2.0E+00/2.0E-02
Breast	2.7E-04/2.7E-06	1.5E-01	4.0E-05/4.0E-07
Red Marrow	4.3E+01/4.3E-01	1.2E-01	5.2E+00/5.2E-02
Lung	2.1E+02/2.1E+00	1.2E-01	2.5E+01/2.5E-01
Thyroid	2.5E-04/2.5E-06	3.0E-02	7.5E-06/7.5E-08
Bone Surface	5.6E+02/5.6E+00	3.0E-02	1.7E+01/1.7E-01
Liver	1.0E+02/1.0E+00	6.0E-02	6.0E+00/6.0E-02
Other	9.5E+00/9.5E-02	6.0E-02	5.7E-01/5.7E-03
Lower Large Intestine	2.0E-02/2.0E-04	6.0E-02	1.2E-03/1.2E-05
Upper Large Intestine	6.9E-03/6.9E-05	6.0E-02	4.1E-04/4.1E-06
Small Intestine	1.4E-03/1.4E-05	6.0E-02	8.4E-05/8.4E-07
Effective Dose Equivalent			5.5E+01/5.5E-01

One urine sample was analyzed by gross alpha counting and alpha spectrometry. The gross alpha analysis was not included in the modeling since an alpha spectrometry result was available for the same sample. The result was fit using CINDY and the Jones excretion model, to estimate an intake (185,000 pCi), organ doses, and a CEDE (55 rem/0.55 Sv; ICRP-30) as shown above. LUDEP was also used to estimate an intake of 888,000 pCi and a CEDE (ICRP-60) of 62 rem (0.62 Sv).

Conclusion:

Based on the results of intake estimates and dose calculations, this individual received an estimated intake of about 185,000 pCi of ^{239}Pu resulting in a 50-year committed effective dose equivalent of 55 rem (0.55 Sv). That dose is more than the cumulative dose (7 rem) from a lifetime (70 years) of exposure at the current level (0.100 rem) for members of the public. It is 10% more than the working lifetime limit of 50

rem recommended by the National Council on Radiation Protection and Measurements (NCRP). Serious health effects are not normally associated with these dose levels. However, follow-up urine sampling should be considered to provide additional assessment of the exposure.

Prepared By:

Name: _____

Signature: _____ Date: _____

Peer Reviewed By:

Name: _____

Signature: _____ Date: _____

(b) (6)

(b) (6) (b) (6)

Internal Dosimetry Evaluation Form

NAME: (b) (6) SSN: (b) (6)

MODE OF INTAKE:
☒ Inhalation ☐ Injection
☐ Ingestion ☐ Absorption
☐ Unknown ☐ Not applicable

INTAKE DATE OR PERIOD:
2/6/66 through 2/28/66, onsite
2/17/66

SUMMARY OF EXPOSURE CONDITIONS:
Radionuclides/Respiratory Class/Particle Size: ^{239}Pu/100% Class Y/1 μm AMAD
Date or Period of Evaluated Data: 2 samples, 3/8/66 and 6/1/66
Duration of Exposure: Unknown
Location of Exposure: Camp Wilson, near Palomares, Spain

EVALUATION DATA:

Air Sampling	☐ Attached	☐ In Process	☒ Unavailable
Health Physics Survey Data	☐ Attached	☐ In Process	☒ Unavailable
Bioassay – Urinalysis	☒ Attached	☐ In Process	☐ Unavailable
Fecal	☐ Attached	☐ In Process	☒ Unavailable
Nasal Smears	☐ Attached	☐ In Process	☒ Unavailable
In Vivo	☐ Attached	☐ In Process	☒ Unavailable

Medical Treatment:

Skin Decontamination:	☐ Yes	☒ No	Date: _____
Decorporation:	☐ Yes	☒ No	Agent: _____ Date: _____
Catharsis:	☐ Yes	☒ No	Agent: _____ Date: _____
Surgical excision:	☐ Yes	☒ No	Date: _____

EVALUATION METHODOLOGY:
Assumptions: Acute inhalation intake of ^{239}Pu, 100% Class Y, 1 μm AMAD particle size on 2/17/66

Code/Model used for: Intake Estimate: CINDY, Ver. 1.4/JONES
Dose Estimate: CINDY, Ver. 1.4/ICRP 30, Part 4, General Systemic Model

RESULTS SUMMARY
Estimated Intake Activity (pCi): 4,400
50 YR CEDE (rem) : 1.4 (0.014 Sv)

Organ Dose Equivalent Summary	**50 YR CDE (rem/Sv)**
Bone Surface	14/0.14
Lung	5/0.05
Liver	2.5/0.025
Red Marrow	1.1/0.011
Other	0.2/0.002
Testes	0.2/0.002

DOSE ASSESSOR: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

PEER REVIEWER: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

RECOMMENDATIONS:
Additional Bioassay Required ☐ Urinalysis ☐ Fecal ☐ In Vivo
Suggested Sampling Frequency: _____
Work Restrictions: N/A

Internal Dosimetry Case Narrative

Identification:

Name: (b) (6)
SSN:

Incidents:

Individual participated on site in response duties resulting from an accident involving three nuclear weapons at Palomares, Spain on January 17, 1966. Individual may have been exposed to weapons materials (primarily plutonium-239) by inhalation and ingestion from contaminated weapon and aircraft debris, lands, and vegetation. Primary activities included search, radiological monitoring, recovery of accident debris, and processing for disposal.

Previous Intake/Dose Assessments:

This assessment applies to Palomares accident activities only. No previous intakes or doses were considered.

Other Information:

None.

Radionuclide(s): ^{239}Pu.

Assumptions/Basis/Data Sources:

Acute inhalation intake of Pu-239; 100% Class Y; 1 μm AMAD particle size on 2/17/66. The date is the midpoint of the period on station from 2/6/66 to 2/28/66.

Inhalation was assumed as the major route of entry because the primary contaminant was created by explosion and fire and deposited in sandy soil and on buildings and plants. Conditions were generally windy and significant activity was underway.

Dose was determined entirely from modeling intake based on the following urinalysis results for this individual. This individual's sample was identified for a follow-up analysis using alpha spectrometry after the initial gross alpha result was reviewed. That is, the initial urine sample for this individual was reprocessed radiochemically for alpha spectrometry. Results of the follow-up alpha spectrometry analysis are reported below and were used in preparing the dose estimate.

Sample	Analysis*	Sample Date	Result (pCi/day)	Error (pCi/day)	Included
66-2446	G	3/8/66	1.49	0.790	
66-3273	AS	6/1/66	ND	ND	✓
66-3273	G	6/1/66	NR	NR	

* G means gross alpha counting; AS means alpha spectrometry.

Intakes and estimates of dose were prepared using CINDY Version 1.4 and LUDEP Version 2.05.

Intake was estimated using the Jones excretion model in CINDY and LUDEP.

Inhalation intake was estimated using the ICRP 66 respiratory tract model in LUDEP.

CINDY estimated dose derived using the ICRP 30, Part 4, General Systemic Model and weighting factors; and LUDEP used the recommendations of ICRP 60.

Modeling:

CINDY and LUDEP were used to estimate the intake and dose with the following results:

Model	Intake (pCi)	CEDE (rem/Sv)
CINDY	4,400	1.4/0.014
LUDEP	12,400	0.9/0.009

Doses to individual organs and estimation of the effective dose equivalent using CINDY reported the following results:

Organ	Dose Equivalent (rem/Sv)	Weighting Factors	Weighted Organ Dose Equivalent (rem/Sv)
Testes	2.0E-01/2.0E-03	2.5E-01	4.9E-02/4.9E-04
Breast	6.5E-06/6.5E-08	1.5E-01	9.8E-07/9.8E-09
Red Marrow	1.1E+00/1.1E-02	1.2E-01	1.3E-01/1.3E-03
Lung	5.0E+00/5.0E-02	1.2E-01	6.0E-01/6.0E-03
Thyroid	6.1E-06/6.1E-08	3.0E-02	1.8E-07/1.8E-09
Bone Surface	1.4E+01/1.4E-01	3.0E-02	4.1E-01/4.1E-03
Liver	2.5E+00/2.5E-02	6.0E-02	1.5E-01/1.5E-03
Other	2.3E-01/2.3E-03	6.0E-02	1.4E-02/1.4E-04
Lower Large Intestine	5.0E-04/5.0E-06	6.0E-02	3.0E-05/3.0E-07
Upper Large Intestine	1.7E-04/1.7E-06	6.0E-02	1.0E-035/1.0E-037
Small Intestine	3.4E-05/3.4E-07	6.0E-02	2.1E-06/2.1E-08
Effective Dose Equivalent			1.4E+00/1.4E-02

One urine sample was analyzed by gross alpha counting only, and the other was analyzed by both gross alpha counting and alpha spectrometry. For the sample analyzed with both methods, the gross alpha analysis was not included in the modeling since no result was reported and an alpha spectrometry result was available for the same sample. The alpha spectrometry sample result was reported as No Detectable Activity. A value of 0.003 pCi was used to represent this outcome. The gross alpha sample was also excluded because it was suspected of contamination during sample collection on the site and because it did not fit the expected pattern of urinary excretion. The result was fit using CINDY and the Jones excretion model, to estimate an intake (4,400 pCi), organ doses, and a CEDE (1.4 rem/0.14 Sv; ICRP-30) as shown above. LUDEP was also used to estimate an intake of 12,400 pCi and a CEDE (ICRP-60) of 0.9 rem (0.009 Sv).

In a separate run that used the gross alpha result, CINDY produced estimated intake and CEDE of 890,000 pCi and 270 rem (2.7 Sv) respectively. However, these estimates were not considered realistic for the reasons stated above.

Conclusion:

Based on the results of intake estimates and dose calculations, this individual received an estimated intake of about 4,400 pCi of ^{239}Pu resulting in a 50-year committed effective dose equivalent of 1.4 rem (0.014 Sv). That dose is much less than the cumulative dose (7 rem) from a lifetime (70 years) of exposure at the current level (0.100 rem) for members of the public. Serious health effects are not normally associated with these dose levels.

Prepared By:

Name: _____

Signature: _____ Date: _____

Peer Reviewed By:

Name: _____

Signature: _____ Date: _____

(b) (6) [redacted] (b) (6) [redacted]

RESAMPLE JUN 6 1966

INTERNAL DOSE DATA

ARMY: (b) (6) [redacted]

(b) (6) [redacted] Pvt. SOC. SEC. NO. (21-29) (b) (6) [redacted] TYPE SAMPLE (30) Urine TYPE ANAL. (31-32)

SAMPLE NO. (33-38) 66-3273	SAMPLE DATE (39-44) FROM 1 June 66 TO	EXPOSURE DATE Feb 66 TYPE	
BASE (57-60) Giessen	OCCUPATION (61-62)	REQUESTED BY	
DATE RECEIVED 6 June 1966	SAMPLE VOLUME 760 ml	VOLUME ANALYZED 420 ml	DATE ANALYZED
TECHNICIAN (SIGNATURE AND DATE)			

URINE				RADON		FECES/BLOOD	
Counter Number				Chamber Number		Counter Number	
Counter Bkg. (cpm)				Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)				Counter Eff. (%)		Counter Eff.	
Date/Time — Start				Millivolt — Start		Date/Time — Start	
— Stop				Millivolt — Stop		— Stop	
Total Counts				Total Millivolts		Total Counts	
Counting Time				Total Drift Time		Counting Time	
Gross cpm				Gross mv/sec		Gross cpm	
Bkg. Cpm				Bkg. Mv/sec		Bkg. cpm	
Net cpm				Net mv/sec		net cpm	
dpm				curies/mv		dpm	
dpm/24 hr. (69-74)				liter (69-74)		dps/cc	
K 40 Correction						Neutron Dose (rads) (63-68)	
Net Beta				D(q) (63-68)		uc/mg (69-74)	
D(q) (63-68)						D(q) (63-68)	

Repeat Recount 602

NAME:	SOCIAL SECURITY NUMBER:	SAMPLE NUMBER:
AIR FORCE BASE		

RESULTS OF ANALYSIS LABORATORY ACCIDENT "A" SAMPLE 2 SEPT

☐ Repeat the sample for the following reason:

( ) Significant activity in recently analyzed sample(s)

( ) Data required to establish dose

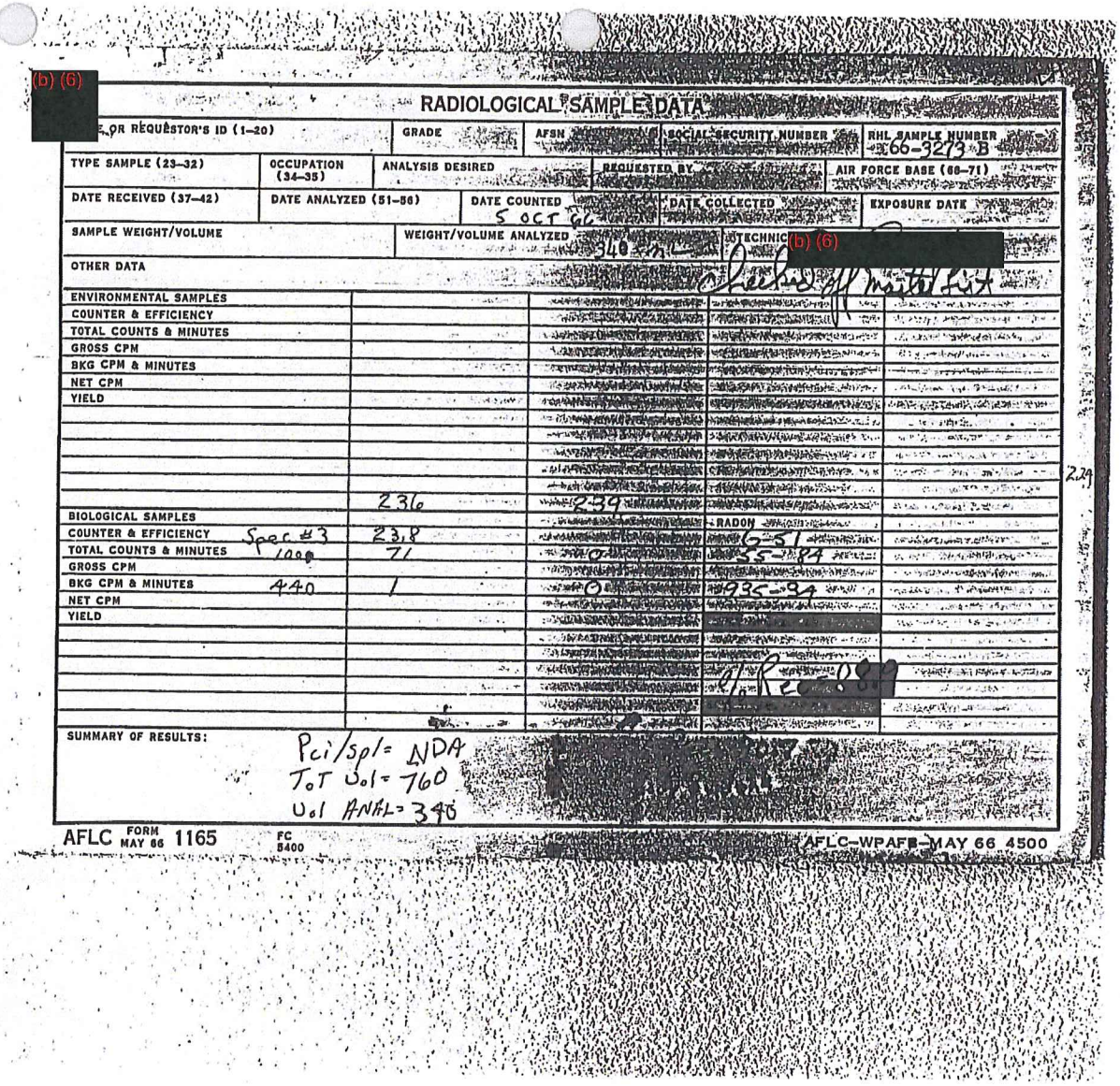
( ) Improper flask used

( ) Other

( ) Suggested sampling schedule

SIGNATURE: DATE:

ONE TIME FORM. OBSOLETE AFTER 30 JUN 66. (MCGSCPF, RAG, 4 APR 66) AFLC—WPAFB—APR 66 2500



(b) (6)

RADIOLOGICAL SAMPLE DATA

OR REQUESTOR'S ID (1–20)	GRADE	AFSN	SOCIAL SECURITY NUMBER	RHL SAMPLE NUMBER 66-3273-B
TYPE SAMPLE (23–32)	OCCUPATION (34–35)	ANALYSIS DESIRED	REQUESTED BY	AIR FORCE BASE (68–71)
DATE RECEIVED (37–42)	DATE ANALYZED (51–56)	DATE COUNTED 5 OCT 66	DATE COLLECTED	EXPOSURE DATE
SAMPLE WEIGHT/VOLUME	WEIGHT/VOLUME ANALYZED 340 ml	TECHNIC (b) (6)		
OTHER DATA				

ENVIRONMENTAL SAMPLES				
COUNTER & EFFICIENCY				
TOTAL COUNTS & MINUTES				
GROSS CPM				
BKG CPM & MINUTES				
NET CPM				
YIELD				
				2.29
	236	239		
BIOLOGICAL SAMPLES			RADON	
COUNTER & EFFICIENCY	Spec #3	23.8	651	
TOTAL COUNTS & MINUTES	1000	71	935-84	
GROSS CPM			0	935-94
BKG CPM & MINUTES	440	1		
NET CPM				
YIELD				

SUMMARY OF RESULTS:

Pci/spl = NDA
Tot Vol = 760
Vol ANAL = 340

AFLC FORM MAY 66 1165 FC 5400 AFLC-WPAFB-MAY 66 4500

(b) (6)

29

ARMY: (b) (6)

INTERNAL DOSE DATA

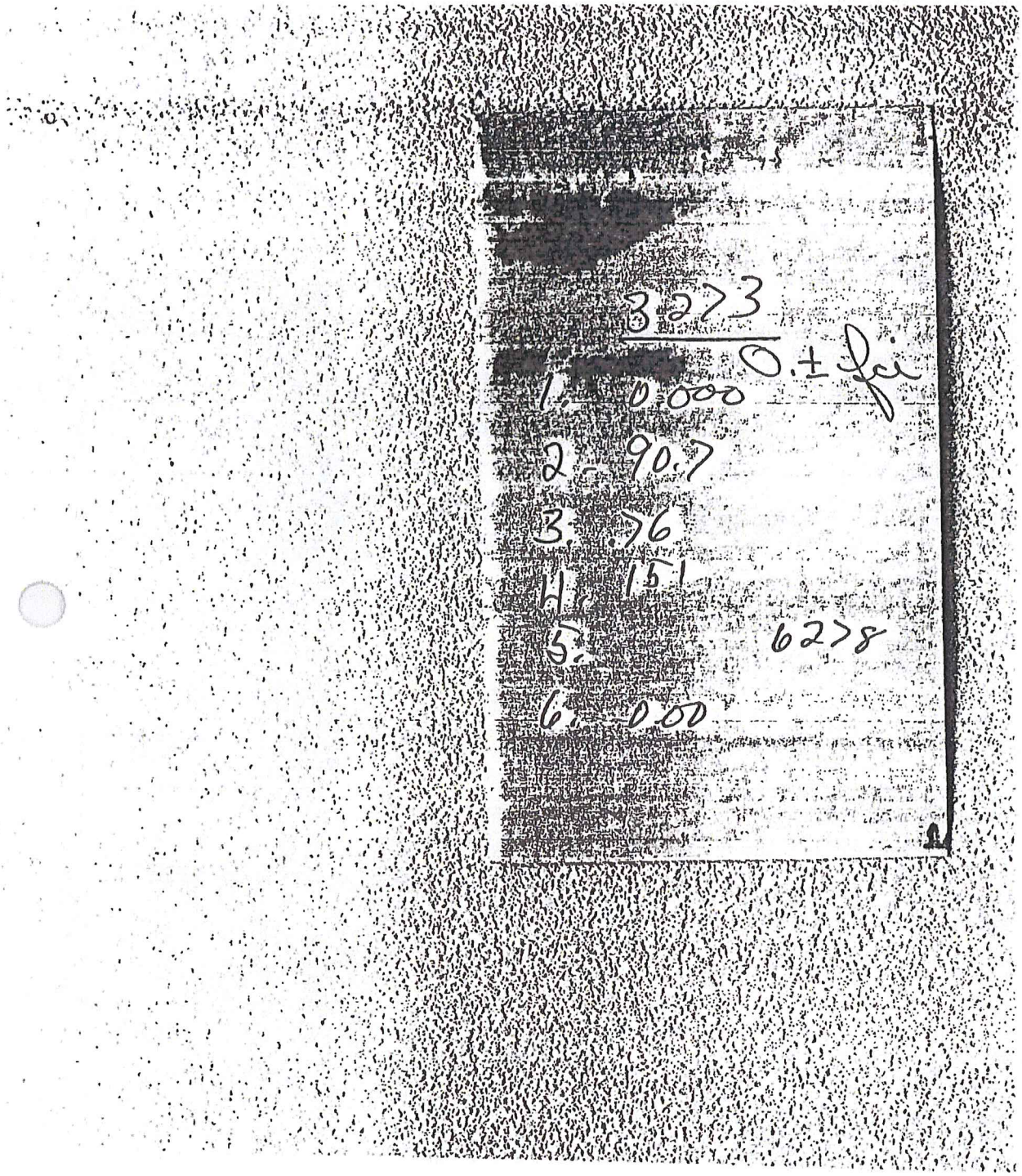
NAME (LAST, FIRST, M.I.) (1-20)	SOC. SEC. NO. (21-29)	TYPE SAMPLE (30)	TYPE ANAL. (31-32)
(b) (6) PVT	(b) (6)	Urine	

SAMPLE NO. (33-38)	SAMPLE DATE (39-44) FROM / TO	EXPOSURE DATE / TYPE
66-2446		6 Feb 66
BASE (57-60)	OCCUPATION (61-62)	REQUESTED BY
Giessen	57E20	
DATE RECEIVED	SAMPLE VOLUME	VOLUME ANALYZED / DATE ANALYZED
7 April 1966	750	750

TECHNICIAN (SIGNATURE) (b) (6)

URINE				RADON		FECES/BLOOD	
Counter Number	3B#7			Chamber Number		Counter Number	
Counter Bkg. (cpm)	0.03			Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)	0.45			Counter Eff. (%)		Counter Eff.	
Date/Time – Start	4-28-66			Millivolt – Start		Date/Time – Start	
–Stop				Millivolt – Stop		– Stop	
Total Counts	1411			Total Millivots		Total Counts	✓
Counting Time	960			Total Drift Time		Counting Time	
Gross cpm	1.47			Gross mv/sec		Gross cpm	
Bkg. Cpm	0.03			Bkg. Mv/sec		Bkg. cpm	1.92 PC
Net cpm	1.44			Net mv/sec		net cpm	0.28 BB
dpm	3.20			curies/mv		dpm	
dpm/24 hr. (69-74)				Iitter (69-74)		dps/cc	
~~K 40 Correction~~	1.92 ± 0.11					Neutron Dose (rads) (63-68)	
~~Net Beta~~	1.44 ± 0.79			D(q) (63-68)		uc/mg (69-74)	
D(q) (63-68)						D(q) (63-68)	

(b) (6)


3273
0.± fi
1. 0.000
2. 90.7
3. 76
Hr. 151
5. 6278
6. 0.00

(b) (6)

Internal Dosimetry Evaluation Form

NAME (b) (6)	SSN: (b) (6)

MODE OF INTAKE:
☒ Inhalation ☐ Injection
☐ Ingestion ☐ Absorption
☐ Unknown ☐ Not applicable

INTAKE DATE OR PERIOD:
3/14/66 through 4/08/66, on-site
3/26/66

SUMMARY OF EXPOSURE CONDITIONS:
Radionuclides/Respiratory Class/Particle Size: ^{239}Pu/100% Class Y/1 μm AMAD
Date or Period of Evaluated Data: 2 samples, 4/8/66 and 5/26/66
Duration of Exposure: Unknown
Location of Exposure: Camp Wilson, near Palomares, Spain

EVALUATION DATA:

Air Sampling	☐ Attached	☐ In Process	☒ Unavailable
Health Physics Survey Data	☐ Attached	☐ In Process	☒ Unavailable
Bioassay – Urinalysis	☒ Attached	☐ In Process	☐ Unavailable
Fecal	☐ Attached	☐ In Process	☒ Unavailable
Nasal Smears	☐ Attached	☐ In Process	☒ Unavailable
In Vivo	☐ Attached	☐ In Process	☒ Unavailable

Medical Treatment:

Skin Decontamination:	☐ Yes	☒ No	Date: _____
Decorporation:	☐ Yes	☒ No	Agent: _____ Date: _____
Catharsis:	☐ Yes	☒ No	Agent: _____ Date: _____
Surgical excision:	☐ Yes	☒ No	Date: _____

EVALUATION METHODOLOGY:
Assumptions: Acute inhalation intake of ^{239}Pu, 100% Class Y, 1 μm AMAD particle size on 3/26/66

Code/Model used for: Intake Estimate: CINDY, Ver. 1.4/JONES
Dose Estimate: CINDY, Ver. 1.4/ICRP 30, Part 4, General Systemic Model

RESULTS SUMMARY
Estimated Intake Activity (pCi): 400000
50 YR CEDE (rem) : 120 (1.2 Sv)

Organ Dose Equivalent Summary	**50 YR CDE (rem/Sv)**
Bone Surface	1200/12
Lung	460/4.6
Liver	220/2.2
Red Marrow	96/0.96
Other	21/0.21
Testes	18/0.18

DOSE ASSESSOR: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

PEER REVIEWER: **DATE:** _____
Signature: _____
Print Name: _____
SSN: _____

RECOMMENDATIONS:
Additional Bioassay Required ☐ Urinalysis ☐ Fecal ☐ In Vivo
Suggested Sampling Frequency: _____
Work Restrictions: N/A

Internal Dosimetry Case Narrative

Identification:

Name: (b) (6)
SSN:

Incidents:

Individual participated on site in response duties resulting from an accident involving three nuclear weapons at Palomares, Spain on January 17, 1966. Individual may have been exposed to weapons materials (primarily plutonium-239) by inhalation and ingestion from contaminated weapon and aircraft debris, lands, and vegetation. Primary activities included search, radiological monitoring, recovery of accident debris, and processing for disposal.

Previous Intake/Dose Assessments:

This assessment applies to Palomares accident activities only. No previous intakes or doses were considered.

Other Information:

None.

Radionuclide(s): ^{239}Pu.

Assumptions/Basis/Data Sources:

Acute inhalation intake of Pu-239; 100% Class Y; 1 μm AMAD particle size on 3/26/66. The date is the midpoint of the period on station from 3/14/66 to 4/8/66.

Inhalation was assumed as the major route of entry because the primary contaminant was created by explosion and fire and deposited in sandy soil and on buildings and plants. Conditions were generally windy and significant activity was underway.

Dose was determined entirely from modeling intake based on the following urinalysis results for this individual. This individual's sample was identified for a follow-up analysis using alpha spectrometry after the initial gross alpha result was reviewed. That is, the initial urine sample for this individual was reprocessed radiochemically for alpha spectrometry. Results of the follow-up alpha spectrometry analysis are reported below and were used in preparing the dose estimate.

Sample	Analysis*	Sample Date	Result (pCi/day)	Error (pCi/day)	Included
66-2860	AS	4/8/66	0.296	0.016	✓
66-2860	G	4/8/66	0.619	0.203	
66-3241	AS	5/26/66	NR	NR	
66-3241	G	5/26/66	0.423	0.423	✓

* G means gross alpha counting; AS means alpha spectrometry.

Intakes and estimates of dose were prepared using CINDY Version 1.4 and LUDEP Version 2.05.

Intake was estimated using the Jones excretion model in CINDY and LUDEP.

Inhalation intake was estimated using the ICRP 66 respiratory tract model in LUDEP.

CINDY estimated dose derived using the ICRP 30, Part 4, General Systemic Model and weighting factors; and LUDEP used the recommendations of ICRP 60.

Modeling:

CINDY and LUDEP were used to estimate the intake and dose with the following results:

Model	Intake (pCi)	CEDE (rem/Sv)
CINDY	400,000	120/1.2
LUDEP	1,280,000	90/0.9

Doses to individual organs and estimation of the effective dose equivalent using CINDY reported the following results:

Organ	Dose Equivalent (rem/Sv)	Weighting Factors	Weighted Organ Dose Equivalent (rem/Sv)
Testes	1.8E+01/1.8E-01	2.5E-01	4.5E+00/4.5E-02
Breast	5.9E-04/5.9E-06	1.5E-01	8.9E-05/8.9E-07
Red Marrow	9.6E+01/9.6E-01	1.2E-01	1.2E+01/1.2E-01
Lung	4.6E+02/4.6E+00	1.2E-01	5.5E+01/5.5E-01
Thyroid	5.6E-04/5.6E-06	3.0E-02	1.7E-05/1.7E-07
Bone Surface	1.2E+03/1.2E+01	3.0E-02	3.7E+01/3.7E-01
Liver	2.2E+02/2.2E+00	6.0E-02	1.3E+01/1.3E-01
Other	2.1E+01/2.1E-01	6.0E-02	1.3E+00/1.3E-02
Lower Large Intestine	4.5E-02/4.5E-04	6.0E-02	2.7E-03/2.7E-05
Upper Large Intestine	1.5E-02/1.5E-04	6.0E-02	9.1E-04/9.1E-06
Small Intestine	3.1E-03/3.1E-05	6.0E-02	1.9E-04/1.9E-06
Effective Dose Equivalent			1.2E+02/1.2E+00

Two urine samples were analyzed by gross alpha counting and alpha spectrometry. For the first sample, the gross alpha analysis was not included in the modeling since an alpha spectrometry result was available for the same sample. For the second sample, no result was reported for the alpha spectrometry analysis, so the gross alpha counting result was used. The results were fit using CINDY and the Jones excretion model, to estimate an intake (400,000 pCi), organ doses, and a CEDE (120 rem/1.2 Sv; ICRP-30) as shown above. LUDEP was also used to estimate an intake of 1,280,000 pCi and a CEDE (ICRP-60) of 90 rem (0.9 Sv).

Conclusion:

Based on the results of intake estimates and dose calculations, this individual received an estimated intake of about 400,000 pCi of ^{239}Pu resulting in a 50-year committed effective dose equivalent of 120 rem (1.2

Sv). That dose is more than the cumulative dose (7 rem) from a lifetime (70 years) of exposure at the current level (0.100 rem) for members of the public. It is more than the working lifetime limit of 50 rem recommended by the National Council on Radiation Protection and Measurements (NCRP). These estimated dose levels are significant, although they were based on one sample that may have been collected on-site. However, follow-up urine sampling should be considered to provide additional assessment of the exposure.

Prepared By:

Name: _____

Signature: _____ Date: _____

Peer Reviewed By:

Name: _____

Signature: _____ Date: _____

INTERNAL DOSE DATA

NAME (LAST, FIRST, M.I.) (1-20)	SOC. SEC. NO. (21-29)	TYPE SAMPLE (30)	TYPE ANAL. (31-32)
(b) (6) A2C	(b) (6)	Urine	

66-2860	SAMPLE DATE (39-47) FROM 8 Apr 66 TO		EXPOSURE DATE 14 Mar 66 TYPE
BASE (57-60) Moron	OCCUPATION (61-62) Not Listed	REQUESTED BY	
DATE RECEIVED 22 Apr 66	SAMPLE VOLUME 2000	VOLUME ANALYZED 2000	DATE ANALYZED

TECHNICIAN (SIGNATURE AND DATE)

URINE				RADON		FECES/BLOOD	
Counter Number	H			Chamber Number		Counter Number	
Counter Bkg. (cpm)	0.03 (900)		≤ 25	Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)	51			Counter Eff. (%)		Counter Eff.	
Date/Time – Start	13 May 66			Millivolt – Start		Date/Time – Start	
– Stop				Millivolt – Stop		– Stop	
Total Counts	40	Reported value		Total Millivolts		Total Counts	
Counting Time	55	corrected for spike		Total Drift Time		Counting Time	
Gross cpm	0.73	of 0.965 pc/sample		Gross mv/sec		Gross cpm	
Bkg. Cpm	0.03			Bkg. Mv/sec		Bkg. cpm	
Net cpm	0.70			Net mv/sec		net cpm	
~~dpm~~ pci/l	0.309	± 0.102		curies/mv		dpm	
dpm/24 hr. (69-74)				litter (69-74)		dps/cc	
K 40 Correction						Neutron Dose (rads) (63-68)	
~~Net Beta~~ pci/gal	0.619	± 0.203		D(q) (63-68)		uc/mg (69-74)	
D (q) (63-68)						D(q) (63-68)	

(b) (6)

(b) (6)

(b)
(6)

(b)
(6)

RADIOLOGICAL SAMPLE DATA

NAME OR REQUESTOR'S ID (1–20)		GRADE	AFSN	SOCIAL SECURITY NUMBER	RHL SAMPLE NUMBER 66-2860
TYPE SAMPLE (23–32)	OCCUPATION (34–35)	ANALYSIS DESIRED	REQUESTED BY		AIR FORCE BASE (68–71)
DATE RECEIVED (37–42)	DATE ANALYZED (51–56)	DATE COUNTED 7 July 66	DATE COLLECTED		EXPOSURE DATE
SAMPLE WEIGHT/VOLUME		WEIGHT/VOLUME ANALYZED		TECHNICIAN	
OTHER DATA .953					

ENVIRONMENTAL SAMPLES					
COUNTER & EFFICIENCY					
TOTAL COUNTS & MINUTES					
GROSS CPM					
BKG CPM & MINUTES					
NET CPM					
YIELD					
BIOLOGICAL SAMPLES		256	239	RADON	
COUNTER & EFFICIENCY	Spec	27.3	27.3	1.44 dpm	1.37 DPM
TOTAL COUNTS & MINUTES	100	40	4208	±0.15	
GROSS CPM		0.40			
BKG CPM & MINUTES	800	1 0.0013	4 ± 0.005		
NET CPM		0.3987	0.0750		
YIELD			0.296 ± 0.016		
	% Rec	41.84			

SUMMARY OF RESULTS:

[redacted]

AFLC FORM MAY 66 1165 FC 5400 AFLC–WPAFB–MAY 66 4500

INTERNAL DOSE DATA

NAME (LAST, FIRST, M.I.) (1-20) (b) (6) [redacted] A2C		SOC. SEC. NO. (21-29) (b) (6) [redacted]	TYPE SAMPLE (30) Urine	TYPE ANAL. (31-32)
SAMPLE NO. (33-38) 66-3241	SAMPLE DATE (39-44) FROM 1300 25 May TO 1300 26 May 66		EXPOSURE DATE 14 MAR 66 TYPE	
BASE (57-60) Moron	OCCUPATION (61-62) Not Stated	REQUESTED BY		
DATE RECEIVED 6 June 1966	SAMPLE VOLUME 2280 ml	VOLUME ANALYZED 1140 ml	DATE ANALYZED	
TECHNICIAN (SIGNATURE AND DATE) SSgt (b) (6) [redacted] USAF		9 JUN 1966		

URINE			
Counter Number	B		
Counter Bkg. (cpm)	78 (926)		
Counter Eff. (%)	51		
Date/Time – Start	9 June		
– Stop			
Total Counts	36		
Counting Time	120		
Gross cpm	0.30		
Bkg. Cpm	0.08		
Net cpm	0.22		
~~dpm~~ pCi/liter	0.185 ± 0.087		
dpm/24 hr. (69-74)			
K 40 Correction			
~~Net Beta~~ pCi/Sd	0.423 ± 0.199		
D (q) (63-68)			

RADON		
Chamber Number		
Cham. Bkg. (mv/sec)		
Counter Eff. (%)		
Millivolt – Start		
Millivolt – Stop		
Total Millivots		
Total Drift Time		
Gross mv/sec		
Bkg. Mv/sec		
Net mv/sec		
curies/mv		
litter (69-74)		
D(q) (63-68)		

FECES/BLOOD	
Counter Number	
Counter Bkg.	
Counter Eff.	
Date/Time – Start	✓
– Stop	
Total Counts	
Counting Time	
Gross cpm	0.19 PC
Bkg. cpm	0810 BB
net cpm	
dpm	
dps/cc	
Neutron Dose (rads) (63-68)	
uc/mg (69-74)	
D (q) (63-68)	

x = [redacted].72D D_R = ~~[illegible]~~ 4.75×10^{-3} µc

Spiked 5 ml Pu^{239} (Labeled 4.52 DPM/ml)

INTERNAL DOSE DATA

NAME (LAST, FIRST, M.I.) (1-20)	SOC. SEC. NO. (21-29)	TYPE SAMPLE (30)	TYPE ANAL. (31-32)
(b) (6) A2C		URINE	ALPHA

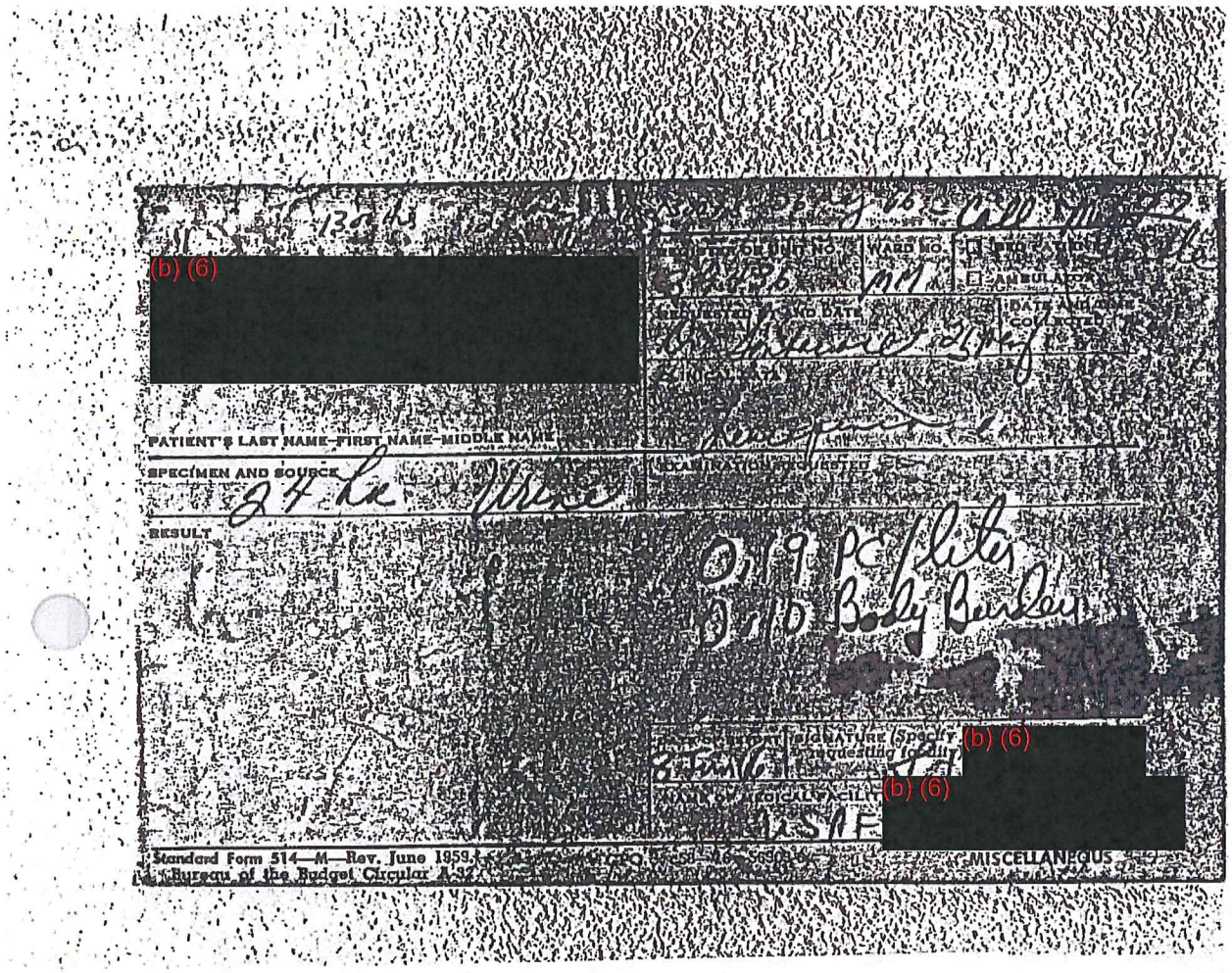
SAMPLE NO. (33-38)	SAMPLE DATE (39-44) FROM	TO	EXPOSURE DATE	TYPE
66-3241-S				S

BASE (57-60)	OCCUPATION (61-62)	REQUESTED BY	
		SGHW	

DATE RECEIVED	SAMPLE VOLUME	VOLUME ANALYZED	DATE ANALYZED
	2280 ml	114 ml	

TECHNICIAN (SIGNATURE AND DATE)

URINE				RADON		FECES/BLOOD	
Counter Number	C			Chamber Number		Counter Number	
Counter Bkg. (cpm)	39 (926)			Cham. Bkg. (mv/sec)		Counter Bkg.	
Counter Eff. (%)	51			Counter Eff. (%)		Counter Eff.	
Date/Time – Start	9 June		5.20	Millivolt – Start		Date/Time – Start	
– Stop			5.588	Millivolt – Stop		– Stop	L
Total Counts	349			Total Millivolts		Total Counts	
Counting Time	120			Total Drift Time		Counting Time	
Gross cpm	2.91			Gross mv/sec		Gross cpm	Recovery
Bkg. Cpm	0.04			Bkg. Mv/sec		Bkg. cpm	
Net cpm	2.87			Net mv/sec		net cpm	93%
dpm	0.22			curies/mv		dpm	
dpm/24 hr. (69-74)	2.65			litter (69-74)		dps/cc	
K 40 Correction	5.20					Neutron Dose (rads) (63-68)	
Net Beta				D(q) (63-68)		uc/mg (69-74)	
D(q) (63-68)	93.1% Rec					D(q) (63-68)	


(b) (6)
PATIENT'S LAST NAME–FIRST NAME–MIDDLE NAME
SPECIMEN AND SOURCE
RESULT
0.19 PC/liter
Body Burden
(b) (6)
(b) (6)
Standard Form 514—M—Rev. June 1959
Bureau of the Budget Circular A-47
MISCELLANEOUS

APPENDIX C.3

CONTAMINATION CUTOFF CASES

Portions of this report have been designated records subject to the restriction of the Privacy Act, 5 U.S.C. 552(a) and are so marked.

APPENDIX C.3 CONTAMINATION CUTOFF CASES

This section contains the intake and dose estimates for individuals whose urinalysis results were categorized as below a "contamination cutoff" of 0.1 picocuries per day (pCi/d). These individuals primarily submitted samples while on-site at Palomares. Most of these initial samples were analyzed by the gross alpha procedure. The results of the analysis were less than 0.1 pCi/d and were evaluated for intake and dose. Most samples collected became contaminated with plutonium because of limited controls on spread of the very low amounts required to indicate a positive urinalysis result. The main body of the report contains a discussion on the problem of sample contamination and the "contamination cutoff".

This "contamination cutoff" group consisted of 314 individuals. Their urinalysis results ranged from 0.002 to 0.099 pCi/d for those processed by the gross alpha procedure and from 0.018 to 0.097 pCi/day for those processed by alpha spectrometry. Intakes ranged from 1,500 to 150,000 picocuries and produced 50-year committed effective dose equivalents (CEDEs) of 0.46 to 46 rem (0.0046 to 0.46 Sv). Table C.3-1 shows the distribution of CEDE for this group and indicates that most individuals' doses were relatively low. This section contains a listing of the results of the assessments. Individual narrative summaries were not prepared for these

Table C.3-1 Distribution of effective doses.

CEDE Range (rem)	Number of Cases
0-10	149
10-20	94
20-30	55
30-40	14
40-50	2

individuals.

The listing requires some explanatory notes to clarify features of the data presented. These notes include the following.

- An entry of "n/a" means that data were not available in any of the records reviewed generally because no entry was recorded.
- An entry of "NR" means that a result for an analysis was not recorded on the appropriate data form.
- An entry of "ND" means that an analytical result was recorded as No Detectable Activity (NDA).
- An entry of "(12-hr)" in a Sample Volume cell means that a data form for the sample noted that the sample was collected for 12 hours.
- A shaded cell represents a result for a sample (collected on site) that exceeded 0.1 pCi/day; the established maximum for modeling individuals in the "Contamination Cutoff" category.
- An entry of "mean" represents the average value for intake or CEDE from two or more sample results for the same person.

Results of Modeling Individuals with Samples Assumed to be "Uncontaminated."

Cell shaded = Additional sample for indiv not modeled since >0.1 pCi/sample, NR, or ND

NAME	SSN	START EXPOSURE DATE	END EXPOSURE DATE	ESTIMATED ACUTE EXPOSURE DATE	SAMPLE #	SAMPLE DATE	ELAPSED DAYS	SAMPLE VOLUME (mL)	ANALYSIS	RESULT (pCi/ sample)	+/- (pCi/ sample)	INTAKE (1000s pCi)	50-YEAR CEDE (rem/Sv)
(b) (6)	(b) (6)	02/27/66	03/19/66	03/09/66	66-2049	03/19/66	10	430	Gross Alpha	0.064	7.930E-02	52.0	16/0.16
		01/18/66	02/03/66	01/26/66	66-1811	02/03/66	8	720	Gross Alpha	0.041	1.013E-02	29.0	8.9/0.089
		03/14/66	03/19/66	03/16/66	66-2332	03/19/66	3	890	Gross Alpha	0.092	9.890E-02	19.0	5.8/0.058
												mean =	7.35/0.0735
(b) (6)	(b) (6)	01/19/66	03/23/66	02/19/66	66-2581	03/23/66	32	1000	Gross Alpha	0.034	6.230E-02	40.0	12/0.12
					66-888	02/05/66		970	Gross Alpha	3.77	1.360E+00		
(b) (6)	(b) (6)	02/09/66	03/09/66	02/23/66	66-2057	03/09/66	14	650	Gross Alpha	0.079	6.220E-02	73.0	22/0.22
		01/24/66	02/08/66	01/31/66	66-2684	03/28/66	56	1100	Gross Alpha	0.037	1.030E-01	52.0	16/0.16
		02/11/66	03/19/66	03/01/66	66-2232	03/19/66	18	700	Gross Alpha	0.032	7.875E-03	32.0	9.8/0.098
		01/18/66	01/26/66	01/22/66	66-1943	01/26/66	4	1300	Gross Alpha	0.018	4.500E-03	5.5	1.7/0.017
		01/24/66	01/24/66	01/24/66	66-1249	02/27/66	34	1525	Gross Alpha	0.077	2.390E-02	94.0	29/0.29
		01/18/66	03/04/66	02/09/66	66-2379	03/04/66	23	1350	Gross Alpha	0.027	8.010E-02	29.0	8.9/0.089
		01/23/66	03/19/66	02/19/66	66-2170	03/19/66	28	900	Gross Alpha	0.081	2.025E-02	93.0	29/0.29
		02/13/66	03/08/66	02/24/66	66-2506	03/08/66	12	950	Gross Alpha	0.027	6.750E-03	24.0	7.4/0.074
		01/18/66	03/08/66	02/11/66	66-2457	03/08/66	25	1000	Gross Alpha	0.028	2.120E-02	31.0	9.5/0.095
		01/18/66	02/23/66	02/05/66	66-1247	02/23/66	16	1180	Gross Alpha	0.026	1.890E-02	26.0	8/0.08
		01/18/66	02/03/66	01/26/66	66-1816	02/03/66	8	890	Gross Alpha	0.009	2.250E-03	6.4	2/0.02
		02/24/66	03/19/66	03/07/66	66-2172	03/19/66	12	350	Gross Alpha	0.059	1.463E-02	52.0	16/0.16
		02/13/66	03/09/66	02/25/66	66-2055	03/09/66	12	550	Gross Alpha	0.072	6.230E-02	64.0	20/0.2
		01/18/66	02/03/66	01/26/66	66-1838	02/03/66	8	600	Gross Alpha	0.032	7.875E-03	22.0	6.8/0.068
		01/23/66	03/03/66	02/11/66	66-1923	03/03/66	20	510	Gross Alpha	0.038	2.870E-02	39.0	12/0.12
		02/13/66	03/08/66	02/24/66	66-2452	03/08/66	12	350	Gross Alpha	0.014	1.490E-02	12.0	3.7/0.037
		01/18/66	02/11/66	01/30/66	66-1237	02/11/66	12	1600	Gross Alpha	0.030	2.510E-02	27.0	8.3/0.083
		02/11/66	03/19/66	03/01/66	66-2134	03/19/66	18	730	Gross Alpha	0.063	1.570E-02	63.0	19/0.19
		01/21/66	03/03/66	02/10/66	66-1917	03/03/66	21	800	Gross Alpha	0.097	6.850E-02	100.0	31/0.31
		01/18/66	01/24/66	01/21/66	66-1117	01/24/66	3	1250	Gross Alpha	0.047	2.290E-02	9.8	3/0.03
		01/30/66	03/18/66	02/22/66	66-2104	03/18/66	24	870	Gross Alpha	0.073	8.340E-02	79.0	24/0.24
		02/13/66	03/08/66	02/24/66	66-1891	03/08/66	12	925	Gross Alpha	0.045	2.460E-02	40.0	12/0.12
		02/17/66	03/08/66	02/26/66	66-2430	03/08/66	10	700	Gross Alpha	0.028	1.680E-02	23.0	7.1/0.071
		02/09/66	03/03/66	02/20/66	66-1925	03/03/66	11	910	Gross Alpha	0.067	2.300E-02	57.0	18/0.18
		02/18/66	03/18/66	03/04/66	66-2116	03/18/66	14	880	Gross Alpha	0.055	5.630E-02	52.0	16/0.16
		02/09/66	03/08/66	02/22/66	66-2424	03/08/66	14	500	Gross Alpha	0.007	1.680E-02	6.8	2.1/0.021
					66-1896	03/08/66		n/a	Gross Alpha	NR	NR		
		02/06/66	02/28/66	02/17/66	66-1365	02/28/66	11	915 (12-hr)	Gross Alpha	0.032	7.875E-03	54.0	17/0.17
		02/22/66	03/08/66	03/01/66	66-2434	03/08/66	7	950	Gross Alpha	0.057	3.140E-02	36.0	11/0.11
		02/13/66	03/04/66	02/22/66	66-2697	04/05/66	42	700	Gross Alpha	0.091	1.200E-01	120.0	37/0.37

NR - Not Reported; ND - No Detectable Activity; n/a - not available

Results of Modeling Individuals with Samples Assumed to be "Uncontaminated."

Cell shaded = Additional sample for indiv not modeled since >0.1 pCi/sample, NR, or ND

NAME	SSN	START EXPOSURE DATE	END EXPOSURE DATE	ESTIMATED ACUTE EXPOSURE DATE	SAMPLE #	SAMPLE DATE	ELAPSED DAYS	SAMPLE VOLUME (mL)	ANALYSIS	RESULT (pCi/ sample)	+/- (pCi/ sample)	INTAKE (1000s pCi)	50-YEAR CEDE (rem/Sv)
(b) (6)	(b) (6)	02/11/66	03/19/66	03/01/66	66-2200	03/19/66	18	900	Gross Alpha	0.035	8.750E-03	35.0	11/0.11
		02/05/66	02/25/66	02/15/66	66-1340	02/25/66	10	1300	Gross Alpha	0.022	1.850E-02	18.0	5.5/0.055
		02/21/66	03/18/66	03/05/66	66-2258	03/18/66	13	780	Gross Alpha	0.034	7.260E-02	31.0	9.5/0.095
		02/21/66	03/19/66	03/06/66	66-2329	03/19/66	13	700	Gross Alpha	0.021	7.350E-02	19.0	5.8/0.058
		02/13/66	03/08/66	02/24/66	66-2425	03/08/66	12	1000	Gross Alpha	0.010	2.740E-02	9.2	2.8/0.028
		02/21/66	03/18/66	03/05/66	66-2245	03/18/66	13	1000	Gross Alpha	0.098	1.090E-01	89.0	27/0.27
		02/08/66	02/28/66	02/18/66	66-1357	02/28/66	10	950 (12-hr)	Gross Alpha	0.032	7.875E-03	52.0	16/0.16
		03/14/66	03/19/66	03/16/66	66-2333	03/19/66	3	900	Gross Alpha	0.096	1.017E-01	20.0	6.1/0.061
					66-2357	03/04/66		900	Gross Alpha	0.15	1.190E-01		
(b) (6)	(b) (6)	01/18/66	02/03/66	01/26/66	66-1823	02/03/66	8	800	Gross Alpha	0.016	4.500E-03	13.0	4/0.04
		02/11/66	03/08/66	02/23/66	66-2454	03/08/66	13	1000	Gross Alpha	0.085	2.460E-02	77.0	24/0.24
					66-3121	04/13/66		700	Gross Alpha	0.364	1.340E-01		
(b) (6)	(b) (6)	02/09/66	03/08/66	02/22/66	66-1889	03/08/66	14	940	Gross Alpha	0.031	1.960E-02	29.0	8.9/0.089
		01/18/66	03/08/66	02/11/66	66-2615	03/08/66	25	850	Gross Alpha	0.070	7.900E-02	77.0	24/0.24
		02/13/66	03/08/66	02/24/66	66-2471	03/08/66	12	1000	Gross Alpha	0.077	1.913E-02	68.0	21/0.21
		02/09/66	03/08/66	02/22/66	66-1882	03/08/66	14	750	Gross Alpha	0.017	2.000E-02	16.0	4.9/0.049
	(b) (6)	02/10/66	03/19/66	02/28/66	66-2208	03/19/66	19	900	Gross Alpha	0.093	1.017E-01	94.0	29/0.29
		01/17/66	01/27/66	01/22/66	66-1234	02/19/66	28	1000	Gross Alpha	0.036	2.120E-02	41.0	13/0.13
		01/18/66	02/03/66	01/26/66	66-1835	02/03/66	8	750	Gross Alpha	0.016	4.500E-03	13.0	4/0.04
		02/24/66	03/19/66	03/07/66	66-2552	03/19/66	12	820	Gross Alpha	0.049	7.140E-02	43.0	13/0.13
		02/21/66	03/18/66	03/05/66	66-2088	03/18/66	13	860	Gross Alpha	0.096	7.640E-02	87.0	27/0.27
		01/18/66	01/20/66	01/19/66	66-1132	01/20/66	1	n/a	Gross Alpha	0.029	1.930E-02	2.5	0.77/0.0077
		01/18/66	03/19/66	02/17/66	66-2337	03/19/66	30	800	Gross Alpha	0.016	9.120E-02	19.0	5.8/0.058
		02/10/66	03/29/66	03/05/66	66-2593	03/29/66	24	1475	Gross Alpha	0.057	8.040E-02	63.0	19/0.19
		02/11/66	03/08/66	02/23/66	66-2453	03/08/66	13	750	Gross Alpha	0.024	3.820E-02	21.0	6.5/0.065
		02/17/66	03/08/66	02/26/66	66-1892	03/08/66	10	930	Gross Alpha	0.021	2.800E-02	17.0	5.2/0.052
		01/18/66	02/03/66	01/26/66	66-1820	02/03/66	8	390	Gross Alpha	0.050	1.238E-02	35.0	11/0.11
		02/24/66	03/19/66	03/07/66	66-2566	03/19/66	12	600	Gross Alpha	0.060	8.030E-02	53.0	16/0.16
		02/09/66	03/09/66	02/23/66	66-2398	03/09/66	14	1200	Gross Alpha	0.026	7.150E-02	25.0	7.7/0.077
		02/10/66	03/19/66	02/28/66	66-2046	03/19/66	19	695	Gross Alpha	0.013	8.480E-02	13.0	4/0.04
		02/06/66	03/08/66	02/21/66	66-1869	03/08/66	15	1020	Gross Alpha	0.050	1.250E-02	47.0	14/0.14
		01/18/66	03/08/66	02/11/66	66-2623	03/08/66	25	1100	Gross Alpha	0.070	7.900E-02	77.0	24/0.24
		01/18/66	01/22/66	01/20/66	66-1136	01/22/66	2	975	Gross Alpha	0.057	2.560E-02	7.9	2.4/0.024
		02/26/66	03/18/66	03/08/66	66-2112	03/18/66	10	580	Gross Alpha	0.058	6.960E-01	47.0	14/0.14
					66-1157	02/15/66		645	Gross Alpha	ND	ND		
					66-3128	04/13/66		1650	Gross Alpha	NR	NR		
(b) (6)	(b) (6)	01/18/66	03/28/66	02/21/66	66-2681	03/28/66	35	1520	Gross Alpha	0.061	7.140E-02	75.0	23/0.23

NR - Not Reported; ND - No Detectable Activity; n/a - not available

Results of Modeling Individuals with Samples Assumed to be "Uncontaminated."

Cell shaded = Additional sample for indiv not modeled since >0.1 pCi/sample, NR, or ND

NAME	SSN	START EXPOSURE DATE	END EXPOSURE DATE	ESTIMATED ACUTE EXPOSURE DATE	SAMPLE #	SAMPLE DATE	ELAPSED DAYS	SAMPLE VOLUME (mL)	ANALYSIS	RESULT (pCi/l sample)	+/- (pCi/l sample)	INTAKE (1000s pCi)	50-YEAR CEDE (rem/Sv)
(b) (6)	(b) (6)	01/19/66	03/18/66	02/17/66	66-2240	03/18/66	29	700	Gross Alpha	0.090	8.800E-02	100.0	31/0.31
		01/31/66	03/19/66	02/23/66	66-2165	03/19/66	24	800	Gross Alpha	0.059	1.463E-02	64.0	20/0.2
		01/17/66	01/22/66	01/19/66	66-3105	04/13/66	84	800	Gross Alpha	0.056	4.800E-02	81.0	2.5/0.025
		01/21/66	03/18/66	02/18/66	66-2251	03/18/66	28	1000	Gross Alpha	0.040	8.130E-02	45.0	14/0.14
		01/18/66	01/29/66	01/23/66	66-1140	01/29/66	6	560	Gross Alpha	0.025	1.890E-02	13.0	4/0.04
		02/03/66	02/28/66	02/15/66	66-1358	02/28/66	13	550 (12-hr)	Gross Alpha	0.009	2.250E-03	16.0	4.9/0.049
		02/13/66	03/08/66	02/24/66	66-2429	03/08/66	12	1000	Gross Alpha	0.039	2.220E-02	34.0	10/0.1
		01/18/66	01/22/66	01/20/66	66-1131	01/22/66	2	950	Gross Alpha	0.085	2.620E-02	12.0	3.7/0.037
		02/21/66	03/19/66	03/06/66	66-2206	03/19/66	13	850	Gross Alpha	0.090	2.250E-02	82.0	25/0.25
		01/18/66	04/05/66	02/25/66	66-2696	04/05/66	39	1000	Gross Alpha	0.040	7.210E-02	51.0	16/0.16
		02/13/66	03/08/66	02/24/66	66-2445	03/08/66	12	1250	Gross Alpha	0.026	1.900E-02	23.0	7.1/0.071
		01/18/66	02/03/66	01/28/66	66-1821	02/03/66	8	700	Gross Alpha	0.090	2.253E-02	64.0	20/0.2
		01/21/66	02/19/66	02/04/66	66-1229	02/19/66	15	1200	Gross Alpha	0.054	2.190E-02	51.0	16/0.16
		03/14/66	03/19/66	03/16/66	66-2187	03/19/66	3	850	Gross Alpha	0.059	1.463E-02	12.0	3.7/0.037
		02/06/66	02/28/66	02/17/66	66-1361	02/28/66	11	625 (12-hr)	Gross Alpha	0.059	1.465E-02	100.0	31/0.31
		01/18/66	01/29/66	01/23/66	66-1080	01/29/66	6	2050	Pu239	0.079	1.975E-02	42.0	13/0.13
		01/18/66	02/03/66	01/28/66	66-1808	02/03/66	8	540	Gross Alpha	0.099	2.478E-02	70.0	22/0.22
		01/22/66	03/19/66	02/19/66	66-2141	03/19/66	28	500	Gross Alpha	0.056	5.650E-02	64.0	20/0.2
		01/18/66	02/03/66	01/26/66	66-1826	02/03/66	8	900	Gross Alpha	0.059	1.465E-02	83.0	25/0.25
		02/06/66	02/28/66	02/17/66	66-1368	02/28/66	11	950 (12-hr)	Gross Alpha	0.050	1.245E-02	85.0	26/0.26
		02/10/66	03/08/66	02/23/66	66-2464	03/08/66	13	850	Gross Alpha	0.021	1.840E-02	19.0	27/0.27
		02/13/66	03/18/66	03/01/66	66-2103	03/18/66	17	640	Gross Alpha	0.051	6.020E-02	51.0	16/0.16
		02/13/66	03/29/66	03/07/66	66-2594	03/29/66	22	1900	Gross Alpha	0.088	9.500E-02	93.0	29/0.29
		02/21/66	03/19/66	03/06/66	66-2230	03/19/66	13	550	Gross Alpha	0.054	7.210E-02	49.0	15/0.15
		01/18/66	03/27/66	02/21/66	66-2587	03/27/66	34	1300	Gross Alpha	0.097	1.020E-01	120.0	37/0.37
		01/18/66	03/08/66	02/11/66	66-1873	03/08/66	25	910	Gross Alpha	0.099	2.478E-02	110.0	34/0.34
		01/18/66	03/08/66	02/11/66	66-2438	03/08/66	25	350	Gross Alpha	0.013	1.700E-02	14.0	4.3/0.043
		01/18/66	02/03/66	01/28/66	66-1813	02/03/66	8	940	Gross Alpha	0.032	7.675E-03	22.0	6.8/0.068
		01/18/66	03/19/66	02/17/66	66-2227	03/19/66	30	925	Gross Alpha	0.075	1.160E-01	88.0	27/0.27
		01/18/66	01/21/66	01/19/66	66-1135	01/21/66	2	n/a	Gross Alpha	0.025	2.110E-02	3.4	1/0.01
		02/09/66	03/08/66	02/22/66	66-1895	03/08/66	14	900	Gross Alpha	0.044	2.270E-02	41.0	13/0.13
		02/25/66	03/18/66	03/07/66	66-2259	03/18/66	11	500	Gross Alpha	0.065	8.100E-02	55.0	17/0.17
		01/18/66	01/30/66	01/24/66	66-1481	02/25/66	32	1720	Pu239	0.039	1.560E-01	46.0	14/0.14
		01/24/66	02/05/66	01/30/66	66-1248	02/23/66	24	1345	Gross Alpha	0.024	1.880E-02	26.0	8/0.08
		02/06/66	02/28/66	02/17/66	66-1364	02/28/66	11	610 (12-hr)	Gross Alpha	0.032	7.875E-03	54.0	17/0.17
		02/27/66	03/28/66	03/13/66	66-2675	03/28/66	15	1600	Gross Alpha	0.087	9.500E-02	83.0	25/0.25
		02/27/66	03/08/66	03/03/66	66-2462	03/08/66	5	1000	Gross Alpha	0.024	2.910E-02	10.0	3.1/0.031

NR - Not Reported; ND - No Detectable Activity; n/a - not available

Results of Modeling Individuals with Samples Assumed to be "Uncontaminated."

Cell shaded = Additional sample for indiv not modeled since >0.1 pCi/sample, NR, or ND

NAME	SSN	START EXPOSURE DATE	END EXPOSURE DATE	ESTIMATED ACUTE EXPOSURE DATE	SAMPLE #	SAMPLE DATE	ELAPSED DAYS	SAMPLE VOLUME (mL)	ANALYSIS	RESULT (pCi/ sample)	+/- (pCi/ sample)	INTAKE (1000s pCi)	50-YEAR CEDE (remSv)
(b) (6)	(b) (6)	03/02/66	03/19/66	03/10/66	66-2218	03/19/66	9	400	Gross Alpha	0 058	1 096E-01	45 0	14/0 14
		02/24/66	03/18/66	03/07/66	66-2119	03/18/66	11	990	Gross Alpha	0 057	6 990E-02	49 0	15/0 15
		01/18/66	02/03/66	01/28/66	66-1833	02/03/66	8	910	Gross Alpha	0 041	1 013E-02	29 0	8 9/0 089
		01/18/66	03/16/66	02/15/66	66-2645	03/16/66	29	450	Gross Alpha	0 026	5 090E-02	36 0	11/0.11
					66-2646	03/17/66	24183	850	Gross Alpha	0 048	8 840E-02		
(b) (6)	(b) (6)	01/20/66	02/22/66	02/05/66	66-2671	03/24/66	47	910	Gross Alpha	0 026	5 080E-02	34 0	10/0 1
					66-1086	01/29/66		1250	Gross Alpha	118	3 000E+00		
(b) (6)	(b) (6)	03/26/66	04/11/66	04/03/66	66-3204	04/21/66	18	1160	Gross Alpha	0 080	1 121E-01	80 0	25/0.25
					66-3204-5	04/21/66		1160	Gross Alpha	580	1 450E+02		
(b) (6)	(b) (6)	01/18/66	02/12/66	01/30/66	66-1125	02/12/66	13	950	Gross Alpha	0 024	2 060E-02	3 2	0 98/0 0098
		01/31/66	02/26/66	02/13/66	66-1417	02/26/66	13	940	Gross Alpha	0 060	1 500E-02	55 0	17/0.17
		03/12/66	03/20/66	03/16/66	66-2286	03/20/66	4	900	Gross Alpha	0 091	9 540E-02	28 0	8 6/0 086
		01/17/66	02/25/66	02/05/66	66-1338	02/25/66	20	1200	Gross Alpha	0 043	1 850E-02	44 0	14/0.14
		02/18/66	03/08/66	02/27/66	66-2436	03/08/66	9	1000	Gross Alpha	0 025	1 640E-02	19 0	5 8/0 058
		02/27/66	03/08/66	03/03/66	66-2442	03/08/66	5	1000	Gross Alpha	0 037	2 010E-02	15 0	4 6/0.046
		02/21/66	03/03/66	02/26/66	66-1922	03/03/66	5	450	Gross Alpha	0 051	2 330E-02	21 0	6 5/0.065
		02/25/66	03/18/66	03/07/66	66-2273	03/18/66	11	850	Gross Alpha	0 036	6 270E-02	31 0	9 5/0.095
		02/27/66	03/19/66	03/09/66	66-2193	03/19/66	10	960	Gross Alpha	0 050	1 238E-02	41 0	13/0.13
		01/18/66	02/03/66	01/26/66	66-1812	02/03/66	8	490	Gross Alpha	0 072	1 803E-02	51 0	16/0.16
		02/11/66	03/03/66	02/21/66	66-1914	03/03/66	10	825	Gross Alpha	0 075	5 930E-02	62 0	19/0.19
		02/13/66	03/18/66	03/01/66	66-2246	03/18/66	17	320	Gross Alpha	0 080	1 030E-01	78 0	24/0.24
		02/13/66	03/03/66	02/22/66	66-1924	03/03/66	9	850	Gross Alpha	0 063	2 770E-02	48 0	15/0.15
		02/21/66	03/09/66	03/01/66	66-2050	03/09/66	8	900	Gross Alpha	0 076	7 120E-02	54 0	17/0.17
		02/13/66	03/25/66	03/05/66	66-2287	03/20/66	15	560	Gross Alpha	0 036	6 270E-02	34 0	10/0.1
					66-3126	04/13/66		1150	Gross Alpha	NR	NR		
					66-3126-S	04/13/66		1100	Gross Alpha	NR	NR		
(b) (6)	(b) (6)	02/10/66	03/08/66	02/23/66	66-2518	03/08/66	13	400	Gross Alpha	0 014	3 375E-03	12 0	3 7/0 037
		01/23/66	03/20/66	02/20/66	66-2300	03/20/66	28	800	Gross Alpha	0 055	1 040E-01	63 0	19/0 19
		01/17/66	02/03/66	01/25/66	66-1841	02/03/66	9	800	Gross Alpha	0 009	2 250E-03	7 0	2 2/0 022
		01/17/66	03/09/66	02/11/66	66-2598	03/09/66	26	600	Gross Alpha	0 051	8 040E-02	57 0	18/0.18
		01/20/66	03/18/66	02/17/66	66-2254	03/18/66	29	950	Gross Alpha	0 075	1 160E-01	87 0	2 7/0 027
		01/23/66	03/20/66	02/20/66	66-2288	03/20/66	28	900	Gross Alpha	0 091	1 150E-01	100 0	31/0 31
		02/17/66	02/17/66	02/17/66	66-2673	03/25/66	36	1410	Gross Alpha	0 035	7 220E-02	43 0	13/0 13
		03/14/66	03/19/66	03/18/66	66-2149	03/19/66	3	300	Gross Alpha	0 082	1 023E-01	17 0	5 2/0 052
		03/17/66	03/18/66	03/17/66	66-2437	03/18/66	1	300	Gross Alpha	0 049	5 900E-02	4 1	1.3/0 013
		02/10/66	03/18/66	02/28/66	66-2248	03/18/66	18	800	Gross Alpha	0 072	8 080E-02	72 0	22/0 22
		02/17/66	03/08/66	02/26/66	66-1880	03/08/66	10	910	Gross Alpha	0 045	2 400E-02	37 0	11/0.11

NR - Not Reported; ND - No Detectable Activity; n/a - not available

Results of Modeling Individuals with Samples Assumed to be "Uncontaminated."

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NAME	SSN	START EXPOSURE DATE	END EXPOSURE DATE	ESTIMATED ACUTE EXPOSURE DATE	SAMPLE #	SAMPLE DATE	ELAPSED DAYS	SAMPLE VOLUME (mL)	ANALYSIS	RESULT (pCi/ sample)	+/- (pCi/ sample)	INTAKE (1000s pCi)	50-YEAR CEDE (rem/Sv)
(b) (6)	(b) (6)	01/17/66	02/25/66	02/05/66	66-1341	02/25/66	20	600	Gross Alpha	0.030	2.330E-02	31.0	9.5/0.095
		02/10/66	03/04/66	02/21/66	66-2376	03/04/66	11	220	Gross Alpha	0.004	1.010E-01	3.6	11/0.11
		01/18/66	01/29/66	01/23/66	66-1077	01/29/66	6	1415	Pu239	0.079	1.975E-02	42.0	13/0.13
		01/17/66	01/18/66	01/17/66	66-1134	01/18/66	1	n/a	Gross Alpha	0.034	2.200E-02	2.9	0.89/0.0089
		01/18/66	02/03/66	01/26/66	66-1834	02/03/66	8	280	Gross Alpha	0.018	4.500E-03	13.0	4/0.04
		02/18/66	03/04/66	02/25/66	66-2342	03/04/66	7	900	Gross Alpha	0.092	1.060E-01	58.0	18/0.18
		03/12/66	03/19/66	03/15/66	66-2189	03/19/66	4	1000	Gross Alpha	0.009	2.250E-03	2.8	0.86/0.0086
		01/18/66	01/20/66	01/19/66	66-1128	01/20/66	1	800	Gross Alpha	0.028	2.120E-02	2.4	0.74/0.0074
		02/21/66	03/19/66	03/06/66	66-2330	03/19/66	13	920	Gross Alpha	0.047	8.110E-02	43.0	13/0.13
		01/18/66	01/29/66	01/23/66	66-1070	01/29/66	6	2200	Pu239	0.035	8.750E-03	19.0	5.8/0.058
		01/29/66	03/18/66	02/22/66	66-2099	03/18/66	24	870	Gross Alpha	0.003	8.270E-02	3.3	1/0.01
		02/13/66	03/08/66	02/24/66	66-2426	03/08/66	12	1000	Gross Alpha	0.034	1.990E-02	30.0	9.2/0.092
		01/21/66	03/08/66	02/13/66	66-2449	03/08/66	23	600	Gross Alpha	0.034	1.990E-02	37.0	11/0.11
		03/01/66	03/08/66	03/04/66	66-2450	03/08/66	4	1150	Gross Alpha	0.072	2.510E-02	22.0	6.8/0.068
		02/10/66	03/08/66	02/23/66	66-2447	03/08/66	13	1300	Gross Alpha	0.026	1.660E-02	24.0	7.4/0.074
		02/06/66	02/28/66	02/17/66	66-1369	02/28/66	11	960 (12-hr)	Gross Alpha	0.018	4.500E-03	31.0	9.5/0.095
		03/15/66	03/19/66	03/17/66	66-2570	03/19/66	2	700	Gross Alpha	0.084	9.520E-02	12.0	3.7/0.037
		03/08/66	03/19/66	03/13/66	66-2325	03/19/66	6	910	Gross Alpha	0.062	9.760E-02	33.0	10/0.1
		03/16/66	03/19/66	03/17/66	66-2556	03/19/66	2	950	Gross Alpha	0.045	8.760E-02	6.1	1.9/0.019
		02/23/66	03/08/66	03/01/66	66-2509	03/08/66	7	900	Gross Alpha	0.090	2.250E-02	57.0	18/0.18
		01/18/66	01/29/66	01/23/66	66-1073	01/29/66	6	510	Pu239	0.097	2.425E-02	51.0	16/0.16
		02/27/66	03/08/66	03/03/66	66-2456	03/08/66	5	700	Gross Alpha	0.098	2.570E-02	41.0	13/0.13
		02/27/66	03/08/66	03/03/66	66-2465	03/08/66	5	550	Gross Alpha	0.072	2.350E-02	30.0	9.2/0.092
		01/17/66	01/18/66	01/17/66	66-1138	01/18/66	1	725	Gross Alpha	0.068	2.490E-02	5.8	1.8/0.018
		02/25/66	03/18/66	03/07/66	66-2237	03/18/66	11	340	Gross Alpha	0.062	9.660E-02	53.0	16/0.16
					66-772	02/11/66		360	Gross Alpha	1	4.000E-01		
(b) (6)	(b) (6)	02/27/66	03/16/66	03/07/66	66-2670	03/27/66	20	820	Gross Alpha	0.066	9.510E-02	68.0	21/0.21
		02/17/66	03/08/66	02/26/66	66-1894	03/08/66	10	900	Gross Alpha	0.075	2.360E-02	62.0	19/0.19
		02/25/66	03/19/66	03/08/66	66-2228	03/19/66	11	920	Gross Alpha	0.002	1.060E-01	1.5	0.46/0.0046
		02/27/66	03/19/66	03/09/66	66-2313	03/19/66	10	1350	Gross Alpha	0.061	8.870E-02	50.0	15/0.15
		02/10/66	03/08/66	02/23/66	66-2451	03/08/66	13	1250	Gross Alpha	0.012	1.420E-02	11.0	3.4/0.034
		02/13/66	03/23/66	03/04/66	66-2583	03/23/66	19	1600	Gross Alpha	0.060	8.030E-02	61.0	19/0.19
		02/25/66	03/19/66	03/08/66	66-2225	03/19/66	11	1000	Gross Alpha	0.037	9.770E-02	32.0	9.8/0.098
		01/25/66	03/13/66	02/17/66	66-2547	03/13/66	24	750	Gross Alpha	0.098	1.010E-01	110.0	34/0.34
		02/13/66	03/08/66	02/24/66	66-2467	03/08/66	12	1000	Gross Alpha	0.032	1.970E-02	29.0	8.9/0.089
		01/18/66	02/03/66	01/26/66	66-1825	02/03/66	8	600	Gross Alpha	0.050	1.238E-02	35.0	11/0.11
		02/13/66	03/19/66	03/02/66	66-2182	03/19/66	17	900	Gross Alpha	0.072	1.800E-02	71.0	22/0.22

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Results of Modeling Individuals with Samples Assumed to be "Uncontaminated."

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NAME	SSN	START EXPOSURE DATE	END EXPOSURE DATE	ESTIMATED ACUTE EXPOSURE DATE	SAMPLE #	SAMPLE DATE	ELAPSED DAYS	SAMPLE VOLUME (mL)	ANALYSIS	RESULT (pCi/ sample)	+/- (pCi/ sample)	INTAKE (1000s pCi)	50-YEAR CEDE (rem/Sv)
(b) (6)	(b) (6)	02/21/66	03/10/66	03/01/66	66-1946	03/18/66	17	1690	Gross Alpha	0.093	7.460E-02	92.0	28/0.28
		01/18/66	01/20/66	01/19/66	66-1130	01/20/66	1	780	Gross Alpha	0.048	2.310E-02	4.0	1.2/0.012
		02/10/66	03/18/66	02/28/66	66-2262	03/18/66	18	988	Gross Alpha	0.055	9.120E-02	55.0	17/0.17
		01/18/66	02/23/66	02/05/66	66-1246	02/23/66	18	1340	Gross Alpha	0.040	2.410E-02	40.0	12/0.12
		02/13/66	03/18/66	03/01/66	66-2234	03/18/66	17	780	Gross Alpha	0.093	1.220E-01	91.0	28/0.28
		03/12/66	03/13/66	03/12/66	66-2387	03/13/66	1	1300	Gross Alpha	0.045	8.760E-02	3.8	1.2/0.012
		01/18/66	02/03/66	01/26/66	66-1815	02/03/66	8	190 (12-hr)	Gross Alpha	0.018	4.500E-03	26.0	8/0.08
		03/26/66	04/07/66	04/01/66	66-3104	04/13/66	12	900	Gross Alpha	0.094	5.500E-02	83.0	25/0.25
		02/25/66	03/19/66	03/08/66	66-2317	03/19/66	11	790	Gross Alpha	0.072	8.850E-02	62.0	19/0.19
		02/10/66	03/19/66	02/28/66	66-2149	03/19/66	19	800	Gross Alpha	0.009	7.360E-02	8.0	2.5/0.025
		02/10/66	03/08/66	02/22/66	66-2386	03/09/66	15	450	Gross Alpha	0.078	1.215E-01	74.0	23/0.23
		01/18/66	01/29/66	01/23/66	66-1142	01/29/66	6	380	Gross Alpha	0.022	2.080E-02	12.0	3.7/0.037
		02/18/66	03/08/66	02/27/66	66-2455	03/08/66	9	550	Gross Alpha	0.026	2.460E-02	21.0	6.5/0.065
		03/14/66	03/20/66	03/17/66	66-2303	03/20/66	3	420	Gross Alpha	0.026	8.270E-02	4.7	1.4/0.014
					66-1093	02/22/66		520	Gross Alpha	7.08	6.900E-01		
(b) (6)	(b) (6)	03/14/66	03/19/66	03/16/66	66-2334	03/19/66	3	900	Gross Alpha	0.022	7.310E-02	4.7	1.4/0.014
		02/13/66	03/08/66	02/24/66	66-2431	03/08/66	12	750	Gross Alpha	0.024	2.280E-02	21.0	6.5/0.065
		01/18/66	02/28/66	02/07/66	66-1078	02/28/66	21	1100	Pu239	0.062	1.550E-02	65.0	20/0.2
		02/25/66	03/19/66	03/08/66	66-2196	03/19/66	11	1000	Gross Alpha	0.041	1.013E-02	35.0	11/0.11
		02/11/66	03/08/66	02/23/66	66-2443	03/08/66	13	650	Gross Alpha	0.016	3.160E-02	15.0	4.6/0.046
		01/24/66	03/08/66	02/14/66	66-2599	03/08/66	22	1250	Gross Alpha	0.067	8.800E-02	80.0	25/0.25
		02/18/66	03/19/66	03/04/66	66-2329	03/19/66	15	875	Gross Alpha	0.083	9.540E-02	78.0	24/0.24
		02/06/66	02/28/66	02/17/66	66-1363	02/28/66	11	730 (12-hr)	Gross Alpha	0.018	4.500E-03	31.0	9.5/0.095
		02/06/66	02/28/66	02/17/66	66-1370	02/28/66	11	920 (12-hr)	Gross Alpha	0.050	1.238E-02	85.0	26/0.26
		01/18/66	02/23/66	02/05/66	66-1244	02/23/66	18	1200	Gross Alpha	0.086	2.280E-02	86.0	26/0.26
		01/18/66	03/28/66	02/21/66	66-1992	03/28/66	35	1350	Gross Alpha	0.041	1.013E-02	50.0	15/0.15
					66-910	02/18/66		1900	Gross Alpha	3.44	2.090E+00		
					66-1396	03/02/66		1620	Gross Alpha	0.444	3.840E-01		
(b) (6)	(b) (6)	01/18/66	03/01/66	02/08/66	66-1847	03/01/66	21	520	Gross Alpha	0.058	8.910E-02	61.0	19/0.19
		02/21/66	03/19/66	03/06/66	66-2204	03/19/66	13	1000	Gross Alpha	0.032	7.875E-03	29.0	8.9/0.089
		01/21/66	03/19/66	02/18/66	66-2188	03/19/66	29	1500	Gross Alpha	0.032	7.875E-03	36.0	11/0.11
		02/17/66	03/08/66	02/26/66	66-1893	03/08/66	10	700	Gross Alpha	0.017	3.010E-02	14.0	4.3/0.043
		03/14/66	03/19/66	03/16/66	66-2326	03/19/66	3	880	Gross Alpha	0.083	9.500E-01	17.0	5.2/0.052
					66-1072	01/29/66		1040	Pu239	ND	ND		
(b) (6)	(b) (6)	02/27/66	03/08/66	03/03/66	66-2433	03/08/66	5	500	Gross Alpha	0.042	2.250E-02	17.0	5.2/0.052
		02/10/66	03/06/66	02/22/66	66-1956	03/06/66	12	1100	Gross Alpha	0.076	7.520E-02	67.0	21/0.21
		03/14/66	03/19/66	03/16/66	66-2151	03/19/66	3	925	Gross Alpha	0.070	8.800E-02	15.0	4.6/0.046

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NAME	SSN	START EXPOSURE DATE	END EXPOSURE DATE	ESTIMATED ACUTE EXPOSURE DATE	SAMPLE #	SAMPLE DATE	ELAPSED DAYS	SAMPLE VOLUME (mL)	ANALYSIS	RESULT (pCi/ sample)	+/- (pCi/ sample)	INTAKE (1000s pCi)	50-YEAR CEDE (rem/Sv)
(b) (6)	(b) (6)	01/18/66	03/18/66	02/16/66	66-2260	03/18/66	30	700	Gross Alpha	0.097	1.092E-01	110.0	34/0.34
		02/23/66	03/19/66	03/07/66	66-2202	03/19/66	12	600	Gross Alpha	0.032	7.875E-03	28.0	8.6/0.086
		02/11/66	03/18/66	02/28/66	66-2275	03/18/66	18	950	Gross Alpha	0.055	8.100E-02	55.0	17/0.17
		01/18/66	01/29/66	01/23/66	66-1143	01/29/66	6	590	Gross Alpha	0.033	2.360E-02	18.0	5.5/0.055
		02/21/66	03/19/66	03/06/66	66-2201	03/19/66	13	650	Gross Alpha	0.032	7.875E-03	29.0	8.9/0.089
		02/08/66	02/28/66	02/18/66	66-1359	02/28/66	10	850 (12-hr)	Gross Alpha	0.072	1.803E-02	120.0	37/0.37
		01/24/66	02/22/66	02/07/66	66-1337	02/22/66	15	425	Gross Alpha	0.030	1.940E-02	29.0	8.9/0.089
		01/25/66	04/11/66	03/04/66	66-3413	06/07/66	95	980	Gross Alpha	0.075	4.590E-02	110.0	34/0.34
					66-258	01/21/66		1160	Gross Alpha	6.33	1.960E+00		
					66-406	02/02/66		4822	Gross Alpha	ND	ND		
					66-558	02/03/66		1440	Gross Alpha	2.66	1.840E+00		
					66-564	02/04/66		1660	Gross Alpha	6.97	1.743E+00		
(b) (6)	(b) (6)	02/13/66	03/19/66	03/02/66	66-2195	03/19/66	17	950	Gross Alpha	0.032	7.950E-03	31.0	9.5/0.095
		02/08/66	02/28/66	02/18/66	66-1360	02/28/66	10	900 (12-hr)	Gross Alpha	0.059	1.465E-02	96.0	29/0.29
		01/30/66	03/18/66	02/22/66	66-2106	03/18/66	24	900	Gross Alpha	0.055	5.650E-02	60.0	18/0.18
		03/14/66	03/19/66	03/16/66	66-2331	03/19/66	3	910	Gross Alpha	0.028	1.359E-01	6.0	1.8/0.018
		01/18/66	03/01/66	02/08/66	66-1515	03/01/66	21	1315	Pu239	0.073	1.356E-01	76.0	23/0.23
					66-347	02/04/66		900	Pu239	83.8	4.900E+00		
					66-2233	03/18/66		900	Gross Alpha	0.2	6.540E-01		
(b) (6)	(b) (6)	01/18/66	01/29/66	01/23/66	66-1081	01/29/66	6	670	Pu239	0.018	4.500E-03	9.5	2.9/0.029
		02/18/66	03/04/66	02/25/66	66-2340	03/04/66	7	860	Gross Alpha	0.036	7.258E-02	23.0	7.1/0.071
		01/18/66	01/20/66	01/19/66	66-1129	01/20/66	1	450	Gross Alpha	0.030	1.710E-02	2.6	0.8/0.008
		01/18/66	03/10/66	02/12/66	66-1954	03/10/66	26	1100	Gross Alpha	0.044	2.409E-02	50.0	15/0.15
		02/23/66	03/19/66	03/07/66	66-2191	03/19/66	12	600	Gross Alpha	0.081	2.025E-02	72.0	22/0.22
		02/27/66	03/08/66	03/03/66	66-2458	03/08/66	5	1000	Gross Alpha	0.028	1.680E-02	12.0	3.7/0.037
		01/18/66	03/08/66	02/11/66	66-2439	03/08/66	25	750	Gross Alpha	0.014	1.755E-02	15.0	4.6/0.046
		02/23/66	03/19/66	03/07/66	66-2081	03/19/66	12	960	Gross Alpha	0.096	7.640E-02	85.0	26/0.26
		02/10/66	03/19/66	02/28/66	66-2043	03/19/66	19	830	Gross Alpha	0.092	6.810E-02	93.0	29/0.29
		01/21/66	03/16/66	02/17/66	66-2027	03/16/66	27	630	Gross Alpha	0.067	6.310E-02	76.0	23/0.23
		02/21/66	03/18/66	03/05/66	66-2098	03/18/66	13	290	Gross Alpha	0.076	6.600E-02	69.0	21/0.21
		02/27/66	03/18/66	03/08/66	66-2271	03/18/66	10	750	Gross Alpha	0.020	1.120E-01	16.0	4.9/0.049
		01/18/66	04/11/66	02/28/66	66-3203	04/25/66	56	1080	Gross Alpha	0.421	0.184	580.0	180/1.8
												mean =	92.45/0.9245
(b) (6)	(b) (6)	02/11/66	03/19/66	03/01/66	66-2231	03/19/66	18	750	Gross Alpha	0.029	6.315E-02	29.0	8.9/0.089
		01/18/66	02/03/66	01/26/66	66-1840	02/03/66	8	650	Gross Alpha	0.009	2.250E-03	6.4	2/0.02
		02/06/66	02/28/66	02/17/66	66-1313	02/28/66	11	800 (12-hr)	Gross Alpha	0.018	4.500E-03	28.0	8.6/0.086
		02/27/66	03/08/66	03/03/66	66-2463	03/08/66	5	975	Gross Alpha	0.044	1.640E-02	18.0	5.5/0.055

NR - Not Reported; ND - No Detectable Activity; n/a - not available

Results of Modeling Individuals with Samples Assumed to be "Uncontaminated."

Cell shaded = Additional sample for Indiv not modeled since >0.1 pCi/sample, NR, or ND

NAME	SSN	START EXPOSURE DATE	END EXPOSURE DATE	ESTIMATED ACUTE EXPOSURE DATE	SAMPLE #	SAMPLE DATE	ELAPSED DAYS	SAMPLE VOLUME (mL)	ANALYSIS	RESULT (pCi/ sample)	+/- (pCi/ sample)	INTAKE (1000s pCi)	50-YEAR CEDE (rem/Sv)
(b) (6)	(b) (6)	01/18/66	01/29/66	01/23/66	66-1083	01/29/66	6	690	Pu239	0.062	1.550E-02	33.0	10/0.1
		02/18/66	03/08/66	02/27/66	66-2466	03/08/66	9	450	Gross Alpha	0.090	2.320E-02	69.0	21/0.21
		03/26/66	04/10/66	04/02/66	66-3206	04/21/66	19	875 (12-hr)	Gross Alpha	0.076	6.240E-02	150.0	46/0.46
		02/09/66	02/28/66	02/18/66	66-1362	02/28/66	10	675 (12-hr)	Gross Alpha	0.041	1.013E-02	66.0	20/0.2
		02/11/66	03/19/66	03/01/66	66-2169	03/19/66	18	650	Gross Alpha	0.047	1.163E-02	47.0	14/0.14
		01/22/66	03/13/66	02/16/66	66-2541	03/13/66	25	1400	Gross Alpha	0.059	1.463E-02	65.0	20/0.2
		02/17/66	03/08/66	02/26/66	66-1890	03/08/66	10	890	Gross Alpha	0.087	3.460E-02	71.0	22/0.22
		01/18/66	01/29/66	01/23/66	66-1076	01/29/66	6	510	Pu239	0.079	1.975E-02	42.0	13/0.13
		02/25/66	03/19/66	03/08/66	66-2203	03/19/66	11	950	Gross Alpha	0.032	7.875E-03	27.0	8.3/0.083
		02/21/66	03/18/66	03/05/66	66-2255	03/18/66	13	720	Gross Alpha	0.081	1.022E-01	73.0	22/0.22
		01/18/66	03/19/66	02/17/66	66-2042	03/19/66	30	300	Gross Alpha	0.078	7.120E-02	89.0	27/0.27
		02/13/66	03/16/66	02/28/66	66-2029	03/16/66	16	620	Gross Alpha	0.095	8.590E-02	92.0	28/0.28
		02/09/66	03/04/66	02/20/66	66-2382	03/04/66	12	600	Gross Alpha	0.062	8.760E-02	55.0	17/0.17
		01/18/66	01/21/66	01/19/66	66-1127	01/21/66	2	590	Gross Alpha	0.064	2.270E-02	8.7	2.7/0.027
		02/05/66	03/08/66	02/20/66	66-1888	03/08/66	16	810	Gross Alpha	0.037	2.010E-02	35.0	11/0.11
		02/24/66	03/08/66	03/02/66	66-1884	03/08/66	6	600	Gross Alpha	0.018	2.010E-02	9.4	2.9/0.029
		03/14/66	03/19/66	03/16/66	66-2138	03/19/66	3	550	Gross Alpha	0.066	8.040E-02	14.0	4.3/0.043
		02/10/66	03/08/66	02/23/66	66-2435	03/08/66	13	400	Gross Alpha	0.024	1.390E-02	22.0	6.8/0.068
		02/10/66	03/08/66	02/23/66	66-2432	03/08/66	13	1000	Gross Alpha	0.013	2.170E-02	11.0	3.4/0.034
		02/10/66	03/19/66	02/28/66	66-2185	03/19/66	19	400	Gross Alpha	0.059	1.463E-02	59.0	18/0.18
		02/13/66	03/18/66	03/01/66	66-2250	03/18/66	17	830	Gross Alpha	0.005	9.047E-02	5.0	1.5/0.015
		02/06/66	02/28/66	02/17/66	66-1374	02/28/66	11	930 (12-hr)	Gross Alpha	0.072	1.803E-02	120.0	37/0.37
		02/27/66	03/19/66	03/09/66	66-2321	03/19/66	10	550	Gross Alpha	0.010	5.176E-02	8.6	2.6/0.026
		01/18/66	02/03/66	01/26/66	66-1824	02/03/66	8	760	Gross Alpha	0.018	4.500E-03	13.0	4/0.04
		01/24/66	03/04/66	02/12/66	66-2374	03/04/66	20	1300	Gross Alpha	0.026	7.150E-02	27.0	8.3/0.083
		01/18/66	02/03/66	01/26/66	66-1818	02/03/66	8	930	Gross Alpha	0.041	1.013E-02	29.0	8.9/0.089
		01/18/66	02/03/66	01/26/66	66-1828	02/03/66	8	300	Gross Alpha	0.099	2.478E-02	70.0	22/0.22
					66-2400	03/09/66		350	Gross Alpha	0.343	1.850E-01		
(b) (6)	(b) (6)	01/18/66	03/13/66	02/14/66	66-2540	03/13/66	27	400	Gross Alpha	0.050	1.238E-02	56.0	17/0.17
		01/31/66	03/18/66	02/23/66	66-2272	03/18/66	23	300	Gross Alpha	0.083	1.029E-01	90.0	28/0.28
		02/10/66	03/08/66	02/23/66	66-2441	03/08/66	13	950	Gross Alpha	0.004	1.642E-02	3.8	1.2/0.012
		02/13/66	03/19/66	03/02/66	66-2222	03/19/66	17	900	Gross Alpha	0.066	8.046E-02	65.0	20/0.2
		02/13/66	03/19/66	03/02/66	66-2197	03/19/66	17	600	Gross Alpha	0.030	7.500E-03	30.0	9.2/0.092
		02/24/66	03/19/66	03/07/66	66-2171	03/19/66	12	750	Gross Alpha	0.081	2.025E-02	72.0	22/0.22
		02/03/66	02/25/66	02/14/66	66-1339	02/25/66	11	490	Gross Alpha	0.062	2.420E-02	53.0	16/0.16
		02/18/66	03/09/66	02/27/66	66-2054	03/09/66	10	1480	Gross Alpha	0.075	7.120E-02	61.0	19/0.19
		02/08/66	03/08/66	02/22/66	66-1881	03/08/66	14	900	Gross Alpha	0.036	2.190E-02	33.0	10/0.1

NR - Not Reported; ND - No Detectable Activity; n/a - not available

Results of Modeling Individuals with Samples Assumed to be "Uncontaminated."

Cell shaded = Additional sample for indiv not modeled since >0.1 pCi/sample, NR, or ND

NAME	SSN	START EXPOSURE DATE	END EXPOSURE DATE	ESTIMATED ACUTE EXPOSURE DATE	SAMPLE #	SAMPLE DATE	ELAPSED DAYS	SAMPLE VOLUME (mL)	ANALYSIS	RESULT (pCi/ sample)	+/- (pCi/ sample)	INTAKE (1000s pCi)	50-YEAR CEDE (rem/Sv)
(b) (6)	(b) (6)	02/13/66	03/08/66	02/24/66	66-2468	03/08/66	12	350	Gross Alpha	0.020	1.580E-02	18.0	5.5/0.055
		01/20/66	03/20/66	02/18/66	66-2298	03/20/66	30	870	Gross Alpha	0.075	1.157E-01	88.0	27/0.27
		02/11/66	03/08/66	02/23/66	66-2428	03/08/66	13	1000	Gross Alpha	0.029	1.920E-02	27.0	8.3/0.083
		02/21/66	03/19/66	03/06/66	66-2145	03/19/66	13	470	Gross Alpha	0.081	1.020E-01	74.0	23/0.23
		02/08/66	03/19/66	02/27/66	66-2199	03/19/66	20	400	Gross Alpha	0.045	1.125E-02	46.0	14/0.14
		01/18/66	02/03/66	01/26/66	66-1842	02/03/66	8	280	Gross Alpha	0.018	4.500E-03	13.0	40/0.4
		02/09/66	03/09/66	02/23/66	66-2405	03/09/66	14	1500	Gross Alpha	0.025	1.640E-02	23.0	7.1/0.071
		03/11/66	03/19/66	03/15/66	66-2190	03/19/66	4	700	Gross Alpha	0.050	1.238E-02	15.0	4.6/0.046
		01/18/66	01/29/66	01/23/66	66-1205	01/29/66	6	1440	Gross Alpha	0.055	2.230E-01	29.0	8.9/0.089
		02/09/66	03/08/66	02/22/66	66-1902	03/08/66	14	850	Gross Alpha	0.093	7.460E-02	87.0	27/0.27
		03/11/66	03/19/66	03/15/66	66-2550	03/19/66	4	320	Gross Alpha	0.079	8.700E-02	24.0	7.4/0.074
		01/18/66	01/22/66	01/20/66	66-1137	01/22/66	2	925	Gross Alpha	0.079	2.890E-02	11.0	3.4/0.034
												mean =	5.4/0.054
(b) (6)	(b) (6)	01/18/66	03/08/66	02/11/66	66-2444	03/08/66	25	1500	Gross Alpha	0.050	2.150E-02	55.0	17/0.17
		02/25/66	03/23/66	03/10/66	66-2591	03/23/66	13	1000	Gross Alpha	0.055	1.150E-01	50.0	15/0.15
		01/18/66	03/09/66	02/12/66	66-2404	03/09/66	25	900	Gross Alpha	0.009	2.253E-03	10.0	3.1/0.031
		01/17/66	02/03/66	01/25/66	66-1827	02/03/66	9	400	Gross Alpha	0.050	1.238E-02	38.0	12/0.12
		01/18/66	03/12/66	02/13/66	66-2039	03/12/66	27	1240	Gross Alpha	0.060	5.620E-02	6.8	21/0.21
		03/14/66	03/19/66	03/16/66	66-2316	03/19/66	3	760	Gross Alpha	0.090	9.500E-02	19.0	5.8/0.058
		01/18/66	03/28/66	02/21/66	66-2676	03/28/66	35	1450	Gross Alpha	0.040	7.210E-02	49.0	15/0.15
		01/25/66	02/21/66	02/07/66	66-1242	02/26/66	19	2000	Gross Alpha	0.032	2.530E-02	33.0	10/0.1
					66-1105	01/24/66		1010	Gross Alpha	ND	ND		
(b) (6)	(b) (6)	01/18/66	03/17/66	02/16/66	66-2644	03/17/66	29	750	Gross Alpha	0.049	8.100E-02	57.0	18/0.18
					66-805	02/09/66		530	Gross Alpha	NR	NR		
					66-2643	03/16/66		550	Gross Alpha	0.14	1.130E-01		
(b) (6)	(b) (6)	02/06/66	02/06/66	02/07/66	66-1376	02/08/66	1	920	Gross Alpha	0.099	2.475E-02	8.4	2.6/0.026
		02/27/66	03/08/66	03/03/66	66-2494	03/08/66	5	1000	Gross Alpha	0.027	6.750E-03	11.0	3.4/0.034
		03/14/66	03/19/66	03/16/66	66-2184	03/19/66	3	960	Gross Alpha	0.081	2.025E-02	17.0	5.2/0.052
		02/27/66	03/08/66	03/03/66	66-2440	03/08/66	5	600	Gross Alpha	0.026	1.660E-02	11.0	3.4/0.034
		02/06/66	02/28/66	02/17/66	66-1367	02/28/66	11	675 (12-hr)	Gross Alpha	0.059	1.465E-02	100.0	31/0.31
		03/14/66	03/19/66	03/16/66	66-2075	03/19/66	3	940	Gross Alpha	0.091	1.020E-01	19.0	5.8/0.058
		02/10/66	03/08/66	02/23/66	66-2427	03/08/66	13	1000	Gross Alpha	0.042	2.610E-02	38.0	12/0.12
		02/11/66	03/16/66	02/27/66	66-2585	03/16/66	17	1000	Gross Alpha	0.052	8.050E-02	52.0	16/0.16
					66-1920	03/03/66		900	Gross Alpha	0.188	8.400E-02		
(b) (6)	(b) (6)	02/13/66	03/19/66	03/02/66	66-2567	03/19/66	17	850	Gross Alpha	0.040	7.210E-02	39.0	12/0.12
		01/18/66	03/09/66	02/12/66	66-2065	03/09/66	25	550	Gross Alpha	0.073	8.400E-02	80.0	25/0.25
		01/18/66	01/29/66	01/23/66	66-1075	01/29/66	6	1335	Pu239	0.062	1.550E-02	33.0	10/0.1

NR - Not Reported; ND - No Detectable Activity; n/a - not available

Results of Modeling Individuals with Samples Assumed to be "Uncontaminated."

Cell shaded = Additional sample for indiv not modeled since >0.1 pCi/sample, NR, or ND

NAME	SSN	START EXPOSURE DATE	END EXPOSURE DATE	ESTIMATED ACUTE EXPOSURE DATE	SAMPLE #	SAMPLE DATE	ELAPSED DAYS	SAMPLE VOLUME (mL)	ANALYSIS	RESULT (pCi/ sample)	+/- (pCi/ sample)	INTAKE (1000s pCi)	50-YEAR CEDE (remISv)
(b) (6)	(b) (6)	01/19/66	02/03/66	01/26/66	66-2683	03/27/66	60	1720	Gross Alpha	0 069	8 800E-02	97 0	30/0 3
		01/18/66	02/03/66	01/26/66	66-1819	02/03/66	8	410	Gross Alpha	0 032	7 875E-03	22 0	6 8/0 068
		02/09/66	03/08/66	02/22/66	66-1885	03/08/66	14	1300	Gross Alpha	0 054	1 980E-02	50 0	15/0 15
		01/18/66	01/26/66	01/22/66	66-1120	01/26/66	4	410	Gross Alpha	0 042	1 900E-02	13 0	4/0 04
		01/18/66	01/29/66	01/23/66	66-1084	01/29/66	6	650	Pu239	0 062	1 550E-02	33 0	10/0 1
		01/18/66	02/28/66	02/07/66	66-1371	02/28/66	21	915 (12-hr)	Gross Alpha	0 072	1 803E-02	150 0	46/0 46
		01/20/66	02/15/66	02/02/66	66-1232	02/18/66	16	790	Gross Alpha	0 032	1 280E-01	31 0	9 5/0 095
		02/10/66	03/08/66	02/23/66	66-1886	03/08/66	13	1250	Gross Alpha	0 017	3 150E-02	15 0	4 6/0 046
		02/21/66	03/19/66	03/06/66	66-2192	03/19/66	13	900	Gross Alpha	0 018	4 500E-03	16 0	4 9/0 049
		01/18/66	03/18/66	02/16/66	66-2238	03/18/66	30	500	Gross Alpha	0 048	9 000E-02	56 0	17/0 17
		02/10/66	03/08/66	02/23/66	66-2459	03/08/66	13	650	Gross Alpha	0 028	2 310E-02	26 0	8/0 08
		02/27/66	03/08/66	03/03/66	66-2507	03/08/66	5	400	Gross Alpha	0 050	1 238E-02	21 0	6 5/0 065
		02/09/66	02/16/66	02/12/66	66-1235	02/19/66	7	1400	Gross Alpha	0 038	2 210E-02	24 0	7 4/0 074
		01/18/66	01/29/66	01/23/66	66-1068	01/29/66	6	1000	Pu239	0 035	8 750E-03	19 0	5 8/0 058

NR - Not Reported; ND - No Detectable Activity; n/a - not available

APPENDIX C.4

REMAINING CASES

Portions of this report have been designated records subject to the restriction of the Privacy Act, 5 U.S.C. 552(a) and are so marked.

APPENDIX C.4 REMAINING CASES

Most of those who responded to the Palomares Broken Arrow submitted one urine sample that was collected during their time on site at Camp Wilson, or nearby. Furthermore, these generally were collected with containers designed for other purposes and under conditions that provided only limited protection against contamination with plutonium in blowing dust. Also, analysis of most of the samples by the gross alpha counting method served primarily as a screening for further study. Since most of the responders were not identified for follow-up, their initial samples were their only sample.

A small number of those in this group initially qualified for assessment in the "Contamination Cutoff" Cases. However, the chemical recovery for the samples processed for alpha spectrometry did not meet the criterion established for this study. Therefore, the data for these individuals are reported in this Remaining Cases category.

Intake and dose assessments were not performed for the cases in this category because the data were considered unreliable. Possible sample contamination, laboratory contamination, and uncertain recording of collection information limit the usefulness of these data for assessing intake and dose. The urine results ranged from 0 to 237.9 pCi per sample. The latter sample, collected three days after the first airmen arrived at the accident site, represents a prime example of possible contamination. That sample was the only sample available for the individual concerned. Personal discussions with one of the first responders indicated that the initial samples were collected using wine, milk, and any other type of bottle available in the village. (Skaar 1999).

The following pages provide a listing of the results for the Remaining Cases. If evaluated, the results documented would produce intakes ranging from about 75,000 pCi to 20,000,000 pCi

corresponding to CEDEs of about 23 rem to 6,000 rem (0.23 to 60 Sv). Results of this magnitude require careful evaluation. The listings contain the basic sample identifying, collection and result information. Hardcopy laboratory records support each of the entries and are maintained by the Air Force.

Individuals with Urine Samples Classified as Remaining Cases

Name	SSN	Estimated Start Exposure Date	Estimated End Exposure Date	Estimated Acute Exposure Date	Sample No.	Sample Date	Sample Vol (mL)	Base	Sample Anal	Date Anal	Result (pCi/sample)	24hr Activity (pCi/day)	Recorded Systemic Body Burden
(b) (6)	(b) (6)	01/18/66	03/08/66	02/11/66	66-2475	03/08/66	1000	Torrejon	1000	N/A	0.131	0.157	n/a
		02/12/66	02/12/66	02/12/66	66-2867	04/11/66	1800	Torrejon	1800	N/A	1.10+/-0.27	1.1	
					66-2867	04/11/66	1800 (22-hr)			08/30/66	NR	NR	
(b) (6)	(b) (6)	01/24/66	02/26/66	02/09/66	66-1428	02/26/66	600	Moron	624	N/A	ND	ND	0
		03/12/66	03/19/66	03/15/66	66-2146	03/19/66	850	Torrejon	850	N/A	0.179+/-0.118	0.253	0.000335
		02/09/66	03/23/66	03/02/66	66-2866	04/06/66	1100	Torrejon	1100	N/A	1.04+/-0.26	1.135	n/a
				03/02/66	66-2866	04/06/66	1100			07/21/66	1.21+/-0.030	1.320	
(b) (6)	(b) (6)	01/17/66	02/26/66	02/06/66	66-1403	02/26/66	660	Torrejon	685	N/A	ND	ND	0
		02/20/66	03/09/66	02/28/66	66-2885	04/02/66	1500	Torrejon	1500	N/A	0.137+/-0.107	0.137	n/a
					66-2885	04/02/66	1500			08/16/66	NR	NR	
(b) (6)	(b) (6)	01/18/66	01/25/66	01/21/66	66-1097	01/25/66	850	Wiesbaden	850	03/17/66	ND	ND	0
		03/14/66	03/19/66	03/16/66	66-2912	03/19/66	550	Torrejon	550	N/A	0.189+/-0.124	0.412	0.000274
		01/18/66	01/21/66	01/19/66	66-213	01/21/66	430	Torrejon	200	N/A	NR	NR	n/a
		01/18/66	01/21/66	01/19/66	66-231	01/21/66	475	Torrejon	200	N/A	0.225 +/- 0.111	0.568	n/a
		01/18/66	01/21/66	01/19/66	66-233	01/21/66	475	Torrejon	200	N/A	0.225 +/- 0.111	0.568	n/a
		01/28/66	02/26/66	02/11/66	66-1402	02/26/66	1000	Torrejon	1000	N/A	1.04+/-1.68	1.248	0
		01/18/66	02/07/66	01/28/66	66-496	02/07/66	600	Moron	200	N/A	3.89+/-1.05	7.780	0.0252
		03/12/66	03/19/66	03/15/66	66-2073	03/19/66	490	Torrejon	490	N/A	0.141+/-0.083	0.345	0
		02/13/66	03/08/66	02/24/66	66-2498	03/08/66	950	Moron	950	N/A	ND	ND	0
		02/06/66	02/26/66	02/17/66	66-1379	02/28/66	500	Torrejon	520	N/A	ND	ND	0
					66-1379	02/28/66	500			08/29/66	NR	NR	
(b) (6)		03/14/66	03/20/66	03/17/66	66-2294	03/20/66	950	Moron	950	N/A	0.162+/-0.136	0.205	0.00027
		01/25/66	02/09/66	02/01/66	66-732	02/09/66	860	Hanaw, Germany	200	N/A	2.62+/-1.07	3.656	0.0125
		01/25/66	02/09/66	02/01/66	66-813	02/09/66	680 (12-hr)	Hanaw, Germany	200	N/A	1.48+/-0.60	1.480	0.00927
		01/25/66	02/09/66	02/01/66	66-739	02/09/66	940	Hanaw, Germany	200	N/A	1.37+/-0.74	1.749	0.00596
		01/24/66	03/08/66	02/14/66	66-1872	03/08/66	940	Naval Station Rota, Spain	978	N/A	0.344	0.439	0.002
(b) (6)	(b) (6)	01/18/66	02/04/66	01/26/66	66-365	02/04/66	550	Moron	200	N/A	1.36+/-0.59	2.967	0.00681
		01/18/66	03/16/66	02/15/66	66-2024	03/16/66	300	American Embassy, Madrid	300	N/A	0.103 +/-0.077	0.412	0
(b) (6)	(b) (6)	01/18/66	02/08/66	01/28/66	66-834	02/08/66	740 (12-hr)	Moron	200	N/A	1.47+/-0.81	1.470	0.00773
		01/18/66	01/21/66	01/19/66	66-266	01/21/66	900	Torrejon	200	N/A	0.612 +/- 0.211	0.816	n/a
		01/18/66	02/08/66	01/28/66	66-551	02/08/66	1040	Offutt AFB, NE	200	N/A	3.11+/-0.99	3.588	0.0101
		01/20/66	02/06/66	01/28/66	66-915	02/06/66	610	Torrejon	200	N/A	ND	ND	0
		01/18/66	01/30/66	01/24/66	66-1146	01/30/66	700	656 Eng. Bn., APO09081	700	N/A	ND	ND	0
(b) (6)		01/17/66	01/17/66	01/17/66	66-1350	01/17/66	610	Moron	634	N/A	0.271+/-0.157	0.533	0.000662
		01/18/66	01/21/66	01/19/66	66-209	01/21/66	300	Torrejon	86	N/A	3.51 +/- 0.96	14.040	n/a
		01/18/66	01/21/66	01/19/66	66-212	01/21/66	480	Torrejon	200	N/A	NR	NR	n/a
		02/04/66	02/25/66	02/14/66	66-1483	03/04/66	1200	USS Amphion AR-13	1000	N/A	0.1884 +/- 0.6132	0.188	0
(b) (6)	(b) (6)	01/20/66	02/07/66	01/29/66	66-481	02/07/66	850	Toul Rosieres	200	N/A	ND	ND	0
		02/18/66	03/04/66	02/25/66	66-2339	03/04/66	400	Moron	400	N/A	ND	ND	0
		02/06/66	02/27/66	02/16/66	66-1387	02/28/66	440	Torrejon	457	N/A	1.3	3.545	0.005
		02/25/66	03/18/66	03/07/66	66-2214	03/18/66	900	Moron	900	N/A	0.105+/-0.102	0.140	0.000448
		01/18/66	01/21/66	01/19/66	66-237	01/21/66	425	Torrejon	200	N/A	NR	NR	n/a
					66-240	01/21/66	425	Torrejon	200	N/A	NR	NR	n/a
(b) (6)	(b) (6)	02/03/66	03/14/66	02/22/66	66-3113	04/13/66	1525	Moron	762	N/A	0.429+/-0.153	0.429	n/a
		02/10/66	03/19/66	02/28/66	66-2157	03/19/66	910	Torrejon	190	N/A	0.129+/-0.114	0.170	0.00084
		01/18/66	02/13/66	01/31/66	66-1443	02/15/66	570	Moron	570	03/17/66	0.25+/-0.22	0.526	0.00246
		02/25/66	03/29/66	03/13/66	66-2284	03/29/66	875	Moron	875	N/A	0.119+/-0.115	0.163	0.00097
		01/18/66	03/13/66	02/14/66	66-2537	03/13/66	800	Moron	800	N/A	0.342	0.513	
		02/11/66	03/19/66	03/01/66	66-2217	03/19/66	950	Moron	950	N/A	0.260+/-0.152	0.328	0.00212
		02/13/66	03/18/66	03/01/66	66-2268	03/18/66	500	Torrejon	500	N/A	0.100+/-0.95	0.240	0.0006
		01/18/66	03/09/66	02/12/66	66-2079	03/09/66	850	Torrejon	850	N/A	0.474+/-0.146	0.669	0.00545
		01/25/66	04/11/66	03/04/66	66-3112	04/13/66	1310	Moron	655	05/17/66	0.348+/-0.130	0.348	
		01/18/66	02/07/66	01/28/66	66-451	02/07/66	580	Torrejon	200	N/A	0.69+/-0.48	1.428	0.00436
		01/18/66	02/07/66	01/28/66	66-471	02/07/66	550	Torrejon	200	N/A	1.02+/-0.58	2.225	0.00721
		02/20/66	02/20/66	02/20/66	66-2689	03/27/66	900	Torrejon	900	N/A	0.150+/-0.107	0.200	
		02/08/66	02/26/66	02/17/66	66-1407	02/26/66	760	Moron	790	N/A	ND	ND	

Individuals with Urine Samples Classified as Remaining Cases

Name	SSN	Estimated Start Exposure Date	Estimated End Exposure Date	Estimated Acute Exposure Date	Sample No.	Sample Date	Sample Vol (mL)	Base	Sample Anal	Date Anal	Result (pCi/sample)	24hr Activity (pCi/day)	Recorded Systemic Body Burden
					66-1407	02/26/66	760			07/29/66	NR	NR	
(b) (6)	(b) (6)	01/18/66	03/04/66	02/09/66	66-2359	03/04/66	950	Albuquerque, NM	950	N/A	0.188+/-0.174	0.237	0.00059
		01/20/66	02/08/66	01/29/66	66-836	02/08/66	905	Toul Rosieres	200	N/A	ND	ND	
		01/30/66	03/01/66	02/14/66	66-1846	03/01/66	1600	Giessen	1600	N/A	0.417+/-0.170	0.417	
					66-1846	03/01/66	1600			07/05/66	0.187+/-0.098	0.187	
(b) (6)	(b) (6)	01/18/66	02/08/66	01/28/66	66-810	02/08/66	880 (12-hr)	Moron	200	N/A	NR	NR	
		03/03/66	03/18/66	03/10/66	66-2101	03/18/66	590	Torrejon	590	N/A	0.351+/-0.128	0.714	0.00186
		02/13/66	03/03/66	02/22/66	66-1919	03/03/66	600	Moron	600	N/A	0.362+/-0.142	0.724	
		01/18/66	03/03/66	02/09/66	66-1940	03/03/66	1500	Torrejon	1580	N/A	0.252+/-0.112	0 252	
		01/16/66	02/16/66	02/01/66	66-982	02/16/66	650	Torrejon	200	N/A	ND	ND	
		01/23/66	03/17/66	02/18/66	66-1104	02/21/66	1000	Pirmasens	1000	03/11/66	0.22+/-0.21	0.264	0.00148
					66-2647	03/17/66	2000	229 Signal BN	2000	N/A	0.144+/-0.135	0.144	
(b) (6)	(b) (6)	01/18/66	02/07/66	01/28/66	66-478	02/07/66	560	Torrejon	200	N/A	ND	ND	
		01/18/66	02/09/66	01/29/66	66-754	02/09/66	540	Moron	200	N/A	2.17+/-0.85	4.822	0.0172
		02/07/66	04/11/66	03/10/66	66-2997	04/27/66	850	Scott	850	N/A	0.802+/-0.232	1.132	
		01/18/66	02/03/66	01/26/66	66-1829	02/03/66	900	Torrejon	900	N/A	0.149	0.199	
		01/17/66	01/17/66	01/17/66	66-452	01/17/66	430	Torrejon	200	02/11/66	0.89+/-0.45	2.484	0.00763
		01/18/66	03/01/66	02/08/66	66-1477	03/01/66	1880	Offutt AFB, NE	1000	N/A	0.207+/-0.168	0.207	0.00141
		01/18/66	04/04/66	02/25/66	66-2892	04/04/66	1050	Vandenburg	1050	N/A	ND	ND	
		01/18/66	01/23/66	01/20/66	66-1103	01/23/66	1340	Pirmasens	1340	03/17/66	ND	ND	
		01/18/66	02/15/66	02/01/66	66-1155	02/15/66	280	Wheelus AF, Libya	280	03/17/66	0.30+/-0.14	1.286	0.00597
		03/14/66	03/19/66	03/16/66	66-2338	03/19/66	610	Moron	610	N/A	0.233+/-0.161	0.458	0.00034
		01/22/66	02/10/66	01/31/66	66-948	02/10/66	905	Torrejón	200	N/A	0.95+/-0.92	1.260	0.00478
		01/18/66	01/20/66	01/19/66	66-1116	01/20/66	810	Toul Rosieres	810	03/23/66	NR	NR	
		03/14/66	03/19/66	03/16/66	66-2320	03/19/66	900	Moron	900	N/A	0.292+/-0.156	0.389	0.00042
		01/18/66	03/13/66	02/14/66	66-2534	03/13/66	1000	Moron	1000	N/A	0	0.000	
		02/27/66	03/19/66	03/09/66	66-2327	03/19/66	700	Torrejon	700	N/A	0.349+/-0.204	0.598	0.00143
		02/21/66	03/18/66	03/05/66	66-2212	03/18/66	820	Zaragoza	820	N/A	0.472+/-0.196	0.691	0.00326
		02/18/66	03/04/66	02/25/66	66-2363	03/04/66	900	Moron	900	N/A	0	0.000	
		02/25/66	03/20/66	03/08/66	66-2290	03/20/66	950	Torrejon	950	N/A	0.462+/-0.213	0.609	0.0022
		02/25/66	03/19/66	03/08/66	66-2223	03/19/66	750	Moron	750	N/A	0.508+/-0.202	0.813	0.00283
		02/11/66	03/01/66	02/20/66	66-2384	03/10/66	1775	Torrejon	1775	N/A	0.325+/-0.182	0.325	0.00167
		01/18/66	02/05/66	01/27/66	66-893	02/05/66	900	Moron	200	N/A	4.13+/-1.29	5.507	0.0159
		01/18/66	02/12/66	01/30/66	66-878	02/12/66	1200	Torrejon	200	N/A	NR	NR	
		02/11/66	03/04/66	02/21/66	66-2368	03/04/66	1300	Moron	1300	N/A	ND	ND	
		02/01/66	04/11/66	03/07/66	66-2542	04/13/66	800	Giessen	800	N/A	0.266	0.399	
		01/18/66	01/28/66	01/23/66	66-2008	03/10/66	500	Norton	500	N/A	0.165+/-0.086	0.396	
		02/10/66	03/19/66	02/28/66	66-2218	03/19/66	580	Torrejon	580	N/A	0.147+/-0.135	0.304	0.00129
		01/18/66	02/11/66	01/30/66	66-770	02/11/66	890	Torrejon	200	N/A	ND	ND	
		02/17/66	03/08/66	02/26/66	66-1887	03/08/66	n/a	Toul Rosieres	n/a	N/A	NR	NR	
					66-2161	03/08/66	925	Toul Rosieres	925	N/A	0.134+/-0.120	0.174	0.00053
(b) (6)	(b) (6)	01/29/66	02/19/66	02/08/66	66-1222	02/09/66	950	San Pablo	950	N/A	0.644+/-0.607	0.813	
					66-1222	02/19/66	1000	San Pablo	1000	N/A	0.184+/-0.124	0.197	0.0007
(b) (6)	(b) (6)	02/08/66	02/08/66	02/07/66	66-1398	02/28/66	980 (12-hr)	Torrejon	980	N/A	NR	NR	
		01/18/66	02/05/66	01/27/66	66-889	02/05/66	900	Moron	200	N/A	4.85+/-1.27	6.467	0.0186
		01/31/66	03/20/66	02/24/66	66-2304	03/20/66	750	Norfolk	750	N/A	0.108+/-0.102	0.173	0.00086
		01/17/66	02/10/66	01/29/66	66-1163	02/17/66	1730	Torrejon	1730	03/21/66	NR	NR	
		01/18/66	02/18/66	02/02/66	66-971	02/18/66	440	Torrejon	440	N/A	ND	ND	
		02/09/66	03/08/66	02/22/66	66-1900	03/08/66	700	Moron	700	N/A	0.216+/-0.092	0.370	
		02/08/66	02/28/66	02/17/66	66-1389	02/28/66	660 (12-hr)	Torrejon	687	N/A	1.1	1.100	0.004
		01/18/66	03/25/66	02/20/66	66-2590	03/25/66	1550	USAH Wurzburg, Germany	1550	N/A	0.659+/-0.252	0.859	0.00734
(b) (6)	(b) (6)	02/27/66	03/08/66	03/03/66	66-2448	03/08/66	1300	Moron	1300	N/A	0.19+/-0.033	0.190	
		01/18/66	01/21/66	01/19/66	66-262	01/21/66	1150	Torrejon	200	N/A	36.5 +/- 3.7	38.087	
					66-408	02/02/66	232	Ramstein	200	N/A	0.48+/-0.24	2.483	0.0055
					66-556	02/03/66	930	Ramstein	200	N/A	3.49+/-1.10	4.503	0.00806
					66-562	02/03/66	1300	Ramstein	200	N/A	5.11+/-1.65	5.110	0.0128
(b) (6)	(b) (6)	02/27/66	03/19/66	03/09/66	66-2121	03/19/66	470	Torrejon	470	N/A	0.144+/-0.107	0.368	0.000592
		02/27/66	03/18/66	03/08/66	66-2211	03/18/66	810	Torrejon	810	N/A	0.401+/-0.197	0.594	0.00261
		01/17/66	01/28/66	01/21/66	66-2879	03/27/66	900	Torrejon	900		0.125+/-0.094	0.167	

Individuals with Urine Samples Classified as Remaining Cases

Name	SSN	Estimated Start Exposure Date	Estimated End Exposure Date	Estimated Acute Exposure Date	Sample No.	Sample Date	Sample Vol (mL)	Base	Sample Anal	Date Anal	Result (pCi/sample)	24hr Activity (pCi/day)	Recorded Systemic Body Burden
(b) (6)	(b) (6)	01/18/66	02/05/66	01/27/66	66-923	02/05/66	767	Moron	200	N/A	2.33+/-0.79	3.645	0.0105
		01/18/66	02/26/66	02/06/66	66-1948	03/17/66	1550	Torrejon	1550	N/A	0.151+/-0.098	0.151	
		02/11/66	03/20/66	03/01/66	66-2293	03/20/66	800	Torrejon	800	N/A	0.251+/-0.143	0.377	0.00202
		02/18/66	03/04/66	02/25/66	66-2367	03/04/66	850	Moron	850	N/A	ND	ND	
		01/18/66	02/08/66	01/28/66	66-515	02/08/66	930	Torrejon	200	N/A	2.18+/-1.12	2.813	0.00858
		03/11/66	03/19/66	03/15/66	66-2150	03/19/66	780	Moron	780	N/A	0.129+/-0.114	0.198	0.00027
		02/13/66	03/09/66	02/24/66	66-2516	03/08/66	900	Torrejon	900	N/A	0	0.000	
		03/09/66	03/19/66	03/14/66	66-2137	03/19/66	450	Dreux	450	N/A	0.330+/-0.184	0.880	0.00081
		01/18/66	01/23/66	01/20/66	66-1202	01/23/66	1240	Torrejon	1000	N/A	NR	NR	
		02/12/66	03/18/66	03/01/66	66-2102	03/18/66	880	Moron	880	N/A	0.126+/-0.087	0.172	0.00079
		01/22/66	02/16/66	02/03/66	66-949	02/16/66	980	Torrejon	200	N/A	1.51+/-1.07	1.849	0.0088
		01/18/66	03/03/66	02/09/66	66-1942	03/03/66	2125	Moron	2125	N/A	0.214+/-0.098	0.214	
		01/17/66	02/12/66	01/30/66	66-775	02/12/66	650	Torrejon	200	N/A	3.56+/-0.98	6.572	0.0258
		01/18/66	02/05/66	01/27/66	66-2929	02/18/66	800	Torrejon	800	N/A	1.09+/-0.27	1.635	
		01/18/66	02/08/66	01/28/66	66-829	02/08/66	400	Torrejon	200	N/A	ND	ND	
		01/25/66	02/09/66	02/01/66	66-744	02/09/66	730	Hanaw, Germany	200	N/A	1.42+/-0.84	2.334	0.0079
		02/10/66	03/08/66	02/23/66	66-2500	03/08/66	900	Torrejon	900	N/A	0	0.000	
		02/19/66	03/19/66	03/05/66	66-2041	03/19/66	1240	Torrejon	1240	N/A	0.484+/-0.185	0.484	0.00122
		01/18/66	02/03/66	01/26/66	66-1830	02/03/66	300	Torrejon	300	N/A	0.131	0.524	0.00427
		01/18/66	02/09/66	01/29/66	66-755	02/09/66	690	Torrejon	200	N/A	7.31+/-1.31	12.713	0.0079
		03/14/66	03/19/66	03/16/66	66-2324	03/19/66	600	Torrejon	600	N/A	0.288+/-0.156	0.576	0.00042
(b) (6)	(b) (6)	01/19/66	02/05/66	01/27/66	66-941	02/05/66	935	Torrejon	200	N/A	ND	ND	
		01/21/66	02/05/66	01/28/66	66-934	02/05/66	750	Moron	200	N/A	2.18+/-0.82	3.488	0.01
		01/25/66	02/09/66	02/01/66	66-798	02/09/66	680	Hanaw, Germany	200	N/A	ND	ND	
		02/18/66	03/04/66	02/25/66	66-2355	03/04/66	900	Moron	900	N/A	0.118+/-0.108	0.157	0.00037
		01/26/66	03/13/66	02/18/66	66-2538	03/13/66	1000	Torrejon	1000	N/A	0	0.000	
		01/18/66	02/08/66	01/28/66	66-1343	02/08/66	810	Torrejon	842	N/A	0.581+/-0.162	0.861	0.00567
		01/18/66	01/18/66	01/18/66	66-1203	01/18/66	820	Torrejon	853	N/A	0.91	1.332	0.005
		01/17/66	03/11/66	02/12/66	66-1167	02/16/66	960	Torrejon	1000	N/A	NR	NR	
					66-1944	03/18/66	950	Torrejon	950	N/A	0.145+/-0.091	0.183	
(b) (6)	(b) (6)	02/10/66	03/01/66	02/19/66	66-1848	03/01/66	900	Torrejon	900	N/A	ND	ND	
					66-1848	03/01/66	900			07/11/66	0.392+/-0.152	0.523	
(b) (6)	(b) (6)	01/25/66	02/09/66	02/01/66	66-741	02/09/66	895	Hanaw, Germany	200	N/A	3.01+/-1.34	4.036	0.00137
		03/04/66	04/11/66	03/23/66	66-2993	04/23/66	1100	Furth , Ger. US Army, 20th Sta Hosp.	1100	N/A	ND	ND	
(b) (6)	(b) (6)	01/17/66	02/18/66	02/02/66	66-950	02/18/66	3140	Torrejon	200	N/A	4.99+/-3.67	4.990	
		01/18/66	01/23/66	01/20/66	66-1102	01/23/66	1530	Pirmasens	1530	03/17/66	ND	ND	
		01/18/66	02/07/66	01/28/66	66-483	02/07/66	595	Torrejon	200	N/A	0.81+/-0.66	1.634	0.0053
		01/18/66	03/09/66	02/12/66	66-2393	03/09/66	650	Torrejon	650	N/A	0.227+/-0.133	0.419	0.00183
		01/18/66	01/24/66	01/21/66	66-1158	01/24/66	1440	Toul Rosieres	1000	N/A	0	0.000	
		01/18/66	01/24/66	01/21/66	66-1108	01/24/66	720	Wiesbaden	720	N/A	ND	ND	
		01/18/66	02/05/66	01/27/66	66-928	02/05/66	600	Torrejon	200	N/A	1.01+/-0.66	2.020	0.00581
		01/22/66	02/11/66	02/01/66	66-774	02/11/66	815	Torrejon	200	N/A	28.7+/-2.93	42.258	0.00734
		01/18/66	01/22/66	01/20/66	66-1099	01/22/66	1470	Pirmasens	1470	03/17/66	ND	ND	
		02/27/66	03/19/66	03/09/66	66-2561	03/19/66	700	Torrejon	700	N/A	0.476+/-0.192	0.816	
		02/06/66	03/09/66	02/21/66	66-2056	03/09/66	1600	Torrejon	1600	N/A	0.161+/-0.102	0.161	0.00092
		01/25/66	03/08/66	02/15/66	66-2505	03/08/66	200	Charleston	200	N/A	0	0.000	
		02/06/66	02/08/66	02/07/66	66-1392	02/28/66	420 (12-hr)	Torrejon	437	N/A	1.3	1.300	0.005
		01/18/66	02/03/66	01/26/66	66-1814	02/03/66	880	Torrejon	880	N/A	ND	ND	
		02/10/66	03/04/66	02/21/66	66-2352	03/04/66	900	Torrejon	900	N/A	ND	ND	
		01/17/66	03/23/66	02/18/66	66-2672	03/23/66	1200	Torrejon	1200	N/A	0.196+/-0.118	0.196	
		02/11/66	03/19/66	03/01/66	66-2045	03/19/66	900	Torrejon	900	N/A	0.168+/-0.086	0.224	0.00101
		01/18/66	01/18/66	01/18/66	66-1646	03/01/66	1050	Torrejon	1050	N/A	0.192+/-0.121	0.221	
					66-1646	03/01/66	1050			07/05/66	0.204+/-0.076	0.233	
	(b) (6)	01/18/66	02/05/66	01/27/66	66-938	02/05/66	540	Torrejon	200	N/A	ND	ND	
		03/26/66	04/11/66	04/03/66	66-3106	04/13/66	900	Moron	900	N/A	0.151+/-0.057	0.201	
		01/18/66	02/12/66	01/30/66	66-879	02/12/66	1800	Torrejon	200	N/A	ND	ND	
		01/28/66	02/06/66	02/01/66	66-510	02/08/66	815	Torrejon	200	N/A	3.31+/-1.23	4.874	0.0149
		02/23/66	03/03/66	02/27/66	66-1921	03/03/66	900	Torrejon	900	N/A	0.263+/-0.110	0.351	

Individuals with Urine Samples Classified as Remaining Cases

Name	SSN	Estimated Start Exposure Date	Estimated End Exposure Date	Estimated Acute Exposure Date	Sample No.	Sample Date	Sample Vol (mL)	Base	Sample Anal	Date Anal	Result (pCi/sample)	24hr Activity (pCi/day)	Recorded Systemic Body Burden
(b) (6)	(b) (6)	01/20/66	02/09/66	01/30/66	66-820	02/09/66	880	Toul Rosieres	200	N/A	2.41+/-1.29	4.253	0.0112
					66-3284	06/01/66	2010	Toul Rosieres	1160	N/A	0	0.000	
(b) (6)	(b) (6)	02/09/66	03/09/66	02/23/66	66-2059	03/09/66	420	Torrejon	420	N/A	0.327+/-0.124	0.934	0.00427
		02/08/66	03/01/66	02/18/66	66-1851	03/01/66	750	Moron	750	N/A	0.443+/-0.176	0.709	
				02/18/66	66-1851	03/01/66	750			07/11/66	0.46+/-0.020	0.736	
(b) (6)	(b) (6)	02/05/66	03/08/66	02/20/66	66-2481	03/08/66	900	Little Creek	900	N/A	0.132+/-0.030	0.176	
		01/18/66	02/10/66	01/29/66	66-489	02/07/66	310	Moron	200	N/A	7.32+/-0.87	28.335	0.0915
					66-1442	03/02/66	1920	Moron	1800	03/17/66	0.432+/-0.27	0.432	0.00291
(b) (6)	(b) (6)	01/18/66	03/17/66	02/16/66	66-2021	03/17/66	1400	24th Avn Bn	1400	N/A	ND	ND	
		01/18/66	02/06/66	01/27/66	66-511	02/06/66	920	Torrejon	200	N/A	1.46+/-1.32	1.904	0.00584
		01/25/66	02/09/66	02/01/66	66-794	02/09/66	930	Hanaw, Germany	200	N/A	1.80+/-1.24	2.323	0.0079
		02/05/66	02/26/66	02/15/66	66-1437	02/26/66	820	Torrejon	852	N/A	0.237+/-0.128	0.347	
					16-1437	02/26/66	820			08/23/66	1.512+/-0.113	2.213	
(b) (6)	(b) (6)	02/13/66	03/19/66	03/02/66	66-2152	03/19/66	380	Torrejon	380	N/A	0.208+/-0.129	0.657	0.00127
		03/11/66	03/19/66	03/15/66	66-2219	03/19/66	1050	Torrejon	1050	N/A	0.197+/-0.124	0.225	0.000958
		03/28/66	04/10/66	04/03/66	66-2990	04/26/66	1875	Furth , Ger. US Army, 20th Sta Hosp.	1875	N/A	ND	ND	
(b) (6)	(b) (6)	02/09/66	03/08/66	02/22/66	66-1875	03/08/66	560	Moron	582	N/A	0.958	2.053	0.0049
		01/18/66	03/08/66	02/11/66	66-2618	03/08/66	1750	Vandenburg	1750	N/A	0.319+/-0.156	0.319	
		01/18/66	02/10/66	01/29/66	66-768	02/11/66	440	Torrejon	200	N/A	0.52+/-0.48	1.418	0.00536
		01/18/66	03/08/66	02/11/66	66-2620	03/08/66	1350	Vandenburg	1350	N/A	ND	ND	
		01/18/66	01/22/66	01/20/66	66-1107	01/22/66	1170	Pirmasens	1000	03/17/66	ND	ND	
		02/08/66	02/17/66	02/12/66	66-1113	02/17/66	960	San Pablo	960	03/23/66	0.539+/-0.251	0.674	0.00125
		03/14/66	03/19/66	03/16/66	66-2154	03/19/66	490	Torrejon	490	N/A	0.135+/-0.119	0.331	0.000198
		01/18/66	04/11/66	02/28/66	66-2945	04/22/66	1000	B097	1000	N/A	ND	ND	
					66-2945	04/22/66	1000			08/01/66	NR	NR	
(b) (6)	(b) (6)	01/18/66	02/08/66	01/28/66	66-836	02/08/66	620	Moron	200	N/A	ND	ND	
		01/18/66	03/17/66	02/16/66	66-2020	03/17/66	1450	24th Avn Bn	1450	N/A	0.137+/-0.079	0.137	0.000948
		03/01/66	04/11/66	03/21/66	66-3199	05/12/66	890	Torrejon	890	N/A	0.166+/-0.082	0.251	
		01/28/66	02/28/66	02/12/66	66-2884	03/31/66	1750	Zaragoza	1750	N/A	0	0.000	
					66-2884	03/31/66	1750			08/17/66	NR	NR	
(b) (6)		01/22/66	04/11/66	03/02/66	66-2991	04/21/66	600	Furth , Ger. US Army, 20th Sta Hosp.	600	N/A	ND	ND	
(b) (6)	(b) (6)	01/18/66	02/04/66	01/26/66	66-350	02/04/66	700	Torrejon	200	N/A	ND	ND	
		01/18/66	02/06/66	01/27/66	66-501	02/06/66	440	Moron	200	N/A	2.43+/-0.67	6.627	0.0202
		01/18/66	03/03/66	02/09/66	66-1938	03/03/66	1700	625TH MASS (MAC)	1760	N/A	2.20+/-0.29	2.200	0.0215
(b) (6)	(b) (6)	02/27/66	03/18/66	03/08/66	66-2265	03/18/66	780	Torrejon	780	N/A	0.173+/-0.130	0.266	0.00101
		01/29/66	02/19/66	02/08/66	66-1219	02/19/66	940	Torrejon	940	N/A	ND	ND	
		03/14/66	03/19/66	03/16/66	66-2562	03/19/66	n/a	Torrejon	n/a	N/A	NR	NR	
(b) (6)	(b) (6)	01/18/66	04/11/66	02/28/66	66-3108	04/13/66	1900	Moron	950	N/A	0.364+/-0.135	0.364	
		02/06/66	03/08/66	02/21/66	66-1883	03/08/66	720	Torrejon	720	N/A	0.120+/-0.030	0.200	0.000669
		02/04/66	03/18/66	02/25/66	66-2092	03/18/66	780	USS Ft. Snelling	780	N/A	0.261+/-0.108	0.402	0.00187
		03/14/66	03/20/66	03/17/66	66-2301	03/20/66	750	Torrejon	750	N/A	0.129 +/- 0.131	0.206	
		01/18/66	02/09/66	01/29/66	66-817	02/09/66	680	Germany	200	N/A	ND	ND	
		01/19/66	02/19/66	02/03/66	66-2881	03/31/66	900	Torrejon	900	N/A	1.68 +/- 0.33	2.240	
					66-2881	03/31/66	900			08/23/66	NR	NR	
(b) (6)	(b) (6)	01/21/66	02/28/66	02/08/66	66-1439	02/28/66	760	Torrejon	790	N/A	ND	ND	
					66-1439	02/28/66	760			08/23/66	0.678+/-0.107	1.071	
(b) (6)	(b) (6)	02/21/66	03/04/66	02/26/66	66-2350	03/04/66	600	Torrejon	600	N/A	ND	ND	
		01/17/66	02/25/66	02/05/66	66-1351	02/25/66	720	Moron	748	N/A	0.410+/-0.586	0.683	
		01/31/66	03/18/66	02/23/66	66-2115	03/18/66	890	Giessen	890	N/A	0.131+/-0.096	0.177	0.00099
		01/18/66	02/18/66	02/01/66	66-960	02/16/66	760	Torrejon	200	N/A	NR	NR	
		02/18/66	03/19/66	03/04/66	66-2198	03/19/66	800	Torrejon	800	N/A	0.202	0.303	
		01/25/66	02/09/66	02/01/66	66-734	02/09/66	510	Hanaw, Germany	200	N/A	0.78+/-0.55	1.835	0.0063
		02/06/66	02/08/66	02/07/66	66-1381	02/26/66	330 (12-hr)	Moron	343	N/A	1.32	1.320	0.005
		02/04/66	03/03/66	02/17/66	66-1912	03/03/66	900	USS Charleston	900	N/A	0.199+/-0.089	0.265	
		02/25/66	03/17/66	03/07/66	66-2700	03/30/66	950	Moron	950	N/A	0.158+/-0.113	0.200	

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(b) (6)	(b) (6)	01/18/66	02/07/66	01/28/66	66-485	02/07/66	950	Torrejon	200	N/A	1.43+/-1.14	1.806	0.00582
		03/14/66	03/19/66	03/16/66	66-2140	03/19/66	960	Torrejon	960	N/A	0.278+/-0.156	0.348	0.000404
(b) (6)	(b) (6)	01/18/66	02/08/66	01/28/66	66-831	02/08/66	430	Torrejon	20	N/A	ND	ND	
		01/18/66	03/04/66	02/09/66	66-2353	03/04/66	1050	Torrejon	105	N/A	0.200+/-0.134	0.229	0.00149
		03/12/66	03/19/66	03/15/66	66-2156	03/19/66	800	Torrejon	800	N/A	0.105+/-0.102	0.158	0.000596
		02/19/66	03/03/66	02/25/66	66-2038	03/21/66	1020	Torrejon	1020	N/A	0.346+/-0.128	0.407	
		03/03/66	04/01/66	03/17/66	66-2702	03/30/66	820	Moron	820	N/A	0.114+/-0.101	0.167	
		02/06/66	02/19/66	02/12/66	66-1210	02/19/66	900	Moron	936	N/A	ND	ND	
		01/18/66	01/18/66	01/18/66	66-1214	01/18/66	970	Wheelus AF, Libya	970	N/A	1.74	2.153	0.009
		01/25/66	02/15/66	02/04/66	66-1154	02/15/66	910	Toul Rosieres	946	N/A	0	0.000	
		01/18/66	02/10/66	01/29/66	66-765	02/11/66	760	Torrejon	200	N/A	2.28+/-0.98	3.600	0.0135
		02/08/66	03/13/66	02/24/66	66-2544	03/13/66	1200	Pirmasens	1200	N/A	0.518	0.518	
		01/18/66	02/06/66	01/27/66	66-1074	02/06/66	960	Moron	960	N/A	4	5.000	
		02/06/66	02/26/66	02/16/66	66-1427	02/26/66	600	Moron	624	N/A	ND	ND	
					66-1427	02/26/66	600			06/23/66	0.337+/-0.075	0.674	
(b) (6)	(b) (6)	01/19/66	01/19/66	01/19/66	66-2877	03/26/66	2300	Torrejon	2300	N/A	0.112+/-0.101	0.112	
		02/18/66	03/09/66	02/27/66	66-2395	03/09/66	770	Torrejon	770	N/A	0.303+/-0.167	0.472	0.0019
		01/18/66	01/29/66	01/23/66	66-1191	01/29/66	n/a	Torrejon	n/a	N/A	0	0.000	
		01/18/66	02/08/66	01/28/66	66-360	02/04/66	750	Torrejon	200	N/A	62.9+/-3.9	100.640	0.315
					66-1233	02/18/66	2050	Torrejon	2050	03/03/66	26.5+/-1.3	26.500	0.126
					66-2032	03/19/66	2300	Torrejon	2300	N/A	0.143+/-0.032	0.143	0.00132
(b) (6)	(b) (6)	02/08/66	02/08/66	02/07/66	66-1380	02/28/66	710 (12-hr)	Torrejon	738	N/A	0.459	0.459	0.002
		01/18/66	02/03/66	01/26/66	66-1843	02/03/66	915	Torrejon	915	N/A	ND	ND	NSBB
		01/18/66	02/03/66	01/26/66	66-1810	02/03/66	920	Moron	920	N/A	0.261	0.340	NSBB
		02/11/66	03/19/66	03/01/66	66-2205	03/19/66	500	Torrejon	500	N/A	0.144	0.346	
		02/21/66	03/14/66	03/03/66	66-2037	03/21/66	980	Torrejon	980	N/A	0.355+/-0.152	0.435	NSBB
		01/18/66	02/06/66	01/27/66	66-523	02/06/66	350	Torrejon	200	N/A	3.08+/-0.68	10.560	0.0324
		02/10/66	03/20/66	03/01/66	66-2289	03/20/66	300	Moron	300	N/A	0.173+/-0.130	0.692	0.00141
		01/18/66	02/07/66	01/28/66	66-492	02/07/66	610	Toul Rosieres	200	N/A	0.67+/-0.62	1.318	0.00427
		01/25/66	02/09/66	02/01/66	66-729	02/09/66	680	Hanaw, Germany	200	N/A	ND	ND	
		01/17/66	02/12/66	01/30/66	66-784	02/12/66	524	Torrejon	200	N/A	23.7+/-2.01	54.275	0.0054
		01/25/66	02/09/66	02/01/66	66-752	02/09/66	940	Hanaw, Germany	200	N/A	ND	ND	
		01/25/66	02/09/66	02/01/66	66-808	02/09/66	800	Hanaw, Germany	200	N/A	NR	NR	
		01/18/66	02/06/66	01/27/66	66-532	02/06/66	705	Torrejon	200	N/A	1.09+/-0.97	1.655	0.00568
		02/24/66	03/07/66	03/01/66	66-2699	04/05/66	1700	Moron	1700	N/A	0.216+/-0.157	0.216	
		02/10/66	03/08/66	02/23/66	66-2479	03/08/66	1000	Moron	1000	N/A	ND	ND	
		03/14/66	03/19/66	03/16/66	66-2318	03/19/66	820	Moron	820	N/A	0.126 +/- 0.136	0.184	
		01/18/66	02/03/66	01/26/66	66-1807	02/03/66	700	Moron	700	N/A	0.288	0.494	0.00402
		02/07/66	03/04/66	02/19/66	66-2375	03/04/66	400	Torrejon	400	N/A	0.200+/-0.128	0.600	0.000972
		01/29/66	02/19/66	02/08/66	66-1196	02/19/66	1320	San Pablo	1000	N/A	.5412 +/- 0.7735	0.541	0
		02/06/66	02/07/66	02/06/66	66-447	02/07/66	510	Moron	200	N/A	0.79+/-0.53	1.859	0.00137
		02/10/66	03/19/66	02/28/66	66-2315	03/19/66	640	Torrejon	640	N/A	0.215+/-0.157	0.403	0.0014
		01/29/66	02/19/66	02/08/66	66-1200	02/19/66	460	Zaragoza	478	N/A	0.396+/-0.514	1.033	0.00394
		01/18/66	02/05/66	01/27/66	66-935	02/05/66	655	Moron	200	N/A	2.11+/-0.92	3.866	0.0111
		01/18/66	02/07/66	01/28/66	66-486	02/07/66	80	Torrejon	80	N/A	0.65+/-0.26	9.750	0.0317
		02/24/66	03/18/66	03/07/66	66-2094	03/18/66	820	Moron	820	N/A	0.861+/-0.078	1.260	0.0048
		01/29/66	02/19/66	02/08/66	66-1223	02/19/66	1195	Torrejon	1195	N/A	.593+/-.224	0.595	0.00253
		02/03/66	02/04/66	02/03/66	66-2897	04/03/66	800	Torrejon	800	N/A	ND	ND	
					66-2897	04/04/66	800 (12-hr)			08/31/66	NR	NR	
(b) (6)	(b) (6)	02/16/66	02/08/66	02/12/66	66-1399	02/28/66	900 (12-hr)	Torrejon	936	N/A	0.203	0.203	0.0008
		02/13/66	03/08/66	02/24/66	66-2484	03/08/66	1000	Moron	1000	N/A	0.104	0.125	
		01/18/66	02/13/66	01/31/66	66-1096	02/13/66	1400	Wiesbaden	1400	03/17/66	ND	ND	
		02/17/66	03/10/66	02/27/66	66-3109	04/13/66	900	Moron	450	N/A	0.446+/-0.141	0.595	
		01/18/66	04/11/66	02/28/66	66-3109-S	04/13/66	900	Norfolk	450	N/A	0.446 +/- 0.141	0.595	n/a
		01/17/66	03/04/66	02/09/66	66-2351	03/04/66	900	Torrejon	900	N/A	ND	ND	
					66-2888	03/26/66	900	Torrejon	900	N/A	0.209+/-0.134	0.279	
(b) (6)	(b) (6)	01/22/66	02/07/66	01/30/66	66-450	02/07/66	500	Torrejon	200	N/A	ND	ND	
		01/18/66	02/10/66	01/29/66	66-766	02/11/66	590	Moron	200	N/A	1.75+/-0.63	3.559	0.0133
		02/13/66	03/18/66	03/01/66	66-2113	03/18/66	700	Moron	700	N/A	0.140+/-0.084	0.240	0.000969
		02/10/66	03/18/66	02/28/66	66-2097	03/18/66	890	Torrejon	890	N/A	0.116+/-0.077	0.156	0.000647

Individuals with Urine Samples Classified as Remaining Cases

Name	SSN	Estimated Start Exposure Date	Estimated End Exposure Date	Estimated Acute Exposure Date	Sample No.	Sample Date	Sample Vol (mL)	Base	Sample Anal	Date Anal	Result (pCi/sample)	24hr Activity (pCi/day)	Recorded Systemic Body Burden
(b) (6)	(b) (6)	01/18/66	02/08/66	01/28/66	66-847	02/08/66	370	Torrejon	200	N/A	ND	ND	
		03/14/66	03/19/66	03/18/66	66-2551	03/19/66	900	Torrejon	900	N/A	0.178+/-0.138	0.237	0.000256
		02/09/66	02/28/66	02/18/66	66-1356	02/28/66	800 (12-hr)	Torrejon	800	N/A	0.149	0.149	0.000756
		01/18/66	02/08/66	01/27/66	66-533	02/08/66	670	Torrejon	200	N/A	1.83+/-0.76	3.278	0.0101
		01/18/66	02/04/66	01/26/66	66-342	02/04/66	550	Moron	200	N/A	1.51+/-0.64	3.295	0.00756
		01/18/66	03/09/66	02/12/66	66-2070	03/09/66	1200	Moron	650	N/A	1.03+/-0.20	1.030	0.00842
		01/20/66	02/08/66	01/29/66	66-2011	02/26/66	1400 (12-hr)	Torrejon	1400	N/A	0.298+/-0.124	0.298	
		01/18/66	02/09/66	01/29/66	66-748	02/09/66	725	Hanaw, Germany	200	N/A	1.47+/-0.84	2.433	
		02/11/66	03/04/66	02/21/66	66-2343	03/04/66	900	Chateauroux, France	900	N/A	0.473+/-0.225	0.631	0.00201
(b) (6)	(b) (6)	02/03/66	03/08/66	02/19/66	66-1908	03/08/66	825	Offutt AFB, NE	825	N/A	0.218+/-0.103	0.317	
		01/18/66	02/16/66	02/01/66	66-965	02/16/66	1250	Torrejon	200	N/A	2.70+/-1.97	2.700	0.0127
		02/17/66	03/08/66	02/26/66	66-1877	03/08/66	780	Toul Rosieres	811	N/A	0.637	0.980	0.002
		02/10/66	03/18/66	02/28/66	66-2091	03/18/66	n/a	Torrejon	n/a	N/A	ND	ND	
		01/18/66	02/07/66	01/28/66	66-487	02/07/66	930	Torrejon	200	N/A	1.02+/-0.88	1.316	0.00373
		02/18/66	03/04/66	02/25/66	66-2372	03/04/66	800	Torrejon	800	N/A	0.143+/-0.129	0.215	0.00045
		01/18/66	01/21/66	01/19/66	66-242	01/21/66	1200	Torrejon	200	N/A	1.45 +/- 1.24	1.450	
		01/17/66	02/08/66	01/28/66	66-849	02/08/66	450	Moron	200	N/A	0.52+/-0.42	1.387	0.0047
		02/11/66	03/23/66	03/03/66	66-2642	03/28/66	1000	09698 "A" Co. 504th Avn Bn	1000	N/A	0.201+/-0.129	0.241	
(b) (6)	(b)	01/18/66	03/14/66	02/14/66	66-2009	03/14/66	300	US Naval Ocean Graph	300	N/A	0.103+/-0.077	0.412	
(b) (6)	(b) (6)	02/07/66	02/17/66	02/12/66	66-1440	02/25/66	2030	Moron	1000	N/A	0.35+/-0.26	0.350	0.00137
		02/12/66	03/03/66	02/21/66	66-1555	03/10/66	2250	Wiesbaden	1150	N/A	NR	NR	0.001
		03/12/66	03/19/66	03/15/66	66-2142	03/19/66	920	Torrejon	920	N/A	ND	ND	
		01/18/66	01/29/66	01/23/66	66-3117	04/13/66	1025	Moron	1025	N/A	0.168+/-0.068	0.197	
		03/14/66	03/19/66	03/16/66	66-2569	03/19/66	750	Moron	750	N/A	0.105+/-0.095	0.168	
		01/18/66	02/07/66	01/28/66	66-481	02/07/66	790	Moron	200	N/A	0.94+/-0.81	1.428	0.00462
		01/25/66	02/09/66	02/01/66	66-742	02/09/66	860	Hanaw, Germany	200	N/A	3.19+/-1.19	4.451	0.0152
		01/18/66	02/05/66	01/27/66	66-1199	02/05/66	1510	Sembach	1000	N/A	0.206+/-0.233	0.206	
		02/11/66	03/01/66	02/20/66	66-1861	03/01/66	1250	Moron	1250	N/A	0.876+/-0.245	0.876	
					66-1861	03/01/66	1250			07/18/66	9.528+/-0.285	8.528	
(b) (6)	(b) (6)	01/29/66	03/08/66	02/17/66	66-2483	03/08/66	350	Moron	350	N/A	0.27	0.926	
		02/01/66	03/01/66	02/15/66	66-1859	03/01/66	956	Torrejon	956	N/A	ND	ND	
					66-1859	03/01/66	956			08/28/66	NR	NR	
(b) (6)	(b) (6)	01/23/66	02/09/66	01/31/66	66-600	02/09/66	920	Torrejon	200	N/A	ND	ND	
		01/18/66	02/05/66	01/27/66	66-937	02/05/66	500	Moron	200	N/A	ND	ND	
		01/18/66	02/05/66	01/27/66	66-918	02/05/66	815	Torrejon	200	N/A	0.59 +/- 0.48	0.869	0.00245
		02/24/66	03/08/66	03/02/66	66-2514	03/08/66	1000	Moron	1000	N/A	0	0.000	
		02/02/66	02/15/66	02/08/66	66-1152	02/15/66	590	Panama City, FL	614	N/A	NR	NR	
		01/25/66	02/09/66	02/01/66	66-751	02/09/66	720	Hanaw, Germany	200	N/A	1.78+/-0.82	2.967	0.0101
		01/18/66	02/16/66	02/01/66	66-959	02/16/66	1390	Torrejon	200	N/A	1.47+/-1.32	1.470	0.00693
		01/18/66	01/24/66	01/21/66	66-1111	01/24/66	1010	Wiesbaden	1000	N/A	NR	NR	
		02/09/66	03/09/66	02/23/66	66-2396	03/09/66	700	Torrejon	700	N/A	0.150+/-0.113	0.257	0.000794
		02/10/66	03/19/66	02/28/66	66-2220	03/19/66	950	Torrejon	950	N/A	ND	ND	
		01/18/66	01/21/66	01/19/66	66-215	01/21/66	475	Torrejon	200	N/A	NR	NR	
		02/13/66	03/03/66	02/22/66	66-1915	03/03/66	900	Moron	900	N/A	0.148+/-0.089	0.197	
		01/18/66	02/05/66	01/27/66	66-895	02/05/66	870	Moron	200	N/A	ND	ND	
		01/18/66	02/06/66	01/27/66	66-517	02/06/66	905	Torrejon	200	N/A	5.00+/-1.30	6.630	0.0202
		02/09/66	03/09/66	02/23/66	66-2078	03/09/66	650	Torrejon	650	N/A	0.200+/-0.096	0.369	0.000112
		01/18/66	02/09/66	01/29/66	66-793	02/09/66	910	Torrejon	200	N/A	4.94+/-1.56	6.514	0
		01/24/66	02/09/66	02/01/66	66-825	02/09/66	870	Germany	200	N/A	ND	ND	
		02/13/66	03/08/66	02/24/66	66-2495	03/08/66	1000	Torrejon	1000	N/A	0.284	0.341	
		01/18/66	02/03/66	01/26/66	66-2886	03/30/66	1800	Torrejon	1800	N/A	1.21+/-0.282	1.210	
					66-2886	03/30/66	1800			08/17/66	NR	NR	
(b) (6)	(b) (6)	01/18/66	02/03/66	01/26/66	66-1821	02/03/66	700	Torrejon	700	N/A	0.0901	0.154	
		01/18/66	04/11/66	02/28/66	66-1207	05/29/66	1450	Torrejon	1000	N/A	1.6	1.600	0.008
		02/14/66	02/14/66	02/14/66	66-2940	04/24/66	1200	Wiesbaden	1200	N/A	ND	ND	
					66-2940	04/24/66	1200			08/01/66	NR	NR	
(b) (6)	(b) (6)	01/18/66	02/05/66	01/27/66	66-942	02/05/66	960	Moron	200	N/A	ND	ND	

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(b) (6)	(b) (6)	03/14/66	03/19/66	03/16/66	66-2071	03/19/66	950	Moron	950	N/A	0.254+/-0.161	0.321	0.000359
		02/21/66	03/18/66	03/05/66	66-2210	03/18/66	1344	Moron	790	N/A	0.226+/-0.134	0.226	0.00109
		02/09/66	03/09/66	02/23/66	66-2391	03/09/66	900	Torrejon	900	N/A	0.147+/-0.113	0.196	0.000778
		01/18/66	02/06/66	01/27/66	66-509	02/06/66	930	Torrejon	200	N/A	1.27+/-0.88	1.639	0.00501
		01/18/66	02/11/66	01/30/66	66-764	02/11/66	320	Torrejon	200	N/A	0.82+/-0.45	3.075	0.0115
		02/03/66	02/21/66	02/12/66	66-1645	03/01/66	n/a	Reuters News Agency AYA LA 5 Madrid, Spain	n/a	N/A	ND	ND	
(b) (6)	(b) (6)	01/29/66	02/19/66	02/08/66	66-1220	02/19/66	1390	Moron	1390	N/A	0.162+/-0.113	0.162	0.000691
					66-1220	02/19/66	880	Moron	880	N/A	1.64+/-1.97	2.236	0
(b) (6)	(b) (6)	02/06/66	02/26/66	02/16/66	66-1384	02/26/66	440	Torrejon	457	N/A	1.39	3.791	0.005
		02/15/66	03/12/66	02/27/66	66-2036	03/18/66	2000	Torrejon	2000	N/A	0.300+/-0.115	0.300	0
		01/18/66	02/09/66	01/29/66	66-750	02/09/66	980	Moron	200	N/A	2.14+/-0.71	2.675	0.0103
		02/08/66	03/08/66	02/21/66	66-1868	03/08/66	750	San Pablo	780	N/A	0.451	0.722	0.002
		02/18/66	03/18/66	03/04/66	66-2266	03/18/66	900	Chambley	900	N/A	0.197+/-0.145	0.263	0.00104
		02/08/66	02/26/66	02/16/66	66-1410	02/26/66	590	Moron	613	N/A	ND	ND	
		02/10/66	03/18/66	02/28/66	66-2267	03/18/66	410	Torrejon	410	N/A	0.378+/-0.187	1.106	0.00241
		01/18/66	01/21/66	01/19/66	66-220	01/21/66	325	Torrejon	200	N/A	NR	NR	
		01/18/66	01/21/66	01/19/66	66-218	01/21/66	250	Torrejon	38	N/A	0.2625 +/- 1.07	1.260	
		01/18/66	01/21/66	01/19/66	66-230	01/21/66	375	Torrejon	200	N/A	0.604 +/- 0.341	1.933	
		01/18/66	01/21/66	01/19/66	66-224	01/21/66	375	Torrejon	200	N/A	6.15 +/- 0.9	19.680	
		01/18/66	01/21/66	01/19/66	66-226	01/21/66	450	Torrejon	200	N/A	1.45 +/- 0.522	3.867	
		02/18/66	03/08/66	02/27/66	66-2489	03/08/66	800	Torrejon	800	N/A	0	0.000	
		03/01/66	03/08/66	03/04/66	66-2517	03/08/66	950	Torrejon	950	N/A	0.221	0.279	
		01/18/66	02/12/66	01/30/66	66-1065	02/12/66	840	Athens	840	03/13/66	ND	ND	
		02/09/66	03/09/66	02/23/66	66-2060	03/09/66	700	Torrejon	700	N/A	ND	ND	0
		01/18/66	03/25/66	02/20/66	66-2596	03/25/66	1250	USAH Wurzburg, Germany	1250	N/A	0.142+/-0.113	0.142	
(b) (6)	(b) (6)	01/18/66	02/05/66	01/27/66	66-885	02/05/66	840	Torrejon	200	N/A	NR	NR	
		01/18/66	02/04/66	01/26/66	66-363	02/04/66	750	Moron	200	N/A	59.2+/-3.8	94.720	0.271
		01/18/66	03/19/66	02/17/66	66-2034	03/19/66	920	Torrejon	920	N/A	0.207+/-110	0.270	0
		01/18/66	01/30/66	01/24/66	66-261	01/21/66	1300	Torrejon	200	N/A	237.9 +/- 10.4	237.900	
					66-1479	02/25/66	1560	Sembach	1000	N/A	ND	ND	
											ND	ND	
(b) (6)	(b) (6)	01/18/66	01/21/66	01/19/66	66-259	01/21/66	850	Torrejon	200	N/A	NR	NR	
		02/09/66	03/03/66	02/20/66	66-1926	03/03/66	800	Torrejon	800	N/A	0.135+/-0.082	0.203	0
		01/18/66	02/05/66	01/27/66	66-901	02/05/66	540	Torrejon	200	N/A	ND	ND	
		01/18/66	02/03/66	01/26/66	66-1822	02/03/66	410	Moron	410	N/A	0.131	0.383	0
		01/18/66	02/05/66	01/27/66	66-900	02/05/66	400	Moron	200	N/A	0.94+/-0.41	2.820	0.00808
		01/18/66	02/05/66	01/27/66	66-694	02/05/66	945	Moron	200	N/A	2.88+/-1.15	3.657	0.0105
		01/18/66	02/05/66	01/27/66	66-883	02/05/66	550	Torrejon	200	N/A	1.68+/-0.59	3.665	0.0105
		01/18/66	02/09/66	01/29/66	66-733	02/09/66	375	Torrejon	200	N/A	0.53+/-0.38	1.696	0.00605
		02/21/66	03/18/66	03/05/66	66-2269	03/18/66	910	Torrejon	910	N/A	0.204+/-0.140	0.269	0.000992
		01/18/66	02/05/66	01/27/66	66-932	02/05/66	490	Torrejon	200	N/A	1.08+/-0.63	2.645	0.00762
		02/10/66	03/08/66	02/23/66	66-2496	03/08/66	1000	Moron	1000	N/A	0.45	0.540	n/a
		01/25/66	02/09/66	02/01/66	66-806	02/09/66	400	Hanaw, Germany	200	N/A	28.5+/-1.9	85.500	0.00526
		02/06/66	03/03/66	02/18/66	66-1642	03/06/66	1040	Wiesbaden	1000	N/A	0.194+/-0.156	0.224	0.000238
					66-3054	04/27/66	1900	Lindsey AS, Germany	950	N/A	0.735+/-0.165	0.735	
(b) (6)	(b) (6)	01/25/66	02/26/66	02/10/66	66-1415	02/26/66	760	Torrejon	790	N/A	0.152	0.240	0.0008
		02/27/66	03/08/66	03/03/66	66-2488	03/08/66	900	Moron	900	N/A	0.149	0.199	
		01/18/66	03/25/66	02/20/66	66-2589	03/25/66	1500	USAH Wurzburg, Germany	1500	N/A	0.141+/-0.113	0.141	n/a
(b) (6)	(b) (6)	01/18/66	02/11/66	01/30/66	66-352	02/04/66	850	Torrejon	200	N/A	80.4+/-4.1	85.271	0.302
					66-1162	02/18/66	1730	Torrejon	1730	03/02/66	0.690+/-0.241	0.690	0.00336
(b) (6)	(b) (6)	02/09/66	02/26/66	02/17/66	66-1416	02/26/66	780	Moron	811	N/A	ND	ND	n/a
					66-1416	02/26/66	780			08/01/66	NR	NR	
(b) (6)	(b) (6)	02/10/66	02/26/66	02/18/66	66-1420	02/26/66	840	Torrejon	873	N/A	ND	ND	0
		01/31/66	03/20/66	02/24/66	66-2297	03/20/66	900	Norfolk	900	N/A	0.258+/-0.153	0.344	0.00205
		01/18/66	01/23/66	01/20/66	66-1101	01/23/66	1455	Pirmasens	1455	03/17/66	ND	ND	0

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(b) (6)	(b) (6)	01/18/66	02/06/66	01/27/66	66-530	02/06/66	670	Torrejon	200	N/A	1.72+/-0.87	3.081	0.00938
		01/18/66	02/04/66	01/26/66	66-357	02/04/66	550	Moron	200	N/A	0.97+/-0.52	2.116	0.00486
		01/18/66	02/16/66	02/01/66	66-1005	02/16/66	1500	Kirtland AFB BO97	200	N/A	ND	ND	0
		02/18/66	03/08/66	02/27/66	66-2485	03/08/66	1500	Dreux	1500	N/A	0	0.000	0
		02/06/66	02/26/66	02/16/66	66-1409	02/26/66	920	Moron	956	N/A	0	0.000	0
		01/25/66	03/24/66	02/23/66	66-2535	03/13/66	450	Charleston	450	N/A	0.293	0.781	n/a
					66-2577	03/24/66	1400	USS Everglades AD 24	1400	N/A	0	0.000	0
(b) (6)	(b) (6)	01/18/66	02/04/66	01/26/66	66-351	02/04/66	500	Torrejon	200	N/A	0.75+/-0.59	1.800	0.00375
		02/10/66	03/18/66	02/28/66	66-2110	03/18/66	900	Torrejon	900	N/A	0.655+/-0.168	0.873	0.00478
		01/18/66	01/21/66	01/19/66	66-227	01/21/66	152	Torrejon	152	N/A	0.233 +/- 0.176	1.839	n/a
		01/18/66	02/09/66	01/29/66	66-757	02/09/66	680	Torrejon	200	N/A	ND	ND	0
		01/18/66	02/09/66	01/29/66	66-749	02/09/66	840	Torrejon	200	N/A	2.15+/-1.09	3.071	0.011
		01/18/66	01/21/66	01/19/66	66-256	01/21/66	1400	Torrejon	200	N/A	18.2 +/- 3.08	18.200	n/a
		01/18/66	02/07/66	01/28/66	66-449	02/07/66	900	Torrejon	200	N/A	2.94+/-1.04	3.920	0.012
		02/04/66	03/13/66	02/22/66	66-2545	03/13/66	530	Charleston	530	N/A	0.178+/-0.138	0.403	0.00116
		01/18/66	02/09/66	01/29/66	66-807	02/09/66	620	Torrejon	200	N/A	4.17+/-1.39	6.102	0.0208
		01/18/66	03/24/66	02/19/66	66-2578	03/24/66	1000	USS Everglades AD 24	1000	N/A	0.109 +/- 0.130	0.131	0
(b) (6)	(b) (6)	01/18/66	02/05/66	01/27/66	66-898	02/05/66	670	Torrejon	200	N/A	3.15+/-0.89	5.642	0.0161
		03/14/66	03/19/66	03/16/66	66-2128	03/19/66	1000	Torrejon	1000	N/A	0.105+/-0.102	0.126	0.000153
		02/27/66	03/18/66	03/08/66	66-2274	03/18/66	600	Torrejon	600	N/A	0.798 +/- 0.1032	1.596	0
		01/25/66	02/09/66	02/01/66	66-745	02/09/66	860	Hanaw, Germany	200	N/A	2.28+/-1.42	3.161	0.0108
		03/14/66	03/19/66	03/16/66	66-2549	03/19/66	600	San Pablo	600	N/A	ND	ND	0
		01/18/66	02/09/66	01/29/66	66-821	02/09/66	520	Moron	200	N/A	ND	ND	0
		02/08/66	02/08/66	02/08/66	66-1390	02/28/66	900 (12-hr)	Moron	936	N/A	0.757	0.757	0.003
		01/18/66	02/28/66	02/07/66	66-1490	02/28/66	250	US Naval Ocean Graph	260	N/A	ND	ND	0
(b) (6)	(b) (6)	02/09/66	03/08/66	02/22/66	66-1866	03/08/66	n/a	Moron	n/a	N/A	NR	NR	n/a
					66-2160	03/08/66	770	Moron	770	N/A	0.116+/-0.114	0.181	0.000597
(b) (6)	(b) (6)	02/08/66	02/08/66	02/07/66	66-1396	02/28/66	930 (12-hr)	Torrejon	967	N/A	ND	ND	0
		01/18/66	02/06/66	01/27/66	66-524	02/06/66	450	Torrejon	200	N/A	1.19+/-0.64	3.173	0.00972
		01/20/66	02/12/66	01/31/66	66-788	02/12/66	630	Moron	200	N/A	1.00+/-0.74	1.905	0.00941
		01/18/66	02/05/66	01/27/66	66-925	02/05/66	810	Moron	200	N/A	4.18+/-1.10	6.193	0.0178
					66-1400	02/28/66	620 (12-hr)	Moron	644	N/A	0.143	0.143	0.001
(b) (6)	(b) (6)	01/18/66	02/07/66	01/28/66	66-474	02/07/66	400	Torrejon	200	N/A	ND	ND	0
		02/27/66	03/19/66	03/09/66	66-2126	03/19/66	940	Torrejon	940	N/A	0.116+/-0.114	0.148	0.000477
		01/18/66	02/04/66	01/26/66	66-754	02/04/66	950	Moron	200	N/A	ND	ND	0
		01/29/66	02/19/66	02/08/66	66-1201	02/19/66	1360	San Pablo	1000	N/A	ND	ND	0
		01/18/66	02/08/66	01/28/66	66-832	02/08/66	475	Moron	200	N/A	ND	ND	0
		01/18/66	02/09/66	01/29/66	66-759	02/09/66	550	Torrejon	200	N/A	1.14+/-0.61	2.487	0.00887
		01/18/66	02/05/66	01/27/66	66-944	02/05/66	430	Torrejon	200	N/A	6.00+/-0.96	16.744	0.0483
					66-2580	03/23/66	n/a	Moron	n/a	N/A	NR	NR	n/a
(b) (6)	(b) (6)	02/11/66	03/08/66	02/23/66	66-2501	03/08/66	975	Torrejon	975	N/A	0	0.000	0
		01/18/66	02/07/66	01/28/66	66-497	02/07/66	810	Torrejon	200	N/A	1.29+/-1.00	1.911	0.00617
		01/19/66	02/19/66	02/03/66	66-1213	02/19/66	960	Moron	998		NR	NR	n/a
					66-3125	04/13/66	900	Moron	450	N/A	0.452+/-0.223	0.603	n/a
					66-3125-S	04/13/66	900	Moron	450	N/A	NR	NR	n/a
(b) (6)	(b) (6)	01/18/66	01/21/66	01/19/66	66-257	01/21/66	1060	Torrejon	200	N/A	11.02 +/- 2.12	12.475	n/a
		01/18/66	01/24/66	01/21/66	66-1003	02/15/66	1475	Kirtland AFB BO97	200	N/A	16.5+/-3.1	16.500	0
		01/18/66	02/02/66	01/25/66	66-407	02/02/66	2628	Ramstein	200	N/A	5.47+/-2.87	5.470	0.0116
		01/29/66	01/29/66	01/29/66	66-2277	01/29/66	1420	Torrejon	1420	04/15/66	.3333+/-0.166	0.333	0.00272
		01/18/66	04/11/66	02/28/66	66-2946	04/22/66	1500	B097	1500	N/A	0.142+/-0.102	0.142	n/a
					66-2946	04/22/66	1500			06/16/66	1.93+/-0.334	1.930	
(b) (6)	(b) (6)	02/13/66	03/18/66	03/01/66	66-2109	03/18/66	890	Moron	890	N/A	0.197+/-0.092	0.266	0.00136
		03/04/66	03/08/66	03/06/66	66-2488	03/08/66	800	Wheelus AF, Libya	800	N/A	0	0.000	0
		01/18/66	02/06/66	01/27/66	66-516	02/06/66	670	Torrejon	200	N/A	7.64+/-1.41	13.684	0.419
		01/18/66	02/18/66	02/01/66	66-961	02/18/66	780	Torrejon	200	N/A	ND	ND	0
		02/24/66	03/17/66	03/06/66	66-2015	03/17/66	1320	Torrejon	1320	N/A	0.266+/-0.109	0.266	0
		01/18/66	02/07/66	01/28/66	66-460	02/07/66	870	Moron	200	N/A	ND	ND	0

Individuals with Urine Samples Classified as Remaining Cases

Name	SSN	Estimated Start Exposure Date	Estimated End Exposure Date	Estimated Acute Exposure Date	Sample No.	Sample Date	Sample Vol (mL)	Base	Sample Anal	Date Anal	Result (pCi/sample)	24hr Activity (pCi/day)	Recorded Systemic Body Burden
(b) (6)	(b) (6)	01/20/66	02/09/66	01/30/66	66-612	02/09/66	510	Torrejon	200	N/A	0.94+/-0.45	2.212	0.00794
		02/10/66	02/08/66	02/09/66	66-1393	02/28/66	600 (12-hr)	Moron	624	N/A	1.09	1.090	0.004
		01/18/66	02/08/66	01/28/66	66-830	02/08/66	552	Torrejon	200	N/A	ND	ND	0
		01/31/66	04/11/66	03/07/66	66-3123	04/13/66	970	Moron	485	N/A	0.225+/-0.161	0.278	n/a
					66-3123-S	04/13/66	970	Moron	485	N/A	NR	NR	n/a
(b) (6)	(b) (6)	01/18/66	02/12/66	01/30/66	66-789	02/12/66	540	Moron	200	N/A	1.05+/-0.66	2.333	0.00912
		03/26/66	04/11/66	04/03/66	66-3122	04/13/66	650	Moron	650	N/A	0.528+/-0.158	0.975	0
(b) (6)	(b) (6)	02/06/66	02/08/66	02/07/66	66-1366	02/28/66	390 (12-hr)	Torrejon	390	N/A	0	0.000	0
		01/18/66	02/04/66	01/26/66	66-340	02/04/66	490	Torrejon	200	N/A	1.39+/-0.58	3.404	0.00946
		02/11/66	03/18/66	02/28/66	66-2213	03/18/66	600	Torrejon	600	N/A	0.242+/-0.148	0.484	0.00206
		02/04/66	02/04/66	02/04/66	66-3116	04/13/66	1125	Moron	562	N/A	0.404+/-0.145	0.431	n/a
		02/13/66	03/08/66	02/24/66	66-2499	03/08/66	1000	Moron	1000	N/A	0	0.000	0
		01/18/66	01/28/66	01/23/66	66-1095	01/28/66	610	Zaragoza	610	N/A	ND	ND	0
		01/18/66	03/03/66	02/09/66	66-1941	03/03/66	1650	625TH MASS (MAC)	1730	N/A	0.173+/-0.091	0.173	0
(b) (6)	(b) (6)	01/18/66	02/08/66	01/28/66	66-835	02/08/66	815	Moron	200	N/A	ND	ND	0
		02/06/66	02/08/66	02/07/66	66-1378	02/28/66	780 (12-hr)	Torrejon	812	N/A	ND	ND	0
		01/18/66	02/09/66	01/29/66	66-824	02/09/66	915	Torrejon	200	N/A	1.98+/-1.01	2.597	0.00882
		01/18/66	03/20/66	02/17/66	66-2017	03/20/66	1500	Tinker AFB	1500	N/A	0.102+/-0.088	0.102	0
		02/12/66	03/01/66	02/20/66	66-1882	03/01/66	700	Ramstein	700	N/A	0.706+/-0.218	1.210	n/a
					66-1882	03/01/66	700			06/28/66	0.043+/-0.025	0.074	
(b) (6)	(b) (6)	01/19/66	03/08/66	02/12/66	66-2476	03/08/66	850	Torrejon	850	N/A	0.27	0.381	n/a
		01/18/66	02/03/66	01/26/66	66-1838	02/03/66	800	Torrejon	800	N/A	1.36	2.040	0.0166
		02/11/66	03/14/66	02/28/66	66-1945	03/14/66	n/a	Torrejon	n/a	N/A	0.357+/-0.130	0.357	0
		01/25/66	02/22/66	02/08/66	66-1084	02/22/66	705	Moron	705	03/17/66	4.46+/-0055	7.591	0.0416
		02/06/66	02/08/66	02/07/66	66-1382	02/28/66	900 (12-hr)	Torrejon	936	N/A	1.18	1.180	0.005
		01/28/66	02/08/66	02/02/66	66-850	02/08/66	810	Toul Rosieres	200	N/A	ND	ND	0
		02/11/66	03/28/66	03/05/66	66-1927	03/28/66	800	Torrejon	800	N/A	0.210+/-0.092	0.315	0
		01/18/66	02/05/66	01/27/66	66-897	02/05/66	780	Torrejon	200	N/A	2.65+/-1.06	4.077	0.0117
		01/18/66	02/05/66	01/27/66	66-906	02/05/66	910	Torrejon	200	N/A	ND	ND	0
		02/09/66	03/09/66	02/23/66	66-2389	03/09/66	850	Torrejon	850	N/A	0.186+/-0.123	0.263	0.0017
		01/18/66	02/09/66	01/29/66	66-827	02/09/66	880	Moron	200	N/A	1.83+/-1.02	2.495	0.00852
		03/02/66	03/18/66	03/10/66	66-2087	03/18/66	890	Lindsey AS, Germany	890	N/A	0.133+/-0.086	0.179	0
(b) (6)	(b) (6)	01/23/66	02/19/66	02/05/66	66-1218	02/19/66	1260	Torrejon	1000	N/A	2.31+/-0.32	2.310	0.012
		01/20/66	02/17/66	02/03/66	66-1115	02/17/66	990	Toul Rosieres	990	03/23/66	0	0.000	0
		01/18/66	02/08/66	01/28/66	66-1345	02/08/66	660	Toul Rosieres	685	N/A	0.286+/-0.148	0.520	0.0165
		01/18/66	02/05/66	01/27/66	66-904	02/05/66	540	Torrejon	200	N/A	2.34+/-0.70	5.200	0.015
		01/20/66	03/18/66	02/17/66	66-2257	03/18/66	600	Torrejon	600	N/A	0.180+/-0.155	0.360	0.00164
		01/18/66	03/19/66	02/17/66	66-2155	03/19/66	900	Torrejon	900	N/A	0.365+/-0.190	0.487	
		02/27/66	03/08/66	03/03/66	66-2512	03/08/66	980	Moron	950	N/A	NR	NR	n/a
		01/18/66	03/04/66	02/09/66	66-2362	03/04/66	700	Torrejon	700	N/A	0.150+/-0.119	0.257	0.000472
		02/08/66	03/10/66	02/23/66	66-1955	03/10/66	1000	Moron	1000	N/A	0.186+/-0.115	0.223	0
		01/18/66	02/12/66	01/30/66	66-766	02/12/66	950	Torrejon	200	N/A	ND	ND	0
		01/18/66	02/06/66	01/27/66	66-520	02/06/66	980	Moron	200	N/A	9.12+/-2.03	11.400	0.0349
		02/13/66	03/19/66	03/02/66	66-2328	03/19/66	820	Moron	820	N/A	0.206+/-0.129	0.301	0.00126
		03/02/66	03/08/66	03/05/66	66-3057	04/27/66	300	Ramstein	300	N/A	0.200+/-0.080	0.800	n/a
		01/18/66	02/18/66	02/02/66	66-973	02/18/66	1600	Torrejon	200	N/A	ND	ND	0
		01/31/66	03/19/66	02/23/66	66-2553	03/19/66	600	Glessen	600	N/A	0.307+/-0.179	0.614	0.00239
		02/13/66	03/18/66	03/01/66	66-2108	03/18/66	780	San Pablo	780	N/A	0.297+/-0.135	0.457	0.00205
		01/29/66	02/19/66	02/08/66	66-1197	02/19/66	n/a	San Pablo	n/a	N/A	0	0.000	n/a
					66-3114	04/13/66	1450	San Pablo	725	N/A	0.446+/-0.139	0.446	n/a
(b) (6)	(b) (6)	01/18/66	02/04/66	01/26/66	66-349	02/04/66	750	Moron	200	N/A	2.06+/-1.10	3.296	0.0103
		03/10/66	03/19/66	03/14/66	66-2164	03/19/66	620	Sembach	620	N/A	0.131	0.254	n/a
		01/18/66	02/08/66	01/28/66	66-828	02/08/66	390	Torrejon	195	N/A	0.48+/-0.44	1.477	0.00471
		01/17/66	03/04/66	02/09/66	66-260	01/21/66	700	Torrejon	200	N/A	1.86 +/- 0.76	3.189	n/a
					66-2380	03/04/66	1420	Torrejon	1420	N/A	0.339+/-0.175	0.339	0.00256
(b) (6)	(b) (6)	02/27/66	03/19/66	03/09/66	66-2127	03/19/66	790	Torrejon	790	N/A	ND	ND	0
		01/18/66	02/07/66	01/28/66	66-476	02/07/66	660	Toul Rosieres	200	N/A	ND	ND	0
		03/14/66	03/19/66	03/16/66	66-2131	03/19/66	900	Moron	900	N/A	ND	ND	0

Individuals with Urine Samples Classified as Remaining Cases

Name	SSN	Estimated Start Exposure Date	Estimated End Exposure Date	Estimated Acute Exposure Date	Sample No.	Sample Date	Sample Vol (mL)	Base	Sample Anal	Date Anal	Result (pCi/sample)	24hr Activity (pCi/day)	Recorded Systemic Body Burden
(b) (6)	(b) (6)	01/18/66	02/05/66	01/27/66	66-917	02/05/66	780	Moron	200	N/A	1.61+/-0.74	2.477	0.00713
		01/18/66	02/09/66	01/29/66	66-756	02/09/66	890	Torrejon	200	N/A	2.20+/-1.23	2.966	0.00973
		02/21/66	03/18/66	03/05/66	66-2236	03/18/66	950	Torrejon	950	N/A	0.108+/-0.102	0.136	0.000719
		02/13/66	03/18/66	03/01/66	66-2243	03/18/66	810	Moron	810	N/A	0.230+/-0.139	0.341	0.00215
		02/09/66	03/08/66	02/22/66	66-1899	03/08/66	800	Moron	800	N/A	0.181+/-0.085	0.362	0
		01/18/66	02/18/66	02/01/66	66-966	02/16/66	800	Torrejon	200	N/A	1.27+/-0.69	1.905	0.00948
		01/18/66	03/24/66	02/19/66	66-2574	03/24/66	n/a	USS Everglades AD-24	n/a	N/A	NR	NR	n/a
					66-2971	04/24/66	600	USS Everglades AD-24	600	N/A	ND	ND	0
(b) (6)	(b) (6)	01/29/66	02/19/66	02/08/66	66-1211	02/19/66	760	San Pablo	790	N/A	NR	NR	n/a
		01/17/66	02/05/66	01/26/66	66-918	02/05/66	730	Torrejon	200	N/A	1.71+/-0.94	2.811	0.00808
		02/08/66	02/08/66	02/08/66	66-1355	02/28/66	500 (12-hr)	Toul Rosieres	500	N/A	0.117	0.117	0.000954
		01/18/66	02/08/66	01/28/66	66-842	02/08/66	760	Torrejon	200	N/A	0.81+/-0.59	1.279	0.00433
		01/17/66	02/20/66	02/03/66	66-1957	02/20/66	1650	Moron	1650	N/A	0.107+/-0.071	0.107	0
		02/08/66	02/26/66	02/16/66	66-1435	02/28/66	760	Moron	789	N/A	ND	ND	0
		02/24/66	03/19/66	03/07/66	66-2085	03/19/66	350	Toul Rosieres	350	N/A	0.112+/-0.074	0.384	0
		01/18/66	02/12/66	01/30/66	66-787	02/12/66	440	Moron	200	N/A	ND	ND	0
		02/09/66	03/08/66	02/22/66	66-1900	03/08/66	800	San Pablo	800	N/A	0.135+/-0.088	0.203	0
		01/18/66	03/13/66	02/14/66	66-2539	03/13/66	1000	Moron	1000	N/A	0.293	0.352	n/a
		01/25/66	02/09/66	02/01/66	66-802	02/09/66	700	Hanaw, Germany	200	N/A	2.75+/-1.01	4.714	0.0161
		01/18/66	03/18/66	02/15/66	66-2028	03/18/66	870	Moron	870	N/A	0.216+/-0.099	0.298	0
		01/18/66	01/21/66	01/19/66	66-263	01/21/66	900	Torrejon	200	N/A	NR	NR	n/a
		03/13/66	03/19/66	03/16/66	66-2175	03/19/66	700	Torrejon	700	N/A	0.131	0.225	n/a
		01/25/66	03/13/66	02/17/66	66-2548	03/13/66	800	Charleston	800	N/A	0.129+/-0.107	0.194	0.000991
					66-2573	03/24/66	700	USS Everglades AD-24	700	N/A	.133+/-0.113	0.228	n/a
(b) (6)	(b) (6)	01/18/66	02/04/66	01/26/66	66-358	02/04/66	1000	Torrejon	200	N/A	108+/-5.9	129.600	0.541
					66-2354	03/04/66	800	Torrejon	800	N/A	0.153+/-0.113	0.230	0.000481
(b) (6)	(b) (6)	02/01/66	03/08/66	02/18/66	66-1864	03/08/66	500	Moron	500	N/A	1.41+/-0.31	3.384	n/a
(b) (6)				02/18/66	66-1884	03/08/66	500			08/29/66	NR	NR	
	(b) (6)	01/18/66	02/04/66	01/26/66	66-346	02/04/66	600	Torrejon	200	N/A	ND	ND	0
					66-2685	03/27/66	1400	Torrejon	1400	N/A	0.477+/-0.192	0.477	n/a
(b) (6)	(b) (6)	02/13/66	03/08/66	02/24/66	66-2473	03/08/66	450	Moron	450	N/A	0.131	0.349	n/a
		01/18/66	02/06/66	01/27/66	66-528	02/06/66	370	Torrejon	200	N/A	0.98+/-0.41	3.178	0.00972
		01/20/66	02/08/66	01/29/66	66-844	02/08/66	760	Toul Rosieres	200	N/A	ND	ND	0
		03/13/66	03/14/66	03/13/66	66-2876	04/01/66	1600	Torrejon	1600	N/A	1.44+/-0.31	1.440	n/a
					66-2876	04/01/66	1600			07/13/66	2.701+/-0.020	2.701	
(b) (6)	(b) (6)	01/28/66	02/09/66	02/03/66	66-801	02/09/66	950	Torrejon	200	N/A	1.51+/-1.26	1.907	0.00651
		01/18/66	02/03/66	01/26/66	66-1844	02/03/66	925	Moron	925	N/A	0.108	0.140	0
		01/18/66	02/05/66	01/27/66	66-890	02/05/66	900	Moron	200	N/A	1.23+/-0.96	1.640	0.00472
		02/10/66	03/19/66	02/28/66	66-2147	03/19/66	830	Moron	830	N/A	ND	ND	0
		02/26/66	03/18/66	03/08/66	66-2095	03/18/66	n/a	Torrejon	n/a	N/A	0.132+/-0.095	0.132	0.000736
		02/09/66	03/09/66	02/23/66	66-2068	03/09/66	n/a	Torrejon	n/a	N/A	0.351 +/- 0.123	0.351	0.00196
		01/17/66	02/11/66	01/29/66	66-760	02/11/66	665	Torrejon	200	N/A	ND	ND	0
		01/18/66	02/05/66	01/27/66	66-899	02/05/66	480	Moron	200	N/A	1.48+/-0.66	3.700	0.0107
		02/11/66	03/08/66	02/23/66	66-2481	03/08/66	900	Torrejon	900	N/A	ND	ND	0
		02/09/66	02/28/66	02/18/66	66-2385	03/11/66	1875	Torrejon	1875	N/A	0.155+/-0.113	0.155	
		02/11/66	03/08/66	02/23/66	66-2482	03/08/66	100	Torrejon	100	N/A	0	0.000	0
		02/21/66	03/18/66	03/05/66	66-2263	03/18/66	550	Zaragoza	550	N/A	0.322+/-0.484	0.703	0.00156
		01/21/66	03/18/66	02/17/66	66-2026	03/18/66	n/a	Torrejon	n/a	N/A	NR	NR	n/a
					66-2144	03/19/66	780	Torrejon	780	N/A	0.112 +/- 0.126	0.172	0
(b) (6)	(b) (6)	01/17/66	02/07/66	01/27/66	66-459	02/07/66	915	Torrejon	800	N/A	ND	ND	0
		01/18/66	02/07/66	01/28/66	66-484	02/07/66	560	Moron	200	N/A	1.59+/-0.66	3.407	0.011
		01/18/66	01/29/66	01/23/66	66-1226	01/29/66	1210	San Pablo	1000	N/A	3.83+/-0.29	3.830	0.021
		02/24/66	03/08/66	03/02/66	66-1879	03/08/66	300	Toul Rosieres	312	N/A	1.92	7.680	0.00538
		01/18/66	02/07/66	01/28/66	66-498	02/07/66	760	Moron	200	N/A	6.65+/-1.59	10.500	0.034
		01/18/66	02/09/66	01/29/66	66-819	02/09/66	410	Torrejon	200	N/A	2.65+/-0.67	7.756	0.0264
		01/16/66	02/05/66	01/26/66	66-902	02/05/66	750	Torrejon	502	03/17/66	35.47+/-0.73	58.752	
		03/11/66	03/19/66	03/15/66	66-2174	03/19/66	700	Torrejon	700	N/A	0.431	0.739	

Individuals with Urine Samples Classified as Remaining Cases

Name	SSN	Estimated Start Exposure Date	Estimated End Exposure Date	Estimated Acute Exposure Date	Sample No.	Sample Date	Sample Vol (mL)	Base	Sample Anal	Date Anal	Result (pCi/sample)	24hr Activity (pCi/day)	Recorded Systemic Body Burden
(b) (6)	(b) (6)	02/09/66	03/08/66	02/22/66	66-1909	03/08/66	550	Moron	550	N/A	0.357+/-0.125	0.779	
		01/18/66	02/11/66	01/30/66	66-787	02/11/66	590	Torrejon	200	N/A	1.75+/-0.87	3.559	0.0133
		01/18/66	02/04/66	01/26/66	66-348	02/04/66	900	Moron	200	N/A	ND	ND	
		02/01/66	02/16/66	02/08/66	66-1947	03/03/66	1650	Torrejon	1650	N/A	0.195+/-0.092	0.195	NSBB
		04/02/66	04/10/66	04/06/66	66-2938	04/19/66	1500	Torrejon	1500	N/A	1.40+/-0.30	1.400	
					66-2938	04/19/66	1500			n/a	NR	NR	
(b) (6)	(b) (6)	03/01/66	03/20/66	03/10/66	66-2299	03/20/66	880	Torrejon	880	N/A	0.126 +/- 0.126	0.172	
		01/18/66	02/06/66	01/27/66	66-507	02/06/66	590	Torrejon	200	N/A	2.61+/-0.90	5.308	0.0162
		02/10/66	03/19/66	02/28/66	66-2565	03/19/66	500	Moron	500	N/A	0.150+/-0.113	0.360	0.000976
		02/24/66	03/04/66	02/28/66	66-2391	03/04/66	1450	US Bureau of Mines, Pills, PA	1450	04/01/66	0.168+/-0.118	0.168	0.00035
(b) (6)	(b) (6)	01/25/66	02/19/66	02/06/66	66-1054	02/19/66	1550	Wiesbaden	1550	03/17/66	ND	ND	
		02/17/66	02/28/66	02/22/66	66-3103	05/13/66	1400	HQ Atlantic Air Rescue	700	N/A	0.700 +/- 0.163	0.700	
					66-3103	05/13/66	1400	HQ Atlantic Air Rescue	700	N/A	0.700+/-0.163	0.700	
(b) (6)	(b) (6)	02/14/66	02/26/66	02/20/66	66-1432	02/26/66	500	Wiesbaden	520	N/A	0	0.000	
		01/18/66	02/03/66	01/26/66	66-1839	02/03/66	910	Torrejon	910	N/A	0.239	0.315	
		01/18/66	02/07/66	01/28/66	66-473	02/07/66	670	Toul Rosieres	200	N/A	ND	ND	
		02/11/66	04/11/66	03/12/66	66-3130	04/13/66	860	Wheelus AF, Libya	860	N/A	NR	NR	
					66-3130	04/13/66	1720	Wheelus AF, Libya	860	N/A	1.19+/-0.34	1.190	
(b) (6)	(b) (6)	02/21/66	03/20/66	03/06/66	66-2308	03/20/66	700	Torrejon	700	N/A	0.119+/-0.115	0.204	0.000613
		03/18/66	03/19/66	03/18/66	66-2076	03/19/66	980	Moron	980	N/A	0.239+/-0.102	0.293	
		01/18/66	02/11/66	01/30/66	66-364	02/04/66	825	Torrejon	200	N/A	58.4+/-3.9	64.945	0.292
					66-1161	02/18/66	1680	Torrejon	1680	03/02/66	3.61+/-0.50	3.610	0.0176
(b) (6)	(b) (6)	02/08/66	02/17/66	02/12/66	66-1112	02/17/66	910	Toul Rosieres	910	03/23/66	0.896+/-0.515	1.182	0.00207
		01/18/66	02/05/66	01/27/66	66-936	02/05/66	860	Torrejon	200	N/A	0.83+/-0.8	1.158	0.00334
		02/09/66	03/09/66	02/23/66	66-2403	03/09/66	1300	Torrejon	1300	N/A	0.152+/-0.124	0.152	0.000847
		01/25/66	02/09/66	02/01/66	66-740	02/09/66	960	Hanaw, Germany	200	N/A	1.16 +/- 1.11	1.450	0.00613
		02/13/66	03/09/66	02/25/66	66-2401	03/09/66	1350	Torrejon	1350	N/A	0.102+/-0.094	0.102	0.00048
		02/10/66	03/08/66	02/23/66	66-2493	03/08/66	950	Moron	950	N/A	0	0.000	
		01/18/66	03/09/66	02/12/66	66-2062	03/09/66	890	Moron	890	N/A	0.164+/-0.095	0.221	0.00134
		02/06/66	02/08/66	02/07/66	66-1372	02/28/66	910 (12-hr)	Moron	910	N/A	0	0.000	
		01/18/66	01/29/66	01/23/66	66-1079	01/29/66	960	Torrejon	960	N/A	0.141	0.176	0.00026
		01/27/66	02/19/66	02/07/66	66-1221	02/19/66	860	San Pablo	860	N/A	0.296+/-0.160	0.413	0.00135
					66-1221	02/19/66	950	San Pablo	950	N/A	0.185+/-0.259	0.234	
(b) (6)	(b) (6)	03/08/66	03/19/66	03/13/66	66-2167	03/19/66	930	Toul Rosieres	930	N/A	0.162	0.209	
		01/18/66	01/24/66	01/21/66	66-1159	01/24/66	1260	Toul Rosieres	1000	N/A	0	0.000	
		02/25/66	03/19/66	03/08/66	66-2148	03/19/66	900	Moron	900	N/A	0.100+/-0.074	0.133	0.000441
		02/12/66	03/16/66	02/28/66	66-2859	04/18/66	1400	Chateauroux, France	1400	N/A	ND	ND	
					66-2859	04/18/66	1400			07/07/66	NR	NR	
(b) (6)	(b) (6)	01/18/66	02/06/66	01/27/66	66-508	02/06/66	870	Torrejon	200	N/A	ND	ND	
		01/21/66	03/03/66	02/10/66	66-1916	03/03/66	850	Charleston	850	N/A	0.292+/-0.107	0.412	
		01/18/66	02/19/66	02/02/66	66-1951	02/23/66	1900	Torrejon	1900	N/A	0.882+/-0.189	0.882	0.00597
					66-2040	03/20/66	2900	Torrejon	2000	N/A	0.155+/-0.120	0.155	0.000435
					66-2927	04/21/66	1200	Torrejon	1200	N/A	1.02+/-0.26	1.020	
(b) (6)	(b) (6)	02/04/66	03/02/66	02/17/66	66-1918	03/02/66	825	USS Simon Lake	825	N/A	0.122+/-0.087	0.177	
		01/18/66	03/09/66	02/12/66	66-2067	03/09/66	n/a	Torrejon	n/a	N/A	NR	NR	
		01/18/66	02/06/66	01/27/66	66-914	02/06/66	940	Moron	200	N/A	ND	ND	
		01/18/66	02/05/66	01/27/66	66-905	02/05/66	650	Moron	200	N/A	ND	ND	
		01/18/66	02/08/66	01/28/66	66-846	02/08/66	800	Moron	200	N/A	ND	ND	
		01/19/66	02/09/66	01/29/66	66-747	02/09/66	790	Torrejon	200	N/A	1.08+/-0.79	1.641	0.00587
		01/18/66	01/21/66	01/19/66	66-216	01/21/66	500	Torrejon	200	N/A	NR	NR	
		01/18/66	01/21/66	01/19/66	66-211	01/21/66	113	Torrejon	113	N/A	NR	NR	
					66-221	01/21/66	250	Torrejon	190	N/A	48.8 +/- 2	234.240	
(b) (6)	(b) (6)	01/18/66	02/05/66	01/27/66	66-903	02/05/66	570	Moron	200	N/A	0.94+/-0.43	1.979	0.0061
		01/18/66	03/24/66	02/19/66	66-2576	03/24/66	1400	USS Everglades AD 24	1400	N/A	0.292+/-0.151	0.292	
(b) (6)	(b) (6)	01/21/66	02/18/66	02/04/66	66-1444	02/26/66	790	Moron	790	03/17/66	ND	ND	

Individuals with Urine Samples Classified as Remaining Cases

Name	SSN	Estimated Start Exposure Date	Estimated End Exposure Date	Estimated Acute Exposure Date	Sample No.	Sample Date	Sample Vol (mL)	Base	Sample Anal	Date Anal	Result (pCi/sample)	24hr Activity (pCi/day)	Recorded Systemic Body Burden
(b) (6)	(b) (6)	01/21/66	03/04/66	02/11/66	66-2371	03/04/66	1300	Moron	1300	N/A	NR	NR	
		03/11/66	03/19/66	03/15/66	66-2133	03/19/66	790	Moron	790	N/A	ND	ND	
		01/18/66	02/12/66	01/30/66	66-763	02/12/66	770	Torrejon	200	N/A	1.29+/-0.73	2.010	0.00791
		01/18/66	02/06/66	01/27/66	66-526	02/06/66	930	Moron	200	N/A	1.44+/-0.93	1.858	0.00568
		01/18/66	02/18/66	02/02/66	66-972	02/18/66	1500	Torrejon	200	N/A	ND	ND	
		02/09/66	03/09/66	02/23/66	66-2058	03/09/66	680	Torrejon	680	N/A	0.149+/-0.088	0.263	0.000831
		01/18/66	03/10/66	02/12/66	66-2388	03/10/66	2275	Torrejon	2275	N/A	0.623+/-0.225	0.623	0.00347
		01/18/66	02/13/66	01/31/66	66-1133	02/13/66	1030	Torrejon	1000	03/23/66	0.772+/-0.494	0.899	0.00327
		01/20/66	02/08/66	01/29/66	66-845	02/08/66	570	Toul Rosieres	200	N/A	1.84+/-0.62	3.453	0.0111
		02/11/66	03/08/66	02/23/66	66-2492	03/08/66	200	Torrejon	200	N/A	0	0.000	
		02/04/66	02/25/66	02/14/66	66-1486	03/04/66	3780	USS Paprgo ATF-160	1000	N/A	0.176+/-0.574	0.176	
(b) (6)	(b) (6)	02/06/66	03/04/66	02/19/66	66-2369	03/04/66	500	Torrejon	500	N/A	0.309+/-0.159	0.742	0.00155
		01/17/66	01/25/66	01/21/66	66-1168	02/17/66	1490	Torrejon	1000	N/A	NR	NR	
		01/18/66	02/18/66	02/01/66	66-963	02/18/66	1780	Torrejon	200	N/A	94.45+/-7.67	94.450	
		01/18/66	03/09/66	02/12/66	66-2066	03/09/66	1400	Torrejon	1400	N/A	0.488+/-0.148	0.488	0.00399
		01/25/66	02/09/66	02/01/66	66-795	02/09/66	480	Hanaw, Germany	200	N/A	2.07+/-0.66	5.175	0.0185
		01/18/66	01/25/66	01/21/66	66-3120	04/13/66	795	Moron	795	N/A	0.483+/-0.145	0.699	
		03/14/66	03/19/66	03/16/66	66-2554	03/19/66	900	Moron	900	04/19/66	ND	ND	
		02/13/66	03/18/66	03/01/66	66-2105	03/18/66	790	Torrejon	790	N/A	0.189+/-0.134	0.287	0.00154
		01/18/66	02/07/66	01/28/66	66-1098	02/07/66	685	Wiesbaden	685	N/A	ND	ND	
		02/13/66	03/03/66	02/22/66	66-1913	03/03/66	800	Moron	800	N/A	0.232+/-0.106	0.348	
		02/01/66	03/02/66	02/15/66	66-3027	05/05/66	1350	Ramstein	1350	N/A	0.306+/-0.091	0.306	
		01/18/66	02/09/66	01/29/66	66-818	02/09/66	360	Torrejon	200	N/A	2.03+/-0.63	6.767	0.0231
		02/21/66	03/19/66	03/06/66	66-2209	03/19/66	600	San Pablo	600	N/A	0.148+/-0.135	0.296	0.00108
		02/13/66	03/04/66	02/22/66	66-2349	03/04/66	820	Torrejon	820	N/A	0.110+/-0.108	0.161	0.000435
		01/18/66	01/28/66	01/23/66	66-3118	04/13/66	1500	Moron	750	N/A	0.218+/-0.113	0.218	
		01/20/66	02/09/66	01/30/66	66-796	02/09/66	750	Torrejon	200	N/A	ND	ND	
		01/18/66	01/21/66	01/19/66	66-235	01/21/66	480	Torrejon	200	N/A	0.227 +/- 0.112	0.568	
		01/18/66	01/21/66	01/19/66	66-232	01/21/66	480	Torrejon	200	N/A	0.227 +/- 0.112	0.568	
		01/18/66	01/21/66	01/19/66	66-223	01/21/66	475	Torrejon	200	N/A	NR	NR	
		02/01/66	02/19/66	02/10/66	66-1204	02/19/66	900	Moron	936	N/A	1.16+/-0.90	1.547	0.00454
		01/18/66	01/21/66	01/19/66	66-228	01/21/66	410	Torrejon	200	N/A	1.71 +/- 0.60	5.005	
		01/23/66	03/20/66	02/20/66	66-2308	03/20/66	760	Pirmasens	760	N/A	0.144+/-0.114	0.227	0.00123
		02/10/66	03/09/66	02/23/66	66-2053	03/09/66	790	Zaragoza	790	N/A	0.218+/-0.101	0.331	0.00112
		01/19/66	01/27/66	01/23/66	66-3131	04/13/66	2000	Wheelus AF, Libya	1000	N/A	1.17 +/- 0.33	1.170	
					66-3131	04/13/66	2000	Wheelus AF, Libya	1000	N/A	1.17+/-0.33	1.170	
					66-3131	04/13/66	2000			06/03/66	0.590	0.590	
(b) (6)	(b) (6)	02/18/66	03/04/66	02/25/66	66-2360	03/04/66	650	Moron	650	N/A	0.117+/-0.101	0.216	0.000368
		01/18/66	02/05/66	01/27/66	66-891	02/05/66	860	Torrejon	200	N/A	ND	ND	
		01/18/66	02/07/66	01/28/66	66-457	02/07/66	820	Moron	200	N/A	0.94+/-0.77	1.376	0.00422
		02/13/66	03/04/66	02/22/66	66-2364	03/04/66	900	Torrejon	900	N/A	0.147+/-0.119	0.196	0.000581
		01/23/66	02/08/66	01/31/66	66-848	02/08/66	930	Toul Rosieres	200	N/A	ND	ND	
		02/02/66	02/15/66	02/08/66	66-1156	02/15/66	340	Panama City, FL	340	03/17/66	0.65+/-0.21	2.294	0.00712
		02/09/66	03/09/66	02/23/66	66-2061	03/09/66	1200	Torrejon	1200	N/A	0.212+/-0.096	0.212	0.00118
		01/28/66	02/12/66	02/04/66	66-947	02/12/66	1060	Torrejon	200	N/A	ND	ND	
		02/13/66	03/18/66	03/01/66	66-2252	03/18/66	980	Moron	980	N/A	0.189+/-0.135	0.231	0.00177
		02/03/66	02/25/66	02/14/66	66-1346	02/25/66	540	Toul Rosieres	562	N/A	0.118+/-0.385	0.262	
		02/11/66	03/04/66	02/21/66	66-2368	03/04/66	1000	Wiesbaden	1000	N/A	ND	ND	
		01/18/66	02/06/66	01/27/66	66-522	02/06/66	540	Torrejon	200	N/A	1.96+/-0.64	4.358	0.0127
		01/18/66	03/08/66	02/11/66	66-1910	03/08/66	n/a	Torrejon	n/a	N/A	NR	NR	
		01/18/66	03/08/66	02/11/66	66-2159	03/08/66	730	Torrejon	730	N/A	0.129+/-0.114	0.212	0.00103
		01/18/66	03/08/66	02/11/66	66-1907	03/08/66	875	Torrejon	875	N/A	0.236+/-0.120	0.324	
(b) (6)	(b) (6)	01/29/66	02/22/66	02/10/66	66-1089	02/22/66	755	Torrejon	755	03/17/66	8.86+/-0.78	14.082	0.0682
		01/29/66	02/23/66	02/10/66	66-2939	04/14/66	500	Torrejon	500	N/A	ND	ND	
					66-2939	04/14/66	500			08/01/66	NR	NR	
(b) (6)	(b) (6)	02/06/66	03/04/66	02/19/66	66-2356	03/04/66	900	Moron	900	N/A	ND	ND	
		02/10/66	03/19/66	02/28/66	66-2130	03/19/66	800	Torrejon	800	N/A	0.223+/-0.162	0.335	0.00145
		01/18/66	03/08/66	02/11/66	66-2480	03/08/66	900	Torrejon	900	N/A	ND	ND	
		01/25/66	02/09/66	02/01/66	66-737	02/09/66	940	Hanaw, Germany	200	N/A	ND	ND	

Individuals with Urine Samples Classified as Remaining Cases

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(b) (6)	(b) (6)	02/14/66	02/26/66	02/20/66	66-1421	02/26/66	940	Moron	978	N/A	0	0.000	
					66-1421	02/26/66	940			08/29/66	NR	NR	
(b) (6)	(b) (6)	01/17/66	02/07/66	01/27/66	66-248	01/21/66	750	Torrejon	200	N/A	2.23 +/- 0.863	3.568	
					66-469	02/07/66	760	Torrejon	200	N/A	0.84+/-0.72	1.326	0.00427
(b) (6)	(b) (6)	02/25/66	03/18/66	03/07/66	66-2249	03/18/66	1300	Torrejon	1300	N/A	0.144+/-0.114	0.144	0.000614
		01/18/66	01/21/66	01/19/66	66-229	01/21/66	126	Torrejon	126	N/A	4.41 +/- 0.58	42.000	
		02/09/66	03/09/66	02/23/66	66-2402	03/09/66	600	Torrejon	600	N/A	0.238+/-0.143	0.476	0.00133
		01/18/66	01/26/66	01/22/66	66-1227	01/26/66	1480	Torrejon	1000	N/A	0.504+/-0.159	0.504	0.00123
		01/25/66	02/09/66	02/01/66	66-803	02/09/66	770	Hanaw, Germany	200	N/A	ND	ND	
		01/18/66	02/07/66	01/28/66	66-472	02/07/66	965	Moron	200	N/A	ND	ND	
		01/18/66	03/16/66	02/15/66	66-2025	03/16/66	700	Torrejon	700	N/A	0.278+/-0.121	0.477	
		02/11/66	03/24/66	03/03/66	66-3205	04/21/66	1720	Torrejon	860	N/A	0.275+/-0.163	0.275	
					66-3205-5	04/21/66	1720	Torrejon	860	N/A	0.275 +/- 0.163	0.275	
(b) (6)	(b) (6)	01/18/66	03/03/66	02/09/66	66-1937	03/03/66	1100	Torrejon	1180	N/A	0.138+/-0.078	0.151	
		01/18/66	01/18/66	01/18/66	66-1106	01/18/66	1110	Torrejon	1000	N/A	ND	ND	
		02/15/66	03/08/66	02/25/66	66-2515	03/08/66	980	Zaragoza	980	N/A	0.131	0.160	
		03/08/66	03/19/66	03/13/66	66-2311	03/19/66	750	Toul Rosieres	750	N/A	0.384+/-0.211	0.614	0.001
		01/17/66	02/12/66	01/30/66	66-782	02/12/66	550	Torrejon	200	N/A	1.29+/-0.66	2.815	0.011
		02/24/66	03/08/66	03/02/66	66-1905	03/08/66	550	Dreux	550	N/A	0.121+/-0.074	0.264	
		02/21/66	03/18/66	03/05/66	66-2117	03/18/66	900	Torrejon	900	N/A	0.223+/-0.162	0.297	0.0015
		01/17/66	02/03/66	01/25/66	66-2880	04/01/66	800	Torrejon	800	N/A	ND	ND	
					66-2880	04/01/66	800			08/23/66	NR	NR	
(b) (6)	(b) (6)	02/18/66	03/04/66	02/25/66	66-2344	03/04/66	900	Torrejon	900	N/A	ND	ND	
		02/13/66	03/19/66	03/02/66	66-2560	03/19/66	700	Moron	700	N/A	0.152+/-0.124	0.261	0.00093
		01/18/66	02/11/66	01/30/66	66-773	02/11/66	980	Torrejon	200	N/A	1.17+/-.84	1.433	0.00536
		02/08/66	03/08/66	02/22/66	66-1878	03/08/66	925	Toul Rosieres	956	N/A	0.536	0.698	0.002
		03/27/66	04/04/66	03/31/66	66-2988	04/26/66	1200	Furth , Ger. US Army, 20th Sta Hosp.	1200	N/A	ND	ND	
					66-2988	04/26/66	1200			07/15/66	NR	NR	
(b) (6)	(b) (6)	02/07/66	03/04/66	02/19/66	66-2347	03/04/66	700	Bilburg	700	N/A	0.367+/-0.280	0.629	0.00178
		03/04/66	03/08/66	03/06/66	66-2511	03/08/66	1000	Torrejon	1000	N/A	0	0.000	
		01/18/66	02/06/66	01/27/66	66-534	02/06/66	360	Torrejon	200	N/A	0.55+/-0.18	1.833	0.00565
					66-2503	03/08/66	1500	Torrejon	1500	N/A	0	0.000	
(b) (6)	(b) (6)	01/18/66	04/04/66	02/25/66	66-2893	04/04/66	800	Vandenburg	800	N/A	ND	ND	
		01/18/66	03/08/66	02/11/66	66-1698	03/08/66	700	Torrejon	700	N/A	0.764+/-0.167	1.310	0.00913
		01/19/66	02/05/66	01/27/66	66-939	02/05/66	500	Torrejon	200	N/A	1.45+/-0.79	3.480	0.01
		01/25/66	02/09/66	02/01/66	66-792	02/09/66	770	Hanaw, Germany	200	N/A	0.55+/-0.72	0.857	
		02/09/66	03/08/66	02/22/66	66-1871	03/08/66	940	Moron	978	N/A	0.811	0.780	0.003
		01/18/66	02/12/66	01/30/66	66-790	02/12/66	800	Moron	200	N/A	ND	ND	
		02/09/66	03/08/66	02/22/66	66-1876	03/08/66	720	San Pablo	720	N/A	NR	NR	
		01/18/66	02/07/66	01/28/66	66-445	02/07/66	370	Moron	200	N/A	0.50+/-0.31	1.622	0.00501
		01/25/66	02/09/66	02/01/66	66-822	02/09/66	530	Germany	200	N/A	0.93+/-0.76	2.106	0.00722
		02/15/66	03/25/66	03/06/66	66-2930	04/18/66	900	Torrejon	900	N/A	1.50+/-0.31	2.000	
		01/18/66	01/29/66	01/23/66	66-1067	01/29/66	1245	Torrejon	1245	N/A	ND	ND	
		01/17/66	02/07/66	01/27/66	66-462	02/07/66	620	Torrejon	200	N/A	0.79+/-0.50	1.529	0.00469
		02/20/66	04/11/66	03/17/66	66-3196	05/09/66	690	Torrejon	690	N/A	0.190+/-0.087	0.330	
		02/18/66	03/19/66	03/04/66	66-2047	03/19/66	460	Torrejon	460	N/A	0.190+/-0.100	0.496	
		01/18/66	02/05/66	01/27/66	66-933	02/05/66	840	Moron	200	N/A	2.12+/-1.13	3.029	0.00868
		01/18/66	02/03/66	01/26/66	66-1832	02/03/66	920	Moron	920	N/A	0.18	0.235	
		02/09/66	03/08/66	02/22/66	66-1867	03/08/66	800	Torrejon	800	N/A	ND	ND	
					66-1867	03/08/66	800			07/07/66	0.273+/-0.226	0.410	
(b) (6)	(b) (6)	02/07/66	03/04/66	02/19/66	66-2358	03/04/66	375	Bilburg	375	N/A	ND	ND	
		01/18/66	02/07/66	01/28/66	66-475	02/07/66	820	Torrejon	200	N/A	ND	ND	
		01/17/66	02/07/66	01/27/66	66-454	02/07/66	795	Torrejon	200	N/A	ND	ND	
		01/18/66	02/04/66	01/26/66	66-353	02/04/66	800	Torrejon	200	N/A	1.10+/-0.92	1.650	0.00551
		03/28/66	04/11/66	04/04/66	66-2989	04/23/66	600	Furth , Ger. US Army, 20th Sta Hosp.	600	N/A	ND	ND	
				04/04/66	66-2989	04/23/66	600			07/15/66	4.286+/-0.455	8.572	

Individuals with Urine Samples Classified as Remaining Cases

Name	SSN	Estimated Start Exposure Date	Estimated End Exposure Date	Estimated Acute Exposure Date	Sample No.	Sample Date	Sample Vol (mL)	Base	Sample Anal	Date Anal	Result (pCi/sample)	24hr Activity (pCi/day)	Recorded Systemic Body Burden
(b) (6)	(b) (6)	01/25/66	02/17/66	02/05/66	66-1123	02/17/66	970	Toul Rosieres	970	03/23/66	ND	ND	
		02/09/66	03/09/66	02/23/66	66-2074	03/09/66	700	Torrejon	700	N/A	0.308+/-0.121	0.528	0.00172
		01/18/66	01/30/66	01/24/66	66-3127	04/13/66	2090	Moron	1045	N/A	NR	NR	
					66-3127-S	04/13/66	2090	Moron	1045	N/A	NR	NR	
(b) (6)	(b) (6)	01/18/66	04/04/66	02/25/66	66-2890	04/04/66	720	Vandenburg	720	N/A	ND	ND	
		03/28/66	04/11/66	04/04/66	66-2994	04/23/66	1600	Furth , Ger. US Army, 20th Sta Hosp.	1600	N/A	ND	ND	
(b) (6)	(b) (6)	01/21/66	02/01/66	01/26/66	66-2878	04/04/66	1300	Torrejon	1300	N/A	0.249+/-0.133	0.249	
					66-2878	04/04/66	1300			07/13/66	NR	NR	
(b) (6)	(b) (6)	01/18/66	03/08/66	02/11/66	66-2616	03/08/66	650	Vandenburg	650	N/A	ND	ND	
		01/18/66	01/27/66	01/22/66	66-1139	01/27/66	148	US Naval Ocean Graph	148	03/17/66	ND	ND	
					66-1493	02/28/66	250	US Naval Ocean Graph	250	N/A	1.40+/-0.17	6.720	0.00888
(b) (6)	(b) (6)	02/20/66	03/29/66	03/10/66	66-2279	03/29/66	1000	Torrejon	1000	N/A	0.214+/-0.129	0.257	0.00119
		02/16/66	03/19/66	03/03/66	66-2322	03/19/66	870	Torrejon	870	N/A	0.117 +/- 0.159	0.161	
		02/13/66	03/09/66	02/25/66	66-2051	03/09/66	440	Torrejon	440	N/A	0.137+/-0.079	0.374	
		01/19/66	02/19/66	02/03/66	66-1208	02/19/66	860	Toul Rosieres	894	N/A	ND	ND	
		01/18/66	03/03/66	02/09/66	66-1929	03/03/66	850	Albuquerque, NM	850	N/A	0.255+/-0.099	0.360	
		02/28/66	03/18/66	03/09/66	66-2098	03/18/66	900	Lindsey AS, Germany	900	N/A	0.115+/-0.085	0.153	0.000487
(b) (6)	(b) (6)	02/24/66	03/19/66	03/07/66	66-2335	03/19/66	890	Toul Rosieres	890	N/A	0.221+/-0.139	0.298	0.001
		02/21/66	03/27/66	03/10/66	66-2595	03/27/66	7510	Moron	750	N/A	0.102+/-0.102	0.102	
		02/18/66	03/18/66	03/04/66	66-2239	03/18/66	950	Toul Rosieres	950	N/A	0.180+/-0.155	0.227	0.00168
		01/17/66	02/12/66	01/30/66	66-776	02/12/66	340	Torrejon	200	N/A	1.21+/-0.80	4.271	0.0106
		02/13/66	03/19/66	03/02/66	66-2559	03/19/66	700	Torrejon	700	N/A	0.167+/-0.124	0.286	0.00102
		01/18/66	02/07/66	01/28/66	66-470	02/07/66	990	Moron	200	N/A	1.05+/-0.76	1.273	0.00411
		02/25/66	03/11/66	03/04/66	66-3132	04/13/66	740	Wheelus AF, Libya	740	N/A	0.168+/-0.087	0.272	
					66-3132	04/13/66	740			n/a	0.230	0.373	
(b) (6)	(b) (6)	02/13/66	03/16/66	02/28/66	66-2030	03/16/66	980	Torrejon	980	N/A	0.136+/-0.079	0.167	
		01/25/66	02/09/66	02/01/66	66-804	02/09/66	810	Hanaw, Germany	200	N/A	2.07+/-1.05	3.067	0.0105
		01/17/66	04/01/66	02/23/66	66-2679	04/01/66	900	Torrejon	900	N/A	1.48+/-1.31	1.973	
					66-2879	04/01/66	900			08/22/66	NR	NR	
(b) (6)	(b) (6)	01/18/66	02/12/66	01/30/66	66-765	02/12/66	420	Torrejon	200	N/A	0.94+/-0.62	2.686	0.0106
		02/27/66	03/08/66	03/03/66	66-2502	03/08/66	1000	Torrejon	1000	N/A	0	0.000	
		01/18/66	03/09/66	02/12/66	66-2064	03/09/66	830	Torrejon	830	N/A	0.161+/-0.088	0.233	
		02/09/66	03/08/66	02/22/66	66-1897	03/08/66	825	San Pablo	825	N/A	0.183+/-0.112	0.266	
		01/24/66	01/29/66	01/28/66	66-1190	01/29/66	n/a	San Pablo	n/a	N/A	0	0.000	
		02/11/66	03/19/66	03/01/66	66-2086	03/19/66	550	Moron	550	N/A	0.172+/-0.103	0.375	n/a
		01/24/66	02/12/66	02/02/66	66-781	02/12/66	670	Toul Rosieres	200	N/A	0.94+/-0.78	1.684	0.00681
					66-3265	06/01/66	1780	Toul Rosieres	1060	N/A	0	0.000	
(b) (6)	(b) (6)	01/18/66	01/21/66	01/19/66	66-225	01/21/66	350	Torrejon	200	N/A	0.662 +/- 0.385	2.270	
		01/31/66	03/28/66	02/28/66	66-2674	03/28/66	1000	Torrejon	1000	N/A	ND	ND	
		01/18/66	01/21/66	01/19/66	66-219	01/21/66	275	Torrejon	84	N/A	5.45 +/- 1.18	23.782	
		01/19/66	02/23/66	02/05/66	66-1047	02/23/66	960	Ramstein	980	05/17/66	2.39+/-0.40	2.988	0.0173
		02/12/66	03/08/66	02/24/66	66-2497	03/08/66	500	Moron	500	N/A	0.14	0.336	
		02/13/66	03/19/66	03/02/66	66-2207	03/19/66	600	Moron	600	N/A	1.45	2.900	
		02/11/66	03/24/66	03/03/66	66-2701	03/30/66	1300	Moron	1300	N/A	0.209+/-0.134	0.209	n/a
		01/20/66	03/21/66	02/19/66	66-2008	03/21/66	300	US Naval Ocean Graph	300	04/11/66	0.203+/-0.103	0.812	0.00663
(b) (6)	(b) (6)	01/30/66	03/18/66	02/22/66	66-2118	03/18/66	900	Giessen	900	N/A	0.162+/-0.113	0.216	0.00151
		02/09/66	03/08/66	02/22/66	66-1911	03/08/66	850	Torrejon	850	N/A	0.230+/-0.096	0.325	n/a
		01/18/66	02/08/66	01/28/66	66-1348	02/08/66	400	Toul Rosieres	416	N/A	0.115 +/- 0.154	0.345	
		02/03/66	02/15/66	02/09/66	66-1164	02/15/66	1875	American Embassy, Madrid	1000	N/A	0	0.000	
(b) (6)	(b) (6)	01/18/66	02/07/66	01/28/66	66-500	02/07/66	970	Torrejon	200	N/A	3.72+/-1.45	4.602	0.0149
		01/18/66	01/21/66	01/19/66	66-252	01/21/66	1275	Torrejon	200	N/A	2.04 +/- 1.44	2.040	
		01/18/66	02/12/66	01/30/66	66-1002	02/12/66	1500	Kirtland AFB BO97	200	N/A	ND	ND	
		01/18/66	03/04/66	02/09/66	66-1953	03/04/66	1825	Moron	1825	N/A	0.560+/-0.152	0.560	0.0044

Individuals with Urine Samples Classified as Remaining Cases

Name	SSN	Estimated Start Exposure Date	Estimated End Exposure Date	Estimated Acute Exposure Date	Sample No.	Sample Date	Sample Vol (mL)	Base	Sample Anal	Date Anal	Result (pCi/sample)	24hr Activity (pCi/day)	Recorded Systemic Body Burden
(b) (6)	(b) (6)	01/17/66	03/19/66	02/16/66	66-1934	03/03/66	1875	Torrejon	1875	N/A	0.25+/-0.106	0.250	
					66-2572	03/19/66	900	Torrejon	900	N/A	1.21+/-0.31	1.613	0.01163
(b) (6)	(b) (6)	01/25/66	03/13/66	02/17/66	66-2546	03/13/66	1500	Charleston	1500	N/A	0.382+/-0.171	0.382	0.00317
		01/18/66	02/07/66	01/28/66	66-494	02/07/66	970	Torrejon	200	N/A	8.49+/-1.84	10.503	0.034
		02/25/66	03/08/66	03/02/66	66-2478	03/08/66	300	Torrejon	300	N/A	0.311	1.244	
		01/29/66	03/18/66	02/22/66	66-2090	03/18/66	890	Torrejon	890	N/A	0.327+/-0.130	0.441	0.00259
		02/27/66	03/19/66	03/09/66	66-2226	03/19/66	920	Moron	920	N/A	ND	ND	
		01/18/66	02/09/66	01/29/66	66-816	02/09/66	290	Moron	200	N/A	0.46+/-0.32	1.903	0.00651
		01/18/66	01/29/66	01/23/66	66-1144	01/29/66	194	556 Eng. Bn., APO09081	194	03/17/66	ND	ND	
(b) (6)	(b) (6)	01/29/66	02/19/66	02/08/66	66-1206	02/19/66	1400	San Pablo	1000	N/A	ND	ND	
		02/25/66	03/08/66	03/02/66	66-2490	03/08/66	1000	San Pablo	1000	N/A	ND	ND	
		01/18/66	01/17/66	01/17/66	66-1150	01/17/66	465	Torrejon	465	03/17/66	ND	ND	
		01/18/66	02/28/66	02/07/66	66-1495	02/28/66	260	US Naval Ocean Graph	270	N/A	ND	ND	
(b) (6)	(b) (6)	02/27/66	03/14/66	03/06/66	66-2680	03/28/66	900	Torrejon	900	N/A	0.178+/-0.113	0.237	
		01/19/66	02/08/66	01/29/66	66-843	02/08/66	650	Toul Rosieres	200	N/A	ND	ND	
		03/08/66	03/19/66	03/13/66	66-2178	03/19/66	250	Toul Rosieres	250	N/A	0.212	1.018	
(b) (6)	(b) (6)	02/13/66	03/08/66	02/24/66	66-2460	03/08/66	850	Moron	850	N/A	ND	ND	
		02/08/66	02/08/66	02/08/66	66-1375	02/28/66	840 (12-hr)	Torrejon	840	N/A	0.108	0.108	
		02/08/66	03/01/66	02/18/66	66-1850	03/01/66	760	Moron	760	N/A	ND	ND	
		02/16/66	03/04/66	02/25/66	66-2345	03/04/66	910	Moron	910	N/A	ND	ND	
		02/25/66	03/18/66	03/07/66	66-2253	03/18/66	900	Moron	900	N/A	0.233+/-0.134	0.311	0.000994
		03/14/66	03/19/66	03/16/66	66-2072	03/19/66	960	Moron	960	N/A	1.23+/-0.23	1.538	0.00179
		01/18/66	02/05/66	01/27/66	66-920	02/05/66	420	Torrejon	200	N/A	1.33+/-0.49	3.800	0.0011
		03/17/66	03/17/66	03/17/66	66-2937	04/20/66	500	Torrejon	500	N/A	ND	ND	
					66-2937	04/20/66	500			07/18/66	NR	NR	
(b) (6)	(b) (6)	02/04/66	02/25/66	02/14/66	66-1487	03/04/66	3700	USS Masopelea ATF-158	1000	N/A	NR	NR	
					66-2874	03/04/66	1000	USS Masopelea ATF-158	1000	04/15/66	0.171+/-0.119	0.205	
(b) (6)	(b) (6)	01/25/66	02/09/66	02/01/66	66-799	02/09/66	910	Hanaw, Germany	200	N/A	ND	ND	
		01/18/66	02/15/66	02/01/66	66-951	02/15/66	2100	Torrejon	200	N/A	ND	ND	
		02/27/66	03/08/66	03/03/66	66-2474	03/08/66	900	Torrejon	900	N/A	0.27	0.360	
		01/18/66	02/05/66	01/27/66	66-692	02/05/66	540	Torrejon	200	N/A	6.63+/-1.12	14.733	0.0426
		01/25/66	02/09/66	02/01/66	66-730	02/09/66	980	Hanaw, Germany	200	N/A	ND	ND	
		02/08/66	03/19/66	02/27/66	66-2084	03/19/66	990	Moron	990	N/A	0.254+/-0.112	0.308	0.00176
		02/18/66	03/18/66	03/04/66	66-2089	03/18/66	800	Torrejon	800	N/A	0.191+/-0.106	0.287	
		01/25/66	02/09/66	02/01/66	66-743	02/09/66	725	Hanaw, Germany	200	N/A	1.34+/-0.77	2.218	0.00756
		01/29/66	02/19/66	02/08/66	66-1195	02/19/66	1395	San Pablo	1000	N/A	3.85+/-9.56	3.850	
		01/18/66	01/29/66	01/23/66	66-1110	01/29/66	960	Moron	960	N/A	NR	NR	
		02/10/66	03/12/66	02/25/66	66-2035	03/19/66	900	Torrejon	900	04/07/66	NR	NR	
		01/29/66	02/22/66	02/10/66	66-1083	02/22/66	910	Torrejon	910	03/17/66	8.22+/-0.78	10.840	0.0526
					66-2928	04/21/66	600	Torrejon	600	N/A	1.37+/-0.30	2.740	
(b) (6)	(b) (6)	01/18/66	02/08/66	01/27/66	66-505	02/06/66	930	Torrejon	200	N/A	5.05+/-1.66	6.516	0.0199
		03/12/66	03/19/66	03/15/66	66-2181	03/19/66	500	Torrejon	500	N/A	0.54	1.296	
		01/19/66	02/08/66	01/29/66	66-833	02/08/66	775	Toul Rosieres	200	N/A	NR	NR	
		01/18/66	02/05/66	01/27/66	66-887	02/05/66	870	Torrejon	200	N/A	1.08+/-0.67	1.462	0.00443
		01/18/66	01/29/66	01/23/66	66-1066	01/29/66	440	Zaragoza	440	N/A	ND	ND	
		02/10/66	03/19/66	02/28/66	66-2166	03/19/66	1150	Moron	1150	N/A	0.329	0.343	
		02/01/66	02/18/66	02/09/66	66-1198	02/18/66	n/a	Moron	n/a	N/A	NR	NR	
		01/24/66	04/11/66	03/03/66	66-1038	02/20/66	495	Torrejon	200	N/A	1.42+/-0.55	3.442	0.0183
					66-3404	06/10/66	590	HQ 8 AF Westover AFB, Mass	330	N/A	NR	NR	
(b) (6)	(b) (6)	02/10/66	03/20/66	03/01/66	66-2309	03/20/66	860	Torrejon	860	N/A	0.199+/-0.134	0.278	0.000132
		01/20/66	02/08/66	01/29/66	66-443	02/08/66	600	Toul Rosieres	200	N/A	0.76+/-0.48	1.520	0.00403
		02/26/66	03/28/66	03/13/66	66-2583	03/19/66	n/a	Moron	n/a	N/A	NR	NR	
					66-3111	04/13/66	550	Moron	550	N/A	0.233+/-0.072	0.508	
(b) (6)	(b) (6)	02/25/66	03/18/66	03/07/66	66-2247	03/18/66	510	Torrejon	510	N/A	0.126+/-0.128	0.296	
		01/18/66	02/19/66	02/03/66	66-1225	02/19/66	650	Torrejon	650	N/A	NR	NR	

Individuals with Urine Samples Classified as Remaining Cases

Name	SSN	Estimated Start Exposure Date	Estimated End Exposure Date	Estimated Acute Exposure Date	Sample No.	Sample Date	Sample Vol (mL)	Base	Sample Anal	Date Anal	Result (pCi/sample)	24hr Activity (pCi/day)	Recorded Systemic Body Burden
(b) (6)	(b) (6)	01/18/66	02/07/66	01/28/66	66-493	02/07/66	950	Torrejon	200	N/A	1.43+/-1.11	1.806	0.00582
		01/18/66	02/08/66	01/28/66	66-1395	02/28/66	980 (12-hr)	Torrejon	1000	N/A	0.539	0.539	0.003
		01/18/66	03/04/66	02/09/66	66-341	02/04/66	1000	Torrejon	200	N/A	2.16+/-1.25	2.592	0.0108
					66-2373	03/04/66	700	Torrejon	700	N/A	0.435+/-0.182	0.746	0.00137
(b) (6)	(b) (6)	02/09/66	03/09/66	02/23/66	66-2392	03/09/66	1200	Torrejon	1200	N/A	0.147+/-0.143	0.147	0.000778
		01/18/66	02/07/66	01/28/66	66-491	02/07/66	830	Torrejon	200	N/A	3.93+/-1.31	5.682	0.0183
		03/12/66	03/19/66	03/15/66	66-2179	03/19/66	600	Torrejon	600	N/A	0.108	0.216	
		01/18/66	02/07/66	01/28/66	66-477	02/07/66	625	Torrejon	200	N/A	ND	ND	
		01/18/66	02/14/66	01/31/66	66-269	01/21/66	790	Torrejon	200	N/A	1.074+/-0.7031	1.631	
					66-1006	02/14/66	1170	Kirtland AFB BO97	200	N/A	NR	NR	
(b) (6)	(b) (6)	01/29/66	02/22/66	02/10/66	66-1092	02/22/66	1150	Torrejon	1150	03/17/66	3.93+/-0.54	4.101	0.0192
		01/18/66	01/21/66	01/19/66	66-210	01/21/66	300	Torrejon	200	N/A	NR	NR	
		01/18/66	01/21/66	01/19/66	66-217	01/21/66	400	Torrejon	200	N/A	NR	NR	
		02/25/66	03/18/66	03/07/66	66-2261	03/18/66	880	Moron	880	N/A	0.1338+/-0.1408	0.182	
		02/06/66	02/26/66	02/16/66	66-1385	02/26/66	900	Torrejon	930	N/A	1.51	2.013	0.006
		03/14/66	03/19/66	03/16/66	66-2123	03/19/66	900	Torrejon	900	N/A	0.240+/-0.165	0.320	0.00035
		01/22/66	03/07/66	02/13/66	66-2992	04/26/66	750	Furth , Ger. US Army, 20th Sta Hosp.	750	N/A	ND	ND	
(b) (6)	(b) (6)	01/25/66	02/09/66	02/01/66	66-735	02/09/66	970	Hanaw, Germany	200	N/A	1.66+/-0.87	2.326	0.0079
		03/14/66	03/19/66	03/16/66	66-2077	03/19/66	310	Torrejon	310	N/A	0.128+/-0.076	0.495	
		02/09/66	03/09/66	02/23/66	66-2399	03/09/66	980	Torrejon	980	N/A	0.129+/-0.107	0.158	0.000719
		01/18/66	02/05/66	01/27/66	66-886	02/05/66	840	Moron	200	N/A	0.63+/-0.34	0.900	0.00259
		03/11/66	03/19/66	03/15/66	66-2180	03/19/66	950	Moron	950	N/A	0.342	0.432	
		02/25/66	03/19/66	03/08/66	66-2224	03/19/66	730	Moron	730	N/A	0.1015+/-0.1088	0.167	
		01/31/66	03/03/66	02/15/66	66-2012	03/03/66	890	Torrejon	890	N/A	0.401+/-0.147	0.541	
		01/18/66	04/11/66	02/28/66	66-3115	04/13/66	1450	San Pablo	725	N/A	0.217+/-0.120	0.217	
		01/26/66	02/09/66	02/02/66	66-815	02/09/66	910	Hanaw, Germany	200	N/A	ND	ND	
		01/18/66	02/07/66	01/28/66	66-456	02/07/66	520	Torrejon	200	N/A	0.55+/-0.40	1.269	0.00389
		01/18/66	02/03/66	01/26/66	66-1817	02/03/66	875	Torrejon	875	N/A	0.64	0.878	0.00714
		01/18/66	02/06/66	01/27/66	66-512	02/06/66	570	Torrejon	200	N/A	1.19+/-0.74	2.505	0.00764
		01/18/66	03/17/66	02/16/66	66-2019	03/17/66	1750	Blytheville AFB, AR	1750	N/A	ND	ND	
(b) (6)	(b) (6)	01/24/66	02/19/66	02/06/66	66-1952	02/23/66	1350	Torrejon	1350	N/A	0.187+/-0.093	0.187	
		01/18/66	02/04/66	01/28/66	66-344	02/04/66	900	Torrejon	200	N/A	2.37+/-0.92	3.555	0.0112
		03/14/66	03/14/66	03/14/66	66-2069		960	Moron	960	N/A	0.571+/-0.171	0.714	0.00235
		01/17/66	02/06/66	01/27/66	66-913	02/06/66	945	Torrejon	200	N/A	ND	ND	
		02/06/66	03/19/66	02/26/66	66-2129	03/19/66	600	Torrejon	600	N/A	0.159+/-0.119	0.318	0.000231
					66-1377	02/28/66	840 (12-hr)	Torrejon	872	N/A	ND	ND	
					66-1377	02/28/66	840 (12-hr)			08/29/66	NR	NR	
(b) (6)	(b) (6)	02/10/66	03/19/66	02/28/66	66-2136	03/19/66	860	Moron	860	N/A	ND	ND	
		02/01/66	02/19/66	02/10/66	66-1216	02/19/66	970	Sandia Base	970	N/A	4.67+/-1.29	5.777	0.0183
		02/06/66	02/26/66	02/16/66	66-1386	02/26/66	1520	Torrejon	1000	N/A	2.13	2.130	0.009
		01/19/66	02/08/66	01/29/66	66-840	02/08/66	780	Moron	200	N/A	ND	ND	
		02/01/66	02/26/66	02/13/66	66-1406	02/26/66	800	Torrejon	832	N/A	0.363+/-0.212	0.545	0.00182
		01/29/66	02/22/66	02/10/66	66-1085	02/22/66	510	Torrejon	510	03/17/66	1.28+/-0.34	3.012	0.0147
		01/18/66	02/05/66	01/27/66	66-931	02/05/66	880	Moron	200	N/A	18.2+/-2.2	22.091	0.0634
		01/18/66	02/07/66	01/28/66	66-468	02/07/66	845	Torrejon	200	N/A	0.90+/-0.78	1.278	0.00411
		02/15/66	04/11/66	03/14/66	66-1949	03/18/66	1550	Torrejon	1550	N/A	1.31+/-0.23	1.310	0.00756
					66-2936	04/15/66	1000	Torrejon	1000	N/A	ND	ND	
					66-2938	04/14/66	1000			07/05/66	7.403+/-0.455	8.916	
(b) (6)	(b) (6)	01/18/66	01/21/66	01/19/66	66-243	01/21/66	510	Torrejon	200	N/A	0.0528+/-0.6375	1.536	
		02/06/66	02/26/66	02/16/66	66-1425	02/26/66	820	Moron	644	N/A	0.440+/-1.81	0.852	
		02/06/66	02/26/66	02/16/66	66-1431	02/26/66	900	Moron	936	N/A	NR	NR	
		02/21/66	03/19/66	03/08/66	66-2082	03/19/66	870	Moron	870	N/A	0.163+/-0.086	0.225	0.000937
		01/18/66	02/08/66	01/28/66	66-1342	02/08/66	1210	Toul Rosieres	1000	N/A	NR	NR	
		01/17/66	01/24/66	01/20/66	66-2588	03/23/66	1200	Norton AFB, CA	1200	N/A	0.221+/-0.134	0.221	
		02/11/66	03/19/66	03/01/66	66-2314	03/19/66	550	Torrejon	550	N/A	0.111+/-0.108	0.242	0.000852
		01/18/66	02/07/66	01/28/66	66-490	02/07/66	920	Torrejon	200	N/A	4.64+/-1.48	5.052	0.0195
		01/18/66	02/05/66	01/27/66	66-940	02/05/66	350	Torrejon	200	N/A	0.70+/-0.57	2.400	0.00687

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(b) (6)	(b) (6)	02/11/66	03/19/66	03/01/66	66-2132	03/19/66	880	Torrejon	880	N/A	0.212+/-0.134	0.289	0.00133
		01/25/66	02/21/66	02/07/66	66-1114	01/24/66	980	Ramstein	980	03/23/66	NR	NR	
					66-1013	02/21/66	1870	Torrejon	200	N/A	ND	ND	
					66-2586	03/16/66	2325	Ramstein	2325	N/A	0.120+/-0.108	0.120	
(b) (6)	(b) (6)	01/18/66	02/08/66	01/28/66	66-368	02/04/66	900	Torrejon	200	N/A	61.4+/-4.3	81.867	0.307
					66-1160	02/18/66	2120	Torrejon	2120	N/A	ND	ND	
(b) (6)	(b) (6)	01/18/66	01/21/66	01/19/66	66-236	01/21/66	500	Torrejon	200	N/A	NR	NR	
					66-239	01/21/66	425	Torrejon	200	N/A	NR	NR	
(b) (6)	(b) (6)	01/18/66	02/07/66	01/28/66	66-460	02/07/66	395	Moron	200	N/A	2.06+/-0.71	6.258	0.0202
		01/18/66	03/18/66	02/16/66	66-2244	03/18/66	440	Torrejon	440	N/A	ND	ND	
		01/18/66	02/04/66	01/26/66	66-339	02/04/66	900	Torrejon	200	N/A	2.22+/-0.99	2.960	0.0111
		02/13/66	03/19/66	03/02/66	66-2153	03/19/66	940	Torrejon	940	N/A	0.137+/-0.107	0.175	0.000839
		01/18/66	02/07/66	01/28/66	66-465	02/07/66	960	Torrejon	200	N/A	1.23+/-0.82	1.538	0.00469
		01/18/66	02/04/66	01/26/66	66-338	02/04/66	660	Torrejon	200	N/A	ND	ND	
		01/18/66	03/03/66	02/09/66	66-1936	03/03/66	1825	625TH MASS (MAC)	1905	N/A	0.225+/-0.118	0.225	
(b) (6)	(b) (6)	02/08/66	02/25/66	02/16/66	66-1354	02/25/66	500	Toul Rosieres	520	N/A	ND	ND	
		01/29/66	03/19/66	02/22/66	66-2044	03/19/66	790	Torrejon	790	04/06/66	NR	NR	
		01/18/66	02/26/66	02/08/66	66-1414	02/26/66	880	Torrejon	915	N/A	ND	ND	
					66-1414	02/26/66	880			07/29/66	NR	NR	
(b) (6)	(b) (6)	01/18/66	01/21/66	01/19/66	66-265	01/21/66	1100	Torrejon	200	N/A	NR	NR	
		01/18/66	01/31/66	01/24/66	66-381	02/01/66	2800	Sembach	200	N/A	ND	ND	
					66-381	02/01/66	2800			n/a	ND	ND	
(b) (6)	(b) (6)	01/18/66	03/02/66	02/08/66	66-912	02/18/66	2760	Seymour Johnson	200	02/23/66	ND	ND	
					66-1298	03/02/66	2910	Seymour Johnson	1000	N/A	ND	ND	
(b) (6)	(b) (6)	01/18/66	02/07/66	01/28/66	66-1353	02/07/66	340	Moron	353	N/A	0.156+/-0.209	0.551	
		01/20/66	02/07/66	01/29/66	66-466	02/07/66	655	Toul Rosieres	200	N/A	0.64+/-0.52	1.173	0.00375
		01/31/66	03/20/66	02/24/66	66-2291	03/20/66	550	Norfolk	550	N/A	0.133+/-0.120	0.290	0.00124
		01/18/66	02/22/66	02/04/66	66-1243	02/22/66	810	Offutt AFB, NE	842	N/A	ND	ND	
		02/08/66	02/26/66	02/16/66	66-1423	02/26/66	760	Moron	790	N/A	0.453+/-0.175	0.715	
					66-1423	02/26/66	760			06/23/66	0.057+/-0.023	0.090	
(b) (6)	(b) (6)	01/18/66	02/16/66	02/01/66	66-967	02/16/66	2570	Torrejon	200	N/A	ND	ND	
		02/18/66	03/18/66	03/04/66	66-2114	03/18/66	430	Moron	430	N/A	0.179+/-0.118	0.500	0.00137
		02/08/66	02/26/66	02/16/66	66-1433	02/26/66	720	Moron	748	N/A	0.131+/-0.176	0.218	
		02/10/66	03/08/66	02/23/66	66-2510	03/08/66	1000	Moron	1000	N/A	0.45	0.540	
		01/18/66	03/25/66	02/20/66	66-2597	03/25/66	950	USAH Wurzburg, Germany	950	N/A	0.371+/-0.210	0.469	
(b) (6)	(b) (6)	02/27/66	03/19/66	03/09/66	66-2125	03/19/66	940	Torrejon	940	N/A	ND	ND	
		02/05/66	02/25/66	02/15/66	66-1349	02/25/66	600	Sembach	624	N/A	0.176+/-0.574	0.352	
		02/09/66	03/01/66	02/19/66	66-1852	03/01/66	600	San Pablo	600	N/A	1.86+/-0.35	3.720	
		02/25/66	03/18/66	03/07/66	66-2264	03/18/66	950	Moron	950	N/A	0.161+/-0.113	0.203	0.000986
		01/18/66	02/12/66	01/30/66	66-778	02/12/66	785	Torrejon	200	N/A	2.77+/-0.96	4.234	0.0166
		02/02/66	02/22/66	02/12/66	66-1088	02/22/66	370	San Pablo	370	03/17/66	10.6+/-0.8	34.378	0.146
					66-2592	03/26/66	1750	San Pablo	1750	N/A	0.229+/-0.184	0.229	
(b) (6)	(b) (6)	02/18/66	03/19/66	03/04/66	66-2048	03/19/66	800	Moron	800	N/A	0.269+/-0.109	0.404	
		02/21/66	03/18/66	03/05/66	66-2579	03/18/66	1000	Torrejon	1000	N/A	.396+/-0.175	0.475	
		02/18/66	03/12/66	03/01/66	66-2033	03/19/66	1500	Torrejon	1500	N/A	0.167+/-0.093	0.167	
		02/06/66	02/08/66	02/07/66	66-1397	02/28/66	880 (12-hr)	Moron	915	N/A	0.195	0.195	0.0008
		01/18/66	03/08/66	02/11/66	66-2477	03/08/66	250	Torrejon	250	N/A	0.38	1.728	
		01/18/66	02/06/66	01/27/66	66-502	02/06/66	860	Torrejon	200	N/A	2.36+/-0.99	3.293	0.01
		01/29/66	02/22/66	02/10/66	66-1090	02/22/66	1460	Torrejon	1460	03/17/66	4.35+/-0.53	4.350	0.0212
		03/14/66	03/19/66	03/16/66	66-2158	03/19/66	900	Torrejon	900	N/A	0.148+/-0.135	0.197	0.000215
		03/21/66	04/11/66	03/31/66	66-3198	05/09/66	950	Torrejon	950	N/A	0.191+/-0.089	0.241	
		01/18/66	02/06/66	01/27/66	66-503	02/06/66	900	Torrejon	200	N/A	4.89+/-1.43	6.520	1.99
		02/27/66	03/24/66	03/11/66	66-2698	04/05/66	800	Moron	800	N/A	0.133+/-0.113	0.200	
		03/14/66	03/19/66	03/16/66	66-2555	03/19/66	950	Torrejon	950	N/A	0.147+/-0.143	0.186	0.000213
		01/17/66	02/02/66	01/25/66	66-3211	05/16/66	450	67th ARS Prestwick MOA, Scotland	450	N/A	0.161+/-0.078	0.429	
(b) (6)	(b) (6)	02/11/66	02/15/66	02/13/66	66-3208	04/20/66	1340	Torrejon	670	N/A	0.500+/-0.198	0.500	

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(b) (6)	(b) (6)	01/16/66	04/11/66	02/28/66	66-3208-5	04/20/66	1340	n/a	670	N/A	NR	NR	
		02/09/66	03/09/66	02/23/66	66-2063	03/09/66	1000	Torrejon	1000	N/A	0.136+/-0.082	0.163	0.000758
		02/11/66	02/11/66	02/11/66	66-2887	03/25/66	1350	Torrejon	1350	N/A	0.105+/-0.102	0.105	
		02/12/66	03/16/66	02/28/66	66-2031	03/16/66	960	Moron	960	N/A	0.114+/-0.081	0.143	0.000714
		02/13/66	03/19/66	03/02/66	66-2135	03/19/66	920	Moron	920	N/A	0.151+/-0.100	0.197	0.000925
		02/27/66	03/19/66	03/09/66	66-2139	03/19/66	950	Torrejon	950	N/A	0.1302+/-0.1302	0.164	
		01/18/66	02/04/66	01/26/66	66-355	02/04/66	560	Torrejon	200	N/A	ND	ND	
		02/17/66	03/10/66	02/27/66	66-2014	03/16/66	630	Torrejon	630	N/A	0.176+/-0.114	0.335	
		01/18/66	03/03/66	02/09/66	66-1930	03/03/66	845	Albuquerque, NM	845	N/A	0.183+/-0.093	0.260	
		01/18/66	02/08/66	01/27/66	66-513	02/06/66	640	Moron	200	N/A	4.53+/-1.06	8.494	0.0259
		01/18/66	02/09/66	01/29/66	66-738	02/09/66	970	Hanaw, Germany	200	N/A	ND	ND	
		01/18/66	03/20/66	02/17/66	66-2018	03/20/66	1320	Tinker AFB	1320	N/A	0.156+/-0.084	0.156	
		01/18/66	02/06/66	01/27/66	66-525	02/06/66	460	Torrejon	200	N/A	1.44+/-0.71	3.757	0.0115
		01/23/66	03/20/66	02/20/66	66-2305	03/20/66	880	Pirmasens	880	N/A	0.214+/-0.129	0.292	0.00183
		02/21/66	03/18/66	03/05/66	66-2256	03/18/66	920	Zaragoza	920	N/A	0.225+/-0.134	0.293	0.00109
		01/18/66	02/05/66	01/27/66	66-882	02/05/66	950	Moron	200	N/A	1.22+/-0.73	1.541	0.00443
		02/21/66	03/18/66	03/05/66	66-2100	03/18/66	980	Moron	980	N/A	0.119+/-0.074	0.146	0.000864
		02/13/66	03/19/66	03/02/66	66-2229	03/19/66	500	San Pablo	500	N/A	0.226+/-0.134	0.542	0.00184
		02/09/66	03/08/66	02/22/66	66-1901	03/08/66	880	Moron	880	N/A	0.186+/-0.085	0.254	
		01/18/66	01/21/66	01/19/66	66-238	01/21/66	475	Torrejon	200	N/A	NR	NR	
					66-241	01/21/66	350	Torrejon	200	N/A	NR	NR	
(b) (6)	(b) (6)	01/18/66	01/29/66	01/23/66	66-1212	01/29/66	680	San Pablo	707	N/A	0.427+/-0.159	0.754	0.00108
		01/18/66	01/21/66	01/19/66	66-234	01/21/66	490	Torrejon	200	N/A	NR	NR	
		02/24/66	03/19/66	03/07/66	66-2168	03/19/66	1000	Toul Rosieres	1000	N/A	0.64	0.768	
		02/06/66	02/26/66	02/16/66	66-1424	02/26/66	860	Moron	894	N/A	0.205+/-0.124	0.286	
					66-1424	02/26/66	860			06/28/66	NR	NR	
(b) (6)	(b) (6)	02/13/66	03/13/66	02/27/66	66-2678	03/25/66	2000	Torrejon	2000	N/A	0.125+/-0.094	0.125	
		01/17/66	02/12/66	01/30/66	66-777	02/12/66	292	Torrejon	200	N/A	0.49+/-0.45	2.014	0.00791
		01/18/66	02/05/66	01/27/66	66-924	02/05/66	465	Torrejon	200	N/A	1.42+/-0.65	3.665	0.0105
		01/22/66	02/20/66	02/05/66	66-1040	02/20/66	2200	Furth , Ger. US Army, 20th Sta Hosp.	200	03/17/66	12.91+/-3.17	12.910	
(b) (6)	(b) (6)	02/06/66	02/26/66	02/16/66	66-1411	02/26/66	640	Moron	665	N/A	1.07+/-0.13	2.006	0.00454
		02/22/66	03/19/66	03/06/66	66-2194	03/19/66	800	Moron	800	N/A	ND	ND	
		01/18/66	01/28/66	01/23/66	66-3026	05/06/66	1400	Ramstein	1400	N/A	0.131+/-0.057	0.131	
		02/08/66	03/19/66	02/27/66	66-2183	03/19/66	802	Toul Rosieres	800	N/A	0.829	1.240	
		01/18/66	02/05/66	01/27/66	66-884	02/05/66	880	Torrejon	200	N/A	ND	ND	
		02/06/66	02/26/66	02/16/66	66-1412	02/26/66	650	Moron	676	N/A	0.135+/-0.103	0.249	
					66-1412	02/26/66	650			06/27/66	NR	NR	
(b) (6)	(b) (6)	03/14/66	03/26/66	03/20/66	66-2280	03/29/66	710	Torrejon	710	N/A	ND	ND	
					66-2865	04/06/66	1500	Torrejon	1500	N/A	1.16+/-0.28	1.160	
					66-2865	04/06/66	1500			08/30/66	NR	NR	
(b) (6)	(b) (6)	02/09/66	03/08/66	02/22/66	66-1865	03/08/66	800	Moron	800	N/A	ND	ND	
					66-1865	03/08/66	800			07/07/66	0.273+/-0.226	0.410	
(b) (6)	(b) (6)	01/18/66	02/09/66	01/29/66	66-656	02/09/66	1950	Blytheville AFB, AR	n/a	N/A	NR	NR	
(b) (6)	(b) (6)	01/18/66	02/05/66	01/27/66	66-922	02/05/66	820	Torrejon	200	N/A	NR	NR	
		03/26/66	04/11/66	04/03/66	66-3110	04/13/66	625	Moron	625	N/A	0.330+/-0.087	0.634	
		02/11/66	03/12/66	02/25/66	66-2841	03/28/66	600	09696 "D" Trp, 2/4 1966	600	N/A	0.287+/-0.166	0.574	
(b) (6)	(b) (6)	02/06/66	02/18/66	02/12/66	66-1388	02/18/66	700	Torrejon	728	N/A	1.05	1.800	0.004
		01/18/66	02/13/66	01/31/66	66-1441	03/02/66	930	Moron	930	03/17/66	ND	ND	
		01/25/66	02/09/66	02/01/66	66-811	02/09/66	810	Hanaw, Germany	200	N/A	1.64+/-.74	2.430	0.00873
		01/17/66	02/26/66	02/06/66	66-1418	02/26/66	880	Torrejon	915	N/A	0.117+/-0.157	0.160	
		01/18/66	01/17/66	01/17/66	66-1100	01/17/66	1160	Torrejon	1160	03/17/66	ND	ND	
		03/26/66	03/29/66	03/27/66	66-3124	04/13/66	980	Moron	490	N/A	0.212+/-0.161	0.260	
					66-3124-S	04/13/66	980	Moron	490	N/A	NR	NR	
(b) (6)	(b) (6)	01/24/66	01/30/66	01/27/66	66-2686	03/26/66	1800	Torrejon	1800	N/A	0.112+/-0.101	0.112	
		02/18/66	03/08/66	02/27/66	66-2472	03/08/66	900	Torrejon	900	N/A	0.194	0.259	
		01/18/66	02/04/66	01/26/66	66-336	02/04/66	950	Moron	200	N/A	ND	ND	

Individuals with Urine Samples Classified as Remaining Cases

Name	SSN	Estimated Start Exposure Date	Estimated End Exposure Date	Estimated Acute Exposure Date	Sample No.	Sample Date	Sample Vol (mL)	Base	Sample Anal	Date Anal	Result (pCi/sample)	24hr Activity (pCi/day)	Recorded Systemic Body Burden
(b) (6)	(b) (6)	02/09/66	02/13/66	02/11/66	66-1165	02/15/66	1840	American Embassy, Madrid	1000	N/A	NR	NR	
(b) (6)	(b) (6)	01/17/66	02/12/66	01/30/66	66-780	02/12/66	710	Torrejon	200	N/A	ND	ND	
		01/17/66	02/03/66	01/25/66	66-1837	02/03/66	750	Moron	750	N/A	0.252	0.403	
		02/08/66	03/29/66	03/04/66	66-2278	03/29/66	1000	Torrejon	1000	N/A	0.136+/-0.108	0.163	0.00094
					66-3207	04/25/66	845	Torrejon	845	N/A	0.125+/-0.074	0.178	
(b) (6)	(b) (6)	02/13/66	03/08/66	02/24/66	66-2508	03/08/66	970	Moron	970	N/A	ND	ND	
		01/18/66	02/07/66	01/28/66	66-455	02/07/66	625	Torrejon	200	N/A	1.27+/-0.65	2.438	0.00744
		02/10/66	03/08/66	02/23/66	66-2487	03/08/66	950	Moron	950	N/A	0.153	0.193	
		01/23/66	02/15/66	02/03/66	66-1151	02/15/66	660	Toul Rosieres	688	N/A	NR	NR	
		01/18/66	02/07/66	01/28/66	66-482	02/07/66	595	Moron	200	N/A	2.39+/-0.87	4.820	0.0156
		02/11/66	02/18/66	02/14/66	66-3056	04/27/66	1000	Ramstein	1000	N/A	0.290+/-0.086	0.348	
		02/12/66	03/04/66	02/22/66	66-2383	03/04/66	550	Chaumont	550	N/A	0.307+/-155	0.674	0.00171
		01/18/66	02/07/66	01/28/66	66-444	02/07/66	395	Torrejon	195	N/A	0.61+/-0.35	1.853	0.00568
		01/18/66	01/29/66	01/23/66	66-1228	01/29/66	900	San Pablo	900	N/A	0.503	0.751	
		02/08/66	02/08/66	02/08/66	66-1383	02/28/66	860 (12-hr)	Torrejon	893	N/A	2.95	2.950	0.012
		01/18/66	02/12/66	01/30/66	66-361	02/04/66	875	Torrejon	200	N/A	63+/-4.3	86.400	0.315
					66-1166	02/18/66	960	Torrejon	960	N/A	2.93+/-1.23	3.663	0.0178
(b) (6)	(b) (6)	01/25/66	02/17/66	02/05/66	66-1124	02/17/66	780	Torrejon	780	03/23/66	0.276+/-0.241	0.425	0.00126
		02/10/66	03/19/66	02/28/66	66-2120	03/19/66	800	Torrejon	800	N/A	ND	ND	
		01/19/66	04/04/66	02/25/66	66-2895	04/04/66	550	Vandenburg	550	N/A	ND	ND	
		01/25/66	03/13/66	02/17/66	66-2543	03/13/66	450	Charleston	450	N/A	0.284	0.757	
		03/11/66	03/19/66	03/15/66	66-2319	03/19/66	900	Moron	900	N/A	0.200+/-0.134	0.267	0.000413
		02/04/66	02/10/66	02/07/66	66-3212	05/09/66	1300	814 Civil Eng. Sq. Westover AFB	650	N/A	0.234+/-0.136	0.234	
					66-3213-s	n/a	650	N/A	n/a	N/A	NR	NR	
(b) (6)	(b) (6)	01/18/66	02/03/66	01/26/66	66-1831	02/03/66	550	Torrejon	550	N/A	NR	NR	
		01/29/66	02/19/66	02/08/66	66-1217	02/19/66	570	Torrejon	570	N/A	NR	NR	
					66-3209	04/21/66	1000	Torrejon	500	N/A	0.302+/-0.162	0.362	
					66-3209-S	04/21/66	1000	N/A	500	N/A	NR	NR	
(b) (6)	(b) (6)	01/18/66	02/13/66	01/31/66	66-1109	02/13/66	1490	Moron	1000	N/A	ND	ND	
		02/14/66	02/26/66	02/20/66	66-1422	02/26/66	940	Moron	978	N/A	ND	ND	
		01/18/66	02/05/66	01/27/66	66-930	02/05/66	650	Moron	450	03/17/66	28.11+/-0.53	51.895	
		01/18/66	02/06/66	01/27/66	66-516	02/06/66	960	Moron	200	N/A	6.53+/-1.48	8.163	0.0249
		01/29/66	02/19/66	02/08/66	66-1192	02/19/66	1140	San Pablo	1000	N/A	2.11+/-0.68	2.221	0.00929
		02/06/66	02/25/66	02/15/66	66-1352	02/25/66	1400	Moron	1000	N/A	0.232+/-0.760	0.232	
		01/19/66	02/08/66	01/29/66	66-823	02/08/66	975	Torrejon	200	N/A	ND	ND	
					66-2295	03/20/66	980	Torrejon	980	N/A	0.331+/-0.160	0.405	0.0031
(b) (6)	(b) (6)	01/18/66	03/03/66	02/09/66	66-1933	03/03/66	1875	Torrejon	1875	N/A	0.337+/-0.114	0.337	
					66-250	01/21/66	190	Torrejon	190	N/A	0.5225+/-0.2261	3.300	
(b) (6)	(b) (6)	01/18/66	02/06/66	01/27/66	66-504	02/06/66	960	Moron	200	N/A	1.61+/-1.18	2.013	0.00617
		01/18/66	03/03/66	02/09/66	66-1939	03/03/66	1450	625TH MASS (MAC)	1530	N/A	0.189+/-0.102	0.189	
(b) (6)	(b) (6)	02/10/66	03/18/66	02/28/66	66-2093	03/18/66	700	Moron	700	N/A	ND	ND	
		01/25/66	02/09/66	02/01/66	66-736	02/09/66	960	Hanaw, Germany	200	N/A	3.22+/-1.23	4.025	0.0137
		02/04/66	02/25/66	02/14/66	66-1484	03/04/66	1920	USS Recovery ARS-43	1000	N/A	1.61+/-0.75	1.610	
(b) (6)	(b) (6)	01/30/66	01/31/66	01/30/66	66-3107	04/13/66	850	Moron	850	N/A	0.136+/-0.057	0.192	
		02/13/66	03/19/66	03/02/66	66-2584	03/19/66	1200	Moron	1200	N/A	0.176+/-0.118	0.176	
		02/27/66	03/19/66	03/09/66	66-2124	03/19/66	860	Moron	860	N/A	0.119+/-0.101	0.166	0.00049
		01/18/66	01/21/66	01/19/66	66-245	01/21/66	890	Torrejon	200	N/A	5.9363+/-1.4685	8.004	
		01/18/66	03/04/66	02/09/66	66-2370	03/04/66	1450	Torrejon	1450	N/A	0.187+/-0.133	0.187	0.00139
					66-1874	03/08/66	960	Torrejon	582	N/A	1.67	2.088	0.013
(b) (6)	(b) (6)	01/18/66	02/09/66	01/29/66	66-809	02/09/66	570	Moron	200	N/A	11.1+/-1.65	23.368	
		01/25/66	02/17/66	02/05/66	66-1121	02/17/66	220	Torrejon	220	03/17/66	0.25+/-0.21	1.364	0.0066
		02/10/66	03/19/66	02/28/66	66-2122	03/19/66	800	Torrejon	800	N/A	ND	ND	
		01/20/66	02/09/66	01/30/66	66-826	02/09/66	800	Toul Rosieres	200	N/A	ND	ND	
		03/14/66	03/18/66	03/16/66	66-2932	03/18/66	1800	Torrejon	1800	N/A	ND	ND	
					66-2932	03/18/66	1800			06/19/66	NR	NR	
(b) (6)	(b) (6)	01/19/66	02/05/66	01/27/66	66-945	02/05/66	930	Moron	200	N/A	4.64+/-1.77	5.987	0.0172

Individuals with Urine Samples Classified as Remaining Cases

Name	SSN	Estimated Start Exposure Date	Estimated End Exposure Date	Estimated Acute Exposure Date	Sample No.	Sample Date	Sample Vol (mL)	Base	Sample Anal	Date Anal	Result (pCi/sample)	24hr Activity (pCi/day)	Recorded Systemic Body Burden
(b) (6)	(b) (6)	02/13/66	03/19/66	03/02/66	66-2571	03/19/66	975	Torrejon	975	N/A	0.133+/-0.113	0.184	
		01/18/66	02/11/66	01/30/66	66-771	02/11/66	771	Moron	200	N/A	2.42+/-1.13	3.767	0.0141
		01/24/66	02/20/66	02/06/66	66-1046	02/20/66	1410	Torrejon	200	N/A	3.24+/-1.51	3.240	0.017
		01/18/66	01/21/66	01/19/66	66-222	01/21/66	450	Torrejon	200	N/A	NR	NR	
		03/10/66	04/08/66	03/24/66	66-2987	04/26/66	1100	Furth , Ger. US Army, 20th Sta Hosp.	1100	N/A	ND	ND	
					66-2987	04/26/66	1100			07/14/66	0.437+/-0.027	0.477	
(b) (6)	(b) (6)	03/05/66	03/19/66	03/12/66	66-2336	03/19/66	890	Glessen	890	N/A	0.165+/-0.125	0.222	0.000519
		01/18/66	03/19/66	02/17/66	66-2183	03/19/66	480	Torrejon	480	N/A	0.108	0.270	
		01/18/66	02/08/66	01/28/66	66-837	02/08/66	690	Torrejon	200	N/A	ND	ND	
		01/18/66	03/20/66	02/17/66	66-2307	03/20/66	930	Torrejon	930	N/A	0.411+/-0.201	0.530	0.0035
		02/08/66	02/26/66	02/16/66	66-1413	02/26/66	920	Moron	956	N/A	0.194+/-0.156	0.253	0.00108
		03/14/66	03/19/66	03/16/66	66-2173	03/19/66	750	Moron	750	N/A	0.108	0.173	
		02/09/66	03/09/66	02/23/66	66-2397	03/09/66	450	Torrejon	450	N/A	ND	ND	
		02/21/66	03/18/66	03/05/66	66-2235	03/18/66	940	Torrejon	940	N/A	ND	ND	
		03/11/66	03/29/66	03/20/66	66-2283	03/29/66	700	Pimasens	700	N/A	0.147+/-0.136	0.252	0.000332
		02/01/66	02/10/66	02/05/66	66-3197	05/07/66	520	Torrejon	520	N/A	0.145+/-0.079	0.335	
		02/07/66	03/13/66	02/24/66	66-2536	03/13/66	1000	Torrejon	1000	N/A	0.135	0.162	
		02/10/66	03/08/66	02/23/66	66-2491	03/08/66	700	Moron	700	N/A	0	0.000	
		02/21/66	03/18/66	03/05/66	66-2215	03/18/66	630	Zaragoza	630	N/A	10.205+/-0.158	19.438	0.000997
		02/28/66	03/19/66	03/09/66	66-2568	03/19/66	500	Torrejon	500	N/A	0.229+/-0.184	0.550	
		01/18/66	01/29/66	01/23/66	66-1094	01/29/66	1030	Torrejon	1030	N/A	ND	ND	
		01/18/66	02/22/66	02/04/66	66-1245	02/22/66	2000	Offutt AFB, NE	1000	N/A	ND	ND	
		01/29/66	02/22/66	02/10/66	66-1087	02/22/66	555	Torrejon	555	03/17/66	16.1+/-1.0	34.811	0.17
					66-2935	03/18/66	1600	Torrejon	1600	N/A	1.32+/-0.29	1.320	
					66-2935	03/18/66	1600			08/27/66	NR	NR	
(b) (6)	(b) (6)	01/18/66	02/07/66	01/28/66	66-488	02/07/66	550	Moron	200	N/A	1.46+/-0.71	3.185	0.0103
		01/18/66	02/16/66	02/01/66	66-964	02/16/66	1050	Torrejon	200	N/A	2.04+/-1.11	2.331	0.011
		01/18/66	01/30/66	01/24/66	66-1069	01/30/66	750	Moron	750	N/A	0.115	0.184	0.000312
		01/17/66	03/04/66	02/09/66	66-2378	03/04/66	1400	Torrejon	1400	N/A	0.238+/-0.143	0.238	0.00179
(b) (6)		01/17/66	01/21/66	01/19/66	66-253	01/21/66	800	Torrejon	200	N/A	17.76 +/- 6.88	28.640	
		02/24/66	03/19/66	03/07/66	66-2558	03/19/66	800	Toul Rosieres	800	N/A	0.173+/-0.118	0.260	0.00079
		02/13/66	03/23/66	03/04/66	66-2582	03/23/66	1400	Moron	1400	N/A	0.976+/-0.295	0.976	0.005977
		01/18/66	02/05/66	01/27/66	66-1347	02/05/66	610	Torrejon	634	N/A	NR	NR	
		01/18/66	02/08/66	01/28/66	66-1344	02/08/66	720	Toul Rosieres	750	N/A	0.620+/-0.161	1.033	0.00255
		01/18/66	01/23/66	01/20/66	66-1935	01/23/66	1200	Torrejon	1250	N/A	0.247+/-0.104	0.247	
		01/18/66	01/25/66	01/21/66	66-1991	01/25/66	1000	Torrejon	1000	N/A	0.217+/-0.099	0.260	
		01/18/66	01/22/66	01/20/66	66-2883	04/03/66	1600	Torrejon	1600	N/A	ND	ND	
					66-2883	04/03/66	1600			08/17/66	NR	NR	
(b) (6)	(b) (6)	01/19/66	02/11/66	01/30/66	66-769	02/11/66	117	Torrejon	117	N/A	0.36+/-0.29	3.892	0.0139
		01/18/66	02/07/66	01/28/66	66-453	02/07/66	460	Moron	200	N/A	0.51+/-0.40	1.330	0.00373
		01/18/66	04/08/66	02/27/66	66-2862	04/08/66	800	Moron	800	N/A	ND	ND	
					66-2862	04/08/66	800			07/20/66	1.306+/-0.098	1.959	
(b) (6)	(b) (6)	03/10/66	03/20/66	03/15/66	66-2292	03/20/66	750	Sembach	750	N/A	0.161+/-0.118	0.258	0.000687
		01/25/66	02/09/66	02/01/66	66-797	02/09/66	930	Hanaw, Germany	200	N/A	4.47+/-1.35	5.788	0.0197
		01/18/66	02/07/66	01/28/66	66-446	02/07/66	960	Moron	200	N/A	1.53+/-0.92	1.913	0.00583
		01/18/66	03/02/66	02/08/66	66-1445	03/02/66	350	Moron	350	N/A	ND	ND	
		01/18/66	01/29/66	01/23/66	66-1141	01/29/66	340	656 Eng. Bn., APO09081	340	N/A	ND	ND	
(b) (6)	(b) (6)	02/05/66	02/25/66	02/15/66	66-1419	02/26/66	880			08/27/66	0.163+/-0.024	0.222	
											0.731+/-0.216		
(b) (6)	(b) (6)	01/18/66	01/21/66	01/19/66	66-214	01/21/66	325	Torrejon	200	N/A	NR	NR	
		01/25/66	02/09/66	02/01/66	66-753	02/09/66	690	Hanaw, Germany	200	N/A	4.60+/-1.32	8.000	0.0273
		01/18/66	03/08/66	02/11/66	66-2629	03/08/66	1350	Vandenburg	1350	N/A	0.222+/-0.115	0.222	
		01/18/66	01/29/66	01/23/66	66-1082	01/29/66	1540	Torrejon	1540	N/A	0.177	0.177	
		01/24/66	02/17/66	02/05/66	66-1119	02/17/66	530	Rein-Main	530	03/23/66	0.473+/-0.334	1.071	0.00231
		01/18/66	02/06/66	01/27/66	66-514	02/06/66	820	Torrejon	200	N/A	6.52+/-1.42	9.541	0.0291
		01/18/66	03/08/66	02/11/66	66-1870	03/08/66	500	Torrejon	520	N/A	NR	NR	
		02/24/66	03/18/66	03/06/66	66-2013	03/18/66	980	Torrejon	980	N/A	0.108+/-0.074	0.132	

Individuals with Urine Samples Classified as Remaining Cases

Name	SSN	Estimated Start Exposure Date	Estimated End Exposure Date	Estimated Acute Exposure Date	Sample No.	Sample Date	Sample Vol (mL)	Base	Sample Anal	Date Anal	Result (pCi/sample)	24hr Activity (pCi/day)	Recorded Systemic Body Burden
(b) (6)	(b) (6)	02/09/66	03/09/66	02/23/66	66-2052	03/09/66	1450	Torrejon	1450	N/A	0.194+/-0.129	0.194	0.00102
		01/18/66	02/04/66	01/26/66	66-356	02/04/66	370	Torrejon	200	N/A	ND	ND	
		01/18/66	02/05/66	01/27/66	66-919	02/05/66	375	Torrejon	200	N/A	0.99+/-0.40	3.168	0.00914
		02/11/66	03/18/66	02/28/66	66-2089	03/18/66	820	Moron	820	N/A	0.169+/-0.091	0.247	0.00108
		02/11/66	03/19/66	03/01/66	66-2221	03/19/66	900	Moron	900	N/A	ND	ND	
		03/12/66	03/18/66	03/15/66	66-2270	03/18/66	640	Moron	640	N/A	0.126+/-0.105	0.238	0.00021
		01/18/66	02/07/66	01/28/66	66-458	02/07/66	180	Torrejon	180	N/A	0.203 +/- 0.23	1.353	
		02/10/66	03/04/66	02/21/66	66-2341	03/04/66	820	Torrejon	820	N/A	0.181+/-0.129	0.265	0.000799
		01/18/66	02/02/66	01/25/66	66-1071	02/02/66	400	Moron	400	N/A	ND	ND	
		02/10/66	03/09/66	02/23/66	66-2390	03/09/66	1400	Moron	1400	N/A	0.115+/-0.107	0.116	0.00059
		02/04/66	03/20/66	02/26/66	66-2016	03/20/66	2000	USAH Numberg, Germany	2000	N/A	0.386+/-0.134	0.386	
		02/04/66	02/20/66	02/12/66	66-1039	02/20/66	700	Furth , Ger. US Army, 20th Sta Hosp.	200	N/A	92+/-5	157.714	0.813
(b) (6)	(b) (6)	01/18/66	02/07/66	01/28/66	66-467	02/07/66	500	Moron	200	N/A	0.75+/-0.59	1.800	0.00582
		02/18/66	03/04/66	02/25/66	66-2348	03/04/66	900	Torrejon	900	N/A	ND	ND	
		01/18/66	02/04/66	01/26/66	66-345	02/04/66	800	Torrejon	200	N/A	ND	ND	
		01/18/66	02/05/66	01/27/66	66-928	02/05/66	480	Moron	200	N/A	1.06+/-1.02	2.650	0.00365
		02/13/66	04/11/66	03/13/66	66-3119	04/13/66	725	Moron	725	N/A	0.133+/-0.066	0.220	
		02/11/66	03/18/66	02/28/66	66-2111	03/18/66	950	Torrejon	950	N/A	0.251+/-0.138	0.317	0.00157
		01/18/66	01/31/66	01/24/66	66-1091	01/31/66	625	Torrejon	625	N/A	ND	ND	
		02/18/66	03/04/66	02/25/66	66-2361	03/04/66	900	San Pablo	900	N/A	ND	ND	
		01/23/66	03/20/66	02/20/66	66-2296	03/20/66	820	Pirmasens	820	N/A	0.289+/-0.169	0.423	
		01/18/66	02/05/66	01/27/66	66-927	02/05/66	845	Torrejon	200	N/A	NR	NR	
		01/18/66	03/08/66	02/11/66	66-1903	03/08/66	1025	Torrejon	1025	N/A	0.199+/-0.093	0.233	
(b) (6)	(b) (6)	02/06/66	03/04/66	02/19/66	66-2377	03/04/66	900	Ramstein	900	N/A	0.102+/-0.094	0.136	0.00051
		01/18/66	02/18/66	02/02/66	66-911	02/18/66	1085	Seymour Johnson	200	02/23/66	ND	ND	
		01/18/66	03/02/66	02/08/66	66-1297	03/02/66	2150	Seymour Johnson	1000	N/A	ND	ND	
(b) (6)	(b) (6)	01/25/66	02/09/66	02/01/66	66-746	02/09/66	980	Hanaw, Germany	200	N/A	2.20+/-1.35	2.694	0.0092
		02/13/66	03/18/66	03/01/66	66-2276	03/18/66	800	Torrejon	800	N/A	0.376+/-0.195	0.564	0.00235
		01/18/66	02/07/66	01/28/66	66-440	02/07/66	380	Moron	200	N/A	0.52+/-0.37	1.642	0.00533
		01/18/66	04/08/66	02/27/66	66-2864	04/08/66	1800	Moron	1800	N/A	ND	ND	
(b) (6)	(b) (6)				66-2864	04/08/66	1800			07/20/66	1.428+/-0.181	1.428	
		01/18/66	03/08/66	02/11/66	66-1904	03/08/66	850	Torrejon	850	N/A	0.151+/-0.079	0.213	
					66-2310	03/19/66	660	Torrejon	660	N/A	0.136+/-0.114	0.247	0.000887
(b) (6)	(b) (6)	01/18/66	02/06/66	01/27/66	66-529	02/06/66	945	Torrejon	200	N/A	ND	ND	
		01/18/66	03/24/66	02/19/66	66-2575	03/24/66	1100	USS Everglades AD 24	1100	N/A	0.208+/-0.139	0.227	
(b) (6)	(b) (6)	01/18/66	02/05/66	01/27/66	66-929	02/05/66	400	Moron	200	N/A	1.08+/-0.66	3.240	0.00929
		02/06/66	02/26/66	02/16/66	66-1401	02/26/66	800	Torrejon	832	N/A	ND	ND	
		01/18/66	02/08/66	01/28/66	66-839	02/08/66	620	Torrejon	200	N/A	1.23+/-0.82	2.381	0.00773
		01/18/66	02/05/66	01/27/66	66-943	02/05/66	720	Torrejon	200	N/A	6.71+/-1.30	11.183	0.0322
		02/07/66	03/04/66	02/19/66	66-2365	03/04/66	850	Wiesbaden	850	N/A	ND	ND	
		01/19/66	01/24/66	01/21/66	66-1482	03/03/66	1080	Ramstein	1000	N/A	0	0.000	
		02/11/66	03/18/66	02/28/66	66-2107	03/18/66	970	Torrejon	970	N/A	0.253+/-0.106	0.313	0.00175
		01/18/66	02/05/66	01/27/66	66-531	02/06/66	310	Torrejon	200	N/A	ND	ND	
		02/14/66	03/13/66	02/27/66	66-2533	03/13/66	800	Torrejon	800	N/A	0.135	0.203	
		03/11/66	03/19/66	03/15/66	66-2557	03/19/66	800	Moron	800	N/A	0.202+/-0.133	0.303	0.000417
		01/18/66	02/04/66	01/26/66	66-359	02/04/66	490	Torrejon	200	N/A	ND	ND	
		01/18/66	02/07/66	01/28/66	66-479	02/07/66	610	Torrejon	200	N/A	1.73+/-0.81	3.403	0.011
		01/18/66	01/13/66	01/15/66	66-1126	01/13/66	875	Torrejon	875	N/A	ND	ND	
		01/18/66	02/06/66	01/27/66	66-506	02/06/66	920	Torrejon	200	N/A	3.82+/-1.30	4.983	0.0152
		01/18/66	02/03/66	01/26/66	66-1609	02/03/66	740	Moron	740	N/A	0.131	0.212	
		01/18/66	02/07/66	01/28/66	66-448	02/07/66	845	Torrejon	200	N/A	2.67+/-1.04	3.390	0.0104
		01/17/66	03/13/66	02/13/66	66-2532	03/13/66	950	Torrejon	950	N/A	0	0.000	
					66-2162	04/05/66	850	Torrejon	850	N/A	0.108	0.152	
(b) (6)	(b) (6)	02/04/66	02/25/66	02/14/66	66-1485	03/04/66	2710	USS Recovery ARS-43	1000	N/A	3.14 +/- 12.20	3.140	
(b) (6)	(b) (6)	02/13/66	03/08/66	02/24/66	66-2469	03/08/66	1000	Wheelus AF, Libya	1000	N/A	0.689+/-0.056	0.827	

Individuals with Urine Samples Classified as Remaining Cases

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(b) (6)	(b) (6)	01/18/66	02/12/66	01/30/66	66-791	02/12/66	655	Moron	200	N/A	ND	ND	
		02/21/66	03/18/66	03/05/66	66-2241	03/18/66	630	Zaragoza	630	N/A	0.182+/-0.145	0.347	0.000885
		01/17/66	01/19/66	01/18/66	66-1950	02/22/66	1900	Torrejon	1900	N/A	0.660+/-0.169	0.680	0.00428
		01/18/66	02/12/66	01/30/66	66-779	02/12/66	720	Torrejon	200	N/A	3.34+/-1.11	5.567	
		01/19/66	02/11/66	01/30/66	66-763	02/11/66	570	Torrejon	200	N/A	1.98+/-0.82	3.546	0.0133
		02/01/66	03/29/66	03/01/66	66-2282	03/29/66	970	Torrejon	970	N/A	0.367+/-0.168	0.454	
		01/18/66	02/06/66	01/27/66	66-519	02/06/66	810	Moron	200	N/A	2.88+/-1.24	4.237	0.013
		02/13/66	03/08/66	02/24/66	66-2513	03/08/66	1300	Torrejon	1300	N/A	0	0.000	
		03/14/66	03/29/66	03/21/66	66-2281	03/29/66	820	Moron	820	N/A	0.449+/-0.200	0.657	0.000552
		01/18/66	02/07/66	01/28/66	66-441	02/07/66	570	Torrejon	200	N/A	1.44+/-0.66	3.032	0.00924
		01/18/66	02/04/66	01/26/66	66-335	02/04/66	260	Torrejon	260	02/07/66	ND	ND	
		02/13/66	03/19/66	03/02/66	66-2177	03/19/66	570	Torrejon	570	N/A	n/a	n/a	
		01/25/66	02/09/66	02/01/66	66-731	02/09/66	700	Hanaw, Germany	200	N/A	1.70+/-1.14	2.914	0.00995
		03/28/66	04/11/66	04/04/66	66-2986	04/26/66	900	Furth , Ger. US Army, 20th Sta Hosp.	900	N/A	ND	ND	
(b) (6)	(b)				66-2986	04/26/66	900			07/13/66	NR	NR	
		01/18/66	03/11/66	02/13/66	66-1643	03/11/66	260	US Naval Ocean Graph	270	N/A	NR	NR	
(b) (6)	(b) (6)	02/18/66	03/19/66	03/04/66	66-2564	03/19/66	850	Torrejon	850	N/A	0.178+/-0.138	0.251	0.000967
		01/18/66	02/05/66	01/27/66	66-898	02/05/66	820	Moron	200	N/A	ND	ND	
		01/18/66	04/04/66	02/25/66	66-2894	04/04/66	1500	Vandenburg	1500	N/A	ND	ND	
		01/24/66	03/04/66	02/12/66	66-2346	03/04/66	600	Torrejon	600	N/A	ND	ND	
		01/27/66	02/19/66	02/07/66	66-1224	02/19/66	1140	San Pablo	1190	N/A	0.261+/-0.143	0.275	0.00119
					66-1224	02/19/66	1030	San Pablo	1000	N/A	0.176+/-0.574	0.205	
(b) (6)	(b) (6)	02/09/66	03/09/66	02/23/66	66-2394	03/09/66	750	San Pablo	750	N/A	0.220+/-139	0.352	0.00116
		01/18/66	01/21/66	01/19/66	66-268	01/21/66	690	Torrejon	200	N/A	0.72 +/- 0.69	1.252	
		02/12/66	02/28/66	02/19/66	66-1404	02/26/66	860	Torrejon	893	N/A	0.116+/-0.156	0.162	
(b) (6)	(b) (6)	01/18/66	02/05/66	01/27/66	66-2882	03/25/66	1500	Torrejon	1500	N/A	0.155+/-0.124	0.155	
		01/17/66	02/11/66	01/29/66	66-761	02/11/66	940	Torrejon	n/a	N/A	3.95+/-1.61	5.043	0.0189
		03/27/66	04/08/66	04/02/66	66-2933	04/20/66	900	Torrejon	900	N/A	0.136+/-0.107	0.181	
					66-2933	04/20/66	900			08/19/66	NR	NR	
(b) (6)	(b) (6)	01/24/66	02/13/66	02/03/66	66-1231	02/15/66	1390	Torrejon	700	N/A	0.427+/-0.0207	0.427	0.000368
		01/25/66	03/29/66	02/25/66	66-2285	03/29/66	620	n/a	620	N/A	0.119+/-0.115	0.230	0.000973
		02/13/66	03/03/66	02/22/66	66-1928	03/03/66	800	Moron	800	N/A	0.203+/-0.110	0.305	
		02/10/66	03/19/66	02/28/66	66-2080	03/19/66	890	Torrejon	890	N/A	0.143+/-0.088	1.541	
		02/08/66	02/26/66	02/16/66	66-1405	02/26/66	540	Moron	562	N/A	NR	NR	