ORP/SEPD-80-12
April 1981

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Radiation

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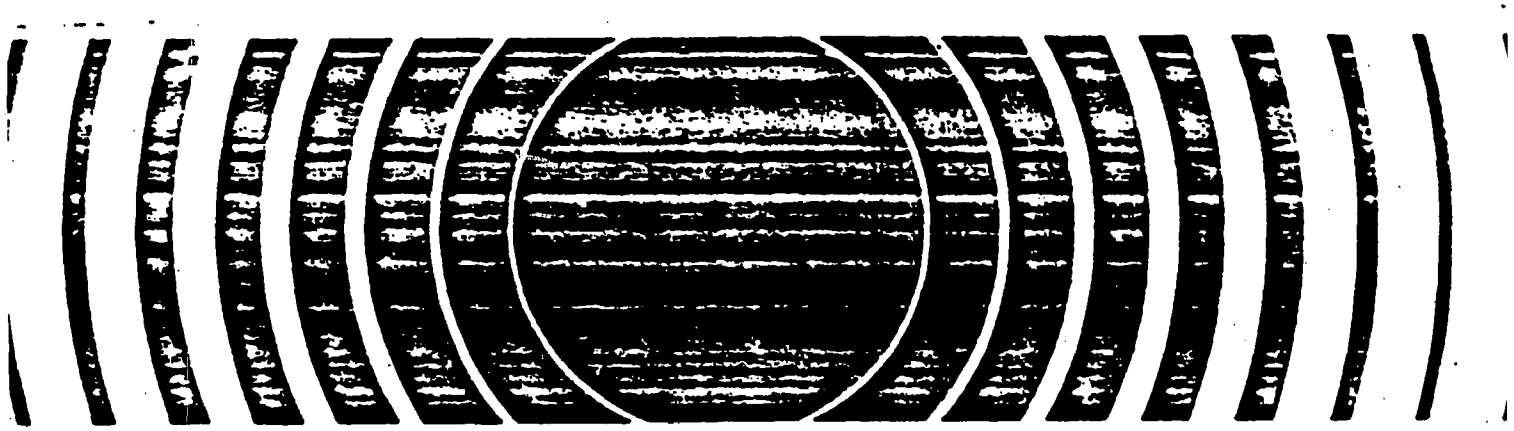
# Population Exposure to External Natural Radiation Background in the United States



Appendix B

Corrections to ORP/SID 72-1

Three errors were noted in the histograms of figure 13 of Oakley's report (Oa72). One of these was misplacement of the vertical axis for Rocky Flats-Denver (Fig 13q ). This axis was misplaced one scale division to the left. The first noticeable non-zero readings should be in the range 2 to 4 microrems/hour, the mode should be in the range 8-10 microrems/hour, and the arrow should be located at 10.4 microrems/hour.

The other two errors were in the placement of the arrows indicating the mean values for Cincinnati, Ohio, (Fig. 13m) and Los Angeles, California (Fig 13y). For the convenience of the reader, the location of the mean values for the 25 histograms of Figure 13 in (Oa72) are given as Table B-1:

Table B-1

Average Terrestrial Dose Equivalent Values for Measured Sites (Oa72)

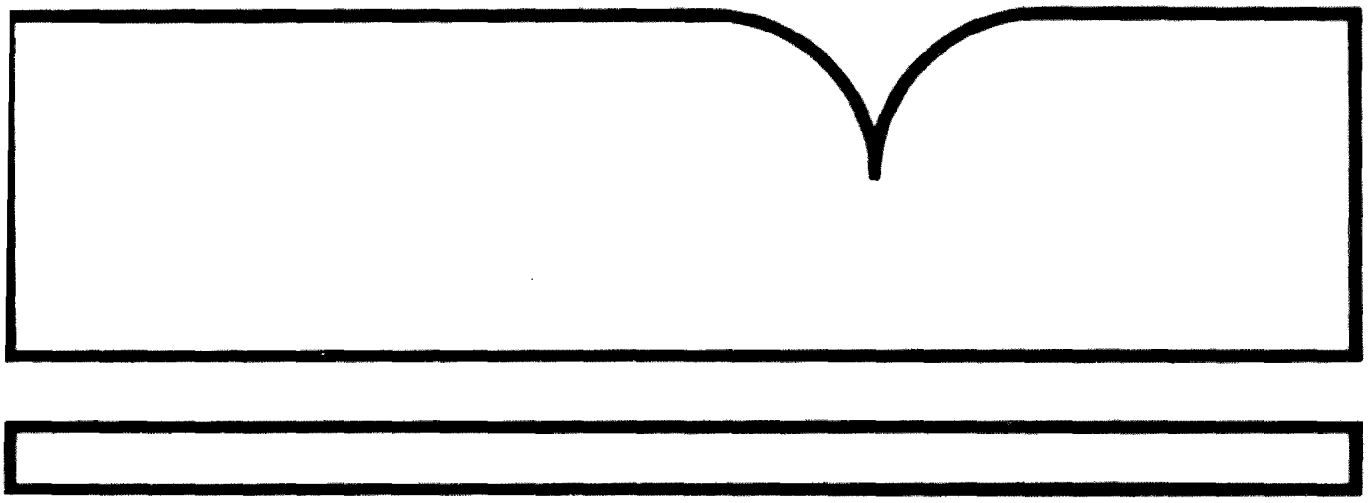
| Location | microrems/ hour | Location | microrems/ hour |
|---|---|---|---|
| No. New England | 5.33 | Cincinnati, Ohio | 4.05 |
| So. New England | 6.11 | Chicago, Ill. | 5.18 |
| Camden/Philadelphia | 2.70 | Minneapolis, Minn. | 4.21 |
| Fort Belvoir, Va./D.C. | 4.12 | Galveston, Texas | 2.26 |
| Norfolk, Va. | 3.09 | Rocky Flats-Denver, Colo. | 10.23 |
| Parr, S.C. | 3.76 | Albuquerque, N.M, | 7.34 |
| Sav. Riv./Augusta, Ga. | 3.89 | Carlsbad N.M. | 2.93 |
| Cape Kennedy-Orlando, Fla. | 1.51 | NRTS-Idaho Falls, Idaho | 0.35 |
| Ga. Nuclear Lab-Atlanta, Ga. | 6.61 | Las Vegas, Nevada | 5.35 |
| Oak Ridge, Pa. | 5.95 | Hanford- Richland, Wash. | 5.87 |
| Pittsburgh, Pa. | 5.48 | San Francisco, Calif. | 4.78 |
| Columbus, Ohio | 5.78 | Arguello-Santa Barbara, Calif. | 5.44 |
| | | Los Angeles, Calif. | 6.00 |

PB81-233082

# Population Exposure to External Natural Radiation Background in the United States

(U.S.) Office of Radiation Programs
Washington, DC

Apr 81



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## TECHNICAL REPORT DATA
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| 1. REPORT NO. | 2. | 3. RECIPIENT'S ACCESSION NO. |
|---|---|---|
| ORP/SEPD-80-12 | | PB81 233082 |

| 4. TITLE AND SUBTITLE | 5. REPORT DATE |
|---|---|
| Population Exposure to External Natural Radiation Background in the United States | April 1981 |
| | 6. PERFORMING ORGANIZATION CODE |
| 7. AUTHOR(S) | 8. PERFORMING ORGANIZATION REPORT NO. |
| Kenneth T. Bogen and Abraham S. Goldin | |
| 9. PERFORMING ORGANIZATION NAME AND ADDRESS | 10. PROGRAM ELEMENT NO. |
| Office of Radiation Programs (ANR-461)<br>Environmental Protection Agency<br>Washington, D.C. 20460 | 11. CONTRACT/GRANT NO. |
| 12. SPONSORING AGENCY NAME AND ADDRESS | 13. TYPE OF REPORT AND PERIOD COVERED |
| Same | 14. SPONSORING AGENCY CODE |

15. SUPPLEMENTARY NOTES

16. ABSTRACT

This report revises estimates of population exposure to external natural background made by D. T. Oakley in 1972. The revisions include more recent estimates of dose equivalents from cosmic rays, use of 1970 U.S. census data, and corrections for building shielding and for self-shielding in the body. The dose equivalents calculated are those from cosmic rays and terrestrial radiation, and do not include doses from natural radioactive materials in the body.

17. KEY WORDS AND DOCUMENT ANALYSIS

| a. DESCRIPTORS | b. IDENTIFIERS/OPEN ENCED TERMS | c. COSATI Field Group |
|---|---|---|
| natural background radiation<br>cosmic rays<br>terrestrial radiation<br>population radiation dose<br>radiation | | |

| 18. DISTRIBUTION STATEMENT | 19. SECURITY CLASS (This Report) | 21. NO. OF PAGES |
|---|---|---|
| Unlimited | None | 42 |
| | 20. SECURITY CLASS (This page) | 22. PRICE |
| | None | |

EPA Form 2220-1 (Rev. 4-77) PREVIOUS EDITION IS OBSOLETE

TECHNICAL NOTE
ORP/SEPD-80-12

# POPULATION EXPOSURE TO EXTERNAL NATURAL RADIATION BACKGROUND IN THE UNITED STATES

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and
Abraham S. Goldin

April 1981

Surveillance and Emergency Preparedness Division
Office of Radiation Programs
U. S. Environmental Protection Agency
Washington, D.C. 20460

## ABSTRACT

This report revises estimates of population exposure to external natural background made by D. T. Oakley in 1972. The revisions include more recent estimates of dose equivalents from cosmic rays, use of 1970 U.S. census data, and corrections for building shielding and for self-shielding in the body. The dose equivalents calculated are those from cosmic rays and terrestrial radiation, and do not include doses from natural radioactive materials in the body.

The revised data, not including shielding corrections, give a mean dose equivalent of 71 millirems per year to the U.S. population. Twenty percent of the population receive less than 50 millirems per year, seventy percent less than 82 millirems per year, and ninety-five percent less than 108 millirems per year. These dose equivalents, which correspond approximately to skin dose equivalents out-of-doors, are useful for comparison with other exposures measured or stated without shielding corrections.

The revised data, including shielding corrections, give a mean dose equivalent of 53 millirems per year to the United States population. Twenty percent receive dose equivalents less than 38 millirems per year, seventy percent less than 58 millirems per year, and ninety-five percent less than 76 millirems per year. These dose equivalents correspond approximately to those received by internal organs, such as gonads or red marrow. They are useful for estimating dose equivalents received by these organs and for estimating population health risks from natural radiation.

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TABLES



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ACKNOWLEDGEMENT

The authors gratefully acknowledge helpful discussions with Dr. Donald T. Oakley and thank Mr. Christopher B. Nelson and Mr. Philip Cuny for assistance in computer programming.

## Introduction and Summary

Man's exposure to natural background radiation is often used as a basis of comparison for exposures to man-made sources of ionizing radiation (NCRP75). This technical note revises estimates of the U.S. population dose equivalent from cosmic and natural terrestrial radiation as reported by Oakley in 1972 (Oa72). This revision uses: 1) newer estimates of cosmic-ray dose equivalents in the United States (NCRP75), 2) 1970 U.S. census data rather than 1960 data, 3) corrections for shielding by building structures, and 4) corrections for self-shielding in the body.

The values without shielding corrections are most useful for comparison with other measurements of unshielded radiation doses or exposures in the outdoor environment. The values with a shielding correction are useful for estimating the actual dose equivalent received by internal organs or calculating the health risks from background radiation. Johnson et al. (Jo81) have used these values, with shielding corrections, to prepare a contour map of the ambient natural radiation levels in the United States.

## Oakley's Work

In 1972 Oakley (Oa72) reported estimated dose equivalents to people in specified locations in the United States and average dose equivalents to the total U.S. population. Oakley estimated the dose equivalent from cosmic rays as a function of the elevation above sea level, which is the primary determinant of cosmic-ray dose equivalents in the United States. His terrestrial dose equivalents were estimated from aerial survey measurements.

To calculate the frequency distribution of dose equivalents in the United States, Oakley used Census Bureau data on populations in urbanized and nonurbanized areas. For each population segment, he calculated the appropriate cosmic-ray dose equivalent from the altitude and the appropriate terrestrial dose equivalent from the aerial survey measurements. For areas where no aerial survey measurements were available, he estimated the distribution of terrestrial dose equivalents from the frequency distribution of the available aerial survey dose equivalent data.

## Cosmic Radiation

The National Council on Radiation Protection and Measurements (NCRP75) evaluated natural background radiation in the United States.

They accepted Oakley's natural terrestrial values, but used different cosmic-ray dose equivalents.

The NCRP used lower cosmic-ray ionizing component doses based on three sets of data (Lo66, Sh66, Li75) rather than the eight values (So60, Ka63, Lo66, Sh66, Oh69, Ga70. O'Br70, Ye70) used by Oakley. They also used newer cosmic-ray neutron measurements and a lower neutron quality factor.

We based our revised estimates of cosmic-ray dose equivalent to the U.S. population on the NCRP long-term average cosmic-ray dose equivalent rates at various altitudes. To facilitate our reanalysis, we described the NCRP dose equivalent graph for altitudes from 0 to 2.5 kilometers by the equation:

$$D = 28.9 + 7.45x + 1.69x^2 + 1.21x^3 + 0.193x^4 \quad (1)$$

where x is the altitude in kilometers and D is the corresponding average dose equivalent rate in millirem per year (mrem/y).

Table A-1 of Appendix A shows the cosmic-ray dose equivalents calculated from equation (1), the natural terrestrial radiation dose equivalents (Oa72), and the sum of cosmic-ray and natural terrestrial dose equivalents, for all 349 population regions in the United States. These values were combined with 1970 U.S. census data to give the distribution of natural radiation dose equivalent in the United States, uncorrected for shielding. The mean dose equivalent was 71 mrem/y. Twenty percent of the population received less than 50 mrem/y, seventy percent less than 82 mrem/y, and ninety-five percent less than 108 mrem/y. Figure 1 shows the frequency distribution of dose equivalents. Table 1 gives the average values of these uncorrected dose equivalents for each state.

## Shielding Corrections

The estimates in Table A-1 represent the dose equivalents that would be received outdoors by the surface tissues of a person. Dose equivalents received indoors by a person are generally reduced by attenuation by building materials. Oakley (Oa72) estimated that buildings reduced the dose equivalent from terrestrial sources by 20 percent, so that a person actually received, in surface tissues, 80 percent of the dose equivalents of Table A-1.

The NCRP (NCRP75) estimated that building materials reduced cosmic-ray dose equivalents by 10 percent, leaving 90 percent that reached a person.

Internal organs, such as gonads and red marrow, incur somewhat lower dose equivalents because of shielding by outer portions of the body. Oakley estimated a futher 20 percent attenuation, based on work by Bennett (Be70), so that the terrestrial dose equivalent received by internal organs is 0.8 x 0.8, or 0.64 (64 percent) of the values given in Table A-1. The attenuation of cosmic-ray radiation in the body is small and was taken into account by the NCRP in their cosmic radiation estimates (NCRP75). The actual cosmic-ray dose equivalent received by internal organs is therefore 90 percent of the Table A-1 values.

Table A-2 in appendix A gives the values of cosmic-ray and natural terrestrial radiation dose equivalents, and their sums, for the same 349 population regions used by Oakley. Corrections for building and body shielding are included. The mean dose equivalent was 53 mrem/yr; twenty percent of the population received less than 38 mrem/yr; seventy percent less than 58 mrem/yr; and ninety-five percent less than 76 mrem/yr.

Table 1 includes the average dose equivalent values with shielding corrections for each state. Figure 2 presents the cumulative frequency for the uncorrected and shielding-corrected total dose equivalents from natural radiation. Figure 3 gives the frequency distribution of the corrected dose equivalents.

## Discussion

About half the difference between the cosmic-ray data in the original Oakley work and those in the NCRP report originates from the NCRP selection of three sets of data, rather than the eight sets used by Oakley. Another portion comes from the use of newer neutron flux measurements and a revised quality factor. The remainder originates in an NCRP decision that the absorbed dose rate in air from cosmic ray muons and fast electrons could be used as the absorbed dose rate within the body. NCRP stated that the small difference in stopping power between air and tissue was approximately compensated by attenuation in the body. To the extent that this is an oversimplification, our cosmic-ray dose equvalents in tissue, obtained from the NCRP data, may be too low by two or three millirem per year.

Table 1. Average Dose Equivalents by State

| State | 1970 Population | Mean Elevation (meters) | Dose Equivalent(mrem/y) (Unshielded) Cosmic | Terr. | Total | Dose Equivalent(mrem/y) (Shielded) Cosmic | Terr. | Total |
|---|---|---|---|---|---|---|---|---|
| Total | 203,235,297 | | 30.9 | 40.0 | 70.8 | 27.8 | 25.6 | 53.4 |
| Alabama | 3,444,164 | 154 | 30.1 | 35.2 | 65.4 | 27.1 | 22.5 | 49.7 |
| Alaska | 302,166 | 76 | 29.5 | 45.6 | 75.1 | 26.6 | 29.2 | 55.7 |
| Arizona | 1,772,479 | 628 | 35.0 | 45.6 | 80.6 | 31.5 | 29.2 | 60.7 |
| Arkansas | 1,923,295 | 191 | 30.5 | 29.8 | 60.4 | 27.5 | 19.1 | 46.6 |
| California | 19,953,106 | 106 | 29.8 | 36.2 | 66.0 | 26.8 | 23.2 | 50.0 |
| Colorado | 2,207,260 | 1651 | 52.8 | 66.5 | 119.3 | 47.5 | 42.6 | 90.1 |
| Connecticut | 3,032,219 | 51 | 29.3 | 51.0 | 80.4 | 26.4 | 32.7 | 59.1 |
| Delaware | 548,106 | 33 | 29.2 | 31.3 | 60.5 | 26.3 | 20.1 | 46.3 |
| D.C. | 756,510 | 46 | 29.3 | 35.4 | 64.7 | 26.4 | 22.7 | 49.0 |
| Florida | 6,789,447 | 16 | 29.1 | 22.3 | 51.4 | 26.2 | 14.3 | 40.4 |
| Georgia | 4,589,574 | 217 | 30.7 | 40.2 | 70.9 | 27.6 | 25.7 | 53.3 |
| Hawaii | 769,911 | 43 | 29.3 | 45.6 | 74.9 | 26.3 | 29.2 | 55.5 |
| Idaho | 713,003 | 1080 | 40.8 | 45.6 | 86.4 | 36.8 | 29.2 | 65.9 |
| Illinois | 11,113,962 | 194 | 30.4 | 41.5 | 72.0 | 27.4 | 26.6 | 54.0 |
| Indiana | 5,193,672 | 222 | 30.7 | 44.9 | 75.6 | 27.6 | 28.7 | 56.3 |
| Iowa | 2,825,038 | 314 | 31.5 | 45.6 | 77.1 | 28.3 | 29.2 | 57.5 |
| Kansas | 2,249,079 | 417 | 32.5 | 45.6 | 78.1 | 29.2 | 29.2 | 58.4 |
| Kentucky | 3,219,296 | 234 | 30.8 | 43.5 | 74.3 | 27.7 | 27.8 | 55.6 |
| Louisiana | 3,643,188 | 23 | 29.1 | 22.8 | 51.9 | 26.6 | 14.6 | 40.8 |
| Maine | 993,659 | 104 | 29.7 | 45.6 | 75.3 | 26.8 | 29.2 | 55.9 |
| Maryland | 3,922,397 | 52 | 29.3 | 32.3 | 61.7 | 26.4 | 20.7 | 47.1 |
| Massachusetts | 5,689,172 | 56 | 29.4 | 45.2 | 74.6 | 26.4 | 29.0 | 55.4 |
| Michigan | 8,875,092 | 214 | 30.6 | 45.6 | 76.2 | 27.6 | 29.2 | 56.7 |
| Minnesota | 3,805,064 | 337 | 31.7 | 39.2 | 70.9 | 28.5 | 25.1 | 53.6 |
| Mississippi | 2,216,908 | 78 | 29.5 | 22.8 | 52.3 | 26.6 | 14.6 | 41.2 |
| Missouri | 4,677,403 | 218 | 30.7 | 44.9 | 75.5 | 27.6 | 28.7 | 56.3 |
| Montana | 694,409 | 1055 | 40.3 | 45.6 | 85.9 | 36.3 | 29.2 | 65.5 |
| Nebraska | 1,483,797 | 424 | 32.5 | 45.6 | 78.1 | 29.3 | 29.2 | 58.5 |
| Nevada | 488,736 | 1013 | 40.6 | 33.2 | 73.8 | 36.6 | 21.2 | 57.8 |
| New Hampshire | 737,680 | 177 | 30.3 | 45.6 | 75.9 | 27.3 | 29.2 | 56.5 |

Table 1. Average Dose Equivalents by State (continued)

| State | 1970 Population | Mean Elevation (meters) | Dose Equivalent(mrem/y) (Unshielded) Cosmic | Terr. | Total | Dose Equivalent(mrem/y) (Shielded) Cosmic | Terr. | Total |
|---|---|---|---|---|---|---|---|---|
| New Jersey | 7,168,158 | 21 | 29.1 | 43.8 | 72.9 | 26.2 | 28.0 | 54.2 |
| New Mexico | 1,016,002 | 1575 | 50.8 | 52.6 | 103.4 | 45.7 | 33.7 | 79.4 |
| New York | 18,241,270 | 64 | 29.4 | 45.1 | 74.5 | 26.5 | 28.8 | 55.3 |
| North Carolina | 5,082,058 | 234 | 30.8 | 38.1 | 69.0 | 27.8 | 24.4 | 52.2 |
| North Dakota | 617,757 | 493 | 33.2 | 45.6 | 78.8 | 29.9 | 29.2 | 59.1 |
| Ohio | 10,652,018 | 231 | 30.8 | 43.8 | 74.5 | 27.7 | 28.0 | 55.7 |
| Oklahoma | 2,559,250 | 392 | 32.2 | 45.0 | 77.2 | 29.0 | 28.8 | 57.8 |
| Oregon | 2,091,386 | 190 | 30.5 | 45.6 | 76.1 | 27.4 | 29.2 | 56.6 |
| Pennsylvania | 11,793,905 | 158 | 30.2 | 36.3 | 66.5 | 27.2 | 23.2 | 50.4 |
| Rhode Island | 949,722 | 32 | 29.2 | 42.8 | 71.9 | 26.3 | 27.4 | 53.6 |
| South Carolina | 2,590,515 | 126 | 29.9 | 37.1 | 67.0 | 26.9 | 23.4 | 50.7 |
| South Dakota | 666,253 | 582 | 34.1 | 45.6 | 79.7 | 30.7 | 29.2 | 59.5 |
| Tennessee | 3,924,174 | 216 | 30.7 | 39.3 | 69.9 | 27.6 | 25.1 | 52.7 |
| Texas | 11,196,736 | 245 | 31.2 | 28.4 | 59.6 | 28.1 | 18.2 | 46.3 |
| Utah | 1,059,272 | 1381 | 46.4 | 45.6 | 92.0 | 41.8 | 29.2 | 71.0 |
| Vermont | 444,739 | 180 | 30.3 | 45.6 | 75.9 | 27.3 | 29.2 | 56.5 |
| Virginia | 4,648,490 | 164 | 30.3 | 33.5 | 63.8 | 27.2 | 21.4 | 48.7 |
| Washington | 3,409,173 | 125 | 29.9 | 45.6 | 75.5 | 26.9 | 29.2 | 56.1 |
| West Virginia | 1,744,233 | 385 | 32.2 | 46.7 | 78.9 | 28.9 | 29.9 | 58.8 |
| Wisconsin | 4,417,948 | 249 | 30.9 | 45.6 | 76.5 | 27.8 | 29.2 | 57.0 |
| Wyoming | 332,412 | 1768 | 56.0 | 45.6 | 101.6 | 50.4 | 29.2 | 79.6 |

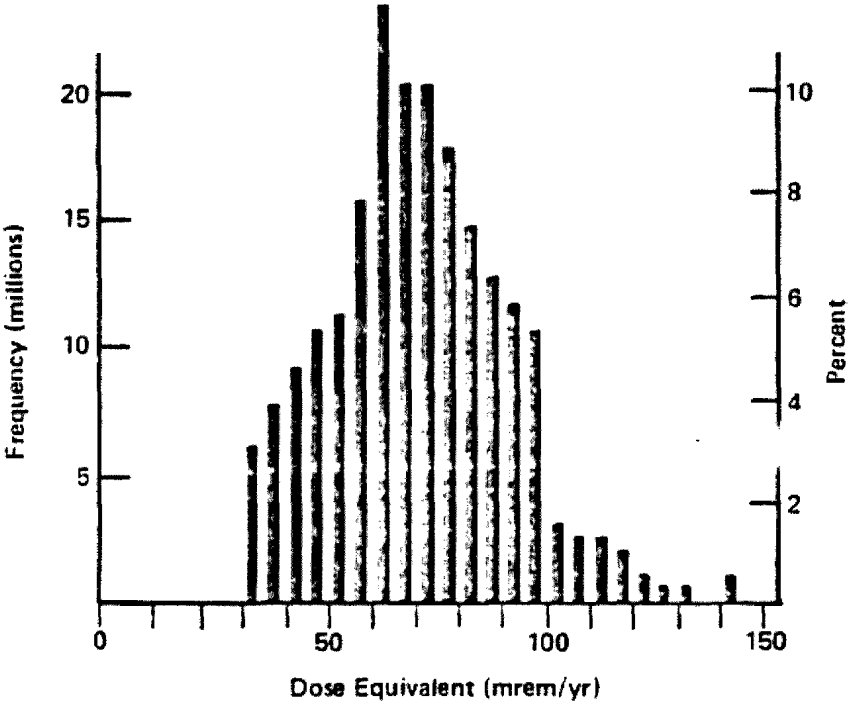


Figure 1. Frequency Distribution of Dose Equivalent in the U.S. Population (not corrected for shielding)

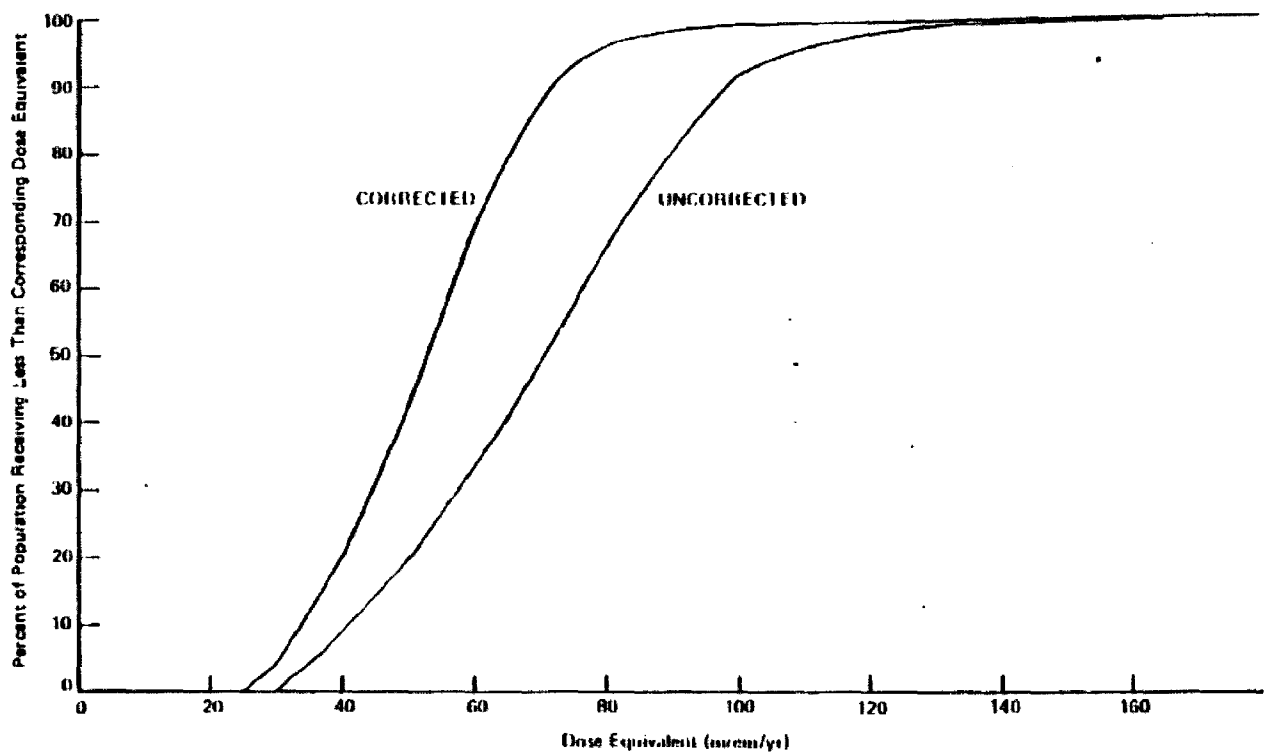


Figure 2. Cumulative Distribution of Dose Equivalent in the U.S. Population

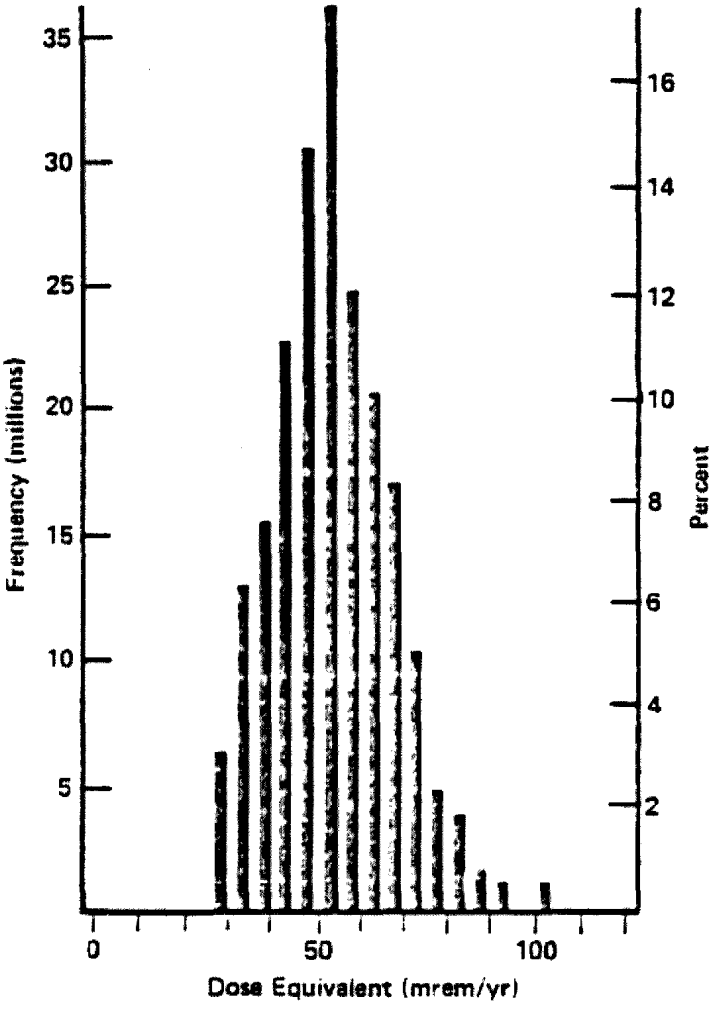


Figure 3. Frequency Distribution of Dose Equivalent in the U.S. Population (corrected for shielding)

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# Appendix A

## Dose Equivalent Value Tables

Table A-1. Average Dose Equivalents from Terrestrial and Cosmic Radiation
(Not Corrected for Shielding)

| Location | 1970 Population | Elevation (meters) | Dose Equivalent (mrem/y) | | | Population Dose Equivalent (person-rem) |
|---|---|---|---|---|---|---|
| | | | Cosmic | Terrestrial | Total | |
| **ALABAMA** | | | | | | |
| BIRMINGHAM AL | 558099 | 183 | 30.4 | 45.6 | 76.0 | 42394 |
| COLUMBUS AL-GA | 25281 | 81 | 29.5 | 22.8 | 52.3 | 1323 |
| GADSDEN AL | 67706 | 169 | 30.2 | 45.6 | 75.8 | 5135 |
| HUNTSVILLE AL | 146565 | 194 | 30.5 | 45.6 | 76.1 | 11147 |
| MOBILE AL | 257816 | 5 | 29.0 | 22.8 | 51.8 | 13347 |
| MONTGOMERY AL | 138983 | 79 | 29.3 | 22.8 | 52.1 | 7241 |
| TUSCALOOSA AL | 85875 | 69 | 29.5 | 22.8 | 52.3 | 4487 |
| ALABAMA NU-CP | 1058052 | 76 | 29.5 | 22.8 | 52.3 | 55350 |
| ALABAMA NU-NCP | 1105788 | 264 | 31.0 | 45.6 | 76.6 | 84750 |
| **ALASKA** | | | | | | |
| ALASKA NU | 302173 | 76 | 29.5 | 45.6 | 75.1 | 22697 |
| **ARIZONA** | | | | | | |
| PHOENIX AZ | 863357 | 332 | 31.6 | 45.6 | 77.2 | 66689 |
| TUCSON AZ | 294184 | 728 | 35.8 | 45.6 | 81.4 | 23941 |
| ARIZONA NU | 614941 | 996 | 39.6 | 45.6 | 85.0 | 52283 |
| **ARKANSAS** | | | | | | |
| FORT SMITH AR | 73419 | 117 | 30.0 | 45.6 | 75.6 | 5550 |
| LITTLE ROCK AR | 222616 | 101 | 29.7 | 22.8 | 52.5 | 11688 |
| PINE BLUFF AR | 60907 | 66 | 29.4 | 22.8 | 52.2 | 3181 |
| TEXARKANA AR-TX | 21682 | 102 | 29.7 | 22.8 | 52.5 | 1139 |
| ARKANSAS NU-CP | 1025647 | 61 | 29.4 | 22.8 | 52.2 | 53535 |
| ARKANSAS NU-NCP | 519024 | 515 | 33.4 | 45.6 | 79.0 | 41000 |

NU-Non-Urban CP-Coastal Plain NCP-Not Coastal Plain

Table A-1. Average Dose Equivalents from Terrestrial and Cosmic Radiation (continued)
(Not Corrected for Shielding)

| Location | 1970 Population | Elevation (meters) | Dose Equivalent (mrem/y) | | | Population Dose Equivalent (person-rem) |
|---|---|---|---|---|---|---|
| | | | Cosmic | Terrestrial | Total | |
| **CALIFORNIA** | | | | | | |
| BAKERSFIELD CA | 376155 | 124 | 29.9 | 45.6 | 75.5 | 13297 |
| FRESNO CA | 262908 | 90 | 29.6 | 45.6 | 75.2 | 19775 |
| LOS ANGELES CA | 8351266 | 87 | 29.6 | 31.9 | 61.5 | 513618 |
| MODESTO CA | 106107 | 27 | 29.1 | 45.6 | 74.7 | 7931 |
| OXNARD-VENT CA | 244653 | 15 | 29.0 | 45.6 | 74.6 | 18263 |
| SACRAMENTO CA | 633732 | 8 | 29.0 | 45.6 | 74.6 | 47272 |
| SALINAS CA | 62456 | 15 | 29.0 | 45.6 | 74.6 | 4662 |
| S BERNARDINO CA | 583597 | 320 | 31.5 | 45.6 | 77.1 | 45014 |
| SAN DIEGO CA | 1198323 | 13 | 29.0 | 45.6 | 74.6 | 89432 |
| S FRANCISCO CA | 2987850 | 19 | 29.1 | 27.6 | 56.7 | 169349 |
| SAN JOSE CA | 1025273 | 20 | 29.1 | 27.6 | 56.7 | 58116 |
| STA BARBARA CA | 129774 | 13 | 29.0 | 35.9 | 64.9 | 8426 |
| SANTA ROSA CA | 75083 | 46 | 29.3 | 45.6 | 74.9 | 5622 |
| SEASIDE-MONT CA | 93294 | 15 | 29.0 | 45.6 | 74.6 | 6964 |
| SIMI VALLEY CA | 56936 | 233 | 30.8 | 45.6 | 76.4 | 4349 |
| STOCKTON CA | 160373 | 4 | 29.0 | 45.6 | 74.6 | 11958 |
| CALIFORNIA NU | 3805364 | 272 | 31.1 | 45.6 | 76.7 | 291923 |
| **COLORADO** | | | | | | |
| BOULDER CO | 68634 | 1631 | 52.2 | 45.6 | 97.8 | 6712 |
| COLORADO SPG CO | 204766 | 1823 | 57.6 | 45.6 | 103.2 | 21132 |
| DENVER CO | 1047311 | 1609 | 51.6 | 89.7 | 141.3 | 148037 |
| PUEBLO CO | 103300 | 1430 | 47.4 | 45.6 | 93.0 | 9606 |
| COLORADO NU | 783248 | 1693 | 53.9 | 45.6 | 99.5 | 77906 |
| **CONNECTICUT** | | | | | | |
| BRIDGEPORT CT | 413366 | 3 | 29.0 | 58.8 | 87.8 | 36276 |
| BRISTOL CT | 71732 | 101 | 29.7 | 45.6 | 75.3 | 5402 |
| DANBURY CT | 66851 | 111 | 29.8 | 45.6 | 75.4 | 5026 |
| HARTFORD CT | 465001 | 12 | 29.0 | 41.9 | 70.9 | 32981 |
| MERIDEN CT | 98434 | 46 | 29.3 | 53.2 | 82.5 | 8120 |
| NEW BRITAIN CT | 131349 | 61 | 29.4 | 61.6 | 91.0 | 11952 |
| NEW HAVEN CT | 348341 | 12 | 29.0 | 50.3 | 79.3 | 27633 |
| NORWALK CT | 106707 | 12 | 29.0 | 70.0 | 99.0 | 10567 |
| SP'FIELD CT-MA | 58173 | 26 | 29.1 | 40.0 | 69.1 | 4021 |
| STAMFORD CT | 184898 | 11 | 29.0 | 64.4 | 93.4 | 17272 |
| WATERBURY CT | 156986 | 79 | 29.5 | 61.6 | 91.1 | 14307 |
| CONN NU | 910559 | 105 | 29.7 | 45.6 | 75.3 | 70105 |

NU-Non-Urban CP-Coastal Plain NCP-Not C

Table A-1. Average Dose Equivalents from Terrestrial and Cosmic Radiation (continued)
(Not Corrected for Shielding)

| Location | 1970 Population | Elevation (metres) | Dose Equivalent (mrem/y) | | | Population Dose Equivalent (person-rem) |
|---|---|---|---|---|---|---|
| | | | Cosmic | Terrestrial | Total | |
| **DELAWARE** | | | | | | |
| WILMINGTN DE | 349674 | 41 | 29.2 | 36.2 | 65.4 | 22884 |
| DELAWARE NU-CP | 198430 | 18 | 29.1 | 22.8 | 51.9 | 10293 |
| **DISTRICT OF COLUMBIA** | | | | | | |
| WASH DC | 756510 | 46 | 29.3 | 35.4 | 64.7 | 48931 |
| **FLORIDA** | | | | | | |
| FT LAUD FL | 613797 | 3 | 29.0 | 22.8 | 51.8 | 31769 |
| GAINESVILLE FL | 69329 | 55 | 29.3 | 22.8 | 52.1 | 3615 |
| JACKSONVILLE FL | 529585 | 6 | 29.0 | 22.8 | 51.8 | 27422 |
| MIAMI FL | 1219661 | 3 | 29.0 | 22.8 | 51.8 | 63128 |
| ORLANDO FL | 305479 | 21 | 29.1 | 11.6 | 40.7 | 12432 |
| PENSACOLA FL | 166619 | 5 | 29.0 | 22.8 | 51.8 | 8626 |
| ST PETERSBRG FL | 495159 | 6 | 29.0 | 22.8 | 51.8 | 25640 |
| TALLAHASSEE FL | 77851 | 56 | 29.4 | 22.8 | 52.2 | 4060 |
| TAMPA FL | 368742 | 5 | 29.0 | 22.8 | 51.8 | 19090 |
| W PALM BEACH FL | 287561 | 5 | 29.0 | 22.8 | 51.8 | 14887 |
| FLORIDA NU-CP | 2655660 | 30 | 29.2 | 22.8 | 52.0 | 137999 |
| **GEORGIA** | | | | | | |
| ALBANY GA | 76512 | 58 | 29.4 | 22.8 | 52.2 | 3992 |
| ATLANTA GA | 1172778 | 320 | 31.5 | 57.2 | 88.7 | 104066 |
| AUGUSTA GA-SC | 126770 | 44 | 29.3 | 42.8 | 72.1 | 9135 |
| CHATTA GA-TN | 28947 | 206 | 30.6 | 45.6 | 76.2 | 2204 |
| COLUMBUS GA-AL | 183135 | 81 | 29.5 | 22.8 | 52.3 | 9597 |
| MACON GA | 128065 | 102 | 29.7 | 22.8 | 52.5 | 6725 |
| SAVANNAH GA | 163753 | 6 | 29.0 | 22.8 | 51.8 | 8479 |
| GEORGIA NU-CP | 1137211 | 76 | 29.5 | 22.8 | 52.3 | 58465 |
| GEORGIA NU-NCP | 1592204 | 309 | 31.4 | 45.6 | 77.0 | 122654 |
| **HAWAII** | | | | | | |
| HONOLULU HI | 442397 | 5 | 29.0 | 45.6 | 74.6 | 32992 |
| HAWAII NU | 327516 | 94 | 29.6 | 45.6 | 75.2 | 24645 |

NU-Non-Urban CP-Coastal Plain NCP-Not Coastal Plain

Table A-1. Average Dose Equivalents from Terrestrial and Cosmic Radiation (continued)
(Not Corrected for Shielding)

| Location | 1970 Population | Elevation (meters) | Dose Equivalent (mrem/y) | | | Population Dose Equivalent (person-rem) |
|---|---|---|---|---|---|---|
| | | | Cosmic | Terrestrial | Total | |
| **IDAHO** | | | | | | |
| BOISE ID | 85387 | 823 | 37.0 | 45.6 | 82.6 | 7034 |
| IDAHO NU | 627821 | 1115 | 41.3 | 45.6 | 86.9 | 54575 |
| **ILLINOIS** | | | | | | |
| AURORA IL | 232917 | 194 | 30.5 | 38.6 | 69.1 | 16083 |
| BLOOMINGTON IL | 69392 | 253 | 30.9 | 45.6 | 76.5 | 5312 |
| CHAMPAIGN IL | 100417 | 226 | 30.7 | 45.6 | 76.3 | 7663 |
| CHICAGO IL | 6185156 | 181 | 30.3 | 38.6 | 68.9 | 426463 |
| DAVENPORT IL-IA | 139824 | 180 | 30.3 | 45.6 | 75.9 | 10618 |
| DECATUR IL | 99693 | 208 | 30.6 | 45.6 | 76.2 | 7593 |
| DUBUQUE IL-IA | 2408 | 197 | 30.5 | 45.6 | 76.1 | 183 |
| JOLIET IL | 155500 | 166 | 30.2 | 44.1 | 74.5 | 11589 |
| PEORIA IL | 247121 | 143 | 30.0 | 45.6 | 75.6 | 18692 |
| ROCKFORD IL | 206084 | 218 | 30.7 | 45.6 | 76.3 | 15714 |
| ST LOUIS IL-MO | 314476 | 143 | 30.0 | 45.6 | 75.6 | 23787 |
| SPRINGFIELD IL | 120794 | 186 | 30.4 | 45.6 | 76.0 | 9179 |
| ILLINOIS NU | 3240194 | 225 | 30.7 | 45.6 | 76.3 | 247262 |
| **INDIANA** | | | | | | |
| ANDERSON IN | 80704 | 272 | 31.1 | 45.6 | 76.7 | 6191 |
| CHICAGO IN-IL | 529422 | 181 | 30.3 | 38.6 | 68.9 | 36503 |
| EVANSVILLE IN | 142476 | 117 | 29.8 | 45.6 | 75.4 | 10748 |
| FT WAYNE IN | 225184 | 241 | 30.8 | 45.6 | 76.4 | 17214 |
| INDIANAPOLIS IN | 820259 | 216 | 30.6 | 45.6 | 76.2 | 62536 |
| LAFAYETTE IN | 79117 | 201 | 30.5 | 45.6 | 76.1 | 6022 |
| LOUISV'LE IN-KY | 81488 | 137 | 30.0 | 45.6 | 75.6 | 6160 |
| MUNCIE IN | 90427 | 290 | 31.3 | 45.6 | 76.9 | 6951 |
| SO BEND IN -MI | 265148 | 216 | 30.6 | 45.6 | 76.2 | 20215 |
| TERRA HAUTE IN | 80908 | 151 | 30.1 | 45.6 | 75.7 | 6125 |
| INDIANA NU | 2798536 | 237 | 30.8 | 45.6 | 76.4 | 213854 |
| **IOWA** | | | | | | |
| CEDAR RAPIDS IA | 132008 | 223 | 30.7 | 45.6 | 76.3 | 10071 |
| DAVENPORT IA-IL | 126895 | 180 | 30.3 | 45.6 | 75.9 | 9636 |
| DES MOINES IA | 255824 | 245 | 30.9 | 45.6 | 76.5 | 19566 |
| DUBUQUE IA-IL | 63142 | 197 | 30.5 | 45.6 | 76.1 | 4804 |
| OMAHA IA-NE | 64847 | 317 | 31.5 | 45.6 | 77.1 | 5000 |
| SOUIX CTY IA-NE | 87157 | 338 | 31.7 | 45.6 | 77.3 | 6737 |
| WATERLOO IA | 112881 | 259 | 31.0 | 45.6 | 76.6 | 8647 |
| IOWA NU | 1982287 | 343 | 31.7 | 45.6 | 77.1 | 153110 |

NU-Non-Urban CP-Coastal Plain NCP-Not Coastal Plain

Table A-1. Average Dose Equivalents from Terrestrial and Cosmic Radiation (continued)
(Not Corrected for Shielding)

| Location | 1970 Population | Elevation (meters) | Dose Equivalent (mrem/y) | | | Population Dose Equivalent (person-rem) |
|---|---|---|---|---|---|---|
| | | | Cosmic | Terrestrial | Total | |
| **KANSAS** | | | | | | |
| KANSAS CY KS-MO | 350208 | 229 | 30.7 | 45.6 | 76.3 | 26735 |
| ST JOSEPH KS-MO | 1283 | 259 | 31.0 | 45.6 | 76.6 | 98 |
| TOPEKA KS | 132108 | 283 | 31.2 | 45.6 | 76.8 | 10147 |
| WICHITA KS | 302334 | 393 | 32.2 | 45.6 | 77.8 | 23523 |
| KANSAS NU | 1463138 | 479 | 33.0 | 45.6 | 78.6 | 115047 |
| **KENTUCKY** | | | | | | |
| CINTI KY-OH | 196978 | 168 | 30.2 | 30.2 | 60.4 | 11905 |
| HUNT KY-WV-OH | 53316 | 172 | 30.3 | 45.6 | 75.9 | 4045 |
| LEXINGTON KY | 159538 | 291 | 31.3 | 45.6 | 76.9 | 12265 |
| LOUISV'LE KY-IN | 657908 | 137 | 30.0 | 45.6 | 75.6 | 49733 |
| OWENSBORO KY | 53133 | 146 | 30.1 | 45.6 | 75.7 | 4020 |
| KENTUCKY NU-CP | 164822 | 104 | 29.7 | 22.8 | 52.5 | 8658 |
| KENTUCKY NU-NCP | 1933616 | 285 | 31.2 | 45.6 | 76.8 | 148545 |
| **LOUISIANA** | | | | | | |
| BATON ROUGE LA | 249463 | 17 | 29.1 | 22.8 | 51.9 | 12939 |
| LAFAYETTE LA | 78544 | 9 | 29.0 | 22.8 | 51.8 | 4069 |
| LAKE CHARLES LA | 88260 | 6 | 29.0 | 22.8 | 51.8 | 4570 |
| MONROE LA | 90567 | 25 | 29.1 | 22.8 | 51.9 | 4702 |
| NEW ORLEANS LA | 961728 | 2 | 28.9 | 22.8 | 51.7 | 49767 |
| SHREVEPORT LA | 234564 | 62 | 29.4 | 22.8 | 52.2 | 12246 |
| LOUISIANA NU-CP | 1940054 | 30 | 29.2 | 22.8 | 52.0 | 100813 |
| **MAINE** | | | | | | |
| LEWISTON ME | 65212 | 61 | 29.4 | 45.6 | 75.0 | 4891 |
| PORTLAND ME | 106599 | 8 | 29.0 | 45.6 | 74.6 | 7951 |
| MAINE NU | 821852 | 120 | 29.9 | 45.6 | 75.5 | 62016 |
| **MARYLAND** | | | | | | |
| BALTIMORE MD | 1579781 | 6 | 29.0 | 27.4 | 56.4 | 89070 |
| WASH DC(MD) | 1009138 | 46 | 29.3 | 35.4 | 64.7 | 65271 |
| MARYLAND NU-CP | 568133 | 30 | 29.2 | 22.8 | 52.0 | 29531 |
| MARYLAND NU-NCP | 765147 | 170 | 30.1 | 45.6 | 75.9 | 58042 |

NU-Non-Urban CP-Coastal Plain NCP-Not Coastal Plain

Table A-1. Average Dose Equivalents from Terrestrial and Cosmic Radiation (continued)
(Not Corrected for Shielding)

| Location | 1970 Population | Elevation (meters) | Dose Equivalent (mrem/y) | | | Population Dose Equivalent (person-rem) |
|---|---|---|---|---|---|---|
| | | | Cosmic | Terrestrial | Total | |
| **MASSACHUSETTS** | | | | | | |
| BOSTON MA | 2652575 | 8 | 29.0 | 45.6 | 74.6 | 197874 |
| BROCKTON MA | 148844 | 40 | 29.2 | 45.6 | 74.8 | 11139 |
| FALL RIV MA-RI | 123491 | 12 | 29.0 | 45.6 | 74.6 | 9216 |
| FITCH-LEO MA | 78053 | 134 | 30.0 | 45.6 | 75.6 | 5898 |
| LAW-HAVER MA-NH | 182438 | 20 | 29.1 | 45.6 | 74.7 | 13625 |
| LOWELL MA | 182731 | 30 | 29.2 | 45.6 | 74.8 | 13662 |
| NEW BEDFORD MA | 133667 | 5 | 29.0 | 45.6 | 74.6 | 9968 |
| PITTSFIELD MA | 62872 | 309 | 31.4 | 27.9 | 59.3 | 3731 |
| PRO'DENCE MA-RI | 65974 | 24 | 29.1 | 41.9 | 71.0 | 4685 |
| SPRNGFLD MA-CT | 456135 | 26 | 29.1 | 40.0 | 69.1 | 31532 |
| WORCESTER MA | 247416 | 145 | 30.1 | 53.1 | 83.2 | 20573 |
| MASS NU | 1354974 | 150 | 30.1 | 45.6 | 75.7 | 102564 |
| **MICHIGAN** | | | | | | |
| ANN ARBOR MI | 178605 | 268 | 31.1 | 45.6 | 76.7 | 13695 |
| BAY CITY MI | 78097 | 181 | 30.3 | 45.6 | 75.9 | 5931 |
| DETROIT MI | 3970584 | 183 | 30.4 | 45.6 | 76.0 | 301683 |
| FLINT MI | 330128 | 218 | 30.7 | 45.6 | 76.3 | 25173 |
| GRD RAPIDS MI | 352703 | 186 | 30.4 | 45.6 | 76.0 | 26801 |
| JACKSON MI | 78572 | 287 | 31.2 | 45.6 | 76.8 | 6037 |
| KALAMAZOO MI | 152083 | 230 | 30.8 | 45.6 | 76.4 | 11612 |
| LANSING MI | 229518 | 253 | 30.9 | 45.6 | 76.5 | 17569 |
| MUSKEGON MI | 105716 | 191 | 30.4 | 45.6 | 76.0 | 8037 |
| SAGINAW MI | 147552 | 181 | 30.3 | 45.6 | 75.9 | 11206 |
| SO BEND MI-IN | 23424 | 216 | 30.6 | 45.6 | 76.2 | 1786 |
| TOLEDO MI-OH | 11861 | 179 | 30.3 | 45.6 | 75.9 | 901 |
| MICHIGAN NU | 1216240 | 249 | 30.9 | 45.6 | 76.5 | 24p089 |
| **MINNESOTA** | | | | | | |
| DULUTH MN-WI | 105639 | 186 | 30.4 | 45.6 | 76.0 | 8027 |
| FARG MOOR MN-ND | 32026 | 274 | 31.1 | 45.6 | 76.7 | 2457 |
| LA CROSSE MN-WI | 3142 | 198 | 30.5 | 45.6 | 76.1 | 239 |
| MINN-ST PAUL MN | 1704423 | 248 | 30.9 | 31.2 | 62.1 | 105861 |
| ROCHESTER MN | 56604 | 302 | 31.4 | 45.6 | 77.0 | 4357 |
| MINNESOTA NU | 1903235 | 428 | 32.5 | 45.6 | 78.1 | 148702 |

NU-Non-Urban CP-Coastal Plain NCP-Not Coastal Plain

Table A-1. Average Dose Equivalents from Terrestrial and Cosmic Radiation (continued)
(Not Corrected for Shielding)

| Location | 1970 Population | Elevation (meters) | Dose Equivalent (mrem/y) | | | Population Dose Equivalent (person-rem) |
|---|---|---|---|---|---|---|
| | | | Cosmic | Terrestrial | Total | |
| **MISSISSIPPI** | | | | | | |
| BILOXI GULF MS | 121601 | 5 | 29.0 | 22.8 | 51.8 | 6295 |
| JACKSON MS | 190060 | 90 | 29.6 | 22.8 | 52.4 | 9962 |
| MEMPHIS MS-TN | 8931 | 84 | 29.6 | 22.8 | 52.4 | 468 |
| MISSISSIPPI NU-CP | 1896320 | 81 | 29.6 | 22.8 | 52.4 | 99279 |
| **MISSOURI** | | | | | | |
| COLUMBIA MO | 59231 | 225 | 30.7 | 45.6 | 76.3 | 4520 |
| KANSAS CY MO-KS | 751579 | 229 | 30.7 | 45.6 | 76.3 | 57377 |
| ST JOSEPH MO-KS | 75940 | 259 | 31.0 | 45.6 | 76.6 | 5817 |
| ST LOUIS MO-IL | 1568468 | 143 | 30.0 | 45.6 | 75.6 | 118640 |
| SPRINGFIELD MO | 121340 | 396 | 32.2 | 45.6 | 77.8 | 9444 |
| MISSOURI NU-CP | 149905 | 107 | 29.8 | 22.8 | 52.6 | 7878 |
| MISSOURI NU-NCP | 1950936 | 269 | 31.1 | 45.6 | 76.7 | 149602 |
| **MONTANA** | | | | | | |
| BILLINGS MT | 71197 | 951 | 38.7 | 45.6 | 84.3 | 6005 |
| GREAT FALLS MT | 70905 | 1015 | 39.7 | 45.6 | 85.3 | 6049 |
| MONTANA NU | 552307 | 1073 | 40.6 | 45.6 | 86.2 | 47627 |
| **NEBRASKA** | | | | | | |
| LINCOLN NE | 153443 | 351 | 31.8 | 45.6 | 77.4 | 11878 |
| OMAHA NE-IA | 426929 | 317 | 31.5 | 45.6 | 77.1 | 32919 |
| SIOUX CY NE-IA | 7920 | 338 | 31.7 | 45.6 | 77.3 | 612 |
| NEBRASKA NU | 895499 | 489 | 33.1 | 45.6 | 78.7 | 70506 |
| **NEVADA** | | | | | | |
| LAS VEGAS NV | 236681 | 619 | 34.5 | 19.9 | 54.4 | 12877 |
| RENO NV | 99687 | 1371 | 46.1 | 45.6 | 91.7 | 9145 |
| NEVADA NU | 152370 | 1391 | 46.6 | 45.6 | 92.2 | 14043 |
| **NEW HAMPSHIRE** | | | | | | |
| LAW HAVER NH-MA | 17842 | 20 | 29.1 | 45.6 | 74.7 | 1333 |
| MANCHESTER NH | 95140 | 53 | 29.3 | 45.6 | 74.9 | 7130 |
| NASHUA NH | 60961 | 46 | 29.3 | 45.6 | 74.9 | 4565 |
| NEW HAMP NU | 563738 | 217 | 30.6 | 45.6 | 76.2 | 42982 |

NU-Non Urban CP-Coastal Plain NCP-Not Coastal Plain

Table A-1. Average Dose Equivalents from Terrestrial and Cosmic Radiation (continued)
(Not Corrected for Shielding)

| Location | 1970 Population | Elevation (meters) | Dose Equivalent (mrem/y) | | | Population Dose Equivalent (person-rem) |
|---|---|---|---|---|---|---|
| | | | Cosmic | Terrestrial | Total | |
| **NEW JERSEY** | | | | | | |
| ALLEN-BETHNJ-PA | 25201 | 78 | 29.5 | 45.6 | 75.1 | 1893 |
| ATLANTIC CY NJ | 134016 | 3 | 29.0 | 22.8 | 51.8 | 6936 |
| NEW YORK NJ-NY | 4837265 | 9 | 29.0 | 45.6 | 74.6 | 360879 |
| PHILADEL NJ-PA | 744045 | 14 | 29.0 | 47.5 | 76.5 | 56948 |
| TRENTON NJ-PA | 242673 | 11 | 29.0 | 41.9 | 70.9 | 17209 |
| VINELAND NJ | 73579 | 15 | 29.0 | 22.8 | 51.8 | 3815 |
| WILMINGTN NJ-DE | 21593 | 41 | 29.2 | 36.2 | 65.4 | 1413 |
| N JERSEY NU-CP | 369678 | 61 | 29.4 | 22.8 | 52.2 | 19296 |
| N JERSEY NU-NCP | 720134 | 90 | 29.6 | 45.6 | 75.2 | 54167 |
| **NEW MEXICO** | | | | | | |
| ALBUQUERQUE NM | 297451 | 1511 | 49.2 | 69.5 | 118.7 | 35321 |
| NEW MEXICO NU | 718549 | 1601 | 51.4 | 45.6 | 97.0 | 69734 |
| **NEW YORK** | | | | | | |
| ALBANY NY | 486525 | 6 | 29.0 | 25.1 | 54.1 | 26312 |
| BINGHAMPTON NY | 167224 | 264 | 31.0 | 45.6 | 76.6 | 12816 |
| BUFFALO NY | 1086594 | 178 | 30.3 | 45.6 | 75.9 | 82499 |
| NEW YORK NY | 11369576 | 9 | 29.0 | 45.6 | 74.6 | 848214 |
| ROCHESTER NY | 601361 | 157 | 30.2 | 45.6 | 75.8 | 45554 |
| SYRACUSE NY | 376169 | 122 | 29.9 | 45.6 | 75.5 | 28390 |
| UTICA ROME NY | 180155 | 126 | 29.9 | 45.6 | 75.5 | 13618 |
| NEW YORK NU | 3973462 | 166 | 30.2 | 45.6 | 75.8 | 301279 |
| **NORTH CAROLINA** | | | | | | |
| ASHEVILLE NC | 72451 | 675 | 35.2 | 45.6 | 80.8 | 5851 |
| CHARLOTTE NC | 279530 | 220 | 30.7 | 45.6 | 76.3 | 21319 |
| DURHAM NC | 100764 | 126 | 29.9 | 45.6 | 75.5 | 7608 |
| FAYETTEVILLE NC | 161370 | 52 | 29.3 | 22.8 | 52.1 | 8412 |
| HIGH POINT NC | 93547 | 287 | 31.2 | 45.6 | 76.8 | 7188 |
| GREENSBORO NC | 152252 | 256 | 31.0 | 45.6 | 76.6 | 11659 |
| RALEIGH NC | 152289 | 111 | 29.8 | 45.6 | 75.4 | 11480 |
| WILMINGTON NC | 57645 | 15 | 29.0 | 22.8 | 51.8 | 2989 |
| WINSTON SAL NC | 142584 | 262 | 31.0 | 45.6 | 76.6 | 10926 |
| N CAROL NU-CP | 1442903 | 30 | 29.2 | 22.8 | 52.0 | 74979 |
| N CAROL NU-NCP | 2426724 | 367 | 32.0 | 45.6 | 77.6 | 188217 |

NU=Non-Urban CP=Coastal Plain NCP=Not Coastal Plain

Table A-1. Average Dose Equivalents from Terrestrial and Cosmic Radiation (continued)
(Not Corrected for Shielding)

| Location | 1970 Population | Elevation (meters) | Dose Equivalent (mrem/y) Cosmic | Terrestrial | Total | Population Dose Equivalent (person-rem) |
|---|---|---|---|---|---|---|
| **NORTH DAKOTA** | | | | | | |
| FARG MOOR ND-MN | 53420 | 274 | 31.1 | 45.6 | 76.7 | 4099 |
| N DAKOTA NU | 564341 | 514 | 33.4 | 45.6 | 79.0 | 44578 |
| **OHIO** | | | | | | |
| AKRON OH | 542775 | 313 | 31.5 | 45.6 | 77.1 | 41833 |
| CANTON OH | 244279 | 323 | 31.6 | 45.6 | 77.2 | 18849 |
| CINCINNATI OH | 913536 | 168 | 30.2 | 30.2 | 60.4 | 55212 |
| CLEVELAND OH | 1959880 | 207 | 30.6 | 45.6 | 76.2 | 149271 |
| COLUMBUS OH | 790019 | 238 | 30.8 | 41.9 | 72.7 | 57449 |
| DAYTON OH | 685942 | 231 | 30.8 | 41.9 | 72.7 | 49840 |
| HAMILTON OH | 90912 | 184 | 30.4 | 45.6 | 76.0 | 6907 |
| HUNT OH-KY-WV | 29250 | 172 | 30.3 | 45.6 | 75.9 | 2219 |
| LIMA OH | 70295 | 268 | 31.1 | 47.5 | 78.6 | 5524 |
| LOR-ELYRIA OH | 192265 | 185 | 30.4 | 45.6 | 76.0 | 14609 |
| MANSFIELD OH | 77599 | 351 | 31.8 | 45.6 | 77.4 | 6007 |
| SPRINGFIELD OH | 93653 | 299 | 31.3 | 45.6 | 76.9 | 7206 |
| STEUBENVL OH-WV | 48262 | 218 | 30.7 | 60.5 | 91.2 | 4399 |
| TOLEDO OH | 475928 | 179 | 30.3 | 45.6 | 75.9 | 36337 |
| WHEELING OH-WV | 32239 | 198 | 30.5 | 68.9 | 99.4 | 3204 |
| YOUNGSTOWN OH | 395540 | 256 | 31.0 | 40.8 | 71.8 | 28390 |
| OHIO NU | 4009643 | 244 | 30.9 | 45.6 | 76.5 | 306609 |
| **OKLAHOMA** | | | | | | |
| FT SMITH OK-AR | 2098 | 137 | 30.0 | 45.6 | 75.6 | 159 |
| LAWTON OK | 95687 | 338 | 31.7 | 45.6 | 77.3 | 7396 |
| OKLAHOMA CY OK | 579788 | 368 | 32.0 | 45.6 | 77.6 | 44973 |
| TULSA OK | 371499 | 227 | 30.7 | 45.6 | 76.3 | 28355 |
| OKLAHOMA NU-CP | 68807 | 137 | 30.0 | 22.8 | 52.8 | 3632 |
| OKLAHOMA NU-NCP | 1441374 | 461 | 32.9 | 45.6 | 78.5 | 113083 |
| **OREGON** | | | | | | |
| EUGENE OR | 139255 | 129 | 29.9 | 45.6 | 75.5 | 10517 |
| PORTLAND OR-WA | 751756 | 23 | 29.1 | 45.6 | 74.7 | 56165 |
| SALEM OR | 93041 | 37 | 29.2 | 45.6 | 74.8 | 6960 |
| OREGON NU | 1107333 | 324 | 31.6 | 45.6 | 77.2 | 85453 |

NU-Non-Urban CP-Coastal Plain NCP-Not Coastal Plain

Table A-1. Average Dose Equivalents from Terrestrial and Cosmic Radiation (continued)
(Not Corrected for Shielding)

| Location | 1970 Population | Elevation (meters) | Dose Equivalent (mrem/y) | | | Population Dose Equivalent (person-rem) |
|---|---|---|---|---|---|---|
| | | | Cosmic | Terrestrial | Total | |
| **PENNSYLVANIA** | | | | | | |
| ALLEN-BETH PA | 338316 | 78 | 29.5 | 45.6 | 75.1 | 25416 |
| ALTOONA PA | 81795 | 360 | 31.9 | 45.6 | 77.5 | 6339 |
| ERIE PA | 175263 | 209 | 30.6 | 45.6 | 76.2 | 13351 |
| HARRISBURG PA | 240751 | 111 | 29.8 | 45.6 | 75.4 | 18149 |
| JOHNSTOWN PA | 96146 | 361 | 31.9 | 45.6 | 77.5 | 7452 |
| LANCASTER PA | 117097 | 108 | 29.8 | 45.6 | 75.4 | 8825 |
| PHILADEL PA-NJ | 3277021 | 14 | 29.0 | 42.5 | 71.5 | 234432 |
| PITTSBURG PA | 1846042 | 232 | 30.8 | 52.0 | 82.8 | 152792 |
| READING PA | 167932 | 81 | 29.5 | 45.6 | 75.1 | 12620 |
| SCRANTON PA | 204205 | 221 | 30.7 | 45.6 | 76.3 | 15576 |
| TRENTON PA-NJ | 31475 | 11 | 29.0 | 41.9 | 70.9 | 2232 |
| WILKES BARRE PA | 222830 | 195 | 30.5 | 45.6 | 76.1 | 16949 |
| YORK PA | 123106 | 113 | 29.8 | 45.6 | 75.4 | 9282 |
| PENN NU | 4871930 | 229 | 30.7 | 22.8 | 53.5 | 260851 |
| **RHODE ISLAND** | | | | | | |
| FALL RIV RI-MA | 15901 | 12 | 29.0 | 45.6 | 74.6 | 1187 |
| PRO'DENCE RI-MA | 729337 | 24 | 29.1 | 41.9 | 71.0 | 51796 |
| RHODE ID NU | 204485 | 61 | 29.4 | 45.6 | 75.0 | 15336 |
| **SOUTH CAROLINA** | | | | | | |
| AUGUSTA SC-GA | 22183 | 44 | 29.1 | 42.8 | 72.1 | 1599 |
| CHARLESTON SC | 228399 | 3 | 29.0 | 22.8 | 51.8 | 11821 |
| COLUMBI/ SC | 241781 | 79 | 29.5 | 68.3 | 97.8 | 23655 |
| GREENVILLE SC | 157073 | 294 | 31.3 | 22.8 | 54.1 | 8499 |
| S CAROL NU-CP | 818823 | 30 | 29.2 | 22.8 | 52.0 | 42549 |
| S CAROL NU-NCP | 1122257 | 209 | 30.6 | 45.6 | 76.2 | 85492 |
| **SOUTH DAKOTA** | | | | | | |
| SIOUX CY SD-IA | 860 | 338 | 31.7 | 45.6 | 77.3 | 66 |
| SIOUX FALLS SD | 75146 | 425 | 32.5 | 45.6 | 78.1 | 5869 |
| S DAKOTA NU | 590251 | 603 | 34.3 | 45.6 | 79.9 | 47178 |
| **TENNESSEE** | | | | | | |
| CHATTA TN-GA | 194633 | 206 | 30.6 | 45.6 | 76.2 | 14821 |
| KNOXVILLE TN | 190502 | 271 | 31.1 | 60.0 | 91.1 | 17356 |
| MEMPHIS TN | 655045 | 84 | 29.6 | 22.8 | 52.4 | 34306 |
| NASHVILLE TN | 448446 | 137 | 30.0 | 45.6 | 75.6 | 33899 |
| TENN NU-CP | 556808 | 91 | 29.6 | 22.8 | 52.4 | 29194 |
| TENN NU-NCP | 1878732 | 311 | 31.5 | 45.6 | 77.1 | 144792 |

NU-Non-Urban CP-Coastal Plain NCP-Not Coastal Plain

Table A-1. Average Dose Equivalents from Terrestrial and Cosmic Radiation (continued)
(Not Corrected for Shielding)

| Location | 1970 Population | Elevation (meters) | Dose Equivalent (mrem/y) | | | Population Dose Equivalent (person-rem) |
|---|---|---|---|---|---|---|
| | | | Cosmic | Terrestrial | Total | |
| **TEXAS** | | | | | | |
| ABILENE TX | 90371 | 530 | 33.6 | 45.6 | 79.2 | 7159 |
| AMARILLO TX | 127010 | 1120 | 41.4 | 45.6 | 87.0 | 11052 |
| AUSTIN TX | 264499 | 168 | 30.2 | 22.8 | 53.0 | 14028 |
| BEAUMONT TX | 116150 | 7 | 29.0 | 22.8 | 51.8 | 6026 |
| BROWNSVILLE TX | 52627 | 13 | 29.0 | 22.8 | 51.8 | 2728 |
| BRYAN TX | 51395 | 110 | 29.8 | 22.8 | 52.6 | 2702 |
| CORPUS CHRIS TX | 212820 | 11 | 29.0 | 22.8 | 51.8 | 11027 |
| DALLAS TX | 1338684 | 156 | 30.1 | 22.8 | 52.9 | 70875 |
| EL PASO TX | 337471 | 1147 | 41.9 | 45.6 | 87.5 | 29516 |
| FT WORTH TX | 676944 | 204 | 30.5 | 45.6 | 76.1 | 51541 |
| GALVESTON TX | 61809 | 6 | 29.0 | 19.7 | 48.7 | 3009 |
| HARLINGEN TX | 50469 | 11 | 29.0 | 22.8 | 51.8 | 2615 |
| HOUSTON TX | 1677863 | 17 | 29.1 | 19.7 | 48.8 | 81814 |
| LAREDO TX | 70197 | 128 | 29.9 | 22.8 | 52.7 | 3701 |
| LUBBOCK TX | 150135 | 988 | 39.3 | 45.6 | 84.9 | 12746 |
| MCALLEN TX | 91141 | 129 | 29.9 | 22.8 | 52.7 | 4805 |
| MIDLAND TX | 60371 | 847 | 37.3 | 45.6 | 82.9 | 5004 |
| ODESSA TX | 81645 | 881 | 37.8 | 45.6 | 83.4 | 6805 |
| PT ARTHUR TX | 116474 | 3 | 29.0 | 22.8 | 51.8 | 6028 |
| SAN ANGELO TX | 63884 | 563 | 33.9 | 45.6 | 79.5 | 5079 |
| SAN ANTONIO TX | 772511 | 214 | 30.6 | 22.8 | 53.4 | 41265 |
| SHERMAN TX | 55143 | 219 | 30.7 | 22.8 | 53.5 | 2959 |
| TEXARKANA TX-AR | 36888 | 102 | 29.7 | 22.8 | 52.5 | 1937 |
| TEXAS CITY TX | 84054 | 6 | 29.0 | 22.8 | 51.8 | 4352 |
| TYLER TX | 59781 | 166 | 30.2 | 22.8 | 53.0 | 3170 |
| WACO TX | 118843 | 130 | 29.9 | 22.8 | 52.7 | 6267 |
| WICHITA FALL TX | 97564 | 288 | 31.3 | 45.6 | 76.9 | 7498 |
| TEXAS NU-CP | 2972390 | 76 | 29.5 | 22.8 | 52.3 | 155496 |
| TEXAS NU-NCP | 1306995 | 728 | 35.8 | 45.6 | 81.4 | 106357 |
| **UTAH** | | | | | | |
| OGDEN UT | 149727 | 1311 | 44.9 | 45.6 | 90.5 | 13551 |
| PROVO UT | 104110 | 1387 | 46.5 | 45.6 | 92.1 | 9584 |
| SALT LAKE CY UT | 479162 | 1298 | 44.7 | 45.6 | 90.3 | 43266 |
| UTAH NU | 326094 | 1533 | 49.8 | 45.6 | 95.4 | 31093 |
| **VERMONT** | | | | | | |
| VERMONT NU | 444712 | 180 | 30.3 | 45.6 | 75.9 | 33772 |

NU-Non-Urban CP-Coastal Plain NCP-Not Coastal Plain

Table A-1. Average Dose Equivalents from Terrestrial and Cosmic Radiation (continued)
(Not Corrected for Shielding)

| Location | 1970 Population | Elevation (meters) | Dose Equivalent (mrem/y) | | | Population Dose Equivalent (person-rem) |
|---|---|---|---|---|---|---|
| | | | Cosmic | Terrestrial | Total | |
| **VIRGINIA** | | | | | | |
| LYNCHBURG VA | 70842 | 198 | 30.5 | 45.6 | 76.1 | 5390 |
| NEWPORT NEWS VA | 268263 | 6 | 29.0 | 19.5 | 48.5 | 13006 |
| NORFOLK VA | 668259 | 4 | 29.0 | 19.5 | 48.5 | 32386 |
| PETERSBURG VA | 100617 | 23 | 29.1 | 22.8 | 51.9 | 5222 |
| RICHMOND VA | 416563 | 46 | 29.3 | 22.8 | 52.1 | 21695 |
| ROANOKE VA | 156621 | 289 | 31.3 | 45.6 | 76.9 | 12038 |
| WASH DC(VA) | 715841 | 46 | 29.3 | 35.4 | 64.7 | 46300 |
| VIRGINIA NU-CP | 556040 | 30 | 29.2 | 22.8 | 52.0 | 28894 |
| VIRGINIA NU-NCP | 1695448 | 170 | 32.0 | 45.6 | 77.6 | 131547 |
| **WASHINGTON** | | | | | | |
| PORTLAND WA-OR | 73170 | 23 | 29.1 | 45.6 | 74.7 | 5467 |
| SEATTLE WA | 1238107 | 38 | 29.2 | 45.6 | 74.8 | 92637 |
| SPOKANE WA | 229620 | 360 | 31.9 | 45.6 | 77.5 | 17794 |
| TACOMA WA | 332521 | 76 | 29.5 | 45.6 | 75.1 | 24977 |
| WASHINGTON NU | 1535751 | 176 | 30.3 | 45.6 | 75.9 | 116570 |
| **WEST VIRGINIA** | | | | | | |
| CHARLESTON WV | 157662 | 183 | 30.6 | 45.6 | 76.0 | 11977 |
| HUNT WV-KY-OH | 85017 | 172 | 30.3 | 45.6 | 75.9 | 6451 |
| STEUBENVL WV-OH | 37230 | 218 | 30.7 | 60.5 | 91.2 | 3394 |
| WHEELING WV-OH | 60705 | 198 | 30.5 | 68.9 | 99.4 | 6033 |
| WEST VA NU | 1403623 | 431 | 32.6 | 45.6 | 78.2 | 109741 |
| **WISCONSIN** | | | | | | |
| APPLETON WI | 129532 | 219 | 30.7 | 45.6 | 76.3 | 9878 |
| DULUTH WI-MN | 32713 | 186 | 30.6 | 45.6 | 76.0 | 2486 |
| GREEN BAY WI | 129105 | 180 | 30.3 | 45.6 | 75.9 | 9804 |
| KENOSHA WI | 84262 | 186 | 30.4 | 45.6 | 76.0 | 6403 |
| LA CROSSE WI-MN | 60233 | 198 | 30.5 | 45.6 | 76.1 | 4583 |
| MADISON WI | 205457 | 262 | 31.0 | 45.6 | 76.6 | 15744 |
| MILWAUKEE WI | 1252457 | 186 | 30.4 | 45.6 | 76.0 | 95170 |
| OSHKOSH WI | 55480 | 229 | 30.7 | 45.6 | 76.3 | 4235 |
| RACINE WI | 117408 | 192 | 30.4 | 45.6 | 76.0 | 8927 |
| WISCONSIN NU | 2351288 | 295 | 31.1 | 45.6 | 76.9 | 180845 |
| **WYOMING** | | | | | | |
| WYOMING NU | 332416 | 1768 | 56.0 | 45.6 | 101.6 | 11763 |

NU-Non-Urban CP-Coastal Plain NCP-Not Coastal Plain

Table A-2. Average Dose Equivalents from Terrestrial and Cosmic Radiation (Corrected for Shielding)

| Location | 1970 Population | Elevation (meters) | Dose Equivalent (mrem/y) | | | Population Dose Equivalent (person-rem) |
|---|---|---|---|---|---|---|
| | | | Cosmic | Terrestrial | Total | |
| **ALABAMA** | | | | | | |
| BIRMINGHAM AL | 558099 | 183 | 27.3 | 29.2 | 56.5 | 31538 |
| COLUMBUS AL-GA | 25281 | 81 | 26.6 | 14.6 | 41.2 | 1041 |
| GADSDEN AL | 67706 | 169 | 27.2 | 29.2 | 56.4 | 3819 |
| HUNTSVILLE AL | 146565 | 194 | 27.4 | 29.2 | 56.6 | 8294 |
| MOBILE AL | 257816 | 5 | 26.1 | 14.6 | 40.7 | 10484 |
| MONTGOMERY AL | 138981 | 49 | 26.4 | 14.6 | 41.0 | 5693 |
| TUSCALOOSA AL | 85075 | 69 | 26.5 | 14.6 | 41.1 | 3530 |
| ALABAMA NU-CP | 1058052 | 76 | 26.6 | 14.6 | 41.2 | 43543 |
| ALABAMA NU-NCP | 1105788 | 244 | 27.9 | 29.2 | 57.1 | 63165 |
| **ALASKA** | | | | | | |
| ALASKA NU | 302173 | 76 | 26.6 | 29.2 | 55.7 | 16845 |
| **ARIZONA** | | | | | | |
| PHOENIX AZ | 863357 | 332 | 28.5 | 29.2 | 57.7 | 49784 |
| TUCSON AZ | 294184 | 728 | 32.2 | 29.2 | 61.4 | 18059 |
| ARIZONA NU | 614941 | 996 | 35.5 | 29.2 | 64.7 | 39764 |
| **ARKANSAS** | | | | | | |
| FORT SMITH AR | 73419 | 137 | 27.0 | 29.2 | 56.2 | 4124 |
| LITTLE ROCK AR | 222616 | 101 | 26.7 | 14.6 | 41.3 | 9200 |
| PINE BLUFF AR | 60907 | 66 | 26.5 | 14.6 | 41.1 | 2502 |
| TEXARKANA AR-TX | 21682 | 102 | 26.7 | 14.6 | 41.3 | 896 |
| ARKANSAS NU-CP | 1025647 | 61 | 26.5 | 14.6 | 41.0 | 42101 |
| ARKANSAS NU-NCP | 519024 | 515 | 30.1 | 29.2 | 59.2 | 30746 |

NU-Non-Urban CP-Coastal Plain NCP-Not Coastal Plain

Table A-2. Average Dose Equivalents from Terrestrial and Cosmic Radiation (Continued)
(Corrected for Shielding)

| Location | 1970 Population | Elevation (meters) | Dose Equivalent (mrem/y) | | | Population Dose Equivalent (person-rem) |
|---|---|---|---|---|---|---|
| | | | Cosmic | Terrestrial | Total | |
| **CALIFORNIA** | | | | | | |
| BAKERSFIELD CA | 176155 | 124 | 26.9 | 29.2 | 56.1 | 9879 |
| FRESNO CA | 262998 | 90 | 26.7 | 29.2 | 55.8 | 14681 |
| LOS ANGELES CA | 8351266 | 87 | 26.6 | 20.4 | 47.1 | 392984 |
| MODESTO CA | 106107 | 27 | 26.2 | 29.2 | 55.4 | 5880 |
| OXNARD-VENT CA | 244653 | 15 | 26.1 | 29.2 | 55.3 | 13536 |
| SACRAMENTO CA | 633732 | 8 | 26.1 | 29.2 | 55.3 | 35011 |
| SALINAS CA | 62456 | 15 | 26.1 | 29.2 | 55.3 | 3456 |
| S BERNARDINO CA | 583597 | 320 | 28.4 | 29.2 | 57.6 | 33593 |
| SAN DIEGO CA | 1198323 | 11 | 26.1 | 29.2 | 55.3 | 66282 |
| S FRANCISCO CA | 2987850 | 19 | 26.2 | 17.7 | 43.8 | 130973 |
| SAN JOSE CA | 1025273 | 20 | 26.2 | 17.7 | 43.8 | 44947 |
| STA BARBARA CA | 129774 | 13 | 26.1 | 23.0 | 49.1 | 6372 |
| SANTA ROSA CA | 75083 | 46 | 26.4 | 29.2 | 55.5 | 4170 |
| SEASIDE-MONT CA | 93284 | 15 | 26.1 | 29.2 | 55.3 | 5161 |
| SIMI VALLEY CA | 56936 | 233 | 27.7 | 29.2 | 56.9 | 3239 |
| STOCKTON CA | 160373 | 4 | 26.1 | 29.2 | 55.3 | 8861 |
| CALIFORNIA NU | 3805364 | 272 | 28.0 | 29.2 | 57.2 | 217615 |
| **COLORADO** | | | | | | |
| BOULDER CO | 68634 | 1631 | 47.0 | 29.2 | 76.2 | 5227 |
| COLORADO SPG CO | 204766 | 1823 | 51.8 | 29.2 | 81.0 | 16591 |
| DENVER CO | 1047311 | 1609 | 46.5 | 57.4 | 103.9 | 108808 |
| PUEBLO CO | 103300 | 1430 | 42.6 | 29.2 | 71.8 | 7420 |
| COLORADO NU | 781248 | 1691 | 48.5 | 29.2 | 77.7 | 60829 |
| **CONNECTICUT** | | | | | | |
| BRIDGEPORT CT | 413366 | 3 | 26.1 | 37.6 | 63.7 | 26329 |
| BRISTOL CT | 71732 | 101 | 26.7 | 29.2 | 55.9 | 4011 |
| DANBURY CT | 66651 | 113 | 26.8 | 29.2 | 56.0 | 3733 |
| HARTFORD CT | 465001 | 12 | 26.1 | 26.8 | 52.9 | 24617 |
| MERIDEN CT | 98454 | 46 | 26.4 | 34.0 | 60.4 | 5947 |
| NEW BRITAIN CT | 131149 | 61 | 26.5 | 39.4 | 65.9 | 8653 |
| NEW HAVEN CT | 348341 | 12 | 26.1 | 32.2 | 58.1 | 20314 |
| NORWALK CT | 106707 | 12 | 26.1 | 44.8 | 70.9 | 7568 |
| SP'FIELD CT-MA | 58173 | 26 | 26.2 | 25.6 | 51.8 | 3014 |
| STAMFORD CT | 184898 | 11 | 26.1 | 41.2 | 67.3 | 12449 |
| WATERBURY CT | 156986 | 79 | 26.6 | 39.4 | 66.0 | 10362 |
| CONN NU | 930559 | 105 | 26.8 | 29.2 | 55.9 | 52062 |

NU=Non-Urban CP=Coastal Plain NCP=Hot Coastal Plain

Table A-2. Average Dose Equivalents from Terrestrial and Cosmic Radiation (Continued)
(Corrected for Shielding)

| Location | 1970 Population | Elevation (meters) | Dose Equivalent (mrem/y) | | | Population Dose Equivalent (person-rem) |
|---|---|---|---|---|---|---|
| | | | Cosmic | Terrestrial | Total | |
| **DELAWARE** | | | | | | |
| WILMINGTN DE | 349674 | 41 | 26.3 | 23.2 | 49.5 | 17305 |
| DELAWARE NU-CP | 198430 | 18 | 26.2 | 14.6 | 40.8 | 8087 |
| **DISTRICT OF COLUMBIA** | | | | | | |
| WASH DC | 756510 | 46 | 26.4 | 22.7 | 49.0 | 37075 |
| **FLORIDA** | | | | | | |
| FT LAUD FL | 613797 | 3 | 26.1 | 14.6 | 40.7 | 24954 |
| GAINESVILLE FL | 69329 | 55 | 26.4 | 14.6 | 41.0 | 2843 |
| JACKSONVILLE FL | 529585 | 6 | 26.1 | 14.6 | 40.7 | 21541 |
| MIAMI FL | 1219661 | 3 | 26.1 | 14.6 | 40.7 | 49585 |
| ORLANDO FL | 305479 | 21 | 26.2 | 7.4 | 33.6 | 10267 |
| PENSACOLA FL | 166619 | 5 | 26.1 | 14.6 | 40.7 | 6776 |
| ST PETERSBRG FL | 495159 | 6 | 26.1 | 14.6 | 40.7 | 20141 |
| TALLAHASSEE FL | 77851 | 56 | 26.4 | 14.6 | 41.0 | 3193 |
| TAMPA FL | 368742 | 5 | 26.1 | 14.6 | 40.7 | 14995 |
| W PALM BEACH FL | 287561 | 5 | 26.1 | 14.6 | 40.7 | 11696 |
| FLORIDA NU-CP | 2655660 | 30 | 26.2 | 14.6 | 40.8 | 108457 |
| **GEORGIA** | | | | | | |
| ALBANY GA | 76512 | 58 | 26.4 | 14.6 | 41.0 | 3139 |
| ATLANTA GA | 1172778 | 320 | 28.4 | 36.6 | 65.0 | 76218 |
| AUGUSTA GA-SC | 126770 | 44 | 26.3 | 27.4 | 53.7 | 6811 |
| CHATTA GA-TN | 28947 | 206 | 27.5 | 29.2 | 56.7 | 1641 |
| COLUMBUS GA-AL | 183135 | 83 | 26.6 | 14.6 | 41.2 | 7551 |
| MACON GA | 128065 | 102 | 26.7 | 14.6 | 41.3 | 5294 |
| SAVANNAH GA | 163753 | 6 | 26.1 | 14.6 | 40.7 | 6661 |
| GEORGIA NU-CP | 1117211 | 76 | 26.6 | 14.6 | 41.2 | 45978 |
| GEORGIA NU-NCP | 1592204 | 309 | 28.3 | 29.2 | 57.5 | 91511 |
| **HAWAII** | | | | | | |
| HONOLULU HI | 442197 | 5 | 26.1 | 29.2 | 55.3 | 24448 |
| HAWAII NU | 327516 | 94 | 26.7 | 29.2 | 55.9 | 18297 |

NU-Non-Urban CP-Coastal Plain NCP-Not Coastal Plain

Table A-2. Average Dose Equivalents from Terrestrial and Cosmic Radiation (Continued)
(Corrected for Shielding)

| Location | 1970 Population | Elevation (meters) | Dose Equivalent (mrem/y) | | | Population Dose Equivalent (person-rem) |
|---|---|---|---|---|---|---|
| | | | Cosmic | Terrestrial | Total | |
| **IDAHO** | | | | | | |
| BOISE ID | 85387 | 823 | 33.3 | 29.2 | 62.5 | 5321 |
| IDAHO NU | 627824 | 1115 | 37.2 | 29.2 | 66.4 | 41674 |
| **ILLINOIS** | | | | | | |
| AURORA IL | 232917 | 194 | 27.4 | 24.7 | 52.1 | 12138 |
| BLOOMINGTON IL | 69392 | 253 | 27.9 | 29.2 | 57.0 | 3958 |
| CHAMPAIGN IL | 100417 | 226 | 27.6 | 29.2 | 56.8 | 5707 |
| CHICAGO IL | 6185156 | 181 | 27.3 | 24.7 | 52.0 | 321742 |
| DAVENPORT IL-IA | 139824 | 180 | 27.3 | 29.2 | 56.5 | 7898 |
| DECATUR IL | 99693 | 208 | 27.5 | 29.2 | 56.7 | 5652 |
| DUBUQUE IL-IA | 2408 | 197 | 27.4 | 29.2 | 56.6 | 136 |
| JOLIET IL | 155500 | 166 | 27.2 | 28.4 | 55.6 | 8639 |
| PEORIA IL | 247121 | 143 | 27.0 | 29.2 | 56.2 | 13893 |
| ROCKFORD IL | 206084 | 218 | 27.6 | 29.2 | 56.8 | 11700 |
| ST LOUIS IL-MO | 314476 | 143 | 27.0 | 29.2 | 56.2 | 17680 |
| SPRINGFIELD IL | 120794 | 186 | 27.1 | 29.2 | 56.5 | 6829 |
| ILLINOIS NU | 3240194 | 225 | 27.6 | 29.2 | 56.8 | 184120 |
| **INDIANA** | | | | | | |
| ANDERSON IN | 80704 | 272 | 28.0 | 29.2 | 57.2 | 4615 |
| CHICAGO IN-IL | 529422 | 181 | 27.3 | 24.7 | 52.0 | 27540 |
| EVANSVILLE IN | 142476 | 117 | 26.9 | 29.2 | 56.0 | 7984 |
| FT WAYNE IN | 225184 | 241 | 27.8 | 29.2 | 56.9 | 12823 |
| INDIANAPOLIS IN | 820259 | 216 | 27.6 | 29.2 | 56.8 | 46557 |
| LAFAYETTE IN | 79117 | 201 | 27.5 | 29.2 | 56.6 | 4482 |
| LOUISV'LE IN-KY | 81488 | 137 | 27.0 | 29.2 | 56.2 | 4578 |
| MUNCIE IN | 90427 | 290 | 28.1 | 29.2 | 57.3 | 5181 |
| SO BEND IN -MI | 265148 | 216 | 27.6 | 29.2 | 56.8 | 15050 |
| TERRA HAUTE IN | 80908 | 151 | 27.1 | 29.2 | 56.3 | 4553 |
| INDIANA NU | 2798536 | 217 | 27.7 | 29.2 | 56.9 | 159289 |
| **IOWA** | | | | | | |
| CEDAR RAPIDS IA | 232008 | 223 | 27.6 | 29.2 | 56.8 | 7499 |
| DAVENPORT IA-IL | 126895 | 180 | 27.3 | 29.2 | 56.5 | 7168 |
| DES MOINES IA | 255824 | 245 | 27.8 | 29.2 | 57.0 | 14577 |
| DUBUQUE IA-IL | 63142 | 197 | 27.4 | 29.2 | 56.6 | 3575 |
| OMAHA IA-NE | 64647 | 317 | 28.4 | 29.2 | 57.5 | 3731 |
| SOUIX CTY IA-NE | 87157 | 338 | 28.5 | 29.2 | 57.7 | 5030 |
| WATERLOO IA | 112881 | 259 | 27.9 | 29.2 | 57.1 | 6446 |
| IOWA NU | 1982287 | 343 | 28.6 | 29.2 | 57.8 | 114477 |

NU-Non-Urban CP-Coastal Plain NCP-Not Coastal Plain

Table A-2. Average Dose Equivalents from Terrestrial and Cosmic Radiation (Continued)
(Corrected for Shielding)

| Location | 1970 Population | Elevation (meters) | Dose Equivalent (mrem/y) | | | Population Dose Equivalent (person-rem) |
|---|---|---|---|---|---|---|
| | | | Cosmic | Terrestrial | Total | |
| **KANSAS** | | | | | | |
| KANSAS CY KS-MO | 350208 | 229 | 27.7 | 29.2 | 56.9 | 19910 |
| ST JOSEPH KS-MO | 1283 | 259 | 27.9 | 29.2 | 57.1 | 73 |
| TOPEKA KS | 132108 | 283 | 28.1 | 29.2 | 57.3 | 7566 |
| WICHITA KS | 302334 | 393 | 29.0 | 29.2 | 58.2 | 17586 |
| KANSAS NU | 1463138 | 479 | 29.7 | 29.2 | 58.9 | 86195 |
| **KENTUCKY** | | | | | | |
| CINTI KY-OH | 196978 | 168 | 27.2 | 19.3 | 46.5 | 9168 |
| HUNT KY-WV-OH | 53316 | 172 | 27.2 | 29.2 | 56.4 | 3009 |
| LEXINGTON KY | 159538 | 291 | 28.2 | 29.2 | 57.3 | 9147 |
| LOUISV'LE KY-IN | 657908 | 137 | 27.8 | 29.2 | 56.2 | 36959 |
| OWENSBORO KY | 53133 | 146 | 27.1 | 29.2 | 56.2 | 2988 |
| KENTUCKY NU-CP | 164822 | 104 | 26.8 | 14.6 | 41.3 | 6815 |
| KENTUCKY NU-NCP | 1933616 | 285 | 28.1 | 29.2 | 57.3 | 110765 |
| **LOUISIANA** | | | | | | |
| BATON ROUGE LA | 249463 | 17 | 26.2 | 14.6 | 40.8 | 10166 |
| LAFAYETTE LA | 78544 | 9 | 26.1 | 14.6 | 40.7 | 3196 |
| LAKE CHARLES LA | 88260 | 6 | 26.1 | 14.6 | 40.7 | 3590 |
| MONROE LA | 90567 | 25 | 26.2 | 14.6 | 40.8 | 3695 |
| NEW ORLEANS LA | 961728 | 2 | 26.1 | 14.6 | 40.6 | 39089 |
| SHREVEPORT LA | 234564 | 62 | 26.5 | 14.6 | 41.1 | 9630 |
| LOUISIANA NU-CP | 1940054 | 30 | 26.2 | 14.6 | 40.8 | 79231 |
| **MAINE** | | | | | | |
| LEWISTON ME | 65212 | 61 | 26.5 | 29.2 | 55.6 | 3628 |
| PORTLAND ME | 106599 | 8 | 26.1 | 29.2 | 55.3 | 5892 |
| MAINE NU | 821852 | 120 | 26.9 | 29.2 | 56.1 | 46071 |
| **MARYLAND** | | | | | | |
| BALTIMORE MD | 1579781 | 6 | 26.1 | 17.5 | 43.6 | 68908 |
| WASH DC(MD) | 1009138 | 46 | 26.4 | 22.7 | 49.0 | 49456 |
| MARYLAND NU-CP | 568333 | 30 | 26.2 | 14.6 | 40.8 | 23211 |
| MARYLAND NU-NCP | 7(  47 | 170 | 27.2 | 29.2 | 56.4 | 41166 |

NU-Non-Urban CP-Coastal Plain NCP-Not Coastal Plain

Table A-2. Average Dose Equivalents from Terrestrial and Cosmic Radiation (Continued)
(Corrected for Shielding)

| Location | 1970 Population | Elevation (meters) | Dose Equivalent (mrem/y) | | | Population Dose Equivalent (person-rem) |
|---|---|---|---|---|---|---|
| | | | Cosmic | Terrestrial | Total | |
| **MASSACHUSETTS** | | | | | | |
| BOSTON MA | 2652575 | 8 | 26.1 | 29.2 | 55.3 | 146638 |
| BROCKTON MA | 148844 | 40 | 26.3 | 29.2 | 55.5 | 8260 |
| FALL RIV MA-RI | 123491 | 12 | 26.1 | 29.2 | 55.3 | 6830 |
| FITCH-LEO MA | 78053 | 134 | 27.0 | 29.2 | 56.2 | 4383 |
| LAW-HAVER MA-NH | 182438 | 20 | 26.2 | 29.2 | 55.4 | 10100 |
| LOWELL MA | 182731 | 30 | 26.2 | 29.2 | 55.4 | 10129 |
| NEW BEDFORD MA | 133667 | 5 | 26.1 | 29.2 | 55.3 | 7386 |
| PITTSFIELD MA | 62872 | 309 | 28.3 | 17.9 | 46.2 | 2902 |
| PRO'DENCE MA-RI | 65974 | 24 | 26.2 | 26.8 | 53.0 | 3498 |
| SPRNGFLD MA-CT | 456135 | 26 | 26.2 | 25.6 | 51.8 | 23635 |
| WORCESTER MA | 247416 | 145 | 27.0 | 34.0 | 61.0 | 15100 |
| MASS NU | 1354974 | 150 | 27.1 | 29.2 | 56.3 | 76243 |
| **MICHIGAN** | | | | | | |
| ANN ARBOR MI | 178605 | 268 | 28.0 | 29.2 | 57.2 | 10208 |
| BAY CITY MI | 78097 | 181 | 27.3 | 29.2 | 56.5 | 4412 |
| DETROIT MI | 3970584 | 181 | 27.3 | 29.2 | 56.5 | 224376 |
| FLINT MI | 330128 | 218 | 27.6 | 29.2 | 56.8 | 18742 |
| GRD RAPIDS MI | 352703 | 186 | 27.3 | 29.2 | 56.5 | 19939 |
| JACKSON MI | 78572 | 287 | 28.1 | 29.2 | 57.3 | 4502 |
| KALAMAZOO MI | 152083 | 230 | 27.7 | 29.2 | 56.9 | 8648 |
| LANSING MI | 229518 | 253 | 27.9 | 29.2 | 57.0 | 13091 |
| MUSKEGON MI | 105716 | 191 | 27.4 | 29.2 | 56.6 | 5980 |
| SAGINAW MI | 147552 | 181 | 27.3 | 29.2 | 56.5 | 8336 |
| SO BEND MI-IN | 23424 | 216 | 27.6 | 29.2 | 56.8 | 1330 |
| TOLEDO MI-OH | 11861 | 179 | 27.3 | 29.2 | 56.5 | 670 |
| MICHIGAN NU | 3216240 | 249 | 27.8 | 29.2 | 57.0 | 183349 |
| **MINNESOTA** | | | | | | |
| DULUTH MN-WI | 105639 | 186 | 27.3 | 29.2 | 56.5 | 5972 |
| FARG MOOR MN-ND | 32026 | 274 | 28.0 | 29.2 | 57.2 | 1832 |
| LA CROSSE MN-WI | 3142 | 198 | 27.4 | 29.2 | 56.6 | 178 |
| MINN-ST PAUL MN | 1704423 | 248 | 27.8 | 20.0 | 47.8 | 81448 |
| ROCHESTER MN | 56604 | 302 | 28.2 | 29.2 | 57.4 | 3250 |
| MINNESOTA NU | 1903215 | 428 | 29.3 | 29.2 | 58.5 | 111267 |

NU-Non-Urban CP-Coastal Plain NCP-Not Coastal Plain

Table A-2. Average Dose Equivalents from Terrestrial and Cosmic Radiation (Continued)
(Corrected for Shielding)

| Location | 1970 Population | Elevation (meters) | Dose Equivalent (mrem/y) | | | Population Dose Equivalent (person-rem) |
|---|---|---|---|---|---|---|
| | | | Cosmic | Terrestrial | Total | |
| **MISSISSIPPI** | | | | | | |
| BILOXI-GULF MS | 121601 | 5 | 26.1 | 14.6 | 40.7 | 4945 |
| JACKSON MS | 190060 | 90 | 26.7 | 14.6 | 41.2 | 7840 |
| MEMPHIS MS-TN | 8931 | 84 | 26.6 | 14.6 | 41.2 | 368 |
| MISS'IPPI NU-CP | 1896120 | 81 | 26.6 | 14.6 | 41.2 | 78110 |
| **MISSOURI** | | | | | | |
| COLUMBIA MO | 59231 | 225 | 27.6 | 29.2 | 56.8 | 3366 |
| KANSAS CT MO-KS | 751579 | 229 | 27.7 | 29.2 | 56.9 | 42728 |
| ST JOSEPH MO-KS | 75940 | 259 | 27.9 | 29.2 | 57.1 | 4335 |
| ST LOUIS MO-IL | 1568468 | 143 | 27.0 | 29.2 | 56.2 | 88181 |
| SPRINGFIELD MO | 121340 | 396 | 29.0 | 29.2 | 58.2 | 7061 |
| MISSOURI NU-CP | 149905 | 107 | 26.8 | 14.6 | 41.4 | 6203 |
| MISSOURI NU-MCP | 1950936 | 269 | 28.0 | 29.2 | 57.2 | 111511 |
| **MONTANA** | | | | | | |
| BILLINGS MT | 71197 | 951 | 34.9 | 29.2 | 64.1 | 4563 |
| GREAT FALLS MT | 70905 | 1015 | 35.7 | 29.2 | 64.9 | 4603 |
| MONTANA NU | 552307 | 1073 | 36.6 | 29.2 | 65.8 | 36336 |
| **NEBRASKA** | | | | | | |
| LINCOLN NE | 153443 | 151 | 28.6 | 29.2 | 57.8 | 8871 |
| OMAHA NE-IA | 426929 | 317 | 28.4 | 29.2 | 57.5 | 24566 |
| SIOUX CT NE-IA | 7920 | 338 | 28.5 | 29.2 | 57.7 | 457 |
| NEBRASKA NU | 895499 | 489 | 29.8 | 29.2 | 59.0 | 52839 |
| **NEVADA** | | | | | | |
| LAS VEGAS NV | 236681 | 619 | 31.1 | 12.7 | 43.8 | 10365 |
| RENO NV | 99687 | 1371 | 41.5 | 29.2 | 70.7 | 7048 |
| NEVADA NU | 152370 | 1391 | 41.9 | 29.2 | 71.1 | 10832 |
| **NEW HAMPSHIRE** | | | | | | |
| LAW HAVER NH-MA | 17842 | 20 | 26.2 | 29.2 | 55.4 | 988 |
| MANCHESTER NH | 95140 | 53 | 26.4 | 29.2 | 55.6 | 5289 |
| NASHUA NH | 60961 | 46 | 26.4 | 29.2 | 55.5 | 3386 |
| NEW HAMP NU | 563738 | 217 | 27.6 | 29.2 | 56.8 | 32000 |

NU-Non-Urban CP-Coastal Plain MCP-Not Coastal Plain

Table A-2. Average Dose Equivalents from Terrestrial and Cosmic Radiation (Continued)
(Corrected for Shielding)

| Location | 1970 Population | Elevation (meters) | Dose Equivalent (mrem/y) | | | Population Dose Equivalent (person-rem) |
|---|---|---|---|---|---|---|
| | | | Cosmic | Terrestrial | Total | |
| **NEW JERSEY** | | | | | | |
| ALLEN-BETHNJ-PA | 25201 | 78 | 26.6 | 29.2 | 55.8 | 1405 |
| ATLANTIC CY NJ | 134016 | 3 | 26.1 | 14.6 | 40.7 | 5448 |
| NEW YORK NJ-NY | 4837265 | 9 | 26.1 | 29.2 | 55.3 | 267440 |
| PHILADEL NJ-PA | 744045 | 14 | 26.1 | 30.4 | 56.5 | 42064 |
| TRENTON NJ-PA | 242673 | 11 | 26.1 | 26.8 | 52.9 | 12845 |
| VINELAND NJ | 73579 | 15 | 26.1 | 14.6 | 40.7 | 2997 |
| WILMINGTN NJ-DE | 21593 | 41 | 26.1 | 23.2 | 49.5 | 1069 |
| N JERSEY NU-CP | 369678 | 61 | 26.5 | 14.6 | 41.0 | 15175 |
| N JERSEY NU-NCP | 720114 | 90 | 26.7 | 29.2 | 55.8 | 40212 |
| **NEW MEXICO** | | | | | | |
| ALBUQUERQUE NM | 297451 | 1511 | 44.3 | 44.5 | 88.8 | 26414 |
| NEW MEXICO NU | 718549 | 1601 | 46.3 | 29.2 | 75.5 | 54241 |
| **NEW YORK** | | | | | | |
| ALBANY NY | 486525 | 6 | 26.1 | 16.1 | 42.1 | 20506 |
| BINGHAMPTON NY | 167226 | 264 | 27.9 | 29.2 | 57.1 | 9552 |
| BUFFALO NY | 1086594 | 178 | 27.3 | 29.2 | 56.5 | 61366 |
| NEW YORK NY | 11369576 | 9 | 26.1 | 29.2 | 55.3 | 628595 |
| ROCHESTER NY | 601361 | 157 | 27.1 | 29.2 | 56.3 | 33869 |
| SYRACUSE NY | 376169 | 122 | 26.9 | 29.2 | 56.1 | 21091 |
| UTICA ROME NY | 180355 | 126 | 26.9 | 29.2 | 56.1 | 10118 |
| NEW YORK NU | 3973462 | 166 | 27.2 | 29.2 | 56.4 | 224043 |
| **NORTH CAROLINA** | | | | | | |
| ASHEVILLE NC | 72451 | 675 | 31.6 | 29.2 | 60.8 | 4407 |
| CHARLOTTE NC | 279530 | 220 | 27.6 | 29.2 | 56.8 | 15873 |
| DURHAM NC | 100764 | 126 | 26.9 | 29.2 | 56.1 | 5653 |
| FAYETTEVILLE NC | 161370 | 52 | 26.4 | 14.6 | 41.0 | 6614 |
| HIGH POINT NC | 93547 | 287 | 28.1 | 29.2 | 57.3 | 5360 |
| GREENSBORO NC | 152252 | 256 | 27.9 | 29.2 | 57.1 | 8688 |
| RALEIGH NC | 152289 | 111 | 26.8 | 29.2 | 56.0 | 8526 |
| WILMINGTON NC | 57645 | 15 | 26.1 | 14.6 | 40.7 | 2348 |
| WINSTON SAL NC | 142584 | 262 | 27.9 | 29.2 | 57.1 | 8143 |
| N CAROL NU-CP | 1442903 | 30 | 26.2 | 14.6 | 40.8 | 58928 |
| N CAROL NU-NCP | 2426724 | 167 | 28.8 | 29.2 | 57.9 | 140624 |

NU-Non-Urban CP-Coastal Plain NCP-Not Coastal Plain

Table A-2. Average Dose Equivalents from Terrestrial and Cosmic Radiation (Continued)
(Corrected for Shielding)

| Location | 1970 Population | Elevation (meters) | Dose Equivalent (mrem/y) | | | Population Dose Equivalent (person-rem) |
|---|---|---|---|---|---|---|
| | | | Cosmic | Terrestrial | Total | |
| **NORTH DAKOTA** | | | | | | |
| FARG MOOR ND-MN | 51428 | 274 | 28.0 | 29.2 | 57.2 | 3056 |
| N DAKOTA NU | 56434 | 514 | 30.3 | 29.2 | 59.2 | 33429 |
| **OHIO** | | | | | | |
| AKRON OH | 542775 | 313 | 28.3 | 29.2 | 57.5 | 31214 |
| CANTON OH | 244279 | 323 | 28.4 | 29.2 | 57.6 | 14068 |
| CINCINNATI OH | 913536 | 188 | 27.2 | 19.3 | 46.5 | 42518 |
| CLEVELAND OH | 1959880 | 207 | 27.5 | 29.2 | 56.7 | 111107 |
| COLUMBUS OH | 790019 | 238 | 27.7 | 26.8 | 54.6 | 43098 |
| DAYTON OH | 685942 | 231 | 27.7 | 26.8 | 54.5 | 37384 |
| HAMILTON OH | 90912 | 184 | 27.3 | 29.2 | 56.5 | 5138 |
| HUNT OH-KY-WV | 29250 | 172 | 27.2 | 29.2 | 56.4 | 1651 |
| LIMA OH | 70295 | 268 | 28.0 | 30.4 | 58.4 | 4103 |
| LOR-ELYRIA OH | 192265 | 185 | 27.3 | 29.2 | 56.5 | 10868 |
| MANSFIELD OH | 77599 | 351 | 28.6 | 29.2 | 57.8 | 4486 |
| SPRINGFIELD OH | 93653 | 299 | 28.2 | 29.2 | 57.4 | 5375 |
| STEUBENVL OH-WV | 48262 | 218 | 27.6 | 38.7 | 66.3 | 3200 |
| TOLEDO OH | 475928 | 179 | 27.3 | 29.2 | 56.5 | 26881 |
| WHEELING OH-WV | 32239 | 198 | 27.4 | 44.1 | 71.5 | 2306 |
| YOUNGSTOWN OH | 395540 | 256 | 27.9 | 26.1 | 54.0 | 21355 |
| OHIO NU | 4009643 | 244 | 27.8 | 29.2 | 57.0 | 228410 |
| **OKLAHOMA** | | | | | | |
| FT SMITH OK-AR | 2098 | 137 | 27.0 | 29.2 | 56.2 | 118 |
| LAWTON OK | 95687 | 368 | 28.5 | 29.2 | 57.7 | 5522 |
| OKLAHOMA CY OK | 579788 | 368 | 28.8 | 29.2 | 58.0 | 33602 |
| TULSA OK | 371499 | 227 | 27.7 | 29.2 | 56.8 | 21115 |
| OKLAHOMA NU-CP | 68807 | 137 | 27.0 | 14.6 | 41.6 | 2861 |
| OKLAHOMA NU-NCP | 1441374 | 461 | 29.6 | 29.2 | 58.8 | 84686 |
| **OREGON** | | | | | | |
| EUGENE OR | 139255 | 129 | 26.9 | 29.2 | 56.1 | 7814 |
| PORTLAND OR-WA | 751756 | 23 | 26.2 | 29.2 | 55.4 | 41635 |
| SALEM OR | 93041 | 37 | 26.3 | 29.2 | 55.5 | 5161 |
| OREGON NU | 1107333 | 324 | 28.4 | 29.2 | 57.6 | 63779 |

NU-Non-Urban CP-Coastal Plain NCP-Not Coastal Plain

Table A-2. Average Dose Equivalents from Terrestrial and Cosmic Radiation (Continued)
(Corrected for Shielding)

| Location | 1970 Population | Elevation (meters) | Dose Equivalent (mrem/y) | | | Population Dose Equivalent (person-rem) |
|---|---|---|---|---|---|---|
| | | | Cosmic | Terrestrial | Total | |
| **PENNSYLVANIA** | | | | | | |
| ALLEN-BETH PA | 338316 | 78 | 26.6 | 29.2 | 55.8 | 18863 |
| ALTOONA PA | 81795 | 360 | 28.7 | 29.2 | 57.9 | 4735 |
| ERIE PA | 175263 | 209 | 27.5 | 29.2 | 56.7 | 9938 |
| HARRISBURG PA | 240751 | 111 | 26.8 | 29.2 | 56.0 | 13480 |
| JOHNSTOWN PA | 96146 | 361 | 28.7 | 29.2 | 57.9 | 5567 |
| LANCASTER PA | 117097 | 108 | 26.8 | 29.2 | 56.0 | 6554 |
| PHILADEL PA-NJ | 3277021 | 14 | 26.1 | 27.2 | 53.3 | 174778 |
| PITTSBURG PA | 1846042 | 232 | 27.7 | 33.3 | 61.0 | 112554 |
| READING PA | 167932 | 81 | 26.6 | 29.2 | 55.8 | 9367 |
| SCRANTON PA | 204205 | 221 | 27.6 | 29.2 | 56.8 | 11598 |
| TRENTON PA-NJ | 31475 | 11 | 26.1 | 26.8 | 52.9 | 1666 |
| WILKES BARRE PA | 222830 | 195 | 27.4 | 29.2 | 56.6 | 12612 |
| YORK PA | 123106 | 113 | 26.8 | 29.2 | 56.0 | 6894 |
| PENN NU | 4871930 | 229 | 27.7 | 14.6 | 42.3 | 205885 |
| **RHODE ISLAND** | | | | | | |
| FALL RIV RI-MA | 15901 | 12 | 26.1 | 29.2 | 55.3 | 879 |
| PRO'DENCE RI-MA | 729337 | 24 | 26.2 | 26.8 | 53.0 | 38671 |
| RHODE ID NU | 204485 | 61 | 26.5 | 29.2 | 55.6 | 11378 |
| **SOUTH CAROLINA** | | | | | | |
| AUGUSTA SC-GA | 22183 | 44 | 26.3 | 27.4 | 53.7 | 1192 |
| CHARLESTON SC | 228399 | 3 | 26.1 | 14.6 | 40.7 | 9285 |
| COLUMBIA SC | 241781 | 79 | 26.6 | 43.7 | 70.3 | 16996 |
| GREENVILLE SC | 157073 | 294 | 28.2 | 14.6 | 42.8 | 6718 |
| S CAROL NU-CP | 818823 | 30 | 26.2 | 14.6 | 40.8 | 33441 |
| S CAROL NU-NCP | 1122257 | 209 | 27.5 | 29.2 | 56.7 | 63637 |
| **SOUTH DAKOTA** | | | | | | |
| SIOUX CY SD-IA | 860 | 338 | 28.5 | 29.2 | 57.7 | 50 |
| SIOUX FALLS SD | 75146 | 425 | 29.3 | 29.2 | 58.4 | 4392 |
| S DAKOTA NU | 590251 | 603 | 30.9 | 29.2 | 60.1 | 35462 |
| **TENNESSEE** | | | | | | |
| CHATTA TN-GA | 194633 | 206 | 27.5 | 29 | 56.7 | 11032 |
| KNOXVILLE TN | 190502 | 271 | 28.0 | 38 | 66.4 | 12648 |
| MEMPHIS TN | 655045 | 84 | 26.6 | 14.6 | 41.2 | 26993 |
| NASHVILLE TN | 448444 | 137 | 27.0 | 29.2 | 56.2 | 25192 |
| TENN NU-CP | 556808 | 91 | 26.7 | 14.6 | 41.3 | 22974 |
| TENN NU-NCP | 1878732 | 313 | 28.1 | 29.2 | 57.5 | 108039 |

NU-Non-Urban CP-Coastal Plain NCP-Not Coastal Plain

Table A-2. Average Dose Equivalents from Terrestrial and Cosmic Radiation (Continued)
(Corrected for Shielding)

| Location | 1970 Population | Elevation (meters) | Dose Equivalent (mrem/y) | | | Population Dose Equivalent (person-rem) |
|---|---|---|---|---|---|---|
| | | | Cosmic | Terrestrial | Total | |
| **TEXAS** | | | | | | |
| ABILENE TX | 90571 | 530 | 30.2 | 29.2 | 59.4 | 5378 |
| AMARILLO TX | 127010 | 1120 | 37.3 | 29.2 | 66.5 | 8441 |
| AUSTIN TX | 264499 | 168 | 27.2 | 14.6 | 41.8 | 11058 |
| BEAUMONT TX | 116350 | 7 | 26.1 | 14.6 | 40.7 | 4733 |
| BROWNSVILLE TX | 52627 | 13 | 26.1 | 14.6 | 40.7 | 2143 |
| BRYAN TX | 51395 | 110 | 26.8 | 14.6 | 41.4 | 2127 |
| CORPUS CHRIS TX | 212820 | 11 | 26.1 | 14.6 | 40.7 | 8663 |
| DALLAS TX | 1338684 | 156 | 27.1 | 14.6 | 41.7 | 55852 |
| EL PASO TX | 337471 | 1147 | 37.7 | 29.2 | 66.9 | 22563 |
| FT WORTH TX | 676944 | 204 | 27.5 | 29.2 | 56.7 | 38361 |
| GALVESTON TX | 61809 | 6 | 26.1 | 12.6 | 38.7 | 2391 |
| HARLINGEN TX | 50469 | 11 | 26.1 | 14.6 | 40.7 | 2054 |
| HOUSTON TX | 1677863 | 17 | 26.2 | 12.6 | 38.8 | 65039 |
| LAREDO TX | 70197 | 128 | 26.9 | 14.6 | 41.5 | 2915 |
| LUBBOCK TX | 150135 | 988 | 35.4 | 29.2 | 64.6 | 9691 |
| MCALLEN TX | 91141 | 129 | 26.9 | 14.6 | 41.5 | 3785 |
| MIDLAND TX | 60371 | 847 | 33.6 | 29.2 | 62.7 | 3788 |
| ODESSA TX | 81645 | 881 | 34.0 | 29.2 | 63.2 | 5157 |
| PT ARTHUR TX | 116474 | 3 | 26.1 | 14.6 | 40.7 | 4735 |
| SAN ANGELO TX | 63884 | 563 | 30.5 | 29.2 | 59.7 | 3814 |
| SAN ANTONIO TX | 772513 | 214 | 27.6 | 14.6 | 42.1 | 32559 |
| SHERMAN TX | 55343 | 219 | 27.6 | 14.6 | 42.2 | 2335 |
| TEXARKANA TX-AR | 36888 | 102 | 26.7 | 14.6 | 41.3 | 1525 |
| TEXAS CITY TX | 84054 | 6 | 26.1 | 14.6 | 40.7 | 3419 |
| TYLER TX | 59781 | 166 | 27.2 | 14.6 | 41.8 | 2499 |
| WACO TX | 118843 | 130 | 26.9 | 14.6 | 41.5 | 4936 |
| WICHITA FALL TX | 97564 | 288 | 28.1 | 29.2 | 57.3 | 5592 |
| TEXAS NU-CP | 2972390 | 76 | 26.6 | 14.6 | 41.2 | 122326 |
| TEXAS NU-NCP | 1306995 | 728 | 32.2 | 29.2 | 61.4 | 80225 |
| **UTAH** | | | | | | |
| OGDEN UT | 149727 | 1311 | 40.4 | 29.2 | 69.6 | 10420 |
| PROVO UT | 104110 | 1387 | 41.8 | 29.2 | 71.0 | 7392 |
| SALT LAKE CY UT | 479342 | 1298 | 40.2 | 29.2 | 69.4 | 33256 |
| UTAH NU | 326094 | 1533 | 44.8 | 29.2 | 74.0 | 24118 |
| **VERMONT** | | | | | | |
| VERMONT NU | 444732 | 180 | 27.1 | 29.2 | 56.5 | 25122 |

NU-Non-Urban CP-Coastal Plain NCP-Not Coastal Plain

Table A-2. Average Dose Equivalents from Terrestrial and Cosmic Radiation (Continued)
(Corrected for Shielding)

| Location | 1970 Population | Elevation (meters) | Dose Equivalent (mrem/y) | | | Population Dose Equivalent (person-rem) |
|---|---|---|---|---|---|---|
| | | | Cosmic | Terrestrial | Total | |
| **VIRGINIA** | | | | | | |
| LYNCHBURG VA | 70842 | 198 | 27.4 | 29.2 | 56.6 | 4011 |
| NEWPORT NEWS VA | 268263 | 6 | 26.1 | 12.5 | 38.6 | 10345 |
| NORFOLK VA | 668259 | 4 | 26.1 | 12.5 | 38.5 | 25759 |
| PETERSBURG VA | 100617 | 23 | 26.2 | 14.6 | 40.8 | 4104 |
| RICHMOND VA | 416563 | 46 | 26.4 | 14.6 | 40.9 | 17056 |
| ROANOKE VA | 156621 | 289 | 28.1 | 29.2 | 57.3 | 8977 |
| WASH DC(VA) | 715841 | 46 | 26.4 | 22.7 | 49.0 | 35082 |
| VIRGINIA NU-CP | 556040 | 30 | 26.2 | 14.6 | 40.8 | 22709 |
| VIRGINIA NU-NCP | 1695448 | 370 | 28.8 | 29.2 | 58.0 | 98291 |
| **WASHINGTON** | | | | | | |
| PORTLAND WA-OR | 73170 | 23 | 26.2 | 29.2 | 55.4 | 4052 |
| SEATTLE WA | 1238107 | 38 | 26.3 | 29.2 | 55.5 | 68695 |
| SPOKANE WA | 229620 | 360 | 28.7 | 29.2 | 57.9 | 13292 |
| TACOMA WA | 332521 | 76 | 26.6 | 29.2 | 55.7 | 18537 |
| WASHINGTON NU | 1535751 | 176 | 27.3 | 29.2 | 56.5 | 86706 |
| **WEST VIRGINIA** | | | | | | |
| CHARLESTON WV | 157662 | 183 | 27.3 | 29.2 | 56.5 | 8910 |
| HUNT WV-KY-OH | 85017 | 172 | 27.2 | 29.2 | 56.4 | 4798 |
| STEUBENVL WV-OH | 37230 | 218 | 27.6 | 38.7 | 66.3 | 2469 |
| WHEELING WV-OH | 60705 | 198 | 27.4 | 44.1 | 71.5 | 4343 |
| WEST VA NU | 1403623 | 433 | 29.3 | 29.2 | 58.5 | 82126 |
| **WISCONSIN** | | | | | | |
| APPLETON WI | 129532 | 219 | 27.6 | 29.2 | 56.8 | 7355 |
| DULUTH WI-MN | 32713 | 186 | 27.3 | 29.2 | 56.5 | 1849 |
| GREEN BAY WI | 129105 | 180 | 27.3 | 29.2 | 56.5 | 7293 |
| KENOSHA WI | 84262 | 186 | 27.3 | 29.2 | 56.5 | 4764 |
| LA CROSSE WI-MN | 60231 | 198 | 27.4 | 29.2 | 56.6 | 3410 |
| MADISON WI | 205457 | 262 | 27.9 | 29.2 | 57.1 | 11733 |
| MILWAUKEE WI | 1252457 | 186 | 27.3 | 29.2 | 56.5 | 70804 |
| OSHKOSH WI | 55480 | 229 | 27.7 | 29.2 | 56.9 | 3154 |
| RACINE WI | 117408 | 192 | 27.4 | 29.2 | 56.6 | 6643 |
| WISCONSIN NU | 2351288 | 295 | 28.2 | 29.2 | 57.4 | 134883 |
| **WYOMING** | | | | | | |
| WYOMING NU | 332416 | 1768 | 50.4 | 29.2 | 79.6 | 26446 |

NU=Non-Urban CP=Coastal Plain NCP=Not Coastal Plain

Appendix B

Corrections to OKI/SIB 72-1

Appendix B

Corrections to ORP/SID 72-1

Three errors were noted in the histograms of figure 13 of Oakley's report (Oa72). One of these was misplacement of the vertical axis for Rocky Flats-Denver (Fig 13q ). This axis was misplaced one scale division to the left. The first noticeable non-zero readings should be in the range 2 to 4 microrems/hour, the mode should be in the range 8-10 microrems/hour, and the arrow should be located at 10.4 microrems/hour.

The other two errors were in the placement of the arrows indicating the mean values for Cincinnati, Ohio, (Fig. 13m) and Los Angeles, California (Fig 13y). For the convenience of the reader, the location of the mean values for the 25 histograms of Figure 13 in (Oa72) are given as Table B-1:

Table B-1

Average Terrestrial Dose Equivalent Values for Measured Sites (Oa72)

| Location | microrems/ hour | Location | microrems/ hour |
|---|---|---|---|
| No. New England | 5.33 | Cincinnati, Ohio | 4.05 |
| So. New England | 6.11 | Chicago, Ill. | 5.18 |
| Camden/Philadelphia | 2.70 | Minneapolis, Minn. | 4.21 |
| Fort Belvoir, Va./D.C. | 4.12 | Galveston, Texas | 2.26 |
| Norfolk, Va. | 3.09 | Rocky Flats-Denver, Colo. | 10.23 |
| Parr, S.C. | 3.76 | Albuquerque, N.M, | 7.34 |
| Sav. Riv/Augusta, Ga. | 3.89 | Carlsbad N.M. | 2.93 |
| Cape Kennedy-Orlando, Fla. | 1.51 | NRTS-Idaho Falls, Idaho | 6.35 |
| Ga. Nuclear Lab-Atlanta, Ga. | 6.61 | Las Vegas, Nevada | 5.35 |
| Oak Ridge, Pa. | 5.95 | Hanford- Richland, Wash. | 5.87 |
| Pittsburgh, Pa. | 5.48 | San Francisco, Calif. | 4.78 |
| Columbus, Ohio | 5.78 | Arguello-Santa Barbara, Calif. | 5.44 |
| | | Los Angeles, Calif. | 6.00 |