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### 1989 ENVIRONMENTAL MONITORING REPORT TONOPAH TEST RANGE TONOPAH, NEVADA

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### **ABSTRACT**

This report summarizes the environmental surveillance activities conducted by Environmental Frotection Agency (EPA) and Reynolds Electrical and Engineering Company (REECo) for the Tonopah Test Range (TTR) operated by Sandia National Laboratories (SNL). Other environmental compliance programs such as National Environmental Policy Act of 1969 (NEPA), environmental permits, environmental restoration, and waste management programs are also included. The maximum offsite dose impact from 1989 operations was  $8.7 \times 10^{-4}$  mrem as a result of an unusual occurrance. The population received a collective dose of  $1.2 \times 10^{-5}$  person-rem from this incidence, while the same population received 4.94 person-rem from natural background radiation. The 1989 SNL, TTR operations had no adverse impact on the general public or the environment. This report is prepared for the U.S. Department of Energy (DOE) in compliance with DOE Order 5400-1.

### **ACKNOWLEDGMENT**

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# **ABBREVIATIONS**

### Acronyms

ADM	Action Description Memorandum
AEC	U.S. Atomic Energy Commission
AL	Albuquerque Operations Office (DOE)
ALI	Annual Limit of Intake
ASN	Air Surveillance Network
BLM	U.S. Bureau of Land Management
BOD	Biochemical oxygen demand
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response Compensation and
	Liability Act
CG	Concentration Guide
CEQ	Council on Environmental Quality
CWA	Clean Water Act
DAC	Derived Air Concentration
DCG	DOE-derived concentration guides
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DRCF	Dose Rate Conversion Factor
DRI	Desert Research Institute
EA	Environmental Assessment
EIS	Environment impact statement
EG&G	Edgerton, Germeshausen, & Grier Corp.
EPA	U.S. Environmental Frotection Agency
ER	Environmental Restoration (Program)
FIDLER	Field Instrument for the Detection of Low Energy Radiation
HE	High explosive
ICRP	International Commission on Radiation Protection
LLNL	Lawrence Livermore National Laboratory
LTHMP	Long-Term Hydrologic Monitoring Program (EPA)
MDA	Minimum Detectable Activity
MDC	Minimum Detectable Concentrations
MDL	Minimum Detectable Level
NBS	National Bureau of Standards
NEPA	National Environmental Policy Act of 1969
NESHAP	National Emission Standards for Hazardous Air Pollutants
NGTSN	Noble Gas and Tritium Surveillance Network
NTS	Nevada Test Site
NV	Nevada
NVO	Nevada Operations Office
PA	Preliminary assessment
PCB	Polychlorinated biphenyl
PIC	Pressurized Ion Chamber
RCG	Radiation Concentration Guide
RCRA	Resource Conservation and Recovery Act
REECo	· · · · · · · · · · · · · · · · · · ·
SD	Reynolds Electrical and Engineering Company Standard Deviation
SARA	
SAKA SE	Superfund Amendment and Reauthorization Act Standard Error
SNL	Sandia National Laboratories

# ABBREVIATIONS (Concluded)

### Acronyms

SPCC	Spill Prevention Control and Countermeasure
TLD	Thermoluminescent Dosimeter
TSCA	Toxic Substances Control Act
TSS	Total suspended solids
TTR	Tonopah Test Range
USPCI	United States Pollution Control Incorporated
UST	Underground Storage Tank

### System International Prefixes

Exponent	Prefix	Symbol	Exponent	Prefix	Symbol
10 <sup>6</sup> 10 <sup>3</sup> 10 <sup>-3</sup> 10 <sup>-6</sup>	mega kilo milli micro	M k m	10-9 10-12 10-15 10-18	nano pico femto atto	n p f a

Units	<u>Symbols</u>

g	gram	σ	statistical variance
ha	10,000 square meters	s	standard deviation
°C	Celsius degree	x	mean value
m	meter	sx	standard error of the mean
% moisture	weight percent of water	>	greater than
L ml h	liter milliliter hour	β α	less than Beta particle Alpha particle
mi cpm ppm m3	mile counts per minute parts per million cubic meter	P HTO	Statistical probability Tritiated water

### Radioactivity Measurements

$\mu$ R	microroentgen (exposure)
mrem	millirem (unit of radiation dose)
person-rem	Radiation dose to population
mGy	milligray (unit of radiation dose = 100 mrem)
Ci	Curie (unit of radioactivity)
Bq	Becquerel (unit of radioactivity = 37 nCi)
μR/h	microroentgen per hour (exposure rate)

# CHAPTER 1 EXECUTIVE SUMMARY

### 1.1 Assessment of Environmental Compliance Activities

### Regulations and Permits

Sandia National Laboratories at Tonopah Test Range (SNL, TTR) must operate in compliance with environmental and other requirements established by Federal and State Statutes and regulations, Executive Orders, and U.S. Department of Energy (DOE) Orders. The following paragraphs summarize the compliance status of the SNL, TTR with major environmental statutes.

Comprehensive Environmental Response Compensation and Liability Act (CERCLA), Superfund Amendment and Reauthorization Act (SARA)—As required under Comprehensive Environmental Response Compensation and Liability Act (CERCLA)/Superfund Amendment and Reauthorization Act (SARA) Section 120(d) a Preliminary Assessment (PA) must be submitted for all facilities listed on the Federal Agency Hazardous Waste Compliance docket. Fifteen sites separated into three tasks were identified for future investigations. One site was evaluated in 1989. The sludge in the septic tank of this site will be disposed of as hazardous waste. No release to the environment from this source was identified.

Clean Air Act (CAA)--SNL, TTR, is regulated by Clean Air Act (CAA) and the Nevada Air Quality Regulations published in Nevada Revised Statutes, Title 40 - Public Health and Safety, Chapter 445. The SNL, TTR currently holds six air quality permits for fuel storage, two permits for dust control, four permits for construction, one permit for open burning (fire training) and one permit for an incinerator. All of these permits were issued by the State of Nevada. Sandia National Laboratories, Albuquerque (SNL, Albuquerque), assessed the potential offsite dose impacts from a 1989 test activity that involved a small release of depleted uranium. The dose impact from this incidence was calculated according to AIRDOS-EPA as required by National Emission Standards for Hazardous Air Pollutants (NESHAP).

<u>Clean Water Act (CWA)</u>--SNL, TTR, is regulated by Clean Water Act (CWA) and the Nevada Water Pollution, Public Water Supply and Public Water System, and Sewage Systems regulations. Drinking water for the SNL, TTR is provided by a well, operated under a permit issued by the State of Nevada in compliance with the Public Water Supply standards. All sewage is currently routed to septic systems. The septic systems are registered with the State of Nevada.

Resource Conservation and Recovery Act (RCRA)--The SNL, TTR, is a less-than-90-day storage generator of hazardous waste. Hazardous chemical wastes are collected, packaged, and shipped offsite to an Environmental Protection Agency (EPA)-permitted disposal facility. Programs are being

brought into compliance with Resource Conservation and Recovery Act (RCRA) regulations governing less-than-90-day storage generators. Six underground storage tanks and septic tanks are registered with the State of Nevada.

### Current Issues and Actions for the SNL, TTR

<u>Septic Tanks/Sewage Line</u>--All septic tanks have permits as required by the State of Nevada. A sewer line is being constructed to connect from the Station 3 to the Air Force's facultative lagoon. This sewer line will replace all septic systems serving Station 3. A new monitoring station with a flow-proportional sampler will be installed to monitor the wastewater continuously for flow and pH.

<u>Underground Storage Tanks (USTs)</u>--Tightness testing was performed on the six Underground Storage Tanks (USTs) registered with the State of Nevada. Investigations are in progress on three of the tanks, since the results were inconclusive. A draft Tank Management Plan was prepared in 1989. The final plan is expected to complete in early 1990.

<u>SNL</u>, <u>TTR Water System</u>--The Nevada State Consumer Health Division has approved the SNL, TTR water system upgrade, which will upgrade well EH-7 and increase its capacity.

### 1.2 Assessment of Radiological Impact on the Public

There is no routine radioactive emission from the SNL, TTR. However, based on the types of test activities such as air drops, gun firings, ground-launched rockets, air-launched rockets, and other explosive tests, there are some possibilities that small amounts of depleted uranium (as part of weapon components) may be released to the air or to the ground due to unusual circumstances (failures) during testing.

During 1989, there was a small release of depleted uranium (approximately 5 oz.) as a result of test failure. The instance is described in detail under Section 3.4, "Release Reporting," and Section 5.4, "Potential Dose Assessment for the Public," of this report. The maximum offsite dose impacts due to this incident were  $8.7 \times 10^{-4}$  mrem/yr in whole-body dose and  $3.6 \times 10^{-3}$  mrem/yr to the lungs. The dose impacts are less than 0.004 percent of the 25 mrem/yr whole-body dose limit and less than 0.005 percent of the 75 mrem/yr of critical organ dose limit specified in NESHAP standards for radionuclide emissions (40 CFR 61. Subpart H).

### 1.3 Overview of 1989 Monitoring Results

<u>EPA Air Surveillance Network (ASN)</u>--The only gamma-emitting radionuclide detected on the prefilters from all four stations listed (Chapter 5) was Be-7, a naturally-occurring spallation product formed by the interaction of cosmic radiation with atmospheric oxygen and nitrogen. The weighted average results were consistent with the area background concentrations.

EPA Noble Gas and Tritium Surveillance Network (NGTSN)--The EPA Noble Gas and Tritium Surveillance Network (NGTSN) analyze air samples for Kr-85, Xe-133, H-3 (as HTO and HT). The 1989 monitoring results for Xe-133 and H-3 are typically below detectable levels, as expected, but the actual analysis results are reported. The results for Kr-85 exceed the minimum detectable concentration, due to enhanced background levels resulting from world-wide use of nuclear power. The 1989 results for the two stations listed (Chapter 5) were consistent with the results of 1988 monitoring.

EPA Thermoluminescent Dosimetry Network (TLD) and Pressurized Ion Chamber (PIC)--Normal results were reported for four Thermoluminescent Dosimetry (T.D) stations (Chapter 5) and two Pressurized Ion Chamber (PIC) stations (Chapter 5), except that third quarter TLD for SNL, TTR had an exposure period of five months. The results show an average increment of 1.1 mrem/month above background. This may be attributed to normal fluctuation of background radiation and the uncertainty associated with the TLD processing. No special incident was reported for that period of time.

EPA Long-Term Hydrological Monitoring Program (LTHMP)--Analytical results for H-3 in well water were reported for three well stations (well 6, SNL, TTR; City well, Tonopah; and well 28, Las Vegas) in Chapter 5. The sampling was conducted quarterly, and all results were well below DOE-derived concentration guides (DCGs).

Reynolds Electrical and Engineering Company (REECo) Drinking Water Sampling Program—Analytical results were reported for four wells near the SNL, TTR for H-3, gross  $\alpha$ ,  $\beta$ , gamma scan, Sr-90 and Pu-239. All results were within EPA's primary drinking water standards (Chapter 5).

### **CHAPTER 2**

### INTRODUCTION

# 2.1 <u>Sandia National Laboratories, Tonopah Test Range (SNL, TTR) History and Operations</u>

The SNL, TTR is operated by the SNL, Albuquerque, for the DOE, nuclear ordinance programs. The SNL, TTR dates from 1957, when it came into limited use after similar facilities at Salton Sea Test Base, California, and at Yucca Flat on the Nevada Test Site (NTS) became inadequate. It had been a bombing range during World War II.

The SNL, TTR was originally designed and equipped to gather raw data on aircraft-delivered inert test vehicles coming under Atomic Energy Commission (AEC) cognizance. Over the years, the facilities and capabilities at the SNL, TTR have been expanded to accommodate tests related to the AEC (later, the DOE) weapons development program, varying from simple tests of hardware components or systems needing only limited support, to rocket launches or air drops of test vehicles requiring full range support.

The test activities at the SNL, TTR can be divided into seven categories: (1) Air Drops, (2) Gun Firings, (3) Ground-Launched Rockets, (4) Air-Launched Rockets, (5) Explosive Effects, (6) Static Rocket Tests, and (7) Earth Penetrator Tests. Most of these activities require a remote range for safety and security reasons. During 1989, there were a total of 225 tests conducted at the SNL, TTR, including 51 airdrop tests, 142 gun tests, 30 rocket tests, and two fly-around tests.

### 2.2 Location and Population

The SNL, TTR is located about 140 mi (225 km) northwest of Las Vegas, Nevada (Figures 2-1 and 2-2). The SNL, TTR covers 624 sq mi (1,616 km²) within the boundaries of the Nellis Air Force Base Range Complex. It is bordered on three sides by the Range Complex and on the north, by sparsely populated public land administered by the Bureau of Land Management (BLM) and the U.S. Forest Service. The nearest population center is Goldfield, population 400 (Millard, 1984), which is about 25 mi (40 km) west of the SNL, TTR. The next closest populated area is Tonopah with a population of 4,500 (U.S. Bureau of the Census, 1983). It is located 30 mi (48 km) northwest of the SNL, TTR.

### 2.3 Geology and Climatology

The SNL, TTR is situated in a high desert and consists of broad valleys surrounded by north-south trending mountain ranges. It is in the western part of the Basin-and-Range geophysical province. The SNL, TTR lies east of a zone of transcurrent faulting and shear, termed the Walker Lane, to the northwest and the Las Vegas Valley shear zone to the southeast (Sinnock, 1982). Cactus Flat, which constitutes the basic working area of

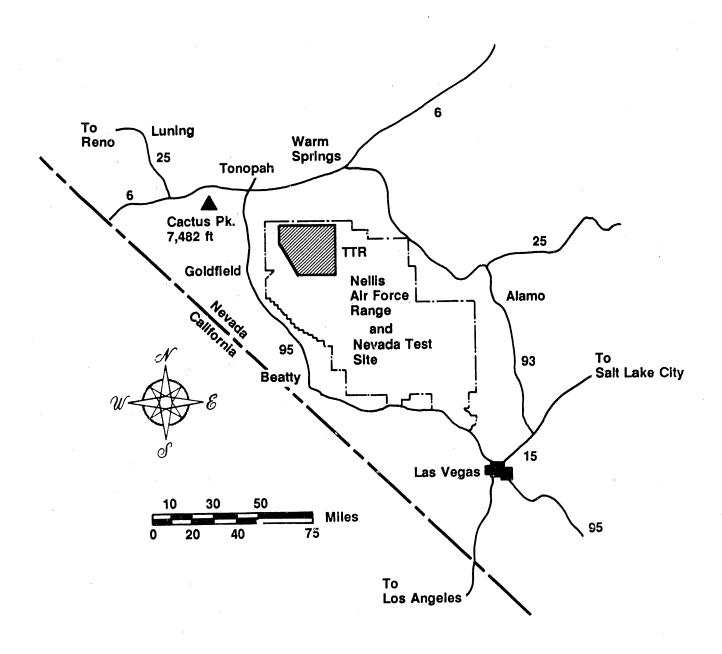
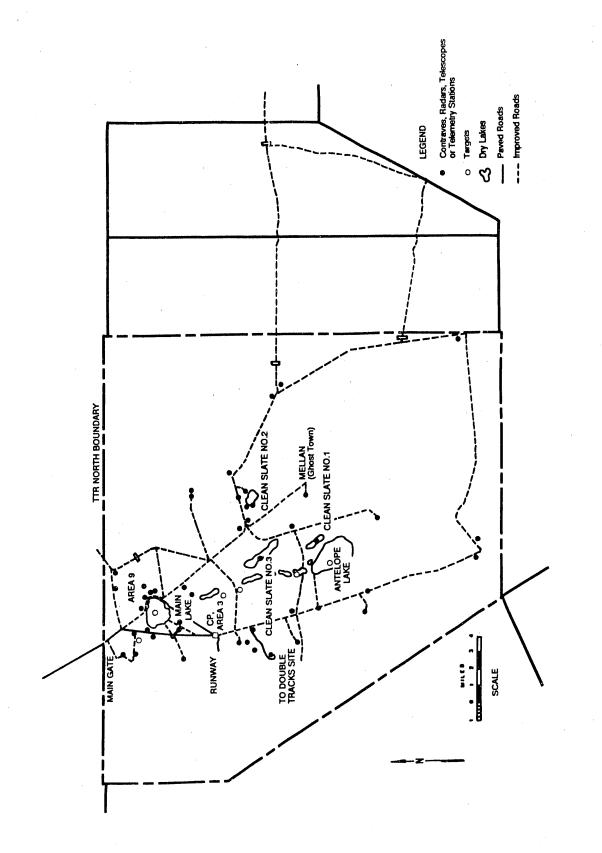


Figure 2-1. Map of Nevada, Showing Locations of Tonopah Test Range



Sandia National Laboratories Facilities at the Tonopah Test Range Figure 2-2.

the SNL, TTR, is surrounded by the Cactus Range. The Cactus Range is a northwest-trending raised structural block, one of five at least that lie along the Las Vegas Valley-Walker Land lineaments (ERDA, 1975).

All the working areas of the SNL, TTR lie in approximately 400 sq mi. The streams in and near the SNL, TTR are intermittent and end in closed basins. There are three springs within the SNL, TTR: Cactus, Antelope, and Silverbow Springs. Water from these springs does not travel far; it disappears rapidly through evaporation and infiltration, and its effect on the landscape is purely local. Water used in the SNL, TTR facilities comes from wells tapping the underlying groundwater in alluvium, derived from the surrounding mountains. Depth to water varies from 90 to 150 ft (ERDA, 1975).

The climate is mild and usually dry, but as is typical of high deserts, it is subject to large diurnal and seasonal changes in temperature from a record high of 102°F (38.9°C) to a record low of -24°F (-31.1°C) (Schaeffer, 1982). Clear, sunny days with light to moderate winds are usual. Average rainfall is approximately 5 in. (12.7 cm)/yr in the valley with most of the precipitation occurring in August (ERDA, 1975; Schaeffer, 1982). Winds are mostly from the west-northwest and from the south-southeast. Dust storms are common in the spring and dust devils, in summer.

Due to the temperature extremes and arid conditions at the SNL, TTR, the valley in which most of the SNL, TTR activities occur is sparsely covered with range grasses and low shrubs (ERDA, 1975; EG&G, 1979b). Joshua trees are found in the foothills, and juniper trees are found in the foothills and mountains. Hundreds of wild horses are grazing freely throughout the Range. Their exposure to Range activities has apparently had little effect on their population and grazing habits.

### 2.4 Project Roller Coaster Tests

### Historical Information

Project Roller Coaster included a series of plutonium dispersal tests at SNL, TTR and the Nellis Gunnery Range. The tests were executed May to June 1963. All four test areas are now fenced to prevent access. These are the most significant sites of radiological contamination at the SNL, TTR. Detailed information related these contaminated sites are summarized in Table 2-1.

### Environmental Monitoring at Roller Coaster Areas

The Clean Slate and Double Track areas have been studied by the Nevada Applied Ecology Group (NAEG). In 1973, a Field Instrument for the Detection of Low Energy Radiation (FIDLER) survey was conducted inside the fenced areas using a 61-m grid. The area was then refenced, using a 1,000-cpm detection level to place fences. An aerial radiologic survey was done by EG&G for the Nevada Applied Ecology Group in 1977 using the 1973 grid. Radiation isopleths showing soil activity due to Am-241 (Pu-241 daughter),

Test	Clean Slate 1	Clean Slate 2	Clean Slate 3	Double Track
Date	May 25, 1963	May 31, 1963	June 9, 1963	May 15, 1963
Location	TTR	TTR	TTR	Nellis
Plutonium Inventory (Ci)	5.2 ± 1.6	29 ± 6.2	30 ± 4.9	5.0 ± 1.4
Contaminated Area (Lm <sup>2</sup> )	0.22	0.81	1.38	0.30
Inner Fence (km)	0.15	0.73	1.22	0.15
Outer Fence (km)	2.88	2.68	8.44	2.26

<sup>\*</sup>Data from report provided by REECo Environmental Sciences Department/NTS, October 31, 1986.

Pu-239, and Pu-240 were drawn for each area and results were published (EG&G, 1979a). Annual FIDLER monitoring was performed and soil samples were collected in the 1970s. This was discontinued since migration of plutonium was not detected. Currently there is no soil sampling or surveying performed at the test areas. Twice yearly the test areas are visually examined to perform fence repairs. Animals which may have wandered inside the area are promptly removed.

The Double Track area has never been disturbed. As a result, most of the activity in the Double Track area is estimated to be within the top 2.54 cm of soil. The Clean Slate areas were bladed to cover hot spots. No other stabilization has been performed. Because the blading covered the surface contamination, 90 percent of the activity at the Clean Slate areas is expected to be within the top 7.62 cm of soil. An estimated 4.53 x  $10^5~\text{m}^3$  of soil are contaminated.

The EPA has also performed soil sampling at the SNL, TTR for special projects (Bliss, 1980). Soil sampling (gamma spectrum analysis and Pu-239) of surface soils has been done intermittently at the Clean Slate areas. A survey was done in 1972. Surface soil sampling was performed at the Clean Slate areas in 1978. (Double Track was not included.)

### **CHAPTER 3**

### SUMMARY OF SIGNIFICANT ENVIRONMENTAL ACTIVITIES

### 3.1 National Environmental Policy Act of 1969 (NEPA) Compliance

The National Environmental Policy Act of 1969 (NEPA), the most comprehensive Federal legislative and public policy statement or environmental protection, applies to all agencies of the Federal government. Executive and DOE orders apply NEPA and NEPA-related activities to SNL, Albuquerque.

The Council on Environmental Quality (CEQ) was created in the Executive Office of the President under the authority of NEPA. CEQ regulations were formally adopted by the DOE in August of 1979.

Environmental documents serve as articles for presentation and review of the environmental issues associated with projects. Division 3223 of the Environmental Programs Department consults and trains line organizations in NEPA, coordinates NEPA document preparation, maintains a corporate NEPA document file, and reviews all NEPA documents before their submittal to the DOE.

### 1989 Activities

In late 1989, a staff member was assigned full-time to NEPA coordination for SNL, Albuquerque, who also resumed overall responsibility for NEPA compliance at the SNL, TTR.

At the DOE's request, a standard operating procedure was written in November, 1989, for the preparation of Action Description Memorandums (ADMs) and permitting procedures for burn tests. The documents suggested steps expected to streamline the process for approving ADMs and open burning permits.

Consistent with a Department of Energy, Albuquerque Office (DOE/AL) memorandum of April 17, 1989, archaeological surveys for all construction projects were prepared through Facilities Engineering. The survey reports have been integrated into our documentation.

In 1989, SNL, Albuquerque increased employee awareness of NEPA responsibilities. Our training initiative culminated in a day-long workshop held on 11/30/89, titled "Compliance With the National Environmental Policy Act."

### Environmental Assessments (EAs)

The primary role of the Environmental Assessments (EA) is to determine the significance of the proposed action on the human environment.

An EA is a "concise public document" that is intended to briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement (EIS) or a Finding of No Significant Impact (FONSI). A number of facilities at SNL, Albuquerque, are currently preparing EAs, which are designed to (1) reduce the number of ADMs needed and (2) facilitate the application of appropriate categorical exclusions.

The existing EA (prepared in 1975) for the SNL, TTR still accurately describes the current activities at the SNL, TTR. There is no EA being prepared for the SNL, TTR.

### Action Description Memoranda (ADMs)

ADMs are used by the DOE to determine the appropriate level of NEPA documentation for proposed actions and to support memo-to-file reviews.

The number of ADMs written in 1989 for the SNL, TTR was three. Their approval status is indicated in Table 3-1.

Table 3-1	1989	SNL,	TTR	ADMs	and	Approval	Status
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Title	Memo to DOE	DOE Approval Letter
SNL,TTR Powder Assembly Facility	03/27/89	05/15/89
The W82/XM 785 Projectiles at SNL, TTR	10/5/89	12/06/89
Vehicle Service Facility at SNL, TTR	09/25/89	

### 3.2 Environmental Permits

The SNL, TTR, as part of the DOE complex, is committed to full compliance with all applicable environmental laws and regulations and to protection of the environment. The SNL, TTR is regulated by Federal laws and State of Nevada regulations for the applicable activities. See Table B-1 in Appendix B for the state regulations and the corresponding activities.

The permit application and registration of SNI, TTR activities are administered by the Environmental Compliance Division of Reynolds Electrical and Engineering Company (REECo). There are a total of 14 air permits, four water system permits, one sewage system permit, one hazardous waste permit, and one miscellaneous permit. Detailed permit listings with

expiration dates, issuance agencies, and responsible parties are included in Table B-2 of Appendix B. The SNL, TTR was in full compliance with all permit requirements for CY89.

### 3.3 Overview of Environmental Monitoring Programs

SNL, Albuquerque, compiles environmental monitoring information collected and reported by other agencies at the SNL, TTR.

The SNL, TTR landowner is the BLM. The DOE maintains a use permit with BLM which is renewed every 5 yr. BLM approves new construction such as roads. Other agencies operate under memorandums of understanding with the DOE. SNL, Albuquerque, has oversight responsibility for environmental monitoring and health physics activities at the SNL, TTR, although most of these activities are actually performed by other contractors under agreements with SNL, Albuquerque, and the DOE.

These other agencies include the following:

### U.S. Environmental Protection Agency (EPA)

The EPA Environmental Monitoring Systems Laboratory in Las Vegas, under an interagency agreement with the DOE, monitors background radiation at the SNL, TTR as part of its Offsite Radiation Monitoring Program and reports to the Department of Energy, Nevada Operations Office (DOE/NVO) on a quarterly and annual basis. The EPA forwards current year data to SNL, Albuquerque for inclusion in the annual SNL, TTR environmental monitoring report, published by SNL, Albuquerque. The monitoring data for 1989 is listed in Section 5.1 of this report.

### Desert Research Institute (DRI)

The Desert Research Institute (DRI), part of the Water Resources Center of the University of Nevada at Las Vegas, Nevada, is under contract with the DOE to provide a number of services which include public information activities and radiation monitoring support.

The DRI provides and trains the Station Managers who run the EPA Community Monitoring Stations at remote locations such as Tonopah and Goldfield. These managers are generally local science teachers. EPA laboratory in Las Vegas provides the equipment and performs the analysis and reporting. The DRI also provides external quality assurance (QA) on the field measurements taken by the EPA at the Selected locations are monitored by Community Monitoring Stations. the DRI with a portable monitoring station (PMS) and TLDs concurrently, with EPA monitors to compare results. The analysis for the PMS is done by REECo. The QA results which summarize EPA and DRI data at the selected locations are reported annually by DRI. DRI also does other monitoring, primarily hydrology, for the DOE as requested. This may include evaluating environmental impacts due to road construction. The 1989 monitoring conducted by DRI is included in Section 5.1 of the EPA Monitoring Program.

### **REECo**

REECo (NTS), as part of their SNL, TTR support activities, also performs environmental monitoring activities at the SNL, TTR. These activities include water monitoring and obtaining permits in compliance with EPA and State of Nevada regulations.

The radiological analysis results for SNL, TTR wells were published by REECo in the annual NTS environmental monitoring report until 1984. Starting in 1986, data for the SNL, TTR well 6 in the Control Point area (as well as information on other SNL, TTR wells) and relevant permit information have been forwarded to SNL, Albuquerque, so that these data can be reported in the annual SNL, TTR environmental monitoring report published by SNL, Albuquerque. The summary of the 1988 and 1989 results are listed in Section 5.2.

REECo has also been involved in special studies at the SNL, TTR such as soil monitoring for plutonium at the Clean Slate areas (Roller Coaster Project) in the late 1970's.

REECo performs the Hazardous Waste Manifesting for offsite disposal of hazardous wastes at EPA-approved facilities. Radioactive waste is handled by SNL, Albuquerque, and is sent to the NTS for final disposal.

### Edgerton, Germeshausen, & Grier Corp. (EG&G) Energy Measurements Group

The Edgerton, Germeshausen, & Grier Corp. (EG&G) Energy Measurements Group, under contract to the Applied Ecology Group, did an aerial radiological survey of the SNL, TTR Clean Slate Areas in 1977. A report was published in 1979 (EG&G, 1979a).

EG&G also published a report in 1979 on the status of endangered plant species at the SNL, TTR (EG&G, 1979b).

Other agencies also prepare reports which may include information on the SNL, TTR. These reports have been described in Volumes 1 through 4 of the SNL, TTR Environmental Compliance Manuals. They are available from the respective agencies. Reports which are prepared on a regular basis include the following:

- REECo: Annual Permits/Registration Certificates for SNL, TTR,
- EPA, Dose Assessment Branch, Nuclear Radiation Assessment Division: <u>Interim Offsite Monitoring Report-Nevada Test Site and Other Test</u> <u>Areas, Quarterly Report</u>,
- EPA, Dose Assessment Branch, Nuclear Radiation Assessment Division:

  Offsite Environmental Monitoring Report: Radiation Monitoring

  Around United States Nuclear Test Areas, Calendar Year Report, and

• DRI, University of Nevada System: <u>Community Radiation Monitoring Program, Annual Report</u>.

### 3.4 1989 Release Reporting

On Friday, February 3, 1989, a W79 8-in. artillery round, Type 6D, Serial D-138, which had been damaged when a recovery parachute failed to deploy during the test, was deliberately detonated at the SNL, TTR. The artillery round was destroyed in an earth-filled pit at the test impact location after X-ray examination revealed serious damage to the internal high explosive (HE) structure. Range safety personnel and Lawrence Livermore National Laboratory (LLNL) Test Engineers concurred that the test unit could be potentially dangerous to transport from the impact site. The unit was detonated to destroy the HE components. A classified amount of depleted uranium (D38) and beryllium exceeding the EPA reportable quantities (0.1 Ci for 238U and 1 lb for beryllium) was dispersed onto the soil surface by the destruction blast. The D38 was in the form of small chunks which had sufficient energy to penetrate 20 ft of soil covering the pit. Most of D38 pieces in the form of small chunks found on the ground were recovered following the detonation. Six surface samples of the contaminated soil plus two background samples were collected and analyzed by the Industrial Hygiene/Toxicology Division of SNL, Albuquerque (Section 5.3).

The release reporting was made to National Response Center and a "Memorandum to Record" was filed by Division 7173 on February 7, 1989. The total amount of D38 release to the soil described above is classified. The most conservative estimation of airborne D38 release in this incident is 5 oz. The potential dose assessment for this incidence is described in Section 5.4. The experience and data obtained from this incidence will assist in the design of future similar detonation practices, if necessary.

### **CHAPTER 4**

### OTHER ENVIRONMENTAL COMPLIANCE PROGRAMS

### 4.1 Spill Control

A draft Spill Prevention Control and Countermeasure (SPCC) Plan for SNL, TTR was developed in December 1989. This plan was prepared in accordance with 40 CFR 112. No SPCC Plan has been prepared or implemented for this site prior to this effort. The schedule for the implementation of the plan recommendations is to have all improvements in place one year after the effective date of the plan. Spill control activities for 1989 include the purchase and distribution of spill control pallets.

### 4.2 Underground Storage Tanks (USTs)

USTs at SNL, TTR, Tonopah, Nevada, are managed in accordance with the State of Nevada, Division of Environmental Protection which adopted the Federal regulations in Fall 1989.

Tightness testing was performed in 1989 on the six USTs registered with the State of Nevada. Of these, three tanks tested inconclusive. Investigations are in progress on these tanks.

There were no UST removals in 1989. The registered USTs are listed in Table 4-1.

A Tank Management Plan was being developed in 1989. At the end of 1989, the plan was in draft form with an expected completion date in early 1990. The plan includes UST database inventory, an upgrade/prioritization schedule, and procedures for inventory control, leak detection, removal, and installation.

Table 4-1. 1989 USTs Survey

Tank I.D.	Capacity	Contents	Year Installed
0353-1	4,000	Diesel	1968
0359-1	10,000	Unleaded Gasoline	1983
0359-2	10,000	Unleaded Gasoline	1983
0359-3	10,000	Diesel	1983
0359-4	10,000	Diesel	1983
0958-1	1,000	Diesel	1966

### 4.3 <u>Waste Management Programs</u>

### Chemical and Hazardous Waste Management

Chemical wastes generated by SNL, TTR activities during CY89 were managed by REECo, the SNL, TTR facilities support contractor. During 1989, 1,700 gal and 400 lb of RCRA-regulated waste generated at the SNL, TTR, were disposed of at United States Pollution Control Incorporated (USPCI) facilities in Clive, Utah (EPA No. UTD980635890).

An additional 5208 1b of parts cleaning solvents and corrosives were managed through Safety Kleen Inc. facilities in N. Las Vegas, Nevada (EPA No. NVT330010208). These cleaning solvents and corrosives constitute a waste minimization initiative by SNL, because the solvents and corrosives are cleaned and recycled for reuse by the SNL, TTR, and other industries involved in parts and equipment cleaning activity.

In Toxic Substances Control Act (TSCA)-regulated activities, 40 gal of polychlorinated biphenyl (PCB)-containing transformer cooling oil and the associated drained transformer were treated and disposed of at PPM/USPCI Inc. at its treatment and disposal facilities in Clive, Utah.

The SNL, TTR operations also generated 2,760 gal of nonregulated, combustible liquids, primarily waste oils, which were disposed of at USPCI facilities near Clive, Utah.

### 4.4 Environmental Restoration (ER) Program

The Environmental Restoration (ER) Program is a phased DOE program to identify, assess, and correct past spill, release, or disposal sites at all DOE/AL facilities including SNL, TTR. The methodology parallels the EPA CERCLA program to identify, characterize, and cleanup inactive release sites.

As required under CERCLA/SARA Section 120(d) a PA which identifies all potential release sites was submitted on April 14, 1988. Fifteen sites separated into three tasks (Table 4-2) were identified for future investigations.

Site 122 was evaluated in 1989. The sludge in the septic tank of this site will be disposed of as hazardous waste. No release to the environment from this source was identified (SNL, Albuquerque, 1990). Other analytical results are being received and compiled currently and will be presented in the future Environmental Monitoring Report.

Table 4-2. ER Program Sites at SNL, TTR

ER Program Task	ER Program Site No.	Site Name
AL-SA-15	118.	Area 3 Underground Diesel Tank
(SNL, TTR	119.	Area 3 Landfills
Area 3)	120.	Fire Training Area
,	121.	Waste Oil Sumps, Bldg 360
	122.	Area 3 Septic Tanks and Leach Fields
	123.	Photo Shop French Drains
	134.	Heavy Duty Shop Floor Drains
AL-SA-16	124.	High Explosive Disposal Area
(SNL, TTR	125.	Area 9 Landfill
Area 9)	126.	Mobile Photographic Lab
AL-SA-17	127.	Non-Violent Explosive Destruct System (NEDS) Site
(SNL, TTR	128.	Antelope Lake
Test Areas)	129.	Cactus Springs
·	130.	Roller Coaster Radioactive Decontamination Area roller Coaster
	131.	Sanitary Sewage System and Lagoons

### CHAPTER 5

# 1989 ENVIRONMENTAL MONITORING AT TONOPAH TEST RANGE

### 5.1 1989 EPA Monitoring at Sandia National Laboratories, Tonopah Test Range (SNL, TTR)

### Background

The EPA does the most extensive routine monitoring at the SNL, TTR. This includes TLDs which measure gamma radiation, air monitoring for noble gases, tritium and other radionuclides, and water monitoring for radionuclides primarily. A detailed description of the EPA monitoring procedures, equipment, QA, and detection limits can be found in the annual Offsite Environmental Monitoring Report published by the EPA (Grossman et al., 1986).

Routine sample results are reported on a quarterly basis to DOE/NVO. Copies of these data have been provided to SNL, Albuquerque, 3223, and are summarized in Tables 5-1 through 5-5.

### Location

The EPA has a monitoring station located at the SNL, TTR Control Point (Station 3) adjacent to the medical aid station. Water samples are collected at the SNL, TTR well 6. These are the only two onsite monitoring stations at the SNL, TTR.

For comparative purposes, results of air, water, and dosimetry analyses are also reported for Goldfield, Nevada, which is the closest populated area; Tonopah, Nevada, which is the next nearest populated area; and Las Vegas, Nevada, (water only). Goldfield is 25 mi (40 km) west of the SNL, TTR. Tonopah is 30 mi (48 km) northwest of the SNL, TTR. Las Vegas is 140 mi (225 km) southeast of the SNL, TTR.

### Soil Sampling

Soil sampling is not performed on a routine basis by the EPA at the SNL, TTR. Soil sampling and radiation surveys have been performed in the past (Bliss, 1980). During 1989, a set of special soil samples were collected for the W-79 detonation site (Section 5.2).

### External Radiation

External radiation measurements are done primarily with TLDs. TLDs are exchanged quarterly. A Harshaw TLD-200 (CaF<sub>2</sub>) system consisting of three cards, each with two TLDs, was used to monitor external radiation exposure through 1986. In 1986, a Panasonic TLD system (consisting of four CaSO<sub>4</sub> TLDs per card) was placed in the field concurrent with the Harshaw system

Table 5-1. Summary of 1989 EPA Dosimetry Network Exposures (EPA, 1989a)

Sample Location	1989 Quarter	Gross Exposure (mR)	Associated Environmental Background (mR)	Net Exposure Increment (mR)
Tonopah Test Range	1	23.4	22.1	1.3
	2	17.8	21.1	0.0
•	Δ 3	41.9	36.2	5.7
	4	24.5	<b>§</b>	
Tonopah, NV	1	25.0	25.9	0.0
• •	2	18.9	21.2	0.0
	3	20.0	23.7	0.0
	.4	22.0	§	
Clark Station, NV*	1	18.8	27.1	0.0
,	2	21.8	25.8	0.0
	3	23.6	22.0	1.6
	4	20.7	§	
Goldfield, NV	1 .	19.1	20.1	0.0
	+ 2	2.7	7.7	0.0
	3	16.4	17.2	0.0
	4	20.3	§	

<sup>\*</sup>Clark Station is located immediately north of SNL, TTR.

with the intention of obtaining comparative values prior to the discontinuance of the Harshaw system in January 1987. All 1989 average exposure values are from Panasonic dosimeters. Table 5-1 summarizes TLD data for SNL, TTR and nearby areas. Environmental background is determined by an average of the previous four quarters. Harshaw CaF2 TLDs were used in the fourth quarter for environmental background measurements. The net exposure increment from the SNL, TTR, 1.3 mR to 5.7 mR (Table 5-1), is within the fluctuations of the natural background radiation in the area. Therefore, no net exposure is resulting from SNL, TTR operations.

<sup>+</sup>The station was vandalized, the second quarter TLD was lost. The Gross Exposure numbers quoted here were for the period of 3/31/89 to 5/8/89 (38 days) only.

 $<sup>\</sup>Delta$ The Gross Exposure corresponds to time period of five months or 148 days.

<sup>§</sup>No associated background values reported for the 4th quarter.

Reuter Stokes PICs are located at the Goldfield Nevada, and Tonopah, Nevada, community monitoring stations. Quarterly summary data are provided for Goldfield and Tonopah in Table 5-2.

Table 5-2. Summary of 1989 B	EPA.	PIC	Data
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Location	1989 Quarter	Average Exposure Rate (EPA, 1988) $\mu \text{rem/hr} \pm 1\sigma$	mrem/QTR
Goldfield, NV	1	15.2 ± 0.3	34.8
	2	$15.2 \pm 0.2$	34.8
	3	$15.1 \pm 0.1$	34.6
	4	$15.5 \pm 0.2$	35.4
Conopah, NV	1	16.0 ± 0.5	36.6
	2	$16.4 \pm 0.2$	37.5
	3	$16.4 \pm 0.1$	37.5
	4	$16.7 \pm 0.2$	38.2

### Water

The SNL, TTR is included in the EPA's Long-Term Hydrologic Monitoring Program (LTHMP). The LTHMP was established to monitor water sources in areas where nuclear tests have been conducted (and surrounding communities) for the presence of nuclear test-related radioactivity, if any occurs. Samples were collected on a semiannual basis until 1984, but are now collected monthly. Monthly sample analysis includes a gamma spectral analysis, suspended solids, pH, temperature, and conductivity. Tritium analysis is done semiannually. When the conventional analysis yields tritium concentrations  $\leq 700$  pCi/L, a reanalysis is performed sing a tritium enrichment analysis technique (Minimum Detectable Concentrations (MDC) = 9 pCi/L). Gross  $\alpha$  and gross  $\beta$  analysis is not performed on the routine samples. A detailed analysis including isotopic uranium and alpha count is only performed for initial samples at new sample locations.

Two, 3.8-L (1-gal) samples are collected monthly. One sample is filtered and acidified. Two, 0.47-L (1-pint) samples are collected for the tritium analysis, one of which is stored for a year as a backup sample.

Tritium concentrations reported by the EPA for SNL, TTR well 6 are compared to Las Vegas and Tonopah results (Table 5-3). No unexpected gamma-emitting radionuclides were detected, so only tritium values are reported. All tritium concentrations observed were consistent with previous years' data.

Table 5-3. Summary of 1989 Analytical Results for the EPA LTHMP (EPA, 1989b)

		the state of the s	The second secon
Sample Location	1989 Quarter Report	Tritium (EPA, 1989b) pCi/L Value ± 2σ	Percent DOE Concentration Guide
Clarify Ch. NY	1	NT TO A MINISTRAL	and the state of t
Clark St., NV	1	No Data	<0.01
Well 6 SNL, TTR	2	$-2.1 \pm 7.1+$	<0.01
	3	$-1.2 \pm 6.9+$	<0.01
	4	$-1.2 \pm 6.9 +$	<0.01
Tonopah, NV	1	No Data	qui avi su
City Well	2	No Data	
	3	No Data	
	· · · · . <b>4</b>	2 ± 6+	0.01
Las Vegas, NV	1 .	GSN*	<del></del>
Well 28	2	No Data	
Water District	3	3 ± 6.6+,	
		$1.5 \pm 6.4 +$	<0.02
	4	No Data	

<sup>\*</sup>Gamma spectrum negligible (GSN) is entered here, indicating that tritium results will be reported later.
+Concentration does not exceed the MDC.

### Air Monitoring

A continuous particulate air monitoring station is located at the SNL, TTR as part of the EPA Air Surveillance Network (ASN). Air filters are exchanged three times per week. Filters are analyzed by gamma spectrometry. This network also includes a station at Goldfield and at Tonopah, Nevada (Table 5-4). Beryllium-7 (<sup>7</sup>Be), a naturally occurring radionuclide, is generally the only nuclide detected by gamma spectrometry. Samples are collected at Goldfield and Tonopah, Nevada, for tritium and noble gas analysis as well (Table 5-5).

The noble gas and tritium analysis results reported in Table 5-5 were all well below the DOE-derived radiation concentration guides. Air concentrations for  $^{85}$ Kr averaged 30 pCi/m³ throughout the air surveillance network. Tritium and  $^{133}$ Xe concentrations were all less than or near the MDC. The MDC for xenon-133 ranges from 4 to 40 pCi/m³ depending on sample size and the time between collection and analysis.

0.06 (14)

Sample Location	1988 Quarter	Days Sampled	Average Concentration* pCi/m <sup>3</sup> 7Be
SNL, TTR, NV	1	120	0.068 (60)
• •	2	91	0.10 (27)
	3	91	0.08 (20)
	4	77	GSN **
Goldfield, NV	1	84	0.052 (14)
•	2	91	0.11 (35)
	3	91	0.09 (28)
	4	91	0.14 (28)
Tonopah, NV	. 1	84	0.066 (14)
• •	2	91	0 18 (56)
	3	91	0.15 (35)
	4	84	0.13 (35)
Clark St., NV	1	84	0.12 (28)
,	2	91	0.12 (42)
	3	91	0.13 (35)

Table 5-4. Summary of 1989 EPA ASN Results

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# 5.2 <u>1989 Reynolds Electrical and Engineering Company (REECo) Monitoring Program</u>

### Background

REECo (NTS) environmental monitoring activities at the SNL, TTR are limited to water monitoring and obtaining of permits in compliance with EPA regulations. Environmental compliance permits for the SNL, TTR include potable water supply, burn, sewage, and tanks. These permits are updated annually or as necessary. Current permit listing is in Table B-2 of Appendix B.

REECo collects water samples at the SNL, TTR wells and submits them to REECo Health Physics for radiological analysis. Samples are also collected for nonradiation analysis.

<sup>\*</sup>Value is time-weighed concentration average over the location's entire sampling period with number of days detected reported in parentheses.

\*\*GSN = Gamma-Spectra negligible.

Table 5-5. Summary of 1989 Analytical Results for the EPA NGTSN

		R	<u>adionuclide - Ave</u>	erage Concenti	ration*
Sample Location	1989 Quarter	85 <sub>Kr</sub> (pCi/m <sup>3</sup>		<sup>3</sup> H in Air (pCi/m <sup>3</sup> )	HTO (pCi/ml)
Goldfield, NV	1	24 (0.02	) -0.24 (<0.01)	-0.021**	0.10 (<0.01)
	2	27 (0.02	) 3.1 (<0.01)	0.064**	0.40 (<0.01)
	3	26 (0.02	) 1.1 (<0.01)	-0.064**	0.31 (<0.01)
	4	27 (0.02	) -0.49 (<0.01)	0.038**	0.11 (<0.01
Tonopah, NV	1	26 (0.02	) 2.1 (<0.01)	0.014**	0.14 (<0.01
•	2	26 (0.02	) 1.2 (<0.01)	-0.11**	-0.69 (<0.01
	3	27 (0.02	) -0.97 (<0.01)	-0.0014**	0.13 (<0.01
	4	28 (0.02	) -3.1 (<0.01)	0.021**	-0.18 (<0.01

<sup>\*</sup>Values are concentrations. Percent of DOE-derived concentration guides (DCG) are given in parentheses. \*\*No DCG value is quoted in DOE 5400.5 for  $^3\text{H}$  in air.

### Water

REECo collects water samples from wells at the SNL, TTR for analysis. SNL, TTR, owns one drinking water well identified as well 6 at the Control Point area. REECo collects samples at this location on a quarterly basis. This is the same well that EPA uses to collect SNL, TTR water samples.

The Environmental Health Section of REECo is responsible for sample collection at the SNL, TTR. Tables 5-6 and 5-7 describe the details of drinking water sampling and wastewater sampling, respectively.

Well 6 located at the Control Point area is the only potable water supply owned by SNL, TTR. It is 743 ft deep with a low water level of 426 ft. It was constructed in 1963. Other nonpotable, construction supply wells, as well as potable non-SNL, TTR, wells are also located at the SNL, TTR.

Well 6 is permitted by the State of Nevada and renewed on an annual basis. The permit updates are obtained by REECo and copies are forwarded to SNL, Albuquerque, for inclusion in the annual SNL, TTR environmental monitoring report. Samples are collected for radiological analysis to comply with the Safe Drinking Water Act. Samples are collected as described in the REECo Monitoring Procedures Manual, RE-1002 (REECo, 1987). One-gallon samples are collected on a regular schedule (every three months). Sample collection dates are determined at the start of each year.

Table 5-6. Summary of REECo Drinking Water Sampling Program

Location	Number of Samples	Frequency	Analysis	Analytical Laboratory
Well 1-A Well 3-A	7	Monthly	Bacteriological (total coliform)	Associated pathologist laboratory
Well 6 Well AF	4	Quarterly	Radiological $(\alpha, \beta, \gamma, ^{3}H, ^{90}Sr, ^{239}Pu)$	NTS-Environmental Surveillance Lab- oratory

Table 5-7. Summary of REECo Wastewater Sampling Program

Location	Number of Samples	Frequency	Analysis	Analytical Laboratory
Head works	4	Quarterly	Biochemical Oxygen Demand (BOD5)	Wastewater Treatment Plant
Sewage Lagoon	4	Quarterly	Total Suspended Solid (TSS)	City of Hen- derson

Samples are sent to REECo at the NTS for analysis within 24 hr of collection. The analysis is for gross  $\alpha$ , gross  $\beta$ , tritium, strontium-90 and plutonium-239. A 20-min gamma count is also done.

Table 5-8 summarizes the results for the 1988 and 1989 water samples collected at wells 6, 3A, 1A, and AF. These values are comparable to results reported for NTS wells in the 1988 NTS Environmental Monitoring Report. Analysis techniques and associated detection levels are included in the NTS report (Gonzalez, 1986).

### Sewage System

SNL sewage at the SNL, TTR goes into septic tanks and associated drain fields. These discharges fall primarily under the statutory authority of the Safe Drinking Water Act (as amended). These discharges are regulated under Nevada Administrative Code, Chapter 444-445, and are administered by the State of Nevada, Division of Health, Consumer Protection Services, and the State of Nevada, Division of Environmental Protection. The wastewater

Table 5-8. SNL, TTR Supply Wells Subject to the Safe Drinking Water Act--Analysis Results (Sygitowicz, 1990)

			Analysi	Analysis (value $\pm$ 2 $\sigma$ error)*	error)*	·	
Location	Date	3 <sub>H</sub> pCi/ml	Alpha 10- <sup>3</sup> pCi/ml	Beta 10- <sup>3</sup> pCi/ml	Gamma pCi/ml	90Sr 10-3 pci/ml	239Pu 10-3 pci/ml
Well 6 (SNL)	3/88 9/88 1/89 5/89	0.69 0.1. 0.1. 0.1. 0.1.	1.47 ± 0.80 <d.l. 0.66 ± 0.58 1.74 ± 0.83 0.95 ± 0.71</d.l. 	4.40 ± 1.10 5.82 ± 1.10 5.32 ± 1.01 8.70 ± 1.13 6.48 ± 1.23	NPF NPF NPF <d.l.< td=""><td>NA <d.l. <d.l. <d.l. 0.32 ± 0.31</d.l. </d.l. </d.l. </td><td>NA</td></d.l.<>	NA <d.l. <d.l. <d.l. 0.32 ± 0.31</d.l. </d.l. </d.l. 	NA
Well 3A	3/88 9/88 1/89 5/89	0.69 .0.L. .0.L. .0.L.	1.30 ± 0.70 <d.l. <d.l. 1.10 ± 0.70 1.43 ± 0.72</d.l. </d.l. 	6.76 ± 1.07 4.66 ± 1.44 4.67 ± 0.98 6.79 ± 1.15 7.05 ± 1.20	NPF NPF NPF NPF	NA	NA <d.l. 0.06 ± 0.03 <d.l. <d.l.< td=""></d.l.<></d.l. </d.l. 
Well 1A	3/88 9/88 1/89 5/89	0.69 0.1. 0.1. 0.1.	1.37 ± 0.70 0.79 ± 0.59 <d.l. 0.96 ± 0.76 2.19 ± 0.83</d.l. 	6.51 ± 1.11 7.36 ± 1.10 9.58 ± 1.15 7.63 ± 1.14 6.65 ± 1.13	NPF NPF NPF NPF 0.14 ± 0.09**	NA 0.28 ± 0.22 <d.l. <d.l. <d.l.< td=""><td>NA <d.l. 0.07 ± 0.03 <d.l. <d.l.< td=""></d.l.<></d.l. </d.l. </td></d.l.<></d.l. </d.l. 	NA <d.l. 0.07 ± 0.03 <d.l. <d.l.< td=""></d.l.<></d.l. </d.l. 
Well AF	3/88 9/88 1/89 5/89 7/89	0.69 <0.L. <0.L. <0.L. 0.50	1.24 ± 0.75 0.90 ± 0.62 <d.l. <d.l. 1.64 ± 0.74</d.l. </d.l. 	7.73 ± 1.16 5.84 ± 1.11 4.76 ± 1.00 8.50 ± 1.10 9.93 ± 1.09	NPF NPF NPF NPF	NA	NA

\*Screening level standard for gross alpha is 5 x  $10^{-3}$  pCi/ml and for gross beta is 15 x  $10^{-3}$  pCi/ml. Maximum contaminant levels for  $^{3}$ H and  $^{90}$ Sr are  $^{2}$ 0 pCi/ml and  $^{8}$  x  $^{10^{-3}}$  pCi/ml, respectively. \*\*Th-228 concentration.

NA - Data not available.
NPF - No peaks are found.

samples from head works and sewage lagoons are analyzed quarterly for biochemical oxygen demand (BODs) and total suspended solids (TSS).

### 5.3 1989 Special Sampling and Surveillance (W79)

The only unusual occurrence during CY89 is described in detail in Section 3.4. This occurrence released two hazardous materials, depleted uranium and beryllium, in excess of reportable quantities. The National Response Center was called by SNL, TTR personnel immediately after the unit was detonated.

The site clean-up activity was started a few days after the snow dissipated. The SNL, TTR Rad-Safe team collected all D-38 and beryllium fragments on the ground, and then sampled a few sets of surface soil for laboratory analysis. The results of these analyses are listed in Table 5-9. The collected wastes (D38 and Be) were stored in a 55-gal drum and marked "mixed waste."

Although some residual D-38 (in  $\mu g$  range) and beryllium (in  $\mu g$  range) were detected in samples near the site, neither SNL nor the DOE staff believe that they pose a health risk either to the public or workers. Therefore, no further remediation is necessary. The results were reported to the Radiological Health Section, Nevada Department of Human Resources, by Nevada Operations Office of the DOE.

### 5.4 Potential Dose Assessment for the Public

Although no routine radioactive source was present in 1989 at the SNL, TTR, one incident resulted in the inadvertent airborne release of 5 oz of depleted uranium (D38). Doses to the appropriate public receptors were calculated for that event.

The D38 release is considered to be an instantaneous release because it was discharge to the air in a very short period of time. Consequently, the released material is considered to have moved off in a single direction. Meteorological measurements made at the time of release showed the wind direction to be towards the north-northwest at a speed of 11.6~m/s. In addition, these data combined with daytime stability properties imply a neutral stability class (Pasquill class D).

The location of the release was in the north central part of the SNL, TTR (latitude 37° 49′ 32.3″, longitude 116° 40′ 24.9″). The plume traveled north-northwest passing well east of the base housing and on across the sparsely populated monitor range and Ralston Valley. Approximately 33.4 km north of the release, the plume crossed State Highway 6. Although a few residents are found along this highway, neither the plume nor the sector containing the plume actually passed over a public receptor location. Nevertheless, because of the presence of public receptors left and right of the plume along the highway, a zone of public receptors was arbitrarily maintained at the highway (described in SNL, TTR public receptor survey), and the maximum individual location was taken to be here. This

Table 5-9. Results of the Special Sampling (W79)

Sample** μg I I.D.	Be/gm of soil No. l	μg Be/gm of soil No. 2	$\mu$ g <sup>238</sup> U/g of soil (dry)
No. 1 Top	47.0	58.1	411.0
No. 1 Bottom	8.7	4.4	38.6
No. 2 Top	5.6	7.5	43.1
No. 2 Bottom	1.1	1.4	17.9
No. 3 Top	2.3	1.5	35.2
No. 3 Bottom	0.6	1.2	28.2
*WES73	0.3	0.2	8.3
*WES74	0.3	0.3	9.7

<sup>\*</sup>WES73 is 0.1 mi south of the site; WES74 is 0.1 mi west of the site.

These represent background soil samples near the site.

conservative approach was necessary to prevent an under estimation of exposure due to unexpected plume meandering.

The dose assessment was performed using a modified AIRDOS-EPA computer code to accommodate the very short duration of the puff release.

The whole-body dose to the maximum individual was calculated to be  $8.7 \times 10^{-4}$  mrem due primarily to the inhalation of U-238. A maximum organ dose to the lung was calculated to be  $2.0 \times 10^{-2}$  mrem, also due to the inhalation of U-238. These doses are well below the NESHAP standards for radionuclide emissions.

A population dose was calculated for the 238 people who reside in the sector north-northwest of the release to a distance of 50 mi. A population dose of  $9.2 \times 10^{-5}$  person-rem was calculated including a correction reduction factor of .22, which accounts for the ratio of the plume width to sector width. Since the width of the instantaneous release plume is not as wide as the grid sector, only 22 percent of the 238 people residing in the

<sup>\*\*</sup>Top 1/4" of a 9" x 8" x 1/4" sample size was taken for each "Top" sample, and the next 1/2" of 9" x 8" x 1/2" from the same sampling location was taken for each respective "Bottom" sample.

sector are actually affected by the passing of the plume. Therefore, a corresponding reduction in population dose was made in this case. Table 5-10 summarizes the maximum offsite dose impacts in comparison to NESHAP standards and the nature radiation.

Table 5-10. Summary of Offsite Dose Impacts in Comparison to NESHAP Standards and the Nature Radiation

TTR	SNL, TTR Operations	NESHAP s Standards	Natural Background Radiation at SNL,
Max. whole-body dose (mrem/yr)	8.7 x 10 <sup>-4</sup>	25	95*
Max. critical organ dose (mrem/yr)	$3.6 \times 10^{-3}$	75	
Annual Population dose (person-rem)**	9.2 X 10 <sup>-5</sup>		4.94

<sup>\*</sup>Based on the average of community TLD values near Tonopah, NV.

\*\*The population dose was calculated for the particulate incidence that approximately 52 people (22 percent of 238 people) residing in the sector of the plume were affected by the release.

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# APPENDIX A

Table A-1. EPA Routine Monitoring Frequency, Sample Size, MDC and Concentration Guides (CG)\*

Air Surveillance Network	Frequency	Locations	Size	Time	Concentration Guide (CG)*	n Guide (C	G)* MDC	\$CG
70.	ce Network		ш3	Minutes	Bq/m <sup>3</sup>	nCi/m <sup>3</sup>	mBq/m <sup>3</sup>	
eq.	1/wk	al1	260	30	1700	47	17	1 x 10-3
95Zr 95Nb	1/wk 1/wk	all	095	9 9 9 9	12 110	9.3 3.3	1.8	$4 \times 10^{-2}$ $2 \times 10^{-3}$
99Mo	1/wk	al1	260	30	110	3	1.5	$2 \times 10^{-3}$
103 <sub>Ru</sub> 131+	1/wk	all	560	30	58	1.5	8. 6	$3 \times 10^{-3}$ $4 \times 10^{-2}$
132Te	1/wk 1/wk	all	560	S 8	17	0.5	1.8 1.8	$1 \times 10^{-2}$
$137_{\mathrm{Cs}}$	1/wk	a11	260	30	12	0.3	1.8	$2 \times 10^{-2}$
$140_{Ba}$	1/wk	. all	260	30	120	ť	8.4	×
$140_{La}$	1/wk	all	260	30	120	ന	2.6	×
141 <sub>Ce</sub>	1/wk	all	260	30	52	1.4	3.0	×
144Ce	1/wk	a11	260	30	1.2	0.03	12	1.0
Pu	1/mo	a11	1120	1000	$5 \times 10^{-4}$		$1.48 \times 10^{-3}$	.32
ss Beta	1/wk	all	260	30	10	$5 \times 10^{-4}$	0.11	$6 \times 10^{-1}$
$^{3 m H}$	1/wk	17	2	150	×	125	148	×
$^{85}\mathrm{Kr}$	1/wk	17	7.0	200	$2.2 \times 10^4$	620	148	$6 \times 10^{-4}$
133Xe	1/wk	17	7.0	200	×	067	370	$2 \times 10^{-3}$
Xe	1/wk	17	0.4	200	$2.3 \times 10^3$	62	370	$2 \times 10^{-2}$
er Surveill	Water Surveillance Network <u>(LTHMP)</u> **	(LTHMP)**	Liters	Minutes	Bq/1	pCi/l	Bq/1	
						•		
$^{3}$ H	1/шо	a11	Н	200	740	$2 \times 10^4$	12	1.6
3H+	1/шо	all	0.1	200	740	$2 \times 10^4$	0.37	5 x 10-2
89Sr 90 <sub>Sr</sub>	lst time 1st time	all a11		20 20	16 0.8	440	0.18 0.074	1.1 9.2

EPA Routine Monitoring Frequency, Sample Size, MDC and Concentration Guides\* (Concluded) Table A-1.

Sampling Frequency
Water Surveillance Network (LTHMP)**
, H
all
a11
all
a11
all
all
3.5
61 154 28

MDC = Minimum detectable concentrations.

NA = Not Available.

\*\*For tritium, Sr, and Cs, the concentration guide is based on Drinking Water Regulations (4 mrem/yr).

<sup>\*</sup>ALI and DAC values from ICRP-30 were modified to 1 mSv annual effective dose equivalent for continuous exposure. Te and I data were corrected to 2 g thyroid, greater milk intake, and smaller volume of air breathed annually (1-year-old infant).

# APPENDIX B

Table B-1. State of Nevada Regulations Applicable to the SNL, TTR

### Regulation

### Applicable Activity

### Nevada Wildlife Regulations

Nevada Revised Statute. Title 45, Chapter 501. NRS 501.010 - 501.243

Wildlife Regulations NAC 504.510 - 504.550

### Nevada Air Quality Regulations

Nevada Revised Statutes, NRS 445.401 - 445.601

NAC 445.430 - 445.995

Title 40 - Public Health and Safety, Chapter 445.

### Nevada Water Pollution

Nevada Revised Statutes, Title 40 - Public Health Safety, Chapter 445. NRS 445.131 - 445.354

NAC 445.070 - 445.194

Nevada Regulations Solid Waste Management

Nevada Revised Statutes, Title 40 - Public Health and Safety, Chapter 444. NRS 444.510 - 444.610

Regulations Governing Solid Waste Management

- Diversion of surface drainage channels
- Clearing, leveling, and grading of site
- Road construction
- Highway improvement
- Installation of water lines
- Installation of water reservoirs
- Installation of fuel storage tanks
- Construction of sanitary landfill
- Construction of explosives bunkers

### - Diversion of surface drainage channels

- Clearing, leveling, and grading of site
- Road construction
- Highway improvement
- Installation of water lines
- Installation of water reservoirs
- Installation of fuel storage tanks
- Construction of sanitary landfill
- Construction of explosives bunkers
- Construction of support buildings
- Incinerator
- Diesel-powered emergency generator

### - Construction of operation of Control Regulations sewage treatment plant

- Disposal of drilling fluids
- Water treatment plant
- Clearing, leveling, and grading of site
- Construction of support buildings
- Construction and operation of sanitary landfill
- Daily sanitary wastes
- Disposal of sewage sludge

Table B-1. State of Nevada Regulations Applicable to SNL, TTR (Concluded)

### Regulation

### Applicable Activity

Nevada Regulations Governing Individual Sewage Systems - Construction of sewage collection systems

Nevada Revised Statutes, Title 40 - Public Health and Safety, Chapter 444. NRS 444.650

NAC 444.750 - 444.840

Nevada Public Water Supply and Public Water Systems Regulations Installation of water linesInstallation of water reservoirs

Nevada Revised Statutes, Title 40 - Public Health and Safety, Chapter 445. NRS 445.030

NAC 445.370 - 445.420

Nevada Water Resources

- Installation of water lines
- Installation of water reservoirs

Nevada Revised Statutes, Underground Water and Wells, Chapters 533 and 534. NRS 534.010 - 534.190

Regulations for Drilling Wells

Radiation Control

- Use of radioactive sources

Nevada Revised Statutes, Title 40 - Public Health and Safety, Chapter 459. NRS 459.010 - 459.290

Nevada Regulations for Radiation Control

Table B-2. SNL, TTR Permits/Registration

	Type of Activity	Permit Expiration Date	Report to Agency Due by	Comments
AIR	QUALITY*			
1.	PETRO STORAGE JP-4	03/26/92		State of NV to REECo Permit #1312
2.	PETRO STORAGE JP-4	03/26/92		State of NV to REECo Permit #1313
3.	PETRO STORAGE JP-4	03/26/92		State of NV to REECo Permit #1314
4.	PETRO STORAGE JP-4	03/26/92		State of NV to REECo Permit #1315
5.	PETRO STORAGE DIESEL #1	03/26/92		State of NV to REECo Permit #1311
6.	PETRO STORAGE DIESEL #1			State of NV to REECo Registration Certification #1379
7.	DUST	01/30/91		State of NV to REECo Large Batch Plant (Ross) Permit #1083
		01/30/91		Small Batch Plant (S. C. Johnson) Permit #1081
8.	CRUSHER Cedarapids Md1 #1524	08/08/90		State of NV to DOE/NV Permit to Construct #2274
9.	CRUSHER Cedarapids Md1 #2416	08/08/90		State of NV to DOE/NV Permit to Construct #2275
10.	SCREEN Cedarapids Mdl #2416	08/08/90		State of NV to DOE/NV Permit to Construct #2276

Table B-2. SNL, TTR Permits/Registration (Continued)

	Type of Activity	Permit Expiration Date	Report to Agency Due by	Comments
11.	SCREEN Kolberg Mdl #1130x50	08/08/90		State of NV to DOE/NV Permit to Construct #2277
12.	SURFACE DISTURBANCE		04/15/90	State of NV to REECo Registration Certificate #1400
13.	OPEN BURN (FIRE TRAINING)	09/30/90	10/15/90	State of NV to DOE/NV Permit #90 - 5
14.	INCINERATOR (MDL 500CA)	03/26/92	04/15/90	State of NV to REECo Permit #1316
WAT	ER SYSTEMS			
1.	MANCAMP AREA WELL 1A BLM WELL	09/30/90		State of NV to DOE/NV Permit #NY-4068-12C
2.	INDUSTRIAL AREA WELL 3A WELL 3B WELL EH-2	09/30/90		State of NV to DOE/NV Permit #NY-5001-12NC
3.	SANDIA COMPOUND WELL 6	09/30/90		State of NV to DOE/NV Permit #NY-3014-12NC
4.	TECR (O&M) WELL	09/30/90		State of NV to DOE/NV Permit #NY-5002-12NC
SEW	AGE SYSTEM			
1.	TIADS MANCAMP INDUSTRIAL AREA	08/20/92	Monthly Quarterly	State of NV to DOE/NV Permit #NEV20001

Table B-2. SNL, TTR Permits/Registration (Concluded)

	Type of Activity	Permit Expiration Date	Report to Agency Due by	Comments		
MIS	CELLANEOUS					
1.	BORROW PIT (BLM) Outside TTR Main Gate	09/16/92 10/16/92	09/16/89	Dept. of Interior BLM to DOE-TTR Permit #NV67-FU8-05		
HAZARDOUS WASTE						
1.	Tonopah Test Range (TTR)			US EPA to DOE-TTR EPA I.D. #NV3570090016		

<sup>\*</sup>Activities 1 to 6 concerning air quality are surface tanks in Area X, the Industrial Area.

# DATE FILMED 0117/9/