**An Assessment of the Radon
Concentrations in Air Caused
by Emissions from Multiple
Sources in a Uranium Mining
and Milling Region. A Case
Study of the Ambrosia Lake
Region of New Mexico**

December 1981

**Prepared for
the U.S. Environmental Protection Agency
under an Interagency Agreement with the
U.S. Department of Energy
under Contract DE-AC06-76RLO 1830**

**Pacific Northwest Laboratory
Operated for the U.S. Department of Energy
by Battelle Memorial Institute**

NOTICE

This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the Department of Energy, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

The views, opinions and conclusions contained in this report are those of the contractor and do not necessarily represent those of the United States Government or the United States Department of Energy.

PACIFIC NORTHWEST LABORATORY
operated by
BATTELLE
for the
UNITED STATES DEPARTMENT OF ENERGY
Under Contract DE-AC06-76RLO 1830

Printed in the United States of America
Available from
National Technical Information Service
United States Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22151

Price: Printed Copy \$_____*: Microfiche \$3.00

*Pages	NTIS
	Selling Price
001-025	\$4.00
026-050	\$4.50
051-075	\$5.25
076-100	\$6.00
101-125	\$6.50
126-150	\$7.25
151-175	\$8.00
176-200	\$9.00
201-225	\$9.25
226-250	\$9.50
251-275	\$10.75
276-300	\$11.00

AN ASSESSMENT OF THE RADON CONCENTRATIONS IN AIR
CAUSED BY EMISSIONS FROM MULTIPLE SOURCES IN A
URANIUM MINING AND MILLING REGION. A CASE STUDY
OF THE AMBROSIA LAKE REGION OF NEW MEXICO

J. G. Droppo
J. A. Glissmeyer

December 1981

Prepared for
the U.S. Environmental Protection Agency
under an Interagency Agreement with the
U.S. Department of Energy under
Contract DE-AC06-76RL0-1830

Project Officer
Paul J. Magno
Office of Radiation Programs (ANR 460)
U.S. Environmental Protection Agency
Washington, DC 20460

Pacific Northwest Laboratory
Richland, Washington 99352

ABSTRACT

Uranium mining and milling operations result in the release of radon from numerous sources of various types and strengths. The Ambrosia Lake mining and milling operations were selected to characterize the relative importance of these sources on ambient atmospheric radon concentrations. All uranium mines at Ambrosia Lake are underground. The comparisons of interest were both between the sources and between the sources and background concentrations.

Source strengths for mine vents were estimated from field measurements made in previous studies. Emission rates for active and inactive mill tailings piles were estimated using data from several of the sites. Emission estimates were made for sites with no data. Other sources from uranium mining and milling were assumed to be small relative to these emissions.

Annual average radon concentrations were computed from the over one hundred vent and four mill tailings pile sources using a sector average Gaussian dispersion model. Ground level point source releases were assumed for vent emissions and ground level virtual point source releases were assumed for the tailings piles.

The results show that vents are by far the greatest source of the computed radon concentrations in the immediate area of the operations. The computed radon concentrations at receptor points were largely influenced by the closer sources, rather than by more distant stronger sources. The area where computed radon concentrations significantly exceed the background is confined to the general area around the vents and mills.

A comparison between computed radon concentrations and monitoring data at selected points demonstrates order of magnitude agreement. The comparison is limited by different time periods for the computed and monitored values, but does not show that the elevated radon concentrations monitored in such regions are of the same order as computed from the uranium mining and milling emissions.

CONTENTS

LIST OF FIGURES	vi
LIST OF TABLES	vii
ABSTRACT	iii

SECTIONS

I. INTRODUCTION	1
II. METHODOLOGY	4
III. RESULTS	16
IV. DISCUSSION AND CONCLUSIONS	23
V. REFERENCES	27
VI. APPENDIX	28

FIGURES

	Page
1. Geographical Features of the Ambrosia Lake District	2
2. Frequency Plot of Mine Vent Source Terms for Spring 1979 Data	10
3. Detailed Map of Mining Area Showing Source and Receptor Points	13
4. Comparison of Monitored and Computed Radon Concentrations	18
5. Computed Radon Concentration Map for Region	20
6. Computed Radon Concentration Map for Intensive Mining Area	22

TABLES

	Page
1. Annual Wind Speed, Wind Direction, and Stability Joint Frequency Summary for the Mining Area	8
2. Comparisons of Onsite Stability with Other STAR Regional Data	9
3. Number of Mine Vents Sampled	9
4. Tailings Pile Source Terms	11
5. Source Terms for Vents and Tailings Piles	14
6. Receptor Locations	15
7. Average Computed and Monitored Radon Concentrations	17
8. Number of Large Sources that Account for 10, 50 and 90% of the Computed Radon Concentrations at Each Receptor	24
9. Sources with the Largest Computed Concentration at Each Receptor	25

Appendix Tables

A.1 - A.12	Computed Radon Concentrations at Receptors Ranked by Source Size
A.13 - A.24	Computed Radon Concentrations at Receptors Ranked by Computed Concentrations

SECTION I

INTRODUCTION

Uranium mining and milling operations result in the release of radon from numerous sources of various types and strength. EPA, under the Clean Air Act, is assessing the health impact of air emissions of radon from various sources, including uranium mines. In the case of uranium mines, multiple sources of radon emissions are often located relatively close together. Therefore, it is necessary for EPA to know the extent to which these multiple sources increase the radon concentration in the air in the mining region and particularly at locations where people may be living. To obtain this type of information, the Ambrosia Lake District of New Mexico was chosen as a "case study". This area was selected because it contained a large number of radon sources for which emission data are available. In addition, radon monitoring data are available for a number of locations in this region.

This region has intensive underground mining with shafts and vents located on a low broad flat area located between several mesas. The geographical features of the Ambrosia Lake area are shown in Figure 1. The dashed area encloses the intensive mining area. Four mill tailings piles are outlined and labeled by letters, A, B, C, and D. Piles A and B are within the mining dashed area, C and D occur below and to the left of the mining area.

Relative contributions of radon are evaluated based on atmospheric modeling of the combinations of the many radon sources. This involves characterization of the source in terms of location and emission rate for input to an atmospheric dispersion model. This model incorporates the local dispersion characteristics to compute atmospheric radon concentrations from the various sources at selected locations.

Annual average radon concentrations are selected for study as being appropriate to EPA interests. In addition, this permits use of models that allow inclusion of a large number of sources without requiring excessive computations.

In addition to releases from various facets of mining and milling, radon is also released from natural sources. The latter occur largely as soil emissions over the entire region. Natural outcroppings of uranium deposits may result

in higher local emissions. Natural emissions maintain a background radon concentration to which the radon contributions from the uranium mining and milling are assumed to be additive.

Although the natural radon emissions through the soil and rocks represent a large total emission over the region, the lack of data on spatial variability precludes inclusion in the radon modeling. Instead, the natural emissions are characterized in terms of an estimated range of background radon concentrations based on monitoring data.

The mine vents and mill tailings piles have by far the greatest total annual radon releases related to the mining and milling operations. In the next section these two groups of sources are used to characterize the radon emissions. Other sources (i.e., ore storage piles, subore and waste rock piles, etc.) are assumed to be sufficiently small that they can be neglected without changing the results.

The large number of sources in the region dictates using relatively simple models and assumptions to keep the required computations within the scope of this evaluation. Although this will limit some aspects of the results, sufficient detail is maintained to meet the objectives related to the comparison of the relative importance of various radon emissions.

SECTION II

METHODOLOGY

Annual average radon concentrations from the multiple radon sources are computed using a Gaussian dispersion model. The following is a description of this dispersion model and the preparation of input data. This involved characterization of local dispersion, identification of radon source locations and emission rates, and selection of receptor locations.

Atmospheric Dispersion Model

The modeling of atmospheric dispersion and transport is kept within reasonable computational limits by selecting appropriate but efficient models and assumptions. Hence from a range of possible dispersion models, a relatively simple model is selected to study relative radon concentrations. The sector averaged Gaussian plume model used to compute average annual radon air concentrations is based directly on many of the algorithms documented by Busse and Zimmerman (1973) as applicable to a rural region.

The sector average concentration $\bar{C}_n$ resulting from point source n is given by

$$\bar{C}_n = \frac{16}{2\pi} \sum_{\ell=1}^6 \sum_{m=1}^6 \frac{\phi(k_n, \ell, m) G_n S(\rho_n, z; U_\ell, P_m)}{\rho_n} \quad (1)$$

where

k_n = wind sector appropriate to the n^{th} point source

G_n = emission rate of the n^{th} point source

ρ_n = distance from the receptor to the n^{th} source

ℓ = index identifying the wind speed class

m = index identifying the class of the Pasquill stability category

$\phi(k, \ell, m)$ = joint frequency function of wind speed, wind direction, and stability

$S(\rho, z; U_\ell, P_m)$ = dispersion function defined in Equation 3

z = height of receptor above ground level

U_ℓ = class interval wind speed

P_m = Pasquill stability category

The sector average concentration C_t resulting from t sources is given by

$$C_t = \sum_{n=1}^t \bar{C}_n \quad (2)$$

The receptor is assumed to be at ground level, that is, $z=0$, making the dispersion function

$$S(\rho_n, 0; U_x, P_m) = \frac{2}{\sqrt{2\pi} U_x \sigma_z(\rho_n)} \exp \left[-\frac{1}{2} \left(\frac{h}{\sigma_z(\rho_n)} \right)^2 \right] \exp \left(-\frac{0.692 \rho_n}{U_x T_{1/2}} \right) \quad (3)$$

New terms in Equation 3 are defined as

$\sigma_z(\rho_n)$ = vertical dispersion function, i.e., the normalized standard deviation of the radon concentration in the vertical plane

h = effective stack height of source, meters

$T_{1/2}$ = half life of radon, hours

The values of vertical dispersion parameter in the six Pasquill stability categories as a function of downwind distance are taken directly from Busse and Zimmerman (1973).

All radon releases are assumed to be at ground level. The exponential containing the release height reduces to unity in Equation 3. The diverse nature of the release modes for the large number of radon releases dictates this as a first step approximation. Although none of the releases occur through a conventional stack, many of the near surface mine vent releases have initial momentum and/or thermal buoyancy that may result in at least low level plume rise. This uncertainty in plume rise characteristics limits the reliability of concentration computed very near the releases.

Atmospheric mixing height considerations are not included. The processes controlling the order of magnitude of the radon concentrations at the relatively close distances are the limited nocturnal dispersion from surface releases. Mixing height limitations are not important under these conditions.

The possibility of radon decay is included in the last exponential in Equation 3. This term is assumed to be unity in this analysis. The relatively short travel times for the distances of interest in this analysis compared to the radon half time of 3.82 days makes this a trivial influence on the computed concentrations.

The mill tailings piles are modeled as virtual area sources using the point source equations given above. One half of the average crosswind widths are used to define the initial dispersion values in terms of a virtual upwind distance of ρ_v . The average concentrations from the area sources are computed using the distance value, ρ , computed as the sum of actual and virtual distances.

Output summaries of both $\bar{C}_n$ and $\bar{C}_t$ are necessary to study the relative contributions of the radon sources. The procedure is to study the fractional radon contributions at a number of selected receptor points in the region. In addition computed radon concentration maps from all emissions are generated to study the spatial characteristics.

Local Meteorological Data

Complex air flow patterns result from the complex topography in this region (Figure 1). Studies show that nocturnal air flow patterns are related to topographically induced air drainage flow (Gedayloo et al, 1979). Since the concentrations computed for near surface releases will be largest for nighttime stable conditions, the characterization of the onsite meteorological conditions is particularly important for complex meteorological areas such as this.

One annual cycle of meteorological data from a central location in this mining and milling area was supplied by Mr. William Fort, Programs, Environmental Protection Agency, Las Vegas, NV. This consisted of time, wind speed and direction, and precipitation values on a computer tape. A STAR¹ scheme in modified form is used to generate joint wind speed, direction, and stability tables. The procedure uses wind speeds, solar angle, and precipitation values to define stability groups. All conditions from one hour after local sunset to one hour before sunrise are considered stable unless winds are greater than 5 m/s. In the latter case conditions are considered night neutral stability.

¹STAR is a computer code used by the National Climatic Center to derive joint wind direction, wind speed and stability summaries from hourly surface observations.

Day neutral stability conditions are considered to occur over two hour transition periods at sunrise and sunset, for daytime conditions with winds greater than 4 m/s, and during precipitation. The remaining daytime periods are considered unstable. The frequencies of the three unstable Pasquill classes are derived by apportioning the unstable based on the frequencies for unstable conditions from a station located 25 km to the south of the mining area.

The annual percentage occurrences of wind speed, direction, and stability class based on onsite meteorological data are in Table 1. Allowing for expected site specific differences, this summary is consistent with other summaries at other locations in this region. Table 2 shows the total frequencies in stability groups are comparable. However, the onsite data have larger frequencies of low wind speeds and differences in wind direction frequency peaks. These differences underline the importance of use on onsite data for the mining and milling operations area.

Source Definition

The radon emission locations are four uranium mill tailings piles and vents of twenty underground uranium mines. This section describes the methods and references used to estimate source terms for these emissions.

For the mine vents, extensive use is made of emissions reported by Jackson, et al (1979,1980). Radon emissions from vents were measured in two campaigns in the Fall 1978 and Spring 1979. Each vent sampling consisted of an air flow measurement and a pair of grab samples using evacuated scintillation flasks. Table 3 summarizes the number of vents sampled, inoperative (zero emission values) or missed during each campaign. Where possible, each vent was sampled twice during each campaign. With the combination of both campaigns, only the vents of two small underground mining operations were unaccounted for. Based upon limited knowledge of these two small operations it is estimated that one had two vents and the other just one. This means emission measurements are available for 114 vents out of an estimated 117 total vents.

A plot of the number of mine vents versus emission rate is given in Figure 2 for the spring measurements. The spring campaign has the most complete coverage. Logarithm of emission rate is plotted to show the predominance of smaller

TABLE 1. Annual Wind Speed, Wind Direction, and Stability Joint Frequency Summary for the Mining Area.

WIND SPEED, KNOTS	ATMOSPHERIC STABILITY	WIND DIRECTION																	TOTAL
		N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM	
0 TO 3	STABLE	1.08	0.84	0.88	0.74	0.91	0.60	0.57	0.65	0.86	0.59	0.61	0.74	1.32	1.08	1.33	1.01	0.26	14.08
	NIGHT NEUTRAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	DAY NEUTRAL	0.54	0.44	0.38	0.38	0.55	0.38	0.41	0.37	0.40	0.24	0.21	0.37	0.64	0.57	0.60	0.53	0.09	7.11
	SLT UNSTABLE	0.98	0.75	0.77	0.69	0.76	0.46	0.48	0.54	0.61	0.44	0.44	0.52	1.10	0.86	1.04	0.91	0.19	11.52
	UNSTABLE	0.74	0.57	0.58	0.52	0.58	0.34	0.36	0.40	0.46	0.33	0.33	0.39	0.83	0.65	0.78	0.68	0.14	8.68
	V UNSTABLE	0.21	0.16	0.16	0.14	0.16	0.10	0.10	0.11	0.13	0.09	0.09	0.11	0.23	0.18	0.22	0.19	0.04	2.40
4 TO 6	STABLE	0.63	0.45	0.26	0.25	0.39	0.23	0.30	0.50	0.76	0.44	0.45	0.50	1.12	0.77	0.70	0.56	0.11	8.44
	NIGHT NEUTRAL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	DAY NEUTRAL	0.30	0.18	0.07	0.07	0.17	0.09	0.18	0.23	0.33	0.22	0.23	0.21	0.59	0.36	0.28	0.20	0.06	3.75
	SLT UNSTABLE	0.17	0.16	0.10	0.07	0.11	0.08	0.17	0.29	0.43	0.30	0.29	0.29	0.51	0.41	0.32	0.20	0.04	3.94
	UNSTABLE	0.13	0.12	0.08	0.05	0.08	0.06	0.13	0.22	0.32	0.22	0.21	0.21	0.39	0.31	0.24	0.15	0.03	2.97
	V UNSTABLE	0.04	0.03	0.02	0.02	0.02	0.02	0.04	0.06	0.09	0.06	0.06	0.06	0.11	0.09	0.07	0.04	0.01	0.82
7 TO 10	STABLE	0.24	0.17	0.04	0.06	0.08	0.04	0.09	0.10	0.26	0.23	0.21	0.25	0.56	0.28	0.25	0.20	0.03	3.10
	NIGHT NEUTRAL	0.33	0.22	0.06	0.03	0.09	0.09	0.09	0.20	0.49	0.50	0.41	0.42	1.03	0.66	0.45	0.35	0.04	5.44
	DAY NEUTRAL	0.25	0.19	0.04	0.01	0.05	0.02	0.04	0.12	0.48	0.45	0.37	0.37	1.05	0.45	0.29	0.25	0.03	4.45
	SLT UNSTABLE	0.09	0.07	0.02	0.00	0.02	0.01	0.04	0.08	0.25	0.28	0.25	0.25	0.47	0.22	0.18	0.13	0.02	2.40
	UNSTABLE	0.07	0.06	0.02	0.00	0.01	0.01	0.03	0.06	0.19	0.21	0.19	0.19	0.35	0.16	0.14	0.10	0.02	1.81
	V UNSTABLE	0.02	0.02	0.00	0.00	0.00	0.00	0.01	0.02	0.05	0.06	0.05	0.05	0.10	0.05	0.04	0.03	0.00	0.50
11 TO 16	STABLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	NIGHT NEUTRAL	0.35	0.15	0.04	0.03	0.10	0.04	0.07	0.20	0.69	0.70	0.51	0.60	1.46	0.84	0.71	0.50	0.03	7.03
	DAY NEUTRAL	0.25	0.13	0.01	0.00	0.02	0.03	0.02	0.07	0.66	0.70	0.50	0.55	1.52	0.86	0.52	0.46	0.02	6.35
	SLT UNSTABLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	UNSTABLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	V UNSTABLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17 TO 21	STABLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	NIGHT NEUTRAL	0.07	0.02	0.00	0.00	0.02	0.00	0.01	0.05	0.18	0.17	0.17	0.24	0.54	0.30	0.22	0.14	0.00	2.14
	DAY NEUTRAL	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.14	0.17	0.09	0.16	0.43	0.27	0.15	0.11	0.00	1.58
	SLT UNSTABLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	UNSTABLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	V UNSTABLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OVER 21	STABLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	NIGHT NEUTRAL	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.03	0.08	0.11	0.11	0.27	0.13	0.10	0.03	0.00	0.90
	DAY NEUTRAL	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.07	0.04	0.08	0.13	0.11	0.04	0.04	0.00	0.62
	SLT UNSTABLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	UNSTABLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	V UNSTABLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	STABLE	1.96	1.47	1.19	1.05	1.38	0.87	0.97	1.25	1.88	1.26	1.27	1.49	3.00	2.13	2.27	1.76	0.40	25.61
	NIGHT NEUTRAL	0.76	0.38	0.10	0.07	0.21	0.14	0.18	0.45	1.39	1.45	1.20	1.37	3.30	1.93	1.47	1.03	0.08	15.51
	DAY NEUTRAL	1.41	0.94	0.51	0.46	0.80	0.52	0.65	0.80	2.07	1.87	1.44	1.74	4.36	2.61	1.88	1.59	0.20	23.85
	SLT UNSTABLE	1.24	0.99	0.89	0.76	0.89	0.55	0.68	0.91	1.29	1.01	0.98	1.06	2.08	1.49	1.54	1.24	0.25	17.85
	UNSTABLE	0.94	0.75	0.67	0.57	0.67	0.41	0.51	0.69	0.97	0.76	0.74	0.80	1.57	1.12	1.16	0.93	0.19	13.45
	V UNSTABLE	0.26	0.21	0.19	0.16	0.19	0.11	0.14	0.19	0.27	0.21	0.20	0.22	0.43	0.31	0.32	0.26	0.05	3.72

BASED ON DATA FROM OFFICE OF RADIATION
PROGRAMS, EPA, LAS VEGAS NV; NOV 1978 to OCT 1979.
Values are expressed in percentage of total observations.

Table 2. COMPARISONS OF ONSITE STABILITY WITH OTHER STAR REGIONAL DATA

<u>Station</u>	<u>Percentage Total Occurrence in Stability Groups</u>					
	<u>Very Unstable</u>	<u>Unstable</u>	<u>Slightly Unstable</u>	<u>Day Neutral</u>	<u>Night Neutral</u>	<u>Stable</u>
Onsite	3.72%	13.45	17.85	23.85	15.51	25.61
25 km South	2.58	9.32	12.37	30.69	16.80	28.17
90 km West	0.37	6.60	10.5	48.033 ¹	--	32.92

¹Single neutral stability value applies to both neutral classes.

Table 3. NUMBER OF MINE VENTS SAMPLED

	<u>Fall 1978</u>	<u>Spring 1979</u>
Sampled	70	104
Zero Value	3	2
Missed	<u>41</u>	<u>8</u>
Total Accounted For	114	114

FIGURE 2. FREQUENCY PLOT OF MINE VENT SOURCE TERMS FOR SPRING 1979 DATA

sources. The distribution is approximately log-normal with a geometric mean emission rate of about 500 Ci/yr. The arithmetic average is 1090 Ci/yr.

Three active and one inactive uranium mills are found within a 20 km radius of the mining area and are located as shown in Figure 1. Each mill has one or more tailings piles which represent the major ^{222}Rn sources for the mill operations. Radon emissions are a function of the areal extent of the piles and the condition and type of cover over the pile. Data on active and inactive tailings pile exhalation rates per unit area are available for some mills (Silker 1979 and Momeni 1979). Published estimates of the areal extent of both active and inactive piles that were unstabilized during the vent sampling periods are also available. Annual emission values are calculated by multiplying the pile area by 365 days/year and by the measured daily exhalation rate where available or the rate measured for a similar pile. Table 4 shows the calculated annual emissions, pile areas and exhalation rates.

Table 4. TAILINGS PILE SOURCE TERMS

Mill	Radon Exhalation Rates Ci/day/km ²	Approximate Area km ²	Approximate Radon Curies/yr
A - inactive	25 ^a	0.37 ^f	3400
B - active	7.1 ^b	1.1 ^g	2800
C - active	7 ^c	0.8 ^h	2000
D - active	8 ^d	0.92 ⁱ	2700
D - inactive	24 ^e	0.3 ^j	2600

5300

a Average of measurements at three other inactive piles. Momeni (1979 pg. 6) measured average values of 35.9 and 15.1 Ci/day/km² at two piles. At another, Silker (1979, see e below) measured a rate of 24 Ci/day/km².

b Silker (1979, pg. 48)

c Silker (1979, pg. 2) an average measured at two other active piles.

d Silker (1979, pg. 47)

e Silker (1979, pg. 49) measured an average exhalation of 500 atoms/cm²/sec or 24 Ci/day/km²

$$\frac{500 \text{ atoms}}{\text{cm}^2 \text{ sec}} \times \frac{{}^{222}\text{Rn} \lambda (\text{min}^{-1}) \text{Ci}}{2.22 \times 10^{12} \text{ disintegration min.}} \times \frac{86,400 \text{ sec}}{\text{day}} \times \frac{10^{10} \text{ cm}^2}{\text{km}^2} = 24 \text{ Ci/day/km}^2$$

$${}^{222}\text{Rn} \lambda = 1.26 \times 10^{-4} \text{ min}^{-1}$$

f Perkins (1979, pg. 122)

g Silker (1979, pg. 6)

h Momeni (1979, pg. 1). The two inactive piles at this mill had been stabilized with clay by the time of vent sampling.

i Silker (1979, pg. 4)

j Silker (1979, pg. 4)

Location and Magnitude of Sources

The intensive mining area identified in Figure 1 is replotted in Figure 3 with the locations of the vents marked by map identification numbers beside solid dots. Mill tailings piles A and B also are in the area covered by Figure 3.

The location of the mine vent sources is accomplished through a combination of aerial photos, published maps, reports and maps supplied by mine operators. The worst case location errors are estimated to be up to 0.35 km. Most vents are located more accurately than this worst case value, particularly in terms of the vent separation distances. The average error is about 0.12 km for absolute vent location. The location of the mill tailings piles are obtained in the same manner. The accuracy of location of these is the 0.02 km resolution used in the definition of source locations.

The source terms derived for input to the dispersion model are listed in Table 5. The map identification numbers for vents and locations in kilometers east and north refer to Figure 3. For the purposes of computation, mill tailings piles A, B, C, and D in Figures 1 and 2 are assigned in Table 5 "map" numbers 120, 121, 122 and 123 respectively. These occur as emission rank numbers, 10, 12, 20 and 4.

The emission rates for the vents are derived primarily from the more complete spring campaign data. Vents missed in the spring campaign are given the emission rate from the fall. The three possible missed vents are approximated with the geometric mean emission rate of about 500 Ci/yr. The mill tailings emissions are from Table 4. These consist of 117 vents and 4 mills of the former, uncapped vents consist of 114 sources.

Receptor Selection

Twelve receptor points are selected for studying the relative radon concentrations from the many sources. These are selected to represent monitoring stations and locations of human activity within the intensive mining area. These receptor points are plotted as open triangles on Figure 3. Table 6 contains a summary of receptor points and their relative locations based on the kilometer distance scales on Figure 3.

FIGURE 3. DETAILED MAP OF MINING AREA SHOWING SOURCE AND RECEPTOR POINTS

Table 5. SOURCE TERMS FOR VENTS AND TAILINGS PILES

RANK	MAP #	X ¹ (km)	Y ² (km)	Q Ci/yr	RANK	MAP #	X (km)	Y (km)	Q Ci/yr
1	94	.97	11.41	8310	60	17	6.45	8.93	600
2	99	2.48	11.53	5670	61	96	1.39	11.66	580
3	110	2.83	9.82	5310	62	107	3.22	9.57	580
4	123	-5.46	-6.82	5300	63	98	2.73	11.93	570
5	82	1.07	11.98	5170	64	35	9.05	8.01	530
6	105	3.72	9.23	4900	65	81	3.25	13.19	530
7	87	2.73	10.49	4570	66	60	10.07	8.23	500
8	95	1.26	11.58	4540	67	77	6.30	5.01	500
9	25	13.17	7.04	3990	68	116	7.79	1.39	500
10	120	8.08	8.85	3400	69	117	7.94	1.49	500
11	54	2.70	9.87	3180	70	80	3.99	12.45	460
12	121	5.31	7.19	2800	71	50	2.73	10.24	450
13	52	3.00	11.48	2770	72	7	6.05	9.57	430
14	51	3.00	11.38	2510	73	91	1.81	10.64	420
15	53	3.55	11.48	2490	74	103	4.24	9.99	410
16	58	11.01	7.59	2330	75	46	5.06	12.87	380
17	27	13.27	6.94	2160	76	22	5.78	10.76	350
18	79	2.60	14.16	2100	77	36	7.59	8.83	350
19	49	2.98	10.71	2050	78	14	6.20	9.23	340
20	122	-5.46	-6.82	2000	79	73	6.18	1.44	340
21	2	4.98	9.72	1950	80	6	5.70	9.60	330
22	29	11.93	7.27	1840	81	114	15.55	3.94	330
23	40	6.35	12.05	1730	82	64	8.46	9.55	319
24	9	5.70	9.37	1720	83	32	12.45	7.34	300
25	88	2.43	10.94	1690	84	10	4.71	9.15	290
26	44	5.03	12.33	1680	85	61	10.49	9.23	280
27	97	1.91	11.61	1560	86	100	2.31	12.03	270
28	15	6.08	10.02	1500	87	34	8.63	8.04	250
29	8	5.48	9.94	1410	88	71	6.05	1.74	240
30	113	7.32	8.41	1400	89	18	6.30	10.79	220
31	43	6.25	11.28	1320	90	112	6.80	8.48	220
32	21	5.03	11.73	1290	91	12	4.96	8.70	210
33	56	4.14	10.76	1260	92	55	28.22	10.99	210
34	1	4.86	9.72	1250	93	74	5.98	1.54	210
35	4	4.71	9.05	1230	94	102	4.17	10.24	210
36	108	3.15	10.07	1230	95	26	12.80	7.99	200
37	30	11.76	7.69	1210	96	47	6.35	13.14	200
38	86	.60	12.60	1180	97	69	6.27	1.34	200
39	62	10.07	9.50	1160	98	37	7.39	8.95	190
40	28	11.95	7.54	1070	99	67	5.93	1.69	180
41	42	5.75	12.65	1060	100	19	5.46	10.81	170
42	106	28.35	9.77	940	101	70	6.32	1.44	170
43	111	6.32	8.56	890	102	33	11.28	8.80	160
44	104	3.84	8.90	880	103	109	2.93	9.92	160
45	13	6.57	9.87	810	104	20	55.40	11.41	150
46	38	6.35	9.13	810	105	66	5.93	1.69	140
47	89	2.33	10.94	790	106	68	5.93	1.69	130
48	5	4.64	9.57	770	107	23	5.11	10.54	100
49	92	1.61	10.49	760	108	90	2.06	10.66	99
50	59	10.69	7.81	750	109	57	1.81	9.25	96
51	48	4.81	13.07	720	110	85	.82	12.08	88
52	115	15.57	3.57	720	111	78	4.98	.79	87
53	11	6.03	8.88	660	112	39	6.45	12.28	72
54	16	5.58	10.17	660	113	31	12.08	8.51	54
55	24	12.95	7.34	650	114	75	5.03	.60	52
56	45	6.80	13.09	650	115	76	5.08	.74	47
57	65	8.56	9.75	643	116	83	.87	13.44	40
58	63	10.99	8.95	620	117	72	5.93	1.69	37
59	101	3.65	10.07	620	118	93	1.19	10.54	10

¹ positive X - km east of origin in Figure 3² positive Y - km north of origin in Figure 3

Table 6. RECEPTOR LOCATIONS¹

<u>Receptor ID</u>	<u>East (km)</u>	<u>North (km)</u>
1	5.90	12.85
2	5.90	10.14
3	6.22	9.20
4	8.13	7.24
5	11.23	7.91
6	6.13	8.11
7	6.75	7.07
8	3.27	6.84
9	4.02	6.15
10	9.25	2.26
11	4.41	8.95
12	6.00	9.62

¹Relative to Scale on Figure 3

SECTION III

RESULTS

Average annual radon concentrations are computed using the source terms listed in Table 5. Detailed analysis of radon concentrations are made at the selected receptor points. In addition patterns of total computed concentrations are plotted.

Receptor Concentrations

The receptor point analysis provides both a basis for comparing computed radon values with monitored values and for studying the relative contributions of the many sources.

The total computed average radon concentration from all sources are given for each receptor in Table 7. Dividing the sources into two groups, vents and tailings piles, provides a means of comparison of the relative radon contribution. The last column in Table 7 contains the monitored radon values obtained over a period of six months.

The computed values do not include a background radon term. For comparison of the monitored and computed values, allowance should be made for a background value. Using the monitored values at monitoring stations located away from the intensive mining area gives an upper limit value for background. For receptors 8, 9, and 10 (Figure 3) the monitored radon values are .63, .82, and 1.25 pCi/l respectively. Allowing that the milling and mining operations may be contributing to these values, the range of possible background radon concentrations are taken to be from 0.0 up to about 0.5 pCi/l.

The computed and monitored values are plotted in Figure 4. The agreement in Figure 4 shows that the computed concentrations from releases from mining and milling activities are of sufficient magnitude to be the major source of the monitored radon values. The fit of points is about as good as can be expected given the major modeling limitations for values adjacent to sources and the different time periods covered by computations and monitored values.

Table 7. AVERAGE COMPUTED AND MONITORED RADON CONCENTRATIONS

Receptor Station Map ID	Annual Average Computed Concentrations			Monitored ^a Concentrations (six months)
	Mine Vents	Tailings Piles	All Sources	
1	1.8 ^b	0.03	1.8	0.94
2	3.9	0.06	4.0	1.99
3	6.0	0.11	6.1	3.14
4	0.83	0.22	1.0	2.58
5	1.8	0.07	1.8	1.77
6	1.6	0.15	1.8	3.29
7	0.89	0.25	1.1	2.67
8	0.82	0.06	0.88	0.63
9	0.63	0.08	0.70	0.82
10	0.33	0.03	0.36	1.25
11	3.3	0.07	3.4	c
12	5.1	0.07	5.2	c

^a Preliminary data for April-Sept 1978 supplied, Radiation Protection Section, Environmental Improvement Division, State of New Mexico in "Status Report, Uranium Mine and Mill Tailings Study for the Grants Mineral Belt", January 1979

^b All values expressed in pCi/ℓ.

^c Not a monitoring site.

FIGURE 4. COMPARISON OF MONITORED AND COMPUTED RADON CONCENTRATIONS

The consideration of background radon concentrations in the comparison of computed and monitored values is limited by the scatter and uncertainty in Figure 4. The y-intercept value of a best fit line would be the background value. For comparison lines with a 1:1 slopes are shown for the estimated range of background values (0.0 to 0.5 pCi/l). Both lines fall within the scatter of points.

The contribution of each source to the concentration at the twelve receptor points is summarized in Appendix A in two sets of tables. The first set containing the emissions ranked by size contains contributions for computed radon values ranked by source size (Table A.1 to A.12 for receptors 1 to 12 respectively). The first column contains emission rank numbers. The second column is map source numbers referring to Table 5 and Figure 3. (Note that tailings piles A to D are sources 120 to 123, respectively.) Each table contains information for total mills, total vents, all sources, and each source in decending order by emission rate. The angle and distance from receptor to each source are given. The computed concentrations are given both as pCi/l and as percentage of the total concentration from all sources. The last column is the cumulative percentage concentration. These tables show that for none of the receptor points are the largest emissions dominating the computed concentrations. Instead the total radon value contains significant contributions from multiple sources with a range of emission rates.

The sources that are contributing the largest fractions of computed radon are more clearly shown in Tables A.13 to A.24 for receptors 1 to 12 respectively. These tables have the results in the first set of tables reorganized in order of relative radon concentration contributions. This second set of tables shows that although several of the receptors have very close sources that contribute a large fraction of the radon concentration, in most cases the largest fraction of computed radon values are from many sources rather than one.

Computed Radon Concentration Patterns

All mine vent and tailings pile source terms are input to a grid output version of the dispersion model. Figure 5 shows the radon concentration patterns plotted over the map presented as Figure 1. The radon values are plotted as lines of constant value. These lines are labeled in pCi/l and occur at natural logarithm concentration spacings to allow display of many order of magnitude.

A detailed map of computed average annual radon concentrations for the intensive mining area is given in Figure 6. The dashed area in Figure 5 is the area covered by Figure 6. The influence of single vents and tailings piles are more evident in this figure.

FIGURE 6. COMPUTED RADON CONCENTRATION MAP FOR INTENSIVE MINING AREA. ISOPLETHS ARE IN pCi/l

SECTION IV

DISCUSSION AND CONCLUSIONS

The computed radon concentrations are of the same order of magnitude as concentrations measured at the receptor points. The major fraction of each of the computed concentrations are from many sources, rather than one. Table 8 summarizes the results in Tables A.1 to A.12 in terms of the number of sources in the region (starting with the largest) that account for 10, 50, and 90% of the computed radon value. The largest source contributors for each receptor are summarized in Table 9. Tables 8 and 9 indicate that the closer sources, rather than the larger sources in the region tend to control the computed radon values.

The accuracy of the large fractional contributions of computed radon for several of the receptors is open to question from a modeling standpoint. Receptors particularly close to a source are marked with a star (*) in Table 9. The uncertainty arises in two ways. First, the computed concentrations will be very sensitive to the exact separation distances. These are on the order of the distance error estimated for location of sources in several cases. Second, the model does not adequately treat dispersion influences at these very close distances. For example, the concentrations will be a function of release vent size, orientation, plume rise, and local surface roughness elements (buildings, walls, trees, etc.). Computed radon concentrations for very close receptors and sources can only be considered as an indication of a large local concentration influence. With the possible exception of a distance error, most modeling limitations will overestimate concentrations computed at very close distances.

This discussion of the accuracy of radon concentrations applies only to the concentrations computed at close distances. As the distance of radon plume travel becomes greater, the effect of the local release point dispersion characteristics becomes progressively smaller. Also, uncertainty about the very close distance computations applies only to a fraction of about one third or less of the computed radon values. The rest of the fraction is contributed by multiple sources at distances appropriate to the modeling assumptions.

Table 8. NUMBER OF LARGE SOURCES THAT ACCOUNT FOR 10,
50 AND 90% OF THE COMPUTED RADON CONCENTRATIONS
AT EACH RECEPTOR¹

<u>Receptor No.</u>	<u>10%</u>	<u>50%</u>	<u>90%</u>
1	7	41	63
2	7	28	59
3	13	46	78
4	6	23	69
5	10	22	63
6	6	30	67
7	5	19	64
8	3	12	58
9	3	13	60
10	3	23	78
11	5	21	57
12	11	31	76

¹Based on Appendix Tables A.1 to A.12.

Table 9. SOURCES WITH THE LARGEST COMPUTED CONCENTRATION AT EACH RECEPTOR

Map Receptor No.	Largest Source No.	Concen. (%)	Emission Rate (Ci/yr)	Distance (m)	Emission Rank No.
1*	42	36.3	1060	248	41
2*	15	24.2	1500	213	28
3*	14	33.7	340	100	78
4	120	14.0	3440	1610	10
5*	58	34.1	2330	392	16
6	111	10.0	890	488	43
7	121	17.5	2800	1640	12
8	105	12.2	4900	2420	6
9	105	10.2	4900	3090	6
10	117	4.4	500	1522	69
11	105	21.9	4900	746	6
12*	7	21.3	430	100	72

* receptors with relatively close sources

Although, the computed and monitored values are of comparable magnitudes, the comparison is limited by the different time frames for these values and by modeling assumptions. A tendency occurs for the larger computed values to exceed corresponding monitored values. These also are computed values with a close source contributing a relatively large fraction. The comparison of monitored and computed values is improved when radon contributions from very close sources are excluded. This relates to the preceding discussion on computed radon values from very close sources.

The scatter in the concentration values precluded evaluation of background concentration from the plot of monitored and computed values. The points do occur in a pattern that is consistent with a background in the estimated range of 0.0 to 0.5 $\mu\text{Ci/l}$.

The relatively high radon concentrations are restricted to an area within and surrounding the mining and milling operations area. Average annual radon con-

centrations approach the estimated background (0.5 pCi/l) at distances of 5 to 10 km away from the intensive mining area. Very high concentrations are computed adjacent to the vents; these range up to 16 pCi/l. The area nature of the tailings piles results in relatively smaller adjacent concentrations than for equivalent vent emission rates.

The receptor point analysis and the concentration maps both clearly demonstrate that the mine vents are the major influence on the computed radon concentrations. The tailing piles contribute to, but do not control the computed radon patterns.

SECTION V

REFERENCES

A. D. Busse and J. R. Zimmerman. "User's Guide for the Climatological Dispersion Model," Publ. No. EPA-RA-73-024 (NTIS PB 227346/AS), Environmental Protection Agency, Research Triangle Park, North Carolina, December 1973.

T. Gedayloo, S. Barr, W. E. Clements and S. K. Wilson. "Summertime Nocturnal Drainage Flow in the San Mateo and Ambrosia Lake Air Sheds of the Grants Basin," Los Alamos Scientific Laboratory, New Mexico, LA-7628-MS, January 1979.

B. L. Perkins, An Overview of the New Mexico Uranium Industry, New Mexico Energy and Minerals Department, Santa Fe, New Mexico, January 1979.

M. H. Momeni, W. E. Kisielski, S. Tyler, A. Zielen, Y. C. Yuan and C. J. Roberts. "Radiological Impact of Uranium Tailings and Alternatives for Their Management," Presented at the Health Physics Society Twelfth Midyear Topical Symposium on Low Level Radioactive Waste Management, February 1979. U. S. Environmental Protection Agency 520/3-27-002.

W. B. Silker and P. G. Heasler. Diffusion and Exhalation of Radon from Uranium Tailings, NUREG/CR-1138, PNL-3207, Pacific Northwest Laboratory, Richland, Washington, October 1979.

APPENDIX A

TABLES OF COMPUTED RADON CONCENTRATIONS
AT SELECTED RECEPTOR POINTS

TABLE A.1a. Computed Radon Concentrations at Receptor 1.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
TOTAL	MILLS	13500	ALL	ALL	.030	1.614	-
TOTAL	VENTS	121174	ALL	ALL	1.804	98.386	-
TOTAL	ALL	134674	ALL	ALL	1.833	100.000	-
1	94	8310	247.5	5140	.035	1.886	1.886
2	99	5670	247.5	3666	.042	2.274	4.160
3	110	5310	225.0	4314	.025	1.373	5.533
4	123	5300	202.5	22710	.002	.127	5.660
5	82	5170	270.0	4913	.048	2.630	8.290
6	105	4900	202.5	4227	.025	1.365	9.655
7	87	4570	225.0	3953	.025	1.365	11.021
8	95	4540	247.5	4806	.021	1.165	12.185
9	25	3990	135.0	9299	.005	.246	12.432
10	120	3400	157.5	4550	.014	.768	13.200
11	54	3180	225.0	4369	.015	.805	14.005
12	121	2800	180.0	5685	.012	.672	14.677
13	52	2770	247.5	3206	.025	1.386	16.063
14	51	2510	247.5	3249	.023	1.228	17.291
15	53	2490	247.5	2722	.030	1.633	18.925
16	58	2330	135.0	7330	.004	.202	19.127
17	27	2160	135.0	9438	.002	.131	19.257
18	79	2100	292.5	3550	.024	1.307	20.564
19	49	2050	225.0	3621	.013	.708	21.272
20	122	2000	202.5	22710	.001	.048	21.320
21	2	1950	202.5	3256	.015	.836	22.156
22	29	1840	135.0	8213	.002	.136	22.292
23	40	1730	157.5	910	.104	5.674	27.966
24	9	1720	180.0	3477	.017	.919	28.886
25	88	1690	247.5	3962	.011	.596	29.482
26	44	1680	247.5	1012	.105	5.703	35.185
27	97	1560	247.5	4180	.009	.504	35.688
28	15	1500	180.0	2832	.021	1.125	36.814
29	8	1410	180.0	2932	.018	.999	37.813
30	113	1400	157.5	4658	.006	.304	38.117
31	43	1320	157.5	1600	.031	1.686	39.803
32	21	1290	225.0	1413	.039	2.119	41.922
33	56	1260	225.0	2727	.013	.695	42.617
34	1	1250	202.5	3293	.010	.526	43.143
35	4	1230	202.5	3976	.007	.379	43.522
36	108	1230	225.0	3910	.007	.374	43.896
37	30	1210	135.0	7801	.002	.096	43.992
38	86	1180	270.0	5312	.010	.525	44.517
39	62	1160	135.0	5344	.003	.158	44.676
40	28	1070	135.0	8048	.001	.081	44.757
41	42	1060	225.0	248	.665	36.267	81.024
42	106	940	90.0	22653	.000	.024	81.047
43	111	890	180.0	4311	.006	.334	81.381
44	104	880	202.5	4448	.004	.225	81.607
45	13	810	157.5	3050	.006	.354	81.961
46	38	810	180.0	3746	.007	.383	82.344
47	89	790	247.5	4049	.005	.269	82.613
48	5	770	202.5	3509	.005	.292	82.905
49	92	760	247.5	4894	.003	.189	83.094
50	59	750	135.0	6946	.001	.070	83.164
51	48	720	292.5	1113	.056	3.073	86.238
52	115	720	135.0	13400	.000	.026	86.264
53	11	660	180.0	3969	.005	.284	86.548
54	16	660	180.0	2697	.010	.537	87.084
55	24	650	135.0	8939	.001	.042	87.127
56	45	650	67.5	926	.033	1.787	88.914
57	65	643	135.0	4080	.003	.138	89.052
58	63	620	135.0	6403	.001	.065	89.117
59	101	620	225.0	3578	.004	.218	89.335
60	17	600	180.0	3956	.005	.259	89.594

TABLE A.1b. Computed Radon Concentrations at Receptor 1.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
61	96	580	247.5	4667	.003	.156	89.751
62	107	580	225.0	4229	.003	.155	89.905
63	98	570	247.5	3304	.005	.271	90.177
64	35	530	157.5	5771	.001	.082	90.259
65	81	530	270.0	2676	.013	.736	90.994
66	60	500	135.0	6215	.001	.055	91.049
67	77	500	180.0	7846	.001	.076	91.125
68	116	500	180.0	11611	.001	.043	91.168
69	117	500	180.0	11539	.001	.044	91.212
70	80	460	247.5	1950	.010	.524	91.736
71	50	450	225.0	4105	.002	.126	91.863
72	7	430	180.0	3276	.005	.254	92.116
73	91	420	247.5	4649	.002	.114	92.230
74	103	410	202.5	3300	.003	.172	92.402
75	46	380	270.0	843	.066	3.606	96.008
76	22	350	180.0	2086	.008	.435	96.444
77	36	350	157.5	4357	.002	.085	96.529
78	14	340	180.0	3633	.003	.169	96.698
79	73	340	180.0	11411	.001	.030	96.728
80	6	330	180.0	3254	.004	.197	96.925
81	114	330	135.0	13127	.000	.012	96.937
82	64	319	135.0	4171	.001	.066	97.003
83	32	300	135.0	8554	.000	.021	97.024
84	10	290	202.5	3882	.002	.093	97.117
85	61	280	135.0	5844	.001	.034	97.151
86	100	270	247.5	3687	.002	.107	97.258
87	34	250	157.5	5530	.001	.041	97.299
88	71	240	180.0	11111	.000	.022	97.321
89	18	220	180.0	2096	.005	.272	97.593
90	112	220	157.5	4455	.001	.051	97.644
91	12	210	202.5	4247	.001	.058	97.702
92	55	210	90.0	22397	.000	.005	97.708
93	74	210	180.0	11309	.000	.019	97.727
94	102	210	202.5	3129	.002	.096	97.823
95	26	200	135.0	8435	.000	.014	97.837
96	47	200	67.5	536	.025	1.386	99.223
97	69	200	180.0	11513	.000	.018	99.241
98	37	190	157.5	4168	.001	.050	99.290
99	67	180	180.0	11160	.000	.017	99.307
100	19	170	202.5	2082	.003	.153	99.460
101	70	170	180.0	11415	.000	.015	99.475
102	33	160	135.0	6730	.000	.016	99.490
103	109	160	225.0	4173	.001	.044	99.534
104	20	150	90.0	49521	.000	.001	99.535
105	66	140	180.0	11160	.000	.013	99.548
106	68	130	180.0	11160	.000	.012	99.560
107	23	100	202.5	2439	.001	.069	99.629
108	90	99	247.5	4420	.001	.029	99.659
109	57	96	225.0	5447	.000	.017	99.676
110	85	88	270.0	5141	.001	.041	99.717
111	78	87	180.0	12087	.000	.007	99.724
112	39	72	135.0	789	.004	.239	99.963
113	31	54	135.0	7547	.000	.004	99.967
114	75	52	180.0	12281	.000	.004	99.972
115	76	47	180.0	12130	.000	.004	99.975
116	83	40	270.0	5069	.000	.019	99.994
117	72	37	180.0	11160	.000	.003	99.998
118	93	10	247.5	5246	.000	.002	100.000

TABLE A.2a. Computed Radon Concentrations at Receptor 2.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
TOTAL	MILLS	13500	ALL	ALL	.056	1.414	-
TOTAL	VENTS	121174	ALL	ALL	3.896	98.586	-
TOTAL	ALL	134674	ALL	ALL	3.952	100.000	-
1	94	8310	292.5	5094	.051	1.303	1.303
2	99	5670	292.5	3693	.061	1.534	2.837
3	110	5310	270.0	3092	.106	2.693	5.530
4	123	5300	225.0	20414	.003	.066	5.596
5	82	5170	292.5	5172	.031	.793	6.389
6	105	4900	247.5	2367	.074	1.879	8.268
7	87	4570	270.0	3193	.087	2.198	10.466
8	95	4540	292.5	4855	.031	.782	11.248
9	25	3990	112.5	7900	.005	.134	11.382
10	120	3400	112.5	2534	.027	.688	12.070
11	54	3180	270.0	3210	.060	1.515	13.585
12	121	2800	202.5	3010	.025	.635	14.220
13	52	2770	292.5	3195	.038	.952	15.172
14	51	2510	292.5	3155	.035	.881	16.053
15	53	2490	292.5	2710	.044	1.124	17.177
16	58	2330	112.5	5711	.005	.124	17.301
17	27	2160	112.5	8030	.003	.071	17.372
18	79	2100	315.0	5198	.013	.330	17.702
19	49	2050	270.0	2981	.044	1.104	18.806
20	122	2000	225.0	20414	.001	.025	18.831
21	2	1950	247.5	1009	.122	3.083	21.915
22	29	1840	112.5	6677	.003	.079	21.993
23	40	1730	22.5	1961	.033	.846	22.839
24	9	1720	202.5	793	.142	3.591	26.430
25	88	1690	292.5	3561	.019	.486	26.916
26	44	1680	337.5	2348	.031	.777	27.692
27	97	1560	292.5	4252	.013	.334	28.027
28	15	1500	135.0	213	.955	24.158	52.185
29	8	1410	247.5	465	.327	8.268	60.453
30	113	1400	135.0	2238	.015	.377	60.830
31	43	1320	22.5	1192	.058	1.479	62.309
32	21	1290	337.5	1809	.036	.920	63.230
33	56	1260	292.5	1866	.042	1.056	64.285
34	1	1250	247.5	1123	.065	1.654	65.939
35	4	1230	225.0	1614	.030	.751	66.690
36	108	1230	270.0	2753	.030	.756	67.446
37	30	1210	112.5	6346	.002	.056	67.501
38	86	1180	292.5	5847	.006	.152	67.653
39	62	1160	90.0	4216	.006	.157	67.810
40	28	1070	112.5	6587	.002	.047	67.857
41	42	1060	.0	2509	.022	.555	68.412
42	106	940	90.0	22447	.000	.011	68.424
43	111	890	157.5	1642	.020	.505	68.929
44	104	880	247.5	2403	.013	.329	69.258
45	13	810	112.5	723	.052	1.327	70.585
46	38	810	157.5	1110	.035	.884	71.469
47	89	790	292.5	3658	.009	.217	71.686
48	5	770	247.5	1387	.028	.717	72.403
49	92	760	270.0	4304	.009	.223	72.626
50	59	750	112.5	5323	.002	.044	72.670
51	48	720	337.5	3123	.008	.207	72.878
52	115	720	135.0	11693	.001	.015	72.893
53	11	660	180.0	1270	.034	.869	73.761
54	16	660	270.0	323	.618	15.648	89.410
55	24	650	112.5	7580	.001	.023	89.433
56	45	650	22.5	3083	.006	.150	89.583
57	65	643	90.0	2683	.007	.184	89.767
58	63	620	112.5	5221	.001	.038	89.805
59	101	620	270.0	2258	.021	.529	90.334
60	17	600	157.5	1332	.019	.483	90.817

TABLE A.2b. Computed Radon Concentrations at Receptor 2.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
61	96	580	292.5	4760	.004	.103	90.920
62	107	580	247.5	2738	.007	.175	91.095
63	98	570	292.5	3642	.006	.158	91.253
64	35	530	135.0	3803	.002	.059	91.312
65	81	530	315.0	4043	.005	.127	91.439
66	60	500	112.5	4583	.002	.038	91.477
67	77	500	180.0	5148	.003	.064	91.541
68	116	500	157.5	8954	.001	.019	91.561
69	117	500	157.5	8890	.001	.019	91.580
70	80	460	315.0	2994	.007	.181	91.761
71	50	450	270.0	3175	.009	.218	91.980
72	7	430	157.5	589	.054	1.361	93.341
73	91	420	270.0	4121	.005	.132	93.473
74	103	410	270.0	1668	.023	.579	94.052
75	46	380	337.5	2855	.005	.127	94.179
76	22	350	337.5	632	.057	1.452	95.631
77	36	350	135.0	2138	.004	.102	95.733
78	14	340	157.5	964	.019	.470	96.202
79	73	340	180.0	8709	.001	.021	96.223
80	6	330	202.5	580	.046	1.167	97.390
81	114	330	112.5	11467	.000	.007	97.397
82	64	319	112.5	2622	.002	.061	97.458
83	32	300	112.5	7121	.000	.012	97.469
84	10	290	225.0	1549	.007	.190	97.659
85	61	280	112.5	4678	.001	.021	97.680
86	100	270	292.5	4060	.002	.062	97.742
87	34	250	135.0	3447	.001	.033	97.775
88	71	240	180.0	8408	.001	.015	97.790
89	18	220	22.5	757	.021	.528	98.319
90	112	220	157.5	1886	.004	.099	98.418
91	12	210	202.5	1719	.005	.121	98.538
92	55	210	90.0	22335	.000	.003	98.541
93	74	210	180.0	8605	.001	.013	98.554
94	102	210	270.0	1738	.011	.277	98.831
95	26	200	112.5	7224	.000	.008	98.838
96	47	200	.0	3033	.003	.077	98.915
97	69	200	180.0	8811	.000	.012	98.927
98	37	190	135.0	1905	.003	.067	98.994
99	67	180	180.0	8456	.000	.011	99.005
100	19	170	337.5	804	.019	.470	99.475
101	70	170	180.0	8715	.000	.010	99.485
102	33	160	112.5	5545	.000	.009	99.494
103	109	160	270.0	2984	.003	.086	99.580
104	20	150	90.0	49516	.000	.001	99.581
105	66	140	180.0	8456	.000	.009	99.589
106	68	130	180.0	8456	.000	.008	99.598
107	23	100	292.5	887	.011	.290	99.887
108	90	99	270.0	3879	.001	.035	99.922
109	57	96	247.5	4188	.001	.014	99.936
110	85	88	292.5	5439	.000	.013	99.949
111	78	87	180.0	9394	.000	.005	99.953
112	39	72	22.5	2201	.001	.029	99.982
113	31	54	112.5	6388	.000	.002	99.985
114	75	52	180.0	9587	.000	.003	99.988
115	76	47	180.0	9434	.000	.003	99.990
116	83	40	292.5	6018	.000	.005	99.995
117	72	37	180.0	8456	.000	.002	99.997
118	93	10	270.0	4728	.000	.003	100.000

TABLE A.3a. Computed Radon Concentrations at Receptor 3.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
TOTAL	MILLS	13500	ALL	ALL	.114	1.881	-
TOTAL	VENTS	121174	ALL	ALL	5.964	98.119	-
TOTAL	ALL	134674	ALL	ALL	6.078	100.000	-
1	94	8310	292.5	5702	.044	.721	.721
2	99	5670	292.5	4411	.045	.744	1.464
3	110	5310	270.0	3453	.089	1.458	2.923
4	123	5300	225.0	19826	.003	.045	2.968
5	82	5170	292.5	5858	.026	.431	3.399
6	105	4900	270.0	2504	.139	2.290	5.689
7	87	4570	292.5	3727	.048	.792	6.481
8	95	4540	292.5	5501	.025	.414	6.895
9	25	3990	112.5	7271	.006	.098	6.993
10	120	3400	90.0	1892	.069	1.130	8.123
11	54	3180	270.0	3584	.050	.821	8.944
12	121	2800	202.5	2208	.042	.690	9.634
13	52	2770	315.0	3949	.027	.450	10.084
14	51	2510	315.0	3893	.025	.417	10.501
15	53	2490	315.0	3518	.030	.489	10.990
16	58	2330	112.5	5050	.006	.097	11.086
17	27	2160	112.5	7395	.003	.052	11.138
18	79	2100	315.0	6140	.010	.169	11.307
19	49	2050	292.5	3583	.023	.379	11.686
20	122	2000	225.0	19826	.001	.017	11.703
21	2	1950	292.5	1344	.111	1.833	13.536
22	29	1840	112.5	6023	.004	.059	13.595
23	40	1730	.0	2854	.029	.476	14.071
24	9	1720	292.5	548	.441	7.262	21.333
25	88	1690	292.5	4172	.015	.243	21.576
26	44	1680	337.5	3343	.017	.281	21.857
27	97	1560	292.5	4940	.010	.170	22.027
28	15	1500	.0	831	.195	3.216	25.243
29	8	1410	315.0	1052	.125	2.055	27.299
30	113	1400	135.0	1349	.035	.571	27.869
31	43	1320	.0	2083	.037	.612	28.481
32	21	1290	337.5	2795	.018	.290	28.771
33	56	1260	315.0	2604	.025	.407	29.179
34	1	1250	292.5	1460	.062	1.025	30.203
35	4	1230	270.0	1520	.080	1.317	31.521
36	108	1230	292.5	3195	.017	.275	31.796
37	30	1210	112.5	5733	.003	.042	31.837
38	86	1180	292.5	6575	.005	.083	31.921
39	62	1160	90.0	3855	.007	.119	32.039
40	28	1070	112.5	5964	.002	.035	32.074
41	42	1060	.0	3479	.013	.210	32.285
42	106	940	90.0	22128	.000	.007	32.292
43	111	890	180.0	652	.141	2.323	34.615
44	104	880	270.0	2399	.027	.442	35.057
45	13	810	22.5	734	.077	1.273	36.330
46	38	810	112.5	144	.965	15.880	52.209
47	89	790	292.5	4263	.007	.110	52.319
48	5	770	292.5	1630	.032	.525	52.845
49	92	760	292.5	4789	.005	.087	52.932
50	59	750	112.5	4675	.002	.036	52.967
51	48	720	337.5	4118	.005	.085	53.053
52	115	720	112.5	10913	.001	.010	53.063
53	11	660	202.5	378	.198	3.264	56.327
54	16	660	337.5	1162	.039	.640	56.967
55	24	650	112.5	6973	.001	.017	56.984
56	45	650	.0	3935	.006	.105	57.089
57	65	643	67.5	2394	.007	.109	57.198
58	63	620	90.0	4768	.003	.045	57.243
59	101	620	292.5	2721	.011	.181	57.424
60	17	600	135.0	352	.151	2.484	59.908

TABLE A.3b. Computed Radon Concentrations at Receptor 3.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
61	96	580	292.5	5423	.003	.054	59.962
62	107	580	270.0	3023	.012	.198	60.161
63	98	570	315.0	4435	.005	.076	60.237
64	35	530	112.5	3067	.003	.051	60.288
65	81	530	315.0	4979	.004	.059	60.347
66	60	500	112.5	3963	.002	.031	60.378
67	77	500	180.0	4191	.004	.059	60.437
68	116	500	157.5	7966	.001	.015	60.452
69	117	500	157.5	7900	.001	.015	60.467
70	80	460	315.0	3941	.005	.075	60.542
71	50	450	292.5	3648	.005	.081	60.622
72	7	430	337.5	410	.151	2.485	63.107
73	91	420	292.5	4642	.003	.051	63.158
74	103	410	292.5	2136	.011	.178	63.336
75	46	380	337.5	3851	.003	.050	63.387
76	22	350	337.5	1624	.012	.194	63.581
77	36	350	112.5	1413	.007	.121	63.702
78	14	340	315.0	100	2.050	33.734	97.436
79	73	340	180.0	7762	.001	.016	97.452
80	6	330	315.0	654	.045	1.066	98.518
81	114	330	112.5	10704	.000	.005	98.523
82	64	319	90.0	2258	.005	.079	98.602
83	32	300	112.5	6496	.001	.009	98.610
84	10	290	270.0	1513	.019	.313	98.923
85	61	280	90.0	4265	.001	.024	98.947
86	100	270	315.0	4831	.002	.031	98.979
87	34	250	112.5	2673	.002	.030	99.009
88	71	240	180.0	7466	.001	.012	99.021
89	18	220	.0	1588	.010	.160	99.181
90	112	220	135.0	917	.010	.171	99.352
91	12	210	247.5	1358	.008	.132	99.483
92	55	210	90.0	22069	.000	.002	99.485
93	74	210	180.0	7667	.001	.010	99.495
94	102	210	292.5	2306	.005	.080	99.575
95	26	200	90.0	6683	.001	.009	99.584
96	47	200	.0	3945	.002	.032	99.616
97	69	200	180.0	7861	.001	.009	99.625
98	37	190	112.5	1191	.005	.088	99.713
99	67	180	180.0	7520	.001	.009	99.722
100	19	170	337.5	1785	.005	.081	99.802
101	70	170	180.0	7763	.000	.008	99.810
102	33	160	90.0	5074	.001	.010	99.820
103	109	160	292.5	3375	.002	.033	99.853
104	20	150	90.0	49227	.000	.000	99.853
105	66	140	180.0	7520	.000	.007	99.860
106	68	130	180.0	7520	.000	.006	99.866
107	23	100	315.0	1743	.004	.063	99.929
108	90	99	292.5	4415	.001	.013	99.942
109	57	96	270.0	4414	.001	.018	99.960
110	85	88	292.5	6124	.000	.007	99.967
111	78	87	180.0	8498	.000	.004	99.970
112	39	72	.0	3083	.001	.017	99.988
113	31	54	90.0	5893	.000	.003	99.990
114	75	52	180.0	8687	.000	.002	99.993
115	76	47	180.0	8533	.000	.002	99.994
116	83	40	315.0	6832	.000	.003	99.997
117	72	37	180.0	7520	.000	.002	99.999
118	93	10	292.5	5209	.000	.001	100.000

TABLE A.4a. Computed Radon Concentrations at Receptor 4.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
TOTAL	MILLS	13500	ALL	ALL	.215	20.563	-
TOTAL	VENTS	121174	ALL	ALL	.832	79.437	-
TOTAL	ALL	134674	ALL	ALL	1.048	100.000	-
1	94	8310	292.5	8290	.026	2.445	2.445
2	99	5670	315.0	7097	.023	2.151	4.597
3	110	5310	292.5	5900	.027	2.542	7.139
4	123	5300	225.0	19555	.003	.264	7.404
5	82	5170	315.0	8508	.016	1.516	8.919
6	105	4900	292.5	4839	.034	3.200	12.119
7	87	4570	292.5	6307	.021	1.989	14.108
8	95	4540	292.5	8125	.014	1.375	15.482
9	25	3990	90.0	5038	.016	1.491	16.974
10	120	3400	.0	1612	.147	13.989	30.963
11	54	3180	292.5	6033	.015	1.475	32.437
12	121	2800	270.0	2827	.065	6.209	38.647
13	52	2770	315.0	6658	.012	1.151	39.798
14	51	2510	315.0	6595	.011	1.057	40.856
15	53	2490	315.0	6247	.012	1.133	41.989
16	58	2330	90.0	2897	.023	2.214	44.203
17	27	2160	90.0	5142	.008	.784	44.987
18	79	2100	315.0	8857	.006	.581	45.569
19	49	2050	315.0	6218	.010	.939	46.508
20	122	2000	225.0	19555	.001	.100	46.608
21	2	1950	315.0	4008	.019	1.792	48.399
22	29	1840	90.0	3794	.012	1.120	49.519
23	40	1730	337.5	5131	.009	.815	50.334
24	9	1720	315.0	3233	.024	2.253	52.587
25	88	1690	292.5	6796	.007	.661	53.248
26	44	1680	337.5	5954	.007	.640	53.887
27	97	1560	315.0	7602	.006	.537	54.424
28	15	1500	315.0	3457	.018	1.759	56.184
29	8	1410	315.0	3787	.015	1.422	57.606
30	113	1400	315.0	1424	.075	7.144	64.750
31	43	1320	337.5	4460	.008	.796	65.546
32	21	1290	315.0	5455	.007	.713	66.258
33	56	1260	315.0	5323	.008	.721	66.979
34	1	1250	315.0	4106	.012	1.103	68.082
35	4	1230	292.5	3871	.012	1.161	69.243
36	108	1230	292.5	5730	.006	.614	69.858
37	30	1210	90.0	3648	.008	.786	70.643
38	86	1180	315.0	9248	.003	.307	70.950
39	62	1160	45.0	2972	.010	.908	71.858
40	28	1070	90.0	3830	.007	.641	72.499
41	42	1060	337.5	5907	.004	.408	72.907
42	106	940	90.0	20369	.001	.048	72.956
43	111	890	315.0	2237	.022	2.145	75.100
44	104	880	292.5	4600	.007	.625	75.725
45	13	810	337.5	3058	.010	.912	76.637
46	38	810	315.0	2596	.016	1.525	78.162
47	89	790	292.5	6879	.003	.304	78.466
48	5	770	292.5	4202	.007	.635	79.100
49	92	760	292.5	7286	.003	.269	79.369
50	59	750	67.5	2617	.007	.636	80.005
51	48	720	337.5	6708	.002	.231	80.236
52	115	720	112.5	8296	.001	.085	80.321
53	11	660	315.0	2668	.012	1.188	81.509
54	16	660	315.0	3884	.007	.639	82.148
55	24	650	90.0	4812	.003	.267	82.415
56	45	650	337.5	6004	.003	.245	82.659
57	65	643	.0	2540	.013	1.245	83.904
58	63	620	67.5	3325	.004	.353	84.257
59	101	620	292.5	5304	.004	.346	84.603
60	17	600	315.0	2384	.014	1.301	85.904

TABLE A.4b. Computed Radon Concentrations at Receptor 4.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
61	96	580	292.5	8061	.002	.178	86.081
62	107	580	292.5	5435	.003	.312	86.394
63	98	570	315.0	7155	.002	.214	86.608
64	35	530	45.0	1197	.020	1.888	88.496
65	81	530	315.0	7700	.002	.179	88.675
66	60	500	67.5	2173	.006	.577	89.252
67	77	500	225.0	2889	.005	.439	89.691
68	116	500	180.0	5863	.002	.201	89.892
69	117	500	180.0	5757	.002	.206	90.098
70	80	460	315.0	6654	.002	.191	90.289
71	50	450	292.5	6183	.002	.201	90.491
72	7	430	315.0	3126	.006	.596	91.086
73	91	420	292.5	7178	.002	.152	91.238
74	103	410	315.0	4768	.003	.283	91.521
75	46	380	337.5	6414	.001	.130	91.651
76	22	350	315.0	4237	.003	.293	91.945
77	36	350	337.5	1678	.011	1.067	93.011
78	14	340	315.0	2770	.006	.575	93.586
79	73	340	202.5	6124	.001	.092	93.678
80	6	330	315.0	3384	.004	.401	94.079
81	114	330	112.5	8115	.000	.040	94.119
82	64	319	.0	2328	.007	.713	94.832
83	32	300	90.0	4316	.002	.148	94.980
84	10	290	292.5	3919	.003	.268	95.248
85	61	280	45.0	3080	.002	.207	95.455
86	100	270	315.0	7541	.001	.094	95.549
87	34	250	22.5	935	.017	1.586	97.135
88	71	240	202.5	5886	.001	.069	97.203
89	18	220	337.5	3993	.002	.159	97.363
90	112	220	315.0	1825	.008	.743	98.106
91	12	210	292.5	3495	.002	.235	98.341
92	55	210	90.0	20434	.000	.011	98.351
93	74	210	202.5	6098	.001	.057	98.409
94	102	210	315.0	4974	.001	.135	98.544
95	26	200	90.0	4721	.001	.085	98.629
96	47	200	337.5	6166	.001	.072	98.701
97	69	200	202.5	6188	.001	.053	98.754
98	37	190	337.5	1865	.005	.485	99.240
99	67	180	202.5	5977	.001	.050	99.290
100	19	170	315.0	4464	.001	.131	99.421
101	70	170	202.5	6079	.000	.047	99.468
102	33	160	67.5	3515	.001	.083	99.551
103	109	160	292.5	5856	.001	.077	99.628
104	20	150	90.0	47452	.000	.002	99.631
105	66	140	202.5	5977	.000	.039	99.670
106	68	130	202.5	5977	.000	.036	99.706
107	23	100	315.0	4475	.001	.077	99.783
108	90	99	292.5	6973	.000	.037	99.820
109	57	96	292.5	6635	.000	.039	99.859
110	85	88	292.5	8769	.000	.024	99.883
111	78	87	202.5	7176	.000	.019	99.902
112	39	72	337.5	5309	.000	.032	99.934
113	31	54	67.5	4141	.000	.021	99.955
114	75	52	202.5	7333	.000	.011	99.966
115	76	47	202.5	7178	.000	.010	99.976
116	83	40	315.0	9551	.000	.010	99.986
117	72	37	202.5	5977	.000	.010	99.997
118	93	10	292.5	7687	.000	.003	100.000

TABLE A.5a. Computed Radon Concentrations at Receptor 5.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
TOTAL	MILLS	13500	ALL	ALL	.067	3.618	-
TOTAL	VENTS	121174	ALL	ALL	1.773	96.382	-
TOTAL	ALL	134674	ALL	ALL	1.839	100.000	-
1	94	8310	292.5	10846	.017	.949	.949
2	99	5670	292.5	9473	.014	.786	1.735
3	110	5310	292.5	8621	.015	.842	2.577
4	123	5300	225.0	22261	.002	.125	2.702
5	82	5170	292.5	10951	.011	.583	3.285
6	105	4900	270.0	7628	.024	1.293	4.577
7	87	4570	292.5	8888	.013	.693	5.271
8	95	4540	292.5	10623	.010	.534	5.805
9	25	3990	112.5	2120	.043	2.333	8.137
10	120	3400	292.5	3287	.044	2.395	10.533
11	54	3180	292.5	8753	.009	.493	11.026
12	121	2800	270.0	5970	.019	1.050	12.076
13	52	2770	292.5	8974	.008	.415	12.490
14	51	2510	292.5	8935	.007	.378	12.869
15	53	2490	292.5	8476	.007	.404	13.273
16	58	2330	225.0	392	.628	34.146	47.419
17	27	2160	112.5	2251	.021	1.143	48.562
18	79	2100	315.0	10655	.005	.255	48.817
19	49	2050	292.5	8720	.006	.320	49.136
20	122	2000	225.0	22261	.001	.047	49.184
21	2	1950	292.5	6506	.009	.462	49.646
22	29	1840	135.0	947	.082	4.480	54.126
23	40	1730	315.0	6404	.008	.433	54.559
24	9	1720	292.5	5720	.009	.491	55.050
25	88	1690	292.5	9309	.004	.240	55.290
26	44	1680	315.0	7610	.006	.329	55.619
27	97	1560	292.5	10030	.004	.199	55.818
28	15	1500	292.5	5572	.008	.444	56.262
29	8	1410	292.5	6102	.007	.366	56.628
30	113	1400	270.0	3949	.019	1.018	57.646
31	43	1320	315.0	6018	.007	.361	58.007
32	21	1290	292.5	7281	.005	.260	58.268
33	56	1260	292.5	7644	.004	.237	58.505
34	1	1250	292.5	6625	.005	.289	58.794
35	4	1230	270.0	6621	.007	.398	59.191
36	108	1230	292.5	8367	.004	.203	59.395
37	30	1210	112.5	566	.118	6.423	65.818
38	86	1180	292.5	11625	.002	.122	65.940
39	62	1160	315.0	1969	.036	1.968	67.908
40	28	1070	112.5	809	.057	3.115	71.022
41	42	1060	315.0	7244	.004	.223	71.245
42	106	940	90.0	17212	.001	.035	71.280
43	111	890	270.0	4952	.008	.445	71.725
44	104	880	270.0	7456	.004	.240	71.965
45	13	810	292.5	5057	.005	.276	72.241
46	38	810	292.5	5034	.005	.278	72.518
47	89	790	292.5	9403	.002	.111	72.629
48	5	770	292.5	6802	.003	.171	72.800
49	92	760	292.5	9962	.002	.098	72.898
50	59	750	270.0	554	.264	14.356	87.255
51	48	720	315.0	8238	.002	.126	87.381
52	115	720	135.0	6137	.001	.080	87.461
53	11	660	270.0	5297	.005	.294	87.755
54	16	660	292.5	6088	.003	.172	87.927
55	24	650	112.5	1803	.009	.497	88.424
56	45	650	315.0	6824	.003	.149	88.572
57	65	643	315.0	3246	.009	.477	89.049
58	63	620	337.5	1070	.042	2.280	91.329
59	101	620	292.5	7889	.002	.112	91.441
60	17	600	292.5	4893	.004	.219	91.660

TABLE A.5b. Computed Radon Concentrations at Receptor 5.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
61	96	580	292.5	10533	.001	.069	91.729
62	107	580	292.5	8180	.002	.099	91.828
63	98	570	292.5	9407	.001	.080	91.908
64	35	530	270.0	2184	.019	1.027	92.935
65	81	530	292.5	9574	.001	.072	93.007
66	60	500	292.5	1209	.034	1.854	94.861
67	77	500	247.5	5724	.002	.097	94.958
68	116	500	202.5	7377	.001	.059	95.017
69	117	500	202.5	7220	.001	.061	95.078
70	80	460	292.5	8546	.001	.074	95.152
71	50	450	292.5	8820	.001	.069	95.221
72	7	430	292.5	5443	.002	.132	95.353
73	91	420	292.5	9810	.001	.055	95.408
74	103	410	292.5	7297	.002	.082	95.490
75	46	380	315.0	7920	.001	.070	95.561
76	22	350	292.5	6156	.002	.090	95.650
77	36	350	292.5	3759	.004	.198	95.848
78	14	340	292.5	5203	.002	.111	95.959
79	73	340	225.0	8215	.001	.033	95.992
80	6	330	292.5	5781	.002	.093	96.085
81	114	330	135.0	5862	.001	.039	96.124
82	64	319	292.5	3224	.004	.232	96.356
83	32	300	112.5	1342	.007	.375	96.731
84	10	290	270.0	6639	.002	.093	96.825
85	61	280	337.5	1510	.011	.580	97.404
86	100	270	292.5	9831	.001	.035	97.440
87	34	250	270.0	2606	.007	.361	97.801
88	71	240	225.0	8062	.000	.024	97.825
89	18	220	292.5	5712	.001	.063	97.888
90	112	220	270.0	4475	.002	.130	98.018
91	12	210	270.0	6324	.001	.072	98.091
92	55	210	90.0	17264	.000	.008	98.098
93	74	210	225.0	8262	.000	.020	98.119
94	102	210	292.5	7442	.001	.041	98.160
95	26	200	90.0	1564	.006	.301	98.461
96	47	200	315.0	7159	.001	.043	98.504
97	69	200	225.0	8233	.000	.019	98.523
98	37	190	292.5	3982	.002	.098	98.621
99	67	180	225.0	8180	.000	.018	98.638
100	19	170	292.5	6466	.001	.041	98.679
101	70	170	225.0	8124	.000	.017	98.696
102	33	160	.0	894	.018	1.004	99.700
103	109	160	292.5	8547	.000	.026	99.726
104	20	150	90.0	44307	.000	.001	99.727
105	66	140	225.0	8180	.000	.014	99.741
106	68	130	225.0	8180	.000	.013	99.754
107	23	100	292.5	6665	.000	.023	99.777
108	90	99	292.5	9580	.000	.013	99.790
109	57	96	270.0	9518	.000	.018	99.808
110	85	88	292.5	11218	.000	.010	99.818
111	78	87	225.0	9471	.000	.007	99.825
112	39	72	315.0	6477	.000	.018	99.843
113	31	54	45.0	1032	.003	.141	99.983
114	75	52	225.0	9589	.000	.004	99.987
115	76	47	225.0	9444	.000	.004	99.991
116	83	40	292.5	11749	.000	.004	99.995
117	72	37	225.0	8180	.000	.004	99.999
118	93	10	292.5	10382	.000	.001	100.000

TABLE A.6a. Computed Radon Concentrations at Receptor 6.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
TOTAL	MILLS	13500	ALL	ALL	.154	8.630	-
TOTAL	VENTS	121174	ALL	ALL	1.632	91.370	-
TOTAL	ALL	134674	ALL	ALL	1.786	100.000	-
1	94	8310	292.5	6122	.040	2.214	2.214
2	99	5670	315.0	5000	.037	2.081	4.295
3	110	5310	292.5	3715	.056	3.146	7.442
4	123	5300	225.0	18895	.003	.163	7.604
5	82	5170	315.0	6368	.024	1.343	8.947
6	105	4900	292.5	2651	.091	5.073	14.021
7	87	4570	315.0	4148	.042	2.327	16.348
8	95	4540	315.0	5973	.023	1.292	17.640
9	25	3990	90.0	7123	.010	.533	18.174
10	120	3400	67.5	2095	.044	2.447	20.621
11	54	3180	292.5	3848	.032	1.778	22.399
12	121	2800	225.0	1229	.106	5.958	28.357
13	52	2770	315.0	4597	.021	1.191	29.548
14	51	2510	315.0	4525	.020	1.108	30.656
15	53	2490	315.0	4245	.022	1.221	31.876
16	58	2330	90.0	4913	.010	.543	32.419
17	27	2160	90.0	7236	.005	.282	32.702
18	79	2100	337.5	7001	.007	.372	33.074
19	49	2050	315.0	4086	.019	1.070	34.144
20	122	2000	225.0	18895	.001	.061	34.205
21	2	1950	315.0	1974	.061	3.390	37.596
22	29	1840	90.0	5864	.006	.325	37.920
23	40	1730	.0	3949	.017	.947	38.867
24	9	1720	337.5	1333	.081	4.514	43.382
25	88	1690	315.0	4652	.013	.712	44.094
26	44	1680	337.5	4354	.011	.618	44.712
27	97	1560	315.0	5477	.009	.503	45.215
28	15	1500	.0	1910	.049	2.732	47.948
29	8	1410	337.5	1945	.035	1.972	49.920
30	113	1400	67.5	1227	.044	2.464	52.384
31	43	1320	.0	3176	.018	1.035	53.419
32	21	1290	337.5	3781	.011	.599	54.018
33	56	1260	315.0	3313	.017	.930	54.948
34	1	1250	315.0	2048	.037	2.044	56.993
35	4	1230	292.5	1698	.048	2.666	59.659
36	108	1230	292.5	3563	.014	.781	60.440
37	30	1210	90.0	5645	.004	.225	60.666
38	86	1180	315.0	7122	.005	.261	60.927
39	62	1160	67.5	4180	.005	.266	61.193
40	28	1070	90.0	5855	.003	.189	61.382
41	42	1060	.0	4553	.008	.459	61.841
42	106	940	90.0	22282	.000	.025	61.866
43	111	890	22.5	488	.178	9.963	71.829
44	104	880	292.5	2415	.019	1.063	72.892
45	13	810	22.5	1816	.018	.995	73.887
46	38	810	22.5	1041	.045	2.521	76.408
47	89	790	315.0	4731	.006	.324	76.732
48	5	770	315.0	2086	.022	1.222	77.954
49	92	760	292.5	5103	.005	.263	78.217
50	59	750	90.0	4572	.004	.197	78.414
51	48	720	337.5	5131	.004	.199	78.613
52	115	720	112.5	10482	.001	.036	78.648
53	11	660	.0	775	.097	5.420	84.068
54	16	660	337.5	2129	.014	.794	84.862
55	24	650	90.0	6863	.002	.092	84.954
56	45	650	.0	5029	.004	.234	85.188
57	65	643	45.0	2930	.005	.302	85.491
58	63	620	90.0	4933	.003	.144	85.634
59	101	620	315.0	3160	.009	.495	86.129
60	17	600	22.5	879	.044	2.477	88.606

TABLE A.6b. Computed Radon Concentrations at Receptor 6.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
61	96	580	315.0	5917	.003	.167	88.774
62	107	580	292.5	3249	.008	.429	89.203
63	98	570	315.0	5111	.004	.203	89.405
64	35	530	90.0	2928	.005	.290	89.696
65	81	530	337.5	5841	.002	.122	89.817
66	60	500	90.0	3945	.003	.167	89.985
67	77	500	180.0	3104	.006	.331	90.316
68	116	500	157.5	6923	.001	.061	90.377
69	117	500	157.5	6864	.001	.062	90.438
70	80	460	337.5	4835	.003	.142	90.581
71	50	450	292.5	4011	.004	.235	90.816
72	7	430	.0	1465	.022	1.218	92.034
73	91	420	292.5	5001	.003	.150	92.183
74	103	410	315.0	2665	.008	.434	92.617
75	46	380	337.5	4879	.002	.116	92.733
76	22	350	.0	2676	.007	.365	93.097
77	36	350	67.5	1630	.007	.383	93.480
78	14	340	.0	1118	.027	1.511	94.991
79	73	340	180.0	6671	.001	.067	95.057
80	6	330	337.5	1546	.012	.676	95.733
81	114	330	112.5	10303	.000	.017	95.750
82	64	319	67.5	2739	.003	.147	95.897
83	32	300	90.0	6370	.001	.047	95.944
84	10	290	315.0	1755	.011	.613	96.557
85	61	280	67.5	4505	.001	.057	96.614
86	100	270	315.0	5471	.002	.087	96.701
87	34	250	90.0	2505	.003	.177	96.878
88	71	240	180.0	6374	.001	.050	96.929
89	18	220	.0	2684	.004	.228	97.157
90	112	220	67.5	765	.015	.856	98.012
91	12	210	292.5	1308	.013	.703	98.715
92	55	210	90.0	22283	.000	.006	98.721
93	74	210	180.0	6573	.001	.042	98.763
94	102	210	315.0	2896	.003	.194	98.956
95	26	200	90.0	6672	.001	.029	98.986
96	47	200	.0	5039	.001	.072	99.058
97	69	200	180.0	6772	.001	.038	99.096
98	37	190	67.5	1520	.004	.234	99.330
99	67	180	180.0	6426	.001	.037	99.367
100	19	170	337.5	2784	.002	.131	99.498
101	70	170	180.0	6674	.001	.033	99.531
102	33	160	90.0	5204	.001	.033	99.565
103	109	160	292.5	3675	.002	.097	99.661
104	20	150	90.0	49387	.000	.001	99.662
105	66	140	180.0	6426	.001	.029	99.691
106	68	130	180.0	6426	.000	.027	99.718
107	23	100	337.5	2634	.002	.085	99.803
108	90	99	292.5	4802	.001	.038	99.841
109	57	96	292.5	4463	.001	.042	99.883
110	85	88	315.0	6626	.000	.022	99.905
111	78	87	180.0	7404	.000	.015	99.919
112	39	72	.0	4178	.001	.036	99.955
113	31	54	90.0	5965	.000	.009	99.965
114	75	52	180.0	7593	.000	.008	99.973
115	76	47	180.0	7438	.000	.008	99.981
116	83	40	315.0	7488	.000	.008	99.989
117	72	37	180.0	6426	.000	.008	99.997
118	93	10	292.5	5501	.000	.003	100.000

TABLE A.7a. Computed Radon Concentrations at Receptor 7.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
TOTAL	MILLS	13500	ALL	ALL	.248	21.819	-
TOTAL	VENTS	121174	ALL	ALL	.887	78.181	-
TOTAL	ALL	134674	ALL	ALL	1.135	100.000	-
1	94	8310	315.0	7226	.032	2.838	2.838
2	99	5670	315.0	6174	.028	2.424	5.262
3	110	5310	315.0	4788	.038	3.361	8.622
4	123	5300	225.0	18486	.003	.264	8.887
5	82	5170	315.0	7307	.019	1.672	10.559
6	105	4900	315.0	3716	.053	4.711	15.270
7	87	4570	315.0	5277	.028	2.444	17.715
8	95	4540	315.0	7100	.018	1.590	19.305
9	25	3990	90.0	6423	.011	.973	20.278
10	120	3400	45.0	2232	.045	3.953	24.231
11	54	3180	315.0	4918	.022	1.926	26.157
12	121	2800	270.0	1443	.199	17.502	43.659
13	52	2770	315.0	5788	.015	1.298	44.957
14	51	2510	315.0	5713	.014	1.199	46.156
15	53	2490	315.0	5451	.014	1.271	47.427
16	58	2330	90.0	4297	.012	1.066	48.493
17	27	2160	90.0	6523	.006	.515	49.009
18	79	2100	337.5	8213	.005	.466	49.475
19	49	2050	315.0	5244	.013	1.107	50.581
20	122	2000	225.0	18486	.001	.100	50.681
21	2	1950	337.5	3184	.022	1.895	52.576
22	29	1840	90.0	5186	.007	.609	53.185
23	40	1730	.0	5000	.011	.990	54.175
24	9	1720	337.5	2530	.028	2.446	56.621
25	88	1690	315.0	5795	.009	.791	57.412
26	44	1680	337.5	5529	.007	.657	58.069
27	97	1560	315.0	6632	.007	.602	58.671
28	15	1500	337.5	3026	.018	1.586	60.257
29	8	1410	337.5	3142	.016	1.401	61.658
30	113	1400	22.5	1455	.044	3.916	65.574
31	43	1320	.0	4245	.011	1.010	66.584
32	21	1290	337.5	4966	.007	.602	67.185
33	56	1260	315.0	4520	.010	.877	68.062
34	1	1250	315.0	3254	.017	1.496	69.558
35	4	1230	315.0	2841	.021	1.843	71.401
36	108	1230	315.0	4683	.009	.807	72.208
37	30	1210	90.0	5047	.005	.416	72.625
38	86	1180	315.0	8271	.004	.333	72.957
39	62	1160	45.0	4117	.006	.489	73.446
40	28	1070	90.0	5229	.004	.350	73.796
41	42	1060	.0	5667	.006	.507	74.303
42	106	940	90.0	21769	.000	.041	74.344
43	111	890	337.5	1546	.033	2.871	77.214
44	104	880	292.5	3433	.011	.935	78.150
45	13	810	.0	2807	.014	1.227	79.377
46	38	810	.0	2096	.023	1.991	81.367
47	89	790	315.0	5869	.004	.363	81.730
48	5	770	315.0	3273	.010	.913	82.643
49	92	760	292.5	6169	.004	.315	82.958
50	59	750	90.0	4012	.004	.384	83.342
51	48	720	337.5	6305	.003	.233	83.576
52	115	720	112.5	9496	.001	.065	83.640
53	11	660	337.5	1948	.016	1.450	85.090
54	16	660	337.5	3311	.007	.601	85.691
55	24	650	90.0	6205	.002	.167	85.858
56	45	650	.0	6026	.003	.285	86.143
57	65	643	45.0	3232	.005	.404	86.547
58	63	620	67.5	4640	.002	.188	86.735
59	101	620	315.0	4314	.005	.466	87.201
60	17	600	.0	1883	.020	1.761	88.962

TABLE A.7b. Computed Radon Concentrations at Receptor 7.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
61	96	580	315.0	7053	.002	.205	89.167
62	107	580	315.0	4321	.005	.435	89.602
63	98	570	315.0	6306	.003	.236	89.838
64	35	530	67.5	2491	.005	.450	90.288
65	81	530	337.5	7053	.002	.146	90.435
66	60	500	67.5	3521	.003	.239	90.674
67	77	500	202.5	2106	.008	.714	91.387
68	116	500	180.0	5773	.002	.190	91.577
69	117	500	157.5	5705	.001	.127	91.704
70	80	460	337.5	6044	.002	.158	91.862
71	50	450	315.0	5120	.003	.251	92.113
72	7	430	337.5	2599	.007	.585	92.698
73	91	420	315.0	6091	.002	.183	92.881
74	103	410	315.0	3851	.004	.372	93.253
75	46	380	337.5	6043	.001	.131	93.384
76	22	350	337.5	3819	.003	.252	93.635
77	36	350	22.5	1952	.007	.600	94.236
78	14	340	337.5	2225	.007	.599	94.834
79	73	340	180.0	5658	.002	.133	94.967
80	6	330	337.5	2735	.005	.412	95.379
81	114	330	112.5	9342	.000	.030	95.410
82	64	319	45.0	3013	.003	.225	95.635
83	32	300	90.0	5710	.001	.087	95.722
84	10	290	315.0	2911	.005	.417	96.139
85	61	280	67.5	4321	.001	.095	96.235
86	100	270	315.0	6656	.001	.104	96.338
87	34	250	67.5	2118	.003	.278	96.617
88	71	240	180.0	5377	.001	.101	96.717
89	18	220	.0	3746	.002	.207	96.924
90	112	220	.0	1414	.012	1.040	97.964
91	12	210	315.0	2422	.005	.410	98.374
92	55	210	90.0	21831	.000	.009	98.383
93	74	210	180.0	5583	.001	.084	98.466
94	102	210	315.0	4090	.002	.172	98.639
95	26	200	90.0	6120	.001	.052	98.691
96	47	200	.0	6088	.001	.086	98.777
97	69	200	180.0	5748	.001	.076	98.854
98	37	190	22.5	1992	.004	.315	99.169
99	67	180	180.0	5443	.001	.074	99.243
100	19	170	337.5	3960	.001	.115	99.358
101	70	170	180.0	5645	.001	.067	99.425
102	33	160	67.5	4859	.001	.045	99.470
103	109	160	315.0	4766	.001	.102	99.572
104	20	150	90.0	48850	.000	.002	99.574
105	66	140	180.0	5443	.001	.058	99.632
106	68	130	180.0	5443	.001	.054	99.685
107	23	100	337.5	3838	.001	.071	99.757
108	90	99	315.0	5907	.001	.045	99.802
109	57	96	292.5	5396	.001	.048	99.850
110	85	88	315.0	7760	.000	.027	99.877
111	78	87	202.5	6516	.000	.020	99.897
112	39	72	.0	5216	.000	.039	99.936
113	31	54	67.5	5522	.000	.012	99.948
114	75	52	202.5	6695	.000	.011	99.960
115	76	47	202.5	6538	.000	.011	99.970
116	83	40	315.0	8670	.000	.011	99.981
117	72	37	180.0	5443	.000	.015	99.996
118	93	10	292.5	6550	.000	.004	100.000

TABLE A.8a. Computed Radon Concentrations at Receptor 8.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
TOTAL	MILLS	13500	ALL	ALL	.064	7.230	-
TOTAL	VENTS	121174	ALL	ALL	.817	92.770	-
TOTAL	ALL	134674	ALL	ALL	.880	100.000	-
1	94	8310	337.5	5112	.041	4.686	4.686
2	99	5670	.0	4753	.041	4.640	9.325
3	110	5310	.0	3009	.081	9.243	18.568
4	123	5300	202.5	16215	.004	.425	18.993
5	82	5170	337.5	5587	.023	2.566	21.560
6	105	4900	.0	2422	.108	12.216	33.776
7	87	4570	.0	3686	.050	5.689	39.465
8	95	4540	337.5	5145	.022	2.537	42.001
9	25	3990	90.0	9897	.006	.678	42.680
10	120	3400	67.5	5213	.010	1.080	43.759
11	54	3180	.0	3078	.047	5.330	49.089
12	121	2800	90.0	2063	.049	5.564	54.654
13	52	2770	.0	4645	.021	2.354	57.008
14	51	2510	.0	4546	.019	2.210	59.219
15	53	2490	.0	4645	.019	2.116	61.335
16	58	2330	90.0	7773	.005	.558	61.893
17	27	2160	90.0	9994	.003	.362	62.255
18	79	2100	.0	7346	.008	.894	63.150
19	49	2050	.0	3880	.021	2.345	65.495
20	122	2000	202.5	16215	.001	.160	65.655
21	2	1950	22.5	3347	.016	1.763	67.418
22	29	1840	90.0	8665	.003	.378	67.796
23	40	1730	22.5	6048	.005	.601	68.397
24	9	1720	45.0	3507	.011	1.218	69.614
25	88	1690	337.5	4177	.012	1.351	70.966
26	44	1680	22.5	5756	.006	.626	71.592
27	97	1560	337.5	4953	.008	.942	72.534
28	15	1500	45.0	4234	.007	.778	73.312
29	8	1410	45.0	3805	.008	.872	74.184
30	113	1400	67.5	4333	.005	.613	74.797
31	43	1320	45.0	5344	.004	.461	75.258
32	21	1290	22.5	5193	.005	.557	75.815
33	56	1260	22.5	4013	.007	.844	76.659
34	1	1250	22.5	3285	.010	1.166	77.825
35	4	1230	22.5	2634	.015	1.654	79.478
36	108	1230	.0	3226	.017	1.908	81.386
37	30	1210	90.0	8523	.002	.254	81.641
38	86	1180	337.5	6346	.004	.488	82.129
39	62	1160	67.5	7294	.002	.228	82.357
40	28	1070	90.0	8707	.002	.218	82.575
41	42	1060	22.5	6310	.003	.346	82.921
42	106	940	90.0	25243	.000	.043	82.964
43	111	890	67.5	3497	.005	.555	83.519
44	104	880	22.5	2135	.015	1.676	85.195
45	13	810	45.0	4475	.003	.383	85.578
46	38	810	45.0	3829	.004	.496	86.074
47	89	790	337.5	4199	.006	.626	86.701
48	5	770	22.5	3049	.007	.812	87.513
49	92	760	337.5	4006	.006	.651	88.164
50	59	750	90.0	7478	.002	.190	88.354
51	48	720	22.5	6411	.002	.230	88.584
52	115	720	112.5	12728	.000	.055	88.640
53	11	660	45.0	3422	.004	.487	89.126
54	16	660	45.0	4045	.003	.369	89.495
55	24	650	90.0	9684	.001	.114	89.609
56	45	650	22.5	7173	.002	.177	89.786
57	65	643	67.5	6026	.001	.166	89.952
58	63	620	67.5	7995	.001	.107	90.059
59	101	620	.0	3245	.008	.953	91.012
60	17	600	67.5	3796	.003	.327	91.339

TABLE A.8b. Computed Radon Concentrations at Receptor 8.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
61	96	580	337.5	5167	.003	.322	91.661
62	107	580	.0	2728	.010	1.187	92.848
63	98	570	.0	5113	.004	.407	93.255
64	35	530	67.5	5894	.001	.141	93.396
65	81	530	.0	6348	.002	.278	93.674
66	60	500	67.5	6935	.001	.106	93.780
67	77	500	112.5	3538	.002	.262	94.042
68	116	500	135.0	7080	.001	.095	94.137
69	117	500	135.0	7101	.001	.094	94.231
70	80	460	.0	5650	.003	.285	94.516
71	50	450	.0	3441	.006	.628	95.143
72	7	430	45.0	3893	.002	.256	95.400
73	91	420	337.5	4066	.003	.351	95.751
74	103	410	22.5	3294	.003	.381	96.131
75	46	380	22.5	6285	.001	.125	96.256
76	22	350	22.5	4650	.002	.184	96.440
77	36	350	67.5	4749	.001	.132	96.572
78	14	340	45.0	3772	.002	.213	96.785
79	73	340	157.5	6135	.001	.100	96.885
80	6	330	45.0	3672	.002	.217	97.102
81	114	330	112.5	12614	.000	.026	97.127
82	64	319	67.5	5845	.001	.086	97.213
83	32	300	90.0	9189	.000	.057	97.270
84	10	290	22.5	2718	.003	.370	97.640
85	61	280	67.5	7599	.000	.052	97.692
86	100	270	.0	5272	.002	.185	97.877
87	34	250	67.5	5487	.001	.074	97.951
88	71	240	157.5	5815	.001	.076	98.027
89	18	220	45.0	4970	.001	.088	98.114
90	112	220	67.5	3883	.001	.115	98.230
91	12	210	45.0	2510	.002	.259	98.489
92	55	210	90.0	25290	.000	.009	98.498
93	74	210	157.5	5955	.001	.064	98.563
94	102	210	22.5	3512	.002	.175	98.738
95	26	200	90.0	9591	.000	.036	98.773
96	47	200	22.5	7009	.000	.056	98.830
97	69	200	157.5	6270	.001	.057	98.887
98	37	190	67.5	4625	.001	.075	98.961
99	67	180	157.5	5800	.001	.057	99.019
100	19	170	22.5	4528	.001	.093	99.112
101	70	170	157.5	6207	.000	.049	99.161
102	33	160	67.5	8246	.000	.026	99.188
103	109	160	.0	3094	.002	.266	99.454
104	20	150	90.0	52328	.000	.002	99.456
105	66	140	157.5	5800	.000	.045	99.501
106	68	130	157.5	5800	.000	.041	99.542
107	23	100	22.5	4125	.001	.064	99.606
108	90	99	337.5	4007	.001	.085	99.691
109	57	96	337.5	2815	.001	.147	99.838
110	85	88	337.5	5780	.000	.042	99.880
111	78	87	157.5	6288	.000	.025	99.905
112	39	72	22.5	6290	.000	.024	99.928
113	31	54	90.0	8959	.000	.011	99.939
114	75	52	157.5	6492	.000	.014	99.953
115	76	47	157.5	6363	.000	.013	99.966
116	83	40	337.5	7021	.000	.014	99.980
117	72	37	157.5	5800	.000	.012	99.992
118	93	10	337.5	4241	.000	.008	100.000

TABLE A.9a. Computed Radon Concentrations at Receptor 9.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
TOTAL	MILLS	13500	ALL	ALL	.076	10.885	-
TOTAL	VENTS	121174	ALL	ALL	.626	89.115	-
TOTAL	ALL	134674	ALL	ALL	.702	100.000	-
1	94	8310	337.5	6078	.032	4.583	4.583
2	99	5670	337.5	5596	.025	3.520	8.103
3	110	5310	337.5	3858	.043	6.070	14.172
4	123	5300	225.0	16061	.004	.521	14.694
5	82	5170	337.5	6532	.018	2.572	17.266
6	105	4900	.0	3089	.072	10.236	27.501
7	87	4570	337.5	4527	.028	4.011	31.513
8	95	4540	337.5	6088	.018	2.498	34.011
9	25	3990	90.0	9194	.007	.944	34.954
10	120	3400	67.5	4883	.011	1.531	36.485
11	54	3180	337.5	3945	.025	3.504	39.989
12	121	2800	45.0	1657	.061	8.635	48.625
13	52	2770	.0	5428	.016	2.277	50.902
14	51	2510	.0	5330	.015	2.117	53.019
15	53	2490	.0	5352	.015	2.088	55.107
16	58	2330	67.5	7139	.004	.592	55.699
17	27	2160	90.0	9284	.004	.504	56.203
18	79	2100	.0	8134	.007	.970	57.173
19	49	2050	337.5	4680	.012	1.703	58.877
20	122	2000	225.0	16061	.001	.197	59.073
21	2	1950	22.5	3699	.013	1.873	60.946
22	29	1840	90.0	7989	.004	.531	61.478
23	40	1730	22.5	6346	.005	.703	62.181
24	9	1720	22.5	3638	.012	1.698	63.879
25	88	1690	337.5	5042	.009	1.218	65.097
26	44	1680	.0	6258	.008	1.127	66.224
27	97	1560	337.5	5849	.006	.909	67.134
28	15	1500	22.5	4382	.008	1.089	68.223
29	8	1410	22.5	4066	.008	1.158	69.381
30	113	1400	45.0	3996	.007	1.001	70.382
31	43	1320	22.5	5597	.005	.642	71.024
32	21	1290	.0	5671	.007	.996	72.020
33	56	1260	.0	4614	.010	1.357	73.377
34	1	1250	22.5	3669	.009	1.217	74.594
35	4	1230	22.5	2983	.012	1.687	76.281
36	108	1230	337.5	4013	.009	1.318	77.598
37	30	1210	90.0	7888	.002	.356	77.954
38	86	1180	337.5	7299	.004	.501	78.455
39	62	1160	67.5	6915	.002	.308	78.763
40	28	1070	90.0	8056	.002	.305	79.069
41	42	1060	22.5	6725	.003	.396	79.465
42	106	940	90.0	24596	.000	.055	79.521
43	111	890	45.0	3332	.006	.860	80.380
44	104	880	.0	2758	.016	2.218	82.598
45	13	810	45.0	4512	.003	.474	83.072
46	38	810	45.0	3780	.004	.635	83.707
47	89	790	337.5	5074	.004	.564	84.271
48	5	770	.0	3478	.009	1.322	85.594
49	92	760	337.5	4962	.004	.573	86.167
50	59	750	67.5	6875	.001	.201	86.368
51	48	720	.0	6964	.003	.415	86.783
52	115	720	112.5	11841	.001	.077	86.860
53	11	660	45.0	3387	.004	.620	87.480
54	16	660	22.5	4310	.003	.492	87.973
55	24	650	90.0	9007	.001	.158	88.131
56	45	650	22.5	7478	.001	.209	88.340
57	65	643	45.0	5790	.002	.251	88.591
58	63	620	67.5	7511	.001	.147	88.738
59	101	620	.0	3936	.006	.868	89.606
60	17	600	45.0	3690	.003	.489	90.095

TABLE A.9b. Computed Radon Concentrations at Receptor 9.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
61	96	580	337.5	6101	.002	.318	90.414
62	107	580	337.5	3513	.005	.774	91.188
63	98	570	337.5	5920	.002	.326	91.514
64	35	530	67.5	5367	.001	.202	91.717
65	81	530	.0	7085	.002	.298	92.015
66	60	500	67.5	6399	.001	.148	92.163
67	77	500	112.5	2550	.004	.564	92.727
68	116	500	135.0	6073	.001	.148	92.875
69	117	500	135.0	6090	.001	.148	93.022
70	80	460	.0	6299	.002	.306	93.328
71	50	450	337.5	4290	.003	.432	93.760
72	7	430	22.5	3980	.003	.366	94.126
73	91	420	337.5	5002	.002	.306	94.432
74	103	410	.0	3850	.004	.595	95.027
75	46	380	.0	6801	.002	.226	95.254
76	22	350	22.5	4937	.001	.209	95.463
77	36	350	45.0	4463	.001	.208	95.671
78	14	340	45.0	3770	.002	.268	95.939
79	73	340	157.5	5182	.001	.160	96.098
80	6	330	22.5	3837	.002	.298	96.397
81	114	330	90.0	11741	.000	.055	96.452
82	64	319	45.0	5590	.001	.131	96.583
83	32	300	90.0	8515	.001	.079	96.662
84	10	290	22.5	3080	.003	.377	97.039
85	61	280	67.5	7166	.000	.071	97.110
86	100	270	337.5	6121	.001	.147	97.257
87	34	250	67.5	4983	.001	.109	97.366
88	71	240	157.5	4860	.001	.127	97.493
89	18	220	22.5	5168	.001	.120	97.613
90	112	220	45.0	3626	.001	.185	97.798
91	12	210	22.5	2722	.002	.335	98.133
92	55	210	67.5	24683	.000	.009	98.142
93	74	210	157.5	5011	.001	.103	98.246
94	102	210	.0	4094	.002	.275	98.521
95	26	200	67.5	8968	.000	.037	98.558
96	47	200	22.5	7371	.000	.066	98.624
97	69	200	157.5	5314	.001	.091	98.714
98	37	190	45.0	4385	.001	.117	98.831
99	67	180	157.5	4855	.001	.095	98.926
100	19	170	22.5	4879	.001	.103	99.029
101	70	170	157.5	5246	.001	.078	99.108
102	33	160	67.5	7735	.000	.036	99.144
103	109	160	337.5	3924	.001	.178	99.322
104	20	150	90.0	51653	.000	.003	99.325
105	66	140	157.5	4855	.001	.074	99.399
106	68	130	157.5	4855	.000	.069	99.468
107	23	100	22.5	4523	.000	.069	99.537
108	90	99	337.5	4920	.001	.076	99.613
109	57	96	315.0	3805	.001	.143	99.756
110	85	88	337.5	6735	.000	.042	99.798
111	78	87	180.0	5443	.000	.058	99.856
112	39	72	22.5	6590	.000	.028	99.884
113	31	54	67.5	8397	.000	.011	99.895
114	75	52	180.0	5647	.000	.033	99.928
115	76	47	180.0	5510	.000	.031	99.958
116	83	40	337.5	7942	.000	.015	99.974
117	72	37	157.5	4855	.000	.020	99.993
118	93	10	337.5	5221	.000	.007	100.000

TABLE A.10a. Computed Radon Concentrations at Receptor 10.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
TOTAL	MILLS	13500	ALL	ALL	.033	9.168	-
TOTAL	VENTS	121174	ALL	ALL	.328	90.832	-
TOTAL	ALL	134674	ALL	ALL	.361	100.000	-
1	94	8310	315.0	12343	.015	4.174	4.174
2	99	5670	315.0	11483	.011	3.154	7.328
3	110	5310	315.0	9923	.013	3.634	10.962
4	123	5300	247.5	17281	.004	1.086	12.047
5	82	5170	315.0	12707	.009	2.492	14.539
6	105	4900	315.0	8896	.014	3.916	18.455
7	87	4570	315.0	10503	.010	2.885	21.340
8	95	4540	315.0	12276	.008	2.298	23.637
9	25	3990	45.0	6185	.010	2.761	26.399
10	120	3400	.0	6698	.015	4.029	30.428
11	54	3180	315.0	10041	.008	2.140	32.568
12	121	2800	315.0	6317	.013	3.643	36.211
13	52	2770	315.0	11143	.006	1.608	37.820
14	51	2510	315.0	11061	.005	1.473	39.292
15	53	2490	337.5	10846	.004	1.170	40.462
16	58	2330	22.5	5615	.008	2.195	42.657
17	27	2160	45.0	6173	.005	1.499	44.157
18	79	2100	337.5	13633	.003	.713	44.870
19	49	2050	315.0	10530	.005	1.290	46.160
20	122	2000	247.5	17281	.001	.410	46.569
21	2	1950	337.5	8597	.005	1.276	47.845
22	29	1840	22.5	5680	.006	1.705	49.550
23	40	1730	337.5	10216	.003	.885	50.435
24	9	1720	337.5	7952	.005	1.258	51.693
25	88	1690	315.0	11038	.004	.994	52.687
26	44	1680	337.5	10915	.003	.782	53.469
27	97	1560	315.0	11887	.003	.826	54.296
28	15	1500	337.5	8386	.004	1.017	55.313
29	8	1410	337.5	8562	.003	.928	56.240
30	113	1400	337.5	6447	.005	1.381	57.622
31	43	1320	337.5	9512	.003	.748	58.369
32	21	1290	337.5	10369	.002	.646	59.016
33	56	1260	337.5	9922	.002	.672	59.688
34	1	1250	337.5	8659	.003	.809	60.497
35	4	1230	337.5	8171	.003	.865	61.362
36	108	1230	315.0	9911	.003	.843	62.205
37	30	1210	22.5	5980	.004	1.042	63.247
38	86	1180	315.0	13485	.002	.523	63.770
39	62	1160	.0	7287	.004	1.219	64.989
40	28	1070	22.5	5933	.003	.932	65.921
41	42	1060	337.5	10963	.002	.491	66.411
42	106	940	67.5	20521	.000	.104	66.516
43	111	890	337.5	6945	.003	.789	67.305
44	104	880	315.0	8567	.003	.742	68.047
45	13	810	337.5	8070	.002	.580	68.627
46	38	810	337.5	7457	.002	.649	69.276
47	89	790	315.0	11100	.002	.461	69.737
48	5	770	337.5	8648	.002	.499	70.237
49	92	760	315.0	11231	.002	.436	70.673
50	59	750	22.5	5738	.002	.685	71.358
51	48	720	337.5	11688	.001	.304	71.662
52	115	720	67.5	6459	.001	.411	72.073
53	11	660	337.5	7364	.002	.538	72.612
54	16	660	337.5	8721	.002	.423	73.035
55	24	650	45.0	6285	.002	.440	73.474
56	45	650	337.5	11112	.001	.295	73.770
57	65	643	.0	7521	.002	.646	74.416
58	63	620	22.5	6917	.002	.434	74.849
59	101	620	315.0	9614	.002	.444	75.293
60	17	600	337.5	7235	.002	.502	75.795

TABLE A.10b. Computed Radon Concentrations at Receptor 10.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
61	96	580	315.0	12253	.001	.294	76.089
62	107	580	315.0	9478	.002	.424	76.513
63	98	570	315.0	11665	.001	.310	76.823
64	35	530	.0	5757	.003	.780	77.603
65	81	530	337.5	12475	.001	.204	77.807
66	60	500	.0	6032	.002	.688	78.495
67	77	500	315.0	4035	.005	1.319	79.815
68	116	500	247.5	1701	.013	3.632	83.447
69	117	500	247.5	1522	.016	4.367	87.814
70	80	460	337.5	11468	.001	.200	88.014
71	50	450	315.0	10310	.001	.292	88.306
72	7	430	337.5	7984	.001	.313	88.618
73	91	420	315.0	11207	.001	.242	88.860
74	103	410	337.5	9217	.001	.243	89.103
75	46	380	337.5	11411	.001	.166	89.269
76	22	350	337.5	9187	.001	.208	89.477
77	36	350	337.5	6778	.001	.321	89.799
78	14	340	337.5	7607	.001	.265	90.064
79	73	340	247.5	3182	.003	.875	90.939
80	6	330	337.5	8152	.001	.233	91.172
81	114	330	67.5	6521	.001	.186	91.358
82	64	319	.0	7334	.001	.332	91.690
83	32	300	22.5	6006	.001	.257	91.947
84	10	290	337.5	8254	.001	.201	92.148
85	61	280	.0	7078	.001	.307	92.455
86	100	270	315.0	11987	.001	.141	92.596
87	34	250	.0	5811	.001	.363	92.959
88	71	240	270.0	3241	.004	1.233	94.192
89	18	220	337.5	9027	.000	.134	94.326
90	112	220	337.5	6691	.001	.206	94.532
91	12	210	337.5	7744	.001	.159	94.691
92	55	210	67.5	20884	.000	.023	94.714
93	74	210	247.5	3351	.002	.496	95.211
94	102	210	337.5	9466	.000	.120	95.330
95	26	200	22.5	6737	.001	.145	95.476
96	47	200	337.5	11267	.000	.089	95.565
97	69	200	247.5	3114	.002	.534	96.098
98	37	190	337.5	6949	.001	.168	96.267
99	67	180	270.0	3371	.003	.866	97.133
100	19	170	337.5	9359	.000	.099	97.232
101	70	170	247.5	3038	.002	.472	97.704
102	33	160	22.5	6855	.000	.113	97.817
103	109	160	315.0	9935	.000	.109	97.927
104	20	150	90.0	47051	.000	.007	97.934
105	66	140	270.0	3371	.002	.674	98.608
106	68	130	270.0	3371	.002	.626	99.233
107	23	100	337.5	9260	.000	.059	99.292
108	90	99	315.0	11063	.000	.058	99.350
109	57	96	315.0	10210	.000	.063	99.413
110	85	88	315.0	12943	.000	.041	99.455
111	78	87	247.5	4509	.000	.126	99.581
112	39	72	337.5	10403	.000	.036	99.617
113	31	54	22.5	6859	.000	.038	99.655
114	75	52	247.5	4531	.000	.075	99.730
115	76	47	247.5	4432	.000	.070	99.800
116	83	40	315.0	13977	.000	.017	99.816
117	72	37	270.0	3371	.001	.178	99.995
118	93	10	315.0	11557	.000	.006	100.000

TABLE A.11a. Computed Radon Concentrations at Receptor 11.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
TOTAL	MILLS	13500	ALL	ALL	.073	2.145	-
TOTAL	VENTS	121174	ALL	ALL	3.346	97.855	-
TOTAL	ALL	134674	ALL	ALL	3.419	100.000	-
1	94	8310	315.0	4232	.073	2.140	2.140
2	99	5670	315.0	3224	.078	2.287	4.427
3	110	5310	292.5	1809	.185	5.417	9.844
4	123	5300	202.5	18606	.003	.090	9.934
5	82	5170	315.0	4512	.041	1.197	11.131
6	105	4900	292.5	746	.750	21.940	33.071
7	87	4570	315.0	2282	.112	3.266	36.337
8	95	4540	315.0	4102	.042	1.230	37.567
9	25	3990	112.5	8960	.004	.130	37.697
10	120	3400	90.0	3671	.023	.669	38.366
11	54	3180	292.5	1941	.099	2.884	41.251
12	121	2800	157.5	1974	.046	1.352	42.603
13	52	2770	337.5	2897	.036	1.044	43.647
14	51	2510	337.5	2811	.034	.995	44.642
15	53	2490	337.5	2674	.037	1.072	45.715
16	58	2330	112.5	6736	.004	.114	45.828
17	27	2160	112.5	9078	.002	.069	45.897
18	79	2100	337.5	5513	.009	.274	46.171
19	49	2050	315.0	2273	.050	1.474	47.645
20	122	2000	202.5	18606	.001	.034	47.679
21	2	1950	45.0	957	.106	3.099	50.778
22	29	1840	112.5	7701	.003	.074	50.852
23	40	1730	22.5	3654	.012	.348	51.200
24	9	1720	67.5	1356	.046	1.336	52.537
25	88	1690	315.0	2805	.029	.858	53.394
26	44	1680	.0	3429	.021	.607	54.001
27	97	1560	315.0	3649	.018	.513	54.514
28	15	1500	67.5	1974	.021	.623	55.137
29	8	1410	45.0	1456	.038	1.109	56.246
30	113	1400	90.0	2952	.014	.395	56.641
31	43	1320	45.0	2966	.011	.318	56.958
32	21	1290	22.5	2845	.013	.393	57.351
33	56	1260	.0	1830	.044	1.287	58.638
34	1	1250	22.5	889	.091	2.649	61.287
35	4	1230	67.5	313	.417	12.198	73.484
36	108	1230	315.0	1686	.050	1.452	74.936
37	30	1210	90.0	7448	.003	.079	75.015
38	86	1180	315.0	5279	.007	.209	75.225
39	62	1160	90.0	5680	.004	.112	75.336
40	28	1070	90.0	7670	.002	.067	75.404
41	42	1060	22.5	3930	.006	.189	75.593
42	106	940	90.0	23945	.000	.012	75.605
43	111	890	112.5	1950	.011	.321	75.926
44	104	880	270.0	572	.294	8.586	84.513
45	13	810	67.5	2344	.009	.253	84.765
46	38	810	90.0	1942	.016	.458	85.223
47	89	790	315.0	2876	.013	.385	85.608
48	5	770	22.5	658	.092	2.701	88.309
49	92	760	292.5	3196	.010	.302	88.611
50	59	750	90.0	6377	.002	.061	88.673
51	48	720	.0	4135	.007	.191	88.863
52	115	720	112.5	12389	.001	.015	88.878
53	11	660	90.0	1613	.017	.508	89.386
54	16	660	45.0	1683	.014	.407	89.793
55	24	650	90.0	8682	.001	.034	89.828
56	45	650	22.5	4777	.003	.084	89.912
57	65	643	90.0	4216	.003	.101	90.012
58	63	620	90.0	6572	.002	.049	90.061
59	101	620	315.0	1355	.036	1.053	91.114
60	17	600	90.0	2033	.011	.314	91.429

TABLE A.11b. Computed Radon Concentrations at Receptor 11.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
61	96	580	315.0	4057	.005	.160	91.589
62	107	580	292.5	1342	.033	.972	92.561
63	98	570	337.5	3420	.006	.163	92.724
64	35	530	112.5	4732	.002	.044	92.769
65	81	530	337.5	4398	.003	.100	92.869
66	60	500	90.0	5699	.002	.048	92.917
67	77	500	157.5	4370	.002	.065	92.981
68	116	500	157.5	8281	.001	.025	93.006
69	117	500	157.5	8253	.001	.025	93.031
70	80	460	.0	3522	.005	.159	93.190
71	50	450	315.0	2122	.012	.362	93.552
72	7	430	67.5	1750	.007	.218	93.771
73	91	420	292.5	3102	.006	.175	93.946
74	103	410	.0	1055	.036	1.048	94.994
75	46	380	.0	3971	.004	.108	95.101
76	22	350	45.0	2266	.005	.132	95.233
77	36	350	90.0	3176	.003	.088	95.320
78	14	340	90.0	1806	.007	.217	95.537
79	73	340	157.5	7717	.001	.019	95.556
80	6	330	67.5	1441	.008	.232	95.787
81	114	330	112.5	12210	.000	.007	95.794
82	64	319	90.0	4085	.002	.053	95.847
83	32	300	112.5	8195	.000	.011	95.858
84	10	290	67.5	357	.077	2.257	98.115
85	61	280	90.0	6082	.001	.024	98.140
86	100	270	315.0	3728	.003	.086	98.225
87	34	250	112.5	4314	.001	.024	98.250
88	71	240	157.5	7400	.000	.014	98.263
89	18	220	45.0	2630	.002	.065	98.328
90	112	220	90.0	2426	.003	.086	98.414
91	12	210	112.5	599	.019	.545	98.960
92	55	210	90.0	23894	.000	.003	98.962
93	74	210	157.5	7578	.000	.012	98.974
94	102	210	.0	1313	.013	.373	99.347
95	26	200	90.0	8438	.000	.011	99.358
96	47	200	22.5	4616	.001	.027	99.385
97	69	200	157.5	7837	.000	.011	99.396
98	37	190	90.0	2976	.002	.053	99.449
99	67	180	157.5	7422	.000	.010	99.459
100	19	170	22.5	2131	.003	.084	99.543
101	70	170	157.5	7753	.000	.009	99.552
102	33	160	90.0	6871	.000	.012	99.564
103	109	160	292.5	1774	.006	.168	99.732
104	20	150	90.0	51047	.000	.001	99.733
105	66	140	157.5	7422	.000	.008	99.741
106	68	130	157.5	7422	.000	.007	99.748
107	23	100	22.5	1732	.002	.069	99.818
108	90	99	315.0	2911	.002	.047	99.865
109	57	96	270.0	2620	.003	.074	99.939
110	85	88	315.0	4763	.001	.019	99.958
111	78	87	180.0	8179	.000	.007	99.964
112	39	72	22.5	3896	.000	.013	99.977
113	31	54	90.0	7676	.000	.003	99.981
114	75	52	180.0	8380	.000	.004	99.985
115	76	47	180.0	8236	.000	.004	99.988
116	83	40	315.0	5720	.000	.006	99.995
117	72	37	157.5	7422	.000	.002	99.997
118	93	10	292.5	3593	.000	.003	100.000

TABLE A.12a. Computed Radon Concentrations at Receptor 12.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
TOTAL	MILLS	13500	ALL	ALL	.071	1.362	-
TOTAL	VENTS	121174	ALL	ALL	5.146	98.638	-
TOTAL	ALL	134674	ALL	ALL	5.217	100.000	-
1	94	8310	292.5	5341	.048	.922	.922
2	99	5670	292.5	4006	.053	1.016	1.938
3	110	5310	270.0	3180	.102	1.947	3.885
4	123	5300	225.0	20040	.003	.051	3.937
5	82	5170	292.5	5468	.029	.555	4.491
6	105	4900	270.0	2315	.159	3.039	7.530
7	87	4570	292.5	3386	.056	1.081	8.611
8	95	4540	292.5	5125	.028	.535	9.145
9	25	3990	112.5	7617	.006	.107	9.253
10	120	3400	112.5	2220	.034	.649	9.902
11	54	3180	270.0	3307	.057	1.093	10.995
12	121	2800	202.5	2527	.034	.642	11.637
13	52	2770	292.5	3530	.032	.612	12.248
14	51	2510	292.5	3479	.030	.568	12.816
15	53	2490	315.0	3080	.037	.710	13.526
16	58	2330	112.5	5406	.005	.102	13.628
17	27	2160	112.5	7744	.003	.057	13.685
18	79	2100	315.0	5669	.012	.221	13.905
19	49	2050	292.5	3216	.028	.528	14.434
20	122	2000	225.0	20040	.001	.019	14.453
21	2	1950	270.0	1021	.246	4.721	19.174
22	29	1840	112.5	6378	.003	.064	19.237
23	40	1730	.0	2455	.037	.712	19.949
24	9	1720	225.0	387	.474	9.089	29.038
25	88	1690	292.5	3805	.017	.330	29.368
26	44	1680	337.5	2871	.022	.422	29.790
27	97	1560	292.5	4547	.012	.227	30.017
28	15	1500	.0	403	.684	13.115	43.132
29	8	1410	292.5	612	.301	5.766	48.898
30	113	1400	135.0	1790	.022	.415	49.313
31	43	1320	.0	1680	.053	1.019	50.332
32	21	1290	337.5	2319	.024	.461	50.794
33	56	1260	292.5	2181	.032	.617	51.411
34	1	1250	270.0	1145	.130	2.501	53.912
35	4	1230	247.5	1410	.044	.844	54.756
36	108	1230	270.0	2886	.028	.530	55.286
37	30	1210	112.5	6070	.002	.045	55.331
38	86	1180	292.5	6171	.006	.106	55.437
39	62	1160	90.0	4069	.007	.126	55.563
40	28	1070	112.5	6306	.002	.038	55.601
41	42	1060	.0	3035	.016	.307	55.908
42	106	940	90.0	22345	.000	.009	55.916
43	111	890	157.5	1114	.038	.732	56.648
44	104	880	247.5	2274	.014	.273	56.921
45	13	810	67.5	621	.080	1.535	58.456
46	38	810	135.0	605	.077	1.480	59.936
47	89	790	292.5	3898	.008	.148	60.084
48	5	770	270.0	1364	.060	1.150	61.234
49	92	760	270.0	4474	.008	.159	61.392
50	59	750	112.5	5024	.002	.036	61.429
51	48	720	337.5	3646	.006	.122	61.550
52	115	720	112.5	11324	.001	.011	61.561
53	11	660	180.0	744	.084	1.608	63.170
54	16	660	315.0	689	.119	2.276	65.446
55	24	650	112.5	7309	.001	.019	65.465
56	45	650	22.5	3561	.005	.090	65.554
57	65	643	90.0	2557	.008	.151	65.705
58	63	620	90.0	5029	.002	.047	65.752
59	101	620	270.0	2397	.019	.363	66.115
60	17	600	157.5	825	.043	.815	66.930

TABLE A.12b. Computed Radon Concentrations at Receptor 12.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
61	96	580	292.5	5041	.004	.070	67.000
62	107	580	270.0	2778	.014	.266	67.266
63	98	570	315.0	4004	.005	.105	67.372
64	35	530	112.5	3450	.003	.049	67.420
65	81	530	315.0	4509	.004	.081	67.501
66	60	500	112.5	4297	.002	.032	67.533
67	77	500	180.0	4622	.003	.059	67.592
68	116	500	157.5	8424	.001	.016	67.608
69	117	500	157.5	8361	.001	.016	67.623
70	80	460	315.0	3468	.006	.108	67.731
71	50	450	270.0	3331	.008	.153	67.884
72	7	430	135.0	100	1.112	21.318	89.202
73	91	420	292.5	4312	.003	.067	89.268
74	103	410	292.5	1799	.014	.277	89.545
75	46	380	337.5	3382	.004	.073	89.618
76	22	350	.0	1162	.026	.499	90.117
77	36	350	112.5	1774	.005	.097	90.214
78	14	340	157.5	443	.070	1.344	91.558
79	73	340	180.0	8185	.001	.017	91.575
80	6	330	270.0	298	.358	6.863	98.439
81	114	330	112.5	11109	.000	.005	98.444
82	64	319	90.0	2456	.004	.080	98.524
83	32	300	112.5	6839	.000	.009	98.533
84	10	290	247.5	1372	.011	.208	98.741
85	61	280	90.0	4506	.001	.026	98.767
86	100	270	292.5	4409	.002	.041	98.808
87	34	250	112.5	3070	.001	.028	98.836
88	71	240	180.0	7886	.001	.013	98.849
89	18	220	22.5	1202	.010	.184	99.033
90	112	220	135.0	1389	.005	.099	99.133
91	12	210	225.0	1388	.007	.125	99.258
92	55	210	90.0	22262	.000	.002	99.259
93	74	210	180.0	8084	.001	.011	99.270
94	102	210	292.5	1937	.007	.125	99.396
95	26	200	112.5	6989	.000	.006	99.402
96	47	200	.0	3538	.002	.045	99.447
97	69	200	180.0	8287	.001	.010	99.456
98	37	190	112.5	1541	.003	.066	99.523
99	67	180	180.0	7936	.000	.009	99.532
100	19	170	337.5	1309	.008	.157	99.690
101	70	170	180.0	8190	.000	.009	99.698
102	33	160	90.0	5345	.001	.011	99.709
103	109	160	270.0	3089	.003	.062	99.771
104	20	150	90.0	49433	.000	.000	99.771
105	66	140	180.0	7936	.000	.007	99.779
106	68	130	180.0	7936	.000	.007	99.785
107	23	100	315.0	1280	.006	.122	99.908
108	90	99	292.5	4078	.001	.017	99.925
109	57	96	270.0	4207	.001	.022	99.947
110	85	88	292.5	5735	.000	.009	99.956
111	78	87	180.0	8887	.000	.004	99.960
112	39	72	.0	2690	.001	.025	99.985
113	31	54	90.0	6177	.000	.003	99.988
114	75	52	180.0	9078	.000	.002	99.991
115	76	47	180.0	8925	.000	.002	99.993
116	83	40	315.0	6398	.000	.004	99.996
117	72	37	180.0	7936	.000	.002	99.998
118	93	10	270.0	4897	.000	.002	100.000

TABLE A.13. Largest Computed Concentrations at Receptor 1.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
41	42	1060	225.0	248	.665	36.267	36.267
26	44	1680	247.5	1012	.105	5.703	41.970
23	40	1730	157.5	910	.104	5.674	47.644
73	46	380	270.0	843	.066	3.606	51.250
51	48	720	292.5	1113	.056	3.073	54.324
5	82	5170	270.0	4913	.048	2.630	56.954
2	99	5670	247.5	3666	.042	2.274	59.228
32	21	1290	225.0	1413	.039	2.119	61.347
1	94	8310	247.5	5140	.035	1.886	63.233
56	45	650	67.5	926	.033	1.787	65.020
31	43	1320	157.5	1600	.031	1.686	66.705
15	53	2490	247.5	2722	.030	1.633	68.339
13	52	2770	247.5	3206	.025	1.386	69.725
96	47	200	67.5	536	.025	1.386	71.111
3	110	5310	225.0	4314	.025	1.373	72.484
6	105	4900	202.5	4227	.025	1.365	73.849
7	87	4570	225.0	3953	.025	1.365	75.215
18	79	2100	292.5	3550	.024	1.307	76.522
14	51	2510	247.5	3249	.023	1.228	77.750
8	95	4540	247.5	4806	.021	1.165	78.915
28	15	1500	180.0	2832	.021	1.125	80.040
29	8	1410	180.0	2932	.018	.999	81.039
24	9	1720	180.0	3477	.017	.919	81.959
21	2	1950	202.5	3256	.015	.836	82.795
11	54	3180	225.0	4369	.015	.805	83.600
10	120	3400	157.5	4550	.014	.768	84.369
65	81	530	270.0	2676	.013	.736	85.104
19	49	2050	225.0	3621	.013	.708	85.812
33	56	1260	225.0	2727	.013	.695	86.507
12	121	2800	180.0	5685	.012	.672	87.179
25	88	1690	247.5	3962	.011	.596	87.775
54	16	660	180.0	2697	.010	.537	88.312
34	1	1250	202.5	3293	.010	.526	88.838
38	86	1180	270.0	5312	.010	.525	89.363
70	80	460	247.5	1950	.010	.524	89.888
27	97	1560	247.5	4180	.009	.504	90.391
76	22	350	180.0	2086	.008	.435	90.827
46	38	810	180.0	3746	.007	.383	91.210
35	4	1230	202.5	3976	.007	.379	91.589
36	108	1230	225.0	3910	.007	.374	91.963
45	13	810	157.5	3050	.006	.354	92.317
43	111	890	180.0	4311	.006	.334	92.651
30	113	1400	157.5	4658	.006	.304	92.955
48	5	770	202.5	3509	.005	.292	93.247
53	11	660	180.0	3969	.005	.284	93.531
89	18	220	180.0	2096	.005	.272	93.802
63	98	570	247.5	3304	.005	.271	94.074
47	89	790	247.5	4049	.005	.269	94.343
60	17	600	180.0	3956	.005	.259	94.602
72	7	430	180.0	3276	.005	.254	94.855
9	25	3990	135.0	9299	.005	.246	95.102
112	39	72	135.0	789	.004	.239	95.341
44	104	880	202.5	4448	.004	.225	95.566
59	101	620	225.0	3578	.004	.218	95.785
16	58	2330	135.0	7330	.004	.202	95.987
80	6	330	180.0	3254	.004	.197	96.184
49	92	760	247.5	4894	.003	.189	96.373
74	103	410	202.5	3300	.003	.172	96.545
78	14	340	180.0	3633	.003	.169	96.714
39	62	1160	135.0	5344	.003	.158	96.872

TABLE A.14. Largest Computed Concentrations at Receptor 2.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
28	15	1500	135.0	213	.955	24.158	24.158
54	16	660	270.0	323	.618	15.648	39.806
29	8	1410	247.5	465	.327	8.268	48.074
24	9	1720	202.5	793	.142	3.591	51.666
21	2	1950	247.5	1009	.122	3.083	54.749
3	110	5310	270.0	3092	.106	2.693	57.442
7	87	4570	270.0	3193	.087	2.198	59.640
6	105	4900	247.5	2367	.074	1.879	61.519
34	1	1250	247.5	1123	.065	1.654	63.172
2	99	5670	292.5	3693	.061	1.534	64.706
11	54	3180	270.0	3210	.060	1.515	66.222
31	43	1320	22.5	1192	.058	1.479	67.701
76	22	350	337.5	632	.057	1.452	69.153
72	7	430	157.5	589	.054	1.361	70.514
45	13	810	112.5	723	.052	1.327	71.842
1	94	8310	292.5	5094	.051	1.303	73.145
80	6	330	202.5	580	.046	1.167	74.312
15	53	2490	292.5	2710	.044	1.124	75.436
19	49	2050	270.0	2981	.044	1.104	76.540
33	56	1260	292.5	1866	.042	1.056	77.596
13	52	2770	292.5	3195	.038	.952	78.548
32	21	1290	337.5	1809	.036	.920	79.468
46	38	810	157.5	1110	.035	.884	80.352
14	51	2510	292.5	3155	.035	.881	81.233
53	11	660	180.0	1270	.034	.869	82.101
23	40	1730	22.5	1961	.033	.846	82.947
5	82	5170	292.5	5172	.031	.793	83.740
8	95	4540	292.5	4855	.031	.782	84.522
26	44	1680	337.5	2348	.031	.777	85.299
36	108	1230	270.0	2753	.030	.756	86.054
35	4	1230	225.0	1614	.030	.751	86.806
48	5	770	247.5	1387	.028	.717	87.522
10	120	3400	112.5	2534	.027	.688	88.210
12	121	2800	202.5	3010	.025	.635	88.845
74	103	410	270.0	1668	.023	.579	89.424
41	42	1060	.0	2509	.022	.555	89.979
59	101	620	270.0	2258	.021	.529	90.508
89	18	220	22.5	757	.021	.528	91.036
43	111	890	157.5	1642	.020	.505	91.542
25	88	1690	292.5	3561	.019	.486	92.027
60	17	600	157.5	1332	.019	.483	92.510
100	19	170	337.5	804	.019	.470	92.980
78	14	340	157.5	964	.019	.470	93.450
30	113	1400	135.0	2238	.015	.377	93.827
27	97	1560	292.5	4252	.013	.334	94.161
18	79	2100	315.0	5198	.013	.330	94.491
44	104	880	247.5	2403	.013	.329	94.820
107	23	100	292.5	887	.011	.290	95.110
94	102	210	270.0	1738	.011	.277	95.386
49	92	760	270.0	4304	.009	.223	95.610
71	50	450	270.0	3175	.009	.218	95.828
47	89	790	292.5	3658	.009	.217	96.045
51	48	720	337.5	3123	.008	.207	96.253
84	10	290	225.0	1549	.007	.190	96.442
57	65	643	90.0	2683	.007	.184	96.626
70	80	460	315.0	2994	.007	.181	96.808
62	107	580	247.5	2738	.007	.175	96.983
63	98	570	292.5	3642	.006	.158	97.140
39	62	1160	90.0	4216	.006	.157	97.298
38	86	1180	292.5	5847	.006	.152	97.449

TABLE A.15. Largest Computed Concentrations at Receptor 3.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
78	14	340	315.0	100	2.050	33.734	33.734
46	38	810	112.5	144	.965	15.880	49.614
24	9	1720	292.5	548	.441	7.262	56.876
53	11	660	202.5	378	.198	3.264	60.140
28	15	1500	.0	831	.195	3.216	63.356
72	7	430	337.5	410	.151	2.485	65.841
60	17	600	135.0	352	.151	2.484	68.325
43	111	890	180.0	652	.141	2.323	70.648
6	105	4900	270.0	2504	.139	2.290	72.938
29	8	1410	315.0	1052	.125	2.055	74.993
21	2	1950	292.5	1344	.111	1.833	76.826
3	110	5310	270.0	3453	.089	1.458	78.285
35	4	1230	270.0	1520	.080	1.317	79.602
45	13	810	22.5	754	.077	1.273	80.875
10	120	3400	90.0	1892	.069	1.130	82.005
80	6	330	315.0	654	.065	1.066	83.071
34	1	1250	292.5	1460	.062	1.025	84.096
11	54	3180	270.0	3584	.050	.821	84.917
7	87	4570	292.5	3727	.048	.792	85.709
2	99	5670	292.5	4411	.045	.744	86.453
1	94	8310	292.5	5702	.044	.721	87.173
12	121	2800	202.5	2208	.042	.690	87.863
54	16	660	337.5	1162	.039	.640	88.503
31	43	1320	.0	2083	.037	.612	89.115
30	113	1400	135.0	1349	.035	.571	89.686
48	5	770	292.5	1630	.032	.525	90.211
15	53	2490	315.0	3518	.030	.489	90.700
23	40	1730	.0	2854	.029	.476	91.176
13	52	2770	315.0	3949	.027	.450	91.626
44	104	880	270.0	2399	.027	.442	92.067
5	82	5170	292.5	5858	.026	.431	92.499
14	51	2510	315.0	3893	.025	.417	92.916
8	95	4540	292.5	5501	.025	.414	93.330
33	56	1260	315.0	2604	.025	.407	93.737
19	49	2050	292.5	3583	.023	.379	94.116
84	10	290	270.0	1513	.019	.313	94.429
32	21	1290	337.5	2795	.018	.290	94.720
26	44	1680	337.5	3343	.017	.281	95.001
36	108	1230	292.5	3195	.017	.275	95.276
25	88	1690	292.5	4172	.015	.243	95.519
41	42	1060	.0	3479	.013	.210	95.729
62	107	580	270.0	3023	.012	.198	95.927
76	22	350	337.5	1624	.012	.194	96.121
59	101	620	292.5	2721	.011	.181	96.302
74	103	410	292.5	2136	.011	.178	96.481
90	112	220	135.0	917	.010	.171	96.652
27	97	1560	292.5	4940	.010	.170	96.821
18	79	2100	315.0	6140	.010	.169	96.990
89	18	220	.0	1588	.010	.160	97.150
91	12	210	247.5	1358	.008	.132	97.282
77	36	350	112.5	1413	.007	.121	97.403
39	62	1160	90.0	3855	.007	.119	97.522
47	89	790	292.5	4263	.007	.110	97.632
57	65	643	67.5	2394	.007	.109	97.741
56	45	650	.0	3935	.006	.105	97.846
9	25	3990	112.5	7271	.006	.098	97.944
16	58	2330	112.5	5050	.006	.097	98.040
98	37	190	112.5	1191	.005	.088	98.128
49	92	760	292.5	4789	.005	.087	98.215
51	48	720	337.5	4118	.005	.085	98.301

TABLE A.16. Largest Computed Concentrations at Receptor 4.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
10	120	3400	.0	1612	.147	13.989	13.989
30	113	1400	315.0	1424	.075	7.144	21.133
12	121	2800	270.0	2827	.065	6.209	27.342
6	105	4900	292.5	4839	.034	3.200	30.542
3	110	5310	292.5	5900	.027	2.542	33.085
1	94	8310	292.5	8290	.026	2.445	35.530
24	9	1720	315.0	3233	.024	2.253	37.783
16	58	2330	90.0	2897	.023	2.214	39.997
2	99	5670	315.0	7097	.023	2.151	42.149
43	111	890	315.0	2237	.022	2.145	44.294
7	87	4570	292.5	6307	.021	1.989	46.282
64	35	530	45.0	1197	.020	1.888	48.170
21	2	1950	315.0	4008	.019	1.792	49.962
28	15	1500	315.0	3457	.018	1.759	51.721
87	34	250	22.5	935	.017	1.586	53.307
46	38	810	315.0	2596	.016	1.525	54.833
5	82	5170	315.0	8508	.016	1.516	56.348
9	25	3990	90.0	5038	.016	1.491	57.839
11	54	3180	292.5	6033	.015	1.475	59.314
29	8	1410	315.0	3787	.015	1.422	60.736
8	95	4540	292.5	8125	.014	1.375	62.111
60	17	600	315.0	2384	.014	1.301	63.412
57	65	643	.0	2540	.013	1.245	64.656
53	11	660	315.0	2668	.012	1.188	65.844
35	4	1230	292.5	3871	.012	1.161	67.005
13	52	2770	315.0	6658	.012	1.151	68.156
15	53	2490	315.0	6247	.012	1.133	69.289
22	29	1840	90.0	3794	.012	1.120	70.409
34	1	1250	315.0	4106	.012	1.103	71.512
77	36	350	337.5	1678	.011	1.067	72.579
14	51	2510	315.0	6595	.011	1.057	73.636
19	49	2050	315.0	6218	.010	.939	74.576
45	13	810	337.5	3058	.010	.912	75.487
39	62	1160	45.0	2972	.010	.908	76.395
23	40	1730	337.5	5131	.009	.815	77.210
31	43	1320	337.5	4460	.008	.796	78.006
37	30	1210	90.0	3648	.008	.786	78.792
17	27	2160	90.0	5142	.008	.784	79.576
90	112	220	315.0	1825	.008	.743	80.319
33	56	1260	315.0	5323	.008	.721	81.040
82	64	319	.0	2328	.007	.713	81.753
32	21	1290	315.0	5455	.007	.713	82.466
25	88	1690	292.5	6796	.007	.661	83.126
40	28	1070	90.0	3830	.007	.641	83.767
26	44	1680	337.5	5954	.007	.640	84.407
54	16	660	315.0	3884	.007	.639	85.045
50	59	750	67.5	2617	.007	.636	85.681
48	5	770	292.5	4202	.007	.635	86.316
44	104	880	292.5	4600	.007	.625	86.941
36	108	1230	292.5	5730	.006	.614	87.555
72	7	430	315.0	3126	.006	.596	88.150
18	79	2100	315.0	8857	.006	.581	88.732
66	60	500	67.5	2173	.006	.577	89.309
78	14	340	315.0	2770	.006	.575	89.884
27	97	1560	315.0	7602	.006	.537	90.421
98	37	190	337.5	1865	.005	.485	90.906
67	77	500	225.0	2889	.005	.439	91.345
41	42	1060	337.5	5907	.004	.408	91.753
80	6	330	315.0	3384	.004	.401	92.154
58	63	620	67.5	3325	.004	.353	92.507

TABLE A.17. Largest Computed Concentrations at Receptor 5.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
16	58	2330	225.0	392	.628	34.146	34.146
50	59	750	270.0	554	.264	14.356	48.503
37	30	1210	112.5	566	.118	6.423	54.926
22	29	1840	135.0	947	.082	4.480	59.406
40	28	1070	112.5	809	.057	3.115	62.521
10	120	3400	292.5	3287	.044	2.395	64.916
9	25	3990	112.5	2120	.043	2.333	67.249
58	63	620	337.5	1070	.042	2.280	69.529
39	62	1160	315.0	1969	.036	1.968	71.497
66	60	500	292.5	1209	.034	1.854	73.351
6	105	4900	270.0	7628	.024	1.293	74.643
17	27	2160	112.5	2251	.021	1.143	75.786
12	121	2800	270.0	5970	.019	1.050	76.836
64	35	530	270.0	2184	.019	1.027	77.863
30	113	1400	270.0	3949	.019	1.018	78.881
102	33	160	.0	894	.018	1.004	79.885
1	94	8310	292.5	10846	.017	.949	80.834
3	110	5310	292.5	8621	.015	.842	81.676
2	99	5670	292.5	9473	.014	.786	82.461
7	87	4570	292.5	8888	.013	.693	83.155
5	82	5170	292.5	10951	.011	.583	83.737
85	61	280	337.5	1510	.011	.580	84.317
8	95	4540	292.5	10623	.010	.534	84.851
55	24	650	112.5	1803	.009	.497	85.348
11	54	3180	292.5	8753	.009	.493	85.841
24	9	1720	292.5	5720	.009	.491	86.332
57	65	643	315.0	3246	.009	.477	86.808
21	2	1950	292.5	6506	.009	.462	87.271
43	111	890	270.0	4952	.008	.445	87.716
28	15	1500	292.5	5572	.008	.444	88.160
23	40	1730	315.0	6404	.008	.433	88.593
13	52	2770	292.5	8974	.008	.415	89.008
15	53	2490	292.5	8476	.007	.404	89.412
35	4	1230	270.0	6621	.007	.398	89.810
14	51	2510	292.5	8935	.007	.378	90.188
83	32	300	112.5	1342	.007	.375	90.563
29	8	1410	292.5	6102	.007	.366	90.929
87	34	250	270.0	2606	.007	.361	91.290
31	43	1320	315.0	6018	.007	.361	91.651
26	44	1680	315.0	7610	.006	.329	91.980
19	49	2050	292.5	8720	.006	.320	92.300
95	26	200	90.0	1564	.006	.301	92.601
53	11	660	270.0	5297	.005	.294	92.895
34	1	1250	292.5	6625	.005	.289	93.184
46	38	810	292.5	5034	.005	.278	93.462
45	13	810	292.5	5057	.005	.276	93.737
32	21	1290	292.5	7281	.005	.260	93.998
18	79	2100	315.0	10653	.005	.255	94.252
25	88	1690	292.5	9309	.004	.240	94.492
44	104	880	270.0	7456	.004	.240	94.732
33	56	1260	292.5	7644	.004	.237	94.969
82	64	319	292.5	3224	.004	.232	95.202
41	42	1060	315.0	7244	.004	.223	95.424
60	17	600	292.5	4893	.004	.219	95.643
36	108	1230	292.5	8367	.004	.203	95.847
27	97	1560	292.5	10030	.004	.199	96.046
77	36	350	292.5	3759	.004	.198	96.244
54	16	660	292.5	6088	.003	.172	96.416
48	5	770	292.5	6802	.003	.171	96.587
56	45	650	315.0	6824	.003	.149	96.736

TABLE A.18. Largest Computed Concentrations at Receptor 6.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
43	111	890	22.5	488	.178	9.963	9.963
12	121	2800	225.0	1229	.106	5.958	15.921
53	11	660	.0	775	.097	5.420	21.341
6	105	4900	292.5	2651	.091	5.073	26.414
24	9	1720	337.5	1333	.081	4.514	30.929
21	2	1950	315.0	1974	.061	3.390	34.319
3	110	5310	292.5	3715	.056	3.146	37.466
28	15	1500	.0	1910	.049	2.732	40.198
35	4	1230	292.5	1698	.048	2.666	42.864
46	38	810	22.5	1041	.045	2.521	45.385
60	17	600	22.5	879	.044	2.477	47.863
30	113	1400	67.5	1227	.044	2.464	50.327
10	120	3400	67.5	2095	.044	2.447	52.774
7	87	4570	315.0	4148	.042	2.327	55.102
1	94	8310	292.5	6122	.040	2.214	57.315
2	99	5670	315.0	5000	.037	2.081	59.397
34	1	1250	315.0	2048	.037	2.044	61.441
29	8	1410	337.5	1945	.035	1.972	63.413
11	54	3180	292.5	3848	.032	1.778	65.191
78	14	340	.0	1118	.027	1.511	66.702
5	82	5170	315.0	6368	.024	1.343	68.045
8	95	4540	315.0	5973	.023	1.292	69.337
48	5	770	315.0	2086	.022	1.222	70.559
15	53	2490	315.0	4245	.022	1.221	71.779
72	7	430	.0	1465	.022	1.218	72.997
13	52	2770	315.0	4597	.021	1.191	74.188
14	51	2510	315.0	4525	.020	1.108	75.296
19	49	2050	315.0	4086	.019	1.070	76.366
44	104	880	292.5	2415	.019	1.063	77.429
31	43	1320	.0	3176	.018	1.035	78.465
45	13	810	22.5	1816	.018	.995	79.460
23	40	1730	.0	3949	.017	.947	80.407
33	56	1260	315.0	3313	.017	.930	81.337
90	112	220	67.5	765	.015	.856	82.192
54	16	660	337.5	2129	.014	.794	82.987
36	108	1230	292.5	3563	.014	.781	83.768
25	88	1690	315.0	4652	.013	.712	84.480
91	12	210	292.5	1308	.013	.703	85.183
80	6	330	337.5	1546	.012	.676	85.859
26	44	1680	337.5	4354	.011	.618	86.477
84	10	290	315.0	1755	.011	.613	87.090
32	21	1290	337.5	3781	.011	.599	87.690
16	58	2330	90.0	4913	.010	.543	88.233
9	25	3990	90.0	7123	.010	.533	88.766
27	97	1560	315.0	5477	.009	.503	89.269
59	101	620	315.0	3160	.009	.495	89.763
41	42	1060	.0	4553	.008	.459	90.222
74	103	410	315.0	2665	.008	.434	90.656
62	107	580	292.5	3249	.008	.429	91.085
77	36	350	67.5	1630	.007	.383	91.468
18	79	2100	337.5	7001	.007	.372	91.840
76	22	350	.0	2676	.007	.365	92.204
67	77	500	180.0	3104	.006	.331	92.535
22	29	1840	90.0	5864	.006	.325	92.860
47	89	790	315.0	4731	.006	.324	93.184
57	65	643	45.0	2930	.005	.302	93.486
64	35	530	90.0	2928	.005	.290	93.776
17	27	2160	90.0	7236	.005	.282	94.059
39	62	1160	67.5	4180	.005	.266	94.324
49	92	760	292.5	5103	.005	.263	94.587

TABLE A.19. Largest Computed Concentrations at Receptor 7.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
12	121	2800	270.0	1443	.199	17.502	17.502
6	105	4900	315.0	3716	.053	4.711	22.213
10	120	3400	45.0	2232	.045	3.953	26.166
30	113	1400	22.5	1455	.044	3.916	30.082
3	110	5310	315.0	4788	.038	3.361	33.443
43	111	890	337.5	1546	.033	2.871	36.313
1	94	8310	315.0	7226	.032	2.838	39.152
24	9	1720	337.5	2530	.028	2.446	41.598
7	87	4570	315.0	5277	.028	2.444	44.042
2	99	5670	315.0	6174	.028	2.424	46.466
46	38	810	.0	2096	.023	1.991	48.457
11	54	3180	315.0	4918	.022	1.926	50.382
21	2	1950	337.5	3184	.022	1.895	52.277
35	4	1230	315.0	2841	.021	1.843	54.120
60	17	600	.0	1883	.020	1.761	55.881
5	82	5170	315.0	7507	.019	1.672	57.554
8	95	4540	315.0	7100	.018	1.590	59.144
28	15	1500	337.5	3026	.018	1.586	60.730
34	1	1250	315.0	3254	.017	1.496	62.226
53	11	660	337.5	1948	.016	1.450	63.675
29	8	1410	337.5	3142	.016	1.401	65.076
13	52	2770	315.0	5788	.015	1.298	66.374
15	53	2490	315.0	5451	.014	1.271	67.646
45	13	810	.0	2807	.014	1.227	68.872
14	51	2510	315.0	5713	.014	1.199	70.071
19	49	2050	315.0	5244	.013	1.107	71.178
16	58	2330	90.0	4297	.012	1.066	72.244
90	112	220	.0	1414	.012	1.040	73.284
31	43	1320	.0	4245	.011	1.010	74.293
23	40	1730	.0	5000	.011	.990	75.283
9	25	3990	90.0	6423	.011	.973	76.256
44	104	880	292.5	3433	.011	.935	77.192
48	5	770	315.0	3273	.010	.913	78.104
33	56	1260	315.0	4520	.010	.877	78.981
36	108	1230	315.0	4683	.009	.807	79.789
25	88	1690	315.0	5795	.009	.791	80.580
67	77	500	202.5	2106	.008	.714	81.293
26	44	1680	337.5	5529	.007	.657	81.950
22	29	1840	90.0	5186	.007	.609	82.559
27	97	1560	315.0	6632	.007	.602	83.161
32	21	1290	337.5	4966	.007	.602	83.763
54	16	660	337.5	3311	.007	.601	84.364
77	36	350	22.5	1952	.007	.600	84.964
78	14	340	337.5	2225	.007	.599	85.563
72	7	430	337.5	2599	.007	.585	86.148
17	27	2160	90.0	6523	.006	.515	86.663
41	42	1060	.0	5667	.006	.507	87.170
39	62	1160	45.0	4117	.006	.489	87.659
18	79	2100	337.5	8213	.005	.466	88.125
59	101	620	315.0	4314	.005	.466	88.591
64	35	530	67.5	2491	.005	.450	89.041
62	107	580	315.0	4321	.005	.435	89.476
84	10	290	315.0	2911	.005	.417	89.893
37	30	1210	90.0	5047	.005	.416	90.310
80	6	330	337.5	2735	.005	.412	90.722
91	12	210	315.0	2422	.005	.410	91.132
57	65	643	45.0	3232	.005	.404	91.536
50	59	750	90.0	4012	.004	.384	91.921
74	103	410	315.0	3851	.004	.372	92.292
47	89	790	315.0	5869	.004	.363	92.655

TABLE A.20. Largest Computed Concentrations at Receptor 8.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
6	105	4900	.0	2422	.108	12.216	12.216
3	110	5310	.0	3009	.081	9.243	21.459
7	87	4570	.0	3686	.050	5.689	27.148
12	121	2800	90.0	2063	.049	5.564	32.712
11	54	3180	.0	3078	.047	5.330	38.042
1	94	8310	337.5	5112	.041	4.686	42.728
2	99	5670	.0	4753	.041	4.640	47.368
5	82	5170	337.5	5587	.023	2.566	49.934
8	95	4540	337.5	5145	.022	2.537	52.471
13	52	2770	.0	4645	.021	2.354	54.825
19	49	2050	.0	3880	.021	2.345	57.170
14	51	2510	.0	4546	.019	2.210	59.380
15	53	2490	.0	4645	.019	2.116	61.497
36	108	1230	.0	3226	.017	1.908	63.405
21	2	1950	22.5	3347	.016	1.763	65.168
44	104	880	22.5	2135	.015	1.676	66.844
35	4	1230	22.5	2634	.015	1.654	68.498
25	88	1690	337.5	4177	.012	1.351	69.849
24	9	1720	45.0	3507	.011	1.218	71.067
62	107	580	.0	2728	.010	1.187	72.254
34	1	1250	22.5	3285	.010	1.166	73.420
10	120	3400	67.5	5213	.010	1.080	74.499
59	101	620	.0	3245	.008	.953	75.452
27	97	1560	337.5	4953	.008	.942	76.394
18	79	2100	.0	7346	.008	.894	77.288
29	8	1410	45.0	3805	.008	.872	78.161
33	56	1260	22.5	4013	.007	.844	79.005
48	5	770	22.5	3049	.007	.812	79.817
28	15	1500	45.0	4234	.007	.778	80.595
9	25	3990	90.0	9897	.006	.678	81.273
49	92	760	337.5	4006	.006	.651	81.924
71	50	450	.0	3441	.006	.628	82.552
47	89	790	337.5	4199	.006	.626	83.178
26	44	1680	22.5	5756	.006	.626	83.804
30	113	1400	67.5	4333	.005	.613	84.417
23	40	1730	22.5	6048	.005	.601	85.018
16	58	2330	90.0	7773	.005	.558	85.576
32	21	1290	22.5	5193	.005	.557	86.133
43	111	890	67.5	3497	.005	.555	86.688
46	38	810	45.0	3829	.004	.496	87.184
38	86	1180	337.5	6346	.004	.488	87.672
53	11	660	45.0	3422	.004	.487	88.159
31	43	1320	45.0	5344	.004	.461	88.620
4	123	5300	202.5	16215	.004	.425	89.046
63	98	570	.0	5113	.004	.407	89.453
45	13	810	45.0	4475	.003	.383	89.836
74	103	410	22.5	3294	.003	.381	90.217
22	29	1840	90.0	8665	.003	.378	90.594
84	10	290	22.5	2718	.003	.370	90.965
54	16	660	45.0	4045	.003	.369	91.334
17	27	2160	90.0	9994	.003	.362	91.696
73	91	420	337.5	4066	.003	.351	92.047
41	42	1060	22.5	6310	.003	.346	92.393
60	17	600	67.5	3796	.003	.327	92.720
61	96	580	337.5	5167	.003	.322	93.042
70	80	460	.0	5650	.003	.285	93.327
65	81	530	.0	6348	.002	.278	93.605
103	109	160	.0	3094	.002	.266	93.871
67	77	500	112.5	3538	.002	.262	94.133
91	12	210	45.0	2510	.002	.259	94.391

TABLE A.21. Largest Computed Concentrations at Receptor 9.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
6	105	4900	.0	3089	.072	10.236	10.236
12	121	2800	45.0	1657	.061	8.635	18.871
3	110	5310	337.5	3858	.043	6.070	24.941
1	94	8310	337.5	6078	.032	4.583	29.524
7	87	4570	337.5	4527	.028	4.011	33.533
2	99	5670	337.5	5596	.025	3.520	37.055
11	54	3180	337.5	3945	.025	3.504	40.559
5	82	5170	337.5	6532	.018	2.572	43.131
8	95	4540	337.5	6088	.018	2.498	45.628
13	52	2770	.0	5428	.016	2.277	47.906
44	104	880	.0	2758	.016	2.218	50.123
14	51	2510	.0	5330	.015	2.117	52.241
15	53	2490	.0	5352	.015	2.088	54.329
21	2	1950	22.5	3699	.013	1.873	56.202
19	49	2050	337.5	4680	.012	1.703	57.905
24	9	1720	22.5	3638	.012	1.698	59.603
35	4	1230	22.5	2983	.012	1.687	61.290
10	120	3400	67.5	4883	.011	1.531	62.821
33	56	1260	.0	4614	.010	1.357	64.178
48	5	770	.0	3478	.009	1.322	65.501
36	108	1230	337.5	4013	.009	1.318	66.818
25	88	1690	337.5	5042	.009	1.218	68.037
34	1	1250	22.5	3669	.009	1.217	69.254
29	8	1410	22.5	4066	.008	1.158	70.412
26	44	1680	.0	6258	.008	1.127	71.539
28	15	1500	22.5	4382	.008	1.089	72.628
30	113	1400	45.0	3996	.007	1.001	73.629
32	21	1290	.0	5671	.007	.996	74.625
18	79	2100	.0	8134	.007	.970	75.595
9	25	3990	90.0	9194	.007	.944	76.539
27	97	1560	337.5	5849	.006	.909	77.448
59	101	620	.0	3936	.006	.868	78.316
43	111	890	45.0	3332	.006	.860	79.176
62	107	580	337.5	3513	.005	.774	79.950
23	40	1730	22.5	6346	.005	.703	80.653
31	43	1320	22.5	5597	.005	.642	81.295
46	38	810	45.0	3780	.004	.635	81.930
53	11	660	45.0	3387	.004	.620	82.550
74	103	410	.0	3850	.004	.595	83.146
16	58	2330	67.5	7139	.004	.592	83.738
49	92	760	337.5	4962	.004	.573	84.311
47	89	790	337.5	5074	.004	.564	84.876
67	77	500	112.5	2530	.004	.564	85.439
22	29	1840	90.0	7989	.004	.531	85.970
4	123	5300	225.0	16061	.004	.521	86.492
17	27	2160	90.0	9284	.004	.504	86.996
38	86	1180	337.5	7299	.004	.501	87.497
54	16	660	22.5	4310	.003	.492	87.989
60	17	600	45.0	3690	.003	.489	88.479
45	13	810	45.0	4512	.003	.474	88.952
71	50	450	337.5	4290	.003	.432	89.384
51	48	720	.0	6964	.003	.415	89.799
41	42	1060	22.5	6725	.003	.396	90.195
84	10	290	22.5	3080	.003	.377	90.573
72	7	430	22.5	3980	.003	.366	90.939
37	30	1210	90.0	7888	.002	.356	91.294
91	12	210	22.5	2722	.002	.335	91.629
63	98	570	337.5	5920	.002	.326	91.956
61	96	580	337.5	6101	.002	.318	92.274
39	62	1160	67.5	6915	.002	.308	92.583

TABLE A.22. Largest Computed Concentrations at Receptor 10.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
69	117	500	247.5	1522	.016	4.367	4.367
1	94	8310	315.0	12343	.015	4.174	8.541
10	120	3400	.0	6698	.015	4.029	12.571
6	105	4900	315.0	8896	.014	3.916	16.486
12	121	2800	315.0	6317	.013	3.643	20.130
3	110	5310	315.0	9923	.013	3.634	23.763
68	116	500	247.5	1701	.013	3.632	27.396
2	99	5670	315.0	11483	.011	3.154	30.550
7	87	4570	315.0	10503	.010	2.885	33.435
9	25	3990	45.0	6185	.010	2.761	36.196
5	82	5170	315.0	12707	.009	2.492	38.688
8	95	4540	315.0	12276	.008	2.298	40.986
16	58	2330	22.5	5615	.008	2.195	43.181
11	54	3180	315.0	10041	.008	2.140	45.321
22	29	1840	22.5	5680	.006	1.705	47.026
13	52	2770	315.0	11143	.006	1.608	48.634
17	27	2160	45.0	6173	.005	1.499	50.133
14	51	2510	315.0	11061	.005	1.473	51.605
30	113	1400	337.5	6447	.005	1.381	52.987
67	77	500	315.0	4035	.005	1.319	54.306
19	49	2050	315.0	10530	.005	1.290	55.596
21	2	1950	337.5	8597	.005	1.276	56.871
24	9	1720	337.5	7952	.005	1.258	58.129
88	71	240	270.0	3241	.004	1.233	59.362
39	62	1160	.0	7287	.004	1.219	60.582
15	53	2490	337.5	10846	.004	1.170	61.752
4	123	5300	247.5	17281	.004	1.086	62.837
37	30	1210	22.5	5980	.004	1.042	63.879
28	15	1500	337.5	8386	.004	1.017	64.896
25	88	1690	315.0	11038	.004	.994	65.890
40	28	1070	22.5	5933	.003	.932	66.822
29	8	1410	337.5	8562	.003	.928	67.749
23	40	1730	337.5	10216	.003	.885	68.635
79	73	340	247.5	3182	.003	.875	69.510
99	67	180	270.0	3371	.003	.866	70.377
35	4	1230	337.5	8171	.003	.865	71.242
36	108	1230	315.0	9911	.003	.843	72.085
27	97	1560	315.0	11887	.003	.826	72.911
34	1	1250	337.5	8659	.003	.809	73.721
43	111	890	337.5	6945	.003	.789	74.510
26	44	1680	337.5	10915	.003	.782	75.292
64	35	530	.0	5757	.003	.780	76.072
31	43	1320	337.5	9512	.003	.748	76.820
44	104	880	315.0	8567	.003	.742	77.562
18	79	2100	337.5	13633	.003	.713	78.275
66	60	500	.0	6032	.002	.688	78.963
50	59	750	22.5	5738	.002	.685	79.648
105	66	140	270.0	3371	.002	.674	80.322
33	56	1260	337.5	9922	.002	.672	80.994
46	38	810	337.5	7457	.002	.649	81.643
32	21	1290	337.5	10369	.002	.646	82.290
57	65	643	.0	7521	.002	.646	82.936
106	68	130	270.0	3371	.002	.626	83.562
45	13	810	337.5	8070	.002	.580	84.141
53	11	660	337.5	7364	.002	.538	84.680
97	69	200	247.5	3114	.002	.534	85.214
38	86	1180	315.0	13485	.002	.523	85.736
60	17	600	337.5	7235	.002	.502	86.238
48	5	770	337.5	8648	.002	.499	86.738
93	74	210	247.5	3351	.002	.496	87.234

TABLE A.23. Largest Computed Concentrations at Receptor 11.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
6	105	4900	292.5	746	.750	21.940	21.940
35	4	1230	67.5	313	.417	12.198	34.138
44	104	880	270.0	572	.294	8.586	42.724
3	110	5310	292.5	1809	.185	5.417	48.141
7	87	4570	315.0	2282	.112	3.266	51.407
21	2	1950	45.0	957	.106	3.099	54.506
11	54	3180	292.5	1941	.099	2.884	57.390
48	5	770	22.5	658	.092	2.701	60.091
34	1	1250	22.5	889	.091	2.649	62.740
2	99	5670	315.0	3224	.078	2.287	65.027
84	10	290	67.5	357	.077	2.257	67.284
1	94	8310	315.0	4232	.073	2.140	69.424
19	49	2050	315.0	2273	.050	1.474	70.898
36	108	1230	315.0	1686	.050	1.452	72.349
12	121	2800	157.5	1974	.046	1.352	73.702
24	9	1720	67.5	1356	.046	1.336	75.038
33	56	1260	.0	1830	.044	1.287	76.325
8	95	4540	315.0	4102	.042	1.230	77.555
5	82	5170	315.0	4512	.041	1.197	78.753
29	8	1410	45.0	1456	.038	1.109	79.861
15	53	2490	337.5	2674	.037	1.072	80.934
59	101	620	315.0	1355	.036	1.053	81.987
74	103	410	.0	1055	.036	1.048	83.034
13	52	2770	337.5	2897	.036	1.044	84.079
14	51	2510	337.5	2811	.034	.995	85.074
62	107	580	292.5	1342	.033	.972	86.046
25	88	1690	315.0	2805	.029	.858	86.904
10	120	3400	90.0	3671	.023	.669	87.573
28	15	1500	67.5	1974	.021	.623	88.196
26	44	1680	.0	3429	.021	.607	88.803
91	12	210	112.5	599	.019	.545	89.348
27	97	1560	315.0	3649	.018	.513	89.861
53	11	660	90.0	1613	.017	.508	90.369
46	38	810	90.0	1942	.016	.458	90.828
54	16	660	45.0	1683	.014	.407	91.235
30	113	1400	90.0	2952	.014	.395	91.630
32	21	1290	22.5	2845	.013	.393	92.023
47	89	790	315.0	2876	.013	.385	92.408
94	102	210	.0	1313	.013	.373	92.780
71	50	450	315.0	2122	.012	.362	93.143
23	40	1730	22.5	3654	.012	.348	93.491
43	111	890	112.5	1950	.011	.321	93.813
31	43	1320	45.0	2966	.011	.318	94.130
60	17	600	90.0	2033	.011	.314	94.445
49	92	760	292.5	3196	.010	.302	94.746
18	79	2100	337.5	5513	.009	.274	95.020
45	13	810	67.5	2344	.009	.253	95.273
80	6	330	67.5	1441	.008	.232	95.504
72	7	430	67.5	1750	.007	.218	95.723
78	14	340	90.0	1806	.007	.217	95.939
38	86	1180	315.0	5279	.007	.209	96.149
51	48	720	.0	4135	.007	.191	96.340
41	42	1060	22.5	3930	.006	.189	96.529
73	91	420	292.5	3102	.006	.175	96.704
103	109	160	292.5	1774	.006	.168	96.872
63	98	570	337.5	3420	.006	.163	97.036
61	96	580	315.0	4057	.005	.160	97.196
70	80	460	.0	3522	.005	.159	97.355
76	22	350	45.0	2266	.005	.132	97.486
9	25	3990	112.5	8960	.004	.130	97.616

TABLE A.24. Largest Computed Concentrations at Receptor 12.

EMISSION ORDER RANK	MAP SOURCE #	EMISSION RATE (Ci/yr)	SOURCE ANGLE (degrees)	SOURCE DISTANCE (m)	CONC (pCi/l)	CONC %	CUMULATIVE CONC %
72	7	430	135.0	100	1.112	21.318	21.318
28	15	1500	.0	403	.684	13.115	34.433
24	9	1720	225.0	387	.474	9.089	43.523
80	6	330	270.0	298	.358	6.863	50.386
29	8	1410	292.5	612	.301	5.766	56.152
21	2	1950	270.0	1021	.246	4.721	60.873
6	105	4900	270.0	2315	.159	3.039	63.912
34	1	1250	270.0	1145	.130	2.501	66.413
54	16	660	315.0	689	.119	2.276	68.689
3	110	5310	270.0	3180	.102	1.947	70.636
53	11	660	180.0	744	.084	1.608	72.245
45	13	810	67.5	621	.080	1.535	73.779
46	38	810	135.0	605	.077	1.480	75.259
78	14	340	157.5	443	.070	1.344	76.604
48	5	770	270.0	1364	.060	1.150	77.753
11	54	3180	270.0	3307	.057	1.093	78.846
7	87	4570	292.5	3386	.056	1.081	79.927
31	43	1320	.0	1680	.053	1.019	80.947
2	99	5670	292.5	4006	.053	1.016	81.963
1	94	8310	292.5	5341	.048	.922	82.885
35	4	1230	247.5	1410	.044	.844	83.729
60	17	600	157.5	825	.043	.815	84.545
43	111	890	157.5	1114	.038	.732	85.276
23	40	1730	.0	2455	.037	.712	85.988
15	53	2490	315.0	3080	.037	.710	86.698
10	120	3400	112.5	2220	.034	.649	87.347
12	121	2800	202.5	2527	.034	.642	87.989
33	56	1260	292.5	2181	.032	.617	88.607
13	52	2770	292.5	3530	.032	.612	89.218
14	51	2510	292.5	3479	.030	.568	89.786
5	82	5170	292.5	5468	.029	.555	90.341
8	95	4540	292.5	5125	.028	.535	90.875
36	108	1230	270.0	2886	.028	.530	91.405
19	49	2050	292.5	3216	.028	.528	91.933
76	22	350	.0	1162	.026	.499	92.432
32	21	1290	337.5	2319	.024	.461	92.893
26	44	1680	337.5	2871	.022	.422	93.315
30	113	1400	135.0	1790	.022	.415	93.730
59	101	620	270.0	2397	.019	.363	94.093
25	88	1690	292.5	3805	.017	.330	94.422
41	42	1060	.0	3035	.016	.307	94.729
74	103	410	292.5	1799	.014	.277	95.006
44	104	880	247.5	2274	.014	.273	95.279
62	107	580	270.0	2778	.014	.266	95.545
27	97	1560	292.5	4547	.012	.227	95.772
18	79	2100	315.0	5669	.012	.221	95.992
84	10	290	247.5	1372	.011	.208	96.200
89	18	220	22.5	1202	.010	.184	96.384
49	92	760	270.0	4474	.008	.159	96.543
100	19	170	337.5	1309	.008	.157	96.700
71	50	450	270.0	3331	.008	.153	96.853
57	65	643	90.0	2557	.008	.151	97.004
47	89	790	292.5	3898	.008	.148	97.152
39	62	1160	90.0	4069	.007	.126	97.279
94	102	210	292.5	1937	.007	.125	97.404
91	12	210	225.0	1388	.007	.125	97.529
107	23	100	315.0	1280	.006	.122	97.651
51	48	720	337.5	3646	.006	.122	97.773
70	80	460	315.0	3468	.006	.108	97.881
9	25	3990	112.5	7617	.006	.107	97.988