IV.F. Hazards and Hazardous Materials

IV.F.1 Introduction

Potential exposure to hazards and hazardous materials could result from continued University operation of LBNL under the 2006 LRDP, including continued facility development. This section discusses existing hazards and hazardous materials at the project site and analyzes the potential for the LRDP to increase the use, generation, and disposal of or exposure to hazards and hazardous materials, focusing on existing site conditions and anticipated future demolition, construction, and laboratory activities. The characteristics of the site and surrounding areas are also described and discussed with respect to wildland fire hazards.

IV.F.2 Setting

IV.F.2.1 Hazards and Hazardous Materials

Numerous hazardous materials, including radioactive materials,[1] volatile organic compounds, acids, solvents, and petroleum products, are used within LBNL in laboratory activities and/or facility operations (such as maintenance). The transportation, use, storage, treatment, and disposal of these materials can expose individuals or the environment to health and/or environmental hazards. LBNL complies with applicable federal, state, and local laws and regulations. Additional information regarding these materials, associated potential health hazards, and regulatory requirements is provided in the Regulatory Environment section, p. IV.F-9.

Hazardous Materials

The term "hazardous material" is defined as any material that, because of quantity, concentration, or physical or chemical characteristics poses a significant present or potential hazard to human health and safety or to the environment.[2] Hazardous materials are grouped into the following four categories, based on their properties: toxic (causes human health effects), ignitable (has the ability to burn), corrosive (causes severe burns or damage to materials), and reactive (causes explosions or generates toxic gases).[3] Hazardous materials are commonly used in research laboratories and commercial, agricultural, and industrial applications, as well as in residential areas to a limited extent. Hazardous materials at LBNL are used and are present in hazardous and mixed wastes (i.e., radioactive wastes with hazardous waste components) resulting from these uses.

Radioactive materials are used in a variety of research activities at LBNL, including studies that investigate the dynamics of living cells, trace the movement of chemicals through ecological systems, and determine how they react in the environment and the human body. In addition to research, radionuclides at LBNL are present in analytical laboratories and in radioactive and

[1] Radioactive material is any material or combination of materials that spontaneously emit ionizing radiation. The rate at which radioactive materials emit radiation is measured in Curies (Ci); one Curie is defined as 37 billion disintegrations per second, or approximately the radioactivity of one gram of radium.

[2] State of California, Health and Safety Code, Chapter 6.95, Section 25501(o).

[3] Title 22 of the California Code of Regulations, Division 4.5, Chapter 11, Article 3.

mixed waste and are produced as a by-product of accelerator operations. Radiochemical and radiobiological studies performed at LBNL typically use small quantities of radionuclides, measured in millicuries.[4] A wide variety of radionuclides is used at LBNL. Table IV.F-1 lists the most important of these and their decay characteristics.

TABLE IV.F-1
MAJOR RADIONUCLIDES USED AT BERKELEY LAB[a]

Nuclide Name (atomic number)	Symbol	Principal Radiation Types	Half-Life[b]
Carbon (6)	^{11}C	positron	20.4 minutes
Fluorine (9)	^{18}F	positron	1.8 hours
Hydrogen/Tritium (1)	^{3}H	beta	12.3 years
Iodine (53)	^{123}I	gamma	13.2 hours
	^{125}I	gamma	59.4 days
Nitrogen (7)	^{13}N	positron	10.0 minutes
Phosphorus (15)	^{32}P	beta	14.3 days
Sulfur (16)	^{35}S	beta	87.2 days
Technetium (43)	^{99m}Tc	gamma	6.0 hours
	^{99}Tc	beta	213,000 years

a For a complete list of radionuclides evaluated under NESHAP regulations, see the Radionuclide Air Emission Annual Report for 2005, found on Berkeley Lab's Environmental Services Group home page at http://www.lbl.gov/ehs/esg/tableforreports/assets/nesh05.pdf.
b The half-life is the time required for the disintegration of one-half of the radioactive atoms present when measurement begins.

Hazardous, Radioactive and Medical Waste

LBNL stores, treats, and prepares for disposal hazardous, radioactive, and mixed wastes at its Hazardous Waste Handing Facility. A hazardous waste is generally defined as any hazardous material that is discarded, abandoned, or recycled. The criteria that render a material hazardous also make a waste hazardous.[5] The transportation, use, storage, treatment, and disposal of hazardous wastes, as well investigation and remediation of historical releases of hazardous materials to the environment, are closely regulated under a permitting program administered by the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC).

The current permit for LBNL's Hazardous Waste Handling Facility (HWHF) was approved by DTSC on May 4, 1993, and was valid until May 2003. LBNL submitted a permit-renewal application for operation of this facility within the time frame mandated by regulations and

4 A millicurie is one-thousandth of a curie.
5 California Health and Safety Code, Section 25151.

operations continue under an extension of the existing permit until a new permit is issued. The permit authorizes storage and treatment of certain hazardous and mixed wastes.

LBNL has an additional hazardous waste permit to operate five fixed treatment units (FTUs). The FTUs are operated independently of the HWHF, and the City of Berkeley administers the FTU permitting program under its Certified Unified Program Agency program authority (see Regulatory Environment discussion, below). The type and location of each unit are listed in Table IV.F-2.

TABLE IV.F-2
LBNL FIXED TREATMENT UNITS (FTUS)

FTU	Building	Description of Treatment
002	25	Metals precipitation and acid neutralization
003	76	Oil/water separation
004	70A/70F	Acid neutralization
005	2	Acid neutralization
006	77	Metals precipitation and acid neutralization

In October 1995, DTSC approved the Laboratory’s Mixed Waste Site Treatment Plan (LBNL, 2006; p. 3-15), which documents the plan and schedule for treatment of the hazardous waste portion of LBNL mixed waste prior to land disposal. The Laboratory prepares an annual report that quantifies the amount of mixed waste in storage at the end of the reporting period.

Transportation, use, storage, treatment and disposal of LBNL radioactive wastes and the radioactive portions of LBNL mixed wastes are closely regulated by DOE and its regulations. DOE also closely regulates the investigation and remediation of historical releases of radioactive materials to the environment.

LBNL also generates medical waste. A substance is considered a medical waste[6] if it is composed of waste generated or produced as a result of diagnosis, treatment, or immunization of human beings or animals, or the production or testing of biologicals,[7] and is either a biohazardous waste or a sharps waste.[8] LBNL sends medical waste to off-site vendor facilities for treatment. Under the state’s program, LBNL is considered a large-quantity generator because it generates more than 91 kilograms (200 pounds) of medical waste each month.

6 Medical waste includes materials generated or produced from diagnosis, treatment, or immunization of human beings or animals, or research pertaining to those activities (California Health and Safety Code, Section 117690).

7 The term “biologicals” means medicinal preparations made from living organisms and their products, including but not limited to serums, vaccines, antigens, and antitoxins (California Health and Safety Code, Section 117690).

8 The term “sharps waste” refers to any device having acute rigid corners, edges, or protuberances capable of cutting or piercing, including but not limited to hypodermic needles and broken glass items (such as pipettes and vials) contaminated with biohazardous waste (California Health and Safety Code, Section 117755).

LBNL's waste management program sends hazardous, mixed, medical and radioactive waste generated at the Laboratory off-site for treatment and disposal. Specific low-level aqueous wastes at Berkeley Lab (containing only radioisotopes with short half-lives) are stored until the radioactivity has decayed to undetectable levels; then the wastes are discharged in conformance with a wastewater discharge permit issued by the East Bay Municipal Utility District.

Existing Structures

Existing buildings at LBNL range in age from less than 10 years to over a half century old. Some 30 outdated structures could be demolished under the LRDP, including the Bevatron complex (Building 51/51A). (As previously described, the Bevatron is currently being considered for demolition under the 1987 LRDP EIR, as amended, but is also considered in this EIR for the purpose of analysis.) Structural demolition or renovation could involve exposure to hazardous materials historically used or present in these structures, such as lead-based paint, asbestos, polychlorinated biphenyls (PCBs), and/or radioactive materials. Prior to demolition or renovation of buildings where such hazards may exist, the Laboratory ensures that surveys are performed to determine the types and locations of hazards, and establishes procedures to safely perform this work.

Asbestos is a naturally occurring fibrous material used as a fireproofing and insulating agent in building construction before such uses were banned by the U.S. Environmental Protection Agency (EPA) in the 1970s. Lead-based paint was commonly used on interior and exterior surfaces prior to 1978, when its use was banned by the EPA. PCBs are organic oils that were formerly placed in many types of electrical equipment, including transformers and capacitors, primarily as electrical insulators. In 1979, the EPA banned the use of PCBs in most new electrical equipment and began a program to phase out certain existing PCB-containing equipment. Fluorescent lighting ballasts manufactured after January 1, 1978 do not contain PCBs and are required to have a label clearly stating that PCBs are not present in the unit. Radioactive materials were discussed earlier.

Aboveground Storage Tanks

LBNL has over two dozen aboveground storage tanks (ASTs) that contain petroleum products, with capacities ranging between 50 gallons and 6,000 gallons (LBNL, 2006c). LBNL also has numerous non-petroleum ASTs associated with the FTUs described above, as well as storage drums associated with waste accumulation areas and product distribution areas.

Underground Storage Tanks

Six underground storage tanks (USTs), with capacities between 1,000 gallons and 10,000 gallons, are currently in use at LBNL for gasoline or diesel storage. Since 1993, LBNL has removed nine USTs formerly used for storage of kerosene, diesel, and gasoline. Two USTs have been abandoned in place: one diesel tank located at Building 88 and one gasoline tank at Building 46A. LBNL has received case closure from the City of Berkeley for all abandoned or removed USTs (LBNL, 2006c; LBNL, 2003d).

Soil and Groundwater Contamination

LBNL identified areas of soil and groundwater contamination that existed as a result of historical releases of hazardous materials into the environment. The primary chemical constituents of concern are volatile organic compounds, mostly degreasing solvents used to clean equipment. Other detected constituents include PCBs, petroleum hydrocarbons, and very small amounts of polynuclear aromatic hydrocarbons, semivolatile organic compounds, and metals. The principal radioactive contaminant is tritium. These areas of soil and groundwater contamination are all confined within the boundary of LBNL's main hill site. The geographic extent of groundwater contaminant plumes at LBNL and primary constituents of concern are shown on Figure IV.F-1. The locations and extent of these plumes have been determined using more than 300 wells over a period of more than 14 years.

All areas of soil contamination have been cleaned up to levels consistent with Berkeley Lab operations (designated as institutional land use) and acceptable to regulatory oversight agencies.

Currently, there are about 150 groundwater monitoring wells at LBNL, with an additional groundwater monitoring well located off-site. Table IV.F-3 lists of maximum constituent concentrations detected during groundwater sampling activities in 2005 and the associated drinking water standard, if one exists.[9] Groundwater under the LBNL site is not used as a drinking water source by the Lab or by local utilities, and groundwater contamination is therefore not a threat to the local drinking water supply.

Remediation and monitoring of non-radioactive contamination in groundwater are being conducted under the Resource Conservation and Recovery Act of 1976 Corrective Action Program, while monitoring of a tritium plume in groundwater is being conducted under the Atomic Energy Act. Is should be noted that tritium concentrations in all monitoring wells at the Lab are currently less than the drinking water standard. Following an extensive review by DTSC, which included a public involvement phase, LBNL's proposed corrective measures to remedy soil and groundwater contamination were approved by DTSC on October 20, 2005 (LBNL, 2006b; p. 1). These measures include cleaning up areas of soil contamination, stopping discharge of contaminated groundwater to surface waters, preventing further migration of contaminated groundwater, and cleaning up groundwater contaminations to the drinking water standard. Separate CEQA and NEPA reviews were conducted for these activities by DTSC and the U.S. Department of Energy (DOE), respectively.

Site cleanup activities are coordinated closely with the regulatory oversight agencies. DTSC has the primary responsibility for regulatory oversight of non-radioactive contamination. In addition, the San Francisco Bay Regional Water Quality Control Board (RWQCB) and City of Berkeley have oversight roles with respect to these activities. DOE is responsible for the regulatory oversight of tritium in groundwater. These agencies have been involved in review and approval of various work plans and reports related to these investigation and cleanup activities. LBNL

9 Groundwater at LBNL is not used for human consumption, and the use of drinking water standards is included only as a reference point.

TABLE IV.F-3
2005 GROUNDWATER CONSTITUENT CONCENTRATIONS AT LBNL

Constituent	Range of Concentrations	Drinking Water Standard
Metals	Listed in µg/L[1]	Listed in µg/L
Antimony	4	6
Arsenic	76	10
Barium	1,200	1,000
Beryllium	Not detected	4
Cadmium	Not detected	5
Chromium	18	50
Hexavalent Chromium	Not detected	50
Cobalt	Not detected	Not specified
Copper	Not detected	1,000
Lead	1.8	15
Mercury	Not detected	2
Molybdenum	1,000	Not Specified
Nickel	44	100
Selenium	100	50
Silver	Not detected	100
Thallium	Not detected	2
Vanadium	35	Not Specified
Zinc	51	5,000
Volatile Organic Compounds	Listed in µg/L	Listed in µg/L
Benzene	69.5	1
1,4-dichlorobenzene	Not detected	5
p-isopropyltoluene	Not detected	—c
Methyl tert-butyl ether	Not detected	13
Toluene	6.8	150
Xylenes (total)	Not detected	1750
Bromodichloromethane	1.3	80d
Bromoform	Not detected	80d
Carbon tetrachloride	1,900	0.5
Chloroform	40	80d
1,1-dichloroethane	8,560	5
1,2-dichloroethane	20	0.5
1,1-dichloroethene	1,180	6
cis-1,2-dichloroethene	1,010	6
Trans-1,2-dichloroethene	99.3	10
Methylene chloride	500	5
1,1,1,2-tetrachloroethane	55	—
Tetrachloroethene	50,800	5
1,1,1-trichloroethane	13.9	200
1,1,2-trichloroethane	1.8	5
Trichloroethene	33,000	5
1,1,2-trichlorotrifluoroethane (Freon 113)	7.8	1,200
Vinyl chloride	735	0.5
Radioactive Compounds	Listed in Bq/L[2]	Listed in Bq/L
Tritium	788	740[3]

1 µg/L = micrograms per liter.
2 Bq/L = becquerels per liter.
3 740 Bq/L is the approximate equivalent of 2.0 x 10^{-8} Curies (20,000 picocuries) per liter.

SOURCE: LBNL, 2006c.

submits quarterly progress reports to these agencies and meets with them periodically to review the status of these activities. Progress has also been reviewed by the City of Berkeley Community Environmental Advisory Commission and members of the community. Plans and reports of this project are maintained at the Berkeley Public Library and are available at the following LBNL web site: http://www.lbl.gov/ehs/erp/html/documents.shtml.

IV.F.2.2 Fire Hazards

The degree of fire hazard for an area depends on three major components: (1) the natural setting of the wildland or developed area, (2) the degree of human use and occupancy of the wildland or developed area, and (3) the ability of public services to respond to fires that do occur. The eastern boundary of LBNL is located along a portion of the interface between wildlands and developed lands in the East Bay hills. The Laboratory is similar in character to other developed hillside areas in the region as it combines developed lands, groves of trees, and non-irrigated grassland areas. Dry summers desiccate plant materials and make them more prone to burning, and a “fire season” is declared by the state each summer and fall. The fire risk during brief periods of the fall months is even more pronounced when strong offshore winds, often called “Diablo winds,” occur in the East Bay hills. These offshore winds further desiccate fuel material and can drive fire fronts and fire brands at extreme speeds.

These winds contributed to the extensive damage that occurred in the devastating Oakland-Berkeley Hills Fire of October 1991, in which 1,520 acres were burned, 25 people were killed, and 3,469 houses and apartments were damaged or destroyed, with losses totaling approximately $1.5 billion (Oakland Office of Fire Services, 1992). This fire occurred less than one mile to the south of the Laboratory site, in an area with similar Diablo-wind conditions and topographic characteristics as LBNL (i.e., steep wooded canyons with highly flammable vegetation).

Vegetation Management

On average, serious Diablo-wind-driven wildland fires that destroy structures occur in the regional vicinity of LBNL approximately every 20 years. The site where LBNL now is situated last burned in 1923 (LBNL, 2003a). These fire conditions are now well understood. Although these fires can spread over large areas, it has been shown that each structure is at risk of damage for approximately 10 minutes, since during this interval a Diablo-wind-driven fire will typically consume the adjacent fuel. LBNL has reviewed fire histories, worked with fire researchers, and applied computer models to determine how the fuels adjacent to its buildings can be reduced to levels that will not support fire intensities that pose serious risks to the structures. Under LBNL’s vegetation management program, the site is now managed to minimize wildland fire damage to structures. This program provides for annual treatment of vegetation on the Laboratory site (except in the Limited Management Area; see below) such that ground fuels cannot produce flame heights in excess of 3 feet (and ground plantings within 10 feet of buildings and roadways produce even lower flame heights); trees are “limbed up” so that flammable branches are at least 8 to 10 feet above the ground, and bushes that would allow ground-based fires to rise into tree canopies are removed.

Firefighting Resources

LBNL provides firefighting services through a service contract with the Alameda County Fire Department, which staffs a fire station on the LBNL grounds (Alameda County Station 19 is located at LBNL Building 48). At least four firefighters are on duty at all times. Equipment at Station 19 includes one fire engine, one reserve fire engine, a hazardous materials vehicle, and a light-duty four-wheel drive "brush rig" that can be used for low-intensity wildland fires.

LBNL has an automatic aid agreement with the City of Berkeley, which means that the fire engine at Station 19 responds to locations in Berkeley, including the UC Berkeley campus, when the first-due Berkeley Fire Department engine is on another call, and Berkeley Fire Department personnel and apparatus respond to the Lab when Engine 19 – stationed at the firehouse at Berkeley Lab – is on another call. The Alameda County Fire Department has mutual aid agreements with other agencies, including Oakland and the East Bay Regional Park District, which can be activated in the event of a major emergency. As serious Diablo-wind-driven fires typically begin to destroy structures before the arrival of mutual aid suppression forces, the LBNL vegetation management program is designed to provide a level of structural protection that goes beyond the more traditional principle of "defensible space." Computer simulations and case-study analysis have resulted in strategies to manage fuels, not merely to levels that would allow a firefighter to safely stand adjacent to a building, but also so that the intensity of wildland fires at the Laboratory site would not reach levels that facilitate ignition. Fire intensity is a function of fuel availability and characteristics; therefore, fire behavior can be altered through fuel management. LBNL anticipates that fire intensity on the Lab site would be reduced, and that on-site and mutual aid responders would thus be able to focus attention on fire-front suppression.

IV.F.2.3 Regulatory Environment

LBNL is subject to environmental, health, and safety regulations applicable to the transportation, use, management, and disposal of hazardous materials and wastes. This section provides an overview of the regulatory setting for health and safety at the project site and describes LBNL's current health and safety policies and procedures.

The primary federal agencies with responsibility for hazardous materials management include the EPA, U.S. Department of Labor Occupational Safety and Health Administration (OSHA), U.S. Department of Transportation (DOT), and DOE. The applicable federal laws, regulations, and responsible agencies are shown in Table IV.F-4 and are discussed in detail in this section. In many cases, California state law mirrors or is more restrictive than federal law, and enforcement of these laws has been delegated to the state or a local agency. In January 1996, the California Environmental Protection Agency adopted regulations implementing a Unified Hazardous Waste and Hazardous Materials Management Regulatory Program (Unified Program). The program has six elements: hazardous waste generators and hazardous waste on-site treatment, underground storage tanks, aboveground storage tanks, hazardous materials release response plans and inventories, risk management and prevention programs, and Unified Fire Code hazardous materials management plans and inventories. The local agency responsible for implementation of the Unified Program is called the Certified Unified Program Agency (CUPA). Since the LBNL

TABLE IV.F-4
FEDERAL LAWS AND REGULATIONS RELATED TO HAZARDOUS MATERIALS MANAGEMENT

Classification	Law or Responsible Federal Agency	Description
Hazardous Materials Management	Emergency Planning and Community Right-to-Know Act of 1986 (also known as Title III of the Superfund Amendments and Reauthorization Act)	Imposes requirements to ensure that hazardous materials are properly handled, used, stored, and disposed of and to prevent or mitigate injury to human health or the environment in the event that such materials are accidentally released.
Hazardous Waste Storage, Handling, and Disposal	Resource Conservation and Recovery Act (RCRA)	Under RCRA, the EPA regulates the generation, transportation, treatment, storage, and disposal of hazardous waste from "cradle to grave."
	Hazardous and Solid Waste Amendments Act	Amended RCRA in 1984, affirming and extending the "cradle-to-grave" system of regulating hazardous wastes. The amendments specifically prohibit the use of certain techniques for the disposal of some hazardous wastes.
Hazardous Materials Transportation	U.S. Department of Transportation (DOT)	The DOT has regulatory responsibility for the safe transportation of hazardous materials. DOT regulations govern all means of transportation except packages shipped by mail (49 Code of Federal Regulations).
	U.S. Postal Service	The Postal Service regulations govern the transportation of hazardous materials shipped by mail.
Occupational Safety	Occupational Safety and Health Administration (OSHA)	OSHA sets standards for safe workplaces and work practices, including the reporting of accidents and occupational injuries (29 Code of Federal Regulations).
Radioactive Materials	Atomic Energy Act	Administered by DOE at LBNL, the act regulates the control and disposal of radioactive material.
	Clean Air Act	The EPA regulates airborne radioactive air emissions.
Biosafety Standards	The U.S. Public Health Service, National Institutes of Health, and Centers for Disease Control and Prevention	Operated under the U.S. Department of Health and Human Services, these agencies establish standards for working with biohazardous materials.
Building Components, Materials, and Equipment (USTs, ASTs, PCBs, and asbestos)	Toxic Substances Control Act (TSCA)	TSCA regulates the use and management of PCBs in electrical equipment, and sets forth detailed safeguards to be followed during the disposal of such items (40 Code of Federal Regulations).
	Resource Conservation and Recovery Act	RCRA establishes requirements for the design, installation, and operation of USTs. The EPA banned the use of asbestos in the 1970s.
	Clean Water Act	The Clean Water Act requires petroleum aboveground and underground storage tank owners to develop a Spill Prevention, Control, and Countermeasures Plan.
	OSHA	OSHA establishes requirements to protect workers during activities that could involve exposure to lead or asbestos.
	Clean Air Act	The EPA establishes requirements to protect the environment during asbestos removal activities.

SOURCE: Environmental Science Associates.

main site is located within the city limits of the City of Berkeley and the City of Oakland, both cities are the designated CUPAs. In order to streamline their oversight of CUPA regulations at LBNL, Berkeley and Oakland have entered into a Memorandum of Understanding that established the City of Berkeley as the lead agency for all CUPA activities (other than emergency release reporting).

Hazardous Materials Management

Federal and state laws require detailed planning to ensure that hazardous materials are properly handled, used, stored, and disposed of, and in the event that such materials are accidentally released, to prevent or to mitigate injury to health or the environment. These laws require hazardous materials users to prepare written plans, such as Hazard Communication Plans and Hazardous Materials Management Plans. Laws and regulations require hazardous materials users to store these materials appropriately and to train employees to manage them safely. A number of agencies participate in enforcing hazardous materials management requirements. The Federal Emergency Planning and Community Right-to-Know Act (EPCRA), enacted as Title III of the Superfund Amendments and Reauthorization Act (SARA), requires facilities handling in excess of designated threshold quantities of hazardous materials to provide hazardous materials, hazardous waste, and emission information to public agencies, and to prepare emergency response plans for accidents or other unauthorized releases of designated threshold quantities of hazardous materials. More stringent emergency response handling is required for facilities handling designated "extremely hazardous substances." Hazardous materials present in exempt quantities or under the direct supervision of a technically qualified individual are exempt for EPCRA reporting, inventory, and emergency planning requirements.[10] In California, the requirements of SARA Title III are incorporated into the state's Hazardous Materials Release Response Plans and Inventory Law.[11]

This law is administered by the City of Berkeley through its CUPA program, and requires any business that handles hazardous materials above certain thresholds to prepare a Hazardous Materials Business Plan, which must include the following:

- Details of the facility and business conducted at the site.
- An inventory of hazardous materials that are handled or stored on-site.
- An emergency response plan.
- A safety and emergency response training program for new employees with annual refresher courses.

Although sovereign immunity for federal facilities has not been waived in the federal law, LBNL voluntarily complies with these state requirements as implemented by the City of Berkeley.

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10 LBNL has always been below reporting thresholds for Toxic Release Inventory (TRI) reporting under EPCRA. Toxic chemicals used in laboratories are exempt from TRI reporting when used under the supervision of a technically qualified individual. The laboratory activity exemption is intended to reduce the chemical tracking burden by exempting laboratories from tracking small or diffuse quantities of listed TRI chemicals used for experimental purposes.

11 California Health and Safety Code, Section 25500.

The Toxic Substances Control Act (TSCA) also establishes reporting requirements for PCBs. Because LBNL does not have PCB-containing transformers or capacitors that exceed TSCA reporting thresholds, the Laboratory is not required to prepare an annual report documenting PCB activity for EPA.

Hazardous Waste Handling

The federal Resource Conservation and Recovery Act of 1976 (RCRA) created a major new federal hazardous waste “cradle-to-grave” regulatory program administered by EPA. Under RCRA, EPA regulates the generation, treatment, and disposal of hazardous waste, and the investigation and remediation of hazardous waste sites. Individual states may apply to EPA to authorize them to implement their own hazardous waste programs in lieu of RCRA, as long as the state program is at least as stringent as federal RCRA requirements. California has been authorized by EPA to implement its own hazardous waste program, with certain exceptions.

In California, DTSC regulates the generation, transportation, treatment, storage, and disposal of hazardous waste, and the investigation and remediation of hazardous waste sites. The California DTSC program incorporates the provisions of both federal and state hazardous waste laws.

Hazardous Materials Transportation

The DOT regulates the transportation of hazardous materials between states and foreign countries. DOT regulations govern all means of transportation, except that the U.S. Postal Service regulations govern packages sent by mail. DOT regulations are contained in the Code of Federal Regulations (CFR) Title 49 (49 CFR). U.S. Postal Service regulations are found in 39 CFR. The State of California has adopted DOT regulations for the intrastate movement of hazardous materials. In addition, the State of California regulates the transportation of hazardous waste originating in the state and passing out of the state. State regulations are contained in Title 26 of the California Code of Regulations (26 CCR). Both regulatory programs apply in California.

The two state agencies that have primary responsibility for enforcing federal and state regulations and responding to hazardous materials transportation emergencies are the California Highway Patrol (CHP) and the California Department of Transportation (Caltrans).

The CHP enforces hazardous material and hazardous waste labeling and packing regulations to prevent leakage and spills of material in transit and to provide detailed information to cleanup crews in the event of an accident. Vehicle and equipment inspection, shipment preparation, container identification, and shipping documentation are all part of the responsibility of the CHP, which conducts regular inspections of licensed transporters to assure regulatory compliance. Caltrans has emergency chemical spill identification teams at as many as 72 locations throughout the state that can respond quickly in the event of a spill.

Common carriers are licensed by the CHP, pursuant to California Vehicle Code Section 32000. This section requires the licensing of every common carrier that transports, for a fee, in excess of 500 pounds of hazardous materials at one time, and every carrier, if not for hire, that carries more than 1,000 pounds of hazardous material of the type requiring placards.

Every hazardous materials package type used by a hazardous materials shipper must undergo tests that imitate some of the possible rigors of travel. While not every package must be put through every test, representative packages for any package design must be able to be dropped, fully loaded, onto a concrete floor with no significant leakage; survive a compression test in a stacked configuration with no significant damage or distortion; demonstrate leakproofness when subjected to internal air and/or liquid pressure; and not have package closure mechanisms adversely affected by vibration.

Medical Waste

The storage, treatment, transportation, and disposal of medical waste is regulated under the California Medical Waste Management Act (MWMA; Sections 117600 et seq. of the California Health and Safety Code). Medical waste includes biohazardous waste (e.g., blood and blood-contaminated materials) and "sharps" waste (e.g., needles) produced in research relevant to the diagnosis, treatment, or immunization of human beings or animals or in the production of biological products used in medicine. Within the statutory framework of the MWMA, the Medical Waste Management Program of the California Department of Health Services (DHS) ensures the proper handling and disposal of medical waste by permitting and inspecting medical waste generators, off-site treatment facilities, and transfer stations throughout the state. The DHS also oversees all medical waste transporters.

Occupational Safety

Occupational safety standards exist in federal and state laws to minimize worker safety risks from both physical and chemical hazards in the workplace. OSHA is generally responsible for assuring worker safety in the workplace. However, at DOE facilities such as LBNL, the occupational worker safety program is administered by DOE pursuant to the authority provided by the Atomic Energy Act over health and safety at its facilities. Beginning in 2007, DOE will enforce its own Health and Safety Program regulation (10 CFR 851), which includes requirements set forth in the OSHA regulations. DOE enforces OSHA requirements in accordance with a Memorandum of Agreement with OSHA.

OSHA regulations at 29 CFR 1910 and 1926 contain requirements concerning the use of hazardous materials in the workplace and during construction that mandate employee safety training, safety equipment, accident and illness prevention programs, hazardous substance exposure warnings, emergency action and fire prevention plan preparation, and a hazard communication program. The hazard communication program regulations contain training and information requirements, including procedures for identifying and labeling hazardous substances, and communicating hazard information relating to hazardous substances and their handling. The hazard communication program also requires that Material Safety Data Sheets be available to employees, and that employee information and training programs be documented. These regulations also require preparation of emergency action plans (escape and evacuation procedures, rescue and medical duties, alarm systems, and training in emergency evacuation).

The federal OSHA regulations include special provisions for hazard communication to employees in research laboratories, including training in chemical work practices. Specific, more detailed training and monitoring is required for the use of carcinogens, ethylene oxide, lead, asbestos, and certain other chemicals listed in 29 CFR. Emergency equipment and supplies, such as fire extinguishers, safety showers, and eye washes, must also be provided and maintained in accessible places.

The OSHA regulations also include extensive, detailed requirements for worker protection applicable to any activity that could disturb asbestos-containing materials, including maintenance, renovation, and demolition. These regulations are also designed to ensure that people working near the maintenance, renovation, or demolition activity are not exposed to asbestos.

Radioactive Materials

Pursuant to the federal Atomic Energy Act, DOE regulates the storage and use of sources of ionizing radiation (radioactive material and radiation-producing equipment) at DOE contractor-managed sites like LBNL. Radiation protection regulations require control of sources of ionizing radiation and radioactive material and protection against radiation exposure. DOE regulations concerning occupational radiation exposure are prescribed in 10 CFR 835, Occupational Radiation Protection. These regulations specify appropriate worker safety precautions and worker health monitoring programs. Radiation protection requirements for the public and the environment are prescribed in DOE Order 5400.5, "Radiation Protection of the Public and the Environment." The use of radioactive materials at LBNL is also subject to EPA radioactive air emission regulations in 40 CFR Part 61, Subpart H, National Emission Standards for Hazardous Airborne Pollutants other than Radon from DOE Facilities (NESHAP). Under this regulation, all potential emission sources are controlled and assessed, and the assessments are reported annually to DOE and EPA. In addition, all use of radioactive materials at LBNL is conducted in accordance with an internal authorization process approved by DOE. Emissions of radioactive material to the environment are monitored as described by LBNL's Environmental Monitoring Plan, which ensures that all Laboratory activities operate within regulatory requirements (LBNL, 2006a).

Radiological emissions from LBNL are less than 1 percent of the EPA regulatory limit of 10 millirem/year.[12]

DOE also regulates radioactive waste and the radioactive portion of mixed waste pursuant to the Atomic Energy Act and DOE Order 435.1, Radioactive Waste Management. Radioactive and mixed wastes are routinely generated from LBNL research activities involving radioisotopes. Routinely generated radioactive waste is staged in radioactive waste accumulation areas at individual generator sites, and subsequently transported to the LBNL HWHF for storage and

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[12] In 2005, LBNL emissions were approximately 0.2 percent of this limit. For comparison, 10 millirem is roughly equivalent to the additional radiation a passenger would receive on between two and four round-trip cross-country airline trips (radiation at altitude is higher than on the ground due to the thinner atmosphere providing less shielding from the sun's rays); a medical chest x-ray exposes the patient to between about 20 and 50 millirem (San Luis Obispo County, 2002; Washington University, 2002).

management. Mixed waste is also subject to California hazardous waste regulations and is staged in a mixed waste satellite accumulation area inside the radioactive material area and subsequently transported to the LBNL HWHF for storage and management. Radioactive and mixed waste is either managed on-site through a decay-in-place program or is shipped off-site to a licensed commercial or DOE treatment/disposal facility. Decayed mixed waste is then managed as hazardous waste and shipped off-site to a licensed commercial facility.

In 2000, DOE established a moratorium on the release of volumetrically[13] contaminated metals from radiological areas[14] at DOE facilities, and temporarily suspended the unrestricted release of scrap metal for recycling from such areas. The moratorium remains in place pending the preparation of a programmatic environmental impact statement by DOE. LBNL applies the moratorium to former radiological areas at accelerators (e.g., at the accelerator that was formerly operational at the Bevatron complex), where metals may have become activated by exposure to radiation beams.

Biosafety Standards

Federal (9 CFR 121, 29 CFR 1910.1030, 42 CFR 73) and state (Title 8 CCR, Section 5193) laws establish standards for working with biohazardous materials. A hazardous biological material is any potentially harmful biological material (including infectious agents, oncogenic viruses, and recombinant DNA) or any material contaminated with a potentially harmful biological material. The U.S. Public Health Service, the National Institutes of Health, and the Centers for Disease Control and Prevention operate under the U.S. Department of Health and Human Services. These agencies establish standards for working with biohazardous materials.

Emergency Response

The Federal Emergency Planning and Community Right-to-Know Act of 1986 requires detailed planning to ensure that hazardous materials are properly handled, used, stored, and disposed of to prevent or minimize adverse effects to human health or the environment in the event such materials are accidentally released. California has developed an emergency response plan to coordinate emergency services provided by federal, state, and local government and private agencies. Responding to hazardous materials incidents is one part of this plan. The plan is administered by the State Office of Emergency Services, which coordinates the responses of other agencies, including the California Environmental Protection Agency, the CHP, the Department of Fish and Game, the San Francisco Bay RWQCB, and Alameda County Fire Department. LBNL's on-site fire department provides first response capabilities, if needed, for hazardous materials emergencies.

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[13] Volumetric contamination is radioactive contamination that resides in or throughout the volume of an item. This contrasts with surface contamination, which is radioactive contamination that resides on or near the surface of an item.

[14] A radiological area is an area designated under 10 CFR 835, for which DOE requires specific measures to be taken, such as access control and monitoring, to protect DOE workers from radiological hazards. A radiological area may or may not contain radioactive materials.

Structural and Building Components

Asbestos

Federal and state laws and regulations (such as OSHA's 19 CFR Parts 1910.1001 and 1926.1101, EPA's NESHAP regulations at 40 CFR 763 61 Subpart M and other asbestos regulations at 40 CFR, California Code of Regulations Title 8, Section 5208, as well as the BAAQMD's Regulation 11, Rule 2) apply to building materials containing asbestos. Inhalation of airborne fibers is the primary mode of asbestos entry into the body, making friable (easily crumbled) materials the greatest health threat. These regulations prohibit emissions of asbestos from asbestos-related manufacturing, demolition, or construction activities; require medical examinations and monitoring of employees engaged in activities that could disturb asbestos; specify precautions and safe work practices that must be followed to minimize the potential for release of asbestos fibers; and require notice to federal and local governmental agencies prior to beginning renovation or demolition that could disturb asbestos.

Polychlorinated Biphenyls

As previously discussed, PCBs are organic oils that were formerly placed in many types of electrical equipment, including fluorescent lighting ballasts. Exposure to PCBs may cause various health effects, and PCBs are highly persistent in the environment. The use and management of PCBs in electrical equipment are regulated pursuant to TSCA (40 CFR 761). These regulations generally require labeling and periodic inspection of certain types of PCB equipment and set forth detailed safeguards to be followed during the disposal of such items. Fluorescent light ballasts that contain PCBs, regardless of size or quantity, are regulated as hazardous waste and must be transported and disposed of as hazardous waste. Ballasts manufactured after January 1, 1978 do not contain PCBs and are required to have a label clearly stating that PCBs are not present in the unit. LBNL has reduced use of PCB-containing equipment in response to TSCA regulations. All TSCA-regulated PCB transformers (PCB concentrations greater than 500 parts per million) have been removed from service and properly disposed. The remaining TSCA-regulated PCB-containing equipment items are four large low-voltage capacitors, containing an estimated total of approximately 170 kilograms (375 pounds) of regulated PCB dielectric fluid (LBNL, 2004b).

Lead

OSHA regulates worker exposure during construction activities that involve paint that contains lead. 29 CFR Part 1926.62 covers construction work where employees may be exposed to lead during such activities as demolition, removal, surface preparation for repainting, renovation, clean-up, and routine maintenance. The OSHA-specified compliance includes, among other things, respiratory protection, protective clothing, housekeeping, special high-efficiency filtered vacuums, hygiene facilities, medical surveillance, and training. Under Title 22 of the California Code of Regulations, waste soil containing lead is considered to be hazardous if it exceeds a total concentration of 1,000 parts per million (ppm) and a soluble[15] concentration of 5 ppm.

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[15] Susceptible to being dissolved, especially in water.

Aboveground and Underground Storage Tanks

The State Water Resources Control Board (SWRCB) administers the petroleum Aboveground Storage Tank (AST) program. This authority has been delegated to the City of Berkeley as the lead CUPA for LBNL. The AST program covers facilities that store petroleum in a single tank, or multiple tanks with an aggregate capacity in excess of 1,320 gallons, and requires that tank owners or operators file a storage statement, pay a facility fee, and prepare and implement a federal Spill Prevention, Control, and Countermeasure (SPCC) Plan (LBNL, 2002). The SPCC Plan must include procedures, methods, and equipment in place at the facility to prevent discharges of petroleum from reaching navigable waters. The total capacity of LBNL's petroleum ASTs exceeds 1,320 gallons, and LBNL meets the associated AST requirements, including the preparation and implementation of a SPCC Plan. Non-petroleum ASTs are regulated by various authorities, principally the LBNL Fire Marshal, the City of Berkeley, or DTSC, depending upon their contents and location.

The SWRCB also administers the Underground Storage Tank (UST) program in California. State laws governing USTs specify requirements for permitting, construction, installation, leak detection monitoring, repairs, release reporting requirements, corrective actions, clean-up, and closure. Although some of LBNL's USTs are located in Oakland and some are in Berkeley, Oakland and Berkeley have a formal agreement that Berkeley is the lead regulatory agency for all of LBNL's USTs. The City of Berkeley Toxics Management Division enforces applicable regulations, which include permitting and inspection requirements. LBNL's six USTs are permitted by the City of Berkeley.

LBNL Hazardous Materials Plans and Policies

LBNL has developed an Integrated Safety Management (ISM) system that establishes environment, safety, and health policies and procedures to ensure all work is performed safely and in a manner that strives for the highest degree of protection for employees, participating guests, visitors, the public, and the environment, commensurate with the nature and scale of the work. To achieve these goals, LBNL has adopted the following seven ISM principles, which are reflected in the detailed policies and procedures of LBNL. Principal investigators, managers, and supervisors are expected to incorporate these principles into the management of their work activities. While these principles apply to all work, the exact implementation of these principles is flexible and can be tailored to the complexity of the work and the severity of the hazards and environmental risks.

1. Line Management Responsibility for Environment, Safety, and Health. Line management is responsible for the protection of the public, the workers, and the environment. More specifically, LBNL line managers are responsible for integrating environment, safety, and health considerations into work and for ensuring active communication up and down the management line and with the workforce. In addition, line management must also ensure that exposures of workers, the public, and the environment to radiation hazards are kept as low as reasonably achievable.

2. Clear Roles and Responsibilities. Clear and unambiguous lines of authority and responsibility for ensuring environment, safety, and health are established and maintained at all organizational levels within LBNL, and for work performed by its contractors.

3. Competence Commensurate with Responsibilities. Personnel possess the experience, knowledge, skills, and abilities necessary to discharge their responsibilities. LBNL management takes steps to ensure the appropriate depth and breadth of technical talent are available and that LBNL has in place the means for periodically evaluating competencies. Competence includes training, experience, and fitness for duty.

4. Balanced Priorities. Resources are effectively allocated to address environment, safety, and health; programmatic; and operational considerations. Protecting the public, workers, and the environment is a priority whenever activities are planned and performed.

5. Identification of Environment, Safety, and Health Standards and Requirements. Before work is performed, the associated hazards are evaluated and an agreed-upon set of standards and requirements is established. These standards, if properly implemented, provide adequate assurance that the public, workers, and the environment are protected from adverse consequences.

6. Hazard Controls Tailored to Work Being Performed. Administrative and engineering controls to prevent and mitigate hazards are tailored to the work and associated hazards being performed.

7. Operations Authorization. The conditions and requirements that must be satisfied for operations to be initiated and conducted are clearly established and agreed upon. LBNL PUB-3000, Berkeley Lab's Health and Safety Manual (LBNL, 2003c), outlines a method for ensuring the form and content of authorizations. Examples for LBNL include Radiation Work Authorizations, Activity Hazard Documents, and Safety Analysis Documents. Operating permits are obtained from regulatory agencies for certain activities, including wastewater and storm water discharges, specific air emissions, underground tank storage, and hazardous waste storage and treatment.

In addition, the Laboratory has developed an Environmental Management System (EMS) to implement sound environmental stewardship practices that protect the air, water, land, and other environmental resources potentially affected by facility operations. The EMS is integrated into the Laboratory's ISM processes. DOE Order 450.1, *Environmental Protection Program*, established the requirement for an EMS, including that it be integrated with a facility's ISM. The Laboratory's EMS program is described in the Laboratory's Performance-Based EMS Plan (PUB-3180).

The LBNL Environment, Health, and Safety (EH&S) Division has primary responsibility for developing compliance strategies for federal, state, and local environmental laws and regulations, and for developing related LBNL policies and procedures. In conformance with applicable laws and regulations, the EH&S Division establishes procedures for storage, handling, use, and disposal of hazardous and radioactive materials and medical wastes. These are described in LBNL PUB-3000 and in supporting documents referenced in that document. In addition, LBNL maintains a Hazardous Materials Business Plan that lists the hazardous materials stored in each

LBNL building in quantities that meet or exceed the state's minimum reporting requirements; the plan also summarizes emergency plans, procedures, and training (LBNL, 2006c). Operation of USTs and ASTs within LBNL is required to comply with measures identified in LBNL's SPCC Plan. The EH&S Division also oversees the monitoring and remediation of soil and groundwater affected by historic hazardous material use at LBNL, and ensures regulatory compliance.

LBNL stores chemicals and other hazardous substances in aboveground tanks and storage drums, the latter located at product distribution areas. Hazardous, radioactive, and mixed waste are accumulated at designated Satellite Accumulation Areas and Waste Accumulation Areas in research and support locations through the Laboratory. These are taken to LBNL's HWHF, which collects wastes from laboratories and buildings throughout the site for temporary storage, some forms of treatment as specified by the DTSC-issued permit for the HWHF, and subsequent transport for off-site treatment and disposal. The HWHF operates in accordance with DTSC requirements and oversight applicable to hazardous wastes. In compliance with the operating permit from DTSC, the EH&S Division produces an annual hazardous waste report for DTSC that incorporates treatment and disposal information for all hazardous waste activities, and an annual report of waste generation and pollution prevention progress for DOE that details waste minimization efforts undertaken at the facility (LBNL, 2006c). DOE requirements also apply to the handling of radioactive and mixed waste at the HWHF.

IV.F.2.4 Local Plans and Policies

LBNL is a federal facility operated by the University of California and conducting work within the University's mission on land that is owned or controlled by The Regents of the University of California. As such, LBNL is generally exempted by the federal and state constitutions from compliance with local land use regulations, including general plans and zoning. However, LBNL seeks to cooperate with local jurisdictions to reduce any physical consequences of potential land use conflicts to the extent feasible. The western part of the LBNL site is within the Berkeley city limits, and the eastern part is within the Oakland city limits. This section summarizes relevant policies contained in the Berkeley and Oakland general plans.

Berkeley General Plan

Berkeley General Plan policies pertaining to hazards and hazardous materials relevant to implementation of the LBNL LRDP include the following:

> <u>Policy EM-13 Hazardous Materials Disclosure</u>: Continue to require the disclosure of hazardous materials usage and encourage businesses using such materials to prepare and implement a plan to reduce the use of hazardous materials and the generation of hazardous wastes.

> <u>Policy EM-14 Hazardous Materials Regulation</u>: Control and regulate the use, storage, and transportation of toxic, explosive, and other hazardous and extremely hazardous material to prevent unauthorized and accidental discharges.

Actions:

A) Regularly inspect businesses using, storing, transporting, or generating hazardous materials or wastes to ensure compliance with federal, state, and local regulations.

B) Require facility operators to write and implement contingency plans in preparation for emergency situations and accidental releases. Additionally, require facilities to train their employees on how to activate the contingency plans.

Policy EM-15 Environmental Investigation: When reviewing applications for new development in areas historically used for industrial uses, require environmental investigation as necessary to ensure that soils, groundwater, and buildings affected by hazardous material releases from prior land uses would not have the potential to affect the environment or the health and safety of future property owners, users, or construction workers.

Policy EM-16 Risk Reduction: Work with owners of vulnerable structures with significant quantities of hazardous material to mitigate potential risks.

Policy EM-17 Warning Systems: Establish a way to warn residents of a release of toxic material or other health hazard, such as sirens and/or radio broadcasts.

Policy EM-31 Landscaping: Encourage drought-resistant, rodent-resistant, and fire-resistant plants to reduce water use, prevent erosion of soils, improve habitat, lessen fire danger, and minimize degradation of resources.

Policy S-23 Property Maintenance: Reduce fire hazard risks in existing developed areas by ensuring that private property is maintained to minimize vulnerability to fire hazards.

Oakland General Plan

The Open Space, Conservation and Recreation Element, adopted in 1996, addresses the management of open land, natural resources, and parks in Oakland. The following policies are relevant to the proposed project:

Policy CO-1.2 Soil Contamination Hazards: Minimize hazards associated with soil contamination through the appropriate storage and disposal of toxic substances, monitoring of dredging activities, and cleanup of contaminated sites. In this regard, require soil testing for development of any site (or dedication of any parkland or community garden) where contamination is suspected due to prior activities on the site.

Policy CO-5.2 Improvements to Groundwater Quality: Support efforts to improve groundwater quality, including the use of nontoxic herbicides and fertilizers, the enforcement of anti-litter laws, the cleanup of sites contaminated by toxics, and ongoing monitoring by the Alameda County Flood Control and Water Conservation District.

IV.F.3 Impacts and Mitigation Measures

IV.F.3.1 Significance Criteria

The impacts of LBNL projects involving hazards and hazardous materials would be considered significant if they would exceed the following Standards of Significance, in accordance with Appendix G of the CEQA Guidelines and the UC CEQA Handbook:

- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;
- Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;
- Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school;
- Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, create a significant hazard to the public or the environment;
- Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan; or
- Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands.

IV.F.3.2 Impact Assessment Methodology

Potential impacts were analyzed based on data on the existing site and on proposed facility development under the 2006 LRDP. LBNL will evaluate whether the hazards and hazardous materials impacts of any later activity implemented pursuant to the LRDP were examined in this program EIR before approving the activity as being within the scope of the project covered by the program EIR. If specific project differences from the presentation of the Illustrative Development Scenario and the 2006 LRDP EIR are such that the project is not within the scope of the LRDP EIR or the specific impact statements and mitigation measures do not cover the individual project pursuant to CEQA Guidelines Sections 15168(c)(2) and 15168(c)(5), then appropriate, project-specific CEQA analysis will be tiered from this 2006 LRDP EIR in accordance with CEQA Guidelines Section 15168(d)(1-3).

Potential impacts associated with air emissions are addressed in Section IV.B, Air Quality, of this document.

Numerous laws and regulations governing environment, health, and safety apply to activities at LBNL. As well, LBNL has policies, programs, and guidance documents implementing these requirements, which in some cases contain protective measures beyond what is required by law.

LBNL also continues to implement mitigation measures set under the 1987 LRDP as amended relevant to environment, health, and safety. Compliance with the above, and with new requirements as they arise, is part of the project for CEQA purposes, and reduces the impacts of the management of hazardous materials, hazardous waste, and other hazards discussed in this section to less-than-significant levels.

IV.F.3.3 2006 LRDP Principles, Strategies, and the LBNL Design Guidelines

2006 LRDP Principles and Strategies

The 2006 LRDP proposes four fundamental principles that form the basis for the Plan's development strategies provided for each element of the Plan. The two principles most applicable to concerns regarding hazards and hazardous materials related to new development are to "Preserve and enhance the environmental qualities of the site as a model of resource conservation and environmental stewardship" and to "Build a safe, efficient, and cost-effective scientific infrastructure capable of long-term support of evolving scientific missions."

Development strategies provided by the 2006 LRDP are intended to minimize potential environmental impacts that could result from implementation of the 2006 LRDP (see Chapter III, Project Description for further discussion, and see Appendix B for a full listing of principles, strategies, and design guidelines). Development strategies set forth in the 2006 LRDP applicable to hazards and hazardous materials include the following:

- Protect and enhance the site's natural and visual resources, including native habitats, streams, and mature tree stands by focusing future development primarily within the already developed areas of the site.
- Site and design new facilities in accordance with University of California energy-efficiency and sustainability policies to reduce energy, water, and material consumption and provide improved occupant health, comfort, and productivity.
- Exhibit the best practices of modern sustainable development in new projects as a way to foster a greater appreciation of sustainable practices at the Laboratory.
- Improve efficiency and security of Laboratory access through improvements to existing gates and the creation of new gates.
- Provide separated routes of travel wherever possible for pedestrians and vehicles.
- Eliminate parking from the sides of major roadways, thereby improving safety and allowing one-way roads to be converted to two-way traffic.
- Improve pedestrian access and safety throughout the Laboratory site by developing new routes and enhancing existing routes.
- Develop all new landscape improvements in accordance with the Laboratory's vegetation management program to minimize the threat of wildland fire damage to facilities and personnel.

- Maintain a safe and reliable utility infrastructure capable of sustaining the Laboratory's scientific endeavors.

LBNL Design Guidelines

The LBNL Design Guidelines were developed in parallel with the LRDP. The LBNL Design Guidelines are proposed to be adopted by the Lab following the Regents' consideration of the 2006 LRDP. The LBNL Design Guidelines provide specific guidelines for site planning, landscape and building design as a means to implement the LRDP's development strategies as each new project is developed. Specific design guidelines are organized by a set of design objectives that essentially correspond to the strategies provided in the LRDP. The LBNL Design Guidelines provide the following specific planning and design guidance relevant to hazards and hazardous materials:

- Provide appropriate site lighting for safety and security.
- Minimize impacts of disturbed slopes.
- Segregate public entries and paths from service entries and paths where feasible.
- Where segregation is not possible and service and public access overlap in accessing buildings, design service courts to intelligently serve both.

IV.F.3.4 Construction[16] and Demolition Impacts

Impact HAZ-1: Demolition or renovation of existing structures could expose construction workers, the public, or the environment to hazardous materials in building materials. (Less than Significant)

Development under the LRDP includes the demolition or renovation of some existing structures. Based on the age and nature of the structures, some of these buildings may contain non-radioactive hazardous materials or radioactivity. In general, the most common non-radioactive regulated building materials that are encountered during demolition and renovation are lead-based paint, asbestos, and light ballasts containing PCBs.

Demolition and renovation activities, including removal of walls, sanding, welding, and material disposal, potentially could expose on- and off-site receptors to these materials. Compliance with laws, regulations, policies, and procedures described in this chapter, coupled with continuation of the Lab's current management practices, would ensure that exposure of workers and the public resulting from the demolition and renovation of LBNL buildings would result in less-than-significant impacts.

To deal with potential hazards when demolition or renovation is proposed, a survey and/or review of existing data is conducted to determine whether hazardous substances or radioactivity, whether

[16] For the purposes of this EIR, the term "construction," unless specifically indicated otherwise, includes activities that involve construction of new facilities, major rehabilitation or modification of existing facilities, and demolition of existing facilities.

in the building or the subsurface, may be encountered. Hazardous and radioactive substances are handled and, if necessary, removed in accordance with applicable regulations and LBNL procedures (e.g., as specified by LBNL's Asbestos Management, Lead Compliance, and Radiation Protection Programs).

The LBNL Facilities Division has developed detailed project specifications that are required of all subcontractors performing various activities, including demolition (LBNL, 2003e). These specifications include requirements that subcontractors meet applicable environmental, health, and safety regulations and LBNL requirements, and that subcontractor employees receive an initial EH&S orientation prior to performing work. If required to work in certain areas, such employees must attend a more specific safety training session, for example, for work in radiation areas, and meet the requirements of LBNL authorization documents, such as a Radiation Work Permit. Subcontractors are also subject to requirements for reporting spills of hazardous substances or wastes to the LBNL project manager. LBNL project managers and/or assigned delegates periodically monitor subcontractor compliance with these and other EH&S requirements.

One category of materials that may be encountered during demolition and renovation activities is items from former accelerator facilities. As described elsewhere in this EIR, LBNL plans to demolish the former accelerator facility at Building 51. Certification of the Building 51 (Bevatron) EIR and approval of the demolition project are anticipated to be considered in early 2007. Extensive modifications may be made to other accelerator facilities, such as the one formerly located at Building 71. Such facilities contain a wide variety of items that may require reuse, recycling, or disposal, either during the operation of the facilities or after their closure. These items include hundreds of multi-ton concrete shielding blocks that were installed to protect workers from exposure to radiation; concrete in floors and foundations; beamline components; and miscellaneous equipment. LBNL has sent thousands of tons of blocks and lesser quantities of other items to off-site recipients for disposal or reuse, recycling, and would continue these activities under the LRDP.

As a result of accelerator operations, some of the above items contain low amounts of radioactivity, which are measured at levels that are above the levels found in nature. (This is termed "residual radioactivity," which means radioactivity above detection limits that has been added as a result of a DOE activity.) For the most part, this residual activity was produced when energetic particles from the accelerator activated a small fraction of the elements in these items. Also, some of the items might have surface radioactivity, due to releases from radioactive targets that were used in some accelerator experiments.

There is no detectable residual radioactivity in a substantial fraction of the concrete and other items at these facilities (LBNL, 2003b). Such materials can be sent off-site for disposal, reused, or recycled by government agencies and private sector parties without restrictions, with the exception of metals subject to the DOE Metals Moratorium discussed above. In the case of concrete blocks, reuse options include shielding at other accelerators, and soil stabilization. If reuse or recycling is not feasible, non-radioactive concrete and other non-radioactive materials can be sent to landfills that accept these types of materials. Prior to release for shipment off-site, concrete blocks are screened according to a DOE-approved protocol, such as the EH&S Division's Protocol for Survey and Release of Bevatron & Building 51 Materials. Concrete debris from floors and foundations, should these be made available for release in the future, would be surveyed and handled in a manner similar to that used for blocks.

Regarding metals and other types of materials from accelerator facilities, items from former radiological areas as defined by 10 CFR 835 require screening prior to release. External radiation measurements are taken of each such item, using appropriate survey instrumentation and/or swipe samples. Items from other, non-radiological areas are not required to undergo such screening.

Another recycling option for concrete with no detectable residual radioactivity is to send it to commercially operated off-site locations that break concrete into rubble. Alternately, rubbling equipment could be temporarily set up at LBNL and the concrete rubbled on-site. Rubbling offers transportation advantages, as rubbled material is more efficient in filling the volume capacity of trucks, which would decrease the number of truck trips generated in hauling concrete to subsequent destinations, compared with hauling unbroken concrete. The resulting rubble could be released for such uses as fill for construction projects and road building, or could be sent to landfills.

Concrete and other items that have detectable residual radioactivity are subject to greater restrictions. Options for these items include leaving them in place, reusing them at LBNL, transferring them to other DOE facilities for reuse, or shipping them to a DOE-authorized facility for disposal as low-level radioactive waste. It is anticipated that approximately 30 percent of the concrete shielding blocks and an as yet unknown percentage of other materials in the Building 51 accelerator might have levels of residual radioactivity that would prevent their release to other than these restricted destinations, except as provided under DOE Order 5400.5, as detailed below.

It is possible that LBNL might, during the period covered by the LRDP, apply to DOE in accordance with DOE Order 5400.5 for approval of reuse or disposal options other than those listed above for concrete containing residual radioactivity. The types of uses that potentially can be approved under this process are similar to those allowed for concrete or other materials without residual radioactivity. However, the specific options that might be proposed to DOE would depend on a detailed analysis of the financial costs and potential radiological impacts of the options concerned, including a plan to maintain radiation doses to the public as low as reasonably achievable.

LBNL currently complies with measures identified in the 1987 LRDP EIR, as amended, to ensure that hazardous materials and wastes are properly stored, used, and generated at the sites in a manner that minimizes exposure of potential hazardous materials to the public and environment. Under the LRDP, LBNL would continue to comply with federal and state laws regulating the use, transportation, and disposal of hazardous material and would continue to develop LBNL project specifications that ensure subcontractors meet applicable environmental, health, and safety regulations. LBNL management protocols would ensure that waste materials from accelerator facilities would be properly disposed or recycled in accordance with federal regulations, depending on the level of residual radioactivity. Compliance with applicable laws, regulations, and policies guiding the use, storage, and disposal of hazardous materials at LBNL would ensure that potential impacts would remain less than significant.

Mitigation: None required.

Project Variant. The project variant would increase the average daily population on the Berkeley Lab hill site, but would not change the projected building square footage. While some buildings could be used in different ways than might be the case under the project as proposed, the variant would not result in appreciably different hazard impacts with regard to building demolition or renovation.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the 2006 LRDP. Actual overall development that is approved and constructed pursuant to the 2006 LRDP would be less intense than portrayed in the scenario. The scenario was developed before the 2006 LRDP was reduced in scope in response to comments from the City of Berkeley, and thus the scenario includes an overall level of potential development that is greater than is being proposed in the 2006 LRDP. Each of the potential buildings that is included in the scenario, however, might be constructed pursuant to the 2006 LRDP, and thus the scenario remains an appropriate and conservative basis for the evaluation of hazard impacts of construction. Effects due to demolition or renovation of potential structures under the LRDP such as those denoted in the Illustrative Development Scenario would be as described above. For the reasons stated above with regard to full implementation of the LRDP, this impact would be less than significant.

Impact HAZ-2: Future construction activities, including earth-moving activities such as excavation and grading, could expose construction workers or the environment to hazardous materials. (Less than Significant)

Excavation, grading, and dewatering associated with future construction activities could encounter soil or groundwater that has been affected by hazardous materials use at LBNL. For example, future construction activities could require the removal of USTs or ASTs, which would occur in compliance with state tank regulations. Soil and/or groundwater sampling performed at the time of tank removal could reveal previously unknown petroleum hydrocarbon impacts. Building demolition activities could also allow testing and/or remediation of suspected or known soil contamination in areas that were previously inaccessible.

LBNL has performed site investigations for soil and groundwater contamination in accordance with requirements of the RCRA Corrective Action Program. Human health and ecological risk assessments performed under the program have identified areas of potential hazards. As depicted on Figure IV.F-1, p. IV.F-6, groundwater contamination has been detected at a number of locations, and corrective action measures have been implemented to address the contamination. Construction activities at some locations, including former USTs for which LBNL has received case closure, have the potential to encounter soil that contains residual petroleum hydrocarbon contamination.[17] Improper handling or disposal of contaminated soil or groundwater associated with future laboratory and facility expansion could expose construction workers, the public, and the environment to hazardous conditions.

The most recently published (2001) California Hazardous Waste and Substances List, compiled in accordance with Government Code Section 65962.5 and more commonly known as the Cortese List, included six locations within LBNL: Buildings 7E, 50, 62, 69, 74, and 76. These sites were included due to the presence of leaking USTs. LBNL has received case closure from the City of Berkeley and San Francisco Bay RWQCB for these former USTs.

Construction activities at LBNL would continue to comply with applicable laws and regulations that govern the exposure of workers, the public, and the environment to hazardous materials, as well as LBNL-specific policies. Potential exposure of workers, the public, and the environment to hazardous materials would be minimized through development of Construction Site Health and Safety Plans and proper handling, storage, and disposal of contaminated soil and groundwater. This would reduce impacts to less-than-significant levels.

Mitigation: None required.

Project Variant. The project variant would increase the average daily population on the Berkeley Lab hill site but would not change the projected building square footage. While some buildings could be used in different ways than might be the case under the project as proposed, the variant would not result in appreciably different effects with regard to building construction.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the LRDP. Actual overall development that is approved and constructed pursuant to the 2006 LRDP would be less intense than portrayed in the scenario. The scenario was developed before the 2006 LRDP was reduced in scope in response to comments from the City of Berkeley, and thus the scenario includes an overall level of development that is greater than is being proposed in the 2006 LRDP. Each of the potential buildings that is included in the scenario, however, might be constructed pursuant to the 2006 LRDP, and thus the scenario remains an appropriate and conservative basis for evaluating the potential exposure to workers or the environment of hazardous materials in connection with future construction activities. Effects due to construction of specific potential structures under the LRDP such as those denoted in the Illustrative Development Scenario would be as described above. For the reasons stated above with regard to the LRDP, this impact would be less than significant.

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[17] Regulatory case closure for leaking USTs (or other hazardous material sources) can be received even though contaminated soil and/or groundwater remains on-site. The potential for petroleum hydrocarbon impacts to remain at former UST locations, including areas that have received regulatory closure, would therefore be ascertained during detailed environmental review of specific development projects on or adjacent to former UST locations.

IV.F.3.5 Operations Impacts

Impact HAZ-3: Operation of LBNL pursuant to the 2006 LRDP, including proposed increases in laboratory and facility space, would increase the use of hazardous materials in research, facility construction, and facility maintenance activities, consequently resulting in increased generation, storage, transportation, and disposal of hazardous wastes, including transport associated with off-site disposal of hazardous and radioactive wastes, from research and facility maintenance activities. (Significant; Less than Significant with Mitigation)

Expansion of laboratory space under the 2006 LRDP would increase the quantity of hazardous and radioactive materials stored at LBNL. Table IV.F-5 summarizes the estimated quantities of hazardous and radioactive materials stored at LBNL in 2025, compared with quantities stored in 2003. These quantities do not include temporary storage and use of hazardous materials associated with construction of proposed facilities. These estimates are conservatively based on full build-out of laboratories and other facilities as depicted in the Illustrative Development Scenario.

Hazardous materials use and other activities at LBNL result in the generation of hazardous, low-level radioactive, mixed, and medical wastes. Implementation of the LRDP would result in the expansion of laboratory facilities that use these materials; therefore, waste generation on the site is expected to increase. Table IV.F-6 summarizes waste quantities produced by LBNL during 2003 and projected operations in 2025.

As summarized in Table IV.F-5, future expansion of LBNL facilities and laboratory space is expected to result in a 45-percent increase in hazardous materials storage and a 38-percent increase in radioactive materials storage by 2025. Storage of these materials would continue to be regulated by applicable federal, state and local requirements, as well as LBNL's policies and plans.

TABLE IV.F-5
QUANTITIES OF HAZARDOUS MATERIALS STORED AT LBNL

Classification	Quantity Stored (2003)	Projected Quantity Stored (2025)[1]
Hazardous Materials		
Gas	103,116 cubic feet	149,518 cubic feet (45% increase)
Liquid	40,604 gallons	58,876 (45% increase)
Solid	27,895 pounds	40,488 pounds (45% increase)
Radioactive Materials		
Sealed	681 Curies[2]	940 Curies (38% increase)
Unsealed	8 Curies	11 Curies (38% increase)

1 Projected quantities conservatively based on full build-out of laboratories and other facilities as depicted in the Illustrative Development Scenario.
2 See footnote 1, page IV.F-1.

SOURCE: LBNL, 2004a.

TABLE IV.F-6
QUANTITY OF HAZARDOUS WASTE GENERATED AT LBNL

Classification	Quantity Generated (2003)	Projected Quantity Stored (2025)[1]
Hazardous Waste	61,335 pounds	88,777 pounds (45% increase)
Low-Level Radioactive Waste	4,273 pounds (1,230 Curies[2])	5,888 pounds (38% increase) (1,697 Curies [<38% increase])
Mixed Waste	492 pounds (585 Curies)	534 pounds (9% increase) (638 Curies [<9% increase])
Medical Waste	33,922 pounds	49,187 pounds (45% increase)

1 Projected quantities conservatively based on full build-out of laboratories and other facilities as depicted in the Illustrative Development Scenario.
2 See footnote 1, page IV.F-1.

SOURCE: LBNL, 2004a.

As shown in Table IV.F-6, the quantity of hazardous waste, low-level radioactive waste, mixed waste, and medical waste generated at LBNL is also expected to increase, particularly as laboratory space and functions increase. Future generation, handling, storage, and transport of these types of wastes would continue to be subject to applicable federal, state, and local requirements. For example, LBNL is required by DOE to minimize hazardous waste production, and to detail waste minimization efforts in annual reports. Also, future operation of LBNL's HWHF would continue to be subject to applicable DTSC and DOE regulations and reporting requirements. For a detailed accounting of Berkeley Lab's environmental performance in regard to the handling, storage, and transport of hazardous waste and low-level radioactive waste, please refer to Berkeley Lab's Annual Site Environmental Report (and related reports) at: http://www.lbl.gov/ehs/esg/tableforreports/tableforreports.htm. In addition, LBNL regularly reports to the City of Berkeley on the types and quantities of such materials stored and used at the Lab in its annual Hazardous Materials Business Plan.

LBNL currently complies with measures identified in the 1987 LRDP EIR, as amended, to ensure that hazardous materials and wastes are stored, used, and generated at the site in a manner that minimizes potential exposure of individuals and the environment to hazardous conditions. These would be continued under the new LRDP. Continued compliance with these measures, and with applicable laws, regulations, and policies, would reduce impacts to less-than-significant levels.

The following 2006 LRDP EIR mitigation measures are taken from the 1987 LRDP EIR, as amended, with slight modifications:

> **Mitigation Measure HAZ-3a:** LBNL shall continue to prepare an annual self-assessment summary report and a Site Environmental Report that summarize environment, health, and safety program performance and identify any areas where LBNL is not in compliance with environmental laws and regulations governing hazardous materials, and worker safety, emergency response, and environmental protection.

An EH&S assessment of LBNL activities is performed annually, and these results are reported annually in the LBNL Self-Assessment Report. In addition, LBNL prepares an annual Site Environmental Report that describes the environmental activities noted above. Implementation of this measure would ensure that the information in the LBNL Self-Assessment and Site Environmental Reports continues to be collected, reviewed, and provided.

Mitigation Measure HAZ-3b: Prior to shipping hazardous materials to a hazardous waste treatment, storage, or disposal facility, LBNL shall confirm that the facility is licensed to receive the type of waste LBNL is proposing to ship.

LBNL is required by DOE Order 435.1 to verify that the receiving facility has all appropriate licenses and that the waste meets all waste acceptance criteria of the receiving facility.

Mitigation Measure HAZ-3c: LBNL shall require hazardous waste haulers to provide evidence that they are appropriately licensed to transport the type of wastes being shipped from LBNL.

Shipping procedures at LBNL require all transporters of hazardous, radioactive, and mixed waste to provide evidence that they are appropriately licensed.

Mitigation Measure HAZ-3d: LBNL shall continue its waste minimization programs and strive to identify new and innovative methods to minimize hazardous waste generated by LBNL activities.

Each LBNL Division is required to identify and implement new waste minimization activities each year. The waste minimization program at LBNL reduced hazardous waste by 72% during the period 1993-2004.

Mitigation Measure HAZ-3e: In addition to implementing the numerous employee communication and training requirements included in regulatory programs, LBNL shall undertake the following additional measures as ongoing reminders to workers of health and safety requirements:

- Continue to post phone numbers of LBNL EH&S subject matter experts on the EH&S website.[18]
- Continue to post Emergency Response and Evacuation Plans in all LBNL buildings.
- Continue to post sinks, in areas where hazardous materials are handled, with signs reminding users that hazardous materials and wastes cannot be poured down the drain.
- Continue to post dumpsters and central trash collection areas where hazardous materials are handled with signs reminding users that hazardous wastes cannot be disposed of as trash.

[18] This mitigation measure has been slightly altered from the previous wording of "Post, in areas where hazardous materials are handled, phone numbers of LBNL offices that can assist in proper handling and emergency response information."

> **Mitigation Measure HAZ-3f:** LBNL shall update its emergency preparedness and response program on an annual basis and shall provide copies of this program to local emergency response agencies and to members of the public upon request.

Compliance with the measures identified above and with federal, state, and local rules and regulations would reduce potential impacts associated with increased quantities of hazardous and radioactive materials used, and the subsequent waste generated, stored, and transported to a less-than-significant level.

> **Significance after Mitigation:** Less than significant.

Project Variant. The project variant would increase the average daily population on the Berkeley Lab hill site but would not change the projected building square footage. Under the variant, some buildings could be used in different ways than might be the case under the project as proposed. However, under the variant, most of the off-site staff who would move to the Lab's main hill site would be administrative staff, and therefore changes in building usage would likely take the form of, for example, office space being used more intensively. Because the variant would result in no substantial change in the number of technical staff on the hill site, no measurable change in the nature or volume of hazardous or radioactive materials used or related waste generated would be expected. Thus, the variant would not result in appreciably different effects from the project as proposed.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the 2006 LRDP. Actual overall development that is approved and constructed pursuant to the 2006 LRDP would be less intense than portrayed in the scenario. The scenario was developed before the 2006 LRDP was reduced in scope in response to comments from the City of Berkeley, and thus the scenario includes an overall level of potential development that is greater than is being proposed in the 2006 LRDP. Each of the potential buildings that is included in the scenario, however, might be constructed pursuant to the 2006 LRDP, and thus the scenario remains an appropriate and conservative basis for the evaluation of hazardous material and hazardous waste impacts. Potential individual projects under the 2006 LRDP such as those denoted in the Illustrative Development Scenario would result in the same activities and uses on the Lab hill site as described above, and therefore their effects would be the same as those of the LRDP as a whole. For the reasons stated above with regard to full implementation of the LRDP, this impact would be less than significant with implementation of Mitigation Measures HAZ-3a through HAZ-3f.

Impact HAZ-4: Implementation of the LRDP would involve the handling of hazardous materials and wastes within one-quarter mile of an existing school. (Significant; Less than Significant with Mitigation)

There are no public or private elementary, middle, or high schools within one-quarter mile of LBNL, although there are several day-care/child-care centers and preschools. Portions of the

UC Berkeley campus are also within one-quarter mile of Berkeley Lab. Compliance with federal, state, and local rules and regulations, and Mitigation Measures HAZ-3a through HAZ-3f, would reduce potential impacts to nearby schools associated with the handling of hazardous materials and wastes to a less-than-significant level.

Effects related to emissions of toxic air contaminants and radionuclides from LBNL laboratories and other emissions sources at Berkeley Lab are assessed separately in Section IV.B, Air Quality, of this document.

Mitigation: See Mitigation Measures HAZ-3a through HAZ-3f, above.

Significance after Mitigation: Less than significant.

Project Variant. As described under Impact HAZ-3, the project variant would result in no substantial change in the number of technical staff on the hill site and no measurable change in the nature or volume of hazardous materials used or hazardous waste generated. Thus, the variant would not result in appreciably different effects from the project as proposed, and would be less than significant with implementation of Mitigation Measures HAZ-3a through HAZ-3f.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the 2006 LRDP. Actual overall development that is approved and constructed pursuant to the 2006 LRDP would be less intense than portrayed in the scenario. The scenario was developed before the 2006 LRDP was reduced in scope in response to comments from the City of Berkeley, and thus the scenario includes an overall level of potential development that is greater than is being proposed in the 2006 LRDP. Each of the potential buildings that is included in the scenario, however, might be constructed pursuant to the 2006 LRDP, and thus the scenario remains an appropriate and conservative basis for the evaluation of impacts to schools associated with the handling of hazardous materials and wastes. Development of the facilities that are conceptually portrayed in the Illustrative Development Scenario would not substantially alter the proximity of LBNL uses that handle hazardous materials and wastes to local schools. Therefore, for the reasons stated above with regard to the LRDP, this impact would be less than significant with implementation of Mitigation Measures HAZ-3a through HAZ-3f.

Impact HAZ-5: Implementation of the LRDP could increase exposure of people or structures to hazards that could result from regional, compounded, or terrorist-related catastrophic events. (Less than Significant)

Full development under the LRDP would increase the number of people and the amount of property that could be exposed to regional, compounded, or terrorist-related catastrophic events. Regionally catastrophic events could include earthquakes or fires of sufficient magnitude to impair regional emergency support and service systems such that LBNL could not expect to receive aid from external sources. Compounded catastrophic events could include a confluence of calamitous events, such as a large earthquake followed by a subsequent major wildland fire, that could put additional strains on the ability of LBNL, local, and regional services to address them. Catastrophic terrorist events could include direct acts of terror at the LBNL main site, such as bombings or releases of hazardous materials, or in the region. All of these conditions are referred to throughout this section as “catastrophic events.” Any of these catastrophic events could warrant consideration of whether to evacuate the Berkeley Lab main site, if possible.

Impacts resulting from such catastrophic events may be different from or more severe than those that could result from single events (earthquake, fire, etc.) that are described and analyzed in other sections of this EIR. This section considers the relative likelihood of such catastrophic events occurring at the LBNL site, as well as the potential direct impacts and secondary impacts (e.g., from evacuation) of such catastrophic events. It further identifies how these factors could be influenced by implementation of the 2006 LRDP program.

Likelihood of Occurrence

Earthquake and Fire

Under the 2006 LRDP, additional Berkeley Lab population and space could be subject to potential compounded earthquake and fire events. However, the likelihood of these compounded events occurring is relatively low, and this would not be substantially altered by the proposed project. In fact, in some ways, this likelihood may be decreased due to new construction standards and best management practices.

As described in Section IV.E of this EIR, LBNL’s proximity to the Hayward fault, Alquist-Priolo seismic hazard zone, and other area faults puts it in a region that may experience a major seismic event during the 2006 LRDP planning period (e.g., probability of a magnitude 6.7 or greater earthquake along the 60+ mile Hayward fault by 2032 is estimated at 27 percent; for all regional faults, probability is 62 percent by 2032). The last major earthquake on the Hayward Fault Zone occurred in 1868.

As described in Section IV.F of this EIR, the LBNL main site is also located at an interface of development and vegetated wildlands in the lower East Bay hills. This area can be subject to wildland fires, particular for brief periods of the fall when “Diablo” wind conditions occur. Such fires have been noted to occur in the nearby East Bay hills at approximately ten-year intervals; the last major wildland fire in this area occurred in 1991.

The probability that, during the 20-year planning period, a major earthquake would occur during a fall month on a rare “Diablo” wind condition day is considerably lower than the probability of either of these events occurring individually. Nevertheless, under the 2006 LRDP, Berkeley Lab would undertake or continue to undertake the following preventative measures:

- LBNL’s ongoing vegetation management program would continue to maintain the surrounding vegetative fuel supply so as to provide protection from worst case Diablo wind-driven wildland fires.

- Construction under the 2006 LRDP would continue to comply with requirements of the latest California Building Code, University of California seismic design safety policies, federal standards, and LBNL's lateral force design criteria.
- All new structures built on the LBNL main site would include installation of automatic fire-sprinkler systems.
- LBNL's main gas lines would be protected by automatic shut-off valves. With loss of system continuity or pressure occurring from a breach, this system would shut off and prevent an uncontrolled release of natural gas.
- Many older buildings built to less stringent standards would be replaced under the 2006 LRDP. This would remove people and property from structures that are potentially less able to withstand seismic events.
- LBNL would continue to support its Environment, Health & Safety Division, which is staffed with health and safety experts who monitor and oversee safety aspects of the Lab and its operations. It would also continue to maintain Facilities Division inspectors and preventative maintenance crews to keep the Lab's facilities and safety systems in working order.
- Subsequent development projects resulting from implementation of the proposed LRDP would occur within the Lab boundary and generally would not extend into the adjacent wildland areas, meaning that the project would not be anticipated to increase the number or intensity of potential wildfires.

Terrorist Event

Under the 2006 LRDP, additional Berkeley Lab population and space could be subject to potential acts of terrorism. However, the likelihood of terrorist events occurring is expected to be very low, and this would not be substantially altered by the proposed project.

LBNL is a National Laboratory, a federal and state asset, and it is associated with the advancement of science and technology in the United States. It is also, at times, a subject of controversy due to the nature of its scientific work and mission. Accordingly, LBNL could be a potential target of interest to terrorist or other extremist groups. However, the likelihood for terrorist actions occurring at Berkeley Lab is expected to be very low under the proposed planning period.

Terrorist actions in the U.S. are relatively rare, and there has never been a major terrorist act or attempt at Berkeley Lab. LBNL is not a facility with a high public profile in comparison to some more widely known National Laboratories. With the exception of the distinctive Advanced Light Source dome, LBNL's presence in the East Bay hills is not highly visible to the greater outside community. Furthermore, Berkeley Lab does not conduct classified research. The Laboratory is spread over a fairly dispersed area among its 202 acres, and thus it does not present a concentrated target of population and facilities for a bombing or toxic release. Nevertheless, under the 2006 LRDP, Berkeley Lab would undertake or continue to undertake the following preventative measures to further decrease the likelihood of a terrorist event at LBNL:

- LBNL would continue to maintain its secure perimeter fence line and controlled access gates. All persons entering the Lab will have to present identification and permission for entering the main site or its off-site leased space.
- LBNL would continue to operate its 24-hour-per-day, seven-day-per-week on-site security services, as well as its contract with UC Berkeley police services.
- LBNL would continue to be supported by the FBI, DOE Counterintelligence Office, DOE Security Office, and DOE IG Office.
- LBNL would continue to benefit from the State of California's Law Enforcement Mutual Aid Agreement with response from local and state law enforcement agencies when necessary.
- Development under the 2006 LRDP would follow along the pattern of dispersed clusters, thus not concentrating the majority of the Lab's population or property in a close area.
- The 2006 LRDP would not redirect Berkeley Lab's research mission toward a classified or weapons-related area.

Under the proposed 2006 LRDP, the likelihood of potential catastrophic events occurring to the incrementally increased population and facilities of LBNL would not be significant or substantially more severe than under existing conditions.

Direct Impacts

Earthquake and Fire

As discussed elsewhere in this section and in Sections IV.E, Geology and Soils, and IV.K, Public Services and Recreation, impacts associated with earthquakes or fires at LBNL under the proposed project are, individually, less than significant. Under compounded events such as major earthquakes and associated fires, such effects could be different from or more severe than might be the case with single earthquake or fire events.

The immediate effects of a catastrophic event on the LBNL main site could include injury to on-site personnel and damage to on-site property. Under earthquake conditions, risk of structural failure, falling objects, and landslides could result. Possible rupture of gas lines or downing of electrical power lines could increase the chance of post-earthquake fire or injury, and leave LBNL without external sources of power. Conventional communication lines could be cut off. Water lines may be damaged, interrupting water service or pressure, thus limiting the ability of LBNL to fight subsequent fires. Under widespread fire conditions, risk of damage and injury due to heat and smoke could result. A catastrophic earthquake and fire event could potentially damage or constrict access roads and/or tie up local and regional emergency service providers such that their assistance would not be available. Moreover, under regionally catastrophic conditions, such emergency service providers could be overextended and not available to assist LBNL.

Under the proposed project, additional staff and facilities would be subject to potential impacts from major catastrophic events, as those identified above. However, newer buildings under the program would be constructed to the latest building and safety codes, and these would replace several older, outdated buildings. Current safety measures and procedures would continue under the 2006 LRDP program. As described elsewhere in this EIR, LBNL has taken many precautions to limit the impacts of such events should they occur. These measures would include the following:

- LBNL would continue to provide for an on-site Alameda County fire station, which provides fire and emergency medical response.
- LBNL would continue to maintain its own medical clinic, which is staffed by doctors and other trained medical personnel during business hours.
- Construction under the 2006 LRDP would comply with requirements of the latest California Building Code, University of California seismic design safety policies, federal standards, and LBNL's lateral force design criteria. Such construction would help to minimize the potential injuries, damage, and subsequent fire that could result from a seismic event.
- LBNL would continue to maintain and update its Master Emergency Program Plan (MEPP), which establishes policies, procedures, and an organizational structure for responding to and recovering from a major disaster at LBNL.
- LBNL would continue to maintain its three 200,000-gallon emergency water tanks, which are spaced strategically throughout its site. These are designed to maintain pressure and supply of emergency water even in the event of loss of water supply from external sources.

Terrorist Event

Acts of terrorism or extremist groups at LBNL could include bombings, arson, release of toxic materials or biological agents, personal acts of violence, or sabotage of mechanical or computing systems. Such potential events, however unlikely to occur, are the subject of careful prevention and response planning undertaken by LBNL, the University, and the Department of Energy.

Berkeley Lab is a secure facility. Its distinctive geography, which disperses its population throughout winding canyons and plateaus throughout an almost two-mile stretch of the East Bay hills, would prevent a large concentration of the Lab's population from being exposed directly to a single conventional bombing event. Similarly, dispersed wind patterns would render a toxic or biological release less effective at LBNL than at a concentrated urban location where a maximum number of people could be exposed within a minimal or confined area. Nevertheless, should such events occur at LBNL, the following measures would be undertaken, or would continue to be undertaken, under the LRDP program to minimize the effects of a terrorist or extremist group action:

- LBNL would continue to maintain its 24-hour, seven-day-per-week on-site security force and its police services contract with UC Berkeley Police Department.
- LBNL would continue to maintain through contract with Alameda County its 24-hour, seven-day-per-week on-site fire station with emergency medical response capabilities.
- Hazardous materials emergency response (HAZMAT) services would continue to be provided by LBNL's on-site Alameda County fire station, which maintains an "around-the-clock" engine company staffed by four HAZMAT (Hazardous Materials Emergency

Response)-certified firefighters. HAZMAT automatic aid is offered through the Berkeley Fire Department, when available, and the Alameda County Fire Department. Depending on the magnitude of an incident, additional HAZMAT response support is available through the formal Fire Mutual Aid Plan, which the Alameda County Fire Department coordinates. Additionally, the Lab has an “around-the-clock” contract with a private vendor for HAZMAT clean-up.

- LBNL would continue to maintain its on-site medical clinic, which is staffed with medical doctors and nursing staff during Lab business hours.
- The Lab would continue to enhance its participation in the National Incident Management System (NIMS), as prescribed by Homeland Security Presidential Directive-5 – Management of Domestic Incidents. NIMS is a nationwide, standardized approach to incident management and response that establishes a single, comprehensive system for incident management and cooperation among departments and agencies at all levels of government, from federal to local. For more information, please refer to Section IV.K, Public Services and Recreation).
- All procedural, equipment, and supply safety procedures, including locking and securing of sensitive systems and of potentially dangerous equipment and chemicals, would continue to be undertaken under the 2006 LRDP and overseen by LBNL’s Environment, Health, & Safety division.
- LBNL would continue its aggressive programs to maintain, update, and improve its computer and “cyber-security” systems.

Under the proposed 2006 LRDP, the impacts associated with potential catastrophic events to the incrementally increased population and facilities of LBNL would not be significant or substantially more severe than under existing conditions.

Evacuation Impacts

A catastrophic event occurring during business hours at LBNL could trigger a decision whether or not to evacuate the LBNL site. Evacuation decisions and procedures would reside with LBNL’s Executive Team under its Emergency Operations Center (EOC). A decision on whether to evacuation under catastrophic conditions could result in three principal outcomes: evacuation by vehicle, evacuation by foot, or “shelter in place.” In any of these three scenarios, LBNL also may order evacuation of specific buildings or areas of the Lab deemed unsafe.

Evacuation by Vehicle

Evacuation by vehicle would involve moving personnel off the LBNL main site via personal vehicles and/or, if appropriate, by Lab shuttle buses and government vehicles. Evacuees would be directed to leave through gates as identified by LBNL security and traffic control forces.

Under a catastrophic earthquake scenario, many roadways in the region could be rendered unusable for reasons including earthquake damage, landslides, loss of more remote area roads and bridges, heightened congestion from other evacuating motorists, and increased emergency vehicle use on the roadways. Under catastrophic conditions, vehicles leaving from LBNL’s exits in an uncontrolled or uninformed manner could unintentionally travel toward the path of an on-coming fire.

An uncontrolled LBNL evacuation by vehicle could add to congestion and hamper evacuation or emergency vehicle access to that area. For example, the Panoramic Hill neighborhood, which is a Berkeley neighborhood inhabiting the slopes south of LBNL across Strawberry Canyon, has only one egress/access road – Panoramic Way. Panoramic Way feeds into Stadium Rim Way and Prospect Street in a relatively constricted intersection configuration. If the Panoramic Hill neighborhood were evacuating by vehicle, egress constriction at that intersection could be exacerbated if additional cars evacuating from LBNL through its Grizzly and Strawberry Canyon gates were to then travel southward on Centennial Drive to Stadium Rim Road.

Under the 2006 LRDP, EOC measures would not allow uncontrolled vehicle evacuation of the site if conditions did not warrant this. During or after a catastrophic event, the Lab's perimeter gates would be controlled. For example, gates may be closed to all vehicles except for emergency services, as warranted by the EOC. Any decision to evacuate would be coordinated through EOC command, including with the UC Berkeley Police Department, City of Berkeley Police Department, Alameda County Sheriff's Department, and the California Highway Patrol to ensure an informed and coordinated response.[19] Uncontrolled evacuation by vehicle, particularly during a wildland fire and on roads that would affect constricted areas such as the Panoramic Hills neighborhood, would not be permitted.

Evacuation by Foot

An evacuation by foot order would direct LBNL staff to leave the site, walking by way of the Lab's roadways and walkways, to an assembling point in UC Berkeley's intramural sports grass field in Strawberry Canyon, approximately 600 feet south of the Lab's fence line, or any other area designated by the University. Those requiring special assistance would be provided with other means of transport.

Shelter in Place

A shelter in place order would have LBNL staff remain on-site for an indeterminate period of time. This is viable because the Lab can be self-sustaining in emergencies, with its own internal, temporary supplies of food, water, shelter, heating and warmth, emergency power, medical supplies and medical professionals, and communications, along with its own on-site fire station and security forces.

In most scenarios, where a catastrophic event has occurred, shelter in place would be the preferred option to evacuation.

Mitigation: None required.

[19] Communication with regional EOC command, the City of Berkeley, and outside emergency providers, among others, would be maintained by the LBNL's on-site microwave relaying, digital communication system. This system employs the Lab's 140-foot-tall microwave tower and can be powered by back-up generators in emergencies. The system patches LBNL to the Alameda County Regional Emergency Communications Dispatch Center located at the Lawrence Livermore National Laboratory.

Project Variant. The project variant would increase the average daily population (ADP) at the hill site by 350 people, an increase of 30 percent over the projected ADP increase under the project as proposed. The additional staff would be consolidated from off-site locations and accommodated within the 2.42 million gross square feet of building space on the hill site proposed under the 2006 LRDP.

The increase in on-site population that would result from implementation of the project variant would increase the number of people that could be subject to the impacts from a potentially occurring catastrophic event, including a potential terrorist act. There also might be increased demand for on-site security, emergency responders, and others associated with preventing or responding to catastrophic events.

This incremental increase in population that could be exposed to potential but rare catastrophic events and any slight increase in demand for police, fire, and emergency medical services are not anticipated to result in the need for new facilities, staff, or equipment. The preventative measures described above would apply to the project variant. Therefore the impact would be less than significant.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the 2006 LRDP. Actual overall development that is approved and constructed pursuant to the 2006 LRDP would be less intense than portrayed in the scenario. The scenario was developed before the 2006 LRDP was reduced in scope in response to comments from the City of Berkeley, and thus the scenario includes an overall level of potential development that is greater than is being proposed in the 2006 LRDP. Each of the potential buildings that is conceptually portrayed in the scenario, however, might be constructed pursuant to the 2006 LRDP, and thus the scenario remains an appropriate and conservative basis for the evaluation of impacts to public services and recreation. Potential individual projects under the LRDP such as those identified in the Illustrative Development Scenario would not result in substantial new risks due to potentially occurring catastrophic events and therefore the impact of such projects on Berkeley Lab hazards would be less than significant for the reasons noted above.

Impact HAZ-6: Implementation of the LRDP would expose people or structures to wildland fire hazards. (Less than Significant)

Full development under the LRDP would increase both laboratory and other facility space at the LBNL hill site. Although this development would meet required safety standards and fire codes at the time of individual facility construction, wildland fire hazards would continue to threaten the LBNL site. However, continued implementation of LBNL’s vegetation management program would limit damage to assets from these fires and would reduce potential wildland fire hazards to a less-than-significant level.

As described in Chapter III, Project Description, the great majority of new construction and renovation occurring under the LRDP would be located within the area designated as developable area, which includes approximately 72 percent of the 202-acre Lab site. The Perimeter Open Space land use zone, shown in Figure III-3, LRDP Land Use Map, in Chapter III, Project Description, would continue to be managed to reduce wildland fire risks, where future development would be primarily reserved for minor maintenance, support structures, or paths and where the open, wooded, or grassland character of the hillside site would be retained to the extent feasible.

Mitigation: None required.

Project Variant. While the project variant would result in an increase in average daily population on the Lab's main hill site compared to the project as proposed, the Lab's continued vegetation management program would be anticipated to reduce wildland fire hazard risks to a less-than-significant level, as described above. Therefore, no substantial increase in the severity of the wildland fire risk is anticipated.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the 2006 LRDP. Actual overall development that is approved and constructed pursuant to the 2006 LRDP would be less intense than portrayed in the scenario. The scenario was developed before the 2006 LRDP was reduced in scope in response to comments from the City of Berkeley, and thus the scenario includes an overall level of potential development that is greater than is being proposed in the 2006 LRDP. Each of the potential buildings that is included in the scenario, however, might be constructed pursuant to the 2006 LRDP, and thus the scenario remains an appropriate and conservative basis for the evaluation of wildfire hazard impacts. Development of the facilities conceptually portrayed in the Illustrative Development Scenario would affect only the placement of specific facilities on the Lab's hill site and would not alter the Lab's approach to vegetation management. Therefore, effects of projects under the LRDP such as denoted in the Illustrative Development Scenario would be the same as those resulting from the LRDP. For the reasons stated above with regard to full implementation of the LRDP, this impact would be less than significant.

IV.F.3.6 Cumulative Impacts

This analysis considers cumulative growth as represented by the implementation of the Berkeley and Oakland general plans (and thus includes growth anticipated by the City of Berkeley General Plan EIR), and implementation of the UC Berkeley 2020 LRDP (including the Southeast Campus Integrated Projects) along with implementation of the proposed LBNL 2006 LRDP. Additional projects currently under way at UC Berkeley, described in Section VI.C of this EIR, are also accounted for in the cumulative analysis.

The geographic context for this cumulative analysis is generally limited to the LBNL hill site and the UC Berkeley campus, as these are the locations where hazardous materials use would be expected to increase and to reasonably be expected to result in some cumulative effect, were any to occur. This analysis evaluates whether the impacts of the proposed LRDP, together with the impacts of cumulative development, would result in a significant impact (based on the significance criteria on p. IV.F-21) and, if so, whether the contribution of the LRDP to this impact would be considerable. Both conditions must apply in order for the project's cumulative impacts to rise to a level of significance.

Impact HAZ-7: Implementation of the LRDP would contribute to cumulative increases in exposure to hazards and hazardous materials. (Less than Significant)

As discussed above, implementation of the LRDP would increase storage of hazardous and radioactive materials at LBNL and increase the generation of hazardous, low-level radioactive, mixed, and medical waste. Additionally, implementation of the LRDP could result in development that disturbs contaminated soil or groundwater, or increase exposure to wildland fire hazards. In the vicinity of LBNL, UC Berkeley would increase the amount of hazardous materials handled and hazardous waste requiring disposal through implementation of its own LRDP update.[20] Other changes that could further increase the amount of hazardous materials and waste handled in the area include expansion of biotechnology industry firms in the East Bay and expansion of or changes in the operations of refineries, chemical companies, and other hazardous materials and waste facilities in western Contra Costa County.

Compliance by LBNL with federal, state, and local regulations, LBNL policies, and the mitigation measures listed above would reduce potential impacts. Similar compliance with regulations governing hazardous materials and hazardous wastes by UC Berkeley and other institutions would reduce potential cumulative impacts in the vicinity of LBNL to less-than-significant levels. Therefore, implementation of the LRDP would not result in a considerable contribution to any cumulative increases in the use of or exposure to hazards or hazardous materials.

Mitigation: None required.

Project Variant. While the project variant would result in an increase in average daily population on the Lab's main hill site and therefore an increased exposure to hazards and hazardous materials, the impact would be similar to that of the project as proposed. Accordingly, the project variant would not result in a considerable contribution to any cumulative increases in the use of or exposure to hazards or hazardous materials. Therefore, this impact would be less than significant.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the 2006 LRDP. Actual overall development that is approved and constructed pursuant to the 2006 LRDP would be less intense

[20] The EIR for the UC Berkeley Southeast Campus Integrated Projects (SCIP) found that those projects would not result in any adverse impacts related to hazards or hazardous materials, and thus the SCIP would not contribute to any cumulative impacts (UC Berkeley, 2006).

than portrayed in the scenario. The scenario was developed before the 2006 LRDP was reduced in scope in response to comments from the City of Berkeley, and thus the scenario includes an overall level of potential development that is greater than is being proposed in the 2006 LRDP. Each of the potential buildings that is included in the scenario, however, might be constructed pursuant to the 2006 LRDP, and thus the scenario remains an appropriate and conservative basis for the evaluation of cumulative impacts related to hazardous materials use. Development of a project under the LRDP such as identified in the Illustrative Development Scenario would result in increased exposure to hazards and hazardous materials; however, such a project would not result in a considerable contribution to any cumulative increases in the use of or exposure to hazards or hazardous materials for the reasons stated above for the LRDP. Therefore, this impact would be less than significant.

In terms of cumulative impacts related to catastrophic events, the analysis under Impact HAZ-5, above, describes effects that could occur subsequent to a regional catastrophe, such as an earthquake or wildfire (or a combination of the two) and terrorist events, and concludes that the impact would be less than significant. Based on this analysis, it is reasonable to conclude that LBNL's contribution to any region-wide impacts would be less than considerable, in the context of CEQA cumulative impacts, because implementation of the 2006 LRDP would not substantially increase the Lab's contribution to any such risk and would, in some instances, decrease the Lab's contribution, compared to existing conditions (such as through construction of newer, more seismically secure facilities). Therefore, the cumulative impact would be less than significant.

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