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2007 LANL Radionuclide Air Emissions Report

Los Alamos
NATIONAL LABORATORY
EST. 1943

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David P. Fuehne

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U.S. Department of Energy Report

2007 LANL Radionuclide Air Emissions

Site Name: Los Alamos National Laboratory

Location: County of Los Alamos, New Mexico

Operations Office Information:

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Compliance Assessment:

2007 Off-Site Effective Dose Equivalent: 0.52 mrem

Executive Summary

This report describes the impacts from emissions of radionuclides at Los Alamos National Laboratory (LANL) for calendar year 2007. This report fulfills the requirements established by the National Emissions Standards for Hazardous Air Pollutants – Emissions of Radionuclides other than Radon from Department of Energy Facilities (Rad-NESHAP). This report is prepared by LANL's Rad-NESHAP compliance team, part of the Environmental Protection Division. The information in this report is required under the Clean Air Act and is being reported to the U.S. Environmental Protection Agency (EPA). The highest effective dose equivalent (EDE) to an off-site member of the public was calculated using procedures specified by the EPA and described in this report. LANL's EDE was 0.52 mrem for 2007. The annual limit established by the EPA is 10 mrem per year.

During calendar year 2007, LANL continuously monitored radionuclide emissions at 27 "major" release points, or stacks. The Laboratory estimates emissions from an additional 58 "minor" release points using radionuclide usage source terms in lieu of stack monitoring. Also, LANL uses a network of air samplers around the Laboratory perimeter to monitor ambient airborne levels of radionuclides. To provide data for dispersion modeling and dose assessment, LANL maintains and operates meteorological monitoring systems. From these measurement systems, a comprehensive evaluation is conducted to calculate the EDE for the Laboratory.

The EDE is evaluated as any member of the public at any off-site location where there is a residence, school, business, or office. In 2007, this location was on DP Road, adjacent to Materials Disposal Area B (MDA-B). MDA-B is a Manhattan Project-era waste disposal site that is preparing for cleanup. The evaluated location is Airnet station 71, near the west end of MDA-B. There are two buildings adjacent to this Airnet station, so to be conservative, we are using the geographical location of the station itself as the location of the maximally exposed individual. Significant contributors to the reported off-site dose included the potential emissions from non-monitored (minor) emissions sources and the ambient air sampling of plutonium at the EDE location. Doses reported to the EPA for the past 10 years are shown in Table E1.

Table E1. Ten-Year Summary of Rad-NESHAP Dose Assessment for LANL

Year	EDE (mrem)	Highest EDE Location
1998	1.72	2470 East Gate Dr.
1999	0.32	County Landfill Office
2000	0.64	2470 East Gate Dr.
2001	1.84	2470 East Gate Dr.
2002	1.69	2470 East Gate Dr.
2003	0.65	2470 East Gate Dr.
2004	1.68	2470 East Gate Dr.
2005	6.46	2470 East Gate Dr.
2006	0.47	Los Alamos Airport Terminal
2007	0.52	DP Road, Airnet Station 71

2007 Significant Events

Several events which took place in 2007 are worth discussion in this Executive Summary.

Rad-NESHAP External Audit. From March to June 2007, LANL hosted an external audit of the Laboratory's Rad-NESHAP compliance program. Earl Allred, Certified Lead Auditor, and Joe Lochamy, Certified Health Physicist, reviewed several areas of the program and gave evaluations and recommendations. The contract was issued in March 2007, with a site visit in April. The audit final report was delivered in June 2007. Specifically, the team reviewed the following topic areas:

- elevated Los Alamos Neutron Science Center (LANSCE) emissions in 2005 and LANL's implementation of the LANSCE Emissions Management Plan;
- overview of the LANSCE gas emissions calculations and peer review of the processes;
- planned emissions monitoring for legacy waste area clean-up, including general philosophy and implementation plan;
- LANL's new project review process for assessing Rad-NESHAP requirements of new and modified programs;
- various procedure reviews, including analytical chemistry data review and CAP88 dose assessment;

(continued next page)

- follow-through on audit findings from the 2004 external audit by Hamilton Consulting; and
- an evaluation of LANL program status in staffing and funding trends.

In general, the program was found to be effectively implementing the requirements of 40 CFR 61 Subpart H. There were three findings and several additional observations noted by the audit. These have been entered into the Environmental Protection Division's Action Item database and are being addressed. A summary of this audit can be found on the LANL Rad-NESHAP web site at the following address: http://int.lanl.gov/environment/air/neshap/audit.shtml

EPA Region 6 Inspection. In July 2007, Region 6 performed an inspection of the Laboratory's Rad-NESHAP compliance program. This inspection was a follow-up to the external audit discussed above and driven in part by concerns raised by citizens organizations. The Regional Health Physicist was on-site for a week in July. He visited several LANL sites, reviewed many LANL processes, and attended two public meetings. The outcome of the inspection was a positive evaluation of the Laboratory's compliance status.

Tritium Stack Consolidation. Throughout late 2006 and early 2007, the ventilation exhaust system at the Weapons Engineering Test Facility (WETF) at LANL Technical Area (TA) 16 was being upgraded. The WETF is expanding from the existing Building 205 and into the neighboring Building 450. This work culminated in the consolidation of the exhaust stacks of TA-16 Buildings 205 and 450. The discharge duct from Building 205 was redirected from its older exhaust stack, designated Exhaust Stack (ES) 4, and into the newer stack on Building 450, designated ES-5. With the stack consolidation in early July 2007, air exhaust from both the new and old sections of the WETF will be discharged from a single point. Note that since the existing Building 205 emissions monitor ("bubbler") is located in the rooftop exhaust duct and not part of the old stack, the old monitor continued to operate throughout the duration of this upgrade, and is still in operation today. This old bubbler measures emissions from Building 205 only, while the new stack is equipped with a bubbler that will measure emissions from both WETF buildings, 205 and 450.

To account for the relocation of the emissions point, LANL designated the stack sample change-out on July 10 as being the turnover date. The ventilation consolidation took place that week. Tritium emissions from January 2007 through the July 10 sample were exhausted from the "old" Building 205 stack, ES-4, and emissions from July 10 through the end of the year were exhausted from the "new" stack on Building 450, ES-5. Emissions were modeled using CAP88 and the appropriate stack-specific information as described above. A more complete description of the system upgrade, subsequent testing of the new stack sample location, and future plans will be sent to EPA Region 6 in a separate memo.

Planning for Future Operations. There are several upcoming activities at LANL which have been the focus of the Rad-NESHAP team in 2007.

- The cleanup of MDA B is currently scheduled to begin in the late 2008 or early 2009 time frame. This cleanup operation will require extensive air monitoring to ensure Rad-NESHAP compliance. A preconstruction application for this activity is being submitted to EPA Region 6 in the summer of 2008.
- The first phase of the Chemistry & Metallurgy Research – Replacement (CMRR) facility construction is underway. This first phase, the Radiological Laboratory/Utility/Office Building, will have a single monitored stack. The final stack design and associated performance testing has not yet been completed, but the sample system will be certified under American National Standards Institute/Health Physics Society N13.1-1999 prior to major radiological operations taking place in the building. Preconstruction approval for this phase of construction was received from EPA Region 6 in 2005.
- The second phase of the CMRR construction is planned to commence, at the earliest, in the 2010 time frame. This activity will require preconstruction approval from EPA Region 6. Per agreement with local citizen organizations, this application will incorporate public comment on the emissions monitoring systems and other issues. This preconstruction application will be sent to EPA Region 6 approximately six months before construction is planned to commence.
- Radioactive waste processing at TA-54 will be ramping up in late summer 2008, with plans for increasing throughput so that a previously non-monitored stack will require emissions monitoring. While this is an ongoing activity at LANL and thus is exempt from preconstruction notification, a full description of the processes and monitoring plans will be sent to EPA Region 6 as a separate memo.
- There are other facilities planned for which stack monitoring issues are a high priority. These include planned upgrades of the TA-55 Plutonium Facility stacks, the transuranic waste processing facility, and others. As plans finalize, updated communications with EPA Region 6 will take place.

2007 LANL Radionuclide Air Emissions Report

Abstract

The emissions of radionuclides from Department of Energy Facilities such as Los Alamos National Laboratory (LANL) are regulated by the Amendments to the Clean Air Act of 1990, National Emissions Standards for Hazardous Air Pollutants (40 CFR 61 Subpart H). These regulations established an annual dose limit of 10 mrem to the maximally exposed member of the public attributable to emissions of radionuclides. This document describes the emissions of radionuclides from LANL and the dose calculations resulting from these emissions for calendar year 2007. This report meets the reporting requirements established in the regulations.

Section I. Facility Information

61.94(b)(1) Name and Location of Facility

Los Alamos National Laboratory (LANL or the Laboratory) and the associated residential areas of Los Alamos and White Rock are located in Los Alamos County in north-central New Mexico, approximately 100 km (60 mi) north-northeast of Albuquerque and 40 km (25 mi) northwest of Santa Fe, (Figure 1).

61.94(b)(2) List of Radioactive Materials Used at LANL

Since the Laboratory's inception in 1943, its primary mission has been nuclear weapons research and development. Programs include weapons development, nonproliferation, magnetic and inertial fusion, nuclear fission, nuclear safeguards and security, and laser isotope separation. There is also basic research in the areas of physics, chemistry, engineering, and biology.

The primary facilities involved in the emissions of radioactivity are outlined in this section. The facility locations are designated by technical area (Figure 2) and building. For example, the facility designation TA-3-29 is Building 29 at Technical Area (TA) 3. Potential radionuclide release points are listed in several tables that follow. Some of the sources described below are characterized as non-point (diffuse and fugitive) emissions. Off-site impacts resulting from non-point emissions of radioactive particles and tritium oxide (HTO) are calculated using LANL's air sampling network (Airnet).

Radioactive materials used at LANL include weapons-grade plutonium, heat-source plutonium, enriched uranium, depleted uranium, and tritium. Also, a variety of materials are generated through the process of activation; consequent emissions occur as gaseous mixed activation products (GMAP) and other particulate or vapor activation products (P/VAP).

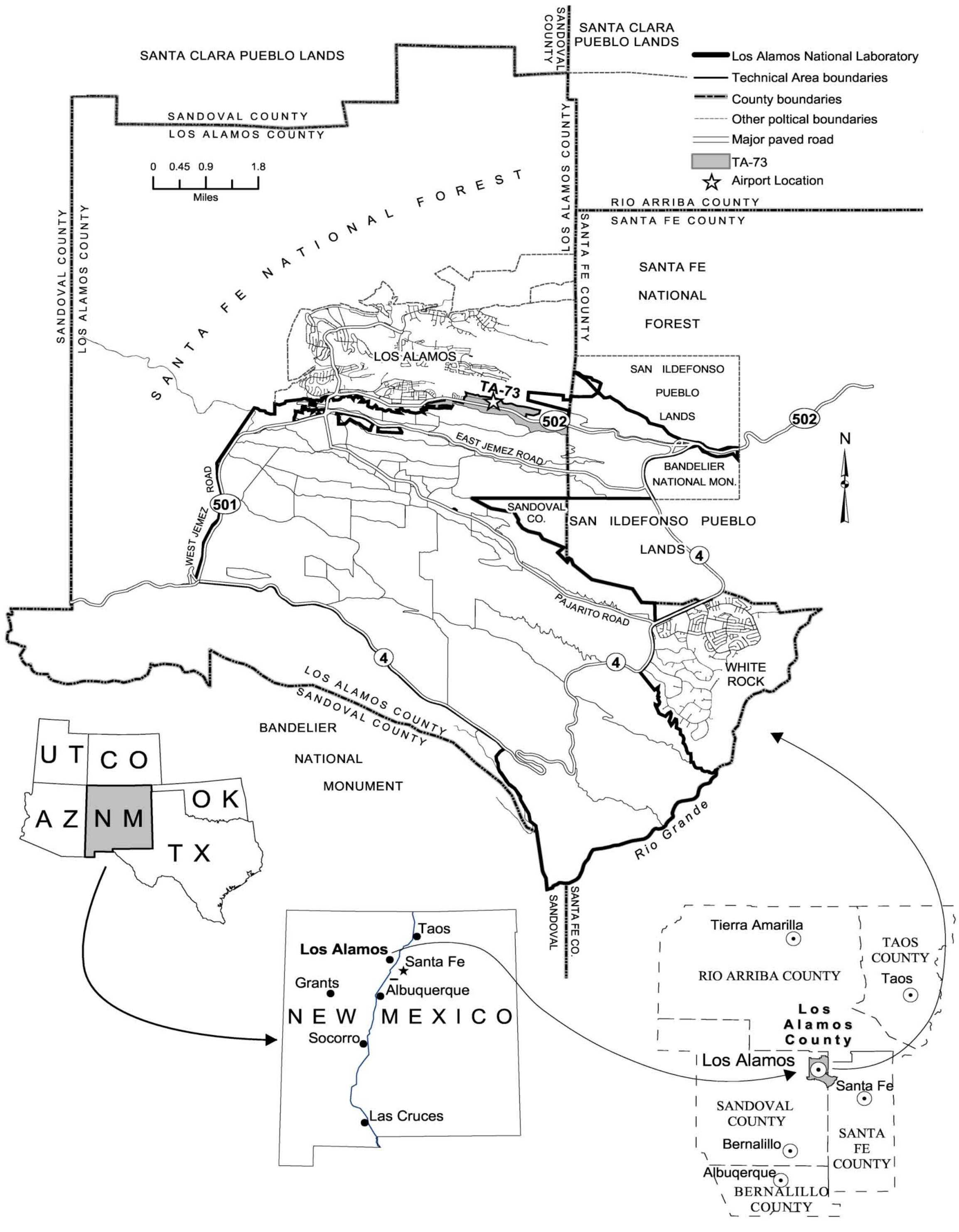

Figure 1. Location of Los Alamos National Laboratory.

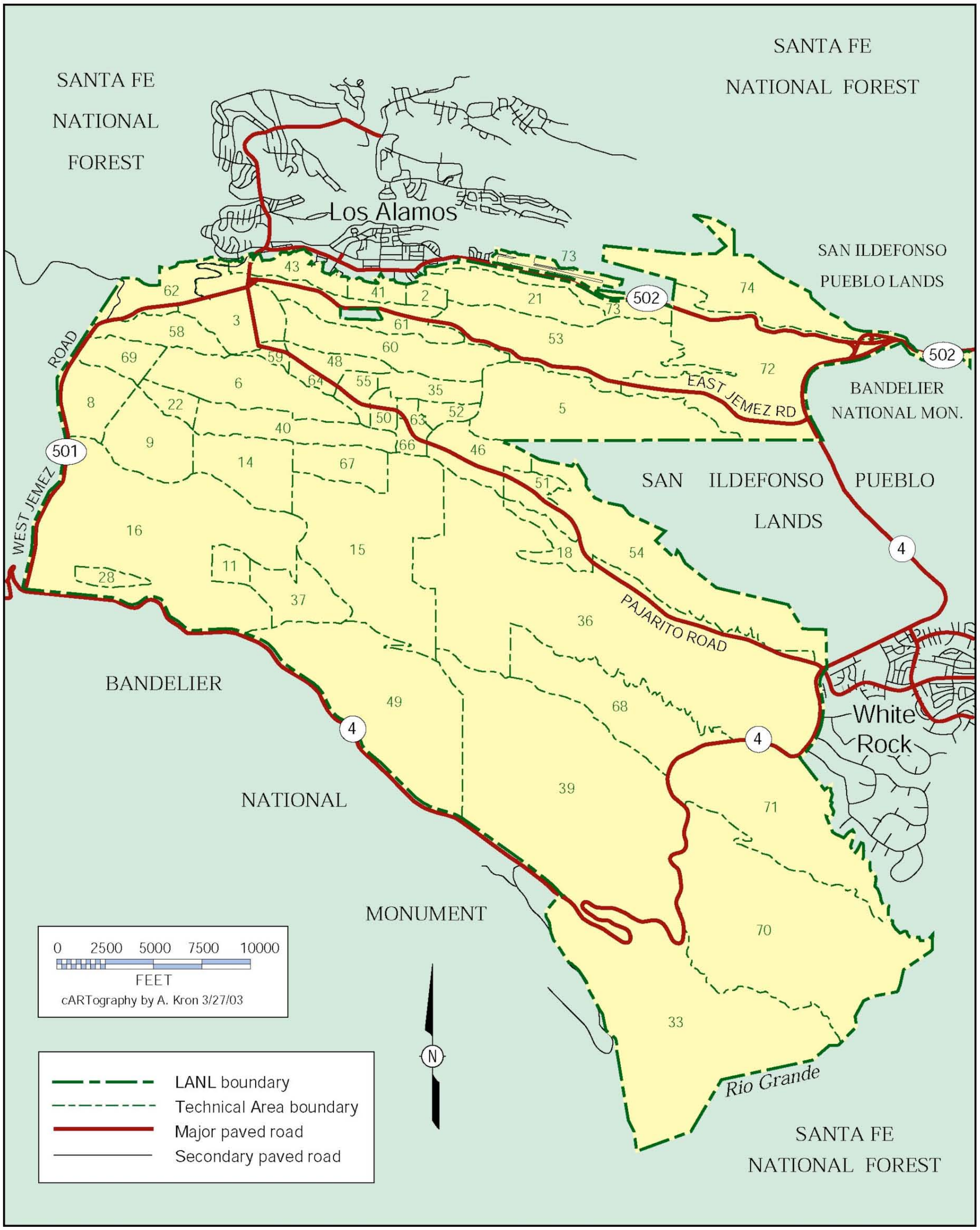

Figure 2. Los Alamos National Laboratory technical areas by number.

The radionuclides emitted from point sources at LANL in calendar year 2007 are listed in the subsequent tables. Tritium is released as either tritiated water vapor (called HTO) or elemental tritium gas (HT). Plutonium contains traces of Am-241, a transformation product of Pu-241. Some of the uranium emissions are from open-air explosive tests involving depleted uranium. GMAP emissions include Ar-41, C-11, N-13, and O-15. Various radionuclides such as Hg-197m, Ge-68, and Br-76 make up the majority of the P/VAP emissions.

61.94(b)(3) Handling and Processing of Radioactive Materials at LANL Technical Areas

Additional descriptions of LANL technical areas can be found in the Annual Environmental Surveillance Report for LANL.[1] More thorough descriptions of LANL operations can be found in the Site-Wide Environmental Impact Statement Yearbooks, the most recent being published in 2006.[2] A complete list of non-monitored sources and activities is found in the Radioactive Materials Usage Survey, described in the next section.

The primary facilities responsible for radiological airborne emissions are as follows.

TA-3-29: The Chemistry and Metallurgy Research (CMR) facility conducts chemical and metallurgical research. The principal radionuclides used are isotopes of plutonium as well as other actinides. There are a variety of activities involving plutonium and uranium, which support many LANL and other U.S. Department of Energy (DOE) programs.

TA-3-66: This facility is used for a variety of nuclear materials work, primarily for dealing with metallic and ceramic items, including depleted uranium.

TA-3-102: This machine shop is used for the metalworking of radioactive materials, primarily depleted uranium.

TA-3-1698: This facility is designated as the Materials Science Laboratory. The building was designed to accommodate a wide variety of chemicals used in small amounts that are typical of many university and industrial labs conducting research in materials science.

TA-15 and TA-36: These facilities conduct open-air explosive tests involving depleted uranium and weapons development testing.

TA-15-312: Dual-Axis Radiographic Hydrodynamic Test (DARHT) Facility: This facility conducts high-explosive-driven experiments to investigate weapons functions and behavior during nonnuclear tests using advanced radiography. Starting in 2007, explosive operations at DARHT are conducted in containment vessels. Use of these vessels virtually eliminates air emissions from these operations.

TA-16-205 and -450: Weapons Engineering Tritium Facility (WETF): Building 205 was specifically designed and built to process tritium safely. The operations at WETF are divided into two categories: tritium processing and activities that support tritium processing. Examples of tritium-processing operations include the repackaging of tritium into smaller quantities and the packaging of tritium and other gases to user-specified pressures. Other operations include reacting tritium with other materials to form compounds and analyzing the effects of tritium. In 2007, expansion of WETF into Building 450 began. At the present time, no significant radiological activities are taking place in Building 450 and that part of WETF remains in a standby status. The exhaust stack was certified to measure emissions from Building 450 whenever this building status changes.

TA-21: Many of the facilities at this decommissioned radiochemistry site are undergoing decontamination and demolition. Some of these operations may contribute to diffuse emissions of uranium and plutonium into the air. The tritium operations in TA-21 were relocated in 2006 to other LANL sites, primarily WETF.

TA-41-4: This building was formerly used as a tritium-handling facility. The tritium sources were removed in 2002. Diffuse tritium emissions could result from residual tritium contamination and cleanup operations.

TA-48-1: The principal activities carried out in this facility are radiochemical separations supporting the medical radioisotope production program, the Yucca Mountain program, nuclear chemistry experiments, and geochemical and environmental research. These separations involve nCi to Ci (hot cell) amounts of radioactive materials and use a wide range of analytical chemical separation techniques, such as ion exchange, solvent extraction, mass spectroscopy, plasma emission spectroscopy, and ion chromatography.

TA-50-1: This waste management site consists of an industrial low-level (radioactive) liquid waste treatment plant.

TA-50-37: Currently there are no operations involving radioactive material in this building; future operations may involve the use of radioactive actinides**.**

TA-50-69: This waste management site consists of a waste characterization, reduction, and repackaging facility.

TA-53: This technical area houses the Los Alamos Neutron Science Center (LANSCE), a linear particle accelerator complex. The accelerator is used to conduct research in stockpile stewardship, radiobiology, materials science, and isotope production, among other areas. LANSCE consists of the Manuel Lujan Neutron Scattering Center, the Proton Storage Ring, the Weapons Neutron Research facilities, the Proton Radiography facility, and the high-intensity beam line (Line A). The facility accelerates protons and H- ions to energy of 800 MeV into target materials such as graphite and tungsten to produce neutrons and other subatomic particles. The design current of the accelerator is approximately 1000 microamperes. Airborne radioactive emissions result from proton beams and secondary particles passing through and activating air in target cells, beam stop, and surrounding areas, or activating water used in target cooling systems. The majority of the emissions are short-lived activation products such as C-11, N-13, and O-15. Most of the activated air is vented through the main stacks; however, a fraction of the activated air becomes a fugitive emission from the target areas. Two solar evaporative basins were constructed and began operation in 1999 to evaporate wastewater from the accelerator. Evaporation of water from these facilities can result in a diffuse source of airborne tritium.

TA-54: This waste management site consists of active and inactive shallow land burial sites for solid waste and is the primary storage area for mixed and transuranic radioactive waste. MDA G at TA-54 is a known source of diffuse emissions of tritium vapor. Resuspension of soil contaminated with low levels of plutonium/americium has also created a diffuse source. Shipments of transuranic waste for disposal at the Waste Isolation Pilot Plant began in 1999.

TA-55-4: This facility provides a pit production capability and continues the role providing the capability for research-and-development applications in chemical and metallurgical processes for recovering, purifying, and converting plutonium and other actinides.[3] A wide range of activities (e.g., the heating, dissolution, forming, and welding of special nuclear materials) is also conducted. Additional activities include investigating the means to safely ship, receive, handle, and store nuclear materials and to manage wastes and residues from TA-55. Limited-scope tritium operations also take place in certain areas of TA-55.

Section II. Air Emissions Data

61.94(b)(4) Point Sources

Monitored and unmonitored release points at LANL are listed in Table 1. Note: Tables are presented at the end of the report. The point sources are identified using an eight-digit identification number for each exhaust stack (StackID); the first two digits represent the LANL technical area, the next four the building, and the last two digits the stack number. Also listed in Table 1 are type, number, and efficiency of the effluent controls used on the release points. Each stage of the high-efficiency particulate air (HEPA) exhaust filters is tested at least once every 12 months. The performance criteria for HEPA filter systems are a maximum penetration of 5×10^{-4} for one stage and 2.5×10^{-7} for two stages in series, in which penetration equals the concentration of aerosol downstream of the air cleaner divided by concentration upstream.

In addition to the 27 monitored point sources, 57 unmonitored release points in more than 40 LANL buildings are included in Table 1. Under 40 CFR 61.93(b)(4)(i), sampling of these release points is not required because each release point has a potential effective dose equivalent (PEDE) of less than 0.1 mrem/yr at the critical receptor. However, in order to verify that emissions from unmonitored point sources remain low, LANL conducts periodic confirmatory measurements in the form of the *2007 Radioactive Materials Usage Survey for Unmonitored Point Sources*.[4] The purpose of this survey is to collect and analyze radioactive materials usage and process information for the monitored and unmonitored point sources at LANL.

The distance between each of the release points and the nearest receptor is provided in Table 1. The nearest receptor can be a residence, school, business, or office. In this report, the nearest receptor is defined as the public receptor most impacted by a given release point; that is, the air dispersion pattern is taken into account to determine the nearest or most critical receptor location.

In compliance with Appendix D to 40 CFR 61, we have used data collected from the facilities in conjunction with engineering calculations and other methods to develop conservative emissions estimates from unmonitored point sources. Estimated PEDEs are calculated by modeling these emissions estimates using the U.S. Environmental Protection Agency (EPA)-approved CAP88 dose modeling software. A comprehensive survey of all of LANL's monitored and unmonitored point sources is conducted annually or biannually, depending on the magnitude of potential emissions and are presented in the *2007 Radioactive Materials Usage Survey for Unmonitored Point Sources*.[4] The Laboratory has established administrative requirements to evaluate all potentially new sources. These requirements are established for the review of new Laboratory activities and projects, ensuring that air quality regulatory requirements will be met before the activity or project begins.[5]

Non-point Sources

There are a variety of non-point sources within the 111 km^2 of land occupied by LANL. Non-point sources can occur as diffuse or large-area sources or as leaks or fugitive emissions from facilities. Examples of non-point sources of airborne radionuclides include surface impoundments, shallow land burial sites, open burn sites, live firing sites, outfalls, container storage areas, unvented buildings, waste treatment areas, solid waste management units, and tanks. Additionally, buildings with only standard heating/ventilating/air conditioning systems and/or without active process ventilation are considered to be non-point sources.

LANL summarizes the potential impacts of non-point sources by analyzing and reporting air concentration measurements of significant radionuclides (other than activation products) collected at ambient air-sampling (Airnet) sites around the Laboratory and at locations of public receptors surrounding the Laboratory. The LANL Airnet system was approved for use in monitoring LANL's non-point radioactive air emission sources in 1996.[6] Based on the original methodology approved by EPA, additional procedures were developed to identify when new Airnet stations were required to assure continued compliance with the Rad-NESHAP.[7,8] These procedures were implemented in 2007 for the MDA B Removal, Characterization and Restoration (RCR) Project, a major remediation project scheduled to begin in 2009. A preconstruction application under 40 CFR 61 Subparts A and H for the MDA B RCR Project is being submitted to EPA in early summer of 2008. However, in anticipation of this project, seven new Airnet stations were sited in 2007 along the boundary of MDA B for the purpose of collecting preconstruction baseline data. The data collected in 2007 from these stations are reported in Section III of this report. A more thorough description of this monitoring network will be found in the preconstruction application. No unusual measurements were recorded for the Airnet environmental monitoring system for 2007.

Radionuclide Emissions

Radionuclides released from monitored point sources, along with the annual emissions in Ci for each radionuclide, are documented in Table 2. The point sources are identified using an eight-digit identification number for each exhaust stack: the first two digits represent the LANL technical area, the next four digits the building, and the last two digits the stack number. No detectable emissions are denoted as "none." A map showing the general locations of the facilities continuously monitored for radionuclide emissions is shown in Figure 3.

Pollution Controls

The most common type of filtration for emission control purposes at LANL is the HEPA filter, as noted in Table 1. HEPA filters are constructed of submicrometer glass fibers that are pressed and glued into a compact, paper-like, pleated media. The media are folded alternately over corrugated separators and mounted into a metal or wood frame in eight standard sizes and airflow capacities. A Type I nuclear-grade HEPA filter is capable of removing 99.95% of 0.3-μm particles at rated airflow. Other types of

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If you would like a copy of this figure, please contact the Los Alamos National Laboratory Ecology and Air Quality Group at (505) 665-8855 for a hard copy of this page.

Figure 3. Location of facilities with continuously operated stack-sampling systems for radionuclide emissions.

filters used in ventilation systems are Aerosol 95; RIGA-Flow 220, 221, and 222; and FARR 30/30. These units are typically used as prefilters in HEPA filtration systems. These filters are significantly less efficient than HEPA filters and are typically used for collecting particulate matter larger than 5 μm.

The above-mentioned filters are only effective for particles. When the contaminant of concern is in the form of a gas or vapors, activated charcoal beds can be used. Charcoal beds collect the gas contaminant through an adsorption process in which the gas comes in contact with the charcoal and adheres to the surface of the charcoal. The charcoal can be coated with different types of materials to make the adsorption process more efficient for different types of contaminants. Typically, charcoal beds achieve an efficiency of 98% capture.

Tritium effluent controls are generally composed of a catalytic reactor and a molecular sieve bed. Tritium-contaminated effluent is passed through a catalyst that converts HT into HTO. This HTO is then collected as water on a molecular sieve bed. This process can be repeated until the tritium level is at, or below, the desired level. The effluent is then vented through the stack.

A delay system is used to reduce some of the short-lived radionuclides generated by activation at LANSCE. Emissions from the highest source of activated gas (the off-gas system for the 1L target cooling loops) are directed into a long transport line to hold up the radionuclide gases before emission. This delay system is used to provide a reduction in radionuclide emissions from the 1L target area.

Compliance with Maintenance and Inspection Requirements under the Revised Rad-NESHAP

The 2003 revisions to Subpart H established several inspection and maintenance requirements for monitored stacks. These requirements are based on American National Standards Institute/Health Physics Society N13.1-1999, *Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities*. Annual visual inspection of particulate monitoring systems is a component of the Laboratory's program to comply with these new requirements. Of the 27 monitored stacks at LANL, we performed stack sampling system inspections on 24 of these stacks in 2007. These systems were subjected to internal and external inspections using a borescope. One other particulate system was not inspected for two reasons: first, the stack does not require monitoring under Rad-NESHAP regulations, but is monitored for facility safety basis requirements; second, this stack's exhaust fan was down for the entire calendar year. Two additional stacks are tritium-only samplers, and per alternative method approval from EPA Region 6, we use quantitative performance tests in lieu of visual inspections for tritium systems. For tritium samplers, the measured emissions are scaled up as needed based on the results of these performance tests.

For the stacks that were inspected in 2007, there were five systems in which visible particulate deposition was such that cleaning is required. These systems will be cleaned in the summer of 2008. In 2007, no radiological material was measured on inspection equipment. Therefore, no additions to the source term are required from this pathway for 2007.

Section III. Dose Assessment

61.94(b)(7) Description of Dose Calculations

Effective dose equivalent (EDE or dose) calculations for point sources, unmonitored point sources, and non-point gaseous activation products from LANSCE were performed with the CAP88 code. Starting with the 2006 annual emissions report, LANL uses CAP88-PC version 3 to demonstrate compliance. Verification of the CAP88 code is performed by periodically running the EPA test case.

Development of Source Term

Tritium emissions

Tritium emissions from the Laboratory's tritium facilities are measured using a collection device known as a bubbler. This device enables the Laboratory to determine not only the total amount of tritium released but also if it is in the elemental (HT) or oxide (HTO) form. The bubbler operates by pulling a continuous sample of air from the stack, which is then "bubbled" through three sequential vials containing ethylene glycol. The ethylene glycol collects the water vapor from the sample of air, including any tritium that is part of a water molecule (tritium oxide, or HTO). After bubbling through these three vials, essentially all the HTO is removed from the air, leaving elemental tritium, or HT. The sample, containing the HT, is then passed through a palladium catalyst that converts the HT to HTO. The sample is pulled through three additional vials containing ethylene glycol, which collects the newly formed HTO. The amount of HTO and HT is determined by analyzing the ethylene glycol for the presence of tritium using liquid scintillation counting. Although LANL's measurement device can distinguish the presence of HTO from HT, all emissions of tritium are assumed to be HTO for modeling the off-site dose. Because HTO contributes approximately 20,000 times more dose than an equivalent amount of HT, this is a conservative measure, further ensuring that the dose to an off-site receptor is not underestimated.

Tritium emissions from LANSCE do not require monitoring under 40 CFR 61.93(b)(4)(i). The primary source for airborne tritium emissions at LANSCE is activation of water vapor in air and activation and subsequent evaporation of water in the cooling system of beam targets. Because of the low relative contribution of tritium to the off-site dose at LANSCE, formal monitoring for tritium was discontinued after July 2001. However, the tritium emissions for 2007 can be calculated based on the rate of generation measured in 2001. Using these rate-of-generation calculations, the tritium emissions from LANSCE stacks in 2007 were calculated to be about 11 Ci.

Radioactive particulate emissions

Emissions of radioactive particulate matter, generated by operations at facilities such as the CMR facility (TA-3-29) and the Plutonium Facility (TA-55), are sampled using a glass-fiber filter. A continuous sample of stack air is pulled through the filter, where small particles of radioactive material are captured. These samples are analyzed weekly using gross alpha/beta counting and gamma spectroscopy to identify any increase in emissions and to identify short-lived radioactive materials. Every six months, LANL composites these stack samples for subsequent analysis at an off-site laboratory. These composite samples are analyzed to determine the total activity of materials such as U-234, U-235, U-238, Pu-238, Pu-239, and Am-241. These data are then combined with estimates of sampling losses and stack and sample flows to calculate emissions. LANL no longer includes short-lived progeny in the emissions source term, as these progeny are automatically included when evaluating emission with the CAP88-PC version 3 dose assessment model.

Vapor form emissions

Vapor emissions, generated by LANSCE operations and by hot-cell activities at TA-3-29 and TA-48, are sampled using a charcoal filter or canister. A continuous sample of stack air is pulled through a charcoal filter upon which vaporous emissions of radionuclides are adsorbed. The amount and identity of the radionuclide(s) present on the filter are determined through the use of gamma spectroscopy. This information is then used to calculate emissions. Examples of radionuclides of this type include Ge-68 and Br-76.

Gaseous mixed activation products (GMAP)

GMAP emissions resulting from activities at LANSCE are measured using near-real-time monitoring data. A sample of stack air is pulled through an ionization chamber that measures the total amount of radioactivity in the sample. Specific radioisotopes are identified through the use of gamma spectroscopy and decay curves. This information is then used to calculate emissions. Radionuclides of this type include C-11, N-13, and O-15.

Summary of Input Parameters

EDE to potential receptors was calculated for all radioactive air emissions from sampled LANL point sources. Input parameters for these point sources are provided in Table 3. The geographic locations of the release points, given in New Mexico State Plane coordinates, are provided in Table 4. The relationship of the highest receptor location to the individual release points are provided in Table 5. Other site-specific parameters and the sources of these data are provided in Table 6.

LANL operates an on-site network of meteorological monitoring towers. Data gathered by the towers are summarized and formatted for input to the CAP88 program. For 2007, data from two different towers were used for the air-dispersion modeling; the tower data that are most representative of the release point are applied. Copies of the meteorological data files used for the 2007 dose assessment are provided in Table 7.

The Laboratory also inputs population array data to the CAP88 program. The data file represents a 16-sector polar-type array, with 20 radial distances for each sector. Population arrays are developed for each release point using U.S. Census data, updated with annual projections from the New Mexico Bureau of Business and Economic Research. An example of the population array used for the LANSCE facility is provided in Table 8. For agricultural array input, LANL is currently using the default values in CAP88. Finally, the radionuclide inputs for the point sources monitored in 2007 are provided in Table 2.

Public Receptors

Compliance with the annual dose standard is determined by calculating the highest EDE to any member of the public at any off-site point where there is a residence, school, business, or office. The Laboratory routinely evaluates public areas to assure that any new residence, school, business, or office is identified for the EDE calculation. As per EPA guidance,[9] personnel that work in leased space within the boundaries of the Laboratory are not considered members of the public for the EDE determination. Personnel of this type are considered to be subcontractors to DOE, similar to security guards and maintenance workers.

Point Source Emissions Modeling

The CAP88 version 3 program was used to calculate doses from both the monitored and unmonitored point sources at LANL. The CAP88 program uses on-site meteorological data to calculate atmospheric dispersion and transport of the radioactive effluents. CAP88 includes all radionuclides for which there are dose conversion factors in the EPA's Federal Guidance Reports.[10,11,12] In 2007, only two monitored radionuclides were not included in CAP88: C-10 and O-14. For these, C-11 was used as a surrogate, as described in the Laboratory procedure ENV-EAQ-512.[13] CAP88 was used to calculate the C-11 dose, which was then adjusted for the number of Ci emitted, the gamma energy emitted per decay, and the half life of the radionuclides. The maximum dose from emissions of radionuclides not included in the CAP88 library was 4.2E-6 mrem. This dose contribution is well below the criteria for individual nuclide monitoring, which is 10% of a source's PEDE.

LANSCE Fugitive Emission Modeling

Some of the GMAP created at the accelerator target cells or at other accelerator beam line locations migrate into room air and into the environment. These fugitive sources are continuously monitored throughout the beam-operating period. In 2007, approximately 80 Ci of C-11 and 3 Ci of Ar-41 were released from LANSCE as fugitive emissions.[14] These sources were modeled as area sources using CAP88. Fugitive effluents were modeled from two areas at LANSCE, and the additional source information is provided in Table 9.

Environmental Data Used for Non-point Source Emission Estimation

The net annual average ambient concentration of airborne radionuclides measured at 26 air sampling stations (Figure 4) is calculated by subtracting an appropriate background concentration value.[15] The net concentration at each air sampler is converted to the annual EDE using Table 2 of Appendix E of 40 CFR 61 and applying the valid assumption that each table value is equivalent to 10 mrem/yr from all appropriate exposure pathways (100% occupancy assumed at the respective location).[16] Dose assessment results from each air sampler are given in Table 10. The operational performance and analytical completeness of each air sampler is provided in Table 11.

LANSCE Monthly Assessments

The Laboratory evaluates and reports the dose from short-lived radioactive gases released from LANSCE exhaust stack 53000702 on a monthly basis. This is so we can track the emissions and identify any issues that need addressing. The monthly dose values are evaluated with the actual meteorology for the month and these doses are shown in Table 12. For 2007 the Laboratory also evaluated this stack's total gaseous emissions for the year in a single CAP88 run and compared the results to the sum of the monthly values summed for the calendar year. The sum of monthly doses resulted in a dose of 0.0544 mrem, while the annual total single analysis resulted in a total of 0.0556 mrem. All doses were evaluated at the East Gate receptor location. The values show satisfactory agreement. Since the "annual total" run

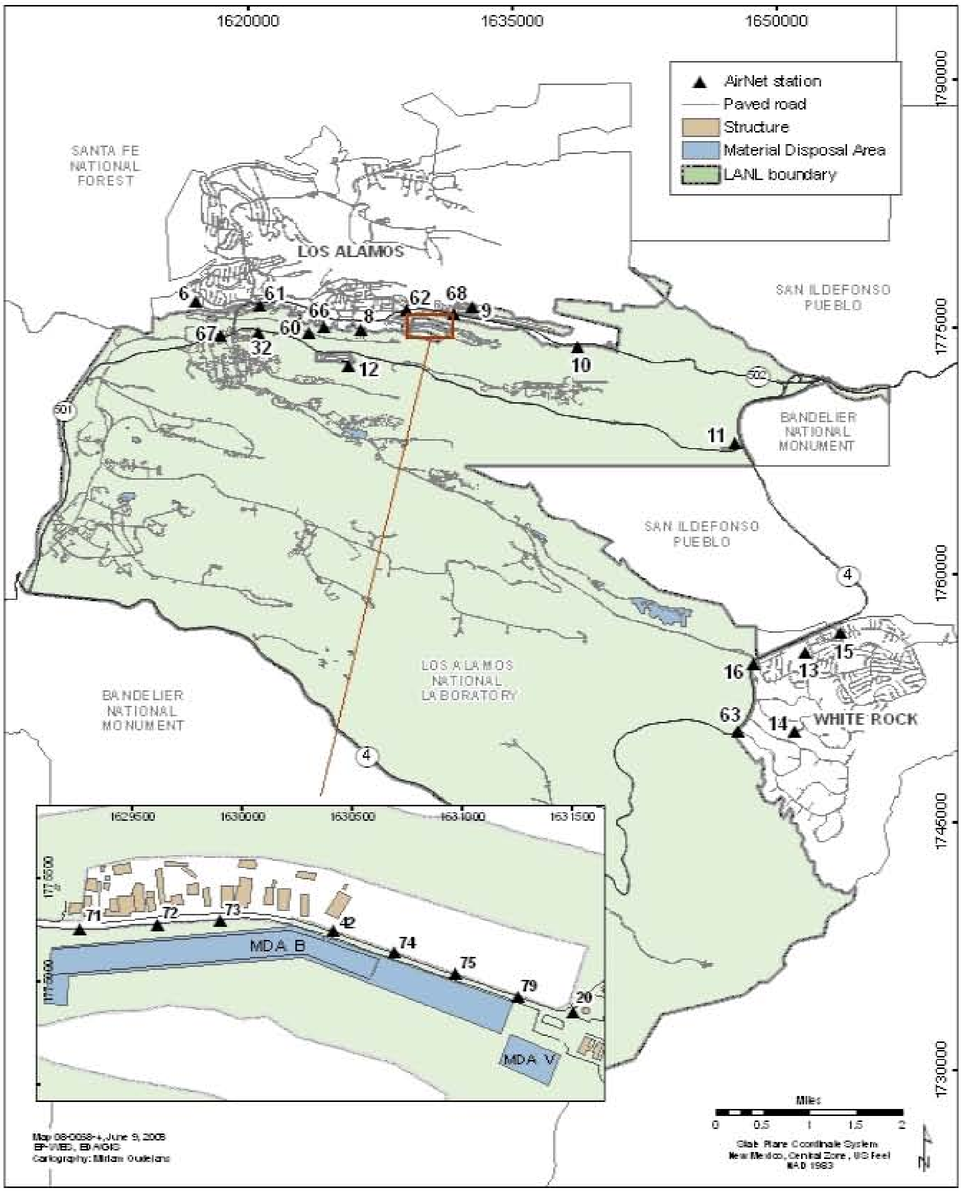

Figure 4. Locations of air sampling stations used for non-point source emissions compliance.

resulted in a slightly higher dose in 2007, this value was conservatively used for reporting purposes. Additionally, subsequent analyses to different receptor locations only used this evaluation method; individual monthly CAP88 runs were not performed for the DP Road receptor location.

Highest EDE Determination

For most of the recent past, the maximally exposed individual (MEI) location has been at 2470 East Road, usually referred to as "East Gate." The dose was mostly a result of LANSCE emissions. Because the LANSCE emissions after 2005 have been reduced to such low levels, the location of the MEI for this year was not as readily apparent as in the past and required more detailed evaluation, as follows.

We know that the dose from LANSCE emissions is a significant contributor at the East Gate location, but much less so at other possible MEI locations. So we evaluated the LANSCE facility total emissions contribution from Table 12 (0.117 mrem) and added to it the contribution from the East Gate Airnet station (0.00948 mrem) for a rounded total of 0.126 mrem. We used this value as a point of comparison for examining the Airnet dose at other locations (see Table 10).

The only station exceeding this value was the Airnet Station 71, located on DP Road at the west end of MDA B. At the other locations, the doses from Airnet are smaller and they are farther from LANSCE, so the total off-site dose total is smaller. Thus, there are two MEI candidates: East Gate and the DP Road location of Airnet Station 71. To determine which was the higher, we performed a full set of calculations for both (Table 13) and added the corresponding Airnet doses measured at each location. These calculations result in annual dose values of 0.41 mrem at the East Gate location and 0.52 mrem at the DP Road location. The dose at DP Road was higher so it is the MEI location for 2007 operations.

61.92 Compliance Assessment

The highest EDE to any member of the public at any off-site point where there is a residence, school, or business was 0.52 mrem for radionuclides released by LANL in 2007. This dose was calculated by adding up the doses for each of the point sources at LANL, the diffuse and fugitive gaseous activation products from LANSCE, and the dose measured by the ambient air sampler in the vicinity of the public receptor location. The compliance assessment also includes a potential dose contribution of 0.282 mrem from unmonitored stacks. Because the emissions estimates do not account for pollution control systems, the actual dose will be significantly less for these unmonitored point sources. Also, this dose includes a minor contribution from radionuclides not included in CAP88. Table 13 of this report provides the compliance assessment summary. The location of the off-site point of highest EDE for 2007 was DP Road, near Airnet Station 71.

Section IV. Construction and Modifications

61.94(b)(8) Construction, Modifications, and 61.96 Activity Relocations

A brief description of construction and modifications that were completed and/or reviewed in 2007 but for which the requirement to apply for approval to construct or modify was waived under 61.96 is listed below.

WETF Evaporator

An electric evaporator was installed at the WETF, TA-16-205, to be used for the evaporation of mop and decontamination water. The water going to the evaporator can contain very low levels of tritium, so the evaporator is considered a new source of radioactive air emissions. Routine use of the evaporator will result in very small amounts of tritium being vented through the monitored WETF stack. In order to accommodate unexpected situations, a bounding estimate of 40 Ci/yr was used with CAP88, and assuming 100% release of all tritium going to the evaporator, which resulted in a worst-case uncontrolled dose of 1.8E-3 mrem/yr. Based on actual usage information, the evaporator's potential emissions in 2007 were 3.1E-4 Ci, resulting in an uncontrolled off-site dose of 1.4E-8 mrem. As a point of comparison, 2007 stack emissions from routine operations in the WETF were 240 Ci of tritium, with an off-site dose of less than 0.01 mrem. Operations personnel plan to continue to use the evaporator.

Containerized Vessel Shots at TA-15

In 2007, LANL began performing DARHT explosive tests (shots) in containment vessels. Previously, shots were done in open air or using foam mitigation. In 2007, four shots were performed, all using containment vessels. Sampling and analysis have shown greater than 99.9% containment of radioactive material. Ambient radioactive air monitoring remains in place at public receptor locations. Future DARHT shots will continue to be performed in containment vessels.

Depleted Uranium Analytical Work in TA-15-534

Analytical laboratory work using radioactive materials took place in Building TA-15-534 in 2007. This represents the first-time usage of radioactive material in this building. In 2007, this laboratory processed residual high explosive shot material containing 12 grams of depleted uranium.

Using CAP88 and assuming 100% release of the depleted uranium, the worst-case uncontrolled dose was less than 2E-5 mrem in 2007. Note that this building is the Vessel Preparation Building; plans for this building are to prepare containment vessels for high explosive shots at DARHT, and to clean out these vessels after completion of the shot. No vessel clean-out activities were performed in 2007 in TA-15-534, but these activities are planned to take place in 2008. Analytical laboratory work supporting DARHT will also continue in 2008. LANL's Ecology and Air Quality group will track operations from this facility as part of the non-monitored source program, and potential emissions will be reported in the annual Radioactive Materials Usage Survey.

Uranium Hexafluoride Experiments at TA-39-57

A series of experiments using uranium hexafluoride (UF6) are being performed at a building adjacent to Firing Point 57 at TA-39. The UF6 experiments are part of existing ongoing research taking place at TA-3-66 and TA-35. The apparatus in use is a closed-loop manifold system and project personnel do not anticipate any release of UF6 to the ambient air. However, this work does constitute the first-time use of radioactive material in this building. Using CAP88 and assuming all of the UF6 to be used was released, the worst-case uncontrolled dose estimate was 5.3E-2 mrem. Based on operational sampling on the apparatus, there was no detectable release of radioactive materials from this location. These experiments will continue in 2008.

Section V. Additional Information

This section is provided pursuant to DOE guidance and is not required by Subpart H reporting requirements.

Unplanned Releases

During 2007, the Laboratory had no instances of increased airborne emissions of radioactive materials that required reporting to the EPA. There were no instances of an unplanned event.

Environmental Monitoring

In addition to the Airnet monitors identified in this report, additional environmental monitoring stations are operated at LANL and include several environmental monitoring stations located near the LANSCE boundary inhabited by the public. Measurement systems at these stations include thermoluminescent dosimeters, continuously operated air samplers, and in-situ high-pressure ion chambers. The combination of these measurement systems allows for monitoring of radionuclide air concentrations and the radiation exposure rate. Results for air sampling associated with NESHAP compliance are included in this document, while results for all monitoring data are published in the Annual Environmental Surveillance Report for DOE Order compliance. This can be found on the web at the following URL: http://www.lanl.gov/environment/air/reports.shtml?1

Other Supplemental Information

The following information is included for completeness, but not directly required under 40 CFR 61 Subpart H regulations.

- 80-km collective effective (population) dose equivalent for 2007 airborne releases: 0.357 person-rem
- Compliance with Subparts Q and T of 40 CFR 61—Radon-222 Emissions

  These regulations apply to Rn-222 emissions from DOE storage/disposal facilities that contain by-product material. "By-product material" is the tailings or wastes produced by the extraction or concentration of uranium from ore. Although this regulation targets uranium mills, LANL has likely stored small amounts of by-product material used in experiments in the TA-54 low-level waste facility, MDA G; this practice makes the Laboratory subject to this regulation. Subject facilities cannot exceed an emissions rate of 20 pCi/m^2 s of Rn-222. In 1993 and 1994, LANL conducted a study to characterize emissions from the MDA G disposal site.[17] This study showed an average emission rate of 0.14 pCi/m^2 s for MDA G. The performance assessment for MDA G has determined that there will not be a significant increase in Rn-222 emissions in the future.[18]
- Potential to exceed 0.1 mrem from LANL sources of Rn-222 or Rn-220 emissions: not applicable at LANL.
- Status of compliance with EPA effluent monitoring requirements as of June 3, 1996: LANL is in compliance with these requirements.

Table 1. 40-61.94(b)(4-5) Release Point Data

StackID	Location	Control Description	Number of Effluent Controls	Control Efficiency	Monitored	Nearest Receptor (m)	Receptor Direction
03001600	TA-03-16	none	0	0%		924	N
03002913	TA-03-29-1	unknown	0	0%		848	NNE
03002914	TA-03-29-2	HEPA	2	99.95% each	X	731	NE
03002915	TA-03-29-2	HEPA	2	99.95% each	X	732	NE
03002919	TA-03-29-3	Aerosol 95	1	80%	X	836	NNE
03002920	TA-03-29-3	Aerosol 95	1	80%	X	835	NNE
03002923	TA-03-29-4	FARR 30/30	1	20%	X	575	NNW
03002924	TA-03-29-4	FARR 30/30	1	20%	X	575	NNW
03002928	TA-03-29-5	HEPA	2	99.95% each	X	936	NE
03002929	TA-03-29-5	HEPA	2	99.95% each	X	937	NE
03002932	TA-03-29-7	HEPA	2	99.95% each	X	856	NNE
03002933	TA-03-29-7	HEPA	2	99.95% each	X	855	NNE
03002937	TA-03-29-V	HEPA	2	99.95% each	X	870	NE
03002944	TA-03-29-9	RIGA-Flow	1	80%	X	937	NNE
03002945	TA-03-29-9	RIGA-Flow	1	80%	X	939	NNE
03002946	TA-03-29-9	RIGA-Flow	1	80%	X	938	NNE
03003299	TA-03-32	unknown	0	0%		627	NNE
03003400	TA-03-34	none	0	0%		665	NNE
03003501	TA-03-35	HEPA	1	99.95%		691	NNE
03006601	TA-03-66	none	0	0%		644	N
03006602	TA-03-66	none	0	0%		611	N
03006603	TA-03-66	none	0	0%		645	N
03006604	TA-03-66	none	0	0%		695	N
03006605	TA-03-66	none	0	0%		707	N
03006606	TA-03-66	none	0	0%		730	N
03006626	TA-03-66	HEPA	1	99.95%		619	N
03006654	TA-03-66	HEPA	1	99.95%		694	N
03006699	TA-03-66	none	0	0%		633	N
03010222	TA-03-102	HEPA	1	99.95%	X	746	N
03010225	TA-03-102	HEPA	1	99.95%		729	N

Table 1 (Continued)

StackID	Location	Control Description	Number of Effluent	Control Efficiency	Monitored	Nearest Receptor (m)	Receptor Direction
03169800	TA-03-1698	none	0	0%		716	NNE
09002103	TA-09-21	none	0	0%		3006	NE
15053401	TA-15-534	HEPA	1	99.95%		3250	NNE
16020299	TA-16-202	unknown	0	0%		1191	S
16020504	TA-16-205	CR/MS	1	>99%	X	718	S
16020599	TA-16-205	none	0	0%		778	SSW
16045005	TA-16-450	none	0	0%	X	725	S
21000507	TA-21-5	HEPA	2	99.95% each		608	N
21015001	TA-21-150	HEPA	1	99.95%		595	N
21015505	TA-21-155	CR/MS	1	>99%		680	NNW
21020901	TA-21-209	CR/MS	1	>99%		712	NNW
21025704	TA-21-257	none	0	0%		598	N
35000200	TA-35-2	none	0	0%		1262	NNW
35021305	TA-35-213	none	0	0%		1017	N
36000104	TA-36-1	unknown	0	0%		5378	SE
41000104	TA-41-1	HEPA	2	99.95% each		125	N
41000417	TA-41-4	none	0	0%		197	N
43000100	TA-43-1	none	0	0%		100	NNE
46002499	TA-46-24	none	0	0%		2694	N
46003100	TA-46-31	none	0	0%		3086	N
46004106	TA-46-41	none	0	0%		3194	N
46015405	TA-46-154	none	0	0%		3073	N
46015899	TA-46-158	none	0	0%		3348	N
46020099	TA-46-200	none	0	0%		2694	N
48000107	TA-48-1	HEPA/Charcoal	2	99.95% each	X	749	NNE
48000111	TA-48-1	none	0	0%		871	NNE
48000115	TA-48-1	none	0	0%		759	NNE
48000135	TA-48-1	none	0	0%		782	NNE
48000145	TA-48-1	none	0	0%		884	NNE
48000154	TA-48-1	HEPA	2	99.95% each	X	751	NNE
48000160	TA-48-1	HEPA	1	99.95%	X	764	NNE

Table 1 (Continued)

StackID	Location	Control Description	Number of Effluent	Control Efficiency	Monitored	Nearest Receptor (m)	Receptor Direction
48000166	TA-48-1	HEPA	2	99.95% each		860	NNE
48000167	TA-48-1	HEPA	2	99.95% each		888	NNE
48000168	TA-48-1	none	0	0%		884	NNE
48004500	TA-48-45	none	0	0%		736	N
50000102	TA-50-1	HEPA	1	99.95% each	X	1183	N
50000299	TA-50-2	none	0	0%		1210	N
50003701	TA-50-37	HEPA	2	99.95% each	X	1171	N
50006901	TA-50-69	HEPA	1	99.95%		1187	N
50006902	TA-50-69	HEPA	1	99.95%		1191	N
50006903	TA-50-69	HEPA	2	99.95% each	X	1186	N
53000116	TA-53-1	unknown	0	0%		1380	ENE
53000303	TA-53-3	HEPA	1	99.95%	X	800	NNE
53000702	TA-53-7	HEPA	1	99.95%	X	944	NNE
53000799	TA-53-7	none	0	0%		944	NNE
53001899	TA-53-18	none	0	0%		1044	NNE
53098401	TA-53-984	none	0	0%		1230	NE
53109099	TA-53-1090	none	0	0%		1007	NNE
54028101	TA-54-281	HEPA	1	99.95%		1920	ESE
54100199	TA-54-1001	none	0	0%		4995	ESE
54100999	TA-54-1009	none	0	0%		4995	ESE
55000415	TA-55-4	HEPA	4	99.95% each	X	1016	NNE
55000416	TA-55-4	HEPA	4	99.95% each	X	1089	NNE
59000100	TA-59-1	none	0	0%		1097	N

Table 2. 40-61.94(b)(7) User Supplied Data—Radionuclide Emissions

StackID	Nuclide	Emissions (Ci)
03002914	None	0.00E+00
03002915	Th-232	1.60E-08
03002919	Am-241-R	1.13E-08
03002919	Pu-238	6.14E-08
03002919	Pu-239	1.83E-07
03002919	Th-228	1.32E-08
03002920	Pu-239	2.95E-08
03002923	Am-241-R	5.78E-09
03002923	Pu-238	3.91E-08
03002923	Pu-239	4.05E-08
03002923	Th-228	3.33E-08
03002923	U-234	1.16E-06
03002923	U-235	3.97E-08
03002923	U-238	7.23E-08
03002923	Pa-234m(p)	7.23E-08
03002923	Th-234(p)	7.23E-08
03002924	Pu-238	3.09E-07
03002924	Pu-239	1.14E-07
03002924	Th-228	3.45E-07
03002924	U-234	8.36E-06
03002928	Pu-238	2.90E-07
03002928	Pu-239	5.87E-08
03002929	Th-230	4.01E-08
03002932	None	0.00E+00
03002933	None	0.00E+00
03002937	None	0.00E+00
03002944	Br-82	1.85E-05
03002944	Th-230	3.98E-08
03002945	Th-228	4.03E-08
03002945	Th-232	3.06E-08
03002946	Th-230	8.49E-08
03002946	Th-232	2.23E-08
03010222	U-234	3.66E-09
16020504	H-3(Gas)	3.70E+01
16020504	H-3(HTO)	1.09E+02
16045005	H-3(Gas)	4.80E+01
16045005	H-3(HTO)	4.83E+01
48000107	As-72	4.32E-06
48000107	Br-76	4.25E-04
48000107	Br-77	2.95E-04
48000107	Br-82	4.93E-06
48000107	Ge-68	3.89E-03
48000107	Ga-68(p)	3.89E-03
48000107	Hg-197m	4.04E-05
48000107	Hg-197(p)	4.04E-05
48000107	Se-75	2.70E-04
48000154	Th-228	1.64E-09
48000160	As-73	9.10E-04
48000160	As-74	1.14E-06
48000160	Br-77	1.58E-04
48000160	Ge-68	7.97E-06
48000160	Ga-68(p)	7.97E-06
48000160	Se-75	5.86E-06
50000102	Th-228	3.60E-08
50003701	Pu-239	1.15E-09
50003701	Th-230	5.33E-09
50006903	Am-241-R	1.10E-09
50006903	Pu-238	8.63E-10
50006903	Pu-239	1.90E-09
50006903	Th-230	5.35E-10
50006903	Th-232	2.12E-10
53000303	Ar-41	7.52E-01
53000303	Br-82	1.82E-05
53000303	C-11	1.80E+01
53000303	H-3(HTO)	6.43E+00
53000702	Ar-41	1.01E+01
53000702	Be-7	1.62E-06
53000702	Br-76	7.60E-04
53000702	Br-77	9.50E-05
53000702	Br-82	2.15E-03
53000702	C-10	2.33E-01
53000702	C-11	1.27E+02
53000702	H-3(HTO)	4.68E+00
53000702	Hg-197m	1.50E-03
53000702	Hg-197(p)	1.50E-03
53000702	N-13	2.18E+01
53000702	Na-24	2.11E-06
53000702	O-14	3.90E-01
53000702	O-15	3.95E+01
53000702	Os-191	1.60E-05
53000702	Se-75	2.29E-05
55000415	Pu-239	1.02E-09
55000415	Th-228	1.96E-09
55000415	Th-230	1.37E-08
55000415	Th-232	1.96E-09
55000416	H-3(Gas)	3.66E+00
55000416	H-3(HTO)	2.63E+00
55000416	Th-230	2.61E-08
55000416	Th-232	4.07E-09
55000416	U-234	1.92E-08

Table 2 Notes:

Stacks at the Chemistry & Metallurgy Research (CMR) facility identified as 03002915 through 03002933 are recorded in the RADAIR database as N3002915 through N3002933, to indicate measurements made with the New sampling systems, effective 2001.

Starting in 2006, particulate emissions from TA-55 stacks 55000415 and 55000416 are measured from new sample systems, which consist of four independent sample systems on each stack. The four samplers are identified as 5500415A, -B, -C, and -D; and 5500416A, -B, -C, and -D. Stack emissions data reported in this table represent average emission values measured from these four samplers. In the RADAIR database, these average emissions are given the stack ID 5500415X and 5500416X, with the "X" indicating the calculated average value from the four samples. The emissions of tritium (H-3, both HT and HTO forms) from the ES-16 stack use a different sample system, and references remain unchanged in the database.

Radionuclides with the designator "(p)" are short-lived progeny in secular equilibrium with their parent radionuclide; e.g., Ga-68 (progeny) is in equilibrium with Ge-68 (parent).

The term "None" in the Nuclide column indicates no detectable emissions from this source for this calendar year.

Table 3. 40-61.94(b)(7) User-Supplied Data—Monitored Stack Parameters

StackID	Height (m)	Diameter (m)	Exit Velocity (m/s)	Nearest Meteorological Tower
03002914	15.9	1.07	8.31	TA-6
03002915	15.9	1.05	23.52	TA-6
03002919	15.9	1.07	20.12	TA-6
03002920	15.9	1.07	23.78	TA-6
03002923	15.9	1.07	22.70	TA-6
03002924	15.9	1.06	10.51	TA-6
03002928	15.9	1.05	22.52	TA-6
03002929	15.9	1.07	10.73	TA-6
03002932	15.9	1.07	4.99	TA-6
03002933	15.9	1.06	26.86	TA-6
03002937	16.8	0.20	0.0*	TA-6
03002944	16.5	1.52	8.40	TA-6
03002945	16.5	1.52	9.74	TA-6
03002946	16.5	1.88	6.16	TA-6
03010222	13.4	0.91	0.46	TA-6
16020504	18.3	0.46	22.07	TA-6
16045005	18.3	1.176	15.00	TA-6
48000107	13.4	0.30	21.16	TA-6
48000154	13.1	0.91	6.04	TA-6
48000160	12.4	0.38	9.04	TA-6
50000102	15.5	1.82	11.58	TA-6
50003701	12.4	0.91	5.96	TA-6
50006903	10.5	0.31	5.96	TA-6
53000303	33.5	0.91	11.57	TA-53
53000702	13.1	0.91	8.05	TA-53
55000415	9.5	0.93	8.34	TA-6
55000416	9.5	0.94	10.44	TA-6

*stack was not used for 2007; the stack fan was off the entire year.

**Table 4. 61.94(b)(7) User-Supplied Data—Monitored Stack Parameters—
NM State Plane Coordinates (NAD '83)**

StackID	Easting	Northing

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If you would like a copy of this table, please contact the Los Alamos National Laboratory Ecology and Air Quality Group at (505) 665-8855 for a hard copy of this page.

Table 5. 40-61.94(b)(7) User-Supplied Data—Highest Off-Site Dose Location for Monitored Release Points

StackID	Associated Meteorological Tower	Distance to LANL Highest Dose Location (m)	Direction to LANL Highest Dose Location
03002914	TA-06	3164	ENE
03002915	TA-06	3165	ENE
03002919	TA-06	3177	ENE
03002920	TA-06	3175	ENE
03002923	TA-06	3313	ENE
03002924	TA-06	3315	ENE
03002928	TA-06	3324	ENE
03002929	TA-06	3326	ENE
03002932	TA-06	3179	ENE
03002933	TA-06	3178	ENE
03002937	TA-06	3257	ENE
03002944	TA-06	3247	ENE
03002945	TA-06	3277	ENE
03002946	TA-06	3276	ENE
03010222	TA-06	3463	NE
16020504	TA-06	7471	NE
16045005	TA-06	7462	NE
48000107	TA-06	2218	NE
48000154	TA-06	2191	NE
48000160	TA-06	2224	NE
50000102	TA-06	2105	NNE
50003701	TA-06	2157	NNE
50006903	TA-06	2195	NNE
53000303	TA-53	2931	WNW
53000702	TA-53	2971	WNW
55000415	TA-06	2148	NE
55000416	TA-06	2231	NE

Table 6. 40-61.94(b)(7) User-Supplied Data—Other Input Parameters

Description	Value	Units	CAP88 Variable Name
Annual rainfall rate	45.3	cm/y	RR
Lid height	1600	m	LIPO
Annual median temp	281.9	K	TA
E-vertical temperature gradient	0.02	K/m	TG
F-vertical temperature gradient	0.035	K/m	TG
G-vertical temperature gradient	0.035	K/m	TG
Food supply fraction - local vegetables	1	F1V	
Food supply fraction - vegetable regional	0	F2V	
Food supply fraction - meat local	1	F1B	
Food supply fraction - meat regional	0	F2B	
Food supply fraction - meat imported	0	F3B	
Food supply fraction - milk local	1	F1M	
Food supply fraction - milk regional	0	F2M	
Food supply fraction - milk imported	0	F3M	
Ground surface roughness factor	0.5	GSCFAC	
Food supply fraction - vegetable imported	0	F3V	

Table 7. 40-61.94(b)(7) User-Supplied Data—Wind Frequency Arrays

```
CAP88 Input Data for 2007 TA-6 Meteorological Tower
(95.0% Data Completeness)
-------------------------------------------------------------------
   N A 0.001050.000480.000030.000000.000000.00000
 NNE A 0.001740.000960.000000.000000.000000.00000
  NE A 0.002370.001440.000000.000000.000000.00000
 ENE A 0.003540.001710.000000.000000.000000.00000
   E A 0.003480.001920.000030.000000.000000.00000
 ESE A 0.002940.001860.000000.000000.000000.00000
  SE A 0.003150.002310.000000.000000.000000.00000
 SSE A 0.002310.002100.000000.000000.000000.00000
   S A 0.001710.001650.000000.000000.000000.00000
 SSW A 0.000900.000660.000000.000000.000000.00000
  SW A 0.000600.000330.000000.000000.000000.00000
 WSW A 0.000690.000210.000000.000000.000000.00000
   W A 0.000510.000180.000000.000000.000000.00000
 WNW A 0.000360.000300.000000.000000.000000.00000
  NW A 0.000540.000240.000000.000000.000000.00000
 NNW A 0.000600.000270.000000.000000.000000.00000
   N B 0.000300.000450.000000.000000.000000.00000
 NNE B 0.000540.000510.000000.000000.000000.00000
  NE B 0.000660.001530.000000.000000.000000.00000
 ENE B 0.001050.001890.000000.000000.000000.00000
   E B 0.000900.001770.000000.000000.000000.00000
 ESE B 0.000780.001890.000000.000000.000000.00000
  SE B 0.000630.002040.000000.000000.000000.00000
 SSE B 0.000570.002520.000000.000000.000000.00000
   S B 0.000330.001590.000000.000000.000000.00000
 SSW B 0.000180.000870.000000.000000.000000.00000
  SW B 0.000090.000390.000000.000000.000000.00000
 WSW B 0.000120.000150.000000.000000.000000.00000
   W B 0.000090.000210.000000.000000.000000.00000
 WNW B 0.000030.000180.000030.000000.000000.00000
  NW B 0.000030.000240.000000.000000.000000.00000
 NNW B 0.000120.000210.000000.000000.000000.00000
   N C 0.000270.000990.000060.000000.000000.00000
 NNE C 0.000900.002400.000030.000000.000000.00000
  NE C 0.000810.003540.000000.000000.000000.00000
 ENE C 0.000930.005010.000000.000000.000000.00000
   E C 0.001050.004440.000060.000000.000000.00000
 ESE C 0.001170.004740.000060.000000.000000.00000
  SE C 0.000960.006060.000330.000000.000000.00000
 SSE C 0.000930.008260.000480.000000.000000.00000
   S C 0.000840.005970.000900.000000.000000.00000
 SSW C 0.000450.002670.000690.000000.000000.00000
  SW C 0.000270.001440.000240.000000.000000.00000
 WSW C 0.000210.000960.000300.000000.000000.00000
   W C 0.000240.000720.000120.000030.000000.00000
 WNW C 0.000030.000990.000150.000000.000000.00000
  NW C 0.000030.000600.000300.000000.000000.00000
 NNW C 0.000240.000630.000210.000000.000000.00000
   N D 0.003930.008260.004080.001350.000090.00000
 NNE D 0.003870.013480.007390.002880.000420.00000
  NE D 0.003810.010540.005460.000420.000000.00000
 ENE D 0.004230.007360.001770.000090.000000.00000
```

Table 7 (continued)

```
  E D 0.006090.007780.000870.000060.000000.00000
ESE D 0.004500.008860.001080.000150.000000.00000
 SE D 0.004770.011710.003540.000180.000000.00000
SSE D 0.004680.017050.013390.001110.000000.00000
  S D 0.004110.021250.033320.006570.000120.00000
SSW D 0.003900.018340.024500.008770.000600.00006
 SW D 0.003750.010690.014380.009280.001830.00078
WSW D 0.003960.009400.011920.009610.002220.00078
  W D 0.003510.008680.012670.010120.001680.00030
WNW D 0.002940.007450.012340.008050.003630.00069
 NW D 0.004530.009310.012760.008020.001470.00021
NNW D 0.004590.008110.006120.001560.000030.00000
  N E 0.002010.004980.003270.000000.000000.00000
NNE E 0.001680.004410.002550.000000.000000.00000
 NE E 0.001140.001830.000510.000000.000000.00000
ENE E 0.001020.000900.000060.000000.000000.00000
  E E 0.001110.000720.000000.000000.000000.00000
ESE E 0.000870.000690.000000.000000.000000.00000
 SE E 0.000900.001050.000150.000000.000000.00000
SSE E 0.001260.002160.000120.000000.000000.00000
  S E 0.001920.007750.001680.000000.000000.00000
SSW E 0.001710.013630.004350.000000.000000.00000
 SW E 0.001950.012130.011050.000000.000000.00000
WSW E 0.002040.004740.004020.000000.000000.00000
  W E 0.001380.003600.001740.000000.000000.00000
WNW E 0.002130.003780.004230.000000.000000.00000
 NW E 0.002070.008110.006870.000000.000000.00000
NNW E 0.002070.005970.001890.000000.000000.00000
  N F 0.006300.007480.000600.000000.000000.00000
NNE F 0.004290.002550.000150.000000.000000.00000
 NE F 0.002130.000900.000000.000000.000000.00000
ENE F 0.001530.000450.000000.000000.000000.00000
  E F 0.001200.000240.000000.000000.000000.00000
ESE F 0.000960.000240.000000.000000.000000.00000
 SE F 0.001020.000240.000000.000000.000000.00000
SSE F 0.001650.000660.000000.000000.000000.00000
  S F 0.002160.001140.000060.000000.000000.00000
SSW F 0.003510.004320.000030.000000.000000.00000
 SW F 0.005790.014830.001950.000000.000000.00000
WSW F 0.006570.027290.006780.000000.000000.00000
  W F 0.006030.025760.004860.000000.000000.00000
WNW F 0.007020.024050.004860.000000.000000.00000
 NW F 0.005550.023990.001740.000000.000000.00000
NNW F 0.006450.014770.000570.000000.000000.00000
```

Table 7 (continued)

CAP88 Input Data for 2007 TA-53 Meteorological Tower
(99.0% Data Completeness)

N	A	0.001230.000400.000000.000000.000000.00000
NNE	A	0.002380.000920.000000.000000.000000.00000
NE	A	0.004500.002010.000000.000000.000000.00000
ENE	A	0.005050.004620.000000.000000.000000.00000
E	A	0.005190.003870.000000.000000.000000.00000
ESE	A	0.003470.002580.000000.000000.000000.00000
SE	A	0.003410.002900.000000.000000.000000.00000
SSE	A	0.003380.002440.000000.000000.000000.00000
S	A	0.001920.002120.000000.000000.000000.00000
SSW	A	0.001090.001410.000000.000000.000000.00000
SW	A	0.000690.000770.000000.000000.000000.00000
WSW	A	0.000540.000540.000000.000000.000000.00000
W	A	0.000320.000600.000000.000000.000000.00000
WNW	A	0.000430.000520.000000.000000.000000.00000
NW	A	0.000490.000200.000000.000000.000000.00000
NNW	A	0.000520.000260.000000.000000.000000.00000
N	B	0.000140.000320.000090.000000.000000.00000
NNE	B	0.000520.000600.000000.000000.000000.00000
NE	B	0.000980.002270.000000.000000.000000.00000
ENE	B	0.001720.003360.000000.000000.000000.00000
E	B	0.001120.003150.000030.000000.000000.00000
ESE	B	0.000890.002840.000000.000000.000000.00000
SE	B	0.001090.002240.000000.000000.000000.00000
SSE	B	0.000720.002470.000000.000000.000000.00000
S	B	0.000400.001750.000000.000000.000000.00000
SSW	B	0.000110.000750.000000.000000.000000.00000
SW	B	0.000140.000320.000030.000000.000000.00000
WSW	B	0.000000.000340.000000.000000.000000.00000
W	B	0.000030.000320.000030.000000.000000.00000
WNW	B	0.000060.000260.000090.000000.000000.00000
NW	B	0.000030.000320.000060.000000.000000.00000
NNW	B	0.000090.000090.000000.000000.000000.00000
N	C	0.000370.000890.000320.000060.000000.00000
NNE	C	0.000800.002040.000460.000000.000000.00000
NE	C	0.001660.005100.000520.000000.000000.00000
ENE	C	0.001660.006970.000400.000000.000000.00000
E	C	0.001410.006770.000200.000000.000000.00000
ESE	C	0.001180.004990.000340.000000.000000.00000
SE	C	0.001030.004130.000170.000000.000000.00000
SSE	C	0.000950.007230.000340.000000.000000.00000
S	C	0.000690.005560.000980.000000.000000.00000
SSW	C	0.000370.002350.000750.000000.000000.00000
SW	C	0.000140.001380.000140.000000.000000.00000
WSW	C	0.000110.001030.000370.000000.000000.00000
W	C	0.000090.001460.000830.000000.000000.00000
WNW	C	0.000000.000690.000890.000090.000000.00000
NW	C	0.000110.000570.000290.000090.000000.00000
NNW	C	0.000260.000430.000290.000000.000000.00000
N	D	0.005680.009980.010610.003840.000520.00000
NNE	D	0.006020.014480.011500.003610.000520.00000
NE	D	0.005760.011180.006250.001230.000030.00000
ENE	D	0.004760.009840.003410.000290.000090.00000

Table 7 (continued)

```
  E D 0.004560.006370.002240.000170.000030.00000
ESE D 0.002980.004700.001630.000110.000000.00000
 SE D 0.003180.005280.002180.000430.000060.00000
SSE D 0.003100.011670.009290.002750.000290.00000
  S D 0.003700.017520.027650.011930.000600.00003
SSW D 0.002870.013850.034960.020100.002490.00049
 SW D 0.002180.011440.021740.011560.001890.00063
WSW D 0.002040.006570.010950.008060.001890.00040
  W D 0.002470.006420.013250.007030.000890.00003
WNW D 0.002240.005190.009810.005850.000750.00009
 NW D 0.003330.003700.005280.004160.000660.00009
NNW D 0.004450.005560.004850.002180.000110.00000
  N E 0.004790.009840.002240.000000.000000.00000
NNE E 0.004160.008950.003470.000000.000000.00000
 NE E 0.003100.005220.000890.000000.000000.00000
ENE E 0.001890.002550.000340.000000.000000.00000
  E E 0.001950.001580.000060.000000.000000.00000
ESE E 0.001520.001200.000060.000000.000000.00000
 SE E 0.001230.001260.000140.000000.000000.00000
SSE E 0.001090.002810.000490.000000.000000.00000
  S E 0.001290.006880.005310.000000.000000.00000
SSW E 0.001350.012880.025920.000000.000000.00000
 SW E 0.002320.020790.014200.000000.000000.00000
WSW E 0.002440.010470.011560.000000.000000.00000
  W E 0.001610.011930.012160.000000.000000.00000
WNW E 0.002350.009150.004420.000000.000000.00000
 NW E 0.002980.005190.002010.000000.000000.00000
NNW E 0.003730.007710.002950.000000.000000.00000
  N F 0.005280.002380.000060.000000.000000.00000
NNE F 0.005420.002120.000260.000000.000000.00000
 NE F 0.004960.001260.000090.000000.000000.00000
ENE F 0.003530.001000.000000.000000.000000.00000
  E F 0.003560.000540.000000.000000.000000.00000
ESE F 0.002610.000370.000000.000000.000000.00000
 SE F 0.002900.001030.000000.000000.000000.00000
SSE F 0.002980.001490.000000.000000.000000.00000
  S F 0.003930.004420.000090.000000.000000.00000
SSW F 0.004930.007080.000890.000000.000000.00000
 SW F 0.004270.004010.000200.000000.000000.00000
WSW F 0.002490.006850.002240.000000.000000.00000
  W F 0.003810.008400.003330.000000.000000.00000
WNW F 0.003870.005100.000200.000000.000000.00000
 NW F 0.004300.002440.000110.000000.000000.00000
NNW F 0.005390.002210.000200.000000.000000.00000
```

Table 8. 40-61.94(b)(7) User-Supplied Data—Population Array

Estimated 2002 Population within 80 km of Los Alamos National Laboratory, TA-53-LANSCE (km)

Direction	0.8–1.0	1.0–1.5	1.5–2.0	2.0–2.5	2.5–3.0	3.0–3.5	3.5–4.0	4.0–5.0	5.0–6.0	6.0–7.0	7.0–8.0	8.0–10	10–20	20–30	30–40	40–80
N	9	17	56	27	53	82	94	139	0	0	0	0	16	97	1003	1483
NNW	7	17	48	230	169	89	257	278	21	0	0	0	8	22	276	492
NW	9	17	21	57	320	384	208	678	415	393	54	0	2	26	53	1076
WNW	0	0	10	15	68	210	819	1047	1866	2613	723	0	0	33	38	3195
W	0	0	0	0	0	0	96	163	0	0	0	0	9	80	356	175
WSW	0	0	0	0	0	0	0	0	0	0	0	2	9	45	493	2909
SW	0	0	0	0	0	0	0	0	0	0	0	4	4	0	0	2932
SSW	0	0	0	0	0	0	0	0	0	0	0	35	4	1048	1564	72580
S	0	0	0	0	0	0	0	0	0	0	0	19	7	20	177	3953
SSE	0	0	0	0	0	0	0	0	0	336	220	313	56	349	6351	3057
SE	0	0	0	0	0	0	0	0	0	1546	3305	563	1	1160	81840	9164
ESE	0	0	0	0	0	0	0	0	0	0	0	11	13	788	9029	3085
E	0	0	0	0	0	0	0	0	0	0	2	1	1928	4593	447	490
ENE	0	0	0	0	0	0	0	0	0	0	0	0	2309	5111	3953	3153
NE	7	10	2	0	0	0	0	0	0	0	0	0	1298	15818	2690	6744
NNE	7	17	53	8	38	32	25	24	0	0	0	0	15	2514	413	1047

Table 9. 40-61.94(b)(7) User-Supplied Data—Modeling Parameters for LANL Non-Point Sources

LANL Air Activation Sources

Source	Radionuclide	Emission (Ci)	Area of Source (m^3)	Distance to LANL Maximum Dose Location (m)	Direction to LANL Maximum Dose Location
TA-53 Switchyard	Ar-41	7.73E-01	484	2905	WNW
	C-11	1.85E+01	484	2905	WNW
TA-53-1L Service Area	Ar-41	2.55E+00	1.0	2971	WNW
	C-11	6.11E+01	1.0	2971	WNW

Table 10. Environmental Data—Compliance Stations

2007 Effective Dose Equivalent (net in mrem) measured at air sampling locations around LANL.

Site Number and Name		H-3	Am-241	Pu-238	Pu-239	U-234	U-235	U-238	Rounded Total (mrem)
06	48th Street	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
08	McDonalds	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02
09	Los Alamos Airport Terminal	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.02
10	Eastgate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
11	Well PM-1 (East Jemez)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
12	Royal Crest Trailer Court	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	Rocket Park	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.02
14	Pajarito Acres	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
15	White Rock Fire Station	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
16	White Rock Nazarene Ch.	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.03
20	TA-21 Area B	0.00	0.00	0.00	0.04	0.01	0.00	0.02	0.08
32	County Landfill	0.00	0.00	0.00	0.00	0.03	0.00	0.03	0.07
60	LA Canyon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
61	LA Hospital	0.00	0.00	0.00	-0.01	0.00	0.00	0.01	0.01
62	Crossroads Bible Church	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.03
63	Monte Rey South	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
66	Los Alamos Inn - South	0.00	0.00	0.00	0.09	0.00	0.00	0.00	0.11
67	TA-3 Research Park	0.00	0.00	0.00	-0.01	0.01	0.00	0.01	0.01
68	Los Alamos Airport Road	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.02
Airnet Samplers Added in 2007 for MDA B Environmental Remediation									
42	A15 – West End	0.00	0.00	0.00	0.02	0.01	0.00	0.01	0.05
71	DP – Fire Station	0.01	0.02	0.01	0.16	0.01	0.00	0.01	0.22
72	DP – Ace	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01
73	DP – Monitor	0.00	0.01	0.00	0.01	0.01	0.00	0.01	0.05
74	A15 - West Center	0.01	0.00	-0.01	0.01	0.01	0.00	0.01	0.03
75	A15 – East Center	0.02	0.01	0.00	0.02	0.01	0.00	0.01	0.08
79	A15 – East End	0.01	0.00	0.00	0.05	0.01	0.00	0.02	0.09

Table 11. Environmental Data—Compliance Stations

2007 Analytical Completeness and Air Sampler Operation Summary

Site Number and Name		Percent Analytical Completeness							
		H-3	Am-241	Pu-238	Pu-239	U-234	U-235	U-238	Percent run time
06	48th Street	100	100	100	100	100	100	100	99.6
08	McDonalds	100	100	100	100	100	100	100	99.6
09	Los Alamos Airport Terminal	100	100	100	100	100	100	100	99.6
10	Eastgate	100	100	100	100	100	100	100	99.1
11	Well PM-1 (East Jemez)	100	100	100	100	100	100	100	99.8
12	Royal Crest Trailer Court	100	100	100	100	100	100	100	99.7
13	Rocket Park	100	100	100	100	100	100	100	99.7
14	Pajarito Acres	100	100	100	100	100	100	100	98.8
15	White Rock Fire Station	100	100	100	100	100	100	100	99.8
16	White Rock Nazarene Ch.	100	100	100	100	100	100	100	99.7
20	TA-21 Area B	100	100	100	100	100	100	100	97.5
32	County Landfill	96.2	100	100	100	100	100	100	99.8
60	LA Canyon	100	100	100	100	100	100	100	99.8
61	LA Hospital	100	100	100	100	100	100	100	99.5
62	Crossroads Bible Church	100	100	100	100	100	100	100	99.6
63	Monte Rey South	100	100	100	100	100	100	100	97.8
66	Los Alamos Inn - South	100	100	100	100	100	100	100	99.1
67	TA-3 Research Park	100	100	100	100	100	100	100	98.9
68	Los Alamos Airport Road	100	100	100	100	100	100	100	99.4
Airnet Samplers Added in 2007 for MDA B Environmental Remediation									
42	A15 – West End	98.4	100	100	100	100	100	100	100
71	DP – Fire Station	97.2	100	90.9	100	100	100	100	100
72	DP – Ace	94.7	100	90.9	100	100	100	100	100
73	DP – Monitor	98.2	100	90.9	100	100	100	100	100
74	A15 – West Center	99.3	100	90.9	100	100	100	100	100
75	A15 – East Center	99.3	100	90.9	100	100	100	100	100
79	A15 – East End	99.3	100	90.9	100	100	100	100	100

Table 12. LANSCE Monthly Assessments and Comparison Summary

Description	StackID	Dose at East Gate Receptor
LANSCE-stack-January GMAP	53000702	none
LANSCE-stack-February GMAP	53000702	none
LANSCE-stack-March GMAP	53000702	none
LANSCE-stack-April GMAP	53000702	none
LANSCE stack-May GMAP	53000702	none
LANSCE stack-June GMAP	53000702	5.14E-03
LANSCE stack-July GMAP	53000702	4.35E-03
LANSCE stack-August GMAP	53000702	7.68E-03
LANSCE stack-September GMAP	53000702	5.75E-03
LANSCE-stack-October GMAP	53000702	4.47E-03
LANSCE-stack-November GMAP	53000702	1.20E-02
LANSCE-stack-December GMAP	53000702	1.50E-02
Sum of monthly GMAP runs for this stack	53000702	5.44E-02
GMAP single annual analysis for this stack	53000702	5.56E-2
Other LANSCE facility emissions: all are annual CAP88 assessments		
LANSCE-stack-PVAP	53000702	3.05E-03
LANSCE-Non-CAP88 Radionuclides	53000702	4.20E-06
LANSCE-stack- GMAP	53000303	2.87E-03
LANSCE-stack-PVAP	53000303	1.80E-03
LANSCE-Non-CAP88 Radionuclides	53000303	None
LANSCE-Fugitive Emissions - Switchyard	530003SY	1.53E-02
LANSCE-Fugitive Emissions - 1L Service Area	5300071L	3.50E-02
LANSCE facility summary using monthly gas emissions totals:		1.12E-01
LANSCE facility summary using annual gas emissions totals:		1.14E-01

To be conservative, the **GMAP Annual Analysis** is used for further reporting and emissions evaluations.

GMAP = Gaseous Mixed Activation products; short-lived radioactive gases (e.g., C-11, O-15, Ar-41)

PVAP = Particulate & Vapor Activation Products (e.g., Na-24, Br-76)

Table 13. 40-61.92 Highest Effective Dose Equivalent Summary

Description	StackID	Dose for Release Site Receptor	Dose at East Gate Receptor	Dose at DP Road Receptor
CMR Stack	03002914	none	none	none
CMR Stack	03002915	2.50E-06	2.81E-07	6.80E-07
CMR Stack	03002919	4.58E-05	4.97E-06	1.22E-05
CMR Stack	03002920	5.03E-06	5.58E-07	1.34E-06
CMR Stack	03002923	3.65E-05	3.58E-06	8.51E-06
CMR Stack	03002924	2.99E-04	2.46E-05	6.25E-05
CMR Stack	03002928	4.58E-05	6.01E-06	1.43E-05
CMR Stack	03002929	6.66E-06	7.10E-07	1.79E-06
CMR Stack	03002932	none	none	none
CMR Stack	03002933	none	none	none
CMR Stack	03002937	none	none	none
CMR Stack	03002944	6.26E-06	7.11E-07	1.78E-06
CMR Stack	03002945	7.30E-06	8.48E-07	2.10E-06
CMR Stack	03002946	1.73E-05	1.94E-06	4.88E-06
Shops Addition Stack	03010222	1.00E-07	6.29E-09	1.64E-08
WETF Stack – old	16020504	3.55E-02	3.70E-03	4.48E-03
WETF Stack – new	16045005	1.56E-02	1.95E-03	2.34E-03
Radiochemistry Stack	48000107	8.60E-03	1.03E-03	2.53E-03
Radiochemistry Stack/non-CAP88 radionuclides	48000107	none	none	none

Table 13 (Continued)

Description	StackID	Dose for Release Site Receptor	Dose at East Gate Receptor	Dose at DP Road Receptor
Radiochemistry Stack	48000154	1.75E-07	1.96E-08	5.04E-08
Radiochemistry Stack	48000160	3.01E-05	3.33E-06	8.41E-06
Waste Management Stack	50000102	1.50E-06	4.29E-07	7.24E-07
Waste Management Stack	50003701	9.44E-07	2.39E-07	4.26E-07
Waste Management Stack	50006903	4.93E-07	1.19E-07	2.13E-07
LANSCE-Stack-Annual – Gas	53000303	2.87E-03	2.87E-03	2.75E-04
LANSCE-Stack-Annual – Particulate/Vapor	53000303	1.80E-03	1.80E-03	1.72E-04
LANSCE Fugitive Emissions – Switch Yard	530000sy	1.53E-02	1.53E-02	5.50E-04
LANSCE-Stack-Annual – Gas	53000702	5.56E-02	5.56E-02**	3.55E-03
LANSCE-Stack-Annual – Particulate/Vapor	53000702	3.05E-03	3.05E-03	1.95E-04
LANSCE-Stack/non CAP88 radionuclides	53000702	4.20E-06	4.20E-06	2.70E-07
LANSCE Fugitive Emissions – 1L Service Area	5300071L	3.50E-02	3.50E-02	1.75E-03
Plutonium Facility Stack	55000415	3.50E-06	6.06E-07	1.50E-06
Plutonium Facility Stack	55000416	1.88E-03	3.90E-04	8.79E-04
Unmonitored Stacks – gross	99000000	2.82E-01	2.82E-01	2.82E-01
Air-Sampler Net Dose	99000010	N/A	9.48E-03	2.21E-01
Total Maximally Exposed Individual dose (mrem)			**4.12E-01**	**5.20E-01**
Rounded total for reporting purposes (mrem)			**0.41**	**0.52**

**Since the annual gases measurement is greater than the sum of the monthly gas measurements in Table 12, the annual measurement is reported here.

61.94(b)(9) Certification

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

Signature: ____ Date: _________________

Donald L. Winchell, Jr., Owner
Manager
Los Alamos Site Office
National Nuclear Security Administration
U.S. Department of Energy

Signature: ____ Date: _________________

Richard S. Watkins, Operator
Associate Director
Environment, Safety, Health and Quality Division
Los Alamos National Security, LLC
Los Alamos National Laboratory

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