CHAPTER 3.0
Description of Proposed Action and Alternatives

3.1 Proposed Action

3.1.1 Introduction

Lawrence Berkeley National Laboratory (LBNL; also referred to as “Berkeley Lab,” “the Laboratory,” or “the Lab” in this document) is an approximately 200-acre multi-program research laboratory operated and managed by the University of California (UC or the University) under a contract with the U.S. Department of Energy (DOE). This Environmental Assessment (EA) evaluates a proposal to demolish the Bevatron and the structure housing it, Building 51,[1] at Berkeley Lab.

The approximately 180-foot-diameter Bevatron was constructed as a proton synchrotron—a particle accelerator that accelerated protons within a beam pipe to near the speed of light. When the protons struck “targets” composed of various materials placed within a target chamber, the resulting interactions often produced new types of particles. Study of these interactions and the particles themselves led to important advances in the fields of particle and nuclear physics. Later modifications of the Bevatron enabled researchers to accelerate heavy ions and expand the facility’s usefulness in additional areas, including medical research, cancer treatment, and cosmic ray experiments. During its operation from 1954 until 1993, the Bevatron was among the world’s leading accelerators, and during the 1950s and 1960s four Nobel Prizes were awarded for work that utilized this apparatus.

Building 51 is a large, approximately 126,500-gross-square-foot steel-frame shed-like structure built to shelter the Bevatron apparatus and its associated mechanical, electrical, shop, and office functions. Since the end of the Bevatron’s operations in 1993, Building 51 has had limited use for equipment storage, office space, and dry laboratories (e.g., for computer repair). The building presently is largely unoccupied. The history of the facility is discussed in Section 4.3.3, Cultural Resources.

Under the Proposed Action, the Bevatron apparatus would be disassembled, Building 51 and the foundation underneath the building would be demolished, and the resulting debris and other materials would be removed. The site would then be backfilled, and the fill would be compacted and leveled. This would make future reuse of the site more feasible, although further preparatory

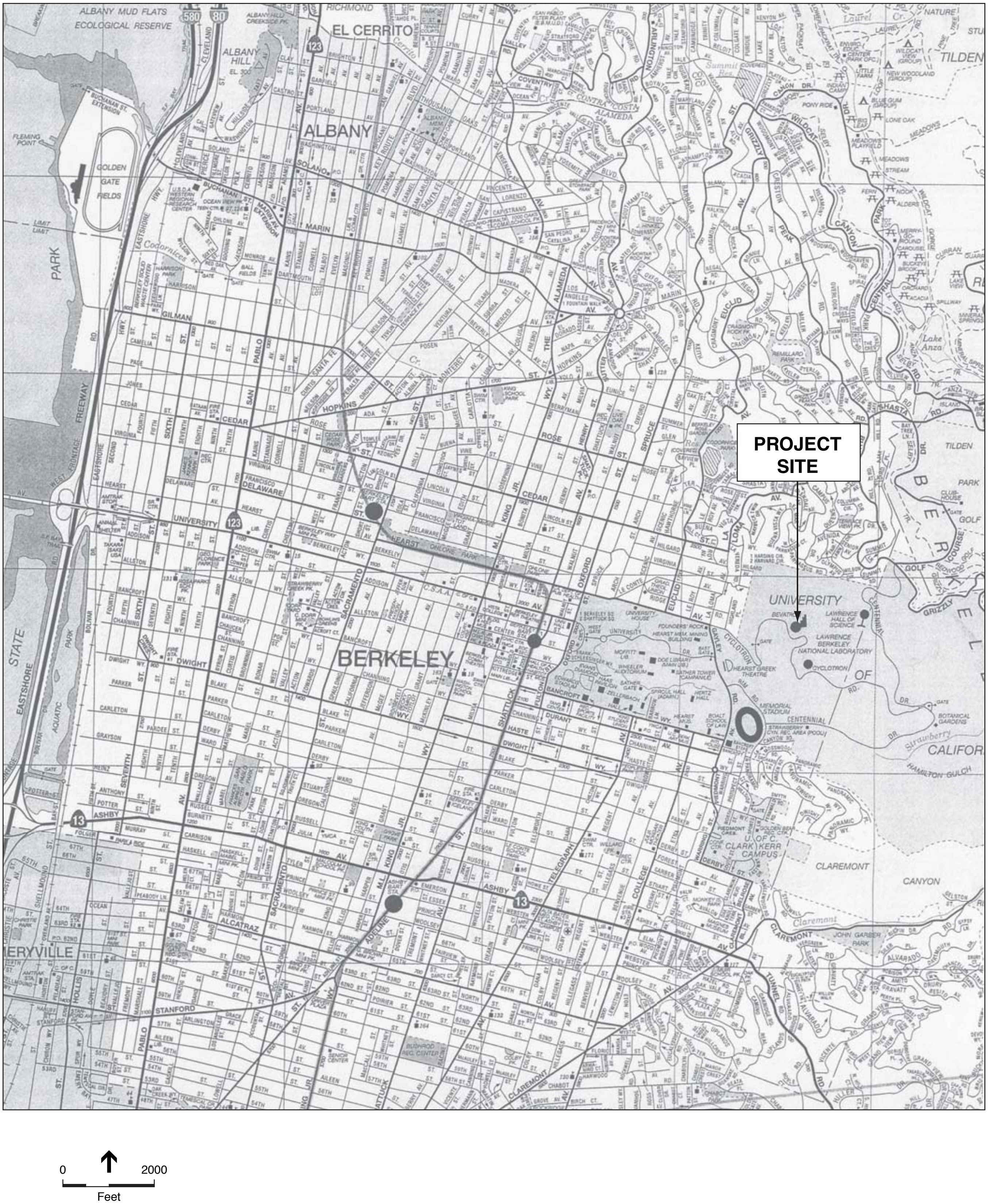
1 Building 51 includes Building 51A, an integral addition to the main building.

site work outside of the scope of this project would be necessary. However, there are no firm plans for future development of the site at this time.

3.1.2 Location and Existing Conditions

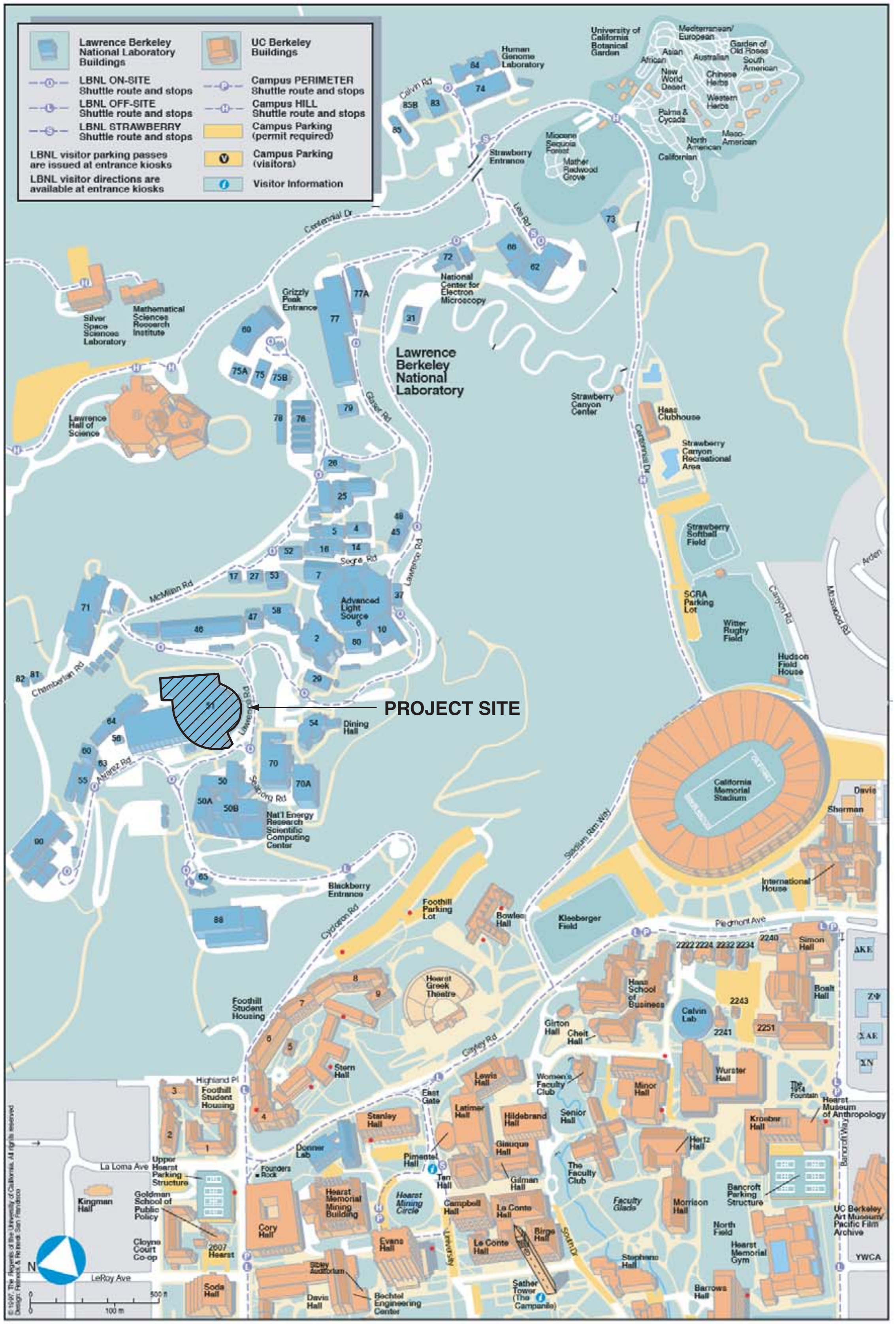
LBNL is located in the cities of Berkeley and Oakland in Alameda County on land owned by the University of California. The project site comprises approximately four acres. Of this total, approximately 2.25 acres (the “demolition zone”) would be converted from developed area (i.e., occupied by Building 51) to an undeveloped area for an indeterminate time, until another use for this area is proposed, approved, and initiated. The remaining acreage would be used for parking and staging. The site is located within the City of Berkeley portion of LBNL, in the west-central part of LBNL, and is located adjacent to Lawrence Road (from which vehicles enter and leave the site) and McMillan Road within Berkeley Lab. See **Figures 1** through **4**. Laboratory, office, engineering, and computing functions occupy the LBNL buildings immediately adjacent to Building 51. Open space or landscaped areas border the site immediately to the east and north. Surrounding land uses include residential areas to the north of the LBNL property line; LBNL buildings and UC Berkeley athletic fields to the south; LBNL buildings, non-UC Berkeley residences, and UC Berkeley student housing, amphitheater, and classrooms to the west; and additional LBNL buildings and the UC Berkeley Lawrence Hall of Science to the east. Building 51 is approximately 1,100 feet from the nearest residences to the west and north, and about 1,300 to 1,400 feet from the Lawrence Hall of Science to the east.

The project site is entirely developed with the exception of two small areas of ornamental landscaping at the entrance to Building 51. With the exception of two ornamental low-lying trees at this location, no trees would be removed as a result of the project. Small areas of the site are underlain by the edges of two groundwater plumes containing volatile organic compounds (VOCs). Soils underneath portions of the site were contaminated by VOCs, petroleum hydrocarbons, polychlorinated biphenyls (PCBs), and/or mercury that were released at unknown times during the period when the Bevatron was in operation. Starting in the early 1990s, investigation and cleanup actions have been undertaken. These actions are under the oversight of the California Department of Toxic Substances Control, which consults with such other agencies as the San Francisco Bay Regional Water Quality Control Board, DOE, and the City of Berkeley Toxics Management Division. As a result of the completion of interim corrective measures at two soil units at Building 51 under the Laboratory’s Environmental Restoration Program, soil contaminants have been reduced to levels considered “protective of human health and the environment” under U.S. Environmental Protection Agency risk assessment guidelines. Groundwater contamination continues to be remediated under the Environmental Restoration Program. Contamination and remediation activities are discussed in more detail in Section 5.1.5, Hazards and Human Health. The site is not listed on the California Environmental Protection Agency (Cal/EPA) Hazardous Waste and Substances Sites List compiled pursuant to Government Code Section 65962.5, also known as the Cortese List.



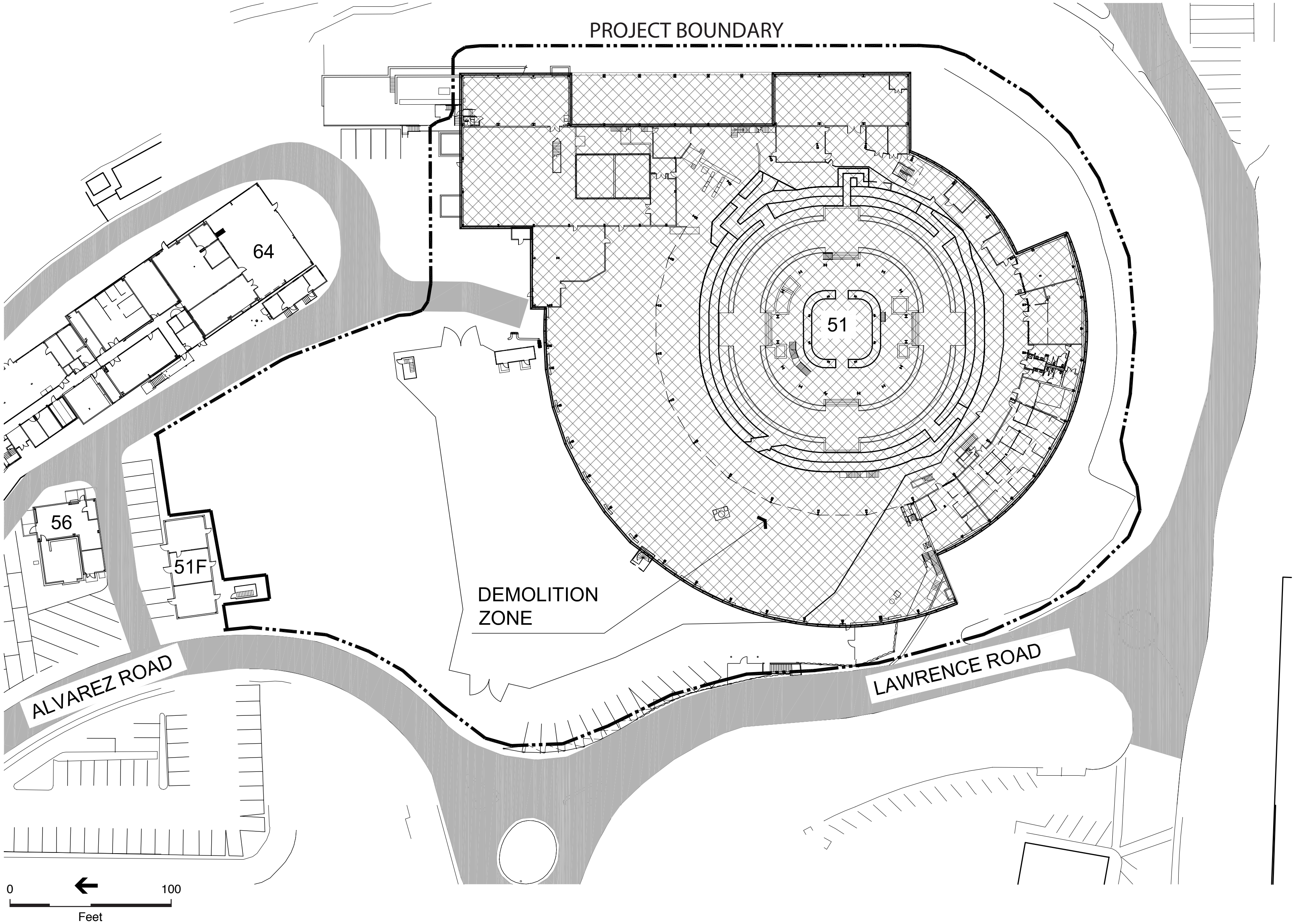
SOURCE: Environmental Science Associates

Figure 1
Regional Map



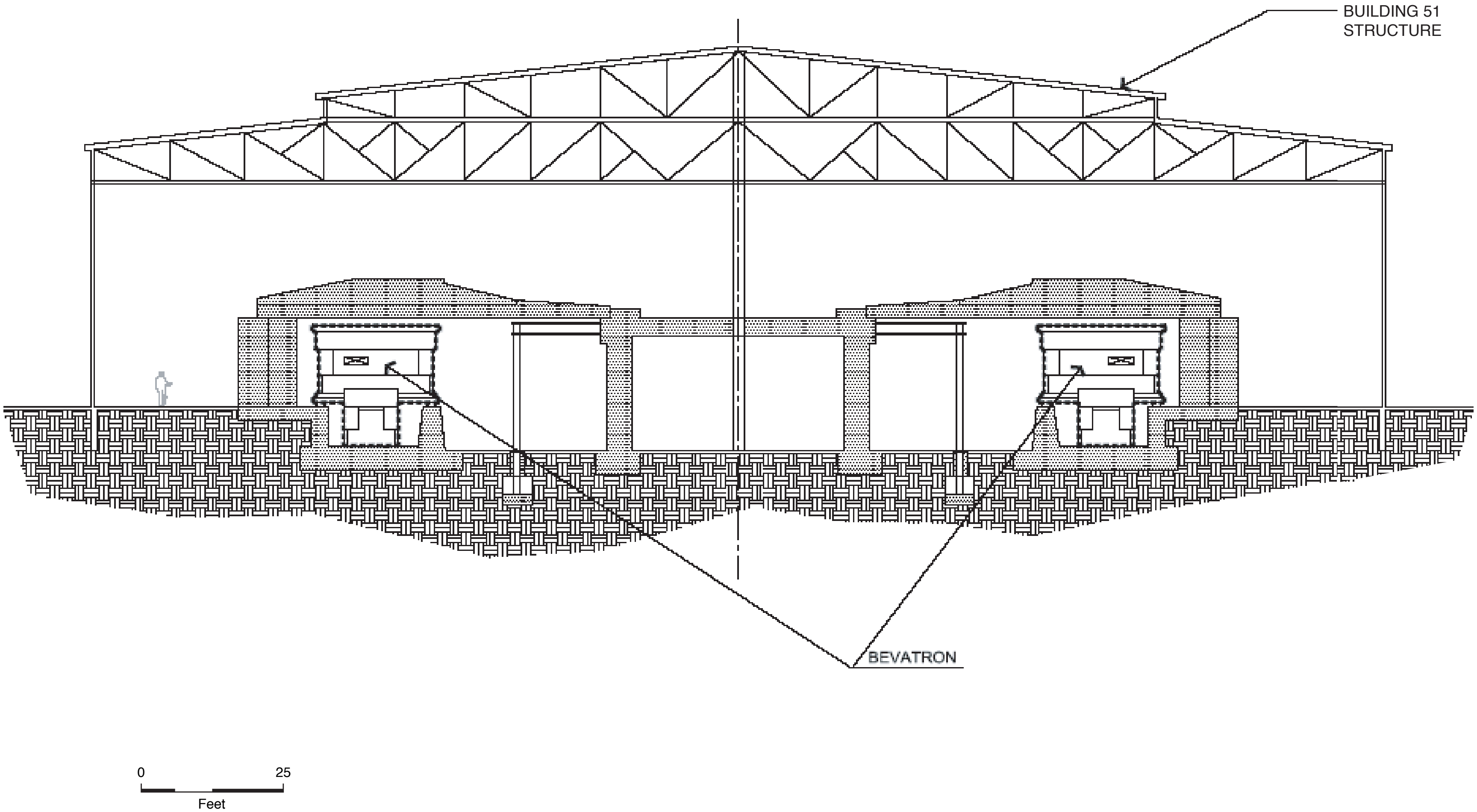
SOURCES: LBNL (2005) and ESA (2005)

Figure 2
Project Site Location



SOURCE: LBNL (2005)

Figure 3
Bevatron within Building 51 Project Area



SOURCE: LBNL (2005)

Figure 4
Bevatron within Building 51 Section Diagram

3.1.3 Project Characteristics/Components

In brief, under the Proposed Action, the concrete block shielding surrounding the Bevatron would be removed, the Bevatron apparatus would be disassembled, Building 51 and the shallow foundation underneath the building would be demolished, and the resulting debris and other materials would be removed. The site would then be backfilled, and the fill would be compacted to grade. This would make future reuse of the site more feasible, although further preparatory site work outside of the scope of this project would be necessary.

3.1.4 Project Activities

The Proposed Action would entail the removal of approximately 22,000 to 26,000 tons of reinforced concrete, structural steel, siding, glass, and other building materials; 12,000 to 16,000 tons of reinforced concrete shielding blocks that enclose the Bevatron and protected personnel from penetrating radiation produced by the Bevatron when it was in operation; and 12,000 to 15,000 tons of Bevatron materials, mostly metals, such as yokes, support steel and equipment. Approximately half of the shipments of materials that would be generated by the project would consist of non-hazardous debris and other items typical of building demolition projects. The other half of these shipments would be of materials having some hazardous characteristics. Portions of the Bevatron apparatus, its concrete block shielding, and other items have low levels of induced radioactivity above naturally-occurring levels, due to their exposure to neutron and charged particle radiation produced by the Bevatron. Also, there may be small amounts of surface radioactivity on some pieces of equipment.[2] The concrete in a small number of shielding blocks contains concentrations of uranium slightly above background levels, and a small number of other shielding blocks are composed of depleted uranium encased in steel. Other types of hazardous materials also would be encountered. For example, the exterior siding of Building 51 is made of transite, an asbestos-containing material, and some surfaces were painted with lead-containing paint.

The duration of the physical work for the project may vary from four to seven years, from mid 2006 through 2009 or 2012, contingent upon funding and results of material sampling. For the purposes of conservative impact assessment, where impacts presumably are intensified in a shorter project timeframe, the project is assumed to take place over a four-year period.

Apart from planning activities and actions to secure the site (e.g., locating and deactivating electrical lines as necessary), the main categories of project activities would be as follows:

Clean-out would remove equipment and materials that are not an integral part of the building structure. This includes the 750 to 800 concrete shielding blocks and the Bevatron itself. The shielding blocks would be removed in advance of the Bevatron components. The Bevatron itself,

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2 Induced radioactivity was produced when energetic particles from the accelerator interacted with elements in items struck by the beam. Surface radioactivity resulted from the presence of radioactive targets that were used in some accelerator experiments. It is anticipated that very limited amounts of surface radioactivity, affecting a small volume of materials, would be encountered.

including steel yokes, magnets, and beamline pipes, would then be disassembled using such means as pneumatic impact tools, saw cutting, and possibly torch cutting. Other large mechanical equipment (e.g., fans and electrical panels) would also be removed, using similar methods.

Demolition would involve removal of the building structure and its shallow foundations. The general sequence of demolition activities would be (1) identification and isolation of building elements to be demolished; (2) removal of non-structural materials; (3) removal of non-load-bearing structural elements; and (4) removal of load-bearing structural elements.

Manual removal of the external asbestos-containing siding materials, by unbolting fasteners, would be conducted prior to building demolition to prevent creation of airborne particles. The roof membrane and sections of the roof structure would be removed to permit the dismantling and removal of three cranes that are within the building. The building superstructure would be dismantled and demolished to the grade level concrete slab. This slab would be surveyed, decontaminated if required, and removed along with the shallow foundation structures. Those portions of the concrete slab that are not beneath the building would remain in place. In addition, a cooling tower adjacent to and surrounded on three sides by Building 51 that formerly provided chilled water for air conditioning would be demolished and removed. Deep underground concrete foundations would remain, as would most of the concrete retaining walls that support the hillside above the facility.

The Building 51 outer wall forms a portion of the retaining walls. In order to keep the hillside in place during and after the building is demolished, approximately 170 feet of new concrete retaining wall would be constructed inside Building 51 prior to the demolition of that building, which would be kept in place after demolition.

The particular demolition methods that would be employed have not been finalized. However, the most likely methods for the removal of the superstructure would involve the use of mobile cranes and other heavy equipment for superstructure dismantling, in conjunction with torch and mechanical cutting procedures. The concrete slab and foundations would be demolished using pneumatic, hydraulic, and/or chemical breaking techniques. For the latter, an expansive slurry would be poured into holes drilled into the concrete mass. Over several hours, this product expands through the process of hydration, generating cracks between holes and free faces in reinforced concrete. The slurry hardens into a non-hazardous solid that would be disposed of in the same manner as the concrete itself, and would not pose any contamination issues.

Materials disposition would occur at various stages of the project. About half of the demolition materials would consist of non-hazardous debris and other items typical of demolition projects. The project would seek to reuse or recycle such materials (e.g., uncontaminated metals and concrete) where feasible. For example, uncontaminated metals might go to scrap dealers. Items that could not be salvaged would be sent to appropriate municipal landfills, such as the Altamont Landfill in Livermore, California.

Some materials are not suitable for salvage and cannot be sent to municipal landfills. For example, while it is known that there is no radioactivity above naturally-occurring levels in the outer structure of Building 51, portions of the Bevatron apparatus, the concrete block shielding, and other items have low levels of such radioactivity. Also, some non-radioactive hazardous materials would be encountered, including asbestos, lead, mercury, machine oils, and polychlorinated biphenyls. As part of Berkeley Lab's Environment, Health and Safety program, sampling and instrument surveys are conducted at various facilities, including Building 51, to characterize the types, locations, and degree of chemical or radiological contamination. Such monitoring would be continued at Building 51 during the project. Potentially contaminated items would be screened and characterized based on their location and the associated degree of potential hazard.

In general, characterization of potentially radioactive materials would be accomplished by taking external radiation measurements using appropriate survey instrumentation and/or swipe samples according to DOE-approved protocols. The results of these surveys would determine the eventual destinations of the materials. For example, concrete shielding blocks that are found to have no detectable DOE-added radioactivity could be transferred to a third party for reuse, transferred to a third party for crushing and recycling, or transported to a landfill permitted to accept this type of waste.

Any items showing detectable DOE-added radioactivity would be sent to an approved disposal site, such as Envirocare in Clive, Utah (a licensed, privately operated facility), or the Nevada Test Site (a DOE facility approximately 65 miles from Las Vegas). Also, other DOE facilities are permitted to receive and reuse such materials, for example, for their own accelerator operations. However, at this time, no DOE users for Bevatron components or shielding blocks have been found. Based on prior experience, the Laboratory anticipates that less than one-third of the shielding blocks would have detectable DOE-added radioactivity. It is expected that much of the Bevatron apparatus itself will have detectable radioactivity.

Items contaminated with non-radioactive hazardous materials would be sent to treatment and disposal facilities or landfills permitted to receive such items. Mixed waste (i.e., waste that is both hazardous and radioactive) would be handled in accordance with applicable regulations and DOE policies. In addition, the project would comply with the DOE Metals Recycling Moratorium, which restricts metals from radiological areas from being recycled.

Testing, fill replacement, and stabilization would be the final set of field activities. The area to be demolished extends to the exterior of Building 51. Soil under this area would be surveyed for contaminants under the auspices of the Laboratory's Environment, Health, and Safety (EH&S) Division. Residual chemical or radiological contamination, if any, would be addressed by the EH&S Division in consultation with the appropriate regulatory agency. Radiological contamination of the soil is not anticipated, due to the shielding provided by the foundation of the building.

The open area, or demolition zone, which would be approximately 2.25 acres, would then be backfilled with suitable clean fill material and compacted to grade in accordance with engineering requirements. The source of this material would be determined at the time of need, based upon local supply, and would be partially drawn from LBNL stockpiles, e.g., from clean soil excavated for the Lab's Molecular Foundry or other projects. It is also likely that some clean residual rubble from the slab and foundations would be used as fill material. Although the Laboratory would use clean LBNL-derived fill material as much as possible, this EA conservatively assumes that half of the project's backfill requirements would be fill certified as clean by the provider and brought in from off-site. The demolition zone would be hydro-seeded with native grasses. Sampling wells for the Laboratory's Environmental Restoration Program would continue to function. The Proposed Action would not add any impervious surfaces to Berkeley Lab. There are no longer any natural drainages on the site, and no streams or rivers would be altered.

Utility systems that traverse the project site and serve other areas would need to remain in continuous operation; thus, new segments would be built to re-route those services prior to disconnection at Building 51. No new utility connections would be required.

If it would be necessary to perform some work activity after sunset or before sunrise, such as truck loading and departure, or to complete a critical phase of work that would not cause important noise or other impacts, the Lab would install night shields on all outdoor fixtures used during demolition activities to minimize potential light and glare spillover impacts.

3.1.5 Related Traffic and Employment

An estimated maximum of about 4,700 one-way truck trips would be required over the four- to seven-year term of the Proposed Action. Most of the trips would be one of two types: (1) trips removing material (inbound trips with empty trucks and outbound trips removing material for appropriate disposal), or (2) trips delivering backfill (inbound trips delivering clean backfill and outbound empty trucks). Other truck trips would be for the delivery of project-related demolition equipment and miscellaneous supplies.

Demolition materials would be staged at or near the project site, inside the LBNL property line. Truck shipments from the site are planned to proceed west on Hearst Avenue, south on Oxford Street, and then west on University Avenue to Interstate 80. Shipments to the site would follow this route in reverse. Demolition work would be conducted approximately 40 hours per week, Monday through Friday. Normal work hours would be between 7:00 a.m. and 3:30 p.m. It is possible that some truck loading and departure would take place on Saturdays and/or Sundays, although this would be infrequent. No roads would be closed as a result of the action, and no new roads, road extensions, or improvements would be required. Similarly, project equipment (including excavators, front-end loaders, graders, hoe-rams, and mobile cranes) would be staged at or near the site, primarily at the parking lot north of Building 51.

Demolition activities would require temporary workers. Their number would vary over the multi-year demolition period, but is estimated to be about 20 to 25 workers on average per day, with a maximum of up to about 50 workers. For the purpose of calculating traffic impacts, this EA conservatively assumes that all would drive alone to the project site. Parking would be available near the site or elsewhere at LBNL.

3.1.6 Environmental and Workplace Controls

Agency-approved environmental protection measures would be employed as part of the proposed project, including dust and hazardous materials controls specified by Bay Area Air Quality Management District regulations and guidelines; hazardous waste handling in accordance with Cal/EPA, DOE, and other agency requirements; and stormwater pollution prevention measures as required by the San Francisco Bay Regional Water Quality Control Board. Further, as described in Section 3.1.7, below, applicable mitigation measures from Berkeley Lab's program EIR, the 1987 LRDP EIR, as amended (see Chapter 2, Purpose and Need), would be part of this present project. Also, as part of its normal operations, the Laboratory would implement other measures to address site-specific potential environmental impacts.

LBNL has an organizational structure and the technical expertise to self-monitor and control on-site safety and environmental conditions so that LBNL implements DOE and UC policies and procedures, complies with federal and state regulatory requirements, adheres to agreements with other parties, and carries out applicable mitigation measures.

A primary mechanism at LBNL for implementing these requirements and agreements into specific projects is to incorporate them into the general contract terms and conditions for the contractor that will be conducting the demolition work, and then to monitor the contractor's implementation steps and the efficacy of the measures. LBNL or independent technical staff would conduct project-related monitoring and/or oversight to assure that the requisite control measures implemented by the contractor are effective in controlling off-site emissions and on-site health and safety risks.

For the proposed demolition project, a series of reviews has been and continues to be performed by LBNL to identify potential adverse effects and to assess and develop the environmental monitoring and the structural and operational control measures needed to prevent project actions from exceeding relevant standards. LBNL has adapted existing procedures, or has prescribed new specific procedures or performance standards, to assure that the proposed project would be in regulatory compliance. Although not all of these specific procedures or performance standards for the proposed project have been completed, LBNL policy (as described, for example, in various sections of LBNL PUB-3000, Berkeley Lab's Health and Safety Manual; LBNL 2005c), requires that they be complete and in place before work may proceed.

3.1.7 Standard LBNL Project Features

LBNL has identified several environmentally proactive measures in its 1987 LRDP EIR, as amended, that are required in all LBNL projects and development to avoid or minimize potentially important environmental impacts. These mitigation measures have been adopted as part of the LRDP EIR by The Regents of the University of California, and thus are required of all LBNL activities pursuant to the California Environmental Quality Act, and are included as part of this NEPA analysis. Measures relevant to and incorporated into the project description of the Proposed Action are listed in Appendix A of this document.

3.2 Alternatives

3.2.1 No Action Alternative

Under this alternative, the Bevatron would not be dismantled and Building 51 would not be demolished. Radioactive materials, as well as other hazardous materials such as lead dust, oils, and asbestos, would continue to remain in place.

Under this alternative, the induced radioactivity contained in the concrete and other material of the Bevatron would remain on site and continue to decay over time.[3] The facility would remain a long-term maintenance and financial drain on LBNL, and would not address the multiple legacy hazards on site. As indicated in the Project Description, the Bevatron has not operated since 1993 and is non-functional. The Building 51 structure housing the Bevatron does not meet current building codes or standards, including seismic design standards, and, as it is relatively old and deteriorating (e.g., roof leaks exist in several locations), it consumes disproportionate maintenance resources. Currently, the building and its contents are in fair to poor condition. Other hazards also exist, e.g. unabated hazards for lead dust, lead paint, and asbestos. Because of these problems, all present occupants are slated for relocation during 2005-2006. Further, under this alternative the deterioration of Building 51 and Bevatron would continue and eventually, the value of the historic resource would be lost. Lastly, this alternative would not include any hazard abatement or seismic upgrade activities, and therefore, long-term impacts to worker or public health could be greater than under the Proposed Action.

3.2.2 Preservation Alternative

Under the Preservation Alternative, the entire site would be dedicated to non-LBNL uses and could be managed by another public agency, such as the National Park Service, with the intention of actively preserving Building 51 and the Bevatron equipment within it. The public agency would maintain and preserve the building in accordance with the *Secretary of the Interior's Standards for Preservation*, and would allow limited public access for interpretive/educational purposes. These Standards for Preservation define Preservation as "the act or process of applying measures necessary to sustain the existing form, integrity, and materials of an historic property. Work, including preliminary measures to protect and stabilize the property, generally focuses upon the ongoing maintenance and repair of historic materials and features rather than extensive

[3] This alternative is also a decay-in-place alternative. The nuclei of radioactive atoms are unstable. Over time, the nuclei will eventually decay by emitting a particle and/or radiation, which transforms the nucleus into another nucleus, or into a lower energy state. The chain of decays continues until the resulting nucleus is stable. Decay for an interval of 10 half-lives would reduce the radioactivity to roughly 1/1000 of the original. Thus, for Co-60, which has a half-life of 5.2 years; decay for 52 years would reduce the Co-60 radioactivity to roughly 1/1000 of its present value.

replacement and new construction. New exterior additions are not within the scope of this treatment; however, the limited and sensitive upgrading of mechanical, electrical, and plumbing systems and other code-required work to make properties functional is appropriate within a preservation project." This alternative would also allow some level of abatement of hazardous materials, such as lead and asbestos removal, to the extent that abatement can be accomplished while maintaining the Bevatron equipment in place.

This alternative would not achieve most of the Laboratory's goals for the site. Apart from the other disadvantages of the Preservation Alternative, the facility would still require long-term maintenance and substantial financial investment for clean-up and refurbishment. This would include such things as significant re-roofing and exterior waterproofing. Reinforcement may be required to strengthen the structure. New rollup doors would also be required to replace those that were either removed or are inoperable. The facility would have to be patrolled periodically to prevent unauthorized uses due to the continuing presence of hazardous materials, and, as would be the case for any unoccupied building, to ensure that it did not become occupied by unwanted animals or pests.

3.2.3 On-Site Rubbling Alternative

Under the On-Site Rubbling Alternative, the Proposed Action activities would remain the same with the exception of activities related to concrete. A local "crushing plant" operation would be set up in the work zone outside of Building 51. Two large (approximately 35 feet [length] by 15 feet [width] by 10 feet [height]) diesel-powered concrete crushing machines would form the core of the operation. Concrete from shielding, the building walls, and the floor and foundation would be broken up using the crushing equipment. Following initial crushing, the material would require transfer by heavy equipment for processing through a second crusher to achieve the uniform sizing necessary to make the material attractive for reuse.

Under this alternative, most of the concrete from the building structure (i.e., walls and floors), foundation, and many of the concrete blocks shielding the Bevatron would be rubbled on-site. Metal (e.g., rebar) in the debris would be separated and disposed of separately. Only concrete free of detectable added (i.e., non-naturally-occurring) radioactivity and otherwise clear of contaminants would be rubbled. The rubbled material and segregated reinforcing steel would be recycled if public or private sector demand was available at the time of production. If not, it would be disposed of at a landfill. LBNL could use the rubble as aggregate or fill material if the need for such materials coincided with their production, although this is speculative at the present time.

This alternative would share most of the advantages and disadvantages of the proposed project, although impacts would vary in some respects (e.g., this alternative would result in increased dust generation). However, sufficient space adjacent to Building 51 does not currently exist for this alternative to be feasible, and a site or sites would have to be made available elsewhere at LBNL, at a sufficient distance from off-site sensitive receptors to avoid nuisance impacts.

3.2.4 Alternatives Considered but Rejected as Infeasible

Adaptive Reuse Alternative

An Adaptive Reuse Alternative would keep as much of the Building 51 structure as practical, remove the Bevatron and other unused equipment, and construct new offices or laboratories inside the structure. Under this alternative, the building would be structurally upgraded. This would include extensive rebuilding to seismically update the building and to meet current building code requirements. The roof and exterior cladding and window systems would be removed and replaced with insulated and weather-tight roofing, glazing, and siding; mechanical and electrical systems would be removed and replaced with updated systems; and existing hazards such as lead dust, lead paint, and asbestos would be abated.

This alternative would also eliminate most of the existing potential hazards associated with Building 51, and reduce some of the burden on existing LBNL maintenance resources, although not to the extent achieved by the proposed project. Costs for hazard abatement and Bevatron and equipment removal would be similar. However, this alternative would be more costly, in terms of building and safety code compliance. The building does not meet modern fire/life safety regulatory codes or seismic requirements, and to upgrade it with fire proofing, fire separations, and structural enhancements would prove to be cost prohibitive. Compared with new construction, costs per square foot for building-wide renovation, including complete rebuilding of heating, ventilation, and air conditioning; electrical; communication; and plumbing systems would likely be greater, while the quality and configuration of the resulting space would be less desirable and inefficient for modern laboratory or office uses.

Finally, this alternative would not meet the other objectives of the proposed project, such as helping to meet the DOE policy requiring that the square footage of new construction at a DOE facility be balanced by elimination of an equivalent amount of excess space.

Encasing the Facility as a Central Courtyard Feature for Future Development at the Site

Under this alternative, which was suggested by members of the public, the Bevatron and Building 51 would be enclosed within a new building superstructure and utilized as a central design feature for any future development that may occur at the project site. This alternative is essentially another version of a preservation alternative, and would have similar advantages in avoiding impacts to cultural resources, and similar disadvantages in requiring major upgrades to the building and in not fulfilling the objectives of the proposed project. Also, this alternative would entail significant additional costs in creating the new building superstructure.