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1988 Environmental Monitoring Report Tonopah Test Range Tonopah, Nevada

G. Millard, R. Hamilton, J. Phelan, G. West

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1988 ENVIRONMENTAL MONITORING REPORT TONOPAH TEST RANGE TONOPAH, NEVADA

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Prepared for the U.S. Department of Energy
in Compliance with U.S. DOE Order 5400.1

G. C. Millard, R. G. Hamilton, J. Phelar
Environmental Protection Division, 3202

G. L. West
Range Operations Division, 7173

Sandia National Laboratories
Albuquerque, New Mexico 87185

ABSTRACT

The Tonopah Test Range is located about 140 air miles northwest of Las Vegas, Nevada, and covers 624 square miles within the Nellis Air Force Base Bombing and Gunnery Range. The range is used for various USDOE and USDOD program tests that are critical to national defense. Activities that affect the environment are mainly road construction, preparation of instrumentation sites, and disturbance of the terrain from weapons testing. Monitoring of the test range is done routinely by the U.S. Environmental Protection Agency (EPA) to supplement Sandia's monitoring effort associated with Sandia test activities. EPA monitoring results for 1988 indicate that test range operations do not adversely affect the off-site environment or the public.

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ABBREVIATIONS

Acronyms

ADM	Action Description Memorandum
AL	Albuquerque Operations Office (DOE)
ALI	Annual Limit of Intake
BLM	Bureau of Land Management
CG	Concentration Guide
CP	Control Point
DAC	Derived Air Concentration
DOD	Department of Defense
DRCF	Dose Rate Conversion Factor
DRI	Desert Research Institute
EA	Environmental Assessment
EPA	Environmental Protection Agency
ER	Environmental Restoration (Program)
ICRP	International Commission on Radiation Protection
LTHMP	Long Term Hydrologic Monitoring Program (EPA)
MDA	Minimum Detectable Activity
MDC	Minimum Detectable Concentrations
MDL	Minimum Detectable Level
NBS	National Bureau of Standards
NTS	Nevada Test Site
NV	Nevada
NVO	Nevada Operations Office
PIC	Pressurized Ion Chamber
RCG	Radiation Concentration Guide
REECo	Reynolds Electrical and Engineering Company
SD	Standard Deviation
SE	Standard Error
SNL	Sandia National Laboratories
TLD	Thermoluminescent Dosimeter
TTR	Tonopah Test Range
USDOE	United States Department of Energy
USEPA	United States Environmental Protection Agency

System International Prefixes

Exponent	Prefix	Symbol	Exponent	Prefix	Symbol
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

g	gram
ha	10,000 square meters
°C	Celsius degree
m	meter
% moisture	weight percent of water
L	liter
ml	milliliter
h	hour

Symbols

σ	statistical variance
s	standard deviation
$\bar{x}$	mean value
$s_{\bar{x}}$	standard error of the mean
>	greater than
<	less than
β^-	Beta particle
α	Alpha particle
P	Statistical probability
HTO	Tritiated water

Radioactivity Measurements

μR	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)

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1988 ENVIRONMENTAL MONITORING REPORT
TONOPAH TEST RANGE, TONOPAH, NEVADA*

INTRODUCTION

The Tonopah Test Range (TTR) is located about 140 miles (225 km) northwest of Las Vegas, Nevada (Figure 1). TTR covers 624 square miles (1,616 km^2) 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 and the U.S. Forest Service. The nearest population center is Goldfield (402 population)[1] which is about 25 miles (40 km) west of TTR. The next closest populated area is Tonopah with a population of 3,114.[2] It is located 30 miles (48 km) northwest of TTR.

GEOLOGY AND CLIMATOLOGY

TTR is described in detail in an Environmental Assessment (EA) prepared in 1977.[3] TTR is situated in a high desert and consists of broad valleys surrounded by north-south trending mountain ranges. The geology of TTR is described in: Geology of the Nevada Test Site and Nearby Areas - Southern Nevada.[4] An unpublished survey report (M. Whelan, November 1962: Magnetometer Survey and Report of Part of the Tonopah Test Range in Nye County, Nevada), briefly describes fault locations at TTR as determined from a magnetometer survey of the central portion of TTR.

The climate[5] is mild and usually dry, but as is typical of high deserts, 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). Clear, sunny days with light to moderate winds are usual. Average rainfall is about 5 inches (12.7 cm) per year in the valley[3] with most of the precipitation occurring in August.[5]

Historical meteorology summary data are available in a publication entitled Climatology of TTR.[5] Current meteorological data are obtained only during a test at TTR. Additional weather information may be available from the meteorologist at the adjacent Nevada Test Site (NTS).

Due to the temperature extremes and arid conditions at TTR, the valley in which most of the TTR activities occur is sparsely covered with range grasses and low shrubs.[3,6] Joshua trees are found in the foothills and juniper trees are found in the foothills and mountains. There are no perennial streams and few permanent springs at TTR.

TTR OPERATIONS

The prime mission of TTR (Figure 2) is to provide research and development (R&D) test support for United States Department of Energy (USDOE) nuclear

*This report was prepared by Sandia National Laboratories, Albuquerque, to fulfill the requirements of USDOE Order 5400.1 and is for calendar year 1988.

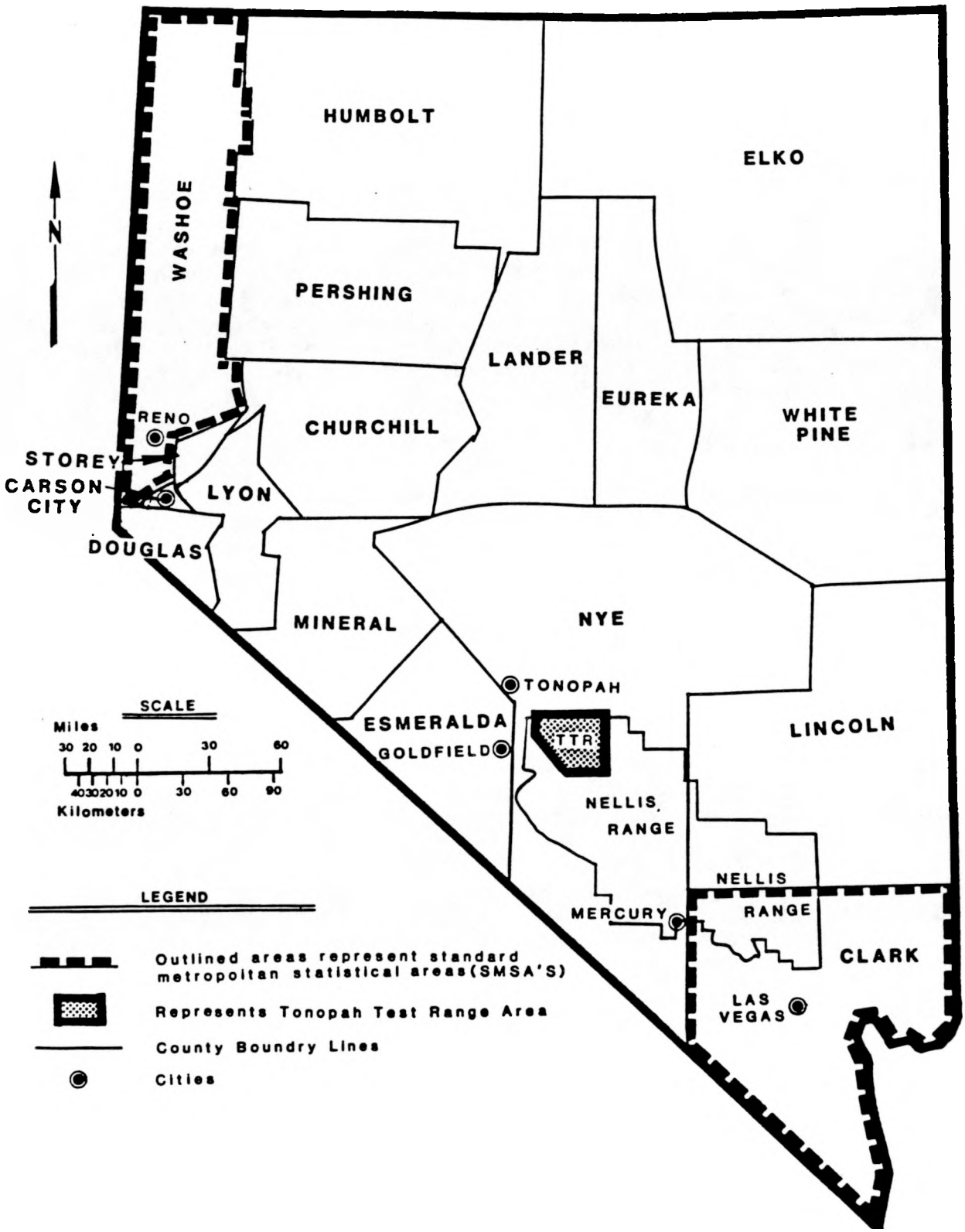

Figure 1. Map of Nevada, Showing Locations of Tonopah Test Range

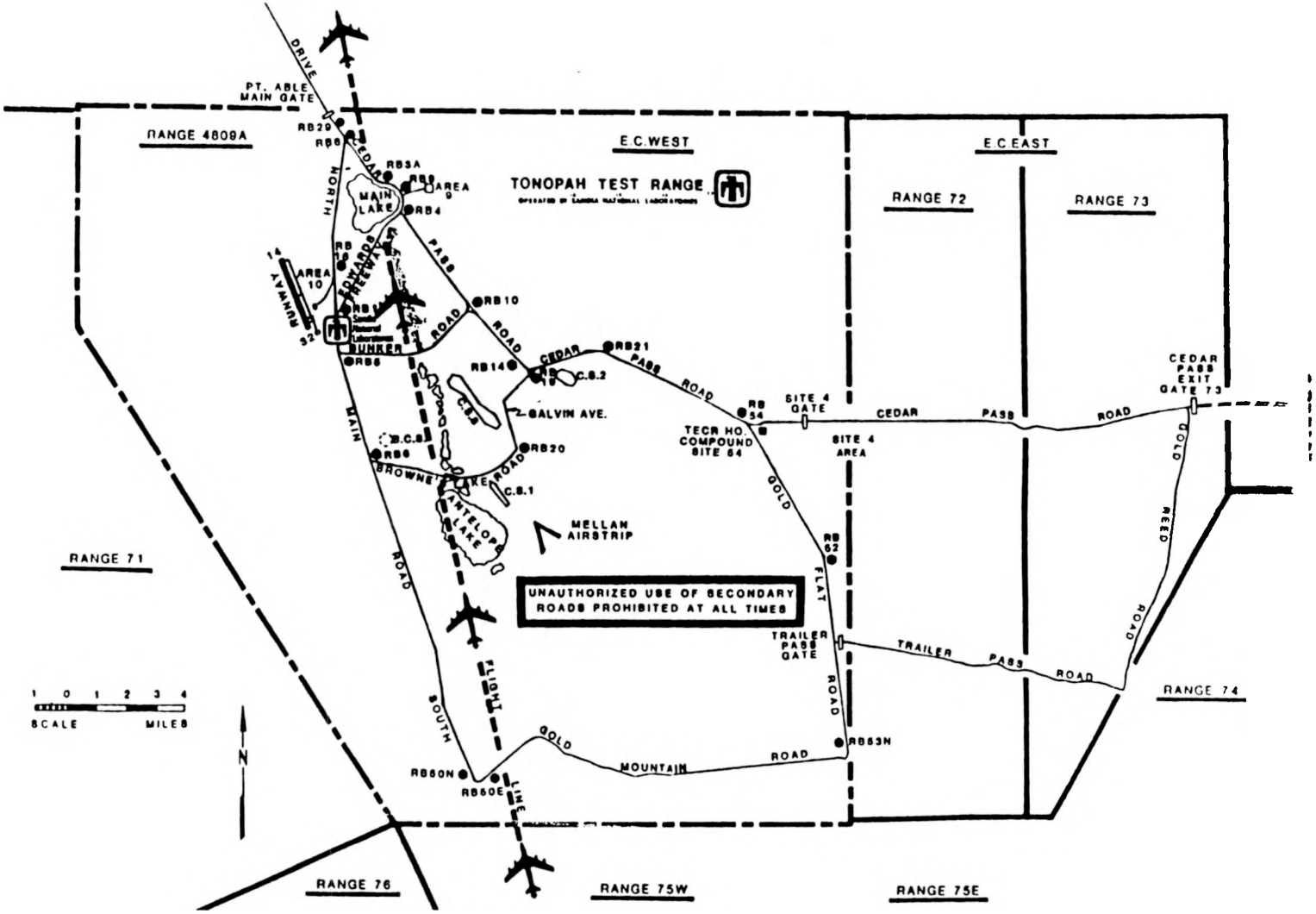

Figure 2. Sandia National Laboratories Facilities at the Tonopah Test Range C.P. Area

ordinance programs. Test support for other government agencies is also provided on a reimbursable, noninterference basis.

Sandia National Laboratories activity[7] at TTR includes air drops, artillery projectile firings, ground launched rockets (both high altitude and low altitude), air launched rockets, explosion effects tests, earth penetrator tests, cruise missile flights, and many miscellaneous activities requiring a remote range for safety or security reasons.

TTR instrumentation includes tracking radars, optical tracking and recording instruments, telemetry receiving and recording equipment, and extensive radio and hardwire communication systems.

Sandia began operation at TTR in 1957 after similar facilities at Salton Sea, California, and Yucca Flat, Nevada, became inadequate. TTR was previously used as a bombing range by the U.S. Air Force.

Personnel in support of Sandia operations usually number about 200. Sandia personnel are primarily located at the Control Point (Station Three), which is the center of operations for range and test activities. It is identified as Sandia National Laboratories in Figure 2. Several other Department of Defense agencies have also established operations on TTR.

The environmental effects of operating the TTR are mainly modification of existing desert terrain to allow operations such as road and runway construction, preparation of instrumentation sites, and technical support areas. The environmental impacts are described in the Environmental Assessment for TTR.[3]

Sewage waste consisting primarily of sanitary waste is disposed of in septic tanks and associated drain fields.

Environmental effects of test operations are usually noise (from aircraft, rockets or guns), and scars in the terrain resulting from impact and recovery of test units.

Some test units contain materials potentially hazardous to the environment such as beryllium, uranium or plutonium. Test procedures are designed to minimize the potential of materials being released to the atmosphere. Trained personnel with the required safety equipment are available to monitor and mitigate any unintentional release.

A series of tests, called Roller Coaster,[8] were conducted on TTR and the Range Complex in 1963 to study plutonium (principally Pu-239) dispersal from accidental non-nuclear explosions of plutonium-bearing weapons. These tests resulted in three contaminated areas on TTR ("Clean Slate" 1, 2, and 3) and a contaminated area on the Nellis Range Complex (Double Track). These areas are fenced and posted to administratively restrict access.

None of the present activities on Tonopah Test Range are considered to have an effect on the off-site environment and none affect the public due to the very small releases and the 40 km distance from Goldfield, Nevada.

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

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

These other agencies include the following:

USEPA

USEPA (USEPA, Las Vegas, Environmental Monitoring Systems Laboratory), under an interagency agreement with USDOE, monitors background radiation at TTR as part of its Off-Site Radiation Monitoring Program and reports to USDOE/NVO on a quarterly and annual basis. EPA forwards current year data to SNL, Albuquerque for inclusion in the annual 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 USDOE 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 Lab in Las Vegas provides the equipment and performs the analysis and reporting. The DRI also provides external quality assurance on the field measurements taken by EPA at the Community Monitoring Stations. Selected locations are monitored by 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 data and DRI data at the selected locations are reported annually by DRI. DRI also does other monitoring, primarily hydrology, for USDOE as requested. This may include evaluating environmental impacts due to road construction.

REECo

REECo (NTS), as part of their TTR support activities, also performs environmental monitoring activities at TTR. This monitoring includes water monitoring and obtaining permits in compliance with EPA regulations.

The radiological analysis results for TTR wells were published by REECo in the annual NTS environmental monitoring report until 1984. Starting in 1986, data for the SNL, Albuquerque Well 6 at the CP area (as well as information on other TTR wells) and relevant permit information have been forwarded to SNL, Albuquerque so that these data can be reported in the annual TTR environmental monitoring report published by SNL, Albuquerque.

REECo has also been involved in special studies at TTR such as soil monitoring for plutonium at the Clean Slate Areas (Roller Coaster Project).

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

USDOE Nevada Applied Ecology Group

The Nevada Applied Ecology Group was active in the 1970s and published a number of reports which described soil sampling results at NTS and surrounding areas.

EG&G Energy Measurements Group

The EG&G Energy Measurements Group, under contract to the Applied Ecology Group, did an aerial radiological survey of the TTR Clean Slate Areas in 1977. A report was published in 1979.[8]

EG&G also published a report in 1979 on the status of endangered plant species at TTR.[6]

PROJECT ROLLER COASTER TESTS

HISTORICAL INFORMATION

Project Roller Coaster included a series of plutonium dispersal tests at TTR and the Nellis Gunnery Range. The tests were executed May to June 1963. All four test areas are now fenced to prevent access.

Table 1. Roller Coaster Test Information*

TEST	Clean Slate 1	Clean Slate 2	Clean Slate 3	Double Track
DATE	25 May 1963	31 May 1963	9 June 1963	15 May 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

*Data from report provided by REECo Environmental Sciences Department/NTS, October 31, 1986.
**Placed using 1000 cpm detection level.

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 FIDLER (Field Instrument for the Detection of Low Energy Radiation) 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), Pu-239, and Pu-240 were drawn for each area and results were published.[8]

Annual FIDLER monitoring was done 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 done at the test areas. Twice a year 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 done. Because the blading covered the surface contamination, 90% of the activity at the Clean Slate Areas is expected to be within the top 7.62 cm of soil. An estimated 4.53×10^5 cubic meters of soil are contaminated.

EPA has also performed soil sampling[9] at TTR for special projects. 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.)

1988 EPA MONITORING RESULTS AT TTR

BACKGROUND

EPA does the most extensive routine monitoring at TTR. This includes thermoluminescent dosimeters (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, quality assurance, and detection limits can be found in the annual Off-Site Environmental Monitoring Report published by EPA.[10]

Routine sample results are reported on a quarterly basis to USDOE/NVO. Copies of these data have been provided to SNL, Albuquerque, 3202, and are summarized in Tables 2 through 6.

LOCATION

EPA has a monitoring station located at the TTR Control Point (Station 3) adjacent to the medical aid station. Water samples are collected at TTR Well 6.

Results from sample analysis can be compared to data 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 miles (40 km) west of TTR. Tonopah is 30 miles (48 km) northwest of TTR. Las Vegas is 140 miles (225 km) southeast of TTR.

SOIL SAMPLING

Soil sampling is not done on a routine basis by EPA at TTR. Soil sampling and radiation surveys have been done in the past.[9]

EXTERNAL RADIATION

External radiation measurements are done primarily with TLDs. TLDs are exchanged quarterly. A Harshaw TLD-200 (CaF_2) system consisting of three cards, each with two TLDs, was used to monitor external radiation exposure through 1986. A Panasonic TLD system (consisting of four $CaSO_4$ TLDs per card) was placed in the field in 1986 concurrent with the Harshaw system with the intention of obtaining comparative values prior to the discontinuance of the Harshaw system in January 1987. All 1988 average exposure values are from Panasonic dosimeters. Table 2 summarizes TLD data for TTR and nearby areas. Environmental background is determined by an average of the previous four quarters. Harshaw CaF_2 TLDs were used in the fourth quarter for environmental background measurements.

Reuter Stokes PICs (Pressurized Ion Chamber) are located at the Goldfield Nevada, and Tonopah, Nevada, community monitoring stations. Quarterly summary data are provided for Goldfield and Tonopah in Table 3.

Table 2. Summary of 1988 EPA Dosimetry Network Exposures*

Sample Location	1988 Quarter	Average Exposure (μR/h) ± 1s	Environmental Background (μR/h) ± 1s	Net Exposure Increment mR ± S.E.
Tonopah Test Range	1	No Data	No Data	
	2	10.5 ± 0.1	13.2 ± 3.3	0.0
	3	10.3 ± 0.3	11.8 ± 2.9	0.0
	4	10.8	10.8	0.0
Tonopah, NV	1	No Data	No Data	
	2	11.0 ± 0.4	12.5 ± 2.6	0.0
	3	11.1 ± 0.4	12.7 ± 2.3	0.0
	4	10.8	11.7	0.0
Clark Station, NV**	1	14.0 ± 0.5	12.3 ± 3.1	0.0
	2	10.0 ± 0.8	13.1 ± 2.8	0.0
	3	15.2 ± 0.6	12.3 ± 3.2	0.0
	4	10.4	12.1	0.0
Goldfield, NV	1	No Data	No Data	
	2	8.75 ± 0.25	9.58 ± 2.88	0.0
	3	8.38 ± 0.46	9.92 ± 2.33	0.0
	4	8.8	9.8	0.0

*Data from EPA "Interim Off-Site Monitoring Report-Nevada Test Site and Other Test Areas." Draft Quarterly Reports, 1988.
**Clark Station is located immediately north of TTR.

WATER

TTR is included in 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) to monitor 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 done[10] using a tritium enrichment analysis technique (MDC = 9 pCi/L). Gross alpha and gross beta analysis is not done on the routine samples. A detailed analysis including isotopic uranium and alpha count is only performed for initial samples at new sample locations.

Table 3. Summary of 1988 EPA Pressurized Ion Chamber (PIC) Data

Location	1988 Quarter	No. of 5 min. Readings	Average Exposure Rate* μrem/hr $\pm$ 1s	mrem/QTR
Goldfield, NV	1	21,248	16.5 $\pm$ 0.5	36.3
	2	19,068	15.7 $\pm$ 0.3	36.0
	3	25,546	15.6 $\pm$ 0.2	34.4
	4	17**	15.7 $\pm$ 0.2	36.0
Tonopah, NV	1	19,778	17.8 $\pm$ 0.4	39.2
	2	20,852	16.8 $\pm$ 0.4	38.5
	3	25,085	16.5 $\pm$ 0.2	36.4
	4	16**	16.8 $\pm$ 0.3	38.4

*Date from EPA "Interim Off-Site Monitoring Report-Nevada Test Site and Other Test Areas." Quarterly Reports, 1988.
**Number of weekly values.

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

Tritium concentrations reported by EPA for TTR Well 6 are compared to Las Vegas and Tonopah results (Table 4). No unexpected gamma-emitting radionuclides were detected so only tritium values are reported. All tritium concentrations observed were consistent with previous year's data.

AIR MONITORING

A continuous particulate air monitoring station is located at TTR as part of the EPA Air Surveillance Network. 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).

Beryllium-7 (^{7}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 6).

The noble gas and tritium analysis results reported in Table 6 were all well below the DOE derived radiation concentration guides. Air concentrations for ^{85}Kr averaged 30 pCi/m^3 throughout the air surveillance network. Tritium and ^{133}Xe concentrations were all less than or near the Minimum Detectable Concentrations (MDC). The MDC for Xenon-133 ranges from 4 to 40 pCi/m^3 depending on sample size and the time between collection and analysis.

Table 4. Summary of 1988 Analytical Results for the EPA Long-Term Hydrological Monitoring Program (LTHMP)*

Sample Location	1988 Quarter Report	Tritium* pCi/L Value ± 2σ	Percent DOE Concentration Guide
Clark St., NV	1	No Data	
Well 6 TTR	2	-2 ± 11**	<0.01
	3	No Data	
	4	180 ± 360**	<0.01
Tonopah, NV	1	No Data	
City Well	2	-6 ± 11**	<0.01
	3	No Data	
	4	40 ± 360**	<0.01
Las Vegas, NV	1	-3 ± 230**	<0.01
Well 28	2	No Data	
Water District	3	No Data	
	4	No Data	

*Data from EPA "Interim Off-Site Monitoring Report-Nevada Test Site and Other Test Areas. Quarterly Reports, 1988. Semiannual tritium analysis.
**Concentration is less than the minimum detectable concentration (10 pCi/L using electrolytic enrichment procedure).

Table 5. Summary of 1988 EPA Air Surveillance Network Results

Sample Location	1988 Quarter	Days Sampled	Average Concentration** pCi/m^3 ^{7}Be
TTR, NV	1	*	*
	2	58	0.11(43)
	3	57	0.44(65)
	4	*	*
Goldfield, NV	1	*	*
	2	*	*
	3	92	0.02(5)
	4	*	*
Tonopah, NV	1	*	*
	2	*	*
	3	90	0.52(12)
	4	*	*

*Negligible gamma spectra.
**Values are concentrations with % days detected reported in parenthesis.

Table 6. Summary of 1988 Analytical Results for the EPA Noble Gas and Tritium Surveillance Network

		Radionuclide - Average Concentration			
Sample Location	1988 Quarter	^{85}Kr (pCi/m^3)	^{133}Xe (pCi/m^3)	HTO (pCi/ml)	^{3}H in Air (pCi/m^3)
Goldfield, NV	1	26(0.03)	-0.66(<0.01)	-0.12(<0.01)	-0.029
	2	26(0.03)	1.5 (<0.01)	0.38(<0.01)	0.058
	3	25(0.05)	0.71(<0.01)	-0.17(<0.01)	-0.0041
	4	24(0.05)	-0.17(<0.01)	-0.31(<0.01)	-0.027
Tonopah, NV	1	26(0.03)	-9.6E(<0.01)	0.24(<0.01)	0.069
	2	25(0.02)	-0.23(<0.01)	0.50(<0.01)	0.059
	3	25(0.05)	1.2 (<0.01)	-0.46(<0.01)	-0.046
	4	25(0.05)	2.6 (<0.01)	0.081(<0.01)	0.0017

*Values are concentrations. Percent of DOE derived concentration guides are given in parentheses.

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1988 REECo MONITORING AND ENVIRONMENTAL COMPLIANCE ACTIVITIES AT TTR

BACKGROUND

REECo (NTS) environmental monitoring activities at TTR are limited to water monitoring and obtaining of permits in compliance with EPA regulations. Environmental compliance permits for TTR include potable water supply, burn, sewage, and tanks. These permits are updated annually or as necessary.

REECo collects water samples at the TTR wells and submits them to REECo Health Physics for radiological analysis. Samples are also collected for non-rad analysis.

The radiological analysis results for TTR wells were published[11] in the annual NTS monitoring report until 1984. Current year water sample data and permit information relevant to SNL, Albuquerque activities will be reported in the annual TTR environmental[12] monitoring report to the USDOE.[13]

LOCATION

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

PERMITS

Permit information and registration numbers (Table 7) were obtained from REECo. Descriptions of permits and registrations are included in the following discussions of the water, sewage and air quality at TTR.

Table 7. 1988 Permits/Registration Certificates for TTR, SNL, Albuquerque Activities*

Activity	Application Date	Permit Expiration Date	Comments
SNL, Albuquerque Well 6 CP Area	12/16/87	9/30/88	State of NV to REECo Permit # NY-3014-12NC

*Data from REECo 1987 report.

WATER

The SNL, Albuquerque water system is located at the CP Area and consists of one well (SNL, Albuquerque Well 6). It is the only potable water supply owned by SNL, Albuquerque. It is 743 ft deep with a low water level of 426 ft (as of October 9, 1981). It was constructed in 1963. Other nonpotable, construction supply wells, as well as potable non-SNL, Albuquerque wells, are also located at 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 TTR environmental monitoring report. Bi-monthly samples of water are collected and sent to the Nevada State Health Laboratory for bacteriological analysis (coliform) according to state requirements. Samples are also 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.[14] 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 NTS for analysis within 24 hours of collection. The analysis is for gross alpha, gross beta, tritium, strontium-90 and plutonium-239. A 20-minute gamma count is also done.

Table 8 summarizes the results for the 1987 water samples collected at Well 6 in February, June, September and July 1987. Data from 1988 is not yet available. Results from other non-SNL, Albuquerque wells at TTR are provided as well. These values are comparable to results reported for NTS wells in the 1986 NTS Environmental Monitoring Report.[11] Analysis techniques and associated detection levels are included in the NTS report.[11]

SEWAGE SYSTEM

SNL sewage at 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.

During CY1988 a survey was done by Environmental Protection Division 3202 to determine the regulatory status of the septic tanks associated with SNL facilities. The results of the survey will be available in CY1989 and will be used to guide appropriate regulatory actions.

A sewer line connecting all buildings at TTR is planned for construction during FY89. The line will flow into the permitted DOE facultative lagoons. At that time, all septic tank usage will be discontinued.

Table 8. Tonopah Test Range Supply Wells Subject to the Safe Drinking Water Act - Analysis Results*

Location	Date	Analysis (value ± 2 σ error)** ^{3}H pCi/ml	Alpha 10^{-3} pCi/ml	Beta 10^{-3} pCi/ml	Gamma pCi/ml	^{90}Sr 10^{-3} pCi/ml	^{239}Pu 10^{-3} pCi/ml
Well 6	02/13/87	<1.4	<6.4	7.47 ± 12.4	<MDL	<0.45	<0.043
(SNL)	06/05/87	<1.1	<6.6	8.64 ± 11.2	<MDL	<650	<0.089
	09/01/87	<0.87	<3.9	3.09 ± 24.0	<MDL	<0.35	<0.030
	12/01/87	<0.74	---	7.25 ± 15.5	<MDL	<0.51	<0.45
Well 3A	02/13/87	<1.4	<4.8	6.68 ± 13.1	<MDL	<0.58	<0.034
	06/05/87	<1.1	<5.0	9.67 ± 13.9	<MDL	<420	<0.089
	09/01/87	<0.87	<4.0	6.02 ± 13.6	<MDL	<0.39	<0.043
	12/01/87	<0.74	---	6.53 ± 16.9	<MDL	<0.75	<0.42
Well BLM	02/13/87	<1.4	<6.4	7.09 ± 12.9	<MDL	<0.44	<0.053
	06/05/87	<1.1	<6.6	6.98 ± 13.4	<MDL	<650	<0.098
	09/01/87	<0.87	<3.7	12.2 ± 24.1	<MDL	<0.33	<0.82
	12/01/87	<0.74	---	8.00 ± 14.8	<MDL	<0.50	<0.32
Well AF	02/13/87	<1.4	<4.9	7.73 ± 11.9	<MDL	<0.67	<0.041
	06/05/87	<1.1	12.8 ± 280.7	11.9 ± 11.7	<MDL	<420	<0.13
	09/01/87	<0.87	5.2 ± 39.1	7.46 ± 11.4	<MDL	<0.28	<0.38
	12/01/87	<0.74	---	8.09 ± 14.1	<MDL	<0.48	<0.54

*Data provided by REECo for 1987. Data for 1988 is not yet available.

**Screening level standard for gross alpha is 5×10^{-3} pCi/ml and for gross beta is 1.5×10^{-2} pCi/ml. Maximum contaminant levels for ^{3}H and ^{90}Sr are 20 pCi/ml and 8×10^{-3} pCi/ml respectively.

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UNUSUAL OCCURRENCES

There were no unusual occurrences in TTR in 1988. Routine testing activities at TTR in 1988 resulted in the release of limited quantities of depleted uranium and beryllium on and in the ground. Generally, only milligram quantities of these materials were potentially released into the air since all test components were recovered intact.

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OTHER ENVIRONMENTAL COMPLIANCE ACTIVITIES

ADMs REVIEWED FOR TTR IN 1988

Action Description Memorandums (ADMs) are written in compliance with NEPA requirements and AL Order 5440.1B, "Implementation of the National Environmental Policy Act (NEPA)." Tests which are not covered under the 1975 TTR EA[3] and which have a potential for an environmental impact may be required to have an ADM. The ADMs, if deemed necessary, are written by the organization responsible for the test and are reviewed by SNL, Albuquerque personnel prior to submission to USDOE for review and approval. The ADMs reviewed by SNL, Albuquerque and submitted to USDOE in 1988 are listed in Table 9.

Table 9. ADMs Reviewed for TTR in 1988

ADMs for TTR in 1988*
None

*ADM = Action Description Memorandum

ENVIRONMENTAL RESTORATION (ER) PROGRAM

The ER Program is a phased DOE program to identify, assess, and correct past spill, release or disposal sites at all DOE/AL facilities including Sandia National Laboratories, Tonopah. The methodology parallels the EPA Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) program to identify, characterize and cleanup inactive release sites.

As required under CERCLA/SARA Section 120(d) a Preliminary Assessment (PA) must be submitted for all facilities listed on the Federal Agency Hazardous Waste Compliance Pocket. To fulfill that requirement, the identification of all potential release sites was performed and PAs were submitted on April 14, 1988. Fourteen sites separated into three tasks (Table 10) were identified for future investigations.

REPORTING

SNL, Albuquerque compiles all relevant environmental data and information and prepares the annual TTR Environmental Monitoring Report[12] for USDOE.[13] The sources of information include EPA/Las Vegas and REECo. The annual TTR Environmental Monitoring report is unclassified and is available for public distribution following acceptance of the final report by USDOE.

Table 10. Sandia National Laboratories Environmental Restoration (ER) Program Sites at TTR.

ER Program Task	Site Name
AL-SA-15 (Tonopah Test Range, Area 3)	Area 3 Underground Diesel Tank
	Area 3 Landfills
	Fire Training Area
	Waste Oil Sumps, Bldg. 360
	Area 3 Septic Tanks and Leach Fields
	Photo Shop French Drains
AL-SA-16 (Tonopah Test Range, Area 9)	High Explosive Disposal Area
	Area 9 Landfill
	Mobile Photographic Lab
AL-SA-17 (Tonopah Test Range, Test Areas)	Non-Violent Explosive Destruct System (NEDS) Site
	Antelope Lake
	Cactus Springs
	Roller Coaster Radioactive Decontamination Area
	Roller Coaster Sanitary Sewage System and Lagoons

SNL, Albuquerque may also prepare reports (ADMs) for specific tests which describe the tests and potential environmental impacts. They may be classified or unclassified and are not generally available for public distribution.

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

REECo: Annual Permits/Registration Certificates for TTR

Environmental Protection Agency (EPA), Dose Assessment Branch, Nuclear Radiation Assessment Division: Interim Off-Site Monitoring Report-Nevada Test Site and Other Test Areas, Quarterly Report

Environmental Protection Agency, Dose Assessment Branch, Nuclear Radiation Assessment Division: Off-Site Environmental Monitoring Report: Radiation Monitoring Around United States Nuclear Test Areas, Calendar Year Report

Desert Research Institute (DRI), University of Nevada System: Community Radiation Monitoring Program, Annual Report.

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5. J. R. Schaeffer, Climatology of the Tonopah Test Range, 1967, SC-M-68-522 (Albuquerque: Sandia National Laboratories, 1982).

6. EG&G, Status of Endangered and Threatened Species on Tonopah Test Range - A Survey, October 1979.

7. R. Manhart, Technical Manual Tonopah Test Range Capabilities, SAND81-1871 (Albuquerque: Sandia National Laboratories, November 1982).

8. An Aerial Radiological Survey of Clean Slates 1, 2, and 3, and Double Track, Tonopah Test Range, EGG-1183-1737, EG&G, 1979.

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10. R. F. Grossman, S. C. Black, R. E. Dye, D. D. Smith, D. J. Thome, A. A. Mullen, and Nuclear Radiation Assessment Division, Offsite Environmental Monitoring Report, Radiation Monitoring Around the United States Nuclear Test Areas, Calendar Year 1985, EPA-600/4-86-022, DOE/DP/0539-055, USEPA, Las Vegas, Nevada, April 1986.

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12. Gloria C. Millard and Gary L. West, 1987 Environmental Monitoring Report, Sandia National Laboratories, Tonopah Test Range, Tonopah, Nevada, SAND88-0698 (Albuquerque: Sandia National Laboratories, April 1988).

13. R. J. Stern, U.S. DOE Memorandum, February 28, 1986, "Preparation of Annual Site Environmental Reports for Calendar year 1986."

14. M-14 Environmental Surveillance Program, Sampling and Analysis, Jan. 1987 Update, REECo Standard Procedures Manual, RE-1002, 8/79.

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APPENDIX A

EPA SAMPLE COLLECTION ANALYSIS MDC CONCENTRATION GUIDES

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Table A.1. EPA Routine Monitoring Frequency, Sample Size, MDC and Concentration Guides*

Nuclide	Sampling Frequency	Locations	Sample Size	Count Time	Concentration Guide*		MDC	MDC as %CG
Air Surveillance Network			m^3	Minutes	kBq/m^3	nCi/m^3	mBq/m^3	
Be-7	3/wk	all	160-240	30	2.9	80	17	6E-4
Zr-95	3/wk	all	160-240	30	0.009	0.25	4.1	4E-2
Nb-95	3/wk	all	160-240	30	0.09	2.5	1.8	2E-3
I-131	3/wk	all	160-240	30	0.003	0.06	1.8	6E-2
Cs-137	3/wk	all	160-240	30	0.009	0.25	1.8	2E-2
Gross Beta	3/wk	all	160-240	30	1.5E-5	0.4E-4	0.11	7.5E-1
H-3	1/wk	16	5	200	3.6	98	148	4E-3
Nobel Gas Tritium in Air								
Kr-85	1/wk	16	0.4	200	22	600	14	6E-5
Xe-133	1/wk	16	0.4	200	18	480	14	8E-5
Water Surveillance Network (LTHMP)			Liters	Minutes	Bq/l	pCi/l	Bq/l	
H-3	1/mo	all	1	200	740	2E4	12	1.6
H-3 (Enrich)	1/mo	all	0.1	200	740	2E4	0.37	5E-2
Sr-89	1/mo	all	1	50	550	1.5E4	0.18	0.03
Sr-90	1/mo	all	1	11	20	540	0.074	0.37
Cs-137	1/mo	all	1	100	110	3000	0.33	0.3
Ra-226	1st time	all	1	1000	2.4	66	NA	
Gamma	1/mo	all	3.5	30	--	--	0.18	<0.2

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

Nuclide	Sampling Frequency	Locations	Sample Size	Count Time	Concentration Guide*	MDC	MDC as %CG
Dosimetry Network			Number		Exposure Guide	MDA	
TLD (Station)	1/qtr	130	6	--	--	2mR	--
Ion Chamber (PIC)	weekly	23	2016	--	--	2μR/hr	--

NA - Not Available.

*Information is taken from EPA "Interim Off-Site Monitoring Report - Nevada Test Site and Other Test Areas." Draft Quarterly Reports, 1987.

**ALI and DAC values from ICRP-30 modified to 1.0 mGy annual dose equivalent for continuous exposure and to 70 year dose commitment for Sr, Ra, U, and Pu. Te and I data corrected to 2 g thyroid, greater milk intake, and smaller volume of air breathed annually for 1 year-old infant. Concentration Guides are DOE derived Concentration Guides.

SUMMARY ASSESSMENT
ENVIRONMENTAL COMPLIANCE ACTIVITY
U.S. DEPARTMENT OF ENERGY,
SANDIA NATIONAL LABORATORIES, ALBUQUERQUE
TONOPAH TEST RANGE

BACKGROUND

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

Comprehensive Environmental Response Compensation and Liability Act (CERCLA) -- As required under CERCLA/SARA Section 120(d) a Preliminary Assessment (PA) must be submitted for all facilities listed on the Federal Agency Hazardous Waste Compliance Pocket. To fulfill that requirement, the identification of all potential release sites was performed and PAs were submitted on April 14, 1988. Fourteen sites separated into three tasks were identified for future investigations.

Clean Air Act (CAA) -- SNL, Albuquerque at TTR is regulated by CAA and the Nevada Air Quality Regulations published in Nevada Revised Statutes, Title 40 - Public Health and Safety, Chapter 445. None of the 1988 activities on TTR affected off-site environment and the public. No corrective activities for air emission are anticipated for TTR. However, all future tests involving potential release of radioactive material, incluing depleted uranium, will have off-site dose calculations performed according to the AIRDOS-EPA model as required by National Emission Standards for Hazardous Air Pollutants (NESHAPs) regulations by the EPA for radionuclide air emissions.

Clean Water Act (CWA) -- SNL, Albuquerque at TTR is regulated by CWA and the Nevada Water Pollution, Public Water Supply and Public Water System, and Sewage Systems regulations. Drinking water for 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 waste is disposed via septic tanks and associated drain fields. The septic tanks are permitted by the State of Nevada. No corrected actions for water are anticipated for TTR.

Resource Conservation and Recovery Act (RCRA) -- SNL, Albuquerque at TTR is a less-than-90-day generator of hazardous waste. Hazardous chemical wastes are colleted, packaged and shipped off-site to an EPA-permitted disposal facility. Programs are being brought into compliance with RCRA regulations governing less-than-90-day generators.

CURRENT ISSUES AND ACTIONS (for Tonopah Test Range)

Underground Storage Tanks (40 CFR 280)--All USTs identified so far (total of six) have been registered with the state of Nevada. Two of these USTs will be either removed or upgraded to ensure compliance with the regulation.

Septic Tanks / Sewage line-- 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 Forces's facultative lagoon. This sewer line will replace all septic tanks serving Station 3. A new monitoring station with flow-proportional sampler will be installed to monitor the waste water continuously.

A Spill Prevention and Control Plan for TTR is under preparation.

DOE F 1325.8
(8-89)

United States Government **Department of Energy**

memorandum

DATE: JAN 11 1990

REPLY TO ATTN OF: EH-232

SUBJECT: Approval of the Cover Letter to the 1988 Environmental Report

TO: Manager, Albuquerque Operations Office
Manager, Idaho Operations Office

This is to notify you that the cover memorandum with attachment for the 1988 Annual Environmental Report submitted to EH has been approved for distribution. Please ensure that a copy of this memorandum is attached to each distributed copy of the 1988 monitoring report.

Peter N. Brush
Acting Assistant Secretary for
Environment, Safety, and Health

Leo P. Duffy
Director
Office of Environmental Restoration and
Waste Management

Attachment

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Nevada Operations Office
Health Physics and Environmental Division
P.O. Box 14100
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Attn: D. C. Boyce

U.S. Department of Energy
Nevada Operations Office
Health Physics and Environmental Division
P.O. Box 14100
Las Vegas, NV 87114-4100
Attn: J. C. Burrows

REECo
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Las Vegas, NV 89114
Attn: O. L. Haworth
M.S. 708

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Las Vegas, NV 89114
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