MASTER

PNE-132F

U.S. ATOMIC ENERGY COMMISSION
CLOWSHARE PROGRAM

Project

GNOME

CARLSBAD, NEW MEXICO

DECEMBER 10, 1961

Final Report

OFF-SITE RADIOLOGICAL
SAFETY REPORT

O. R. Placak

PUBLIC HEALTH SERVICE

ISSUED: MAY 22, 1962

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of 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. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

P21-132 F

NUCLEAR EXPLOSIONS—PEACEFUL APPLICATIONS

PROJECT GNOME
CARLSBAD, NEW MEXICO

OFF-SITE RADIOLOGICAL SAFETY REPORT

1961

U. S. Public Health Service
Off-Site Radiological Safety Organization
Las Vegas, Nevada

O. R. Placak, Officer-in-Charge

FORWARD

The purpose of this report is to present a summary of the off-site radiological safety activities of the U. S. Public Health Service during the Project Gnome operation.

The report is intended to serve as a source of information concerning the procedures followed to protect the public from ionizing radiation and the results obtained. It is hoped that the information and data contained will be of value in planning for similar future projects.

It is neither possible nor desirable to include in this report all of the individual data collected by the U. S. Public Health Service; however, in the event more detailed information is desired, it may be obtained from the office of the PHS Off-Site Activities, P. O. Box 1676, Las Vegas, Nevada.

Every effort has been made to eliminate errors; however, if any anomalies are detected, it would be appreciated if they would be called to our attention for verification.

I N D E X

	<u>Page</u>
CHAPTER I - OPERATIONAL PROCEDURES	1
CHAPTER II - COLLECTION OF DATA	3
A. AERIAL MONITORING	4
Map - Cloud Pattern As Found By Aerial Monitoring	6
B. MOBILE MONITORING.	7
Map - Roads Monitored	9
Table I - Monitoring Results	
Carlsbad-Artesia-Roswell Area	10
Highway 128 Area	13
Highway 62/180 Area	19
Hudson Farm Area	22
Illinois Camp Area	24
IMCC Mine Area	26
C. POTASH MINE SURVEYS	28
Table II - Mine Survey Monitoring Results	
Duval Mining Company - Shafts 1 & 2	30
Duval Mining Company - Shafts 3 & 4	30
IMCC Mine.	31
National Potash Mine	33
Potash Company of America	34
Southwest Mine	34
U. S. Borax #1	35
U. S. Borax #1	36
U. S. Borax #3	37
D. AIR SAMPLING	38
Map - Air Sampling Stations	40
Table III - Isotopic Air Sample Activity Col- lected on Activated Charcoal Cartridges	41

INDEX - CONTINUED

Page

Table IV - Gross Beta Air Sample Data

Artesia	44
Carlsbad	46
Carlsbad Caverns	47
El Paso Natural Gas--Pecos River	
Station	48
Hobbs	49
IMCC Shaft #3	50
IMCC Shaft #4	51
Jal.	52
Loco Hills	54
Loving.	56
Lovington	57
Malaga School	59
Red Bluff	61
Roswell	63
San Simon.	64
Transwestern Pipeline Company	66
U. S. Borax Mine	68

Graphs - December Air Activity

Artesia-Carlsbad	69
Carlsbad Caverns--EPNG Pumping Station	70
Hobbs-Jal.	71
IMCC Shafts Nos. 3 and 4.	72
Loco Hills-Loving	73
Lovington-Malaga School	74
Red Bluff Lodge-Roswell	75
San Simon Ranch-Transwestern Pipeline	
Company	76
U. S. Borax Mine	77

E. MILK SAMPLING	78
Map - Milk Sampling Stations	79
Table V - Milk Sample Data	80

INDEX - CONTINUED

	<u>Page</u>
F. WATER SAMPLING.	81
Map - Water Sampling Stations.	82
Table VI - Water Sample Data	83
G. GAMMA SPECTROSCOPY RESULTS ON SOIL AND VEGETATION SAMPLES	85
H. FILM BADGE PROGRAM	85
CHAPTER III - LABORATORY CONTROL.	86
CHAPTER IV - EMERGENCY MEASURES	87
CHAPTER V - MEDICAL SERVICES	88
CHAPTER VI - VETERINARY ACTIVITIES	89
Table VII - Cattle Samples - Pre-Shot	90
Table VIII - Cattle Samples - Post-Shot	91
CHAPTER VII - DISCUSSION	92
Graph - Net Gamma Monitoring Results-- Highways 128 and 31 Area	93
Graph - Net Gamma Monitoring Results-- IMCC Mine Area.	94
Graph - Net Gamma Monitoring Results-- Hudson Ranch Vicinity	95
CHAPTER VIII - CONCLUSION	96

CHAPTER I

OPERATIONAL PROCEDURES

The U. S. Public Health Service Off-Site Radiological Safety Organization of the Office of Field Operations, AEC, in cooperation with other agencies charged with related public safety activities, was responsible to the Test Manager for the establishment of a program to provide complete documentation of any radiation exposure to the off-site population resulting from the Gnome operation. This included the establishment of a procedure for taking appropriate action to limit exposure to those values established by the Atomic Energy Commission which was considered as a safe criteria for Project Gnome. These criteria were outlined in Chapter 0524, SOP-PGO, and Federal Radiation Council Reports Nos. 1 and 2.

Operational procedures of the U. S. Public Health Service to protect public exposure to ionizing radiation were based on the assumption that radioactivity could vent to the atmosphere from the nuclear detonation of Project Gnome.

Using this assumption, it was necessary to inform the communities in the Gnome-site vicinity of this possibility so that the necessary radioactivity detection and environmental sampling devices could be used in all populated areas without undue alarm of the people. Information was disseminated by meeting with civic groups and explaining the safety precautions that were necessary during events such as Project Gnome. In all instances, these meetings were coordinated with similar activities performed by the office of the Support Director--Project Gnome, AEC. By these public appearances and by thoroughly explaining the operations for the safeguard of public health to as many people as possible in advance of the Gnome detonation, it was felt that the people in the vicinity were confident that every practical precaution was being used to assure their safety. This fact was borne out by the few complaints received when it was learned publicly that radioactivity had escaped after the detonation.

The off-site area defined as the responsibility of the U. S. Public Health Service by a Memorandum of Understanding between the Public Health Service and the Atomic Energy Commission was the area extending from five miles to fifty miles from Ground

Zero, including all mines operating in this area. To fulfill this responsibility, trained USPHS personnel assigned to the Las Vegas Office of Field Operations were utilized to document the event and take the necessary actions for public safety of the off-site area during the operation. In addition to this group, PHS Reserve Officers who had experience in monitoring were called to active duty and public health representatives of the New Mexico Health Department, who carry out normal public health activities in the area, gave valuable assistance in fulfilling public health responsibilities of this project.

The U. S. Weather Bureau at the Control Point furnished predicted cloud trajectory maps and meteorological information which was used to direct monitoring teams prior to and during the operation.

The U. S. Geological Survey supplied assistance concerning the water bearing strata in the Gnome vicinity. This information, along with data received from studies conducted by the USGS in previous years, was used to direct the water surveillance program.

CHAPTER II

COLLECTION OF DATA

As outlined in the Off-Site Radiological Safety Plan for Project Gnome, dated November 27, 1961, the basic objectives of this program were:

1. Conduct necessary public information activities in surrounding communities to maintain public confidence in the safe conduct of the operation.
2. Determine the extent of airborne, surface, and sub-surface radioactivity resulting from the operation.
3. Maintain a comprehensive record of radioactivity associated with the operation, including negative data.
4. Conduct evaluations and effect necessary emergency measures should an unacceptable situation develop.
5. Investigate incidents and conditions that might possibly be attributed to the operation.
6. Distribute film badges in locations around the project to record possible exposure to radiation.
7. Provide mobile monitoring teams in selected populated places relatively near the operation site.
8. Locate air sampling equipment and continuous recorders and secure local personnel for operation of the sampling stations.
9. Participate actively in pre- and post-mine surveys.
10. Insure continuing protection of the public health.

To carry out these objectives and secure the facts and data, it was necessary to perform many operations concurrently and utilize equipment and personnel to the best advantage in the operation.

A. Aerial Monitoring

An Air Force H-21 helicopter and crew were made available to a Public Health Service monitor for cloud tracking. All readings reported are gross gamma as measured inside the aircraft. Aircraft attenuation was not determined, but is probably in the range of 30% to 50% depending on the position of the helicopter relative to the cloud. The principle instrument used was an EG&G aerial monitor with a range of 2 mr/hr to 2 R/hr. Also used was an Eberline E-500b survey meter.

The following is a summary of the findings. A map showing the measured cloud pattern and times of measurement is included in this report. The imposed ceiling on the helicopter did not permit flying over the cloud and as it was not considered advisable to fly through the cloud, it was not possible to measure cloud width for the first ten miles.

At 1222 hours, the leading edge of the cloud measured in excess of 2 R/hr over Indian Well at 4000' mean sea level, four miles from Gnome on a bearing of 310°. Over the junction of Routes 128 and 31, 9.5 miles from the shaft on a bearing of 305°, the west edge of the cloud measured 150 mr/hr at 1245 hours. Five minutes later at this location, the reading was 450 mr/hr.

At 1306 hours, the cloud extended from this junction to the IMCC Mine. At the mine, the dose rate at approximately 1000' above ground level was 50 mr/hr. One-half mile southwest it was 1 R/hr and at the mid-point a maximum of 2 R/hr was found. By 1320 hours, the leading edge of the cloud was 17 miles from Gnome on a bearing of 320°. The peak reading on a quarter mile wide front was 450 mr/hr.

At 1408 hours, the west edge of the cloud was 3 miles west of Hudson Farm and the east edge was 2 miles east of Hudson Farm. The peak reading one-half mile north of the farm at 4300' mean sea level was 430 mr/hr. The cloud was found to center on a bearing of 320° 30 miles from Ground Zero at 1433 hours, with a high reading at the center of 300 mr/hr. Cloud width at this time was five miles. At 1440 hours, the west edge of the cloud was four miles north of the east edge of Lake McMillan.

Cloud width at 1451 hours was 10 miles, extending from four miles south of Artesia to the junction of Highways 360 and 83 with a peak reading of 100 mr/hr. At 1506 hours, the cloud extended from Artesia to ten miles east with a peak reading of 90 mr/hr.

The final reading was made at 1517 hours. At this time, the cloud front was 7.5 miles wide with the west edge five miles northwest of Artesia. The peak reading was 70 mr/hr.

Low fuel caused the cancellation of the mission at this time.

US PUBLIC HEALTH SERVICE RADIOLOGICAL HEALTH FIELD ACTIVITIES LAS VEGAS, NEVADA				
CLOUD PATTERN AS FOUND BY AERIAL MONITORING				
BY	CODE	DATE	SCALE	PAGE

B. Mobile Monitoring

Eleven mobile monitoring teams consisting of two men each, using vehicles equipped with two-way radios and portable monitoring instruments, were in contact with the Control Point continuously. All teams were strategically located off-site in the predicted wind trajectory which was verified by aerial monitoring. These teams performed several functions in addition to the measurement of radiation levels with portable instrumentation. The instruments used were Eberline E-500b survey meters with a range of 2 R/hr, Beckman MX-5 survey meters with a range of 20 mr/hr, and Precision Model 111 scintillators with a range of 5 mr/hr.

After predicted cloud trajectory was learned just prior to the detonation, monitoring teams were positioned and continuous monitoring radiation detection instruments and air sampling equipment were put into operation.

After it was learned from the aerial monitor that venting of radioactivity had occurred from the detonation, mobile monitoring was initiated for the detection of radiation near ground level. At H+0.63 hours, 0.7 miles east of the junction of Highways 128 and 31, there was a net gamma reading of 0.3 mr/hr. This mobile unit was moved to a point 1.7 miles east of Highway 30 on Highway 128 where at H+0.66 hours, activity was found to be 7.99 mr/hr and continuously increased to a level of 160 mr/hr at H+0.87 hours.

At H+1.09 hours, 3.5 miles west of the CP junction and 3.9 miles east of the junction of Highways 31 and 128, the highest mobile gamma reading was recorded at 1400 mr/hr. This reading was of very short duration and by H+1.52 hours, in the same vicinity, the activity had dropped to 190 mr/hr. This location was identified by ground monitoring as the point of highest activity of cloud passage over Highway 128. By H+2.9 hours, the activity level in this location was 95 mr/hr. There were fluctuations of readings in this area during the cloud passage, with a return to background at approximately H+10.5 - H+11 hours.

The cloud was next detected at the junction of Highway 31 and the IMCC Mine at H+0.87 hours with a reading of 1.5 mr/hr. Activity increased in this location until H+1 when

a maximum reading of 35 mr/hr was recorded. Activity in this area fluctuated during cloud passage until approximately H+2 hours when readings approached background.

In order to determine the cloud width and if any activity passed over the Carlsbad area, considerable monitoring was done along Highway 62/180 northeast of Carlsbad. On this highway, the maximum activity recorded was 95 mr/hr in an area eleven miles northeast of Carlsbad at H+2.02. The cloud width along this highway was approximately 8.4 miles wide, extending from about 9 miles northeast of Carlsbad to a point 17.4 miles northeast. Activity at the center of cloud passage was approaching background at approximately H+5 hours with fluctuations in readings.

A monitoring team was stationed at the Hudson Farm located near Highway 62/180 approximately ten miles northeast of Carlsbad. Activity in this area was first detected at approximately H+1.72 hours, reaching a maximum of 95 mr/hr at H+2.02 hours, and decreasing to essentially background at approximately H+5.25 hours.

Mobile ground monitoring was carried out along all highways and populated areas in the path of the cloud and results documented. For complete monitoring data, see Table I, "Monitoring Results".

Experimental continuous recorders were employed at the IMCC Mine, Highway 128 - 5 miles east of Junction 31 and 128, CP area, Carlsbad, Getty Oil Lease, Transwestern Pipeline Pumping Station, and the Hudson Farm. Only the recorder at the IMCC Mine performed satisfactorily.

LEGEND

- MONITORED ROADS
- UNMONITORED ROADS
- HIGHWAY NUMBERS
- 0.0 VALUES ARE mr/hr

SCALE: 1" = 12 MILES

RED BLUFF

US PUBLIC HEALTH SERVICE RADIOLOGICAL HEALTH FIELD ACTIVITIES LAS VEGAS, NEVADA				
ROADS MONITORED PROJECT GNOME				
BY	CODE	DATE	SCALE	PAGE
				— of —

TABLE I

MONITORING RESULTS

CARLSBAD-ARTESIA-ROSWELL AREA

<u>LOCATION</u>	TIME	<u>NET MR/HR</u>
	(HOURS) <u>H-PLUS</u>	
Carlsbad	2.87	Bkg *
5 miles N Carlsbad, Hwy 285	3.00	Bkg
10 miles N Carlsbad, Hwy 285	3.16	Bkg
17 miles N Carlsbad, Hwy 285	3.25	Bkg
20 miles N Carlsbad, Hwy 285	3.33	Bkg
23 miles N Carlsbad, Hwy 285	3.42	Bkg
Lakewood	3.58	Bkg
McMillan Dam	3.66	Bkg
5 miles S Artesia, Hwy 285	4.50	Bkg
Artesia	4.75	Bkg
7 miles N Artesia, Hwy 285	5.33	Bkg
14 miles N Artesia, Hwy 285	5.50	Bkg
Junction, Hwys 285 and 83, Artesia	5.75	Bkg
4 miles E Artesia, Hwy 83	5.92	0.07
6 miles E Artesia, Hwy 83	6.00	0.08
8 miles E Artesia, Hwy 83	6.17	0.10
10 miles E Artesia, Hwy 83	6.25	0.50
14 miles E Artesia, Hwy 83	6.58	0.20
15 miles E Artesia, Hwy 83	6.66	0.1
18 miles E Artesia, Hwy 83	6.75	0.2
21 miles E Artesia, Hwy 83	6.92	0.3
25 miles E Artesia, Hwy 83	7.00	Bkg
Loco Hills	7.17	Bkg
Maljamar	7.50	Bkg
Junction, Hwys 31 and 172	7.83	Bkg
17 miles W Junction of Hwys 31 and 172, on Hwy 31	8.25	Bkg
18 miles W Junction of Hwys 31 and 172, on Hwy 31	8.33	0.07
24 miles W Junction of Hwys 31 and 172, on Hwy 31	8.50	0.15
28 miles W Junction of Hwys 31 and 172, on Hwy 31	8.75	0.3
31 miles W Junction of Hwys 31 and 172, on Hwy 31	8.80	0.4
Hagerman	9.00	0.2
Dexter	9.58	0.2
Hagerman	9.75	0.4
10 miles N Hagerman, Hwy 285	9.90	0.15
7 miles S Roswell, Hwy 285	10.00	0.25
Roswell	10.17	0.3
Roswell	10.33	0.2

* Normal Background - .02 to .03 mr/hr

Monitoring Results
CARLSBAD-ARTESIA-ROSWELL AREA - CONTINUED

<u>LOCATION</u>	TIME (HOURS)	
	<u>H-PLUS</u>	<u>NET MR/HR</u>
5 miles W of Roswell, Hwys 380 and 70	10.40	0.12
15 miles W of Roswell, Hwys 380 and 70	10.66	0.25
19 miles W Roswell, Hwys 380 and 70	10.75	Bkg
Dexter	11.90	Bkg
Hagerman	12.00	Bkg
Lake Arthur	12.17	0.08
Artesia	12.50	0.7
6 miles S Artesia, Hwy 285	12.75	0.4
13 miles S Artesia, Hwy 285	12.83	0.5
16 miles S Artesia, Hwy 285	12.92	0.5
17 miles S Artesia, Hwy 285	12.97	Bkg
2 miles S Artesia, Hwy 285	8.50	0.15
Artesia	8.55	0.2
17 miles N Artesia, Hwy 285	8.66	0.2
Lake Arthur	8.75	0.15
Hagerman	8.92	0.15
Dexter	9.20	0.1
Roswell	10.25	0.09
5 miles W Roswell, Hwys 70 and 380	10.66	Bkg
Walker Air Force Base	12.00	0.15
Artesia	12.75	0.2
5 miles S Artesia, Hwy 285	12.83	0.2
11 miles S Artesia, Hwy 285	13.09	0.22
12 miles S Artesia, Hwy 285	13.11	0.25
13 miles S Artesia, Hwy 285	13.12	0.19
14 miles S Artesia, Hwy 285	13.12	0.17
15 miles S Artesia, Hwy 285	13.13	0.15
16 miles S Artesia, Hwy 285	13.15	0.07
17 miles S Artesia, Hwy 285	13.16	Bkg
18 miles S Artesia, Hwy 285	13.18	Bkg
19 miles S Artesia, Hwy 285	13.19	Bkg
20 miles S Artesia, Hwy 285	13.20	Bkg
Artesia	96.00	Bkg
Lake McMillan	100.47	Bkg
Junction, Hwys 285 and 180, Carlsbad	0.17-2.03	Bkg
AEC Office, Carlsbad (Background recorder at this location showed background from H+0 to H+45 hours)	7.80	Bkg
10 miles N Carlsbad, Hwy 285	8.08	Bkg
Junction, Hwys 285 and 137, N Carlsbad	8.16	Bkg
1/2 mile W on Hwy 137 from Hwy 285	8.18	Bkg
1.5 miles W on Hwy 137 from Hwy 285	8.22	Bkg

Monitoring Results
CARLSBAD-ARTESIA-ROSWELL AREA - CONTINUED

<u>LOCATION</u>	TIME (HOURS)	<u>NET MR/HR</u>
	<u>H-PLUS</u>	
2.5 miles W on Hwy 137 from Hwy 285	8.25	Bkg
3.5 miles W on Hwy 137 from Hwy 285	8.28	Bkg
4.5 miles W on Hwy 137 from Hwy 285	8.31	Bkg
5.5 miles W on Hwy 137 from Hwy 285	8.35	Bkg
Junction, Hwys 285 and 137	8.50	Bkg
AEC Office - Carlsbad	46.50-53.00	Bkg
AEC Office - Carlsbad	68.00-74.50	Bkg
U. S. Potash Refinery, Hwy 31	2.45	0.29
Dirt road, NW U. S. Refinery	2.50	0.29
3 miles NW U. S. Refinery	2.65	0.14
4 miles NW U. S. Refinery	2.66	0.14
7 miles NW U. S. Refinery	2.78	0.09
9 miles NW U. S. Refinery	2.80	0.09
Junction, dirt road and Hwy 180/62	2.88	Bkg
Port of Entry Bldg, Hwy 285, Malaga	25.33	Bkg
Port of Entry Bldg, Hwy 285, Malaga	53.73	Bkg
El Paso Natural Gas Pecos River Pump Station	25.93	Bkg
El Paso Natural Gas Pecos River Pump Station	53.28	Bkg
El Paso Natural Gas Pecos River Pump Station	74.20	Bkg
Carlsbad	29.50	Bkg
Loving	31.00	Bkg
Loving	54.62	Bkg
Harroun Farm	31.50	Bkg
Harroun Farm	54.28	Bkg
Harroun Farm	70.83	Bkg
Junction, Hwys 285 and 62/180	44.87	Bkg
Musical Museum	45.03	Bkg
White's City	45.23	Bkg
Carlsbad Caverns	45.50	Bkg
Black River Village	46.13	Bkg
Loving	46.42	Bkg

MONITORING RESULTS

HIGHWAY 128 AREA

<u>LOCATION</u>	TIME (HOURS)	
	<u>H-PLUS</u>	<u>NET MR/HR</u>
Junction, Hwys 128 and 31	0.50-0.58	Bkg
0.7 miles E of Hwys 128 and 31	0.66	0.3
1.7 miles E of Hwys 128 and 31	0.63	0.79
" "	0.66	7.99
" "	0.67-0.72	9.99
" "	0.73	15.0
" "	0.77	50.0
" "	0.78	75.0
" "	0.80	120.0
" "	0.82	130.0
" "	0.83	145.0
" "	0.85	150.0
" "	0.87	160.0
" "	0.875	100.0
" "	0.88	50.0
" "	0.90	20.0
" "	0.92	15.0
" "	0.93	9.5
" "	0.95	15.0
" "	0.97	11.0
" "	0.98	7.5
" "	1.00	4.0
" "	1.01	2.5
" "	1.03	1.5
" "	1.05-1.07	1.1
" "	1.08	1.2
" "	1.10	2.0
" "	1.12	5.0
" "	1.13	18.0
" "	1.17	35.0
" "	1.18	60.0
" "	1.20	20.0
" "	1.22	4.0
" "	1.23-1.25	2.0
" "	1.27	5.0
" "	1.28	60.0
" "	1.30	130.0
" "	1.32	100.0
" "	1.33	50.0
" "	1.35	40.0
" "	1.37	8.0

Monitoring Results
HIGHWAY 128 AREA - CONTINUED

LOCATION	TIME (HOURS)	NET MR/HR
	H-PLUS	
1.7 miles E of Hwys 128 and 31 - Continued	1.38	2.0
" "	1.40-1.42	1.0
" "	1.43	1.0
" "	1.45	1.6
" "	1.47	10.0
" "	1.48	50.0
" "	1.49	75.0
" "	1.50	25.0
" "	1.52	4.0
" "	1.53	2.0
" "	1.55	2.0
" "	1.57	3.0
" "	1.58	8.0
" "	1.60	5.0
" "	1.62	4.0
" "	1.63	10.0
" "	1.65	45.0
" "	1.70	20.0
" "	1.72	2.5
" "	1.73	1.5
" "	1.75	0.7
" "	1.77	0.9
" "	1.78	1.2
" "	1.80	1.1
" "	1.82	0.9
" "	1.83	1.0
" "	1.85	1.9
" "	1.87	3.5
" "	1.88	1.5
" "	1.90	0.5
" "	1.92	0.45
" "	1.93	0.4
" "	1.95	0.4
" "	1.97	0.35
" "	1.98	0.4
" "	2.00	0.5
" "	2.03	1.0
" "	2.04	1.5
" "	2.05	1.2
" "	2.07	0.6
" "	2.08	0.3
" "	2.20	0.2

Monitoring Results
HIGHWAY 128 AREA - CONTINUED

<u>LOCATION</u>	<u>TIME</u>	
	<u>(HOURS)</u>	<u>NET MR/HR</u>
	<u>H-PLUS</u>	
1.7 miles E of Hwys 128 and 31 - Continued	2.23	0.3
" "	2.28	0.3
" "	2.33	0.3
" "	2.42	0.2
" "	2.50	0.13
" "	2.57	0.3
" "	2.65	0.17
" "	2.66	0.1
" "	2.75	0.2
" "	2.77	0.4
" "	2.80	0.5
" "	2.82	0.4
" "	2.85	0.2
1.5 miles E Junction, Hwys 128 and 31	2.87	Bkg
1.2 miles E Junction, Hwys 128 and 31	2.93	Bkg
1 mile E Junction, Hwys 128 and 31	2.97	Bkg
.5 miles E Junction, Hwys 128 and 31	2.98	Bkg
Junction, Hwys 128 and 31	3.00	Bkg
.5 miles SW Junction, Hwys 128 and 31	3.10	Bkg
1 mile SW Junction, Hwys 128 and 31	3.12	Bkg
1.5 miles SW Junction, Hwys 128 and 31	3.17	Bkg
2 miles SW Junction, Hwys 128 and 31	3.25	Bkg
2.5 miles SW Junction, Hwys 128 and 31, at road block	4.00	Bkg
Junction, Hwys 128 and 31	4.13	Bkg
2 miles N Junction, Hwys 128 and 31	4.20	0.15
2.5 miles N Junction, Hwys 128 and 31	4.25	1.3
3 miles N Junction, Hwys 128 and 31	4.27	0.8
3.5 miles N Junction, Hwys 128 and 31	4.28	0.8
4 miles N Junction, Hwys 128 and 31	4.30	1.0
4.5 miles N Junction, Hwys 128 and 31	4.33	0.8
5.5 miles N Junction, Hwys 128 and 31	4.38	0.8
6 miles N Junction, Hwys 128 and 31	4.42	0.4
Entrance to IMCC Mine	4.43	0.2
7 miles N Junction, Hwys 128 and 31	4.50	0.1
7.5 miles N Junction, Hwys 128 and 31	4.52	0.12
8 miles N Junction, Hwys 128 and 31	4.66	0.4
9 miles N Junction, Hwys 128 and 31	4.70	0.4
10 miles N Junction, Hwys 128 and 31	4.75	0.3
12.2 miles N Junction, Hwys 128 and 31	4.78	0.2
14 miles N Junction, Hwys 128 and 31	4.83	0.12
Junction, Hwys 31 and 62/180	4.90	0.12

Monitoring Results
HIGHWAY 128 AREA - CONTINUED

<u>LOCATION</u>	TIME (HRS)	
	<u>H-PLUS</u>	<u>NET MR/HR</u>
Junction, Hwys 31 and 62/180	4.95	1.4
2 miles W on Hwy 180 from Jct Hwys 31 and 180	5.03	0.35
CP and Hwy 128	0.88	Bkg
.5 miles W CP, Hwy 128	0.91	0.1
1.5 miles W CP, Hwy 128	0.95	9.0
2.3 miles W CP, Hwy 128 (people at roadblock re- turned to Gnome CP)	1.00	1100.0
3.5 miles W CP, Hwy 128	1.09	1400.0
4.5 miles W CP, Hwy 128	1.16	40.0
5.7 miles W CP, Hwy 128	1.27	2.0
5.7 miles W CP, Hwy 128	1.33	120.0
5.7 miles W CP, Hwy 128	1.37	30.0
5.7 miles W CP, Hwy 128	1.41	11.0
4.7 miles W CP, Hwy 128	1.45	130.0
3.3 miles W CP, Hwy 128	1.52	190.0
3.0 miles W CP, Hwy 128	1.57	22.0
1.1 miles W CP, Hwy 128	1.60	6.5
0.7 miles W CP, Hwy 128	1.63	4.5
Junction, CP and Hwy 128	1.67	4.5
Junction, CP and Hwy 128	2.61	0.04
1.0 miles W CP, Hwy 128	2.68	0.1
2.0 miles W CP, Hwy 128	2.75	0.2
3.0 miles W CP, Hwy 128	2.82	2.0
4.0 miles W CP, Hwy 128	2.87	65.0
4.5 miles W CP, Hwy 128	2.90	95.0
5.0 miles W CP, Hwy 128	2.97	30.0
6.0 miles W CP, Hwy 128	3.00	0.3
7.0 miles W CP, Hwy 128	3.05	0.15
7.4 miles W CP, Hwy 128	3.08	0.2
4 miles E Junction, Hwys 31 and 128	2.22	135.0
Junction, Hwys 31 and 128	5.72	0.3
1.7 miles E of Junction on Hwy 128	6.05	1.0
2.6 miles E of Junction on Hwy 128	6.40	45.0
1 mile E CP turnoff, Hwy 128	0.00-1.75	Bkg
4 miles W Junction, Hwys 31 and 62/180	5.12	0.16
6.6 miles W Junction, Hwys 31 and 62/180	5.17	0.07
7.8 miles W Junction, Hwys 31 and 62/180	5.22	Bkg
10 miles W Junction, Hwys 31 and 62/180	5.25	Bkg
Carlsbad	5.28	Bkg
Junction, Hwy 128 and CP Road	10.50	Bkg
1 mile E on Hwy 128 from CP Road	10.53	Bkg

Monitoring Results
HIGHWAY 128 AREA - CONTINUED

<u>LOCATION</u>	<u>TIME (HOURS) H-PLUS</u>	<u>NET MR/HR</u>
3 miles E on Hwy 128 from CP Road	10.60	0.12
4.7 miles E on Hwy 128 from CP Road	10.65	Bkg
5.9 miles E on Hwy 128 from CP Road	10.73	0.3
6.9 miles E on Hwy 128 from CP Road	11.00	0.25
Junction, Hwys 128 and 31	11.07	2.5
0.2 miles SW Junction Hwys 128 and 31 on Hwy 31	11.12	3.5
1.0 miles SW Junction Hwys 128 and 31 on Hwy 31	11.25	3.0
1.2 miles SW Junction Hwys 128 and 31 on Hwy 31	11.30	1.0
1.5 miles SW Junction Hwys 128 and 31 on Hwy 31	11.35	0.2
2.5 miles SW Junction Hwys 128 and 31 on Hwy 31	11.42	Bkg
3.5 miles SW Junction Hwys 128 and 31 on Hwy 31	11.45	Bkg
4.5 miles SW Junction Hwys 128 and 31 on Hwy 31	11.48	Bkg
5.5 miles SW Junction Hwys 128 and 31 on Hwy 31	11.51	Bkg
6.5 miles SW Junction Hwys 128 and 31 on Hwy 31	11.55	Bkg
7.5 miles SW Junction Hwys 128 and 31 on Hwy 31	11.58	Bkg
Junction, Hwys 31 and 285	11.60	Bkg
Junction, Hwys 31 and 285	13.50	Bkg
4.5 miles W Junction, Hwys 31 and 285	13.66	Bkg
6.3 miles W Junction, Hwys 31 and 285	13.70	Bkg
6.8 miles W Junction, Hwys 31 and 285	13.73	0.5
7.2 miles W Junction, Hwys 31 and 285	13.75	5.0
7.4 miles W Junction, Hwys 31 and 285	13.77	7.0
Junction, Hwys 31 and 128	13.80	0.6
Junction, Hwys 31 and 128	14.12	Bkg
Junction, Hwys 31 and 128	21.50	Bkg
4.5 miles E Hwys 31 and 128	21.58	0.5
5.3 miles E Junction, Hwys 31 and 128	21.65	0.9
5.8 miles E Junction, Hwys 31 and 128	21.66	Bkg
6.2 miles E Junction, Hwys 31 and 128	21.70	Bkg
7.0 miles E Junction, Hwys 31 and 128	21.73	Bkg
Junction, Hwy 128 and CP Road	21.80	Bkg
Junction, Hwy 128 and CP Road	26.08	Bkg
0.5 miles W of Junction, Hwy 128 and CP Road	26.13	Bkg
1 mile W of Junction, Hwy 128 and CP Road	26.15	Bkg
2.5 miles W Junction, Hwy 128 and CP Road	26.20	Bkg
4 miles W Junction, Hwy 128 and CP Road	26.23	Bkg
7 miles W Junction, Hwy 128 and CP Road	26.38	Bkg
Junction, Hwys 285 and 31	46.83	Bkg
Junction, Hwys 31 and 128	46.72	Bkg
Junction, CP Road and Hwy 128	46.90	Bkg
CP	47.00	Bkg

Monitoring Results
HIGHWAY 128 AREA - CONTINUED

<u>LOCATION</u>	<u>TIME (HOURS) H-PLUS</u>	<u>NET MR/HR</u>
Junction, Hwy 128 and Snyder Ranch	47.23	Bkg
Snyder Ranch	47.60	Bkg
Oil Drilling Rig, Approx. 6 miles S of Ground Zero	48.10	Bkg
CP Road and Hwy 128	49.75	Bkg
Junction, Hwys 128 and 31	50.55	Bkg
1 mile E Junction, Hwys 128 and 31	50.68	Bkg
2 miles E Junction, Hwys 128 and 31	50.85	Bkg
3 miles E Junction, Hwys 128 and 31	51.05	Bkg

MONITORING RESULTS

HIGHWAY 62/180 AREA

<u>LOCATION</u>	<u>TIME (HOURS) H-PLUS</u>	<u>NET MR/HR</u>
Carlsbad Downtown	0.00	Bkg
Junction, Hwys 285 and 180	0.17-2.03	Bkg
5 miles NE Carlsbad, Hwy 62/180	2.13	Bkg
9.2 miles NE Carlsbad, Hwy 62/180	2.27	3.0
10.2 miles NE Carlsbad, Hwy 62/180	2.33	13.0
10.9 miles NE Carlsbad, Hwy 62/180	2.42	65.0
11.7 miles NE Carlsbad, Hwy 62/180	2.50	47.0
13.8 miles NE Carlsbad, Hwy 62/180	2.55	3.5
14.1 miles NE Carlsbad, Hwy 62/180	2.57	1.7
14.8 miles NE Carlsbad, Hwy 62/180	2.62	1.5
17.4 miles NE Carlsbad, Hwy 62/180, Wayne Cowlen Farm	2.72	1.0
" "	2.92	0.6
" "	3.15	0.5
" "	3.33	0.3
" "	3.50	0.3
" "	3.66	0.3
" "	3.83	0.5
" "	4.00	0.5
" "	4.16	0.2
" "	4.33	0.3
" "	4.50	0.3
" "	5.00	0.4
1.5 miles NE Carlsbad, Hwy 62/180	3.25	0.04
3 miles NE Carlsbad, Hwy 62/180	4.80	Bkg
5 miles NE Carlsbad, Hwy 62/180	4.91	Bkg
7 miles NE Carlsbad, Hwy 62/180	5.00	Bkg
8.1 miles NE Carlsbad, Hwy 62/180	5.08	0.04
9.1 miles NE Carlsbad, Hwy 62/180	5.12	0.5
10 miles NE Carlsbad, Hwy 62/180	5.18	0.09
Junction, Hwys 31 and 62/180	11.53	Bkg
7.5 miles W Junction, Hwys 31 and 62/180	11.72	0.14
11.6 miles W Junction, Hwys 31 and 62/180	11.82	0.9
14.6 miles W Junction, Hwys 31 and 62/180	11.90	0.08
17.2 miles W Junction, Hwys 31 and 62/180	11.97	0.07
18.8 miles W Junction, Hwys 31 and 62/180	12.03	Bkg
Junction, Hwys 62/180 and 285 in Carlsbad	9.78	Bkg
2.6 miles E on Hwy 62/180 from Carlsbad	9.87	0.2
3.2 miles E on Hwy 62/180 from Carlsbad	9.92	1.0
3.6 miles E Carlsbad on Hwy 62/180	9.93	3.6
3.6 miles E Carlsbad on Hwy 62/180	10.00	3.0

Monitoring Results
HIGHWAY 62/180 AREA - CONTINUED

<u>LOCATION</u>	TIME (HOURS)	<u>NET MR/HR</u>
	<u>H-PLUS</u>	
3.6 miles E Carlsbad on Hwy 62/180 - Continued	10.08	3.0
" "	10.12	2.4
" "	10.15	3.0
" "	10.17	3.2
" "	10.20	2.6
" "	10.25	4.0
" "	10.37	3.2
" "	10.50	2.5
" "	10.52	2.3
1.4 miles E Carlsbad on Hwy 62/180	10.66	Bkg
AEC Office - Carlsbad	10.77	Bkg
11 miles NE Carlsbad, Hwy 62/180	5.25	0.19
12 miles NE Carlsbad, Hwy 62/180	5.33	0.19
13 miles NE Carlsbad, Hwy 62/180	5.37	0.69
14 miles NE Carlsbad, Hwy 62/180	5.42	0.24
15 miles NE Carlsbad, Hwy 62/180	5.50	Bkg
16.1 miles NE Carlsbad, Hwy 62/180	5.53	Bkg
17.4 miles NE Carlsbad, Hwy 62/180	5.58	Bkg
18.6 miles NE Carlsbad, Hwy 62/180	5.63	Bkg
20.2 miles NE Carlsbad, Hwy 62/180	5.66	Bkg
Hwy 62/180 and Bataam Bridge	9.50	3.5
3.5 miles E of Bataam Bridge on Hwy 62/180	9.58	3.5
4.0 miles E Bataam Bridge, Hwy 62/180	9.75	5.0
4.3 miles E Malaco Station	9.80	2.0
0.7 miles E Malaco Station	9.87	1.5
1.7 miles E Malaco Station	9.93	0.9
2.7 miles E Malaco Station	9.97	0.5
3.5 miles E Malaco Station	10.00	0.6
4.7 miles E Malaco Station	10.25	0.9
3.7 miles E Malaco Station	10.37	0.7
3.0 miles E Malaco Station	10.53	1.0
3.4 miles E Malaco Station	10.62	0.5
8.3 miles E Malaco Station	10.78	0.4
Junction, Hwys 31 and 62/180	10.98	0.1
Junction, Hwys 31 and 62/180	11.02	0.07
3.1 miles E of Junction Hwys 31 and 62/180	11.17	0.05
4.5 miles E Junction, Hwys 31 and 62/180	11.22	0.04
6.4 miles E Junction, Hwys 31 and 62/180	11.28	0.04
Junction, Hwys 31 and 62/180	21.66	1.6
Lovington	18.83	Bkg
Hobbs	19.75	Bkg

Monitoring Results
HIGHWAY 62/180 AREA - CONTINUED

<u>LOCATION</u>	TIME (HOURS)	<u>NET MR/HR</u>
	<u>H-PLUS</u>	
Arkansas Junction	20.00	Bkg
Half-Way Station	20.42	Bkg
Transwestern Pipeline	20.75	Bkg
25 miles E Carlsbad, Hwy 62/180	20.92	0.1
Junction, 4-Lane Highway, E of Carlsbad	21.00	0.15
Junction, Hwys 31 and 62/180	21.09	0.2
4 miles W of Junction, Hwys 31 and 62/180	21.17	Bkg
Remainder of distance to Carlsbad	21.33	Bkg
1 mile NE of Carlsbad, Hwy 62/180	45.42	Bkg
2 miles NE of Carlsbad, Hwy 62/180	45.50	Bkg
6 miles NE of Carlsbad, Hwy 62/180	45.66	Bkg
8 miles NE of Carlsbad, Hwy 62/180	45.78	Bkg
10 miles NE of Carlsbad, Hwy 62/180	45.92	Bkg
13 miles NE of Carlsbad, Hwy 62/180	46.00	Bkg
Getty Oil Lease on Hwy 62/180	46.33	Bkg
Between Getty Oil Lease and Hwy 31	46.75	Bkg
Bridge over Pecos River on Hwy 180	45.08	Bkg
5.4 miles E of Bridge on Hwy 62/180	45.17	Bkg
7.4 miles E of Bridge on Hwy 62/180	45.25	Bkg
8.4 miles E of Bridge on Hwy 62/180	45.27	Bkg
9.5 miles E of Bridge on Hwy 62/180	45.30	Bkg
12.5 miles E of Bridge on Hwy 62/180	45.37	Bkg
Junction of Hwys 31 and 62/180	45.43	Bkg
Transwestern Pipeline	45.70	Bkg
IMCC	46.92	Bkg
Transwestern Pipeline	69.83	Bkg
U. S. Potash	70.83	Bkg

MONITORING RESULTS

HUDSON FARM AREA

<u>LOCATION</u>	TIME (HOURS) <u>H-PLUS</u>	<u>NET MR/HR</u>
10 miles NE Carlsbad, Hwy 62/180	1.67	0.03
" "	1.72	2.0
" "	1.75	2.0
" "	1.78	9.0
11 miles NE Carlsbad, Hwy 62/180	1.80	1.0
" "	1.92	80.0
" "	1.95	50.0
" "	1.96	30.0
" "	1.98	50.0
" "	2.00	60.0
" "	2.02	95.0
" "	2.03	80.00
" "	2.07	40.0
" "	2.08	5.0
" "	2.11	9.0
" "	2.13	9.0
" "	2.15	12.0
" "	2.17	14.0
" "	2.18	11.0
" "	2.20	8.0
" "	2.25	14.0
" "	2.27	38.0
" "	2.30	45.0
" "	2.33	50.0
Hudson Farm, 10 miles NE Carlsbad	2.37	40.0
" "	2.42	50.0
" "	2.50	50.0
" "	2.55	45.0
" "	2.60	50.0
" "	2.63	30.0
" "	2.66	30.0
" "	2.75	35.0
" "	2.78	45.0
" "	2.83	30.0
" "	2.90	6.0
" "	2.93	5.0
" "	3.00	8.0
" "	3.08	3.0

Monitoring Results
HUDSON FARM AREA - CONTINUED

<u>LOCATION</u>	TIME (HOURS)	<u>NET MR/HR</u>
	<u>H-PLUS</u>	
Hudson Farm, 10 miles NE Carlsbad - Continued	3.15	2.5
" "	3.25	5.0
" "	3.33	2.0
" "	3.42	1.5
" "	3.62	0.8
" "	3.75	1.1
" "	3.87	0.7
" "	4.00-4.46	0.3
" "	4.58	0.2
" "	4.83	0.15
" "	5.00	0.15
" "	5.25	0.15
16 miles NE Carlsbad, Hwy 62/180	45.00-47.00	Bkg
	47.25	Bkg

MONITORING RESULTS

ILLINOIS CAMP AREA

<u>LOCATION</u>	<u>TIME (HOURS) H-PLUS</u>	<u>NET MR/HR</u>
Transwestern Pipeline, Hwy 62/180	0.20	Bkg
2 miles W Transwestern Pipeline, Hwy 62/180	0.52	Bkg
5 miles W Transwestern Pipeline, Hwy 62/180	0.62	Bkg
7 miles W Transwestern Pipeline, Hwy 62/180	0.68	Bkg
Junction, Hwys 62/180 and 31	0.87	Bkg
" "	1.15	0.07
" "	1.17	0.2
" "	1.18	0.4
" "	1.20	0.7
" "	1.27	1.5
" "	1.37	2.0
" "	1.38	3.5
" "	1.50	1.5
" "	1.60	2.0
" "	1.73	0.4
2.4 miles S Junction, Hwys 62/180 and 31	1.77	0.2
3.5 miles S Junction, Hwys 62/180 and 31	1.83	0.2
4.4 miles S Junction, Hwys 62/180 and 31	1.85	0.1
6.4 miles S Junction, Hwys 62/180 and 31	1.93	0.1
7.0 miles S Junction, Hwys 62/180 and 31	2.00	0.06
IMCC Mine on Hwy 31	2.05	0.08
2 miles E IMCC Mine, on dirt road	2.17	Bkg
Crawford and London Ranch	2.33	Bkg
IMCC Mine on Hwy 31	2.58	0.04
Junction, Hwys 31 and 62/180	2.78	Bkg
Junction, Hwys 31 and 360	2.90	Bkg
Dirt road to Illinois Camp	3.13	Bkg
6 miles NW on dirt road to Illinois Camp	3.18	0.07
7.9 miles NW on dirt road to Illinois Camp	3.27	0.09
10.4 miles NW on dirt road to Illinois Camp	3.58	0.15
13.9 miles NW on dirt road to Illinois Camp	3.72	0.17
Western Devco and Yates Brothers Well	3.75	0.16
" "	3.88	0.4
" "	3.97	0.2
" "	4.02	0.13
" "	4.12	0.09
" "	4.23	0.06
1 mile NW Western Devco	4.45	0.05
Illinois Camp	4.50	0.09
2 miles SW Illinois Camp	4.58	0.08

Monitoring Results
ILLINOIS CAMP AREA - CONTINUED

<u>LOCATION</u>	TIME (HOURS)	
	<u>H-PLUS</u>	<u>NET MR/HR</u>
4 miles SW Illinois Camp	4.66	0.07
4 miles SW Illinois Camp	4.70	Bkg
6 miles SW Illinois Camp	4.80	Bkg
14 miles SW Illinois Camp	4.97	Bkg
Otis, Hwy 285	1.13	Bkg
Pecos River Bridge	1.33	Bkg
North Canal Bridge, Pecos River	2.83	Bkg
Illinois Camp Road, N	3.17	Bkg
1 mile N on Illinois Camp Road	3.27	0.01
6 miles N on Illinois Camp Road	3.52	0.09
7 miles N on Illinois Camp Road	3.60	0.28
Illinois Camp Road Ranch House	3.66	0.68
Illinois Camp Road Cattle Guard	3.73	0.68
11 miles N on Illinois Camp Road	3.80	2.0
12 miles N on Illinois Camp Road	3.83	0.58
Illinois Camp Road Phillips Pet.	4.13	0.13
Illinois Camp Road Water Tower	4.33	0.28
S Illinois Camp Road	4.60	0.08
1 mile S Illinois Camp Road	4.73	0.02
3.3 miles S Illinois Camp Road	4.90	0.01
5.5 miles S Illinois Camp Road	4.98	Bkg
8.6 miles S Illinois Camp Road Ranch House	5.08	0.04
5 miles S Illinois Camp Road Ranch House	5.35	Bkg
10.5 miles S Illinois Camp Road Ranch House	5.55	Bkg

MONITORING RESULTS

IMCC MINE AREA

<u>LOCATION</u>	TIME (HOURS)	<u>H-PLUS</u>	<u>NET MR/HR</u>
Junction, Hwy 31 and IMCC Mine	0.16-0.50		Bkg
"	0.78		0.02
"	0.87		1.5
"	0.88		3.0
"	0.90		5.0
"	0.92		10.0
"	0.95		12.0
"	0.97		15.0
"	0.98		17.0
"	1.00		35.0
"	1.07		11.0
"	1.12		5.0
"	1.15		3.0
"	1.20		8.0
"	1.22		12.0
"	1.23		15.0
"	1.25		20.0
"	1.26		30.0
"	1.27		20.0
"	1.45		0.7
"	1.55		0.28
"	1.75		0.08
"	2.00		0.04
"	2.30		0.04
"	2.40		0.01
"	2.75		Bkg
"	3.50		0.28
"	3.70		0.48
"	3.75		0.58
"	3.92		0.68
"	4.00		0.68
"	4.20		0.38
"	4.83		0.58
"	5.30-5.75		Bkg
"	5.95		0.18
"	6.25		0.09
"	6.67		0.04
"	6.87		0.14
"	6.90		0.23

Monitoring Results
IMCC MINE AREA - CONTINUED

<u>LOCATION</u>	TIME	
	(HOURS)	
	<u>H-PLUS</u>	<u>NET MR/HR</u>
Junction, Hwy 31 and IMCC Mine - Continued	6.92	0.33
" "	7.08	0.49
" "	7.13	0.29
" "	7.41	0.13
" "	8.00	0.05
" "	8.11	0.15
" "	8.28	0.02
" "	8.42-9.00	Bkg
	10.75	Bkg
1.0 miles S IMCC Mine on Hwy 31	10.78	0.02
1.4 miles S IMCC Mine on Hwy 31	10.80	1.0
1.5 miles S IMCC Mine on Hwy 31	10.85	0.12
1.7 miles S IMCC Mine on Hwy 31	10.88	0.23
2.0 miles S IMCC Mine on Hwy 31	10.91	0.23
2.5 miles S IMCC Mine on Hwy 31	10.95	0.14
3.0 miles S IMCC Mine on Hwy 31	11.00	0.14
4.0 miles S IMCC Mine on Hwy 31	11.03	0.14
4.5 miles S IMCC Mine on Hwy 31	11.08	0.53
Junction, Hwys 31 and 128	11.12	1.2
0.5 miles SW Junction, Hwys 31 and 128	11.17	2.5
Junction, Hwys 31 and 62/180	4.78	0.1
Junction, Hwys 31 and 62/180	5.25	0.2
6.0 miles S on Hwy 31	5.33	0.2
9.2 miles S on Hwy 31	5.43	0.2
12.6 miles S on Hwy 31	5.55	1.9
13.9 miles S on Hwy 31	5.62	2.0
14.4 miles S on Hwy 31	5.65	9.0
Junction, Hwys 31 and 128	5.72	0.3
Junction, IMCC and Hwy 31	21.75	1.0
IMCC Mine	22.00	0.3
Junction, IMCC and Hwy 31	22.25	0.6
8.5 miles N of IMCC and Hwy 31	22.47	0.2

C. Potash Mine Surveys

The function of the U. S. Public Health Service in regard to mine inspections was to determine the existing working conditions prior to the Gnome experiment, particularly from the standpoint of radiation exposure and to establish background radiation levels in each of the eight mines of the potash industry. After these facts were established, a post-shot survey of the mines would indicate any increase of radiation after the detonation.

Under the supervision of a representative of the U. S. Bureau of Mines, eight survey teams were formed consisting of a member from each of the following agencies:

U. S. Atomic Energy Commission
U. S. Geological Survey
New Mexico Mine Inspection Department
Representative of the potash mine industry
U. S. Public Health Service

Since radiation exposure to miners working underground was of primary importance to the Public Health Service, the survey team members representing the Public Health Service were equipped with Precision Model 111 Scintillators for gamma detection, and Beckman MX-5 beta-gamma survey instruments, to document radiation levels in the mines. These instruments, when used concurrently, were considered adequate to give a reasonable degree of accuracy for portable instruments in measuring the gamma and beta activity up to 20 mr/hr. Samples of the ore from the mines were collected during the survey so that more extensive analysis could be made in the event this would be necessary.

On December 7 and 8, 1961, a Public Health Service representative accompanied each mine survey team on a pre-detonation inspection of the mines.

Mines that are located within a thirty mile radius from Ground Zero which were inspected are listed below:

1. Southwest Mine
2. International Minerals and Chemicals Corporation
3. Potash of America
4. Duval #1 and #2

5. Duval #3 and #4
6. U. S. Borax #1
7. U. S. Borax #2
8. National Potash Mines

In each mine, gamma and beta-gamma readings of radioactivity were made and documented for all areas of the mine workings covered by the survey teams.

A summary of the data recorded during the pre-detonation surveys revealed that the radioactivity in the mines was less than or equivalent to 0.02 - 0.03 mr/hr background radiation determined for aboveground levels.

On December 10, 1961, the same representative of the Public Health Service, using the same instruments that were used on the pre-detonation survey, was stationed at each mine until after the Gnome detonation, and then accompanied the survey teams during the post-detonation inspection.

Radiation level readings were again taken in the same locations as during the pre-detonation surveys. Reports of this survey indicated that readings remained essentially the same as the previous readings within the tolerance of the instruments used.

TABLE II

MINE SURVEY MONITORING RESULTS

DUVAL MINING COMPANY - SHAFTS 1 & 2

<u>LOCATION CODE NO.</u>	<u>LOCATION</u>	<u>PRE-SHOT</u>		<u>POST-SHOT</u>	
		<u>DATE</u>	<u>GROSS MR/HR</u>	<u>DATE</u>	<u>TIME (HRS.)</u> <u>GROSS MR/HR</u>
1	6N, Station 386	12/7	0.03	12/10	1255 0.02
2	6N, Station 457		0.03		1300 0.02
3	57 Slant		0.02		1320 0.02
4	Room 8, 19E20		0.03		1330 0.02
5	Mech. Shop		0.02		1235 0.01
6	Bottom #1 Shaft		0.02		1230 0.02
7	Bottom #2 Shaft		0.01		1225 0.01
	Surface Shaft #2		-		1215 0.01
	Surface Shaft #2		-		1350 0.01

DUVAL MINING COMPANY - SHAFTS 3 & 4

Top of Shaft #3	12/7	0.02	12/10	1218	0.02
Bottom of Shaft #3		0.02		1235	0.02
B-4 at Δ 23		0.02		1300	0.03
B-10 at Δ 51		0.01		1303	0.01
B-15 at Δ 78		0.02		1304	0.02
25 feet past B-16		0.02		1305	0.02
1 left, BT-16, 87 feet from Δ 77		0.01		-	-
1 left, BT-16, 97 feet from Δ 77		-		1310	0.03
BT-16 North off 1-L at Δ 77		0.03		1312	0.03
BT-16 North off 2-L at intersection		0.03		1317	0.02
BT-15, 3 Left at Inter- section		0.02		1315	0.02
100 ft from Intersection off 15-2R		0.02		1317	0.01
Intersection 15 and 3R		0.02		1319	0.01
14-S at 90 ft from 3R		0.02		1322	0.03
Intersection 10-S and 3R		0.02		1333	0.02
Bench at Door of Ware- house		0.02		1342	0.02
Bottom of Shaft #4		0.02		1230	0.03
Top of Shaft #4		0.02		1220	0.01

MINE SURVEY MONITORING RESULTS

IMCC MINE

LOCATION CODE NO.	LOCATION	PRE-SHOT		DATE	POST-SHOT	
		DATE	GROSS MR/HR		TIME (HRS.)	GROSS MR/HR
319.4	Shaft No. 1 (enroute)	12/8	0.01	12/10	1210	0.01-0.03
318.51	No. 1 Dump, 900'		0.01			0.02
	Shaft No. 1 (entry) 850'		-			0.02
	Interior of IMCC Office				1250	5.0
	Shaft No. 2 Collar		-		1350	0.04
329.1	(Underground) Shaft No.					
	2 Entry		-			0.02
	Monitored out 5 East to					
	BT-22 (Panel 10), Down 22					
	to Room 15, East on 15 to					
	BT-32, South on BT-32 to					
	Rm 47, East on Room 47 to					
	BT-67, Down BT-67 to Room					
	124, arriving at 71 at					
	1425 hours		-			0.01-0.04
71	Panel 10, BT-69, R. 124		0.01		1425	0.01
72	BT-70, R. 133		0.02			0.02
73	BT-71, R. 133		0.03		1430	0.02
	Monitored from R. 133 and					
	BT-64 north to Room 47,					
	West to BT-32, North to					
	Room 16, West to BT-24		-			0.01-0.03
	Room 15, BT-24		-			0.02
	Monitored North from					
	BT-24 to R. 7, West on					
	R. 7 to BT-22, North on					
	22 to 5 East, West to					
	No. 2 Shaft		-			0.01-0.03
76	Shaft No. 2, Blower Exhaust		0.02		1500	0.01
	Monitored outside rim					
	of exhaust		-			0.02-0.03
	Shaft No. 2 (entry) 900'				1505	0.02
	Shaft No. 2 (entry) 850'				1510	0.01
	Monitored from No. 2 North,					
	North to Room 39, West to					
	10 North, North to R. 40,					
	West to BT-3, Raise 17					0.01-0.03
77	Raise 17		0.02			0.01
78	BT-14, R. 18		0.01		1530	0.02
	Shaft No. 2 (top) surface		-		1545	0.40
	Shaft No. 1 (top) surface		-		1555	0.80

IMCC MINE - CONTINUED

LOCATION CODE NO.	LOCATION	PRE-SHOT		POST-SHOT		GROSS MR/HR
		DATE	GROSS MR/HR	DATE	TIME (HRS.)	
	Hallway at IMCC Office	12/8	-	12/10		0.30-0.50
	Shaft No. 4 (top) surface		-		1630	0.70
	By Shaft No. 4 Collar		-			0.90
	Shaft No. 4 (entry) under-		-		1645	0.05
	ground--next to cage		-			
	5 ft. distance from cage		-			
	area, averaged read-		-			0.02
	ings circling cage		-			
	3 inches off entry sur-		-			0.02
	face ceiling cage		-			
	From No. 4 Shaft entry		-			
	down corridor to man		-			
	trap station		-			0.01
349.7	Repair Shop		0.01		1700	0.01
349.8	Machine Shop		-		1705	0.02
61	Switch 64, Panel 100E		0.02			0.02
	5 South Entry		-			0.01
8599	(IMCC Dosimeter Location)		-			
	35E, Crosscut 94		-		1725	0.01
	100 East to R. 26		-			0.01
62	BT-12, R. 27, Panel 100E		0.02		1730	0.01
63	BT-21, R. 29, Panel 100E		0.01		1740	0.01
64	BT-25, R. 25		0.01		1745	0.01
65	R. 26, 100 East, Track		-			
	Bend		0.02		1750	0.02
	5 South (enroute)		-			0.01-0.04
	Shaft No. 3 Blower		-			
	Exhausts		-		1815	0.02
	Monitored exhausts		-			0.02-0.05
66	Shaft No. 3, outside air		-			
	lock		0.02			0.02
67	No. 3 Shaft, 37 West,		-			
	Slant 37, R. 29		0.01		1825	0.03
69	BT-36, R. 11, Panel 6Z		0.02		1840	0.02
68	BT-14, R. 15		0.01		1845	0.02
70	Shaft No. 1, No. 2 Dump		0.01			-
	Panel 10, Belt Line		0.01			-
74	Panel 10, BT-72, R. 132		0.02			-
75	Panel 10, BT-74, R. 130		0.02			-
	Shaft No. 1 (entry) 900'		-		1900	0.02
349.10	Shaft No. 4 (entry)		0.01		1930	0.02
	Shaft No. 4 (top)		-			4.00
	Shaft No. 4 (top) surface		-			
	3" off ground		-			4.00

MINE SURVEY MONITORING RESULTS

NATIONAL POTASH MINES

<u>LOCATION CODE NO.</u>	<u>LOCATION</u>	<u>PRE-SHOT</u>		<u>POST-SHOT</u>		<u>GROSS MR/HR</u>
		<u>DATE</u>	<u>GROSS MR/HR</u>	<u>DATE</u>	<u>TIME (HRS.)</u>	
1	Above Ground, Lamp Pickup Station	12/7	0.02	12/10	1202	0.01
2	Entrance to Passenger Elevator, #2 Shaft		0.01		1218	0.01
3	Bottom of Shaft, Landing, No. 2 Station		0.01		1230	0.01
4	Maintenance Office		0.01		1235	0.02
5	First North, 14+40, No.3		0.01		1242	0.01
6	First Right, 15+20, No.5		0.01		1245	0.02
7	First Right, 19+20, No.5		0.01		1250	0.01
8	First Left, 21+60, No.5		0.01		1256	0.01
9	First Left, 44+00, No.5		0.01		1300	0.01
10	First Left, 55+20, No.5		0.01		1305	0.01
11	First Left, 58+00, No.7		0.01		1310	0.01
12	First Left, 57+60, No.6		0.01		1310	0.01
13	First Left, 57+80, No.4		0.01		1315	0.01
14	First Left, 57+60, No.2		0.01		1317	0.01
15	First Left, 57+60, No.1		0.01		1323	0.01
16	First Left, 32+00, No.4		0.01		1330	0.01
17	East Main, 19+20, No.4		0.01		1435	0.02
18	First Left North, 52+80, No.7		0.02		1405	0.01
19	First Left North, 53+60, No. 6		0.02		1407	0.01
20	First Left North, 53+60, No.5		0.01		1408	0.02
21	First Left North, 52+00, No.1		0.02		1412	0.02
22	East Main, 32+80, No.5		0.02		1435	0.02
23	No. 1 Shaft, at 500' Stn		0.01		1505	0.01
24	Crusher Station		0.01		1450	0.01

MINE SURVEY MONITORING RESULTS

POTASH COMPANY OF AMERICA

<u>LOCATION CODE NO.</u>	<u>LOCATION</u>	<u>PRE-SHOT</u>		<u>POST-SHOT</u>		<u>GROSS MR/HR</u>
		<u>DATE</u>	<u>GROSS MR/HR</u>	<u>DATE</u>	<u>TIME (HRS.)</u>	
	Shifters Office	12/8	0.02	12/10	1235	0.02
	SW Air Course Dog Leg		0.01		1334	0.01
	Main S. off SW 15		0.01		1248	0.02
	S. Shaft - Intake Air		0.02		1254	0.01
	Approx. 500 N of S					
	Shaft in Main		0.01		1359	0.01
	2 E at Main Shop Turnoff		0.02		1415	0.02
	Old #2 Shop (2E)		0.01		1420	0.01

SOUTHWEST MINE

1	Top of Shaft #2 (ex- haust air)	12/7	0.02	12/10	1210	0.02
2	Bottom of Shaft #2 (exhaust air)		0.02		1216	0.02
3	Bottom of Shaft #1 (intake air)		0.02		1220	0.02
4	Main East, Jct 10N		0.02		1227	0.02
5	Main 40 East Mouth		0.02		1253	0.02
6	Main 40 East, Entry #35, Break #43		0.03		1239	0.02
7	Main 40 East, Entry #36		0.04		1245	0.03
8	No. 1 South, Entry #49F, Break #13		0.03		1400	0.02
9	No. 1 South, Mouth of Tunnel		0.02		1416	0.02
10	East #29, Entry #9		0.02		1334	0.02
11	East #31, Jct., North #2		0.02		1327	0.02
12	North #2, North Entry, Break #61		0.02		1322	0.02
13	West #7, Entry #46, North		0.02		1314	0.02
14	West #7, Entry, Break #83		0.02		1305	0.02

MINE SURVEY MONITORING RESULTS

U. S. BORAX - #1

<u>LOCATION CODE NO.</u>	<u>LOCATION</u>	<u>PRE-SHOT</u>		<u>POST-SHOT</u>		
		<u>DATE</u>	<u>GROSS MR/HR</u>	<u>DATE</u>	<u>TIME (HRS.)</u>	<u>GROSS MR/HR</u>
	6 Level, #2 Shaft	12/7	0.01	12/10	1240	0.01
	6 Level, #2 Fan		0.03		1245	0.02
	Intersection 4 West					
	and 1 South		0.02		1300	0.015
	Shifters Desk #1 Stn		0.03		1305	0.02
	1 North, Water Valve					
	For Scrubbers		0.01		1310	0.02
	1 North, Breakthru 14		0.01		1315	0.005
	1 North, Breakthru 68		0.01		1320	0.005
	Yo-Yo at North End		0.005		1330	0.015
	Breakthru 80, 3 North,					
	Shot Out for A Frame		0.01		1340	0.01
	Breakthru 81, Room 11		0.01		1343	0.01
	Breakthru 88, Room 11		0.01		1346	0.015
	Breakthru 89, Room 3		0.01		1350	0.005
	Breakthru 84, 1 North,					
	Crusher Station		0.015		1355	0.01
	3 North, Breakthru 72		0.01		1400	0.01
	Panel 7 West, Breakthru					
	7, Room 15		0.02		1430	0.02
	Panel 7 West, Breakthru					
	8, Room 10		0.02		1435	0.01
	Panel 7 West, Breakthru					
	2, Room 1		0.01		1443	0.01
	Panel 9 West, Breakthru					
	6, Room 1		0.01		1448	0.02
	Panel 9 West, Breakthru					
	6, Room 6		0.01		1450	0.01
	Panel 9 West, Breakthru					
	8, Room 3		0.005		1500	0.01
	Overcast near 7 Right		0.02		1425	0.01

MINE SURVEY MONITORING RESULTS

U. S. BORAX - #1

<u>LOCATION CODE NO.</u>	<u>LOCATION</u>	<u>PRE-SHOT</u>		<u>POST-SHOT</u>	
		<u>DATE</u>	<u>GROSS MR/HR</u>	<u>DATE</u>	<u>GROSS MR/HR</u>
	#1 Shaft, Top	12/7	0.01	12/10	0.01
	#1 Shaft, Main Pump Station		0.01		0.01
	#1 Shaft, 4th Level		0.01		0.02
	#1 Shaft, 5th Level		0.01		0.01
	#1 Shaft, 6th Level		0.01		0.01
	#1 Shaft, 7th Level		0.01		0.01
1	6th Level		0.03		0.02
	Transformer Station near Bottom Shaft		0.02		0.02
	NE Incline, 1000', near Fire Shovel		0.03		0.04
2	NE Incline, Backdown		0.01		0.02
3	NE Incline, Overcast		0.02		0.01
4	NE Incline, Overcast		0.02		0.02
5	Room 4 AE		0.02		0.02
	12470 Volt Station NE Entrance		0.02		0.01
6	1-NE Entry		0.01		0.01
7	BT-8, Room 14A		0.02		0.02
	BT-2, Room 14A		0.02		-
8	1-NE, Room 23		0.01		0.01
9	1-NE, Room 27A, Entrance		0.01		0.02
10	Room 28, at Rear		0.02		0.02
11	2-NE, Room 27		0.02		0.02
12	Timber		0.02		0.01
	Shop		0.02		0.01

MINE SURVEY MONITORING RESULTS

U. S. BORAX - #3

<u>LOCATION CODE NO.</u>	<u>LOCATION</u>	<u>PRE-SHOT</u>		<u>POST-SHOT</u>	
		<u>DATE</u>	<u>GROSS MR/HR</u>	<u>DATE</u>	<u>GROSS MR/HR</u>
	#3 Shaft Entrance	12/7	0.02	12/10	0.01
	#3 Shaft, Halfway Point		0.01		0.01
	#3 Shaft, Pump Station		0.005		0.005
	#3 Shaft, Level 6		0.01		0.01
	736-1		0.01		0.01
1	4-Main		0.01		0.01
2	4-Main		0.01		0.01
	4-Main, BT-9		0.01		0.01
	4-Main, BT-14		0.01		0.015
	4-Main, BT-20		0.01		0.01
	4-Main, BT-25		0.02		0.02
	4-Main, BT-27		0.01		0.02
3	BT-26		0.015		0.02
	BT-26		0.02		0.01
4	BT-26, Curtain		0.03		0.02
	1-N, BT-4		0.01		0.01
	1-N, BT-9		0.01		0.01
	2-N, BT-12		0.015		0.01
6	BT-26-R		0.005		0.01
7	2-N, Near BT-12		0.03		0.03

D. Air Sampling

The air sampling program for Project Gnome began about September 15, 1961, with the establishment of six air sampling stations. It was necessary to begin the sampling of air for radioactivity well in advance of the detonation for two major reasons--in order to establish the average concentration of air particulate radioactivity, daily samples must be collected, and after the recent Russian nuclear detonations it was imperative that continuous air sampling be continued up to the time of the Gnome detonation to determine changes that may occur in the air radioactivity.

The six sampling stations that were established in September were operated by local people and supplied with the necessary materials and supervision by the Public Health Service.

Staplex high volume air samplers were used with an 8"x10" glass fiber filter with the sample rate of approximately 50 cubic feet of air per minute. Prior to the Gnome detonation, each of these air samplers were equipped with an MSA activated charcoal cartridge secondary to the glass fiber filters to sample radioactive gases. After wind trajectory was predicted by the U. S. Weather Bureau, additional air samplers were employed in monitoring the radioactivity released from the Gnome detonation. A total of seventeen air samplers were run in various locations around the site within a 100-mile radius for varied lengths of time.

Glass fiber filters were counted in the proportional region for gross beta activity using a large area probe and methane as the counting gas. Gamma-emitting isotopes on the filters composed largely of I^{133} - Xe^{133} and Te^{132} - I^{132} were detected on a 400-channel gamma pulse height analyzer. All of the charcoal MSA cartridges were scanned for gamma-emitting isotopes, and I^{133} (half-life 20.8 hours) was detected in areas of cloud passage.

Only one prefilter was counted on the 400-channel analyzer. This filter was used on the day of the shot at the IMCC Mine. The gamma activity of this filter was due to I^{133} - Xe^{133} and Te^{132} - I^{132} .

The charcoal cartridge data is given in Table III. The cartridges which have the short half-life, 20.8 hour P^{133} , in them indicating activity from the Gnome shot were at the following locations: IMCC Mine, Transwestern Pipeline Company, Red Bluff Lodge, and the Water Department at Carlsbad.

None of the samples had levels of activity near the MPC values for the isotopes involved.

AIR FILTER STATION
285 HIGHWAY ROUTE NOS.

SCALE: 1" = 12 MILES

RED
BLUFF

US PUBLIC HEALTH SERVICE
RADIOLOGICAL HEALTH FIELD ACTIVITIES
LAS VEGAS, NEVADA

AIR SAMPLING STATIONS PROJECT GNOME

BY	CODE	DATE	SCALE	PAGE
				of

TABLE III
ISOTOPIC AIR SAMPLE ACTIVITY
COLLECTED ON ACTIVATED CHARCOAL CARTRIDGES

LOCATION	COLLECTION TIME	SAMPLE VOLUME IN CUBIC METERS	$\mu\text{c}/\text{M}^3$ AT TIME OF COLLECTION		
			I ¹³¹	I ¹³³	I ¹³⁵
Artesia	1030 12/11-	1428	0.093	ND	ND
	1030 12/12				
Carlsbad	0615 12/10-	1392	ND	ND	ND
	0935 12/11				
Carlsbad Water Dept.	0800 12/11-	1478	0.22	0.84	ND
	1300 12/12				
Carlsbad Caverns	0610 12/10-	1326	ND	ND	ND
	0930 12/11				
	0934 12/11-	1139	Trace	ND	ND
	0930 12/12				
El Paso Nat'l Gas Pump Stn	0545 12/10-	1282	ND	ND	ND
	1010 12/11				
	1020 12/11-	978	ND	ND	ND
	0920 12/12				
Harroun Farm	0830 12/10-	1217	ND	ND	ND
	0800 12/11				
	0800 12/11-				
	1022 12/12	1345	0.06	ND	ND
	1030 12/12-	385	ND	ND	ND
	1600 12/12				
Hobbs	0505 12/10-	910	ND	ND	ND
	0740 12/11				
IMCC Processing Plant	0600 12/10-	925	ND	14	3.5
	2245 12/10				
IMCC Shaft No. 3	0945 12/7-	3270	ND	ND	ND
	0620 12/10				
IMCC (Upcast) Shaft No. 3	0630 12/10- 1410 12/11	1570	0.25	2.4	ND

ISOTOPIC AIR SAMPLE ACTIVITY - CONTINUED

LOCATION	COLLECTION TIME	SAMPLE VOLUME IN CUBIC METERS	$\mu\text{Ci}/\text{M}^3$ AT TIME OF COLLECTION		
			I^{131}	I^{133}	I^{135}
IMCC Shaft No. 4	1200 12/7-	3142	ND	ND	ND
	0600 12/10				
IMCC (intake) Shaft No. 4	2300 12/10-	950	1.7	18	ND
	1430 12/11				
Jal	1210 12/11-	1038	ND	ND	ND
	1045 12/12				
	1045 12/12-	1138	ND	ND	ND
	1040 12/13				
Lovington	0538 12/10-	950	ND	ND	ND
	0610 12/11				
	0625 12/11-	927	ND	ND	ND
	0540 12/12				
Malaga School	0630 12/10-	1105	ND	ND	ND
	0830 12/11				
	0830 12/11-	1127	Trace	ND	ND
	1000 12/12				
Red Bluff Lodge	0625 12/10-	1256	ND	ND	ND
	1050 12/11				
	1055 12/11-	985	0.38	1.8	ND
	1030 12/12				
Roswell	1712 12/11-	1018	Trace	ND	ND
	1615 12/12				
San Simon	0440 12/10-	1303	ND	ND	ND
	0830 12/11				
	0830 12/11-	1475	ND	ND	ND
	0930 12/12				
Transwestern Pipeline Co.	0727 12/10-	954	ND	ND	ND
	1820 12/10				
	1820 12/10-	818	ND	ND	ND
	1100 12/11				
	1100 12/11-	1010	0.46	3.3	ND
	0945 12/12				

ISOTOPIC AIR SAMPLE ACTIVITY - CONTINUED

<u>LOCATION</u>	<u>COLLECTION TIME</u>	<u>SAMPLE VOLUME IN CUBIC METERS</u>	<u>AT TIME OF COLLECTION</u>		
			<u>I¹³¹</u>	<u>I¹³³</u>	<u>I¹³⁵</u>
Williams Farm	1130 12/10-				
Loving	1210 12/11	629	ND	ND	ND
	1220 12/11-				
	0925 12/12	487	0.20	ND	ND

ND = Not detected

Zr95-Nb95, Ru103, and Ce141&144 which are present in the air due to Russian fallout was also found in small quantities on some of the above cartridges.

TABLE IV

GROSS BETA AIR SAMPLE DATA

ARTESIA, NEW MEXICO

<u>TIME AND DATE OF COLLECTION</u>	<u>TIME OF COUNT</u>	<u>AIR VOLUME M³</u>	<u>ACTIVITY μic/M³</u>
1010 12/1 - 0508 12/2	1003 12/18	2180	3.11
0510 12/2 - 1010 12/3	1006 12/18	3400	2.43
1015 12/3 - 1100 12/4	1008 12/18	3070	3.62
1105 12/4 - 1000 12/5	1011 12/18	2980	5.28
1000 12/5 - 0900 12/6	1013 12/18	2720	7.48
0900 12/6 - 0910 12/7	1015 12/18	2820	6.21
1400 12/7 - 1700 12/7	1018 12/18	385	5.52
0830 12/8 - 1010 12/9	1020 12/18	2780	8.05
1015 12/9 - 0935 12/10	1022 12/18	2930	6.34
0810 12/10 - 1020 12/10	1024 12/18	252	1.69
1030 12/11 - 1030 12/12	1259 12/14	1428	16.9
1050 12/12 - 1030 12/13	1513 1/2	1445	6.35
1030 12/13 - 1015 12/14	1515 1/2	1432	5.35
1025 12/14 - 1000 12/15	1518 1/2	1362	6.85
1030 12/15 - 1010 12/16	1443 1/2	1485	6.28
1030 12/16 - 1045 12/17	1326 1/5	1482	2.33
1045 12/17 - 0945 12/18	1428 1/10	2619	6.27
0945 12/18 - 0850 12/19	1440 1/2	2620	9.25
0900 12/19 - 0900 12/20	1442 1/3	2754	13.9
0915 12/20 - 1000 12/21	1444 1/3	2760	7.83

ARTESIA, NEW MEXICO - CONTINUED

<u>TIME AND DATE OF COLLECTION</u>	<u>TIME OF COUNT</u>	<u>AIR VOLUME</u> <u>M³</u>	<u>ACTIVITY</u> <u>μuc/M³</u>
1000 12/21 - 0915 12/22	1446 1/3	2650	6.61
0915 12/22 - 0945 12/23	1448 1/3	2730	14.9
1100 12/24 - 1100 12/25	1450 1/3	1510	4.27
1100 12/25 - 0900 12/26	1452 1/3	1345	27.0
0900 12/26 - 1120 12/27	1455 1/3	1680	15.1
1125 12/27 - 0125 12/28	1432 1/10	916	30.1
0125 12/28 - 1010 12/29	1434 1/10	2087	12.4
1010 12/29 - 1045 12/30	1436 1/10	1483	13.8
1045 12/30 - 1005 12/31	1438 1/10	1447	15.8
1010 12/31 - 1015 1/1	1440 1/10	1473	8.63

GROSS BETA AIR SAMPLE DATA

CARLSBAD, NEW MEXICO

<u>TIME AND DATE OF COLLECTION</u>	<u>TIME OF COUNT</u>	<u>AIR VOLUME M³</u>	<u>ACTIVITY μc/M³</u>
1500 12/1 - 1030 12/2	1512 12/12	2020	3.88
1030 12/2 - 1200 12/3	1514 12/12	2688	2.57
1200 12/3 - 1300 12/4	1421 1/2	2592	3.40
1300 12/4 - 1300 12/5	1423 1/2	2428	5.08
1300 12/5 - 1230 12/6	1425 1/2	2455	1.27
1230 12/6 - 0800 12/7	1427 1/2	1955	5.50
0800 12/8 - 0800 12/9	1546 1/2	2244	5.50
0800 12/9 - 0600 12/10	2254 12/11	2300	9.18
0615 12/10 - 0935 12/11	2213 12/11	1392	3.19
1400 12/15 - 1230 12/16	1443 1/10	1129	3.84
1230 12/16 - 1230 12/17	1445 1/10	1224	2.63
1230 12/17 - 0800 12/18	1448 1/10	1939	18.4
1600 12/21 - 1930 12/22	1422 1/16	2875	9.96
1930 12/22 - 1000 12/24	1424 1/16	3959	19.5
1000 12/24 - 1015 12/26	1426 1/16	4839	16.8
1015 12/26 - 1200 12/27	1428 1/16	2626	7.38
1200 12/27 - 1700 12/28	1430 1/16	2908	10.2
1700 12/28 - 1700 12/29	1432 1/16	2387	10.7
1700 12/29 - 1230 12/30	1434 1/16	1889	5.95
1230 12/30 - 1800 12/31	1451 1/16	2808	7.70
1800 12/31 - 0900 1/2	1453 1/16	3613	4.84

GROSS BETA AIR SAMPLE DATA
CARLSBAD CAVERNS, NEW MEXICO

<u>TIME AND DATE OF COLLECTION</u>	<u>TIME OF COUNT</u>	<u>AIR VOLUME</u> <u>M³</u>	<u>ACTIVITY</u> <u>μic/M³</u>
1556 12/1 - 1555 12/2	0950 12/18	2285	3.57
1558 12/2 - 1605 12/3	0952 12/18	2330	3.49
1606 12/3 - 1600 12/4	0955 12/18	2530	5.02
1603 12/4 - 1539 12/5	0957 12/18	2514	5.50
1538 12/5 - 1555 12/6	0959 12/18	2270	16.4
1558 12/6 - 1546 12/8	1001 12/18	4600	4.09
1550 12/8 - 1556 12/9	1402 1/16	2230	5.19
1556 12/9 - 0604 12/10	2311 12/11	1285	15.6
0934 12/11 - 0930 12/12	1255 12/14	1139	16.1
0935 12/12 - 0910 12/13	1507 1/2	1105	9.56

GROSS BETA AIR SAMPLE DATA

EL PASO NATURAL GAS - PECOS RIVER STATION

<u>TIME AND DATE OF COLLECTION</u>	<u>TIME OF COUNT</u>	<u>AIR VOLUME M³</u>	<u>ACTIVITY μuc/M³</u>
1215 12/9 - 0540 12/10	1150 12/10	1703	18.8
0545 12/10 - 1010 12/11	0135 12/12	1282	2.91
1020 12/11 - 0920 12/12	1225 12/14	978	12.0
1000 12/12 - 1040 12/13	1526 1/2	1025	8.35
1050 12/13 - 1050 12/14	1628 1/10	2244	4.64
1055 12/14 - 0915 12/15	1630 1/10	2296	5.85
0920 12/15 - 0800 12/16	1633 1/10	2176	4.13
0800 12/16 - 0800 12/17	1635 1/10	2346	3.30
0805 12/17 - 0720 12/18	1637 1/10	2272	5.83
0725 12/18 - 0730 12/19	1324 1/4	2210	11.4
0730 12/19 - 0725 12/20	1326 1/4	2420	13.7
0730 12/20 - 0730 12/21	1329 1/4	2203	10.3
0730 12/21 - 0715 12/22	1251 1/3	2300	7.45
0720 12/22 - 0815 12/23	1253 1/3	2390	18.0
0815 12/23 - 0815 12/24	1255 1/3	2365	21.2
0825 12/24 - 0740 12/26	1257 1/3	4660	18.7
0745 12/26 - 0745 12/27	1639 1/10	2346	7.25
0750 12/27 - 0840 12/28	1641 1/10	2438	8.55
0845 12/28 - 0815 12/29	1643 1/10	2317	8.84
0820 12/29 - 0825 12/30	1630 1/16	2313	8.71
0825 12/30 - 1740 1/1	1138 1/17	5207	6.09

GROSS BETA AIR SAMPLE DATA

HOBBS, NEW MEXICO

<u>TIME AND DATE OF COLLECTION</u>	<u>TIME OF COUNT</u>	<u>AIR VOLUME M³</u>	<u>ACTIVITY μpc/M³</u>
1430 12/9 - 0500 12/10	0055 12/12	1356	9.1
0505 12/10 - 0740 12/11	1234 12/14	910	1.7
0700 12/12 - 0815 12/13	1533 1/2	1082	6.71
0820 12/13 - 0830 12/14	1431 1/2	926	7.96
0835 12/14 - 0820 12/15	1434 1/2	808	4.4
0920 12/15 - 0800 12/16	1318 1/5	675	4.15
0805 12/16 - 0720 12/17	1349 1/2	895	5.56
0720 12/17 - 0830 12/18	1351 1/2	2122	8.06
0830 12/18 - 0900 12/19	1353 1/2	2030	1.84
0930 12/20 - 1300 12/21	1356 1/2	2800	1.12

GROSS BETA AIR SAMPLE DATA

IMCC MINE SHAFT #3

<u>TIME AND DATE OF COLLECTION</u>	<u>TIME OF COUNT</u>	<u>AIR VOLUME M³</u>	<u>ACTIVITY μuc/M³</u>
0630 12/8 - 0930 12/9	0305 12/12	1285	2.2
0930 12/9 - 0620 12/10	0945 12/11	990	11.0
0620 12/10 - 1410 12/11	2017 12/11	1570	30.0
1415 12/11 - 1000 12/12	1215 12/13	975	8.0
1000 12/12 - 1000 12/13	1528 1/2	1142	2.19
1000 12/13 - 1400 12/16	1453 1/2	3113	1.6
1405 12/16 - 1155 12/17	1323 1/5	970	1.42
1200 12/17 - 1355 12/18	1406 1/5	1735	1.67
1355 12/18 - 1355 12/19	1408 1/5	1896	2.66
1355 12/19 - 1200 12/20	1410 1/5	2014	10.7

GROSS BETA AIR SAMPLE DATA

IMCC MINE SHAFT #4

<u>TIME AND DATE OF COLLECTION</u>	<u>TIME OF COUNT</u>	<u>AIR VOLUME M³</u>	<u>ACTIVITY μuc/M³</u>
0650 12/8 - 0800 12/9	0238 12/12	1310	6.6
0800 12/9 - 0600 12/10	1025 12/11	1085	11.0
0600 12/10 - 2245 12/10	0930 12/11	925	160.0
2300 12/10 - 1430 12/11	2000 12/11	950	5.8
1430 12/11 - 1015 12/12	2205 12/13	1140	15.0
1015 12/12 - 1015 12/13	1440 1/2	1306	6.6
1015 12/13 - 1415 12/16	1447 1/2	4840	5.32
1420 12/16 - 1120 12/17	1321 1/5	1090	3.88
1145 12/17 - 1345 12/18	1358 1/5	2870	7.7
1345 12/18 - 1345 12/19	1401 1/5	2562	13.7
1345 12/19 - 1220 12/20	1403 1/5	2445	2.56

GROSS BETA AIR SAMPLE DATA

JAL, NEW MEXICO

<u>TIME AND DATE OF COLLECTION</u>	<u>TIME OF COUNT</u>	<u>AIR VOLUME</u> <u>M³</u>	<u>ACTIVITY</u> <u>μuc/M³</u>
1540 12/9 - 0630 12/10	1115 12/10	1388	15.2
0630 12/10 - 1205 12/11	0223 12/12	1103	2.21
1210 12/11 - 1045 12/12	2237 12/13	1038	6.33
1045 12/12 - 1040 12/13	2245 12/13	1138	12.4
1040 12/13 - 1045 12/14	1618 1/10	2244	6.72
1045 12/14 - 1045 12/15	1620 1/10	2244	8.23
1045 12/15 - 1045 12/16	1622 1/10	2244	1.87
1045 12/16 - 1030 12/17	1624 1/10	1716	1.55
1030 12/17 - 1030 12/18	1626 1/10	2142	6.71
1030 12/18 - 1030 12/19	1107 1/3	2244	16.2
1030 12/19 - 1030 12/20	1110 1/3	2244	5.85
1030 12/20 - 1030 12/21	1112 1/3	2244	10.0
1030 12/21 - 1000 12/22	1114 1/3	2200	8.88
1000 12/22 - 1000 12/23	1116 1/3	2244	25.5
1000 12/23 - 1030 12/24	1118 1/3	2290	24.0
1030 12/24 - 1145 12/25	1151 1/3	2360	29.5
1145 12/25 - 1130 12/26	1154 1/3	2220	14.5
1130 12/26 - 1100 12/27	1156 1/3	2200	10.3
1100 12/27 - 1030 12/28	1158 1/3	2200	12.6
1030 12/28 - 1030 12/29	1618 1/16	2244	10.1

JAL, NEW MEXICO - CONTINUED

<u>TIME AND DATE OF COLLECTION</u>	<u>TIME OF COUNT</u>	<u>AIR VOLUME</u> <u>M³</u>	<u>ACTIVITY</u> <u>μpc/M³</u>
1030 12/29 - 1030 12/30	1620 1/16	2244	10.4
1030 12/30 - 1030 12/31	1623 1/16	2244	75.0
1030 12/31 - 1030 1/1	1625 1/16	2244	4.61

GROSS BETA AIR SAMPLE DATA

LOCO HILLS, NEW MEXICO

<u>TIME AND DATE OF COLLECTION</u>	<u>TIME OF COUNT</u>	<u>AIR VOLUME</u> <u>M³</u>	<u>ACTIVITY</u> <u>μpc/M³</u>
1500 12/1 - 1500 12/2	1540 12/12	2387	4.04
1500 12/2 - 1500 12/3	1542 12/12	2448	3.58
1500 12/3 - 1500 12/4	1544 12/12	2346	7.00
1500 12/4 - 1500 12/5	0927 12/18	2407	5.60
1500 12/5 - 1500 12/6	0930 12/18	2285	8.64
1500 12/6 - 1500 12/7	0932 12/18	2489	6.71
1500 12/7 - 1500 12/8	0935 12/12	2448	1.46
1500 12/8 - 1500 12/9	0945 12/18	2407	11.0
1500 12/9 - 1500 12/10	0948 12/18	2448	6.19
1500 12/11 - 1500 12/12	1500 1/2	1224	14.0
1500 12/12 - 1500 12/13	1500 1/2	1306	6.75
1500 12/13 - 1500 12/14	1524 1/2	1224	7.13
1500 12/14 - 1500 12/15	1331 1/2	1223	7.78
1500 12/15 - 1500 12/16	1344 1/2	1265	3.94
1500 12/16 - 1500 12/17	1341 1/2	1140	4.22
1500 12/17 - 1500 12/18	1328 1/2	1265	6.73
1500 12/18 - 1500 12/19	1458 1/3	2387	17.5
1500 12/19 - 1500 12/20	1500 1/3	2346	11.1
1500 12/20 - 1500 12/21	1502 1/3	2346	7.25
1500 12/21 - 1500 12/22	1504 1/3	2264	11.0

LOCO HILLS, NEW MEXICO - CONTINUED

<u>DATE AND TIME OF COLLECTION</u>	<u>TIME OF COUNT</u>	<u>AIR VOLUME</u> <u>M³</u>	<u>ACTIVITY</u> <u>μuc/M³</u>
1500 12/23 - 1500 12/24	1451 1/10	2080	27.3
1500 12/24 - 1500 12/25	1453 1/10	2203	24.7
1500 12/25 - 1500 12/26	1455 1/10	2162	14.1
1500 12/26 - 1500 12/27	1457 1/10	2183	10.5
1500 12/27 - 1500 12/28	1459 1/10	2183	12.0
1500 12/28 - 1500 12/29	1502 1/10	2142	12.2
1500 12/29 - 1500 12/30	1504 1/10	2121	10.4

GROSS BETA AIR SAMPLE DATA

LOVING, NEW MEXICO

<u>TIME AND DATE OF COLLECTION</u>	<u>TIME OF COUNT</u>	<u>AIR VOLUME M³</u>	<u>ACTIVITY μuc/M³</u>
1130 12/10 - 1210 12/11	0150 12/12	629	6.30
0925 12/12 - 0953 12/13	1455 1/2	623	12.5
0955 12/13 - 1225 12/14	1535 1/2	1620	10.16
1225 12/14 - 1240 12/15	1723 1/10	1484	11.1
1240 12/15 - 1255 12/16	1725 1/10	1566	7.10
1255 12/16 - 1300 12/17	1727 1/10	1535	6.04
1300 12/17 - 1300 12/18	1730 1/10	1510	12.4
1300 12/18 - 1250 12/19	1318 1/3	1500	19.8
1250 12/19 - 1310 12/20	1410 1/3	1550	23.9
1310 12/20 - 1230 12/21	1412 1/3	1520	13.1
1230 12/21 - 1305 12/22	1414 1/3	1650	14.5
1300 12/22 - 1255 12/23	1416 1/3	1605	32.4
1255 12/23 - 1330 12/24	1418 1/3	1650	47.0
1330 12/24 - 1300 12/25	1421 1/3	1575	44.4
1300 12/25 - 1305 12/26	1423 1/3	1588	17.6
1305 12/26 - 1320 12/27	1732 1/10	1587	14.7
1320 12/27 - 1330 12/28	1734 1/10	1561	15.8
1330 12/28 - 1250 12/29	1736 1/10	1566	15.8
1250 12/29 - 1310 12/30	1301 1/17	1509	14.5
1310 12/30 - 1330 12/31	1303 1/17	1509	12.2
1330 12/31 - 1310 1/1	1305 1/17	1468	8.34

GROSS BETA AIR SAMPLE DATA

LOVINGTON, NEW MEXICO

<u>TIME AND DATE OF COLLECTION</u>	<u>TIME OF COUNT</u>	<u>AIR VOLUME</u> <u>M³</u>	<u>ACTIVITY</u> <u>μuc/M³</u>
0730 12/1 - 0745 12/2	1546 12/12	2170	2.68
0745 12/2 - 0730 12/3	0912 12/18	2020	3.54
0730 12/3 - 0745 12/4	0915 12/18	2060	5.48
0745 12/4 - 0730 12/5	0917 12/18	2020	7.61
0730 12/5 - 0730 12/6	0919 12/18	1836	10.4
0730 12/6 - 0730 12/7	0921 12/18	1428	10.6
0730 12/7 - 0730 12/8	0923 12/18	1836	1.12
0730 12/8 - 0730 12/9	0925 12/18	1836	10.7
0730 12/9 - 0532 12/10	0045 12/12	1761	8.91
0625 12/11 - 0540 12/12	2250 12/13	927	3.37
0545 12/12 - 0725 12/13	1531 1/2	983	8.75
0725 12/13 - 0725 12/14	1522 1/2	919	9.07
0720 12/16 - 0630 12/17	1508 1/10	787	6.41
0630 12/17 - 0730 12/18	1510 1/10	2231	7.25
0735 12/18 - 0815 12/19	1512 1/10	2305	17.3
0815 12/19 - 0730 12/20	1514 1/10	1877	8.7
0730 12/20 - 0730 12/21	1506 1/3	2040	7.75
0730 12/21 - 0800 12/22	1508 1/3	2080	1.29
0800 12/22 - 0800 12/23	1510 1/3	2040	30.5
0800 12/23 - 0820 12/24	1512 1/3	2060	28.2

LOVINGTON, NEW MEXICO - CONTINUED

<u>TIME AND DATE OF COLLECTION</u>	<u>TIME OF COUNT</u>	<u>AIR VOLUME</u> <u>M³</u>	<u>ACTIVITY</u> <u>μc/M³</u>
0820 12/24 - 0700 12/25	1544 1/16	2096	24.9
0900 12/25 - 0750 12/26	1546 1/16	1843	16.1
0755 12/26 - 0715 12/27	1548 1/16	1685	11.8
0720 12/27 - 0800 12/28	1516 1/10	1781	16.7
0800 12/28 - 0815 12/29	1518 1/10	1855	16.1
0815 12/29 - 0815 12/30	1520 1/10	1734	13.3
0815 12/30 - 0730 12/31	1551 1/16	1679	13.3
0730 12/31 - 0930 1/1	1553 1/16	1989	5.75

GROSS BETA AIR SAMPLE DATA

MALAGA SCHOOL, NEW MEXICO

<u>TIME AND DATE OF COLLECTION</u>	<u>TIME OF COUNT</u>	<u>AIR VOLUME</u> <u>M³</u>	<u>ACTIVITY</u> <u>μc/M³</u>
1300 12/9 - 0630 12/10	0107 12/12	1636	11.4
0630 12/10 - 0830 12/11	2050 12/11	1105	6.95
0830 12/11 - 1000 12/12	1205 12/14	1127	15.6
1005 12/12 - 1100 12/13	1449 1/2	1145	9.65
1115 12/13 - 1545 12/14	1537 1/2	2570	7.74
1555 12/15 - 1605 12/16	1331 1/4	2108	5.8
1610 12/16 - 1600 12/17	1333 1/4	2066	5.09
1605 12/17 - 1720 12/18	1336 1/4	2210	12.6
1725 12/18 - 1650 12/19	1338 1/4	2132	15.0
1655 12/19 - 1735 12/20	1340 1/4	2347	16.1
1740 12/20 - 1700 12/21	1343 1/4	2220	8.70
1705 12/21 - 1048 12/22	1345 1/4	1720	11.6
1050 12/22 - 1720 12/23	1201 1/3	2770	23.7
1725 12/23 - 1645 12/24	1204 1/3	2290	33.4
1650 12/24 - 1710 12/25	1206 1/3	2360	26.5
1715 12/25 - 1720 12/26	1208 1/3	2290	14.7
1720 12/26 - 1725 12/27	1210 1/3	2290	11.3
1725 12/27 - 1930 12/28	1703 1/10	2527	10.9
1935 12/28 - 1850 12/29	1705 1/10	2134	13.1

MALAGA SCHOOL, NEW MEXICO - CONTINUED

<u>TIME AND DATE OF COLLECTION</u>	<u>TIME OF COUNT</u>	<u>AIR VOLUME</u> <u>M³</u>	<u>ACTIVITY</u> <u>μic/M³</u>
1855 12/29 - 1500 12/30	1707 1/10	1909	9.54
1500 12/30 - 1630 12/31	1156 1/17	2340	9.71
1630 12/31 - 2030 1/1	1158 1/17	2641	6.12

GROSS BETA AIR SAMPLE DATA

RED BLUFF, TEXAS

<u>TIME AND DATE OF COLLECTION</u>	<u>TIME OF COUNT</u>	<u>AIR VOLUME M³</u>	<u>ACTIVITY μuc/M³</u>
1305 12/9 - 0620 12/10	1140 12/10	1657	20.6
0625 12/10 - 1050 12/11	2200 12/11	1256	3.83
1055 12/11 - 1035 12/12	1220 12/14	985	12.3
1335 12/13 - 1330 12/14	1709 1/10	2550	5.75
1330 12/14 - 1420 12/15	1711 1/10	2659	6.31
1420 12/15 - 1830 12/16	1713 1/10	3064	4.25
1835 12/16 - 1700 12/17	1347 1/4	2383	3.51
1703 12/17 - 1735 12/18	1349 1/4	2668	9.03
1740 12/18 - 1810 12/19	1352 1/4	2602	13.6
1815 12/19 - 1745 12/20	1354 1/10	2519	13.4
1745 12/20 - 2045 12/21	1300 1/3	2842	8.95
2050 12/21 - 1730 12/22	1302 1/3	2230	14.0
1733 12/22 - 1610 12/23	1304 1/3	2426	21.4
1610 12/23 - 1710 12/24	1306 1/3	2715	26.1
1710 12/24 - 1620 12/25	1308 1/3	2485	22.7
1620 12/25 - 1720 12/26	1311 1/3	2638	13.6
1723 12/26 - 1830 12/27	1715 1/10	2733	8.72
1835 12/27 - 1730 12/28	1717 1/10	2550	9.55
1735 12/28 - 2000 12/29	1719 1/10	2941	10.4

RED BLUFF, TEXAS - CONTINUED

<u>TIME AND DATE OF COLLECTION</u>	<u>TIME OF COUNT</u>	<u>AIR VOLUME</u> <u>M³</u>	<u>ACTIVITY</u> <u>μc/M³</u>
2005 12/29 - 2100 12/30	1314 1/24	2680	8.0
2103 12/30 - 1750 12/31	1316 1/24	2261	6.52
1755 12/31 - 1830 1/1	1318 1/24	2528	4.8

GROSS BETA AIR SAMPLE DATA

ROSWELL, NEW MEXICO

<u>TIME AND DATE OF COLLECTION</u>	<u>TIME OF COUNT</u>	<u>AIR VOLUME</u> <u>M</u>	<u>ACTIVITY</u> <u>$\mu\text{mc}/\text{M}^3$</u>
1712 12/11 - 1615 12/12	1304 12/14	1018	24.0
1625 12/12 - 1618 12/13	1458 1/2	1260	7.15
1624 12/13 - 1607 12/14	1445 1/2	1252	5.1
1615 12/14 - 1635 12/15	1457 1/2	1900	2.9

GROSS BETA AIR SAMPLE DATA

SAN SIMON, NEW MEXICO

<u>TIME AND DATE OF COLLECTION</u>	<u>TIME OF COUNT</u>	<u>AIR VOLUME</u> <u>M³</u>	<u>ACTIVITY</u> <u>μpc/M³</u>
0800 12/1 - 0800 12/2	0855 12/18	2509	2.94
0800 12/2 - 0800 12/3	0857 12/18	2570	3.08
0800 12/3 - 0900 12/4	0859 12/18	2515	4.37
0900 12/4 - 0900 12/5	0901 12/18	2509	7.03
0900 12/5 - 0800 12/6	0903 12/18	2423	7.20
0800 12/6 - 1600 12/7	0906 12/18	2893	8.03
1600 12/7 - 0800 12/8	0908 12/18	1690	3.22
0800 12/9 - 1500 12/10	0910 12/18	2580	5.46
0440 12/10 - 0830 12/11	2120 12/11	1303	2.84
0830 12/11 - 0930 12/12	1237 12/14	1475	7.09
0930 12/12 - 0915 12/13	1520 1/2	1212	7.85
1435 12/13 - 0800 12/14	1013 12/22	1719	11.5
0800 12/14 - 0800 12/15	1015 12/22	2570	11.0
0800 12/15 - 0800 12/16	1017 12/22	2550	3.95
0800 12/16 - 0800 12/17	1019 12/22	2387	6.73
0800 12/17 - 0800 12/18	1021 12/22	2224	9.95
0730 12/18 - 0800 12/19	1405 1/2	2498	16.5
0800 12/19 - 0800 12/20	1407 1/2	2448	8.44
0800 12/20 - 0800 12/21	1409 1/2	2428	8.78

SAN SIMON, NEW MEXICO - CONTINUED

<u>TIME AND DATE OF COLLECTION</u>	<u>TIME OF COUNT</u>	<u>AIR VOLUME</u> <u>M³</u>	<u>ACTIVITY</u> <u>μc/M³</u>
0800 12/21 - 0800 12/22	1412 1/2	2407	7.45
0800 12/22 - 0800 12/23	1414 1/2	2448	23.5
0800 12/23 - 1400 12/24	1416 1/2	2930	27.9
1400 12/24 - 0800 12/25	1418 1/2	1807	30.6
0800 12/25 - 1300 12/26	1523 1/10	2760	16.0
1300 12/26 - 0830 12/27	1525 1/10	1955	10.2
0830 12/27 - 0830 12/28	1527 1/10	2387	12.3
0830 12/28 - 0900 12/29	1529 1/10	2394	12.8
0900 12/29 - 0830 12/30	1532 1/10	2297	9.85
0830 12/30 - 1400 1/1	1534 1/10	5366	2.25

GROSS BETA AIR SAMPLE DATA

TRANSWESTERN PIPELINE COMPANY

<u>TIME AND DATE OF COLLECTION</u>	<u>TIME OF COUNT</u>	<u>AIR VOLUME</u> <u>M³</u>	<u>ACTIVITY</u> <u>μuc/M³</u>
1640 12/5 - 0815 12/6	1626 12/18	1388	6.96
0815 12/6 - 0815 12/7	1628 12/18	2101	9.00
0815 12/7 - 0815 12/8	1630 12/18	2080	5.12
0815 12/8 - 0815 12/9	1655 12/11	2183	10.2
0815 12/9 - 0723 12/10	0020 12/12	2100	9.94
0727 12/10 - 1820 12/10	0250 12/12	1630	1.29
1100 12/11 - 0945 12/12	1317 12/14	1010	14.7
1000 12/12 - 0955 12/13	1509 1/2	1082	9.21
1000 12/13 - 1585 12/16	1548 1/2	6780	6.95
1535 12/16 - 0815 12/17	1610 1/10	1416	4.80
0815 12/17 - 0915 12/18	1613 1/10	2125	7.82
0915 12/18 - 0915 12/20	1615 1/10	3998	13.8
0915 12/20 - 0915 12/21	1425 1/3	2162	10.1
0915 12/21 - 0915 12/22	1428 1/3	2101	34.6
0915 12/23 - 0915 12/24	1430 1/3	2162	31.2
0915 12/24 - 0915 12/25	1432 1/3	2224	31.4
0915 12/25 - 0915 12/26	1434 1/3	2183	19.3
0915 12/26 - 0915 12/27	1436 1/3	2183	10.8
0915 12/27 - 0915 12/28	1438 1/3	2183	14.2

TRANSWESTERN PIPELINE COMPANY - CONTINUED

<u>TIME AND DATE OF COLLECTION</u>	<u>TIME OF COUNT</u>	<u>AIR VOLUME</u> <u>M³</u>	<u>ACTIVITY</u> <u>μmc/M³</u>
0915 12/28 - 0915 12/29	1607 1/16	2183	12.1
0915 12/29 - 1100 12/31	1610 1/16	4228	10.4
1100 12/31 - 0915 1/1	1613 1/16	1891	5.86

GROSS BETA AIR SAMPLE DATA

U. S. BORAX MINE

<u>TIME AND DATE OF COLLECTION</u>	<u>TIME OF COUNT</u>	<u>AIR VOLUME M³</u>	<u>ACTIVITY μuc/M³</u>
1420 12/8 - 1415 12/9	2400 12/11	691	5.6
1420 12/9 - 1410 12/10	2310 12/13	689	3.0
1410 12/10 - 0830 12/12	1211 12/14	1150	4.4
0830 12/12 - 0745 12/14	1542 1/2	1085	2.37
1245 12/15 - 0830 12/16	1645 1/10	454	1.60
0830 12/16 - 0815 12/17	1645 1/10	596	1.39
0815 12/17 - 0815 12/18	1649 1/10	552	1.46
0820 12/18 - 0825 12/19	1322 1/4	553	2.90
0825 12/21 - 0820 12/22	1314 1/3	550	2.67
0825 12/22 - 1030 12/23	1316 1/3	600	4.88
0825 12/26 - 0850 12/27	1651 1/10	518	4.59
0855 12/27 - 0820 12/28	1653 1/10	518	3.49
0822 12/28 - 1040 12/29	1655 1/10	458	3.00
1040 12/29 - 0823 12/30	1657 1/10	447	3.15
0825 12/30 - 0820 12/31	1659 1/10	406	4.46

PROJECT GNOME
DECEMBER, 1961
AIR ACTIVITY ($\mu\text{C}/\text{m}^3$)

PROJECT GNOME DECEMBER, 1961 AIR ACTIVITY (uc/m³)

CARLSBAD CAVERNS

EPNG
PUMPING STATION

PROJECT GNOME DECEMBER, 1961 AIR ACTIVITY (uc/m³)

PROJECT GNOME
DECEMBER, 1961
AIR ACTIVITY (uc/m³)

PROJECT GNOME DECEMBER, 1961 AIR ACTIVITY ($\mu\text{C}/\text{m}^3$)

PROJECT GNOME DECEMBER, 1961 AIR ACTIVITY (uc/m³)

PROJECT GNOME DECEMBER, 1961 AIR ACTIVITY (uc/m³)

PROJECT GNOME
DECEMBER, 1961
AIR ACTIVITY (uc/m³)

SAN SIMON RANCH

TRANSWESTERN
PIPELINE C O.

PROJECT GNOME
DECEMBER, 1961
AIR ACTIVITY (uc/m³)

US BORAX MINE

E. Milk Sampling

In preparing for milk sampling in connection with the Gnome experiment, the same basic factors existed as did with the air sampling. It was necessary to sample the milk from dairy cattle that grazed and consumed feed from this area to establish a background of radionuclides normally found in the milk, since the background activity could change rapidly due to fallout from Russian nuclear detonations.

Milk samples were collected as close to the Gnome detonation time as possible.

Milk samples were taken from eight producer dairies in the vicinity of the Gnome site. These dairies are located in the area of Carlsbad, Loving, Eunice, Lovington, White's City, and Artesia. Each milk sample was analyzed for gamma and beta emitting fission products commonly found in milk. After the Gnome detonation, a resampling of the same dairies was made during the week of January 15, 1962. It was believed that this interval after the Gnome event would be the best time to resample in order to detect any increase in the activity in the milk from this experiment without too much interference from Russian fallout. Results indicate that no increase of radioactivity was detected in the milk supplies from the Gnome event.

⊗ MILK SAMPLING STATIONS

SCALE: 1" = 12 MILES

US PUBLIC HEALTH SERVICE
RADIOLOGICAL HEALTH FIELD ACTIVITIES
LAS VEGAS, NEVADA

MILK SAMPLING STATIONS
PROJECT GNOME

BY	CODE	DATE	SCALE	PAGE
				of

TABLE V
MILK SAMPLE DATA

DAIRY LOCATION	DATE COLLECTED	$\mu\text{mc/l}$ AT TIME OF COLLECTION					gms/l	
		I ¹³¹	Ba ¹⁴⁰ - La ¹⁴⁰	Cs ¹³⁷	Sr ⁹⁰	Sr ⁸⁹	K	Ca
Bounds Dairy	12/4/61	< 10	29	14	1.8 $\pm$ 0.6	<2	1.7	1.1
White's City	1/17/62	< 10	< 20	<10	2.2 $\pm$ 1.1	<2	1.5	1.1
Fristo Dairy	12/6/61	260	46	35	6.4 $\pm$ 0.9	140 $\pm$ 5	1.6	1.1
Eunice	1/12/62	< 10	< 20	21	5.6 $\pm$ 1.4	136 $\pm$ 7	2.0	1.3
	1/22/62	44	110	31	7.3 $\pm$ 1.4	151 $\pm$ 7	1.5	1.1
Milk Parlor	12/6/61	< 10	< 20	<10	1.5 $\pm$ 0.6	9.2 $\pm$ 1.8	1.4	1.0
Lovington	1/17/62	< 10	< 20	<10	2.2 $\pm$ 1.1	12 $\pm$ 2.0	1.5	1.2
K.O. Monk Carlsbad	12/4/61	< 10	< 20	<10	1.4 $\pm$ 0.6	<2	1.6	1.1
Klein Dairy	12/6/61	< 10	< 20	<10	1.3 $\pm$ 0.6	<2	1.3	1.1
Carlsbad	1/20/62	< 10	< 20	16	1.0 $\pm$ 0.8	<2	1.2	1.2
Monreposa	12/5/61	< 10	< 20	<10	2.5 $\pm$ 0.7	<2	1.2	1.0
Artesia	1/20/62	< 10	< 20	<10	1.4 $\pm$ 0.8	<2	1.3	1.2
Roberson Dairy	10/31/61	< 10	< 20	<10	2.6 $\pm$ 0.9	<2	1.1	1.3
Loving	12/4/61	< 10	< 20	24	1.6 $\pm$ 0.5	<2	1.7	1.1
	1/19/62	< 10	< 20	14	1.7 $\pm$ 0.6	<2	1.6	1.3
Smith Dairy	12/5/61	< 10	< 20	<10	1.0 $\pm$ 0.6	<2	1.4	1.0
Artesia	1/19/62	< 10	< 20	<10	1.0 $\pm$ 0.9	<2	1.6	0.82

Detection limits: I¹³¹, 10 $\mu\text{mc/l}$; Ba¹⁴⁰-La¹⁴⁰, 20 $\mu\text{mc/l}$;
Cs¹³⁷, 10 $\mu\text{mc/l}$; Sr⁸⁹ 2 $\mu\text{mc/l}$

F. Water Sampling

Since the Gnome experiment was an underground detonation with a potential of underground water-bearing strata contamination, the sampling of water supplies was considered an important phase of the off-site radiological surveillance program.

Water supplies, particularly in the vicinity of the Gnome event, were sampled prior to the detonation and again afterwards. Water samples were analyzed for gross radioactivity with the plan that, if the activity in any of the samples was higher than average or background for the water supplies in the area, an isotopic analysis would be performed on the same sample. No significant difference in radioactivity was found in the post-detonation water samples collected.

Because of the possibility that radioactivity may enter the underground water strata over a long period of time, periodic water samples will continue to be taken during the year 1962 to continue the water surveillance activities in this area.

The water sampling stations were the Nash Well, Trans-western Pipeline Well, San Simon Ranch, James Ranch, Snyder Ranch, El Paso Natural Gas Pumping Station, Rattlesnake Springs (Carlsbad Caverns), Loving, Carlsbad, Lovington, Hobbs, Malaga, Red Bluff, and Artesia. Other reference water samples were collected by monitoring teams for analytical data if the need arises.

US PUBLIC HEALTH SERVICE
RADIOLOGICAL HEALTH FIELD ACTIVITIES
LAS VEGAS, NEVADA

WATER SAMPLING STATIONS
PROJECT GNOME

BY	CODE	DATE	SCALE	PAGE
				of

TABLE VI

WATER SAMPLE DATA

<u>LOCATION</u>	<u>DATE COLLECTED</u>	<u>SAMPLE SIZE--ml</u>	<u>DATE COUNTED</u>	<u>μc/ml OF GROSS BETA ACTIVITY AT TIME OF COUNT x 10⁻⁹</u>
Carlsbad	12/10/61	500	1/12/62	<10
	12/20/61	500	1/11/62	14
Cleveland Well, Malaga	12/8/61	500	1/11/62	<10
	1/15/62	250	3/14/62	<10
El Paso Natural Gas Pumping Station, Pecos River Stn.	12/8/61	500	1/12/62	22
	1/15/62	250	3/14/62	13
Gas Co., Trans- Western Pipeline	12/6/61	500	1/11/62	<10
	12/19/61	500	1/11/62	11
Hobbs	12/10/61	500	1/11/62	<10
	12/20/61	500	1/12/62	14
James Ranch - Well At House w/Wind- charger	12/2/61	500	1/12/62	<10
	12/20/61	500	1/12/62	15
James Ranch - Well At Old House	12/2/61	500	1/12/62	17
	12/20/61	500	1/12/62	<10
Loving	12/8/61	500	1/12/62	<10
	12/22/61	500	1/11/62	<10
Lovington	12/10/61	500	1/11/62	13
	1/4/62	500	1/16/62	<10
Nash Well	12/7/61	500	1/12/62	87
	12/20/61	500	1/15/62	35
Rattlesnake Spr. Water Supply for Carlsbad Caverns	12/5/61	500	1/11/62	<10
	12/20/61	500	1/11/62	12
Red Bluff, Texas	12/8/61	500	1/11/62	20
	1/15/62	250	3/14/62	13

WATER SAMPLE DATA - CONTINUED

<u>LOCATION</u>	<u>DATE COLLECTED</u>	<u>SAMPLE SIZE--ml</u>	<u>DATE COUNTED</u>	<u>µc/ml OF GROSS BETA ACTIVITY AT TIME OF COUNT x 10⁻⁹</u>
San Simon Ranch	12/8/61	500	1/15/62	<10
	12/20/61	500	1/12/62	16
Snyder Ranch Well	12/2/61	500	1/12/62	12
	12/20/61	500	1/11/62	23

Detection limit = 10 µc/ml

G. Gamma Spectroscopy Results on Soil and Vegetation Samples

A soil sample taken from Highway 128 one hour and thirty minutes after the shot and approximately five miles west of the CP turnoff was counted on the 400-channel analyzer ten minutes after collection at which time over 90% of the gamma activity was due to Cs^{138} . Cs^{138} has a half-life of only thirty-two minutes. A recount of the sample after decay of the Cs^{138} left the spectrum of Ru^{103} and $\text{Zr}^{95}\text{-Nb}^{95}$ which in all probability was from Russian fallout.

The gamma spectrum of a vegetation sample collected from the same location was also that of Cs^{138} . However, the gamma spectrum of a later recount had the photopeaks of I^{133} , I^{135} , I^{132} , and $\text{Zr}^{95}\text{-Nb}^{95}$.

A vegetation sample collected one mile further west of the above location also had the same spectrum.

H. Film Badge Program

Monitors conducted a film badge program to give an account of accumulated radiation doses off-site. Three hundred and thirty film badges were placed on individuals and structures within a one hundred mile radius of the test site. The badges were issued on December 7, 8, and 9, and left out for thirty days. Of the 330 badges out, 285 were returned and of these, six film badges recorded radiation exposure. Results of the program agreed with ground monitoring estimates that none of the population in the Project Gnome off-site area received exposures exceeding the Federal Radiation Council guides for the public.

The highest film badge exposures were from the Hudson Farm. A film badge located outside recorded 165 mr while a badge worn by a person at the farm recorded 140 mr. The recorded exposure on a farm house near the west edge of the cloud pattern about five miles west of the IMCC Mine was 35 mr. Film badges placed on two houses on the east and north sides of Illinois Camp recorded 80 mr and 50 mr respectively. The occupant of the second wore a film badge which recorded 40 mr.

CHAPTER III

LABORATORY CONTROL

In almost every phase of off-site radiological safety, a great deal of reliance is placed on laboratory analysis. For this project, two laboratories were employed.

At the Project Gnome Control Point, a specially-equipped instrumental laboratory trailer was stationed. This was also used as net control for dispatching mobile monitoring teams during the operation. This laboratory was equipped with a 400-channel gamma spectrometer utilizing a 4" x 4" NaI crystal mounted in a massive steel shield. In addition to this analyzer, two scalers with external detectors were utilized for gross beta determination. With this equipment, the Public Health Service was able to analyze air, vegetation, and soil samples collected by mobile monitors within a few minutes after collection during D-Day and through D+7. The advantage of this facility was that short-lived isotopes could be identified and by knowing radiation intensities from mobile monitoring, dose rates in areas of cloud passage could be estimated more accurately. This information was important for the Test Manager to determine emergency actions if they were deemed necessary.

In addition to the laboratory at the Gnome site Control Point, the Public Health Service laboratory at Mercury, Nevada, was used to analyze environmental samples collected prior to D-Day and the continued surveillance laboratory work necessary following the operation. This laboratory is equipped to perform complete radioisotope separations and analysis.

CHAPTER IV

EMERGENCY MEASURES

Because the radiation released from the Gnome project was in the form of a gaseous cloud composed of short half-lived isotopes, emergency measures for the people in areas of cloud passage were minimized.

The major precautionary measure taken involved automobiles leaving the Control Point area via Highway 128 west that had become contaminated by passing through the radioactive cloud as it crossed this road. One of the mobile monitoring teams in the area of the Highway 31 and Highway 128 junction noted automobiles with readings of 50 mr/hr - 250 mr/hr beta-gamma activity. This information was radioed to the Control Point and immediately road blocks were ordered by the Test Manager near the CP area to prevent other vehicles from passing through this contaminated area. The seven vehicles that had already passed through this area were monitored and directed to a service station in Carlsbad that had been previously designated as a vehicle decontamination station for washing. After the vehicles had been washed and remonitored, they were released when the activity levels were below 10 mr/hr. People in the vehicles were not subjected to the contamination that the surface of the vehicles were, because the thermal temperature required the windows to be closed. The highest reading recorded inside the vehicles was 15 mr/hr at the time they were first monitored. One individual apparently rubbed the surface of a vehicle with his hand and was directed to wash thoroughly which eliminated the activity.

Road blocks that were established by the Test Manager to prevent vehicles travelling in this area were assisted by Public Health Service personnel in the monitoring of vehicles requiring access through the area and as soon as activity levels along Highway 128 were below 10 mr/hr, at approximately H+2 hours, free movement of traffic was ordered by the Test Manager.

CHAPTER V

MEDICAL SERVICES

A Public Health Service Medical Officer was assigned to the Gnome operation for a period immediately preceding and following D-Day to provide medical advice and assistance to the Off-Site safety operation. So that all public health resources in the community and area around the Gnome site could be coordinated, the USPHS Medical Officer contacted local and state health authorities, medical societies, and private physicians advising them of the safety program and offering assistance with unusual occurrences that may be attributed to the Gnome project.

Through contact with local hospitals at Carlsbad and the physician supplying medical care to employees at the test site, methods were established to administer medical treatments and care for possible accidents that may occur at the observation point and off-site population.

CHAPTER VI

VETERINARY ACTIVITIES

A U. S. Army Veterinary Officer assigned to the Office of Field Operations, AEC, Las Vegas, participated in Project Gnome as a member of the Off-Site Radiological Safety Organization, conducted a study of radiation levels in animal tissue prior to and after the Gnome detonation.

Cattle were selected as the animal to be used for the study since they are readily available around the Gnome Site and are the major food producing animal in the area. Five head of cattle ranging in age from old cows to young calves, having access to the immediate area around the Gnome Site, were slaughtered approximately one week prior to the Gnome detonation.

From these animals, samples of the muscle, bone, and glandular tissue were collected to determine the radioactive isotope burden of the animals. On January 8, 1962, five more animals were sacrificed in an attempt to determine if there had been any increase in the activity in the body burden of the animals. The second group of animals slaughtered were of the same age and ranged in an area of radioactive cloud passage from the Gnome detonation.

A complete post-mortem examination was conducted on each animal slaughtered for this study and tissue samples collected were submitted to the USPHS Off-Site Radiological Safety laboratory at Mercury, Nevada, for analysis.

The isotopes data for the thyroid, liver, and muscle of the cattle slaughtered before and after the Gnome detonation is given in Tables Nos. VII and VIII. Values given in these tables were determined by gamma spectroscopy. The detection limits for I^{131} in the small thyroid was 3 $\mu\text{c/g}$ of wet tissue and 2 $\mu\text{c/g}$ of wet tissue for the larger thyroid. The detection limit for Cs^{137} in muscle samples is 10 $\mu\text{c/kg}$ of wet tissue. Determinations are not yet complete on rumen and bone samples.

Activity levels have been found to be comparable for pre- and post-shot samples with the exception of one animal collected post-shot which was higher than the average in I^{131} and Cs^{137} .

TABLE VII
GNOME CATTLE SAMPLES

(PRE-SHOT)

December 8, 1961

ORGAN	Weight in Grams	Iodine ¹³¹ μuc/g	Cesium ¹³⁷ μuc/Kg	Potassium gK/Kg	Other
Thyroid	20.5	370	--	--	--
Muscle	3942.0	--	54	4.0	Ru ¹⁰³ , Zr ⁹⁵ -Nb ⁹⁵
Liver	504.0	--	<60*	3.1	Ru ¹⁰³
Thyroid	7.0	410	--	--	--
Muscle	3494.0	--	91	3.9	--
Liver	504.0	--	76	3.3	Ru ¹⁰³
Thyroid	17.4	660	--	--	--
Muscle	3488.0	--	95	4.0	--
Liver	472.0	--	90	3.3	Ru ¹⁰³
Thyroid	12.8	5.4	--	--	--
Muscle	3494.0	--	24	4.1	--
Liver	506.0	--	<60	3.6	--
Thyroid	14.7	5.5	--	--	--
Muscle	3448.0	--	21	3.5	--
Liver	478.0	--	<60	3.4	Ru ¹⁰³

-- Not analyzed

* Lower limit of detection

TABLE VIII
GNOME CATTLE SAMPLES

(POST-SHOT)

January 8, 1962

ORGAN	Weight in Grams	Iodine ¹³¹ μuc/g	Cesium ¹³⁷ μuc/Kg	Potassium gK/Kg	Other
Thyroid	22.9	1140	--	--	--
Muscle	3418.0	--	140	3.9	Ru ¹⁰³
Liver	516.0	--	120	5.1	Ru ¹⁰³
Thyroid	9.0	< 3*	--	--	--
Muscle	3382.0	--	26	4.0	--
Liver	526.0	--	<60*	2.7	Ru ¹⁰³
Thyroid	8.7	67	--	--	--
Muscle	3200.0	--	77	4.3	--
Liver	500.0	--	<60	3.6	Ru ¹⁰³
Thyroid	14.4	3	--	--	--
Muscle	3400.0	--	15	3.9	Zr ⁹⁵ -Nb ⁹⁵
Liver	536.0	--	<60	3.4	Ru ¹⁰³
Thyroid	15.5	4.2	--	--	--
Muscle	3150.0	--	24	4.0	--
Liver	504.0	--	<60	3.7	--

-- Not analyzed

* Lower limit of detection

CHAPTER VII

DISCUSSION

The cloud passage was well documented from the ground. In general, the ground monitoring results indicated a much lower activity than that found in the cloud by aerial monitoring. The width of the cloud pattern on the ground was generally wider than that reported from aerial monitoring because the more sensitive instruments used were able to detect the low-level fringe activities of the cloud.

Three graphs show the changing dose rates during cloud passage at three locations. The peak reading 1.7 miles east of the junction of Highways 128 and 31 on Highway 128 was 160 mr/hr, while the total dose was 33 mr. At the IMCC Mine, where the peak activity was 35 mr/hr, the integrated dose was 8.3 mr. The total integrated dose in the vicinity of the Hudson Farm as determined from monitoring was 44 mr with a peak reading of 95 mr/hr.

Only the air filters from the IMCC Mine Shafts #3 and #4 showed any appreciable increase of gross beta air activity from this test. Several other locations showed an increase of gross beta activity on the day following the test. Handbook 69 lists the maximum permissible gross beta concentration in air as 10^{-9} $\mu\text{c/cc}$ for the general population. The highest concentration found was 1.6×10^{-10} $\mu\text{c/cc}$ for a 16 3/4 hour period which averages out far below the Handbook 69 value.

The 168 hour occupational exposure limits for I^{131} , I^{133} , and I^{135} are, respectively, 3×10^{-9} $\mu\text{c/cc}$, 10^{-8} $\mu\text{c/cc}$, and 4×10^{-8} $\mu\text{c/cc}$; or for the population, 3×10^{-10} $\mu\text{c/cc}$, 10^{-9} $\mu\text{c/cc}$, and 4×10^{-9} $\mu\text{c/cc}$. The highest concentrations of I^{131} and I^{133} were found at the IMCC Mine Shaft #4 and were 1.7×10^{-12} $\mu\text{c/cc}$ for I^{131} and 1.8×10^{-11} $\mu\text{c/cc}$ for I^{133} . The highest concentration of I^{135} was found at the IMCC Processing Plant and was 3.5×10^{-12} $\mu\text{c/cc}$. The collection periods were approximately sixteen hours and the concentrations are two to three orders of magnitude below the maximum permissible concentrations for steady exposure.

Monitoring results demonstrated that the cloud was largely gaseous in nature. Some small amounts of short-lived radioactivity were deposited in the path of the cloud for the first ten miles or so. As shown by air samples and monitoring results for the following day, small amounts of radioactive materials were released occasionally, but were far below the levels of the initial release.

-95-

NET GAMMA MONITORING RESULTS
3 FEET ABOVE GROUND
HUDSON RANCH VICINITY

MEASURED WITH EBERLINE E500B
SURVEY METER

12/10/61

TOTAL INTEGRATED DOSE
UNDER CURVE = 44 mr

CHAPTER VIII

CONCLUSION

Since fallout from this test was negligible as far as any external dose is concerned, the only appreciable source of ionizing radiation at populated places was the cloud during the time of passage. It appears that even those places receiving the highest dose rates and total doses were well below the limits set. Likewise, the air sampling results show that no persons off-site were exposed to excessive amounts of airborne radioactive particles or gases. Pre- and post-shot water and milk samples have shown no significant changes due to the Gnome event.

With these findings, it seems reasonable to conclude that no persons in the vicinity of the Gnome test site received harmful amounts of radiation either internally or externally.

TECHNICAL REPORTS SCHEDULED FOR ISSUANCE
BY AGENCIES PARTICIPATING IN PROJECT GNOME

AEC REPORTS

<u>AGENCY</u>	<u>REPORT NO.</u>	<u>SUBJECT OR TITLE</u>
LRL	PNE-101	Power Studies
LRL	102	Isotopes Program
ORNL	103	Design of Sequenced Gas Sampling Apparatus
LRL	104	Close-In Shock Studies
LRL	105	Stress Measurements with Piezoelectric Crystals
LRL	106	Post-Shot Temperature and Radiation Studies
LRL	107	Geologic Studies of the Tunnel and Shaft
SC	108	Particle Motion near a Nuclear Detonation in Halite
SRI	109	Earth Deformation from a Nuclear Detonation in Salt
USC&GS	110	Seismic Measurements from a Nuclear Detonation in Halite
SRI	111	Intermediate-Range Earth Motion Measurements
LRL	112	An Investigation of Possible Chemical Reactions and Phase Transitions Caused by a Nuclear Explosive Shock Wave
LRL	113	Resonance Neutron Activation Measurements
LASL	114	Symmetry of Fission in U^{235} at Individual Resonances
EG&G	115	Timing and Firing
WES	116	Design, Test and Field Pumping of Grout Mixtures
USWB	126	Preliminary Report of Weather and Surface Radiation Prediction Activities for Project Gnome; Final Analysis of Weather and Radiation Data
H&N, INC	127	Pre-Shot and Post-Shot Structure Survey

<u>AGENCY</u>	<u>REPORT NO.</u>	<u>SUBJECT OR TITLE</u>
RFB, INC	PNE- 128	Summary of Predictions and Comparison with Observed Effects of Gnome on Public Safety
SC	129	Monitoring Vibrations at the US Borax and Chemical Company Potash Refinery
USGS	130	Hydrologic and Geologic Studies
FAA	131	Federal Aviation Agency Airspace Closure
USPHS	132	Off-Site Radiological Safety Report
REE Co	133	On-Site Radiological Safety Report
USBM	134	Pre and Post-Shot Mine Examination

ABBREVIATIONS FOR TECHNICAL AGENCIES

ARA	Allied Research Associates Inc. , Boston
EG&G	Edgerton, Germeshausen, and Grier, Inc. , Boston, Las Vegas, and Santa Barbara
ERDL	USA C of E Engineer Research and Develop- ment Laboratories, Ft. Belvoir
GeoTech	The Geotechnical Corporation, Garland
LASL	Los Alamos Scientific Laboratories, Los Alamos
LRL	Lawrence Radiation Laboratory, Livermore
SC	Sandia Corporation, Albuquerque
SGC	Space-General Corporation, Glendale
SRI	Stanford Research Institute, Menlo Park
STL	Space Technology Laboratories, Inc. , Redondo Beach
TI	Texas Instruments, Inc. , Dallas
USC&GS	Coast and Geodetic Survey, Washington, D. C. and Las Vegas
USGS	Geological Survey, Denver
WES	USA C of E Waterways Experiment Station, Jackson
FAA	Federal Aviation Agency, Salt Lake City
H&N, Inc.	Holmes and Narver, Inc. , Los Angeles
RFB, Inc.	R. F. Beers, Inc. , Alexandria
REEC _o	Reynolds Electrical and Engineering Co. , Las Vegas
USBM	U. S. Bureau of Mines, Washington, D. C.
USPHS	U. S. Public Health Service, Las Vegas
USWB	U. S. Weather Bureau, Las Vegas

DISTRIBUTION LIST - PROJECT GNOME

AGENCY	NO. COPIES	AGENCY	NO. COPIES
Oak Ridge National Laboratory Union Carbide Nuclear Company P. O. Box X Oak Ridge, Tennessee ATTN: J. W. Landry	1	Chief Air Force Technical Applications Center Washington 25, D. C.	6
Sandia Corporation Sandia Base P. O. Box 5800 Albuquerque, New Mexico ATTN: W. R. Weart	1	Chief Defense Atomic Support Agency Washington 25, D. C.	6
Stanford Research Institute P. O. Box 725 Menlo Park, California ATTN: R. B. Hoy	1	Commander Field Command, Defense Atomic Support Agency Sandia Base, Albuquerque, New Mexico ATTN: FCWT ATTN: FCTG5	8 2
Stanford Research Institute P. O. Box 725 Menlo Park, California ATTN: L. M. Swift	1	Armed Services Technical Information Agency (ASTIA) Arlington Hall, Virginia	2
U. S. Coast and Geodetic Survey Washington 25, D. C. ATTN: Mr. W. V. Mickey	1	Sandia Corporation Sandia Base, Albuquerque, New Mexico ATTN: Section 7250, Mr. A. D. Thornbrough	2
U. S. Coast and Geodetic Survey Washington 25, D. C. ATTN: Dr. Dean S. Carder	1	Space Technology Laboratories, Inc. Ramo-Wooldridge Corporation P. O. Box 95001 Los Angeles 45, California ATTN: Mr. James F. Halsey	1
U. S. Coast and Geodetic Survey Washington 25, D. C. ATTN: Mr. L. M. Murphy	1	U. S. Geological Survey Federal Center Denver 25, Colorado ATTN: Dr. George Keller and Mr. Karl Roach	2
Los Alamos Scientific Laboratory P. O. Box 1663 Los Alamos, New Mexico ATTN: G. A. Cowan	1	Edgerton, Germeshausen & Grier, Inc. 300 Wall St., P. O. Box 1912 Las Vegas, Nevada ATTN: Mr. R. A. Lusk	2
Edgerton, Germeshausen & Grier, Inc. 160 Brookline Avenue Boston 15, Massachusetts ATTN: Mr. F. I. Strabala	2	Space-General Corporation 777 Flower Street Glendale 1, California ATTN: Mr. Glenn C. Brown	2
U. S. Army Engineer Waterways Experiment Station Corps of Engineers Jackson Installation, Concrete Division P. O. Drawer 2131 Jackson, Mississippi ATTN: J. M. Polatty	3	Director Mine Detection Branch Engineer Research & Development Laboratories Fort Belvoir, Virginia ATTN: Mr. S. E. Dwornik	2
Shell Development Co. 3737 Bellaire Blvd. Houston, Texas ATTN: Dr. Aaron J. Seriff	1	Texas Instruments, Inc. Geosciences Division P. O. Box 35084, Airlawn Station Dallas 35, Texas ATTN: Mr. Hubert M. Rackets	2
Office of Field Operations U. S. Atomic Energy Commission Las Vegas, Nevada	20	The Geotechnical Corporation P. O. Box 28277 Dallas 28, Texas ATTN: Mr. Ernest Stevens	2
University of California Lawrence Radiation Laboratory Livermore, California ATTN: Technical Information Division	25	U. S. Coast & Geodetic Survey Department of Commerce P. O. Box 267 Mercury, Nevada ATTN: Mr. Thomas H. Pearce	2
Assistant to the Secretary of Defense for Atomic Energy Department of Defense Washington 25, D. C.	1	U. S. Coast & Geodetic Survey Department of Commerce Washington 25, D. C. ATTN: Chief, Division of Geophysics	2
Chief Advanced Research Projects Agency Washington 25, D. C.	6	Allied Research Associates, Inc. 43 Leon Street Boston 15, Mass. ATTN: Dr. Arnold H. Glaser	1

DISTRIBUTION LIST--PROJECT GNOME
(TID-4500(17th Ed.) Category UC-35)

	No. Copies		No. Copies
Aberdeen Proving Ground	9	Office of Naval Research (Code 422)	1
Albuquerque Operations Office	2	Office of the Chief of Engineers	3
Argonne National Laboratory	1	Patent Branch, Washington	1
Army Engineer Division, South Pacific	1	Phillips Petroleum Company (NRTS)	1
Atomic Energy Commission (English)	1	Public Health Service	1
AEC Scientific Representative, France	1	RAND Corporation	1
Atomic Energy Commission, Washington	3	San Francisco Operations Office	5
Atomic Energy of Canada Limited	4	Sandia Corporation, Albuquerque	4
Atomics International	2	Sandia Corporation, Livermore	1
Battelle Memorial Institute	1	Space Technology Laboratories, Inc.	1
Brookhaven National Laboratory	1	Strategic Air Command	1
Bureau of Mines, College Park	1	Tennessee Valley Authority	1
Bureau of Mines, Laramie	1	Union Carbide Nuclear Company (ORGDP)	1
Bureau of Mines, Washington	1	Union Carbide Nuclear Company (ORNL)	4
Bureau of Ships (Code 1500)	1	USAF Headquarters (AFTAC)	1
Carnegie Institution	1	U. S. Coast and Geodetic Survey, San Francisco	1
Corps of Engineers, Vicksburg	1	U. S. Coast and Geodetic Survey, Washington	1
Defense Atomic Support Agency, Livermore	1	U. S. Geological Survey, Albuquerque	1
Defense Atomic Support Agency, Sandia	1	U. S. Geological Survey, Denver	3
Defense Atomic Support Agency, Washington	1	U. S. Geological Survey, Menlo Park	2
Division of Raw Materials, Washington	1	U. S. Geological Survey (Nolan)	1
duPont Company, Aiken	1	U. S. Geological Survey, Washington	1
duPont Company, Wilmington	1	U. S. Geological Survey, WR Division	1
Engineer Research and Development Laboratories	1	U. S. Weather Bureau, Las Vegas	1
General Atomic Division	1	U. S. Weather Bureau, Washington	1
General Electric Company (ANPD)	1	University of California, Berkeley	2
General Electric Company, Richland	1	University of California (Libby)	1
Grand Junction Office	1	University of California, Livermore	4
Homestake Mining Company	1	University of California, Los Angeles	1
Johns Hopkins University (Wolman)	1	University of California, Los Angeles (Larson)	2
Knolls Atomic Power Laboratory	1	University of Rochester (Hempelmann)	1
Los Alamos Scientific Laboratory	2	University of Tennessee (UTA)	1
Lovelace Clinic	1	University of Washington	1
Lowry Air Force Base	1	University of Washington (Fleming)	1
Moran, Proctor, Mueser & Rutledge	1	White Sands Missile Range	1
Mound Laboratory	1	Yale University (Sears)	1
National Academy of Sciences (Bascom)	1	Division of Technical Information Extension	325
Naval Radiological Defense Laboratory	1	Office of Technical Services, Washington	100
Oak Ridge Institute of Nuclear Studies	1		