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, 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, and engineering that supports such programs, and in biology that complements and draws upon basic research in the physical sciences.

The primary facilities involved in emissions of radioactivity are outlined in this section. The facility locations are designated by technical area and building. For example, the facility designation TA-3-29 is Building 29 at Technical Area 3 (see Figure 2 showing the technical areas at LANL). Potential radionuclide release points are listed in several tables that follow. Some of the sources described below are characterized as nonpoint. Beginning in 1995, air-sampling results from LANL's air-sampling network (AIRNET) were used, with EPA approval, to calculate off-site impacts due to diffuse and fugitive emissions of radioactive particles and tritium oxide from nonpoint sources.

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

The radionuclides emitted from point sources at LANL in the calendar year (CY) 2000 are listed in subsequent tables. Tritium is released as tritium oxide and elemental tritium. Plutonium contains traces of ^{241}Am, a transformation product of ^{241}Pu. Some of the uranium emissions are from open-air explosive tests involving depleted uranium. GMAP emissions include ^{41}Ar, ^{10}C, ^{11}C, ^{13}N, ^{16}N, ^{14}O, and ^{15}O. Various radionuclides such as ^{193}Hg and ^{197}Hg make up the majority of the P/VAP emissions.

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

The primary facilities responsible for radiological airborne emissions follow. Additional descriptions of LANL technical areas can be found in the annual site environmental report for LANL. More thorough descriptions of LANL operations can be found in the annual yearbooks published by LANL's Site-Wide Issues Program Office, the most recent being the "SWEIS 1999 Yearbook".[1]

TA-3-29: Programs conducting chemical and metallurgical research are located in this facility. Principal radionuclides are isotopes of plutonium and uranium

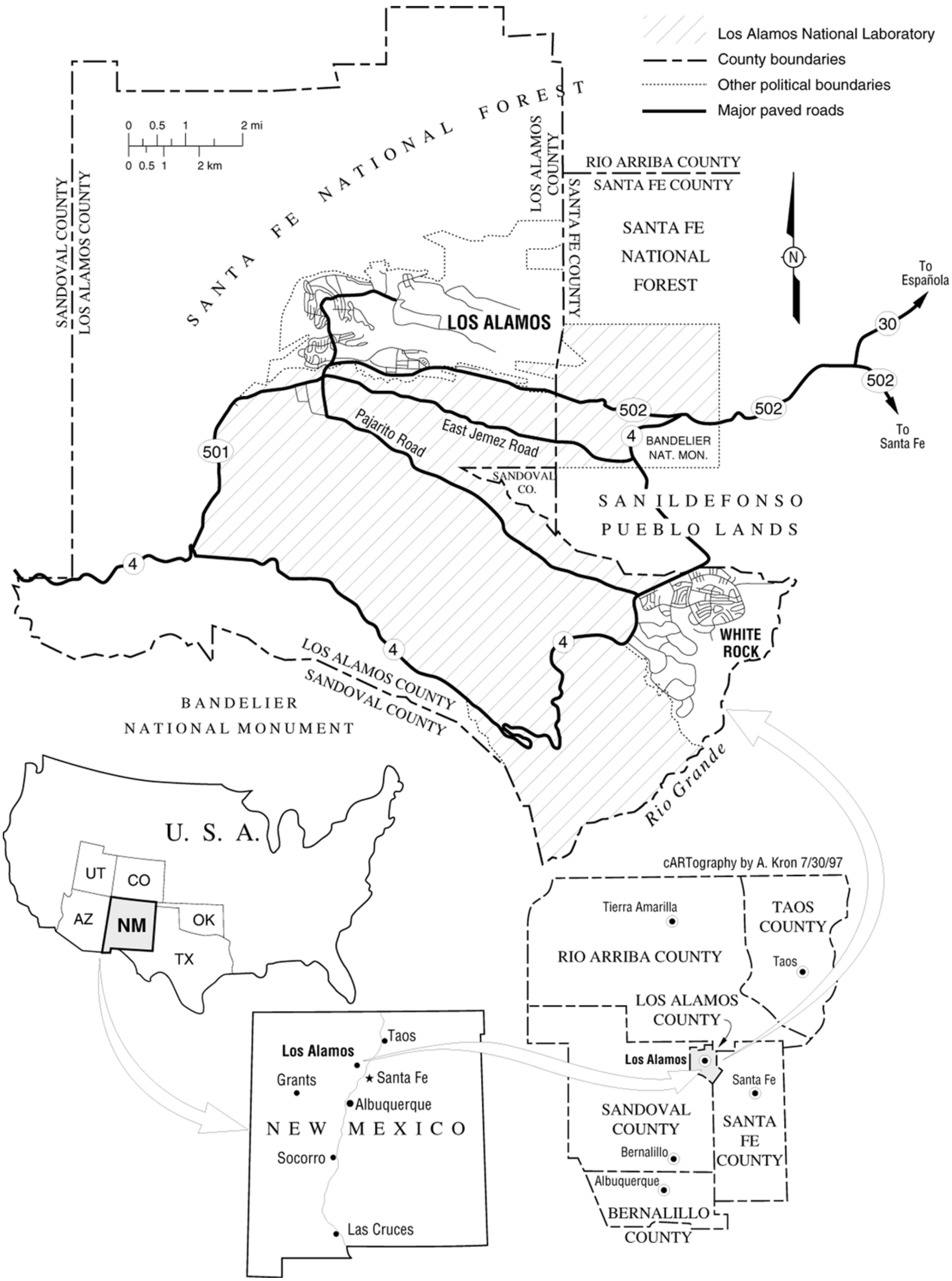

Figure 1. Location of Los Alamos National Laboratory

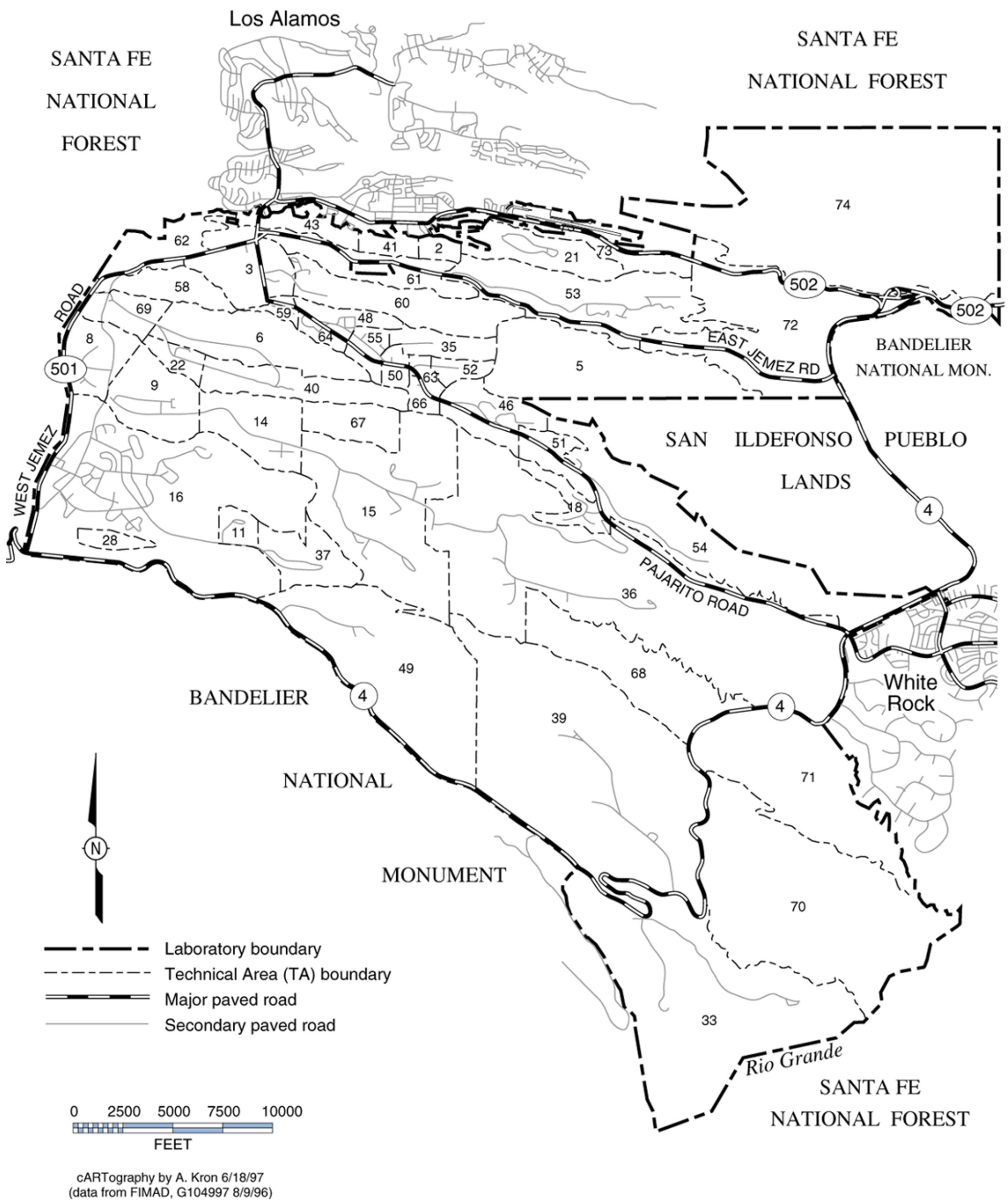

Figure 2. Location of Los Alamos National Laboratory Technical Areas, by Number

TA-3-35: The facility houses a 5,000-ton capacity press that has been used in the metalworking of radioactive materials. Note that stack monitoring at this facility was discontinued in 2000.

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

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

TA-15-312-DAHRT: Construction on this new facility for conducting high-explosive driven experiments was recently completed.

TA-16-205-WETF: This facility is located in Buildings 205 and 205A in the southeast section of TA-16. Building 205 is specifically designed and built to process tritium safely and to meet user needs and specifications. The operations at WETF are divided into two categories: tritium processing and activities that support tritium processing. Examples of tritium-processing operations include repackaging tritium into smaller quantities and repackaging 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.

TA-21-155 and TA-21-209: These facilities also conduct operations involving tritium. Programs include testing of tritium control systems for the nuclear fusion program (TA-21-155), preparation of targets containing tritium for laser-fusion research, and the handling of tritium for defense programs. In addition, operations to recover tritium from old equipment are being conducted at TA-21-209.

TA-18: This nuclear facility studies the behavior of critical assemblies of nuclear materials. Some of the assemblies are used as a source of fission neutrons for experimental purposes, resulting in a diffuse source of ^{41}Ar emissions.

TA-21: Many of the facilities at this decommissioned radiochemistry site are undergoing decontamination, demolition, and disposal. Some of these operations may contribute to diffuse releases of uranium and plutonium into the air.

TA-33-86 and TA-41-4: These buildings were formerly used as tritium-handling facilities. Current emissions primarily result from residual tritium contamination and cleanup operations.

TA-48-1: The principal activities carried out in this facility are radiochemical separations in support of 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 a low-level liquid waste treatment plant. Also, there is a wastewater outfall from TA-50-1 that results in a diffuse source of airborne tritium.

TA-50-37: This controlled air incinerator was decommissioned in 1996 and is no longer active. It has been remodeled to house the Radioactive Materials Research Operations Demonstration (RAMROD) project.

TA-50-69: This waste management site consists of a waste characterization and reduction 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 hydrogen ions to an 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. The primary high-intensity beam line (Line A) and medical isotope production facility did not operate in 2000. Medium-intensity beam (100 microamp) operations to the Proton Storage Ring (PSR) and the Manuel Lujan Neutron Scattering Center were conducted from July to December of 2000. Low-intensity beam (up to 10 microamps) operations to the PSR, the Weapons Neutron Research facility and the Proton Radiography facility were conducted throughout most of 2000.

Airborne radioactive emissions result from the proton beams and secondary particles passing through and activating air molecules in the target cells, beam stop, and surrounding areas. The majority of the emissions are short-lived activation products such as ^{11}C, ^{13}N, and ^{15}O. 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. In addition, there are three wastewater lagoons at TA-53 that have received radioactive liquid effluents from the accelerator; however, none of these lagoons received wastewater in 2000, and the old lagoon facility is being remedied. Two new 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. Area 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 and continued in 2000.

TA-55-4: As discussed in the January 1999 *Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory*, this plutonium facility is slated for a plutonium pit production mission as well as for continuing in its traditional role of housing research-and-development applications in chemical and metallurgical processes for recovering, purifying, and converting plutonium and other actinides.[2] A wide range of activities that include the heating, dissolution, forming, welding, etc., of special nuclear materials is conducted. Additional activities include developing the means to safely ship, receive, handle, and store nuclear materials, as well as to manage the wastes and residues produced by TA-55 operations.

SECTION II. AIR EMISSIONS DATA

61.94(b)(4): Point Sources

Sampled and unsampled point sources at LANL are listed in Table 1. The point sources are identified using an eight-digit identification number for each exhaust stack (ESIDNUM); the first two digits represent the LANL technical area, the next four digits the building area, 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

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

ESIDNUM	Location	Control Description	Number of Effluent	Control Efficiency	Monitored
03001608	TA-03-16	none	0	0%	
03001609	TA-03-16	none	0	0%	
03001614	TA-03-16	none	0	0%	
03001616	TA-03-16	none	0	0%	
03001621	TA-03-16	none	0	0%	
03001641	TA-03-16	none	0	0%	
03002913	TA-03-29-1	unkown	0	0%	
03002914	TA-03-29-2	HEPA	2	99.95% each	√
03002915	TA-03-29-2	HEPA	2	99.95% each	√
03002919	TA-03-29-3	Aerosol 95	1	80%	√
03002920	TA-03-29-3	Aerosol 95	1	80%	√
03002921	TA-03-29-3	none	0	0%	
03002923	TA-03-29-4	FARR 30/30	1	~ 20%	√
03002924	TA-03-29-4	FARR 30/30	1	~ 20%	√
03002928	TA-03-29-5	HEPA	2	99.95% each	√
03002929	TA-03-29-5	HEPA	2	99.95% each	√
03002932	TA-03-29-7	HEPA	2	99.95% each	√
03002933	TA-03-29-7	HEPA	2	99.95% each	√
03002937	TA-03-29-V	HEPA	2	99.95% each	√
03002944	TA-03-29-9	RIGA-Flow 220	1	80%	√
03002945	TA-03-29-9	RIGA-Flow 220	1	80%	√
03002946	TA-03-29-9	RIGA-Flow 220	1	80%	√
03003401	TA-03-34	none	0	0%	
03003435	TA-03-34	none	0	0%	
03003501	TA-03-35	HEPA	1	99.95%	
03003999	TA-3-39	none	0	0%	

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

ESIDNUM	Location	Control Description	Number of Effluent	Control Efficiency	Monitored
03004025	TA-03-40	HEPA	1	99.95%	
03006601	TA-03-66	none	0	0%	
03006602	TA-03-66	none	0	0%	
03006603	TA-03-66	none	0	0%	
03006604	TA-03-66	none	0	0%	
03006605	TA-03-66	none	0	0%	
03006626	TA-03-66	HEPA	1	99.95%	
03006643	TA-03-66	none	0	0%	
03010222	TA-03-102	HEPA	1	99.95%	√
03010225	TA-03-102	HEPA	1	99.95%	
03014110	TA-03-141	none	0	0%	
03169801	TA-03-1698	none	0	0%	
09002103	TA-09-21	none	0	0%	
09003201	TA-09-32	none	0	0%	
15044699	TA-15-446	none	0	0%	
16020504	TA-16-205	CR/MS	1	>99%	√
16020599	TA-16-205	none	0	0%	
16024801	TA-16-248	none	0	0%	
18012701	TA-18-127	none	0	0%	
18016801	TA-18-168	none	0	0%	
21000507	TA-21-5	HEPA	2	99.95% each	
21002S00	TA-21-2S	HEPA	1	99.95%	
21015001	TA-21-150	HEPA	1	99.95%	
21015505	TA-21-155	CR/MS	1	>99%	
21020901	TA-21-209	CR/MS	1	>99%	
21021301	TA-21-213	none	0	0%	
21025704	TA-21-257	none	0	0%	
21041899	TA-21-418	none	0	0	

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

ESIDNUM	Location	Control Description	Number of Effluent	Control Efficiency	Monitored
33008606	TA-33-86	none	0	0%	√
35021305	TA-35-213	none	0	0%	
35021308	TA-35-213	none	0	0%	
41000104	TA-41-1	HEPA	2	99.95% each	
41000417	TA-41-4	none	0	0%	√
43000102	TA-43-1	none	0	0%	
43000109	TA-43-1	none	0	0%	
43000110	TA-43-1	none	0	0%	
43000112	TA-43-1	none	0	0%	
43000113	TA-43-1	none	0	0%	
43000134	TA-43-1	none	0	0%	
46002401	TA-46-24	none	0	0%	
46003101	TA-46-31	none	0	0%	
46003125	TA-46-31	none	0	0%	
46003141	TA-46-31	none	0	0%	
46004106	TA-46-41	none	0	0%	
46015405	TA-46-154	none	0	0%	
46015810	TA-46-158	none	0	0%	
48000107	TA-48-1	HEPA/Charcoal	2	99.95% each	√
48000111	TA-48-1	none	0	0%	
48000115	TA-48-1	none	0	0%	
48000135	TA-48-1	none	0	0%	
48000145	TA-48-1	none	0	0%	
48000154	TA-48-1	HEPA	2	99.95% each	√
48000160	TA-48-1	HEPA	1	99.95%	√
48000199	TA-48-1	HEPA	1	99.95%	
48004501	TA-48-45	none	0	0%	
50000102	TA-50-1	HEPA	1	99.95% each	√

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

ESIDNUM	Location	Control Description	Number of Effluent	Control Efficiency	Monitored
50000201	TA-50-2	none	0	0%	
50003701	TA-50-37	HEPA	2	99.95% each	√
50006901	TA-50-69	HEPA	1	99.95%	
50006902	TA-50-69	HEPA	1	99.95%	
50006903	TA-50-69	HEPA	2	99.95% each	√
50018500	TA-50-185	HEPA	1	99.95%	
53000303	TA-53-3	HEPA	1	99.95%	√
53000702	TA-53-7	HEPA	1	99.95%	√
53000799	TA-53-7	none	0	0%	
53036599	TA-53-365	none	0	0%	
53109010	TA-53-1090	none	0	0%	
54003300	TA-54-33	HEPA	1	99.95%	
54003601	TA-54-36	HEPA	1	99.95%	
54022601	TA-54-226	none	0	0%	
54028101	TA-54-281	HEPA	1	99.95%	
54100110	TA-54-1001	none	0	0%	
55000415	TA-55-4	HEPA	4	99.95% each	√
55000416	TA-55-4	HEPA	4	99.95% each	√
59000104	TA-59-1	none	0	0%	
59000114	TA-59-1	none	0	0%	
59000121	TA-59-1	none	0	0%	
59000122	TA-59-1	none	0	0%	
59000123	TA-59-1	none	0	0%	
59000124	TA-59-1	none	0	0%	
59000125	TA-59-1	none	0	0%	
59000126	TA-59-1	none	0	0%	
59000127	TA-59-1	none	0	0%	
59000130	TA-59-1	none	0	0%	

stage and 2.5×10^{-7} for two stages in series, in which penetration equals concentration of aerosol downstream of the air cleaner divided by concentration upstream.

The distance between each of 30 monitored point sources and the nearest receptor is provided in Table 2. 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 critical receptor location. The distance to the nearest milk-producing farm is 20 km east of the Laboratory's eastern boundary; the nearest farms producing meat and vegetables adjoin the Laboratory's eastern boundary, about 4 km from the main exhaust stack at LANSCE. More detailed agricultural information can be found in a supplemental LANL report.[3] At this time, LANL is not using this site-specific agricultural data in the CAP88 model; preprogrammed or default values for New Mexico are utilized for the number of beef and milk cattle and for agricultural productivity.

In addition to 30 monitored release points, approximately 40 unmonitored release points—distributed over more than 30 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 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 Radioactive Materials Usage Survey. The purpose of the Usage Survey is to collect and analyze radioactive materials usage and process information for the monitored and unmonitored point sources at LANL.

Guided by Appendix D of 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 potential effective dose equivalents (PEDEs) are calculated by modeling these emissions estimates using the EPA-approved CAP88 dose modeling software. A comprehensive survey of all of LANL's monitored and unmonitored point sources is conducted annually or biannually. Results of the 2000 Usage Survey can be found in the report *2000 Radioactive Materials Usage Survey for Point Sources*.[4] The Laboratory has established administrative requirements to evaluate all potential new sources. These requirements are established for the review of new Laboratory activities and projects to ensure that air quality regulatory requirements will be met before the activity or project begins.[5]

Nonpoint Sources

There are a variety of nonpoint sources within the 111 square kilometers of land occupied by LANL. Nonpoint sources can occur as diffuse or large-area sources or as leaks or fugitive emissions from facilities. Examples of nonpoint sources of airborne radionuclides include surface impoundments, shallow land burial sites, open burn sites, firing sites, outfalls, container storage areas, unvented buildings, waste-treatment areas, solid-waste management units, and tanks. The Laboratory measures annual average ambient concentrations of important airborne

Table 2. 40-61.94(b)(6) Distances from Monitored Release Points to Nearest Receptor

ESIDNUM	Nearest Receptor (m)	Receptor Direction
03002914	731	NE
03002915	732	NE
03002919	836	NNE
03002920	835	NNE
03002923	845	NE
03002924	846	NE
03002928	936	NE
03002929	937	NE
03002932	856	NNE
03002933	855	NNE
03002937	870	NE
03002944	937	NNE
03002945	939	NNE
03002946	938	NNE
03010222	1060	NE
16020504	778	SSW
21015505	680	NNW
21020901	712	NNW
33008606	977	WSW
41000417	197	N
48000107	750	NNE
48000154	751	NNE
48000160	764	NNE
50000102	1183	N
50003701	1171	N
50006903	1186	N
53000303	800	NNE
53000702	944	NNE
55000415	1016	NNE
55000416	1089	NNE

radionuclides (other than activated gases) at a number of potential receptor locations, as described below.

Beginning in 1995, LANL began summarizing the potential impacts of nonpoint sources by analyzing and reporting air concentration measurements collected at 17 ambient air-sampling sites around the Laboratory. Previously, LANL had estimated emissions from the most significant nonpoint sources and determined the impacts using EPA's dose assessment computer program. The Laboratory and EPA negotiated this new method of assessing nonpoint sources as part of a Federal Facility Compliance Agreement (FFCA).[6] Results of the air-sampling analysis are provided in Section III of this report. There were no unusual radionuclide readings measured at the air-sampling stations in 2000.

Radionuclide Emissions

Radionuclides released from sampled point sources, along with the annual release rate for each radionuclide, are documented in Table 9 (on pages 43 to 45). No detectable emissions are denoted as ND.

Pollution Controls

At Los Alamos National Laboratory, the most common type of filtration, for emission control purposes, is the high efficiency particulate air (HEPA) filter. HEPA filters are constructed of submicrometer glass fibers that are pressed and glued into a compact, paper-like, pleated media. The paper media is 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 99.97% of 0.3 mm particles at rated airflow. Other types of filters used in ventilation systems are Aerosol 95, RIGA-FLOW 220, 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 particulates. When the contaminant of concern is in the form of a gas, activated charcoal beds are used. Charcoal beds collect the gas contaminant through an adsorption process in which the gas comes in contact with the charcoal and adheres to its surface. 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 can achieve an efficiency of 98% capture with a resident time of 0.25 seconds.

Tritium effluent controls are generally composed of a catalytic reactor and a molecular sieve bed (CR/MS). Tritium-contaminated effluent is passed through a catalyst that converts elemental tritium (HT) into tritium oxide (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.