DOE/EA-0969

Environmental Assessment

Low Energy Accelerator Laboratory

Technical Area 53

Los Alamos National Laboratory

Date Prepared: April 1995

Prepared for: Office of Defense Programs
U S Department of Energy

With the technical assistance of:
Environmental Assessments and Resource Evaluations Group
Los Alamos National Laboratory
Los Alamos, NM 87545

DISCLAIMER

Executive Summary

This Environmental Assessment (EA) analyzes the potential environmental impacts that would be expected to occur if the Department of Energy (DOE) were to construct and operate a small research and development laboratory building at Technical Area (TA) 53 at the Los Alamos National Laboratory (LANL), Los Alamos, New Mexico. DOE proposes to construct a small building to be called the Low Energy Accelerator Laboratory (LEAL), at a previously cleared, bladed, and leveled quarter-acre site next to other facilities housing linear accelerator research activities at TA-53. Operations proposed for LEAL would consist of bench-scale research, development, and testing of the initial section of linear particle accelerators. This initial section consists of various components that are collectively called an injector system. The anticipated life span of the proposed development program would be about 15 years.

The DOE has identified the need to advance the technology of injection systems to meet the physical requirements of high-power accelerators now under study for programmatic applications as a part of its overall energy research and development mission. The next generation of higher-power accelerators will require a higher flux of subatomic particles, or beam current, than is currently available. The extrapolation of present operating beam current levels to the higher levels required has been verified theoretically; the proposed action would, in part, further the technological advancement of the low energy "front end" of the system that supplies the beam current to the linear accelerator.

The proposed action is to construct a two-story, pre-engineered metal building measuring 70 feet in width and 100 feet in length (70 ft x 100 ft), that would feature a high bay laboratory area, as well as supporting shops and offices. Standard methods of industrial construction would be used. The building would be operated as a laboratory for the research and development, and assembly and testing of accelerator injection system components. The bounding operation parameters of the experimental injection systems would be a maximum beam energy of 3 mega-electron volts, maximum beam current of 250 milliamp, maximum time-averaged beam power of 25 kilowatts, and a maximum radio frequency power of 1 megawatt. At these operating parameters, no materials would be expected to become radioactive; generated energy would be dissipated as both heat and x-rays. Heat would be removed by a closed system water cooling loop, and the test apparatus would be shielded to prevent x-ray emissions beyond the immediate vicinity of the injection system.

Alternatives to the proposed action considered, but eliminated from further analyses in this EA, include installing and operating the injection system research program in another LANL facility; constructing the building, and installing and operating the research program at another LANL site; and installing and operating the research program at another DOE facility. Sufficient available space was not identified in pre-existing buildings; no other available building locations with readily available utilities were identified that were easily accessible to workers performing accelerator research and development. Other DOE facilities were eliminated from consideration because they do not currently have similar research programs or resident expertise. The no-action alternative of not constructing the LEAL building and not conducting the injection system research program was analyzed to provide a base line for the proposed action.

Potentially adversely affected resources identified for the proposed action are air quality, water quality, land use, and the worker population.

- Air quality would be impacted by dust and diesel fumes for a short time during building construction activities. Thereafter, small quantities of solvents used to clean equipment would create an impact. All emissions are projected to be far below the air emissions thresholds set by the State of New Mexico to protect members of the public. No radioactive material would be emitted.

- The cooling water system would be operated to avoid adverse impact to surface waters. About 10,000 gallons of water would be released annually to the environment from water cooling system discharge. This discharge would be routed through an existing National Pollution Discharge Elimination System (NPDES) permitted outfall; the discharge water quality would be kept within the NPDES permit specifications related to pH and mineral content.

- LEAL would be constructed on a previously cleared, bladed, and leveled site in a developed area. No cultural resources, or threatened, endangered, or sensitive species are present at the proposed building site; no floodplain or wetland area would be impacted. No solid waste management units or surface contamination areas have been identified for the proposed site. Debris generated by site construction would be disposed of at an existing facility. The operations proposed for LEAL would not produce radioactive waste. However, the beam stop could be classified as low-level radioactive waste at the time of disposal. Hazardous and sanitary wastes would be disposed of at existing facilities, on or off site.

- Operating LEAL would not require siting, construction, or expansion of any solid waste disposal, recovery, or treatment facilities at LANL.

- LEAL would be designed with lead shielding and other features to protect the workers from accidental exposure to x-rays generated during test operations. Operating safety procedures would be enforced; design features would be incorporated into the test equipment to shut down the system in case of a malfunction. Individual exposures to x-rays would be expected to be below 0.1 rem annually. No fatal cancers among workers would be anticipated to result from LEAL operations at the potential level of exposure over the life span of the project. No public exposure to x-rays would result from the proposed actions.

- The construction and operation of LEAL would not cause disproportionately high and adverse health impacts to minority and low-income populations.

Environmental impacts from not developing the site under the no-action alternative are the continued natural weathering and re-vegetation of the site. The effects of LANL's normal operations on the air quality, water quality, and other environmental parameters are summarized in the annual Environmental Surveillance Report. The most recent is for 1992 operations.

TABLE OF CONTENTS

This page has been intentionally left blank.

PREDECISIONAL DRAFT ENVIRONMENTAL ASSESSMENT

LOW ENERGY ACCELERATOR LABORATORY
TECHNICAL AREA 53

LOS ALAMOS NATIONAL LABORATORY
LOS ALAMOS, NEW MEXICO

INTRODUCTION

Linear particle accelerators are devices that project electrically charged subatomic particles such as electrons, protons, and other ions, to high energies in a directed beam. These devices show great promise for application in both weapons and non-weapons programs conducted by the Department of Energy (DOE). Potential future applications under consideration by the DOE include:

- accelerator transmutation of waste whereby long-lived radionuclides could be transformed into stable materials and/or radionuclides with shorter half-lives and thus eliminate long-term (thousands of years) storage requirements,
- accelerator production of tritium whereby tritium for commercial and/or defense needs could be produced without operating a nuclear reactor,
- accelerator based conversion for destroying excess or waste plutonium recovered from US and former Soviet Union nuclear weapons, and
- research in materials science and weapons physics.

If accelerator-based conversion processes are successfully developed, it may be possible to generate electrical power for use while simultaneously eliminating excess or waste plutonium. The potential for environmental impact resulting from the use of this method of plutonium elimination is suspected to be much less than that of other proposed plutonium disposal methods. For these reasons, initiatives to study the feasibility of the use of particle accelerators for applications such as these have been undertaken by DOE.

1.0 PURPOSE AND NEED

Preliminary research and development of accelerators for the above applications has shown the need for higher beam currents than are presently attainable from existing systems. The extrapolation of present operating-beam current levels to the required higher levels has been verified theoretically. Of paramount importance in obtaining these higher beam currents is advancement of the technology of the low energy "front end" of the system that supplies the beam of subatomic particles to the linear accelerator. This part of the accelerator system is referred to as the *injection system*[1] and consists of an ion source, a radio-frequency quadruple (RFQ) preaccelerator, and associated beam transport and matching systems.

The DOE needs to advance the development of injection systems to meet the requirements of the high current accelerators now under study for programmatic application as a part of its overall mission in energy research and development, waste management, and national defense

Environmental Assessment Methodology

The National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321 et seq.), requires DOE to consider environmental consequences of program actions before decisions are made. In complying with NEPA, DOE follows the Council on Environmental Quality (CEQ) regulations (40 CFR 1500-1508) and DOE's own NEPA regulations (10 CFR 1021).

The analysis of effects presented in this environmental assessment (EA) is based on conservative assumptions that tend to maximize the estimates of potential adverse environmental impacts. Thus, actual environmental consequences would be expected to be less than those presented here. The proposed project has the DOE identification number AL-LAN-92-013.

2.0 PROPOSED ACTION

2.1 Description of Proposed Action

Summary

The proposed project is to erect a small metal building to be called the Low Energy Accelerator Laboratory (LEAL)[2] (Fig. 1) at a developed site within Technical Area 53 (TA-53) at LANL (Fig. 2). The building would include an electrical distribution system, mechanical and electrical shops, a mezzanine storage area, rest rooms, a cooling tower for the water cooling system, and a high bay area to house an injector test stand. The building would be operated as a laboratory for the research and development, and assembly and testing of accelerator injection system components. Components of an injection system include a source for a beam of protons, beam transport systems, and a radio-frequency quadrupole (RFQ) preaccelerator. Injection systems would be assembled and operated in that building.

The parameter envelope for anticipated future project operations would be a maximum beam energy of 3 mega-electron volts (MeV), a maximum beam current of 250 milliamps (mA), a maximum time-averaged beam power of 25 kilowatts (kW), and a maximum peak radio-frequency (RF) power of 1 megawatt (MW). At these operating parameters, no materials would be expected to become radioactive; generated energy would be dissipated as both heat and x-rays. Heat would be removed by a closed system water cooling loop, and the test apparatus would be shielded to prevent x-ray emissions beyond the immediate vicinity of the injection system.

The expected operational life of the facility for the proposed development program is approximately 15 years.

[1] Terms, abbreviations, and acronyms are described in Section 9.

[2] The Low Energy Accelerator Laboratory was called the Accelerator Prototype Laboratory (APL) early in conceptual planning. Some documents cited as references use this title.

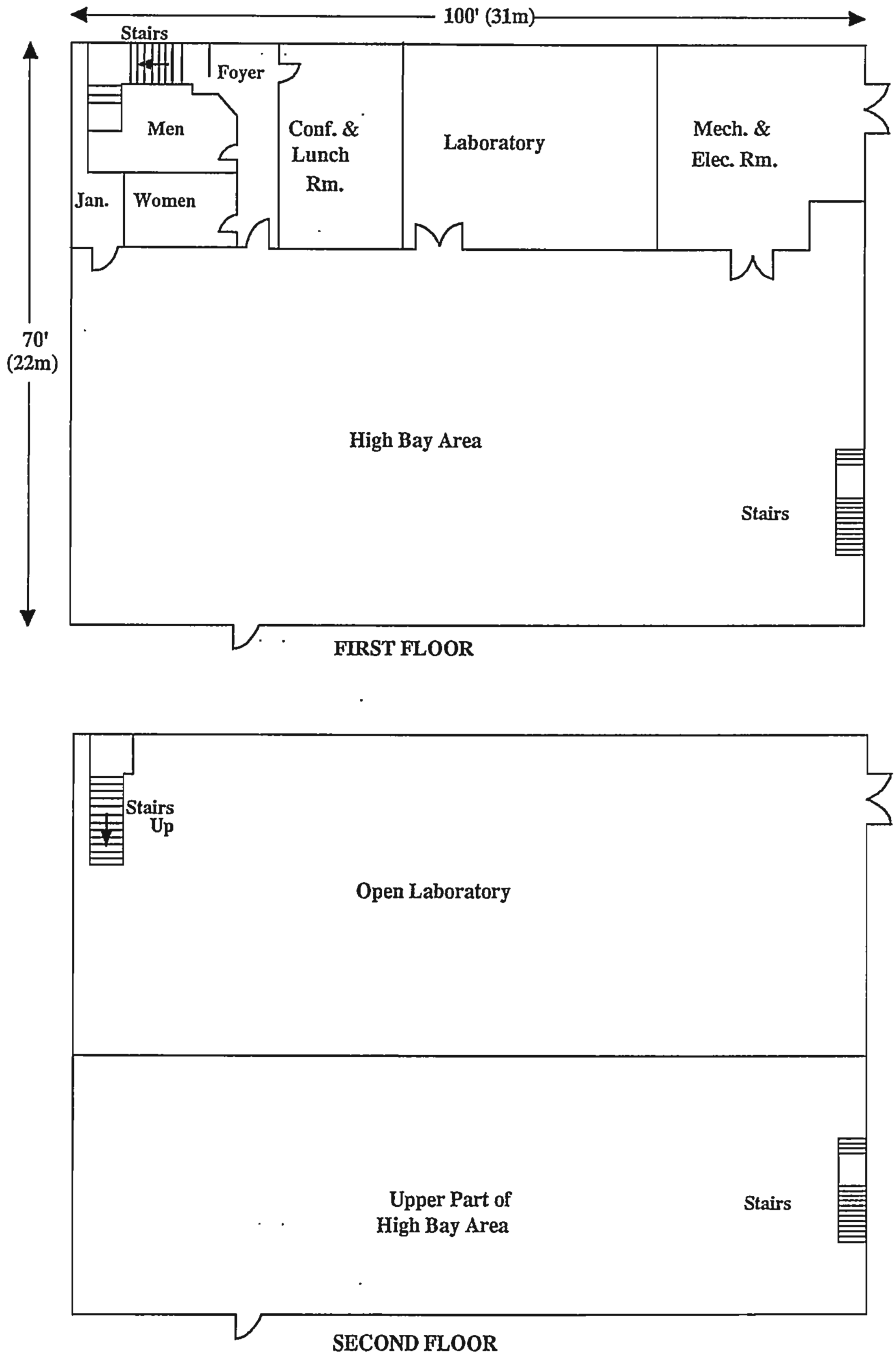

Fig. 1. LEAL floor plan

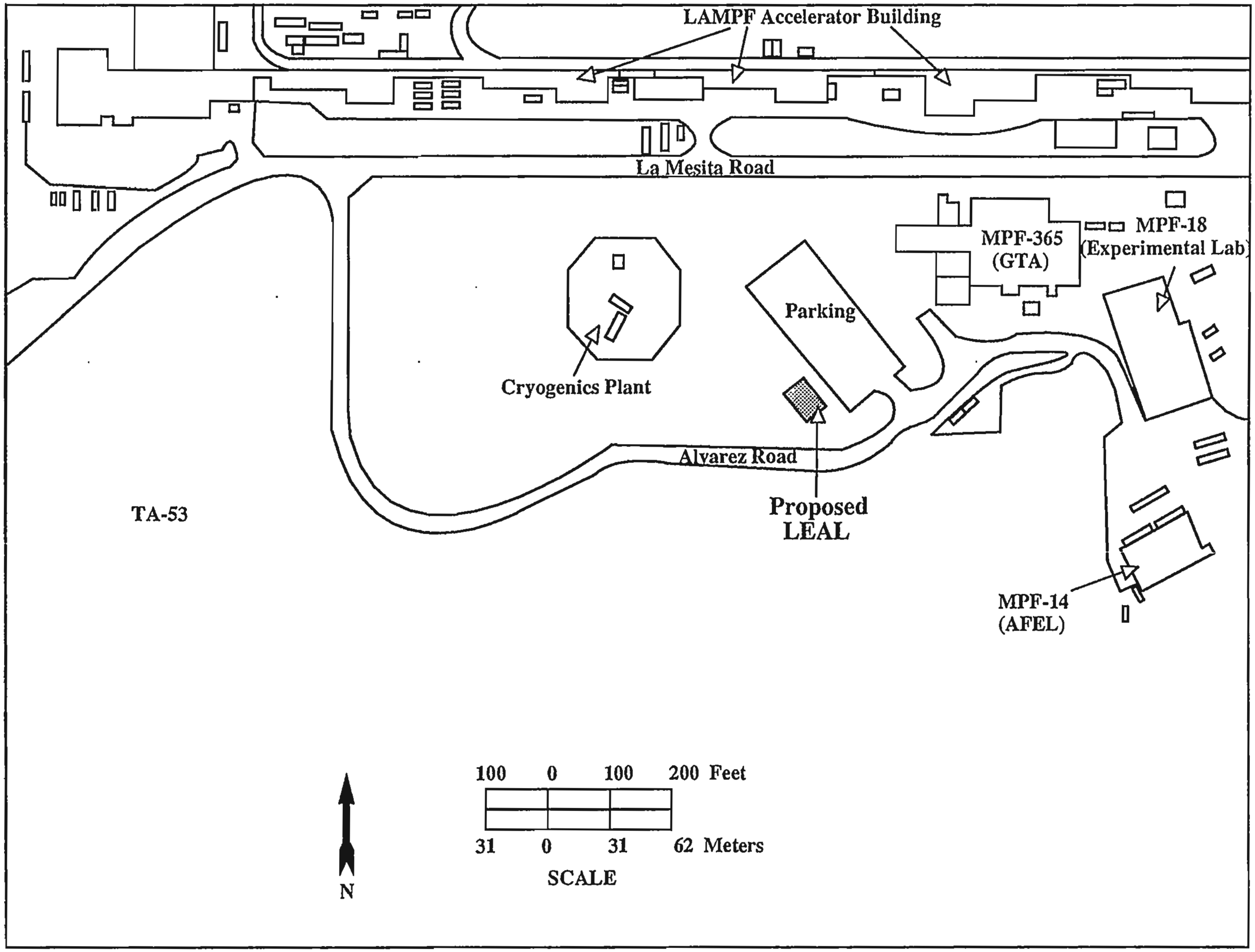

Fig. 2. Location of LEAL and Technical Area 53

Siting criteria for the LEAL set by the technical project personnel and the construction engineering team, were reviewed by the LANL Siting and Space Committee in conjunction with the 1990 Site Development Plan (LANL 1990). The criteria, rationale, and results are summarized in Table 1.

Table 1. Siting Criteria for LEAL

Criterion	Reason	Result
Near other accelerator technology facilities at LANL	Close functional ties - shared expertise - shared equipment	Limits site to TA-53
Collocated with other accelerator technology facilities	LANL programmatic plan	Limits site to TA-53
In controlled area	Industrial security measure Access limited to LANL personnel and those with prior authorization	TA-53 meets criteria Excludes many other TAs
Not in limited security area	Limited security areas would constrain access of visiting scientists and some DOE personnel Some limited security areas pose hazards to personnel	Excludes areas in TA-53 within security fences (in and around Ground Test Accelerator, Experimental Laboratory, Accelerator Technology Laboratory)
Specific site qualities: - access to utilities - flat site ~ 0.25 acre - accommodate building dimensions - no cultural resources - no threatened or endangered species - no flood plains, wetlands - near an existing parking lot - near an existing road - not over an active fault - not in contaminated area	Minimize construction costs Avoid environmentally sensitive areas Avoid contaminated areas Avoid damage due to earthquake	Severely limits available site areas to mesa top in Alvarez Road area, near one of the existing buildings. Precludes many narrow areas near existing roads and buildings
At least 200 ft from existing Cryogenics Plant	Personnel safety	Excludes areas within 200 ft of Cryogenics Plant that meet other criteria

The construction site proposed for the LEAL meets the identified criteria. The LEAL would be located at LANL within TA-53 approximately 150 meters (m) (500 feet [ft]) away from Meson Physics Facility (MPF)-14, the Accelerator Technology Lab, which contains the new Advanced Free Electron Laser Development and Testing Facility, and would also be situated near the Ground Test Accelerator Facility. This site is preferred because it is near other accelerator research facilities which would allow some diagnostic and other equipment to be shared. LANL accelerator personnel would have convenient access to the facility. Conducting an accelerator technology research and development effort outside a limited security area, such as that at TA-53, promotes free interchange with academic and international scientists. Placing the LEAL in a controlled, but not limited, security area would protect members of the public from an area containing high voltage sources. The proposed site has been cleared, bladed, and leveled within the last five years; topsoil was removed some years ago. No solid waste management units (SWMUs) or other known sources of soil waste contamination are present at the site. Utilities are available nearby.

Construction

The transportation of the LEAL building materials, injection system components, and other equipment to the site, would require approximately twelve trips by truck. Standard building construction techniques would be used. The building construction process would take 8 to 9 months. Dust suppression measures, spraying the disturbed soil surface with water, might be needed occasionally during one or two months as there is little rain during May and June. The building and pad for the cooling tower would not exceed 0.5 hectare (0.2 acre); the area impacted by building activities would not exceed 0.6 hectare (0.25 acre).

Facility

The LEAL would consist of a two-story, pre-engineered metal building on a concrete pad measuring 22 m by 31 m (70 ft by 100 ft). The facility would be designed to withstand the type of seismic event expected to occur in seismic Zone 2 (UBC 1991). In the event of an earthquake, the building would be expected to remain intact and the distribution systems for water, gas, and other utilities would not be ruptured. The LEAL would require utilities (gas, water, electricity, and sanitary sewer) to be extended the short distance to the new building. The LEAL would be heated and cooled by systems designed for outside installation located adjacent to the building and ducted inside. The cooling tower for the water cooling system would also be located next to the building on a concrete pad measuring 2.5 m by 3 m (8 ft by 10 ft). The cooling tower would be a 10-ton capacity evaporative unit, with a flow-through rate of 875 liters (230 gallons [gal]) per minute. Most of this water would be recirculated. The cooling tower discharge rate would be about 38,000 liters (10,000 gal) per year. The electric power requirements would vary depending on the particular injector system under test, with an initially installed capacity of 0.50 MW and an envisioned maximum capacity of 2 MW of electric power.

The Injector Test Stand

The components of injector systems would be tested in LEAL in a stand-alone configuration called an injector test stand. A block diagram of a typical injector test stand showing the relationship of the components is shown in Figure 3.

The first stage of an injector test stand would be an ion source and extractor whose function is to ionize hydrogen gas (a positively ionized hydrogen atom is a proton) and form the beam. Hydrogen gas from a small cylinder would feed the ion source. A maximum of two, 0.5 cubic m (m^3) (20 cubic ft [ft^3]) cylinders of hydrogen would be within the building at any one time.

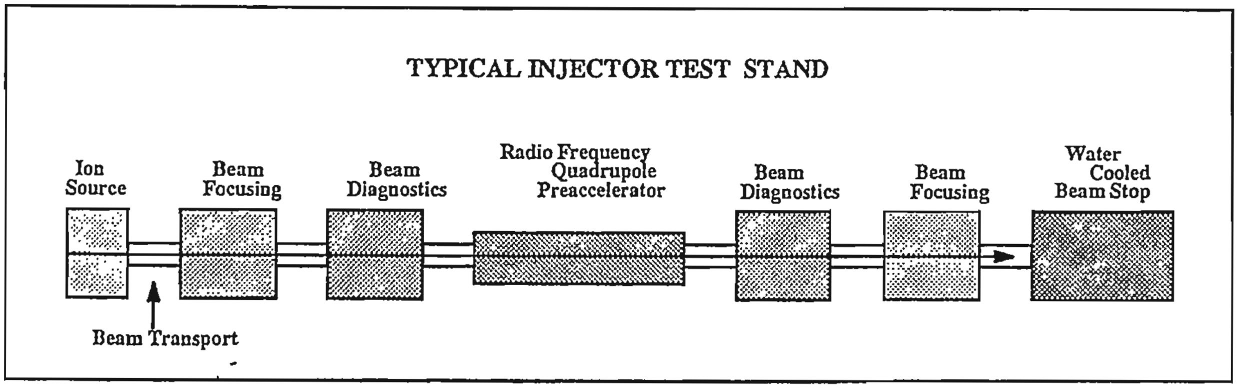

Fig. 3. Typical Injector Test Stand Components

The ion source would be followed by a short beam transport system consisting of an evacuated pipe surrounded by focusing and steering devices. This section would also include diagnostics for understanding the spatial location and spatial extent of the beam before it is injected into an RFQ preaccelerator, which imparts energy to the proton beam. This additional energy is provided by high power radio-frequency (RF) tubes (klystrons).

The RFQ would be followed by another beam transport and diagnostics section and a focusing section. This terminates in a beam stop that absorbs the primary beam energy. The proton beam, from the ion source through all other elements, is always kept within an evacuated pipe. Non-contact cooling water would circulate around the test apparatus.

One example of injector system components and systems that might be tested in the LEAL are the ion source, extractor, beam transport, and beam focusing system for possible future application in accelerator transmutation of waste. Another example is the injector system and RFQ for the Boron Neutron Capture Therapy accelerator, which may later be used in developing cancer treatments.

The parameter envelope for anticipated future operations would be a maximum beam energy of 3 MeV, a maximum beam current of 250 mA, a maximum time-averaged beam power of 25 KW, and a maximum peak RF power of 1 MW. The expected operational life of the facility for the proposed development program is approximately 15 years.

Operations

The injector test stand would be expected to operate approximately 1,000 hours per year. The injector test stand would be turned on and off on a regular basis, perhaps several times per week. Starting up and shutting down the injector test stand would not be expected to have impacts beyond those discussed for operation of the injector test stand.

A maximum of 20 workers would work in the LEAL building and would represent the maximum number present when the injector test stand is operating. These workers would be personnel currently working at TA-53, presently involved in similar activities, and representing less than 5 percent of the present 500-plus work force at this technical area.

Workers would be protected from exposure to x-rays by the facility safety system. Administrative and standard operating procedures would be followed during operations. A continuous physical barrier would surround the injector test stand itself. A hardware interlock system would prevent premature operation of the injector test stand. Lead shielding would be used to protect personnel.

Operations at LEAL would produce no radioactive air emissions.

Waste minimization would be implemented to the extent consistent with good and safe experimental practices. The main waste stream from operations is related to use of small quantities of solvents to clean experimental apparatus. It may not be possible to minimize these wastes without jeopardizing the quality of the experiments.

Equipment Modifications and Decommissioning

Within LEAL, modifications to the ion source, changes to focusing elements, using different RFQs, and improvements to diagnostics could be expected to occur periodically. Any reconfiguring of the injector test stand would not result in any new or different environmental impacts in excess of those analyzed in this EA. Maintenance and modification of the equipment would be required for optimum function and safety. Maintenance activities would be carried out when the injector test stand is not in use, and would include periodic routine calibration for equipment related to safety. Maintenance activities would not be expected to have impacts beyond those discussed for operation of the injector test stand.

Much of the equipment in LEAL would be recycled into other projects as the injector test stand is reconfigured during the normal research and development process. The components that would be reconfigured would not have any detectable induced radioactivity. The LEAL building would be used for the injector test stand research and supporting electronic and mechanical assembly and maintenance. The ultimate decontamination and/or decommissioning of the building would be considered, and a separate NEPA analysis would be prepared, at such time as the facility is no longer needed.

2.2 Foreseeable Related and Future Actions

Long-range plans for some of the facilities in TA-53, particularly the Clinton P. Anderson Meson Physics Facility (LAMPF), are uncertain at present. The linear accelerator research program is expected to continue at LANL regardless of the use or curtailment of other facilities in the area.

Although DOE has recently published an Advance Notice of Intent to prepare a Site-Wide Environmental Impact Statement (SWEIS) for LANL (59 FR 40889, August 10, 1994), it is appropriate to proceed with LEAL during preparation of the SWEIS because it is independently justified and would not prejudice ultimate SEIS decisions. LEAL would not prejudice SWEIS-related decisions because it would be an extension of research that is already underway in other laboratories at LANL.

3.0 ALTERNATIVE ACTIONS

3.1 Alternatives Considered but Eliminated from Detailed Analysis

3.1.1 Construct and Operate LEAL at Another LANL Location

Alternative construction locations for the proposed building were evaluated by the LANL Engineering Division siting group. Other undeveloped areas at TA-53 could be used, but the possibility of adverse impacts to any ecological buffer zone, cultural resources, threatened or endangered species, flood plains, wetlands, etc. exists. Available area at TA-53 is severely constrained by identified environmental buffer areas (LANL 1990), steep slopes, and limited flat mesa-top area. An area along Alvarez Road was judged to meet the siting criteria noted on Table 1 (see Page 5). The LEAL could be constructed along Alvarez Road west of its proposed location; however, greater distance to utility lines and the possibility of the necessity of leveling of the site would increase construction costs. The environmental impacts would be no less than those for the proposed site and offer no environmental advantage.

Adding the required space to an existing building at TA-53 would be possible but not practical. Additions to limited-security buildings would hamper access for non security-cleared accelerator scientists, non-LANL accelerator scientists, and some DOE personnel, and would decrease efficiency of peer interactions. Additions to these and other buildings at TA-53 could pose adverse impacts to the environment due to limited flat land area. Most existing experimental buildings are adjacent to cliffs and roads. At a minimum, site grading operations would be required. This would increase the construction costs and potential for adverse environmental impacts. No satisfactory alternative location was identified.

This alternative was eliminated from further consideration.

3.1.2 Install and Operate Elsewhere at LANL

Alternative locations for the test equipment within other existing buildings at LANL were considered. TA-53 was the only TA with suitable available space identified in an area that had controlled access but was not a limited security area. TA-53 has been identified for collocation of accelerator research activities (LANL 1990). Suitable space within existing buildings meeting the requirements of size and the requisite utilities, exists at TA-53, but its use would require displacing other important research and development programs already underway.

This alternative was eliminated from further consideration.

3.1.3 Operate the Injector Test Stand at Another DOE Facility

Suitable space for the test equipment within an existing building in an unclassified security area might be found at another DOE facility, such as the Argonne National Laboratory or Fermilab near Chicago, Illinois; Sandia National Laboratories, in Albuquerque, New Mexico; or the Brookhaven National Laboratory on Long Island, New York. However, no other DOE research laboratory has a similar research program with low and medium energy accelerators or the same resident expertise in accelerator technology as has LANL. Many accelerator research initiatives at LANL would make use of the testing and development proposed for the LEAL as a part of this technology effort.

This alternative was eliminated from further consideration.

3.2 No Action Alternative

The no action alternative consists of not erecting the LEAL building and instead continuing with the limited research and development on injectors now going on in existing buildings at TA-53. Under this alternative, the proposed site would not be developed and the naturally occurring weathering and revegetation processes would continue. The limited research and development opportunities on injection systems would impede development of high current accelerators needed by DOE for its overall mission in high energy research and development, waste management, and national defense.

This alternative was analyzed to present a base-line comparison.

4.0 AFFECTED ENVIRONMENT

This section presents the present condition of the site and ongoing operations at LANL.

4.1 Regional Setting

The annual surveillance reports prepared by LANL Environmental Protection Group in the Environment Safety and Health Division, describe the LANL environment, including archaeology, geology, seismology, geographic setting, land use, hydrology, climatology, meteorology, and population distribution of Los Alamos and surrounding areas, (LANL 1994). The general location of LANL within the county, and New Mexico is shown in Figure 4.

The site for the proposed action is within a developed technical area with many similar activities within the same ecological environment (see Fig. 2, page 4).

4.2 Current Conditions

LANL is a DOE facility located on 111 square kilometers (km^2) (43 square miles [mi^2]) of land in Los Alamos County in north-central New Mexico, approximately 100 km (60 mi) north-northwest of Albuquerque. LANL is on the Pajarito Plateau, a series of mesas and canyons, at an elevation of about 2,200 m (7,200 ft) above sea level. Los Alamos has a semiarid, temperate mountain climate with about 45 cm (18 in.) of annual precipitation.

Detailed descriptions of LANL environs, its climatology, meteorology, hydrology, cultural resources, floodplains, wetlands, and threatened and endangered species are presented in the site-wide Environmental Impact Statement (DOE 1979) and in annual Environmental Surveillance Reports (see LANL 1994), which are incorporated by reference. Relevant information is summarized below.

LANL supports an ongoing environmental surveillance program, as required by DOE orders (DOE 1981, 1988a). This program includes routine monitoring programs for radiation, radioactive emissions and effluents, and hazardous materials management at LANL.

In 1992, Los Alamos County had an estimated population of approximately 18,200 (based on the 1990 US census adjusted to July 1, 1992). Two residential and related commercial areas exist in the county. The Los Alamos town site has an estimated population of 11,400. The White Rock area, including the residential areas of White Rock and Pajarito Acres, has about 6,800 residents. Approximately one-third of the 7,550 people employed by the University of California at LANL commute from other counties. The 1990 census conducted by the US Census Bureau indicates that approximately 215,000 people live in Los Alamos County and the adjoining counties of Rio Arriba, Santa Fe, and Sandoval.

The proposed LEAL building would be located at TA-53 at LANL (Fig. 5). TA-53 contains LAMPF, the Manuel Lujan Neutron Scattering Center (LANSCE), the Weapons Neutron Research facility, and the Accelerator Operations & Technology Division. All of these facilities are involved with the operation, development, or use of accelerators or lasers.

The proposed LEAL location is in a , developed area of LANL. Slightly over half of the DOE land in Los Alamos County has been surveyed for prehistoric and historic cultural resources and close to 1,000 sites have been recorded (LANL 1994). However, none of these are at the location identified for the LEAL. LANL contains habitat that is highly suitable for several state and federally protected threatened and endangered species (LANL 1994). However, none of these species have been found at TA-53. The LANL site contains floodplains and wetlands. However, none are present at the location proposed for the LEAL (LANL 1990).

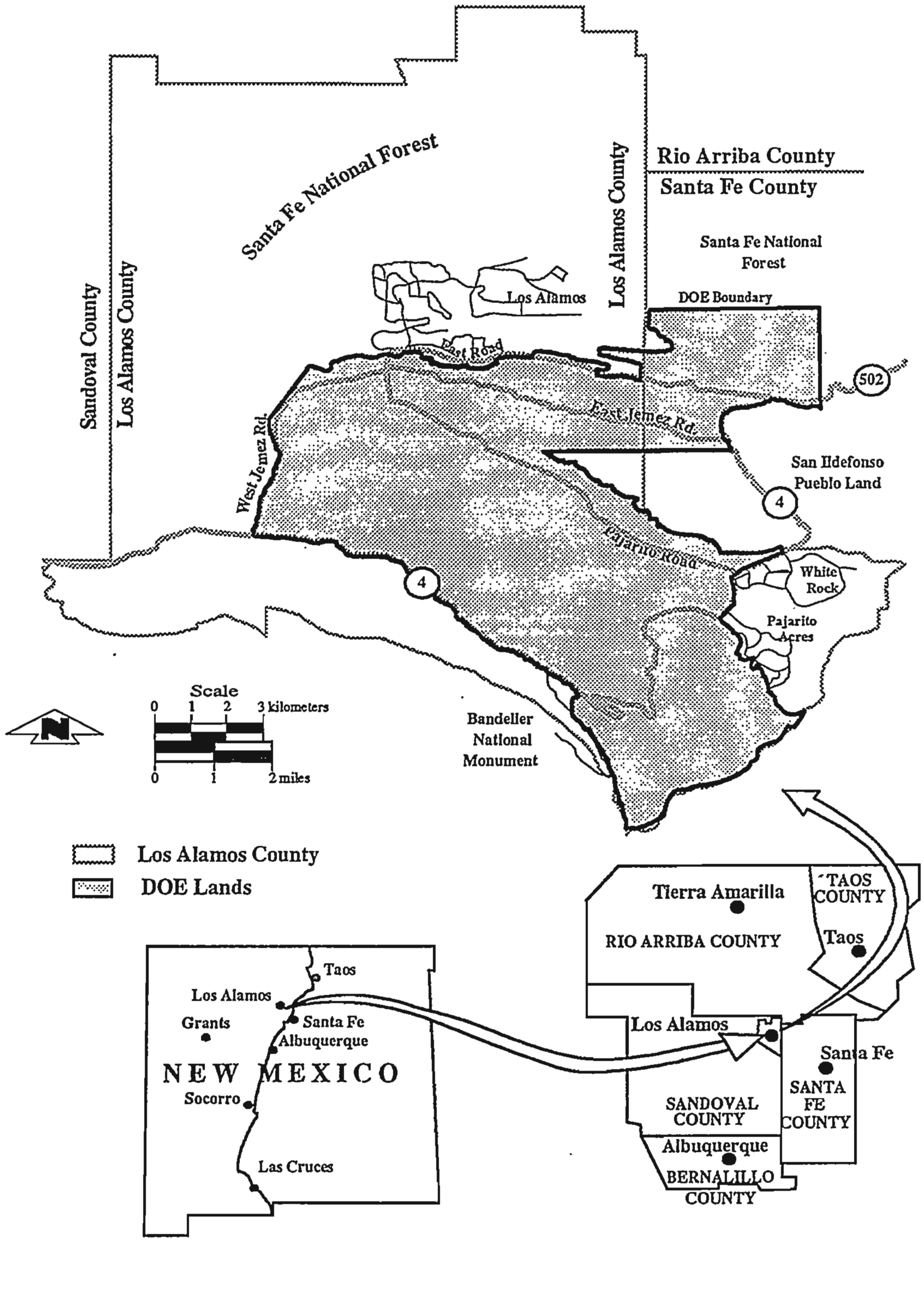

Fig. 4. Location of Los Alamos National Laboratory

4.2.1 Environmental Justice

On February 11, 1994, Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" was published in the Federal Register (59 FR 7629). This Executive Order requires Federal agencies to identify and address disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income communities. DOE is in the process of finalizing procedures for implementing the Executive Order. The manner which environmental justice issues should be addressed in an environmental assessment is expected to be addressed in the procedures. The following discussion is not intended to establish the direction of DOE's future procedures implementing the Executive Order.

With regard to LEAL, the nearest place continuously inhabited by a member of the public is a single trailer across a deep canyon to the northeast at the LANL boundary approximately 1,500 m (5,000 ft) from the proposed LEAL. This is the East Gate location shown on Figure 5. The nearest public access road, East Jemez Road, is in the bottom of a canyon to the south approximately 300 m (1,000 ft) away (Fig. 5). The community of Los Alamos lies to the northwest and the community of White Rock lies to the southwest, neither of which would be in the prevailing downwind path from the LEAL, which is to the northeast (LANL 1994).

No adverse off-site impacts would be expected to occur as a result of this proposed action. In addition, since the proposed LEAL building would be located in a cleared, bladed, and leveled, developed area of LANL, the proposed action would not result in on-site impacts related to Native American tribe archaeological concerns. Thus, the construction and operation of LEAL would not cause disproportionate adverse human health or environmental effects on minority, low-income, or Native American communities.

4.3 Potentially Affected Resources

The potentially affected resources of the proposed action would be air quality, water quality, land use, waste management, and the worker population.

4.3.1 Air Quality

Radioactive Air Emissions

Normal operations at LANL produce radioactive air emissions (see LANL 1994).

Nonradioactive Air Emissions

The LANL and Los Alamos County area is remote from major metropolitan areas and major sources of industrial pollution. In 1992, air quality at LANL was much better than ambient air quality standards set by the US Environmental Protection Agency (EPA) and New Mexico Environment Department (NMED) (LANL 1994).

EM 92-045

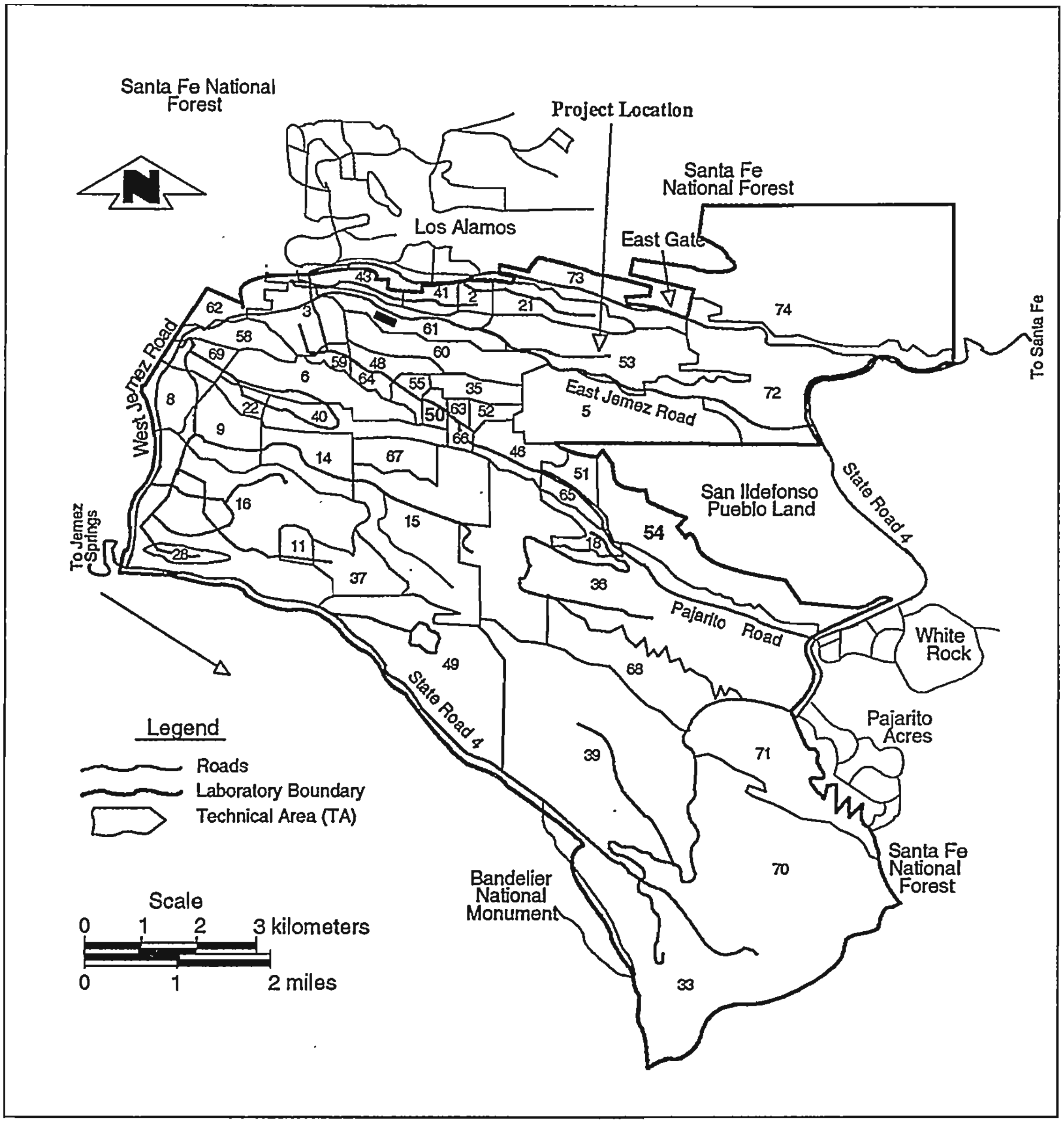

Fig. 5. Los Alamos National Laboratory Technical Areas

Information on nonradioactive air emissions from LANL is summarized in the annual surveillance report (LANL 1994), and in the Los Alamos National Laboratory 1990 Non-Radioactive Air Emission Inventory. Emissions of chemicals from current LANL operations that would also be produced from the LEAL are summarized in Table 2.

Table 2. Nonradioactive Air Emissions from LANL in 1990 for Chemicals Proposed for Use in LEAL.

Chemical	Emission (lb.)
Methanol	1,298
Acetone	4,881
Ethanol	not reported separately

4.3.2 Hydrology and Effluents

There are no naturally occurring, permanent surface waters at LANL. The nearest source of permanent water is the Rio Grande, which flows through White Rock Canyon 10.4 km (6.4 mi) to the southeast. All surface-flows within LANL TAs originate from storm water runoff or from National Pollutant Discharge Elimination System (NPDES) permitted outfalls from LANL facilities. Intermittent flows and storm-water runoff infiltrate the alluvium of the canyon bottoms until its downward movement is impeded by less permeable tuff and volcanic sediment. This results in shallow alluvial ground-water bodies.

The main aquifer lies 180-360 m (600-1,200 ft) below the surface. It is separated from alluvial and perched waters by 110-190 m (350-620 ft) of dry tuff and volcanic sediments. Water withdrawn from the main aquifer meets all current federal and state drinking water standards.

Effluents

Equipment in many facilities is cooled with water, which is then sent through evaporative cooling towers to vent heat. Some blowdown water from these cooling towers is discharged to the ground surface. All such discharge points are covered by, and in compliance with, NPDES permits. For the most part, these surface discharges evaporate on site or are contained within alluvial fill in canyons.

4.3.3 Land Use

The proposed location for LEAL has been zoned for industrial uses in the LANL Site Development Plan (LANL 1990).

4.3.4 Waste Management

LANL has established procedures to be in compliance with all applicable laws and regulations for collecting, storing, processing, and disposing of routinely generated solid wastes at established facilities, on and off site.

5.0 ENVIRONMENTAL CONSEQUENCES

5.1 Environmental Resources Not Affected

The proposed project would not affect sensitive areas, such as flood plains, wetlands, state or federally listed threatened and endangered species or their habitat, archaeological or cultural resources, or other sensitive areas (as defined in 10 CFR 1021).

The area around and including the proposed site for the LEAL was surveyed for cultural resources in 1985, before Alvarez Road was constructed (see Fig. 2). No archaeological sites were found in the area proposed as the LEAL site (Snow 1985, McGehee 1985). The proposed site was reviewed again in 1991. LANL cultural affairs personnel determined that the proposed project would not affect any known cultural resources. DOE has determined that consultation with the State Historic Preservation Office (SHPO) is not required since there would be no effect.

LANL staff biologists have generated a data base of information on threatened and endangered species that might occur in Los Alamos County, that includes expected habitat data. This information together with field surveys was used by the LANL staff biologists to evaluate any potential impact to threatened or endangered species that could result from constructing and operating the LEAL. The proposed site was graded over several years ago. The LANL staff biologists concluded that there would be no potential for adverse habitat impact to threatened and endangered species (Bennett 1993). DOE has determined that consultation with the New Mexico Fish and Game Department or the U S Fish and Wildlife Service is not required since there would be no effect.

5.2 Environmental Consequences of the Proposed Action

Environmental consequences of this proposed action would be mostly associated with the operation of the injector test stand itself, rather than the erection of the building, and would be limited to the LANL site. Construction would generate some noise; however these activities would be carried on during normal work hours and would not be expected to impact members of the public. No blasting or other unusually noisy activities are anticipated.

5.2.1 Air Emissions

Radioactive Airborne Emissions

The proposed LEAL operations would not produce radioactive air emissions. No radioactive particulate material or air activation products would be produced because of the low beam energy levels, the construction, and beam stop materials that would be used.

X-rays, a type of non-particulate penetrating radiation, would be produced during LEAL operations. However, these would be destroyed by interactions with shielding materials to be placed around the experimental apparatus before exiting the structure.

Non-Radioactive Airborne Emissions

Moving the building materials and equipment to the site and constructing the LEAL building would generate some diesel exhaust fumes and some dust. No more than twelve truckloads are expected. During construction, standard dust suppression techniques such as spraying water on loose soil would be used. Not more than 650 liters (200 gal) would be used. This water would evaporate. Therefore, air quality standards would not be exceeded due to the proposed construction activities.

Assembly and maintenance of the injector test stand within the LEAL would require solvents to be used primarily for cleaning and degreasing the equipment. Total yearly usage is expected to be less than 380 liters (100 gal), primarily of ethanol, methanol, and acetone. A review of the projected use rate indicates that emissions would be below the thresholds established under New Mexico Air Quality Control Regulations (AQCR) Section 702 - Permits (NMEIB 1988). Expected use rates and emissions, as shown in Table 2, are expected to be well below state thresholds which have been established to protect the health of humans. The selection of chemicals and expected use rates are based on experience with similar operations and systems at TA-53. As a part of LANL's program to reduce the use of hazardous and toxic materials, benzene and trichloroethane (TCA), which were originally proposed, would not be used.

The cumulative impacts of nonradioactive air emissions from LEAL added to those from other facilities at TA-53 cannot be determined because there is no current information on such emissions from those other facilities. However, assuming that the 1990 information (Table 3) would be representative of conditions at LANL when the LEAL goes into operation, emissions of methanol and acetone would be increased, but by < 0.1 percent each.

Table 3. Nonradioactive Emissions Expected from LEAL[a]

Chemical	LEAL Use Rate (lb./year)	Expected Emission (lb./year)	AQCR 702 Threshold (lb./hr)
Methanol	< 200	< 0.8	17.3
Acetone	< 70	< 0.3	10.0[b]
Ethanol	< 350	< 1.5	10.0[b]

a. from Stavert 1993.
b. Total organic solvent use is regulated as non-methane hydrocarbon use under AQCR 702. Combined emissions cannot exceed 5.5 kilograms (kg) per hour (10 lb./hr).

5.2.2 Effluents

The erection of the building would not adversely impact soil or ground water. The electrical transformers and other equipment would contain up to 1,900 liters (500 gal) of mineral oil for electrical insulation. This oil would not contain polychlorinated biphenyls (PCBs). Gutters and secondary containment would be provided to contain and recover any accidental release of the oil.

Aqueous Waste

The process cooling system would contain up to 1,100 liters (300 gal) of recirculating water. This would be non-contact cooling water, that is the cooling water would not be in contact with accelerated particles or radioactive material and would not contain any radioactive components. The cooling tower would discharge to the ground surface up to 38,000 liters (10,000 gal) of water per year. The discharge would be made daily or as dictated by operations schedule, about 300 liters (80 gal) in an operating day. This effluent would be routed into an existing outfall, Number O3A-113, which serves several cooling towers at nearby buildings. This discharge is covered by an NPDES permit reissued on August 1, 1994. The permit limits mineral content and pH of the discharge. Volume limit is 27,700 liters (7,300 gal) daily. LEAL cooling tower discharges would not cause these parameters to be exceeded.

The cumulative impact of LEAL operations on the cooling water discharge volume would depend upon the operations schedules of the other facilities that can discharge to that outfall. This cannot be projected at present.

Since the total number of personnel at TA-53 would not increase as a result of the LEAL, there would be no increased load to the local sanitary waste treatment system.

5.2.3 Land Use

The land use would remain unchanged from the present zoning, industrial uses.

5.2.4 Waste Management

The proposed project would not require siting, construction, or expansion of solid waste disposal, recovery, or treatment facilities.

Hazardous Waste

As stated above, annual organic solvent usage at LEAL is expected to be less than 380 liters (100 gal), primarily of ethanol, methanol, and acetone. Any used solvents would be collected at a Resource Conservation and Recovery Act (RCRA) satellite accumulation point, to be established in this building. LANL Waste Management Group personnel collect the organic and hazardous liquid wastes and transport them to the waste management site at TA-54 where they are managed as hazardous waste or recycled. The volume would be less than 0.6 m^3 (20 ft^3) annually. Hazardous liquid wastes are generally transported and disposed by a commercial firm. However, LANL is pursuing solvent recovery and reuse as one method of waste minimization. The extent of solvent recovery cannot be projected at present.

Rags and wipes that have been in contact with solvents would be managed as hazardous solid waste. The expected volume is less than 0.6 m^3 (20 ft^3) per year. The modest amounts would also be accumulated in the RCRA satellite storage area.

The cumulative impact of LEAL operations is that 1.2 m^3 (40 ft^3) of new hazardous waste would be produced, a 10 percent increase in the approximately 12 m^3 (440 ft^3) of hazardous waste currently produced at TA-53, and < 0.1 percent increase in the 2,500 m^3 (86,500 ft^3) of hazardous waste managed annually at LANL (LANL 1991).

Radioactive Waste

The operations proposed for LEAL would not produce radioactive waste or short-lived radioactive materials. After decommissioning the injector test stand, there could be some potentially radioactive equipment, primarily the beam stop. This would be moved to the low level radioactive waste (LLW) disposal area (Area G) at TA-54, or to its replacement, where the currently approved methodology/place for disposal would be employed. The anticipated maximum volume of LLW from decommissioning would be about 0.6 m^3 (20 ft^3), a < 0.01 percent increment to LANL's present annual LLW waste volume of 4,500 m^3 (160,000 ft^3).

5.2.5 Personnel Protection

Neither LANL personnel outside LEAL nor members of the public would be exposed to any radiation from the proposed action. Only personnel working in the LEAL could be exposed to radiation which would be only in the form of x-rays.

Worker Protection

Worker exposures to x-rays under normal operations would be controlled under established procedures that require doses to be kept as low as reasonably achievable, and that limit any individual dose to less than 5 rem per year (DOE 1994). Based on relevant experience with other projects, DOE expects the average dose from the proposed project to be maintained below 0.1 rem per year. The cumulative worker dose (20 people for 15 years) would not exceed 30 person-rem. Based on an occupational risk factor of 400 fatal cancers per million person-rem (NRC 1991), workers in this proposed project would not be expected to develop any excess fatal cancers from radiation exposures they may receive during normal operations.

Safety Features

The injector test stand operation would be very similar to, and generally smaller in scale than, operations carried on in the same LANL technical area. These include LAMPF, Ground Test Accelerator, LANSCE and the Advanced Free Electron Research and Development Facility, all of which operate at power levels near or above those projected for the injector test stand. All of these facilities have fully developed and approved operating plans and procedures. The safety systems and operating plan to be implemented for the injector test stand would be based on experience with similar systems at these operating facilities.

The safety of the environment and the workers at the LEAL facility would be assured by three levels of safety system. These levels are introduced here in sequence of increasing importance.

First, safety procedures (administrative procedures, standard operating procedures) would be administered by line management for the facility. It would be the responsibility of line management to make sure the proper procedures would be followed and to assure that the equipment is not used in an unsafe manner or condition. These procedures include making a "safety sweep" through the shielded area prior to startup to ensure that nobody is locked inside the barrier.

Second, a continuous physical barrier surrounding the injector test stand with doors with electrical interlocks would be constructed and its status would be monitored continuously.

Third, a hardware interlock system would be installed. The hardware interlocks include key interlocks in which beam operation is allowed only when all the proper keys would be in the proper locations according to approved procedures. This type of interlock system is used in accelerator-based facilities all over the world.

During operation of the proposed injector test stand, a person present inside the shielded area could receive a radiation (x-ray) dose. To prevent such an accidental exposure, engineered safety systems would include:

- mechanical and electronic interlocks designed to prevent entry when the injector test stand is in operation,
- a warning horn and flashing lights inside the secure area prior to startup, and
- manually operated switches ("scram" buttons) located inside the shielded area, and interlocked with the injector test stand startup circuitry.

Lighted warning signs and devices would be used to warn of energized equipment. Announcements and warning sirens would be sounded prior to energizing the equipment. Access to potential radiation areas would be controlled by physical barriers and signs.

The only other class of equipment with a potential safety hazard is high voltage. This equipment would be equipped with safety interlock systems to shut off the high voltage in addition to the facility safety system described above.

The injector test stand equipment within the LEAL would produce radiation in the form of low energy x-rays. Shielding consisting of 0.6 cm (1/4 in.) lead sheets would be mounted within the LEAL high bay injector test stand area to eliminate measurable x-ray radiation to surrounding lab areas. The shielding would be placed to shield those sources of radiation found during initial surveys. The shielding is only needed to protect operating personnel in proximity to the injector test stand within the LEAL building.

5.2.6 Abnormal Events

No radioactive or toxic materials would be used by operations in the LEAL building. Therefore, the environmental impacts of an accident, such as a fire, would not differ significantly from the impact of a fire in an office building or storage building of a similar size. LEAL would be equipped with a wet-sprinkler fire suppression system.

The safety features described above (Section 5.2.5) would protect workers in the event of a system malfunction that resulted in abnormal beam operation. Such an event might cause a momentary increase in x-ray fluxes before the beam is automatically shut down by the safety system. The dose to an individual would not be expected to exceed 0.1 mrem. Accidental beam spills at other LANL linear accelerator facilities have not shown any detectable increase in personal film badge exposures. No further accidents were analyzed.

5.3 Environmental Consequences of the No-Action Alternative

The environmental consequences of the no-action alternative would be that the site would remain undisturbed. No impacts to air quality would result from construction or evaporation of solvent fumes from the LEAL. No additional cooling tower water would be discharged through Outfall O3A-113. No wastes would be produced. No LANL personnel would be relocated to the LEAL facility. The ongoing natural processes of weathering and vegetation at the proposed site would continue.

6.0 PERMITS

Because no radioactive material would be involved in LEAL, a preconstruction permit from EPA following 40 CFR 61, Subparts A and H, would not be required (Buhl 1991).

The quantities of solvent fumes expected to be emitted from the LEAL do not exceed threshold limits set by the New Mexico Environment Department which implements requirements of the Clean Air Act in New Mexico. A permit for hazardous air emissions would not be required.

The LANL RCRA permit would be amended to include a satellite accumulation point for hazardous waste at LEAL.

The NPDES permit specifications for Outfall Number O3A-113 would be reviewed to assure that the added blowdown water from the LEAL cooling tower to this existing outfall would not exceed the limitations set in the permit.

7.0 AGENCIES AND PERSONS CONTACTED

Personnel from the U S Fish and Wildlife Service and the New Mexico Fish and Game Department provided lists of threatened, endangered, sensitive, and candidate species that might be found in the Los Alamos area.

Preapproval draft copies of this EA were sent to New Mexico Environment Department and to the four Accord Tribes, the Pueblos of San Ildefonso, Cochiti, Jemez, and Santa Clara. Responses to comments on that draft have been incorporated into this final EA.

8.0 REFERENCES

Bennett 1993: Memorandum, K. Bennett to A. Pendergrass, "Ecological Evaluation for the Accelerator Prototype Laboratory," EM-8:93-3134, November 30, 1993.

Buhl 1991: Memorandum, T. Buhl to T. Tomei, "Review of the LEAL Prototype Laboratory under Subparts A and H, National Emissions Standards for Hazardous Air Pollutants," HSE-8:91-727, May 6, 1991.

DOE 1979: "Final Environmental Impact Statement: Los Alamos Scientific Laboratory Site, Los Alamos, New Mexico," US Department of Energy report DOE/EIS0018 (December 1979).

DOE 1981: "Environmental Protection, Safety, and Health Protection Information Reporting Requirements," US Department of Energy Order 5484.1 (1981).

DOE 1988: "General Environmental Protection Program," US Department of Energy Order 5400.1 (1988).

DOE 1994: "Radiation Control Manual," US Department of Energy, DOE/EH-0256T, Revision 1, April 1994.

LANL 1990: "Los Alamos National Laboratory Site Development Plan - Technical Site Information, Facilities Engineering Planning Group, LA-CP-90-405 (September 1990).

LANL 1991: "Waste Management at Los Alamos: Protecting Our Environment," Los Alamos National Laboratory, LALP-90-30 (June 1991).

LANL 1994: "Environmental Surveillance at Los Alamos During 1992, Los Alamos National Laboratory report LA-12764-ENV (1994).

Larson 1994: Memorandum, B. Larson to A. Pendergrass, "Cultural Resource Review of APT Prototype Laboratory, EARE Accession Number 727, Project I.D. 10192," ESH-8/EARE:94-0128, January 25, 1994.

McGehee 1985: Memorandum, E. McGehee to T. Cole, "August 7, 1985 Resurvey of the Future Accelerator Test Stand Upgrade (ATSU) Building Site and Alvarez Road," HSE8-85-958, August 13, 1985.

NMEIB 1988: "Ambient Air Quality Standards and Air Control Regulations, New Mexico Environmental Improvement Board, Health and Environment Department, Environmental Improvement Division, Santa Fe, New Mexico (1988).

NRC 1991: "Preamble to Standards for Protection Against Radiation," US Nuclear Regulatory Commission, 56 Federal Register 23363, May 21, 1991.

Snow 1985: Memorandum, D. H. Snow to C. Olinger, "Archaeological Clearance: Accelerator Test Stand Upgrade, TA-53," HSE8-85-465, April 22, 1985.

Stavert 1993: Memorandum, D. Stavert to D. Woods, "Accelerator Prototype Laboratory," EM-8:93-505, February 25, 1993.

UBC 1991: "Uniform Building Code," International Conference of Building Officials, Whittier, CA (1991).

9.0 GLOSSARY AND LIST OF TERMS, ABBREVIATIONS, AND ACRONYMS

AQCR	Air Quality Control Regulations, published by New Mexico Environmental Improvement Bureau (NMEIB), now Environment Department (NMED)
beam stop	a block of material that may be water cooled where the proton beam is stopped and the energy converted to heat and creation of secondary particles that are absorbed in the surrounding shielding
DOE	United States Department of Energy
EA	Environmental Assessment
EID	The State of New Mexico Environment Division, NMED
injector test stand	an experimental subatomic particle injector apparatus
keV	kilo-electron-volt, thousand electron volts, a measure of electrical energy
klystron	radio-frequency (RF) vacuum tube that supplies power to the RFQ
LAMPF	Clinton P. Anderson Meson Physics Facility (Los Alamos Meson Physics Facility)
LANL	Los Alamos National Laboratory
LANSCE	Manuel Lujan Neutron Scattering Center (Los Alamos Neutron Scattering Center - LANSCE)
LEAL	Low Energy Accelerator Laboratory
linear particle accelerator	device that projects electronically charged subatomic particles, including electrons, protons, and other ions, to high energies in a directed beam

LLW	low-level radioactive waste, > 10 microCi/gram
mA	milliampere, one-thousandth of an ampere, a unit of electrical current
MeV	mega-electron-volt, formerly called million electron volt, a unit of electrical energy
millirem	one thousandth of a rem (mrem)
MPF	meson physics facility, designation for buildings at TA-53
mW	milliwatt, one thousandth of a watt, a unit of power
MW	mega watt, one thousand watts, unit of power
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
rem	the amount of ionizing radiation required to produce the same biological effect as one roentgen of high-penetration x-ray; unit of dose equivalent for a single individual, used in the field of radiation dosimetry
RCRA	Resource Conservation and Recovery Act
RF	radio-frequency
RFQ	radio-frequency quadrupole
SHPO	State Historic Preservation Office
SWEIS	Site-wide Environmental Impact Statement
SWMU	Solid waste management unit
TA	Technical Area at LANL
TCA	trichloroethane, a common degreasing solvent, regulated as toxic