4.6 HAZARDOUS MATERIALS

This chapter assesses the potential adverse impacts on human health and the environment due to exposure to hazards and hazardous materials that could be encountered as a result of implementation of the 2020 LRDP or the Chang-Lin Tien Center for East Asian Studies. A description of existing conditions regarding hazards and hazardous materials in the LRDP area is included to provide context for the analysis.

This section also addresses impacts related to the use of research materials that do not meet the standard criteria of hazardous materials but whose presence and use at UC Berkeley are a matter of concern to the surrounding community. These include laboratory research animals, transgenic materials and non-ionizing radiation. Existing contamination of soil and groundwater from previous activities is also discussed in this section. Potential hazards associated with wildland fires are addressed in Chapter 4.11, Public Services. The potential for impacts from toxic air emissions is considered in Chapter 4.2, Air Quality.

As described in the Initial Study and Notice of Preparation for the 2020 LRDP and Tien Center project,[1] the Tien Center would house office, classroom and library space, and would not significantly expand hazardous materials use on the campus, would not release hazardous materials in the event of upset or accident conditions, would not handle or emit hazardous materials within one-quarter mile of an existing or proposed school, and would not be located on a hazardous materials site.

During the scoping period for this EIR, comments were received regarding hazardous materials related primarily to activities at the Lawrence Berkeley National Laboratory (LBNL), which is outside the scope of this EIR, but is considered in the cumulative analysis. Additionally, commentors suggested mitigations for reducing potential environmental impacts related to hazardous materials. These suggestions were considered in preparing this chapter.

Commentors also sought information about environmental impacts of nanotechnology research. Nanotechnology is an emerging area of research aimed at the development of structures and devices at the atomic, molecular or macromolecular levels to produce materials with novel properties and perform functions at the molecular level. The U.S. Environmental Protection Agency (EPA) has listed nanotechnology as an area for future study under their "Futures Analysis" program, and only recently has the EPA begun funding research in this area. December 11, 2003 was the deadline for applications for grants under the EPA National Center for Environmental Research (NCER) for the "Impacts of Manufactured Nanomaterials on Human Health and the Environment". Thus, nanotechnology is an emerging area of study at the EPA in terms of potential environmental impacts. No regulatory standards have been developed. The topic is therefore not addressed further in this document.

4.6.1 ANALYTICAL METHODS

The term **hazardous material** is defined in different ways for different regulatory programs. This EIR uses the definition given in California Health and Safety Code Section 25501(n) and (o), which defines hazardous material as:

> …Any material that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment. "Hazardous materials" include, but are not limited to, hazardous substances, hazardous wastes, and any material which a handler or the administering agency has a reasonable basis for believing that it would be injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment.

By convention, most hazardous materials are thought to be hazardous chemicals, but certain radioactive materials and biohazardous materials, as defined here, are also hazardous. This EIR considers hazardous materials to include hazardous chemicals, radioactive materials, and biohazardous materials used at UC Berkeley. Some scientific materials do not meet the standard criteria for hazardous materials, but their presence and use on campus is a matter of concern to the surrounding community. These include laboratory research animals, transgenic materials, and non-ionizing radiation. A glossary of these and related terms is included in Chapter 9, Glossary.

This report was prepared using information gathered from available documentation, the Office of Environment, Health & Safety (EH&S) web site, and meetings and discussions with University personnel from EH&S, the Office of Laboratory Animal Care (OLAC) and the Radiation Safety team of EH&S. Data regarding hazardous materials, research materials of concern, and wastes used and generated at UC Berkeley were gathered by compiling available documentation such as program descriptions, monitoring reports, and compliance reports. Potential 2020 LRDP impacts concerning hazardous materials and materials of concern were then evaluated in light of existing programs and proposed LRDP policies intended to protect the environment from unintended consequences.

4.6.2 REGULATORY FRAMEWORK

Research, maintenance, facility operations, and construction activities involving hazardous materials at UC Berkeley are subject to numerous federal, state, and local laws and regulations. Appendix E provides an overview of the laws and regulations governing hazardous materials to which UC Berkeley must adhere.

Hazardous materials are regulated by numerous agencies whose jurisdictions and responsibilities sometimes overlap. At the federal level, the Environmental Protection Agency (EPA) is the principal regulatory agency. The Occupational Safety and Health Administration (Fed/OSHA) regulates the use of hazardous materials, including hazardous building materials, insofar as these affect worker safety through a delegated state program. The Department of Transportation (DOT) regulates transportation of hazardous materials. UC Berkeley laboratories using radioactive or biohazardous materials must comply with regulations of the Nuclear Regulatory Commission (NRC), the National Institutes of Health (NIH), and the US Department of Agriculture (USDA).

At the state level, agencies such as Cal/OSHA, the Office of Emergency Services (OES), and the Department of Health Services (DHS) have rules governing the use of hazardous materials that parallel federal regulations and are sometimes more stringent.

The Department of Toxic Substances Control (DTSC) is the primary state agency governing the storage, transportation and disposal of hazardous wastes. The DTSC may delegate enforcement authority to local jurisdictions that enter into agreements with the state agency under the Certified Unified Program Agency (CUPA) program, such as the City of Berkeley.

One key state law, which requires special assessment under CEQA, relates to the so-called Cortese List. The Hazardous Waste and Substance Sites (Cortese) List is a planning document used by the state, local agencies and developers to comply with CEQA requirements in providing information about the location of hazardous materials release sites. Government Code Section 65962.5 requires that an updated list be prepared at least annually by the California EPA. However, the list has not been updated since 2001 and further updates are not planned.

4.6.3 LOCAL PLANS AND POLICIES

Although the University is constitutionally exempt from local regulations when using its property in furtherance of its educational purposes, it is University policy to evaluate proposed projects for consistency with local plans and policies. Therefore, this section outlines the plans and policy goals of the cities of Berkeley and Oakland related to hazardous materials.

CITY OF BERKELEY

The City of Berkeley General Plan includes a number of policies intended to prevent and respond to hazardous materials incidents. These policies state the City's intention to establish truck routes, provide emergency access routes, control and regulate the use, storage and transport of hazardous materials. Several policies address reducing the risk of hazardous materials exposure through the use of environmental investigations, risk reduction practice and the use of warning systems. Additional policies in the General Plan are intended to encourage a reduction in the quantities of hazardous waste generated in the City.

FINDINGS OF THE BERKELEY GENERAL PLAN EIR

The City of Berkeley General Plan EIR found that no potentially significant hazardous materials impacts would occur with implementation of the General Plan.[2] The EIR further stated that population and employment increases would increase use of hazardous household, commercial and industrial materials, contributing cumulatively to the chance of accidental exposure to hazardous materials and hazardous material disposal sites. The increases "would be incremental, and would not be considered to cause a significant cumulative effect."[3]

CITY OF OAKLAND

As shown in Figure 3.1-1, much of the Hill Campus and a portion of the LRDP Housing Zone are within the City of Oakland city limits. The City of Oakland General Plan does not include any policies pertaining to hazardous materials.

4.6.4 EXISTING SETTING

During the course of daily operations UC Berkeley faculty, staff and students use many materials, some of which are considered hazardous. Such hazardous materials include many chemical reagents, solvents, fuels, paints, cleansers, and pesticides that are used in activities such as laboratory research, building and grounds maintenance, vehicle maintenance, and fine arts. Other hazardous materials, including radioactive and biohazardous materials, are also used in laboratory research. Hazardous materials use at UC Berkeley generates hazardous byproducts that must eventually be handled and disposed of as hazardous wastes.

Most activities involving the use of hazardous materials occur inside buildings. Therefore, once hazardous materials are delivered to UC Berkeley facilities, the sources of potential releases for hazardous materials to the immediate outside environment would be limited to inadvertent sewer disposals, accidents in outdoor areas, and air emissions from the fume hood and other building vents. The potential for impacts from toxic air emissions is considered in Chapter 4.2, Air Quality. The potential impacts from accidents in outdoor areas and impacts due to sewer disposal are discussed in Chapter 4.7, Hydrology and Water Quality. Hazardous materials could be released to the environment during their delivery to or removal from campus facilities; the potential for such a release is considered in this section.

In the following discussion, the six broad categories of hazardous materials and research materials of concern--non-radioactive hazardous chemicals, biohazardous materials, radioactive materials, laboratory animals, transgenic materials and non-ionizing radiation--are addressed in separate subsections. Each of these subsections follows the same outline, with subheadings on types and volumes used and UC Berkeley's safety record. The UC Berkeley emergency response program, existing contamination on campus, and the existing setting for the LRDP Housing Zone are also covered in separate subsections.

NON-RADIOACTIVE HAZARDOUS CHEMICALS

USE, TYPES AND VOLUMES

There are more than 1200 laboratories at UC Berkeley that use a wide variety of chemical substances for research and teaching, including solvents, reagents, organic compounds, and aromatic hydrocarbons. Hazardous materials are also used in vehicle, grounds, and building maintenance as well as in academic programs. Chemicals used in maintenance may include gasoline and diesel fuels, oils and lubricants, antifreeze, solvents and corrosives used as cleaners, paints, and paint thinners, and Freon refrigerants. UC Berkeley maintains a computerized inventory of chemical materials stored on campus and submits this inventory to the City of Berkeley Toxics Management Division (TMD) as part of its annual update to its Hazardous Materials Business Plan.

There are currently four underground storage tanks (USTs) on the Campus Park at UC Berkeley. All four contain diesel fuel for emergency generators. Three of the four USTs are permitted, and one is exempt. An exempt tank used to store hazardous materials must meet all requirements of a UST and have routine visual monitoring and secondary containment.

UC Berkeley currently owns and operates approximately 45 above-ground fuel storage tanks (ASTs) at multiple locations on the Campus Park, with a total shell storage capacity of 10,000 gallons.[4] The ASTs were installed between 1970 and 2003. Most are used to store diesel fuel for emergency generators that are automatically engaged when power to a building is disrupted, to allow for evacuations of buildings and to ensure that critical lab equipment continues to operate. The ASTs managed by UC Berkeley Facilities Services department store diesel fuel for emergency generators needed to provide lighting for building evacuations and for maintaining critical equipment during an emergency power outage. The two tanks owned and operated by the Mechanical Engineering Department share a common manifold and are used to supply gasoline and diesel fuel for the engine laboratory, a research and teaching laboratory.

Hazardous waste is generated through laboratory operations as well as facilities maintenance and operations. UC Berkeley has prepared guidelines for proper disposal of hazardous wastes that are based on regulations established by the EPA and DTSC and that have been reviewed by both agencies. At UC Berkeley, EH&S is responsible for disposing of hazardous waste. Before EH&S picks up materials for disposal, they must be packaged and labeled properly, which includes placing them in appropriately closed containers, segregating incompatible materials, and identifying the contents.

Unwanted hazardous materials are picked up from campus generators. Waste is sorted, packaged and staged for shipment off-campus at the campus Hazardous Materials Facility. Reusable hazardous materials are sorted and held for redistribution to campus users. Low-level radioactive waste is also managed at this facility. The 20,000 GSF facility, which began operating in 1999, is designed to provide safe operations under both normal and upset conditions and to remain operational in the aftermath of a maximum credible earthquake. The building is constructed with noncombustible and fire resistive materials. A system of drains, sumps, and a holding tank is designed to contain potential spills and fire protection flow. The facility has capacity to process an estimated 375 tons of hazardous chemical waste per year.

In 2002, UC Berkeley[5] generated approximately 137,700 pounds of routinely generated hazardous waste, a reduction of over 53 percent from 1990 levels (see Table 4.6-1). Hazardous waste streams at UC Berkeley fall into four major categories:

- **Solvents**. Many different halogenated (organic solvents containing chlorine, bromine, or another halogen element) and non-halogenated solvents (organic solvents that do not contain a halogen element such as hydrocarbon-only solvents, alcohols, non-halogenated aromatic compounds) are used in laboratory experimental processes. The largest quantities of halogenated solvents are used in chemical synthesis, extractions, and analysis in the chemistry and biochemistry laboratories. Various halogenated ignitable organic chemicals are used for cleaning and maintenance in facilities management. The largest quantities of non-halogenated solvents are used in chemical synthesis, extraction, and analysis in the chemistry and biochemistry laboratories, and some waste solvents are used for cleaning glassware. Various non-halogenated ignitable organic chemicals are used for cleaning and maintenance in facilities management.

TABLE 4.6-1
MAJOR HAZARDOUS WASTE STREAMS, UC BERKELEY MAIN CAMPUS (1990–2002)

	1990	1994	1998	2002
All Solvents	110,920	68,477	62,852	45,016
Lab Pack Chemicals	87,330	44,918	20,526	28,037[A]
Dry Waste	47,820	95,508	32,623	48,437[A]
Mixed Radioactive	19,085	11,200	2,891	57
Photo Waste (aqueous)	13,780	17,873	9,775	7,855
Bulk Liquid [B]	7,760	2,342	0[C]	5,392
Motor/Pump oil	4,700	40	0[C]	n/a[D]
Paint	2,620	6,765	1,812	2,006
Others	0	2,667	7,277	907
Total	**294,015**	**249,790**	**137,756**	**137,707**

Notes: all quantities reported in pounds.

n/a = category not in use.

[A] The increases in the amounts of lab pack chemicals and dry waste are probably related to a number of lab cleanouts related to construction projects, particularly Stanley Hall, and increased attention to chemical management resulting from a U.S. EPA self audit in late 2001.

[B] Reported as Heavy Metal Liquids for 1990-1998. The increase in 2002 is due to the inclusion of corrosive liquids, which were previously included in other categories.

[C] In 1998, motor oil and heavy metal liquids were either included in "Others" or exempt from SB14 reporting.

[D] Included in "Others."

Source: Heather Randol, Hazardous Materials Specialist, UC Berkeley Office of Environment Health and Safety. Personal communication with Alisa Klaus, URS Corporation. October 10, 2003. The hazardous waste volumes reported in the table are from UC Berkeley' SB14 reports.

- **Lab Pack Chemicals**. Thousands of different chemicals in quantities ranging from micrograms to several pounds are used in experimental research and teaching processes. Some hazardous chemical waste occurs due to expired shelf life or changes in research techniques. Most of the extremely hazardous waste comes from this category. Building maintenance and facility operations require many chemicals for a variety of purposes.
- **Dry Waste**. Dry waste consists of items contaminated with trace amounts of hazardous chemicals. It includes laboratory debris (such as gloves, wipes, and glassware) generated during experimental operations or cleanup of laboratory spills, as well as crushed empty chemical containers. Dry waste is disposed of as hazardous waste.
- **Photo Waste**. This category consists of fixer and developer generated from small photo labs located in research departments and in teaching studios and facility printing operations.

For each waste stream, Table 4.6-1 summarizes the volumes disposed of in 1990, 1994, 1998, and 2002. The volumes for 1990 and 1994 are included for purposes of comparison. Most of the chemical waste that leaves campus is incinerated at off site facilities licensed for this purpose.

UC Berkeley has also implemented programs and controls to detect inadvertent release of hazardous material to the sanitary sewer. Pouring hazardous wastes down drains and disposing of hazardous materials with ordinary solid waste are prohibited by law and by campus policy. UC Berkeley actively notifies faculty, staff, students and visitors about prohibitions against drain and garbage disposal of hazardous wastes through guidelines,

training and signage. EH&S publishes detailed guidelines for drain disposal of chemicals and best management practices for preventing slug discharges to sewers on its website.

UC BERKELEY SAFETY RECORD

EH&S's commitment to creating a safe workplace and carrying out safe work practices is exemplified by the number of safety programs that have been put in place to meet all federal, state and local regulations. Its safety record has demonstrated compliance on all fronts and a dedicated effort to improve programs to meet, and in some cases, exceed the standard of compliance set by regulatory agencies.

Measures have been put in place to avoid or mitigate potential accident scenarios. The Laboratory Operations and Safety Committee and the Hazardous Waste Management Committee have established guidelines and offer training courses and assistance in developing safety and environmental management programs. Specific topics for guidelines set forth by EH&S to protect the safety of workers and students and maintain safe workplaces include transportation of hazardous materials off campus, drain disposal of chemicals, fume hood maintenance, minimization of hazardous waste, material safety data sheets (MSDSs), chemical exchange programs, and eye protection.

The City of Berkeley TMD inspects USTs annually and periodically inspects locations where hazardous material or hazardous waste is stored at UC Berkeley. During recent City of Berkeley TMD inspections, violations noted were limited to a minor violation involving inaccurate chemical inventory in one lab and a violation for labeling errors in two labs.[6] The City TMD also issued a UST violation notice for a failed secondary piping pressure test at a tank; a corrective action plan is being developed to bring the secondary piping into compliance[8] Campus wastewater is monitored regularly by EBMUD, with the first violation in 4 years occurring in 2000.

EH&S analyzes chemical storage data annually to determine compliance with California Accidental Release Prevention Program (CalARP). A database of hazardous material incidents is maintained by EH&S as they occur. From 2001 to 2003, incidents were usually minor and included broken mercury thermometer cleanups, small chemical spills, sewage and fuel spills. EH&S works directly with departments where incidents occur and provides guidance on avoiding future occurrences when applicable.

BIOHAZARDOUS MATERIALS

USE, TYPES AND VOLUMES

The majority of biological research conducted at UC Berkeley involves the use of relatively low-level biohazardous materials. Nearly all biological research at UC Berkeley is conducted at Biosafety Levels 1 or 2, which are explained in Appendix E. Biosafety Level 3 agents are used at only two locations on the UC Berkeley campus.

All faculty whose research involves working with biohazardous agents in animals and/or the laboratory must apply for a Biohazard Use Authorization (BUA). As of 2004, there were 50 active BUAs on campus for 47 investigators, including three BUAs for Biosafety Level 3 work. The three BUAs issued for Biosafety Level 3 work involve tuberculosis, human immunodeficiency virus (HIV), and the pathogenic fungi Histoplasma.

UC BERKELEY SAFETY RECORD

EH&S oversees the handling of biohazardous materials, conducts annual inspections of facilities where these materials are used, and investigates all incidents. UC Berkeley has an excellent safety record with respect to biohazardous materials and wastes. There have been only minor incidents involving biohazardous materials, and no serious on- or off-site consequences have occurred to people or the environment as a result of these incidents.

The medical waste program at UC Berkeley was inspected by the California Department of Health Services on June 8, 2000. The inspector reviewed tracking records and inspected medical waste accumulation sites and laboratories that generate medical waste. No major violations of biohazardous waste regulations were identified. Minor violations identified during this inspection included procedural practices such as overfull sharps containers and inappropriate containers.[7] EH&S worked directly with individual laboratories to address these problems.

RADIOACTIVE MATERIALS

Radioactive materials are used in certain types of research. Some of the research done at UC Berkeley would be extremely difficult or impossible to perform without the use of low-level radioactive materials. Radioactive materials contain atoms that spontaneously emit radiation in the process of trying to form a more stable atom; this radiation can be detected. Researchers take advantage of the ability to detect radiation to learn about biological, physical, and chemical processes. For example, in biological research, radioactive isotopes can be used to trace biological chemicals through metabolic pathways.

Each nuclear disintegration emits energy. The absorbed dose from radioactivity is measured in *rads* (Roentgen Absorbed Dose). The rad is a measure of the amount of energy absorbed per unit mass of a medium. The rad is not a very useful metric to express the dose to a human; therefore, the *rem* (Roentgen Equivalent Man) is used. The rem relates the risk from radiation exposures to the measurement unit (rad). That is, a measurement expressed in rads can not be used to express the human risk from a rad; therefore, the rad is converted to rem and the rem can be used to express risk.

Residents of the Bay Area receive about 250 to 300 mRem/yr (0.25 to 0.3 rem/yr) from background and medical sources. *Background sources* include solar and cosmic radiation, radon gas (from soil, rocks, and some building materials), and ingestion of potassium-40 (^{40}K) and other naturally radioactive materials present in the body or in food.[8] *Medical sources* include medical and dental X-rays (on average about 70 mRem/yr).

USE, TYPES AND VOLUMES

UC Berkeley uses a variety of radionuclides typical of a large research-oriented university. Over the past 10 years, better laboratory technologies have reduced the use of radioactive materials on campus by over 50 percent.[9]

DISPOSAL OF RADIOACTIVE WASTES

Radioactive waste is segregated, packaged, and labeled by the generating user, who then contacts EH&S for pickup. EH&S removes radioactive materials from laboratories and centralized pickup units and then transports these materials to the Hazardous Materials Facility. The materials are managed and prepared for disposal.

Radioactive wastes are typically liquid or solid. Liquid radioactive wastes are disposed of in three ways:

- If decay time requirement for the specific isotope is allowed per regulations, the liquid waste is collected, held on site, and allowed to decay to background levels in accordance with the radioactive materials license and then shipped to a permitted treatment, storage and disposal facility.
- If it meets the criteria for disposal under the DHS and NRC regulations and the UC Berkeley Drain Disposal Guidelines, it is discharged to the sanitary sewer. The maximum permitted cumulative annual release allowed under the UC Berkeley radioactive materials license is one curie.
- If it cannot be decayed on-site or discharged to the sanitary sewer, it is shipped off-site to a permitted treatment, storage and disposal facility licensed for radioactive materials.

Short-lived solid radioactive wastes are collected and held for decay in the Decay-in-Storage Program where they decay to background levels. These wastes are then disposed of as non-radioactive waste. Long-lived solid waste is shipped off-site to a licensed facility for treatment and consolidation and then burial at a licensed low-level radioactive waste site. Currently there is no disposal capacity in California for low-level radioactive waste and UC Berkeley, like other generators in the state, utilizes out-of-state disposal options. Appendix E provides a detailed discussion of waste disposal.

UC BERKELEY RADIATION SAFETY RECORD

UC Berkeley has never exceeded the license possession limits for radioactive materials and has had good-to-excellent compliance by researchers with inventory and limits.[10]

EXISTING EXPOSURE LEVELS

The EPA provides methods to estimate the dose that humans located both near and far from the campus would receive from the release of radioactive materials to air. The most accurate (and most complex) of these models is the CAP88-PC model. The CAP88-PC model calculates the dose to the maximally exposed individual (MEI). The MEI is the hypothetical person who receives the greatest calculated exposure to radioactive releases from the campus use of radioactive materials. The CAP88-PC model is very conservative because it assumes doses as much as ten times greater than the actual dosage received by people in the area. The MEI dose calculation for academic year 1998-99 was 0.428 mRem for a person located 250 meters south of the campus center. The National Emissions Standards for Hazardous Air Pollutants (NESHAP) limit is 10 mRem/yr, so the calculated dose received by the MEI is less than 5 percent of the EPA limit. Due to the exceptionally conservative nature of the CAP88-PC model, the actual doses are more likely to be less than 1 percent of the calculated value.[11]

NON-IONIZING RADIATION

Non-ionizing radiation (NIR) is radiative energy that is not created by radioactive materials and does not impart ionizing energy in a biological medium such as the body. Many devices throughout the modern world either directly or indirectly act as sources of NIR. Many sources of NIR are present at UC Berkeley in research applications or in ancillary equipment. These sources include lasers, large magnets, microwave generators, and radio-frequency radiation. In general, NIR tends to be less hazardous to humans

than ionizing radiation. However, depending on the wavelength/frequency and the irradiance (or power density) value, NIR sources may present a human health hazard. Most typically the hazard, if any, is to those in the lab and not members of the public.[12]

Regulations for laser hazards fall under the California Code of Regulation (CCR), Title 8, subchapter 7, section 3203 – "Illness and Injury Prevention Program." At this time, Cal/OSHA does not have specific laser safety regulations, however Cal/OSHA inspectors may refer to the ANSI Z136.1 Standard in inspecting laser facilities.

The UC Berkeley Laser Safety Program, overseen by the Non-Ionizing Radiation Safety Committee (NIRSC), is based on the ANSI Z136.1 Standard for the Safe Use of Lasers. The Laser Safety Program provides control measures, medical surveillance, and safety training based on the ANSI Z136.1 standard.[13]

The ANSI Z136.1 standard classifies laser/laser systems into four classifications: Class 1, 2, 3(a & b), and 4. Higher numbers reflect an increase potential for injury/harm.

- Class 1 is a laser/laser system, which under normal operating conditions does not present a hazard.
- Class 2 is a laser/laser system that produces a visible wavelength but does not present a hazard due to the blink reflex of the eye.
- Class 3a is a laser/laser system that would normally not be hazardous is viewed momentarily but is a viewing hazard if viewed directly with an optical instrument.
- Class 3b is a laser/laser system that can be hazardous if viewed directly or from a specular reflection.
- Class 4 is a laser/laser system that can be hazardous if viewed from direct, specular or diffuse reflection. Also presents a skin hazard and fire hazard.

The UC Berkeley laser safety program covers some Class 3a, and all Class 3b and 4 lasers/laser systems. Control measures, safety training, and medical surveillance are required for higher Class lasers/laser systems (3b and 4).

LABORATORY ANIMALS

USE, TYPES AND VOLUMES

Twenty-seven academic departments and organized research units at UC Berkeley use vertebrate animals in research and instruction. Currently 183 faculty members have active animal use protocols. Examples of recent highly recognized research projects at UC Berkeley that involved the use of animals include studies designed to improve the resolution and significance of brain imaging techniques, new models for the treatment of prostate cancer, the impacts of pesticides on native animal species, use of DNA microarray analysis of gene expression to investigate patterns of gene expression in the central nervous system, and the role of diet in cancer.

Approximately 30,000 research animals are housed at UC Berkeley. Seventy percent of these are mice and 20 percent are cold-blooded animals, such as amphibians, fish and reptiles. Nine percent are other rodents (rats, hamsters, guinea pigs and wild rodents), while the remaining one percent is composed of rabbits, cats, non-human primates, coyotes, hyenas, birds, and invertebrates such as cockroaches.[14]

All of the research animals on campus are housed in four main animal facilities and two small satellite facilities designed to comply with federal standards for research animal facilities, including separation of animal rooms from personnel areas and other functional areas; provisions for cage washing and animal isolation and quarantine; and specific requirements for interior drainage, ventilation, temperature and humidity control, and other building features.

UC BERKELEY SAFETY RECORD

Animal care and use facilities are subject to regular inspections by multiple entities, as summarized in Table 4.6-2. As part of compliance with Animal Welfare Act regulations, the UC Animal Care and Use Committee (ACUC), which is responsible for animal care services, conducts twice-yearly inspections of the current animal care and use program and all UC Berkeley animal facilities. Additionally, they conduct annual reviews of animal care and use protocols for any proposed use of live vertebrate animals. This requirement applies to all uses of animals including nonfunded projects, internally funded projects, teaching and pilot studies.

UC Berkeley is also subject to random, unannounced inspections by USDA and DOD veterinarians. Failure to comply with animal welfare regulations could result in civil or criminal prosecution. No noncompliance items were identified during the most recent USDA inspections, conducted in September 2002 and September 2003. Finally, as part of its ongoing participation in the voluntary accreditation program run by Association for Assessment and Accreditation of Laboratory Animal Care (AAALAC) International, UC Berkeley is subject to inspections every three years by AAALAC International to ensure compliance with the National Research Council's Guide for the Care and Use of Laboratory Animals.[15]

UC Berkeley has maintained AAALAC International accreditation since 1994. Since the original accreditation, UC Berkeley has undergone and passed three additional inspections in 1997, 2000, and 2003. Overall, the most recent AAALAC International inspection report praised UC Berkeley laboratory animal care programs and staff for excellence.[16]

TABLE 4.6-2
EXTERNAL REVIEWS OF UC BERKELEY ANIMAL CARE AND USE PROGRAMS

Entity	Frequency	Notes
USDA	Twice yearly	Random, unannounced inspections by USDA veterinarians for compliance with Animal Welfare Act regulation
AAALAC	Once every 3 years	Quality control committee monitors compliance with Animal Welfare Act regulations and the National Research Council Guide for the Care and Use of Laboratory Animals
DoD	Random	Random inspections by DoD veterinarians to assess compliance with Animal Welfare Act regulations

TRANSGENIC MATERIALS

Combining DNA (which is the primary genetic material in all cells) from different existing organisms (plants, animals, insects, bacteria, etc.) results in modified organisms called "transgenic." Transgenic materials include microorganisms, plants, and animals that have been genetically engineered or modified. Recombinant DNA techniques create new genetic combinations by changing, adding, or subtracting DNA genes, but this methodology does not necessarily mean that new organisms are created.

Transgenic cell lines and organisms are used as fundamental research tools in medical, biological, agricultural, and environmental research. Transgenic cell lines and organisms may also become products or be used to produce useful biochemicals such as medicines. Much research is performed using tissue cultures or benign bacteria grown under laboratory-controlled conditions. With the exception of transgenic bacteria that could be infectious, transgenic materials generally do not pose a threat to public health or the environment.

USE, TYPES AND VOLUMES

At UC Berkeley, recombinant DNA research is conducted on microorganisms and animals in laboratories, and on plants. Researchers at UC Berkeley use transgenic organisms and cell lines to investigate fundamental processes in biological metabolic and developmental pathways, to develop improved agricultural products, to investigate causes and cures for disease, and to chronicle and preserve genetic diversity. UC Berkeley researchers currently use recombinant DNA technology to identify the genes of the tuberculosis bacterium, to investigate nerve conduction, to study visual development, and to explore factors that cause diseases. Viral vectors are being created to treat human diseases such as cystic fibrosis and macular degeneration of the eye. Transgenic animals are currently used on campus to define the functions of particular enzymes and to test cancer treatments although in the future, they may be used for other types of research.

Recombinant DNA research on plants at UC Berkeley is conducted in controlled, segregated greenhouses. Some limited field research with transgenic plants is also undertaken on the Oxford Tract near the Campus Park, and at any of the nine UC field stations elsewhere in the state.[17] Currently, one or two UC Berkeley investigators are conducting field-based transgenic research.[18] The research projects use transgenic plants to analyze growth, stress reaction, and general plant development.

Potential environmental concerns associated with transgenic plants relate to genetic contamination of non-transgenic plants from cross-pollination and adverse impacts on biodiversity. Some transgenic plants are engineered to produce a pesticide, which could potentially harm non-target organisms or allow pests to develop immunity to the pesticide. No research at UC Berkeley is currently conducted with pesticidal plants. All research involving transgenic plants at UC Berkeley is conducted at the lowest biosafety levels, BL1-P and BL2-P, and most at BL1-P.[19] With the exception of some types of research involving transgenic plants, research with transgenic materials is conducted in standard laboratories and does not require unique facilities.

UC Berkeley Safety Record

Laboratories involving microorganisms and animal-based recombinant DNA research are subject to annual inspections by EH&S to verify compliance with federal law and guidelines. Animal facilities, including transgenic animal facilities, are inspected internally by the ACUC every six months and by AAALAC International every three years. At the frequency of about twice a year, USDA also conducts random, unannounced inspections of animal facilities for compliance with the Animal Welfare Act.

The greenhouses that contain transgenic plants have been inspected twice in the past ten years by the USDA Animal and Plant Health Inspection Service, accompanied by a representative of the California Department of Agriculture. The inspection results have been satisfactory.[20] The USDA has the authority to inspect field research involving transgenic plants. However, the agency does not conduct inspections on a regular basis. EH&S has no record of any fines or violations as a result of field inspections.[21] UC Berkeley has had no recorded incidents of the unintentional release of transgenic organisms or of any harm caused by transgenics or recombinant DNA technologies. The one complaint to NIH in 1991 resulted in no factual finding of violation and served to strengthen the biosafety program by placing it under internal review.[22]

SITES OF ENVIRONMENTAL CONCERN

Campus Park and City Environs

Only one campus site, the UC Garage at 1952 Oxford Street, which is in the Adjacent Blocks West, is listed on the Cortese list of hazardous materials sites. The California Facility Inventory Database Underground Storage Tank (CA FID UST) and Historical Underground Tank Registered Database (HIST UST) lists show seven historic or existing USTs at the site. The USTs included a 1,000-gallon leaded gasoline tank, a 6,000-gallon and a 7,500-gallon unleaded gasoline tank, a 125-gallon and a 300-gallon waste oil tank, and a 1,000-gallon and a 5,000-gallon diesel tank. All of the USTs predated the leak detection system requirements. The tanks were removed and a diesel fuel release to soil and groundwater was reported in July 1988. Gasoline contamination of soil was also noted in the gasoline tank excavation. The extent of soil and groundwater contamination from the leaking tanks at the UC Garage site has been fully characterized. The soil and groundwater contamination has migrated beneath the garage building but not off-site. In March 1998, the City of Berkeley agreed that further active remediation of the petroleum hydrocarbons in soil at the site would not be required.[23]

Other Campus-Owned Berkeley Properties

The UC Berkeley-owned Physical Plant-Campus Services corporation yard site at 2000 Carleton Street is also on the Cortese list. Contamination of soil and groundwater by

gasoline released from a leaking UST at this site was discovered in July 1988, when the tank was removed.[24] By June 2001, concentrations of contaminants in soil had decreased through natural attenuation to levels below the Regional Water Quality Control Board's (RWQCB's) Risk-Based Screening Levels. UC Berkeley has obtained site closure from the RWQCB and is in the process of closing the remaining monitoring wells.

LRDP HOUSING ZONE

Land uses in the LRDP Housing Zone are predominantly commercial and residential. The largest hazardous materials users in the LRDP Housing Zone are medical facilities. Smaller hazardous materials users include commercial facilities serving the local community, such as automobile repair shops, gasoline service stations, printers and photo processors, dry cleaners, and dentists.[25] Abandoned home heating oil tanks are also found occasionally in some residential buildings.

A detailed assessment of past and current hazardous materials use in the rest of the LRDP Housing Zone has not been conducted, and contaminant sites are not indicated in the City of Berkeley General Plan EIR. At sites historically or currently occupied by gasoline service stations, auto repair facilities, dry cleaners, and other businesses that use hazardous materials, soil and/or groundwater may be contaminated as a result of these uses.

CONTAMINATION IN EXISTING BUILDINGS

Due to the age of UC Berkeley, lead paint, asbestos-containing materials, polychlorinated biphenyls (PCBs) and mercury are present in many campus buildings. In addition, in buildings currently or formerly used as laboratories, building materials such as floor and wall surfaces, sink traps, and drain piping, can be contaminated by spills, aerosol releases, or drain disposal of radioactive or chemical hazardous materials. PCBs may also be present in fluorescent light ballasts and some building materials. Workers can be exposed through inhalation or ingestion of lead dust, asbestos particles, mercury vapors or other contaminants when building materials are disturbed or made friable by drilling, sanding, or other destructive processes.

4.6.5 STANDARDS OF SIGNIFICANCE

The significance of the potential impacts of the 2020 LRDP related to hazardous materials was determined based on the following standards:

Standard: ***Would the project create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?***

Standard: ***Would the project result in development located on a hazardous materials site as listed on the "Cortese List" (compiled pursuant to Government Code Section 65962.5) and, therefore, create a significant hazard to the public or the environment?***

Standard: ***Would the project 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?***

Standard: ***Would the project result in development that would emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?***

4.6.6 POLICIES AND PROCEDURES GUIDING FUTURE PROJECTS

In addition to compliance with law and regulation, projects conducted under the 2020 LRDP would be planned, constructed and operated in accordance with the following policies, programs and procedures. Detailed descriptions of the policies, programs and procedures are provided in Appendix E.

2020 LRDP

The 2020 LRDP acknowledges that providing the space, technology, and infrastructure required to pursue new fields of inquiry and discovery, and integrate education and research, are paramount to the UC Berkeley mission. This chapter recognizes that there are hazards associated with this research, and while the 2020 LRDP does not contain specific policies about hazardous materials, it does present objectives and policies that indirectly support the safe use of these materials. Three Objectives are particularly relevant:

- **Plan every new project as a model of resource conservation and environmental stewardship.**
- **Provide the space, technology and infrastructure we require to excel in education, research, and public service.**
- **Plan every new project to represent the optimal investment of land and capital in the future of the campus.**

The Objective of ensuring every new project serves as a model of resource conservation and environmental stewardship supports the practice of responsible use of hazardous materials. The policies under the second and third Objectives to eliminate 'poor' and 'very poor' seismic ratings in campus buildings through renovation or replacement; to consider enhanced levels of seismic performance for critical buildings; and to design new campus laboratory buildings to a standard equivalent to LEED 2.1 certification and LABS 21 environmental performance criteria also support the safe use, production, and disposal of hazardous materials, and help to decrease the risk of releasing these materials into the environment.

CAMPUS POLICIES AND PROCEDURES

OFFICE OF ENVIRONMENT, HEALTH, AND SAFETY

The UC Berkeley Office of Environment, Health, and Safety (EH&S) has primary responsibility for coordinating the management of hazardous materials on campus in compliance with applicable laws, regulations, and standards. EH&S issues guidelines, evaluates departmental activities, and disseminates general information regarding the handling, storage, and disposal of hazardous materials and wastes. EH&S also provides training programs and annual refresher courses that are compulsory for individuals whose workplaces can potentially expose them to hazardous materials. Descriptions of specific EH&S programs are provided in Appendix E.

HAZARDOUS MATERIALS MANAGEMENT PLAN

In compliance with the Hazardous Materials Release Response Plans and Inventory Act of 1985, UC Berkeley has prepared a Hazardous Materials Management Plan (HMMP) that includes an inventory of hazardous materials handled on campus, an emergency response plan, and a training program in safety procedures and emergency response. The HMMP is updated and submitted to the City of Berkeley TMD annually.

CHEMICAL HYGIENE PLANS

Cal/OSHA (Title 8 CCR Section 5191) requires each laboratory to have a Chemical Hygiene Plan (CHP) containing Standard Operating Procedures (SOPs) relevant to safety and health considerations. EH&S periodically reviews lab-specific SOPs, verifies that proper training has been documented, and performs periodic laboratory inspections.

HAZARDOUS WASTE MANAGEMENT, HANDLING, AND MINIMIZATION

EH&S provides guidelines for proper packaging and labeling of unwanted hazardous materials. EH&S also picks up hazardous materials for proper disposal after users properly package and label unwanted items. EH&S staff members trained and certified by the Department of Transportation oversee all off-campus shipment of hazardous waste and assist in preparing hazardous materials for off-campus shipment. In compliance with the state Hazardous Waste Source Reduction and Management Review Act of 1989, UC Berkeley has implemented a comprehensive waste minimization program since 1991.

TOXIC USE REDUCTION PROGRAMS FOR CAMPUS ACTIVITIES

UC Berkeley has taken proactive voluntary steps that reduce the use of toxic substances in both academic research activities and campus maintenance operations. These programs are responsible in a large part for the reduction of the volume of chemicals used on campus and have made a significant impact in hazardous materials waste reduction. Programs to reduce chemical use in academic and research activities include the chemical exchange program, which promotes efficient use of chemical inventories, and the mercury free labs program which encourages the elimination of mercury containing equipment in laboratories.

In 1996 Cal/EPA honored UC Berkeley for its leadership in promoting reduced-risk methods of urban pest management on campus. The Integrated Pest Management Program, which has been in place since the early 1970s emphasizes the use of parasites, trapping, habitat modification and education over the use of pesticides. This program has resulted in the reduction in use of chemical pesticides by 100 percent in campus housing and research facilities, and by 95 percent in campus kitchens.[26] All new building designs are reviewed by Physical Plant Campus Services EH&S specialists for their ability to structurally resist pests. Campus custodial operations have also switched to environmentally-friendly cleaning products.

BIOHAZARD SAFETY

UC Berkeley has implemented the following programs to ensure that all work involving biohazardous materials and medical waste is conducted in compliance with federal and state regulations:

- All faculty whose research involves working with biohazardous agents, including recombinant DNA, in animals and/or the laboratory must apply for a Biohazard Use Authorization (BUA).
- The Chancellor's Advisory Committee on Laboratory and Environmental Biosafety (CLEB) is charged with the responsibility of formulating campus policies to ensure the safe conduct of research involving biohazardous agents and materials, in accordance with guidelines set forth by the National Institutes of Health and the Centers for Disease Control. CLEB also reviews and approves BUA applications.
- EH&S assists campus users in implementing the OSHA Bloodborne Pathogen Standard and in complying with NSF Standard 49 and Cal/OSHA ventilation requirements for biosafety cabinets. As part of these programs, hepatitis vaccinations are offered free of charge to all employees and students who work with human blood. Exposure Control Plans also provide for worker training and prescribe safety measures such as engineering controls (e.g. splash guards) and personnel protective equipment (e.g. face shields and gloves). All blood is to be handled as if it is contaminated by an infectious agent, whether or not its status is known.
- To minimize workers' exposure to biohazards, UC Berkeley has established a Biosafety Program. In accordance with applicable UC Berkeley policy, protective measures are used and protective clothing is worn when working with biohazardous material to prevent exposure by skin contact. The potential for ingestion of hazardous biological agents is minimized by following the UC Berkeley policy banning eating in laboratories and requiring proper washing. Also in accordance with campus policy aimed at reducing the chance of ingestive exposure, mouth pipetting is not allowed.
- Engineering controls provide a degree of containment of biological agents and minimize personal contact with these agents. These safety features are built into facility and equipment design and operation. The most significant engineering control that can be implemented is observation of the correct BSL criteria of laboratory and equipment design.
- UC Berkeley employees could be exposed to biological agents via contact with open wounds from skin punctures due to animal bites, and scratches or cuts and lacerations with contaminated cages or sharp edges. This risk is minimized by protective clothing and training in animal handling. UC Berkeley staff are also required to wear respiratory protection when research protocols involve readily aerosolized agents, such as tuberculosis.
- An EH&S staff member provides training for those who plan to conduct work with biological materials, including recombinant DNA, and assists researchers in meeting applicable standards. CLEB reviews and approves biological research at UC Berkeley. The committee evaluates the potential risks and the adequacy of the safety measures to be implemented prior to beginning research projects involving biohazardous materials.

RADIATION SAFETY

The UC Berkeley Radiation Safety team (RST) ensures that work with radioactive materials and radiation-producing machines is conducted in accordance with policies and standards set forth by the Radiation Safety Committee. The campus Radiation Safety Officer administers the Radiation Safety Program so as to provide adequate protective measures against exposure for visitors, faculty, staff and the community at large. The oversight and policy setting group (the Radiation Safety Committee or RSC)

is composed of faculty representatives with significant experience in the safe use of radiation and radioactive materials. The RSC reviews the work of the Radiation Safety team and sets its policy.

Before obtaining radioactive materials or machines that produce radiation, each principal investigator must apply for a Radiation Use Authorization (RUA). The campus Radiation Safety Officer reviews and approves all initial RUAs and renewals, and verifies that other required approvals are in place before radioactive materials are delivered or work commences. EH&S is responsible for the UC Berkeley radioactive waste program in conformance with applicable policies and regulations.

UC Berkeley is required to maintain an inventory of the radioactive materials on campus and to periodically assure that it does not exceed the prescribed limits in the Radioactive Materials License. Under this license, UC Berkeley has agreed to follow the regulations in CCR Title 17. Periodically this license is amended or renewed by the state based on changes in state law or approved requests from the University. The state license issued to UC Berkeley stipulates specific limits and conditions as follows:

- The maximum amount of radioactivity acquired under the license that may be possessed at any one time,
- The locations where licensed materials may be used,
- Purpose and conditions of use,
- Monitoring of radiation exposure to personnel by use of radiation dosimetry, and
- Methods of transportation of radioactive materials to and from the use location.

Several regulatory dose limits apply to radioactive releases from UC Berkeley activities. For exposures to the general public due to airborne releases of radionucleides, the EPA National Emission Standards for Hazardous Air Pollutants (NESHAP) limit is 10 mRem/yr.

EH&S holds responsibility for implementing the non-ionizing radiation safety policies established by the Non-Ionizing Radiation Safety Committee (NIRSC), including the Laser Safety Program and the Non-Ionizing Radiation Safety Program.

ANIMAL USE AND CARE

At UC Berkeley, the Director of the Office of Laboratory Animal Care (OLAC) under the Vice Chancellor for Research is responsible for animal care services. The UC Berkeley Animal Care and Use Committee (ACUC) provides oversight for faculty research protocols and functions as the institutional animal care and use committee mandated by the U.S. Animal Welfare Act, the U.S. Public Health Service, and UC policy. OLAC is responsible for managing and administering a centralized program of laboratory animal care and use that complies with the U.S. Animal Welfare Regulations, the National Research Council Guide for the Care and Use of Laboratory Animals (the Guide), and the Public Health Service Policy on the Humane Care and Use of Laboratory Animals (the Policy).

The Committee on Animal Research Space Assignment (CARSA) has been charged by the Vice Chancellor for Research with the responsibility of reviewing requests, assessing needs, and establishing priorities for the use of animal research space. The committee

also reviews animal care per diem rates and requests for capital improvements to existing animal facilities, and advises the OLAC Director on various aspects of the management of animal research space. The committee is composed of at least five representatives from the academic units whose faculty members have animal use protocols, the OLAC Director, and the ACUC Chair.

EMERGENCY RESPONSE

EH&S maintains a Dedicated Spill Response Team (DSRT) that consists of health and safety professionals, hazardous materials technicians, and appropriately licensed hazardous materials drivers. The team is trained to respond to most incidents on campus and arranges for appropriate outside assistance when necessary. New buildings are automatically included in the campus-wide emergency response plan.

HAZARDOUS BUILDING MATERIALS

UC Berkeley procedures require that, before beginning any construction or renovation project, the Physical Plant-Campus Services Asbestos Control Office must perform a survey to determine whether asbestos-containing materials might be disturbed by the project. Any asbestos that might be damaged is removed or encapsulated under specifications developed in collaboration with EH&S and under the oversight of an independent industrial hygiene firm. Suspect paints and other surface coatings are sampled and analyzed for lead content prior to demolition or renovation work that might generate airborne lead hazards. During construction, EH&S oversees worker activities to confirm compliance with Cal/OSHA lead regulations and ensure the safety of nearby faculty, staff and students.

Hazardous materials surveys are conducted by UC Berkeley prior to any capital project in a laboratory building. All abandoned chemicals and other hazardous materials are removed from the building and surfaces are decontaminated. EH&S performs a final evaluation of the decontamination work before releasing the lab to the campus department performing the construction work.

Prior to any demolition or renovation work in a laboratory, all hazardous materials are removed, and EH&S then performs a confirmation survey for contamination resulting from the use of hazardous materials. If there are radioactive materials present, EH&S conducts the survey in coordination with the DHS. Labs are checked for mercury contamination using a portable analyzer and for other contaminants by visual observation. Lab benches and most other surfaces are cleaned using a surfactant regardless of whether contamination is observed. Sink traps, drain piping, and other individual building components are also evaluated as potential hazardous materials based on a review or past site uses and/or sampling, and are handled as hazardous waste if appropriate.

State law requires that contractors and workers be notified of the presence of asbestos in buildings constructed before 1979. The DHS requires the certification of employees and supervisors performing lead-related construction activities in residential and public buildings. Standard specifications included in all UC Berkeley construction contracts require that contractors who disturb or potentially disturb asbestos or lead must comply with all federal, state, and local rules and regulations regarding hazardous materials. Contractors are also required to stop work and inform the University if they encounter material believed to be asbestos, PCB or lead, or other hazardous materials.

4.6.7 2020 LRDP IMPACTS

This section describes the potential hazardous materials impacts of the 2020 LRDP based on the Standards of Significance, whether they are significant or less than significant, and whether any significant impacts can be mitigated to less than significant levels.

LESS THAN SIGNIFICANT IMPACTS

LRDP Impact HAZ-1: Implementation of the 2020 LRDP would increase the routine transport, use, disposal and storage of hazardous materials and waste (including chemical, radioactive, and biohazardous materials and waste), but given continuing campus best practices, this would not increase hazards to the public or the environment.

Development under the 2020 LRDP would increase the amount of laboratory space at UC Berkeley by up to 700,000 gross square feet. Based on current ratios of wet lab space to total lab and lab support space at UC Berkeley, up to 50% of this figure, or up to 350,000 GSF, is anticipated to consist of wet lab space. All of the new laboratory space would be in the Campus Park or Adjacent Blocks West land use zones. Concurrent with this increase in laboratory space there would be an increase in the use of hazardous materials and chemicals, biohazardous materials, radioactive materials, and production of wastes associated with laboratory research activities.

Ancillary services that use hazardous materials, such as printing and maintenance services, would continue to increase incrementally; however, no new facilities of this nature are planned. Management and oversight activities compliant with federal and state law, as well as all UCB procedures for handling of hazardous, biohazardous and radioactive materials and wastes would be extended to all new facilities developed under the 2020 LRDP.

Given continuing campus compliance with regulations and policy, the hazards to the public or the environment resulting from the increase in the use of hazardous materials under routine conditions would continue to be minimal. Additionally, campus programs further reduce risks associated with hazardous materials and waste management. Implementation of Continuing Best Practice HAZ-1 would ensure that this impact would remain less than significant. Impacts associated with the use of hazardous materials under upset and accident conditions are addressed under LRDP Impact HAZ-6.

NON-RADIOACTIVE HAZARDOUS CHEMICALS

The chemicals that would be used in new laboratories and support space developed under the 2020 LRDP would be similar to those currently used at UC Berkeley. The level and the nature of the hazards posed by these chemicals and wastes vary widely and are unique to the individual materials, although they often can be grouped by chemical types. Substances can possess one or more common hazard characteristics such as corrosivity (acids and bases), flammability (solvents such as acetone), toxicity (cyanides, mercuric chloride) and reactivity. Some nonradioactive chemicals have the potential for causing cancer or acute and chronic illnesses, while some substances may present little hazard.

Because most handling of hazardous materials on campus takes place indoors, potential pathways for exposure to non-radioactive hazardous chemicals under routine conditions include direct contact or injection during research or through accidental spills, or inhalation. In spite of the increase in the use of hazardous chemicals on campus under the 2020 LRDP, the risk to the public or the environment would be less than significant, for the reasons discussed below.

WORKER AND STUDENT EXPOSURE. Workers and students might be exposed to hazardous chemicals through inhalation, skin absorption (contact), ingestion, and injection (cuts). To address this potential impact, laboratories and other facilities constructed under the 2020 LRDP would continue to comply with all applicable hazardous materials standards. Fume hoods and other engineering controls would be required to meet Cal/OSHA requirements, and fume hood ventilation rates would continue to be checked annually by Facilities Services. Proper use of the fume hoods and other engineering controls would keep indoor laboratory air toxics concentrations below the American Conference of Governmental Industrial Hygienist Threshold Limit Values and the legal limits of the OSHA Permissible Exposure Levels.

To prevent exposure through skin contact, UC Berkeley policies and procedures require that protective clothing such as laboratory coats, gloves, and safety glasses be worn while handling hazardous materials and wastes. Proper washing after handling chemicals is also required. Also, in accordance with state laws and campus policy, eating, drinking, applying cosmetics, and chewing gum or tobacco are not allowed in laboratories using carcinogenic chemicals materials; these restrictions are imposed to prevent the potential ingestion of chemicals. Continued implementation of these UC Berkeley policies and procedures, and continued compliance with existing laws and regulations would minimize the risk to workers and students from exposure to non-radioactive hazardous chemicals and the impact would be *less than significant*.

PUBLIC EXPOSURE. The potential for exposure to the public, including nearby homes and schools, from hazardous materials used at UC Berkeley under routine conditions would be limited, because most hazardous materials use and storage on campus takes place indoors. The most probable potential pathway for public exposure would be air emissions from accidental releases either on campus or during transportation and routine operations. Exposure to air emissions from routine operations are analyzed in Chapter 4.2 Air Quality and were determined to be less than significant. The potential for public exposure under upset or accident conditions, both from handling of hazardous materials on campus and during transportation, is discussed under LRDP Impact HAZ-6, below.

Hazardous chemical use under routine conditions could result in impacts to the environment if hazardous materials were improperly disposed of (for example, in the sanitary sewer). Hazardous chemical releases to the environment could also occur if the chemicals are not adequately contained, as in the case of leaking underground storage tanks, which can contaminate soil and groundwater. Disposal of chemicals into the sanitary sewer is regulated by state, federal, and local laws and regulations. UC Berkeley is subject to requirements specified in the East Bay Municipal Utility District (EBMUD) Wastewater Discharge Permit issued to UC Berkeley. Federal and California clean water

laws permit laboratories to drain-dispose of some chemicals in small quantities that do not pose a hazard to human health or the environment.

Continued compliance with federal, state, and local regulations governing the storage of hazardous materials, City of Berkeley TMD and EH&S inspections of campus laboratories and support facilities using hazardous materials, campus monitoring of underground storage tanks, and the UC Berkeley Aboveground Storage Tank Spill Prevention Control and Countermeasure Plan all minimize the risk that increased hazardous materials use on campus under routine conditions would result in releases to the environment. The impact of hazardous chemical use on the public would be *less than significant.*

HAZARDOUS WASTE

Development under the 2020 LRDP would continue to follow regulations that limit the potential impacts from hazardous wastes. Compliance with hazardous waste storage and transportation regulations, and continuation of the programs and controls currently in place to reduce and manage hazardous wastes and to prevent inadvertent releases of hazardous materials to the sanitary sewer would minimize the hazards to workers, the public, and the environment. Treatment, storage, and disposal facilities are currently available with adequate capacity to accept and safely manage UC Berkeley chemical waste. A systemwide UC audit program in place for nearly a decade inspects treatment, storage and disposal facilities to help ensure that all waste generated by UC Berkeley is properly disposed.

Conservatively assuming that campus hazardous waste generation would increase in proportion with the increase in laboratory space, under the 2020 LRDP hazardous waste generation could increase by about 70 percent over the current level.[27] The UC Berkeley Hazardous Materials Facility, where campus hazardous waste is held temporarily before it is hauled off site for disposal, is currently operating at approximately 40 percent of capacity and would be adequate to handle this increase. UC Berkeley's current hazardous waste stream represents about 0.026 percent of the capacity owned by the vendor with which UC Berkeley contracts for disposal of hazardous waste.[28] The increase in campus hazardous waste generation would be insignificant in relation to the vendor's disposal capacity. Therefore, the impacts related to the potential increased generation of hazardous chemical wastes would be *less than significant*.

BIOHAZARDOUS MATERIALS

Implementation of the 2020 LRDP would increase laboratory space, which could include increased use of biohazardous materials. As discussed in Section 4.6.4, almost all biological research at UC Berkeley is conducted at Biosafety Levels 1 or 2. Only three BUAs have been issued for Biosafety Level 3 work. The types of biological agents used in the future would likely remain largely the same as those currently used, although new research could create a need for new and different biological agents and there could be an increase in the number of laboratories using organisms requiring Biosafety Level 3.

An increase in use of biohazardous materials could potentially affect workers and the public through air (inhalation of aerosols), water (release to the sewer), waste disposal, and accidents. However, all of these potential effects would be minimized through compliance with stringent building code requirements for such facilities, and through existing UC Berkeley policies and procedures, including the Biosafety Program,

engineering controls and training programs described in Section 4.6.6. Although some of these programs are designed primarily for worker safety, they also control releases to the environment and exposure to the public at large by preventing releases to the air and the sanitary sewer.

These programs are continuously monitored and updated as necessary. Such programs include the Cal/OSHA Bloodborne Pathogen Standard, the Centers for Disease Control guidelines for work in laboratory and animal facilities, Guidelines for Animal Transport and Quarantine, and National Institutes of Health guidelines for work with recombinant DNA. EH&S would continue to inspect all laboratories, ensuring that the policies and procedures are followed and that violations of the policies are identified and corrected. In compliance with the Cal/OSHA's Bloodborne Pathogen Standard all incidents of exposure to bloodborne pathogens, and sharps injuries in laboratories using bloodborne pathogens, would be documented and medically evaluated.

Most biohazardous materials pose no significant hazard to the public due to their limited viability in the environment; however, others could pose a potential hazard if accidentally released or improperly handled. Particulate-borne air emissions of bacteria and viruses would be controlled by HEPA filtration at a very high degree of efficiency, minimizing the potential for public exposure.

In compliance with CDC guidelines, the new laboratories conducting Biosafety Level 3 research, like the existing laboratories operating at Biosafety Level 3, would be provided with special air filtration systems and access would be limited to trained workers. Review of the proposed procedures and authorization by campus and agency officials would be required prior to startup of these laboratories.

Because of continued campus compliance with regulatory requirements and current campus guidelines for controlling employee exposures to biohazardous materials, the potential impact of increasing the use of biohazardous materials on employee health, the environment, and the public would be *less than significant*.

BIOHAZARDOUS WASTE

Research laboratories using biohazardous materials and animal care activities at UC Berkeley produce biohazardous waste. Most laboratory tissues, fluids, and cultures are considered to be potentially infectious waste. Potentially infected animal care wastes can include animal excreta, bedding and uneaten food, cage washing solutions, animal carcasses and tissues, workers' disposable protective clothing and sharp objects such as needles, scalpels, and broken glass. At UC Berkeley, non-medical sharps waste and animal carcasses not contaminated with infectious agents known to cause human illness are also handled as medical waste to protect custodial workers and to reduce public concern. Implementation of the 2020 LRDP would increase campus biohazardous waste generation because use of biohazardous materials and research animals would increase. Also see LRDP Impact HAZ-2 which addresses impacts related to increased laboratory animal use on campus under the 2020 LRDP.

Under the 2020 LRDP UC Berkeley would, as required, temporarily store biohazardous wastes at its Hazardous Materials Facility on the central campus. While this is a change from a previous EIR for the Hazardous Materials Facility, which stated that biohazard-

ous wastes would be picked up only from Central Pickup locations on campus, this change in management method would improve safety and would provide for more secure waste transportation and pick up.[29]

Existing UC Berkeley health and safety practices and compliance with federal and state regulations minimize the potential for adverse health effects related to biohazardous waste. New projects and waste management methods implemented under the 2020 LRDP would comply with these practices. Therefore, the impact of increased generation of biohazardous waste on campus would be *less than significant*.

RADIOACTIVE MATERIALS

As discussed in Section 4.6.4, the quantities of radioactive materials used at UC Berkeley have decreased by over 50 percent over the past ten years, as laboratory technologies requiring the use of radioactive materials have been replaced by other methods. Furthermore, the increasing cost of disposal encourages researchers to find methods that do not require the use of radioactive materials. Nonetheless, radioactive materials are highly useful in research and continue to be used on campus. The increase in laboratory space under the 2020 LRDP could result in an increase in radioactive material use over current levels, although the increase would be less than directly proportional to the increase in laboratory space because use of radioactive materials in research is decreasing and alternate research methods that do not involve radioactive materials are being increasingly employed.

Continued implementation of the existing campus Radiation Safety Program would occur under the 2020 LRDP. Given that adequate safety controls, plans, and procedures are in place to limit exposure to radiation from radioisotopes, radiation-producing machines, and radioactive waste, the potential for 2020 LRDP development to expose campus occupants or the public to significant health or safety risks is low. UC Berkeley projects implemented under the 2020 LRDP would comply with these controls. Similar to current practices with respect to disposal of radioactive waste, under the 2020 LRDP UC Berkeley would continue to use in-state and out-of-state storage and disposal options; no capacity issues are anticipated over the span of the 2020 LRDP.[30] The impact would be *less than significant*.

HAZARDOUS MATERIALS TRANSPORTATION

As discussed above, implementation of the 2020 LRDP would increase hazardous materials use and hazardous waste generation at UC Berkeley. Consequently the transport of hazardous materials to and from UC Berkeley would also increase. UC Berkeley policy requires that packaging of chemicals to be transported on public roads conform with requirements of the U.S. Department of Transportation (DOT). Hazardous materials delivered to the campus would also be required to conform with DOT requirements. All hazardous waste is picked up from generators by EH&S or a licensed hazardous waste contractor, and generators must properly package and label all unwanted hazardous materials. Under the 2020 LRDP, UC Berkeley would continue to require compliance with these safety regulations, guidelines, and policies. Therefore, the impact of the increased transport of hazardous materials to and from UC Berkeley would be *less than significant*.

Continuing Best Practice HAZ-1: UC Berkeley shall continue to implement the same (or equivalent) health and safety plans, programs, practices and procedures related to the use, storage, disposal, or transportation of hazardous materials and wastes (including chemical, radioactive, and biohazardous materials and waste) during the 2020 LRDP planning horizon. These include, but are not necessarily limited to, requirements for safe transportation of hazardous materials, EH&S training programs, the Hazard Communication Program, publication and promulgation of drain disposal guidelines, the requirement that laboratories have Chemical Hygiene Plans, the Chemical Inventory Database, the Toxic Use Reduction Program, the Aboveground Storage Tank Spill Prevention Control and Countermeasure Plan, monitoring of underground storage tanks, hazardous waste disposal policies, the Chemical Exchange Program, the Hazardous Waste Minimization Program, the Biosafety Program, the Medical Waste Management Program, and the Radiation Safety Program. These programs may be subject to modification as more stringent standards are developed or if the programs become obsolete through replacement by other programs that incorporate similar health and safety protection measures.

LRDP Impact HAZ-2: Implementation of the 2020 LRDP would increase the routine use of laboratory animals on campus by UC Berkeley laboratories, but given continuing campus best practices, this would not increase hazards to the public or the environment.

The laboratory space program anticipated under the 2020 LRDP would include an increase in the number of laboratory animals at UC Berkeley. The increased number of animals at UC Berkeley could pose potential hazards to workers, building occupants, and the neighboring community if contacts between humans and animals were not properly managed.

In accordance with the U.S. Public Health Service regulations, the ACUC oversees all aspects of animal care in campus facilities. Before any research involving live vertebrate animals can be initiated, a protocol for the activity must be prepared by the principal investigator and approved by the ACUC. Laboratory animal care practices must comply with federal and state requirements as well as the National Research Council Guide for the Care and Use of Laboratory Animals, and the U.S. Public Health Service Policy on the Humane Care and Use of Laboratory Animals.

UC Berkeley has achieved a high level of compliance with regulatory guidelines concerning care and treatment of laboratory animals. No non-compliant items were identified during the USDA's most recent inspection, in September 2003.[31] New laboratories where animals would be involved in research, and new animal care facilities constructed under the 2020 LRDP would be designed and constructed to control the release of laboratory animals to the environment, and would be operated in compliance with existing programs and controls to reduce the impacts resulting from the increase in the number of laboratory animals at UC Berkeley. Therefore, with implementation of Continuing Best Practice HAZ-2, the impact of increased use of laboratory animals on campus would be *less than significant*.

Continuing Best Practice HAZ-2: UC Berkeley shall continue to implement the same (or equivalent) programs related to laboratory animal use during the 2020 LRDP planning horizon, including, but not necessarily limited to, compliance with U.S. Public Health Service Regulations, the National Research Council Guide for the Care and Use of Laboratory Animals, and Animal Welfare Act regulations. These programs may be subject to modification as more stringent standards are developed or if the programs become obsolete through replacement by other programs that incorporate similar health and safety protection measures.

LRDP Impact HAZ-3: Implementation of the 2020 LRDP would increase the use of transgenic organisms on campus by UC Berkeley laboratories, but given continuing campus best practices, this would not increase hazards to the public or the environment.

Implementation of the 2020 LRDP would increase lab space on the campus which in turn could increase research using transgenic organisms. Transgenic organisms include microorganisms, plants, and animals that have been genetically engineered or modified using recombinant DNA techniques. As discussed in Section 4.6.4, with the exception of transgenic bacteria that could be infectious, transgenic microorganisms do not pose a threat to public health or the environment. If not properly segregated from the surrounding environment, transgenic plants could genetically contaminate non-transgenic plants in the surrounding area or adversely impact biodiversity, through cross-pollination.

All research involving transgenic organisms on campus is required to comply with the NIH Guidelines for Research Involving Recombinant DNA Molecules. The Guidelines specify containment practices for plants, microorganisms, and animals, depending on the potential hazard posed by the organism. The potential for exposure of campus workers or the public to infectious transgenic organisms is minimized by compliance with CDC and NIH guidelines for research involving biohazardous materials, as detailed in the discussion of biohazardous materials, above. Research involving transgenic animals is subject to the same control programs that are discussed above with respect to laboratory animal use and care. All research involving transgenic plants must register with EH&S and a permit from the USDA is required for open field-based research involving transgenic plants. Most research involving transgenic plants on campus is conducted at the lowest plant biosafety level, BLP-1, with organisms that pose no risk. Controls such as segregated and screened greenhouses limit the potential for impact on plants in the surrounding area.

The USDA has inspected campus greenhouses twice in the last ten years. The results have been satisfactory.[32] New facilities constructed under the 2020 LRDP that involve research using transgenic organisms would comply with existing programs and controls that minimize potential impacts of research involving transgenic organisms. Therefore, with implementation of Continuing Best Practice HAZ-3, the impact of increased use of transgenic organisms on campus would be *less than significant*.

Continuing Best Practice HAZ-3: UC Berkeley shall continue to implement the same (or equivalent) programs related to transgenic materials use during the 2020 LRDP planning horizon, including, but not necessarily

limited to, compliance with the NIH Guidelines for Research Involving Recombinant DNA Molecules, USDA requirements for open field-based research involving transgenic plants, and requiring registration with EH&S for all research involving transgenic plants. These programs may be subject to modification as more stringent standards are developed or if the programs become obsolete through replacement by other programs that incorporate similar health and safety protection measures.

LRDP Impact HAZ-4: Implementation of the 2020 LRDP could locate development on a hazardous materials site, exposing construction workers and campus occupants or the general public to contaminated soil or groundwater. Given campus continuing best practices, however, this would not increase the risks to workers, campus occupants or the general public.

Properties owned or acquired since the campus was founded in 1868 have the potential to contain soil and/or groundwater contamination from historic activities by UC Berkeley or previous owners. Known contamination of soil and/or groundwater as a result of leaking underground petroleum storage tanks is present at a number of sites, including the UC Garage at 1952 Oxford Street and the Physical Plant-Campus Services Corporation Yard at 2000 Carleton Street. Known soil contamination believed to have originated from historic disposal of chemicals into a sanitary sewer sump is present under the parking lot at the Plant Conservation Research Center (former Canyon Chemical Facility). The contamination at these sites has been or is in the process of being fully characterized and remediated with local and regional agency oversight. Residual contamination at these sites is believed to pose no threat to human health and the environment if not disturbed by construction or other activities.

Although no specific plans for these sites have yet been formulated, should UC Berkeley develop such plans, it would conduct further tests at the sites and appropriately remediate any contamination that could be encountered during construction.

With respect to other on-campus sites where contamination may be present, UC Berkeley adheres to the following procedures. EH&S maintains files for each university building, with information on site use involving hazardous materials, regulatory actions, and known contamination. To minimize the risk that construction would take place on a site with unknown contamination, EH&S conducts historical reviews of past site uses and regulatory actions for major construction projects on the Campus Park, to assess the potential for hazardous materials releases.[33]

UC Berkeley requires that "due diligence" assessments (Preliminary Phase I Environmental Site Assessments) be performed for all new ground-disturbing construction projects off the Campus Park. If the Preliminary Phase I Environmental Site Assessment reveals activities or practices that may have resulted in releases of hazardous materials to the soil or groundwater, such as underground storage of fuel, samples of the surface and subsurface materials are collected and tested for potential contaminants. If contaminants are found, UC Berkeley reports the findings to the appropriate regulatory agency. Construction would not proceed until after the contamination has been addressed.

Soil and groundwater at Lawrence Berkeley National Laboratory (LBNL) is contaminated with volatile organic compounds and radionuclides.[34] The groundwater contaminant plumes have not migrated off-site.[35,36,37] Although there is a potential for groundwater contaminated with radionuclides to reach Chicken Creek, which flows onto the campus, the concentrations of radionuclides in the vicinity of Chicken Creek are well below the maximum contaminant levels for drinking water. Therefore, development on campus property adjoining the LBNL site would not be significantly affected by contamination on the LBNL site.

Implementation of the 2020 LRDP would involve construction on sites within the LRDP Housing Zone. It is likely that commercial uses in the LRDP Housing Zone have included facilities that use hazardous materials, such as gasoline service stations, auto repair stations, dry cleaners, and printing shops. Soil or groundwater contamination may be present in the vicinity of these sites as a result of accidental spills or releases of hazardous materials or from abandoned home heating oil tanks. If unexpected contamination is encountered during construction of campus housing projects within the LRDP Housing Zone, workers could be exposed through inhalation or ingestion. Implementation of Continuing Best Practice HAZ-4 would minimize the potential that unexpected contamination would be encountered and would reduce the significance of the impact to a *less than significant* level.

> **Continuing Best Practice HAZ-4:** UC Berkeley shall continue to perform site histories and due diligence assessments of all sites where ground-disturbing construction is proposed, to assess the potential for soil and groundwater contamination resulting from past or current site land uses at the site or in the vicinity. The investigation will include review of regulatory records, historical maps and other historical documents, and inspection of current site conditions. UC Berkeley would act to protect the health and safety of workers or others potentially exposed should hazardous site conditions be found.

LRDP Impact HAZ-5: Implementation of the 2020 LRDP could result in exposure to hazardous emissions or handling of contaminated building materials. This is a *less than significant* impact.

Due to the age of the campus, lead paint is present in many campus buildings. Through the combination of large-scale abatement projects and a continuing asbestos maintenance program, all significant asbestos exposure hazards have been eliminated from campus. However, at some locations on campus, asbestos building materials are still in place. In addition, in buildings currently or formerly used as laboratories, building materials such as floor and wall surfaces, sink traps, and drain piping, can be contaminated by spills, aerosol releases, or drain disposal of hazardous materials. Polychlorinated biphenyls (PCBs) may also be present in fluorescent light ballasts and some building materials. If proper procedures are not followed, workers can be exposed through inhalation or ingestion of lead dust, asbestos particles, PCBs, mercury vapor or other contaminants when building materials are disturbed or made friable by drilling, sanding, or other destructive processes.

Current campus practices and federal and state regulations minimize the exposure of construction workers to contaminated building materials during construction on campus sites. Throughout the 2020 LRDP planning horizon, UC Berkeley will continue to perform surveys for hazardous building materials and will comply with laws and regulations governing the handling of such materials. Thus, with implementation of Continuing Best Practice HAZ-5, the impact would be *less than significant*.

> **Continuing Best Practice HAZ-5:** UC Berkeley shall continue to perform hazardous materials surveys prior to capital projects in existing campus buildings. The campus shall continue to comply with federal, state, and local regulations governing the abatement and handling of hazardous building materials and each project shall address this requirement in all construction.

LRDP Impact HAZ-6: Implementation of the 2020 LRDP would increase the handling and transportation of hazardous materials. Given continuing campus best practices, this would not increase the risk of hazardous materials release into the environment through upset and accident conditions.

Under current practice at UC Berkeley, all hazardous waste held on campus must comply with all applicable regulations, including suitable containers that are closed at all times (when not adding or removing waste) and secondary containment. The U.S. Department of Transportation Office of Hazardous Materials Safety prescribes strict regulations for the transportation of hazardous materials, as described in Title 49 CFR. Transportation along state roadways within or near UC Berkeley is also subject to all hazardous materials transportation regulations established by the California Highway Patrol pursuant to the California Vehicle Code. As detailed in the discussion of the previous threshold, campus policy requires that all hazardous materials to be shipped on public roads be packaged in compliance with U.S. Department of Transportation requirements. Compliance with these regulations minimizes the potential for accidental release of hazardous materials being transported to or from UC Berkeley.

New projects constructed under the 2020 LRDP would comply with the California Building Code (CBC), which identifies the minimum standards for structural design and construction in California, including specific requirements for seismic safety. In addition, the projects would comply with the University of California Seismic Safety Policy, which requires design provisions for new structures not included in the CBC, including adequate anchorage of nonstructural building elements such as equipment and material storage facilities. Construction according to these standards would minimize the potential for accidental releases of hazardous materials during an earthquake.

New campus construction would conform to the adopted California Fire Code, which establishes standards for the storage of hazardous materials. Both the City of Berkeley Fire Department and the Alameda County Fire Department, which provide fire protection to the campus, have hazardous materials response capabilities, enabling them to respond effectively to fires in facilities that store hazardous materials. (See also Chapter 4.11, Public Services, for additional information about emergency response.)

The UC Berkeley Business Plan describes procedures to follow in the event of an accidental release of hazardous materials. The EH&S Emergency Response team is capable of responding to most incidents at UC Berkeley and, if necessary, may arrange for appropriate assistance from the City of Berkeley Fire Department, the LBNL Fire Department, and outside emergency response contractors.

One state law governing the storage of hazardous materials is the California Accidental Release Program (CalARP). This law addresses facilities that contain specified hazardous materials or "regulated substances" that, if involved in an accidental release, could result in adverse off-site consequences. Detailed chemical inventories maintained by UC Berkeley to comply with the UC Berkeley Business Plan show the use or storage of regulated substances at any current campus location is not large enough to trigger CalARP requirements. Thus, although the UC Berkeley Business Plan requires UC Berkeley to define emergency response procedures, a risk management plan under CalARP does not need to be submitted, which means maximum storage quantities are below levels that would potentially cause an off-site consequence. Campus best practices will continue to inventory campus hazardous materials in future locations. Given past experience, quantities above CalARP thresholds are not anticipated. Should that occur, UC Berkeley would comply with all applicable CalARP reporting requirements.

Compliance with all applicable federal and state laws, as well as campus programs, practices and procedures related to the transportation, storage and use of hazardous materials would continue under the 2020 LRDP, minimizing the potential for a release and providing for prompt and effective cleanup if an accidental release occurs. Therefore, the impacts related to accidental release due to the increased transportation, storage or use of hazardous materials under the 2020 LRDP would be *less than significant*. Implementation of safety plans, programs, practices and procedures, as defined in the discussion of LRDP Impact HAZ-1 through HAZ-3, would ensure these impacts remain *less than significant*.

LRDP Impact HAZ-7: Implementation of the 2020 LRDP could result in hazardous emissions and the handling of hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school. Given continuing campus best practices, however, such emissions or handling practices would not pose a health or safety hazard to students or employees at such schools. This is a *less than significant* impact.

Existing schools and day care centers within ¼ mile of UC Berkeley include the Montessori Family School adjacent to the north side of the Campus Park at the corner of Scenic Drive and Hearst, the Berkeley Montessori School at 1581 Leroy Avenue (at Cedar), the Berkeley Montessori Pre-School at Francisco at Shattuck Street and Shattuck Avenue, the East Bay School for the Arts at Milvia and Francisco Streets, Berkeley Arts Magnet School at Milvia and Virginia Streets, Woolly Mammoth Day Care Center on Bancroft, and campus child care facilities at 2340 Durant Avenue, 2537 Haste Street, and in Girton Hall.[38] As a result of the implementation of the 2020 LRDP, hazardous materials could be handled within ¼ mile of these existing schools and day care centers.

Potential health risks for occupants of these schools resulting from routine air emissions of hazardous chemicals under existing conditions and with the implementation of the 2020 LRDP are analyzed in Chapter 4.2, Air Quality. With respect to storage and handling of hazardous substances on campus, these materials would not exist in quantities sufficient to pose a risk to occupants of the nearby schools in case of an accidental release. Hazardous materials in laboratories are typically handled in small quantities, so the potential consequences of accidental releases would be limited to a single building and people outside the buildings would not be exposed. Historically, most spills at UC Berkeley have been limited to the individual laboratory where the spill occurred.[39]

Furthermore, on a quarterly basis, EH&S compares quantities of chemicals stored in each campus location to the CalARP thresholds. Under CalARP, if the quantities of a particular chemical exceed the threshold for that chemical, UC Berkeley is required to prepare a Risk Management Plan (RMP) to prevent off site consequences from accidental releases of the hazardous materials stored in quantities above the threshold. The quantities of chemicals currently stored in laboratories and other locations on campus do not meet the CalARP thresholds so a risk management plan is not required. If under the 2020 LRDP, a facility is proposed that stores or handles specific hazardous chemicals in quantities that exceed CalARP thresholds, a RMP would be prepared for that facility to prevent offsite consequences from accidental releases.

Also Section 21151.4 of the Public Resources Code (PRC) requires that when a project located within one-quarter mile of a school involves the construction or alteration of a facility that might reasonably be anticipated to emit hazardous or acutely hazardous air emissions or handle acutely hazardous materials or a mixture containing acutely hazardous materials in a quantity equal to or greater than that specified in Section 25536(a) of the Health and Safety Code, the Lead Agency must (1) consult with the affected school district regarding the potential impact of the project when circulating the environmental document and (2) notify the affected school district in writing prior to approval and certification of the environmental document. UC Berkeley would continue to comply with the provisions of Section 15186 of the CEQA Guidelines (that respond to PRC Section 21151.4), requiring disclosure of potential health impacts associated with any projects near schools, throughout implementation of the 2020 LRDP.

The risks associated with routine toxic air contaminant emissions to sensitive receptors, including schools and day care centers, are analyzed in Chapter 4.2, Air Quality, and were determined to be less than significant. Because the quantities of chemicals stored in labs are typically small and UC Berkeley would continue to evaluate chemical storage in existing and proposed laboratories on campus relative to CalARP thresholds and comply with CalARP regulations, the impact to those attending existing or proposed schools or child care centers near the laboratories would be *less than significant*.

LRDP Impact HAZ-8: Implementation of the 2020 LRDP could expand research uses of non-ionizing radiation sources. This is a *less than significant* impact.

Implementation of the 2020 LRDP would increase lab space on the campus which in turn could increase research involving non-ionizing radiation such as lasers on campus. The only hazards posed by non-ionizing radiation devices used in research on campus are health and safety hazards to those who work in laboratories where such devices are

used and, in the case of Class 4 lasers, laboratory fire hazards. As discussed in Section 4.6.4 and Appendix E, existing campus policies and procedures are in place to minimize the risks, including those associated with fire. Implementation of these policies and procedures would continue under the 2020 LRDP. Therefore, the impact would be *less than significant*.

4.6.8 TIEN CENTER IMPACTS

EFFECTS NOT FOUND TO BE SIGNIFICANT

The Initial Study found that the Chang-Lin Tien Center for East Asian Studies would have no significant impacts in regard to the following thresholds:

> ***Would the project create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?***
>
> ***Would the project result in development located on a hazardous materials site as listed on the "Cortese List" (compiled pursuant to Government Code Section 65962.5) and, therefore, create a significant hazard to the public or the environment?***
>
> ***Would the project 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?***
>
> ***Would the project result in development that would emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?***

As described in the Initial Study and Notice of Preparation for the 2020 LRDP and Tien Center project,[40] the Tien Center would house office, classroom and library space, and would not significantly expand hazardous materials use on the campus, would not release hazardous materials in the event of upset or accident conditions, would not handle or emit hazardous materials within one-quarter mile of an existing or proposed school, and would not be located on a hazardous materials site.

4.6.9 CUMULATIVE IMPACTS

This section evaluates whether development under the 2020 LRDP, in combination with reasonably foreseeable non-UC Berkeley projects, would result in significant cumulative impacts. Such impacts could occur if hazardous material use and generation associated with development under the 2020 LRDP could combine with hazardous material use and generation from other reasonably foreseeable projects to create hazards that would be cumulatively considerable.

The analysis considers cumulative growth as represented by the implementation of municipal general plans, implementation of the Lawrence Berkeley National Laboratory 2004 LRDP, the draft Southside Plan, the AC Transit Major Investment Study, and implementation of the 2020 LRDP, as described in 4.0.5. The analysis also includes

growth anticipated by the City of Berkeley General Plan EIR, and by previously certified UC Berkeley EIRs, including the Northeast Quadrant Science and Safety Projects (SCH 2001022038), Seismic Replacement Building 1 (SCH 99122065), and the Underhill Area Projects (SCH 99042051). The analysis below also considers the transport of materials to and from these areas.

The geographical context for much of the analysis of cumulative hazardous materials impacts from increased hazardous materials use and disposal is limited to the Campus Park, Adjacent Blocks West, and the Lawrence Berkeley National Laboratory site. All future projects involving an increase in the use or generation of hazardous materials are anticipated to be located within these areas. Analysis of cumulative hazardous materials transport would include routes to and from materials handling areas in the broader roadway systems of the Bay Area, including Berkeley, Oakland and regional systems.

The significance of the potential cumulative impacts was determined based on the following standards:

Standard: ***Would the project create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials.***

Standard: ***Would the project 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.***

Standard: ***Would the project result in development that would emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school.***

Standard: ***Would the project result in development located on a hazardous materials site as listed on the "Cortese List" (compiled pursuant to Government Code Section 65962.5) and, therefore, create a significant hazard to the public or the environment.***

The question posed in this section is twofold:

- Is the potential *cumulative* impact of the 2020 LRDP *and* other reasonably foreseeable projects under these standards significant?
- Is the contribution of the 2020 LRDP to these impacts cumulatively considerable?

Cumulative Impact HAZ-1: The 2020 LRDP, in combination with other reasonably foreseeable projects, would result in increased use and transportation of hazardous materials, but would not significantly increase hazards to the public or the environment associated with the use and transport of hazardous materials and the generation of hazardous wastes.

As documented in Section 4.6.7, the use, storage, and transport of hazardous materials and the generation of hazardous waste on campus would increase under the 2020 LRDP. The Land Use Element of the City of Berkeley General Plan does not anticipate

any significant growth in industrial development.[41] The EIR for the City of Berkeley General Plan concluded that no potentially significant hazardous materials impacts would occur with implementation of the plan.[42] The Southside Plan and the AC Transit Berkeley/Oakland/San Leandro corridor project would not result in a significant increase in the use of hazardous materials. The only other project in the area involving significant hazardous materials use is the Lawrence Berkeley National Laboratory 2004 LRDP. This plan would result in the growth of the laboratory's operations and activities, including those that involve use of hazardous materials. However, no major new sources of on-site hazardous materials are anticipated at the LBNL site.[43]

The hazards to the public and the environment resulting from the increased use and storage of hazardous materials on campus and at LBNL would be minimal because UC Berkeley and LBNL would continue to comply with all applicable laws, regulations and campus policies governing hazardous materials and hazardous waste management. As discussed under LRDP Impact HAZ-1, the campus hazardous waste stream represents an insignificant percentage of available non-radioactive chemical hazardous waste disposal capacity, so UC Berkeley would not contribute to a cumulative impact related to increased generation of hazardous waste. Although currently there is no capacity in California for low-level radioactive waste disposal, UC Berkeley and other generators in the state utilize in-state and out-of-state storage and disposal options. It is anticipated that this practice will continue under the 2020 LRDP. Therefore, the cumulative impact associated with the increase in routine use, storage, transport and disposal of hazardous materials and generation of hazardous waste would be *less than significant*.

As discussed under LRDP Impact HAZ-2, the use of laboratory animals on campus would increase under the 2020 LRDP. However, this would not significantly increase the risk to campus occupants and the neighboring community from animal bites, escapes, and disease transmission because UC Berkeley would continue to comply with applicable regulatory guidelines. The increase in laboratory space at LBNL may include an increase in the use of laboratory animals. Because research activities involving laboratory animals are unique to UC Berkeley and LBNL, other development in the surrounding area is not expected to contribute to an increase in laboratory animal use. Like UC Berkeley, LBNL complies with applicable laws, regulations, and guidelines governing the housing and handling of laboratory animals and would continue to do so under the 2004 LBNL LRDP. Therefore, the potential risk associated with the cumulative increase in laboratory animal use would be a *less than significant* impact.

As discussed under LRDP Impact HAZ-3, the use of transgenic materials on campus would increase under the 2020 LRDP. However, this would not result in significant risks to campus occupants and the neighboring community because UC Berkeley would continue to comply with applicable laws, regulations, and policies governing research involving infectious organisms and transgenic plants and the housing and handling of laboratory animals.

The increase in laboratory space at LBNL may also result in an increase in the use of transgenic organisms. Because research activities involving transgenic materials are unique to UC Berkeley and LBNL, other development in the surrounding area is not expected to involve the use of transgenic materials. Like UC Berkeley, LBNL complies with applicable laws, regulations, and guidelines governing the handling of infectious

organisms, transgenic plants, and laboratory animals. Therefore, the potential risk associated with the cumulative increase in the use of transgenic materials would be a *less than significant* impact.

As discussed under LRDP Impacts HAZ-4 and HAZ-5, implementation of the 2020 LRDP could result in exposure to hazardous waste in soil or groundwater or to contaminated building materials, including asbestos, lead, PCBs, and laboratory chemicals or radioactive materials deposited as fumes or aerosols or as a result of chemical spills. These hazards would have only local impacts and would not contribute to a cumulative impact. Furthermore, UC Berkeley, LBNL, and other agencies involved in development in the surrounding area, would comply with existing federal and state regulations and with standard due diligence practices. Therefore, the cumulative impact would be *less than significant*.

As discussed under LRDP Impact HAZ-6, the increase in hazardous materials use on campus under the 2020 LRDP would not significantly increase the risk of a hazardous materials release under upset or accident conditions. The potential risk of a release would be minimized through campus compliance with regulations governing hazardous materials storage, handling, and transportation, and structural design and construction standards and policies. As described in Chapter 4.5, Geology, UC Berkeley programs also reduce risks of upset through bracing of non-structural seismic hazards. Furthermore, available emergency response capacity is adequate to handle hazardous materials releases that may occur on campus.

The cumulative impact on sensitive receptors from toxic air emissions under routine conditions is analyzed in Chapter 4.2, Air Quality. As discussed under LRDP Impact HAZ-7, the potential hazards associated with accidental releases of hazardous materials from campus laboratories within ¼ mile of existing or proposed schools or child care centers under the 2020 LRDP would be a less than significant impact. In addition, this would be a local impact that would affect only particular schools or child care centers. The existing schools or child care centers within ¼ mile of campus laboratories are not within ¼ mile of the LBNL, and other development in the vicinity of these schools is not expected to result in significant hazardous materials use. Therefore, the cumulative impact would be *less than significant*.

4.6.10 REFERENCES

[1] UC Berkeley, *Notice of Preparation: Environmental Impact Report for the 2020 LRDP and Chang-Lin Tien Center for East Asian Studies*, August 29, 2003, pages 25-26.

[2] *City of Berkeley Draft General Plan EIR*, February 2001, page 297.

[3] *City of Berkeley Draft General Plan EIR*, February 2001, page 314.

[4] Hans, Karl, EH&S Specialist, UCB Office of Environment, Health and Safety. Written communication with Jennifer Lawrence, Principal Planner, UCB Facilities Services, February 5, 2004.

[5] This includes the Campus Park and other UC Berkeley facilities in the Hill Campus and City Environs, but excludes off-site facilities such as Richmond Field Station.

[6] City of Berkeley Toxics Management Division, *Inspection Report*, April 4, 2002.

[8] Hans, Karl, EH&S Specialist, UCB Office of Environment, Health and Safety. Written communication with Jennifer Lawrence, Principal Planner, UCB Facilities Services, February 5, 2004.

[7] California Department of Health Services, *Inspection Report*, UC Berkeley, June 8, 2000.

[8] Altitude above sea level and the location and materials used to build homes influences the background dose. For example, in Denver, the background dose from cosmic radiation due to altitude is about twice that of San Francisco.

[9] Lavely, Paul, Associate Director, UCB Office of Environment, Health and Safety. Personal communication with John Koehler, URS Corporation, March 14 and October 1, 2002.

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[17] Lindow, Steven, Chair, UCB Department of Plant & Microbial Biology. Personal communication with Shabnam Barati, URS Corporation, May 2002.

[18] Lindow, Steven, Chair, UCB Department of Plant & Microbial Biology. Personal communication with Shabnam Barati, URS Corporation, May 2002.

[19] Lindow, Steven, Chair, UCB Department of Plant & Microbial Biology. Personal communication with Shabnam Barati, URS Corporation, May 2002.

[20] Carlson, C., Biosafety Officer, UCB Office of Environment, Health and Safety. Personal communication with Shabnam Barati, URS Corporation, May 6 and 7, 2002.

[21] Carlson, C., Biosafety Officer, UCB Office of Environment, Health and Safety. Personal communication with Shabnam Barati, URS Corporation, May 6 and 7, 2002.

[22] Haet, Greg, Associate Director, UCB Office of Environment, Health and Safety. Personal communication with Alisa Klaus, URS Corporation, November 21, 2003.

[23] UC Berkeley Office of Environment Health and Safety, *Underground Storage Tank Closure Report, 1952 (Central Garage) and 1990 Oxford Street, Berkeley, CA*, August 2, 2002.

[24] UC Berkeley Office of Environment Health and Safety, *Underground Storage Tank Closure Report, 2000 Carleton Street, Berkeley, CA*, April 22, 2002.

[25] *City of Berkeley Draft General Plan EIR*, February 2001, pages 287-288.

[26] Hurlbert, Margaret, EH&S Specialist, UCB Physical Plant-Campus Services. Personal communication with Shabnam Barati, URS Corporation, February 25, 2004.

[27] This estimate includes lab space that is currently under construction as well as labs that would be developed under the 2020 LRDP. The estimate is conservative because the increase under the 2020 LRDP includes both "wet" and "dry" lab space, while in fact only "wet" labs would generate hazardous waste.

[28] Haet, Greg, Associate Director, UCB Office of Environment, Health, and Safety. Personal communication with Jennifer Lawrence, Principal Planner, UCB Facilities Services.

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[43] Lawrence Berkeley National Laboratory, *Revised Notice of Preparation, Draft Environmental Impact Report*, October 28, 2003, page 9 of the Checklist.