IV. THE PLANS

A. Introduction to the Plans

The Plans section describes the on-going, planned and future projects by planning areas. The Plans section is organized into eleven subsections. Each relates to one of the planning areas on the adjacent map.

- Site Wide (Total Site)
- Core Planning Area
- Pajarito Corridor West Planning Area
- Pajarito Corridor East Planning Area
- LANSCE Mesa Planning Area
- Experimental Engineering Planning Area
- Dynamic Testing Planning Area
- Sigma Mesa Planning Area
- Omega West Planning Area
- Rio Grande Corridor Planning Area
- Land Transfer Planning Area

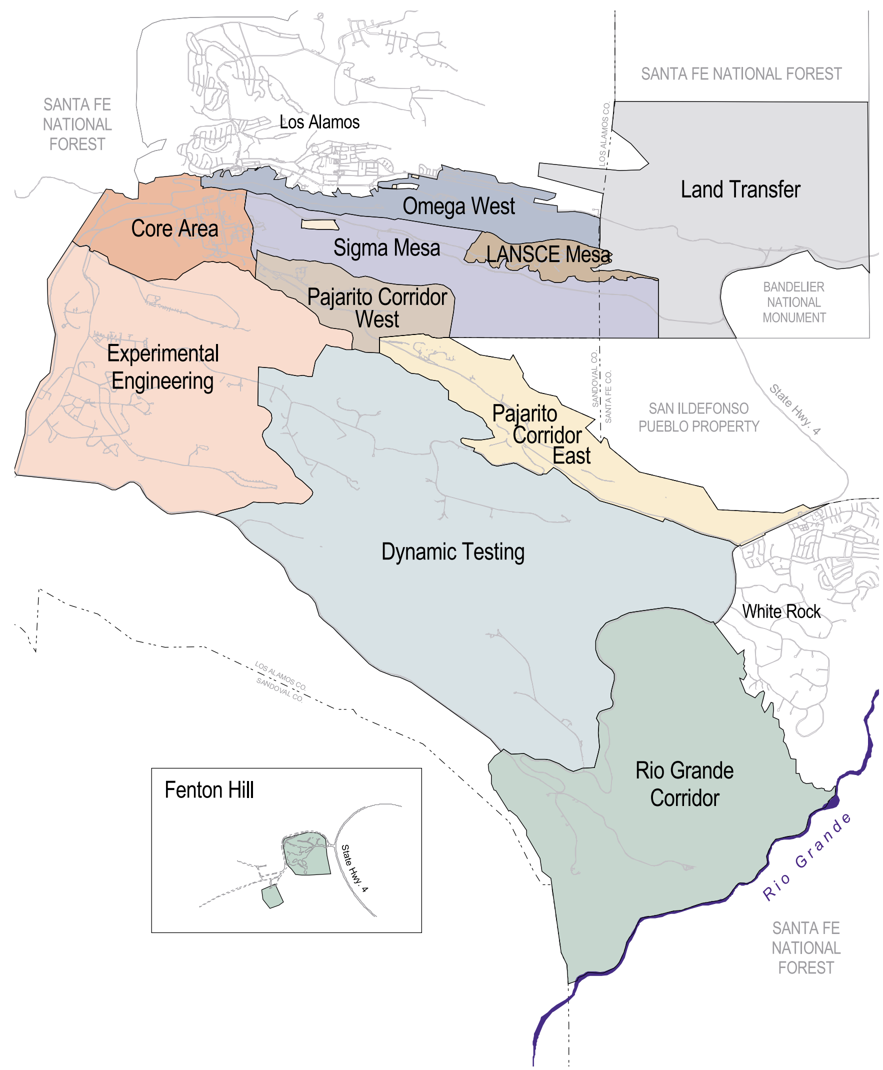
Each subsection summarizes these components of the Comprehensive Site Plan for that individual planning area:

- assumptions for physical planning
- opportunities and constraints
- projects summary
- Planning Area Assessment/Needs Summary (PLAANS) Matrix

The PLAANS Matrix at the end of each subsection lists each project, its mission relationships, its effects on the planning elements of land use, transportation, security, utilities, facilities, quality environment/safety/ health, and the planning status of the project.

The expertise and assistance of many divisions and groups throughout the Laboratory were critical to informing and guiding the Plans.

Map IV-A1: Site Wide Planning Area Boundaries



B. Site Wide Planning Recommendations

1. Site Wide Description

The Laboratory is situated on approximately 26,660 acres or 43 square miles of DOE land making Los Alamos National Laboratory the largest in land area of all the national laboratories. About 87% of the Laboratory is located within Los Alamos County.

Presently, Los Alamos National Laboratory's on-site population is approximately 12,000 including both employees and contractors, housed in over 1,500 buildings which total over 7.8 million square feet.

Although at a cursory glance there appears to be sufficient land for future expansion at the Laboratory, the majority of it is very difficult to develop given significant physical and operational constraints. For example, over 25% of the Laboratory's acreage consists of slopes that exceed 20%. Adding to the scarcity of developable land, is the type of work that the Laboratory performs. Security and safety buffers for defense related work often require large reservations of land for these programs to continue without adversely affecting surrounding areas. These types of constraints severely limit developable land at the Laboratory.

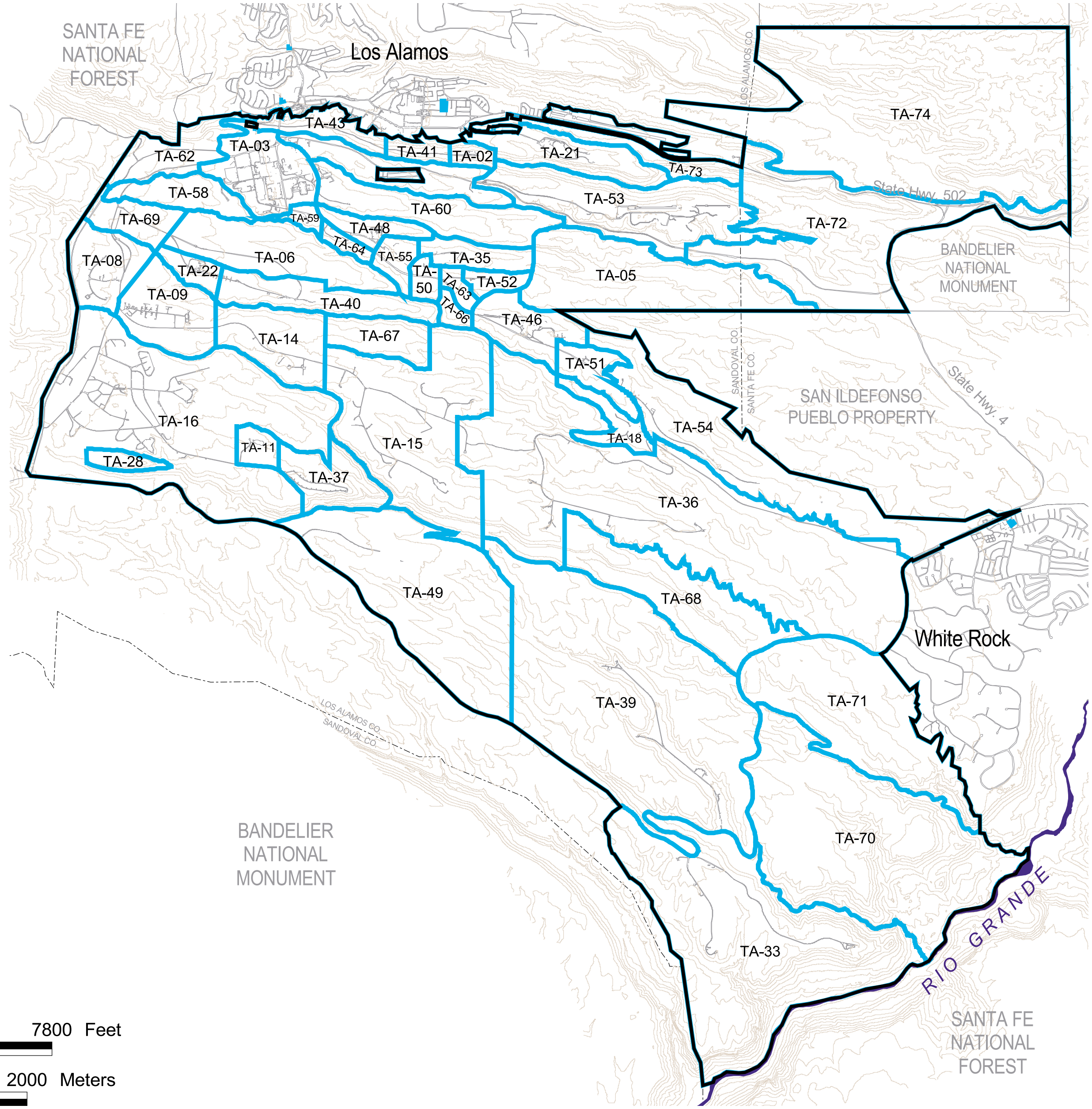
There are currently 50 designated technical areas into which the Laboratory is divided. The non-sequential arrangement of the technical areas as shown on the adjacent Site Wide Technical Area Boundaries Map reflects the fifty year history of development at the Laboratory, the limitations of the natural topography, and the functional relationships that have occurred over the years.

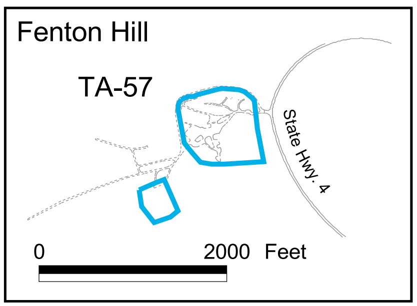
As a facility, the Laboratory is diverse: geographically, programmatically, and operationally. The Laboratory has a multiplicity of divisions and groups accomplishing a wide range of critical functions locally, regionally, nationally and globally. This diversity is a great strength and adds to the complexity of carrying out integrated physical planning at the Laboratory.

Map IV-A2: Site Wide Technical Area Boundaries

LEGEND

- Technical Area
- Dept. of Energy
- Elevation Contour (100-ft)
- Paved Road
- County





7800 0 7800 Feet

1000 0 1000 2000 Meters

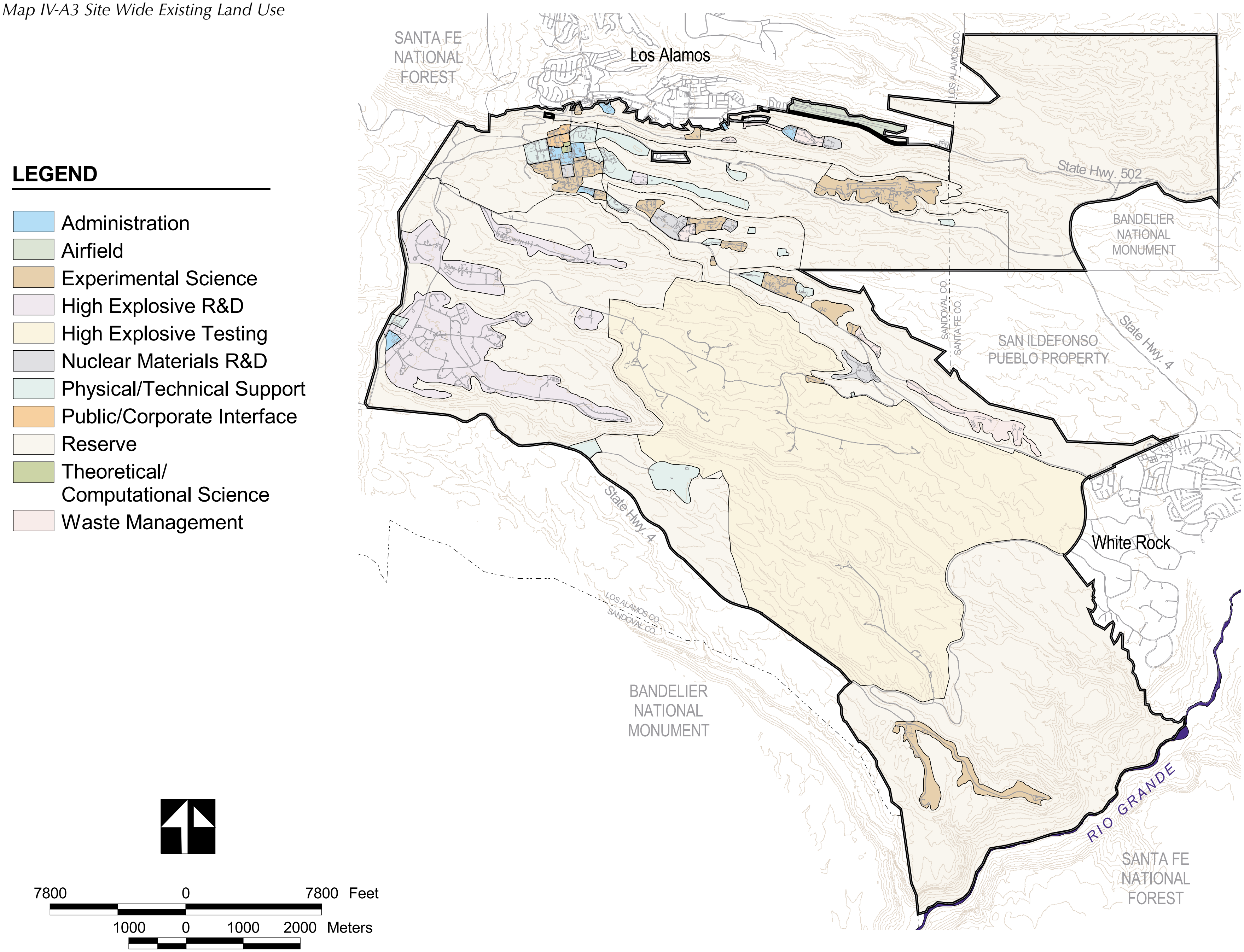
2. *Existing Land Use Analysis*

Existing development patterns and topography impose major constraints on future development. The flat mesas where most development can occur are dissected by steep canyons that critically affect road, utility and facility layout and development. Topography constraints cannot be easily modified; however, historical development patterns can be modified through rational land use and facilities policies and related recommendations. For example, prime building sites can be created by relocating roads and parking to the perimeter of developed areas. Likewise, efficiencies of land use can be realized by relocating disbursed programmatic procedures to sites in close proximity to one another.

Scarcity of suitable land for building characterizes most technical areas. In addition special hazardous testing facilities requiring security and safety buffers limit some developable sites. Environmental regulations and archaeological sites place another level of constraints on Laboratory development. Other man-made land use constraints include

- Existing circulation and utility patterns that split developable parcels;
- Parking areas and temporary or substandard structures that occupy prime developable land;
- High-explosives safety buffers that restrict development on flat mesa tops;
- Potentially contaminated sites that must be characterized and remediated by the Laboratory before they can be reused; and
- Privately owned land, the Royal Crest mobile home park, located on 25 prime acres close to the Core Area and surrounded by the Laboratory.

Map IV-A3 Site Wide Existing Land Use



3. *Future Land Use*

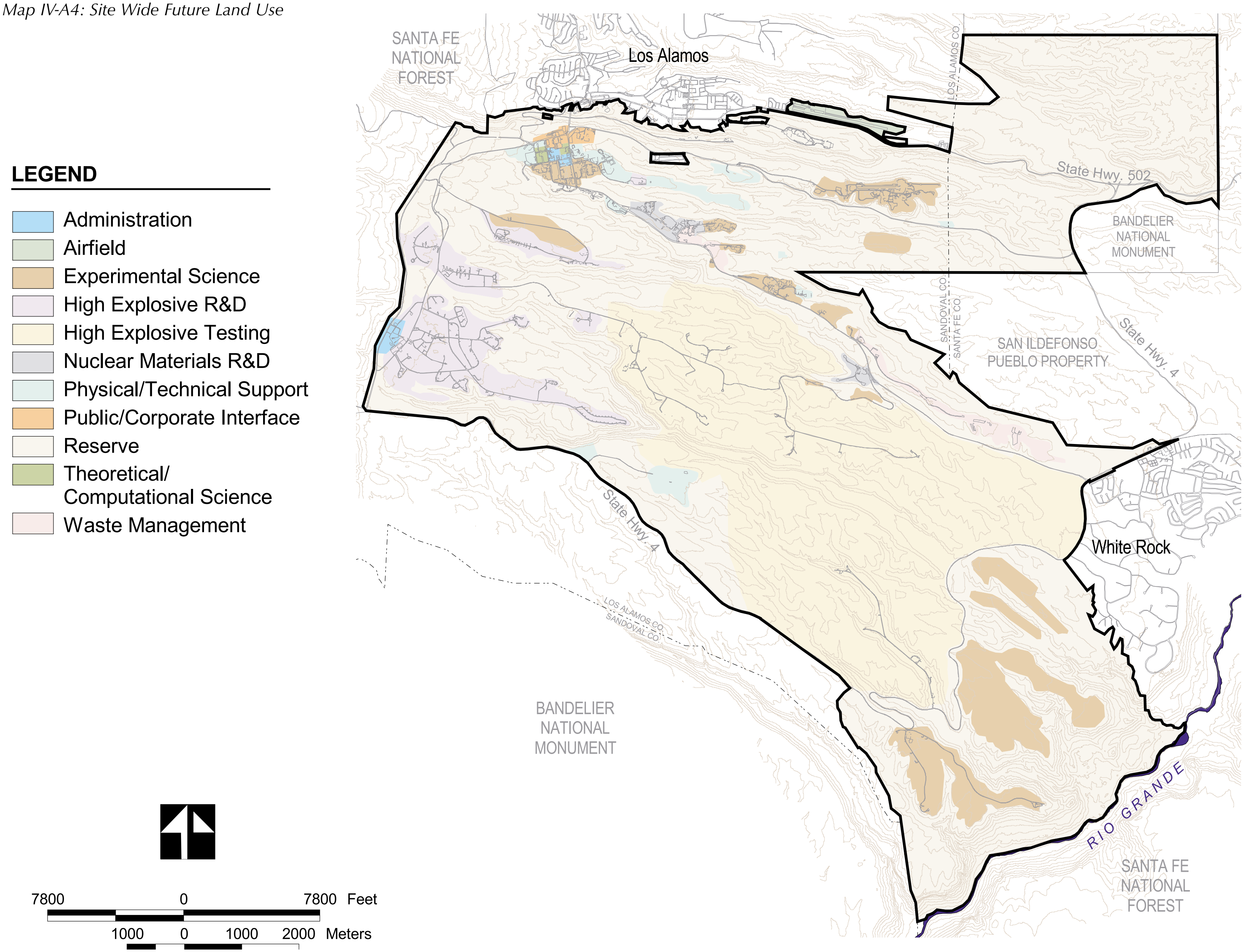
The Future Land Use map depicts the major land use changes recommended in various parts of the Laboratory. In general the major changes involve consolidation of Nuclear Materials R&D areas and the expansion of Experimental Science.

The Existing Land Use map depicts the current status of land use at the Laboratory. A summary of land use acreage by land use category follows.

Table IV-A1: Site Wide Land Use

Existing Land Use		**Future Land Use**	
Land Use Category	**Acreage**	**Land Use Category**	**Acreage**
Administration	140	Administration	161
Experimental Science	514	Experimental Science	544
High Explosives R&D	1,310	High Explosives R&D	1,436
High Explosives Testing	7,096	High Explosives Testing	7,096
Nuclear Materials R&D	374	Nuclear Materials R&D	42
Physical/Technical Support	336	Physical/Technical Support	340
Public/Corporate Interface	31	Public/Corporate Interface	24
Theoretical/Computational Science	2	Theoretical/Computational Science	22
Waste Management	186	Waste Management	231
Reserve	17,874	Reserve	17,586
Total	**27,863**	**Total**	**27,482**

Map IV-A4: Site Wide Future Land Use



4. Land Use Recommendations

Ten land use categories describe the activities at Los Alamos National Laboratory. The land use categories are:

***Administration* –** Non-programmatic technical expertise, support, and services for Laboratory management and employees. TA-03 is the center for this land use with other small scattered sites throughout the Laboratory.

***Experimental Science* –** Applied research and development activities tied to major programs. This land use occurs in a combination of offices, laboratories, and ancillary spaces requiring unique and specialized facilities.

***High Explosives R&D* –** Research and development of new explosive materials. This land use is isolated for security and safety.

***High Explosives Testing* –** Large, isolated, exclusive use areas required to maintain safety and environmental compliance during testing of newly developed explosive materials and new uses for existing materials. This land use also includes exclusion/buffer areas.

***Nuclear Materials R&D* –** Isolated, secured areas for conducting research and development involving nuclear materials. This land use includes security and radiation hazard buffer zones. It does not include waste disposal sites.

***Physical/Technical Support* –** Includes roads, parking lots, and associated maintenance facilities; infrastructure such as communications and utilities; facility maintenance shops; and maintenance equipment storage. This land use is generally free from chemical, radiological, or explosives hazards.

***Public /Corporate Interface* –** Provides link with the general public and other outside entities doing business with the Laboratory, including technology transfer activities. This land use occurs in a variety of settings including offices, laboratories, and special function buildings such as the Otowi Building and Research Library.

***Theoretical/Computational Science* –** Interdisciplinary activities involving mathematical and computational research and related support activities.

***Waste Management* –** Provides for activities related to the handling, treatment, and disposal of all generated waste products, including solid, liquid, and hazardous materials (chemical/ radiological/explosive).

***Reserve* –** Areas that are not otherwise included in one of the previous categories. It may include environmental core and buffer areas, vacant land, and proposed land transfer areas.

Strategies for Land Use

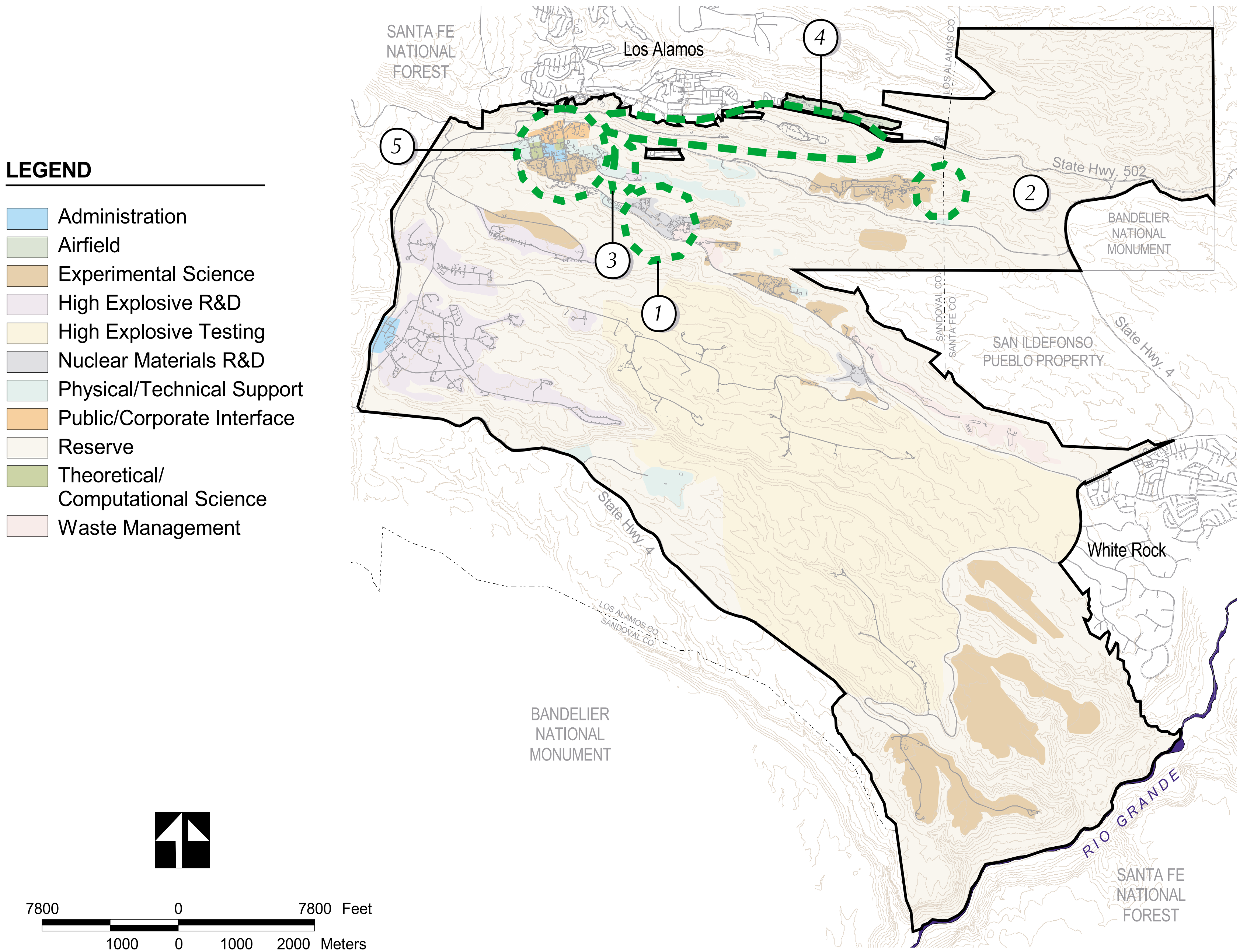
Land use strategies for the Laboratory are:

- Reorganize facilities to bring disbursed program components into closer physical proximity to each other;
- Encourage construction of new facilities within existing developed areas to support revitalization efforts;
- Remove temporary structures such as trailers, and transportables to create space for more cost effective permanent buildings;
- Remove surface parking lots from prime development areas;
- Relocate most facilities at Laboratory sites; and
- Transfer designated lands to other agencies and political entities.

The ***Site Wide Future Land Use Map*** depicts major land use changes that will affect development on a Laboratory scale.

1. Consolidation of most Nuclear Materials R&D to a nuclear campus at TA-55.
2. Expansion of Experimental Science for Advanced Hydrotest Facility (AHF).
3. Relocation of JCNNM from TA-03 to TA-60.
4. Long range removal of all functions from the Omega West Planning Area.
5. Planned revitalization of TA-03.

Map IV-A5: Site Wide Future Land Use



5. *Existing Transportation*

The Laboratory's remote location, topography, and development patterns create unique transportation problems both to and within the site. Mesa tops separated by deep canyons, and the dispersion of the technical areas combine to make access to and between Laboratory facilities difficult and circuitous. There are only four major entrance points to the Laboratory and many areas and facilities have only one avenue of access. As a result, the transportation of employees at the Laboratory is difficult and time consuming, particularly during peak traffic hours. Many major roads and intersections currently provide poor and unsatisfactory levels of service during these times. Just over 50% of the Laboratory's 155 miles of roads are paved and many are not accessible to the public.

Roads and parking at the Laboratory were developed in an incremental fashion, often guided by short-term requirements. This has resulted in difficulties such as

- Infrastructure development lagging behind growth;
- Peak-period traffic congestion on major roadways;
- Insufficient parking in certain areas;
- Transportation of hazardous materials using roads currently accessible to the public;
- Costly utility relocations necessitated by roadway expansion;
- Single access/egress points to technical areas with large employment concentrations in potential high-risk locations containing hazardous materials or conditions;
- Laboratory and non-Laboratory traffic conflicts; and
- Conflicts between vehicles and pedestrians, bicyclists, and joggers.

The transportation maps depict five categories of roads. Specific design details for these roads can be found in the *Facilities Engineering Manual* and the *Site and Architectural Design Principles* (1999).

Arterial – are major access routes into and around the Laboratory. They are designed to carry high traffic volumes and connect the Laboratory to the surrounding region.

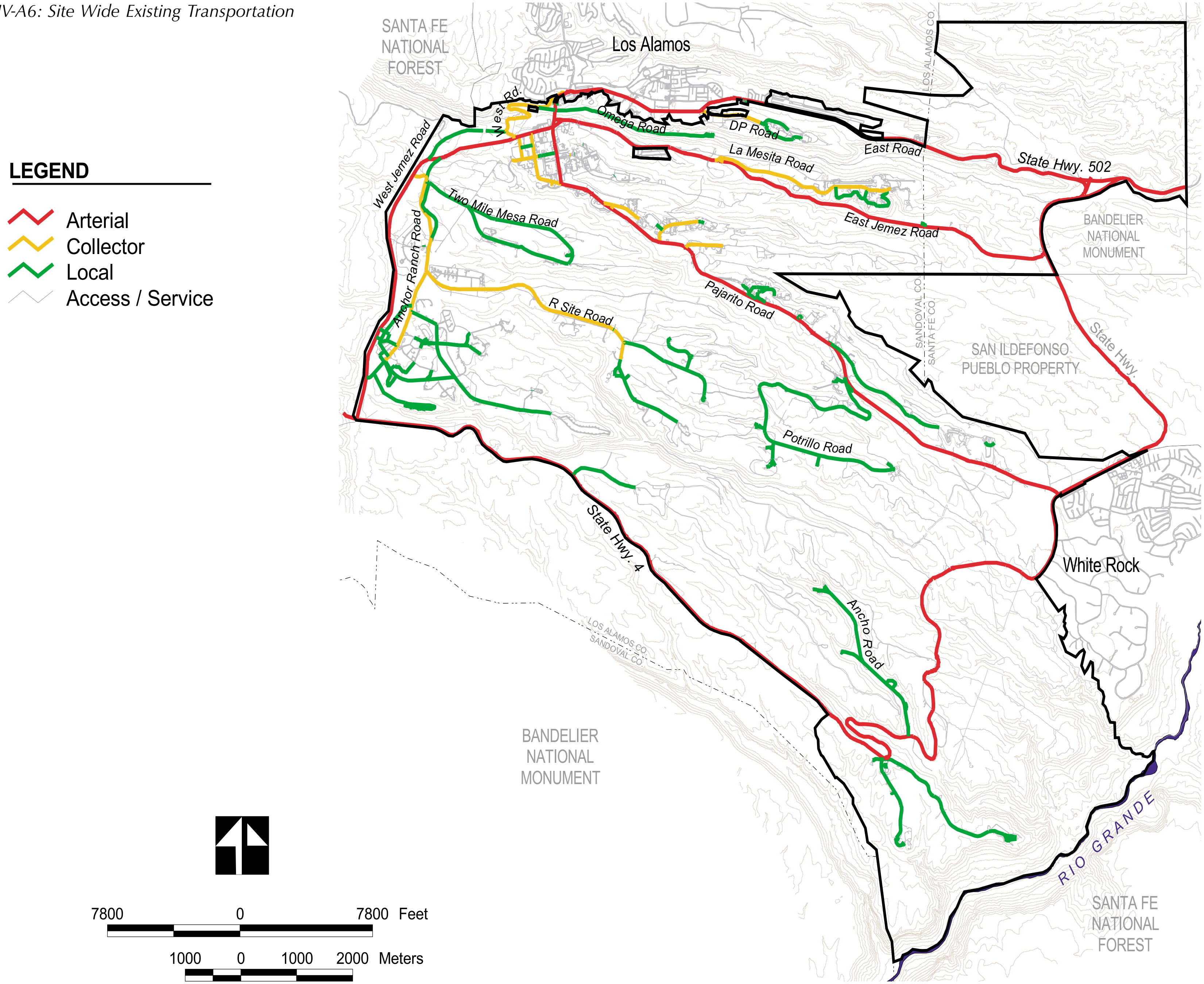
Collector roads – channel traffic onto arterial roads. They are designed to create "loops" that connect arterial roads. They also connect large groups of buildings or technical areas (TAs) within the Laboratory.

Local roads – funnel traffic onto collector roads. Local roads allow for transit between buildings within a technical area. They usually have a particular access point that is either signed or gated.

Access/service roads – are non-public, specific use roads and are used to access remote sites, individual buildings, technical service areas, parking areas within a technical area, and for utility maintenance. They are often unpaved, infrequently used and maintained, and usually terminate at a dead-end. They include roads around security fencing and can provide avenues to detour traffic when necessary.

Emergency lanes – are unmaintained, seldom used dirt roads that generally provide entry into remote, undeveloped areas. They usually dead-end and are designed for emergencies and fire protection.

Map IV-A6: Site Wide Existing Transportation



6. *Future Transportation*

The Laboratory's remote location, topography, and development pattern has created unique transportation problems. Its location on a series of mesa tops separated by deep canyons and the dispersed arrangement of facilities on these mesas combine to make access between Laboratory facilities difficult and circuitous. Development of roads and parking has been incremental-often guided by short-term needs. The incremental growth has neglected incorporation of pedestrian, bicycle and transit improvements. Maintenance of the transportation infrastructure has generally been inadequate to keep up with needs. These factors have resulted in site wide transportation difficulties.

Strategies for Transportation

Transportation strategies for the Laboratory are:

- Move public traffic out of the Core Planning Area by developing an arterial loop road around TA-03;
- Move truck and other large vehicle traffic out of densely developed areas by relocating delivery and distribution activities to areas along East Jemez Road;
- Move parking out of prime developable areas and locate new facilities at the perimeters of built zones where connections to on-site transit can be easily made;
- Develop strategies to reduce conflicts between public traffic and secure zones;
- Create a multi-modal transportation system that supports regional transportation needs;
- Develop a complete transportation system that incorporates pedestrian, bicycle and transit improvements; and
- Develop a transportation infrastructure that provides for emergency and safety needs.

The Site Wide Future Transportation Map, VI-A4, shows projects that are underway or proposed that support the Laboratory's transportation strategies.

(1) ***TA-03 Perimeter Loop Road -*** Revitalization efforts in TA-03 call for a perimeter loop road to route traffic around the core of TA-03. This allows TA-03 to be accessible but secure. The west section of the loop road is currently being planned. The eastern section is awaiting planning.

(2) ***Options for Pajarito Road -*** The development of a nuclear campus at TA-55 will make the security and safety conflicts with public traffic on Pajarito Road more pronounced. Three alternatives are under discussion:

(2a) Closure of Pajarito Road to public traffic, with a guard gate east of TA-54.

(2b) Building of a parallel bypass road south of the current alignment.

(2c) Building of a north-south connector road between Pajarito Road and East Jemez east of TA-46.

(3) ***Add Secondary Accesses -*** Secondary access roads are proposed to improve site circulation, emergency response times, contingency planning and fire fighting capability. A major component would be a north-south connector between Pajarito Road and East Jemez Road and a second bridge to the town site to reduce public traffic in the core of TA-03.

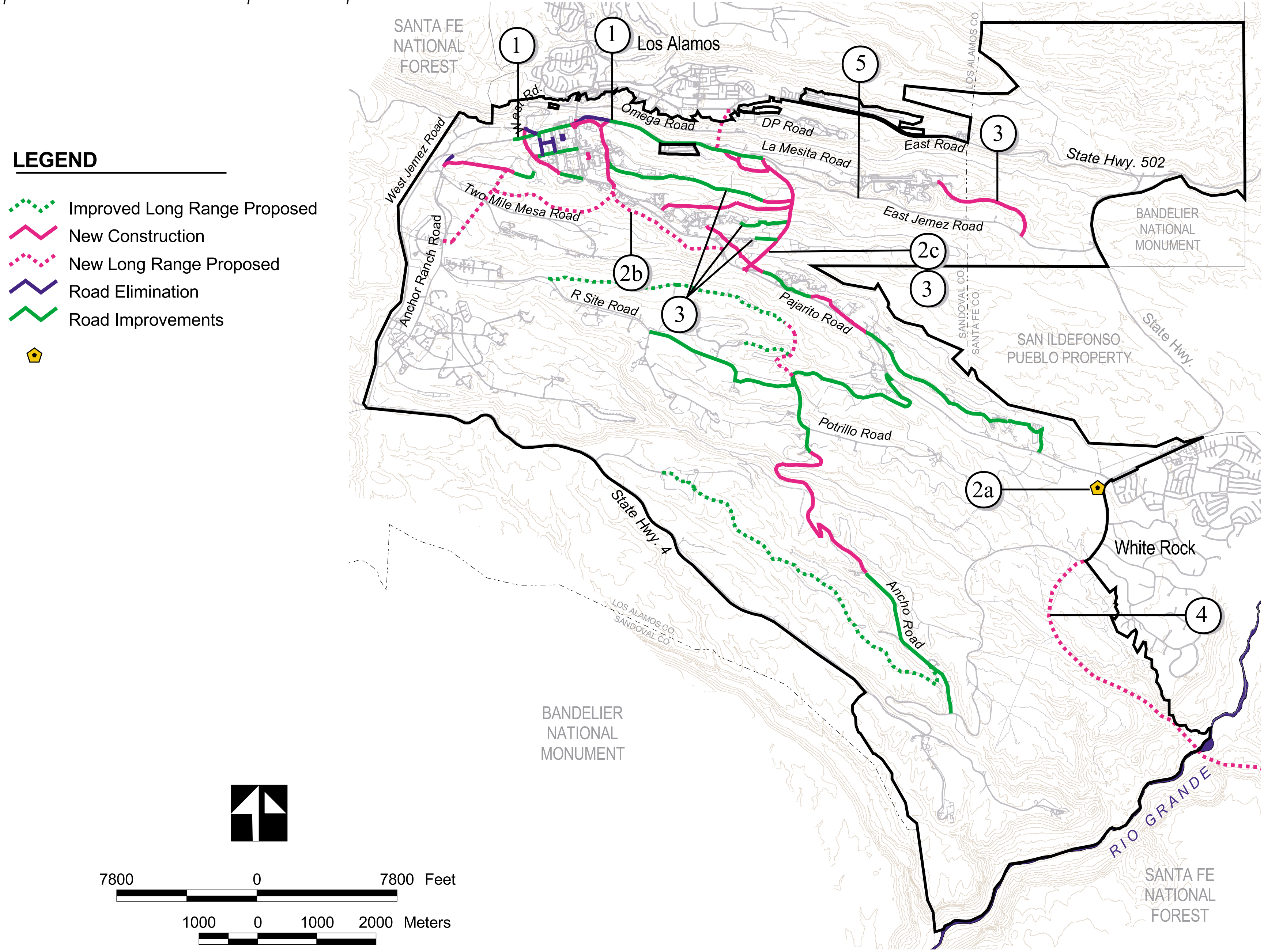
(4) ***Regional Connection to Santa Fe-*** A long range regional road connection to Santa Fe and Albuquerque needs to be considered. A second major access to Los Alamos is a safety and security need.

(5) ***Upgrade East Jemez Road -*** Traffic increases are projected for East Jemez Road if Pajarito Road is closed to public traffic. Improving the total length of East Jemez Road is proposed if the closure occurs.

ns ***Develop Pedestrian Trails -*** The Laboratory staff desires bicycle and pedestrian trails for both work and recreational purposes. These trails can also serve dual purposes as fire access, utility corridors and unpaved emergency access. Proposed improvements for pedestrians and bicyclists are included in the Core Area and LANSCE Mesa Planning Areas.

ns ***Integrate Transit Use -*** As space for surface parking becomes more restricted, the need to integrate transit planning increases. Projects to incorporate transit facilities into parking relocation plans for TA-03 are underway. Site wide transit planning is needed on this issue.

Map IV-A7: Site Wide Future Transportation Map



7. Security

The Security and Safeguards Division (S) drives primary security operations at the Laboratory. However, physical security needs to be incorporated in the design of sites and facilities. There is increased emphasis in Laboratory security to utilize and combine a variety of techniques that are implemented by various groups.

Security planning involves the coordination of input from S-1, S-2, ISEC, and other security initiatives such as the white paper on security issues planning, and the feasibility study on the closure of Pajarito Road and Diamond Drive. Future security planning is evolving to address recent security issues and concepts.

a. Existing Conditions

Security at Los Alamos National Laboratory strives to protect personnel and facilities in a manner appropriate to prevent and respond to postulated threats. Safeguarding consists of guarding, protecting, or providing a defense based on several considerations: the sensitivity of the facility, the level of threat, the Laboratory's vulnerability, and the defense options, which combine for a graded approach.

The hazardous nature of much of the Laboratory's work, the dispersion of facilities within the large site, and constraints imposed by the rugged terrain have led to the development of many scattered and separate security areas. The nature of the security interest in each area determines the type and degree of security required.

The security systems, which date from the mid-1980s, are slated for replacement. The complete project (Nuclear Materials Safeguards & Security Upgrade Project) has been estimated at ~ $300 million. The first phase will replace the control system and communications infrastructure. The second phase will replace the Laboratory's perimeter intrusion detection and assessment system (PIDAS) at Category I and II nuclear materials facilities. This project's dedicated management team is exercising strong, formal change control over cost, scope and schedule.

b. Security Measures

Most Laboratory research follows DOE rules and regulations that govern the protection of national security interests. In complying with these regulations, the Laboratory employs five types of security measures. They are:

Badges - Badges identify their wearers, indicating clearance status and the areas the wearers may enter.

Barriers - Fences and other physical barriers, such as buildings, walls, and natural barriers define areas within which classified information may be used, discussed, and stored. These barriers help to deter penetration and outside monitoring.

Control Points - Access to classified areas is granted to authorized and escorted personnel and denied to unauthorized personnel. Access is restricted by a protective force officer stationed at the access point or by access controlling equipment or personnel.

Surveillance - The Laboratory is monitored by security patrols and by remote electronic devices.

Distance - Site location, canyons, posted property, and security buffer zones all serve as barriers between the area to be protected and potential threats.

c. Types of Security Areas at the Laboratory

There are also five levels of security maintained by the Laboratory. These levels are described below.

Public Access Areas - Public access areas are normally open to the public during working hours. -such as the Otowi Cafeteria and certain roadways at the Laboratory-

Property Protection Areas (PPA) – PPAs are technical areas or buildings outside of security areas in which Laboratory business is conducted. To enter a PPA, employees are required to wear security badges, but clearances are not required. No classified matter may be used or stored in controlled areas, nor may classified matters be discussed. Uncleared visitors on official business may enter these areas with prior authorization.

Limited Areas - Limited security areas may be entered by persons who hold Q or L clearances or by persons accompanied by authorized escorts. In limited-security areas, classified matter can be used and stored, and classified discussions are permitted. However, access to the area does not necessarily constitute access to classified matter.

Exclusion Areas - An exclusion area is designated for the protection of classified matter where mere access to the area would result in access to the classified matter used or processed therein. Access to an exclusion area requires a Q clearance and a specific need-to-know with regard to the classified information contained within the area.

Protected Areas (PA) and Material Access Areas (MAA) - Protected Areas (PAs) and material access areas (MAAs) are established for the protection of Category I and II SNM operations and may be entered only by Q cleared persons with special authorization for each specific area. These protected areas or materials access areas contain SNM and/or classified matter of such a nature that access to the area actually constitutes access to the material.

d. Security Issues/Planning Analysis

The Laboratory must strengthen and maintain security protection to meet DOE security regulations and requirements. Consolidation and centralization of secure functions and control of public access in and around public areas requires careful land use and facilities planning. The planning must incorporate security in the context of overall Laboratory missions, resolve any conflicting goals, and identify/resolve potentially competing programmatic needs. Potential terrorism from and vulnerability to outside forces are other considerations.

Certain items need careful security planning to facilitate siting communication lines, electrical substations, the central computing center at TA-03, and the cooling water facilities for the computing center.

Ideally, the Laboratory site should be arranged concentrically, with the lowest-level security zones (public access and buffer areas) at the perimeter and the highest-level zones (Category I & II SNM areas) at the center. This model is optimal for three major reasons:

- The most sensitive functions are the most highly protected.
- Theoretically, the highest level of security is achieved by locating those with the least need to know on the perimeter and those with the most need to know at the center.
- Circulation would be continuous within each security zone and convenient between zones.

The Laboratory's historic land use pattern and natural topography imposes major limitations on this model. Most of the highly classified activities are dispersed among a number of technical areas.

e. *Security Goal and Objectives*

The Laboratory's physical goal for security/safeguards is to maintain and strengthen security protection through long-term site development planning. This goal can be accomplished through the following objectives.

- Consolidate secure functions and interests to the extent permitted by other Laboratory functional and technical requirements.
- Limit public access to, and visibility of, limited-security and Category I & II SNM areas.
- Minimize public proximity to secured areas by locating public interface functions at the perimeter of the site.
- Establish buffer zones to protect limited-security and Category I & II SNM areas from unauthorized access.
- Surround or buffer higher-security functions with lesser-security functions to protect and insulate these functions from security threats.

f. *Security Policies*

The following policies are proposed to guide the Laboratory's security/safeguards decision making process.

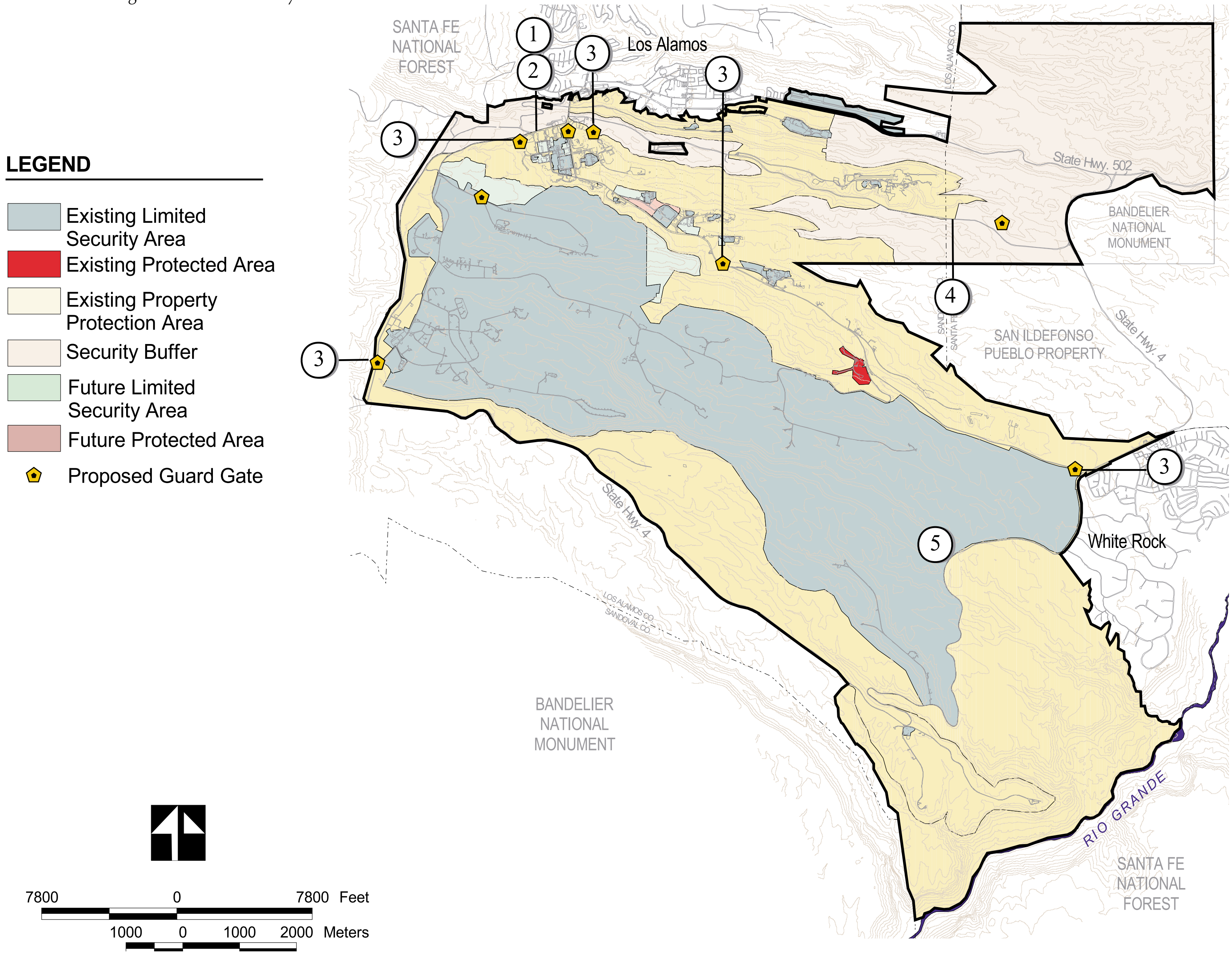
- Enhance awareness of physical security threats through education of all Laboratory personnel as necessary to help identify potential problems before any incident occurs.
- Consolidate all Category I & II special nuclear materials in as few areas as possible to enhance safeguards and security.
- Minimize the number of limited-security areas to the extent permitted by programmatic needs to consolidate and buffer such operations.
- Provide new road linkages between selected points to enhance security and emergency response time capabilities and to lessen reliance on public roads for operational activities.
- Construct peripheral roads and parking to minimize private vehicle access to secure sensitive areas.

The ***Site Wide Existing and Future Security Map*** shows current and proposed projects that support the transportation strategies.

1. Establish a secure, centrally located storage facility for inactive classified documents.
2. Complete the industrial security perimeter fence around TA-03 and construct visible entry points that can be optionally manned.
3. Provide capability to control access at Laboratory entry portals.
4. Widen East Jemez Road and make related intersection improvements so that public use and access along Pajarito Road can be de-emphasized.
5. Install fencing or other deterrents between NM 4 and the southeast boundary of the Dynamic Testing area.

- Continue to fence, sign, and enhance patrols of all Laboratory lands to discourage illegal and undesirable activities such as poaching, unauthorized entry, and vandalism as well as erosion and habitat degradation.
- Close Pajarito Road to public access when limited-security islands along Pajarito Road and the southeast portion of TA-03 expand toward each other. Reroute traffic to the TA-03 bypass roads, after it is constructed.

Map IV-A8: Site Wide Existing and Future Security



C. *Site Wide Utilities*

This analysis addresses utility problems that are evident throughout the Laboratory. Minor defects are not considered unless they are part of a major issue. Major issues are categorized into three areas of concern:

System Condition: Analysis of overall system integrity. Data from maintenance reports, repair logs, and scheduled inspections supports these conclusions.

System Materials: Analysis of systems, main and connecting materials. Data from design documents, construction as built, and repairs notes support materials mapping.

System Capacities: Analysis of current system capacities and demands. Data from previous reports and field investigations have located pinch points and delivery failures.

The five utilities can be divided into "active" and "passive" systems. Active refers to gas, water, steam supply, and electric systems that are pressurized or energized. Failures or fluctuations in these utilities are immediately noticed and located. Repairs are made rapidly and causal issues are fixed. Maintenance of the active systems is proactive and is currently well organized.

Passive systems include sewer and most steam condensate. These utilities are not pressurized and do not exhibit immediate failure. Repairs are made only after surface effluent is exposed and are conducted often after consequential damage. As evident by condensate return rate, some system failures have not been exposed. Maintenance of passive systems is reactive and difficult to anticipate. Television and infrared inspections can assist in maintaining sound sewer and steam systems.

Utility systems include major facilities on the site. The sewage Treatment Plant is three years old and has had award-winning operation. It is a model facility recognized by state and federal agencies. Electricity and steam are generated at the TA-03 power plant. Power generation is currently at 70% design capacity until the second cooling tower is completed in fall of 1999. Steam is also generated at TA-21. The TA-16 central steam plant is dormant and scheduled for demolition.

a. *Water System*

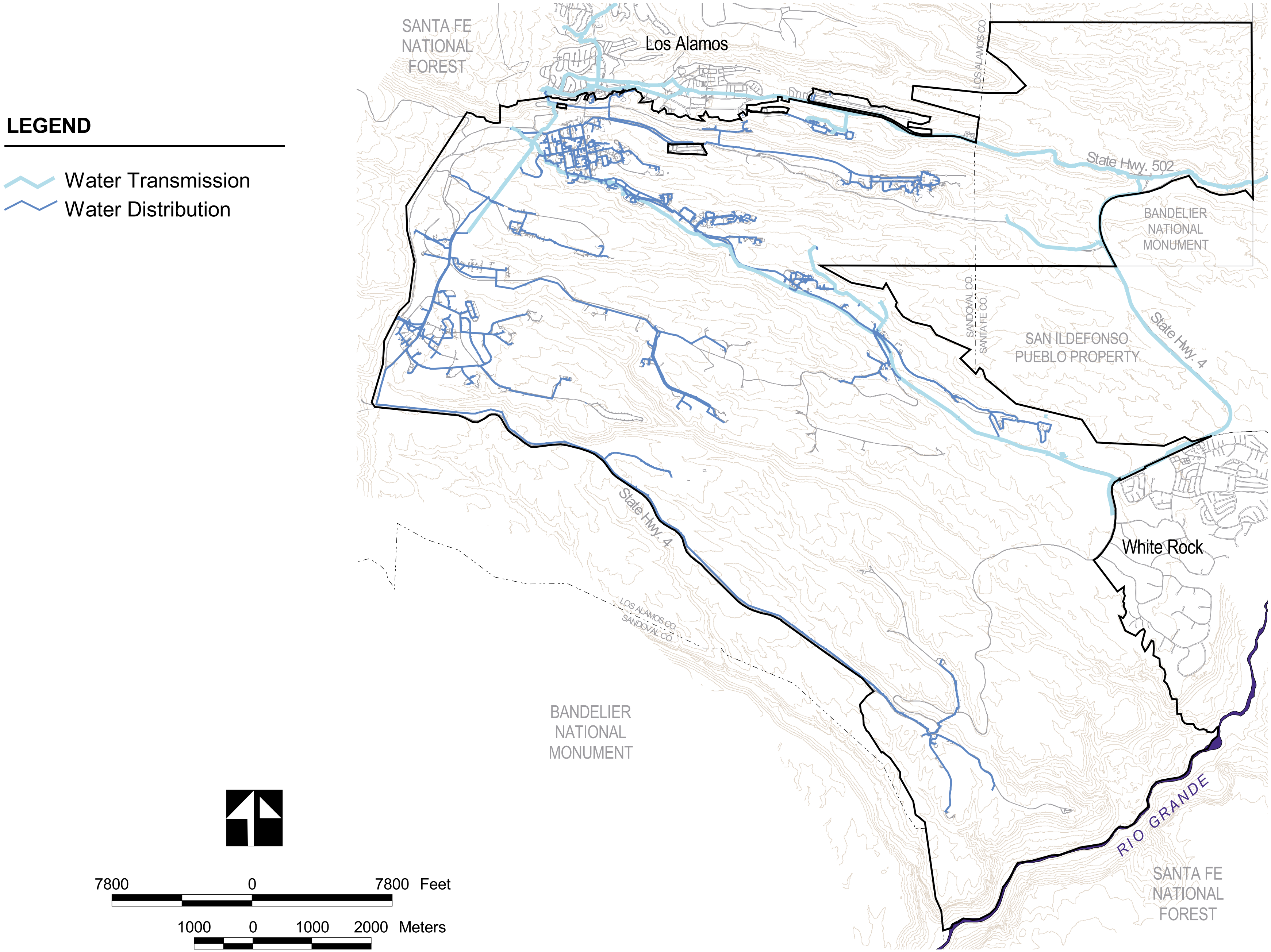
Until November 1998, DOE owned and operated the potable water distribution system for the Laboratory and Los Alamos County. To reduce the cost of operations and maintenance, DOE transferred 35 miles of transmission lines, 14 wells, 14 booster stations, 23 storage tanks and 9 chlorinators to Los Alamos County. Currently, water is obtained from Los Alamos County, transported through the Laboratory's water distribution system and ultimately distributed to both domestic water and fire protection services. Since May 1999 Los Alamos County has been providing potable water at a rate of .9 to 1.4 MGD. This water is piped from the Los Alamos County water supply system into the Laboratory's water distribution system. The Laboratory's water distribution system consists of 120 miles of main distribution piping, 15 storage tanks and 21 in-line pressure reducing valves. Water flows through the distribution pipes until it reaches either a service lateral or a storage tank. These laterals supply needed water to everything from eye wash stations to fire hydrant locations.

The Laboratory constantly works to ensure adequate and reliable water sources. Because of water's importance, tests are preformed to guarantee reliable flow rates, fire hydrants are routinely checked, and maintenance is performed. Some of the programs currently underway involve a leak study to detect defects in the water distribution system; possible replacement of asbestos tainted piping; and expansion efforts to link several new facilities into the fire protection loop.

1. *Water System Condition*

Los Alamos National Laboratory's water system is in generally good condition. However, two areas of concern are pressure consistency and fire supply lines. Water pressure consistency is a particular problem in the areas of lower-elevation where the water pressure often exceeds the pressure rating for the distribution pipe. To allow for random pressure surges, the burst pressure for water pipe is typically 2 to 2.5 times the rated pressure. Pressure-reducing valves provide a reliable and cost-effective means for controlling inflow pressure in select areas. In areas

Map IV-A9: Site Wide Existing Water Utilities



where the pressure-reducing valves are not providing ample protection, the valves can be reworked or replaced. If this is an unacceptable solution, the actual pipes can be replaced with ones that meet pressure requirements. As changes are made, pipelines should be selected that meet current conditions and anticipated needs.

The second concern involves inadequate fire lines. Traditionally, fire hydrants are connected to pipes that are at least 6 inches in diameter. Laboratory water service lines that provide water for fire protection need to be replaced if they have diameters that are less than 6 inches.

2. Water System Materials

The Laboratory's water distribution system is composed of pipes that are made of a variety of materials including cast iron (CI), steel (ST), asbestos cement (TR/AC), reinforced concrete (CON or RC), copper (CU), ductile iron (DI) and plastic (PL, PVC or HDPE). At present, ductile iron is being used to replace old cast iron pipes in areas where the lines are utilized for distribution. Steel and reinforced concrete are no longer commonly used in systems of the Laboratory's size. Plastics and ductile iron are the materials of choice for systems that are less than 24 inches in diameter.

Los Alamos National Laboratory is studying the possibility of replacing asbestos cement piping. This is a particular concern in areas where the pipe may be disturbed for service additions or leak repairs. Asbestos cement pipe is no longer used for domestic services in the United States. Property records indicate that the Laboratory has approximately 28,425 linear feet of 4-, 6- and 8-inch asbestos cement pipeline. This pipe was installed from 1959 to 1967 and is located in Technical Areas -15, -50 and -53. Asbestos cement generally does not cause problems if it is not disturbed. Difficulties arise when asbestos fibers are freed and become airborne. If asbestos pipes are sawed to allow new fittings or service taps, asbestos particulate could be released. To resolve this problem new service leads should be installed in lieu of connections to the asbestos cement pipe.

The second concern involves the condition of aged cast iron or steel pipe in the water system. Cast iron and steel piping can be problematic if not lined or protected from corrosion. Segments should be inspected on an individual basis to determine if the pipelines require remedial action or replacement within the next 10 years. Conductivity tests will determine variations in uniformity and provide information concerning corrosion.

The site wide leak study currently underway will address localized problem segments that require repair or replacement. The distribution maintenance system will be in charge of installation and maintenance.

3. Water System Capacities

Currently, there are no site wide issues regarding the availability or capacity of the water distribution system. Future development will place additional demands on system capacity. Aquifer water sources could be tapped by additional deep wells.

b. Sanitary Sewer System

Los Alamos National Laboratory's sanitary sewer system consists of 42 miles of trunk lines and collection laterals, 42 lift stations and 12 miles of force main piping. Currently, three methods are utilized to manage wastewater. The first directs wastewater to the collection system. The second transports the wastewater in tanker trucks to TA-03 for drop-off into the collection system. Thirdly, where connection to the collection system is not practical or cost effective, septic systems are utilized.

To ensure safe and reliable operation of the collection system, the Laboratory has an aggressive maintenance and inspection program. It involves daily and monthly inspections of the lift stations and annual assessment of the pipelines.

1. Sewer System Condition

The sanitary system is generally in good condition, known problems being a segment of gravity pipe that lies between manholes 769 & 770 in TA-16, a broken section near Building 001 in TA-16 and miscellaneous sections in TA-03. The TA-46 treatment plant is considered to be in excellent operating condition and possesses adequate capacity; thus, no scheduled improvements are planned. Maintenance and treatment will continue for the septic tanks.

There are toxicity concerns about chemicals that have inadvertently been discharged into the system. Waste Acceptance Criteria toxicity monitors will be installed at collection lines leading to TA-03 and TA-53.

Currently, a program is underway to connect building floor drains to the sanitary sewer system. This will help collect and control wastes previously released into the storm drain system. Since the volumes collected are insignificant, they will not adversely affect sanitary wastewater collection or treatment.

2. Sewer System Materials

The Laboratory's sanitary sewer system is composed of pipes that are made of a variety of materials including cast iron (CI), vitrified clay (VC), steel (ST), asbestos cement (TR/AC), reinforced concrete (CON or RC), copper (CU), ductile iron (DI) and plastic (PL, PVC or HDPE). The Laboratory is currently examining two areas of concern.

The first involves replacement of asbestos cement piping. Due to health concerns, asbestos cement pipe is no longer used in domestic services in the United States. However, property records indicate that the Laboratory has approximately 3,435 linear feet of 4- to 6-inch-diameter, asbestos cement pipe. This pipe which was installed between 1956 and 1979 occurs in several technical areas. TA-03 has 650 feet of 4-inch-diameter pipe, TA-18 has 170 feet of 6-inch-diameter pipe, TA-50 has 30 feet of 6-inch-diameter pipe and TA-59 has 2,250 feet of 4-inch-diameter pipe and 335 feet of 6-inch-diameter pipe. Asbestos cement pipe does not present problems unless it is disturbed and asbestos particles are released into breathable air. The 4-inch pipes are considered a low risk due to the fact that this size of pipe is generally used for service connections, and is unlikely to be tapped into for further service. The 6-inch lines are generally collection mains and thus subject to tie-in. However, the 6-inch lines are of minimal length, so it may be feasible to replace or bypass the mains with relatively inexpensive PVC lines.

Vitrified clay pipe was installed throughout the Laboratory from 1944 until 1992. Property records indicate that the Laboratory has over 90,000 feet, 18 miles, of 2- to 10-inch lines. Since vitrified clay is a brittle material it must be manufactured in short lengths to maintain structural integrity. Currently, there are no indicators of site wide problems with vitrified clay pipe; however, these pipes should be monitored to determine if patterns of failure or deterioration arise that would warrant replacement. Video monitoring the pipes' interiors would be an appropriate method for evaluating the existing conditions.

Cast iron and steel piping can be problematic if not lined or protected from corrosion. Thus, segments should be inspected and assessments conducted to determine the current condition of pipes. If it is found that the pipes are damaged, appropriate remedial action should be undertaken. Conductivity tests would be appropriate non-destructive tests to identify problem areas.

3. Sewer System Capacities

Individual pipe segments throughout the Laboratory's sanitary sewer system have inadequate slopes. These segments are prone to clogging. Reaming is required to remove built up solids. These lines should be replaced with lines that possess a minimum flow velocity of 2 feet per second. The flow rate of the new pipes would eliminate solids build up.

c. Solid Waste

Both the Laboratory and Los Alamos County use the same county sanitary landfill located in the western portion of TA-61. Los Alamos County has also contracted with Española to receive selected waste from that community. The anticipated life of the landfill is estimated to be about 5 years. Upon closure, the Laboratory anticipates sending sanitary solid waste to a proposed regional landfill in Ojo Caliente. Operations at this proposed site are anticipated to begin in the next five years.