

M-258

105579 01

Formerly Utilized Sites Remedial Action Program (FUSRAP)

ADMINISTRATIVE RECORD

for Maywood, New Jersey



U.S. Department of Energy



93 108879

Department of Energy

Oak Ridge Operations
P.O. Box 2001
Oak Ridge, Tennessee 37831— 8723

June 25, 1993

Mr. Paul A. Giardina
Radiation Branch Manager
U.S. Environmental Protection Agency
Region II
Jacob K. Javits Federal Building
New York, New York 10278

Dear Mr. Giardina:

FUSRAP-OWNED SITES - NESHAPS 1992 AIR EMISSIONS REPORTS - SUBMITTAL TO EPA REGION II

Enclosed are the Calendar Year 1992 National Emissions Standards for Hazardous Air Pollutants (NESHAPs) Annual Reports for Department of Energy (DOE) Formerly Utilized Sites Remedial Action Program (FUSRAP) sites in Region II. The enclosed reports have been prepared for your information in the spirit of a draft Memorandum of Understanding between DOE and the EPA that addresses, among several issues, the radionuclide NESHAPs requirements under 40 CFR 61, Subparts H and Q.

The annual reports were prepared based on DOE-Headquarters guidance for DOE Field Operations to fulfill the NESHAPs requirements under 40 CFR 61, Part H. Subpart H applies to operations at any facility owned or operated by DOE that may emit any radionuclides, other than radon, into the air. Radionuclide emission rates for non-radon emitters were calculated using the EPA-approved dose model CAP88-PC, as directed in 40 CFR Section 61.93.

Sites subject to Subpart H and for which annual reports have been prepared include the following six sites in Region II:

- Colone Interim Storage Site (CISS)
- Maywood Interim Storage Site (MISS)
- Middlesex Sampling Plant (MSP)
- New Brunswick Site (NBS)
- Niagara Falls Storage Site (NFSS)
- Wayne Interim Storage Site (WISS)

The information in the annual reports has been organized by site and source for ease of review.

Subpart Q of 40 CFR 61 applies to sites that store radium-containing material. The results of radon flux monitoring for MISS, MSP, NBS, and NFSS are included within Section IV as supplemental information.

Paul A. Giardina

2

June 25, 1991

The CAP88 computer model used to prepare the 1992 annual reports was used for the first time for FUSRAP sites. The CAP88 model is more realistic than the AIRDOS computer model, which has been used for past annual reports, and places emphasis on accurate population distribution for the air dispersion modeling. If no facility modifications take place during 1993, the CAP88 results for 1993 will be virtually identical to the 1992 calculations.

Because the CAP88 calculations for CISS, MISS, MSP, NBS, NFSS, and WISS for 1993 will result in virtually the same outcome as the 1992 calculation, DOE requests a waiver from the reporting and modelling requirements of Subpart H, Sections 61.93(a) and 61.94. Should any significant facility modifications requiring an application for approval under Section 61.96(b) be performed during 1993 or any following calendar year, then the Subpart H modelling and reporting requirements would be met.

If you have any questions, please contact me or Steven K. Oldham at (615) 576-7070.

Sincerely,



William M. Seay, Acting Director
Former Sites Restoration Division

Enclosure

U.S. Department of Energy
Air Emissions Annual Report
(under Subpart H, 40 CFR Section 61.94)
Calendar Year 1992

Site Name: Maywood Interim Storage Site (MISS), Maywood, New Jersey

Operations Office Information

Office: Oak Ridge Operations - Former Sites Restoration Division

Address: P.O. Box 2001

Oak Ridge, TN 37831-8723

Contact: Susan M. Cange Phone: (615) 576-5724

Site Information

Operator: Bechtel National, Inc.

Address: 100 North Hunter Avenue

Maywood, NJ 076076

Contact: Mike Redmon Phone: (615) 576-4718

Mailing Address: P.O. Box 350

Oak Ridge, TN 37831-0350

Section I. Facility Information - MISS

Site Description

The site is located in a highly developed area in the Borough of Maywood and the Township of Rochelle Park in Bergen County, New Jersey. MISS is located approximately 19 km (12 mi) north-northwest of New York City and 21 km (13 mi) northeast of Newark, New Jersey. The site consists of a woodframe building used for the storage of investigation-derived waste; a storage pile covered by an impermeable geotextile membrane that contains approximately 35,500 yd³ of low-level radioactive soil; and an office trailer. MISS is bounded by New Jersey Route 17 on the west; a railroad line on the north; and commercial/industrial areas on the south and east. Residential areas are located north of the railroad and within 274 m (300 yd) to the west. The site is a fenced lot occupying approximately 4.7 ha (11.7 acres).

MISS was established to provide interim storage for low-level radioactive soils found in the vicinity of the former Maywood Chemical Works. From 1916 through 1959, the Maywood Chemical Works processed monazite sand for industrial uses. Process wastes were placed in surface impoundments onsite. Some of these process wastes were later used as mulch and fill on nearby properties, contaminating them with radioactive thorium.

In 1954, after the enactment of the Atomic Energy Act, the Atomic Energy Commission (AEC) issued a license to the Maywood Chemical Works for the processing and manufacture of radioactive material. The Maywood Chemical Works stopped processing thorium in 1959 and shortly thereafter was sold to the Stepan Company. Based on AEC inspections and information, remedial actions were performed by the Stepan Company to consolidate some of the radioactively contaminated soil.

From 1980 to 1984, subsequent radiological surveys identified additional areas of contamination, both onsite and offsite. In 1984, DOE negotiated a lease for Stepan company land on which MISS would be established. In 1985, the land was transferred to DOE ownership and currently provides interim storage for contaminated materials removed from vicinity properties.

Based on historical weather data 1951 to 1980, the mean monthly temperature ranges from a low of -2.6°C (27.4°F) in January to a high of 22.9°C (73.2°F) in July. The mean annual precipitation is about 123.8 cm (48.3 in.). The wind blows predominantly from the southwest at approximately 16.4 km/h (10.2 mph).

Source Description

The source area consists of two small vegetative-covered areas. The total source area is 63,118 m² (687,355 ft²).

Section II. Air Emissions Data - MISS

<u>Point Source</u>	<u>Type Control</u>	<u>Efficiency</u>	<u>Distance to Nearest Receptor</u>
None	N.A.	N.A.	N.A.
<u>Grouped Source</u>	<u>Type Control</u>	<u>Efficiency</u>	<u>Distance to Nearest Receptor</u>
None	N.A.	N.A.	N.A.
<u>Non-Point Source</u>	<u>Type Control</u>	<u>Efficiency</u>	<u>Distance to Nearest Receptor</u>
63,118 m ²	Clay, topsoil, and vegetative cover	99 percent	45 m

Non-Point Source
Radionuclide

Annual Quantity Released (Ci)

U-238	8.63×10^{-7}
Th-234	8.63×10^{-7}
Pa-234	8.63×10^{-7}
U-234	8.63×10^{-7}
Th-230	8.63×10^{-7}
Ra-226	4.20×10^{-7}
U-235	3.87×10^{-8}
Th-231	3.87×10^{-8}
Pa-231	3.87×10^{-8}
Ac-227	3.87×10^{-8}
Th-227	3.87×10^{-8}
Th-232	1.84×10^{-6}
Ra-228	1.84×10^{-6}
Ac-228	1.84×10^{-6}
Th-228	1.84×10^{-6}
Ra-224	1.84×10^{-6}

N.A. = Not applicable

Section III. Dose Assessments - MISS

Description of Dose Model

The effective dose equivalent for a maximally exposed individual and for the collective population was calculated in a two-step process. The first step consisted of modeling the release of particulates from the site using the methodology given in EPA's "Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination Sites (EPA/600/8-85/002)". The second step consisted of inputting these particulate release rates, along with local population and meteorological data, into EPA's CAP88-PC computer model.

The CAP88-PC model uses a modified Gaussian plume equation to estimate the average dispersion of radionuclides released from a site. Assessments are done for a circular grid of distances and directions for a radius of 80 km (50 mi) around the site. The location of the nearest receptor is one of the distances for which this assessment is performed. The model reports receptor dose rates based on the distances used as input parameters. These receptor dose rates are based on a continuous exposure scenario. Therefore, in reporting the dose rate to the maximally exposed individual, the computed dose rate is adjusted for an appropriate occupancy scenario.

The program computes radionuclide concentrations in air, rates of deposition on ground surfaces, concentrations in food, and intake rates to people from ingestion of food produced in the assessment area. Estimates of the radionuclide concentrations in produce, leafy vegetables, milk and meat consumed by humans, are made by coupling the output of the atmospheric transport models with the U.S. Nuclear Regulatory Commission Regulatory Guide 1.109 terrestrial food chain models. The population density used in the model was based on known land use surrounding the site and 1990 census figures. The effective dose equivalent is calculated by combining the inhalation and ingestion intake rates and the air and ground surface concentrations with dose conversion factors, using the weighting factors in the International Commission on Radiological Protection (ICRP) Publication 26.

Summary of Input Parameters

Average Annual Temperature: 13°C (55°F)
Total Annual Precipitation: 85 cm (33 in)
Wind Speed and Direction: CAP88-PC file LEA0189

Population Density: 4.97×10^{-4} people/m²
Location and Distance of Maximally Exposed Individual: 45 m Northeast
Maximally Exposed Individual Occupancy Factor: 22.8%

Compliance Assessment (Calculated on the basis of distance of maximally exposed individual from source and adjusted for a reasonable occupancy scenario.)

Effective Dose Equivalent of Maximally Exposed Individual: 2.17×10^{-2} mrem/yr

Section III. (continued)

Certification

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein and based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment. (See, 18 U.S.C. 1001)

Name: William M. Seay, Acting Director, Former Sites Restoration Division

Signature: *Wm M. Seay*

Date: 6/21/93

Section IV. Supplemental Information - MISS

This section is not required by the NESHAPs regulations as part of the annual reporting requirements. The supplemental information is included to provide information for DOE guidance development and for future interactions with EPA. The bullet format of this sections follows the guidance received from DOE-HQ for the preparation of the calendar year 1992 air emissions annual reports for DOE sites.

- o The total collective population dose is the sum of the doses from all exposure pathways. Because the only pathway with a significant potential contribution to the collective population dose is airborne contamination, the total population dose is equal to that calculated by CAP88-PC, Version 1.0, namely 7.60×10^{-2} person-rem/yr (7.60×10^{-4} person-Sv/yr). CAP88-PC output for MISS emissions in 1992 is provided in Appendix A.
- o 40 CFR Part 61 Subpart T, "National Emission Standards for Radon Emissions from the Disposal of Uranium Mill Tailings," is not applicable to FUSRAP sites. Radon flux rate information and monitoring locations demonstrating compliance with the 20 pCi/m²/s (0.74 Bq/m²/s) limit of 40 CFR Part 61 Subpart Q, "National Emission Standards for Radon Emissions from Department of Energy Facilities," is provided in Appendix B.
- o Information on Radon-220 emissions from MISS is provided in Appendix C.
- o MISS is an interim storage site with no known non-disposal/non-storage sources of Rn-222 emissions. Average annual concentrations of radon in the air for MISS are provided in Appendix D.
- o MISS is not subject to 40 CFR Part 61 Subpart H Section 61.93(b) continuous monitoring requirements.

APPENDIX A
CAP88-PC OUTPUT

C A P 8 8 - P C

Version 1.00

Clean Air Act Assessment Package - 1988

S Y N O P S I S R E P O R T

Non-Radon Population Assessment
Jun 16, 1993 2:57 pm

Facility: Maywood Interim Storage Site
Address: 100 West Hunter Avenue
City: Maywood
State: NJ Zip: 07607

Effective Dose Equivalent
(mrem/year)

9.51E-02 *

* without occupancy factor

Max Exposed Individual: $9.51E-02 \times 0.228 = 2.17E-02$ mrem/yr
At This Location: 45 Meters North Northwest
Source Category: Airborne Radiological Particulates
Source Type: Area
Emission Year: 1992

Comments: Bechtel National, Inc.
Calculation No. 14501-138-CV-54

Dataset Name: MISS92
Dataset Date: Jun 16, 1993 2:57 pm
Wind File: WNDFILES@LEA0189.WND
Population File: POPFILES@MISS.POP

MAXIMALLY EXPOSED INDIVIDUAL

Location Of The Individual: 45 Meters North Northwest
Lifetime Fatal Cancer Risk: 1.08E-06

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)	Collective Population (person-rem/y)
GONADS	4.47E-04	8.86E-03
BREAST	3.51E-04	8.44E-03
R MAR	4.43E-02	9.08E-02
LUNGS	6.06E-01	1.35E-01
THYROID	3.36E-04	8.42E-03
ENDOST	5.50E-01	1.11E+00
RMNDR	1.21E-03	3.91E-02
EFFEC	9.51E-02	7.60E-02

FREQUENCY DISTRIBUTION OF LIFETIME FATAL CANCER RISKS

Risk Range	Number of People	Number of People In This Risk Range Or Higher	Deaths/Year In This Risk Range	Deaths/Year In This Risk Range Or Higher
1.0E+00 TO 1.0E-01	0	0	0.00E+00	0.00E+00
1.0E-01 TO 1.0E-02	0	0	0.00E+00	0.00E+00
1.0E-02 TO 1.0E-03	0	0	0.00E+00	0.00E+00
1.0E-03 TO 1.0E-04	0	0	0.00E+00	0.00E+00
1.0E-04 TO 1.0E-05	0	0	0.00E+00	0.00E+00
1.0E-05 TO 1.0E-06	16	16	2.45E-07	2.45E-07
LESS THAN 1.0E-06	9999984	10000000	7.02E-06	7.26E-06

RADIONUCLIDE EMISSIONS DURING THE YEAR 1992

Nuclide	Class	Size	Source #1 Ci/y	TOTAL Ci/y
U-238	Y	1.00	8.6E-07	8.6E-07
TH-234	Y	1.00	8.6E-07	8.6E-07
PA-234	Y	1.00	8.6E-07	8.6E-07
U-234	Y	1.00	8.6E-07	8.6E-07
TH-230	Y	1.00	8.6E-07	8.6E-07
RA-226	W	1.00	4.2E-07	4.2E-07
U-235	Y	1.00	3.9E-08	3.9E-08
TH-231	Y	1.00	3.9E-08	3.9E-08
PA-231	Y	1.00	3.9E-08	3.9E-08
AC-227	Y	1.00	3.9E-08	3.9E-08
TH-227	Y	1.00	3.9E-08	3.9E-08
RA-223	W	1.00	3.9E-08	3.9E-08
TH-232	Y	1.00	1.8E-06	1.8E-06
RA-228	W	1.00	1.8E-06	1.8E-06
AC-228	Y	1.00	1.8E-06	1.8E-06
TH-228	Y	1.00	1.8E-06	1.8E-06
RA-224	W	1.00	1.8E-06	1.8E-06

SITE INFORMATION

Temperature: 13 degrees C
 Precipitation: 85 cm/y
 Mixing Height: 1000 m

SOURCE INFORMATION

Source Number: 1

Source Height (m): 0.00

Area (sq m): 6.31E+04

Plume Rise Pasquill Cat:	A	B	C	D	E	F	G
Fixed (m): (Fixed Rise)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

AGRICULTURAL DATA

	Vegetable	Milk	Meat
Fraction Home Produced:	0.076	0.000	0.008
Fraction From Assessment Area:	0.924	1.000	0.992
Fraction Imported:	0.000	0.000	0.000
Beef Cattle Density:	4.25E-02		
Milk Cattle Density:	3.29E-02		
Land Fraction Cultivated for Vegetable Crops:	1.82E-02		

POPULATION DATA

Direction	Distance (m)						
	45	545	1500	2500	3500	4500	7500
N	1	97	293	488	684	879	7324
NNW	1	97	293	488	684	879	7324
NW	1	97	293	488	684	879	7324
WNW	1	97	293	488	684	879	7324
W	1	97	293	488	684	879	7324
WSW	1	97	293	488	684	879	7324
SW	1	97	293	488	684	879	7324
SSW	1	97	293	488	684	879	7324
S	1	97	293	488	684	879	7324
SSE	1	97	293	488	684	879	7324
SE	1	97	293	488	684	879	7324
ESE	1	97	293	488	684	879	7324
E	1	97	293	488	684	879	7324
ENE	1	97	293	488	684	879	7324
NE	1	97	293	488	684	879	7324
NNE	1	97	293	488	684	879	7324

Direction	Distance (m)						
	15000	25000	35000	45000	55000	65000	75000
N	29297	48828	68359	87891	107422	126953	146484
NNW	29297	48828	68359	87891	107422	126953	146484
NW	29297	48828	68359	87891	107422	126953	146484
WNW	29297	48828	68359	87891	107422	126953	146484
W	29297	48828	68359	87891	107422	126953	146484
WSW	29297	48828	68359	87891	107422	126953	146484
SW	29297	48828	68359	87891	107422	126953	146484
SSW	29297	48828	68359	87891	107422	126953	146484
S	29297	48828	68359	87891	107422	126953	146484
SSE	29297	48828	68359	87891	107422	126953	146484
SE	29297	48828	68359	87891	107422	126953	146484
ESE	29297	48828	68359	87891	107422	126953	146484
E	29297	48828	68359	87891	107422	126953	146484
ENE	29297	48828	68359	87891	107422	126953	146484
NE	29297	48828	68359	87891	107422	126953	146484
NNE	29297	48828	68359	87891	107422	126953	146484

C A P 8 8 - P C

Version 1.00

Clean Air Act Assessment Package - 1988

D O S E A N D R I S K E Q U I V A L E N T S U M M A R I E S

Non-Radon Population Assessment
Jun 16, 1993 2:57 pm

Facility: Maywood Interim Storage Site
Address: 100 West Hunter Avenue
City: Maywood
State: NJ Zip: 07607

Source Category: Airborne Radiological Particulates
Source Type: Area
Emission Year: 1992

Comments: Bechtel National, Inc.
Calculation No. 14501-138-CV-54

Dataset Name: MISS92
Dataset Date: Jun 16, 1993 2:57 pm
Wind File: WNDFILES@LEA0189.WND
Population File: POPFILES@MISS.POP

ORGAN DOSE EQUIVALENT SUMMARY

Organ	Selected Individual (mrem/y)	Collective Population (person-rem/y)
GONADS	4.47E-04	8.86E-03
BREAST	3.51E-04	8.44E-03
R MAR	4.43E-02	9.08E-02
LUNGS	6.06E-01	1.35E-01
THYROID	3.36E-04	8.42E-03
ENDOST	5.50E-01	1.11E+00
RMNDR	1.21E-03	3.91E-02
EFFEC	9.51E-02	7.60E-02

PATHWAY EFFECTIVE DOSE EQUIVALENT SUMMARY

Pathway	Selected Individual (mrem/y)	Collective Population (person-rem/y)
INGESTION	3.18E-05	5.61E-02
INHALATION	9.51E-02	1.99E-02
AIR IMMERSION	1.29E-07	2.23E-08
GROUND SURFACE	1.34E-05	4.77E-06
INTERNAL	9.51E-02	7.60E-02
EXTERNAL	1.35E-05	4.79E-06
TOTAL	9.51E-02	7.60E-02

NUCLIDE EFFECTIVE DOSE EQUIVALENT SUMMARY

Nuclides	Selected Individual (mrem/y)	Collective Population (person-rem/y)
U-238	5.99E-03	1.02E-02
TH-234	1.88E-06	5.17E-05
PA-234	1.59E-07	3.21E-08
U-234	6.73E-03	1.13E-02
TH-230	1.28E-02	6.81E-03
RA-226	2.27E-04	5.73E-03
U-235	2.88E-04	4.91E-04
TH-231	2.35E-09	4.80E-10
PA-231	1.12E-03	2.03E-03
AC-227	1.48E-03	1.85E-03
TH-227	2.73E-05	1.11E-05
RA-223	1.93E-05	6.55E-05
TH-232	3.86E-02	1.59E-02
RA-228	2.69E-04	1.26E-02
AC-228	9.34E-06	1.60E-06
TH-228	2.71E-02	8.70E-03
RA-224	3.77E-04	2.29E-04
TOTAL	9.51E-02	7.60E-02

CANCER RISK SUMMARY

Cancer	Selected Individual Total Lifetime Fatal Cancer Risk	Total Collective Population Fatal Cancer Risk (Deaths/y)
LEUKEMIA	3.84E-08	1.33E-06
BONE	2.52E-08	8.30E-07
THYROID	5.80E-11	2.08E-08
BREAST	5.27E-10	1.75E-07
LUNG	1.01E-06	3.22E-06
STOMACH	4.13E-10	1.49E-07
BOWEL	3.90E-10	1.78E-07
LIVER	3.36E-09	2.79E-07
PANCREAS	2.89E-10	1.09E-07
URINARY	2.81E-10	8.43E-07
OTHER	3.54E-10	1.33E-07
TOTAL	1.08E-06	7.26E-06

PATHWAY RISK SUMMARY

Pathway	Selected Individual Total Lifetime Fatal Cancer Risk	Total Collective Population Fatal Cancer Risk (Deaths/y)
INGESTION	1.61E-10	4.06E-06
INHALATION	1.08E-06	3.20E-06
AIR IMMERSION	3.10E-12	7.55E-12
GROUND SURFACE	3.06E-10	1.54E-09
INTERNAL	1.08E-06	7.26E-06
EXTERNAL	3.09E-10	1.55E-09
TOTAL	1.08E-06	7.26E-06

PATHWAY GENETIC RISK SUMMARY
(Collective Population)

<u>Pathway</u>	<u>Genetic Risk (person-rem/y)</u>
INGESTION	1.12E-03
INHALATION	8.37E-06
AIR IMMERSION	2.19E-08
GROUND SURFACE	3.97E-06
INTERNAL	1.13E-03
EXTERNAL	3.99E-06
TOTAL	1.13E-03

NUCLIDE RISK SUMMARY

Nuclide	Selected Individual Total Lifetime Fatal Cancer Risk	Total Collective Population Fatal Cancer Risk (Deaths/y)
U-238	8.04E-08	9.36E-07
TH-234	1.07E-10	8.51E-09
PA-234	4.10E-12	1.16E-11
U-234	8.97E-08	9.71E-07
TH-230	1.06E-07	4.97E-07
RA-226	5.02E-09	4.20E-07
U-235	3.92E-09	4.32E-08
TH-231	6.85E-14	1.95E-13
PA-231	6.32E-09	8.63E-08
AC-227	1.29E-08	1.64E-07
TH-227	7.51E-10	2.63E-09
RA-223	4.80E-10	6.60E-09
TH-232	2.19E-07	9.94E-07
RA-228	4.42E-09	1.28E-06
AC-228	1.88E-10	4.55E-10
TH-228	5.46E-07	1.82E-06
RA-224	8.57E-09	3.78E-08
TOTAL	1.08E-06	7.26E-06

INDIVIDUAL EFFECTIVE DOSE EQUIVALENT RATE (mrem/y)
(All Radionuclides and Pathways)

Direction	Distance (m)						
	45	545	1500	2500	3500	4500	7500
N	9.5E-02	2.3E-03	4.1E-04	1.8E-04	1.0E-04	7.3E-05	3.6E-05
NNW	9.5E-02	7.4E-04	1.0E-04	4.5E-05	2.9E-05	2.1E-05	1.3E-05
NW	9.5E-02	5.4E-04	9.1E-05	4.1E-05	2.6E-05	2.0E-05	1.2E-05
WNW	9.5E-02	5.0E-04	7.3E-05	3.4E-05	2.2E-05	1.7E-05	1.1E-05
W	9.5E-02	1.2E-03	2.0E-04	8.5E-05	5.2E-05	3.7E-05	2.0E-05
WSW	9.5E-02	1.6E-03	2.7E-04	1.1E-04	6.9E-05	4.8E-05	2.5E-05
SW	9.5E-02	1.7E-03	2.7E-04	1.2E-04	7.0E-05	4.9E-05	2.5E-05
SSW	9.5E-02	1.4E-03	2.1E-04	9.2E-05	5.6E-05	4.0E-05	2.1E-05
S	9.5E-02	1.5E-03	2.5E-04	1.1E-04	6.5E-05	4.6E-05	2.4E-05
SSE	9.5E-02	1.3E-03	2.0E-04	8.7E-05	5.3E-05	3.8E-05	2.0E-05
SE	9.5E-02	1.5E-03	2.4E-04	1.0E-04	6.3E-05	4.4E-05	2.3E-05
ESE	9.5E-02	1.6E-03	2.7E-04	1.2E-04	7.0E-05	5.0E-05	2.6E-05
E	9.5E-02	1.4E-03	2.3E-04	9.9E-05	6.0E-05	4.3E-05	2.2E-05
ENE	9.5E-02	1.4E-03	2.3E-04	9.8E-05	5.9E-05	4.2E-05	2.2E-05
NE	9.5E-02	1.6E-03	2.6E-04	1.1E-04	6.8E-05	4.8E-05	2.5E-05
NNE	9.5E-02	1.4E-03	2.1E-04	9.2E-05	5.6E-05	4.0E-05	2.1E-05

Direction	Distance (m)						
	15000	25000	35000	45000	55000	65000	75000
N	1.7E-05	1.1E-05	8.7E-06	7.7E-06	7.1E-06	6.6E-06	6.4E-06
NNW	8.2E-06	6.8E-06	6.3E-06	6.1E-06	6.0E-06	5.8E-06	5.8E-06
NW	7.9E-06	6.6E-06	6.2E-06	6.0E-06	5.9E-06	5.8E-06	5.8E-06
WNW	7.4E-06	6.4E-06	6.1E-06	5.9E-06	5.8E-06	5.8E-06	5.7E-06
W	1.1E-05	7.8E-06	7.0E-06	6.5E-06	6.3E-06	6.0E-06	5.9E-06
WSW	1.3E-05	8.7E-06	7.5E-06	6.9E-06	6.5E-06	6.3E-06	6.1E-06
SW	1.3E-05	8.8E-06	7.6E-06	6.9E-06	6.6E-06	6.3E-06	6.1E-06
SSW	1.1E-05	8.2E-06	7.2E-06	6.7E-06	6.4E-06	6.1E-06	6.0E-06
S	1.2E-05	8.7E-06	7.5E-06	6.9E-06	6.6E-06	6.3E-06	6.1E-06
SSE	1.1E-05	8.0E-06	7.1E-06	6.7E-06	6.4E-06	6.2E-06	6.0E-06
SE	1.2E-05	8.5E-06	7.4E-06	6.9E-06	6.5E-06	6.2E-06	6.1E-06
ESE	1.3E-05	9.0E-06	7.7E-06	7.1E-06	6.7E-06	6.4E-06	6.2E-06
E	1.2E-05	8.4E-06	7.3E-06	6.8E-06	6.5E-06	6.2E-06	6.1E-06
ENE	1.2E-05	8.3E-06	7.3E-06	6.8E-06	6.4E-06	6.2E-06	6.1E-06
NE	1.3E-05	8.9E-06	7.7E-06	7.0E-06	6.6E-06	6.3E-06	6.2E-06
NNE	1.1E-05	8.2E-06	7.2E-06	6.7E-06	6.4E-06	6.1E-06	6.0E-06

COLLECTIVE EFFECTIVE DOSE EQUIVALENT (person rem/y)
(All Radionuclides and Pathways)

Direction	Distance (m)						
	45	545	1500	2500	3500	4500	7500
N	9.5E-05	2.2E-04	1.2E-04	8.6E-05	7.1E-05	6.4E-05	2.7E-04
NNW	9.5E-05	7.2E-05	2.9E-05	2.2E-05	2.0E-05	1.9E-05	9.4E-05
NW	9.5E-05	5.3E-05	2.7E-05	2.0E-05	1.8E-05	1.7E-05	8.8E-05
WNW	9.5E-05	4.9E-05	2.2E-05	1.7E-05	1.5E-05	1.5E-05	7.7E-05
W	9.5E-05	1.1E-04	5.7E-05	4.1E-05	3.5E-05	3.2E-05	1.4E-04
WSW	9.5E-05	1.6E-04	7.8E-05	5.6E-05	4.7E-05	4.2E-05	1.8E-04
SW	9.5E-05	1.6E-04	8.0E-05	5.7E-05	4.8E-05	4.3E-05	1.9E-04
SSW	9.5E-05	1.3E-04	6.2E-05	4.5E-05	3.8E-05	3.5E-05	1.5E-04
S	9.5E-05	1.5E-04	7.3E-05	5.2E-05	4.4E-05	4.0E-05	1.7E-04
SSE	9.5E-05	1.2E-04	5.9E-05	4.3E-05	3.6E-05	3.3E-05	1.5E-04
SE	9.5E-05	1.4E-04	7.0E-05	5.1E-05	4.3E-05	3.9E-05	1.7E-04
ESE	9.5E-05	1.6E-04	7.9E-05	5.7E-05	4.8E-05	4.4E-05	1.9E-04
E	9.5E-05	1.4E-04	6.7E-05	4.8E-05	4.1E-05	3.7E-05	1.6E-04
ENE	9.5E-05	1.4E-04	6.6E-05	4.8E-05	4.1E-05	3.7E-05	1.6E-04
NE	9.5E-05	1.5E-04	7.6E-05	5.5E-05	4.6E-05	4.2E-05	1.8E-04
NNE	9.5E-05	1.4E-04	6.2E-05	4.5E-05	3.8E-05	3.5E-05	1.6E-04

Direction	Distance (m)						
	15000	25000	35000	45000	55000	65000	75000
N	4.9E-04	5.2E-04	5.9E-04	6.8E-04	7.6E-04	8.4E-04	9.4E-04
NNW	2.4E-04	3.3E-04	4.3E-04	5.4E-04	6.4E-04	7.4E-04	8.5E-04
NW	2.3E-04	3.2E-04	4.3E-04	5.3E-04	6.3E-04	7.4E-04	8.4E-04
WNW	2.2E-04	3.1E-04	4.1E-04	5.2E-04	6.3E-04	7.3E-04	8.4E-04
W	3.1E-04	3.8E-04	4.8E-04	5.7E-04	6.7E-04	7.7E-04	8.7E-04
WSW	3.7E-04	4.2E-04	5.1E-04	6.1E-04	7.0E-04	7.9E-04	9.0E-04
SW	3.7E-04	4.3E-04	5.2E-04	6.1E-04	7.0E-04	7.9E-04	9.0E-04
SSW	3.3E-04	4.0E-04	4.9E-04	5.9E-04	6.9E-04	7.8E-04	8.8E-04
S	3.6E-04	4.2E-04	5.2E-04	6.1E-04	7.1E-04	8.0E-04	9.0E-04
SSE	3.2E-04	3.9E-04	4.9E-04	5.9E-04	6.8E-04	7.8E-04	8.9E-04
SE	3.5E-04	4.2E-04	5.1E-04	6.0E-04	7.0E-04	7.9E-04	9.0E-04
ESE	3.8E-04	4.4E-04	5.3E-04	6.2E-04	7.2E-04	8.1E-04	9.1E-04
E	3.4E-04	4.1E-04	5.0E-04	6.0E-04	6.9E-04	7.9E-04	8.9E-04
ENE	3.4E-04	4.0E-04	5.0E-04	5.9E-04	6.9E-04	7.8E-04	8.9E-04
NE	3.7E-04	4.4E-04	5.3E-04	6.2E-04	7.1E-04	8.0E-04	9.1E-04
NNE	3.3E-04	4.0E-04	4.9E-04	5.9E-04	6.9E-04	7.8E-04	8.8E-04

AVERAGE COLLECTIVE GENETIC DOSE EQUIVALENT
(person rem)
(All Radionuclides and Pathways)

Direction	Distance (m)						
	45	545	1500	2500	3500	4500	7500
N	9.0E-06	2.3E-05	1.8E-05	1.9E-05	2.2E-05	2.6E-05	1.9E-04
NNW	9.0E-06	9.0E-06	9.4E-06	1.3E-05	1.7E-05	2.2E-05	1.8E-04
NW	9.0E-06	7.2E-06	9.2E-06	1.3E-05	1.7E-05	2.2E-05	1.7E-04
WNW	9.0E-06	6.8E-06	8.7E-06	1.3E-05	1.7E-05	2.1E-05	1.7E-04
W	9.0E-06	1.3E-05	1.2E-05	1.5E-05	1.9E-05	2.3E-05	1.8E-04
WSW	9.0E-06	1.7E-05	1.4E-05	1.6E-05	2.0E-05	2.4E-05	1.8E-04
SW	9.0E-06	1.7E-05	1.4E-05	1.7E-05	2.0E-05	2.4E-05	1.8E-04
SSW	9.0E-06	1.5E-05	1.3E-05	1.5E-05	1.9E-05	2.3E-05	1.8E-04
S	9.0E-06	1.6E-05	1.4E-05	1.6E-05	2.0E-05	2.4E-05	1.8E-04
SSE	9.0E-06	1.4E-05	1.2E-05	1.5E-05	1.9E-05	2.3E-05	1.8E-04
SE	9.0E-06	1.6E-05	1.3E-05	1.6E-05	2.0E-05	2.4E-05	1.8E-04
ESE	9.0E-06	1.7E-05	1.4E-05	1.7E-05	2.0E-05	2.4E-05	1.8E-04
E	9.0E-06	1.5E-05	1.3E-05	1.6E-05	1.9E-05	2.4E-05	1.8E-04
ENE	9.0E-06	1.5E-05	1.3E-05	1.6E-05	1.9E-05	2.4E-05	1.8E-04
NE	9.0E-06	1.7E-05	1.4E-05	1.6E-05	2.0E-05	2.4E-05	1.8E-04
NNE	9.0E-06	1.5E-05	1.3E-05	1.5E-05	1.9E-05	2.3E-05	1.8E-04

Direction	Distance (m)						
	15000	25000	35000	45000	55000	65000	75000
N	7.1E-04	1.2E-03	1.6E-03	2.1E-03	2.5E-03	3.0E-03	3.4E-03
NNW	6.9E-04	1.1E-03	1.6E-03	2.0E-03	2.5E-03	3.0E-03	3.4E-03
NW	6.9E-04	1.1E-03	1.6E-03	2.0E-03	2.5E-03	3.0E-03	3.4E-03
WNW	6.9E-04	1.1E-03	1.6E-03	2.0E-03	2.5E-03	3.0E-03	3.4E-03
W	6.9E-04	1.1E-03	1.6E-03	2.0E-03	2.5E-03	3.0E-03	3.4E-03
WSW	7.0E-04	1.1E-03	1.6E-03	2.1E-03	2.5E-03	3.0E-03	3.4E-03
SW	7.0E-04	1.1E-03	1.6E-03	2.1E-03	2.5E-03	3.0E-03	3.4E-03
SSW	7.0E-04	1.1E-03	1.6E-03	2.1E-03	2.5E-03	3.0E-03	3.4E-03
S	7.0E-04	1.1E-03	1.6E-03	2.1E-03	2.5E-03	3.0E-03	3.4E-03
SSE	7.0E-04	1.1E-03	1.6E-03	2.1E-03	2.5E-03	3.0E-03	3.4E-03
SE	7.0E-04	1.1E-03	1.6E-03	2.1E-03	2.5E-03	3.0E-03	3.4E-03
ESE	7.0E-04	1.2E-03	1.6E-03	2.1E-03	2.5E-03	3.0E-03	3.4E-03
E	7.0E-04	1.1E-03	1.6E-03	2.1E-03	2.5E-03	3.0E-03	3.4E-03
ENE	7.0E-04	1.1E-03	1.6E-03	2.1E-03	2.5E-03	3.0E-03	3.4E-03
NE	7.0E-04	1.1E-03	1.6E-03	2.1E-03	2.5E-03	3.0E-03	3.4E-03
NNE	7.0E-04	1.1E-03	1.6E-03	2.1E-03	2.5E-03	3.0E-03	3.4E-03

INDIVIDUAL LIFETIME RISK (deaths)
(All Radionuclides and Pathways)

Direction	Distance (m)						
	45	545	1500	2500	3500	4500	7500
N	1.1E-06	2.6E-08	4.6E-09	2.0E-09	1.2E-09	8.0E-10	3.8E-10
NNW	1.1E-06	8.4E-09	1.1E-09	4.8E-10	2.9E-10	2.1E-10	1.1E-10
NW	1.1E-06	6.1E-09	1.0E-09	4.4E-10	2.7E-10	1.9E-10	1.0E-10
WNW	1.1E-06	5.7E-09	8.0E-10	3.5E-10	2.1E-10	1.5E-10	8.5E-11
W	1.1E-06	1.3E-08	2.2E-09	9.3E-10	5.5E-10	3.8E-10	1.9E-10
WSW	1.1E-06	1.8E-08	3.0E-09	1.3E-09	7.5E-10	5.2E-10	2.5E-10
SW	1.1E-06	1.9E-08	3.1E-09	1.3E-09	7.6E-10	5.3E-10	2.5E-10
SSW	1.1E-06	1.5E-08	2.4E-09	1.0E-09	6.0E-10	4.2E-10	2.1E-10
S	1.1E-06	1.7E-08	2.8E-09	1.2E-09	7.0E-10	4.9E-10	2.4E-10
SSE	1.1E-06	1.4E-08	2.3E-09	9.6E-10	5.7E-10	4.0E-10	1.9E-10
SE	1.1E-06	1.7E-08	2.7E-09	1.1E-09	6.8E-10	4.7E-10	2.3E-10
ESE	1.1E-06	1.8E-08	3.0E-09	1.3E-09	7.6E-10	5.3E-10	2.6E-10
E	1.1E-06	1.6E-08	2.6E-09	1.1E-09	6.5E-10	4.5E-10	2.2E-10
ENE	1.1E-06	1.6E-08	2.5E-09	1.1E-09	6.4E-10	4.5E-10	2.2E-10
NE	1.1E-06	1.8E-08	2.9E-09	1.2E-09	7.4E-10	5.1E-10	2.5E-10
NNE	1.1E-06	1.6E-08	2.4E-09	1.0E-09	6.0E-10	4.2E-10	2.1E-10

Direction	Distance (m)						
	15000	25000	35000	45000	55000	65000	75000
N	1.5E-10	8.5E-11	6.4E-11	5.3E-11	4.6E-11	4.0E-11	3.8E-11
NNW	5.8E-11	4.2E-11	3.7E-11	3.4E-11	3.3E-11	3.1E-11	3.1E-11
NW	5.5E-11	4.0E-11	3.6E-11	3.3E-11	3.2E-11	3.1E-11	3.0E-11
WNW	4.9E-11	3.7E-11	3.4E-11	3.2E-11	3.1E-11	3.0E-11	3.0E-11
W	8.6E-11	5.4E-11	4.4E-11	3.9E-11	3.6E-11	3.4E-11	3.2E-11
WSW	1.1E-10	6.4E-11	5.0E-11	4.4E-11	3.9E-11	3.6E-11	3.4E-11
SW	1.1E-10	6.5E-11	5.1E-11	4.4E-11	4.0E-11	3.6E-11	3.4E-11
SSW	9.4E-11	5.8E-11	4.7E-11	4.1E-11	3.8E-11	3.5E-11	3.3E-11
S	1.1E-10	6.4E-11	5.1E-11	4.4E-11	4.0E-11	3.6E-11	3.5E-11
SSE	8.9E-11	5.6E-11	4.6E-11	4.1E-11	3.7E-11	3.5E-11	3.4E-11
SE	1.0E-10	6.2E-11	4.9E-11	4.3E-11	3.9E-11	3.6E-11	3.4E-11
ESE	1.1E-10	6.7E-11	5.3E-11	4.5E-11	4.1E-11	3.7E-11	3.6E-11
E	9.8E-11	6.0E-11	4.8E-11	4.2E-11	3.8E-11	3.6E-11	3.4E-11
ENE	9.7E-11	5.9E-11	4.8E-11	4.2E-11	3.8E-11	3.5E-11	3.4E-11
NE	1.1E-10	6.6E-11	5.2E-11	4.5E-11	4.1E-11	3.7E-11	3.5E-11
NNE	9.4E-11	5.8E-11	4.7E-11	4.1E-11	3.8E-11	3.5E-11	3.3E-11

COLLECTIVE FATAL CANCER RATE (deaths/y)
(All Radionuclides and Pathways)

Direction	Distance (m)						
	45	545	1500	2500	3500	4500	7500
N	1.5E-08	3.6E-08	1.9E-08	1.4E-08	1.1E-08	9.9E-09	3.9E-08
NNW	1.5E-08	1.1E-08	4.6E-09	3.3E-09	2.8E-09	2.6E-09	1.1E-08
NW	1.5E-08	8.4E-09	4.2E-09	3.0E-09	2.6E-09	2.4E-09	1.0E-08
WNW	1.5E-08	7.8E-09	3.3E-09	2.4E-09	2.1E-09	1.9E-09	8.8E-09
W	1.5E-08	1.8E-08	9.1E-09	6.4E-09	5.3E-09	4.8E-09	2.0E-08
WSW	1.5E-08	2.5E-08	1.2E-08	8.7E-09	7.2E-09	6.4E-09	2.6E-08
SW	1.5E-08	2.6E-08	1.3E-08	8.9E-09	7.4E-09	6.5E-09	2.6E-08
SSW	1.5E-08	2.1E-08	9.8E-09	7.0E-09	5.8E-09	5.2E-09	2.1E-08
S	1.5E-08	2.3E-08	1.2E-08	8.2E-09	6.8E-09	6.0E-09	2.4E-08
SSE	1.5E-08	2.0E-08	9.3E-09	6.6E-09	5.5E-09	4.9E-09	2.0E-08
SE	1.5E-08	2.3E-08	1.1E-08	7.9E-09	6.6E-09	5.9E-09	2.4E-08
ESE	1.5E-08	2.5E-08	1.3E-08	8.9E-09	7.4E-09	6.6E-09	2.7E-08
E	1.5E-08	2.2E-08	1.1E-08	7.6E-09	6.3E-09	5.6E-09	2.3E-08
ENE	1.5E-08	2.2E-08	1.1E-08	7.5E-09	6.2E-09	5.5E-09	2.3E-08
NE	1.5E-08	2.4E-08	1.2E-08	8.6E-09	7.1E-09	6.4E-09	2.6E-08
NNE	1.5E-08	2.2E-08	9.8E-09	7.0E-09	5.8E-09	5.2E-09	2.1E-08

Direction	Distance (m)						
	15000	25000	35000	45000	55000	65000	75000
N	6.4E-08	5.9E-08	6.1E-08	6.5E-08	6.9E-08	7.2E-08	7.9E-08
NNW	2.4E-08	2.9E-08	3.6E-08	4.3E-08	5.0E-08	5.6E-08	6.4E-08
NW	2.3E-08	2.8E-08	3.4E-08	4.2E-08	4.9E-08	5.5E-08	6.3E-08
WNW	2.0E-08	2.6E-08	3.3E-08	4.0E-08	4.7E-08	5.4E-08	6.2E-08
W	3.6E-08	3.7E-08	4.3E-08	4.9E-08	5.5E-08	6.0E-08	6.7E-08
WSW	4.4E-08	4.4E-08	4.9E-08	5.4E-08	6.0E-08	6.5E-08	7.1E-08
SW	4.5E-08	4.5E-08	4.9E-08	5.5E-08	6.0E-08	6.5E-08	7.1E-08
SSW	3.9E-08	4.0E-08	4.5E-08	5.1E-08	5.7E-08	6.2E-08	6.9E-08
S	4.4E-08	4.4E-08	4.9E-08	5.5E-08	6.0E-08	6.5E-08	7.2E-08
SSE	3.7E-08	3.9E-08	4.4E-08	5.0E-08	5.7E-08	6.3E-08	7.0E-08
SE	4.2E-08	4.3E-08	4.8E-08	5.3E-08	5.9E-08	6.4E-08	7.1E-08
ESE	4.7E-08	4.7E-08	5.1E-08	5.6E-08	6.2E-08	6.7E-08	7.4E-08
E	4.1E-08	4.2E-08	4.7E-08	5.2E-08	5.8E-08	6.4E-08	7.1E-08
ENE	4.0E-08	4.1E-08	4.6E-08	5.2E-08	5.8E-08	6.3E-08	7.0E-08
NE	4.6E-08	4.6E-08	5.0E-08	5.6E-08	6.1E-08	6.6E-08	7.3E-08
NNE	3.9E-08	4.0E-08	4.5E-08	5.1E-08	5.7E-08	6.2E-08	6.9E-08

APPENDIX B
RADON FLUX RATES

CUSTOMER
ATTENTION
ADDRESS
CITY
W.O. NO.

Bechtel National, Inc. - MISS Storage Pile
Michael Bradshaw
P.O. Box 350
Oak Ridge, TN. 37831-0350



TYPE OF ANALYSIS

Radon Flux

CUSTOMER ORDER NUMBER

SAMPLES RECEIVED

8/4/92

Customer Identification	Date Collected	Type of Analysis	Date Analyzed	pCi/M ² /sec
138-RF-001	07/21-07/22/92	Rn-222	07/23/92	0.23±0.07
138-RF-002	07/21-07/22/92	Rn-222	07/24/92	0.57±0.09
138-RF-003	07/21-07/22/92	Rn-222	07/23/92	0.22±0.07
138-RF-004	07/21-07/22/92	Rn-222	07/24/92	0.23±0.08
138-RF-005	07/21-07/22/92	Rn-222	07/24/92	0.30±0.09
138-RF-006	07/21-07/22/92	Rn-222	07/24/92	0.26±0.08
138-RF-007	07/21-07/22/92	Rn-222	07/24/92	0.28±0.08
138-RF-008	07/21-07/22/92	Rn-222	07/23/92	0.23±0.07
138-RF-009	07/21-07/22/92	Rn-222	07/24/92	0.25±0.08
138-RF-010	07/21-07/22/92	Rn-222	07/23/92	0.29±0.08
138-RF-011	07/21-07/22/92	Rn-222	07/24/92	0.27±0.08
138-RF-012	07/21-07/22/92	Rn-222	07/24/92	0.22±0.08
138-RF-013	07/21-07/22/92	Rn-222	07/24/92	1.83±0.11
138-RF-014	07/21-07/22/92	Rn-222	07/23/92	0.29±0.07
138-RF-015	07/21-07/22/92	Rn-222	07/23/92	0.26±0.07
138-RF-016	07/21-07/22/92	Rn-222	07/24/92	13.84±0.22
138-RF-017	07/21-07/22/92	Rn-222	07/23/92	0.20±0.07
138-RF-018	07/21-07/22/92	Rn-222	07/23/92	0.21±0.07
138-RF-019	07/21-07/22/92	Rn-222	07/23/92	0.22±0.07
138-RF-020	07/21-07/22/92	Rn-222	07/23/92	0.23±0.07

 REPORTED VIA TELEPHONE

PAGE 1 OF 2 PAGE

TMA Eberline
Thermo Analytical Inc.

21 PAN AMERICAN FREEWAY, N.E.
ALBUQUERQUE, NEW MEXICO 87109
PHONE (505) 345-3461

APPROVED BY

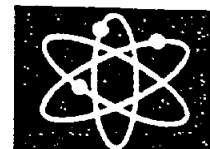
8/5/92
NRB

DATE

8-4-92

CUSTOMER
ATTENTION
ADDRESS
CITY
W.O. NO.

Bechtel National, Inc. - MISS Storage Pile
Michael Bradshaw
P.O. Box 350
Oak Ridge, TN. 37831-0350



REPORT OF ANALYSIS

TYPE OF ANALYSIS

Radon Flux

CUSTOMER ORDER NUMBER

SAMPLES RECEIVED

8/4/92

Customer Identification	Date Collected	Type of Analysis	Date Analyzed	pCi/M ² /sec	
81-RF-021	07/21-07/22/92	Rn-222	07/23/92	0.21±0.07	
88-RF-022	07/21-07/22/92	Rn-222	07/23/92	0.23±0.07	
81-RF-023	07/21-07/22/92	Rn-222	07/24/92	0.23±0.08	
88-RF-024	07/21-07/22/92	Rn-222	07/23/92	0.18±0.07	
81-RF-025	07/21-07/22/92	Rn-222	07/23/92	0.13±0.07	
81-RF-026	07/21-07/22/92	Rn-222	07/23/92	0.22±0.07	
88-RF-027	07/21-07/22/92	Rn-222	07/23/92	0.28±0.07	
81-RF-028	07/21-07/22/92	Rn-222	07/23/92	0.25±0.07	
88-RF-029	07/21-07/22/92	Rn-222	07/24/92	0.28±0.08	
81-RF-030	07/21-07/22/92	Rn-222	07/24/92	0.14±0.08	
81-RF-010	07/21-07/22/92	Rn-222	07/24/92	0.28±0.08	QC
88-RF-020	07/21-07/22/92	Rn-222	07/23/92	0.23±0.07	QC
81-RF-040	07/21-07/22/92	Rn-222	07/23/92	0.22±0.07	QC
88-RF-002	07/21-07/22/92	Rn-222	07/24/92	0.57±0.09	LQC
81-RF-010	07/21-07/22/92	Rn-222	07/23/92	0.31±0.08	LQC
88-RF-028	07/21-07/22/92	Rn-222	07/23/92	0.25±0.07	LQC

REPORTED VIA TELEPHONE

PAGE 2 OF 2 PAGE

MA Eberline
Thermo Analytical Inc.

PAN AMERICAN FREEWAY, N.E.
ALBUQUERQUE, NEW MEXICO 87109
PHONE (505) 345-3461

APPROVED BY

8/5/92
MRB

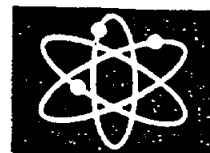
DATE

8-4-92

CUSTOMER
ATTENTION
ADDRESS
CITY
W.O. NO.

Bechtel National, Inc. - MISS Storage Pile
Michael Bradshaw
P.O. Box 350
Oak Ridge, TN. 37831-0350

D-12959



REPORT OF ANALYSIS

TYPE OF ANALYSIS

Radon Flux

CUSTOMER ORDER NUMBER

SAMPLES RECEIVED

10/16/92

Customer Identification	Date Collected	Type of Analysis	Date Analyzed	pCi/M ² /sec
138-RF-001	10/05-10/06/92	Rn-222	10/07/92	<0.04
138-RF-002	10/05-10/06/92	Rn-222	10/07/92	<0.04
138-RF-003	10/05-10/06/92	Rn-222	10/07/92	<0.04
138-RF-004	10/05-10/06/92	Rn-222	10/07/92	<0.04
138-RF-005	10/05-10/06/92	Rn-222	10/07/92	<0.04
138-RF-006	10/05-10/06/92	Rn-222	10/07/92	<0.04
138-RF-007	10/05-10/06/92	Rn-222	10/07/92	<0.04
138-RF-008	10/05-10/06/92	Rn-222	10/07/92	<0.04
138-RF-009	10/05-10/06/92	Rn-222	10/07/92	<0.04
138-RF-010	10/05-10/06/92	Rn-222	10/07/92	<0.04
138-RF-011	10/05-10/06/92	Rn-222	10/07/92	<0.04
138-RF-012	10/05-10/06/92	Rn-222	10/07/92	<0.04
138-RF-013	10/05-10/06/92	Rn-222	10/07/92	5.42±0.12
138-RF-014	10/05-10/06/92	Rn-222	10/07/92	<0.04
138-RF-015	10/05-10/06/92	Rn-222	10/07/92	<0.04
138-RF-016	10/05-10/06/92	Rn-222	10/07/92	<0.04
138-RF-017	10/05-10/06/92	Rn-222	10/07/92	<0.04
138-RF-018	10/05-10/06/92	Rn-222	10/07/92	<0.04
138-RF-019	10/05-10/06/92	Rn-222	10/07/92	<0.04
138-RF-020	10/05-10/06/92	Rn-222	10/07/92	<0.04

 REPORTED VIA TELEPHONE

PAGE 1 OF 2 PAGE

TMA Eberline
Thermo Analytical Inc.

21 PAN AMERICAN FREEWAY, N.E.
ALBUQUERQUE, NEW MEXICO 87109
PHONE (505) 345-3461

APPROVED BY

Martin Day 10/16/92
OK/MSB/10-19-92

DATE

CUSTOMER
ATTENTION
ADDRESS
CITY
W.O. NO.

Bechtel National, Inc. - MISS Storage Pile
Michael Bradshaw
P.O. Box 350
Oak Ridge, TN. 37831-0350

D-12959



TYPE OF ANALYSIS

Radon Flux

CUSTOMER ORDER NUMBER

SAMPLES RECEIVED

10/16/92

Customer Identification	Date Collected	Type of Analysis	Date Analyzed	pCi/M ² /sec	
38-RF-021	10/05-10/06/92	Rn-222	10/08/92	<0.05	
38-RF-022	10/05-10/06/92	Rn-222	10/08/92	<0.05	
38-RF-023	10/05-10/06/92	Rn-222	10/08/92	<0.05	
38-RF-024	10/05-10/06/92	Rn-222	10/08/92	<0.05	
38-RF-025	10/05-10/06/92	Rn-222	10/08/92	<0.05	
38-RF-026	10/05-10/06/92	Rn-222	10/08/92	<0.05	
38-RF-027	10/05-10/06/92	Rn-222	10/08/92	<0.05	
38-RF-031	10/06-10/07/92	Rn-222	10/08/92	<0.10	
38-RF-010	10/05-10/06/92	Rn-222	10/07/92	<0.04	LQC
38-RF-020	10/05-10/06/92	Rn-222	10/07/92	<0.04	LQC
38-RF-027	10/05-10/06/92	Rn-222	10/08/92	<0.05	FQC

REPORTED VIA TELEPHONE

PAGE 2 OF 2 PAGE

MA Eberline
Thermo Analytical Inc.

PAN AMERICAN FREEWAY, N.E.
ALBUQUERQUE, NEW MEXICO 87109
PHONE (505) 345-3461

APPROVED BY

W. J. ... 10/16/92

DATE

OK MMB/10-19-92

APPENDIX C
THORON CONCENTRATIONS

Average Concentrations^{a,b} of Thoron at MISS, 1992

Page 1 of 2

Sampling Location ^c	Quarter				Avg
	1	2	3	4	
(Concentrations are in 10 ⁻⁹ μCi/ml)					
Onsite					
1	0.1	0.4	0.4	0	0.2
2	0.5	0.8	0.8	0	0.6
Fenceline					
3	0.2	0.3	0.5	0	0.3
4	0.4	0.6	1.0	0.1	0.5
5	4.6	4.4	3.6	3.5	4.0
6	0.8	1.5	0.7	0.4	0.9
7	0.2	0.5	0.3	0	0.3
8	0	0.3	0.2	0	0.1
9	0.9	0.8	0.7	0.4	0.7
10	0.9	1.7	1.1	0.8	1.1
11	0.6	1.5	1.0	0.2	0.8
12	1.2	0.7	1.9	0.3	0.8
20	0.9	2.8	0.6	0.1	1.1
21	0.9	1.9	2.2	0.9	1.5
22	4.7	10.7	11.2	4.3	7.7
23	2.0	3.0	3.7	1.9	2.7
24	2.3	2.5	4.8	1.2	2.7
25	1.8	2.1	2.2	1.4	1.9
Quality Control					
13 ^d	0	0.4	0.4	0	0.2
15 ^e	0.8	0.4	0.7	0.1	0.5
Background					
18 ^f	0	0	0	0	0
19 ^g	0	0	0	0	0
26 ^h	--	--	0	0	0

APPENDIX D
RADON CONCENTRATIONS

Average Concentrations^{a,b} of Radon at MISS, 1992

Page 1 of 2

Sampling Location ^c	Quarter				Avg
	1	2	3	4	
(Concentrations are in 10 ⁻⁹ μCi/ml)					
Onsite					
1	<0.4	<0.3	0.4	<0.3	<0.4
2	<0.4	<0.3	<0.3	<0.3	<0.3
Fenceline					
3	<0.4	<0.3	0.3	<0.3	<0.3
4	<0.4	<0.3	<0.3	<0.3	<0.3
5	<0.4	0.4	<0.3	<0.3	<0.4
6	<0.4	<0.3	0.6	<0.3	<0.4
7	<0.4	<0.3	0.3	<0.3	<0.3
8	<0.4	<0.3	<0.3	<0.3	<0.3
9	0.4	<0.3	0.3	<0.3	<0.3
10	<0.4	<0.3	0.4	<0.3	<0.4
11	<0.4	<0.3	0.5	<0.3	<0.4
12	<0.4	<0.3	0.4	<0.3	<0.4
20	<0.4	<0.3	0.4	0.5	<0.4
21	0.4	<0.3	<0.3	<0.3	<0.3
22	<0.4	0.9	0.6	<0.3	<0.6
23	<0.4	0.6	0.4	<0.3	<0.4
24	<0.4	0.5	0.4	<0.3	<0.4
25	0.5	<0.3	0.4	<0.3	<0.4
Quality Control					
13 ^d	<0.4	<0.3	0.4	<0.3	<0.4
15 ^e	<0.4	0.4	0.4	<0.3	<0.4
Background					
18 ^f	<0.4	<0.3	0.3	<0.3	<0.3
19 ^g	<0.4	<0.3	0.4	<0.3	<0.4
26 ^h	--	--	0.3	<0.3	<0.3

(continued)

^a $1 \times 10^{-9} \mu\text{Ci/ml}$ is equivalent to 0.037 Bq/L and 1 pCi/L. The DOE guideline is $3.0 \times 10^{-9} \mu\text{Ci/ml}$.

^bMeasured background has not been subtracted from the fence line and onsite readings.

^cSampling locations are shown in Figures 3-1 and 3-2.

^dQuality control for station 1.

^eQuality control for station 2.

^fLocated at the Rochelle Park Fire Station, approximately 0.8 km (0.5 mi) northwest of MISS.

^gLocated at the Rochelle Park Post Office, approximately 0.8 km (0.5 mi) northwest of MISS.

^hLocated at 100 Fair St., Paterson, N.J., approximately 8 km (0.5 mi) northwest of MISS; established on June 30, 1992.