



AFRL-SA-WP-TR-2023-0014

Missile Community Cancer Study, Round 1 Radon Results for Malmstrom, F.E. Warren, and Minot Air Force Base



**Lt Col Scott M. Boyd
Occupational & Environmental Health Department**

**Report Date
11 January 2024**



DISTRIBUTION STATEMENT A. Clearance number is AFRL-SA-WP-TR-2023-0014. Approved for public release: distribution is unlimited. 11 January 2024. Other requests shall be referred to DCPH-D/OEC, 2510 Fifth St., Bldg. 840, Wright-Patterson AFB, OH 45433-7913

**Controlled by: Department of the Air Force,
711 HPW/DCPH-D
CUI Category: Operational Security
Distribution/Dissemination Control:
Distribution Statement A
POC: Lt Col Scott M. Boyd
937-255-3865**

**Date of Determination: 11 January 2024
Air Force Research Laboratory 711th Human
Performance Wing
U.S. Air Force School of Aerospace Medicine
Occupational & Env. Health 2510 Fifth St.,
Bldg. 840
Wright-Patterson AFB, OH 45433-7913**

NOTICE AND SIGNATURE PAGE

Using Government drawings, specifications, or other data included in this document for any purpose other than Government procurement does not in any way obligate the U.S. Government. The fact that the Government formulated or supplied the drawings, specifications, or other data does not license the holder or any other person or corporation; or convey any rights or permission to manufacture, use, or sell any patented invention that may relate to them.

Qualified requestors may obtain copies of this report from the Defense Technical Information Center (DTIC) (<http://www.dtic.mil>).

AFRL-SA-WP-TR-2023-0014 has been reviewed and is approved for publication in accordance with assigned distribution statement.

SCOTT M. BOYD, Lt Col, USAF, BSC
Chief Consulting Executive
Occupational and Environmental Health
Department

This report is published in the interest of scientific and technical information exchange and its publication does not constitute the Government's approval or disapproval of its ideas or findings.

REPORT DOCUMENTATION PAGE

PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ORGANIZATION.

1. REPORT DATE 11 January 2024		2. REPORT TYPE CONSULTATIVE LETTER		3. DATES COVERED	
				START DATE 8 JUN 2023	END DATE 3 OCT 2023
4. TITLE AND SUBTITLE Missile Community Cancer Study, Round 1 Radon Results for Malmstrom, F.E. Warren, and Minot Air Force Base					
5a. CONTRACT NUMBER		5b. GRANT NUMBER		5c. PROGRAM ELEMENT NUMBER	
5d. PROJECT NUMBER		5e. TASK NUMBER		5f. WORK UNIT NUMBER	
6. AUTHOR(S) Capt Leigh M. Durden, Occupational and Environmental Health Department					
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Air Force Research Laboratory, 711th Human Performance Wing U.S. Air Force School of Aerospace Medicine, Occupational & Env. Health Dept 2510 Fifth St., Bldg. 840 Wright-Patterson AFB, OH 45433-7913				8. PERFORMING ORGANIZATION REPORT NUMBER AFRL-SA-WP-TR-2023-0014	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Air Force Research Laboratory, 711th Human Performance Wing U.S. Air Force School of Aerospace Medicine, Occupational & Env. Health Dept 2510 Fifth St., Bldg. 840 Wright-Patterson AFB, OH 45433-7913				10. SPONSOR/MONITOR'S ACRONYM(S)	11. SPONSOR/MONITOR'S REPORT NUMBER(S) AFRL-SA-WP-TR-2023-0014
12. DISTRIBUTION/AVAILABILITY STATEMENT DISTRIBUTION A. Clearance number is AFRL-SA-WP-TR-2023-0014. Approved for public release: distribution is unlimited. 11 January 2024. Other requests shall be referred to DCPH-D/OEC, 2510 Fifth St., Bldg. 840, Wright-Patterson AFB, OH 45433-7913					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT At the request of the Air Force Global Strike Commander (AFGSC/CC), the United States Air Force School of Aerospace Medicine (USAFSAM) Defense Centers for Public Health-Dayton Occupational and Environmental Health Department (DCPH-D/OE) performed an environmental health survey for all forty-five Missile Alert Facilities (MAFs) at Malmstrom AFB, MT, F.E. Warren AFB, WY, and Minot AFB, ND. The assessment was completed from 8 June to 3 October 2023 and included area air sampling, direct reading instrument (DRI) air monitoring, swipe sampling, drinking water sampling, soil, and radon sampling. This survey was performed to characterize and document potential personnel exposures to environmental hazards in the MAFs. The purpose of this memo is to augment previous Round 1 interim reports by conveying radon survey results analyzed by DCPH-D/OE.					
15. SUBJECT TERMS Missile Community Cancer Study, Round 1 Radon Results for Malmstrom, F.E. Warren, and Minot Air Force Base					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT		18. NUMBER OF PAGES
a. REPORT Unclassified	b. ABSTRACT Unclassified	c. THIS PAGE Unclassified	Unclassified		17
19a. NAME OF RESPONSIBLE PERSON Capt Leigh Durden				19b. PHONE NUMBER (Include area code) (937) 938-3297	



Public Health

DEFENSE HEALTH AGENCY
DEFENSE CENTER FOR PUBLIC HEALTH - DAYTON
2510 5TH STREET, BUILDING 840
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433-7951

11 January 2024

MEMORANDUM FOR: AFGSC/SGPB
ATTN: Lt Col Raymond Mak

FROM: DCPH-D/OE
2510 Fifth Street, Building 840
WPAFB OH 45433-7913

SUBJECT: Consultative Letter, AFRL-SA-WP-TR-2023-0014, Missileer Cancer Study,
Malmstrom, F.E. Warren, and Minot Air Force Base (AFB) Round I Radon Results

References: (a) Keith J. Westpfahl, Stepanie A. Ohms, Jesse M. Ford, Michael J. Anderson, and David M. Flint, *Bioenvironmental Engineering Guidebook for Radon Management* (OH: Air Force Research Laboratory, 2021), p20 & 27.

(b) Agency for Toxic Substances and Disease Registry, *Radon - ToxFAQs* (GA: ATSDR, 2012).

(c) Crystalyn E. Brown, *U.S. Air Force School of Aerospace Medicine Laboratory Sampling and Analysis Guide* (OH: Air Force Research Laboratory, 2016), p90.

(d) Environmental Protection Agency, *Health Risk of Radon*. (Washington, D.C.: EPA, 2023).

(e) Rad Elec, Inc., *Frequently Asked Questions: E-PERMs*. (MD, 2023).

(f) AFMAN 48-148, 20 July 2020, *Ionizing Radiation Protection*.

1. INTRODUCTION

At the request of the Air Force Global Strike Commander (AFGSC/CC), the United States Air Force School of Aerospace Medicine (USAFSAM) Defense Centers for Public Health-Dayton Occupational and Environmental Health Department (DCPH-D/OE) performed an environmental health survey for all forty-five Missile Alert Facilities (MAFs) at Malmstrom AFB, MT, F.E. Warren AFB, WY, and Minot AFB, ND. The assessment was completed from 8 June to 3 October 2023 and included area air sampling, direct reading instrument (DRI) air monitoring, swipe sampling, drinking water sampling, soil, and radon sampling. This survey was performed to characterize and document potential personnel exposures to environmental hazards in the MAFs. The purpose of this memo is to augment previous Round 1 interim reports by conveying radon survey results analyzed by DCPH-D/OE.

A. Survey Personnel:

- (1) Capt Leigh Durden, Environmental Health Consultant, DCPH-D/OEC
- (2) Capt Isabella Muffoletto, Occupational Health Consultant, DCPH-D/OEC
- (3) TSgt Quintin Labs, Occupational and Environmental Health (OEH) Technician, DCPH-D/OEC
- (4) TSgt Willie McElroy, OEH Technician, DCPH-D/OEC
- (5) SSgt Jesse Reed, OEH Technician, DCPH-D/OEC

B. Installation Personnel:

(1) Malmstrom AFB:

- (a) Lt Col Jennifer Harward, 341st Operational Medical Readiness Squadron (OMRS) Commander
- (b) Maj Brian Shuler, 341st OMRS Bioenvironmental Engineering Flight Commander
- (c) TSgt Darryl Adams, 341st OMRS Bioenvironmental Engineering Flight Chief

(2) F.E. Warren AFB:

- (a) Lt Col Donella Beaulieu, 90th OMRS Commander
- (b) Capt Ariel Serrano, 90th OMRS Bioenvironmental Engineering Flight Commander
- (c) SSgt Joseph Bahr, 90th OMRS Bioenvironmental Engineering Flight Chief

(3) Minot AFB:

- (a) Lt Col Stephanie Solberg, 5th OMRS Commander
- (b) 1st Lt Lee Williams, 5th OMRS Bioenvironmental Engineering Officer in Charge
- (c) SSgt Jesse Ford, 5th OMRS Bioenvironmental Engineering Flight Chief

C. Equipment Used:

- (1) Electret Passive Environmental Radon/Radiation Monitor (E-PERM) Electret Ion Chamber
- (2) E-PERM Electret Reader

2. BACKGROUND

Following a March 2023 site visit to address cancer concerns in the missileer community, DCPH-D/OE performed the first round of environmental sampling at all MAFs at Malmstrom AFB, F.E. Warren AFB, and Minot AFB. The sampling plan targeted potential carcinogens which potentially affect MAF personnel through dermal, ingestion, and inhalation pathways. Radon sampling was included in the sampling plan for all MAFs and occurred between 91 and 101 days depending on base and MAF. Radon sampling at Malmstrom AFB MAFs occurred from 28 June 2023 to 28 September 2023. Radon sampling at F.E. Warren from 8 June 2023 to 8 September 2023. Radon sampling at Minot AFB MAFs occurred from 12 June 2023 to 11 September 2023. Due to scheduling availability for each base Bioenvironmental Engineering flight to access MAFs and conduct radon readings, variances in sampling duration occurred between the three bases. However, all durations meet Federal and Air Force guidelines for long-term sampling by exceeding 90-day (Westphahl et al, 2021).

When activated, the MAF is manned under two operational tempos. Malmstrom and Minot AFBs man the MAFs for twenty-four hours per day, seven days per week, three hundred sixty-five days a year. The crews work seven straight days followed by two weeks in non-MAF locations. F.E. Warren mans the MAFs for twenty-four hours per day, seven days per week, three hundred sixty-five days a year with crews occupying the MAF for twenty-four hours at a time, followed by two days in non-MAF locations. Under both tempos, occupancy within the MAF occur for 2,920 hours each year within occupied locations (Topside Facility Manager Bedroom, Topside Common Area, Topside Security Forces Room, and Launch Control Center (LCC)). For non-occupied locations sampled (i.e., the hallway corridor outside the LCCs), an occupancy of 243 hours each year was applied under the conservative calculation that MAF occupants will occupy the hallway outside of the LCC for five minutes each hour.

3. HEALTH HAZARD SUMMARY

Radon is a naturally occurring, radioactive gas that is odorless, colorless, and tasteless (Agency for Toxic Substances and Disease Registry, 2012). Radon is constantly produced in soil and building materials where uranium exists (Brown, 2016). Because the gas is inert and has a 3.8-day half-life, radon can diffuse through the soil, where it enters the atmosphere or groundwater (Ibid, 2016). Radon in the atmosphere decays into particulate daughter products that adhere to dust particles. Per the EPA, radon is the second leading cause of lung cancer in the United States (EPA, 2023).

4. METHODOLOGY & ANALYSIS

E-PERM Electret Ion Chamber measures radon concentrations by quantifying the reduction of voltage over a known time period (Rad Elec Inc, 2023). Radon concentrations, measured in picocuries per liter (pCi/L) are converted to radon exposures (Working Level Months in a year) through a calculation which incorporates the individual measured radon concentration and applicable occupancy (hours per year).

Seven E-PERM Electret Ion Chambers in an S Chamber Long-Term (SLT) electret configuration were placed in each MAF. SLT configurations enable thirty to one hundred and twenty days of sampling with a minimum detection concentration of 0.2 picocuries per liter (pCi/L). Sample locations within each MAF include one electret placed in the:

- A. Topside Facility Manager Bedroom
- B. Topside Common Area
- C. Topside Security Forces Room
- D. LCC
- E. Outside LCC (Hallway Corridor outside the LCC)

One blank and one duplicate electret were placed in the LCC. The blank and duplicates are used to ensure quality assurance/quality control (QA/QC) elements to validate sample results are trustworthy, precise, and unbiased (Westpfahl et al., 2021). Upon completion of the scheduled sampling duration, installation Bioenvironmental Engineering flight personnel transported the E-PERM Electret Ion Chambers Topside, conducted a radon reading via the E-PERM Electret Reader, recorded the results on the E-PERM Calculation Spreadsheet, and returned the E-PERM Electret Reader to its designated location for Round 2 radon sampling. Installation Bioenvironmental Engineering then submitted the E-PERM Calculation Spreadsheet to DCPH-D/OE for final QA/QC. DCPH-D/OE compared the results documented in the E-PERM Calculation Spreadsheet to limits referenced in paragraph 7 of AFMAN 48-148, *Ionizing Radiation Protection*, which direct:

- A. Annual exposure limit to radon is four Working Level Months in a year (4 WLM/yr)
- B. Facility mitigation will begin at exposures greater than 0.8 WLM/yr

5. RESULTS & DISCUSSION

All radon measurements across all forty-five MAFs were below the annual exposure limit and the facility mitigation levels in Chapter 7 of AFMAN 48-148. Therefore, no facility modifications or mitigation to limit radon exposure is recommended. The highest radon levels measured at each installation are:

- A. Malstrom AFB at MAF Mike-01 (Topside Common Area), 0.45 WLM/yr
- B. F.E. Warren AFB at MAF Charlie-01 (Security Forces Room), 0.58 WLM/yr
- C. Minot AFB at MAF Kilo-01 (Security Forces Room), 0.53 WLM/yr

During the Missile Community Cancer Study Town Hall on 14 November 2023, DCPH-D/OE reported one out of the 225 radon samples results was significantly higher than the other 224 radon samples. The location of this radon sample was initially reported at Minot AFB MAF Charlie-01 in the Hallway Corridor outside of the LCC. Following the Town Hall, DCPH-D/OE and Minot AFB Bioenvironmental Engineering confirmed this radon sample was collected under the LCC floor. Considering this sampling location does not meet the criteria of a testable area and is validated by radon measurements within the LCC, DCPH-D/OE omitted this reading from Attachment 3.

6. CONCLUSIONS

The results presented in this report are a part of a multi-faceted study to characterize the environment in which the missileer community works. Three sampling events will occur over a year to determine if seasonal variations exist. Round 2 radon sampling for this project is underway, with Round 3 radon sampling expected to begin in January 2024. If you have any questions, comments, or concerns, please contact Capt Leigh Durden at 937-938-3297 or by e-mail at leigh.durden@us.af.mil.

SCOTT M. BOYD, Lt Col, USAF, BSC
Chief Consulting Executive

3 Attachments

1. Round 1 Radon Results for Malmstrom AFB from 22 June to 3 October 2023
2. Round 1 Radon Results for F.E. Warren AFB from 8 June to 15 September 2023
3. Round 1 Radon Results for Minot AFB from 12 June to 14 September 2023

Attachment 1: Round 1 Radon Results for Malmstrom AFB from 22 June to 3 October 2023

MAF	Location	Start Date	End Date	Total Days Exposed	Bldg Occupancy (hrs/yr)	Radon in Air (pCi/L)	Radon in Air (WLM/yr)
A-01	FM Bedroom	28-Jun-23	28-Sep-23	92	2920	2	0.14
A-01	Topside Common Area	28-Jun-23	28-Sep-23	92	2920	1.2	0.08
A-01	Security Forces Room	28-Jun-23	28-Sep-23	92	2920	2	0.14
A-01	Outside LCC	28-Jun-23	28-Sep-23	92	243	1.1	0.01
A-01	LCC	28-Jun-23	28-Sep-23	92	2920	1.8	0.12
B-01	FM Bedroom	28-Jun-23	28-Sep-23	92	2920	1	0.07
B-01	Topside Common Area	28-Jun-23	28-Sep-23	92	2920	1	0.07
B-01	Security Forces Room	28-Jun-23	28-Sep-23	92	2920	0.7	0.05
B-01	Outside LCC	28-Jun-23	28-Sep-23	92	243	2.2	0.01
B-01	LCC	28-Jun-23	28-Sep-23	92	2920	1.9	0.13
C-01	FM Bedroom	22-Jun-23	28-Sep-23	98	2920	6	0.41
C-01	Topside Common Area	22-Jun-23	28-Sep-23	98	2920	3.3	0.23
C-01	Security Forces Room	22-Jun-23	28-Sep-23	98	2920	2	0.14
C-01	Outside LCC	22-Jun-23	28-Sep-23	98	243	2.6	0.01
C-01	LCC	22-Jun-23	28-Sep-23	98	2920	0.7	0.05
D-01	FM Bedroom	25-Jun-23	28-Sep-23	95	2920	0.7	0.05
D-01	Topside Common Area	25-Jun-23	28-Sep-23	95	2920	0.8	0.05
D-01	Security Forces Room	25-Jun-23	28-Sep-23	95	2920	0.4	0.03
D-01	Outside LCC	25-Jun-23	28-Sep-23	95	243	2.3	0.01
D-01	LCC	25-Jun-23	28-Sep-23	95	2920	1	0.07
E-01	FM Bedroom	29-Jun-23	28-Sep-23	91	2920	1.9	0.13
E-01	Topside Common Area	29-Jun-23	28-Sep-23	91	2920	2.7	0.19
E-01	Security Forces Room	29-Jun-23	28-Sep-23	91	2920	2.2	0.15
E-01	Outside LCC	29-Jun-23	28-Sep-23	91	243	2.3	0.01
E-01	LCC	29-Jun-23	28-Sep-23	91	2920	0.9	0.06
F-01	FM Bedroom	26-Jun-23	3-Oct-23	99	2920	0.5	0.03
F-01	Topside Common Area	26-Jun-23	3-Oct-23	99	2920	2.6	0.18
F-01	Security Forces Room	26-Jun-23	3-Oct-23	99	2920	0.5	0.03
F-01	Outside LCC	26-Jun-23	3-Oct-23	99	243	2.4	0.01

F-01	LCC	26-Jun-23	3-Oct-23	99	2920	0.6	0.04
G-01	FM Bedroom	25-Jun-23	3-Oct-23	100	2920	1.1	0.08
G-01	Topside Common Area	25-Jun-23	3-Oct-23	100	2920	0.8	0.05
G-01	Security Forces Room	25-Jun-23	3-Oct-23	100	2920	1.4	0.1
G-01	Outside LCC	25-Jun-23	3-Oct-23	100	243	1.4	0.01
G-01	LCC	25-Jun-23	3-Oct-23	100	2920	0.7	0.05
H-01	FM Bedroom	25-Jun-23	27-Sep-23	94	2920	0.3	0.02
H-01	Topside Common Area	25-Jun-23	27-Sep-23	94	2920	0.8	0.05
H-01	Security Forces Room	25-Jun-23	27-Sep-23	94	2920	0.3	0.02
H-01	Outside LCC	25-Jun-23	27-Sep-23	94	243	0.9	0.01
H-01	LCC	25-Jun-23	27-Sep-23	94	2920	0.4	0.03
I-01	FM Bedroom	24-Jun-23	3-Oct-23	101	2920	1.3	0.09
I-01	Topside Common Area	24-Jun-23	3-Oct-23	101	2920	0.6	0.04
I-01	Security Forces Room	24-Jun-23	3-Oct-23	101	2920	0.4	0.03
I-01	Outside LCC	24-Jun-23	3-Oct-23	101	243	1.7	0.01
I-01	LCC	24-Jun-23	3-Oct-23	101	2920	2	0.14
J-01	FM Bedroom	24-Jun-23	3-Oct-23	101	2920	1.3	0.09
J-01	Topside Common Area	24-Jun-23	3-Oct-23	101	2920	1.5	0.1
J-01	Security Forces Room	24-Jun-23	3-Oct-23	101	2920	1.1	0.08
J-01	Outside LCC	24-Jun-23	3-Oct-23	101	243	2	0.01
J-01	LCC	24-Jun-23	3-Oct-23	101	2920	0.2	0.01
K-01	FM Bedroom	27-Jun-23	29-Sep-23	94	2920	1.6	0.11
K-01	Topside Common Area	27-Jun-23	29-Sep-23	94	2920	2.4	0.16
K-01	Security Forces Room	27-Jun-23	29-Sep-23	94	2920	1.6	0.11
K-01	Outside LCC	27-Jun-23	29-Sep-23	94	243	2.6	0.01
K-01	LCC	27-Jun-23	29-Sep-23	94	2920	2	0.14
L-01	FM Bedroom	27-Jun-23	29-Sep-23	94	2920	1.8	0.12
L-01	Topside Common Area	27-Jun-23	29-Sep-23	94	2920	0.2	0.01
L-01	Security Forces Room	27-Jun-23	29-Sep-23	94	2920	1.3	0.09
L-01	Outside LCC	27-Jun-23	29-Sep-23	94	243	1	0.01
L-01	LCC	27-Jun-23	29-Sep-23	94	2920	0.7	0.05
M-01	FM Bedroom	26-Jun-23	29-Sep-23	95	2920	2.3	0.16
M-01	Topside Common Area	26-Jun-23	29-Sep-23	95	2920	6.6	0.45

M-01	Security Forces Room	26-Jun-23	29-Sep-23	95	2920	0	0
M-01	Outside LCC	26-Jun-23	29-Sep-23	95	243	3.3	0.02
M-01	LCC	26-Jun-23	29-Sep-23	95	2920	1.5	0.1
N-01	FM Bedroom	22-Jun-23	29-Sep-23	98	2920	1.1	0.08
N-01	Topside Common Area	22-Jun-23	29-Sep-23	98	2920	1.3	0.09
N-01	Security Forces Room	22-Jun-23	29-Sep-23	98	2920	2.7	0.19
N-01	Outside LCC	22-Jun-23	29-Sep-23	98	243	3.3	0.02
N-01	LCC	22-Jun-23	29-Sep-23	98	2920	2.5	0.17
O-01	FM Bedroom	22-Jun-23	29-Sep-23	99	2920	1	0.07
O-01	Topside Common Area	22-Jun-23	29-Sep-23	99	2920	1.7	0.12
O-01	Security Forces Room	22-Jun-23	29-Sep-23	99	2920	1.4	0.1
O-01	Outside LCC	22-Jun-23	29-Sep-23	99	243	1.8	0.01
O-01	LCC	22-Jun-23	29-Sep-23	99	2920	0.4	0.03

Attachment 2: Round 1 Radon Results for F.E. Warren AFB from 8 June to 15 September 2023

MAF	Location	Start Date	End Date	Total Days Exposed	Bldg Occupancy (hrs/yr)	Radon in Air (pCi/L)	Radon in Air (WLM/yr)
A-01	FM Bedroom	8-Jun-23	8-Sep-23	92	2920	1.3	0.09
A-01	Topside Common Area	8-Jun-23	8-Sep-23	92	2920	4.7	0.32
A-01	Security Forces Room	8-Jun-23	8-Sep-23	92	2920	1.6	0.11
A-01	Outside LCC	8-Jun-23	8-Sep-23	92	243	1.4	0.01
A-01	LCC	8-Jun-23	8-Sep-23	92	2920	1	0.07
B-01	FM Bedroom	8-Jun-23	8-Sep-23	92	2920	1.8	0.12
B-01	Topside Common Area	8-Jun-23	8-Sep-23	92	2920	1.3	0.09
B-01	Security Forces Room	8-Jun-23	8-Sep-23	92	2920	2.4	0.16
B-01	Outside LCC	8-Jun-23	8-Sep-23	92	243	2.4	0.01
B-01	LCC	8-Jun-23	8-Sep-23	92	2920	1	0.07
C-01	FM Bedroom	8-Jun-23	8-Sep-23	92	2920	1.6	0.11
C-01	Topside Common Area	8-Jun-23	8-Sep-23	92	2920	2	0.14
C-01	Security Forces Room	8-Jun-23	8-Sep-23	92	2920	8.5	0.58
C-01	Outside LCC	8-Jun-23	8-Sep-23	92	243	1.9	0.01
C-01	LCC	8-Jun-23	8-Sep-23	92	2920	1	0.07
D-01	FM Bedroom	8-Jun-23	8-Sep-23	92	2920	1.4	0.1
D-01	Topside Common Area	8-Jun-23	8-Sep-23	92	2920	1.9	0.13
D-01	Security Forces Room	8-Jun-23	8-Sep-23	92	2920	1.6	0.11
D-01	Outside LCC	8-Jun-23	8-Sep-23	92	243	2.9	0.02
D-01	LCC	8-Jun-23	8-Sep-23	92	2920	1.2	0.08
E-01	FM Bedroom	15-Jun-23	15-Sep-23	92	2920	1.7	0.12
E-01	Topside Common Area	15-Jun-23	15-Sep-23	92	2920	1.8	0.12
E-01	Security Forces Room	15-Jun-23	15-Sep-23	92	2920	1.6	0.11
E-01	Outside LCC	15-Jun-23	15-Sep-23	92	243	2.4	0.01
E-01	LCC	15-Jun-23	15-Sep-23	92	2920	1.6	0.11
F-01	FM Bedroom	8-Jun-23	8-Sep-23	92	2920	1.7	0.12
F-01	Topside Common Area	8-Jun-23	8-Sep-23	92	2920	1.5	0.1
F-01	Security Forces Room	8-Jun-23	8-Sep-23	92	2920	2.2	0.15
F-01	Outside LCC	8-Jun-23	8-Sep-23	92	243	6	0.03

F-01	LCC	8-Jun-23	8-Sep-23	92	2920	4.1	0.28
G-01	FM Bedroom	13-Jun-23	13-Sep-23	92	2920	1.4	0.1
G-01	Topside Common Area	13-Jun-23	13-Sep-23	92	2920	1.7	0.12
G-01	Security Forces Room	13-Jun-23	13-Sep-23	92	2920	1	0.07
G-01	Outside LCC	13-Jun-23	13-Sep-23	92	243	1.9	0.01
G-01	LCC	13-Jun-23	13-Sep-23	92	2920	0.5	0.03
H-01	FM Bedroom	13-Jun-23	13-Sep-23	92	2920	1.6	0.11
H-01	Topside Common Area	13-Jun-23	13-Sep-23	92	2920	1.7	0.12
H-01	Security Forces Room	13-Jun-23	13-Sep-23	92	2920	1.5	0.1
H-01	Outside LCC	13-Jun-23	13-Sep-23	92	243	0	0
H-01	LCC	13-Jun-23	13-Sep-23	92	2920	0.7	0.05
I-01	FM Bedroom	15-Jun-23	15-Sep-23	92	2920	7.3	0.5
I-01	Topside Common Area	15-Jun-23	15-Sep-23	92	2920	1.2	0.08
I-01	Security Forces Room	15-Jun-23	15-Sep-23	92	2920	5.5	0.38
I-01	Outside LCC	15-Jun-23	15-Sep-23	92	243	1.1	0.01
I-01	LCC	15-Jun-23	15-Sep-23	92	2920	0.9	0.06
J-01	FM Bedroom	13-Jun-23	13-Sep-23	92	2920	2	0.14
J-01	Topside Common Area	13-Jun-23	13-Sep-23	92	2920	1.7	0.12
J-01	Security Forces Room	13-Jun-23	13-Sep-23	92	2920	1.6	0.11
J-01	Outside LCC	13-Jun-23	13-Sep-23	92	243	2.6	0.01
J-01	LCC	13-Jun-23	13-Sep-23	92	2920	0.9	0.06
K-01	FM Bedroom	13-Jun-23	13-Sep-23	92	2920	1.6	0.11
K-01	Topside Common Area	13-Jun-23	13-Sep-23	92	2920	1.8	0.12
K-01	Security Forces Room	13-Jun-23	13-Sep-23	92	2920	2.2	0.15
K-01	Outside LCC	13-Jun-23	13-Sep-23	92	243	2.6	0.01
K-01	LCC	13-Jun-23	13-Sep-23	92	2920	1.2	0.08
L-01	FM Bedroom	12-Jun-23	12-Sep-23	92	2920	7.6	0.52
L-01	Topside Common Area	12-Jun-23	12-Sep-23	92	2920	1.7	0.12
L-01	Security Forces Room	12-Jun-23	12-Sep-23	92	2920	1.1	0.08
L-01	Outside LCC	12-Jun-23	12-Sep-23	92	243	2.2	0.01
L-01	LCC	12-Jun-23	12-Sep-23	92	2920	1.4	0.1
M-01	FM Bedroom	12-Jun-23	12-Sep-23	92	2920	2.3	0.16
M-01	Topside Common Area	12-Jun-23	12-Sep-23	92	2920	3.1	0.21

M-01	Security Forces Room	12-Jun-23	12-Sep-23	92	2920	1.7	0.12
M-01	Outside LCC	12-Jun-23	12-Sep-23	92	243	2.5	0.01
M-01	LCC	12-Jun-23	12-Sep-23	92	2920	1.3	0.1
N-01	FM Bedroom	12-Jun-23	12-Sep-23	92	2920	1.6	0.11
N-01	Topside Common Area	12-Jun-23	12-Sep-23	92	2920	2.2	0.15
N-01	Security Forces Room	12-Jun-23	12-Sep-23	92	2920	1.5	0.1
N-01	Outside LCC	12-Jun-23	12-Sep-23	92	243	1.7	0
N-01	LCC	12-Jun-23	12-Sep-23	92	2920	0.6	0.04
O-01	FM Bedroom	12-Jun-23	12-Sep-23	92	2920	1.7	0.12
O-01	Topside Common Area	12-Jun-23	12-Sep-23	92	2920	1.8	0.12
O-01	Security Forces Room	12-Jun-23	12-Sep-23	92	2920	1.9	0.13
O-01	Outside LCC	12-Jun-23	12-Sep-23	92	243	2	0.01
O-01	LCC	12-Jun-23	12-Sep-23	92	2920	1.2	0.08

Attachment 3: Round 1 Radon Results for Minot AFB from 12 June to 14 September 2023

MAF	Location	Start Date	End Date	Total Days Exposed	Bldg Occupancy (hrs/yr)	Radon in Air (pCi/L)	Radon in Air (WLM/yr)
A-01	FM Bedroom	12-Jun-23	11-Sep-23	91	2920	6	0.41
A-01	Topside Common Area	12-Jun-23	11-Sep-23	91	2920	1	0.07
A-01	Security Forces Room	12-Jun-23	11-Sep-23	91	2920	1.2	0.08
A-01	Outside LCC	12-Jun-23	11-Sep-23	91	243	1.2	0.01
A-01	LCC	12-Jun-23	11-Sep-23	91	2920	0.3	0.02
B-01	FM Bedroom	12-Jun-23	11-Sep-23	91	2920	2.4	0.16
B-01	Topside Common Area	12-Jun-23	11-Sep-23	91	2920	0.7	0.05
B-01	Security Forces Room	12-Jun-23	11-Sep-23	91	2920	1	0.07
B-01	Outside LCC	12-Jun-23	11-Sep-23	91	243	0.8	0
B-01	LCC	12-Jun-23	11-Sep-23	91	2920	1	0.07
C-01	FM Bedroom	12-Jun-23	11-Sep-23	91	2920	1.9	0.13
C-01	Topside Common Area	12-Jun-23	11-Sep-23	91	2920	1	0.07
C-01	Security Forces Room	12-Jun-23	11-Sep-23	91	2920	1.9	0.13
C-01	Outside LCC	12-Jun-23	11-Sep-23	91	243	1.4	0.01
C-01	LCC	12-Jun-23	11-Sep-23	91	2920	1.8	0.12
D-01	FM Bedroom	12-Jun-23	13-Sep-23	93	2920	1.4	0.1
D-01	Topside Common Area	12-Jun-23	13-Sep-23	93	2920	0.5	0.03
D-01	Security Forces Room	12-Jun-23	13-Sep-23	93	2920	1.3	0.09
D-01	Outside LCC	12-Jun-23	13-Sep-23	93	243	1.1	0.01
D-01	LCC	12-Jun-23	13-Sep-23	93	2920	1.1	0.08
E-01	FM Bedroom	12-Jun-23	11-Sep-23	91	2920	1.1	0.08
E-01	Topside Common Area	12-Jun-23	11-Sep-23	91	2920	2.4	0.16
E-01	Security Forces Room	12-Jun-23	11-Sep-23	91	2920	1.4	0.1
E-01	Outside LCC	12-Jun-23	11-Sep-23	91	243	1.2	0.01
E-01	LCC	12-Jun-23	11-Sep-23	91	2920	1.3	0.09
F-01	FM Bedroom	12-Jun-23	13-Sep-23	93	2920	2.4	0.16
F-01	Topside Common Area	12-Jun-23	13-Sep-23	93	2920	1.2	0.08
F-01	Security Forces Room	12-Jun-23	13-Sep-23	93	2920	0.9	0.06
F-01	Outside LCC	12-Jun-23	13-Sep-23	93	243	1.9	0.01

F-01	LCC	12-Jun-23	13-Sep-23	93	2920	0.9	0.06
G-01	FM Bedroom	12-Jun-23	13-Sep-23	93	2920	1	0.07
G-01	Topside Common Area	12-Jun-23	13-Sep-23	93	2920	1.2	0.08
G-01	Security Forces Room	12-Jun-23	13-Sep-23	93	2920	0.9	0.06
G-01	Outside LCC	12-Jun-23	13-Sep-23	93	243	0.8	0
G-01	LCC	12-Jun-23	13-Sep-23	93	2920	0.2	0.01
H-01	FM Bedroom	12-Jun-23	13-Sep-23	93	2920	1.1	0.08
H-01	Topside Common Area	12-Jun-23	13-Sep-23	93	2920	1.2	0.08
H-01	Security Forces Room	12-Jun-23	13-Sep-23	93	2920	1.1	0.08
H-01	Outside LCC	12-Jun-23	13-Sep-23	93	243	0.6	0
H-01	LCC	12-Jun-23	13-Sep-23	93	2920	0.4	0.03
I-01	FM Bedroom	12-Jun-23	12-Sep-23	92	2920	1.2	0.08
I-01	Topside Common Area	12-Jun-23	12-Sep-23	92	2920	2.2	0.15
I-01	Security Forces Room	12-Jun-23	12-Sep-23	92	2920		
I-01	Outside LCC	12-Jun-23	12-Sep-23	92	243	6	0.03
I-01	LCC	12-Jun-23	12-Sep-23	92	2920	1.2	0.08
J-01	FM Bedroom	12-Jun-23	12-Sep-23	92	2920	1.1	0.08
J-01	Topside Common Area	12-Jun-23	12-Sep-23	92	2920	4.8	0.33
J-01	Security Forces Room	12-Jun-23	12-Sep-23	92	2920	1.6	0.11
J-01	Outside LCC	12-Jun-23	12-Sep-23	92	243	0.7	0
J-01	LCC	12-Jun-23	12-Sep-23	92	2920	0.8	0.05
K-01	FM Bedroom	12-Jun-23	12-Sep-23	92	2920	0.3	0.02
K-01	Topside Common Area	12-Jun-23	12-Sep-23	92	2920	0	0
K-01	Security Forces Room	12-Jun-23	12-Sep-23	92	2920	7.7	0.53
K-01	Outside LCC	12-Jun-23	12-Sep-23	92	243	0.7	0
K-01	LCC	12-Jun-23	12-Sep-23	92	2920	0.7	0.05
L-01	FM Bedroom	12-Jun-23	12-Sep-23	92	2920	1.3	0.09
L-01	Topside Common Area	12-Jun-23	12-Sep-23	92	2920	0.1	0.01
L-01	Security Forces Room	12-Jun-23	12-Sep-23	92	2920	0.6	0.04
L-01	Outside LCC	12-Jun-23	12-Sep-23	92	243	1.4	0.01
L-01	LCC	12-Jun-23	12-Sep-23	92	2920	0.4	0.03
M-01	FM Bedroom	12-Jun-23	14-Sep-23	94	2920	0.9	0.06
M-01	Topside Common Area	12-Jun-23	14-Sep-23	94	2920	1.2	0.08

M-01	Security Forces Room	12-Jun-23	14-Sep-23	94	2920	1.3	0.09
M-01	Outside LCC	12-Jun-23	14-Sep-23	94	243	0.1	0
M-01	LCC	12-Jun-23	14-Sep-23	94	2920	1.3	0.09
N-01	FM Bedroom	12-Jun-23	14-Sep-23	94	2920	1.2	0.08
N-01	Topside Common Area	12-Jun-23	14-Sep-23	94	2920	1.6	0.11
N-01	Security Forces Room	12-Jun-23	14-Sep-23	94	2920	2	0.14
N-01	Outside LCC	12-Jun-23	14-Sep-23	94	243	1.1	0.01
N-01	LCC	12-Jun-23	14-Sep-23	94	2920	0.6	0.04
O-01	FM Bedroom	12-Jun-23	14-Sep-23	94	2920	1.7	0.12
O-01	Topside Common Area	12-Jun-23	14-Sep-23	94	2920	1.4	0.1
O-01	Security Forces Room	12-Jun-23	14-Sep-23	94	2920	1.8	0.12
O-01	Outside LCC	12-Jun-23	14-Sep-23	94	243	1.4	0.01
O-01	LCC	12-Jun-23	14-Sep-23	94	2920	1.2	0.08