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1990 Environmental Monitoring Report Tonopah Test Range Tonopah, Nevada

S. Hwang, J. Phelan, T. Wolff, G. Yeager, D. Dionne, G. West, C. Girard

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**1990 ENVIRONMENTAL MONITORING REPORT
TONOPAH TEST RANGE
TONOPAH, NEVADA**

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ABSTRACT

This report summarizes the environmental surveillance activities conducted by the U.S. Environmental Protection 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 the National Environmental Policy Act of 1969 (NEPA), environmental permits, environmental restoration, and waste management programs are also included. The 1990 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.

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NOTE TO THE READER

The SNL organization numbers of the authors and supporting staff changed effective August 1, 1991. The former organization numbers were used within the text since the report was initiated prior to the organization change. For reference to the new organization numbers, see the following list:

<u>From</u>	<u>To</u>
3200	7700
3201	7701
3210	7710
3211	7711
3212	7712
3213	7713
3214	7714
3215	7715
3216	7716
3217	7717
3220	7720
3221	7721
3222	7722
3223	7723
7513	2713
7523	2723

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ABBREVIATIONS

International System Prefixes

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

Units

°C	Celsius degree
cpm	counts per minute
ft	feet
g	gram
gal	gallon
h	hour
ha	10,000 square meters
L	liter
m	meter
m ³	cubic meter
mi	mile
ml	milliliter
ppm	parts per million
psi	pounds per square inch
% moisture	weight percent of water
yr	year

Symbols

α	alpha particle
β	beta particle
γ	gamma particle
>	greater than
<	less than
$\bar{x}$	mean value
P	statistical probability
s	standard deviation
$s\bar{x}$	standard error of the mean
σ	statistical variance
HTO	tritiated water vapor

Radioactivity Measurements

Ci	Curie (unit of radioactivity)
Bq	Becquerel (unit of radioactivity = 37 nCi)
μR	microrentgen (exposure)
μR/h	microrentgen per hour (exposure rate)
mGy	milligray (unit of radiation dose = 100 mrem)
mrem	millirem (unit of radiation dose)
person-rem	radiation dose to population
pCi/l	picocuries/liter

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

ABBREVIATIONS (Continued)

Acronyms

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
DOC	U.S. Department of Commerce
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 Corporation
EPA	U.S. Environmental Protection 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
NAFB	Nellis Air Force Base
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 (DOE)
PA	Preliminary Assessment
PCB	polychlorinated biphenyl
PIC	pressurized ion chamber
RCG	Radiation Concentration Guide
RCRA	Resource Conservation and Recovery Act
REEC _o	Reynolds Electrical and Engineering Company
SD	standard deviation
SARA	Superfund Amendment and Reauthorization Act
SE	standard error
SNL	Sandia National Laboratories
SPCC	Spill Prevention Control and Countermeasure

ABBREVIATIONS (Concluded)

Acronyms

TLD	thermoluminescent dosimeter
TSCA	Toxic Substances Control Act
TSS	total suspended solids
TTR	Tcnopah Test Range
USPCI	United States Pollution Control Incorporated
UST	underground storage tank

CHAPTER 1

EXECUTIVE SUMMARY

1.1 Assessment of Radiological Impact on the Public

There is no routine radioactive emission from Sandia National Laboratories, Tonopah Test Range (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, possibilities exist that small amounts of depleted uranium (DU) (as part of weapon components) may be released to the air or to the ground because of unusual circumstances (failures) during testing.

1.2 Overview of 1990 Monitoring Results

EPA Air Surveillance Network (ASN)--The only gamma (γ) emitting radionuclide detected on the prefilters from all four stations listed (Chapter 5) was beryllium-7 (^7Be), 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 Thermoluminescent Dosimetry (TLD) Network and Pressurized Ion Chamber (PIC)--Normal results were reported for four TLD stations (Chapter 5) and two pressurized ion chamber (PIC) stations (Chapter 5), except that the third quarter TLD for Tonopah and Goldfield stations were lost. The results show an average increment of 2.7 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 that might have caused the reported additional increment.

EPA Long-Term Hydrological Monitoring Program (LTHMP)--Analytical results for tritium (^3H) in well water were reported for three well stations (well 6, SNL, TTR; City well, Tonopah; and well 28, Las Vegas) (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 ^3H , gross alpha (α), beta (β), and γ scan, strontium-90 (^{90}Sr) and plutonium-239 (^{239}Pu). All results were within the EPA's primary drinking water standards (Chapter 5).

CHAPTER 2

INTRODUCTION

2.1 Sandia National Laboratories, Tonopah Test Range (SNL, TTR) History and Operations

SNL, TTR, is operated by SNL, Albuquerque, for the DOE nuclear ordnance programs. 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 was used as a bombing range during World War II.

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 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 SNL, TTR, are 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 1990, there were a total of 191 tests conducted at SNL, TTR, including 43 air-drop tests, 102 gun tests, 25 rocket tests, 12 fly-around tests, and 9 cruise missile tests.

2.2 Location and Population

SNL, TTR, is located about 140 mi (225 km) northwest of Las Vegas, Nevada (Figures 2-1 and 2-2). SNL, TTR, covers 624 mi² (1616 km²) within the boundaries of the Nellis Air Force Base (NAFB) Range Complex. It is bordered on three sides by the NAFB 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 centers are Goldfield, population 659, located ~25 mi (40 km) west of SNL, TTR, and Tonopah, population 4400, located 30 mi (48 km) northwest of SNL, TTR (U.S. Department of Commerce, Bureau of the Census, 1991). The total population within a 50-mi region around SNL, TTR, is 9299. This number includes a population of 1000 to account for base housing and onsite and contractor (non-SNL) personnel.

2.3 Geology and Climatology

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. SNL, TTR, lies east of a

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

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

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

All the working areas of SNL, TTR, lie in approximately 400 mi². The streams in and near SNL, TTR, are intermittent and end in closed basins. There are three springs within 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 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.

Because of the temperature extremes and arid conditions at SNL, TTR, the valley in which most of SNL, TTR, activities occur is sparsely covered with range grasses and low shrubs (ERDA, 1975; EG&G, 1979b). Joshua trees grow in the foothills, and juniper trees grow in the foothills and mountains. Hundreds of wild horses graze freely throughout SNL, TTR. Their exposure to SNL, TTR, 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 Pu 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 SNL, TTR. Detailed information related to these contaminated sites is 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 referenced, using a 1000-cpm detection level to place fences. An aerial radiologic survey was done

Table 2-1. Roller Coaster Test Information^a

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 (km ²)	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

^aThe data are from a report provided by the Reynolds Electrical and Engineering Company (REECo) Environmental Sciences Department/Nevada Test Site (NTS), October 31, 1986.

by Edgerton, Germeshausen & Grier Corporation (EG&G) for the NAEG in 1977 using the 1973 grid. Radiation isopleths showing soil activity caused by americium-241 (²⁴¹Am, a ²⁴¹Pu daughter), ²³⁹Pu, and ²⁴⁰Pu 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 because Pu migration 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 10⁵ m³ of soil are contaminated.

The EPA has also performed soil sampling at SNL, TTR, for special projects (Bliss and Parr, 1980). Surface soil sampling (γ spectrum analysis and ²³⁹Pu) 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

COMPLIANCE SUMMARY

3.1 Compliance Status

Regulations and Permits

Sandia National Laboratories, 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 DOE orders. The following paragraphs summarize the compliance status of the SNL, TTR, with major environmental statutes.

Clean Air Act (CAA)--SNL, TTR, is regulated by the CAA and the Nevada Air Quality Regulations published in Nevada Revised Statutes, Title 40, Public Health and Safety, Chapter 445. SNL, TTR, currently holds six air quality permits for fuel storage, two permits for dust control, five 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. There were no radioactive releases during 1990 from SNL, TTR, operations therefore, no National Emission Standards for Hazardous Air Pollutants (NESHAP) report was submitted for SNL, TTR.

Clean Water Act (CWA)--SNL, TTR, is regulated by the CWA and the Nevada Water Pollution, Public Water Supply and Public Water System, and Sewage Systems regulations. Drinking water for SNL, TTR, is provided by a well which operates under a permit issued by the State of Nevada in compliance with the Public Water Supply standards. SNL, TTR, sewage systems in Area 3 (the main industrial area) are connected to the U.S. Air Force sewage lagoon treatment facility. An automatic effluent monitoring system was installed in the SNL, TTR, connection to the Air Force facility to sample and record potential contaminants. Samples were taken from all septic tanks to determine whether they contain hazardous materials. The analysis of these samples should be completed by July 1, 1991. Based on the results, appropriate measures will be taken to abandon the septic tanks in conformance with State of Nevada regulations.

Comprehensive Environmental Response Compensation and Liability Act (CERCLA), Superfund Amendment and Reauthorization Act (SARA)--As required under the CERCLA/SARA, Section 120(d), a Preliminary Assessment (PA) was submitted for all facilities listed on the Federal Agency Hazardous Waste Compliance docket in 1988. Fifteen sites, separated into three tasks, were identified for future investigations.

Cultural Resources Acts--SNL has responsibilities for cultural resources management, including those responsibilities applicable under the National Historic Preservation Act (NHPA), the Archaeological Resources Protection Act (ARPA), and the American Indians Religious Freedom Act (AIRFA). SNL integrates cultural resources management into the National Environmental

Policy Act of 1969 (NEPA) Program (see Section 4.5 for further information on NEPA activities).

Endangered Species Act (ESA)--The DOE must comply with the ESA when planning federal actions or major construction activities. The key provision of the ESA for federal activities is Section 7, Consultation. Under Section 7 of the ESA, federal agencies must consult with the U.S. Fish and Wildlife Service to ensure that any agency actions are "not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species". SNL assists the DOE in complying with the ESA.

Resource Conservation and Recovery Act (RCRA)--SNL, TTR, is a less-than-90-day-storage generator of hazardous waste. Hazardous chemical wastes are collected, packaged, and shipped offsite to an EPA-permitted disposal facility. Standard Operating Procedures (SOPs) are being written to ensure continued compliance with the RCRA. Six underground storage tanks (USTs) and septic tanks are registered with the State of Nevada.

Safe Drinking Water Act (SDWA)--The SDWA does not apply to SNL, TTR.

Toxic Substances Control Act (TSCA)--SNL, TTR, completed a polychlorinated biphenyl (PCB) survey in April 1990. A total of 233 items and pieces or equipment, including utility and nonutility transformers, were inspected for PCB content. Of the 233 items surveyed, 196 items were determined to be "nondetectable" for PCBs. Five items were determined by laboratory analysis to contain trace levels of PCBs and these were well below the concentration level of regulatory concern (50 ppm). A total of 22 items that were inventoried could not be sampled without damaging the unit or interrupting progress. These items were labeled "potential PCB."

Audits Summary

The DOE Albuquerque Operations Office (DOE/AL) conducted the following audits in 1990:

- Health Physics Appraisal (May 29-June 1)
- Industrial Health and Occupational Safety Appraisal (May 29-June 1)
- Firearms Safety Appraisal (March 28-30)
- Fire Protection Appraisal (March 18-30)

3.2 Current Issues and Actions for SNL, TTR

Septic Tanks/Sewage Line--All septic tanks have permits as required by the State of Nevada. All SNL, TTR, sewage systems in Area 3 are connected to the Air Force sewage lagoon treatment facility. An automatic effluent monitoring system was installed in the SNL, TTR, connection to the Air Force facility to sample and record potential contaminants. Construction is essentially complete. Composite 24-hr wastewater sampling was conducted on the effluent during the months of February, March, and April to establish a base line for the discharge.

Underground Storage Tanks (USTs)--During the period November 19 through December 3, 1990, SNL Division 3221 performed Precision Volumetric Quantitative Leak Testing (PVQLT) on all USTs at SNL, TTR. This process identified a substantial (5 gal/hr) leak in the vent pipe of the 5000-gal diesel fuel tank at the backup power generator station inside Area 3. The tank was partially excavated to allow replacement of the vent pipe. When testing was resumed and 2 psi applied to the tank, a second leak was discovered near the top of the 34-yr-old steel tank. All other USTs at SNL, TTR, passed the leak test.

An action plan for removal of the leaking tank and site remediation was prepared by the Reynolds Electrical and Engineering Company (REECo) Environmental Compliance Department, Las Vegas, Nevada. REECo notified the DOE Nevada Operations Office (DOE/NVO) who then provided proper notice to the State of Nevada. A contractor from Las Vegas removed the diesel fuel and rinsed the tank on December 10, 1990. After the State of Nevada approved the action plan, REECo performed the site remediation and closed the tank in place.

SNL Division 3221 also arranged for installation of leak detection equipment on the pressurized piping associated with the Area 3 fuel dispensing station. SNL, TTR, now meets all compliance requirements for USTs through 1993.

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

3.3 Environmental Permits

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. 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 SNL, TTR, activities are administered by the Environmental Compliance Department of 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. SNL, TTR, was in full compliance with all permit requirements for calendar year 1990.

CHAPTER 4

OTHER ENVIRONMENTAL COMPLIANCE PROGRAMS

4.1 Spill Prevention Control and Countermeasure (SPCC) Plan

A SPCC Plan for Sandia National Laboratories, Tonopah Test Range (SNL, TTR) was completed in 1990. 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 1990 include the purchase and distribution of spill control pallets. The SPCC Plan documents 29 locations for secondary containment upgrades, including 12 transformers, 14 aboveground storage tanks, and 3 bulk storage areas.

4.2 Underground Storage Tanks (USTs)

USTs at SNL, TTR, 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 December 1990 on the six USTs registered with the State of Nevada. Of these, one tank failed tightness testing. An onsite investigation is in progress to determine whether this tank can be abandoned in place.

There were no UST removals in 1990. The registered USTs are listed in Table 4-1.

Table 4-1. 1990 USTs Survey

Tank I.D.	Capacity	Contents	Year Installed
0353-1	5,000	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 Waste Management Programs

Chemical and Hazardous Waste Management

Chemical wastes generated by SNL, TTR, activities during calendar year 1990 were managed by REECo, the SNL, TTR, facilities support contractor.

The Safety Kleen Corporation recycled the Safety Kleen Solvent, combustible liquid (1586 lb) and a compound cleaning liquid, corrosive material (180 lb).

In 1990, SNL, TTR, generated the following hazardous and recyclable wastes:

- Oil (2970 gal)
- Paint (285 gal)
- Antifreeze (55 gal)
- Gasoline (110 gal)
- Toner/fixer (laboratory pack) (10 gal)
- Contaminated soil (825 gal)

These wastes were shipped to the following facilities for disposal or recycling:

- Romic Chemical Corporation Southwest (Phoenix, AZ)
- United States Pollution Control, Incorporated (Grassy Mountain, UT)
- Desert Mountain Oil (Las Vegas, NV)

SNL, TTR, completed a polychlorinated biphenyls (PCBs) survey in April 1990. A total of 223 items/pieces of equipment, including utility and nonutility transformers were inspected for PCB content. Of the 223 items surveyed, 196 items were determined to be "nondetectable" for PCBs. Only five items were determined by laboratory analysis to contain trace levels of PCBs, but these were well below the concentration level of regulatory concern (50 ppm). The remaining 22 items could not be sampled for PCBs without damaging or destroying the equipment.

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 method parallels the EPA Comprehensive Environmental Response Compensation and Liability Act (CERCLA) program to identify, characterize, and clean up inactive release sites. Table 4-2 lists the ER Program Sites at SNL, TTR.

4.5 1990 National Environmental Policy Act of 1969 (NEPA) Compliance Activities and Documentation

Background

The NEPA, the nation's most comprehensive legislative and public policy statement on environmental protection, applies to all agencies of the

4. OTHER ENVIRONMENTAL COMPLIANCE PROGRAMS

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

ER Program Task	ER Program Site No.	Site Name
AL-SA-15 (SNL, TTR Area 3)	118.	Area 3 Underground Diesel Tank
	119.	Area 3 Landfills
	120.	Fire Training Area
	121.	Waste Oil Sumps, Building 360
	122.	Area 3 Septic Tanks and Leach Fields
	123.	Photography Shop French Drains
	134.	Heavy Duty Shop Floor Drains
AL-SA-16 (SNL, TTR Area 9)	124.	High-Explosive Disposal Area
	125.	Area 4 Landfill
	126.	Mobile Photographic Laboratory
AL-SA-17 (SNL, TTR Test Areas)	127.	Non-Violent Explosive Destruct System (NEDS) Site
	128.	Antelope Lake
	129.	Cactus Springs
	130.	Roller Coaster Radioactive Decontamination Area Roller Coaster
	131.	Sanitary Sewage System and Lagoons

federal government. Executive and DOE orders, DOE guidance, and DOE regulations apply NEPA and NEPA-related activities to SNL.

The Council on Environmental Quality (CEQ) was created in the Executive Office of the President under the authority of the NEPA. CEQ regulations were formally adopted by the DOE in August 1979. DOE NEPA guidelines were last published in full in the Federal Register on December 15, 1987. On November 2, 1990, the DOE proposed to revise their existing rule of 10 CFR 1021 entitled "Compliance With the National Environmental Policy Act." The proposed rule incorporates certain policy initiatives instituted by the Secretary of Energy.

Although only the DOE has the authority to make decisions regarding the appropriate level of NEPA documentation, SNL, Albuquerque, assists the DOE by drafting appropriate documentation--Environmental Checklists (ECs), Action Description Memoranda (ADMs), and Environmental Assessments (EAs) for DOE approval.

Environmental documents serve as vehicles for assessing potential environmental impacts of proposed federal actions and disclosing federal activities.

At SNL, Albuquerque, Division 3223 of the Environmental Programs Department carries out various NEPA-related activities including consulting and training line organization personnel in NEPA compliance, coordinating document preparation, maintaining a corporate NEPA document file, and reviewing NEPA documents before their submittal to the DOE. These responsibilities are documented in the SNL "National Environmental Policy Act (NEPA) Program" (PG470110).

1990 Activities

In 1990, a second staff member was assigned full-time to assist in maintaining compliance with the NEPA.

Following the Secretary of Energy's February 5, 1990, National Environmental Policy Act Notice (SEN-15-90) with directives intended to bring the DOE into full compliance with NEPA, an Environmental Safety & Health Bulletin was issued to all SNL employees to enhance understanding of SNL NEPA compliance responsibilities. Subsequently, several group meetings were held, including visits to remote sites--Livermore, California and Tonopah, Nevada--were made to better communicate SNL's NEPA responsibilities and enhance NEPA compliance.

SNL "National Environmental Policy Act (NEPA) Program" (PG470110) was completed in 1990 and approved in early 1991.

SNL, Albuquerque, worked with the DOE/Albuquerque Operations Office (AL) to propose input to the DOE NEPA rulemaking and also provided information to the DOE Office of Environmental Restoration and Waste Management for the "Environmental Restoration and Waste Management Programmatic EIS."

SNL, Albuquerque, provided information on historic preservation to the DOE for compilation in a New Mexico Archaeological Council Section 196 Compliance Handbook. Several archaeological surveys were completed for SNL, Albuquerque, and TTR.

A baseline environmental report, "Revision of Species Inventory Checklists for Sandia National Laboratories, Albuquerque, Bernalillo County, New Mexico," SAND90-7098, was published in October of 1990.

Environmental Checklists (ECs)

ECs are used to document the use of a categorical exclusion--a category of actions for which neither an EA nor EIS is required.

Action Description Memoranda (ADMs)

ADMs are documents containing a concise description of proposed actions and a brief discussion of relevant potential environmental issues. ADMs are used by DOE to determine the appropriate level of NEPA documentation for proposed actions.

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In the past, ADMs were also used to document categorical exclusions and to support memo-to-file (MTF) reviews.

The MTF was a unique DOE mechanism that was established in 1980 to justify not preparing EAs on clearly insignificant actions that, because of limited DOE experience, had not yet been added to the DOE published list of categorical exclusions. The MTF system to exclude actions that are clearly insignificant but not specifically categorically excluded from detailed NEPA documentation ended on September 30, 1990. At present, actions which are not categorically excluded or covered in approved NEPA documents require preparation of EAs or EISs.

Environmental Assessments (EAs)

An EA is a "concise public document" 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). The EA also aids in the compliance with NEPA when no EIS is required, and facilitates preparation of an EIS when one is necessary. The 1991 ADMs and EAs written or approved in 1990 and their approval status are listed in Table 4-3.

Table 4-3. ADMs, EAs, and Approval Status for SNL, TTR, in 1990

Title	Memo to DOE	DOE Approval Letter
Lighting System for the Live Range at TTR	11/01/90	02/11/90
W79 Live Pit Firings at TTR	03/26/90	09/24/90
Sewage Line and Wastewater Monitoring Station at TTR	02/05/90	02/21/90

Figure 4-1 describes the sequence for creation and review of NEPA documents.

4.6 Overview of Environmental Monitoring Programs

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

The SNL, TTR, landowner is the Bureau of Land Management (BLM). The DOE maintains a use permit with the BLM which is renewed every 5 yr. The BLM approves new construction such as roads. Other agencies operate under memoranda of understanding with the DOE. SNL, Albuquerque, has oversight

Figure 4-1. Sequence for Creating and Reviewing NEPA Documents

4. OTHER ENVIRONMENTAL COMPLIANCE PROGRAMS

responsibility for environmental monitoring and health physics activities at 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, Nevada, under an interagency agreement with the DOE, monitors background radiation at SNL, TTR, as part of its Offsite Radiation Monitoring Program and reports to the DOE/Nevada Operations Office (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.
- Desert Research Institute (DRI)--The 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. The 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 community monitoring stations. Selected locations are monitored by the DRI with a portable monitoring station (PMS) and thermoluminescent dosimeters (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 the DRI. The DRI also does other monitoring, primarily hydrology, for the DOE as requested. This may include evaluating environmental impacts due to road construction. Monitoring conducted by the DRI is included in Section 5.1 of the EPA Monitoring Program.

- Reynolds Electrical and Engineering Company (REECo)--REECo/Nevada Test Site (NTS), as part of its SNL, TTR, support activities, also performs environmental monitoring activities at 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.

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

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 Corporation (EG&G) Energy Measurements Group--The EG&G Energy Measurements Group, under contract to the Nevada Applied Ecology Group (NAEG), 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 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--Interim Offsite Monitoring Report-Nevada Test Site and Other Test Areas, Quarterly Report
- EPA, Dose Assessment Branch, Nuclear Radiation Assessment Division--Offsite Environmental Monitoring Report: Radiation Monitoring Around United States Nuclear Test Areas, Calendar Year Report
- DRI, University of Nevada System--Community Radiation Monitoring Program, Annual Report

4.7 1990 Release Reporting

The Annual Summary of 1990 Reportable Quantity (RQ) Release Reporting for TTR is listed in Table 4-4. All of the release was caused by the use of a NIKE rocket, which contains lead acetate as part of the propellant.

Table 4-4. Summary of 1990 Reportable Quantity (RQ) Release Reporting

Date	Location	Material	Quantity	RQ	Release To	NRC Number	Report Date
06/27/90	TTR	Pb	3.73 lb	1.016	Air	28680	06/28/90
10/17/90	TTR	Pb	3.73 lb	1.016	Air	43999	10/19/90

CHAPTER 5

1990 ENVIRONMENTAL MONITORING AT TONOPAH TEST RANGE

5.1 1990 EPA Monitoring at Sandia National Laboratories, Tonopah Test Range (SNL, TTR)

Background

The EPA does the most extensive routine monitoring at SNL, TTR. The monitoring includes thermoluminescent dosimeters (TLDs) which measure gamma (γ) radiation, air monitoring for noble gases, tritium (^3H) and other radionuclides, and water monitoring for radionuclides primarily. A detailed description of the EPA monitoring procedures, equipment, quality assurance (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 the DOE Nevada Operations Office (DOE/NVO). Copies of these data have been provided to SNL, Albuquerque, Division 3223 and are summarized in Tables 5-1 through 5-4.

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 SNL, TTR, well 6. These are the only two onsite monitoring stations at 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 SNL, TTR. Tonopah is 30 mi (48 km) northwest of SNL, TTR. Las Vegas is 140 mi (225 km) southeast of SNL, TTR.

Soil Sampling

Soil sampling is not performed on a routine basis by the EPA at SNL, TTR. Soil sampling and radiation surveys have been performed in the past (Bliss and Parr, 1980).

External Radiation

External radiation measurements are done primarily with TLDs. TLDs are exchanged quarterly. A Harshaw TLD-200 (CaF) 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 TLDs per card) was placed in the field concurrent with the Harshaw system

1990 ENVIRONMENTAL MONITORING REPORT,
TONOPAH TEST RANGE, TONOPAH, NEVADA

Table 5-1. 1990 Thermoluminescent Dosimeter Results

<u>Measurement Period</u>		Elapsed Time (Days)	Exposure This Period ^a (mR)	Equivalent Exposure Rate ^a (mR/day)	Equivalent Exposure Rate (μR/hr)
Start Date	End Date				
<u>Tonopah Test Range Station</u>					
01/04/90	04/03/90	89	29	0.32	13.4
04/03/90	07/10/90	98	30	0.31	12.8
07/10/90	10/11/90	93	31	0.33	13.7
10/11/90	01/02/91	83	29	0.36	14.8
<u>Tonopah Station</u>					
11/08/89	02/14/90	98	23	0.24	9.8
02/14/90	05/10/90	85	24	0.29	12.0
05/10/90	08/16/90	98	Dosimeter Lost		
08/16/90	11/07/90	83	21	0.25	10.6
<u>Clark Station</u>					
01/03/90	04/03/90	90	26	0.29	12.1
04/03/90	07/11/90	99	27	0.28	11.5
07/11/90	10/10/90	91	28	0.30	12.7
10/10/90	01/08/91	90	29	0.32	13.4
<u>Goldfield Station</u>					
11/09/89	02/14/90	97	19	0.19	8.0
02/14/90	05/10/90	85	19	0.22	9.3
05/10/90	08/15/90	97	Dosimeter Lost		
08/15/90	11/13/90	90	19	0.21	8.8

^aThe values presented here are gross results including background exposure values.

5. 1990 ENVIRONMENTAL MONITORING AT SNL, TTR

Table 5-2. Summary of 1990 EPA PIC Data

Location	1990 Quarter	Average Exposure Rate ^a (EPA, 1990) $\mu\text{rem/hr} \pm 1\sigma$	mrem/QTR
Goldfield, NV	1	15.5 ± 0.3	34.1
	2	15.2 ± 0.2	33.5
	3	15.1 ± 0.1	33.2
	4	12.6 ± 0.5	27.7
Tonopah, NV	1	16.5 ± 0.3	36.3
	2	16.2 ± 0.2	35.7
	3	16.2 ± 0.3	35.5
	4	16.8 ± 0.5	37.0

^aThe values presented here are gross results including background exposure values.

Table 5-3. Summary of 1990 Analytical Results for the EPA LTHMP (EPA, 1990)

Sample Location	1990 Quarter	Tritium (EPA, 1990) pCi/L Value $\pm 2\sigma$	Percent DOE Concentration Guide ($2\mu\text{Ci/L}$)
Clark St., NV Well 6 SNL, TTR	1	-34.7 ± 2.78	<1.0
	2	GSN ^a	--
	3	-1.96 ± 5.21	<1.0
	4	GSN	--
Tonopah, NV City Well	1	19.3 ± 2.78	<1.0
	2	GSN	--
	3	-2.59 ± 5.59	<1.0
	4	GSN	--
Las Vegas, NV Well 28 Water District	1	96.4 ± 2.79	4.82
	2	GSN	--
	3	-2.10 ± 8.71	<1.0
	4	GSN	--

^aGSN = Gamma spectrum negligible.

Table 5-4. Summary of 1990 EPA ASN Results

Sample Location	1990 Quarter	Weeks Sampled	Average Concentration ^a (pCi/m ³) ⁷ Be
SNL, TTR, NV	1	13	ND ^b (0)
	2	13	0.320 (2)
	3	14	0.494 (1)
	4	13	0.410 (3)
Goldfield, NV	1	13	0.250 (1)
	2	13	ND (0)
	3	14	0.320 (2)
	4	13	0.252 (4)
Tonopah, NV	1	13	ND (0)
	2	13	0.374 (1)
	3	14	0.330 (1)
	4	13	0.301 (1)

^aValue is time-weighted concentration average over the location's entire sampling period with number of days detected reported in parentheses.

^bND = Not detected.

with the intention of obtaining comparative values prior to the discontinuance of the Harshaw system in January 1987.

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

Water

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 (γ) spectral analysis, suspended solids, pH, temperature, and conductivity. Tritium (³H) analysis is done semiannually. When the conventional analysis yields ³H concentrations ≤ 700 pCi/L, a reanalysis is performed using a ³H-enrichment analysis technique (minimum detectable concentrations [MDC] = 9 pCi/L).

Gross alpha (α) and gross beta (β) analysis is not performed on the routine samples. A detailed analysis including isotopic uranium (U) and α 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 ^3H 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 γ -emitting radionuclides were detected, so only ^3H values are reported. All ^3H concentrations observed were consistent with previous years' data.

Air Monitoring

A continuous particulate air monitoring station is located at SNL, TTR, as part of the EPA Air Surveillance Network (ASN). Air filters are exchanged three times per week. Filters are analyzed by γ spectrometry. This network also includes a station at Goldfield and at Tonopah (Table 5-4). Beryllium-7 (^7Be), a naturally occurring radionuclide, is generally the only nuclide detected by γ spectrometry.

5.2 1990 Reynolds Electrical and Engineering Company (REECo) Monitoring Program

Background

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

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

Water

REECo collects water samples from wells at 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 the EPA uses to collect SNL, TTR, water samples.

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

Table 5-5. Summary of REECO Drinking Water Sampling Program

Location	Number of Samples	Frequency	Analysis	Analytical Laboratory
Well 6	4	Monthly	Radiological (α , β , γ , ^3H , ^{90}Sr , ^{239}Pu)	NTS-Environmental Surveillance Laboratory

Table 5-6. Summary of REECO Wastewater Sampling Program

Location	Number of Samples	Frequency	Analysis	Analytical Laboratory
Head works	4	Quarterly	Biochemical Oxygen Demand (BODs)	Wastewater Treatment Plant
Sewage lagoon	4	Quarterly	Total Suspended Solids (TSS)	City of Henderson

Well 6, located in 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 and potable non-SNL, TTR, wells are also located at 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.

Samples are sent to REECO at the NTS for analysis within 24 hr of collection. The analysis is for gross α , gross β , ^3H , strontium-90 (^{90}Sr), and plutonium-239 (^{239}Pu). A 20-min gamma count is also done.

Table 5-7 summarizes the results for the 1990 water samples collected. 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 SNL, TTR, Area 3, goes to the U.S. Air Force sewage lagoon. The sewage at remote areas goes into septic tanks and associated drain fields because of their wide-spread locations. These discharges fall primarily under the statutory authority of the Safe Drinking Water Act (as amended). These discharges are regulated under Nevada Administrative Code, Chapters 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 samples from head works and sewage lagoons are analyzed quarterly for biochemical oxygen demand (BODs) and total suspended solids (TSS).

5.3 Radon Monitoring

A total of 63 buildings and rooms were monitored for radon levels in 1990. The median radon concentration was 1.0 pCi/l. Only four locations exceeded the EPA limit of 4.0 pCi/l (Figure 5-1).

5.4 Potential Dose Assessment for the Public

No routine or accidental radiological releases occurred at SNL, TTR, during 1990. Consequently, the maximum individual dose input was zero and no regional population dose resulted from the 1990 operation at SNL, TTR.

Public Receptors

Based on the 1990 census data (U.S. Department of Commerce, Bureau of the Census, 1991) the population count in the area around the TTR site was updated. Figure 5-2 illustrates two zones of public receptors around SNL, TTR. The first zone shows the permanent public receptor locations and the second zone shows the seasonal public receptor locations.

To the west of SNL, TTR, and Nellis Air Force Base (NAFB) Range Complex permanent residents are found mainly along Highway 95 and as much as 3 mi east of the highway near Goldfield. However, a zone of seasonal public receptors (mainly miners) extends as far as 7 mi east of Highway 95. To the northeast, the public receptors are mainly along or north of Highway 6, with the exception of the Tonopah Airport which protrudes several miles south of the highway.

To the east and northeast, the permanent public receptors are primarily along the paved road, with a few exceptions near Rachel, where a few ranches are located west of the highway and up to the eastern boundary of NAFB Range Complex. However, a significant seasonal population of ranchers inhabit the area to the northwest of SNL, TTR, during late spring, summer,

Table 5-7. SNL, TTR, Supply Wells Subject to the Safe Drinking
Water Act--Analysis Results (Sygitowicz, 1990)

Location	Date	Analysis (value $\pm 2\sigma$ error)					
		^3H (pCi/ml) ^a	Alpha (10^{-3} pCi/ml) ^b	Beta (10^{-3} pCi/ml)	Gamma (pCi/ml)	^{90}Sr (10^{-3} pCi/ml)	^{239}Pu (10^{-3} pCi/ml)
Well 6 SNL	01/04/90	<MDL ^c	<MDL	<MDL	NPF ^d	<MDL	<MDL
	02/07/90	-34.7	<MDL	<MDL	NPF	<MDL	<MDL
	03/08/90	<MDL	<MDL	<MDL	NPF	<MDL	<MDL
	04/03/90	<MDL	<MDL	<MDL	NPF	<MDL	<MDL
	05/01/90	<MDL	<MDL	<MDL	NPF	<MDL	<MDL
	06/05/90	<MDL	<MDL	<MDL	NPF	<MDL	<MDL
	07/10/90	<MDL	<MDL	<MDL	NPF	<MDL	<MDL
	08/09/90	-1.96	<MDL	<MDL	NPF	-0.622 $\pm$ 0.745	<MDL
	09/05/90	<MDL	<MDL	<MDL	NPF	<MDL	<MDL
	10/11/90	<MDL	<MDL	<MDL	NPF	<MDL	<MDL
	11/16/90	<MDL	<MDL	<MDL	NPF	<MDL	<MDL
	12/04/90	<MDL	<MDL	<MDL	NPF	<MDL	<MDL
	12/18/90	<MDL	NA ^e	100 $\pm$ 12	NPF	<MDL	<MDL
	12/18/90	<MDL	NA	140 $\pm$ 13	NPF	<MDL	<MDL
	12/18/90	<MDL	NA	72 $\pm$ 12	NPF	<MDL	<MDL
3014	12/18/90	<MDL	NA	95 $\pm$ 12	NPF	<MDL	<MDL

^aMaximum contaminant levels for ^3H and ^{90}Sr are 20 pCi/ml and 8×10^{-3} pCi/ml, respectively.

^bScreening level standard for gross α is 5×10^{-3} pCi/ml and for gross β is 15×10^{-3} pCi/ml.

^cMDL = minimum detectable level.

^dNPF = No peaks are found.

^eNA = Data not available.

Figure 5-1. Radon Monitoring Results for SNL, TTR (pCi/l)

Figure 5-2. Public Receptor Zone Around the TTR

5. 1990 ENVIRONMENTAL MONITORING AT SNL, TTR

and early fall. During winter months, winter ranching camps are established south of Highway 6 in the Stone Cabin Valley area. Summer ranchers are found up to the NAFB Range Complex boundary during warmer months. Miners are also present during warmer months in the central Kawich Ranges. The zone of seasonal public receptors makes a substantial incursion towards SNL, TTR, in this area.

To the south, no public receptors are found because of the restricted areas in the Nevada Test Site (NTS).

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APPENDIX A

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Table A-1. EPA Routine Monitoring Frequency, Sample Size, Minimum Detectable Concentrations (MDC) and Concentration Guides (CG)

Nuclide	Sampling Frequency	Locations	Sample Size	Count Time	CG ^a MDC			MDC as %CG
			m ³	Minutes	Bq/m ³	nCi/m ³	mBq/m ³	
<u>Air Surveillance Network</u>								
⁷ Be	1/week	all	560	30	1700	47	17	1 x 10 ⁻³
⁹⁵ Zr	1/week	all	560	30	12	0.3	4.1	4 x 10 ⁻²
⁹⁵ Nb	1/week	all	560	30	110	3	1.8	2 x 10 ⁻³
⁹⁹ Mo	1/week	all	560	30	110	3	1.5	2 x 10 ⁻³
¹⁰³ Ru	1/week	all	560	30	58	1.5	1.8	3 x 10 ⁻³
¹³¹ I	1/week	all	560	30	4	0.1	1.8	4 x 10 ⁻²
¹³² Te	1/week	all	560	30	17	0.5	1.8	1 x 10 ⁻²
¹³⁷ Cs	1/week	all	560	30	12	0.3	1.8	2 x 10 ⁻²
¹⁴⁰ Ba	1/week	all	560	30	120	3	4.8	4 x 10 ⁻³
¹⁴⁰ La	1/week	all	560	30	120	3	2.6	2 x 10 ⁻³
¹⁴¹ Ce	1/week	all	560	30	52	1.4	3.0	6 x 10 ⁻³
¹⁴⁴ Ce	1/week	all	560	30	1.2	0.03	12	1.0
²³⁹ Pu	1/month	all	1120	1000	5 x 10 ⁻⁴	1 x 10 ⁻⁵	1.48 x 10 ⁻³	0.32
Gross β	1/week	all	560	30	2 x 10 ⁻²	5 x 10 ⁻⁴	0.11	6 x 10 ⁻¹
³ H	1/week	17	5	150	4.6 x 10 ³	125	148	3 x 10 ⁻³
⁸⁵ Kr	1/week	17	0.4	200	2.2 x 10 ⁴	620	148	6 x 10 ⁻⁴
¹³³ Xe	1/week	17	0.4	200	1.8 x 10 ⁴	490	370	2 x 10 ⁻³
¹³⁵ Xe	1/week	17	0.4	200	2.3 x 10 ³	62	370	2 x 10 ⁻²

Annual Limit of Intake (ALI) and Derived Air Concentration (DAC) values from International Commission on Radiation Protection (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-yr-old infant). NA = Not available.

^aAnnual Limit of Intake (ALI) and Derived Air Concentration (DAC) values from International Commission on Radiation Protection (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-yr-old infant). NA = Not available.

Table A-1. EPA Routine Monitoring Frequency, Sample Size, Minimum Detectable Concentrations (MDC) and Concentration Guides (CG) (Concluded)

Nuclide	Sampling Frequency	Locations	Sample Size	Count Time	CGa MDC	MDC as %CG
<u>Water Surveillance Network (LTHMP)^b</u>						
			<u>Liters</u>	<u>Minutes</u>	<u>Bq/l</u>	<u>Bq/l</u>
³ H	1/month	all	1	200	740	12
³ H+	1/month	all	0.1	200	740	0.37
⁸⁹ Sr	1st time	all	1	50	16	0.18
⁹⁰ Sr	1st time	all	1	50	0.8	0.074
¹³⁷ Cs	1/month	all	1	100	3.3	0.33
²²⁶ Ra	1st time	all	1	1000	1.4	NA
²³⁴ Ru	1st time	all	1	1000	8.2	NA
²³⁵ U	1st time	all	1	1000	10	NA
²³⁸ U	1st time	all	1	1000	10	NA
²³⁸ Pu	1st time	all	1	1000	6.2	0.003
²³⁹ Pu	1st time	all	1	1000	4.1	0.002
γ	1/month	all	3.5	30	--	0.18
<u>Dosimetry Network</u>						
			<u>Number</u>	<u>Exposure Guide</u>	<u>MDA</u>	
TLD (Personnel)	1/month	61	1	--	2 mR	2
TLD (Station)	1/quarter	154	6	--	2 mR	--
PIC	weekly	28	2016	--	2 μ R/hr	--

^aAnnual Limit of Intake (ALI) and Derived Air Concentration (DAC) values from International Commission on Radiation Protection (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-yr-old infant). NA = Not available.

^bLTHMP = Long-Term Hydrologic Program (EPA). For ³H, Sr, and Cs, the concentration guide is based on Drinking Water Regulations (4 mrem/yr).

APPENDIX B

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

Regulation	Applicable Activity
Nevada Wildlife Regulations	- Diversion of surface drainage channels
Nevada Revised Statute, Title 45, Chapter 501. NRS 501.010-501.243	- Clearing, leveling, and grading of site
Wildlife Regulations NAC 504.510-504.550	- 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
Nevada Air Quality Regulations	- Diversion of surface drainage channels
Nevada Revised Statutes, Title 40, Public Health and Safety, Chapter 445. NRS 445.401-445.601	- Clearing, leveling, and grading of site
NAC 445.430-445.995	- 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
Nevada Water Pollution	- Construction of operation of Control Regulations sewage treatment plant
Nevada Revised Statutes, Title 40, Public Health Safety, Chapter 445. NRS 445.131-445.354	- Disposal of drilling fluids
NAC 445.070-445.194	- Water treatment plant
Nevada Regulations Solid Waste Management	- Clearing, leveling, and grading of site
Nevada Revised Statutes, Title 40, Public Health and Safety, Chapter 444. NRS 444.510-444.610	- Construction of support buildings
Regulations Governing Solid Waste Management	- 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
<hr/>	
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 lines - Installation 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 and Registration

Type of Activity	Permit Expiration Date	Report to Agency Due by	Comments
<u>Air Quality^a</u>			
1. Petro Storage JP-4	03/26/92		State of NV to REEC Co Permit #1312
2. Petro Storage JP-4	03/26/92		State of NV to REEC Co Permit #1313
3. Petro Storage JP-4	03/26/92		State of NV to REEC Co Permit #1314
4. Petro Storage JP-4	03/26/92		State of NV to REEC Co Permit #1315
5. Petro Storage Diesel #1	03/26/92		State of NV to REEC Co Permit #1311
6. Petro Storage Diesel #1			State of NV to REEC Co Registration Certification #1379
7. Dust	02/12/96		State of NV to REEC Co Large Batch Plant (Ross) Permit #2229
	02/19/96		Small Batch Plant (S. C. Johnson) Permit #2231
8. Crusher Cedarapids Mdl #1524	04/15/91		State of NV to DOE/NVO Permit to Construct #2274
9. Crusher Cedarapids Mdl #2416	04/15/91		State of NV to DOE/NVO Permit to Construct #2275

^aAir Quality Activities 1 to 6 apply to the surface tanks in Area X (Industrial Area).

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

Type of Activity	Permit Expiration Date	Report to Agency Due by	Comments
10. Screen Cedarapids Mdl #2416	04/15/91		State of NV to DOE/NVO Permit to Construct #2276
11. Screen Kolberg Mdl #1130x50	08/08/90	04/15/91	State of NV to DOE/NVO Permit to Construct #2277
12. Surface Disturbance		04/15/91	State of NV to REEC Registration Certificate #1400
13. Surface Disturbance	09/15/93	04/15/91	State of NV to DOE Air Quality Permit #1662
14. Open Burn (Fire Training)	11/06/91	10/15/90	State of NV to DOE/NVO Permit #91-11
15. Incinerator (MDL 500CA)	03/26/92	04/15/91	State of NV to REEC Permit #1316
<u>Water Systems</u>			
1. Mancamp Area Well 1A BLM Well	09/30/91	Monthly	State of NV to DOE/NVO Permit #NY-4068-12C
2. Industrial Area Well 3A Well 3B Well EH-2	09/30/91	Monthly	State of NV to DOE/NVO Permit #NY-5001-12NC
3. SNL Compound Well 6	09/30/91	Monthly	State of NV to DOE/NVO Permit #NY-3014-12NC
4. TECR (O&M) Well	09/30/91	Monthly	State of NV to DOE/NVO Permit #NY-5002-12NC

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

Type of Activity	Permit Expiration Date	Report to Agency Due by	Comments
<u>Sewage System</u>			
1. TIADS Mancamp Industrial Area	08/20/92	Quarterly	State of NV to DOE/NVO Permit #NEV20001
<u>Miscellaneous</u>			
1. Borrow Pit (BLM) Outside TTR Main Gate	09/16/92 10/16/92	09/16/89	Department of Interior BLM to DOE-TTR Permit #NV67-FU8-05
<u>Hazardous Waste</u>			
1. Tonopah Test Range (TTR)			EPA to DOE-TTR EPA I.D. #NV3570090016

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