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APRIL 2025

Lawrence Berkeley National Laboratory 2025 Long Range Development Plan

Environmental Impact Report

State Clearinghouse Number 2024050545

BERKELEY LAB

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Prepared for
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Berkeley, California 94720

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LIST OF ABBREVIATIONS AND ACRONYMS

2006 LRDP	2006 Long Range Development Plan
2025 LRDP	2025 Long Range Development Plan
AADT	average annual daily traffic volume
AB	Assembly Bill
ABAG	Association of Bay Area Governments
ABPBU	Advanced Biofuels and Bioproducts Process Development
ACC	Advanced Clean Cars
ACCWP	Alameda Countywide Clean Water Program
ACFCWD	Alameda County Flood Control and Water Conservation District
ACFD	Alameda County Fire Department
ACHE	Air Cooling Heat Exchangers
ACM	asbestos-containing materials
AC Transit	Alameda-Contra Costa Transit District
ADA	federal Americans with Disabilities Act of 1990
ADP	Adjusted Daily Population
AEC	Atomic Energy Commission
AEDT	Aviation Environmental Design Tool
AERMOD	American Meteorological Society/Environmental Protection Agency Regulatory Model
AFY	acre-feet per year
AHJ	authority having jurisdiction
ALARA	as low as reasonably achievable
ALS	Advanced Light Source
amsl	above mean sea level
APLIC	Aviation Power Line Interaction Committee
API	Area of Primary Importance
AQI	Air Quality Index
Ar	argon

ARO	LBNL Archives and Records Office
ASHP	air source heat pump
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
AST	Aboveground Storage Tank
ATCM	Airborne Toxic Control Measure
BAAQMD	Bay Area Air Quality Management District
BACT	best available control technology
BART	San Francisco Bay Area Rapid Transit District
BFD	Berkeley Fire Department
bgs	below ground surface
BioEPIC	Biological and Environmental Program Integration Center
BMPs	best management practices
Btu	British thermal units
BUSD	Berkeley Unified School District
°C	degrees Celsius
CAA	federal Clean Air Act
CAAQS	California ambient air quality standards
CalARP	California Accidental Release Prevention Program
CalEEMod	California Emissions Estimator Model
CalEPA	California Environmental Protection Agency
CalFire	California Department of Forestry and Fire Protection
Cal ISO	California Independent System Operator
Cal OES	California Governor's Office of Emergency Services
Cal/OSHA	California Occupational Safety and Health Administration
CalRecycle	California Department of Resources Recycling and Recovery
CALSTAR	California Shock Trauma Air Rescue
Caltrans	California Department of Transportation
CAP	Clean Air Plan
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CBSC	California Building Standards Code
CCA	Community Choice Aggregation
CCAA	California Clean Air Act
CCR	California Code of Regulations

CDDG	LBNL Construction Details and Design Guidelines
CDFW	California Department of Fish and Wildlife
CDHS	California Department of Health Services
CDSS	College of Computing, Data Science, and Society
CGE	Consulting Geotechnical Engineer
CDE	California Department of Education
CDFA	California Department of Food and Agriculture
CDMG	California Division of Mines and Geology
CDPH	California Department of Public Health
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CERCLA	federal Comprehensive Environmental Response, Compensation and Liability Act of 1980
CEMP	Comprehensive Emergency Management Plan
CERP	Community Emissions Reduction Plan
CESA	California Endangered Species Act
Ci	curies
CFLs	compact fluorescent light bulbs
CFR	Code of Federal Regulations
CGP	Construction General Permit
CGS	California Geological Survey
CH_4	methane
CHSP	Berkeley Lab Chemical Hygiene and Safety Plan
CHRIS	California Historical Resources Information System
CHP	California Highway Patrol
CMP	Campus Master Plan
CNDDB	California Natural Diversity Database inventory of rare plants and animals
CNI	Carbon Neutrality Initiative
CNEL	Community Noise Equivalent Level
CNI	Carbon Neutrality Initiative
CNPS	California Native Plant Society
CNRA	California Natural Resources Agency
CO	carbon monoxide
COCs	chemicals of concern

CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COPD	chronic obstructive pulmonary disease
COVID-19	Coronavirus 2019
CNPPA	California Native Plant Protection Act
CRHR	California Register of Historical Resources
CRMP	Cultural Resource Management Plan
CRT	cathode ray tubes
CRT	Computational Research & Theory Building (aka Shyh Wang Hall)
CSC	California Species of Concern
CTC	Alameda County Transportation Commission
CUPAs	certified unified program agencies for hazardous materials programs
CVC	California Vehicle Code
CVP	Central Valley Project
CWA	federal Clean Water Act
cy	cubic yards
dB	decibel
dBA	A-weighted decibel
DCS	Derived Concentration Standard
DDT	dichloro-diphenyl-trichloroethane
DEAR	U.S. Department of Energy Acquisition Regulation
DFN	Distributed Fiber Node
DMP	Drought Management Program
DNL	day-night noise level
DOC	California Department of Conservation
DOE	U.S. Department of Energy
DPM	diesel particulate matter
DPR	California Department of Parks and Recreation
DTSC	California Department of Toxic Substances Control
DWR	California Department of Water Resources
EIA	U.S. Energy Information Administration
EBMUD	East Bay Municipal Utility District
EBRPD	East Bay Regional Park District

EETD	Environmental Energy Technologies Division
EH&S	Environmental Health and Safety
EIR	Environmental Impact Report
EJ	Environmental Justice
EMS	Berkeley Lab Environmental Management System
EO	Executive Order issued by California Governor or U.S. President
EOP	Emergency Operations Plan
EPA	U.S. Environmental Protection Agency
ESA	federal Endangered Species Act
EV	electric vehicle
°F	degrees Fahrenheit
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FICAN	Federal Interagency Committee on Aviation Noise
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Maps
FMMP	Farmland Mapping and Monitoring Program
FRAP	Fire and Resources Assessment Program
FTA	Federal Transit Administration
FTU	Fixed Treatment Unit
FY	Fiscal Year
GAC	granular activated carbon
GHG	greenhouse gas
gpm	gallons per minute
gsf	gross square feet
GPL	General Purpose Lab
GSA	groundwater sustainability agency
GSP	Groundwater Sustainability Plan
GWh	gigawatt hours
GWP	global warming potential
HABS	Historic American Buildings Survey
HAER	Historic American Engineering Record
HALS	Historic American Landscape Survey
He	helium

HEPA	high-efficiency particulate air
HFCs	hydrofluorocarbons
HI	hazard index for hazardous or toxic air pollutant exposure
HMBP	hazardous materials business plan
HP	horsepower
HPCW	high pressure city water
HRA	health risk assessment for hazardous or toxic air pollutants
HSC	California Health and Safety Code
HVAC	heating, ventilation and air conditioning
HWHF	Hazardous Waste Handling Facility
Hz	Hertz
I-80	Interstate 80
I-580	Interstate 580
I-880	Interstate 880
IBC	Berkeley Lab Institutional Biosafety Committee
IEPR	Integrated Energy Policy Report
IGB	Integrative Genomics Building
IGP	Industrial General Permit
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization of Standardization
IT	information technology
JBEI	Joint BioEnergy Institute
kV	kilovolt
kW	kilowatt
kWh	kilowatt-hours
L_{90}	noise level exceeded 90 percent of the time
L_{dn}	day-night noise level
L_{eq}	equivalent continuous sound level
L_{max}	maximum noise level
LAMP	Linear Assets Modernization Project
LAWA	Los Angeles World Airports
lb	pounds
LBNL	Lawrence Berkeley National Laboratory
LHS	Lawrence Hall of Science

LBP	lead-based paint
LCFS	Low Carbon Fuel Standard
LCW	Low Conductivity Water
LEED®	Leadership in Energy and Environmental Design
LHMP	Local Hazard Mitigation Plan
LID	Low Impact Development
LN2	liquid nitrogen
LOS	level of service
LPG	Liquified Petroleum Gas
LRA	Local Responsibility Area
LRDP	Long Range Development Plan
LUTE	City of Oakland Land Use and Transportation Element
M&O	Management and Operating
MBTA	federal Migratory Bird Treaty Act
MCL	maximum contaminant level
MDC	minimum detectable concentration
MED	Manhattan Engineering District
MEIR	maximally exposed individual resident
MEIW	maximally exposed individual worker
MGD	million gallons per day
MGY	million gallons per year
MLD	most likely descendant
MMBTUs	metric million British Thermal Units
MMI	Modified Mercalli Intensity
MMRP	Mitigation Monitoring and Reporting Program required by CEQA
$MMTCO_2e$	million metric tons of carbon dioxide equivalent
mpg	miles per gallon
mph	miles per hour
MRZ	Mineral Resource Zone designated by the State Geologist
MS4	Municipal Separate Storm Sewer System
msl	mean sea level
MT	metric tons
MTC	Metropolitan Transportation Commission
$MTCO_2e$	metric tons of carbon dioxide equivalent

MUP	Modular Utility Plant
MVA	megavolt amperes
Mw	Maximum Moment Magnitude Earthquake
MW	megawatt
MWh	megawatt-hours
MWh/year	megawatt-hours per year
MWWTP	Main Wastewater Treatment Plant
NAAQS	national ambient air quality standards
NACTO	National Association of City Transportation Officials
NAHC	California Native American Heritage Commission
NAL	numeric action level
NECPA	National Energy Conservation Policy Act
NEPA	National Environmental Policy Act
NERSC	National Energy Research Scientific Computing Center
NESHAP	National Emission Standards for Hazardous Airborne Pollutants
NFIP	National Flood Insurance Program
NFPA	National Fire Protection Association
NHPA	National Historic Preservation Act
NHTSA	National Highway Traffic Safety Administration
NIOSH	National Institute on Occupational Health and Safety.
NIH	National Institute of Health
NLR	noise level reduction
NMFS	National Marine Fisheries Service
NMR	Nuclear Magnetic Resonance
NO_2	nitrogen dioxide
N_2O	nitrous oxide
NOA	CEQA Notice of Availability
NOAA	National Oceanic and Atmospheric Association
NOP	CEQA Notice of Preparation
NO_x	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NPPA	California Native Plant Protection Act
NRHP	National Register of Historic Places
NTLF	National Tritium Labeling Facility

NWIC	Northwest Information Center of the California Historical Resources Information System
OFD	Oakland Fire Department
OPD	Oakland Police Department
OHP	State of California Office of Historic Preservation
OPR	California Governor's Office of Planning and Research
OSCAR	Open Space, Conservation, and Recreation
OSHA	Occupation Safety and Health Administration
OSHPD	Office of Statewide Health Planning and Development
OUSD	Oakland Unified School District
pCi/L	picocuries per liter of air
PCBs	polychlorinated biphenyls
PDA	Priority Development Area identified by ABAG
PDP	Preliminary Development Plan
PELs	permissible exposure levels
PEV	plug-in electric vehicle
PFCs	perfluorocarbons
PG&E	Pacific Gas and Electric Company
PhDF	Physical Design Framework
PHEVs	plug-in hybrid electric vehicles
PM	particulate matter
$PM_{2.5}$	particulate matter 2.5 microns or less in diameter
PM_{10}	particulate matter 10 microns or less in diameter
PPA	Power Purchase Agreement
ppb	parts per billion
ppm	parts per million
PPV	peak particle velocity
PRC	California Public Resources Code
PSA	pollutant source assessment
psi	pounds per square inch
psig	pounds per square inch gauge
PUD	Planned Unit Development
PUE	Power Utilization Effectiveness
PV	photovoltaic
RADAR	Radiation Authorization Reporting System

RCCC	Red Cross Red Crescent Climate Center
RCNM	Roadway Construction Noise Model
RCRA	Resource Conservation and Recovery Act of 1976
REL	reference exposure level
RFS	Richmond Field Station
RHNA	Regional Housing Need Allocation developed by ABAG
ROG	reactive organic gas
RPM	Berkeley Lab Requirements and Policy Manual
RPP	Berkeley Lab Radiation Protection Program
RPS	Renewable Portfolio Standard established by the CEC
RSC	Berkeley Lab Radiation Safety Committee
RWQCB	Regional Water Quality Control Board
SAA	Satellite Accumulation Areas
SARA	Superfund Act and Reauthorization Act of 1986
SB	Senate Bill
SBL	Sustainable Berkeley Lab
SCS	Sustainable Communities Strategy required by SB 375
SF_6	sulfur hexafluoride
SEL	Sound Exposure Level
SEP	UC Strategic Energy Plan
SERC	Solar Energy Research Center
SES	Berkeley Lab Security and Emergency Services
SFBAAB	San Francisco Bay Area Air Basin
SFDPH	San Francisco Department of Public Health
SGMA	Sustainable Groundwater Management Act of 2014
SHPO	California State Historic Preservation Officer
SIP	State Implementation Plan
SLF	Sacred Lands File
SMARTS	Storm Water Multiple Application and Report Tracking System
SO_2	sulfur dioxide
SOIS	Secretary of the Interior Standards
SOV	single-occupant vehicle
SPC	Structural Performance Category
SPCC	Spill Prevention, Control, and Countermeasures

SPR	Seismic Performance Rating
SR 13	State Route 13
SR 24	State Route 24
SRA	State Responsibility Area
SSM	Seismic Safety and Modernization Project
STC	sound transmission class
SWPPP	Stormwater Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TA	Time Above
TACs	toxic air contaminants
TAF	thousand acre-feet
TAZ	Transportation Analysis Zone
TDM	Transportation Demand Management
The Regents	The Board of Regents of the University of California
THUP	Transit Hub Utilities Project
TMD	City of Berkeley Toxics Management Division
TMDL	total maximum daily load for water quality standards
TMP	Transportation Management Plan
TPA	Transit Priority Area
TPY	tons per year
TSCA	Toxic Substances Control Act
TSS	total suspended solids
UC	University of California
UCOP	University of California Office of the President
UCPD	University of California, Berkeley Police Department
USACE	U.S Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USDA	U.S. Department of Agriculture
USDHHS	U.S. Department of Health and Human Services
USDOT	U.S. Department of Transportation
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USPS	U.S. Postal Service
UST	Underground Storage Tank

UWMP	Urban Water Management Plan
μg/m^3	micrograms per cubic meter
V	volt
VdBs	vibration decibels
VHFHSZ	Very High Fire Hazard Severity Zone
VMP	Vegetation Management Program
VMT	vehicle miles traveled
VOCs	volatile organic compounds
WAA	Waste Accumulation Area
WAPA	Western Area Power Administration
WDRs	Waste Discharge Requirements
WFMP	Wildland Fire Management Plan
WGCEP	Working Group on California Earthquake Probabilities
WHO	World Health Organization
WMAC	Waste Management of Alameda County
WRCC	Western Regional Climate Center
WSCP	Water Shortage Contingency Plan
WSA	Water Supply Assessment
WUI	Wildland Urban Interface
ZEV	zero emission vehicle

CHAPTER 1
Introduction

1.1 Overview

This environmental impact report (EIR) has been prepared pursuant to the provisions of the California Environmental Quality Act (CEQA) and its implementing guidelines (*CEQA Guidelines*), and the *Amended University Procedures for Implementation of the California Environmental Quality Act*. The University of California (UC or the University) is the lead agency for this EIR, which examines the overall effects of implementation of the proposed 2025 Long Range Development Plan (LRDP; also referred to herein as the proposed "Project" for purposes of CEQA) for Lawrence Berkeley National Laboratory (LBNL; also referred to as "Berkeley Lab," "the Laboratory," or "the Lab" in this document).

Berkeley Lab is a federally funded national laboratory of the U.S. Department of Energy (DOE) Office of Science. The Lab conducts unclassified research to deliver scientific solutions to challenges of national and international significance that are beyond the capabilities of most university and private sector research institutions.

Berkeley Lab occupies approximately 202 acres of UC-owned land in the East Bay hills of the San Francisco Bay Area region. Building parcels on the Berkeley Lab campus (the campus) are leased by the University to the DOE for all major DOE-owned buildings. While the DOE owns most of the facilities and structures within the campus, Lab management and operations are provided by the University under a DOE/UC contract. Due to its research mission and the ownership of the Berkeley Lab property and its management by the University, Berkeley Lab is considered a UC campus. The University, specific to its role as landowner, manager, and operator of Berkeley Lab, is referred to hereinafter as UC LBNL.

UC campuses—including Berkeley Lab—are required to maintain and periodically update their LRDPs. An LRDP is a land use plan that guides overall campus development. The current LBNL 2006 LRDP and its accompanying EIR provide guidance for campus development through approximately 2025. UC LBNL has prepared the proposed 2025 LRDP to guide the Lab's development for the next 20 years. The adoption of an LRDP does not constitute a commitment to, or final decision to implement, any specific project, construction schedule, or funding priority. Rather, an LRDP sets forth general parameters of projected growth in building space and campus population, and principles and policies that would serve to guide future development on a campus. The proposed 2025 LRDP envisions a development program for the Berkeley Lab campus that includes construction of approximately 574,000 gross square feet (gsf) of new research and support space and demolition of about 278,500 gsf of existing facilities, for a total net new 295,500 gsf of building space through 2045. In addition, the proposed 2025 LRDP provides for approximately 63,000 gsf of “flex space allowance,” under which up to 63,000 gsf of existing buildings might be vacated but not demolished within the planning period.

As a campus operated by the University of California, UC LBNL is required to prepare an EIR for its LRDP pursuant to Public Resources Code Section 21080.09. CEQA requires that, before a decision can be made by a public agency to approve a project that may have significant environmental effects, an EIR must be prepared that fully describes and discloses the environmental effects of the project. The EIR is a public informational document for use by University decision-makers and the public. It is intended to identify and evaluate potential environmental consequences of the proposed project, to identify mitigation measures that would lessen or avoid significant adverse impacts, and to examine feasible alternatives to the project. The information contained in the EIR is reviewed and considered by the lead agency’s decision-makers prior to the action to approve, disapprove, or modify the proposed project. Before it can formally adopt the new or updated LRDP, the University must first review, consider public and agency comments, and certify (i.e., approve) the Final EIR.

CEQA states that the lead agency (in this case, the University) shall neither approve nor implement a project as proposed unless the significant environmental effects of that project have been reduced to less-than-significant levels, essentially “eliminating, avoiding, or substantially lessening” its expected impacts. If the lead agency approves the project despite residual significant adverse impacts that cannot be mitigated to less-than-significant levels, the agency must state the reasons for its action in writing. This “Statement of Overriding Considerations” must be included in the record of project approval.

This EIR has been prepared to inform The Regents of the University of California (“The Regents”), responsible agencies, trustee agencies, and the public of the proposed Project’s environmental effects. The EIR is intended to publicly disclose those impacts that may be significant and adverse, describe the possible measures that would mitigate or avoid such impacts, and describe a reasonable range of alternatives to the project that would mitigate or avoid significant impacts.

This EIR also presents the environmental impacts of Berkeley Lab’s Vegetation Management Program, which is a related existing program that will continue to be implemented concurrently with the proposed LRDP.

1.2 Relationship between LBNL, the University, and the U.S. Department of Energy

LBNL is a Federally Funded Research and Development Center, as defined in the Federal Acquisition Regulations and Department of Energy Acquisition Regulations.[1] It is a Government Owned and Contractor Operated Federal Laboratory, as defined in the regulations, funded by the U.S. government to meet specific long-term technical needs that cannot be met by any other

1 CFR Title 48, Chapter 9, Subchapter I, Part 970.

single organization. From a contractual standpoint, the University is a Management and Operating (M&O) contractor of LBNL as defined under the U.S. Department of Energy Acquisition Regulation (DEAR) – specifically DEAR Part 970.[2] As the Lab's M&O Contractor, UC is responsible for providing the intellectual leadership and management expertise necessary and appropriate to manage, operate, and staff the Lab; accomplish the missions and activities assigned and funded by the DOE to the Lab; administer the DOE/UC Prime Contract; and provide UC oversight of the Lab's contract compliance and performance. The Prime Contract (Contract 31) provides the overall statement of work to be performed and the terms and conditions of its performance for the federal government. The contract calls for budget and program planning that is coupled to the DOE and its plans and the federal budgeting process.

The federal government leases land parcels on the Berkeley Lab campus from The Regents and constructs federally-owned buildings on those leased parcels. Laboratory equipment is also acquired and owned by the federal government. The University's role is to provide intellectual scientific and management leadership, and to staff and operate the Lab as provided in Contract 31 between The Regents and the DOE. With the approval of The Regents, the UC President appoints the Lab Director. The appointment of the Lab Directors is also subject to DOE approval. The Lab Director is an Officer of the University of California.

Because The Regents may re-acquire full responsibility for the Lab campus and structures should the federal government close the Lab, and for effective ongoing management, The Regents hold themselves accountable for campus stewardship. The Regents require and approve the University-defined LRDP and require that its approval be consistent with the University's policy and CEQA requirements.

In summary, the DOE's role as Lab owner is to determine LBNL's federal research mission and program, provide its funding, and oversee the execution of DOE programs. The Lab's mission planning is guided by DOE directives and federal program planning guidelines. UC, as landowner and Lab operator, provides the intellectual resources for running the Lab, and it oversees its relationship to the University, the community, and its contract compliance with the DOE.

1.3 Summary of Proposed Project

1.3.1 Existing Conditions

The Berkeley Lab campus occupies approximately 202 acres in the East Bay hills, and straddles the border between the cities of Berkeley and Oakland. The campus is surrounded on the west by UC Berkeley's Campus Park and Hill Campus West, and City of Berkeley multi-unit residential developments; on the north by City of Berkeley single-family residential neighborhoods and various UC Berkeley Hill Campus East facilities and open space; on the east by UC Berkeley's Hill Campus East open space; and on the south by UC Berkeley's Hill Campus West and East, Botanical Garden, and by the Strawberry Canyon recreation area and open space.

[2] Ibid.

The Berkeley Lab campus currently contains approximately 2.06 million gsf of development, including research laboratories, accelerators, offices, workshops, and other facilities contained within eight loosely organized development clusters. Two east-west roadways terminating at the Lab's three entrance gates and various connecting north-south roadways constitute the campus's major vehicle circulation network. Approximately 2,200 campus parking spaces are distributed in parking lots and alongside roads. Approximately two-thirds of the campus is vegetated open space, which includes grasslands, woodlands, scrubland, and riparian areas, as well as planted landscaping. There are two perennial streams and multiple ephemeral and intermittent drainages on the campus.

The current (2024) campus population, expressed as "adjusted daily population" (ADP), is estimated at approximately 3,000. This is lower than pre-pandemic levels, which reached a peak of 4,500 in 2019.

CEQA Guidelines (Section 15125) require that an EIR describe the environmental conditions on the project site and in the project vicinity as they existed at the time the project Notice of Preparation (NOP) was published. The Guidelines state that "this environmental setting will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant." UC LBNL issued the NOP for the proposed 2025 LRDP in May 2024, and therefore this EIR uses 2024 as the baseline year for evaluating the impacts of the proposed 2025 LRDP on its environmental setting.

1.3.2 Proposed Project

The proposed Project is the adoption and implementation of the proposed LBNL 2025 LRDP. The Draft LRDP is being published and publicly circulated concurrently with this EIR in April 2025 and is incorporated by reference into this EIR.

The primary purpose of the LRDP is to guide the physical development of land and facilities and to provide a framework for implementing the Lab's mission and scientific goals. The proposed LRDP sets forth principles and policies that are intended to guide the physical development of the Berkeley Lab campus, including the construction of new buildings, roads, parking lots, and infrastructure systems, while protecting significant natural resources on the campus.

Under the proposed 2025 LRDP, campus population is projected to reach 4,200 ADP by the year 2045. This would be an increase of 1,200 ADP over baseline/existing conditions. The 2025 LRDP projection of 4,200 ADP is, nevertheless, lower than pre-pandemic ADP levels at the campus and below the 4,650 ADP identified in the LBNL 2006 LRDP.[3]

Under the proposed 2025 LRDP, approximately 574,000 gsf of new building space would be constructed on the campus. Subtracting out the estimated 278,500 gsf of demolition, the resulting net new building space under the proposed 2025 LRDP would be about 295,500 gsf. In addition,

[3] Please see Section 3.3.2 in Chapter 3, *Project Description* for the change in the methodology used by Berkeley Lab to calculate the 2024 and 2045 ADP. The change in ADP methodology accounts for more remote and hybrid work by Lab staff at the present time and in the future, compared to the assumption of no remote or hybrid work used to develop the 2006 LRDP ADP projections.

the proposed 2025 LRDP provides for approximately 63,000 gsf of "flex space allowance," under which up to 63,000 gsf of existing buildings might be vacated but not demolished within the 2045 planning period.[4] Therefore, at full development under the proposed 2025 LRDP and with inclusion of the flex space allowance, there could be a total of 2,420,000 gsf of campus building space by year 2045. This would represent a building space increase of approximately 17 percent over existing conditions.

Please refer to Table 2-1 in Chapter 2, *Summary*, for a summary of existing (2024) campus population and building space, and prospective (2025 LRDP) campus population and space program projections. The total projected campus population under the proposed 2025 LRDP would be less than that previously anticipated under the 2006 LRDP. In addition, the 2025 LRDP projects no increase in total building space as compared with the 2006 LRDP; both plans include the same total building space projection of 2,420,000 gsf at full development.

1.4 California Environmental Quality Act Process

1.4.1 Organization of this Draft Environmental Impact Report

This EIR is organized to allow the reader to quickly review a summary of the analysis and impacts, recommended mitigation measures, and residual environmental impacts after mitigation, if any (see Chapter 2, *Summary*). Those readers who wish to read the Draft EIR in greater detail are directed *to Chapter 4, Environmental Setting, Impacts, and Mitigation Measures*. The Draft EIR begins with this *Introduction* (Chapter 1). The chapters following the Introduction are organized as follows:

Chapter 2, *Summary*, describes the proposed Project, issues of controversy associated with the Project, environmental effects of the Project, and alternatives to the Project (including the No Project Alternative). The Summary section includes Table 2-3, *Summary of Proposed 2025 LRDP Impacts and Mitigation Measures*, which lists each identified environmental impact, corresponding mitigation measure(s), and residual level of significance following implementation of mitigation.

Chapter 3, *Project Description*, provides background context; a description of the Project site characteristics; discussion of the proposed 2025 LRDP Project; and a description of Project objectives, Project characteristics, the Illustrative Development Scenario, Project construction scenarios, and required permits and approvals.

Chapter 4, *Environmental Setting, Impacts, and Mitigation Measures*, provides, with respect to each environmental impact category, an introduction to environmental analysis; describes the Project's environmental setting, includes the regulatory framework; discusses the methodology used for evaluating the environmental impacts of the proposed Project; provides a programmatic analysis of the impacts of the proposed Project; analyzes cumulative impacts; and identifies mitigation measures that would reduce or avoid significant impacts.

4 The most likely use of the flex space allowance would be a scenario wherein the 2025 LRDP EIR construction program was fully realized, but there wasn't enough funding to fully realize the demolition program by 2045.

Chapter 5, *Alternatives*, provides an analysis of a reasonable range of alternatives to the proposed Project. As required by the *CEQA Guidelines*, the chapter includes a discussion of the reasons for selecting the alternatives analyzed in detail as well as a discussion of alternatives that were considered but not carried forth for detailed evaluation. The chapter includes a comparative analysis of each alternative and identification of the "environmentally superior" alternative.

Chapter 6, ***CEQA Statutory Sections***, summarizes significant and unavoidable impacts, significant irreversible environmental changes, and any growth-inducing impacts of the proposed Project.

Chapter 7, ***Report Preparation***, identifies the persons who prepared the EIR, and individuals and agencies who were consulted during its preparation.

Appendices. The appendices include the NOP and various supporting technical studies prepared for the Draft EIR.

1.4.2 Environmental Review Process

On May 6, 2024, UC LBNL issued a NOP to governmental agencies, organizations, and interested persons, announcing the preparation of this EIR for the proposed 2025 LRDP along with a request for comments pertinent to the forthcoming EIR's scope. Having determined that an EIR would be required to evaluate changes in the environment that would result from construction and implementation of the Project, UC LBNL elected to not prepare an Initial Study checklist to accompany the NOP, as permitted by Section 15060(d) of the *CEQA Guidelines*. Rather, the EIR addresses all environmental topics included in the *CEQA Guidelines* Appendix G checklist and does not focus out any environmental issues. The NOP is included as an appendix to this EIR, as are responses to the NOP received during the scoping period.

CEQA requires that a Draft EIR be circulated for agency and public review for a minimum of 30 days, and a minimum of 45 days when the Draft EIR is submitted to the State Clearinghouse for state agency review. To provide the agencies and the public more time to review, this Draft EIR is being circulated for review and comment by the public and other interested parties, agencies, and organizations for a 61-day period. The public review period will extend from April 1, 2025 to May 31, 2025. A public hearing on the Draft EIR will be scheduled in May 2025; please refer to the Notice of Availability for further details.

The public is invited to attend the hearing and to offer comments on the Draft EIR. All written comments or questions about the Draft EIR should be addressed to:

> Jeff Philliber, Sr. Site & Environmental Planner
> Campus Planning Dept.
> Lawrence Berkeley National Laboratory
> 1 Cyclotron Road, M/S 50A-4112, Berkeley, CA 94720

Comments may also be sent by e-mail to: **Planning@lbl.gov** (attention: Jeff Philliber).

The Draft 2025 LRDP and this Draft EIR are also publicly available at **https://lrdp.lbl.gov** and at the following location:

Berkeley Public Library
2090 Kittredge Street
2nd Floor, Reference Desk
Berkeley, CA 94704

Following the public review period, responses to all substantive comments received on the adequacy of the Draft EIR and submitted within the specified review period will be prepared and included in the Final EIR. The Regents will then review and consider the Final EIR prior to any decision to approve, revise and approve, or reject the proposed 2025 LRDP. Prior to approval of the proposed Project, the Regents must certify the Final EIR as complete and adequate and adopt a Mitigation Monitoring and Reporting Program. Project requirements and required mitigation measures identified in the Final EIR and Mitigation Monitoring and Reporting Program adopted by The Regents shall be implemented by UC LBNL.

Following the certification of the Final EIR by The Regents, the Lab Director, under delegated authority, will also use this EIR to consider the authorization and approval of the continued implementation of Berkeley Lab's Vegetation Management Program.

1.4.3 Evaluation of Local Plans and Zoning in this EIR

The University of California is exempt from local planning and zoning regulations. Specifically, the University of California was established by Article IX, Section 9 of the California Constitution. Section 9 grants The Regents broad authority with respect to the management and disposition of its property: "The Regents of [UC] . . . shall have the power to take and hold . . . without restriction, all real and personal property for the benefit of the university or incidentally to its conduct." CAL. CONST. Art. IX, Section 9(f). Because the Lab is operated by the UC on University land for UC purposes, it is exempt from local zoning regulations pursuant to its Section 9 grant of autonomy.

Berkeley Lab is a federal facility conducting work within the University of California's mission and as such is generally exempted by the federal and State constitutions from compliance with local land use regulations, including general plans and zoning, whenever using property under its control in furtherance of its educational and research purposes.

The *CEQA Guidelines* (Section 15125(d)) specify that an EIR shall discuss "any inconsistencies between the proposed project and applicable general plans and regional plans." The general plans of the Cities of Berkeley and Oakland are not "applicable" plans, because UC is legally exempt from such plans and those plans do not apply to the conduct of university activities on UC property. In addition, the conduct of federal activity is not subject to such local plans. As such, UC LBNL will not consider local policies and regulations in its evaluation of the environmental effects of the proposed Project unless UC LBNL expressly decides to use a local policy or regulation as a threshold or standard of significance. As discussed in Section 4.11, *Noise and Vibration*, as noise-sensitive receptors located in Berkeley near Berkeley Lab could be affected by noise generated on the Lab, UC LBNL has elected to apply local noise standards from the municipal code to evaluate off-campus noise impacts. The City of Berkeley noise standards are, therefore, discussed and used in the impact analysis in Section 4.11.

1.4.4 Relationship Between this EIR and CEQA Review for Later Project Approvals Pursuant to the LRDP

The proposed 2025 LRDP is a land use plan that would guide the physical development of the Berkeley Lab campus. It is not an implementation plan, and adoption of the proposed 2025 LRDP does not constitute a commitment to any specific project, construction schedule, or funding priority. Rather, it describes at a high level the overall campus development program through 2045. This 2025 LRDP EIR is a program-level EIR that evaluates and discloses the environmental effects of implementation of the entire LRDP. This EIR will be used by The Regents to help decide whether to approve, revise, or reject the proposed 2025 LRDP.

This program EIR will also be used by UC LBNL in conjunction with the approval of individual development and infrastructure projects that are proposed at the Berkeley Lab campus over the next 20 years. Under CEQA guidelines for using program EIRs with later activities, if the proposed activities do not have effects that were not examined in the previous program EIR, and no new or substantially more severe significant effects would occur, and no new mitigation measures would be required, a program EIR has adequately analyzed the later activities for CEQA purposes; i.e., the later activities are within the scope of the program EIR, and no further review under CEQA is required.

Use of program EIRs to cover later activities is addressed in *CEQA Guidelines* Section 15168(c):

(c) **Use with Later Activities**. Subsequent activities in the program must be examined in the light of the program EIR to determine whether an additional environmental document must be prepared.

  (1) If a later activity would have effects that were not examined in the program EIR, a new Initial Study would need to be prepared leading to either an EIR or a Negative Declaration.

  (2) If the agency finds that pursuant to Section 15162, no new effects could occur or no new mitigation measures would be required, the agency can approve the activity as being within the scope of the project covered by the program EIR, and no new environmental document would be required.

  (3) An agency shall incorporate feasible mitigation measures and alternatives developed in the program EIR into subsequent actions in the program.

  (4) Where the subsequent activities involve site specific operations, the agency should use a written checklist or similar device to document the evaluation of the site and the activity to determine whether the environmental effects of the operation were covered in the program EIR.

  (5) A program EIR will be most helpful in dealing with subsequent activities if it deals with the effects of the program as specifically and comprehensively as possible. With a good and detailed analysis of the program, many subsequent activities could be found to be within the scope of the project described in the program EIR, and no further environmental documents would be required.

Future Berkeley Lab campus development projects proposed during the 2025 LRDP planning period would be examined by the UC LBNL to determine whether the projects are adequately analyzed for their environmental impacts in this program EIR or whether additional CEQA documentation must be prepared. As provided under *CEQA Guidelines* Sections 15162 and 15168, if UC LBNL finds, among other things, that no new effects would occur as a result of the project beyond what is evaluated in this EIR and that no new mitigation measures would be required, then The Regents or UC LBNL under authority delegated by The Regents could approve the activity as being within the scope of this LRDP EIR, and no new environmental documentation would be needed. As outlined in *CEQA Guidelines* Section 15164, if the above conditions apply, but some changes or additions to the EIR are necessary, an addendum to the EIR could be prepared. If these conditions do not apply—for example, if UC LBNL finds that a later activity would have effects that were not examined in the EIR—a new Initial Study and/or an EIR may have to be prepared. Also, for projects that require additional CEQA review and documentation before approval, this EIR may be used as a first-tier document pursuant to *CEQA Guidelines* Section 15152. In some circumstances (*CEQA Guidelines* Sections 15300 et seq.), a future project may be subject to a specific exemption from CEQA. Berkeley Lab would use a written checklist or similar device to document the evaluation of the activity to determine whether the environmental effects of the project are adequately addressed in this 2025 LRDP EIR.

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CHAPTER 2
Summary

2.1 Introduction

This EIR evaluates the environmental impacts from the adoption and implementation of the proposed Lawrence Berkeley National Laboratory (LBNL) 2025 Long Range Development Plan (2025 LRDP; also referred to herein as the CEQA "Project") through a horizon year of 2045.

LBNL (also referred to herein as the "Lab," "Berkeley Lab," and the "Laboratory") is a federally funded national laboratory of the U.S. Department of Energy (DOE) Office of Science. The Lab conducts unclassified research to deliver scientific solutions to challenges of national and international significance that are beyond the capabilities of most university and private sector research institutions.

Berkeley Lab is located on approximately 202 acres of UC Regents-owned land in the East Bay hills. Berkeley Lab campus building parcels are leased by the University to the DOE to site all major DOE-owned buildings. While the DOE owns most of the facilities and structures on the campus, Lab management and operations are provided by the University under a DOE/UC contract. Due in part to the ownership of the Berkeley Lab site and its management by the University, Berkeley Lab is considered a UC campus.

UC campuses—including Berkeley Lab—are required to maintain and periodically update their LRDPs. An LRDP provides a high-level planning framework to guide land use, physical parameters, and capital investment in line with the campus's mission and strategic goals.[1] The LRDP provides adequate planning capacity for potential program and on-campus population growth and physical infrastructure that may be needed to support future campus development. UC requires that a new or updated LRDP be accompanied by an EIR pursuant to CEQA (*CEQA Guidelines* Section 15081.5(b)).

Berkeley Lab has prepared a draft LRDP that would replace its current 2006 LRDP. This EIR has been prepared in compliance with CEQA to disclose to the public and decision-makers the significant environmental impacts that could result if the proposed 2025 LRDP were approved by the University and implemented.

1 An LRDP is defined by statute (Public Resources Code [PRC] 21080.09) as a "physical development and land use plan to meet the academic and institutional objectives for a particular campus or medical center of public higher education."

The University is the "lead agency" for the environmental review of the proposed 2025 LRDP under CEQA. The Board of Regents is the University's decision-making body and is responsible for approving the proposed LRDP. The Regents will review and consider this EIR in conjunction with review and consideration of the proposed 2025 LRDP.

This summary highlights the major areas of importance in the environmental analysis for the proposed Project, as required by Section 15123 of the *CEQA Guidelines*. It provides a brief description of the proposed 2025 LRDP, the project objectives, the significant and unavoidable environmental effects, alternatives to the proposed Project, and areas of controversy known to the University. In addition, this chapter summarizes (1) all potential environmental impacts that would occur as the result of proposed Project implementation; (2) the recommended mitigation measures that would avoid or reduce significant environmental impacts; and (3) the level of impact significance after mitigation measures are implemented. It also provides a comparison of the proposed Project's impacts with those of project alternatives.

This EIR also presents the potential environmental impacts from the continued implementation of Berkeley Lab's Vegetation Management Program, which is a related existing program that would be implemented concurrently with the proposed 2025 LRDP. A refreshed VMP approval by the Berkeley Lab Director under UC Regents delegated authority will likely take place sometime after the UC Regent's consideration of the 2025 LRDP and EIR. This approval decision will be based on consideration of the CEQA impact analysis contained in this 2025 LRDP EIR.

2.2 Project Description

The primary purpose of the proposed 2025 LRDP is to guide the physical development of land and facilities at Berkeley Lab for the next 20 years and to provide a framework for implementing the Lab's mission and scientific goals. The proposed 2025 LRDP sets forth principles, goals, and strategies that are intended to guide the physical development of the Berkeley Lab campus, including the construction of new buildings, roads, parking lots, and infrastructure systems, while protecting significant natural resources.

The following subsections present the EIR project objectives and a description of the proposed 2025 LRDP.

2.2.1 Project Objectives

The proposed 2025 LRDP responds to the following objectives that are aimed at further developing and modernizing the Berkeley Lab campus:

1. Strengthen Berkeley Lab's ability to perform transformative, mission-directed scientific research.
    - Provide the Berkeley Lab campus with modern, sound, mission-capable scientific facilities and support space.
    - Prioritize removing buildings that are obsolete or not mission capable, or that are highly inefficient, environmentally unsound, or that fail to meet UC seismic standards.

- Renovate, expand, modernize, or repurpose outdated facilities to meet research needs, where feasible and economical.
- Provide for population and building space growth necessary to flexibly accommodate Berkeley Lab's programmatic and operational needs.
- Outfit the Berkeley Lab campus with modern, mission-capable infrastructure and utilities. Design scientific and support facilities to be readily adaptable to a wide variety of uses and changing conditions.
- Prepare the campus to consolidate personnel and functions from off-site leased space, with a focus on collaboration and efficiency, while retaining flexible use of off-site space as needed.
- Configure indoor and outdoor spaces to encourage collaboration and to support Team Science.[2]
- Design and leverage the Berkeley Lab campus to attract investment, initiatives, and scientific talent.

2. Guide Berkeley Lab's development towards achieving an identifiable and fully realized UC Research Campus.
    - Realize a cohesive UC research campus with a unique sense of identity.
    - Reinforce the campus cluster development scheme when siting buildings and hardscape.
    - Improve wayfinding and user orientation throughout the campus.
    - Improve campus circulation network and mobility opportunities for all campus users.
    - Develop and reinforce attractive and sustainable outdoor areas throughout the campus.
    - Locate facilities and outdoor activities to capitalize on existing opportunities and minimize land use conflicts.
    - Organize the campus to optimize maintenance and day-to-day management.
3. Maintain and strengthen Berkeley Lab's responsible stewardship of public and natural resources.
    - Factor efficiency and cost-effectiveness into campus design and development.
    - Preserve, maintain, and improve the campus natural environment.
    - Promote a sustainable campus by maximizing efficiency and minimizing natural resource consumption and environmental impacts.
    - Consider conservation of energy, material, and water in all LBNL development.
    - Emphasize sitewide safety and security through campus design.
    - Design and manage campus developed areas to minimize wildland fire risk, maintain defensive building perimeters, and ensure safe egress/entry routes.
    - Manage outlying and natural campus vegetation areas to minimize wildland fire risk and intensity.

[2] Attributed to Berkeley Lab founder EO Lawrence, Team Science is a multidisciplinary approach to scientific research that involves researchers from different institutions and disciplines working together to achieve shared goals.

- Plan and implement vegetation management program. Select drought tolerant and fire-smart plants and trees for landscaping areas.

4. Promote a welcoming campus that values and supports its community, neighbors, and the public.
   - Provide a widely distributed, full range of people-serving campus facilities.
   - Improve access and personal mobility throughout the campus.
   - Minimize land use conflicts and foster good relations with nearby residences and communities, to the extent feasible.
   - Reinforce the campus as a location of regional interest and education.

2.2.2 Proposed LBNL 2025 LRDP

The proposed 2025 LRDP presents a strategic vision for the Berkely Lab campus, and it articulates a policy framework that would guide Berkeley Lab's future land development, facility operations, site circulation, open space, and infrastructure.

An overarching development theme in the proposed 2025 LRDP is one of modernization: in the next 20 years of development, UC LBNL seeks to modernize the Lab's aging facilities and infrastructure and realize a more orderly and sustainable campus. The proposed 2025 LRDP does not provide for substantial growth in building space and population compared to existing conditions, nor does it involve a substantial expansion of the campus's development footprint. Rather, the proposed 2025 LRDP emphasizes the removal of aging buildings and construction of new and more efficient buildings within previously disturbed areas.

Development Program

The proposed 2025 LRDP provides for construction of approximately 574,000 gross square feet (gsf) of additional research and support space, and demolition of up to 278,500 gsf of building space due to poor condition and/or seismic safety considerations, for a net increase of 295,500 gsf of building space. In addition, the proposed 2025 LRDP provides for approximately 63,000 gsf of "flex space allowance," under which up to 63,000 gsf of existing substandard buildings might be vacated but not demolished within the 20-year planning period. Therefore, at full development under the proposed 2025 LRDP and with inclusion of the flex space allowance, there would be a total of 2,420,000 gsf of campus building space by year 2045. Campus population is projected to reach an adjusted daily population (ADP)[3] of 4,200 by year 2045. This would be an increase of 1,200 ADP over existing conditions. **Table 2-1** provides a summary of existing (2024) campus population and building space and 2025 LRDP population and space program projections. It is noteworthy that the total projected campus population under the proposed 2025 LRDP would be less than that previously anticipated under the 2006 LRDP. In addition, the 2025 LRDP projects no increase in total building space as compared with the 2006 LRDP.

[3] Berkeley Lab's on-campus population is expressed as "adjusted daily population" (ADP), which is an estimated, annualized average of the campus's daily staff, academics, affiliates, and visitors present on-site.

TABLE 2-1
SUMMARY OF POPULATION AND BUILDING SPACE PROJECTIONS UNDER THE 2025 LRDP (2024-2045)

	Existing 2024	Net Increase in Campus Development over Existing Conditions (for CEQA Analysis)[a]	Flex Space Allowance	Projected 2045
Campus Population (ADP)[a]	3,000 ADP	1,200 ADP	-	4,200 ADP
Campus Building Space (gsf)[b]	2,061,500 gsf	295,500 gsf [c]	63,000 gsf	2,420,000 gsf

NOTE:
a. ADP = Adjusted Daily Population
b. gsf = gross square feet
c. Net increase in development accounts for new construction minus demolition

SOURCE: UC LBNL, 2024.

2025 LRDP Plan Elements

The proposed 2025 LRDP includes five plan elements that address land use, open space, mobility, utility infrastructure, and sustainability. Each of these elements is summarized below. These elements, coupled with the development program described above, serve as the basis for this EIR's proposed 2026 LRDP impact analysis.

Land Use Element

The proposed 2025 LRDP divides the Berkeley Lab campus into four land use zones, which are described below. These zones guide the siting of new facilities and other physical campus improvements and activities.

Research and Academic Zone. Under the proposed 2025 LRDP, the Research and Academic Zone would continue to accommodate and support the Lab's research functions, including research buildings and related support buildings, infrastructure, and parking. Non-research/academic or related support uses would continue to be discouraged in this zone, although some uses may be considered if alternative suitable space is not available.

Central Commons Zone. Under the proposed 2025 LRDP, the Central Commons Zone would continue to be used for community-serving facilities and spaces. These would include single and multi-purpose buildings and spaces dedicated to dining, lodging, conferencing and meeting, visitor accommodations and badging, gathering, health, recreation and fitness, high-level administrative functions, and research and operational surge space; this zone would include related transit, parking, and infrastructure uses.

Support Services Zone. Under the proposed 2025 LRDP, this area would continue to house much of the campus's Lab-serving support uses and equipment storage, along with related parking and infrastructure uses.

Perimeter Open Space Zone. Under the proposed 2025 LRDP, the Perimeter Open Space Zone would be enlarged to ensure more buffering between developable areas and the campus boundary. This zone would continue to be used to preserve open space and campus natural resources. It would buffer neighboring land uses from Lab development and activities. New occupiable buildings or other major development, such as parking lots or structures, would not be permitted in this area. Utility infrastructure and distribution, roads and parking, trails, sampling stations, storage units, and small support structures contiguous to existing development, would continue to be compatible uses.

Mobility and Circulation Element

The mobility and circulation element of the proposed 2025 LRDP sets forth Berkeley Lab's vision and strategies to further improve site access and reduce the reliance of Lab employees on personal automobiles, as well as to improve mobility within the campus, as summarized below.

Multi-model Transportation and Site Access Strategies. Transportation strategies to improve mobility and circulation on the campus include improving wayfinding and user orientation throughout the campus; improving campus circulation network and mobility opportunities for all campus users; and improving access and personal mobility throughout the campus.

Road Network and Parking. The general alignment of the existing campus road network is expected to remain largely unchanged over the term of the proposed 2025 LRDP. Minor realignments and extensions, including those to serve new construction and parking areas, would likely occur. In addition, some roadways would be modernized, improved, and potentially widened where needed to enhance safety. While the existing parking supply is expected to be adequate, the Lab would strive to increase its campus parking efficiency and quality. Berkeley Lab's Transportation Demand Management program would continue to support and increase the use of electric vehicles.

Mobility Hubs, Bicycle and Pedestrian Facilities. During the term of the proposed 2025 LRDP, UC LBNL would continue to encourage use of alternative transportation modes, such as through developing or improving the Central Commons transit center, other mobility hubs/shuttle stops, co-located bicycle and scooter parking, and improved pedestrian connections. Berkeley Lab would also continue to make improvements to the often overly-narrow roadway network to encourage bicycle use; as well as make improvements to and expand safe pedestrian paths, provide better signage and wayfinding, and better integrate outdoor ramps and building elevators.

Open Space and Landscape Element

The proposed 2025 LRDP organizes campus open spaces into four basic types:

Outlying Open Space. Outlying Open Space comprises portions of the Perimeter Open Space Zone that are furthest from development and least historically disturbed. These rustic areas feature steep slopes, natural drainages, often towering vegetation, and sensitive habitat; they offer picturesque views while providing visual and noise screening to neighbors and surrounding land uses from Lab development and operations. Outlying Open Space areas are generally inaccessible to people and afford little opportunity for active use, such as for hiking and recreation. Under the proposed LRDP, disturbance of these areas beyond vegetation management would continue to be minimal and would include maintenance of existing small features such as monitoring equipment and sheds, roadway segments, paths and stairways, and utility lines.

Transitional Open Areas. Transitional Open Areas bridge the gap between Outlying Open Space areas and development areas, and they overlap with portions of the Perimeter Open Space, Research and Academic, and Support Service Zones. Under the proposed 2025 LRDP, Berkeley Lab would preserve the higher quality open space values extant in these areas, as practical. However, Transitional Open Areas would continue to be managed in accordance with the LRDP land use zones in which they are located.

Cluster Open Areas and Outdoor Shared Spaces. Under the proposed 2025 LRDP, Berkeley Lab seeks to develop new and improve existing cluster open areas and outdoor shared spaces. Such spaces could be used for collaboration, social purposes, and general respite from work duties. Each development cluster would be encouraged to feature a principal open space area for multiple uses by cluster users and occupants. Other outdoor space development, both within and outside of the campus clusters, would be encouraged to improve recreational opportunities. Such spaces might facilitate exercise, artistic expression, team and solo sports activities, leisure and play, and hiking and bicycling on an improved campus.

Central Commons Open Area. The Central Commons Open Area is intended to include space for routine activities, like daily dining, as well as for more singular activities, like all-hands gatherings and celebrations. Potential concepts for this area include a large central plaza, an outdoor amphitheater focusing around a stage, and integration with a campuswide pedestrian “spine” or central pathway that leverages Central Commons buildings to navigate the cluster’s steady incline.

Utility Infrastructure Element

Infrastructure improvements would be needed to upgrade existing aging infrastructure and ensure that utilities can adequately support new and expanding research programs and new development on the campus. The following types of utility improvements are anticipated during the term of the proposed 2025 LRDP:

Domestic and Fire Water. Replace degraded and high-risk water mains, create additional system loops; perform deferred maintenance; add whole-building water meters where needed; and install flow meters to new building and existing building branch connection lines.

Sanitary Sewer. Replace or rehabilitate degraded or undersized sewers; install new building services for new facilities; and implement improvements to support water reuse opportunities.

Stormwater. Assess and replace or rehabilitate, as needed storm drain pipes in the highest risk drainage basins; and reconfigure storm drain systems as required to convey drainage toward stormwater management facilities.

Recycled Water. Consider sources of recycled water, including for supplying water for cooling towers; consider replacement of fixtures in existing buildings and provision of dual plumbing; and consider use of future on-site recycled water supply sources for outdoor areas and community open spaces.

Electricity. Improve electrical distribution system to accommodate the new electrical load for retrofit building electrification and provision of additional EV charging stations.

Communications. Several phases of improvements to elements of the communications systems are planned, including new fiber optic cabling and conduits.

Sustainability Element

Berkeley Lab recognizes the need to reduce greenhouse gas (GHG) emissions from its existing and future operations. The Lab is subject to compliance with federal directives and the UC *Policy on Sustainable Practices*, which requires the Lab to achieve net-zero GHG emissions no later than 2045. The Lab’s climate plan is set forth in the Berkeley Lab *Net-Zero Vision and Roadmap,* which provides the Lab's approach to address the climate crisis, overcome challenges, and achieve net-zero greenhouse gas emissions from Berkeley Lab operations.

2.3 Related Project: Berkeley Lab Vegetation Management Program

Berkeley Lab is located in a wildland urban interface (WUI) and is designated a Very High Fire Hazard Severity Zone by CalFire. To minimize potential wildland fire risk on and around the campus, the Lab implements a Vegetation Management Program (VMP) which is overseen by vegetation and fire planning experts and is informed by LBNL guidance documents.

Vegetation management--including by grazing--would continue to occur on an annual basis. The Lab's VMP would continue to encourage native, fire-resistant, drought-tolerant plants and removal of invasive exotic plants for fire control purposes. Eucalyptus, non-native pine, and other non-native tree stands across the campus site would continue to be removed or thinned and replaced as appropriate with native trees. Particular attention will be paid to addressing potentially hazardous vegetation in campus areas of greatest concern. This includes ladder fuels, tree density, and tall trees that could fall across the Lab's entrance/exit roads during a wildland fire event. As part of the on-going planning for future vegetation management efforts, Berkeley Lab has identified certain campus areas as Priority 1 and 2 areas for vegetation treatment. Other parts of the campus are considered low priority and are designated Priority 3 areas to receive vegetation management treatments in the future.

Berkeley Lab's VMP will continue to be implemented concurrently with the implementation of the proposed 2025 LRDP. As the implementation of the VMP has the potential to result in environmental impacts and its impacts could potentially combine with the impacts of the proposed 2025 LRDP to result in significant cumulative impacts, the continued VMP implementation is programmatically analyzed for its environmental impacts in this EIR as a related program. The VMP is not an element of the proposed 2025 LRDP and is a program that is separate and independent of the proposed 2025 LRDP.

2.4 Significant and Unavoidable Environmental Effects

Throughout this EIR, significant environmental impacts are identified, and mitigation measures are described that would eliminate the impacts or reduce them to a less-than significant level. Similarly, many impacts are identified that would be less than significant without the need for mitigation measures. There are, however, a few impacts that cannot be eliminated or cannot be reduced to a level of insignificance even with the implementation of feasible mitigation measures. The significant and unavoidable environmental impacts of the proposed 2025 LRDP and VMP are listed in **Table 2-2**, below.

TABLE 2-2
SIGNIFICANT AND UNAVOIDABLE IMPACTS OF THE PROPOSED 2025 LRDP

Impacts
LRDP Impact CUL-1: Implementation of the LBNL 2025 LRDP could potentially cause a substantial adverse change in the significance of a historical resource pursuant to Section 15064.5.
LRDP Impact NOI-1: Construction activities under the LBNL 2025 LRDP would generate a substantial temporary increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance applied as the relevant threshold of significance, or applicable standards of other agencies.
LRDP Impact NOI-2: Vegetation management activities under the VMP during the LBNL 2025 LRDP timeframe would generate a substantial temporary increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance as applied as the relevant threshold of significance, or applicable standards of other agencies.
LRDP Impact CUM-NOI-1: Implementation of the LBNL 2025 LRDP and the related VMP, combined with other concurrent construction projects in the project area, could generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance applied as the relevant threshold of significance, or applicable standards of other agencies.

2.5 Alternatives to the Proposed 2025 LRDP

The following alternatives were analyzed in detail in this EIR and compared to the proposed 2025 LRDP for their impacts. The objective of the alternatives analysis is to determine whether an alternative would feasibly obtain most of the project objectives, while avoiding or substantially lessening some of the significant effects of the proposed 2025 LRDP.

Alternative 1: No Project

Alternative 2: Reduced Growth

Alternative 3: Partial Off-Site Growth

2.5.1 No Project Alternative

Under the No Project Alternative, the proposed 2025 LRDP would not be implemented, and development and growth at Berkeley Lab would continue to occur pursuant to the 2006 LRDP. The 2006 LRDP envisioned that at full development, the on-campus population would increase to a total of 4,650 ADP and the total amount of building space on Berkeley Lab would increase to 2,420,000 gsf. Although the 2006 LRDP assumed that at buildout, the campus ADP would be about 4,650, however for purposes of the No Project Alternative, it is assumed that the ADP in 2045 would be 4,200, which is the same as the ADP anticipated under the proposed 2025 LRDP. The use of the lower ADP of 4,200 for the No Project Alternative (and not the 4,650 ADP in the 2006 LRDP) is considered reasonable because this ADP is based on more recent roster data and gate counts and it also assumes that some amount of hybrid and remote work will continue to be an element of Lab operations in the future. Net new building space (including flex space created) at Berkeley Lab under the No Project Alternative would increase by 358,500 gsf over existing conditions - the same as that which would occur under the proposed 2025 LRDP. The 2006 LRDP assumed that a total of approximately 2,300 parking spaces would be provided for employees and visitors by buildout. Consequently, this would amount to an increase of 600 parking spaces for employees and visitors under the No Project Alternative over existing conditions.

Any future development under the No Project Alternative would continue to be subject to the goals and strategies of the 2006 LRDP and its elements. Furthermore, existing building height zones that are applicable to the 2006 LRDP development would apply to future development under the No Project Alternative. Future development under the No Project Alternative would also be subject to the mitigation measures identified in the 2006 LRDP Final EIR, as amended. Projects that have been approved pursuant to the 2006 LRDP that are either currently under construction or in planning/design would continue to be completed and operated under the No Project Alternative.

Given that the No Project Alternative would involve the same amount of building space development and ADP growth as the proposed Project, this alternative would result in substantially the same impacts as the proposed Project, except that certain visual, biological resource, and air quality impacts would be greater due to the placement of new building space under this alternative. None of the significant and unavoidable impacts of the proposed Project would be avoided or reduced under this alternative.

2.5.2 Reduced Growth Alternative

Under the Reduced Growth Alternative, building space and population at the Berkeley Lab campus would grow by a smaller amount and at a lower intensity than that which would occur under the proposed 2025 LRDP. Specifically, this alternative would result in a one-third lower increase in both campus population and building space than the increases that would occur under the proposed 2025 LRDP at 2045. Accordingly, the on-campus population under the Reduced Growth Alternative would increase by 800 ADP (one-third less than the 1,200 ADP increase under proposed 2025 LRDP), for a total of 3,800 ADP by 2045. Net new building space developed (including the flex space allowance), would increase by 239,000 gsf (one-third less than the 358,000 gsf increase under the proposed 2025 LRDP) for a total of 2,200,500 gsf by 2045. Similar to the proposed 2025 LRDP, there would be no increase in the parking supply for employees and visitors at Berkeley Lab under the Reduced Growth Alternative.

As the Reduced Growth Alternative would involve a smaller increase in building space and campus ADP than the proposed Project, all environmental impacts would be proportionally reduced but all of the mitigation measures would still be required. Further, none of the significant and unavoidable impacts of the proposed Project would be avoided under this alternative.

2.5.3 Partial Off-site Growth Alternative

The Partial Off-site Growth Alternative would realize most of proposed 2025 LRDP growth and development at the Berkeley Lab campus with the remaining portion of the proposed growth and development to occur off-site at the UC Richmond Bay Campus, also known as the Richmond Field Station (RFS) located in Richmond. Accordingly, net new building space developed on the Berkeley Lab campus (including flex space created) would increase by 239,000 gsf (one-third less than the 358,000 gsf increase under the proposed 2025 LRDP) for a total of 2,300,500 gsf building space by 2045. At the RFS, approximately 191,330 gsf of building space would be developed, which would correspond to about two to three medium to large research buildings. It is assumed these research buildings at RFS would be either DOE-owned buildings or UC-owned buildings that would be leased to the DOE. Corresponding with this pattern of building space development under this alternative, about 2/3rds of the projected ADP increase (about 800 ADP) would occur at Berkeley Lab and 1/3rd of the projected ADP increase (about 400 ADP) would occur at the RFS. Similar to the proposed 2025 LRDP, there would be no increase in the parking supply for employees and visitors at Berkeley Lab under the Partial Off-site Growth Alternative. New parking would be developed at the RFS to serve the two to three new research buildings under this alternative.

It is assumed that future development at Berkeley Lab under the Partial Off-site Growth Alternative would be subject to goals and strategies of the proposed 2025 LRDP and its elements, including land use, mobility and circulation, open space and landscape, and utility infrastructure elements, albeit the 2025 LRDP would be modified, as needed, to reflect the reduced growth of at Berkeley Lab under this alternative. Siting of the Berkeley Lab buildings at the RFS would be guided by the 2014 LRDP adopted by the University for that campus.

As the Partial Off-site Growth Alternative would involve a smaller increase in building space and campus ADP at Berkeley Lab than the proposed Project, all environmental impacts at Berkeley Lab would be proportionally reduced but all of the mitigation measures would still be required. Further, none of the significant and unavoidable impacts of the proposed Project at Berkeley Lab would be avoided under this alternative. Additionally, this alternative would result in incremental impacts at the RFS, including potentially significant and unavoidable impacts related to GHG emissions and transportation.

2.6 Areas of Controversy

Areas of controversy known to the lead agencies, including issues raised by agencies and the public, must be identified in the Summary of an EIR (14 Cal. Code Regs. Section 15123).

On May 6, 2024, UC LBNL issued a NOP to governmental agencies, organizations, and interested persons announcing EIR preparation for the proposed 2025 LRDP along with a request for comments pertinent to the forthcoming EIR's scope. A copy of the NOP is included in **Appendix A**. A scoping meeting was held on June 6, 2024 via Zoom to accept public input on environmental topics to be analyzed in the EIR and approaches to the impact analyses. Written comments received on the NOP, and a transcript of verbal comments received during the scoping meeting, are included in **Appendix B**. There were no comments received during public scoping period that raised any specific areas of controversy.

Nevertheless, potential environmental issues of concern for the proposed 2025 LRDP may include the following:

- Potential effects of new development under the proposed 2025 LRDP on aesthetics, including scenic vistas, scenic quality, and lighting/glare
- Potential for the construction and operation of the proposed 2025 LRDP to generate criteria air pollutants, and/or increase health risk at sensitive receptors from generation of toxic air contaminants

- Potential effects of new development under the proposed 2025 LRDP on campus special-status plant and animal species
- Potential effects of physical changes under the proposed 2025 LRDP on existing or future historical resources and on campus archaeological resources and tribal cultural resources
- Potential groundshaking effects as a result of a seismic event and associated effects on landsliding and liquefaction, and potential unstable geologic units and soil at the campus
- Potential for construction and operation of the proposed 2026 LRDP to result in soil erosion and increases in pollutants in stormwater runoff, and related effects on water quality
- Potential development under the proposed 2025 LRDP in or near campus areas that have been affected by past releases of chemicals to soil and groundwater
- Potential increases in ambient noise associated with construction activities during the proposed 2025 LRDP and related noise generated by vegetation management activities at the campus, and effects of noise at nearby receptors
- Potential increases in demand for public services and utility service systems as a result of increases in campus population and development under the proposed 2025 LRDP
- Potential for proposed 2025 LRDP to impair emergency evacuation plans, and relatedly, feasible approaches to reduce risk, including reducing campus population during high fire risk periods, and enhancing campus shelter-in-place program

Please also see Section 4.0.2, *Scope of Analysis*, for a discussion of this EIR's approach for determining environmental issues within the purview of CEQA.

2.7 Summary of Impacts and Mitigation Measures

Table 2-3 summarizes the impacts of the proposed 2025 LRDP and the VMP, identifies the significance determination of each impact before and after mitigation, and presents the full text of the identified mitigation measures. (Please also refer to Table 6-4 in Chapter 6, Alternatives, which presents an impact comparison between the proposed Project and its identified alternatives. Table 6-4 identifies whether the alternatives would reduce or avoid the significant impacts of the proposed Project.)

TABLE 2-3
SUMMARY OF PROPOSED 2025 LRDP IMPACTS AND MITIGATION MEASURES

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
EIR Section 4.1 Aesthetics			
LRDP Impact AES-1: Implementation of the LBNL 2025 LRDP would not result in substantial adverse visual effects related to construction activities.	LTS	None required.	NA
LRDP Impact AES-2: Implementation of the LBNL 2025 LRDP would not have a substantial adverse effect on a scenic vista.	LTS	None required.	NA
LRDP Impact AES-3: Implementation of the LBNL 2025 LRDP would occur within an urbanized area, and would not conflict with applicable zoning and other regulations governing scenic quality.	LTS	None required.	NA
LRDP Impact AES-4: Implementation of the LBNL 2025 LRDP could create a new source of substantial light or glare which would adversely affect day or nighttime views in the area.	PS	**LRDP Mitigation Measure AES-4a:** Each new building constructed pursuant to the 2025 LRDP shall incorporate design standards that ensure lighting would be designed to confine illumination to its specific site, in order to minimize light spillage to adjacent buildings and open space areas. **LRDP Mitigation Measure AES-4b:** New exterior lighting fixtures shall be compatible with existing lighting fixtures and installations in the vicinity of the new building, and they shall be equipped with automatic control systems (i.e., photocells) to turn the light on or off based on ambient light conditions. In general, and unless otherwise necessary for safety considerations, exterior lighting at building entrances, along walkways and streets, and in parking lots shall maintain an illumination level of not more than 20 Lux (approximately 2 foot-candles). **LRDP Mitigation Measure AES-4c:** All new buildings constructed pursuant to the 2025 LRDP shall incorporate design standards that preclude or limit the use of reflective exterior wall materials or reflective glass, or the use of white surfaces for roofs, roads, and parking lots, except in specific instances when required for energy conservation.	LTS
LRDP Impact CUM-AES-1: Implementation of the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, would not result in significant cumulative impacts related to aesthetics.	LTS	None required.	NA

PS = Potentially Significant Impact
S = Significant Impact
SU = Significant and Unavoidable with Mitigation
LTS = Less than Significant impact
NA = Not applicable

TABLE 2-3 (CONTINUED)
SUMMARY OF PROPOSED 2025 LRDP IMPACTS AND MITIGATION MEASURES

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
EIR Section 4.2 Air Quality (cont.)			
LRDP Impact AQ-1: Implementation of the LBNL 2025 LRDP would not conflict with or obstruct implementation of the applicable air quality plan.	LTS	None required.	NA
LRDP Impact AQ-2: Implementation of the LBNL 2025 LRDP would not result in a cumulatively considerable net increase of any criteria pollutant for which the Project region is non-attainment under an applicable federal or state ambient air quality standard, but would result in significant localized dust emissions.	S	**LRDP Mitigation Measure AQ-2: Best Management Practices for Dust and Emissions Control** • Berkeley Lab shall implement all the following best management practices to reduce fugitive PM_{10} and $PM_{2.5}$ during campus construction activities: • All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered a minimum of two times per day, excluding days with rain. • All haul trucks transporting soil, sand, or other loose material off-site shall be covered. • All visible mud or dirt track-out onto adjacent public or private haul roads shall be removed using hand brooming or other method at least once per day. The use of dry power sweeping is prohibited. • All vehicle speeds on unpaved roads shall be limited to 15 mph. • All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Where applicable, e.g., for low rise buildings, building pads shall be laid as soon as possible after grading unless seeding or soil binders are used. • All excavation, grading, and/or demolition activities shall be suspended when average wind speeds exceed 20 mph. • Dust from all trucks and equipment shall be removed prior to leaving the site. • Unpaved roads providing access to sites located 100 feet or further from a paved road shall be treated with a 6- to 12-inch layer of compacted layer of wood chips, mulch, or gravel. • Post a publicly visible sign with the telephone number and person to contact at Berkeley Lab regarding dust complaints. This person shall respond and take corrective action within 48 hours. The air district's phone number shall also be visible to ensure compliance with applicable regulations.	LTS
LRDP Impact AQ-3: Implementation of the LBNL 2025 LRDP would not expose sensitive receptors to substantial pollutant concentrations.	LTS	None required.	NA
LRDP Impact AQ-4: Implementation of the LBNL 2025 LRDP would not generate odors adversely affecting a substantial number of people.	LTS	None required.	NA

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S = Significant Impact
SU = Significant and Unavoidable with Mitigation
LTS = Less than Significant impact
NA = Not applicable

TABLE 2-3 (CONTINUED)
SUMMARY OF PROPOSED 2025 LRDP IMPACTS AND MITIGATION MEASURES

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
EIR Section 4.2 Air Quality (cont.)			
LRDP Impact CUM-AQ-1: Implementation of the LBNL 2025 LRDP would not result in a cumulatively considerable net increase of criteria pollutants for which the Project region is non-attainment under an applicable federal or state ambient air quality standard.	LTS	None required.	NA
LRDP Impact CUM-AQ-2: Implementation of the LBNL 2025 LRDP, in combination with existing sources at the Berkeley Lab campus, would not expose sensitive receptors to substantial pollutant concentrations.	LTS	None required.	NA
EIR Section 4.3 Biological Resources			
LRDP Impact BIO-1: Implementation of the LBNL 2025 LRDP and the related LBNL VMP would have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.	PS	**LRDP Mitigation Measure BIO-1a: Protection of Rare Plants** 1) Prior to construction on suitably vegetated areas of the campus Perimeter Open Space Zone, a qualified biologist shall conduct a focused survey for rare plant species with potential to be present during their respective blooming periods (western leatherwood blooms January to March; Diablo helianthella blooms March to June; most beautiful jewelflower blooms April to September). Surveys should be conducted during the periods of identification for all species under consideration at each applicable development site. If no special-status plants are observed, no further action is required. If special-status plant species, including western leatherwood, are observed, the plants will be avoided with a suitable buffer, determined in coordination with CDFW. The buffer zone shall be clearly demarcated using exclusion fencing. 2) If establishing an avoidance buffer is not feasible, individual plants shall be transplanted to an area with suitable physical and biological conditions outside of the work area, according to a Rare Plant Relocation Plan to be prepared by UC LBNL or its contractor and reviewed and approved by CDFW. The Relocation Plan will include regular monitoring and weeding for a period of five years, as well as adaptive management criteria, including additional monitoring, weeding, watering, or replanting, if success criteria are not met after the five-year management period. **LRDP Mitigation Measure BIO-1b: Protection of Special-Status Terrestrial Species** 1) At least fifteen (15) calendar days prior to the start of construction, a qualified biologist(s) shall conduct pre-construction surveys for Alameda whipsnake and San Francisco dusky-footed woodrat in all areas of suitable habitat. If Alameda whipsnake or San Francisco dusky-footed woodrat is found, it will be allowed to leave the area of its own accord, and USFWS and/or CDFW shall be notified.	LTS

PS = Potentially Significant impact
S = Significant Impact
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LTS = Less than Significant impact
NA = Not applicable

TABLE 2-3 (CONTINUED)
SUMMARY OF PROPOSED 2025 LRDP IMPACTS AND MITIGATION MEASURES

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
EIR Section 4.3 Biological Resources (cont.)			
LRDP Impact BIO-1 (cont.)		2) UC LBNL shall minimize adverse effects to the Alameda whipsnake and San Francisco dusky-footed woodrat by limiting to the maximum extent possible the number of access routes; construction areas; equipment staging, storage, parking, and stockpile areas, and placing these outside of sensitive habitat for both species. Prior to initial ground disturbance at a project site, equipment staging areas, site access routes, construction equipment and personnel parking areas, debris store areas, and any other areas that may be disturbed will be identified, surveyed by a qualified biologist, and clearly marked with bright orange plastic construction fencing, or equivalent. The fencing shall be inspected regularly by the qualified biologist and maintained daily by the contractor until project completion. 3) Prior to commencement of construction or vegetation management activities with the potential to impact Alameda whipsnake and/or San Francisco dusky-footed woodrat, workers shall be trained in Alameda whipsnake and San Francisco dusky-footed woodrat avoidance, minimization, and conservation measures, legal protection, and other related issues. Training will be prepared and delivered under the guidance of a qualified biologist. 4) If a dusky-footed woodrat midden is identified in a work area, the contractor shall attempt to preserve the midden and maintain an intact dispersal corridor between the midden and undisturbed habitat. An adequate dispersal corridor would be considered to be a minimum of 50 feet wide and have greater than 70 percent vegetative cover. If dusky-footed woodrat midden(s) cannot be avoided, CDFW will be notified and information regarding the midden location(s) and a relocation plan will be provided. With approval from CDFW, a qualified biologist shall dismantle and relocate the midden material. No less than 10 days prior to the beginning of construction a qualified biologist shall deconstruct the midden by hand. Materials from the midden shall be dispersed into adjacent suitable habitat that is outside of the work area. During the deconstruction process, the biologist shall attempt to assess if there are juveniles in the midden. If immobile juveniles are observed, the deconstruction process shall be discontinued until a time when the biologist believes the juveniles are fully mobile. A 50-foot wide no-disturbance buffer will be established around the midden until the juveniles are mobile. The midden may be dismantled once the biologist has determined that adverse effects on the juveniles would not occur. All disturbances to woodrat middens will be documented in a construction monitoring report and submitted to CDFW. 5) In habitat with a high potential for the Alameda whipsnake to occur (see Figure 4.3-3), a biological monitor shall be employed at project sites. Each morning, prior to initiating excavation, construction, equipment or vehicle operation at project sites identified as having high potential for whipsnake occurrence, the project sites shall be surveyed by a designated monitor trained in Alameda whipsnake identification to ensure that no Alameda whipsnakes are present. All laydown and deposition areas, as well as other areas that might conceal or shelter snakes or other animals, shall be inspected each morning by the designated monitor to ensure that Alameda	

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SU = Significant and Unavoidable with Mitigation
LTS = Less than Significant impact
NA = Not applicable

TABLE 2-3 (CONTINUED)
SUMMARY OF PROPOSED 2025 LRDP IMPACTS AND MITIGATION MEASURES

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
EIR Section 4.3 Biological Resources (cont.)			
LRDP Impact BIO-1 (cont.)		whipsnakes are not present. The designated monitor shall have the authority to halt construction or vegetation management activities in the event that a whipsnake is found within the construction footprint or work area until such time as threatening activities can be eliminated in the vicinity of the snake and it can be removed from the site by a biologist permitted to handle whipsnakes. USFWS and CDFW shall be notified within 24 hours of such event. 6) In habitats designated as having low to moderate potential for Alameda whipsnake to occur, a preconstruction survey shall be performed by a qualified biologist to identify presence of suitable habitat. If suitable habitat is observed, daily monitoring shall be provided during clearing and grubbing in suitable whipsnake habitat areas. Work areas shall be limited to the maximum extent possible as stated above in Number 2, and worker training shall be provided as stated in Number 3. 7) A litter control program shall be instituted at each project site to ensure that Alameda whipsnake predators, such as crows, ravens, and coyotes, are not attracted to the construction site by discarded food and trash. All workers will ensure their food scraps, paper wrappers, food containers, cans, bottles, and other trash are deposited in covered trash or removed from the site each working day. **LRDP Mitigation Measure BIO-1c: Protection of Nesting Birds** 1) To the extent feasible, removal of any tree and/or other vegetation suitable for bird nesting shall not occur during the bird breeding season of February 1 to August 15. If tree removal must occur during the bird breeding season, all trees to be removed shall be surveyed by a qualified biologist to verify the presence or absence of nesting raptors or other birds. Pre-removal surveys shall be conducted within 15 days prior to the start of work and shall be submitted to UC LBNL for review and approval. 2) For projects that do not involve tree removal but involve construction during the bird nesting season noted above, pre-construction nesting bird surveys shall be conducted on project sites that contain nesting habitat or are in proximity of suitable nesting habitat, 15 days prior to start of work. The area to be surveyed will be determined by a qualified biologist. 3) If the pre-removal or pre-construction nesting bird survey indicates the potential presence of nesting raptors or other birds, the biologist shall determine an appropriately sized buffer around the nest in which no work would be allowed until the young have successfully fledged. The size of the nest buffer will be determined by the biologist, and will be based to a large extent on the nesting species and its sensitivity to disturbance. In general, buffer sizes of 200 feet for raptors and 50 feet for other birds should suffice to prevent noise, vibration, and visual disturbance to birds nesting in the urban environment, but these buffers may be increased or decreased, as appropriate, in consultation with CDFW, depending on the bird species and the level of disturbance anticipated near the nest.	

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NA = Not applicable

TABLE 2-3 (CONTINUED)
SUMMARY OF PROPOSED 2025 LRDP IMPACTS AND MITIGATION MEASURES

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
EIR Section 4.3 Biological Resources (cont.)			
LRDP Impact BIO-1 (cont.)		**LRDP Mitigation Measure BIO-1d: Protection of Roosting Bats** 1) To the extent feasible, removal of any tree or other structure suitable for bat maternity roosting shall not occur during the bat breeding season of March 1 to July 31. Prior to project construction activities during the breeding season, a qualified bat biologist shall conduct a pre-construction survey for roosting bats in suitable trees to be removed or pruned and suitable structures to be demolished within the work area and within a 50-foot radius of the work area. If no roosting bats are found, no further action is required. 2) If a non-maternal roost of bats is found in a tree or structure to be removed or demolished as part of project construction, the individuals shall be safely evicted, under the direction of a qualified bat biologist, by opening the roosting area to allow airflow through the cavity. Removal or demolition should occur no sooner than at least two nights after the initial minor site modification (to alter airflow). This action allows bats to leave during darkness, thus increasing their chance of finding new roosts with a minimum of disturbance. Departure of the bats from the construction area shall be confirmed with a follow-up survey by a qualified bat biologist prior to start of construction. 3) If active maternity roosts are found in trees or structures that will be removed or demolished as part of project construction, tree removal or structure demolition shall commence and be completed before maternity roosting colonies form (generally before March 1), or those activities shall not commence until after the young are flying (generally after July 31). Active maternity roosts shall not be disturbed between March 1 and July 31.	
LRDP Impact BIO-2: Implementation of the LBNL 2025 LRDP and the related LBNL VMP would have a substantial adverse effect on riparian habitat or other sensitive natural communities identified in local or regional plans, policies, and regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.	PS	**LRDP Mitigation Measure BIO-2: Habitat Restoration and Monitoring** 1) UC LBNL or its contractor shall avoid or minimize impacts on sensitive natural communities and potentially jurisdictional aquatic habitat, and project design shall minimize the extent of temporary and permanent loss of such areas. For any unavoidable permanent loss of sensitive habitat, including riparian, stream, or wetland areas, UC LBNL shall prepare and submit to the USACE for verification an aquatic resources delineation report. 2) For unavoidable temporary or permanent impacts, UC LBNL shall prepare a Habitat Restoration and Monitoring Plan. The Plan shall address the restoration of jurisdictional waters or protected habitats through the replacement or enhancement of a comparable amount of habitat area (i.e., a minimum 1:1 ratio based on acreage or linear feet of channel) at an agency-approved location within the same or nearby watershed. Ephemeral channels or sensitive habitats temporarily impacted by construction-related activity shall be replanted or reseeded with native plants from the watershed, under guidance from a qualified biologist. 3) The Habitat Restoration and Monitoring Plan shall include protocols for replanting of native vegetation removed prior to or during construction, and management and monitoring of the plants for a five-year period to ensure replanting success. The plan shall specify monitoring and	LTS

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LTS = Less than Significant impact
NA = Not applicable

TABLE 2-3 (CONTINUED)
SUMMARY OF PROPOSED 2025 LRDP IMPACTS AND MITIGATION MEASURES

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
EIR Section 4.3 Biological Resources (cont.)			
LRDP Impact BIO-2 (cont.)		performance criteria for the species planted, invasive species control criteria, as well as the best time of year for seeding to occur, pursuant to requirements of permits granted for the project. Appropriate performance standards may include, but are not limited to, a 75-percent survival rate of restoration plantings; absence of invasive plant species; and a viable, self-sustaining creek or wetland system at the end of the five-year monitoring period. The plan shall include adaptive management strategies if success criteria are not being met. The Habitat Restoration and Monitoring Plan shall include interim thresholds for replanting success and alternative management approaches, including weed control, supplementary watering, or additional replanting to undertake if performance thresholds are not met.	
LRDP Impact BIO-3: Implementation of the LBNL 2025 LRDP and the related LBNL VMP would have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.	PS	Implement LRDP Mitigation Measure BIO-2.	LTS
LRDP Impact BIO-4: Implementation of the LBNL 2025 LRDP would interfere substantially with the movement of native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.	PS	**LRDP Mitigation Measure BIO-4: Bird Collision Reduction Measures** • If aboveground electrical lines and other improvements are proposed, bird-safe measures for utility lines based on APLIC recommendations (2006, 2012) shall be developed in consultation with a qualified expert based on site-specific conditions. • Preliminary construction bird-safe measures may include, but not limited to, the following: – Construction areas requiring lights shall implement the following measures to the extent feasible: ▪ Construction-related lighting shall be fully shielded and focused down to ensure no significant illumination passes beyond the immediate work area. ▪ Yellow or orange light shall be used where possible. ▪ Construction personnel shall reduce the amount of lighting to the minimum necessary to safely accomplish the work. • To avoid long-term impacts, campus design shall: – Avoid installation of lighting in areas where not required for public safety. – Consider alternatives to all-night, floor-wide lighting when interior lights would be visible from the exterior or when exterior lights must be left on at night, including: ▪ Installing motion-sensitive lighting ▪ Installing task lighting	LTS

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LTS = Less than Significant impact
NA = Not applicable

TABLE 2-3 (CONTINUED)
SUMMARY OF PROPOSED 2025 LRDP IMPACTS AND MITIGATION MEASURES

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
EIR Section 4.3 Biological Resources (cont.)			
LRDP Impact BIO-4 (cont.)		▪ Installing programmable timers ▪ Installing lower-wattage, sodium, and yellow-red spectrum lighting fixtures (if compatible with personnel safety requirements) – Use fully shielded exterior safety lights to contain and direct light away from the sky. – Employ glazing options such as use of either fritted glass, Dichroic glass, etched glass, translucent glass, or glass that reflects ultraviolet light in appropriate portions of the building façade. – Minimize light and glare resulting from the new building through the use of landscaping materials and choice of primary façade materials. Project design shall not include reflective metal walls and mirrored glass walls as primary building materials for facades.	
LRDP Impact CUM-BIO-1: Implementation of the LBNL 2025 LRDP and the related LBNL VMP would result in cumulatively considerable impacts on biological resources, in combination with past, present, and reasonably foreseeable future projects in the vicinity of Berkeley Lab.	PS	Implement LRDP Mitigation Measures BIO-1a, BIO-1b, BIO-1c, BIO-1d, BIO-2, and BIO-4.	LTS
EIR Section 4.4 Cultural Resources, including Tribal Cultural Resources			
LRDP Impact CUL-1: Implementation of the LBNL 2025 LRDP could potentially cause a substantial adverse change in the significance of a historical resource pursuant to Section 15064.5.	PS	**LRDP Mitigation Measure CUL-1a: Identification of Historical Resources** Prior to any major demolition work or significant alterations to any building or structure that would be 45 years old or older at the time of demolition or alteration activity commencement, UC LBNL shall ensure that the subject building is evaluated for eligibility for listing on the National and California registers. This evaluation shall be completed by a professional that meets the Secretary of the Interior's Professional Qualification Standards for history or architectural history. This evaluation shall follow the guidelines in the 2013 CRMP or the most recent update to that document, as well as current professional standards for documentation of historical resources to support CEQA compliance. **LRDP Mitigation Measure CUL-1b: Secretary of the Interior's Standards Compliance Analysis for Rehabilitation** Prior to any major demolition work or significant alterations to any building identified as a historical resource, UC LBNL shall conduct an analysis to determine if the identified building can be rehabilitated and reused in a manner that is consistent with the Secretary's Standards for Rehabilitation. This analysis shall be completed by a professional that meets the Secretary of the Interior's Professional Qualification Standards for architecture or historic architecture. The analysis shall be submitted to Campus Planning for review, concurrence, and approval for implementation.	SU

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NA = Not applicable

TABLE 2-3 (CONTINUED)
SUMMARY OF PROPOSED 2025 LRDP IMPACTS AND MITIGATION MEASURES

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
EIR Section 4.4 Cultural Resources, including Tribal Cultural Resources (cont.)			
LRDP Impact CUL-1 (cont.)		**LRDP Mitigation Measure CUL-1c: Documentation** Prior to any demolition work initiated under the 2025 LRDP that would remove or substantially alter an architectural historical resource as identified under LRDP Mitigation Measure CUL-1a, and if rehabilitation cannot be implemented in a manner compliant with the Secretary's Standards as determined by the analysis completed under LRDP Mitigation Measure CUL-1b,UC LBNL shall ensure that a qualified architectural historian who meets the Secretary of the Interior's Professional Qualification Standards thoroughly documents existing conditions of the building and associated landscaping and setting. Documentation shall record the building to the National Park Service's standards of the Historic American Buildings Survey (HABS), Historic American Engineering Record (HAER), or Historic American Landscape Survey (HALS), as appropriate. This documentation shall include accurate scaled maps and/or drawings, still photography, and written documentation. If available, scaled architectural plans will also be included. Photographs shall include large-format (4"x5") black-and-white negatives and 8"x10" enlargements. Digital photography may be substituted for large-format negative photography if approved by the UC LBNL Campus Planning Department. The record shall be accompanied by a report containing site-specific history and appropriate contextual information relying as much as possible on previous documentation. Copies of the records shall be submitted to the Northwest Information Center at Sonoma State University, UC Berkeley Environmental Design Archives, Berkeley History Room at the Berkeley Public Library and/or the Oakland History Center at the Oakland Public Library, and the UC LBNL Archives and Records Office (ARO). **LRDP Mitigation Measure CUL-1d: Salvage** Prior to any demolition work initiated under the 2025 LRDP that would remove or significantly alter an architectural historical resource as identified under LRDP Mitigation Measure CUL-1a, UC LBNL shall identify those character-defining features that convey the historical significance of the resource. These features may include equipment or instruments that are related to the historical function of the building, may include elements of the building fabric, or may include fixtures or internal design features that contribute to the historical importance of the building. Where feasibly possible and where permissible in accordance with DOE and UC procurement and EH&S rules, these features shall be considered for availability to other government agencies and/or to interested groups, individuals, and other members of the public. If public salvage is deemed permissible and desirable by UC LBNL, notification of the availability of these salvaged materials shall be provided in advance with a recommended minimum 30-day timeframe for collection of available features. **LRDP Mitigation Measure CUL-1e: Interpretation and Commemoration** Prior to any demolition work initiated under the 2025 LRDP that would remove or substantially alter an architectural historical resource as identified under LRDP Mitigation Measure CUL-1a, UC LBNL shall prepare a plan for interpretation and commemoration that details the historical significance of the building being demolished. The specific location, media, and other characteristics of such commemoration and interpretive display(s) shall be included in this plan. The plan shall be prepared	

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NA = Not applicable

Table 2-3 (continued)
Summary of Proposed 2025 LRDP Impacts and Mitigation Measures

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
EIR Section 4.4 Cultural Resources, including Tribal Cultural Resources (cont.)			
LRDP Impact CUL-1 (cont.)		in coordination with an architectural historian or historian who meets the Secretary of the Interior's Professional Qualification Standards and an exhibit designer or landscape architect with historical interpretation design experience. Commemoration and interpretive display(s) shall document the individually eligible resource to be demolished and its associated history. The commemorative plans should include both physical and digital elements that are freely accessible to the public. Given the limited public access to the Berkeley Lab campus, relevant and appropriate off-site locations for displays should be included. The plan should also explore contributing to digital platforms that are publicly accessible. A proposal describing the general parameters of the interpretive program and the substance, media, and other elements of such interpretive display shall be approved by the UC LBNL Campus Planning Department prior to commencement of any demolition activities. This mitigation measure may be superseded by State and/or federal historic interpretation and commemoration processes negotiated between UC LBNL and relevant State and/or federal agencies.	
LRDP Impact CUL-2: Implementation of the LBNL 2025 LRDP may cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5.	PS	**LRDP Mitigation Measure CUL-2a: Cultural Resources Awareness and Tribal Cultural Sensitivity Training Program** Before any major ground-disturbing and/or construction activities that could disturb native and/or previously unexcavated soils, an archaeologist meeting or under the supervision of an archaeologist meeting the Secretary of the Interior Standards (SOIS) for Archaeology shall conduct a virtual or in-person training program for all construction and field personnel involved in ground disturbance who have not received such training for work on the Berkeley Lab campus within the past year. On-site personnel shall attend a mandatory pre-Project or annual training that shall outline the general archaeological sensitivity of the area and the procedures to follow in the event an archaeological resource and/or human remains are inadvertently discovered. Consulting tribes will be offered the opportunity to attend and provide tribal cultural resources sensitivity training alongside the training conducted by the archaeologist. The consulting tribes may request that the tribal cultural resources sensitivity training be conducted in person. **LRDP Mitigation Measure CUL-2b: Inadvertent Discovery of Cultural Resources** If pre-contact or historic-era archaeological resources are encountered during implementation of the proposed 2025 LRDP, all construction activities within 100 feet shall halt, and a qualified archaeologist, defined as an archaeologist meeting the U.S. Secretary of the Interior's Professional Qualification Standards for Archaeology, shall inspect the find within 24 hours of discovery and notify UC LBNL of their initial assessment. Pre-contact archaeological materials might include obsidian and chert flaked-stone tools (e.g., projectile points, knives, scrapers) or toolmaking debris; culturally darkened soil ("midden") containing heat-affected rocks, artifacts, or shellfish remains; and stone milling equipment (e.g., mortars, pestles, handstones, or milling slabs); and battered stone tools, such as hammerstones and pitted stones. Historic-era materials might include building or structure footings and walls, and deposits of metal, glass, and/or ceramic refuse.	LTS

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S = Significant Impact
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LTS = Less than Significant impact
NA = Not applicable

TABLE 2-3 (CONTINUED)
SUMMARY OF PROPOSED 2025 LRDP IMPACTS AND MITIGATION MEASURES

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
EIR Section 4.4 Cultural Resources, including Tribal Cultural Resources (cont.)			
LRDP Impact CUL-2 (cont.)		If UC LBNL determines, based on recommendations from a qualified archaeologist and a Native American representative (if the resource is pre-contact), that the resource may qualify as a historical resource or unique archaeological resource (as defined in *CEQA Guidelines* Section 15064.5) or a tribal cultural resource (as defined in PRC Section 21080.3), the resource shall be avoided, if feasible. Consistent with *CEQA Guidelines* Section 15126.4(b)(3), this may be accomplished through planning construction to avoid the resource; incorporating the resource within open space; capping and covering the resource; or deeding the site into a permanent conservation easement. If avoidance is not feasible, UC LBNL shall consult with appropriate Native American tribes (if the resource is pre-contact), and other appropriate interested parties to determine treatment measures to avoid, minimize, or mitigate any potential impacts to the resource pursuant to PRC Section 21083.2, and *CEQA Guidelines* Section 15126.4. This shall include documentation of the resource and may include data recovery (according to PRC Section 21083.2), if deemed appropriate, or other actions such as treating the resource with culturally appropriate dignity and protecting the cultural character and integrity of the resource (according to PRC Section 21084.3).	
LRDP Impact CUL-3: Implementation of the LBNL 2025 LRDP may disturb human remains, including those interred outside of designated cemeteries.	PS	**LRDP Mitigation Measure CUL-3: Inadvertent Discovery of Human Remains** In the event of discovery or recognition of any human remains during construction activities, such activities shall cease within 100 feet of the find until the appropriate County Coroner has been contacted to determine that no investigation of the cause of death is required. The Native American Heritage Commission (NAHC) shall be contacted within 24 hours if the remains are determined to be Native American. The NAHC would then identify the person or persons it believes to be the most likely descendant of the deceased Native American, who in turn would make recommendations to UC LBNL for the appropriate means of treating the human remains and any associated funerary belongings. No photography or scientific testing of the remains will be allowed by persons employed or contracted by UC LBNL prior to the Coroner's determination of ethnicity of the remains. If human remains were determined to be Native American, no photography or scientific testing on the identified human remains will be conducted by employees or persons contracted by UC LBNL except at the request and/or with permission of the most likely descendant identified by the NAHC.	LTS
LRDP Impact CUL-4: Implementation of the LBNL 2025 LRDP may cause a substantial adverse change to tribal cultural resources, as defined in Public Resources Code Section 20174.	PS	Implement LRDP Mitigation Measures CUL-2a, CUL-2b, and CUL-3.	LTS
LRDP Impact CUM-CUL-1: Implementation of the LBNL 2025 LRDP would not combine with other cumulative projects to result in an adverse change to the significance of historical resources that share historic significance with resources that could be affected at Berkeley Lab.	LTS	None required.	NA

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LTS = Less than Significant impact
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TABLE 2-3 (CONTINUED)
SUMMARY OF PROPOSED 2025 LRDP IMPACTS AND MITIGATION MEASURES

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
EIR Section 4.4 Cultural Resources, including Tribal Cultural Resources (cont.)			
LRDP Impact CUM-CUL-2: Implementation of the LBNL 2025 LRDP could potentially combine with other cumulative projects to result in an adverse change to the significance of archaeological historical resources, unique archaeological resources, or tribal cultural resources.	PS	Implement LRDP Mitigation Measures CUL-2a, CUL-2b, and CUL-3	LTS
LRDP Impact CUM-CUL-3: Implementation of the LBNL 2025 LRDP would not combine with other cumulative projects to result in any significant impacts related to human remains, including those interred outside of designated cemeteries.	LTS	None required.	NA
EIR Section 4.5 Energy			
LRDP Impact ENE-1: Implementation of the LBNL 2025 LRDP would not result in wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation or conflict with or obstruct a state or local plan for renewable energy or energy efficiency.	LTS	None required.	NA
LRDP Impact CUM-ENE-1: Campus development under the LBNL 2025 LRDP, combined with cumulative development in the Project vicinity and areawide, would not result in significant cumulative energy impacts.	LTS	None required.	NA
EIR Section 4.6 Geology and Soils			
LRDP Impact GEO-1: Implementation of the LBNL 2025 LRDP would directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault.	PS	**LRDP Mitigation Measure GEO-1: Alternative Emergency Access Routes** Within six months of the adoption of the proposed 2025 LRDP, seismic emergency response and evacuation plans for Berkeley Lab shall be updated to address potential inaccessibility of the Blackberry Gate and identify alternative ingress and egress routes for emergency vehicles and facility employees in the event of Cyclotron Road failure from surface fault rupture.	LTS
LRDP Impact GEO-2: Implementation of the LBNL 2025 LRDP would not directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking.	LTS	None required.	NA

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TABLE 2-3 (CONTINUED)
SUMMARY OF PROPOSED 2025 LRDP IMPACTS AND MITIGATION MEASURES

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
EIR Section 4.6 Geology and Soils (cont.)			
LRDP Impact GEO-3: Implementation of the LBNL 2025 LRDP would not directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving earthquake-induced landsliding.	LTS	None required.	NA
LRDP Impact GEO-4: Implementation of the LBNL 2025 LRDP would not directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction.	LTS	None required.	NA
LRDP Impact GEO-5: Implementation of the LBNL 2025 LRDP would not have the potential to result in substantial erosion or the loss of topsoil.	LTS	None required.	NA
LRDP Impact GEO-6: Development under the LBNL 2025 LRDP would not be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.	LTS	None required.	NA
LRDP Impact GEO-7: Development under the LBNL 2025 LRDP would be located on expansive soils but would not cause substantial direct or indirect risks to life or property.	LTS	None required.	NA
LRDP Impact CUM-GEO-1: Implementation of the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, would not result in significant cumulative impacts related to geology and soils.	LTS	None required.	NA
EIR Section 4.7 Greenhouse Gas Emissions			
LRDP Impact GHG-1: Implementation of the LBNL 2025 LRDP would not generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment.	LTS	None required.	NA

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TABLE 2-3 (CONTINUED)
SUMMARY OF PROPOSED 2025 LRDP IMPACTS AND MITIGATION MEASURES

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
EIR Section 4.7 Greenhouse Gas Emissions (cont.)			
LRDP Impact GHG-2: Implementation of the LBNL 2025 LRDP would not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases.	LTS	None required.	NA
LRDP Impact CUM-GHG-1: Implementation of the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable projects, would not generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment or conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases.	LTS	None required.	NA
EIR Section 4.8 Hazards and Hazardous Materials			
LRDP Impact HAZ-1: Campus development under the LBNL 2025 LRDP would not create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials or through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment.	LTS	None required.	NA
LRDP Impact HAZ-2: Campus development under the LBNL 2025 LRDP would not emit hazardous emissions or involve handling hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school.	LTS	None required.	NA
LRDP Impact HAZ-3: Campus development under the LBNL 2025 LRDP would not be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code § 65962.5 and, as a result, would not create a significant hazard to the public or the environment.	LTS	None required.	NA
LRDP Impact CUM-HAZ-1: Campus development under the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future development would not result in a cumulatively significant impact related to hazards and hazardous materials.	LTS	None required.	NA

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TABLE 2-3 (CONTINUED)
SUMMARY OF PROPOSED 2025 LRDP IMPACTS AND MITIGATION MEASURES

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
EIR Section 4.9 Hydrology and Water Quality			
LRDP Impact HYD-1: Implementation of the LBNL 2025 LRDP would not violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality.	LTS	None required.	NA
LRDP Impact HYD-2: Implementation of the LBNL 2025 LRDP would not substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin.	LTS	None required.	NA
LRDP Impact HYD-3: Implementation of the LBNL 2025 LRDP would not substantially alter the existing drainage pattern of the campus in a manner which would result in a substantial erosion or siltation on- or off-site; substantially increase the rate or amount of surface runoff such that it could result in flooding on- or off-site; create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems; provide substantial additional sources of polluted runoff; or impede or redirect flood flows.	LTS	None required.	NA
LRDP Impact HYD-4: Implementation of the LBNL 2025 LRDP would not conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan.	LTS	None required.	NA
LRDP Impact CUM-HYD-1: Implementation of the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, would not result in significant cumulative impacts related to hydrology and water quality.	LTS	None required.	NA
EIR Section 4.10 Land Use and Planning			
LRDP Impact LU-1: Implementation of the LBNL 2025 LRDP would not physically divide an established community.	NI	None required.	NA

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TABLE 2-3 (CONTINUED)
SUMMARY OF PROPOSED 2025 LRDP IMPACTS AND MITIGATION MEASURES

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
EIR Section 4.10 Land Use and Planning (cont.)			
LRDP Impact LU-2: Implementation of the LBNL 2025 LRDP would not cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect.	LTS	None required.	NA
LRDP Impact CUM-LU-1: Campus development under the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, would not physically divide an established community or cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect.	LTS	None required.	NA
EIR Section 4.11 Noise and Vibration			
LRDP Impact NOI-1: Construction activities under the LBNL 2025 LRDP would generate a substantial temporary increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance as applied as the relevant threshold of significance, or applicable standards of other agencies.	S	**LRDP Mitigation Measure NOI-1a: Construction Noise Control Measures** To reduce daytime noise impacts due to construction/demolition activities under the proposed 2025 LRDP, UC LBNL shall require construction/demolition contractors to implement noise reduction measures designed specifically to address the project being undertaken. Measures to be implemented shall include, but not be limited to, the following: • Construction/demolition activities shall be limited, to the maximum extent feasible, to a schedule that minimizes disruption to uses surrounding the project site. Accordingly, such activities would be limited to the hours designated in the Berkeley Community Noise Ordinance, as applicable to the location of the project (e.g., when in the vicinity of city of Berkeley noise-sensitive receptors). This would eliminate or substantially reduce noise impacts that might otherwise occur during nighttime hours and on days when construction noise might be more disturbing. • To the maximum extent feasible, equipment and trucks used for project construction shall utilize the best available noise control techniques (e.g., improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures, and acoustically-attenuating shields or shrouds). • Stationary noise sources shall be located as far from off-site sensitive receptors as possible. • At locations where noise may affect neighboring residential uses (e.g., within 500 feet), UC LBNL will develop a comprehensive construction noise control specification to implement construction/ demolition noise controls, such as noise attenuation barriers, siting of construction laydown and vehicle staging areas, and community outreach, as appropriate to specific projects. The specification will include such information as general provisions, definitions, submittal requirements, construction limitations, requirements for noise and vibration monitoring and control plans, and noise control materials and methods. This document will be modified as appropriate for a particular construction project and included within the construction specification.	SU

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TABLE 2-3 (CONTINUED)
SUMMARY OF PROPOSED 2025 LRDP IMPACTS AND MITIGATION MEASURES

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
EIR Section 4.11 Noise and Vibration (cont.)			
LRDP Impact NOI-1 (cont.)		• At the discretion of UC LBNL environmental planners and community relations officials, and prior to the start of excavation, UC LBNL shall conduct outreach–including but not limited to written notification–to all potentially impacted neighbors within 500 feet of the construction site. Notification shall indicate the estimated duration and completion date of the construction, construction hours, and necessary contact information for potential complaints about construction noise (i.e., name, telephone number, and address of UC LBNL's chief community relations official). The notice shall indicate that noise complaints resulting from construction can be directed to the contact person identified in the notice. **LRDP Mitigation Measure NOI-1b: Construction Noise Control Measures for Large/Long term Projects** For particularly large, long-term, or unusually noisy construction and demolition projects—such as a multi-year demolition project like the Bevatron, or construction of large, multi-story research/office buildings—or projects expected to involve substantial nighttime work, and where such projects might occur within the vicinity of off-site noise-sensitive receptors, UC LBNL subject matter experts shall assess whether additional noise measures should be considered. In such cases, UC LBNL shall engage a qualified noise consultant to determine whether, based on the location of the site and the activities proposed, construction/demolition noise levels could approach the property-line receiving noise standards of the City of Berkeley (as applicable). If the consultant determines that the standards will not be exceeded, no further mitigation is required. If the standards would be reached or exceeded absent further mitigation, one or more of the following additional measures shall be required, as determined necessary by the noise consultant. • Stationary noise sources shall be muffled and enclosed within temporary sheds, shall incorporate insulation barriers, or shall employ other measures to the extent feasible. • Impact tools (e.g., jack hammers, pavement breakers, and rock drills) used for project construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. However, where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used; this muffler can lower noise levels from the exhaust by up to about 10 dBA. External jackets on the tools themselves shall be used where feasible, and this could achieve a reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment, whenever feasible. • Noise from idling trucks shall be kept to a minimum. To the maximum extent feasible, no trucks shall be permitted to idle for more than 10 minutes if waiting within 100 feet of a residential area. • If determined necessary by the noise consultant, a set of site-specific noise attenuation measures shall be developed before construction begins. Possible measures might include erection of temporary noise barriers around the construction site, use of noise control blankets on structures being erected to reduce noise emission, and monitoring the effectiveness of noise attenuation measures by taking noise measurements.	

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TABLE 2-3 (CONTINUED)
SUMMARY OF PROPOSED 2025 LRDP IMPACTS AND MITIGATION MEASURES

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
EIR Section 4.11 Noise and Vibration (cont.)			
LRDP Impact NOI-1 (cont.)		• If determined necessary by the noise consultant, at least two weeks prior to the start of excavation, UC LBNL shall conduct outreach–including but not limited to written notification–to all potentially impacted neighbors within 500 feet of the construction site. The notification shall indicate the estimated duration and completion date of the construction, construction hours, and necessary contact information for potential complaints about construction noise (i.e., name, telephone number, and address of UC LBNL's chief community relations official). The notice shall indicate that noise complaints resulting from construction can be directed to the contact person identified in the notice. The name and phone number of the contact person also shall be posted outside the Berkeley Lab boundaries.	
LRDP Impact NOI-2: Vegetation management activities under the VMP during the LBNL 2025 LRDP timeframe would generate a substantial temporary increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance as applied as the relevant threshold of significance, or applicable standards of other agencies.	S	Implement LRDP Mitigation Measures NOI-1a and NOI-1b.	SU
LRDP Impact NOI-3: Construction activities under the LBNL 2025 LRDP could generate excessive groundborne vibration or groundborne noise levels.	PS	**LRDP Mitigation Measure NOI-3: Construction Vibration** • Prior to any demolition work within 15 feet and construction within 25 feet of a building or structure that is 45 years old or older at the time of work, UC LBNL shall ensure that the subject building is evaluated for eligibility for listing on the National, California, and applicable local register (refer to LRDP Mitigation Measure CUL-1a). If the structure is determined not to qualify for listing on the National or California Registers as a historic resource, no further mitigation is required. • If the structure is determined to be a historic resource, prior to the demolition, grading, or construction near that structure, and unless otherwise specified by a qualified structural engineer, UC LBNL shall require that construction/demolition contractors use (non-vibratory) compaction wheels mounted on an excavator or back-hoe and/or small, smooth drum rollers for final compaction of any asphalt base and asphalt concrete within 25 feet of the historic structure. If needed to meet compaction requirements, smaller, non-seated vibratory rollers shall be used to minimize vibration levels during repaving activities where needed to meet a vibration standard of 0.25 PPV at adjacent historic or older structures. • Avoid using a large bulldozer within 15 feet of a historic structure. Identify potential alternative equipment and techniques with lower vibration levels that could be implemented if construction vibration levels are observed in excess of the vibration standards (e.g., smaller, lighter equipment could be used in some cases, or vibration settings modified on some equipment).	LTS

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TABLE 2-3 (CONTINUED)
SUMMARY OF PROPOSED 2025 LRDP IMPACTS AND MITIGATION MEASURES

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
EIR Section 4.11 Noise and Vibration (cont.)			
LRDP Impact NOI-4: Operation of stationary noise sources under the LBNL 2025 LRDP could generate a substantial permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance as applied as the relevant threshold of significance, or applicable standards of other agencies.	PS	**LRDP Mitigation Measure NOI-4: Noise Controls for Stationary Noise Sources** Mechanical equipment shall be selected and building designs prepared for all future development projects pursuant to the proposed 2025 LRDP so that noise levels from future stationary source operations would not exceed the City of Berkeley Noise Ordinance exterior noise limits for commercial or residential areas as measured at the commercial or residential property line. Controls that would typically be incorporated to attain adequate noise reduction would include selection of quiet equipment, sound attenuators on fans, sound attenuator packages for cooling towers and emergency generators, acoustical screen walls, and equipment enclosures.	LTS
LRDP Impact NOI-5: Traffic generated by campus operation under the LBNL 2025 LRDP would not result in a substantial permanent increase in ambient noise levels in the vicinity of the project more than standards established in the local general plan or noise ordinance, or applicable standards of other agencies.	LTS	None required.	NA
LRDP Impact CUM-NOI-1: Implementation of the LBNL 2025 LRDP and the related VMP, combined with other concurrent construction projects in the project area, could generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance applied as the relevant threshold of significance, or applicable standards of other agencies.	PS	Implement LRDP Mitigation Measures NOI-1a and NOI-1b.	SU
LRDP Impact CUM-NOI-2: Implementation of the LBNL 2025 LRDP, combined with cumulative construction in the project area, could generate excessive groundborne vibration or groundborne noise levels.	PS	Implement LRDP Mitigation Measure NOI-3.	LTS
EIR Section 4.12 Population and Housing			
LRDP Impact POP-1: Implementation of the LBNL 2025 LRDP would not induce substantial unplanned population growth in an area, either directly or indirectly.	LTS	None required.	NA
LRDP Impact POP-2: Implementation of the LBNL 2025 LRDP would not displace substantial numbers of existing people or housing that could necessitate the construction of replacement housing elsewhere.	LTS	None required.	NA

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TABLE 2-3 (CONTINUED)
SUMMARY OF PROPOSED 2025 LRDP IMPACTS AND MITIGATION MEASURES

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
EIR Section 4.12 Population and Housing (cont.)			
LRDP Impact CUM-POP-1: Campus development under the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, would not induce substantial unplanned population growth or displace substantial numbers of existing people or housing that could necessitate the construction of replacement housing elsewhere.	LTS	None required.	NA
EIR Section 4.13 Public Services and Recreation			
LRDP Impact PSR-1: Implementation of the LBNL 2025 LRDP would not result in need for new or physically altered fire protection facilities in order to maintain acceptable service ratios, response times, or other performance objectives for fire protection, the construction of which could cause significant environmental impacts.	LTS	None required.	NA
LRDP Impact PSR-2: Implementation of the LBNL 2025 LRDP would not result in need for new or physically altered police protection facilities in order to maintain acceptable service ratios, response times, or other performance objectives for police protection the construction of which could cause significant environmental impacts.	LTS	None required.	NA
LRDP Impact PSR-3: Implementation of the LBNL 2025 LRDP would not result in the need for new or physically altered school facilities in order to maintain acceptable performance objectives for school services, the construction of which could cause significant environmental impacts.	LTS	None required.	NA
LRDP Impact PSR-4: Implementation of the LBNL 2025 LRDP would not result in the need for new or physically altered parks and recreational facilities in order to maintain acceptable performance objectives for neighborhood and regional parks, the construction of which could cause significant environmental impacts, nor would it increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facilities would occur or be accelerated.	LTS	None required.	NA

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TABLE 2-3 (CONTINUED)
SUMMARY OF PROPOSED 2025 LRDP IMPACTS AND MITIGATION MEASURES

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
EIR Section 4.13 Public Services and Recreation (cont.)			
LRDP Impact PSR-5: The LBNL 2025 LRDP would support the development of new recreational facilities, the construction of which would not have an adverse impact on the environment.	LTS	None required.	NA
LRDP Impact CUM-PSR-1: Campus development under the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, would not result in the need for new or physically altered public facilities in order to maintain acceptable service ratios, response times or other performance objectives, the construction of which could cause significant environmental impacts.	LTS	None required.	NA
EIR Section 4.14 Transportation			
LRDP Impact TRANS-1: Implementation of the LBNL 2025 LRDP would not conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities.	LTS	None required.	NA
LRDP Impact TRANS-2: Implementation of the LBNL 2025 LRDP would not conflict or be inconsistent with *CEQA Guidelines* Section 15064.3, subdivision (b).	LTS	None required.	NA
LRDP Impact TRANS-3: Implementation of the LBNL 2025 LRDP would not substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).	LTS	None required.	NA
LRDP Impact TRANS-4: Implementation of the LBNL 2025 LRDP would not result in inadequate emergency access.	LTS	None required.	NA
LRDP Impact CUM-TRANS-1: Implementation of the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, would not result in significant cumulative transportation impacts.	LTS	None required.	NA

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TABLE 2-3 (CONTINUED)
SUMMARY OF PROPOSED 2025 LRDP IMPACTS AND MITIGATION MEASURES

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
EIR Section 4.15 Utilities and Service Systems			
LRDP Impact UTIL-1: Campus development under the LBNL 2025 LRDP would not require or result in the relocation or construction of new or expanded water, wastewater treatment, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects.	LTS	None required.	NA
LRDP Impact UTIL-2: Sufficient water supplies would be available from EBMUD to serve campus development under the LBNL 2025 LRDP and other reasonably foreseeable future development during normal, dry, and multiple dry years.	LTS	None required.	NA
LRDP Impact UTIL-3: Campus development under the LBNL 2025 LRDP would not result in a determination by the wastewater treatment provider that it does not have adequate capacity to serve the project's projected demand in addition to the provider's existing commitments.	LTS	None required.	NA
LRDP Impact UTIL-4: Campus development under the LBNL 2025 LRDP would not generate solid waste in excess of state or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals.	LTS	None required.	NA
LRDP Impact UTIL-5: Campus development under the LBNL 2025 LRDP would comply with federal, state, and local management and reduction statutes and regulations related to solid waste.	LTS	None required.	NA
LRDP Impact CUM-UTIL-1: Campus development under the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects in the vicinity of the Berkeley Lab campus, would not result in significant cumulative impacts related to utilities and service systems.	LTS	None required.	NA

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TABLE 2-3 (CONTINUED)
SUMMARY OF PROPOSED 2025 LRDP IMPACTS AND MITIGATION MEASURES

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
EIR Section 4.16 Wildfire			
LRDP Impact WF-1: Implementation of the LBNL 2025 LRDP would not expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires.	LTS	None required.	NA
LRDP Impact WF-2: Implementation of the LBNL 2025 LRDP could substantially impair implementation of an adopted emergency response plan or emergency evacuation plan.	PS	**LRDP Mitigation Measure WF-2a: High Fire Risk Warning Period Reduced Campus ADP** During applicable National Weather Service Red Flag Warning periods as determined by Berkeley Lab's Safety and Emergency Services (SES) Division management, Berkeley Lab shall reduce on-campus population to below 3,000 ADP for the duration of the high-risk period. This will be achieved by visitor and guest restrictions, managed remote work instructions to non-essential Lab personnel, and noticing of all Lab staff regarding potential emergency conditions prior to such periods. All Lab personnel—including vendors, contractors, and other campus-based affiliates—shall be notified (whenever possible, at least 24 hours in advance) of applicable Red Flag Warning periods and of any other days considered to be of notable fire risk as determined by SES management. In advance of all applicable high fire risk days, all non-essential Lab personnel shall be advised to avoid the Lab campus through such measures as teleworking or remote working on other non-campus sites not subject to high-risk conditions. Teleworking and remote working on such days shall be enabled and encouraged by Lab line supervisors, division directors, and the Laboratory Directorate and instituted as Lab policy in the Laboratory's Requirements and Policies Manual. In addition, in advance of applicable high fire risk days, Lab visitors and guest lists shall be reviewed and, wherever practical, visits shall be rescheduled for alternate dates. Laboratory ADP on high fire risk days shall be regularly monitored to determine the effectiveness of the above described measures and to determine if and when mandatory work-at-home measures should be imposed to minimize campus population on such days and to keep the Lab campus ADP at or below baseline levels (i.e., 3,000 ADP) during above-described notable fire risk conditions. **LRDP Mitigation Measure WF-2b: Enhanced Wildfire Temporary Refuge Building Program** Berkeley Lab shall complete and institute its enhanced Wildfire Temporary Refuge Building (WTRB) Program that will provide at least two WTRBs that meet all applicable code requirements in each of the campus's six emergency management zones. The program will also clearly define the protocols and procedures for Lab personnel to use WTRBs in case of a fire emergency requiring on-campus shelter-in-place. WTRBs will be clearly marked on the outside for ease of identification, made highly accessible for all users, and located such that they may be quickly accessed by users throughout the Lab campus. Furthermore, the Lab will offer education and outreach throughout the Lab community to increase awareness of WTRBs and to encourage the use of such facilities as an alternative to evacuation, especially under conditions determined by SES management where shelter-in-place may be safer than evacuation. Efforts to enhance the WTRB Program are currently underway and shall be completed within one year of 2025 LRDP adoption.	LTS

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S = Significant Impact
SU = Significant and Unavoidable with Mitigation
LTS = Less than Significant impact
NA = Not applicable

TABLE 2-3 (CONTINUED)
SUMMARY OF PROPOSED 2025 LRDP IMPACTS AND MITIGATION MEASURES

Environmental Impact	Level of Significance Before Mitigation	Mitigation Measures	Level of Significance After Mitigation
EIR Section 4.16 Wildfire (cont.)			
LRDP Impact WF-3: Implementation of the LBNL 2025 LRDP would not exacerbate wildfire risks and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire due to slope, prevailing winds, and other factors.	LTS	None required.	NA
LRDP Impact WF-4: While implementation of the LBNL 2025 LRDP would require the installation or maintenance of associated utility infrastructure, the installation and maintenance of this infrastructure would not substantially exacerbate fire risk or result in temporary or ongoing impacts to the environment.	LTS	None required.	NA
LRDP Impact WF-5: Implementation of the LBNL 2025 LRDP would not expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes.	LTS	None required.	NA
LRDP Impact CUM-WF-1: Implementation of the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, could result in significant cumulative impacts related to wildfire.	PS	Implement LRDP Mitigation Measures WF-2a and WF-2b.	LTS

PS = Potentially Significant Impact
S = Significant Impact
SU = Significant and Unavoidable with Mitigation
LTS = Less than Significant impact
NA = Not applicable

CHAPTER 3
Project Description

This Draft Environmental Impact Report (EIR) chapter describes the University of California (UC) Lawrence Berkeley National Laboratory's (LBNL, Berkeley Lab, or the Lab) proposed 2025 Long Range Development Plan (LRDP), also referred to as the proposed "Project." The proposed 2025 LRDP would guide future development within the Berkeley Lab campus. This chapter provides background information about Berkeley Lab and the proposed Project, describes the Project's location and regulatory setting, provides a detailed description of the proposed 2025 LRDP, and discusses permits and approvals that may be needed to implement the proposed Project.

3.1 Background

Berkeley Lab is a federally funded national laboratory of the U.S. Department of Energy (DOE) Office of Science. The Lab conducts unclassified research to deliver scientific solutions to challenges of national and international significance that are beyond the capabilities of most university and private sector research institutions.

Berkeley Lab is located on approximately 202 acres of UC Regents-owned land in the East Bay hills. Building parcels on the Berkeley Lab campus are leased by the University to the DOE for all major DOE-constructed buildings. While the DOE owns most of the facilities and structures within the campus, Lab management and operations are provided by the University under a DOE/UC contract that currently extends through 2030, and which is expected to continue to be renewed in five-year increments. Due to the ownership of the Berkeley Lab site and its management by the University, Berkeley Lab is considered a UC campus. The University, specific to its role as landowner, manager, and operator of Berkeley Lab, is referred hereinafter as UC LBNL.

UC campuses—including UC LBNL—are required to maintain and periodically update their LRDPs. An LRDP provides a high-level planning framework to guide land use, physical parameters, and capital investment in line with the campus's mission and strategic goals.[1] The LRDP provides adequate planning capacity for potential program and on-campus population growth and physical infrastructure that may be needed to support future campus development. However, an LRDP does not mandate growth or the provision of new facilities. Further, LRDPs do not expire but remain in effect until updated or replaced (UC, 2019).

1 An LRDP is defined by statute (Public Resources Code [PRC] 21080.09(a)(2)) as a "physical development and land use plan to meet the academic and institutional objectives for a particular campus or medical center of public higher education."

Pursuant to the California Environmental Quality Act (CEQA) (PRC Section 21080.09 and *CEQA Guidelines* Section 15081.5(b)), each LRDP must be accompanied by an EIR. An EIR provides a comprehensive review and analysis of the proposed Project and its potential environmental effects. An EIR analysis is presented for review and comment to the public, to relevant government agencies, and to the Lead Agency decision makers.

In July 2007, The Board of Regents of the University of California (The Regents) certified the *LBNL 2006 LRDP Final Environmental Impact Report* (FEIR) (State Clearinghouse [SCH] No. 2000102046) and adopted the *LBNL 2006 LRDP*. The *2006 LBNL LRDP* forecasted campus growth and development through the year 2025.

In 2021, UC LBNL assembled a team of planning, design, and engineering experts to identify potential future programs and population projections for the Berkeley Lab campus and the facilities and infrastructure that would be needed to support that development. In fall 2023, UC LBNL completed the *Berkeley Lab Campus Master Plan* (Campus Master Plan) to address various site plan concepts regarding facilities, circulation, and utilities required for future operation of Berkeley Lab. The Campus Master Plan is an aspirational, not an actionable, plan.

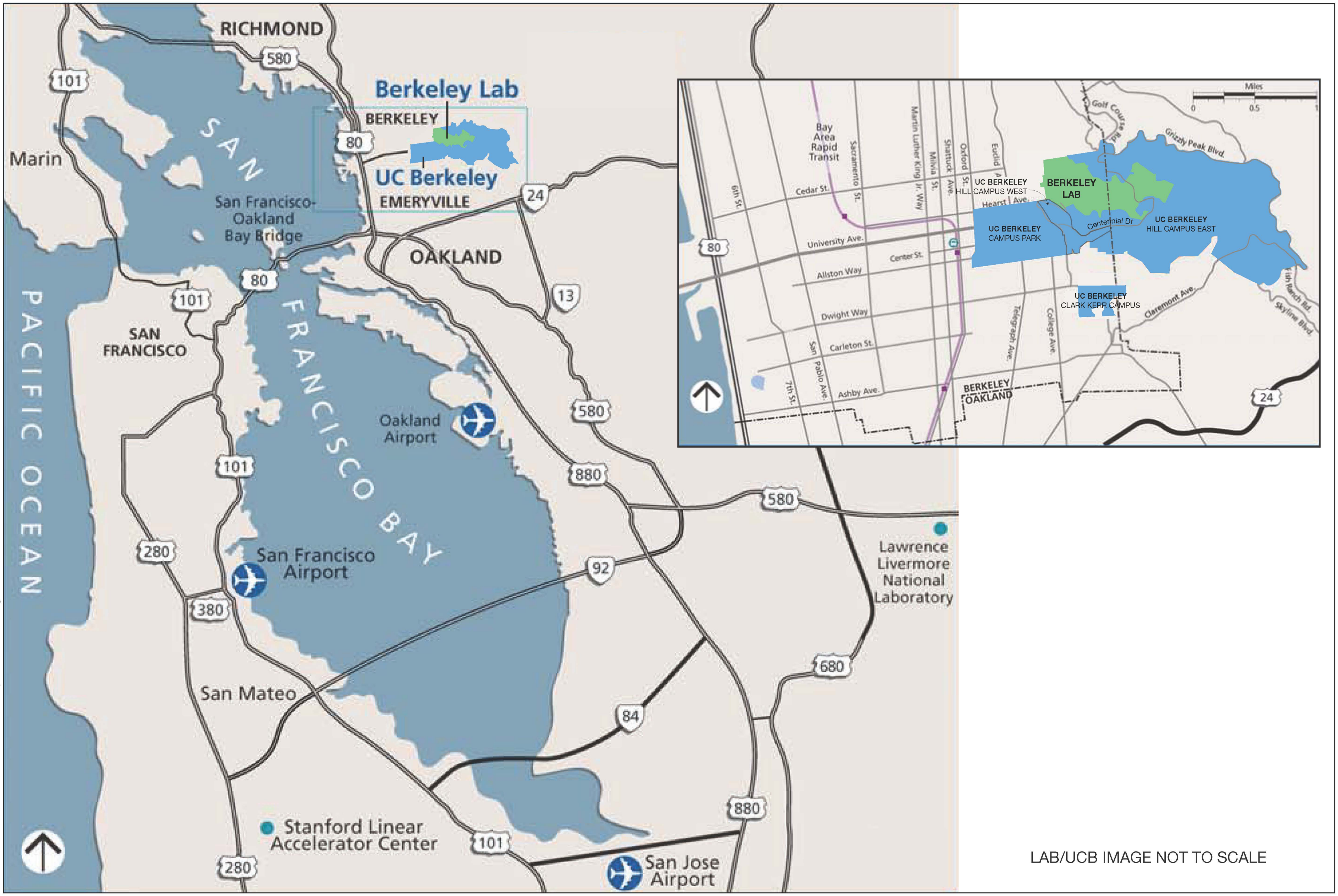
The proposed 2025 LRDP draws upon campus master planning efforts that have helped define the strategic vision for the campus, infrastructure, and facilities. The proposed 2025 LRDP would replace the current 2006 LRDP and includes new on-campus population and building space projections through the year 2045.

The University of California is the Lead Agency for the proposed Project. This LRDP EIR is a Program EIR, prepared pursuant to *CEQA Guidelines* Section 15168, that will be used by UC not only to approve the proposed LRDP but also is intended to be used for the streamlined environmental review of subsequent development projects on the Berkeley Lab campus.

3.2 Campus Location and Existing Site Characteristics

Figure 3-1 presents Berkeley Lab's regional location. The campus occupies 202 acres within 1,232 acres of UC Regent-owned land in the San Francisco Bay Area's East Bay hills. **Figure 3-2** presents the Project location. As shown in Figure 3-2, the campus straddles the border between the cities of Berkeley and Oakland. **Figure 3-3** presents an aerial photograph identifying major roadways, drainages, and buildings on and in the campus vicinity.

The campus is surrounded on the west by UC Berkeley's main campus (Campus Park) and Hill Campus West, and City of Berkeley multi-unit residential developments; on the north by City of Berkeley residential neighborhoods and various UC Berkeley facilities (including the Lawrence Hall of Science, Space Sciences Laboratory, and Mathematical Sciences Research Institute); on the east by UC Berkeley's Hill Campus East; and on the south by UC Berkeley's Hill Campus West and East (including various recreational fields and pools), Botanical Garden, and by the Strawberry Canyon open space. Regional open space lies beyond the UC Berkeley Hill Campus, including the 2,000-acre Tilden Regional Park to the northeast and east, and the 205-acre

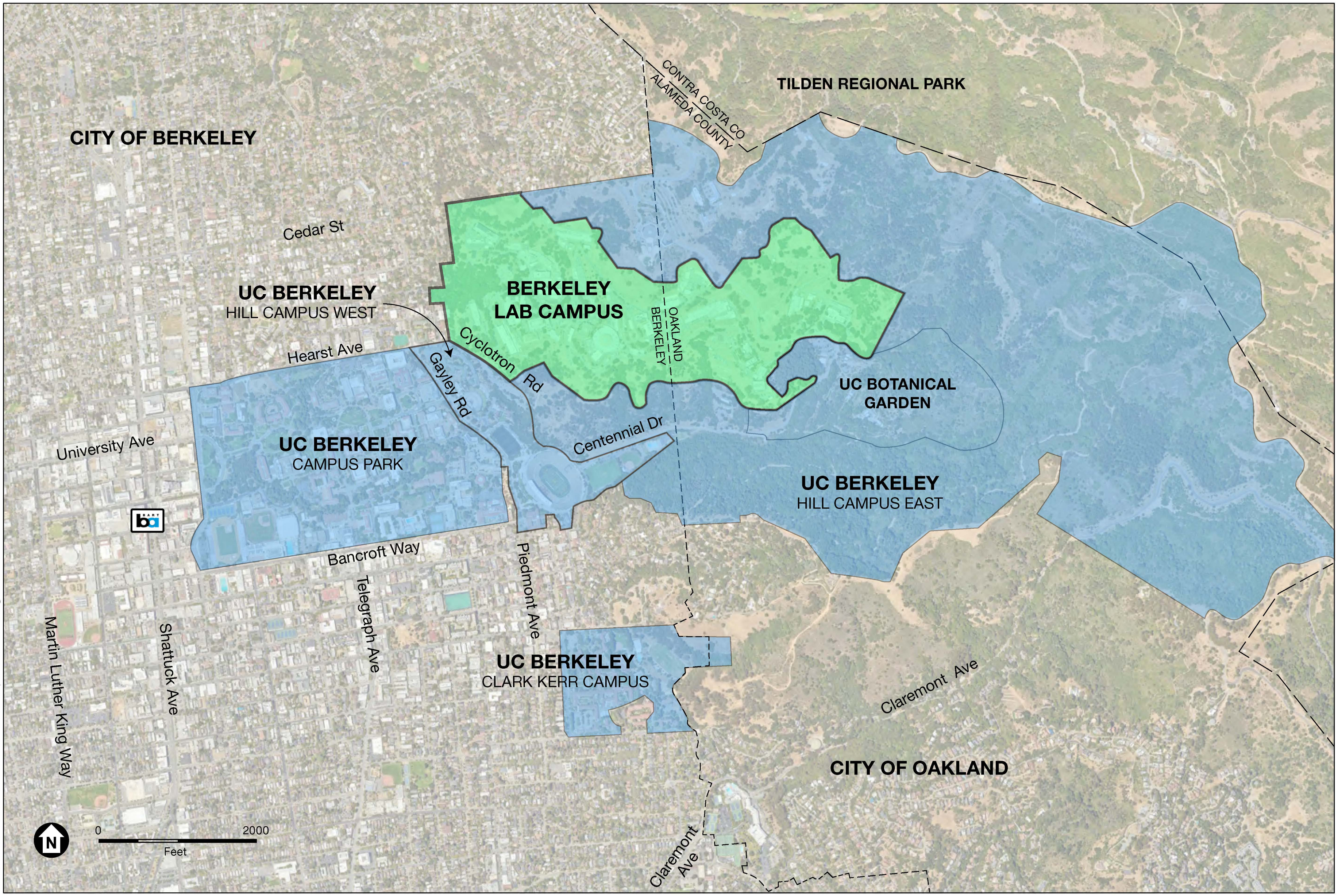


SOURCE: LBNL; ESA, 2024

LBNL LRDP EIR

Figure 3-1
Regional Location

ESA



2019/D201901556.00 - LBNL LRDP EIR/05 Graphics-GIS-Modeling/Illustrator

SOURCE: ESA, 2024; Google Earth, 2024

LBNL LRDP EIR

Figure 3-2
Project Location

ESA

SOURCE: ESA, 2024

LBNL LRDP EIR

Figure 3-3
General Vicinity Features Map

ESA

Claremont Canyon Regional Preserve to the south. The Berkeley Lab campus is a fenced and secured site and is accessed by three controlled vehicular entrances.

The campus lies within the lower- to mid-elevation range of the East Bay hills. Campus elevations range from approximately 450 feet above sea level (asl) in the western portion of the campus near Cyclotron Road to approximately 1,100 feet asl in the north-eastern campus. The hillside topography includes a natural pattern of radiating ridges, knolls, and valleys formed by local seasonal creek drainages. Approximately 60 percent of the campus has slopes greater than 25 percent, and about 27 percent of the campus has slopes greater than 45 percent. The campus slopes support multiple ephemeral and intermittent drainages or streams, many of which have been culverted under adjoining development areas. Perennial streams on the campus include the North Fork of Strawberry Creek and Chicken Creek. The Hayward Fault is located along the campus's western edge.

The campus supports a wide variety of native and non-native vegetation, as well as over 120 species of birds, mammals, reptiles, and amphibians. Approximately two-thirds of the campus remains undeveloped as a result of steep slopes, slope stability issues, and the presence of riparian habitat. The approximate one-third of the campus that is developed is covered largely by impervious surfaces, including, but not limited to, buildings, roads, parking lots, and utility infrastructure.

3.3 Existing Campus Facilities

As noted above, the University leases Berkeley Lab campus parcels to the DOE to support all major DOE-owned buildings, which comprise most of the campus's facilities and structures. **Figure 3-4** presents existing Berkeley Lab campus facilities.

UC LBNL occupies off-site space in buildings on the adjoining UC Berkeley campus as well as commercially leased space, mostly in the cities of Berkeley, Oakland, Richmond, and Emeryville. Off-site facilities are acknowledged but are not considered to be within the development program of the proposed 2025 LRDP. While the proposed 2025 LRDP would encourage continued flexible use of such off-site facilities, there are no specific goals or targets that would directly affect their use. LBNL-occupied off-site spaces therefore are not analyzed in this EIR.

3.3.1 Existing Campus Building Space

There are currently 170 built structures on the campus, consisting of approximately 90 buildings, 20 trailers, and 60 storage containers, which total approximately 2,061,500 gross square feet (gsf). **Table 3-1** lists the major buildings[2] that are present on the campus as of Spring 2024 (refer to Figure 3-4 for building locations). These facilities provide space for research laboratories, accelerators, offices, machine and electrical shops, medical services, storage, food service, and communications. Many of these buildings are considered obsolete due to age, condition, or a poor seismic safety rating per the UC Seismic Performance Rating (SPR) System.

2 Major buildings include all research and administration buildings as well as some of the larger buildings and trailers that provide support services.

Buildings approved under the 2006 LRDP and under construction in 2024/25

NOTE: Please see Table 3-1 for a list of primary buildings on the LBNL campus site.

SOURCE: LBNL, 2023

LBNL LRDP EIR

Figure 3-4
Existing Berkeley Lab Campus Facilities

TABLE 3-1
MAJOR EXISTING BUILDINGS ON THE BERKELEY LAB CAMPUS

Bldg. No.[a]	Building	Bldg. No.[a]	Building	Bldg. No.[a]	Building
2	Advanced Materials Laboratory	50E	Computing Sciences / NERSC	71	Ion Beam / Center for Beam Physics
6	Advanced Light Source (ALS)	50F	NERSC	71B	Center for Beam Physics
6W	Temporary ALS Support-Tent Structure	53	E&E	72	National Center for Electron Microscopy
7W	Temporary ALS Support-Tent Structure	53B	E&E	73	Atmospheric Aerosol Research
15	ALS User Support Building	54	*Under Construction:* Collaboration Commons	74	Life Sciences Laboratory Annex
17	Shop-Assembly	55	Life Sciences	75	EH&S Radiological Service
23	LBNL Guest House	55A	Nuclear Magnetic Resonance (NMR)	75A	Calibration Facility / Radiological Service
26	Medical Services / Environmental Health and Safety (EH&S)	56	Biomedical Isotopes	75B	EH&S
27	Dry Lab and Offices	56A	Offices	77	Engineering Shops
30	Solar Energy Research Center (SERC)	58	Heavy Ion Fusion Accelerator Research	77A	Ultra-High Vacuum Assembly Facility
31	Chicken Creek Barn	58A	Accelerator / R&D Addition	76	Facilities Offices
31A	Chicken Creek Barn / Office Trailer	59	Shyh Wang Hall	80	ALS Support Building
33	General Purpose Lab (GPL)	60	High Bay Laboratory	83	Life Sciences Laboratory
34	ALS Chiller-Utility Building	61	Storage	83A	Laboratory Trailer
37	Utility Services Building	62	Chemical and Materials Sciences	84	Human Genome Lab
45	Fire Station	63	Accelerator & Fusion / Energy & Environmental	85	Hazardous Waste Handling
46	Laboratory	64	Life Sciences / Earth Sciences H-B	85B	Hazardous Waste Offices
46A	Engineering Division Offices	65	Badge Office / Parking / Int. Research	86	Animal Care Facility
46B	AFR Office Trailer	66	Center For Advance Math/ Math Science / Catalysis Lab	88	88-inch Cyclotron
47	Offices	67	Molecular Foundry	90	Copy Center/DOE Site Office/ Environmental Energy Technologies Division (EETD)/ES/EHS
48	Fire Station	69	IT / Shipping-Receiving	91	Integrative Genomics Building (IGB)
50	Laboratory Administration	70	Energy & Environmental / Nuclear Science	91U	IGB Modular Utility Plant (MUP)
50A	Laboratory Administration	70A	Chemical Science / Earth Science / Life Science / Nuclear Science	92	*Under Construction:* Biological and Environmental Program Integration Center (BioEPIC)
50B	Physics/Computing Services	71A	Ion Beam Tech / Low Beta Lab		
50C	Computing Sciences/NERSC	71C,D,F,J, K,P,W,X	EH&S / Chemical Sciences Trailers		

NOTE:
a. Please refer to Figure 3-4 for locations of these buildings on the campus.
SOURCE: UC LBNL, 2024.

Berkeley Lab's major research facilities have been developed within eight loosely organized development areas or clusters on the campus's relatively flat terraces. As illustrated in **Figure 3-5**, these include the Blackberry, Central Commons, Bayview, Northside, Charter Hill, Support Services, Redwood, and Strawberry development clusters. Most development clusters tend toward a dominant research area or support function. Parking–most often arranged in small lots or along roads–and other amenities are distributed throughout the development clusters.

3.3.2 Existing Campus Population

As of spring 2024, Berkeley Lab's total population or roster is about 9,550, and comprises three principal groups: Staff (employees: 3,350), Academics (faculty and students: 1,200), and Affiliates (registered guests, subcontractors, etc.: 5,000). The roster is composed of Staff, Academics, and Affiliates that work at and/or visit either the Lab campus or off-campus leased space.

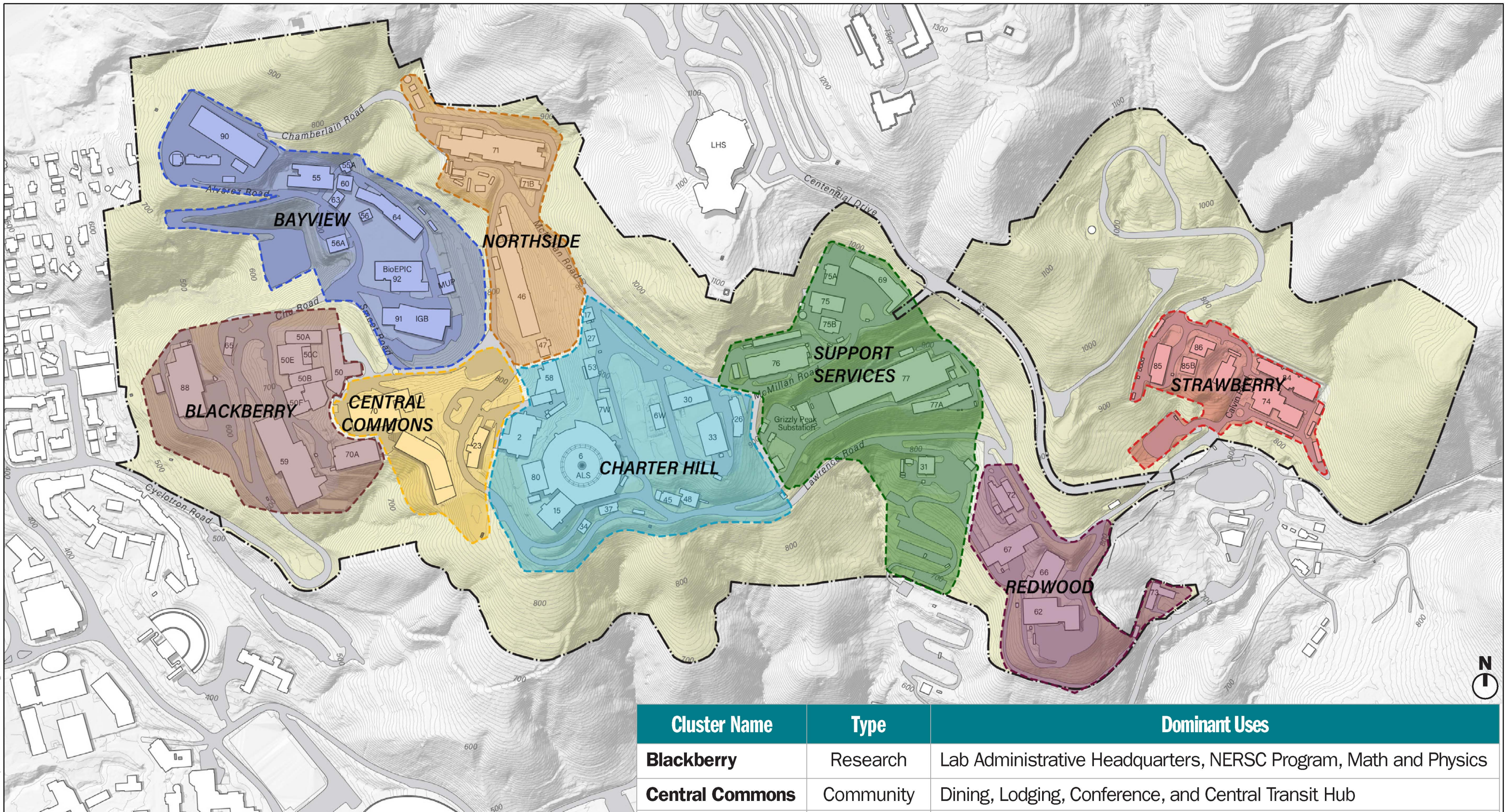
All of the Lab's population is not present on the campus on a typical workday, therefore, since 2006, Berkeley Lab's on-campus population has been expressed as "adjusted daily population" (ADP), which is the estimated Lab staff and others who might be present on the campus on a typical workday. In 2006, ADP was calculated as a function of full-time employee staff added to a fixed percentage of annual visitors; based on that methodology, campus ADP was projected to reach 4,650 by 2025. In fact, prior to the Coronavirus 2019 (COVID-19) pandemic, Berkeley Lab ADP was trending upward and had reached approximately 4,500 ADP in 2019. However, during the pandemic, the Lab ADP was reduced substantially. Post-pandemic, ADP increased but now has tapered at levels below the Lab's pre-pandemic population.

Under the Lab's post-pandemic flexible work model, far fewer staff and visitors are present on the campus on any given day than under pre-pandemic conditions, so the previous ADP methodology is no longer useful. A new ADP methodology has been developed by UC LBNL that utilizes gate counts and badge-in data and reflects a newly established flexible work model where a substantial number of staff telework from remote locations part- or full-time. This flexible work model has been formally adopted as Lab policy and is expected to continue to be the Lab's standard operational mode moving forward. Based on this new methodology, the baseline (2024) ADP is estimated at approximately 3,000 (LBNL, 2025).[3,4]

Of Berkeley Lab's total roster, approximately 61 percent are operational staff (administrative/ managerial, crafts/labor, planning/engineering, health/safety, etc.), and 39 percent are scientific staff (e.g., researchers and research technicians). Of the campus's current 3,000 ADP, approximately 54 percent are categorized as Staff (career, term, and contract employees), 20 percent are Academics (students, post-docs, and faculty), 25 percent are Affiliates (registered guests and visitors, and contractors), and 1 percent are Others (personal guests, school groups, delivery drivers, etc.).

3 In addition, in 2024, there were approximately 305 LBNL staff stationed in UC Berkeley campus space and approximately 355 LBNL staff stationed in off-site leased space in other locations.

4 ADP is now continuously tracked based on gate counts, badge-in data, and the Lab's roster.



Cluster Name	Type	Dominant Uses
Blackberry	Research	Lab Administrative Headquarters, NERSC Program, Math and Physics
Central Commons	Community	Dining, Lodging, Conference, and Central Transit Hub
Bayview	Research	Biosciences, Energy Technology, DOE Site Office
Northside	Research	Accelerator Technology, Applied Physics
Charter Hill	Research	ALS Program, Energy Sciences
Support Services	Support	Engineering, Facilities, EH&S programs
Redwood	Research	Materials and Nano Sciences
Strawberry	Research	Earth Sciences

2019/D201901556.00 - LBNL LRDP EIR/05 Graphics-GIS-Modeling/Illustrator

SOURCE: LBNL, 2024

Figure 3-5
Development Clusters and Prevalent Uses on the Berkeley Lab Campus

ESA

3.3.3 Existing Access, Circulation, and Parking

Vehicular access to the campus occurs primarily along two routes: Hearst Avenue, which borders the north edge of the UC Berkeley Campus Park and becomes Cyclotron Road east of Gayley Road; and Centennial Drive, which extends from the California Memorial Stadium through Strawberry Canyon to the Lawrence Hall of Science and Grizzly Peak Boulevard. These roadways provide access to three controlled Lab entry points: Blackberry Canyon Gate on Cyclotron Road, and Strawberry Canyon Gate and Grizzly Peak Gate on Centennial Drive, all of which are staffed by security personnel. Grizzly Peak Gate is currently used as a staffed entry gate only during the morning commute hours, while it is available as an automated egress point at all times.

Circulation within the campus is primarily via two east-west roadways and connecting north-south roadways. Chamberlain Road and McMillan Road make up the primary "upper route" and Lawrence and Alvarez Roads form the "lower route." Accompanying sidewalks and a series of interconnecting roadways, pedestrian paths, stairways, and elevators allow employees and visitors to move among the Lab's buildings whether in vehicles or on foot.

The campus provides approximately 2,200 parking spaces with about 1,700 parking spaces available for employees and visitors. The 500 parking spaces not available to employees and visitors are used for fleet vehicles, construction vehicles and rigging equipment, electrical charging stations, shuttle bus parking, deliveries and drop-off space, temporary lay-down and storage space, etc. These spaces are located primarily in lots distributed around the campus where space is available or alongside campus roadways, with the result that parking availability does not necessarily match the geographic distribution of personnel. UC LBNL operates an intra-campus shuttle bus that offers free services to employees and visitors. In addition to regular intra-campus routes throughout the business day, shuttle services include off-site connections between the campus and various destinations in the City of Berkeley and surrounding areas, including the UC Berkeley campus, LBNL facilities in West Berkeley and Emeryville, and the Downtown Berkeley, MacArthur, North Berkeley, and Rockridge Bay Area Rapid Transit (BART) stations.

3.3.4 Existing Utilities

Berkeley Lab maintains an extensive array of on-site utility systems. The campus potable and fire protection water distribution network is owned and maintained by UC LBNL with water supplied by the East Bay Municipal Utility District (EBMUD). Campus sanitary sewer lines connect to City of Berkeley facilities and eventually to EBMUD's mains and treatment plant. The campus stormwater network drains downstream into the Strawberry Canyon watershed. Electricity is supplied by the Western Area Power Administration and transmitted by Pacific Gas & Electric (PG&E) powerlines and distributed via the Lab's internal electrical network. Natural gas is currently supplied by NRG Business Marketing LLC under rates negotiated by the Defense Logistics Agency and distributed to the campus by PG&E gas pipelines and then distributed internally by Berkeley Lab's internal natural gas pipeline network. The Lab also employs several sitewide and building-specific utilities to serve research and specialized equipment. The campus includes delivery systems for compressed air, liquid nitrogen, argon, helium, chilled water, heating hot water and steam, low-conductivity water, treated water, tower water, and condenser water.

3.3.5 Existing Natural Landscape and Vegetation Management

Approximately two-thirds of the campus is vegetated open space, which includes grasslands, woodlands, scrubland, and riparian areas, as well as planned landscaping. Non-native annual grasses predominate, occupying about one-third of the total campus area. Tree species include stands of native trees, such as coast live oak, California bay, and redwood; non-native species include blue-gum eucalyptus, Monterey pine, Torrey pine, and Canary Island pine. Planned landscaping includes ornamental trees and plants mostly confined to the Lab's interior developed areas.

The campus is located in a Wildland Urban Interface (WUI) and is designated a Very High Fire Hazard Severity Zone by the California Department of Forestry and Fire Protection (CalFire). UC LBNL first instituted a comprehensive vegetation management program in 1992 in response to the Oakland/Berkeley East Bay Hills Fire of 1991. This on-going program aims to minimize potential wildland fire risk on and around the campus. Berkeley Lab's vegetation management activities are continually evaluated and modified over time to address changing circumstances and evolving best practices. The vegetation management program is overseen by vegetation and fire planning experts and is informed by LBNL guidance documents.

Berkeley Lab's Wildland Fire Management Plan (WFMP), last updated in August 2023, is intended to diminish the risk and consequences of wildland fires through the use of fire prevention, fire suppression, and post-fire rehabilitation (LBNL, 2023a). This includes high-level guidance and recommendations on managing fuels to limit wildland fire intensity and spread. UC LBNL prepared a Vegetation Management Guide, last updated in 2024, which provides a comprehensive framework for managing vegetation within the campus boundaries. The document provides more detailed guidance to aid the design and execution of all work involving vegetation management (LBNL, 2024).

Through its on-going vegetation management program (VMP), which was incorporated into the 2006 LRDP, the Lab strives to limit fuels to those that burn with a slow spread rate and, more importantly, those that limit flame length. This results in low-intensity, slow moving fires requiring minimal emergency response.

Under its VMP, UC LBNL achieves fuel reduction by the use of livestock grazing and/or grass mowing throughout the entire campus. Most fuel reduction work begins in the late spring following the rainy season and after the majority of plant growth has stopped. Other vegetation management and reduction activities undertaken by the Lab's Facilities Division include removing "ladder fuels" within 100-feet of structures; trimming tree branches that overhang roofs; clearing leaf litter from roofs and drains; and trimming trees to provide adequate clearance for fire response vehicles. In addition, several trees are cut and removed each year because they are dead, diseased, or have the potential to fall, which could cause injury, damage, or blockage of exits during emergency evacuation.

3.4 2006 LRDP

Development of the Berkeley Lab campus is currently guided by the LBNL 2006 LRDP. If the 2025 LRDP is adopted by the UC Regents, it would replace the LBNL 2006 LRDP. The environmental effects of growth under the 2006 LRDP were analyzed in the corresponding *LBNL 2006 LRDP FEIR*. That FEIR has been updated since 2007 with two supplements and an addendum. The first supplemental EIR (SCH No. 2008122030) re-evaluated transportation impacts of campus growth under the 2006 LRDP in light of revised significance thresholds adopted by the City of Berkeley, and the second supplemental EIR (SCH No. 2016062007) analyzed the impact of campus growth under the 2006 LRDP on greenhouse gas emissions. The addendum addressed the environmental impacts from the implementation of a proposed vegetation management project.

The *LBNL 2006 LRDP FEIR*, as amended, is a Program EIR, prepared pursuant to Section 15168 of the *CEQA Guidelines* (Title 14, California Code of Regulations, Section 15000 et seq.). The *LBNL 2006 LRDP FEIR*, as amended, analyzed full implementation of land uses and physical development anticipated under the 2006 LRDP assuming a horizon year of 2025. Mitigation measures were identified in the *LBNL 2006 LRDP FEIR*, as amended, to mitigate the significant adverse project and cumulative impacts associated with that projected development. In the years following the 2006 LRDP adoption, several proposed Berkeley Lab projects within the scope of the 2006 LRDP were analyzed and reviewed for environmental impacts in accordance with *CEQA Guidelines* Sections 15152 and 15168 and PRC Section 21094.

The *LBNL 2006 LRDP* described growth and development that could be reasonably projected at the time of that plan's preparation. **Figure 3-6** illustrates the 2006 LRDP Land Use Plan. The 2006 LRDP planned for a projected 2025 ADP of 4,650 as well as 2,420,000 gsf of on-site building space, along with stating relevant LRDP policies.

Table 3-2 presents the 2006 LRDP key parameters compared with 2024 campus conditions.

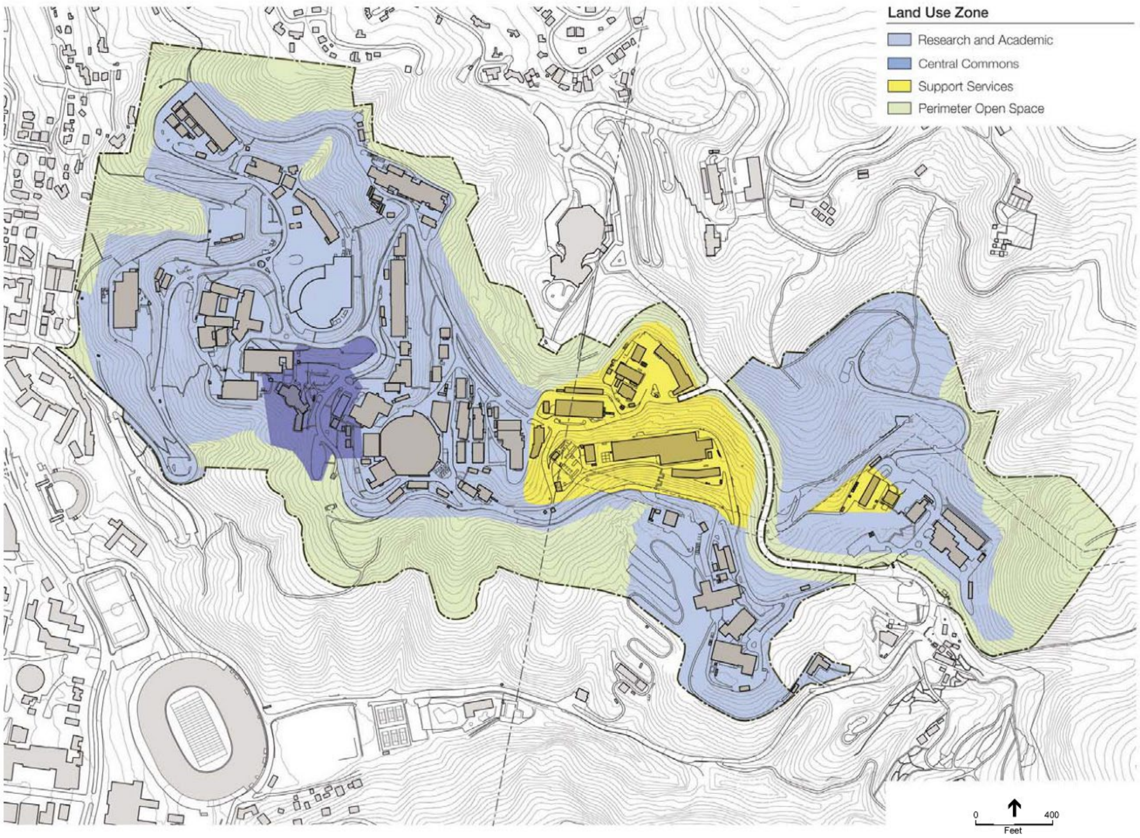
TABLE 3-2
LBNL 2006 LRDP KEY PARAMETERS AND CURRENT STATUS

	2006 LRDP Baseline (2003)	Projected 2025 (per 2006 LRDP)	2025 LRDP Baseline / Existing (2024)
Campus Population (ADP)[a]	3,650 ADP	4,650 ADP	3,000 ADP[c]
Campus Building Space (gsf)[b]	1,760,000 gsf	2,420,000 gsf	2,061,500 gsf

NOTES:

a. ADP = Adjusted Daily Population
b. gsf = gross square feet
c. As described in Section 3.3.2, above, the 2006 LRDP baseline and projected ADP were calculated using a different methodology than the 2025 LRDP's 2024 baseline.

SOURCE: UC LBNL, 2024.



SOURCE: LBNL, 2006

LBNL LRDP EIR

Figure 3-6
Land Use Plan from 2006 LRDP

Major campus buildings developed under the *LBNL 2006 LRDP* include Building 59 (Computational Research and Theory building, or Shyh Wang Hall), Building 15 (User Support building), Building 23 (Guest House), Building 91 (Integrative Genomics Building or IGB), Building 30 (Solar Energy Research Center or SERC), and Building 33 (General Purpose Laboratory building or GPL). Two additional building projects approved under the 2006 LRDP were under construction at the time the 2025 LRDP EIR Notice of Preparation (NOP) was issued. These projects, the Biological and Environmental Program Integration Center (BioEPIC) and the Collaboration Commons building, are depicted on Figure 3-4. In addition, the approved Linear Assets Modernization Project (LAMP), a long-term campus infrastructure upgrade project (which includes electricity, water, natural gas, compressed air, sewer, storm drain, process controls, and information technology systems) is anticipated to begin construction in 2026 and span approximately 10 years. ALS-U, a major upgrade of the equipment in Building 6 (ALS), is also another approved project under the 2006 LRDP that is currently anticipated to be completed by 2029.

The majority of development that was anticipated and has been completed under the 2006 LRDP has been on infill sites created by the demolition of existing facilities, which has resulted in a higher density of development within each cluster and retention of more undeveloped space between development clusters.

3.5 Project Objectives

The proposed 2025 LRDP responds to the following objectives that are aimed at further developing and modernizing the Berkeley Lab campus:

1. Strengthen Berkeley Lab's ability to perform transformative, mission-directed scientific research.
    - Provide the Berkeley Lab campus with modern, sound, mission-capable scientific facilities and support space.
    - Prioritize removing buildings that are obsolete or not mission capable, or that are highly inefficient, environmentally unsound, or that fail to meet UC seismic standards.
    - Renovate, expand, modernize, or repurpose outdated facilities to meet research needs, where feasible and economical.
    - Provide for population and building space growth necessary to flexibly accommodate Berkeley Lab's programmatic and operational needs.
    - Outfit the Berkeley Lab campus with modern, mission-capable infrastructure and utilities. Design scientific and support facilities to be readily adaptable to a wide variety of uses and changing conditions.
    - Prepare the campus to consolidate personnel and functions from off-site leased space, with a focus on collaboration and efficiency, while retaining flexible use of off-site space as needed.
    - Configure indoor and outdoor spaces to encourage collaboration and to support Team Science.[5]
    - Design and leverage the Berkeley Lab campus to attract investment, initiatives, and scientific talent.
2. Guide Berkeley Lab's development towards achieving an identifiable and fully realized UC Research Campus.
    - Realize a cohesive UC research campus with a unique sense of identity.
    - Reinforce the campus cluster development scheme when siting buildings and hardscape.
    - Improve wayfinding and user orientation throughout the campus.
    - Improve campus circulation network and mobility opportunities for all campus users.
    - Develop and reinforce attractive and sustainable outdoor areas throughout the campus.
    - Locate facilities and outdoor activities to capitalize on existing opportunities and minimize land use conflicts.
    - Organize the campus to optimize maintenance and day-to-day management.
3. Maintain and strengthen Berkeley Lab's responsible stewardship of public and natural resources.
    - Factor efficiency and cost-effectiveness into campus design and development.

[5] Attributed to Berkeley Lab founder EO Lawrence, Team Science is a multidisciplinary approach to scientific research that involves researchers from different institutions and disciplines working together to achieve shared goals.

- Preserve, maintain, and improve the campus natural environment.
- Promote a sustainable campus by maximizing efficiency and minimizing natural resource consumption and environmental impacts.
- Consider conservation of energy, material, and water in all LBNL development.
- Emphasize sitewide safety and security through campus design.
- Design and manage campus developed areas to minimize wildland fire risk, maintain defensive building perimeters, and ensure safe egress/entry routes.
- Manage outlying and natural campus vegetation areas to minimize wildland fire risk and intensity.
- Plan and implement vegetation management program. Select drought tolerant and fire-smart plants and trees for landscaping areas.

4. Promote a welcoming campus that values and supports its community, neighbors, and the public.
   - Provide a widely distributed, full range of people-serving campus facilities.
   - Improve access and personal mobility throughout the campus.
   - Minimize land use conflicts and foster good relations with nearby residences and communities, to the extent feasible.
   - Reinforce the campus as a location of regional interest and education.

The proposed 2025 LRDP would carry forward the Berkeley Lab Design Guidelines, originally adopted as a companion document to the 2006 LRDP. The Design Guidelines would continue to provide direction for physical development of the campus under the proposed 2025 LRDP. The 2025 LRDP principles, goals, strategies, and design guidelines are presented in **Appendix C** and are referred to in this Project Description and the various technical sections of this EIR, as appropriate.

3.6 Proposed LBNL 2025 LRDP

The Project under review pursuant to CEQA is the proposed LBNL 2025 LRDP. The proposed 2025 LRDP presents a strategic vision for the campus, and it articulates a policy framework that would guide Berkeley Lab's future land development, facility operations, site circulation, open space, and infrastructure.

An overarching development theme in the proposed 2025 LRDP is one of modernization: in the next 20 years of development, UC LBNL seeks to modernize the Lab's aging facilities and infrastructure and realize a more orderly and sustainable campus. The proposed 2025 LRDP does not provide for substantial growth in building space and population compared to existing conditions or what was analyzed in the 2006 LRDP EIR, nor does it involve a substantial expansion of the campus's development footprint. Rather, the proposed 2025 LRDP emphasizes the removal of aging buildings and construction of new and more efficient buildings within previously disturbed areas, and it provides for enhancements to open spaces and common areas.

The proposed 2025 LRDP is not an implementation plan; rather it is a guide for the development of future facilities. Adoption of the proposed 2025 LRDP would not constitute a commitment to any specific development projects, construction schedules, or funding priorities. Although the pace and nature of development on the campus would depend on a number of factors that cannot be predicted at this time, including future funding levels and the future direction of national research, the planning period for the proposed 2025 LRDP is expected to extend through approximately 2045. Accordingly, an approximately 20-year timeframe is used in this EIR to analyze the environmental impacts of the proposed 2025 LRDP.

3.6.1 Development Program

Population Growth Projections

As discussed above, the baseline 2024 on-campus population is estimated to be approximately 3,000 ADP. Under the proposed 2025 LRDP, the on-campus population is projected to reach 4,200 ADP by the year 2045. This would be an increase of 1,200 ADP over existing conditions. The 2025 LRDP projection of 4,200 ADP is nevertheless lower than pre-pandemic campus ADP levels. The 2025 LRDP projection is also lower than the 2006 LRDP campus buildout projection using the methodology described in the 2006 LRDP EIR. These lower on-site population levels are attributable to institutionalization of the flexible work model that was developed during the COVID-19 pandemic. Nevertheless, even in the event of discontinuation of the current flexible work model, the 2025 LRDP projection of 4,200 ADP is expected to accommodate the Lab's 20-year potential campus population growth.

Building Demolition Projections

The proposed 2025 LRDP projects the demolition and disposal of approximately 278,500 gsf of campus buildings and structures due to poor condition and/or seismic safety considerations. Buildings that would be demolished would range from small or minimally used structures–including trailers and storage containers–to larger, currently occupied buildings. Please refer to Section 3.7, *Illustrative Development Scenario*, for a list and map of specific buildings that may be demolished during the term of the proposed 2025 LRDP.

New Building Space Projections

New construction under the proposed 2025 LRDP would largely replace outdated facilities with modern research and support buildings and infrastructure more suited to meet Berkeley Lab's scientific mission. Such new facilities would be more efficient and sustainable, safer, and adaptable to cutting-edge research. New buildings would be constructed as infill in previously-developed areas, often in the footprints of demolished buildings. New buildings would have all-electric space and water heating to reduce and later zero out the energy-related, operational greenhouse gas footprint of new construction per the Lab's *Sustainability Standards for New Construction and Major Renovations* Policy (LBNL, 2023b).

At present, there are approximately 2,061,500 gsf of existing buildings on the campus. Under the proposed 2025 LRDP, approximately 574,000 gsf of new building space would be constructed on the campus. Subtracting out the estimated 278,500 gsf of demolition identified above, the resulting net new building space under the proposed 2025 LRDP would be about 295,500 gsf. In addition, the proposed 2025 LRDP provides for approximately 63,000 gsf of "flex space allowance," under which up to 63,000 gsf of existing buildings might be vacated but not demolished within the 20-year planning period.[6] Therefore, at full development under the proposed 2025 LRDP and with inclusion of the flex space allowance, there would be a maximum of 2,420,000 gsf of building space on the campus by year 2045. This would represent a building space increase of approximately 17 percent over existing conditions and continue to be within the envelope analyzed in the 2006 LRDP EIR.

Table 3-3 provides a summary of existing (2024) campus population and building space, as well as the proposed 2025 LRDP campus population and space program projections. As shown, the total projected on-campus population under the proposed 2025 LRDP would increase by about 1,200 ADP and the total amount of new building space (net of demolition) on the campus would be about 295,500 gsf.

TABLE 3-3
SUMMARY OF POPULATION AND BUILDING SPACE PROJECTIONS UNDER THE 2025 LRDP (2024-2045)

	Existing 2024 (Baseline)	Net Increase in Campus Development over Existing Conditions (for CEQA Analysis)	Flex Space Allowance	Projected 2045
Campus Population (ADP)[a]	3,000 ADP	1,200 ADP	-	4,200 ADP
Campus Building Space (gsf)[b]	2,061,500 gsf	295,500 gsf	63,000 gsf	2,420,000 gsf

NOTE:
a. ADP = Adjusted Daily Population
b. gsf = gross square feet

SOURCE: UC LBNL, 2024.

It is noteworthy that the proposed 2025 LRDP anticipates a smaller on-campus population than the 2006 LRDP buildout and it projects the same amount of total building space on the campus at full development.

As stated above, the LRDP does not mandate on-going growth or the development of new facilities; it is a planning guide and not an implementation plan. Varying factors affect campus population levels, which might fluctuate differently from the pace of facilities development. The LRDP does not determine the campus's ultimate population or space capacity.

Please see Section 3.7, *Illustrative Development Scenario,* for a description of a conceptual portrayal of potential campus development at full 2025 LRDP development addressed in this EIR.

[6] The most likely use of the flex space allowance would be a scenario wherein the 2025 LRDP EIR construction program was fully realized, but there wasn't enough funding to fully realize the demolition program by 2045.

3.6.2 2025 LRDP Plan Elements

The proposed 2025 LRDP is composed of five plan elements that address land use, open space, mobility, utility infrastructure, and sustainability. Each of these elements is summarized below, and these elements coupled with the development program described above, serve as the basis for the program-level analysis of the impacts of the proposed 2025 LRDP presented in this EIR.

Land Use Element

Land Use Goals and Strategies

The proposed 2025 LRDP sets forth a number of land use goals and strategies to guide the siting and development of new facilities on the campus. For the Land Use goals and strategies, please see Section 4.0 in the 2025 LRDP.

Land Use Zones

The proposed 2025 LRDP divides the Berkeley Lab campus into four land use zones, which are described below. These zones guide the siting of new facilities and other physical improvements and activities. The 2025 LRDP zones generally continue the zoning patterns and definitions established in the 2006 LRDP, with a few minor changes described below.

- **Research and Academic Zone.** This approximately 106-acre area accommodates almost all of the Lab's scientific and many of its operational facilities, along with major infrastructure assets. This includes most campus research and office buildings, and many storage and support structures, parking lots, and main roads.

  Under the 2025 LRDP, the Research and Academic Zone will continue to accommodate and support the Lab's research functions, including research buildings and related support buildings, infrastructure, and parking. Non-research/academic or related support uses would continue to be discouraged in this zone, although allowances may be considered if alternative suitable space is not available. No major non-conforming new uses are contemplated for the Research and Academic Zone under the 2025 LRDP.

- **Central Commons Zone.** The Central Commons Zone is a community-serving focal point for visitors and guests. The roughly 7-acre Central Commons area includes dining, lodging, conferencing, indoor and outdoor gathering, and transportation functions. Among its buildings are the Guest House, the Lab's main auditorium, and the Collaboration Commons or "Welcome Center" building, currently under construction. The building will hold a modernized cafeteria, the Lab's main conference and meeting facilities, a badge office, and the campus health clinic. Outdoor spaces include a multi-modal transit hub and a small plaza with an outdoor stage.

  Under the 2025 LRDP, the Central Commons Zone would continue to be used for with an eye toward expansion of—community-serving facilities and spaces. These would include single and multi-purpose buildings and spaces dedicated to dining, lodging, conferencing and meeting, visitor accommodations and badging, gathering, health, recreation and fitness, high-level administrative functions, and research- and operational-surge space; this zone would include related transit, parking, and infrastructure uses. Special emphasis would be placed on functions and design that create a more collegial and campus-like atmosphere. General research and non-conforming operational activities would be discouraged in this limited space, with the exception of research surge space, administrative headquarters, or similar special uses that could occupy portions of multi-use, community-serving buildings. Novel indoor spaces, like employee club and fitness center space, or outdoor spaces, like major plazas, amphitheater uses and the like, would be encouraged in the Central Commons Zone.

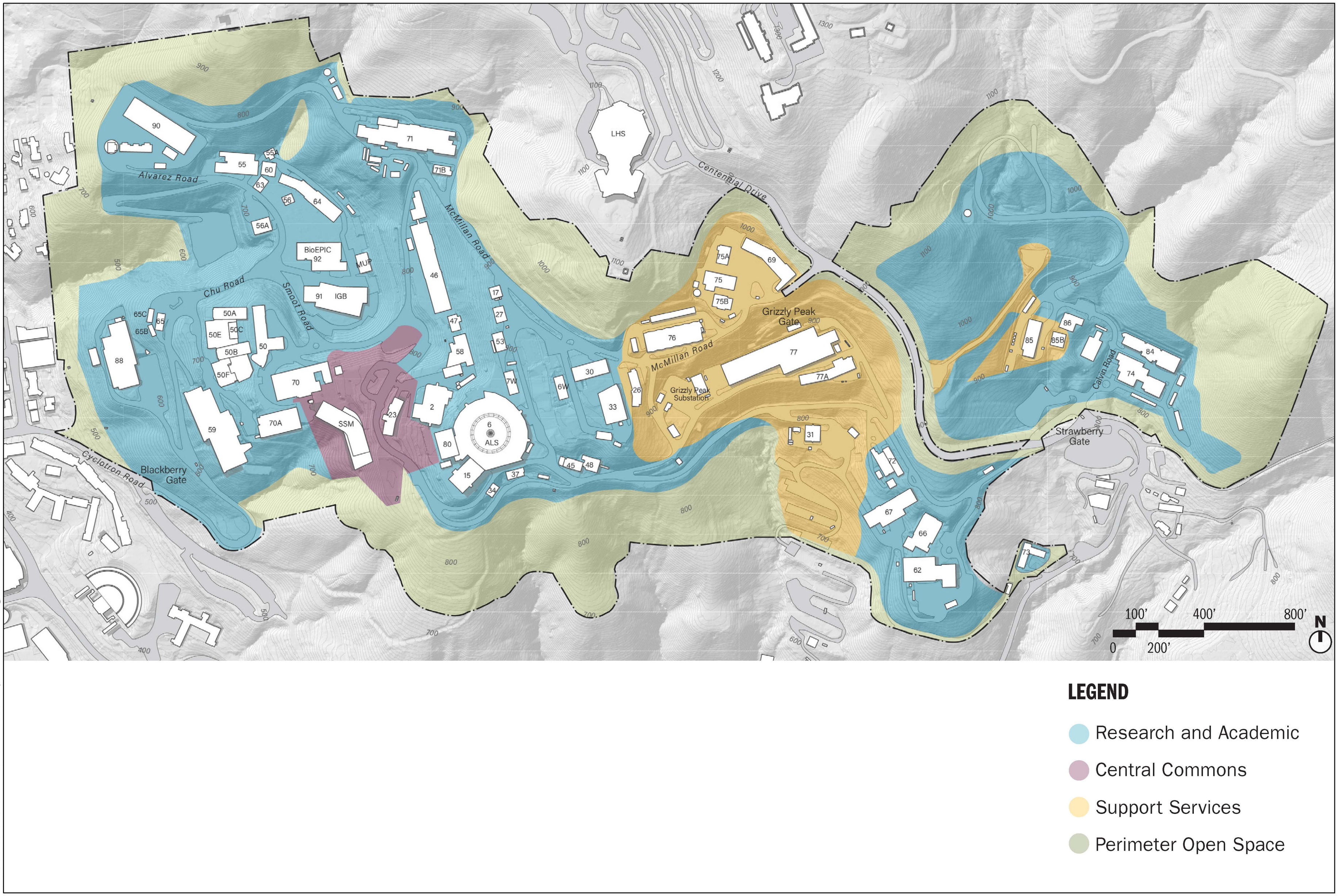
- **Support Services Zone.** The Support Services Zone features many of the campus's major facilities and yards that house personnel, equipment, and activities used to maintain and physically support Lab research and operations. These include the Lab's engineering complex; EH&S and Facilities offices; central receiving and mail functions; painting and mechanical shops; and transport, rigging, shuttle parking, storage, maintenance, and custodial functions. The Hazardous Waste Handling Facility and Grizzly Peak Electrical substation yard are part of the Support Services Zone. There are additional support assets, such as the Lab's on-site fire station and emergency services facilities, that are not included in this zone because they are not geographically contiguous.

  Under the 2025 LRDP, this area would continue to house much of the campus's Lab-serving support uses and equipment storage such as mentioned above, along with related parking and infrastructure uses. While research and academic functions are permitted in this area, this zone would preferentially be reserved for operational uses to maintain efficiencies in the organization and management of campus support services.

- **Perimeter Open Space Zone.** Accounting for almost one-third of the campus, this zone provides undeveloped open space, protection for natural areas, and buffering to neighboring land uses. It incorporates the remainder of Lab campus land not claimed in the three development zones. The Perimeter Open Space Zone encompasses all of the perennial creeks, riparian zones, and designated special-status species habitat, and most of the campus's perimeter spaces, forested areas, steepest hillsides, non-designated special habitats, and non-perennial streams. Limited development exists within this zone.

  Under the proposed 2025 LRDP, the Perimeter Open Space Zone would continue to be used to preserve open space and campus natural resources. It would buffer neighboring land uses from Lab development and activities. New occupiable buildings or other major development such as parking lots or structures would not be permitted in this area. Utility infrastructure and distribution, roads and parking, trails, sampling stations, storage units, and small support structures contiguous to existing development would continue to be compatible uses.

Figure 3-7 presents the proposed 2025 LRDP land use diagram. The proposed 2025 LRDP maintains the current overall land use patterns on the campus and provides only minor adjustments to zone boundaries in a few campus areas. Under the proposed 2025 LRDP, the Perimeter Open Space zone area would increase with a corresponding decrease in the Research and Academic zone area. Such redesignated areas include more steeply sloped and largely undeveloped stretches along the campus perimeter. A minor adjustment is made to accommodate the 2024 management area swap between UC LBNL and UC Berkeley based on the newly aligned Centennial Bridge overpass (an asset managed by UC Berkeley). North of Building 71, a small portion of Perimeter Open Space zone is redesignated as Research and Academic zone to accommodate an ancillary research structure that might provide future support to Building 71. Finally, in the near term, a small segment of the Lab campus's Grizzly Peak Gate driveway (about 0.2 acre) between Centennial Drive and the gate is expected to be transferred from UC Berkeley management to the Lab's campus management area. In addition, during the 2025 LRDP term, Berkeley Lab and UC Berkeley may swap small swaths of management area expected to total no more than 3 acres in the upper East Canyon area. The purpose of this management area swapping would be to more closely align the respective management areas with the existing chain link fence that divides the properties. This area is steep, rugged, largely inaccessible, and not developable for either campus.



SOURCE: LBNL, 2025

Figure 3-7
Land Use Diagram

ESA

Table 3-4 summarizes the proposed land use zones by total area and as percentage of total area of the campus.

TABLE 3-4
PROPOSED LAND USE DIAGRAM AREA CALCULATIONS

Land Use Zone	Area in Acres	Percentage	
		Of Developable Area	Of Total Area
Research and Academic	106	76.3%	52.5%
Central Commons	7	5.0%	3.4%
Support Services	26	18.7%	12.9%
Total Developable Area	**139**	**100%**	**68.8%**
Perimeter Open Space	63		31.2%
Total Berkeley Lab Area	**202**		**100%**

SOURCE: UC LBNL, 2024.

Building Height Zones

Due to the combination of geomorphic features, screening trees and terrain, built and natural elements, and visibility from off-site viewpoints, the campus hosts a variety of opportunities and constraints for building heights. Chief among these opportunities and constraints are aesthetic considerations involving how different building heights and scales might affect the visual character of the campus as viewed from important off-site locations. **Figure 3-8** presents Berkeley Lab's Building Height zones that would apply to development under the proposed 2025 LRDP and would guide building placement and heights with respect to aesthetic considerations. The 2025 LRDP does not propose any changes to building height zones as compared to the 2006 LRDP.

Mobility and Circulation Element

Multi-model Transportation and Site Access Strategies

The proposed 2025 LRDP sets forth a number of transportation goals and strategies to improve mobility and circulation on the campus. Multi-modal transportation and site access goals and strategies that will support and guide the campus's future development include the following:

Goal 2-C: Campus Wayfinding. Improve wayfinding and user orientation throughout the campus

Strategy 1: Mitigate existing administrative wayfinding challenges

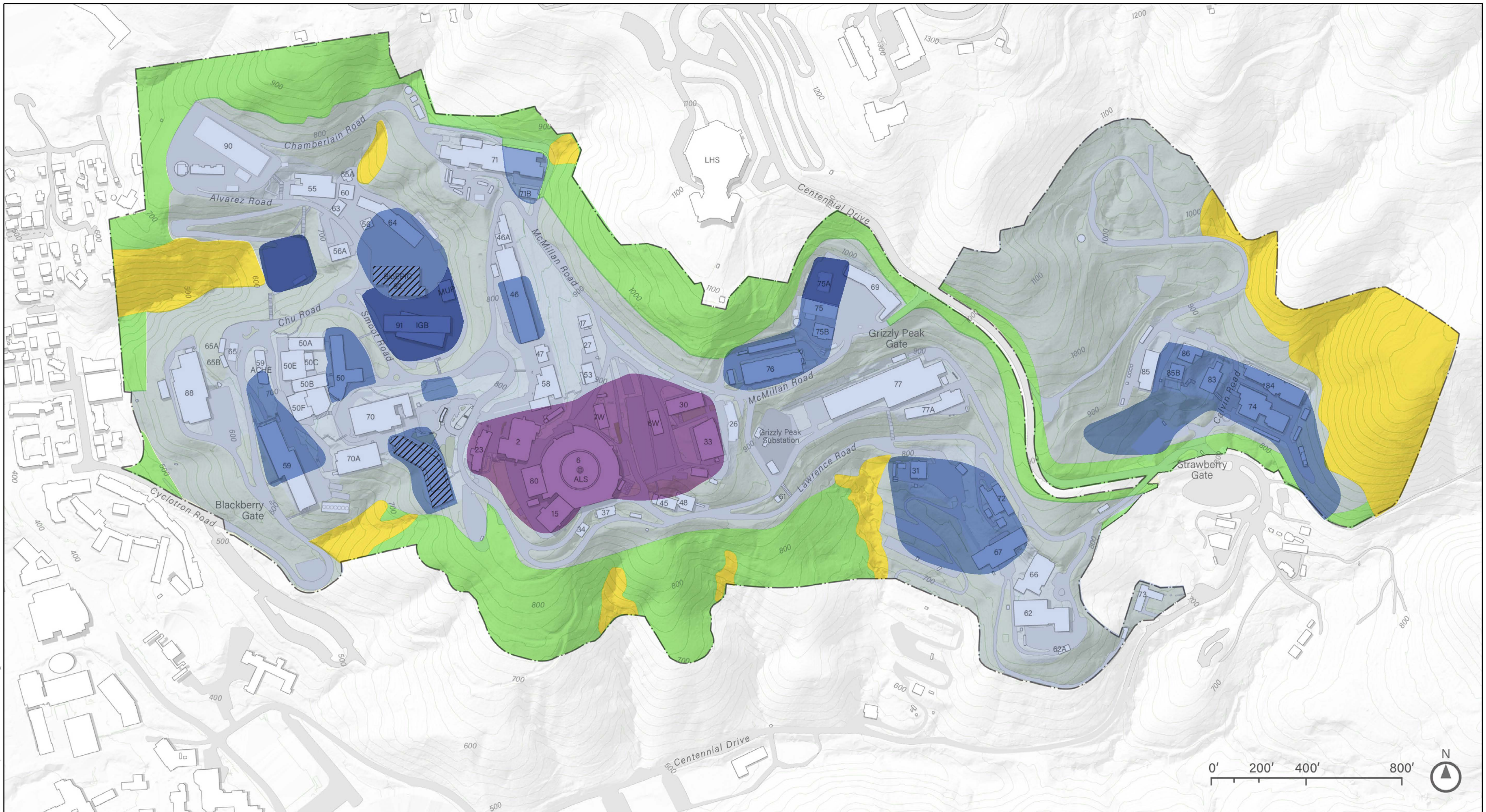
Strategy 2: Create an intuitive pedestrian framework

Strategy 3: Organize pedestrian paths hierarchically

Strategy 4: Optimize pedestrian and driver navigation through design

Goal 2-D: Campus Circulation. Improve campus circulation network and mobility opportunities for all campus users

Strategy 1: Design connective, efficient pedestrian circulation network



Buildings approved under the 2006 LRDP and under construction in 2024/25

NOTE: Please see Table 3-1 for a list of primary buildings on the LBNL campus site.

No Development

Support Structures Only

4 Stories Allowable

6 Stories Allowable

8 Stories Allowable

Special Viewshed Zone*

*Maximum building height in this area shall not extend into the view plane of the ALS dome when it is viewed from the intersection of University Avenue and Milvia Street

2019/D201901556.00 - LBNL LRDP EIR/05 Graphics-GIS-Modeling/Illustrator

SOURCE: LBNL, 2024

Figure 3-8
Building Height Zones

ESA

Strategy 2: Encourage bicycle us

Strategy 3: Improve auto circulation network

Strategy 4: Provide convenient, efficient parking

Strategy 5: Manage steep elevation changes through design

Strategy 6: Improve circulation accessibility for all users

Goal 4-B: Campus Accessibility. Improve access and personal mobility throughout the campus

Strategy 1: Improve ADA Compliance in existing, non-conforming spaces

Strategy 2: Improve pedestrian network accessibility

Strategy 3: Mitigate distances and steep elevation changes

Strategy 4: Design user-friendly signage and wayfinding

Road Network and Parking

The general alignment of the existing campus road network is expected to remain largely unchanged over the term of the proposed 2025 LRDP. Minor realignments and extensions, including to serve new construction and parking areas, would likely occur. In addition, some roadways would be modernized, improved, and potentially widened where needed. Roadway features, such as retaining walls, embankments, guard rails, lighting, signage, and smart technology (sensors), would be elements of such improvements and modernization.

As the campus ADP is projected to increase modestly from 2024 and would still be less than the campus's pre COVID-19 ADP, the existing parking supply is expected to be adequate and no additional parking capacity is planned. The Lab would continue to strive to increase its campus parking efficiency and quality. No parking garage facilities are foreseeable for the campus. Removal of substandard buildings may provide an important opportunity to create a large central parking lot just north of the Central Commons.

Berkeley Lab's Transportation Demand Management (TDM) program would continue to support and increase the use of electric vehicles. The Lab has provided electric vehicle (EV) charging since 2013 and has set a target of tripling the number of EV charging sites across the campus during the 20-year LRDP term.

Mobility Hubs, Bicycle and Pedestrian Facilities

As described above, Berkeley Lab operates a robust shuttle bus system that circulates throughout the campus and connects the campus to off-campus destinations, including the UC Berkeley campus, the downtown Berkeley Bay Area Rapid Transit (BART) station, and the Lab's off-campus leased space. The shuttles are widely used to access facilities within the hilly campus, especially in its more remote areas.

UC LBNL is currently constructing a transit center or mobility hub in the Central Commons development cluster, which would provide convenient access to nearby amenities, including dining, lodging, conference, and event space; and Berkeley Lab's visitor center, health clinic, and leadership offices. During the 2025 LRDP term, UC LBNL would continue to encourage use of alternative transportation modes, such as through developing or improving the Central Commons transit center, other mobility hubs/shuttle stops, co-located bicycle and scooter parking, and good pedestrian connections.

Despite the steep hillsides in and around the campus, many employees opt to commute and/or travel on the campus by bicycle. Over the 2025 LRDP term, Berkeley Lab would continue to make improvements to the often overly narrow roadway network to encourage bicycle use.

While Berkeley Lab's commitment to its robust shuttle system is a key element supporting pedestrian movement around the campus, additional improvements are envisioned under the proposed 2025 LRDP, including:

- Improvements to and expansion of safe pedestrian paths;
- Better signage and wayfinding to clarify best and safest routes; and
- Combined use of outdoor ramps and building elevators to provide barrier-free access up steep slopes and to building entries and approaches.

Open Space and Landscape Element

Open Space Goals and Strategies

The proposed 2025 LRDP sets forth goals and a number of open space and landscape strategies to manage and improve open space and landscaping on the campus. The goals and strategies include the following:

Goal 2-E: Campus Landscape. Develop and reinforce attractive and sustainable outdoor areas throughout the campus

Strategy 1: Restore Natural Landscape

Strategy 2: Provide attractive cultivated landscaping

Strategy 3: Furnish campus with outdoor amenities

Goal 3-E: **Wildland Fire Management**. Design and manage campus to minimize wildland fire risk and impact

Strategy 1: Manage outlying natural vegetation

Strategy 2: Manage and maintain landscaping and developed areas

Strategy 3: Plan for long-term vegetation transition

Open Space Framework

The proposed 2025 LRDP organizes campus open spaces into four basic types, described below. These represent a continuation of the open space framework established in the 2006 LRDP.

- **Outlying Open Space:** Outlying Open Space comprises portions of the Perimeter Open Space Zone that are furthest from development and least historically disturbed. These rustic areas feature steep slopes, natural drainages, often towering vegetation, and sensitive habitat;

they offer picturesque views while providing visual and noise screening to neighbors and surrounding land uses from Lab development and operations. Outlying Open Space areas are generally inaccessible to people and afford little opportunity for active use, such as for hiking and recreation. Under the proposed LRDP, disturbance of these areas beyond vegetation management would continue to be minimal and would include maintenance of existing small features such as monitoring equipment and sheds, roadway segments, paths and stairways, and utility lines.

- **Transitional Open Areas:** Transitional Open Areas bridge the gap between Outlying Open Space areas and development areas, and they overlap with portions of the Perimeter Open Space, Research and Academic, and Support Service Zones. Transitional Open Areas have often been previously disturbed, graded, landscaped, and/or abut major development. They can span steep slopes and feature a variety of landscape elements, including native oaks, non-native eucalyptus and pines, and grasslands.

  Transitional Open Areas offer visual relief between development clusters. They are also accessible in many locations for open space activities, including hiking, bicycling, exercise, and informal gatherings. Depending upon specific conditions, they can provide suitable locations for infrastructure and support elements, including parking lots, major and minor roads, and storage or maintenance uses.

  Under the proposed 2025 LRDP, Berkeley Lab plans to preserve the higher quality open space values extant in these areas, as practical. However, Transitional Open Areas will continue to be managed in accordance with the appropriate LRDP land use zones in which they reside.

- **Cluster Open Areas and Outdoor Shared Spaces:** These are a variety of small open spaces and landscaping that have been integrated within the development clusters. These have typically been developed in an ad hoc manner. The ad hoc approach to open spaces has provided little opportunity for integrated, holistic development of outdoor common areas.

  Under the proposed 2025 LRDP, Berkeley Lab seeks to develop new and improve existing cluster open areas and outdoor shared spaces. Such spaces could be used for collaboration, social purposes, and general respite from work duties. Each development cluster is encouraged to feature a principal open space area for multiple uses by cluster users and occupants. Other outdoor space development, both within and outside of the campus clusters, would be encouraged to improve recreational opportunities. Such spaces might facilitate exercise, artistic expression, team and solo sports activities, leisure and play, and hiking and bicycling on an improved campus.

- **Central Commons Open Area:** This is a contiguous series of developed open space areas located within the people-serving “heart” of the campus. Proximity to the transit hub, cafeteria, conference center, badge office, Guest House, Building 50 Auditorium, the Laboratory Directorate, the Lab’s outdoor stage and gathering area, and central parking makes these hardscaped and landscaped spaces particularly valuable to the Berkeley Lab community. Unlike the other cluster open areas, the Central Commons Open Area is intended to accommodate the entire Lab community. This would include space for commonplace activities, like daily dining, as well as for more singular activities, like all-hands gatherings and celebrations. Potential concepts for this area include a large central plaza, an outdoor amphitheater focusing around a stage, and integration with a campuswide pedestrian “spine” or central pathway that leverages Central Commons buildings to navigate the cluster’s steady incline.

Open Space and Landscape Management

Campus landscape management is an on-going effort that includes maintaining landscaping and vegetation in the Lab's developed spaces while maintaining vegetation in the Lab's undeveloped areas. The former efforts include planting, pruning, and sometimes removing trees and other plants for aesthetic, safety, and compatibility reasons. The latter efforts include fuel reduction for wildland fire control purposes and removal of dead, dying, or otherwise potentially problematic trees. Berkeley Lab implements an on-going VMP that addresses fuel management and vegetation maintenance based on evolving conditions and priorities. The VMP is a related program and is discussed in detail later in this chapter.

Utility Infrastructure Element

Infrastructure Goals and Strategies

The proposed 2025 LRDP includes a goal and a number of strategies to manage and improve utility infrastructure on the campus in support of the existing and future development. The goal and strategies include the following:

> **Goal 1-B**: **Infrastructure and Support Facilities.** Outfit Berkeley Lab campus with modern, mission-capable infrastructure and utilities
>
> > ***Strategy 1***: Ensure adequate campus-wide infrastructure and utility distribution
> >
> > ***Strategy 2***: Accommodate future utility needs
> >
> > ***Strategy 3***: Provide robust, resilient utility systems
> >
> > ***Strategy 4***: Secure reliable utility supplies

Infrastructure Improvements

Infrastructure improvements would be needed during the term of the proposed 2025 LRDP to upgrade existing aging infrastructure and ensure that utilities can adequately support new and expanding research programs and new development on the campus. Utility infrastructure and distribution improvements would serve both existing and new development and operations in all land use zones, although limited utility improvements are expected to occur within the Perimeter Open Space zone.

Domestic and Fire Water

Berkeley Lab's combined domestic and fire water distribution system is supplied at the Shasta and Berkeley View feeds from EBMUD. The system includes three on-site 200,000-gallon water storage tanks that provide emergency fire water in the event of service interruption from EBMUD.

Recent modeling of the system with consideration of the growth in facilities under the proposed 2025 LRDP has identified the following priority work:

- Replace degraded and high-risk water mains;
- Create additional system loops to provide strategic service redundancy and eliminate service interruptions during repair and replacement work;

- Perform deferred maintenance;
- Add whole building water meters where needed to meet requirements of the Energy Act of 2020; and
- Install flow meters to new buildings and to existing building branch connection lines for consumption monitoring.

Sanitary Sewer

Wastewater generated at Berkeley Lab is conveyed into the City of Berkeley's sanitary sewer collection system and transferred to the EBMUD collection system via two points of discharge.

Berkeley Lab works to address any deficiencies that might arise in the campus's sanitary sewer infrastructure, including pipe joint separation and offsets, corroded and cracked pipes, and root intrusions. A Sewer System Management Plan, originally prepared in 2020 and updated in 2023, documents a process to minimize the risk of overflow, and other studies of the impact of future development, such as in the Charter Hill area, have identified capacity issues.

Remedial priorities that have been identified to be implemented over time include:

- Replace or rehabilitate degraded or undersized sewers;
- Install new building services for new facilities; and
- Implement improvements to support water reuse opportunities.

Stormwater

Berkeley Lab primarily relies on traditional collection and piped underground conveyance infrastructure to manage stormwater runoff. The campus's four sub-watersheds drain into outfalls that discharge into existing creeks. The majority of the storm drain pipes are galvanized corrugated metal and are near the end of their useful life.

Priority improvement projects include:

- Assess and replace or rehabilitate, as needed, storm drain pipes in the highest risk drainage basins; and
- Reconfigure storm drain systems as required to convey drainage toward stormwater management facilities.

Recycled Water

Potential sources of recycled water include wastewater, stormwater, outside suppliers, and flow from site hydraugers, the buried horizontal drains used throughout the campus to drain groundwater and enhance slope stability.

Supplying recycled water for cooling towers may be the most practical opportunity to offset potable water demands. Campus cooling tower use is substantial, particularly with respect to the Lab's supercomputing facilities.

Interior non-potable reuse represents only a small fraction of recycled water demand. Replacing fixtures in existing buildings will be considered as part of major renovations or repurposing. Dual plumbing will be considered for new buildings to provide future flexibility to reduce indoor non-potable demand.

While landscape irrigation is a common recommendation for recycled water use, the campus's *Sustainability Standards for Operations* Policy does not allow ongoing, automated irrigation watering beyond the initial establishment period for new landscaping (LBNL, 2023c). However, if and when an on-site recycled water supply were secured, such water could be used to establish new landscaping to improve outdoor areas associated with new buildings and shared community open spaces, offsetting the need to use potable water.

Electricity[7]

Berkeley Lab purchases electricity at 115 kilovolts (kV) through agreements with the Western Area Power Administration (WAPA) and Pacific Gas & Electric (PG&E). The electricity is transmitted by the PG&E transmission network to the campus's Grizzly Peak substation via two 115kV transmission lines, leading ultimately to six switch stations spread throughout the campus.

There are a number of deficiencies in Berkeley Lab's current electrical system that will affect its ability to serve planned facilities:

- Inadequate capacity at the Grizzly Peak substation for the projected load growth;
- A lack of operational flexibility;
- Limitations of the existing distribution configuration; and
- Obsolete equipment and unreliable communication media and pathways.

In addition, Building 59, the Lab's high-performance computing facility, is scheduled to undergo a major upgrade to support future high performance computing loads.

In order to address existing deficiencies and future growth in demand, a variety of electrical systems upgrades will be required during the planning period of the proposed 2025 LRDP. Most of the new facilities projected in future years will require new electrical distribution systems to be fed from nearby switch stations.

The campus will also provide additional EV parking spaces for Laboratory staff. Vehicle electrification is expected to require the construction of 75 charging stations in addition to the existing 35 EV stations, comprising about 2 percent of the planned electrical capacity growth at the Lab. EV parking stalls are projected to be installed near Building 76 to support fleet vehicles. Additional EV charging stations are projected for other centralized locations across the campus, including a large central parking lot envisioned in the vicinity of the Central Commons, which

7 Consistent with federal directives and UC *Policy on Sustainable Practices*, Berkeley Lab will not be increasing natural gas use on the campus. New buildings will be designed and constructed to be fully electric, with no reliance on natural gas for space heating and cooling. Existing natural gas-based infrastructure will be maintained until such time that it can be replaced with electric facilities. Natural gas will continue to be used only in limited applications such as in laboratories that require natural gas for specific processes.

could accommodate up to approximately 200 EV stations, if needed. This would require an additional 3 percent of the planned electrical capacity growth. Improvement to the electrical distribution system will be required to accommodate the new electrical load for retrofit building electrification and EV charging stations.

Communications

The communication infrastructure for the campus consists of manholes and underground conduit, fiber optic and copper backbone cable, and building entrance elements. The IT network consists of three zones of coverage to support individual services to buildings within these zones.

The existing duct bank infrastructure for communications on the campus is aging and nearly at capacity and a number of sections have had partial failures due to land movement or building settlement. The existing conditions are not conducive to supporting Berkeley Lab’s current and future research needs. In addition, a large number of deficiencies have been identified in the duct bank and telecommunication rooms in various buildings across the campus that need to be addressed.

Several phases of improvements to elements of the communications systems are planned – new fiber optic cabling, conduit, copper and fiber, and include:

- Replacing failing duct banks and conduit pathways;
- Adding additional duct bank capacity to increase cable capacity, meeting forecasted science needs;
- Improving substandard telecommunication rooms to better support active and future science uses;
- Replacing failing manholes to protect infrastructure;
- Expanding existing manhole systems to meet capacity needs;
- Removing antiquated copper and fiber cabling that does not meet current standards; and
- Increasing fiber optic cable counts across the Lab.

Sustainability Element

Sustainability is a cornerstone of Berkeley Lab development and operations. As a national lab, Berkeley Lab complies with federal directives related to sustainability and energy efficiency. As a UC campus, Berkeley Lab is subject to sustainability-related state regulations as well as the UC *Policy on Sustainable Practices* as applied to Berkeley Lab and in a manner consistent with applicable federal directives.

The Sustainable Berkeley Lab (SBL) program guides the Lab in meeting its regulatory and policy requirements as well as reducing its climate, waste, and water footprint through education and improvements to site infrastructure and activities.

Sustainability Goals and Strategies

The proposed 2025 LRDP includes a number of goals and strategies to continue and improve sustainability in campus operations and future development. The goals and strategies include the following:

Goal 3-B: Environmental Responsibility. Preserve, maintain, and improve the campus natural environment

Strategy 1: Restore and strengthen native environments

Strategy 2: Promote environmental resilience

Strategy 3: Limit development footprint

Strategy 4: Protect sensitive natural areas

Goal 3-C: Campus Sustainability. Promote a sustainable campus by maximizing efficiency and minimizing natural resource consumption and environmental impacts

Strategy 1: Orient buildings along an east-west axis

Strategy 2: Follow sustainable construction practices

Strategy 3: Incorporate lifecycle considerations into campus development and operation

Strategy 4: Utilize waste heat, where practicable

Strategy 5: Plan for a net-zero transition

Strategy 6: Develop on-site solar generation and resilience capabilities

Strategy 7: Facilitate a transition to electric vehicles

Strategy 8: Incorporate equity and environmental justice principles into sustainable development practices

Sustainable Building Design

With some campus buildings dating back even to the 1940s, much of the Lab's current building inventory is considered obsolete due to age, deterioration, or mission compatibility. A number of buildings have a poor seismic safety rating per the University of California SPR System. These older buildings are typically inefficient in energy and water use. Approximately 41 campus structures are envisioned for demolition during the next 20 years, including many small storage and support structures (see Table 3-6 below). In many cases, the cleared sites would be used to construct new buildings that are up to modern standards and more sustainable by design.

Under the proposed 2025 LRDP, the following would be undertaken with respect to sustainable building development:

- Demolition and/or discontinuation of use of obsolete buildings and structures
- Construction of new buildings and major renovations in compliance with the Lab's *Sustainability Standards for New Construction and Major Renovations* Policy which addresses both federal requirements and green building design goals of the UC *Policy on Sustainable Practices*

Climate

Berkeley Lab recognizes the urgency of the climate crisis and the need to reduce greenhouse gas (GHG) emissions from its existing and future operations. The Lab is subject to compliance with federal directives, DOE orders, and the UC *Policy on Sustainable Practices*, which combined require the Lab to achieve net-zero GHG emissions no later than 2045.

The Lab's climate plan is set forth in the Berkeley Lab *Net-Zero Vision and Roadmap,* which provides the Lab's approach to address the climate crisis, overcome challenges, and achieve net-zero greenhouse gas emissions for Berkeley Lab operations (LBNL, 2024b) The basic strategies in the *Net-Zero Vision and Roadmap* that will enable Berkeley Lab to reach net-zero include:

- **Energy Efficiency:** Continuing improvement in operational and new construction efficiency
- **Renewable Energy:** Shifting to 100-percent carbon-free electricity and increasing the hourly match between carbon-free supply and demand
- **Electrification:** Transitioning away from natural gas and fuel to electricity provided by a decarbonized grid
- **Individual Action:** Providing support for individual and collective action to optimize purchases, commutes, and flights
- **Innovation:** Collaborating with researchers to advance science, implementation, and adoption

On-going implementation of the Berkeley Lab *Net-Zero Vision and Roadmap* will continue concurrently with and be supported by the proposed 2025 LRDP.

Energy

Electricity provides the campus's main power source, and natural gas is mainly used for older building heating systems. As required by federal directives and state laws and regulations and UC *Policy on Sustainable Practice*s and provided under the Berkeley Lab *Net-Zero Vision and Roadmap*, Berkeley Lab seeks to further improve its energy efficiency and electrification in general and to decrease its reliance on fossil fuels.

Under the proposed 2025 LRDP, many older buildings and gas-powered boilers will be replaced with new, fully electric buildings designed to Leadership in Energy and Environmental Design (LEED) standards with modern energy efficiency features. Electrification of the Lab fleet will continue, and EV charging stations will be distributed throughout the Lab.

Water

Although a renewable resource, California's water supply is generally constrained and subject to fluctuations due to yearly changes in precipitation levels. With the high cooling needs of Berkeley Lab research buildings and equipment, the campus is a major consumer of water, which is supplied by East Bay Municipal Utility District.

Under the proposed LRDP's term, Berkeley Lab will continue to comply with the UC *Policy on Sustainable Practices* sustainable water systems goals. This will be achieved by furthering Lab water conservation practices and continuing adherence to the Lab's *Sustainability Standards for Facility Operations* Policy provisions, which include:

- Building HVAC systems should be operated with temperature setbacks for evenings, weekends, and holidays; or when unoccupied to reduce water use for cooling.
- Berkeley Lab will not rely on single-pass cooling as an ongoing or primary cooling strategy for building cooling systems.
- New and existing equipment requiring liquid cooling shall be connected as available to a building treated water (TRW) system, low conductivity water (LCW) system, or other campus chilled water system through an intervening heat exchange system.
- Ongoing, automated irrigation watering at Berkeley Lab is generally prohibited.
- As equipment wears out or needs replacement, Berkeley Lab will replace it with water-conserving fixtures.
- Berkeley Lab will continue to locate and stop leaks.
- Through education and outreach, the Lab will encourage the campus community to conserve water.

Solid Waste

Berkeley Lab is committed to reduce, reuse, recycle, and compost all discarded materials to the maximum extent feasible before disposal through landfilling or a destructive disposal method (for example, incineration). Materials shall be processed to promote their highest and best use. These approaches enable the Lab to fulfill zero waste and waste reduction requirements of the UC *Policy on Sustainable Practices*. Zero waste is defined as diverting at least 90 percent of municipal solid waste material from the landfill through recycling and composting.

Under the term of the proposed 2025 LRDP, UC LBNL plans to achieve zero waste by stepping up composting, recycling, smart purchasing, and working with building managers to improve waste management, including by:

- Providing adequate space for central waste diversion stations, foam peanut bins, plastic film bins, and any other diversion bins identified through waste audits
- Identifying the need for additional central waste stations, removing single waste containers, and improving signage
- Creating and implementing an action plan to reduce waste contamination
- Reporting and follow through on the suitability (size and number) of outside bins to accommodate waste streams

3.6.3 Facilities Maintenance

In addition to the construction and renovation activities described above and elsewhere throughout this chapter, UC LBNL would continue to carry out routine maintenance and repairs to its buildings, equipment, and grounds as part of normal facility management through 2045. The Lab would also continue to make improvements to its buildings, including improvements to address seismic, Americans with Disabilities Act (ADA), and other code requirements as those evolve over time. Under the proposed 2025 LRDP, these activities would be expected to incrementally increase as Lab population and space increase. Facilities maintenance and other operations and logistical spaces would provide for operating, maintaining, and repairing Berkeley Lab's buildings and grounds. Such spaces include wood, metal, machine, and paint shops; materials delivery and storage areas; construction staging and laydown areas; vehicle parking and equipment depots; utility banks and buildings; waste handling facilities; storage containers and facilities; and cleaning facilities.

3.6.4 Construction, Demolition and Renovation under the Proposed 2025 LRDP

The proposed 2025 LRDP would include ongoing demolition and construction and activities over the course of the 20-year planning period. Such activities are already a common part of the Berkeley Lab's operative routine, as the Lab has been undergoing constant growth, change, or renewal of its physical plant since its inception.

Construction

As noted above, a total of 574,000 gsf of new building space is envisioned to be constructed on the campus during the term of the proposed 2025 LRDP. Planning for construction projects includes consideration of each project's environmental and regulatory elements, acquisition of permits and approvals, undertaking of design review and approval processes, etc. Construction activities typically require adjacent lay-down areas for equipment, supplies, and fabrication activities, as well as provision of construction-worker parking. Under the proposed 2025 LRDP, construction activities would be similar in type and intensity to current practices.

During the 20-year LRDP planning period, there is likely to be simultaneous construction, demolition, and renovation activities taking place on multiple large, medium, and small projects. At other times, there may be no large projects underway. When large projects do coincide, it is expected that they would typically overlap with staggered schedules, but that may not always be the case.

Construction at Berkeley Lab begins with site clearing and preparation. This may include demolition of existing facilities, borehole testing, soil remediation, soil stabilization, and utility extension as necessary. If excavation is involved, soil may be shipped off- or on-site with hauling trucks during this phase unless the project is a balanced cut-fill excavation. Foundation work and building frame erection follow; these typically involve multiple shipments of concrete and materials in large trucks. Building finishing and outfitting are the final phases before completion and occupation. Large campus construction activities are often scheduled to occur between the months of April through September for optimal weather conditions, although such work may occur in any month of the year.

As with current practices, equipment for future construction would typically include large vehicles, stationary equipment, and hand-held equipment used on the project site and at nearby staging areas. Such equipment would be powered by diesel fuel, gasoline, or electricity. Equipment would include scraper/dozers, spreader/compactors, loaders, drill rigs, cranes, haul trucks, cement trucks, bore drillers, rough terrain forklifts, pavers, rollers, and other rigs. Pile drivers are not typically used on campus construction, but their future use is possible. All equipment would comply with applicable regulatory standards, including required noise, emissions, safety, and energy efficiency standards.

Demolition

In addition to construction of new building space, demolition of up to 278,500 gsf of outdated facilities on the campus is envisioned to occur during the term of the proposed 2025 LRDP. Demolition is considered for buildings and structures that are seismically poor and not cost-effective to upgrade, no longer suitable for modern science, costly to maintain, or represent inefficient uses of valuable campus building sites. As of 2024, nearly 60 percent of Berkeley Lab buildings were more than 40 years old, and 15 percent were over 60 years old, beyond the effective age of a typical laboratory building. Additionally, many of these buildings were constructed as temporary structures but were never removed or replaced as originally intended.

As discussed further in Section 4.6, *Geology and Soils*, structures at Berkeley Lab are evaluated under the UC SPR system, which includes rating categories ranging between good and very poor.[8] The updated UC SPR[9] indicates several Berkeley Lab facilities have poor or very poor seismic ratings and are thus candidates for demolition or seismic retrofitting. Redevelopment of such buildings would allow not only for physical upgrade of the campus, but would also provide opportunities for increased building efficiency, improvements to site circulation and utility systems, and implementation of sustainable design practices. In many cases, UC LBNL would demolish surplus or outdated facilities prior to the identification of particular replacement buildings. UC LBNL would upgrade utilities and roadways in order to create “plug-in” development sites within the existing development clusters.

Campus demolition project phases generally proceed as follows: (1) building contents are characterized; (2) hazards, if any are present, are abated, including asbestos-containing materials and lead-based paint; (3) the structure is demolished and removed; (4) reusable and recyclable materials are identified and removed; (5) foundation and utilities may be removed; (6) subsurface soils below removed buildings and foundations may be tested for contamination and remediated; and (7) any excavations are filled, the site is graded as necessary, and the site is left unimproved,

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8 Most of the buildings on the campus are owned by DOE, not UC, and consequently, are not subject to the UC SPR; however, the UC SPR system is respected as advisory. Buildings 23, 30, and 59, are UC-owned, and as a result, subject to the UC SPR.

9 The University launched a systemwide initiative in June 2018 to update its seismic performance ratings on buildings across all UC campuses. The current version of the UC *Seismic Safety Policy* became effective in March 2021. The *UC Seismic Program Guidelines* was last updated in November 2023.

landscaped, or reused. Demolition equipment includes large vehicles, hauling trucks, stationary equipment, and hand-held equipment similar to that involved in construction.

Renovation

When a built space becomes outdated, obsolete, or otherwise unsuitable for its intended use, that space becomes a candidate for demolition, rehabilitation, or adaptive reuse to serve another use or need. The latter two approaches are considered in this EIR as renovation. Up to 600,000 gsf of current built space that is not planned for demolition during the 2025 LRDP planning period will likely become obsolete or will be more than 50 years old by the year 2045; such spaces would be candidates for renovation during the planning period.

Renovation includes installation, replacement, repair, or upgrading of heating, ventilation, and air conditioning (HVAC) systems, other mechanical systems, scientific apparatus cooling and support systems, electrical systems, elevators, windows, flooring, roofs, interior building fixtures, and insulation. It includes repairs and repainting of building interiors and exteriors. It is also necessary for upgrading buildings to meet seismic and ADA regulations. Renovation involves general low-level construction and maintenance activities and often includes small or hand-held tools, shop tools, material handling equipment, forklifts and scissor lifts, scaffolding and rigging equipment, trucks to supply materials and remove debris, and occasionally cranes and other larger construction equipment.

3.7 Illustrative Development Scenario

3.7.1 Purpose of the Illustrative Development Scenario

To provide greater detail and a more complete examination of potential project impacts, including a foundation for quantification and modeling of certain environmental impacts, this EIR analyzes full 2025 LRDP development using an analytical tool: the Illustrative Development Scenario.

The Illustrative Development Scenario is a conceptual portrayal of campus development that could be achieved under a fully realized 2025 LRDP. The Illustrative Development Scenario has been designed consistent with the 2025 LRDP goals and objectives, the 2025 LRDP Land Use Map, LBNL Design Guidelines, and assumed maximum buildout of the LRDP's projected space program and land uses. As informed by Lab planners and based on current trends and development patterns, the Illustrative Development Scenario identifies the buildings most likely to be demolished and portrays new buildings and infrastructure that could potentially be built under the 2025 LRDP parameters. Along with the putative buildings themselves, their locations, configurations, and uses may vary as specific projects are considered for approval in the future, and as the Lab's needs and funding opportunities invariably evolve over time. For these reasons, overall future development may manifest somewhat differently from that described in the Illustrative Development Scenario. Nevertheless, the Illustrative Development Scenario allows UC LBNL to conduct an in-depth environmental impact analysis such that the scope and scale of the proposed 2025 LRDP's likely environmental impacts can be understood and disclosed. Cumulative impacts are also studied in this way in this EIR.

Under the *CEQA Guidelines*, for later approvals for projects falling under a program EIR, the Illustrative Development Scenario may be considered (along with other information, and along with the overall limitations on subsequent review that have been stated elsewhere in this EIR) to determine whether the proposed later approval is within the scope of this EIR's analysis, or whether some level of further analysis is required under CEQA. Accordingly, this EIR uses the Illustrative Development Scenario in the following ways:

1. To conceptually illustrate potential 2025 LRDP development and thereby provide a sense of the potential scope and scale of LRDP development at a particular campus building site.
2. To provide a basis for the EIR's impact analysis consistent with the *CEQA Guidelines* provisions for program EIRs, and for consideration and evaluation of future actions and specific development projects after the program EIR has been certified; and
3. To provide a basis for important quantified or modeled studies, such as the human health risk assessment and visual simulations.

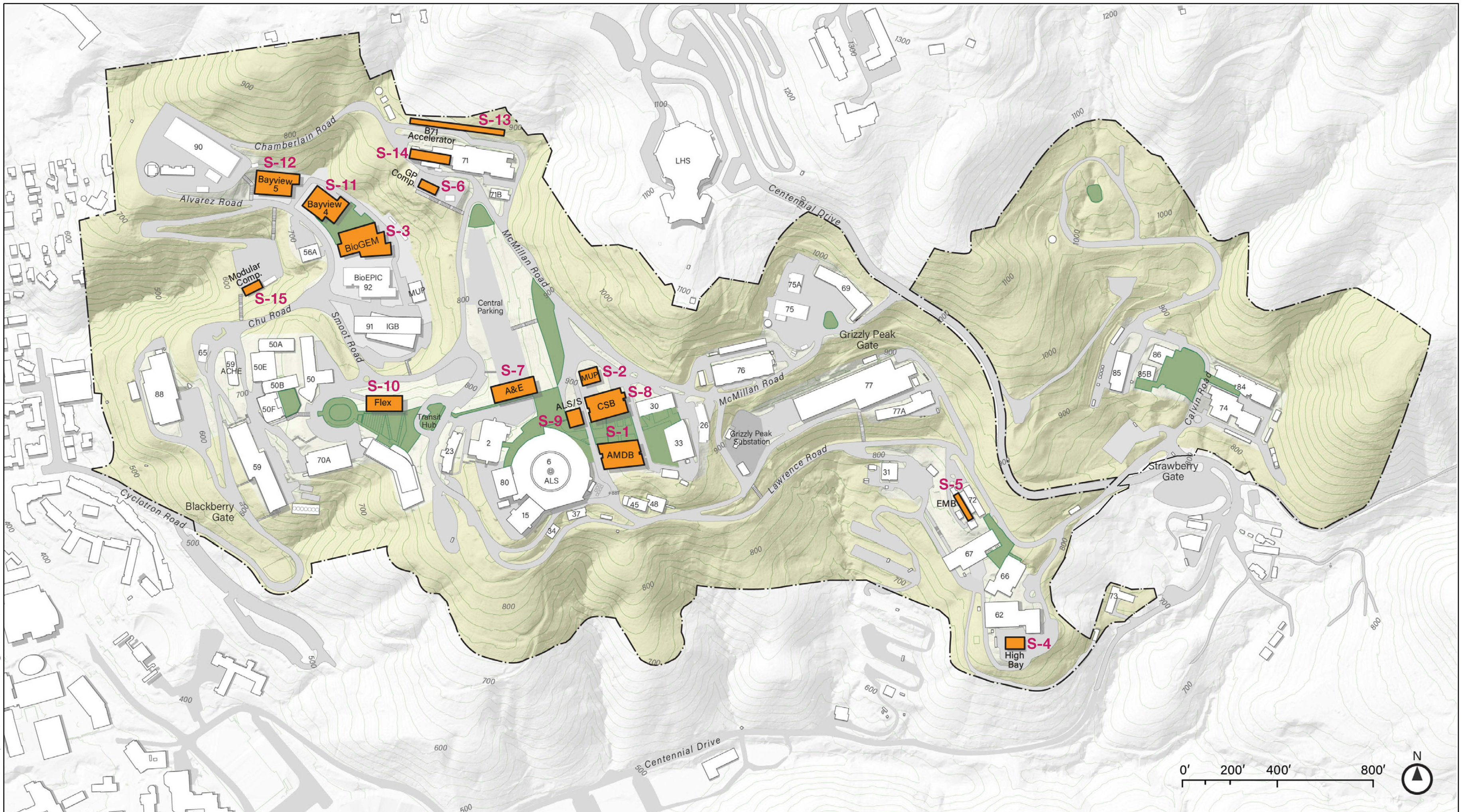
At such times that projects are proposed pursuant to the proposed 2025 LRDP, UC LBNL would: (1) review the project to determine whether it is within the scope of development envisioned under the proposed 2025 LRDP and consistent with planning guidelines and policies, and (2) apply supplemental review standards consistent with CEQA, including *CEQA Guidelines* Section 15168(c).

There are important distinctions between the proposed 2025 LRDP program and the Illustrative Development Scenario. If adopted, the proposed 2025 LRDP will provide planning guidelines and policies for Berkeley Lab. It will be the overarching plan that defines and enables the campus's development direction, and later projects carried out by UC LBNL must be consistent with the proposed 2025 LRDP. In contrast, the Illustrative Development Scenario is an illustrative, analytical tool to aid in determining impacts relative to approvals for specific projects proposed under the 2025 LRDP pursuant to CEQA.

3.7.2 Building and Demolition Program reflected in the Illustrative Development Scenario

Consistent with the proposed 2025 LRDP Land Use Plan, as shown in **Figure 3-9**, the Illustrative Development Scenario indicates that new campus buildings would be focused within the already developed Research and Academic, Central Commons, and Support Services land use zones.

Table 3-5 summarizes the individual campus buildings and other site development, their respective size, and development cluster locations assumed under the Illustrative Development Scenario. The Illustrative Development Scenario includes five major research buildings, three research support buildings, four additions to existing research facilities, two small modular computing facilities, a modular utility plant (MUP), and two building renovations to enhance support functions.



New Buildings

New Site Development

NOTE: Please refer to Table 3-5 for the full names of the new buildings under Illustrative Development Scenario.

SOURCE: LBNL, 2023

LBNL LRDP EIR

Figure 3-9
Illustrative Development Scenario: Building Layout
(Hypothetical Campus Building Layout under 2025 LRDP Conditions. For Analytical Purposes Only.)

ESA

2019/D201901556.00 - LBNL LRDP EIR/05 Graphics-GIS-Modeling/Illustrator

TABLE 3-5
ILLUSTRATIVE DEVELOPMENT SCENARIO – NEW BUILDING CONSTRUCTION AND OTHER SITE DEVELOPMENT

Building Number	Building Name	Building Gross Square Footage (Gross Square Feet)	Number of Floors	Potential Construction Timeline (Fiscal Year)	Cluster Location
S-1	Advanced Materials Discovery Building	75,000	4	2028-30	Charter Hill
S-2	Modular Utility Plant (MUP)	11,000	2	2028-30	Charter Hill
S-3	BioGEM Building	123,000	5	2030-32	Bayview
S-4	Centralized High-Bay Facility	4,000	1 (double height)	2032-33	Redwood
S-5	Microscopy Facility	7,000	1	2033-35	Redwood
S-6	Modular General Purpose Computing Facility	6,000	1	2034	Northside
S-7	Accelerator & Engineering Support Building	70,000	4	2034-36	Charter Hill
S-8	Chemical Sciences Building	75,000	4	2035-37	Charter Hill
S-9	ALS Support Facility	20,000	1 or 2	2036-38	Charter Hill
S-10	Flex Building	40,000	3	2039-41	Central Commons
S-11	Bayview Building 4	60,000	5	2041-43	Bayview
S-12	Bayview Building 5	50,000	5	2042-44	Bayview
S-13	Building 71 Laser Linear Accelerator Tunnel	24,000	1 (subterranean)	2043-45	Northside
S-14	Building 71 Expansion	3,000	1	2043-45	Northside
S-15	Modular Mid-Range Computing Facility	6,000	1	2045	Bayview
	Total	**574,000 gsf**			

Other Site Development	Surface Area (acres)		Potential Construction Timeline (Fiscal Year)	Cluster Location
Central Commons Plaza	1.72		2039-2040	Central Commons
Central Parking Lot	1.68		2032-2034	Northside
Total	**3.4 acres**			

NOTE:
a. Please refer to Figure 3-9 for the location of these buildings on the campus.
SOURCE: UC LBNL, 2024.

The BioGEM Building and Bayview Buildings 4 and 5 in the Bayview development cluster would accommodate bioscience and other wet-lab scientific research. The Flex Building in the Central Commons development cluster would accommodate research laboratories and offices – including swing and surge space – and campus support facilities, such as a new lab Directorate and/or a fitness center. In the Charter Hill development cluster, three new buildings would accommodate materials science research, chemistry research, and ALS support functions, along with a modular utility plant. In addition, an Accelerator and Engineering Support Building would accommodate engineering laboratories, shops, and offices to support accelerator and engineering functions. In the Northside development cluster, an expansion of Building 71 would accommodate more accelerator support space, while a laser plasma accelerator structure would be constructed as a partially subsurface structure in the adjacent hillside. In the Redwood development cluster, an addition to the Building 72 National Center for Electron Microscopy would accommodate next generation electron microscopes and office space, and a shared high-bay facility would provide needed assembly support space. Two modular buildings would house mid-range high-performance and low-range institutional computer servers in the Bayview and Northside development clusters, respectively. As indicated in Table 3-5, new buildings and building additions under the Illustrative Development Scenario would total approximately 574,000 gsf.

Other new site development under the Illustrative Development Scenario would include a Central Commons Plaza and Central Parking Lot, together encompassing approximately 3.4 acres of surface area. Renovations in two additional existing buildings are envisioned in the Illustrative Development Scenario: renovation of the existing shelled space in the Building 59 North High Performance Computing Bay to accommodate long-term needs for expanded mid-range high performance research and low-range institutional computer servers; and renovation of an existing wing of Building 69 to accommodate a new Central Chemical Receiving Facility.

As the proposed 2025 LRDP focuses on redevelopment and more efficient use of campus land, a number of existing obsolete buildings are expected to be demolished during the 2025 LRDP planning period so that their sites can be used for new buildings. **Table 3-6** presents a list of buildings that potentially would be demolished under the Illustrative Development Scenario; **Figure 3-10** shows the locations of these buildings.

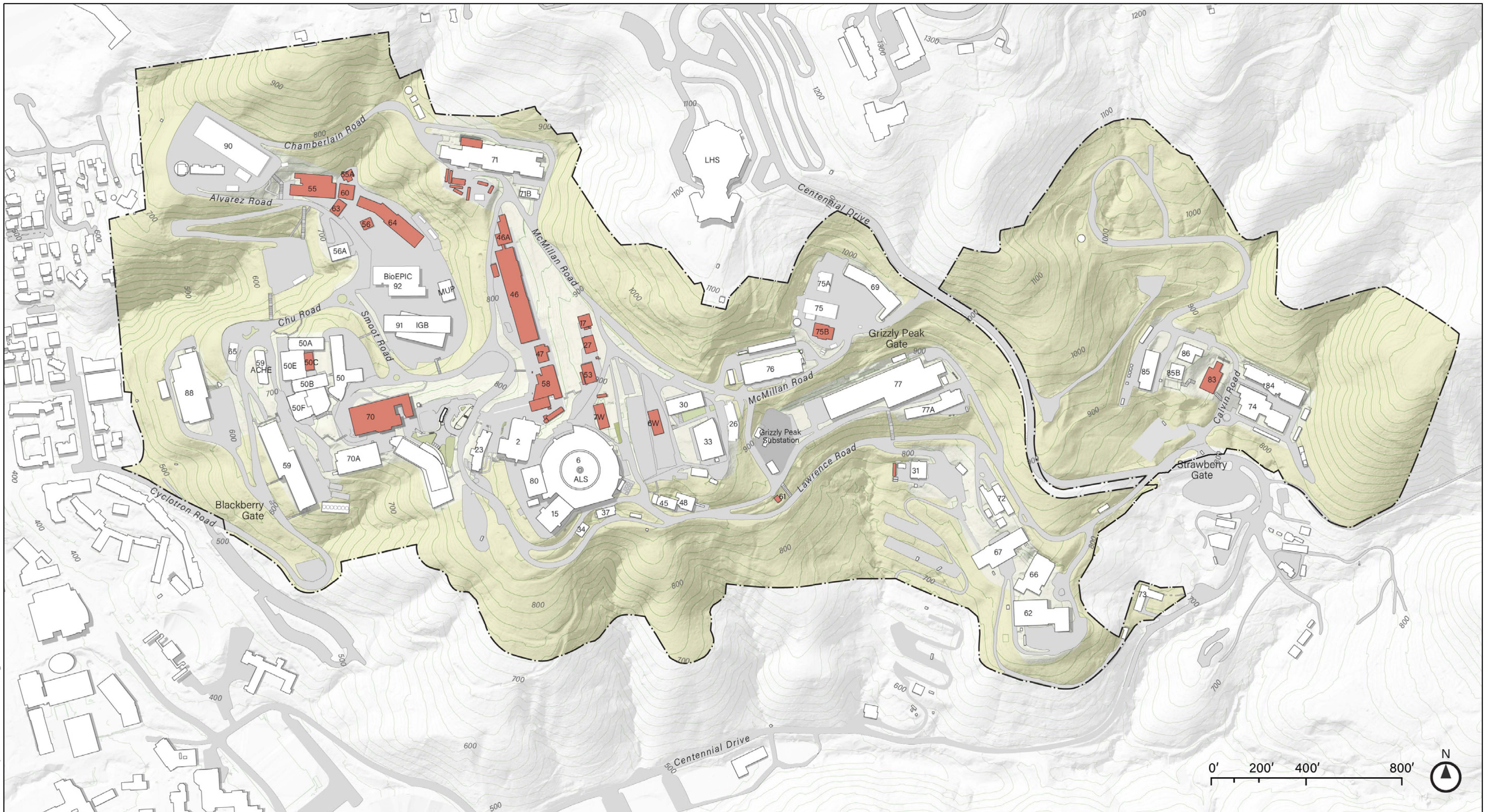
Under the proposed 2025 LRDP, ongoing, small-scale development, renovation, maintenance, and operational activities would continue over the course of the 20-year planning period. The continuation of such minor activities is assumed but not detailed as part of the Illustrative Development Scenario and is considered in the cumulative context of this EIR. Such work would be conducted in adherence with all conditions, best practices, and mitigation specified in this EIR.

TABLE 3-6
ILLUSTRATIVE DEVELOPMENT SCENARIO – MAJOR BUILDING DEMOLITION

Bldg. No.	Building	Area	Potential Demolition timeline (Fiscal Year)	Cluster Location
50C	Computing Sciences/NERSC	2,768	2025-26	Blackberry
64	Life Sciences / Earth Sciences H-B	29,894	2025-26	Bayview
71C,D,F,J, K,P,W,X	EH&S / Chemical Sciences Trailers	6,076	2025-26	Northside
31A	Chicken Creek Barn / Office Trailer	625	2025-26	Redwood
63	Accelerator & Fusion / Energy & Environmental	2,720	2026-27	Bayview
61	Storage	429	2028-29	Support Services
70	Energy & Environmental / Nuclear Science	64,330	2029-30	Central Commons
56	Biomedical Isotopes	1,785	2030-31	Bayview
55	Life Sciences	19,042	2030-31	Bayview
55A	Nuclear Magnetic Resonance (NMR)	1,568	2030-31	Bayview
60	High Bay Laboratory	3,578	2030-31	Bayview
71A	Ion Beam Tech / Low Beta Lab	4,109	2030-31	Northside
58	Heavy Ion Fusion Accelerator Research	10,327	2030-31	Charter Hill
58A	Accelerator / R&D Addition	14,218	2030-31	Charter Hill
83	Life Sciences Laboratory	6,894	2030-31	Strawberry
83A	Laboratory Trailer	504	2030-31	Strawberry
46	Laboratory	66,291	2032-33	Northside
46A	Engineering Division Offices	5,565	2032-33	Northside
46B	AFR Office Trailer	1,239	2032-33	Northside
47	Offices	6,154	2032-33	Charter Hill
6W	Temporary ALS Support-Tent Structure	5,000	2032-33	Charter Hill
7W	Temporary ALS Support-Tent Structure	5,000	2032-33	Charter Hill
53	E&E	6,947	2032-33	Charter Hill
53B	E&E	520	2032-33	Charter Hill
17	Shop-Assembly	2,237	2033-34	Northside
27	Dry Lab and Offices	3,299	2033-34	Charter Hill
75B	EH&S	4,670	2033-34	Support Services

NOTE:
a. Please refer to Figure 3-10 for the location of buildings to be demolished on the LNBL campus.

SOURCE: UC LBNL, 2024.



Building Demolition

SOURCE: LBNL, 2023

Figure 3-10
Illustrative Development Scenario: Anticipated Demolition (Hypothetical Building Demolition under 2025 LRDP Conditions. For Analytical Purposes Only.)

3.7.3 Infrastructure Improvements Reflected in the Illustrative Development Scenario

Based on the scale and potential distribution of new buildings and facilities and the demolition reflected in the Illustrative Development Scenario, UC LBNL has developed conceptual layouts of roadway, parking, recreation, and utility infrastructure that would be needed to support the development.

Mobility and Circulation Improvements

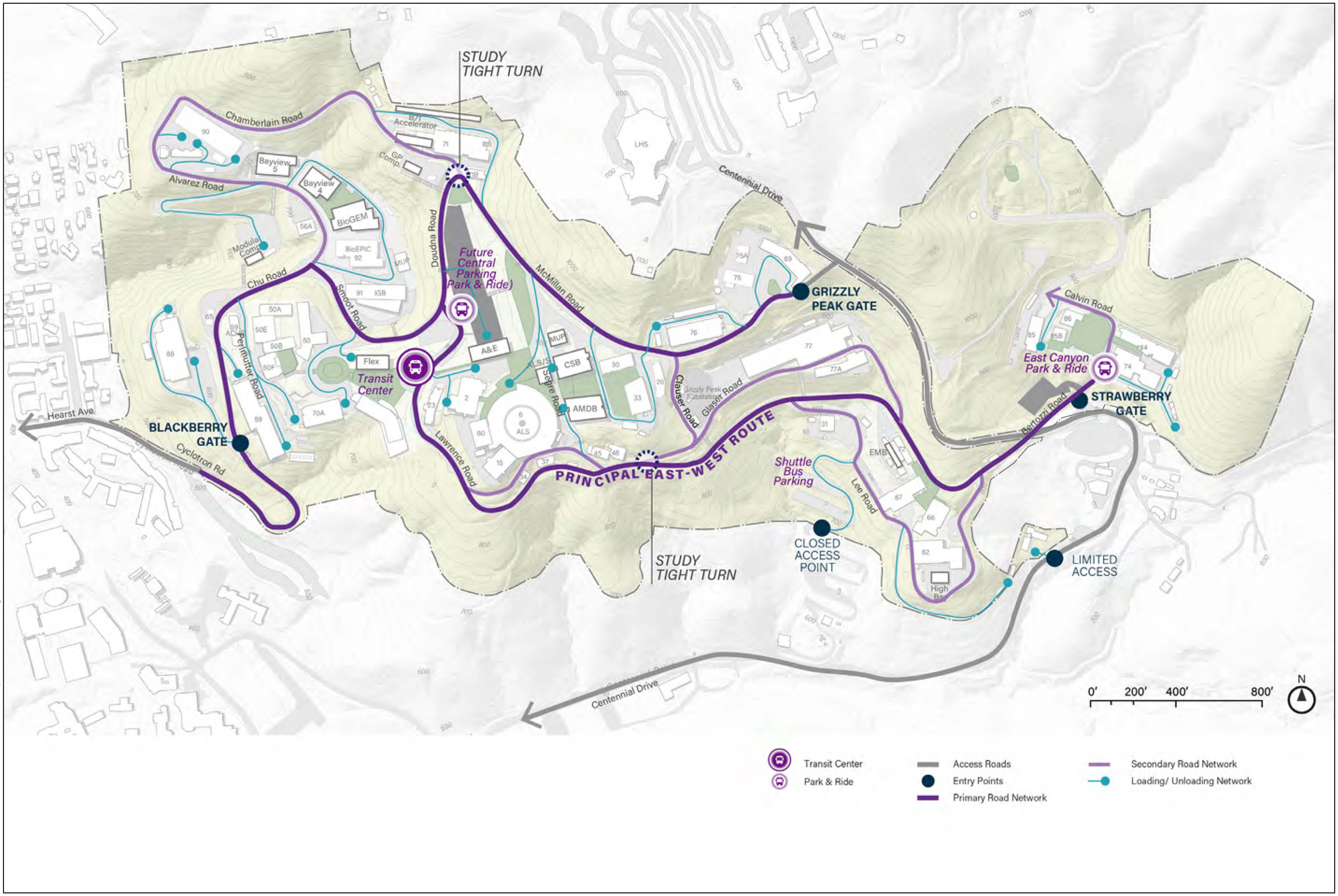
Figure 3-11 and **Figure 3-12** illustrate potential vehicular circulation and parking facilities that are consistent with the proposed 2025 LRDP and included in the Illustrative Development Scenario for impact analysis. **Figure 3-13** illustrates the potential bicycle circulation plan that is consistent with the proposed 2025 LRDP and included for analysis in the Illustrative Development Scenario.

Recreation Improvements

Figure 3-14 presents the potential recreation network that is consistent with the proposed 2025 LRDP and included in the Illustrative Development Scenario for purposes of impact analysis. Additional recreation facilities could be added on the campus and might include team and solo sports activity spaces, exercise facilities, and improvements and expansion of the Lab's trail system. Most development clusters already have an open, partially improved area or a place that could be enhanced or expanded to serve this purpose.

Utility Infrastructure Improvements

Figure 3-15 presents the potential domestic and fire water distribution system that is consistent with currently approved utility planning and the proposed 2025 LRDP and included in the Illustrative Development Scenario for purposes of impact analysis. **Figure 3-16** presents the potential sanitary sewer system that is consistent with currently approved utility planning and the proposed 2025 LRDP and included in the Illustrative Development Scenario for purposes of impact analysis. **Figure 3-17** presents the potential stormwater management system that is consistent with currently approved utility planning and the proposed 2025 LRDP and included in the Illustrative Development Scenario for purposes of impact analysis. **Figure 3-18** presents the potential medium voltage electrical distribution system that is consistent with currently approved utility planning and the proposed 2025 LRDP and included in the Illustrative Development Scenario for purposes of impact analysis.



SOURCE: LBNL, 2023

Figure 3-11
Illustrative Development Scenario: Vehicular Circulation
(Hypothetical Campus Vehicular Circulation under 2025 LRDP Conditions.
For Analytical Purposes Only.)

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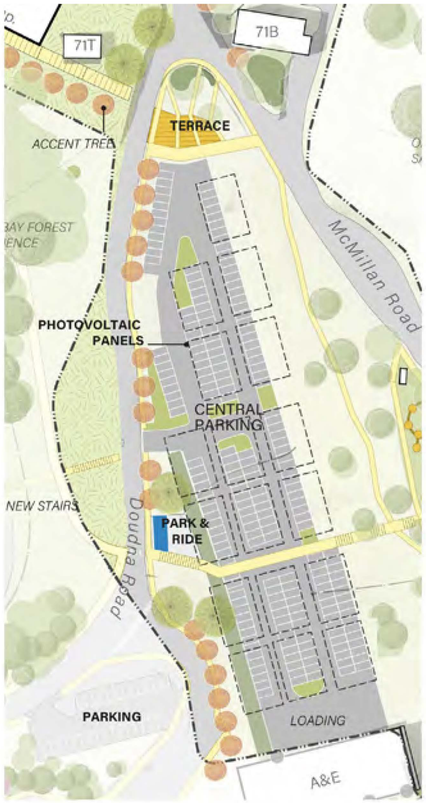

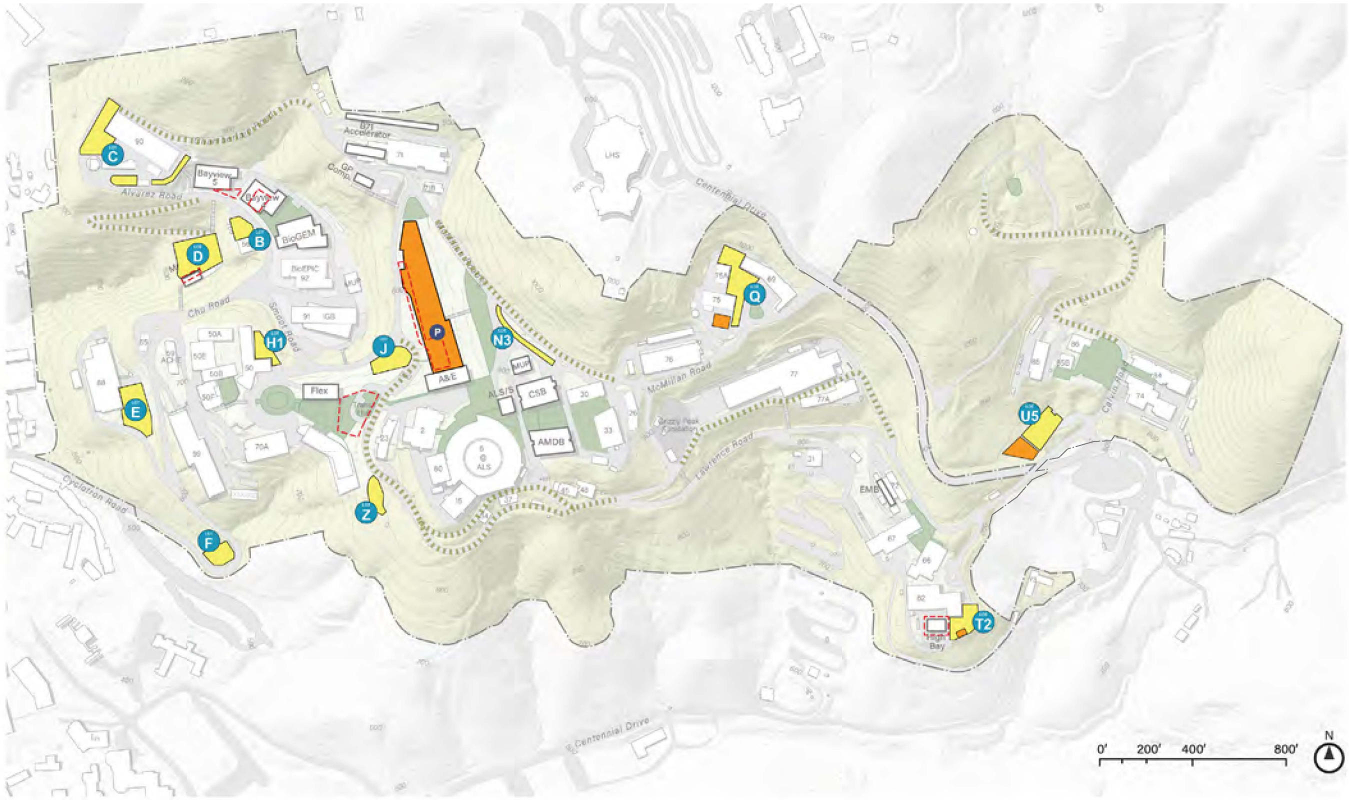

CENTRAL PARKING LOT

PRINCIPAL PARKING LOTS

Existing Parking Lots to be Retained
Existing Parking Lots to be Removed
Roadside Parking
New Parking Lots

2019/D201901556.00 - LBNL LRDP EIR/05 Graphics-GIS-Modeling/Illustrator

SOURCE: LBNL, 2023

Figure 3-12
Illustrative Development Scenario: Parking Scheme
(Hypothetical Campus Parking Layout under 2025 LRDP Conditions. For Analytical Purposes Only.)

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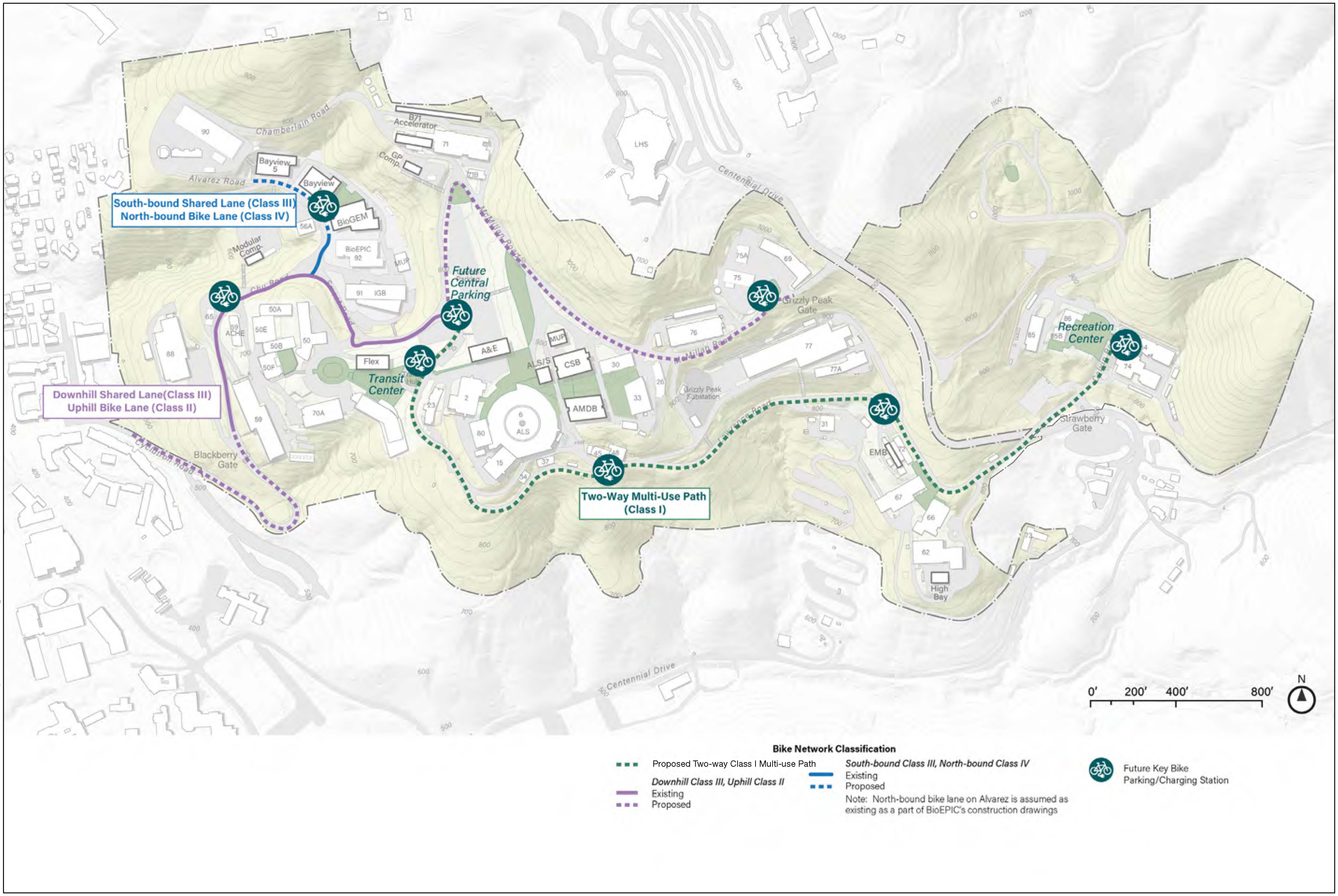

SOURCE: LBNL, 2023

LBNL LRDP EIR

Figure 3-13
Illustrative Development Scenario: Bicycle and Micromobility Circulation (Hypothetical Campus Bicycle and Micromobility Circulation Scheme under 2025 LRDP Conditions. For Analytical Purposes Only.)

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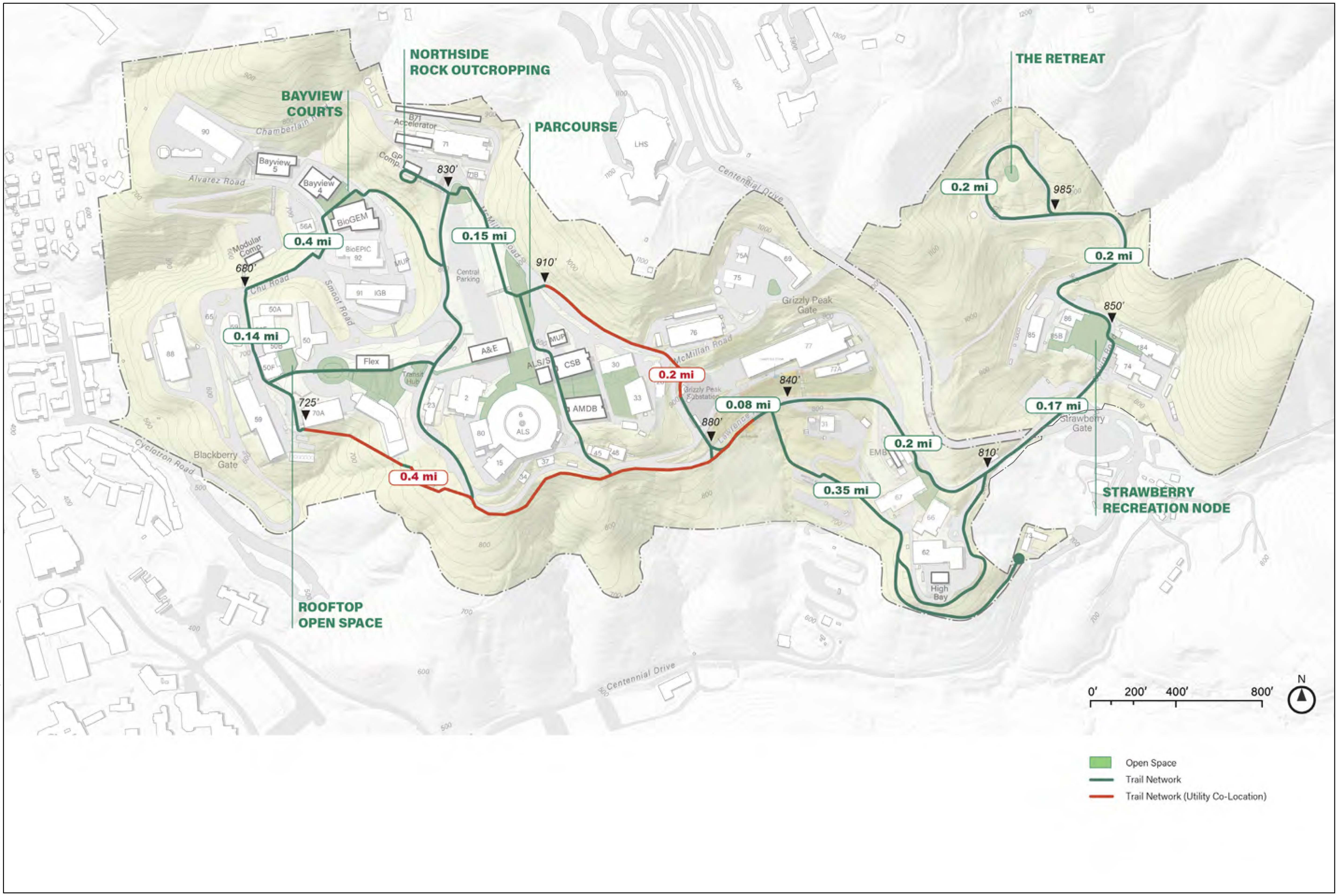
2019/D201901556.00 - LBNL LRDP EIR/05 Graphics-GIS-Modeling/Illustrator



SOURCE: LBNL, 2023

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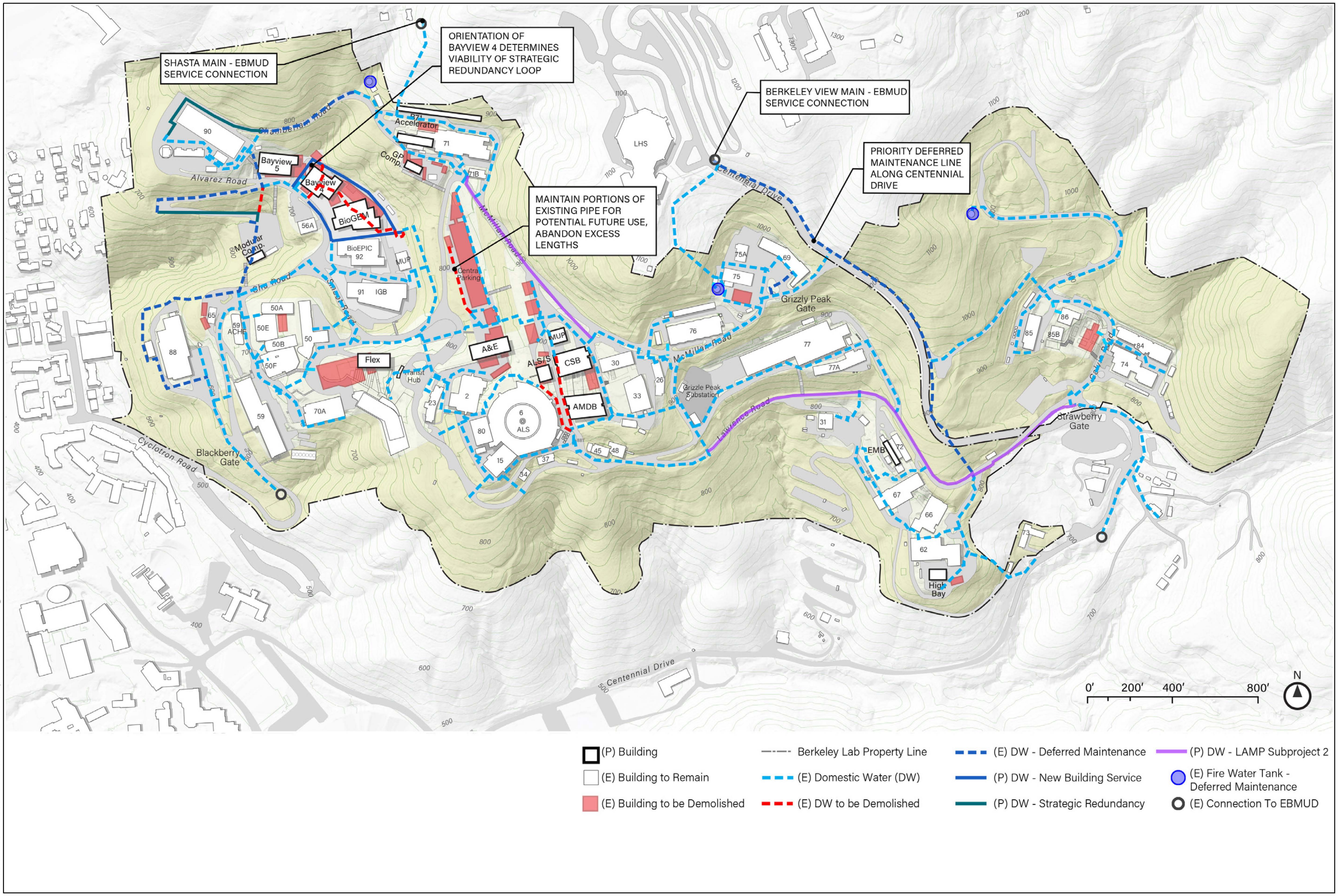
Figure 3-14
Illustrative Development Scenario: Recreation Network
(Hypothetical Recreation Network under 2025 LRDP Conditions.
For Analytical Purposes Only.)



2019/D201901556.00 - LBNL LRDP EIR/05 Graphics-GIS-Modeling/Illustrator

SOURCE: LBNL, 2023

LBNL LRDP EIR

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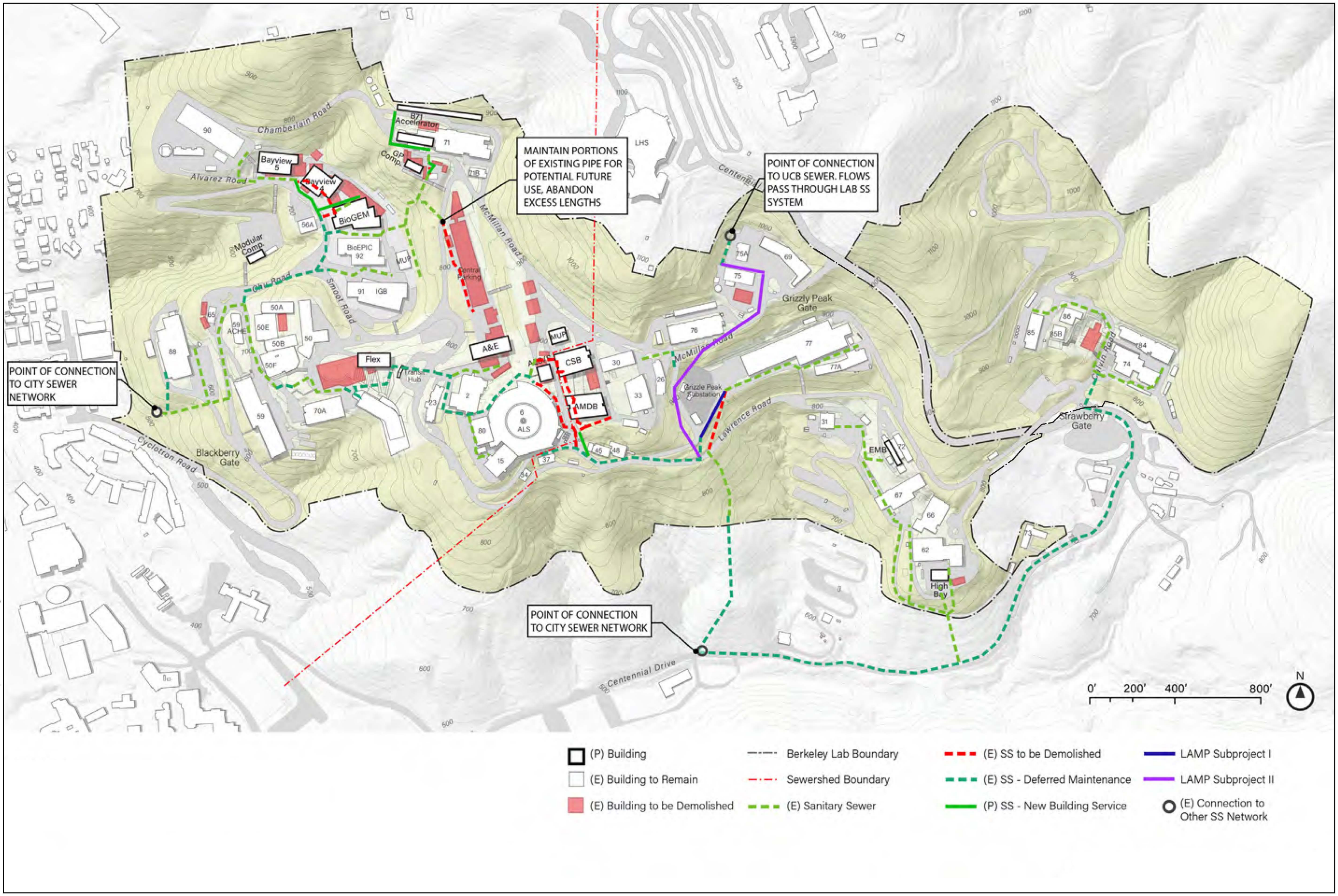
Figure 3-15
Illustrative Development Scenario: Domestic Water and Fire Water Distribution System (Hypothetical Campus Domestic and Fire Water Distribution Systems under 2025 LRDP Conditions. For Analytical Purposes Only.)



SOURCE: LBNL, 2023

LBNL LRDP EIR

Figure 3-16
Illustrative Development Scenario: Sanitary Sewer System
(Hypothetical Sanitary Sewer System under 2025 LRDP Conditions.
For Analytical Purposes Only.)

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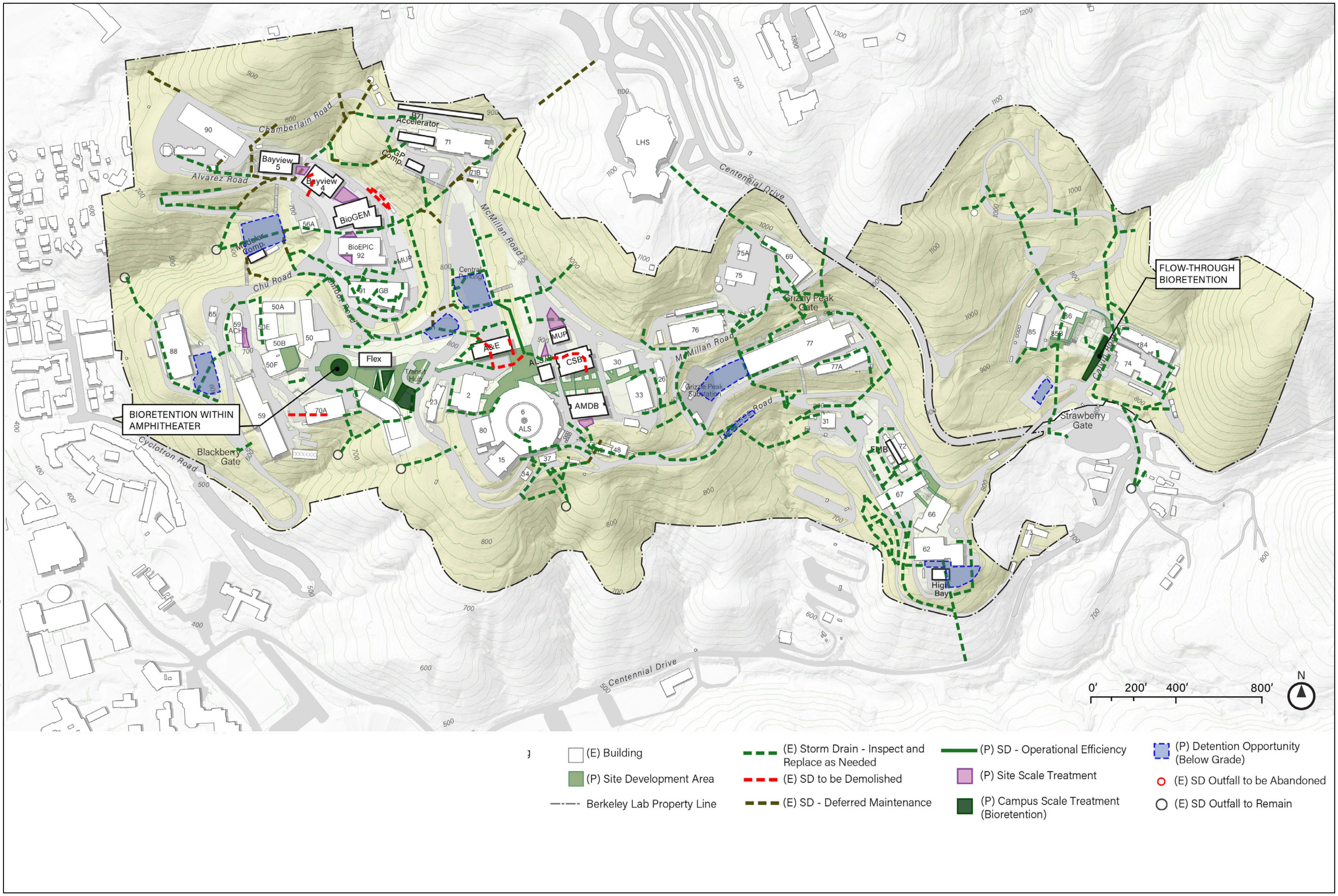
2019/D201901556.00 - LBNL LRDP EIR/05 Graphics-GIS-Modeling/Illustrator



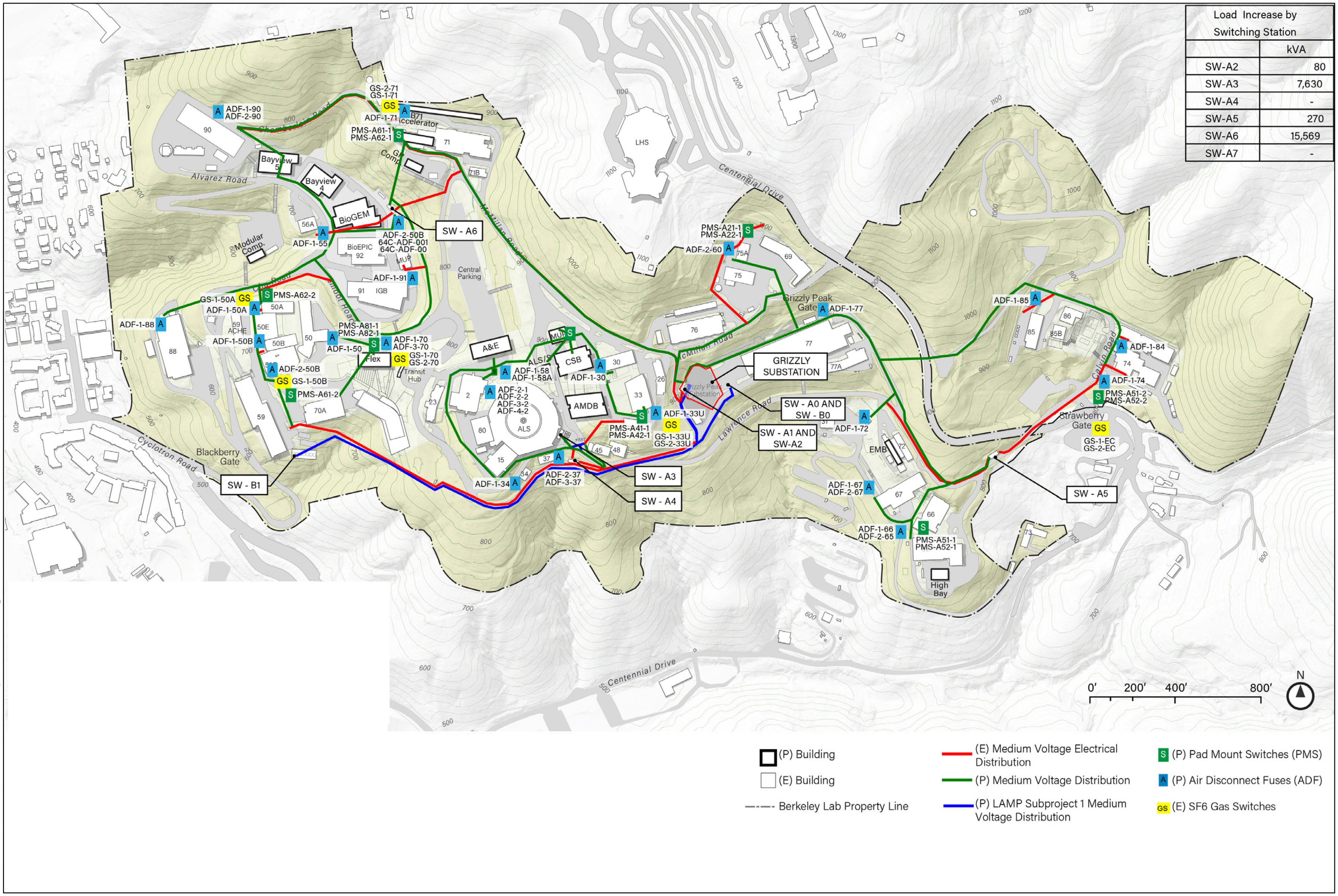
2019/D201901556.00 - LBNL LRDP EIR/05 Graphics-GIS-Modeling/Illustrator

SOURCE: LBNL, 2023

LBNL LRDP EIR

Figure 3-17
Illustrative Development Scenario: Stormwater Management (Hypothetical Campus Stormwater Management System under 2025 LRDP Conditions. For Analytical Purposes Only.)

ESA



Load Increase by Switching Station

	kVA
SW-A2	80
SW-A3	7,630
SW-A4	-
SW-A5	270
SW-A6	15,569
SW-A7	-

SOURCE: LBNL, 2023

LBNL LRDP EIR

Figure 3-18
Illustrative Development Scenario: Medium Voltage Electrical Distribution System (Hypothetical Campus Medium Voltage Electrical Distribution System under 2025 LRDP Conditions. For Analytical Purposes Only.)

ESA

3.8 Construction Scenarios Analyzed in this EIR

In addition to the Illustrative Development Scenario that serves as a tool for impact analysis, potential construction scenarios were developed to analyze the likely construction impacts from the implementation of the proposed 2025 LRDP. The 2025 LRDP construction scenarios presented below provide a basis for this EIR to conservatively analyze 1) projected typical (annual average) aggregate construction impacts (i.e., combined construction, demolition and renovation activities); and 2) reasonably foreseeable maximum (peak annual average) aggregate construction impacts assuming multiple large construction projects might occur simultaneously. In this way, this EIR discloses the likely construction impacts that could result from 2025 LRDP implementation, and it supports the future review of specific development projects proposed under the 2025 LRDP utilizing CEQA's tiering provisions. Average and peak construction activity levels were separately estimated for new building construction, demolition, and renovation activities, as described below.

3.8.1 New Building Construction Scenarios

The *average annual new building construction* activity level/scenario was estimated by dividing the total 2025 LRDP projected building construction (574,000 gsf) by the LRDP's 20-year planning period, amounting to about 30,000 gsf (rounded) per year. Based on the Lab's recent historical construction patterns, actual new building construction activity levels can range from extended periods of little or no major construction interspersed to periods when multiple medium to large construction projects are simultaneously underway. Consequently, the *peak annual new building construction* activity level/scenario was estimated by scaling up three times the annual average activity level (to approximately 90,000 gsf per year), which would represent three medium to large construction projects being underway simultaneously.

New building construction truck trips were estimated based on the amount of projected excavation and grading, foundation and building construction activities, and corresponding truck hauling factors associated with the Lab's Building 67 (Molecular Foundry) project, a 90,000 gsf building constructed in the early 2000s. These factors were adapted to conservatively estimate the number of construction truck trips that would occur under the proposed 2025 LRDP average and peak annual building construction scenarios.

3.8.2 Building Demolition Scenarios

The *annual average building demolition* activity level/scenario was estimated by dividing the 2025 LRDP total projected building demolition (278,500 gsf) by the LRDP's 20-year planning period, amounting to about 14,000 gsf (rounded) per year. Similar to the above building construction approach, the *peak annual building demolition* activity level/scenario was estimated by scaling up three times the annual average demolition activity level (to approximately 42,000 gsf per year), which would represent three medium to large demolition projects being underway simultaneously.

Building demolition truck trips were estimated based on demolition activities and corresponding average truck hauling factors associated with the Lab's largest past demolition project: the

Building 51 / Bevatron accelerator demolition, which occurred from 2009 through 2012. These factors were adapted to conservatively estimate the number of demolition truck trips expected under the proposed 2025 LRDP average and peak annual demolition scenarios.

3.8.3 Building Renovation Scenarios

The *annual average building renovation* activity level was estimated by dividing the campus's total potential renovation space under the proposed 2025 LRDP (600,000 gsf) by the LRDP's 20-year planning period, amounting to 30,000 gsf per year. The *peak annual building renovation* activity level was estimated to be up to two times the annual average activity level (i.e., 60,000 gsf per year). Renovation activity truck hauling factors are based on current renovation activity levels and were used to estimate 2025 LRDP average and peak annual building renovation scenario truck trips.

3.8.4 Summary

For purposes of impact assessment, the combined potential activity levels of construction, demolition, and renovation activities under the proposed 2025 LRDP are analyzed in this EIR by considering the aggregate average and peak annual construction, renovation, and demolition activity levels, along with in- and out-bound trucks associated with those activity levels (see **Table 3-7**).

TABLE 3-7
COMBINED ESTIMATED AVERAGE ANNUAL AND PEAK ANNUAL CONSTRUCTION, DEMOLITION, AND RENOVATION ACTIVITY LEVELS

Metric	Average Annual[d]			Total Average Annual
	Construction	Demolition	Renovation	
Square Feet	30,000[a.]	14,000[b]	30,000[c]	74,000
Truck Loads	560[e]	125[f]	300[g]	985
Metric	**Peak Annual[d]**			**Total Peak Annual**
	Construction	**Demolition**	**Renovations**	
Square Feet	90,000[h]	42,000[i]	60,000[j]	192,000
Truck Loads	1,680[e]	365[f]	600[g]	2,650

NOTES:

a. Average annual construction based on 2025 LRDP projected new building construction divided by 20-year planning period.
b. Average annual demolition based on 2025 LRDP projected building demolition divided by 20-year planning period.
c. Average annual renovation based on 2025 LRDP projected potential renovation space divided by 20-year planning period.
d. Numbers rounded.
e. Construction truck loads account for soil export associated with excavation/grading activities, and import of foundation/construction materials. Trucks are large, multi-axle hauling vehicles and do not include small and regular (operational) delivery trucks.
f Demolition truck loads account for export of building and shielding block waste.
g Renovation truck loads account for materials import and waste export.
h. Peak annual construction level estimated to be up to three times the average annual construction level.
i. Peak annual demolition level estimated to be up to three times the average annual demolition level.
j. Peak annual renovation level estimated to be up to two times the average annual renovation level.

3.9 Related Project: Berkeley Lab Vegetation Management Program

As discussed in Section 3.3.5 above, the campus is located in a WUI and is designated a Very High Fire Hazard Severity Zone by CalFire. To minimize potential wildland fire risk on and around the campus, the Lab implements a VMP which is overseen by vegetation and fire planning experts and is informed by LBNL guidance documents. These include the WFMP, which is a high-level guidance document that provides recommendations on managing fuels to limit wildland fire intensity and spread, and the LBNL Vegetation Management Guide, which provides a comprehensive framework for managing vegetation within the campus boundaries and detailed guidance to aid the design and execution of all work involving vegetation management. In addition to addressing wildfire fuel concerns, the VMP considers vegetation management for other purposes, including biological and habitat health, control of invasive plants, safety, and sound groundskeeping practices. Berkeley Lab's vegetation management activities are continually evaluated and modified over time to address changing circumstances and evolving best practices.

Through its on-going VMP, the Lab limits fuels to those that burn with a slow spread rate and, more importantly, those that limit flame length. This results in low-intensity, slow moving fires requiring minimal emergency response. UC LBNL achieves fuel reduction by the use of livestock grazing and/or grass mowing throughout the entire campus. Most fuel reduction work begins in the late spring following the rainy season and after the majority of plant growth has stopped. Other vegetation management and fuel reduction activities undertaken by the Lab's Facilities Division include removing "ladder fuels" within 100-feet of structures; trimming tree branches that overhang roofs; clearing leaf litter from roofs and drains; and trimming trees to provide adequate clearance for fire response vehicles. In addition, several trees are cut and removed each year because they are dead, diseased, or have the potential to fall, which could cause injury, damage, or blockage of exits during emergency evacuation.

Berkeley Lab's VMP will continue to be implemented concurrently with the implementation of the proposed 2025 LRDP. As the implementation of the VMP has the potential to result in environmental impacts and its impacts could potentially combine with the impacts of the proposed 2025 LRDP to result in significant cumulative impacts, the continued implementation of the VMP is analyzed for its environmental impacts in this EIR as a related program. It is noteworthy that the VMP is not an element of the proposed 2025 LRDP and is a program that is separate and independent of the proposed 2025 LRDP.

Vegetation management—including by grazing—would continue to occur on an annual basis. The Lab's VMP would continue to encourage native, fire-resistant, drought-tolerant plants and removal of invasive exotic plants for fire control purposes. Eucalyptus, non-native pine, and other non-native tree stands across the campus site would continue to be removed or thinned and replaced as appropriate with native trees such as coast live oak, California bay laurel, coastal redwood.

Particular attention will be paid to addressing potentially hazardous vegetation in campus areas of greatest concern. This includes ladder fuels, tree density, and tall trees that could fall across the Lab's entrance/exit roads during a wildland fire event. As part of the on-going planning for future vegetation management efforts, Berkeley Lab has identified certain campus areas as Priority 1 areas for vegetation treatment, including an area surrounding Cyclotron Road and Building 88 in the campus's southwestern corner, and areas on both sides of Centennial Drive in the eastern part of the campus. Other areas have been identified as Priority 2 vegetation treatment areas, which are located in the northern and eastern portions of the campus. Other parts of the campus are considered low priority and are designated Priority 3 areas to receive vegetation management treatments in the future. This EIR presents an analysis of the programmatic effects from the implementation of these potential future vegetation treatment projects under the VMP.

3.10 Required Permits and Approvals

This EIR serves three primary purposes. First, the Regents will use this EIR to evaluate the environmental implications of approving the proposed LBNL 2025 LRDP. Second, if this EIR is certified and the proposed 2025 LRDP is adopted, this EIR and the 2025 LRDP will be used to streamline future environmental review of subsequent development projects implementing the LRDP on the Berkeley Lab campus. Finally, this document may be used as a source of information by responsible, trustee, or federal agencies with permitting or approval authority over projects or portions of projects implementing the proposed 2025 LRDP.

As discussed above, this EIR also presents the environmental impacts from the continued implementation and enhancement of the existing VMP. A refreshed VMP approval by the Berkeley Lab Director under UC Regents delegated authority will likely take place sometime after the UC Regent's consideration of the 2025 LRDP and EIR. This approval decision will be based on consideration of the updated CEQA impact analysis contained in this 2025 LRDP EIR. This EIR may also be used by Berkeley Lab to streamline future environmental review of subsequent specific vegetation management projects.

The only agency approval – federal, state, or local – required for the adoption of the proposed 2025 LRDP and certification of this program-level EIR is that of the UC Regents. However, as potential future development projects are proposed at Berkeley Lab, other permits and approvals could potentially be needed. A list of agencies that may be required to issue permits or approve certain aspects of a particular future project is provided below. A detailed description of these permits is provided in the regulatory framework sections presented in Chapter 4, *Environmental Setting, Impacts, and Mitigation Measures*, of this Draft EIR.

- **U.S. Army Corps of Engineers (federal agency).** Permit related to discharge of fill material to waters of the United States.
- **U.S. Fish and Wildlife Service (federal agency).** Compliance with the federal Endangered Species Act for potential take of listed species.
- **California Department of Fish and Wildlife (responsible and trustee agency).** Compliance with the California Endangered Species Act for potential take of state-listed species; permit for any work in a river, stream, or lake or its tributaries.

- **State Historic Preservation Office (responsible agency).** For projects with federal funding, compliance with the National Historic Preservation Act (NHPA), as amended by 16 United States Code Section 470 et seq., Section 106, 36 Code of Federal Regulations (CFR) 800 for protection of significant archaeological and historical resources; and with 36 CFR 800 for addressing previously unsuspected cultural resources discovered during construction.
- **San Francisco Bay Regional Water Quality Control Board (responsible agency).** Inspections and enforcement related to waste discharge requirements for impacts on waters of the state and stormwater pollution prevention plan for construction/operation.
- **State Water Resources Control Board (responsible agency).** Coverage under nontraditional small municipal separate storm sewer system (MS4), general construction, and industrial stormwater permits.
- **Bay Area Air Quality Management District (BAAQMD) (responsible agency).** Authority to construct and permit to operate for certain stationary sources (e.g., generators and fume hoods) of air pollutant emissions.
- **U.S. Department of Energy (federal lead agency).** Compliance with and review under the National Environmental Policy Act (NEPA). Most Berkeley Lab projects triggering CEQA review also require review under (NEPA, due to the involvement of federal funding, permission, and/or as a result of Berkeley Lab's status as a U.S. DOE federal facility. NEPA review is conducted by the DOE, generally independently of, but simultaneous to, CEQA review. While the DOE does not have direct involvement with the Lab's LRDP or its accompanying EIR, the DOE does recognize the importance of the LRDP as a planning tool and a UC requirement.

3.11 References

LBNL, 2023a. *Wildland Fire Management Plan*. Updated August 22.

LBNL, 2023b. *Sustainability Standards for New Construction and Major Renovations*. Policy in the LBNL Requirements and Policies Manual, dated December 20, 2023.

LBNL, 2023c. *Sustainability Standards for Operations*. Policy in the LBNL Requirements and Policies Manual, dated December 20, 2023.

LBNL, 2024a. *Vegetation Management Guide*. October.

LBNL, 2024b. *Net-Zero Vision and Road Map*. https://sbl.lbl.gov/2023/05/24/a-roadmap-to-net-zero-greenhouse-gas-emissions/

LBNL, 2025, *Population Setting and Projections for 2025 LRDP*. February.

University of California Office of the President, 2019. *University of California, California Environmental Quality Act Implementation Guidance, Frequently Asked Questions*. February.

CHAPTER 4
Environmental Setting, Impacts, and Mitigation Measures

4.0 Introduction to the Environmental Analysis

This chapter describes the environmental setting, assesses impacts, and identifies measures that would avoid or lessen the severity of the significant impacts of the proposed 2025 LRDP. This section, Section 4.0, *Introduction to the Environmental Analysis*, describes the overall approach to the impact analysis, explains the significance determinations and terminology used in the impact analysis, and provides the basis for the cumulative impact analysis.

4.0.1 Definition of Terms Used in the EIR

This EIR uses a number of terms that have CEQA-specific meanings. The following terms are used to describe the significance of environmental impacts of the proposed 2025 LRDP:

- **Significance Criteria:** The criteria or thresholds used by the University, as lead agency under CEQA, to determine whether the magnitude of an adverse, physical, environmental impact would be considered significant. In determining the level of significance, the analysis recognizes that in implementing the proposed 2025 LRDP, UC LBNL must comply with relevant and applicable federal, State, or regional laws and regulations which are regularly enforced through building codes and standards and/or other means.
- **Significant Impact:** An impact is considered significant if the proposed 2025 LRDP *could* result in a substantial adverse change in the physical conditions of the environment. Significant impacts are identified by the evaluation of a project-related or cumulative physical change from baseline conditions, compared to a specified significance criterion. A significant impact is defined as "a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the Project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance."[1]
- **Less-than-Significant Impact:** An impact is considered less than significant when the impact caused by the proposed 2025 LRDP would not exceed the applicable significance criterion.
- **Less-than-Significant Impact with Mitigation:** An impact is considered less than significant with mitigation if the proposed 2025 LRDP could result in a substantial adverse change when evaluated with respect to one or more significance criteria, but feasible mitigation is available that would effectively reduce the impact to below the applicable significance criterion.

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1 *CEQA Guidelines* Section 15382.

- **Significant and Unavoidable Impact:** Significant impacts resulting from implementation of the proposed 2025 LRDP that cannot be feasibly avoided or mitigated to a less-than-significant level, that is, to a level below the applicable significance criterion.
- **Cumulative Impact:** Under CEQA, a cumulative impact refers to "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts."[2] A significant cumulative impact is one in which the cumulative adverse physical environmental effect would exceed the applicable significance criterion and the contribution of the proposed project would be "cumulatively considerable."[3] If the contribution of the project to a significant cumulative impact is less than considerable, the cumulative impact of the project is considered less than significant.
- **Mitigation Measure:** A mitigation measure is a feasible action that could be taken to avoid or reduce the magnitude of a significant impact. Section 15370 of the *CEQA Guidelines* defines mitigation as:
    a) Avoiding the impact altogether by not taking a certain action or parts of an action;
    b) Minimizing impacts by limiting the degree of magnitude of the action and its implementation;
    c) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
    d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and
    e) Compensating for the impact by replacing or providing substitute resources or environments.
- **Feasible:** Under CEQA, the term feasible means "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors."[4]

4.0.2 Scope of Analysis

This program EIR discloses the impacts that could result from the approval and implementation of Berkeley Lab's proposed 2025 LRDP and also establishes a framework for tiered or project-level environmental documents that would be prepared in accordance with the overall program. Accordingly, the EIR provides a program-level environmental impact analysis of full 2025 LRDP implementation, and it identifies Plan-level mitigation measures to reduce potential significant LRDP effects.

Analytical Horizon

This EIR evaluates the foreseeable impacts from LRDP implementation through Year 2045, the proposed 2025 LRDP's estimated planning horizon. Under UC policy, a campus LRDP remains in effect until it is replaced. Accordingly, the proposed 2025 LRDP would not expire in 2045 until it is updated or replaced.

[2] *CEQA Guidelines* Section 15355.
[3] *CEQA Guidelines* Section 15130(a).
[4] *CEQA Guidelines* Section 15364.

Effects of the Environment on the Project

In 2015, the California Supreme Court held that "CEQA generally does not require an analysis of how existing environmental conditions will impact a project's future users or residents." *California Building Industry Association v. Bay Area Air Quality Management District* (2015) 62 Cal.4th 369, 386. The Supreme Court explained that, where existing hazards exist, an agency is only required to analyze the potential impact of such hazards on future residents of the project if the project would exacerbate those existing environmental hazards or conditions. *California Building Industry Association, 62 Cal. 4th at 389.* Thus, with respect to such issues as potential geologic and seismic hazards, potential exposure to existing levels of air pollution and noise, and similar issues at the campus, CEQA does not require consideration of the effects of bringing a new population into an area where such hazards exist, as long as the project itself would not increase, exacerbate, or otherwise affect the conditions that create those hazards.

Accordingly, this EIR does not evaluate the existing impacts of the existing environment on the additional persons expected to work on the Berkeley Lab campus as a result of the implementation of the proposed 2025 LRDP to the extent the 2025 LRDP does not increase, exacerbate, or otherwise affect the existing impacts of the existing environment.

Economic and Social Effects

Under CEQA, economic and social effects by themselves are not considered to be significant impacts. Economic and social effects may be relevant if they would contribute to a connection between the proposed project and a physical environmental effect, or if they would factor into the significance determination of a physical environmental effect.[5] In addition, economic and social factors may be considered in the determination of mitigation measure feasibility or in development of project alternatives.[6] As such, the proposed 2025 LRDP's potential effect on economic and social issues, such as tax revenues, crime, the cost of public services, or property values, are not considered in this EIR. Nevertheless, UC LBNL and the Regents may evaluate a wide range of factors, including social or economic effects, in their consideration of the merits of the proposed 2025 LRDP.

4.0.3 Organization of the Impact Analysis

In accordance with Appendix G, Environmental Checklist, of the *CEQA Guidelines*, the environmental impacts of the proposed 2025 LRDP are analyzed for potential significant impacts in 16 environmental issue areas, set forth in Sections 4.1 through 4.16. In addition, Section 4.17 addresses certain environmental issues, that based upon review by UC LBNL, were determined to have no Project impact, including Agriculture and Forestry Resources, and Mineral Resources.

4.1 Aesthetics
4.2 Air Quality
4.3 Biological Resources
4.4 Cultural Resources, including Tribal Cultural Resources
4.5 Energy

5 *CEQA Guidelines* Section 15131.
6 *CEQA Guidelines* Section 15364.

- 4.6 Geology and Soils
- 4.7 Greenhouse Gas Emissions
- 4.8 Hazards and Hazardous Materials
- 4.9 Hydrology and Water Quality
- 4.10 Land Use and Planning
- 4.11 Noise and Vibration
- 4.12 Population and Housing
- 4.13 Public Services and Recreation
- 4.14 Transportation
- 4.15 Utilities and Service Systems
- 4.16 Wildfire
- 4.17 Effects Found Not to be Significant

Each environmental issue discussion includes these main subsections:

- *Environmental Setting*, which includes a description of the existing environmental conditions;
- *Regulatory Framework*, including relevant federal and State, and regional laws and regulations; and University plans and policies; and
- *Impacts and Mitigation Measures*, which describes the (1) significance criteria; (2) analysis methodology; (3) potential project-specific and cumulative impacts; and (4) proposed feasible mitigation measures that would eliminate or reduce the severity of significant project-specific and/or cumulative impacts. To the extent that no feasible mitigation measures are identified, significant unavoidable impacts are also identified.

This EIR identifies all environmental impacts with an alpha-numeric designation that corresponds to the environmental issue (e.g., Aesthetic impacts are labeled AES, Air Quality impacts are labeled AQ, etc.). The issue identifier is followed by a number that indicates the sequence in which the impact statement occurs within the section. For example, “LRDP Impact AQ-1” is the first (i.e., “1”) air quality impact identified in the EIR. All impact statements are presented in bold text. Each impact statement also includes the impact significance prior to and after mitigation.

Each mitigation measure is labeled and numbered to correspond with the impact that it addresses. Where multiple mitigation measures address a single impact, each mitigation measure is numbered sequentially. For example, “LRDP Mitigation Measure AQ-1a and LRDP Mitigation Measure AQ-1b” are identified to address the first air quality impact (i.e., “LRDP Impact AQ-1”).

4.0.4 Section Structure

Each environmental issue section follows a set structure, as described below.

Introduction

This subsection summarizes the applicable topic analysis and its relevance to the proposed 2025 LRDP.

Environmental Setting

According to Section 15125(a) of the *CEQA Guidelines*, an EIR must include a description of the existing physical environmental conditions in the vicinity of the project to provide the “baseline condition” against which project-related impacts are compared. Normally, the baseline condition is the physical condition that exists when the Notice of Preparation (NOP) is published (in this case, May 2024). However, the *CEQA Guidelines* and applicable case law recognize that the date for establishing an environmental baseline cannot always be rigid. Physical environmental conditions may vary over a range of time periods; thus, the use of environmental baselines that differ from the date of the NOP may be reasonable and appropriate when conducting the environmental analyses as long as they are supported by substantial evidence. Consistent with this approach, some sections of this EIR rely on a variety of data to establish an applicable baseline, as described in those sections. In some instances, pre-NOP environmental setting information is used in the EIR because the data were determined to be more reflective of baseline conditions than May 2024 conditions.[7] Lastly, for additional context, data from pre-coronavirus 2019 (COVID-19) pandemic years may be referenced in this EIR to illustrate long-term baseline conditions.

Regulatory Framework

The Regulatory Framework section presents relevant information about UC plans and policies, and federal, State, regional laws, regulations, plans, policies and standards that pertain to the environmental resources addressed in each section. The Regulatory Framework section includes local (municipal) policies or regulations only in those instances when UC LBNL expressly decides to use them as a threshold or significance criteria.

Applicable University documents presented in the Regulatory Framework sections of this EIR include, but are not limited to, the UC *Policy on Sustainable Practices*, UC *Seismic Safety Policy*, LBNL Design Guidelines, Berkeley Lab *Net-Zero Vision and Roadmap*, LBNL's Storm Water Pollution Prevention Program, and LBNL's Stormwater Monitoring Plan.

Significance Criteria

According to *CEQA Guidelines* Section 15382, a significant effect on the environment means "a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project, including: land, air, water, minerals, flora, fauna, ambient noise, and objects of historic and aesthetic significance." Significance criteria are identified for each environmental issue in each resource section. The environmental criteria and considerations applied to determine the significance of 2025 LRDP-related changes in the environment are based on the *CEQA Guidelines* Appendix G. The significance criteria serve as benchmarks for determining if proposed activities or conditions would result in a significant adverse environmental impact when evaluated against the baseline conditions.

Approach to Analysis

Each section describes the analytical methods and key assumptions used to evaluate effects of the proposed 2025 LRDP.

7 This can occur when there is a short-term variance in normal operations during the baseline month, such as might be caused by unusual weather conditions, road closures, or power supply interruptions.

Impacts and Mitigation Measures

The EIR evaluates the environmental impacts that would result from implementation of the proposed 2025 LRDP. As stated above, the impacts identified are compared with predetermined significance criteria and classified according to significance categories.

The residual impact may still be significant even after implementation of applicable laws and regulations and feasible mitigation measures that would substantially reduce the impact severity. Mitigation measure effectiveness is determined by evaluating the residual impact remaining after mitigation. Those impacts meeting or exceeding the impact significance criteria after potentially feasible mitigation measures are applied are identified as residual impacts that remain significant and unavoidable. Implementation of more than one mitigation measure may be needed to reduce a significant impact below a level of significance.

Cumulative Impact Analysis

A cumulative impacts analysis follows each section's project-specific impacts and mitigation measures evaluations. Cumulative impacts result from project-specific impacts combined with the impacts from other past, present and reasonably foreseeable projects.[8]

As noted above, where a cumulative impact is significant when compared to baseline conditions, the analysis must address whether the project's contribution to the significant cumulative impact is "considerable." If the project's contribution is considerable, then the EIR must identify potentially feasible measures that could avoid or reduce the magnitude of the project's contribution to a less-than-considerable level. If the project's contribution is not considerable, the project's cumulative impact is considered less than significant and no mitigation for the project's contribution is required.[9]

The geographic scope of the cumulative impact analysis varies depending upon the specific environmental issue area being analyzed. The geographic scope defines the physical area within which a project may contribute to a specific cumulative impact. Therefore, past, present, and future reasonably foreseeable projects within the defined geographic area for a given cumulative issue must be considered. The cumulative impact analysis in each technical section includes a description of the cumulative analysis methodology and the geographic or temporal context in which the cumulative impact is analyzed (e.g., the Bay Area Air Basin, other activity concurrent with 2025 LRDP construction, etc.).

Consistent with *CEQA Guidelines* Section 15130(b), the cumulative impact analysis considers the proposed 2025 LRDP's effects in combination with the projections contained within previously approved planning documents and forecasting models, including but not limited to the Alameda County Transportation Commission Countywide Travel Demand Model, East Bay Municipal Utility District *Urban Water Management Plan 2020*, and regional planning documents from the

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8 *CEQA Guidelines* Section 15355.

9 *CEQA Guidelines* Section 15130(a)(3).

Association of Bay Area Governments (ABAG), Bay Area Air Quality Management District (BAAQMD), as well as applicable associated environmental review documents.

In addition, consistent with *CEQA Guidelines* Section 15130(b), the cumulative impact analysis also considers other known or reasonably foreseeable projects that could combine with potential impacts from implementation of the proposed 2025 LRDP within the local geographic area. Cumulative projects which, due to their proximity (located within approximately one-half mile of the Berkeley Lab campus), would have the greatest potential to contribute to localized cumulative effects include the following:

- **Cumulative Projects within the Berkeley Lab Campus**

  Certain projects that were previously approved under the 2006 LRDP and analyzed in the 2006 LRDP Final EIR are currently under construction at the Berkeley Lab campus or will be implemented in the near-term:

  – ***Biological and Environmental Program Integration Center (BioEPIC).*** This project consists of an approximately 73,000 gsf, four-story research and office building being constructed in the former Bevatron area adjacent to and north of Berkeley Lab Building 91. The BioEPIC will accommodate complementary DOE research programs from the Biosciences and Earth and Environmental Sciences Areas. The BioEPIC would not add to Berkeley Lab's overall population, but would relocate onsite workers from Berkeley Lab space and from off-site leased space in Berkeley. Construction of the BioEPIC will be completed by early 2025.

  – ***Collaboration Commons, and Transit Hub and Utilities Project (THUP).*** The Collaboration Commons project consists of a new 46,500-square-foot new hospitality center at the site of the recently demolished Cafeteria Building (Building 54). The Collaboration Commons would house the campus cafeteria, Health Services Department, some Human Resources Department functions, the Badging Office, and a 250-seat Conference Center. The Transit Hub and Utilities Project (THUP) is being constructed in tandem with the Collaboration Commons project. THUP's scope included the installation and relocation of several utilities in preparation for Collaboration Commons as well as construction of a shuttle transit hub that would be located centrally within the reconfigured Collaboration Commons building parking lot. Construction of the Collaboration Commons/THUP, which would not increase the campus population, is expected to be completed by early 2027.

  – ***Linear Assets Modernization Project (LAMP).*** The LAMP is a long-term effort to upgrade utility infrastructure across the Berkeley Lab campus, including electricity, water, natural gas, compressed air, sewer, storm drain, process controls and information technology (IT). These upgrades will modernize the linear utilities across the campus and add system loops, which will increase utility service diversity and resiliency. The LAMP will also develop utility corridors where common system alignments are practical, increase electrical capacity at Grizzly Peak Substation, and provide additional power for users. The LAMP design and construction efforts will span approximately 10 years; construction is expected to start in 2026 at the earliest. The project will be implemented in two subprojects: Subproject 1 will increase the capacity of the Grizzly Peak Substation, provide additional power to Building 59 for the National Energy Research Scientific Computing Center (NERSC), and perform utility upgrades in the Lawrence Corridor. Subproject 2 will involve utility upgrades in the East Canyon Corridor and McMillan Corridor.

- ***Air Cooling Heat Exchangers (ACHE) Yard.*** This project is part of the NERSC-10/ NERSC Facility Upgrade-2 (NFU-2) Project, which received CEQA and related approvals in 2023. The project will install an exterior yard for ACHE equipment to be constructed on undeveloped land just north of Shyh Wang Hall (Building 59), near the Lab main entrance. The yard would be constructed on a concrete foundation and contain perimeter fencing for noise abatement and visual shielding.

- ***ALS-U.*** This project will modernize and upgrade the existing equipment within the ALS. This improvement project is expected to be completed in 2029.

- **Off-site Cumulative Development within the UC Berkeley Campus**

  - ***UC Berkeley 2021 Long Range Development Plan Update.*** The UC Regents certified the *UC Berkeley 2021 LRDP and Housing Projects #1 and #2 Final EIR* and approved the *UC Berkeley 2021 LRDP Update* on July 22, 2021. The LRDP Update will guide UC Berkeley's land use development through the 2036-37 academic year within its Campus Park, Hill Campus West and East, and Clark Kerr Campus zones and elsewhere in Berkeley. The LRDP planning projection for the UC Berkeley population is 48,200 students and 19,000 faculty and staff through buildout. The LRDP Update's development program includes approximately 8.1 million net new gross square feet of academic life, campus life, residential, and parking spaces, including approximately 11,100 student beds and approximately 549 faculty and staff beds.

    The LRDP Update also includes two specific housing projects. Housing Project #1 would include the development of 772 beds for UC Berkeley students, as well as campus life amenities and public commercial space. Housing Project #2 would include development of approximately 1,179 beds for UC Berkeley students and 8 beds for UC Berkeley faculty/staff, as well as public retail and open space; and a separate building providing a clinic and approximately 125 affordable and supportive beds for residents not affiliated with UC Berkeley. Housing Project #1 (Anchor House) has been constructed and opened in August 2024, and Housing Project #2 (Peoples Park) completion date is anticipated to be Fall 2027 at the earliest.

    Other notable approved UC Berkeley projects that are presently under construction include:

    - *Engineering Center*: Approximately 34,700 gsf addition to the existing Bechtel Engineering Center and overlooking Memorial Glade, anticipated to be completed in 2025;

    - *The Gateway*, home of the College of Computing, Data Science, and Society (CDSS): An approximately 367,270-square-foot building to be located on Hearst Avenue at Arch Street, anticipated to be open during the 2025-2026 academic year;

    - *Undergraduate Academic Building*: An approximately 78,000 gsf building located on Campus Park along Campanile Way west of Dwinelle Hall, expected to be completed in 2026;

    - *Creekside Center (formerly Dwinelle Annex Renovation)*: Approximately 8,730 gsf with 20,000 gsf addition - renovation of the existing building for academic and research uses. Anticipated full completion in 2025;

    - *Heathcock Hall*: An approximately 81,700 gsf academic building for the College of Chemistry located at Gayley Road and University Drive, anticipated to be open in early 2027;

- *Berkeley Haas Entrepreneurship Hub,* at 2232 Piedmont Avenue: Renovation of approximately 6,600 gsf (existing) for academic and research is in construction. Estimated completion date unknown;
- *Switch Station #8*: Renovation of the Old Art Gallery to be used as a switch station, approximately 4,000 gsf (existing); and
- *University Hall Demolition:* Demolition of University Hall (145,100 gsf) is now underway. Subsequently, two laboratory buildings will be built on the site (please see Bakar ClimatEnginuity Hub, below).

Upcoming projects that are in planning and design include:

- *Bakar ClimatEnginuity Hub*: Located at Addison Street/Oxford, the project will consist of two buildings providing laboratory, flex space, offices and other uses. Construction is anticipated to start in Summer 2025 and be completed in 2028;
- *Bancroft Parking Structure Replacement*: The project will replace the existing Bancroft parking structure on Bancroft Way between College Avenue and Bowditch Street, and will provide 663 parking spaces. Construction is anticipated to start in Summer 2025 and be completed in Summer 2026;
- *Cal Softball Field Renovation:* The project will upgrade the Cal Softball Field on Centennial Drive, including providing additional spectator seats, a press box, lighting, locker rooms and improved training facilities. Date of construction to be determined pending litigation;
- *Beach Volleyball Courts*: The project will be located west of Edwards Stadium on the parking lot. Date of construction to be determined pending litigation; and
- *Bancroft/Fulton Housing*: The project will develop a 398,770 gsf student housing complex up to 26-stories that would include 590 dormitory units of student housing with 1,634 beds located on the south side of Bancroft Way at its intersection with Fulton Street. Approved in January 2025.

- **Pending Off-site Cumulative Development within the Cities of Berkeley and Oakland in the vicinity of the Berkeley Lab campus:** The notable, approved but not built development projects within either the cities of Berkeley or Oakland (within one-half mile of the Berkeley Lab campus) not already mentioned above include the following:[10]
  – *2660 and 2680 Bancroft Way, Berkeley*: An 8-story mixed-use housing development. 79-units, 32,248 gsf of residential, and 17,466 gsf office/commercial; and
  – *1712 Euclid Avenue, Berkeley*: The project will establish a group living accommodation (dormitory) for up to 35 residents in the existing theology school building.
  – *2737 Durant Avenue, Berkeley*: New 3-story residential with 4 units.

[10] Culled from https://berkeley.buildingeye.com/planning; and https://www.oaklandca.gov/topics/major-development-projects. Other small miscellaneous construction projects not listed here include individual Accessory Dwelling Units (ADUs) and house remodels, hardscape and landscaping improvements, and other minor construction and renovation projects.

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4.1 Aesthetics

4.1.1 Introduction

This section describes and evaluates the potential for proposed 2025 LRDP (the Project) implementation to result in significant impacts related to aesthetics. The section provides a description of the existing visual setting and visual resources on and in the vicinity of Berkeley Lab campus; includes a summary of plans, policies, and guidelines related to aesthetics; identifies criteria used to determine impact significance; and provides an analysis of the potential for campus development under the proposed 2025 LRDP to have a substantial adverse effect on a scenic vista, substantially damage scenic resources, conflict with applicable zoning and other regulations governing scenic quality, or create a new source of substantial light or glare that would adversely affect day or nighttime views in the area.

The analysis herein is based on the Project Description presented in Chapter 3, *Project Description*, a reconnaissance visit to the campus and its vicinity, and computer-generated visual simulations prepared by Prevision Design in support of this EIR.

4.1.2 Environmental Setting

Existing Berkeley Lab Campus and Vicinity

The Berkeley Lab campus occupies an approximately 202-acre site within 1,232 acres of UC Regent-owned land in the San Francisco Bay Area's East Bay hills. The campus straddles the border between the cities of Berkeley and Oakland. Figure 3-3 in Chapter 3 presents an aerial photograph identifying general features on the campus and its vicinity.

Berkeley Lab is surrounded on the west by UC Berkeley (Campus Park and Hill Campus West), and City of Berkeley multi-unit residential developments; on the north by City of Berkeley residential neighborhoods and various UC Berkeley facilities (including the Lawrence Hall of Science (LHS), Space Sciences Laboratory, and Mathematical Sciences Research Institute); on the east by UC Berkeley Hill Campus East; and on the south by UC Berkeley's Hill Campus West and East (including various recreational fields and pools), Botanical Garden, and by the Strawberry Canyon open space. Regional open space lies beyond UC Berkeley Hill Campus, including the 2,000-acre Tilden Regional Park to the northeast and east, and the 205-acre Claremont Canyon Regional Preserve to the south.

Portions of the Berkeley Lab campus are visible from a number of the aforementioned surrounding areas. However, as discussed below, due to the presence of on-site and off-site landforms, structures, and vegetation, and due to its relative elevation, the campus is partially screened from a number of public vantage points. While many limited views of the campus and some campus buildings are available from such vantage points as Memorial Stadium, the LHS, Grizzly Peak Road, and downtown Berkeley, the campus as a whole cannot be viewed from a single on-the-ground vantage point.

Visual Quality

Campus Location and Landform

The Berkeley Lab campus lies within the lower- to mid-elevation range of the East Bay hills. Campus elevations range from approximately 450 feet above sea level (asl) in the western campus near Cyclotron Road to approximately 1,100 feet asl in the north-eastern campus. The hillside topography includes a natural pattern of radiating ridges, knolls, and valleys formed by local seasonal creek drainages. Approximately 60 percent of the campus has slopes greater than 25 percent, and about 27 percent of the campus has slopes greater than 45 percent. The campus slopes support multiple ephemeral and intermittent drainages or streams, many of which have been culverted under adjoining development areas. Perennial streams on the campus include the North Fork of Strawberry Creek and Chicken Creek.

The campus supports a wide variety of native and non-native vegetation. Non-native annual grasses are predominant on the campus. Tree species includes stands of native trees, including coast live oak, California bay, and redwood. Non-native species include blue-gum eucalyptus, Monterey pine, Torrey pine, and Canary Island pine. Approximately two-thirds of the campus remains undeveloped as a result of steep slopes, slope stability issues, and the presence of riparian habitat. Approximately one-third of the campus that is developed is covered largely by impervious surfaces, including, but not limited to, buildings, roads, parking lots, and utility infrastructure.

Because of its varied topography and upland location, the Berkeley Lab campus was constructed as a series of buildings clustered together on interlinked terraces separated by rustic landscaped areas. Surface parking lots are often located adjacent to permanent buildings. Temporary one-story trailers are shoehorned between permanent buildings and roadways. The campus's steep topography influences its visual character by separating structures vertically. Buildings at different elevations may seem clustered tightly together in plan (overhead) view while often appearing distinct and much further apart when observed from mid- and long-range vantage points.

Land Use and Building Design

Figure 3-4 in Chapter 3, *Project Description*, illustrates existing Berkeley Lab campus facilities. Berkeley Lab's major research facilities have been developed within eight loosely organized development pads or clusters on the campus's relatively flat terraces. As illustrated in Figure 3-5 in Chapter 3, these development clusters include the Blackberry, Central Commons, Bayview, Northside, Charter Hill, Support Services, Redwood, and Strawberry development clusters. Most clusters tend toward a dominant research area or support function. Parking is mostly arranged in small lots or along roads, and other amenities are distributed throughout the clusters. There are currently 170 usable built structures on the campus, consisting of approximately 90 buildings, 20 trailers and 60 storage containers. These facilities provide space for research laboratories, accelerators, offices, machine and electrical shops, medical services, storage, food service, and communications.

The visual character of Berkeley Lab's built environment is eclectic. Many buildings display an industrial look and utilitarian quality due to the type of building materials (e.g., concrete, corrugated metal siding) and the visible mechanical equipment (exposed pipes, vents, panels, and tanks) related to the activities occurring in the buildings. Many buildings are painted in neutral colors (e.g., grey, beige) to blend with the natural setting. Some of the campus's newer buildings depict somewhat livelier hues (light green, powder blue). A few Berkeley Lab campus buildings are recognizable landmarks, including Building 6, which houses the Advanced Light Source (ALS), with its distinctive domed roof (see Building 6 on Figure 3-4 in Chapter 3, *Project Description*).

Views

The Berkeley Lab campus is situated in a scenic area that encompasses the East Bay hills and Strawberry and Blackberry Canyons. The hills provide a semi-natural, vegetated open space backdrop to the Berkeley Lab campus. The western slopes of these hills are typically wooded with native oak and California bay stands or with introduced eucalyptus or conifers. Geographic features, most notably the steep slopes that make up Strawberry Canyon, define the campus's visual setting, and stands of tall trees provide cover for the campus from most potential viewpoints in the surrounding region.

The campus is intermittently visible from surrounding short-, medium-, and long-range viewpoints. For purposes of EIR analysis, short-range views are from vantage points on the campus, with limited view corridors to or across the campus. Medium-range views are from public vantage points up to approximately 1 mile from the campus. Long-range views are from public vantage points greater than 1 mile from the campus.

Medium- and long-range viewing opportunities of and across the Berkeley Lab campus are rarely available due to topographic variation and intervening vegetation. Short-range views are generally available only from on-campus roadways and parking areas as well as from the upper stories of Lab buildings. Short-range views include the surrounding hillsides, vegetation, and other Lab buildings. Because Berkeley Lab is a controlled-access site, short-range views are observed primarily by Lab employees and authorized visitors. There are limited opportunities for short-range public views of the campus, with the most notable exception being views from upslope locations at the LHS. For the purposes of this section, only publicly available viewpoints are subject to CEQA review and impact determination and therefore, with the exception of the view from the LHS, the analysis in this section does not include short-range viewpoint locations.

The campus is visible in medium-range views from nearby elevated off-site locations, including Berkeley residential neighborhoods to the north and northwest. Long-range views of the campus are available from downtown Berkeley locations and from points farther west, such as the Berkeley Marina. Long-range off-site views within the Berkeley Lab campus are available from a variety of locations, including long stretches of Cyclotron, Alvarez, Chamberlain, McMillan, Doudna, Klauser, Glaser, Lawrence, and Calvin Roads; many upper elevation parking lots, and clearings throughout the campus; and from south and west-facing upper-story building windows. These vantage points afford views westward toward the Bay, of historic landmarks such as the Golden Gate Bridge and Alcatraz Island, of the San Francisco skyline and Peninsula, as well as the urban landscape of adjacent Berkeley and UC Berkeley campus development.

Light and Glare

Sources of light and glare on the Berkeley Lab campus are generally limited to the interior and exterior lights associated with development, including buildings, parking lots, and roads, and the reflection of sunlight and nighttime lighting on bright or reflective surfaces. All on-campus buildings and parking areas are equipped with outdoor, downward-directed light fixtures for nighttime lighting and security. Street lighting associated with the campus internal roadway and circulation network generates light and glare effects during early morning and evening hours. Existing campus buildings are sources of glare, as some windows and building materials can reflect natural light or nighttime exterior lighting. Moving and parked vehicles represent another campus glare source.

4.1.3 Regulatory Framework

University of California

Long Range Development Plan

UC campuses—including UC LBNL—are required to maintain and periodically update their LRDPs. An LRDP provides a high-level planning framework to guide land use, physical parameters, and capital investment in line with the campus's mission and strategic goals.[1] The LRDP provides adequate planning capacity for potential program and population growth and physical infrastructure that may be needed to support future campus development. However, an LRDP does not mandate growth or the provision of new facilities. Further, UC LRDPs do not expire and remain in effect until updated or replaced.

The current Berkeley Lab LRDP was adopted in 2007 and projected Lab development through 2025. The proposed 2025 LRDP analyzed in this EIR would replace the 2006 LRDP and provide guidance for Lab development through 2045.

LBNL Design Guidelines

The LBNL Design Guidelines provide specific guidelines for site planning, landscape, and building design as a means to implement the LRDP's development principles as each new project is developed. The LBNL Design Guidelines include the following specific planning and design guidance relevant to aesthetics:

The Land, Topography, and Views

- Provide landscape elements to visually screen large buildings;
- Mass and site buildings to minimize their visibility;
- Respect view corridors; and
- Minimize further increases in impermeable campus surfaces.

Linkages

- Minimize visual and environmental impacts of new parking lots; and
- Site and design parking structures to integrate with the natural surroundings.

[1] An LRDP is defined by statute (Public Resources Code [PRC] 21080.09) as a "physical development and land use plan to meet the academic and institutional objectives for a particular campus or medical center of public higher education."

4.1.4 Impacts and Mitigation Measures

Significance Criteria

For the purposes of this EIR, aesthetic impacts would be considered significant if they would exceed the Standards of Significance presented below, which are based on Appendix G of the *CEQA Guidelines*.

Would implementation of the LBNL 2025 LRDP:

a) Have a substantial adverse effect on a scenic vista;

b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway;

c) In nonurbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage points). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality; or

d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area.

Criteria Not Analyzed

Based on the Berkeley Lab campus location and proposed 2025 LRDP characteristics, there would be no impacts related to the following topic for the reasons described below:

- ***Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway***. Development under the proposed 2025 LRDP would not result in significant environmental impacts related to substantial damage to scenic resources within a State scenic highway because the Berkeley Lab campus is not on or within the viewshed of a State scenic highway. Therefore, this topic is not discussed further in this EIR.

Approach to Analysis

Evaluation of potential Project impacts on scenic vistas and scenic quality of the Berkeley Lab campus and its surroundings requires an understanding of the demolition and new construction that would potentially be implemented under the proposed 2025 LRDP. Those potential development changes may then be analyzed (separately or collectively) for how they would affect site character and views. To aid in this analysis, visual simulations illustrating potential future site development from representative public locations have been prepared and are presented in this section.

The visual simulations are based on the Illustrative Development Scenario described in Chapter 3. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of aesthetic impacts. The Illustrative Development Scenario is designed to conform with the proposed 2026 LRDP's design guidelines and height zoning.

The visual impact analysis in this section is based on field observations of the Berkeley Lab campus and vicinity, the aforementioned visual simulations, and a review of local aerial and ground-level photography. A total of nine pedestrian-level viewpoints (Viewpoints 1 through 9) are used to represent existing views of the campus. Viewpoints were identified by independent experts and represent (1) typical views from common types of viewing areas, such as public streets; (2) specific high sensitivity areas (e.g., Upper Jordan Fire Trail and LHS outdoor exhibition area) whose scenic views could be affected by Project development; and (3) views from a variety of directions and distances. Only viewpoints that would prominently capture changes and development posited in the Illustrative Development Scenario were chosen for visual simulation.

Using the nine pedestrian-level viewpoints, a total of eight visual simulations were prepared (Viewpoint 3 was determined to not have any views of development as depicted in the Illustrative Development Scenario analysis, and so no visual simulation was prepared). The visual simulations document views of and through the campus. In addition, for reference and informational purposes, a birds-eye (aerial) photograph of the Berkeley Lab campus was taken with use of a drone, and a visual simulation of the Illustrative Development Scenario was prepared for this elevated viewpoint.

Digitized photographs and computer modeling techniques were used to prepare the visual simulations. The visual simulations are based on a simple massing plan of the Illustrative Development Scenario. Buildings posited for analytical purposes in the scenario are only hypothetical at this time, thus detailed building plans are not available. The building massing included in the simulations illustrates rough approximations of building heights consistent with building height limits, orientation, and form. Actual future building designs under the proposed 2025 LRDP would include visually softening features such as setbacks, modulation, potential variation in the depths of façade planes, and fenestration (windows). Therefore, the visual simulations analyzed in this EIR can be considered a conservative and representative depiction of potential visual changes that could result from proposed 2026 LRDP implementation.

In addition, the visual simulations reflect vegetative changes that would occur on the campus during the term of the proposed Project. As stated in Chapter 3, *Project Description,* Berkeley Lab's Vegetation Management Program (VMP) would continue to implement tree and brush removal, tree trimming, and new tree planting throughout the perimeter open spaces and other heavily vegetated campus areas.

Impact Analysis

LRDP Impact AES-1: Implementation of the LBNL 2025 LRDP would not result in substantial adverse visual effects related to construction activities. (*Less than Significant*)

The proposed 2025 LRDP would continue on-campus demolition, construction, and renovation activities over the course of the 20-year planning period. Such activities are already a common part of the Berkeley Lab's operative routine, as the Lab has been undergoing continuous campus growth, change, and renewal since its inception.

New individual, medium- and large-sized building construction projects timeframes under the proposed 2025 LRDP would typically range between 18 and 24 months. During the 20-year LRDP planning period, there also is likely to be simultaneous construction, demolition, and renovation activities taking place on multiple large, medium, and small projects. At other times, there may be no substantial development projects underway. Typical construction sites would be noticeable hubs of activity and would contain large-scale equipment such as bulldozers, hauling trucks, loaders, cranes, and excavators, as well as disturbed land surfaces and stockpiled soils and materials. Grading and excavation, where required, could result in short-term changes in visual conditions, particularly if new development were to occur on relatively steep slopes. However, the majority of new buildings that would be constructed under the proposed 2025 LRDP are anticipated to occur as infill development in previously disturbed campus areas. These areas are mostly level or only moderately sloped. As a new building is constructed, the aesthetic environment of the development site would shift from one dominated by demolition and site preparation to excavation and grading to construction, which would include concrete pouring, erection of structural framing, and ultimately, application of exterior finishes. During these phases, which would make up the bulk of the construction period, activity at the individual development site would be noticeable from short-range viewpoints.

However, because of the limited duration and confined geographical extent of demolition and construction projects, and because existing vegetation, topography, and structures already limit views of the Berkeley Lab campus from off-site locations, construction activities would be unlikely to adversely affect scenic views or otherwise result in substantial adverse visual effects. Therefore, the visual impact related to construction activities under the proposed 2025 LRDP would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of aesthetic impacts.

For the reasons stated above for the proposed 2025 LRDP, construction activities consistent with campus development portrayed in the Illustrative Development Scenario would also be unlikely to adversely affect scenic views or otherwise result in substantial adverse visual effects, and the impact would be less than significant.

LRDP Impact AES-2: Implementation of the LBNL 2025 LRDP would not have a substantial adverse effect on a scenic vista. (*Less than Significant*)

Scenic vistas are locations from which the public can experience unique and exemplary views, typically from vantage points that offer panoramic views of great breadth and depth. As discussed above in the *Environmental Setting*, the Berkeley Lab campus is situated in a scenic area that encompasses the East Bay hills and Strawberry and Blackberry Canyons. The hills provide a semi-natural, vegetated open space backdrop to the Berkeley Lab campus. Long-range off-site views within the Berkeley Lab campus are available from a variety of locations. These vantage points afford views westward toward the Bay, of historic landmarks such as the Golden Gate Bridge and Alcatraz Island, of the San Francisco skyline and Peninsula, as well as the urban landscape of adjacent Berkeley and UC campus development. The campus is also part of scenic vistas of the East Bay hills that are available to the public from distant to mid-range vantage points in the cities of Berkeley and Oakland.

As described in Chapter 3, *Project Description*, some existing campus buildings are expected to be demolished and new buildings constructed under the proposed 2025 LRDP, with an overall net increase of about 17 percent in campus building space. Most new development would occur as infill in existing development clusters. In addition, under Berkeley Lab's VMP, vegetative changes are expected to occur concurrently throughout the heavily vegetated campus areas over the term of the proposed 2025 LRDP.

Proposed 2025 LRDP implementation would alter views of the Berkeley Lab campus from surrounding areas, including the LHS and residential neighborhoods and commercial areas in the cities of Berkeley and Oakland. Views of the Berkeley Lab campus would incrementally change because some of the campus development areas would be at least partially visible from publicly accessible vantage points. In most instances, however, direct views of any one specific building site would not be available, as views would be limited by topographical variations on the campus; intervening buildings/structures; trees and other vegetation; and setbacks of developable areas. No buildings would be constructed with heights that are inconsistent with existing campus development and/or without sufficient screening to prevent dramatic alteration of existing campus development or its skyline from long-range views. New construction would be required to adhere to the height zones shown on Figure 3-8, Building Height Zones, in Chapter 3, *Project Description*, which present building height zones that would apply to development under the proposed 2025 LRDP. These height zones are also included in the proposed 2025 LRDP. The height zones would guide building placement and heights with respect to aesthetic considerations and would ensure that long-range or panoramic views of and from the Lab Campus would not be obstructed or otherwise marred. Any future proposals under the proposed 2025 LRDP that could exceed the LRDP height zones would be subject to subsequent CEQA review and approval, as needed. In addition, the Lab would continue to implement its existing policies for revegetation and landscaping, with an emphasis on the use of native plants and trees. The proposed 2025 LRDP and the LBNL Design Guidelines call for, among other things, clustering new development primarily in existing developed areas, massing and siting buildings to minimize off-site visibility, and providing landscape to visually screen large buildings.

Given the above factors, development changes on the Lab campus under the proposed 2025 LRDP would not adversely affect a scenic vista and scenic vistas would continue to retain their scenic qualities and the impact would, therefore, be less than significant.

Mitigation: None required.

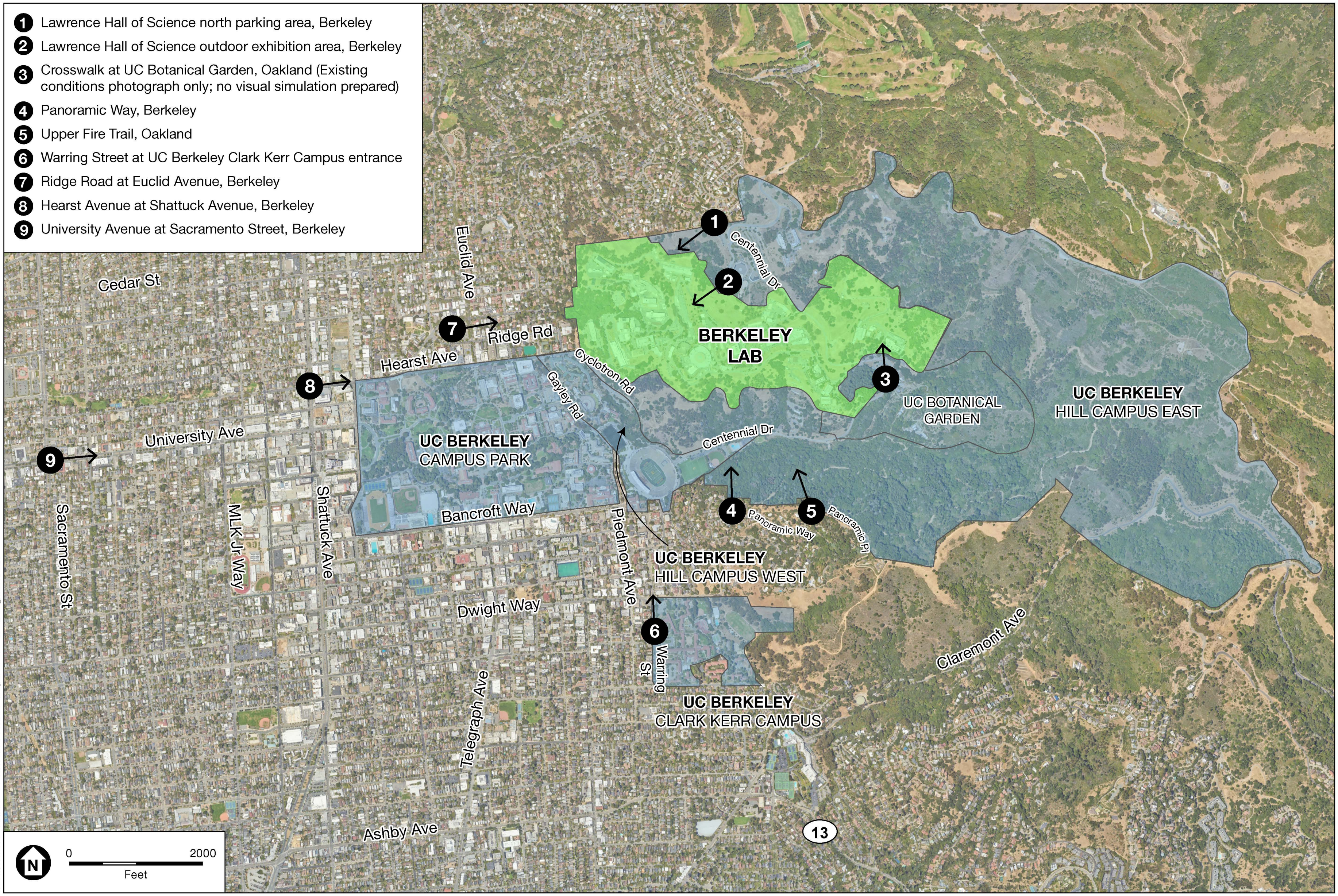
Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the scenario. Any of the buildings analyzed in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for evaluating scenic vista impacts. The analysis below considers existing views of the Berkeley Lab campus from representative public vantage points. Corresponding conceptual simulations and view diagrams are presented that illustrate how the future campus might appear after construction of buildings posited for analysis under the Illustrative Development Scenario.

Figure 4.1-1 illustrates the viewpoint locations included in this analysis. As shown in Figure 4.1-1, a total of nine pedestrian-level publicly available viewpoints (Viewpoints 1 through 9) were selected. Please see *Approach to Analysis*, above, for how viewpoints were selected. Viewpoints 1 and 2 are from points north of, and above, the campus in the vicinity of the LHS; Viewpoint 3 is from Centennial Drive at the UC Botanical Garden east of the campus; Viewpoints 4 and 5 are south of, and across the Strawberry Canyon, from the campus on Panoramic Way and the Upper Jordan Fire Trail, respectively; Viewpoint 6 is south of the campus on Warring Street at the entrance to the UC Berkeley Clark Kerr campus; and Viewpoints 7, 8, and 9 are from varying distances west of the campus on Ridge Road, Hearst Avenue, and University Avenue, respectively.

For informational purposes,[2] **Figure 4.1-2** presents a bird's eye view of the Berkeley Lab campus and a campus-wide simulation of the Illustrative Development Scenario. This figure provides an overall conceptual depiction of existing building removal and new campus building development that could occur as posited under the Illustrative Development Scenario. In addition, this simulation reflects vegetation changes that would occur on the campus as a result of Berkeley Lab's VMP. The simulation also portrays planned cumulative building projects–those projects approved under the 2006 LRDP and currently or soon to be under construction–in comparison to existing conditions.

Figure 4.1-3 (Viewpoint 1) and **Figure 4.1-4** (Viewpoint 2) depict existing and simulated views of campus development posited under the Illustrative Development Scenario from two locations at the LHS: the north parking lot and the outdoor exhibit area, respectively. Both views are from elevated locations and look west-southwest down towards the campus.

2 Only publicly available viewpoints are subject to CEQA review and impact determination. The high-altitude vantage used in Figure 4.1-2 is not from a public viewpoint and is presented only to provide a campus-wide visual context to the reader.



SOURCE: ESA, 2024; Google Earth

Figure 4.1-1
Viewpoint Location Map

ESA

2019/D201901556.00 - LBNL LRDP EIR/05 Graphics-GIS-Modeling/Illustrator

SOURCE: PreVision, 2024

LBNL LRDP EIR

Figure 4.1-2
Aerial Photo of Berkeley Lab Campus and
Simulation of Illustrative Development Scenario

2019/D201901556.00 - LBNL LRDP EIR/05 Graphics-GIS-Modeling/Illustrator

SOURCE: PreVision, 2024

LBNL LRDP EIR

Figure 4.1-3
Viewpoint 1 Site Photo and Simulation of Illustrative Development Scenario

2019/D201901556.00 - LBNL LRDP EIR/05 Graphics-GIS-Modeling/Illustrator

SOURCE: PreVision, 2024

Figure 4.1-4
Viewpoint 2 Site Photo and Simulation of Illustrative Development Scenario

ESA

In Figure 4.1-3 (Viewpoint 1, from the LHS north parking area), existing foreground views consist of sloping hillsides covered in shrubs and trees. Breaks in the vegetation give way to mid-ground views of the Berkeley Lab campus. From this perspective, the most prominent visible campus element is the Building 6 (ALS Building) dome. Adjacent to Building 6, upper portions of existing buildings are visible, including Building 80 (ALS Support Building), Building 15 (ALS User Support Building), Building 2 (Advanced Materials Laboratory), and Building 23 (Guest House). Existing background views include the cityscapes of Oakland, Berkeley, and San Francisco; San Francisco Bay, and wide expanses of the coastal hills.

As depicted in Figure 4.1-3, with campus development posited under the Illustrative Development Scenario, views from this vantage point would change. Foreground views would continue to comprise the hillside sloping down southwestward to the developed campus terraces. In mid-ground views, existing Building 64 (Life Sciences/Earth Sciences High Bay) and Building 70 (Energy & Environmental/Nuclear Science) would be removed, and new buildings posited under the Illustrative Development Scenario would be partially visible, including Building S-3 (BioGEM), Building S-6 (Modular General Purpose Computing Facility), Building S-7 (Accelerator & Engineering Support Building), Building S-10 (Flex Building), Building S-13 (Laser Linear Accelerator Tunnel), and Building S-14 (Building 71 Expansion).

As depicted in the Illustrative Development Scenario, some of these new buildings would be built adjacent to existing structures, while others would replace existing buildings. As shown in the simulation, several of these buildings would be clustered near Building 6, and other new buildings would be located to the west and northwest of Building 6.

As also depicted in Figure 4.1-3, under cumulative conditions (discussed further below under LRDP Impact CUM-AES-1), the existing view from this vantage point would change to include partial views of the planned Collaboration Commons building (currently under construction) at the site of the recently demolished Cafeteria (Building 54).

As shown in Figure 4.1-4, taken from the LHS outdoor exhibition area, Viewpoint 2 provides a closer, more southern perspective of the campus than Viewpoint 1. Existing foreground views consist of sloping hillsides covered in grassland, shrubs, and trees. Similar to Viewpoint 1, the most prominent visible campus element from this perspective is the Building 6 (ALS Building) dome, and in the background, the urbanized areas of Oakland and Berkeley. Further beyond, San Francisco, San Francisco Bay, and coastal hills may be seen.

With campus development posited under the Illustrative Development Scenario, existing views from this vantage point would change. Foreground views would continue to comprise the hillside sloping southwestward to the developed campus terraces. However, in mid-ground views, existing Building 58 (Heavy Ion Fusion Accelerator Research) and Building 70 (Energy & Environmental/Nuclear Science) would be removed, and a number of new buildings posited under the Illustrative Development Scenario would be partially visible. New construction from this viewpoint would generally appear more prominent than from Viewpoint 1. New construction consistent with the Illustrative Development Scenario and visible from Viewpoint 2 would include Building S-1 (Advanced Materials Discovery Building), Building S-2 (Charter Hill Modular Utility

Plant (MUP)), Building S-7 (Accelerator & Engineering Support Building), Building S-8 (Chemical Sciences Building), and Building S-10 (Flex Building). Some of these new buildings would be built adjacent to existing structures, while others would replace existing structures. The Collaboration Commons building, currently under construction, would also be visible from this viewpoint.

Figure 4.1-5 (Viewpoint 3) presents an existing view of the Berkeley Lab campus, looking north from approximately the easternmost extent of Centennial Drive, where an existing crosswalk provides access to the UC Berkeley Botanical Garden. The existing view from this location, near the Berkeley Lab Strawberry Gate, is primarily of stairs that provide pedestrian access to the Berkeley Lab campus, as well as trees, other vegetation, and the open sky. No new buildings posited under the Illustrative Development Scenario, or planned cumulative development, would be visible from this viewpoint. Consequently, no visual simulation is presented from this viewpoint.

SOURCE: Prevision Design, 2024 LBNL LRDP EIR

Figure 4.1-5
Existing View from Centennial Drive
Crosswalk at UC Botanical Garden

Figure 4.1-6 (Viewpoint 4, from Panoramic Way in Berkeley) and **Figure 4.1-7** (Viewpoint 5, from the Upper Jordan Fire Trail in Oakland) depict existing views and simulations of campus development posited under the Illustrative Development Scenario of the Berkeley Lab campus from across Strawberry Canyon to the south. Both viewpoints look generally north.

The existing foreground view in Figure 4.1-6 (Viewpoint 4) is dominated by trees and vegetation, which gives way to mid-range views of the campus Charter Hill development cluster, with Building 30 (Solar Energy Research Center (SERC)), Building 33 (General Purpose Lab (GPL), and Building 48 (Alameda County Fire Station 19) partially visible. With campus development posited under the Illustrative Development Scenario, the view from this vantage point would change to include partial views of two new buildings: Building S-1 (Advanced Materials Discovery Building) and Building S-8 (Chemical Sciences Building).

SOURCE: PreVision, 2024

Figure 4.1-6
Viewpoint 4 Site Photo and Simulation of Illustrative Development Scenario

2019/D201901556.00 - LBNL LRDP EIR/05 Graphics-GIS-Modeling/Illustrator

SOURCE: PreVision, 2024

LBNL LRDP EIR

Figure 4.1-7
Viewpoint 5 Site Photo and Simulation of Illustrative Development Scenario

ESA

Similar to Viewpoint 4, the existing foreground view from Viewpoint 5 is characterized by trees and vegetation, and it also gives way to a long-range view of the Charter Hill development cluster, with the Building 6 dome comprising the most prominent visible element from this viewpoint. Building 76 (Facilities Offices) and Grizzly Peak Substation facilities are also visible from this viewpoint. With campus development posited under the Illustrative Development Scenario this view would change to include partial views of three new buildings: Building S-1 (Advanced Materials Discovery Building), Building S-8 (Chemical Sciences Building), and Building S-9 (ALS Support Facility).

Figure 4.1-8 (Viewpoint 6) depicts long-range existing and simulated future views of the campus Blackberry and Central Commons areas from Warring Street at the UC Berkeley Clark Kerr Campus entrance. The view is looking north. Existing foreground views include expanses of paved roadway (Warring Street) framed by mature trees and low- and medium-rise buildings. In the background, the view corridor gives way to the rising hills of the Berkeley Lab campus. The existing Building 70A (multi-purpose research building) within the Blackberry development cluster is the most prominent visible campus element from this viewpoint. As shown in Figure 4.1-8, no new buildings under the Illustrative Development Scenario are visible from this viewpoint. However, future vegetative changes on the hillside within the southwestern campus as a result of the Lab's VMP activities are visible in the visual simulation. In addition, the Collaboration Commons building, currently under construction, is visible from this viewpoint in the visual simulation (addressed in LRDP Impact CUM-AES-1).

Figure 4.1-9 (Viewpoint 7), **Figure 4.1-10** (Viewpoint 8), and **Figure 4.1-11** (Viewpoint 9) depict long-range existing views and visual simulations of campus development posited under the Illustrative Development Scenario at the Berkeley Lab campus from downtown Berkeley, looking east.

In Figure 4.1-9 (Viewpoint 7), near the intersection of Ridge Road and Euclid Avenue, existing buildings in Berkeley and extensive tree canopies occupy the foreground and mid-ground. In the background, portions of existing buildings within the Blackberry development cluster of the Berkeley Lab campus are visible, including the Building 50 complex (Laboratory administration/multi-purpose research building), and Building 88 (88-inch Cyclotron). With campus development posited under the Illustrative Development Scenario, the view from this vantage point would change to include partial views of three new buildings: Building S-3 (BioGEM), Building S-11 (Bayview Building 4), and Building S-14 (Building 71 Expansion). In addition, as depicted in Figure 4.1-9, the view from this vantage point also reflects the removal or thinning of existing trees and vegetation as a result of the Lab's VMP.

In Figure 4.1-10 (Viewpoint 8), near the intersection of Hearst Avenue and Shattuck Avenue, existing foreground views include expanses of the 4-lane Hearst Avenue roadway framed by low- to medium-density buildings and street trees. Mid-ground views are also of buildings along Hearst Avenue. In the background, the view gives way to the rising hills of the Berkeley Lab campus. Several existing Berkeley Lab buildings are visible from this location. Most notable are Building 59 (Shyh Wang Hall), Building 50B (Physics/Computing Services Building), Building 70A (multi-purpose research building), and the Building 6 (ALS Building) dome.

SOURCE: PreVision, 2024

Figure 4.1-8
Viewpoint 6 Site Photo and Simulation of Illustrative Development Scenario

ESA

2019/D201901556.00 - LBNL LRDP EIR/05 Graphics-GIS-Modeling/Illustrator

SOURCE: PreVision, 2024

Figure 4.1-9
Viewpoint 7 Site Photo and Simulation of Illustrative Development Scenario

2019/D201901556.00 - LBNL LRDP EIR/05 Graphics-GIS-Modeling/Illustrator

SOURCE: PreVision, 2024

Figure 4.1-10
Viewpoint 8 Site Photo and Simulation of Illustrative Development Scenario

SOURCE: PreVision, 2024

Figure 4.1-11
Viewpoint 9 Site Photo and Simulation of Illustrative Development Scenario

With campus development posited under the Illustrative Development Scenario, the view from this vantage point would change to include partial views of two new buildings: Building S-8 (Chemical Sciences Building) and Building S-10 (Flex Building). As a result of the Lab's on-going and future VMP activities, vegetative changes on the hillside within the southwestern portion of the campus are apparent in the visual simulation.

Also depicted in Figure 4.1-10, under cumulative conditions (addressed in LRDP Impact CUM-AES-1), the view from this vantage point would change to include partial views of the Collaboration Commons building, currently under construction, and the Building 59 Air Cooling Heat Exchangers (ACHE) yard.

In Figure 4.1-11 (Viewpoint 9), near the intersection of University Avenue and Sacramento Street, existing foreground views include the 4-lane University Avenue framed by low- to medium-density buildings and street trees. Foreground views give way to the rising hills of the Berkeley Lab campus in the distance. From this perspective, the most prominent visible campus element is the Building 6 (ALS Building) dome. With campus development posited under the Illustrative Development Scenario, the view from this vantage point would change to include partial views of two new buildings: Building S-7 (Accelerator & Engineering Support Building) and Building S-8 (Chemical Sciences Building). In addition, future vegetative changes on the hillside within the southwestern campus as a result of the Lab's VMP activities are apparent in the visual simulation. Lastly, under cumulative conditions, the view from this vantage point would change to include partial views of the Collaboration Commons building, currently under construction, (addressed in LRDP Impact CUM-AES-1).

Based on the visual simulations presented above, and for the same reasons discussed under the proposed 2025 LRDP above, new development on the campus that is consistent with the Illustrative Development Scenario would not substantially block or degrade scenic views from public vantage points, and scenic vistas would continue to retain their scenic qualities. Consequently, campus development posited under the Illustrative Development Scenario would not have a substantial adverse effect on a scenic vista, and the impact would, therefore, be less than significant.

LRDP Impact AES-3: Implementation of the LBNL 2025 LRDP would occur within an urbanized area, and would not conflict with applicable zoning and other regulations governing scenic quality. ***(Less than Significant)***

The Berkeley Lab campus is located on UC Regent-owned land within the cities of Berkeley and Oakland. The Berkeley Lab campus qualifies as an "urban area," as defined in *CEQA Guidelines* Section 21094.5, because it is located in the incorporated cities of Berkeley and Oakland. Therefore, as defined above under *Significance Criteria*, the proposed 2025 LRDP would result in adverse effects related to scenic quality if it were to conflict with applicable regulations governing scenic quality.

Berkeley Lab is a federal facility operated by the University of California and conducts work within the University's mission on land that is owned by the Regents of the University of

California. As such, UC LBNL is generally exempt under the federal and state constitutions from compliance with local zoning and land use regulations related to scenic quality.

The proposed 2025 LRDP, if adopted by the UC Regents, would be the overarching planning guideline document for the Berkeley Lab campus, and development under the Plan would not conflict with its own principles and strategies governing scenic quality. Development projects implemented under the proposed 2025 LRDP would be required to comply with the LRDP principles, goals, and strategies and the LBNL Design Guidelines, including specific planning and design guidance relevant to aesthetics, as provided above in the *Regulatory Framework*.

For the reasons stated above, the proposed 2025 LRDP would not conflict with applicable zoning and other regulations governing scenic quality. The impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of aesthetic impacts.

For the reasons stated above with respect to the proposed 2025 LRDP, campus development posited under the Illustrative Development Scenario would also not conflict with applicable zoning and other regulations governing scenic quality, and the impact would be less than significant.

LRDP Impact AES-4: Implementation of the LBNL 2025 LRDP could create a new source of substantial light or glare which would adversely affect day or nighttime views in the area. *(Potentially Significant; Less than Significant with Mitigation)*

Proposed 2025 LRDP implementation would result in construction of new buildings that would incrementally increase existing lighting levels on the campus. Future new buildings could generate additional light in several ways. Light from the new building interiors may be visible through building windows. In addition, exterior lighting fixtures would be standard features for new Lab buildings for nighttime safety and security, especially at building entrances. Outdoor lighting fixtures may also be installed along new pedestrian walkways around building perimeters and in new parking areas for wayfinding, safety, and security.

New buildings could also be sources of glare, as some windows and building materials can reflect natural light or nighttime exterior lighting. As discussed in Section 4.14, *Transportation*, the proposed 2025 LRDP would continue to encourage the use of non-single occupant automobile travel modes and reduce the motor vehicle trips generated by the campus. Therefore, lighting due to vehicle headlights and glare due to vehicle reflective surfaces would not be expected to increase substantially under the proposed 2025 LRDP.

The varied campus topography, intervening trees and other vegetation, and setbacks of developable areas from the campus boundary would serve, in part, to screen and/or minimize the effects of new, Project-related campus sources of lighting and glare to surrounding land uses. Nevertheless, these sources of new light and glare could adversely affect surrounding land uses and passing motorists. Therefore, the impact related to light or glare is considered potentially significant. Mitigation measures are set forth below to reduce this impact.

> **LRDP Mitigation Measure AES-4a:** Each new building constructed pursuant to the 2025 LRDP shall incorporate design standards that ensure lighting would be designed to confine illumination to its specific site, in order to minimize light spillage to adjacent buildings and open space areas.
>
> **LRDP Mitigation Measure AES-4b:** New exterior lighting fixtures shall be compatible with existing lighting fixtures and installations in the vicinity of the new building, and they shall be equipped with automatic control systems (i.e., photocells) to turn the light on or off based on ambient light conditions. In general, and unless otherwise necessary for safety considerations, exterior lighting at building entrances, along walkways and streets, and in parking lots shall maintain an illumination level of not more than 20 Lux (approximately 2 foot-candles).
>
> **LRDP Mitigation Measure AES-4c:** All new buildings constructed pursuant to the 2025 LRDP shall incorporate design standards that preclude or limit the use of reflective exterior wall materials or reflective glass, or the use of white surfaces for roofs, roads, and parking lots, except in specific instances when required for energy conservation.
>
> **Significance after Mitigation:** Less than significant. Implementation of LRDP Mitigation Measures AES-4a through AES-4c would reduce the impact to a less-than-significant level by requiring new buildings constructed pursuant to the 2025 LRDP incorporate design standards that minimize excessive lighting and glare.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of impacts related to light and glare.

For the reasons stated above with respect to the proposed 2025 LRDP, campus development posited under the Illustrative Development Scenario would also implement LRDP Mitigation Measures AES-4a through AES-4c to reduce adverse impacts related to light or glare to a less-than-significant level.

Cumulative Impacts

LRDP Impact CUM-AES-1: Implementation of the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, would not result in significant cumulative impacts related to aesthetics. (*Less than Significant*)

The geographic context for this cumulative analysis includes the Berkeley Lab campus, UC Berkeley campus, and residential areas proximate to the Lab within the cities of Berkeley and Oakland. As discussed in LRDP Impacts AES-2 through AES-4, development on the Lab would be subject to LRDP principles, goals, and strategies and the LBNL Design Guidelines, including specific planning and design guidance to ensure that adverse effects of new campus development related to scenic vistas, scenic quality, and light and glare are minimized. In addition, implementation of LRDP Mitigation Measures AES-4a through AES-4c would require new buildings constructed pursuant to the proposed 2025 LRDP to incorporate design standards that minimize excessive lighting and glare. Similarly, individual development projects on the UC Berkeley campus would be subject to UC Berkeley requirements related to aesthetics, including project-level design review. Cumulative projects under the jurisdiction of the cities of Berkeley and Oakland would also be reviewed subject to relevant City policies and regulations pertaining to aesthetics, such as those described in Section 4.13, *Regulatory Framework*. These include policies and regulations for both cities that ensure compatibility between various developments and preservation of significant scenic features, such as the East Bay hills and San Francisco Bay. Therefore, cumulative impacts of the proposed 2025 LRDP related to scenic vistas, scenic quality, and light and glare, combined with the impacts of past, present, and future development in the campus vicinity, would be less than significant.

In summary, proposed 2025 LRDP implementation, in combination with past, present, and reasonably foreseeable future projects, would not result in significant cumulative aesthetic impacts, and the cumulative impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the Illustrative Development Scenario is an appropriate and conservative basis for the evaluation of aesthetic impacts. For the reasons stated above with respect to the proposed 2025 LRDP, campus development posited under the Illustrative Development Scenario, in combination with past, present, and reasonably foreseeable future projects in the campus vicinity, would not result in significant cumulative impacts related to aesthetics. The cumulative impact would be less than significant.

4.2 Air Quality

4.2.1 Introduction

This section assesses the potential for the implementation of the proposed 2025 LRDP (the Project) to result in significant air quality impacts. The section discusses the existing air quality conditions in the Project area; includes a summary of the University plans and policies and applicable federal, State, and local laws and regulations related to air quality; identifies significance criteria used to evaluate air quality impacts; and analyzes the potential for the proposed Project to significantly affect existing air quality conditions, both regionally and locally, due to Project activities that have the potential to emit criteria air pollutants and toxic air contaminants (TACs). The analysis determines whether those emissions are significant in relation to applicable air quality standards and identifies feasible mitigation measures for significant adverse impacts. This section also includes an analysis of cumulative air quality impacts. The impacts of Project-related greenhouse gas (GHG) emissions are analyzed and presented in Section 4.7, *Greenhouse Gas Emissions*.

The analysis in this section is based on a review of existing air quality conditions in the region and air quality regulations administered by the United States Environmental Protection Agency (EPA), the California Air Resources Board (CARB), and the Bay Area Air Quality Management District (BAAQMD). The analysis utilizes methodologies set forth in the most recent BAAQMD *California Air Quality Act (CEQA) Air Quality Guidelines* (BAAQMD, 2023a). The analysis in this section also summarizes the findings of a Health Risk Assessment (HRA) prepared in support of this EIR.

4.2.2 Environmental Setting

The study area for analysis of impacts to the applicable air quality plan and cumulatively considerable net increases of criteria pollutants is the San Francisco Bay Area Air Basin (SFBAAB or Bay Area). The study area for analysis of impacts relative to exposure of sensitive receptors to pollutant concentrations and odors is within an approximate 1,000- to 1,500-foot radius of the Berkeley Lab campus boundary, which is typically the distance at which pollutant concentrations decrease substantially (CARB, 2005) and was confirmed by the findings of the study conducted for this EIR (described further below in LRDP Impact AQ-3).

Climate and Meteorology

Climate and meteorological conditions such as wind speed, wind direction, and air temperature gradients interact with the physical features of the landscape to determine the movement and dispersal of air pollutants. Berkeley Lab straddles the boundary between the cities of Berkeley and Oakland, and it is within the SFBAAB. The SFBAAB encompasses the nine-county region including all of Alameda, Contra Costa, Santa Clara, San Francisco, San Mateo, Marin, and Napa counties, and the southern portions of Solano and Sonoma Counties. The Bay Area climate is determined largely by a high-pressure system often present over the eastern Pacific Ocean off the North American west coast. During winter, the Pacific high-pressure system shifts southward, allowing an increased number of storm systems to pass through the region. During summer and early fall, when fewer storms pass through the region, emissions generated within the Bay Area tend to accumulate due to more stable conditions. Abundant sunshine under the restraining influences of topography and subsidence inversions creates conditions that are conducive to the formation of photochemical pollutants, such as ground-level ozone and secondary particulates, including nitrates and sulfates.

More precisely, the Project area lies within the SFBAAB's northern Alameda and western Contra Costa Counties climatological subregion. This subregion extends from Richmond to San Leandro with San Francisco Bay as its western boundary and the East Bay Hills as its eastern boundary. In this subregion, marine air traveling through the Golden Gate and across San Francisco and the San Bruno Gap (a gap in the Coastal Range between the ocean and the San Francisco Airport) is a dominant weather factor. Average wind speeds vary from season to season with the strongest average winds occurring during summer and the lightest average winds during winter. Average maximum summer temperatures in Berkeley are in the mid-70s degrees Fahrenheit (ºF), and average maximum winter temperatures are in the mid- to high-50s ºF. Rainfall is highly variable and confined almost exclusively to the "wet season," which extends from early November to mid-April. Berkeley averages 29 inches of annual precipitation, but because much of the area's rainfall is derived from the fringes of mid-latitude storms, a shift in the annual storm track of a few hundred miles can mean the difference between a very wet year and near drought conditions (BAAQMD, 2017a).

Existing Ambient Air Quality

Criteria Air Pollutants

As required by the 1970 federal Clean Air Act (CAA), the EPA initially identified six air pollutants that are pervasive in urban environments and for which State and federal health-based ambient air quality standards have been established. The EPA calls these pollutants "criteria air pollutants." Ozone, carbon monoxide (CO), particulate matter (PM), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead are the six criteria air pollutants originally identified by the EPA. Since then, subsets of particulate matter have been also identified for which air quality standards have been established. These include particulate matter 10 microns or less in diameter (PM_{10}) and particulate matter 2.5 microns or less in diameter ($PM_{2.5}$).

BAAQMD (the District) is the regional agency with jurisdiction for regulating air quality within the nine-county SFBAAB. The region's air quality monitoring network provides information on ambient concentrations of criteria air pollutants at various locations in the SFBAAB. **Table 4.2-1** presents a three-year summary for the period 2021 to 2023 of the highest annual criteria air pollutant concentrations. These data were collected at the nearest available District monitoring station: the West Oakland air quality monitoring station operated and maintained by BAAQMD at 1100 21st Street, approximately 4.5 miles southwest of Berkeley Lab. Table 4.2-1 also compares measured pollutant concentrations with the most stringent applicable ambient air quality standards (State or federal). The table lists only those pollutants that are monitored at the West Oakland monitoring station.

TABLE 4.2-1
SUMMARY OF AIR QUALITY MONITORING DATA (2021–2023) – OAKLAND WEST

Pollutant	Applicable Standard	Number of Days Standards Were Exceeded and Maximum Concentrations Measured[a]		
		2021	2022	2023
Ozone				
Maximum 1-Hour Concentration (ppm)	0.09 ppm[b]	0.067	0.054	0.054
Days 1-Hour State Standard Exceeded		0	0	0
Maximum 8-Hour Concentration (ppm)	0.07 ppm[b,c]	0.046	0.041	0.045
Days 8-Hour State/National Standard Exceeded		0	0	0
Carbon Monoxide (CO)				
Maximum 1-Hour Concentration (ppm)	20 ppm[b]	2.3	2.2	2.3
Days 1-Hour Standard Exceeded		0	0	0
Maximum 8-Hour Concentration (ppm)	9 ppm[b]	1.8	1.8	1.8
Days 8-Hour Standard Exceeded		0	0	0
Fine Particulate Matter ($PM_{2.5}$)				
Maximum 24-Hour Concentration (μg/m^3)	35 μg/m^3	25.4	33.8	42.8
Days 24-Hour National Standard Exceeded		0	0	1
State and National Annual Average (μg/m^3)	12 μg/m^3[b,c]	7.5	8.1	6.8
Days 24-Hour Standard Exceeded		0	0	1
Nitrogen Dioxide (NO_2)				
Maximum 1-Hour Concentration (ppm)	0.1 ppm[c]	0.049	0.043	0.048
Days 1-Hour National Standard Exceeded		0	0	0

NOTES: - = data not available; μg/m^3 = micrograms per cubic meter; ppm = parts per million.

a. Number of days exceeded is for all days in a given year
b. State standard, not to be exceeded.
c. National standard, not to be exceeded. In February 2024, the EPA lowered the federal primary $PM_{2.5}$ annual average standard to 9.0 ug/m3 from the 12.0 ug/m3 standard set in 2012.

SOURCE: CARB, 2023a.

Compliance with the standards is established on a regional basis, as opposed to the city or local level. In SFBAAB, compliance is demonstrated by ongoing measurements of pollutant concentrations at more than 30 air quality monitoring stations operated by the air district throughout the nine Bay Area counties. An exceedance of an ambient air quality standard at any one of the stations counts as a regional exceedance.

Ozone

Ozone is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving reactive organic gases (ROG) (also sometimes referred to as “volatile organic compounds” [VOCs] by some regulating agencies) and nitrogen oxides (NO_X). The main sources of ROG and NO_X emissions, often referred to as “ozone precursors,” are combustion processes (including motor vehicle engines) and the evaporation of solvents, paints, and fuels. In the SFBAAB, automobiles are the single largest source of ozone precursors. Ozone is referred to as a regional air pollutant because its precursors are transported and diffused by wind concurrently with ozone production through the photochemical reaction process. Exposure to ozone can cause health issues such as eye irritation, airway constriction, and shortness of breath and can aggravate existing respiratory diseases such as asthma, bronchitis, and emphysema (CARB, 2024a).

Table 4.2-1 shows that, between 2021 and 2023, the most stringent applicable standards for ozone (State 1-hour standard of 0.09 parts per million [ppm] and the national 8-hour standard of 0.07 ppm) were not exceeded at the West Oakland monitoring station.

Carbon Monoxide

Carbon monoxide (CO) is an odorless, colorless gas usually formed as the result of the incomplete combustion of fuels. The single largest source of CO emissions is motor vehicles, and the highest emissions levels occur during low travel speeds, stop-and-go driving, cold starts, and hard acceleration. Exposure to high concentrations of CO reduces the oxygen-carrying capacity of the blood and can cause headaches, nausea, dizziness, and fatigue; impair central nervous system function; and induce angina (chest pain) in persons with serious heart disease. Very high levels of CO can be fatal; however, ambient levels of CO have decreased substantially as a result of improved vehicle fuel efficiency and stringent vehicle emission standards. The SFBAAB is in attainment for national and state standards for CO (BAAQMD, 2017b).

Particulate Matter (PM_{10} and $PM_{2.5}$)

Particulate matter is a class of air pollutants that consists of heterogeneous solid and liquid airborne particles from human-made and natural sources. Particulate matter regulated by the federal CAA and the California Clean Air Act (CCAA) is measured in two size ranges: PM_{10} and $PM_{2.5}$. PM_{10} are large dust particles that are 10 microns or less in diameter, and $PM_{2.5}$ are fine particles that are 2.5 microns or less in diameter. Motor vehicles generate about half of the particulates emitted in the SFBAAB, through tailpipe emissions and from brake pads and tire wear. Wood burning in fireplaces and stoves, industrial facilities, and ground-disturbing activities such as construction are other sources of fine particulates.

Large dust particles (particulate matter with diameters greater than 10 microns) settle out rapidly and are easily filtered by human breathing passages. This large dust is of more concern as a soiling nuisance than as a health hazard. However, PM_{10} and $PM_{2.5}$ represent fractions of particulate matter that can be inhaled into the air passages and the lungs and can cause adverse health effects. According to the CARB, studies in the United States and elsewhere "have demonstrated a strong link between elevated particulate levels and premature deaths, hospital admissions, emergency room visits, and asthma attacks," and studies of children's health in California have demonstrated that particle pollution "may significantly reduce lung function growth in children" (CARB, 2018). Recent studies have also shown that long-term average exposure to $PM_{2.5}$ is associated with an increased risk of death from COVID-19 in the United States. One study found that an increase of one microgram per cubic meter in $PM_{2.5}$ emissions is associated with an 11 percent increase in the COVID-19 death rate (Wu, et al, 2020).

$PM_{2.5}$ is of particular concern because epidemiological studies have demonstrated that people who live near freeways and high-traffic roadways have poorer health outcomes, including increased asthma symptoms and respiratory infections, and decreased pulmonary function and lung development in children. One common source of $PM_{2.5}$ is diesel exhaust emissions. $PM_{2.5}$ is emitted directly into the air (e.g., fugitive dust, soot, and smoke from mobile and stationary sources, construction operations, fires, and natural windblown dust), and is also formed in the atmosphere by condensation and/or transformation of sulfur dioxide (SO_2) and ROG. Traffic generates particulate matter emissions through entrainment of dust and dirt particles that settle onto roadways and parking lots. Exposures to $PM_{2.5}$ are strongly associated with mortality, respiratory diseases, and poor lung development in children, and other health effects, such as hospitalization for cardiopulmonary disease (SFDPH, 2008).

Table 4.2-1 shows that, between 2021 and 2023, the most stringent applicable standard for $PM_{2.5}$ (national 24-hour standard of 35 micrograms per cubic meter) was exceeded one time at the West Oakland monitoring station, in 2023. The $PM_{2.5}$ annual standard was not exceeded. In February 2024, the EPA lowered the federal primary $PM_{2.5}$ annual average standard to 9.0 ug/m^3 from the 12.0 ug/m^3 standard set in 2012.

Nitrogen Dioxide

Nitrogen dioxide (NO_2) is a reddish-brown gas that is a byproduct of combustion processes. Automobiles and industrial operations are its main sources. In addition to contributing ozone formation, NO_2 emissions can increase the risk of acute and chronic respiratory disease and reduce visibility. NO_2 may be visible as a coloring component of the air on high pollution days, especially in conjunction with high ozone levels.

Table 4.2-1 shows that, between 2021 and 2023, the most stringent applicable standard for NO_2 (national 1-hour standard of 0.1 parts per million [ppm]) was not exceeded at the West Oakland monitoring station.

Sulfur Dioxide

Sulfur dioxide (SO_2) is a colorless, acidic gas with a strong odor. It is produced by the combustion of sulfur-containing fuels such as oil, coal, and diesel. SO_2 has the potential to damage materials and can cause health effects at high concentrations. It can irritate lung tissue and increase the risk of acute and chronic respiratory disease (BAAQMD, 2017a). Pollutant trends suggest that the SFBAAB currently meets and will continue to meet the State standard for SO_2 for the foreseeable future.

In 2010, the EPA set a new one-hour SO_2 standard (see *Regulatory Framework*, below). The EPA initially designated the SFBAAB as an attainment area for SO_2. Similar to the new federal standard for NO_2, the EPA established requirements for a new monitoring network to measure SO_2 concentrations beginning in January 2013 (U.S. EPA, 2016a). No additional SO_2 monitors were required for the Bay Area because the SFBAAB has never been designated as non-attainment for SO_2, and no state implementation plans or maintenance plans have been prepared for SO_2 (BAAQMD, 2015).

Lead

Leaded gasoline (phased out in the United States beginning in 1973), paint (on older houses, cars), smelters (metal refineries), and manufacture of lead storage batteries have been the primary sources of lead released into the atmosphere. Lead has a range of adverse neurotoxic health effects, which put children at special risk. Some lead-containing chemicals cause cancer in animals. Lead levels in the air have decreased substantially since leaded gasoline was eliminated.

Ambient lead concentrations are only monitored on an as-warranted, site-specific basis in California. On October 15, 2008, the EPA strengthened the national ambient air quality standard for lead by lowering it from 1.50 $\mu g/m^3$ to 0.15 $\mu g/m^3$ on a rolling three-month average. The EPA revised the monitoring requirements for lead in December 2010. These requirements focus on airports and large urban areas resulting in an increase in 76 monitors nationally (U.S. EPA, 2016b). There is a monitor at the San Francisco-Arkansas Street station located at 10 Arkansas Street, San Francisco that monitors for lead in the Bay Area (CARB, 2024b).

Air Quality Index

In order to make the public health impacts of air pollution concentrations easily understandable, the EPA developed the Air Quality Index (AQI). The AQI, much like an air quality "thermometer," translates daily air pollution concentrations into a number on a scale between 0 and 500. The numbers in the scale are divided into six color-coded ranges, with numbers 0–300 as outlined below:

- **Green (0–50)** indicates "good" air quality. No health impacts would be expected when air quality is in the green range.
- **Yellow (51–100)** indicates air quality is "moderate." Unusually sensitive people should consider limiting prolonged outdoor exertion.
- **Orange (101–150)** indicates air quality is "unhealthy for sensitive groups." Active children and adults, and people with respiratory disease, such as asthma, should limit outdoor exertion.
- **Red (151–200)** indicates air quality is "unhealthy." Active children and adults, and people with respiratory disease such as asthma, should avoid prolonged outdoor exertion; everyone else, especially children, should limit prolonged outdoor exertion.
- **Purple (201–300)** indicates air quality is "very unhealthy." Active children and adults, and people with respiratory disease such as asthma, should avoid prolonged outdoor exertion; everyone else, especially children, should limit outdoor exertion.
- **Maroon (301-500)** indicates air quality is "hazardous." This would trigger health warnings of emergency conditions, and the entire population is more likely to be affected.

The AQI numbers refer to specific amounts of pollution in the air and are based on the National Ambient Air Quality Standards (NAAQS) for ozone, CO, NO_2, SO_2, PM_{10}, and $PM_{2.5}$. In most cases, the federal standard for these air pollutants corresponds to the number 100 on the AQI chart. If the concentration of any of these pollutants rises above its respective standard, air quality can be unhealthy for the public. In determining the air quality forecast, local air districts use the anticipated concentration measurements for each major pollutant, convert them into AQI numbers, and determine the highest AQI for each zone in a district.

Readings below 100 on the AQI scale would not typically affect the health of the public (although readings in the moderate range of 50–100 may affect unusually sensitive people). Levels above 200 have only occurred six times in the Bay Area in the past five years, in November 2018 and August/September 2020, due to wildfires north of San Francisco and the complex wildfires that occurred throughout the Bay Area (BAAQMD, 2023b). Wildfires appear to be occurring with increasing frequency in California and the Bay Area as the climate changes. Eighteen of the state's 20 largest wildfires and 18 of the state's 20 most destructive fires on record have occurred since 2000 (CALFIRE, 2022a; 2022b).

As a result of these fires in Bay Area counties (Napa and Sonoma Counties) and counties to the north and east (e.g., Butte, Lassen, Plumas, and Shasta Counties), the AQI in the Bay Area reached the "very unhealthy" and "hazardous" designations, ranging from values of 201 to above 350. During those periods, BAAQMD issued "Spare the Air" alerts and recommended that individuals stay inside with windows closed and refrain from significant outdoor activity.

AQI statistics over recent years indicate that air quality in the SFBAAB is predominantly in the "good" or "moderate" categories and healthy for most people on most days. The SFBAAB had a total of 25 red-level or orange-level (unhealthy or unhealthy for sensitive groups) days in 2021 through 2023 (see **Table 4.2-2**). Some of those days are attributable to the increasing frequency of wildfires. Table 4.2-2 also shows that the SFBAAB did not experience purple-level (very unhealthy) days in 2021 through 2023.

TABLE 4.2-2
AIR QUALITY INDEX STATISTICS FOR THE SAN FRANCISCO BAY AREA AIR BASIN

	Number of Days by Year		
AQI Statistics for SFBAAB	**2021**	**2022**	**2023**
Unhealthy for Sensitive Groups (Orange)	9	8	7
Unhealthy (Red)	1	0	0
Very Unhealthy (Purple)	0	0	0

NOTE: AQI = Air Quality Index
SOURCE: BAAQMD, 2023b.

Toxic Air Contaminants

In addition to criteria air pollutants, individual projects and sources emit toxic air contaminants (TACs), which are a diverse group of air pollutants that may cause chronic (i.e., of long duration) and acute (i.e., severe but short-term) adverse effects on human health, including carcinogenic effects. Human health effects from TACs include birth defects, neurological damage, cancer, and death. There are hundreds of different types of TACs with varying degrees of toxicity. Thus, individual TACs vary greatly in the health risk they present; at a given level of exposure, one TAC may pose a hazard that is many times greater than another.

Unlike criteria air pollutants, TACs are not subject to ambient air quality standards but are regulated by BAAQMD using a risk-based approach to determine which sources and which pollutants to control as well as the degree of control. A health risk assessment (HRA) is an analysis that estimates human health exposure to toxic substances, and when considered together with information regarding the toxic potency of the substances, a HRA provides quantitative estimates of health risks.[1] Health effects from carcinogenic TACs are usually described in terms of increased cancer risk.

In addition to monitoring criteria air pollutants, both BAAQMD and CARB operate TAC monitoring networks in the SFBAAB. These stations measure 10 to 15 TACs, depending on the specific station. The TACs selected for monitoring are those that traditionally have been found in the highest concentrations in ambient air and therefore tend to produce the most significant risk. The nearest TAC monitoring station is located in Berkeley at 1 Bolivar Drive, approximately 3.2 miles west of Berkeley Lab (CARB, 2024).

Motor vehicles are responsible for a large share of TAC-related air pollution, especially in California. Vehicle tailpipe emissions contain diverse forms of particles and gases, and vehicles also contribute to particulates by generating road dust and tire wear. Epidemiologic studies have demonstrated that people living close to freeways or busy roadways have poorer health outcomes, including increased asthma symptoms and respiratory infections, and decreased pulmonary function and poor lung development in children.

Diesel Particulate Matter

Diesel engines emit a complex mixture of pollutants, including very small carbon particles, or “soot” coated with numerous organic compounds, known as DPM. CARB identified DPM as a TAC in 1998, primarily based on evidence demonstrating cancer effects in humans (CARB, 1998). The estimated cancer risk from exposure to diesel exhaust is much higher than the risk associated with any other TAC routinely measured in the region. In addition to “soot” coated with numerous organic compounds, DPM also contains more than 40 cancer-causing substances, most of which are readily adsorbed onto the soot particles. CARB as well as other agencies, such as the World Health Organization, National Toxicology Program, the EPA and the National Institute of Occupational Safety and Health have concluded that exposure to diesel exhaust likely causes cancer.

Diesel engine emissions are believed to be responsible for about 70 percent of California's estimated known cancer risk attributable to TACs. In addition, DPM comprises about 8 percent of outdoor $PM_{2.5}$, which is a known health hazard. As a significant fraction of $PM_{2.5}$, DPM contributes to numerous health impacts that have been attributed to PM exposure, including increased hospital admissions, particularly for heart disease, but also for respiratory illnesses, and even premature death. CARB estimates that DPM contributes to approximately 1,400 premature deaths from cardiovascular disease annually in California. Additionally, exposure to diesel exhaust may contribute to the onset of new allergies; a clinical study of human subjects has shown that diesel exhaust particles, in combination with potential allergens, may actually be able to produce new allergies that did not exist previously.

[1] In general, a health risk assessment is required if BAAQMD concludes that projected emissions of a specific air toxic compound from a proposed new or modified source suggest a potential public health risk. The applicant is then required to prepare a health risk assessment for the source in question. Such an assessment generally evaluates chronic, long-term effects, estimating the increased risk of cancer as a result of exposure to one or more TACs.

In 2000, CARB approved a comprehensive Diesel Risk Reduction Plan to reduce diesel emissions from both new and existing diesel-fueled vehicles and engines. Subsequent board regulations apply to new trucks and diesel fuel. With new controls and fuel requirements, 60 trucks built in 2007 would have the same particulate exhaust emissions as one truck built in 1988. The regulation resulted in an 80 percent decrease in statewide diesel health risk in 2020 as compared with the diesel risk in 2000. Despite notable emission reductions, CARB recommends that proximity to sources of DPM emissions be considered in the siting of new sensitive land uses. CARB notes that these recommendations are advisory and should not be interpreted as defined “buffer zones,” and that local agencies must balance other considerations, including transportation needs, the benefits of urban infill, community economic development priorities, and other quality of life issues. With careful evaluation of exposure, health risks, and affirmative steps to reduce risk where necessary, CARB’s position is that infill development, mixed use, higher density, transit-oriented development, and other concepts that benefit regional air quality can be compatible with protecting the health of individuals at the neighborhood level (CARB, 2005).

Based on estimated ambient statewide DPM levels in 2012, the current cancer risk is estimated to be 520 new cases of cancer projected to occur per million residents exposed statewide.

Odorous Emissions

Odors are generally regarded as an annoyance rather than a health hazard. The ability to detect odors varies considerably among the population and is subjective. The occurrence and the severity of odor impacts depend on the nature, frequency, and intensity of the source; wind speed and direction; and the sensitivity of receptors. Odor impacts should be considered for any proposed new odor sources located near existing receptors, and for any new sensitive receptors located near existing odor sources. Odor sources typically include wastewater treatment plants, landfills, confined animal facilities, composing stations, food manufacturing plants, refineries, and chemical plants (BAAQMD, 2023a).

Sensitive Receptors

Air quality does not affect every individual in the population in the same way. Some groups are more sensitive than others to air pollution. Reasons for greater sensitivity can include existing health problems, duration of exposure to air pollutants, or certain people’s increased susceptibility to pollution-related health problems because of factors such as age. Population subgroups sensitive to the health effects of air pollutants include elderly people and children; population subgroups with higher rates of respiratory disease, such as asthma and chronic obstructive pulmonary disease; and populations with other environmental or occupational health exposures (e.g., to poor indoor air quality) that affect cardiovascular or respiratory diseases. The factors responsible for variations in exposure are also often similar to factors associated with greater susceptibility to air quality health effects. For example, lower income residents may be more likely to live in substandard housing and to live near industrial or roadway sources of pollution.

BAAQMD defines *sensitive receptors* as facilities or land uses that include members of the population that are particularly sensitive to the effects of air pollutants, such as children, elderly people, and people with illnesses. Examples include land uses such as schools, hospitals, and residential areas. Land uses such as schools, day care centers, hospitals, and nursing and convalescent homes are considered sensitive to poor air quality because the population groups associated with these uses have increased susceptibility to respiratory distress. Residential uses are considered sensitive because these individuals could be present there and are often at home for extended periods of time, so they can be exposed to pollutants for extended periods.

Sensitive receptors include single and/or multi-family residential uses located to the north and west of the Lab within the City of Berkeley. The closest residence is approximately 350 feet west of the Lab boundary. In addition, the Orange House Family Child Care facility on LeRoy Avenue is located within one-quarter mile west of the Lab boundary.

4.2.3 Regulatory Framework

Federal

Criteria Air Pollutants

The 1970 CAA (most recently amended in 1990) requires that each regional planning or air pollution control agency prepare a regional air quality plan to outline the measures by which both stationary and mobile sources of pollutants will be controlled to achieve all ambient air quality standards by the deadlines specified in the CAA. These ambient air quality standards are intended to protect the public health and welfare; they specify the concentration of pollutants (with an adequate margin of safety) to which the public can be exposed without adverse health effects. The standards are designed to protect those segments of the public most susceptible to respiratory distress, including asthmatics, very young children, elderly people, people weakened from other illnesses or diseases, or persons engaged in strenuous work or exercise. Healthy adults can tolerate occasional exposure to air pollution levels that somewhat exceed ambient air quality standards before adverse health effects are observed.

Table 4.2-3 presents the current California Ambient Air Quality Standards (CAAQS) and NAAQS and describes the major sources for each pollutant.

The NAAQS and CAAQS have been set at levels considered safe to protect the public, including the health of sensitive populations with a margin of safety; and to protect public welfare, including protecting against decreased visibility and damage to animals, crops, vegetation, and buildings. As explained by CARB, "An air quality standard defines the maximum amount of a pollutant averaged over a specified period of time that can be present in outdoor air without any harmful effects on people or the environment (U.S. EPA, 2024)." That is, if a region is in compliance with the ambient air quality standards, its regional air quality can be considered protective of public health. The NAAQS are statutorily required to be set by the EPA at levels that are requisite to protect public health. Therefore, the closer a region is to attaining a particular ambient air quality standard, the lower the human health impact is from that pollutant. See *Criteria Air Pollutants* above for a brief description of the health effects of exposure to criteria air pollutants.

TABLE 4.2-3
NATIONAL AND STATE AMBIENT AIR QUALITY STANDARDS AND MAJOR POLLUTANT SOURCES

Pollutant	Averaging Time	NAAQS	CAAQS	Major Pollutant Sources
Ozone	1 hour	---	0.09 ppm	Formed when reactive organic gases and NO_X react in the presence of sunlight. Major sources include on-road motor vehicles, solvent evaporation, and commercial/industrial mobile equipment.
	8 hours	0.070 ppm	0.070 ppm	
Carbon Monoxide	1 hour	35 ppm	20 ppm	Internal combustion engines, primarily gasoline-powered motor vehicles
	8 hours	9 ppm	9.0 ppm	
Nitrogen Dioxide	1 hour	100 ppb	0.18 ppm	Motor vehicles, petroleum refining operations, industrial sources, aircraft, ships, and railroads.
	Annual avg.	0.053 ppm	0.030 ppm	
Sulfur Dioxide	1 hour	75 ppb	0.25 ppm	Fuel combustion, chemical plants, sulfur recovery plants, and metal processing
	3 hours	0.5 ppm[a]	---	
	24 hours	0.14 ppm	0.04 ppm	
	Annual avg.	0.030 ppm	---	
Respirable Particulate Matter (PM_{10})	24 hours	150 $\mu g/m^3$	50 $\mu g/m^3$	Dust- and fume-producing industrial and agricultural operations, combustion, atmospheric photochemical reactions, and natural activities (e.g., wind-raised dust and ocean sprays)
	Annual avg.	---	20 $\mu g/m^3$	
Fine Particulate Matter ($PM_{2.5}$)	24 hours	35 ug/m^3	---	Fuel combustion in motor vehicles, equipment, and industrial sources; residential and agricultural burning; Also, formed from photochemical reactions of other pollutants, including NO_X, sulfur oxides, and organics
	Annual avg.	9.0 ug/m^3	12 $\mu g/m^3$	
Lead	Monthly avg.	---	1.5 $\mu g/m^3$	Present sources: lead smelters, battery manufacturing and recycling facilities. Past source: combustion of leaded gasoline
	Quarterly	1.5 ug/m^3	---	
Hydrogen Sulfide	1 hour	No National Standard	0.03 ppm	Geothermal power plants, petroleum production and refining
Sulfates	24 hours	No National Standard	25 $\mu g/m^3$	Produced by the reaction in the air of SO_2
Visibility-Reducing Particles	8 hours	No National Standard	Extinction of 0.23/km; visibility of 10 miles or more	See $PM_{2.5}$
Vinyl chloride	24 hours	No National Standard	0.01 ppm	Polyvinyl chloride and vinyl manufacturing

NOTES: $\mu g/m^3$ = micrograms per cubic meter; km = kilometer; NO_X = nitrogen oxides; $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; ppb = parts per billion; ppm = parts per million; SO_2 = sulfur dioxide.

a. Secondary national standard.

SOURCE: CARB, 2016.

Pursuant to the 1990 federal CAA Amendments, the EPA classifies air basins (or portions thereof) as “attainment,” “non-attainment,” or “unclassified” for each criteria air pollutant, based on whether the national standards had been achieved. As shown in **Table 4.2-4**, at the federal level, the SFBAAB is designated as a non-attainment area for the eight-hour ozone standard and the 24-hour $PM_{2.5}$ standard. The SFBAAB is in attainment for all other federal ambient air quality standards. State-level attainment status of the SFBAAB is discussed further below.

TABLE 4.2-4
SAN FRANCISCO BAY AREA AIR BASIN ATTAINMENT STATUS

Pollutant	Averaging Time	Designation/Classification	
		Federal Standards	State Standards
Ozone	8 hours	Non-attainment	Non-attainment
	1 hour	--	Non-attainment
Carbon Monoxide	8 hours	Attainment	Attainment
	1 hour	Attainment	Attainment
Nitrogen Dioxide	1 hour	--	Attainment
	Annual arithmetic mean	Attainment	--
Sulfur Dioxide	24 hours	--	Attainment
	1 hour	--	Attainment
	Annual arithmetic mean	--	--
Respirable Particulate Matter (PM_{10})	Annual arithmetic mean	--	Non-attainment
	24 hours	Unclassified	Non-attainment
Fine Particulate Matter ($PM_{2.5}$)	Annual arithmetic mean	Unclassified/Attainment	Non-attainment
	24 hours	Non-attainment	--
Sulfates	24 hours	--	Attainment
Lead	30-day average	Attainment	--
	Calendar quarter	Attainment	--
	Rolling month average	--	--
Hydrogen Sulfide	1 hour	--	Unclassified
Vinyl Chloride	24 hours	--	No information available
Visibility-Reducing Particles	8 hours	--	Unclassified

NOTES: $PM_{2.5}$ = particulate matter less than 2.5 microns in diameter; PM_{10} = particulate matter less than 10 microns in diameter
SOURCE: BAAQMD, 2017c.

The CAA requires each state to prepare an air quality control plan called the State Implementation Plan (SIP). The CAA added requirements for states containing areas that violate the national standards to revise their SIPs to incorporate additional control measures to reduce air pollution. The SIP is a living document that is modified periodically to reflect the latest emissions inventories, planning documents, and rules and regulations of air basins as reported by the agencies with jurisdiction over them. The EPA is responsible for reviewing all SIPs to determine whether they conform to the mandates of the CAA and will achieve air quality goals when implemented.

Hazardous Air Pollutants

Hazardous air pollutants, also known as "toxic air pollutants" or "toxic air contaminants," are pollutants that are known or suspected to cause cancer and/or other health effects, such as reproductive effects or birth defects, or adverse environmental effects. The EPA works with state, local, and tribal governments to reduce air emissions of toxic air pollutants to the environment. Under the CAA, the EPA is required to regulate emissions of hazardous air pollutants. The original list of hazardous air pollutants had 189 pollutants, including pollutants such as benzene and asbestos, but the EPA modified the list in 1990 through rulemaking to only include 188 hazardous air pollutants (U.S. EPA, 2024).

State

CARB manages air quality, regulates mobile emissions sources, and oversees the activities of county Air Pollution Control Districts and regional Air Quality Management Districts, such as BAAQMD. CARB also establishes state ambient air quality standards and vehicle emissions standards.

Ambient Air Quality Standards

Although the federal CAA established national ambient air quality standards, individual states retained the option to adopt more stringent standards and to include other pollution sources. California had already established its own air quality standards when federal standards were established, and because of the unique meteorological conditions in California, there is considerable divergence between the State and national ambient air quality standards, as shown in Table 4.2-4. California ambient standards tend to be at least as protective as national ambient standards and are often more stringent. In 1988, California passed the CCAA (California Health and Safety Code Sections 39600 et seq.), which, like its federal counterpart, called for the designation of areas as attainment or nonattainment, but based on State ambient air quality standards rather than federal standards. As indicated in Table 4.2-4, the SFBAAB is designated as "nonattainment" for State ozone (both 1-hour and 8-hour standards), PM_{10}, and $PM_{2.5}$ standards. The SFBAAB is designated as "attainment" for all other criteria air pollutants.

On-Road Diesel Trucks and Off-Road Diesel Equipment

Engines designated as nonroad engines by the EPA are known as off-road engines in California State regulations implemented by CARB. Similar to the EPA Nonroad Diesel Rule, the Off-Road Emissions Regulation for New Compression-Ignition Engines and Equipment applies to diesel engines such as those found in construction, general industrial, and terminal equipment. Initially adopted in 2000 and amended in 2004, the regulation establishes Tier emission standards, test procedures, and warranty and certification requirements. For some model years and engine sizes, the CARB Tier emission standards are more stringent than the EPA standards.

CARB In-Use Off-Road Diesel Vehicle Regulation

In July 2007, CARB adopted the In-Use Off-Road Diesel Vehicle Regulation and amended it in January 2009, July 2009, December 2010 and November 2022. The regulation requires owners of off-road mobile equipment powered by diesel engines 25 horsepower (HP) or larger to meet the fleet average or best available control technology (BACT) requirements for NO_X and PM emissions by January 1 of each year. The regulation also establishes idling restrictions, limitations on buying and selling older off-road diesel vehicles (Tier 0), reporting requirements, and retrofit and replacement requirements. The requirements and compliance dates vary by fleet size, with performance requirements for large fleets beginning in 2014, medium fleets in 2017, and small fleets in 2019. Requirements regarding idling, disclosure, reporting, and labeling took effect in 2008 and 2009. The Diesel Off-road On-line Reporting System (DOORS) is an online tool designed to help fleet owners report their off-road diesel vehicle inventories and actions taken to reduce vehicle emissions to CARB, as required by the In-Use Off-Road Diesel Vehicle Regulation.

The Off-Road Diesel Regulation:

- Imposes limits on idling, requires a written idling policy, and requires a disclosure when selling vehicles;
- Requires all vehicles to be reported to CARB, which can be done through the online reporting system DOORS, and labeled;
- Restricts the adding of older vehicles into fleets starting on January 1, 2014;
- Requires fleets to reduce their emissions by retiring, replacing, or repowering older engines, or installing Verified Diesel Emission Control Strategies, VDECS (i.e., exhaust retrofits);
- Requires the phase-out of the oldest and dirtiest engines starting on January 1, 2024;
- Requires the procurement and use of renewable diesel (R99 or R100) starting January 1, 2024, with limited exceptions; and
- Requires contracting entities to obtain valid Certificates of Reported Compliance for all listed contractors and subcontractors for contract work where vehicles subject to the Off-Road Regulation will operate.

Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling

In 2004, CARB adopted the Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling to reduce public exposure to DPM emissions (13 CCR Section 2485). The measure applies to diesel-fueled commercial vehicles with gross vehicle weight ratings greater than 10,000 pounds that are licensed to operate on highways, regardless of where they are registered. This measure prohibits diesel-fueled commercial vehicles from idling for more than five minutes at any given location. While the goal of this measure is primarily to reduce public health impacts from diesel emissions, compliance with the regulation also results in GHG emissions reduction and energy savings in the form of reduced fuel consumption from unnecessary idling.

Airborne Toxic Control Measure for Stationary Compression Ignition Engines

In 2004, CARB adopted an Airborne Toxic Control Measure to reduce public exposure to emissions of DPM and criteria pollutants from stationary diesel-fueled compression ignition engines (17 CCR Section 93115). The measure applies to any person who owns or operates a stationary compression ignition engine in California with a rated brake horsepower greater than 50, or to anyone who either sells, offers for sale, leases, or purchases a stationary compression ignition engine. This measure outlines fuel and fuel additive requirements; emissions standards; recordkeeping, reporting and monitoring requirements; and compliance schedules for compression ignition engines.

Zero-Emissions Forklifts Regulation

In June 2024, CARB approved for adoption the Zero-Emission Forklift Regulation. The measure was identified in CARB's Mobile Source Strategy, State Implementation Plan, and Sustainable Freight Action Plan as one of several near-term actions intended to help California meet its air quality and climate goals through zero-emission technology. The regulation will achieve emission reductions of both criteria pollutants and greenhouse gases by requiring the phase-out of forklifts using large spark-ignition (LSI) engines, such as those running on propane and gasoline.

Advanced Clean Fleets Regulation

The Advanced Clean Fleets (ACF) Regulation is the latest development in CARB's history of setting increasingly stringent emission standards for mobile sources that are needed to protect public health and welfare of Californians. The ACF Regulation requires fleets that are well suited for electrification to reduce emissions through requirements to both phase-in the use of Zero-Emission Vehicles (ZEVs) for targeted fleets and requirements that manufacturers only manufacture ZEV trucks starting in the 2036 model year.

In November 2023, CARB had applied to the EPA for a federal waiver to enforce this regulation but in January 2025, CARB withdrew its waiver application. While CARB will not be enforcing the portions of this regulation that require a federal waiver or authorization such as those that apply to high priority and drayage fleets, not all elements of the regulation require a federal waiver or authorization. The portions of the regulation applicable to state and local government fleets remain unaffected and will continue to contribute to CARB's efforts to reduce air pollution to protect public health.

Advanced Clean Cars Program

In January 2012, pursuant to Recommended Measures T-1 and T-4 of the Scoping Plan, CARB approved the Advanced Clean Cars Program, a new emissions-control program for model years 2017 through 2025. In response to a midterm review of the standards in March 2017, CARB directed staff to begin working on post-2025 model year vehicle regulations (Advanced Clean Cars II) to research additional measures to reduce air pollution from light-duty and medium-duty vehicles. Additionally, in September 2020, Governor Newsom signed EO N-79-20 that established a goal that 100 percent of California sales of new passenger car and trucks be zero-emission by 2035 and directed CARB to develop and propose regulations toward this goal. The primary mechanism for achieving these targets for passenger cars and light trucks is the Advanced Clean Cars (ACC) II Program. CARB adopted the ACC II regulations on August 25, 2022.

California Building and Energy Efficiency Standards (Title 24)

The California Energy Commission first adopted Energy Efficiency Standards for Residential and Nonresidential Buildings (California Code of Regulations Title 24, Part 6) in 1978 in response to a legislative mandate to reduce energy consumption in the state. This regulation is not overseen by CARB but affects statewide air quality. Although not originally intended to reduce emissions of criteria pollutants or TACs, increased energy efficiency and reduced consumption of natural gas and other fuels would result in fewer criteria pollutant and TAC emissions from residential and non-residential buildings subject to the standards. The standards are updated periodically (typically every three years) to allow for the consideration and inclusion of new energy efficiency technologies and methods. The most recent update to the Title 24 energy efficiency standards (2022 standards) went into effect on January 1, 2023.

Regional

BAAQMD Clean Air Plan

BAAQMD adopted the *2017 Clean Air Plan: Spare the Air, Cool the Climate* on April 19, 2017 (BAAQMD, 2017b). The plan was developed by BAAQMD in cooperation with the MTC, the San Francisco Bay Conservation and Development Commission, and the Association of Bay Area Governments (ABAG) to provide a regional strategy to improve air quality within the SFBAAB and meet public health (U.S. EPA, 2024). The control strategy described in the 2017 Clean Air Plan includes a wide range of control measures designed to reduce emissions and lower ambient concentrations of harmful pollutants, safeguard public health by reducing exposure to air pollutants that pose the greatest health risk and reduce GHG emissions to protect the climate.

The 2017 Clean Air Plan addresses the following four categories of pollutants: ground-level ozone and its key precursors, ROG and NO_X; particulate matter, primarily $PM_{2.5}$, and precursors to secondary $PM_{2.5}$; TACs; and GHG emissions. The control measures are categorized based on the economic sector framework including stationary sources, transportation, energy, buildings, agriculture, natural and working lands, waste management, and water measures.

BAAQMD is the regional agency with jurisdiction over the nine-county region located in the SFBAAB. ABAG, MTC, county transportation agencies, cities and counties, and various non-governmental organizations also participate in the efforts to improve air quality through a variety of programs. These programs include the adoption of regulations and policies, as well as implementation of extensive education and public outreach programs. BAAQMD is responsible for attaining and/or maintaining air quality in the region within federal and State air quality standards. Specifically, BAAQMD monitors ambient air pollutant levels throughout the region and develops and implements strategies to attain the applicable federal and State standards.

BAAQMD Rules

BAAQMD has permit authority over most types of stationary emission sources and can require stationary sources to obtain permits, and can impose emission limits, set fuel or material specifications, or establish operational limits to reduce air emissions. The air district also regulates new or expanding stationary sources of TACs and requires air toxic control measures for many sources emitting TACs. In addition, BAAQMD requires permitting for use of portable equipment, such as portable emergency generators and air compressors. It also establishes and enforces local air quality rules and regulations for these purposes. A list of the air district rules applicable to construction and operation of land development projects includes, but is not limited to, the following (BAAQMD, 2024a):

- **Regulation 2, Rule 1 (Permits):** This regulation provides for the review of new sources or modification of existing sources through the issuance of authorities to construct and permits to operate.

- **Regulation 6, Rule 1 (Particulate Matter):** This regulation restricts emissions of particulate matter darker than No. 1 on the Ringlemann Chart to less than 3 minutes in any one hour**.** This regulation sets standards and requirements for controlling and reducing fugitive dust emissions at dust generating facilities.
- **Regulation 6, Rule 6 (Prohibition of Trackout):** This regulation limits the quantity of particulate matter in the atmosphere through control of trackout of solid materials onto paved public roads.
- **Regulation 8, Rule 3 (Architectural Coatings):** This regulation limits the quantity of volatile organic compounds in architectural coatings applied.
- **Regulation 9, Rule 8 (Stationary Internal-Combustion Engines):** This regulation limits emissions of NO_X and CO from stationary internal-combustion engines of more than 50 hp.
- **Regulation 11, Rule 2 (Asbestos Demolition, Renovation, and Manufacturing):** This regulation limits emissions of asbestos during demolition, renovation, milling, and manufacturing and establishes appropriate waste disposal procedures.

BAAQMD CEQA Guidelines and Significance Thresholds

In December 1999, BAAQMD adopted its *CEQA Guidelines – Assessing the Air Quality Impacts of Projects and Plans*, as a guidance document to provide lead government agencies, consultants, and project proponents with uniform procedures for assessing air quality impacts and preparing the air quality sections of environmental documents for projects subject to CEQA. The *BAAQMD CEQA Air Quality Guidelines* is an advisory document, and local jurisdictions are not required to utilize the methodology outlined therein. The document describes the criteria that BAAQMD uses when reviewing and commenting on the adequacy of environmental documents. It recommends thresholds for use in determining whether plans or projects would have significant adverse environmental impacts, identifies methodologies for predicting project emissions and impacts, and identifies measures that can be used to avoid or reduce air quality impacts.

BAAQMD updated the 1999 *CEQA Air Quality Guidelines* in 2010. In May of 2011, BAAQMD adopted an updated version of its Thresholds of Significance for use in determining the significance of projects' environmental effects under CEQA (Thresholds) and published their CEQA Guidelines for consideration by lead agencies. The 2011 *CEQA Air Quality Guidelines* lowered the previous (1999) significance thresholds for annual emissions of ROG, NO_X, and PM_{10}, and set a standard for $PM_{2.5}$ and fugitive dust. The 2011 *CEQA Air Quality Guidelines* also include methodologies for evaluating risks and hazards for the siting of stationary sources and of sensitive receptors. The BAAQMD resolution adopting the significance thresholds in 2010 and 2011 was set aside by the Alameda County Superior Court on March 5, 2012. On August 13, 2013, the California Court of Appeals issued a full reversal of the Superior Court's judgment, and on December 17, 2015, the California Supreme Court reversed in part the appellate court's judgment and remanded the case for further consideration consistent with the Supreme Court opinion. The California Supreme Court ruled unanimously that CEQA review is focused on a project's impact on the environment "and not the environment's impact on the project." *California Building Industry Association v. Bay Area Air Quality Management District* (2015)_ 62 Cal.4th 369, 378. The Supreme Court confirmed that agencies subject to CEQA generally are not required to analyze the impact of existing environmental conditions on a project's future residents or users.

The Court also held that when a project has "potentially significant exacerbating effects on existing environmental hazards" those impacts are properly within the scope of CEQA because they can be viewed as impacts of the project on "existing conditions" rather than impacts of the environment on the project.

BAAQMD most recently updated its *CEQA Air Quality Guidelines* in April 2023; these guidelines, titled BAAQMD *2022 CEQA Air Quality Guidelines*, continue to provide direction on recommended analysis methodologies and thresholds for the evaluation of impacts. While the 2022 Guidelines updated the significance thresholds for climate impacts from GHG emissions, the criteria pollutant significance thresholds remain unchanged from those adopted in 2011. The analysis presented below accounts for changes to methodology set forth in BAAQMD's *2022 CEQA Air Quality Guidelines*.

University of California

Berkeley Lab Requirements and Policy Manual

The Berkeley Lab Requirements and Policy Manual (RPM) is a collection of policies and environmental programs from the University of California, the DOE, and Berkeley Lab that help define the Lab's operation. The RPM Environment, Safety and Health section features a variety of topics, including an Environmental Protection Program subsection, which contains information on air quality, environmental monitoring, and meteorological monitoring. The Berkeley Lab Air Quality Program ensures that operations emitting hazardous or regulated air pollutants are identified and controlled. This program addresses air pollution sources at Berkeley Lab. Regulated sources at Berkeley Lab as of late 2024 include, but are not limited to:

- Asbestos projects involving demolition or renovation where more than 100 square or linear feet of asbestos-containing material (ACM) is expected.
- Boilers (>2 MMBTU)
- Diesel/Natural Gas generators (>50 hp)
- Diesel Air Compressors
- Off-road diesel vehicle use
- Fuel dispensing (unleaded gasoline and ethanol 85)
- Greenhouse gas (fugitive gas emissions)
- Large spark ignition (e.g., forklifts)
- Paint spray booth
- Refrigerant
- Sandblasting booth

Berkeley Lab operations that emit hazardous (nonradioactive) or regulated air pollutants are subject to the rules and regulations administered by BAAQMD, CARB, and the EPA.

Air emissions of radioactive materials are addressed in the RPM's Environmental Radiological Protection Program. This program ensures compliance with regulatory dose limits and ensures that potential radiation exposure to the public and environment from Berkeley Lab activities is as low as reasonably achievable (ALARA).

4.2.4 Impacts and Mitigation Measures

Significance Criteria

For purposes of this EIR, air quality impacts would be considered significant if they would exceed the Standards of Significance presented below, which are based on Appendix G of the *CEQA Guidelines*.

Would implementation of the LBNL 2025 LRDP:

a) Conflict with or obstruct implementation of the applicable air quality plan;

b) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard;

c) Expose sensitive receptors to substantial pollutant concentrations; or

d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people.

Approach to Analysis – Proposed 2025 LRDP

As noted above, in its *2022 CEQA Air Quality Guidelines*, BAAQMD has provided recommended significance thresholds that a lead agency in the Bay Area may use to evaluate the significance of potential air quality impacts that could result from the implementation of local, long-range plans, such as the proposed 2025 LRDP. These thresholds are shown in **Table 4.2-5** below.

TABLE 4.2-5
LOCAL LONG-RANGE PLAN SIGNIFICANCE THRESHOLDS

Impact	Construction Related	Operational Threshold of Significance
Criteria Air Pollutants	None	Consistency with current air quality plan control measures, and Project vehicle miles traveled (VMT) or trip increase less than or equal to projected employee and/or population increase[a]
Local Risks and Hazards	None	Overlay zones around existing and planned sources of TACs, and Overlay zones of at least 500 feet from all freeways and high-volume roadways
Odors	None	Identify the location and include policies to reduce the impacts of existing or planned sources of odors.

SOURCE: BAAQMD, 2023.

NOTE:

a. The significance threshold in the BAAQMD CEQA guidelines refer to a 'service population,' which includes residents and employees. In the case of the Berkeley Lab campus, this would only represent employees.

The first standard of significance (CEQA Appendix G checklist item (a) listed above), consistency with the current clean air plan, is used to evaluate the impact of the proposed long-range plan's criteria pollutant emissions. The impact of campus development emissions under the proposed 2025 LRDP relative to this standard of significance is analyzed under LRDP Impact AQ-1.

The second standard of significance (CEQA Appendix G checklist item (b) listed above) considers the effect of the vehicular emissions associated with the proposed Project. The proposed 2025 LRDP would not result in any residential population growth, so the second significance threshold focuses on campus employee growth compared to employee VMT. The impact is analyzed under LRDP Impact AQ-2.

The third standard of significance (CEQA Appendix G checklist item (c) listed above) is related to health risk impacts to exposed sensitive receptors from both Project-related TACs and unrelated nearby TACs sources. The health risk impacts from the campus's TAC emissions under the proposed 2025 LRDP are analyzed under LRDP Impact AQ-3.

The fourth standard of significance (CEQA Appendix G checklist item (d) listed above) is related to potential Project-related odor impacts. This impact is evaluated under LRDP Impact AQ-4.

Approach to Analysis – Illustrative Development Scenario

To provide this EIR a means to evaluate the proposed 2025 LRDP's impacts with greater level of specificity, the Illustrative Development Scenario presents a detailed representation of the building demolition, construction, and operation that could potentially occur under the proposed 2025 LRDP. Specific new building locations, as presented under the Illustrative Development Scenario, are shown in Figure 3-9 in Chapter 3, *Project Description*. This section describes the approach to a project-level analysis using the Illustrative Development Scenario to provide a conservative estimate of the types and magnitude of impacts that could occur under the proposed 2025 LRDP.

This project-level analysis uses the BAAQMD project-level significance thresholds, which are presented in **Table 4.2-6** below, to evaluate potential air quality impacts. These thresholds differ from the plan-level significance thresholds presented in Table 4.2-5 and support a quantitative evaluation of the significance of a project's pollutant emissions, both during construction and operation.

The air basin experiences low concentrations of most pollutants when compared to federal or State standards and is designated as either in attainment or unclassified for most criteria air pollutants. The exceptions to this are ozone, $PM_{2.5}$, and PM_{10}, for which the air basin is designated as non-attainment for either the state or federal standards. Ozone is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving ROG and NO_X. For this reason, the air district has identified criteria air pollutant significance thresholds for ROG, NO_X, $PM_{2.5}$, and PM_{10}, which are presented in Table 4.2-6 below.

TABLE 4.2-6
PROJECT-LEVEL SIGNIFICANCE THRESHOLDS

Pollutant	Construction Thresholds	Operational Thresholds	
	Criteria Air Pollutants		
	Average Daily Emissions (lb/day)	**Average Daily Emissions (lb/day)**	**Maximum Annual (tons/year)**
ROG	54	54	10
NO_X	54	54	10
PM_{10}	82 (exhaust)	82	15
$PM_{2.5}$	54 (exhaust)	54	10
PM_{10}/$PM_{2.5}$ (fugitive dust)	Best Management Practices	Not Applicable	
	Local Risks and Hazards		
Project Level Risk			
Cancer (probability)	Same as Operational	10 in one million	
Chronic non-cancer (unitless)		1	
Annual Average $PM_{2.5}$ (ug/m3)		0.3	
Cumulative Risk			
Cancer (probability)	Same as Operational	100 in one million	
Chronic non-cancer (unitless)		10	
Annual Average $PM_{2.5}$ (ug/m3)		0.8	
	Odors		
	None	Five confirmed complaints per year averaged over 3 years	

ABBREVIATIONS:
lb/day = pounds per day; ROG = reactive organic gases; NO_X = nitrogen oxides; PM = particulate matter; $PM_{2.5}$ = PM less than 2.5 microns in diameter; PM_{10} = PM less than 10 microns in diameter

SOURCE: BAAQMD, 2022.

Estimation of Construction Emissions

Construction activities would have the potential to affect air quality. Construction would include emissions associated with heavy-duty off-road construction equipment, construction workers' vehicle trips, and construction vendor truck trips. Demolition, grading, hauling, and other ground-disturbing activities would emit fugitive dust. Construction criteria air pollutant and TAC emissions were estimated using the California Emissions Estimator Model (CalEEMod, 2022) as applied to the Illustrative Development Scenario. CalEEMod outputs and detailed calculation spreadsheets are included in **Appendix AIR**.

Off-Road Equipment

Use of off-road construction equipment related to campus development would result in criteria air pollutant emissions. Use of diesel equipment and vehicles would emit predominantly NO_X, an ozone precursor and TACs. Construction criteria air pollutant and TAC emissions were estimated based on project-specific data provided by Berkeley Lab, where available, and on CalEEMod model defaults, as applied to the Illustrative Development Scenario. For diesel-powered off-road construction equipment, emissions were calculated by CalEEMod assuming fleet average equipment and factors from the CARB OFFROAD2017-ORION v1.0.1 model, which is incorporated in the most recent version of CalEEMod.

On-Road Mobile Sources

On-road mobile sources include vehicle trips associated with construction workers, vendors– including concrete delivery, and haul trucks. Diesel-fueled delivery trucks bringing construction materials to the construction sites at the Berkeley Lab campus, dump trucks, and concrete trucks would emit NO_X, ROG, PM_{10}, and $PM_{2.5}$ as well as TACs. Truck trips associated with construction and renovation activities were derived from the construction scenario presented in Chapter 3, *Project Description*, and supplemented with construction assumptions estimated in CalEEMod. Emissions would vary in location and schedule depending on which of the phases is undergoing construction. The EMFAC2021 on-road emissions model, which is a CARB-approved model, was used to quantify on-road criteria air pollutant and TAC emissions from these sources under the Illustrative Development Scenario, including haul trucks used to transport excavated material from the construction sites.

$PM_{2.5}$ emissions can occur from resuspended road dust that is entrained by vehicular travel on paved roads and from tire and brake wear. These $PM_{2.5}$ emissions were included in the estimated total construction emissions. Factors from the U.S. EPA AP-42 (U.S. EPA, 2011) document were used to calculate entrained road dust from construction-related vehicle trips using default trips lengths.

Demolition of Existing Buildings

The construction emissions analysis modeled demolition of several prospective buildings analyzed under the Illustrative Development Scenario, as listed in Table 3-6 in Chapter 3. Emissions associated with their demolition would result from exhaust from diesel equipment used to dismantle the buildings, exhaust from diesel trucks during the haul-off of demolished material, and fugitive PM_{10} and $PM_{2.5}$ from the movement and handling of demolished material. Truck trips associated with demolition activities were derived from the demolition scenario presented in Chapter 3, *Project Description*, and supplemented with default assumptions included in CalEEMod. While the *Project Description* presents a range of years for the demolition of each building, as a conservative approach, this analysis assumes demolition would occur within the first year of the respective range for each building.

Architectural Coatings and Paving

Architectural coating and paving are the predominant sources of ROGs, also known as VOCs, emissions during construction. These emissions result from the VOC content of coatings and VOC off-gassing during paving activities. Emissions from architectural coatings were estimated based on CalEEMod default values of architectural coatings per square footage, default VOC content, and using the total building square footage provided by Berkeley Lab for the development included in the Illustrative Development Scenario. Emissions from architectural coating would be compliant with air district paint VOC regulations. The VOC content used in CalEEMod is consistent with BAAQMD Regulation 8 Rule 3.

Estimation of Operational Emissions

Emergency Backup Diesel Generators

The new emergency generators that potentially would be installed in eight of the new buildings included in the Illustrative Development Scenario would emit criteria pollutants and TACs in their exhaust during testing and emergency operation. The emissions calculations assumed 100 hours per year for potential emergency use, as recommended in the BAAQMD *2022 Air Quality CEQA Guidelines*, and 50 hours per year for testing and maintenance. Emissions were calculated assuming the generators would be compliant with BAAQMD's BACT for internal combustion engines based on their size in terms of power output (BAAQMD, 2021; BAAQMD 2024b).

Architectural Coating and Consumer Product Use

Operational architectural coatings account for the reapplication of paint and coatings on interior and exterior surfaces, which would result in ROG emissions. Architectural coating emissions were estimated using CalEEMod and were based on the total square footage of the new buildings included in the Illustrative Development Scenario.

Consumer product use would be the predominant source of ROG emissions during proposed Project operation. Consumer product emissions come from various non-industrial solvents, including cleaning supplies, kitchen aerosols, cosmetics, and toiletries, which emit ROGs during their use. Emissions from consumer products were calculated using CalEEMod and the total amount building square footage included in the Illustrative Development Scenario.

Mobile Sources

Employee vehicles, shuttle buses and other Berkeley Lab fleet vehicles would be the predominant source of mobile criteria pollutant emissions. These vehicles are gasoline-powered or use a blend of ethanol and gasoline fuel and would not emit a substantial amount of TACs in their exhaust, unlike petroleum-based, diesel-fueled vehicles. Employee vehicle trip counts from the transportation analysis were used with the EMFAC2021 on-road emissions model to calculate daily and annual criteria pollutant emissions.

Laboratory Sources

Laboratory emissions from chemical use under fume hoods include predominantly evaporative TACs, which are discussed in the section below.

Estimation of Health Risk from TAC Emissions

An HRA was prepared to evaluate potential community health risks and hazards associated with construction and operational sources of TACs depicted under the Illustrative Development Scenario. This HRA is included in Appendix AIR. Sources include those associated with construction activities (demolition, building construction, and haul trucks) and operational activities (laboratories and stationary combustion sources such as boilers, heaters, generators, and compressors). The HRA evaluated TAC concentrations at residential and worker receptors from these sources and their potential impacts to human health.

The TACs modeled in the HRA included those in the BAAQMD's Regulation 2 Rule 5 *New Source Review of Toxic Air Contaminants*. Detailed information on the methodology and models used to estimate health risk impacts is presented in Appendix AIR.

The significance thresholds applied to Project-level cancer risk, chronic non-cancer health risks, and annual average $PM_{2.5}$ concentration estimates are presented in Table 4.2-6 above. If campus development, as analyzed under the Illustrative Development Scenario, would result in TAC emissions that produced increased health risk values or annual average $PM_{2.5}$ concentration contributions exceeding the thresholds at the maximally-exposed individual resident (MEIR) or maximally-exposed individual worker (MEIW), campus development consistent with the Illustrative Development Scenario would be considered to have a significant health risk impact.

Health Risk Calculations

The health risk calculations used in the HRA for the Illustrative Development Scenario are summarized below. Refer to Appendix AIR for additional supporting technical information regarding the HRA.

Cancer Risk

The HRA evaluated the incremental increase in lifetime cancer risk from exposure to both construction and operational TAC emissions. These lifetime "excess" cancer risks were estimated as the upper-bound incremental probability that an individual will develop cancer over a lifetime as a direct result of exposure to potential carcinogens.

The estimated risk is expressed as a probability of developing cancer. The cancer risk of a specific chemical was calculated by multiplying the chemical intake or dose from human inhalation by the chemical's cancer potency factor. The incremental increase in lifetime cancer risk is based on exposure to the TAC emissions described above for construction and operational sources.

Chronic Health Impacts

The non-cancer effects of chronic (i.e., long-term) exposure to construction and operational TACs were evaluated using the hazard index (HI) approach, consistent with OEHHA guidance. The chronic HI is calculated by dividing the modeled annual average concentration at a receptor by the reference exposure level (REL). The REL is the concentration at or below which no adverse health effects are anticipated. RELs for the construction and operational TACs described above were obtained from the OEHHA guidance and the latest data in the HARP2 database (CARB, 2019).[2]

[2] California Air Resources Board, *HARP Air Dispersion Modeling and Risk Tool*, May 2019, https://ww2.arb.ca.gov/resources/documents/harp-air-dispersion-modeling-and-risk-tool, accessed July 3, 2023.

Annual Average $PM_{2.5}$ Concentrations

The HRA also estimated annual average $PM_{2.5}$ concentrations resulting from both construction and operational emissions. $PM_{2.5}$ concentrations include both fugitive and exhaust $PM_{2.5}$ emissions. The modeling evaluated the annual average concentration from all sources for each year of project construction and operation at each receptor location. The $PM_{2.5}$ annual concentration presented is the highest annual year for the MEIR and MEIW locations.

Cumulative Health Risk Assessment Impacts

The cumulative HRA analyzed the combined impact of existing Berkeley Lab campus TAC sources with the incremental increase of TAC emissions analyzed under the Illustrative Development Scenario. The significance thresholds for cumulative health risk impacts are set forth in Table 4.2-6.

A comprehensive inventory of existing Berkeley Lab campus TAC sources was developed and includes the following sources:

1. Stationary combustion sources (diesel-fired generators and air compressors, and natural gas-fired boilers and heaters)
2. Mobile combustion sources (diesel, off-road equipment)
3. Laboratory sources
4. E85 (blend of ethanol and gasoline) and gasoline fuel storage, loading, and dispensing
5. Hazardous waste handling facility
6. Soil vapor extraction system

The emissions for many existing Berkeley Lab campus TAC sources, including boilers, natural gas heaters, and diesel generators, were obtained from the 2007 HRA (Golder Associates, 2007) and from other, updated information obtained from Berkeley Lab staff. Diesel compressor emissions were obtained from the BAAQMD permit application. Natural-gas fired boiler and heater TAC emissions were calculated using AP-42 Chapter 1.4. Laboratory chemical emission factors were obtained from AP-42 chapter 5.2 and from U.S. EPA's Risk Management Program Guidance for Offsite Consequence Analysis (1999).

Each of these sources was modeled as described above under *Exposure of Sensitive Receptors to Substantial Pollutant Concentrations*, using the same receptor locations used for the Illustrative Development Scenario HRA.

Other Criteria Air Pollutants

Regional concentrations of CO and SO_2 have not exceeded the state standards for over two decades. As discussed previously, the air basin is in attainment for both CO and SO_2.

No analysis is required for SO_2, as the air basin has never been designated as non-attainment. SO_2 emissions result predominantly from the combustion of sulfur-containing fuels (oil, coal, high-sulfur diesel), which are no longer used in California.

In contrast, elevated localized concentrations of CO still warrant consideration in the environmental review process, even though the air basin is in attainment of the CO standards. Occurrences of elevated localized CO concentrations, known as hot spots, are often associated with heavy traffic congestion, which most frequently occurs at signalized intersections of high-volume roadways. The air district has demonstrated, based on modeling, that to exceed the California ambient air quality standard of 9.0 ppm (8-hour average) or 20.0 ppm (1-hour average) for CO, project traffic, in addition to existing traffic, would need to exceed 44,000 vehicles per hour at affected intersections. Projects that do not result in 44,000 vehicles per hour in combination with background traffic would not have the potential to result in a significant CO impact. The transportation analysis indicates that the proposed Project would not generate greater than 44,000 vehicles during any hour, in combination with background traffic. Given the air basin's attainment status for these pollutants and the limited CO and SO_2 emissions that could result from the proposed Project, the proposed Project would not result in a cumulatively considerable net increase in CO or SO_2, and a quantitative analysis is not required. Impacts are therefore considered less than significant for CO and SO_2.

Impact Analysis

LRDP Impact AQ-1: Implementation of the LBNL 2025 LRDP would not conflict with or obstruct implementation of the applicable air quality plan. (*Less than Significant*)

The most recently adopted air quality plan for the air basin is the *2017 Clean Air Plan (2017 Clean Air Plan): Spare the Air, Cool the Climate* (BAAQMD, 2017).[3] The 2017 Clean Air Plan is a road map that demonstrates how the Bay Area will, in accordance with the requirements of the CCAA, implement all feasible measures to reduce ozone precursors (ROG and NO_X) and reduce the transport of ozone and its precursors to neighboring air basins. It also provides a climate and air pollution control strategy to reduce ozone, PM, TACs, and GHG emissions that builds upon existing regional, state, and national programs.

In determining consistency with the 2017 Clean Air Plan, this analysis considers whether the proposed 2025 LRDP would (1) support the primary goals of the 2017 Clean Air Plan, (2) include applicable control measures from the 2017 Clean Air Plan, and (3) avoid disrupting or hindering implementation of 2017 Clean Air Plan control measures.

The primary goals of the 2017 Clean Air Plan are to protect air quality and public health at the regional and local scale and to protect the climate by: reducing regional criteria air pollutant emissions; reducing local air-quality-related health risks (by meeting state and national ambient air quality standards); and reducing GHG emissions (by reducing GHG emissions to 40 percent below 1990 levels by 2030 and to 80 percent below 1990 levels by 2050).[4] However, the UC *Policy on Sustainable Practices* requires Berkeley Lab to achieve a 90 percent reduction in GHG emissions by 2045, and the Berkeley Lab *Net-Zero Vision and Roadmap* also proposes more

3 Bay Area Air Quality Management District, *2017 Clean Air Plan: Spare the Air, Cool the Climate*, April 19, 2017, http://www.baaqmd.gov/~/media/files/planning-and-research/plans/2017-clean-air-plan/attachment-a_-proposed-final-cap-vol-1-pdf.pdf?la=en, accessed July 15, 2021.

4 The air district's 2030 GHG target is consistent with the California's GHG 2030 reduction target, per Senate Bill 32. The air district's 2050 target is consistent with the state's 2050 GHG reduction target per Executive Order S-3-05.

stringent standards to negate any residual emissions remaining in 2045 through investments in carbon removal (see Section 4.7 *Greenhouse Gas Emissions*).

To meet these goals, the 2017 Clean Air Plan has defined 85 individual control measures that describe specific actions to reduce emissions of air and climate pollutants across a full range of emission sources. These control measures are grouped into the following sectors based upon the economic sector framework used by CARB for the AB 32 Scoping Plan Update: stationary (industrial) sources, transportation, energy, buildings, agriculture, natural and working lands, waste management, water, and super-GHG pollutants.

The proposed 2025 LRDP and its related actions would not conflict with the primary goals of the 2017 Clean Air Plan or the applicable measures that aim to achieve these goals, as discussed below. It is noted that the vast majority of the control measures included in the 2017 Clean Air Plan do not apply directly to the proposed 2025 LRDP and any of its related development projects, because they target facilities or land uses that do not currently exist and would not be permitted on the Berkeley Lab campus (e.g., energy generation, waste management, agricultural, forest or pasture lands); vehicles or equipment that would not be employed on the campus (e.g., airplanes, farming equipment); and/or involve rulemaking or other actions under the jurisdiction of agencies not directly involved with proposed 2025 LRDP design, approval, or implementation. For example, 40 of these measures address stationary sources (such as oil refineries and cement kilns, and large boilers used in commercial and industrial facilities) and are implemented by the air district using its permit authority. These measures are, therefore, not suited to local planning implementation.

In general, new development on the Berkeley Lab campus incorporates many of the applicable control measures identified in the 2017 Clean Air Plan through a combination of the planning provisions and policies that promote or encourage energy conservation, waste diversion, and transit and bicycling as primary transportation modes. Berkeley Lab development under the proposed 2025 LRDP would continue to support these control measures and would not hinder their implementation.

The control measures most applicable to the proposed 2025 LRDP include transportation control measures, energy use reduction measures, and building measures. These control measures in the 2017 Clean Air Plan are identified in **Table 4.2-7**. The table identifies each measure or group of measures and correlates them to specific 2025 LRDP elements.

For these reasons, the proposed 2025 LRDP would be consistent with and supportive of the 2017 Clean Air Plan primary goals and control measures. Thus, the proposed 2025 LRDP would not conflict with or obstruct 2017 Clean Air Plan implementation, this impact would be less than significant, and no mitigation measures are required.

Mitigation: None required.

TABLE 4.2-7
CONSISTENCY OF THE PROPOSED 2025 LRDP WITH CONTROL MEASURES OF THE 2017 CLEAN AIR PLAN

2017 Clean Air Plan Control Measure		Elements of the Proposed 2025 LRDP Consistent with the Measure
TR2 – Trip Reduction Programs	Implement the regional Commuter Benefits Program (Rule 14-1) that requires employers with 50 or more bay area employees to provide commuter benefits. Encourage trip reduction policies and programs in local plans, e.g., general and specific plans while providing grants to support trip reduction efforts. Encourage local governments to require mitigation of vehicle travel as part of new development approval; to adopt transit benefits ordinances in order to reduce transit costs to employees; and to develop innovative ways to encourage rideshare, transit, cycling, and walking for work trips. Fund various employer-based trip reduction programs.	As described in Section 4.14, *Transportation,* the current Berkeley Lab Transportation Demand Management (TDM) program includes strategies that encourage commuting options other than driving alone, such as public transit, shuttle service, biking, walking, and carpooling. Under the proposed 2025 LRDP, UC LBNL would continue and potentially improve and expand the current TDM measures at the Berkeley Lab campus, including its robust shuttle service to various destinations in the surrounding communities, which would continue to encourage the use of non-single occupant automobile travel modes and reduce the motor vehicle trips generated by the Lab campus site. The TDM program would also continue to support the use of electric vehicles. The Lab has a goal of quadrupling the number of EV charging sites across the campus in order to support the anticipated growth in EV use.
TR5 – Transit Efficiency and Use	Improve transit efficiency and make transit more convenient for riders through continued operation of 511 Transit, full implementation of Clipper® fare payment system and the Transit Hub Signage Program.	Under the proposed 2025 LRDP, Berkeley Lab would continue to operate a shuttle bus system within the campus and provide service to various destinations in surrounding communities. UC LBNL is currently constructing a transit center in the Central Commons development cluster, which will provide convenient access to nearby amenities at the campus. Under the proposed 2025 LRDP, UC LBNL may implement further improvements to this transit center and/or create other mobility hubs/shuttle stops.
TR9 – Bicycle and Pedestrian Access and Facilities	Encourage planning for bicycle and pedestrian facilities in local plans, e.g., general and specific plans, fund bike lanes, routes, paths, and bicycle parking facilities.	During the proposed 2025 LRDP term, UC LBNL would continue to encourage the ongoing transition to non-auto alternate modes of transportation, including co-locating bicycle and scooter parking, and ensuring good pedestrian connections. Over the proposed 2025 LRDP term, UC LBNL would continue to make improvements to the often-narrow roadway network to encourage campus bicycle use. While Berkeley Lab's commitment to its shuttle system is a key element supporting campus pedestrian movement, additional improvements are envisioned under the proposed 2025 LRDP, including: • Improvements to and expansion of safe pedestrian paths; • Better signage and wayfinding to clarify best and safest routes; and • Improvements such as ramps and building elevators to provide barrier-free access up steep slopes and in building entries and approaches.
EN1 – Decarbonize Electricity Production	EN1 focuses on lowering carbon emissions by switching the fuel sources used in electricity generation. The measure would promote and expedite a transition away from fossil fuels used in electricity generation (i.e., natural gas) to a greater reliance on renewable energy sources (e.g., wind, solar).	A key proposed Project objective is to maintain and strengthen Berkeley Lab's responsible stewardship of public and natural resources; a key supporting strategy is to promote a sustainable campus by maximizing efficiency and minimizing natural resource consumption and environmental impacts. Under the proposed 2025 LRDP, UC LBNL would continue to implement the Lab's *Net-Zero Vision and Roadmap,* which describes the actions needed to achieve net-zero GHG direct and indirect emissions by no later than 2045. Implementation of the basic strategies in the *Net-Zero Vision and Roadmap* that would enable Berkeley Lab to reach net-zero are:

TABLE 4.2-7
CONSISTENCY OF THE PROPOSED 2025 LRDP WITH CONTROL MEASURES OF THE 2017 CLEAN AIR PLAN

2017 Clean Air Plan Control Measure		Elements of the Proposed 2025 LRDP Consistent with the Measure
		• *Energy Efficiency*: Continual improvement in the efficiency of operations and new construction; • *Renewable Energy*: Shifting to 100 percent carbon-free electricity and increasing the hourly match between carbon-free supply and demand; • *Electrification*: Transitioning away from natural gas and fuel to electricity provided by a decarbonized grid; • *Individual Action*: Providing support for individual and collective action to optimize purchases, commutes, and flights; and • *Innovation*: Collaborating with researchers to advance science, implementation, and adoption.
BL1 – Green Buildings	BL1 seeks to increase energy efficiency and the use of onsite renewable energy—as well as decarbonize existing end uses—for all types of existing and future buildings. The measure includes policy assistance, incentives, diffusion of public information, and targeted engagement and facilitation of partnerships in order to increase energy efficiency and onsite renewable energy in the buildings sector.	Pursuant to UC's *Policy on Sustainable Practices*, the new campus buildings under the proposed 2025 LRDP would have no natural gas infrastructure, and all new facilities would be entirely powered by electricity to meet the building energy use needs.
WA3 – Green Waste Diversion; and WA4 – Recycling and Waste Reduction	WA3 seeks to reduce the total amount of green waste being disposed in landfills by supporting the diversion of green waste to other uses, while WA4 seeks to reduce greenhouse gas emissions by diverting recyclables and other materials from landfill.	Under the proposed 2025 LRDP, UC LBNL's Sustainable Berkeley Lab (SBL) team would continue to work with the diverse Lab community to reduce the Lab's waste footprint through education and improvements to site infrastructure. SBL initiatives for waste reduction are to promote the purchase of products that use less materials; support composting and recycling to minimize landfill contribution, and partner with scientists and staff to divert waste from the landfill. In addition, pursuant to UC's *Policy on Sustainable Practices*, UC LBNL maintains a target to achieve greater than 90 percent diversion of nonhazardous solid waste from the landfill through recycling or composting. Also, pursuant to UC LBNL's *Sustainability Standards for New Construction and Major Renovations*, UC LBNL maintain a target to divert 80 percent of construction and demolition waste from the landfill for major new construction.
WR2 – Support Water Conservation	WR2 seeks to promote water conservation, including reduced water consumption and increased onsite water recycling, in residential, commercial, and industrial buildings for the purpose of reducing greenhouse gas emissions.	Under the proposed 2025 LRDP, UC LBNL would promote water conservation through use of recycled water at the campus, including considering the use of recycled water for campus cooling; replacing fixtures in existing buildings and considering dual plumbing for new buildings; and using recycled water for landscape irrigation in the limited instances in which landscape irrigation is allowable. In addition, under the proposed 2025 LRDP, UC LBNL's SBL team would continue to work with the diverse Lab community to reduce the Lab's water footprint through education and improvements to site infrastructure. SBL initiatives for water reduction include implementing the *Berkeley Lab Water Action Plan*; retrofitting facilities with water-saving fixtures; and tracking and monitoring to ensure water-efficient operation.

SOURCE: BAAQMD, 2017b.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual development that is approved and constructed pursuant to the 2025 LRDP is expected to be similar in intensity and character to the development depicted in the Illustrative Development Scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus, the scenario is an appropriate and conservative basis for the evaluation of air quality impacts, including the impacts of potential individual projects under the proposed 2025 LRDP. Potential individual projects, such as those analyzed in the Illustrative Development Scenario, would be consistent with the same measures that are shown in Table 4.2-7 above. For the reasons stated above, the impact from campus development consistent with the Illustrative Development Scenario with respect to 2017 Clean Air Plan consistency would be less than significant.

LRDP Impact AQ-2: Implementation of the LBNL 2025 LRDP would not result in a cumulatively considerable net increase of any criteria pollutant for which the Project region is non-attainment under an applicable federal or state ambient air quality standard, but would result in significant localized dust emissions. (*Significant; Less than Significant with Mitigation*)

The significance of a plan's emissions of criteria air pollutants is based on consistency with regional air quality planning projections, including an evaluation of population and employment growth and growth in vehicle trips. As shown in Table 4.2-5, which presents BAAQMD significance thresholds for evaluating plan-level impacts, for a proposed plan to result in less-than-significant criteria air pollutants impact, an analysis must demonstrate that the plan's growth in vehicle trips would not exceed the plan's population and employment growth.

Berkeley Lab campus population is expressed as Adjusted Daily Population (ADP), an estimated, annually averaged, daily headcount of all persons–including staff and visitors–who may be present on the campus on any given workday. Berkeley Lab campus population is projected under the proposed 2025 LRDP to increase from the baseline 3,000 ADP in 2024 to 4,200 by 2045, a 40 percent increase. The trip generation for the proposed 2025 LRDP, is projected to be proportional to campus population growth (Fehr & Peers 2024). **Table 4.2-8** presents the population and trip generation for the proposed 2025 LRDP and shows that percentage increase in trip generation under the proposed 2025 LRDP over existing conditions would not be greater than the percent increase in ADP. Therefore, this impact would be less than significant, and no mitigation is required.

Rather than provide numeric emissions thresholds to evaluate fugitive dust impact significance, the BAAQMD recommends best management practices in its *2022 CEQA Air Quality Guidelines* (Table 5-2 and also shown below in LRDP Mitigation Measure AQ-2) to reduce fugitive dust emissions. Without these measures, fugitive dust impacts would be considered potentially significant. Adherence to these dust minimization measures would reduce dust-related criteria air pollutant impact of Project-related construction to a less-than-significant level.

TABLE 4.2-8
2025 LRDP TRIP GENERATION ESTIMATES

	2024 Existing	LRDP Buildout	Difference	% Increase
ADP	3,000	4,200	1,200	40%
Daily Trips	4,340	6,080	1,740	40%

NOTES:
ADP is adjusted daily campus population
Vehicle trip generation data provided by Fehr & Peers, 2024.

LRDP Mitigation Measure AQ-2: Best Management Practices for Dust and Emissions Control

Berkeley Lab shall implement all the following best management practices to reduce fugitive PM_{10} and $PM_{2.5}$ during campus construction activities:

- All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered a minimum of two times per day, excluding days with rain.
- All haul trucks transporting soil, sand, or other loose material off-site shall be covered.
- All visible mud or dirt track-out onto adjacent public or private haul roads shall be removed using hand brooming or other method at least once per day. The use of dry power sweeping is prohibited.
- All vehicle speeds on unpaved roads shall be limited to 15 mph.
- All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Where applicable, e.g., for low rise buildings, building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.
- All excavation, grading, and/or demolition activities shall be suspended when average wind speeds exceed 20 mph.
- Dust from all trucks and equipment shall be removed prior to leaving the site.
- Unpaved roads providing access to sites located 100 feet or further from a paved road shall be treated with a 6- to 12-inch layer of compacted layer of wood chips, mulch, or gravel.
- Post a publicly visible sign with the telephone number and person to contact at Berkeley Lab regarding dust complaints. This person shall respond and take corrective action within 48 hours. The air district's phone number shall also be visible to ensure compliance with applicable regulations.

Significance after Mitigation: Less than Significant.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to the development analyzed in the Illustrative Development Scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of air quality impacts under the LRDP.

The analysis below presents estimated construction and operational emissions that could result if all of the campus development (demolition plus all new building space) portrayed under the Illustrative Development Scenario were completed on Berkeley Lab within the proposed 2025 LRDP planning period (i.e., 2025 through 2045).

Construction

Criteria pollutant impacts from construction consistent with the Illustrative Development Scenario include fugitive dust emissions, heavy equipment and truck exhaust emissions, and architectural coating emissions. Exhaust emissions from construction equipment and trucks, and emissions from architectural coating, are presented in **Table 4.2-9** and compared to the BAAQMD construction emissions numeric significance thresholds. During the period when construction activities would be the only source of emissions, before any of the buildings would be occupied (assumed to be between the years 2025 through 2030), emissions would be below significance thresholds.

TABLE 4.2-9
COMBINED CONSTRUCTION AND OPERATIONAL EMISSIONS FOR THE ILLUSTRATIVE DEVELOPMENT SCENARIO

	Criteria Pollutant Emissions[a]							
	Annual Emissions (tons/year)				Average Daily Emissions (pounds/day)[b]			
Emissions Source	**ROG**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**	**ROG**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
Construction Year 2030	0.9	1.5	0.3	0.3	4.4	7.7	0.9	0.5
Combined Construction and Operations Year 2031[c,d]	1.7	0.9	0.6	0.3	9.1	4.7	3.5	1.5
Full Buildout Year 2045 (Operational only)	*3.4*	*2.4*	*0.8*	*0.4*	*19.0*	*13.0*	*3.8*	*1.8*
Significance Thresholds	10	10	15	10	54	54	82	54
Exceeds Thresholds in any Year?	No	No	No	No	No	No	No	No

ABBREVIATIONS:

CalEEMod = California Emissions Estimator Model; $PM_{2.5}$ = PM less than 2.5 microns in diameter; PM_{10} = PM less than 10 microns in diameter; ROG = reactive organic gases; NOx = nitrogen oxides; PM = particulate matter

NOTES:

a. Emissions estimated using methods consistent with CalEEMod version 2022.1.
b. Operational emissions shown represent activity and emissions across 365 days per year.
c. The only generators anticipated to be operating in 2031 are those for the AMDB and Chemical Sciences buildings.
d. Emissions in the year 2031 are presented here as it is the year with the highest levels of overlapping emissions from both construction and operational activity.

SOURCE: ESA, 2024. See Appendix AIR

The BAAQMD recommends best management practices, as shown above in LRDP Mitigation Measure AQ-2, to reduce fugitive dust emissions. Adherence to these dust minimization measures would reduce construction dust-related criteria air pollutant impacts from campus development consistent with the Illustrative Development Scenario to a less-than-significant level.

Operation

The first year of partial operation of campus facilities built consistent with the Illustrative Development Scenario is assumed to start when construction of the first development increments have been completed and buildings are occupied, approximately in the year 2031, while later increments of construction are still underway. Thus, using the Illustrative Development Scenario, operational emissions were estimated for the period between 2031 and 2045.

Operational criteria pollutant emissions sources would include employee vehicle trips, emergency backup diesel generators, architectural coating from building maintenance, and consumer products (products used in cleaning, maintenance, and cooking). All new development would be all-electric and would not use natural gas for space or water heating. As a result, there would be no natural gas combustion emissions associated with new campus development.

Table 4.2-9 presents emissions from three periods: construction, overlapping construction plus operations (before full buildout), and full buildout operations (2045). Full buildout emissions from mobile sources were estimated with year 2035 emission factors, as it represents the analytical mid-point for Illustrative Development Scenario completion (For construction equipment and mobile sources, the emission factors vary by year, decreasing in future years. This is due to improved fuel economy required by regulations and also due to the retirement of older, dirtier equipment and vehicles from the area-wide fleet). The year 2030 emissions are shown for the construction-only impacts because the Illustrative Development Scenario posits that there would be the overlap of demolition of nine buildings plus construction of two buildings in that year. This would also be the year with the highest emissions from construction.

Table 4.2-9 shows that emissions from construction, and from construction plus operation, and from full buildout operations would be less than the applicable significance thresholds. The year with the highest emissions from construction plus operations would be 2031.

Table 4.2-10 presents emissions from each of the source categories at full buildout consistent with the Illustrative Development Scenario, after all construction has been completed and all of the new buildings are fully operational.

As shown in Tables 4.2-9 and 4.2-10 above, construction and operational emissions, including the emissions during the period of overlapping construction and operations, would be below the applicable significance thresholds. However, mitigation would still be required to reduce fugitive dust emissions based on the BAAQMD approach to significance of these emissions and dust minimization requirements. Therefore, LRDP Mitigation Measure AQ-2 would be required to reduce fugitive dust emissions. Adherence to the dust minimization measures would reduce dust-related criteria air pollutant impact from project construction consistent with the Illustrative Development Scenario to a less-than-significant level.

TABLE 4.2-10
NEW OPERATIONAL EMISSIONS FOR THE ILLUSTRATIVE DEVELOPMENT SCENARIO AT FULL BUILDOUT

	Criteria Pollutant Emissions[a]							
	Annual Emissions (tons/year)				Average Daily Emissions (pounds/day)[b]			
Emissions Source	**ROG**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**	**ROG**	**NO_X**	**PM_{10}**	**$PM_{2.5}$**
Area	2.9	0.1	0.1	0.1	16.0	0.1	0.1	0.1
Mobile	0.3	0.4	0.6	0.2	1.8	2.0	3.3	1.4
Emergency Generators	0.2	1.7	0.1	0.1	3.3	26.6	1.0	1.0
Total Project Emissions	*3.4*	*2.4*	*0.8*	*0.4*	*19.0*	*13.0*	*3.8*	*1.8*
Significance Thresholds	10	10	15	10	54	54	82	54
Exceeds Thresholds?	No	No	No	No	No	No	No	No

ABBREVIATIONS:

CalEEMod = California Emissions Estimator Model; $PM_{2.5}$ = PM less than 2.5 microns in diameter; PM_{10} = PM less than 10 microns in diameter; ROG = reactive organic gases; NOx = nitrogen oxides; PM = particulate matter

NOTES:

a. Emissions estimated using methods consistent with CalEEMod version 2022.1.
b. Operational emissions shown represent average activity and emissions across 365 days per year. Generators would be tested for one half-hour per week but could be used for emergency purposes. An annual average of one hour per day was conservatively assumed.

SOURCE: ESA, 2024. See Appendix AIR.

LRDP Impact AQ-3: Implementation of the LBNL 2025 LRDP would not expose sensitive receptors to substantial pollutant concentrations. (*Less than Significant*)

The BAAQMD significance criteria for TAC and $PM_{2.5}$ emissions health risks indicate that a proposed plan must have the following features to achieve a less-than-significant impact:

- Identification of special overlay zones around existing and proposed land uses that emit TACs or $PM_{2.5}$ and;
- Establishing a 500-foot overlay zone within 500 feet from all freeways, high-volume roadways, railyards, ports, and rail lines using diesel locomotives.

The proposed 2025 LRDP would not result in new buildings that would emit TACs or $PM_{2.5}$ in close proximity of existing sensitive uses. Project-related development would be more than 500 feet from existing sensitive receptors and greater than 500 feet from any freeway or high-volume roadways (e.g. Interstate 80 or University Avenue), railyard, port, or rail lines.

Therefore, with respect to the plan-level significance threshold, this impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. As noted above under the *Approach to Analysis*, a HRA was prepared which analyzed the increases in operational TAC and radionuclide emissions that would be associated with campus development consistent with the Illustrative Development Scenario for their potential to result in a significant human health risk impact on off-site and on-site receptors. The methodology and results of the HRA are presented below. The study area for this analysis was 1,000 feet from the Berkeley Lab campus boundary to ensure that the maximum health risk results were captured. Based on the results of the HRA, the risk results at the 1,000-foot distance are minimal.

Operation – Cancer Risk from TAC Emissions

TACs emissions from the new buildings consistent with the Illustrative Development Scenario would include DPM and $PM_{2.5}$ from emergency backup generators and evaporative chemical compounds from new buildings with “wet” laboratories–laboratory spaces outfitted with fume hoods where chemical handling is performed. The PM_{10} emissions from the new generators in Table 4.2-10 represent DPM emissions, and the $PM_{2.5}$ emissions from these generators are also shown in Table 4.2-10. Laboratory chemical compound TAC emissions are presented in Appendix AIR and include estimated emissions from each compound for each new building that would include wet and/or chemical-handling laboratories.

The HRA was conducted for workplace receptors on Berkeley Lab and for both residential and workplace receptors off-campus in the vicinity of Berkeley Lab. Although the Orange House Family Child Care facility is located on LeRoy Avenue, approximately one-quarter mile from the Berkeley Lab campus, there are a number of residential receptors which are closer to the Berkeley Lab campus than this childcare facility. With respect to these residential receptors, the analysis assumed that a child as young as a third-trimester fetus is present in the residence and analyzed the health risk to children based on this assumption. Thus, the HRA reports the worst-case impacts on children at nearby residences. The impacts at the childcare facility were not analyzed separately as they are expected to be less than the impact at the nearby residential child receptor.

The HRA was conducted for both residential and workplace receptors, assuming a 30-year exposure period for residential receptors and a 25-year exposure period for workplace receptors, per the OEHHA guidance. The cancer risk calculations are based on an accumulation of TACs exposure over a 30-year period. To ensure the worst-case exposure period was captured, two scenarios were modeled: the first starting with construction followed by operation, and the second with only operational emissions. Therefore, the HRA was completed as follows: (1) the first scenario modeled risks from exposure starting with the 20-year construction period followed by 10 years of operations consistent with the Illustrative Development Scenario, and (2) the second scenario assumed exposure starting with full buildout consistent with the Illustrative Development Scenario and continuing for 30 years.

The results are presented for the off-site residential and workplace (commercial, retail, or business) receptors and on-site workplace receptors (Berkeley Lab campus staff). The off-site, maximally-exposed individual resident is referred to as the MEIR, and the maximally-exposed, individual off-site and on-site workplace receptors are referred to as the off- and on-site MEIW. The closest off-site building to the Berkeley Lab campus was conservatively assumed to be a residence which was modeled and analyzed both as a residential receptor as well as a workplace receptor. Therefore, the location of the off-site MEIW is the same as the off-site MEIR. The results differ, however, due to the resident versus workplace exposure parameters, with the residential exposure parameters being more conservative. **Table 4.2-11** shows the first HRA scenario for a 30-year exposure period for the MEIR and a 25-year exposure period for the MEIW that comprises:

- the assumed Illustrative Development Scenario construction period from 2025 – 2045 = 20 years;
- the full buildout operation of the Illustrative Development Scenario period from 2045 to 2055 = 10 years.

TABLE 4.2-11
INCREASED CANCER RISK (PER MILLION), CHRONIC HI AND ANNUAL AVERAGE $PM_{2.5}$ CONCENTRATIONS UNDER ILLUSTRATIVE DEVELOPMENT SCENARIO: CONSTRUCTION PLUS 10 YEARS OPERATIONS

Receptor Type	Increased Cancer Risk (in 1 million)	Chronic HI	Annual Average $PM_{2.5}$ Concentration (µg/m^3)
MEIR (off-site)	1.98	0.003	0.01
MEIW (off-site)	0.13	0.003	0.01
MEIW (on-site)	1.77	0.06	0.12
Significance Threshold	10	1.0	0.3
Exceeds Threshold?	No	No	No

ABBREVIATIONS:
MEIR = maximally exposed individual resident; MEIW = maximally exposed individual worker; HI = hazard index
SOURCE: ESA, 2024. See Appendix AIR

For the first HRA scenario that includes both construction and operations, the increased cancer risk, chronic HI, and $PM_{2.5}$ concentrations would not exceed the applicable significance thresholds. The off-site MEIR/MEIW is located at a property to the west of the Berkeley Lab campus, approximately 400 feet southwest of Building 90. The primary contributor to the total cancer risk at this receptor location is diesel fuel combustion during construction resulting in DPM emissions (which are carcinogenic). In addition, the age range during which exposure to these emissions begins is the third trimester fetus to 2-years old, which is the age when humans are most sensitive to TACs. The early phases of construction, i.e., the earthwork portions of individual projects, produce high DPM emissions from the use of heavy-duty, off-road equipment and therefore impact those most sensitive age groups and drive the risk at the MEIR. The primary contributor to $PM_{2.5}$ concentrations is fugitive dust during earthmoving activities.

For the Berkeley Lab employees, the increased cancer risk, chronic HI, and $PM_{2.5}$ concentrations would not exceed the applicable significance thresholds. The on-site MEIW for cancer risk and chronic HI is located at Building 56A. The on-site MEIW for $PM_{2.5}$ is located at Building 2. As with the off-site MEIR and MEIW, the primary contributor to the total cancer risk at the on-site MEIW is construction activities resulting in DPM emissions from diesel fuel combustion, and the primary contributor to $PM_{2.5}$ concentrations is fugitive dust during earthmoving activities.

For the second HRA scenario that includes operations of new facilities following buildout consistent with the Illustrative Development Scenario, the analysis assumed exposure to operational TACs for 30 years from 2045 to 2075 for residential receptors and for 25 years from 2045 to 2070 for workplace receptors. **Table 4.2-12** shows that the risks solely from operation of new development consistent with the Illustrative Development Scenario would also not exceed thresholds for increased cancer risk, chronic HI, or annual average $PM_{2.5}$ concentrations at the off-site MEIR, off-site MEIW, or on-site MEIW.

TABLE 4.2-12
INCREASED CANCER RISK (PER MILLION), CHRONIC HI AND ANNUAL AVERAGE $PM_{2.5}$ CONCENTRATIONS UNDER ILLUSTRATIVE DEVELOPMENT SCENARIO: FULL BUILDOUT OPERATIONS

Receptor Type	Cancer Risk (in 1 million)	Chronic HI	Annual Average $PM_{2.5}$ Concentration ($\mu g/m^3$)
MEIR and MEIW (off-site)	2.14	0.001	0.002
MEIW (on-site)	0.73	0.01	0.03
Significance Threshold	10	1.0	**0.3**
Exceeds Threshold?	No	No	No

ABBREVIATIONS:
MEIR = maximally exposed individual resident; MEIW = maximally exposed individual worker; HI = hazard index
SOURCE: ESA, 2024. See Appendix AIR

The off-site MEIR (and MEIW) for cancer risk, chronic HI, and $PM_{2.5}$ concentrations under the second HRA scenario is located at a property directly west of the Berkeley Lab campus, approximately 500 feet from Parking Lot D. The on-site MEIW for cancer and $PM_{2.5}$ is located at Building 30. The on-site MEIW for chronic HI is located at Building 31. The primary contributor to the total cancer risk at these receptor locations is DPM emissions from the emergency backup generators. The risk associated with lab chemical use is far lower than that due to DPM.

Operation – Cancer Risk from Radionuclide Emissions

The HRA conducted for the Illustrative Development Scenario for the 2006 LRDP in support of the 2006 LRDP Final EIR found that the cancer risk increase from radionuclides was estimated at 0.4 in one million at the MEIR. Assuming an increase in radionuclide use associated with the 2025 LRDP EIR Illustrative Development Scenario would be proportional to the increase in new, Project-related radionuclide-using lab space, a proportionally similar increase in cancer risk could be expected. Radionuclides are expected to be handled at these following prospective buildings analyzed under the Illustrative Development Scenario: BioGEM building, Flex building, Laser Linear Accelerator Tunnel, Advanced Materials Discovery Building, and the Chemical Sciences Building.

As depicted in the Illustrative Development Scenario, the Project would likely involve eventual relocation and increase of some existing Berkeley Lab radionuclide activities. Research activities that involve radionuclides currently occur in off-site leased building spaces: the Advanced Biofuels and Bioproducts Process Development Unit (ABPDU) and Joint BioEnergy Institute (JBEI) programs. The HRA conservatively assumes that these two research programs would be relocated to the Berkeley Lab campus, and the Illustrative Development Scenario posits that they would be located in the prospective BioGEM building. The BioGEM building would provide a 150-percent increase in research space available to the ABPDU and JBEI programs, which is reflected in a proportionate increase in radionuclide use assumed in the HRA. Similarly, current radionuclide research activities that occur in Building 70–a candidate for demolition–are assumed to be relocated to the prospective new FLEX building, which would provide a 62-percent increase in available research space. Conservatively assuming campuswide radionuclide handling would increase by 1.5 times that analyzed in the 2006 HRA, the updated cancer risk at the MEIR from radionuclide exposure would be 0.6 in one million.

Based on the analysis above, both on- and off-site sensitive receptors would not be exposed to substantial pollutant concentrations associated with campus development consistent with the Illustrative Development Scenario, and the impact would be less than significant.

LRDP Impact AQ-4: Implementation of the LBNL 2025 LRDP would not generate odors adversely affecting a substantial number of people. (*Less than Significant*)

The proposed 2025 LRDP is not anticipated to involve any new sources of odors. Facilities and land uses that typically generate odors include wastewater treatment and pumping facilities; landfills, transfer stations, and composting facilities; petroleum refineries, asphalt batch plants, chemical (including fiberglass) manufacturing, and metal smelters; large-scale painting and coating facilities; rendering plants; and coffee roasters and food processing facilities. None of these types of facilities are planned as part of the proposed 2025 LRDP.

Project construction-related odors would be localized and temporary, and low-VOC surface coating materials in accordance with BAAQMD Rules would minimize potentially objectionable odors from painting operations. Therefore, this impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to the development analyzed in the Illustrative Development Scenario. Any of the hypothetical buildings analyzed in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of impacts from odorous sources. Potential individual projects, such as those analyzed in the Illustrative Development Scenario, would not result in odorous emissions affecting a substantial number of people. For the reasons stated above with regard to the proposed 2025 LRDP implementation, this impact would be less than significant.

Cumulative Impacts

LRDP Impact CUM-AQ-1: Implementation of the LBNL 2025 LRDP would not result in a cumulatively considerable net increase of criteria pollutants for which the Project region is non-attainment under an applicable federal or state ambient air quality standard. (*Less than Significant*)

Regional air pollution is largely a cumulative impact in that no single project is sufficient in size to, by itself, result in nonattainment of air quality standards. Instead, a project's individual emissions are considered to contribute to the existing, cumulative air quality conditions. If a project's contribution to cumulative air quality conditions is considerable, then the project's impact on air quality would be considered significant and cumulatively considerable (BAAQMD, 2022). As noted earlier, the air basin is a nonattainment area for both the federal and State ozone and $PM_{2.5}$ standards, and state PM_{10} standards; therefore, a Project-related cumulative air quality impact would automatically occur if the additional pollutant emissions exceed significance thresholds (and thereby contribute a considerable amount). Project emissions of ozone precursors NO_X or ROG, $PM_{2.5}$, or PM_{10} over threshold amounts would further degrade air quality related to ozone.

LRDP Impact AQ-2 evaluates whether campus development under the proposed 2025 LRDP would make a cumulatively considerable contribution to this existing significant cumulative impact. Because that analysis shows that proposed 2025 LRDP implementation would not result in a significant impact related to non-attainment criteria pollutants, the Project contribution would therefore not be cumulatively considerable, and a significant cumulative impact would not result.

With respect to dust emissions, campus construction projects would implement LRDP Mitigation Measure AQ-2, which would minimize the Lab's contribution to a cumulative dust emissions impact.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The potential for campus development consistent with that analyzed under the Illustrative Development Scenario to result in significant criteria air pollutant emissions, and therefore a cumulatively considerable contribution to non-attainment criteria pollutants, is addressed under LRDP Impact AQ-2, using the air district's project-level significance thresholds. The BAAQMD project-level criteria air pollutant thresholds are based on levels below which new sources would not result in a cumulatively considerable net increase in criteria air pollutants for which the region is in nonattainment. The thresholds for the ozone precursors ROG and NO_X, and for PM_{10} and $PM_{2.5}$, are tied to the BAAQMD's New Source Review offset requirements for non-attainment pollutants, specifically with respect to Bay Area non-attainment of federal and State ozone standards and State PM_{10} and $PM_{2.5}$ standards. The use of these thresholds is appropriate "to prevent further deterioration of ambient air quality and thus has nexus and proportionality to prevention of a regionally cumulative significant impact (e.g., worsened status of nonattainment)." Therefore, apart from the project-level impact analysis, no separate cumulative criteria air pollutant impact analysis is required. As LRDP Impact AQ-2 shows, with mitigation for dust emissions, the project-level impact of criteria pollutant emissions associated with the Illustrative Development Scenario would be less than significant, and therefore campus development consistent with the Illustrative Development Scenario would not result in a significant cumulative impact.

LRDP Impact CUM-AQ-2: Implementation of the LBNL 2025 LRDP, in combination with existing sources at the Berkeley Lab campus, would not expose sensitive receptors to substantial pollutant concentrations. (*Less than Significant*)

As discussed under LRDP Impact AQ-3, the proposed 2025 LRDP would not place sources of TAC emissions close to off-site sensitive receptors, and therefore the health risk impact from exposure to new TAC sources would be less than significant, and campus development under the proposed 2025 LRDP would not make a cumulatively considerable contribution to the impact.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. LRDP Impact AQ-3 addresses the project-level health risk impact from campus development consistent with the Illustrative Development Scenario. The analysis below evaluates whether the project-level impact of development consistent with the Illustrative Development Scenario would combine with the health risk from existing Berkeley Lab campus TAC sources to result in a significant cumulative impact. To analyze this, a cumulative HRA was prepared (Appendix AIR).

These existing (or baseline) sources of TACs at the Berkeley Lab campus, listed below, were modeled for the cumulative HRA.

- Combustion emissions: generators, boilers, heaters, compressors, and offroad equipment;
- Laboratory fume hood emissions;
- Hazardous waste handling facility fume hood emissions;
- Soil vapor extraction system;
- Gasoline storage and dispensing; and
- Diesel storage and dispensing.

TACs emissions from each of these existing sources are listed in Appendix AIR. Increased cancer risk, chronic non-cancer risk, and $PM_{2.5}$ impacts from the existing sources were combined with the modeled project-level impacts as analyzed under the Illustrative Development Scenario, at all receptor points, to estimate the total health risks.

Cumulative impact analysis requires the inclusion of other reasonably foreseeable projects that may combine with the proposed Project to result in a significant cumulative impact. However, based on the information in Section 4.0, *Introduction to Environmental Analysis*, there are no planned projects in the vicinity of the Berkeley Lab campus that could combine with the cumulative health risk from existing and future sources at Berkeley Lab associated with the Illustrative Development Scenario.

The results of the health risks from existing sources at the Berkeley Lab campus (prior to combining with the estimated health risks from campus development under the Illustrative Development Scenario) are shown below in **Table 4.2-13**.

TABLE 4.2-13
BASELINE CANCER RISK (PER MILLION), CHRONIC HI, AND ANNUAL AVERAGE $PM_{2.5}$ CONCENTRATIONS FROM THE EXISTING BERKELEY LAB CAMPUS SOURCES

Receptor Type	Cancer Risk (in 1 million)	Chronic HI	Annual Average $PM_{2.5}$ Concentration ($\mu g/m^3$)
MEIR (off-site)	66.3	0.02	0.08
MEIW (off-site)	4.7	0.02	0.08
MEIW (on-site)	20.0	0.17	0.32
Cumulative Significance Threshold	100	10.0	0.8
Exceeds Threshold?	No	No	No

ABBREVIATIONS:
MEIR = maximally exposed individual resident; MEIW = maximally exposed individual worker; HI = hazard index

NOTES: For the MEIR, this scenario includes 30 years of exposure duration to existing operational emissions. For the MEIWs, this scenario includes 25 years of exposure to existing operational emissions.

SOURCE: ESA, 2024. See Appendix AIR

As shown in Table 4.2-13, the baseline sources of Berkeley Lab campus TACs result in modeled risks (increased cancer risk, chronic HI, and annual average $PM_{2.5}$ concentrations) that are, by themselves, below the BAAQMD cumulative significance thresholds listed in Table 4.2-6. The baseline off-site MEIR and MEIW are located at a property outside the Berkeley Lab campus, just west of Building 90. The baseline, on-site cancer and $PM_{2.5}$ MEIW is located at Building 50B, and the baseline, on-site chronic MEIW is located at Building 75.

With health risks from new sources consistent with the Illustrative Development Scenario added to those from the existing, baseline sources, the resulting cumulative health risks are also below the cumulative thresholds, as shown in **Table 4.2-14**. The cumulative off-site MEIR and MEIW are located at a residence just west of Building 90. The cumulative, on-site MEIWs are located at the same locations as described above for the baseline scenario.

In addition to the existing Berkeley Lab campus sources, BAAQMD data for stationary TACs sources were evaluated for the presence of any existing sources within 1,000 feet of the MEIR. Nearby major roadways, highways, and railways were also considered. BAAQMD maintains a database on these types of sources and their locations in its Stationary Source Screening Map (BAAQMD, 2024c). Based on the BAAQMD database, no stationary TAC sources are located within 1,000 feet of the cumulative MEIR for cancer, chronic HI, or annual average $PM_{2.5}$ concentrations, so there would not be a potential for health risk from other existing TAC sources to combine with the health risks from existing and new sources at the Berkeley Lab campus.

TABLE 4.2-14
CUMULATIVE CANCER RISK (PER MILLION), CHRONIC HI AND ANNUAL AVERAGE $PM_{2.5}$ CONCENTRATIONS FROM THE EXISTING BERKELEY LAB CAMPUS SOURCES AND NEW SOURCES CONSISTENT WITH THE ILLUSTRATIVE DEVELOPMENT SCENARIO

Receptor Type	Cancer Risk (in 1 million)	Chronic HI	Annual Average $PM_{2.5}$ Concentration ($\mu g/m^3$)
MEIR (off-site)	67.7	0.02	0.08
MEIW (off-site)	4.8	0.02	0.08
MEIW (on-site)	20.3	0.17	0.33
Cumulative Significance Threshold	100	10.0	0.8
Exceeds Threshold?	No	No	No

ABBREVIATIONS:
MEIR = maximally exposed individual resident; MEIW = maximally exposed individual worker; HI = hazard index
SOURCE: ESA, 2024. See Appendix AIR

As shown in Table 4.2-14, the cumulative health risk impact from existing and new TAC sources on the Berkeley Lab campus would be below BAAQMD cumulative risk thresholds, and the cumulative impact would be less than significant.

4.2.5 References

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4.3 Biological Resources

4.3.1 Introduction

This section describes and evaluates the potential for proposed LBNL 2025 LRDP implementation to result in significant impacts on biological resources. This section presents a description of the existing biological resources on and adjacent to the Berkeley Lab campus; includes a summary of University plans and policies, and the federal and state laws and regulations related to biological resources; identifies criteria used to determine impact significance, provides an analysis of the potential biological resources impacts from proposed 2025 LRDP implementation, and identifies feasible mitigation measures to mitigate any potentially significant impacts.

4.3.2 Environmental Setting

The Berkeley Lab campus is located in the western foothills of Alameda County and straddles the border between the cities of Berkeley and Oakland (see Figure 3-2 in Chapter 3, *Project Description*). The campus encompasses about 202 acres. Approximately one-third of the campus area is covered by buildings, roads, and parking lots, while the remaining two-thirds of the campus is undeveloped. The campus ranges in elevation between approximately 450 feet above mean sea level (amsl) in the southwest and approximately 1,100 feet amsl in the northeast. The campus is located upslope and east of UC Berkeley's main campus (Campus Park) and Hill Campus West, and City of Berkeley multi-unit residential developments; south of City of Berkeley residential neighborhoods and various UC Berkeley facilities; west of UC Berkeley's Hill Campus East; and north of UC Berkeley Hill Campus West and East, Botanical Garden, and Strawberry Canyon open space. The boundaries of the campus are, in most places, delineated by a chain-link security fence, but otherwise are indistinguishable from adjacent, open areas outside the boundaries.

The campus contains mostly intermittent and ephemeral drainages, as well as various seeps and areas of wetland vegetation. There are, however, two perennial creeks on the campus. As illustrated in Chapter 3, Figure 3-3, the North Fork of Strawberry Creek (North Fork), located within Blackberry Canyon in the western portion of the campus, maintains water through the year and drains off-site to the west. Chicken Creek, located in the southern portion of the campus, has been determined through past expert investigations to be either intermittent or perennial; for the purpose of this EIR this creek is assumed to be perennial. Chicken Creek drains to the south and into the main branch of Strawberry Creek (South Fork), which carries flows west along Centennial Drive. The North Fork and Chicken Creek drainages have been culverted through the developed portions of the campus, and much of the campus drainage has been routed through the campus stormwater system to the North Fork (LBNL, 2007).

Biological resource information for the campus included in this section derives from a recent review of special-status species and rare plant databases (see below in Section 4.3.2); a May 15, 2024 campus reconnaissance survey by ESA biologists, and a review of existing campus biological reports, including the *Campus-Wide Biological Resources Assessment, Lawrence Berkeley National Laboratory* (WRA, 2019), and other reports as referenced below.

Vegetation Communities and Wildlife Habitats

As discussed in Chapter 3, there are four land use zones designated on the campus: the Research and Academic Zone, Central Commons Zone, Support Services Zone, and Perimeter Open Space Zone (see Chapter 3, Figure 3-7). The Central Commons, Support Services, and Research and Academic Zones are densely developed with roadways, buildings, storage containers, trailers, and other structures. Most of the campus's natural habitats, including chaparral, oak/bay woodland, and coniferous forest, and biological resources are located within the Perimeter Open Space Zone. The campus vegetation communities and land cover are described below and shown in **Figure 4.3-1**.

Urban

Urban areas include buildings, roadways, utilities, and other built features, with sparse ground cover that can include weedy vegetation or barren land. Few wildlife species use urbanized habitat, and those that do are typically adapted to the presence of humans and their activities. The species with a potential to occur in urban areas include common raven (*Corvus corax*), northern mockingbird (*Mimus polyglottos*), raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), and non-native species such as Norway rat (*Rattus norvegicus*) or feral cats. Raptors such as red-tailed hawk (*Buteo jamaicensis*) and barn owl *(Tyto alba)*, which prey on rodents, and peregrine falcon (*Falco peregrinus anatum*), which prey mainly on small-to-medium-sized birds, may forage in these areas. Bats may also colonize abandoned and disused buildings.

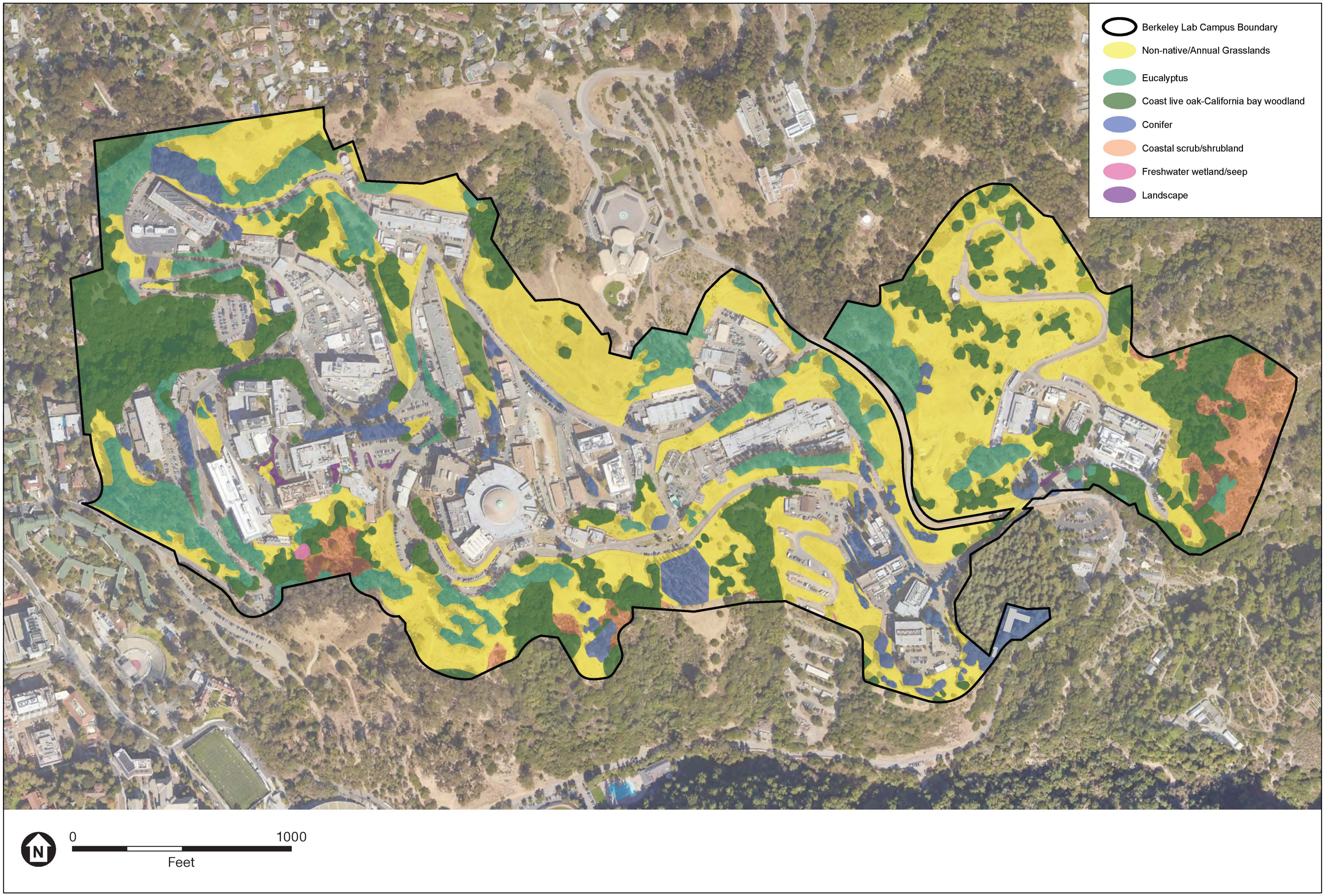
Landscaped

Landscaped areas support ornamental trees, shrubs, and maintained non-native vegetation. Ornamental vegetation in an otherwise urban environment can provide cover, foraging, and nesting habitat for a variety of bird species, as well as reptiles and small mammals tolerant of disturbance and human presence. The campus contains ornamental trees, shrubs, and herbaceous plants in the central campus surrounding buildings and along walkways.

Birds that may be found in ornamental and landscaped vegetation include American robin (*Turdus migratorius*), house finch (*Carpodacus mexicanus*), dark-eyed junco (*Junco hyemalis*), California scrub jay (*Aphelocoma californica*), mourning dove (*Zenaida macroura*), Anna's hummingbird (*Calypte anna*), and non-native species such as house sparrow (*Passer domesticus*) and European starling (*Sturnus vulgaris*). Reptiles using this type of habitat may include western terrestrial garter snake (*Thamnophis elegans*) and western fence lizard (*Sceloporus occidentalis*). Mammals present in landscaped areas may include striped skunk (*Mephitis mephitis*), raccoon, Virginia opossum, roosting bats, Botta's pocket gopher (*Thomomys bottae*), and other small rodents.

Non-Native/Annual Grassland

Acting both as its own vegetation community and as the understory within other habitat types, the campus grasslands are primarily dominated by oats (*Avena* spp.*)*, bromes (*Bromus* spp.*),* Harding grass (*Phalaris aquatica*), hare barley (*Hordeum murinum leporinum*), large quaking grass (*Briza maxima*), and ryegrass (*Festuca perennis*). Non-native plants dominate this vegetation community on the campus and include black mustard *(Brassica nigra)*, bristly ox-tongue *(Helminthotheca echioides)*, Italian thistle *(Carduus pycnocephalus),* wild radish *(Raphanus sativus),* cut-leaf



SOURCE: Wildlife Research Associates, Jane Valerius Environmental Consulting, 2020; ESA, 2024

Figure 4.3-1
Vegetation Communities on the Berkeley Lab Campus

ESA

geranium *(Geranium dissectum)*, bindweed *(Convolvulus arvensis),* bur clover *(Medicago sativa),* yellow star thistle *(Centaurea solstitialis),* fennel *(Foeniculum vulgare),* vetch *(Vicia sativa),* and highly invasive weeds such as French broom *(Genista monspessulana)* and pampas grass *(Cortadaria jubata)*. Native plants which may also be present in smaller numbers include purple needlegrass *(Stipa pulchra),* California brome *(Bromus carinatus),* blue wildrye *(Elymus glaucus),* California poppy (*Eschscholzia californica*), lupines (*Lupinus* spp.), Pacific sanicle (*Sanicula crassicaulis*), and hedge nettle (*Stachys ajugoides ajugoides*), among others.

Annual grasslands provide foraging, hunting, and nesting habitat for a variety of wildlife. Reptiles including the southern alligator lizard *(Gerrhonotus multicarinatus)* and western fence lizard; amphibians such as slender salamander *(Batrachoseps attenuatus);* and small mammals like the meadow vole *(Microtus californicus)*, Botta's pocket gopher, California ground squirrel *(Otospermophilus beecheyi),* and western harvest mouse *(Reithrodontomys megalotis)* utilize this habitat for breeding and foraging. Some ground- and shrub-nesting passerine birds such as California towhee *(Pipilo crissalis)*, dark-eyed junco, California quail *(Lophortyx californicus)* and California scrub jay may be present. Raptors that prey on small mammals, such as the red-tailed hawk and American kestrel *(Falco sparverius),* may utilize open grasslands as hunting grounds and roost in nearby trees. Additionally, wild turkeys *(Meleagris gallopavo)* reside on the Berkeley Lab campus and forage in grasslands.

Eucalyptus

The eucalyptus stands present throughout the campus are composed of a variety of gum trees, including blue gum *(Eucalyptus globulus)*, red ironbark *(Eucalyptus sideroxylon)*, and silver dollar eucalyptus *(Eucalyptus cinerea)*, planted for ornamental purposes or spread from previous land management activities. These eucalyptus groves are largely monotypic with sparse understory composed of non-native grassland species and herbaceous forbs such as black mustard, Italian thistle, and wild radish. Eucalyptus and other non-native tree species are being ranked and prioritized at Berkeley Lab, based on factors including tree health, removal for fire safety, sustainability, and other vegetation management goals (ESA, 2021; LBNL, 2021).

Despite the invasive nature of eucalyptus groves, they offer roosting and nesting sites for a variety of bird species, particularly raptors such as red-tailed hawk, red-shouldered hawk *(Buteo lineatus),* and, in areas with dense canopy cover, great-horned owl *(Bubo virginianus).* Smaller bird species, which also utilize eucalyptus, include the American crow *(Corvus brachyrhynchos)*, Townsend's warbler *(Dendroica townsendii),* yellow-rumped warbler *(Dendroica coronate),* ruby-crowned kinglet *(Regulus calendula)*, and Anna's hummingbird. The tree litter in eucalyptus stands also has potential to host small vertebrates such as the southern alligator lizard and Pacific gopher snake *(Pituophis catenifer catenifer),* while bat species may roost within the trees' immense bark folds. Coastal stands of eucalyptus trees are known to serve as overwintering sites for monarch butterflies *(Danaus plexippus),* a federal candidate species.

Oak/Bay Woodland

Berkeley Lab campus woodlands are primarily dominated by coast live oak *(Quercus agrifolia)* and California bay *(Umbellularia californica)* trees with varying degrees of canopy cover. Other tree species that exist within this vegetation community include interior live oak *(Quercus wislizeni)* and black oak *(Quercus velutina)*. Areas with denser canopy can host herbaceous forbs such as mugwort *(Artemisia douglasiana)*, coastal wood fern *(Dryopteris arguta)*, miner's lettuce *(Claytonia perfoliate)*, fairy bells *(Prosartes hookeri)*, and California honeysuckle *(Lonicera hispidula)*. More open areas are typically dominated by non-native grasses. Shrubs that may be found in this community are poison oak *(Toxicodendron diversilobum)*, California coffeeberry *(Frangula californica)*, toyon *(Heteromeles arbutifolia)*, coyote brush *(Baccharis pilularis),* California blackberry *(Rubus ursinus)*, and the non-native Himalayan blackberry *(Rubus armeniacus).*

A wide variety of birds utilize this vegetation community, including raptors such as Cooper's hawk *(Accipiter cooperi)* and red-shouldered hawk, as well as acorn woodpecker *(Melanerpes formicivorus)*, Stellar's jay *(Cyanocitta stelleri)*, oak titmouse *(Baeolophus inornatus)*, chestnut-backed chickadee *(Poecile rufescens)*, brown creeper *(Certhia americana),* spotted towhee *(Pipilo maculatus),* white-breasted nuthatch *(Sitta carolinensis),* and Swainson's thrush *(Catharus ustulatus)*. Mammals including mule deer *(Odocoileus hemionus)*, western gray squirrel *(Sciurus griseus)*, and San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*), a state species of special concern, may forage in the understory. Larger trees may support cavity- and crevice-roosting bats.

Conifer

Coniferous trees on the campus are located in small patches around the perimeter of buildings, and along the northern boundary of the campus (Figure 4.3-1). Trees are mainly coastal redwood *(Sequoia sempervirens),* Monterey pine *(Pinus radiata)*, and other ornamental pines (*Pinus* spp.). A dense grove of coast redwoods is present in the southeast portion of the Lab adjacent to UC Berkeley's Mather Grove. Where understory is present beneath conifers, it consists primarily of non-native plants such as Harding grass and little robin (*Geranium purpureum),* with some natives such as miner's lettuce, and California pipevine *(Aristolochia californica).* Wildlife species using this vegetation community are similar to those in oak/bay woodlands.

Coastal Scrub/Shrubland

Coastal scrub and shrubland vegetation community is located along the eastern perimeter of the campus and in isolated patches in the southern part of the campus. These areas feature sandy soils and include mainly non-native grasses interspersed with coyote brush (*Baccharis pilularis)* or other native shrubs such as sticky monkeyflower, California sagebrush (*Artemisia californica*), coffeeberry, toyon, sage (*Salvia* sp.), California blackberry, and poison oak. In addition to non-native grasses, native purple needlegrass may be present, along with herbs such as hedge nettle, mugwort, or coyote mint (*Monardella villosa* ssp*. villosa*). In addition to wildlife species found in grassland habitats, such as western fence lizard, gopher snake, and numerous birds and mammals, coastal scrub on the eastern perimeter of the campus and south of the campus supports the federal and state threatened Alameda whipsnake (CDFW, 2024).

Sensitive Natural Communities

Sensitive natural communities are those considered rare in the region, may support special-status plant or wildlife species, or may receive regulatory protection (i.e., through Section 404 of the Clean Water Act (CWA) and/or Sections 1600 et seq. of the California Fish and Wildlife Code).

Sensitive natural communities may be regulated by the U.S. Army Corps of Engineers (USACE), Regional Water Quality Control Board (RWQCB), and/or California Department of Fish and Wildlife (CDFW). The two sensitive natural communities that are known to occur on the Lab campus are discussed below.

Riparian Oak/Bay Woodland

Portions of the oak/bay woodland community occurring in riparian areas along drainages qualify as a CDFW sensitive natural community. The largest tract of this community type is located in the far western portion of the campus in Blackberry Canyon (Strawberry Creek North Fork) and includes mature eucalyptus as well as California bay and coast live oak trees. In addition to the above species listed for oak/bay woodland, such riparian woodland areas may host amphibians, such as Pacific chorus frog (*Pseudacris regilla*) and arboreal salamander *(Aneides lugubris).*

Freshwater Wetland/Seep

Wetlands and seeps present on the campus are also considered a sensitive natural community. These include isolated wetlands surrounding horizontal drains (hydraugers) on the central campus, as well as open seeps and unculverted channels in the northern portion of the campus around Seaborg Glen. Seeps and channels contain open surface water under riparian trees, including coast redwood, coast live oak, and California bay (see Figure 4.3-1). Understory species associated with wetland and seep communities may include cattails (*Typha* spp.), horsetail (*Equisetum arvense*), dock (*Rumex* sp.), tall flat sedge (*Cyperus eragrostis*), rabbitsfoot grass (*Polypogon monspeliensis*), seep monkeyflower (*Erythranthe guttata*), poison hemlock (*Conium maculatum*), bird's-foot trefoil (*Lotus corniculatus*), and willow herb (*Epilobium brachycarpum*). Wildlife species found in oak/bay woodlands may also be found here, as well as amphibian species native to this area.

Wildlife Movement Corridors

Wildlife movement corridors link habitat areas and mitigate fragmentation effects by allowing wildlife to move between remaining habitats, in turn allowing replenishment of depleted populations and promoting genetic exchange between separated populations. The campus is bordered by open space to the east, and by hillsides with considerable habitat value to the north, west and south. The East Bay hills provide habitat for numerous migratory birds, reptiles and amphibians, and small and large mammals. However, the campus's steep terrain, vehicular traffic, perimeter fencing, and disturbed surroundings make the campus unsuitable for wildlife crossing. Surrounding open space, forested campus areas, and riparian corridors would be more likely to provide a terrestrial movement corridor for wildlife.

The San Francisco Bay Area is an important migratory stopover for birds along the Pacific Flyway—one of the four major migratory routes in North America. Raptors, songbirds, shorebirds and waterfowl stop in Berkeley and Oakland, including on East Bay Regional Park District (EBRPD) land, the Berkeley Marina, UC Berkeley campus, Lake Merritt, and other open space areas, during fall and spring migrations. However, numerous forested areas and open space areas near the Berkeley Lab campus have less disturbance and superior habitat conditions for migratory rest stops. While the campus does not constitute an aerial wildlife movement corridor, migratory birds pass through using regional rest stops.

Special-Status Species

For the purpose of this EIR, special-status species include:

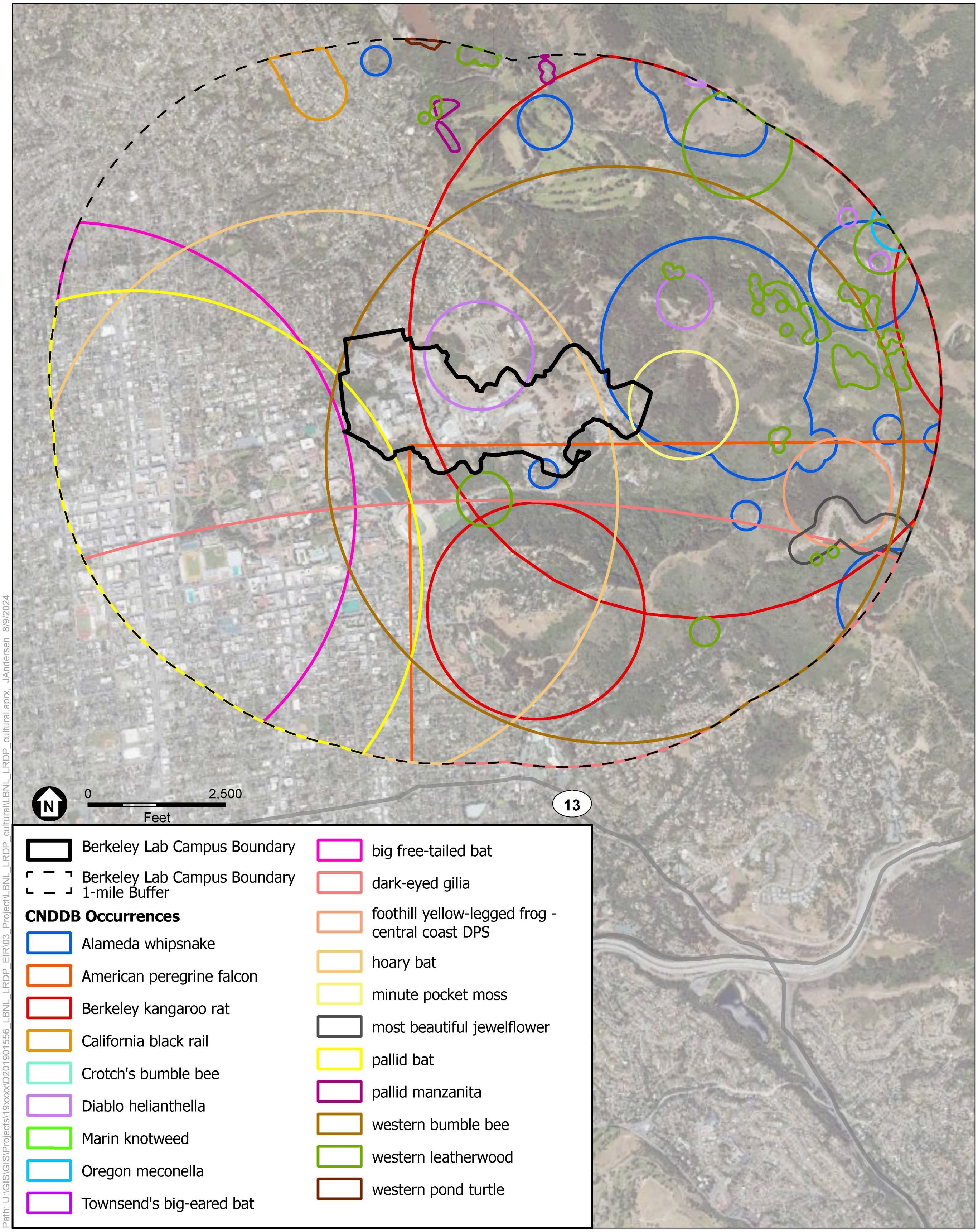
- Plant and wildlife species listed as rare, threatened, or endangered under the federal or State endangered species acts;
- Species that are candidates for listing under either federal or State law;
- Species designated by the U.S. Fish and Wildlife Service (USFWS) as species of concern or by the CDFW as species of special concern;[1]
- Species designated as "fully protected" by the State (there are about 35, most of which are also listed as either endangered or threatened);
- Raptors (birds of prey), which are specifically protected by California Fish and Game Code Section 3503.5, thus prohibiting the take, possession, or killing of raptors and owls, their nests, and their eggs;[2] and
- Species, such as candidate species, that may be considered rare or endangered pursuant to Section 15380(b) of the *CEQA Guidelines*.

As a programmatic document guiding growth and development through a 2045 horizon year, it is acknowledged that the status of sensitive species, including those listed as threatened or endangered, may change over time due to evolving environmental conditions, conservation efforts, and regulatory reviews. Species not currently listed as threatened or endangered may be added to state or federal lists if population declines or habitat threats emerge, while others may be delisted as a result of successful recovery efforts. Future projects and actions covered under this EIR may incorporate new listings or delistings as they arise, following applicable regulatory requirements and conducting necessary assessments to ensure compliance with updated environmental protection standards.

A comprehensive list of the special-status plant and wildlife species that may occur or have the potential to occur on the campus was developed based on data obtained from the California Natural Diversity Database (CNDDB), the California Native Plant Society (CNPS) Electronic Inventory, and the USFWS and other biological literature pertaining to the bioregion (CDFW, 2024; CNPS, 2024; USFWS, 2024). **Figure 4.3-2** illustrates special-status species plant and wildlife species that have been recorded within 1 mile of the Berkeley Lab campus. Potential for occurrence was determined to be low, moderate, or high based on habitat suitability, previous special-status species record locations, and current site conditions, as determined during a site survey (see page 4.3-1). These species lists are provided in **Table BIO-1** in **Appendix BIO**.

1 A California species of special concern is one that: has been extirpated from the state; meets the State definition of threatened or endangered but has not been formally listed; is undergoing or has experienced serious population declines or range restrictions that put it at risk of becoming threatened or endangered; and/or has naturally small populations susceptible to high risk from any factor that could lead to declines that would qualify it for threatened or endangered status.

2 The inclusion of birds protected by Fish and Game Code Section 3503.5 is in recognition of the fact that these birds are substantially less common in California than most other birds, having lost much of their habitat to development, and that the populations of these species are therefore substantially more vulnerable to further loss of habitat and to interference with nesting and breeding than most other birds. It is noted that a number of raptors and owls are already specifically listed as threatened or endangered by State and federal wildlife authorities.



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SOURCE: CNDDB 2024; ESA, 2024

LBNL LRDP EIR

Figure 4.3-2
Special-status Plants and Wildlife Recorded within 1 Mile of the Berkeley Lab Campus

Special-Status Plants

Table BIO-1 in Appendix BIO presents special-status plant species that occur in the regional vicinity (i.e., Oakland West, Richmond, Oakland East, and Briones Valley 7.5-minute USGS quadrangles), and their potential to occur on the campus. Most special-status plant species recorded in the vicinity are considered to have no or low potential to occur outside the Perimeter Open Space Zone due to the historic development and associated habitat disturbance of the campus. Diablo helianthella (*Helianthella castanea*; California Rare Plant Rank 1B.2) was recorded on or near the campus in 2001; however, the precise location is not specified in the database; it has moderate potential to occur in forest, scrub, grassland or woodland. Most beautiful jewelflower (*Streptanthus albidus* ssp. *peramoenus)* also has moderate potential to occur in chaparral, valley and foothill grassland, or woodland. (see Table BIO-1).

Western leatherwood (*Dirca occidentalis*; Rank 1B.2) is a deciduous shrub that can reach 8 to 10 feet in height and prefers to grow on moist shaded slopes in forests and riparian woodlands (Calflora, 2024). From 1991 to 2021, it was recorded on the campus and its immediate vicinity (CDFW, 2024) in mixed bay forest. Floristic surveys conducted for the UC Berkeley Hill Campus Fire Hazard Reduction Program (UC Berkeley, 2020) found suitable western leatherwood habitat and confirmed the presence of the species close to the Berkeley Lab campus.

Special-Status Wildlife

Aside from nesting birds and roosting bats, special-status wildlife species are not likely to occur within the campus Central Commons, Support Services, or Research and Academic Zones, which are mostly paved or dominated by non-native ornamental plantings. The campus Perimeter Open Space Zone provides habitat for special-status wildlife species, both within Blackberry Canyon to the west, and grassland, scrub and woodland areas to the east, north, and south. Table BIO-1 in Appendix BIO presents special-status wildlife species known to occur in the region and their potential to occur on the campus. Wildlife species with moderate or higher potential to occur on the campus are described below. Species not discussed below, including but not limited to mountain lion, burrowing owl and crotch bumble bee, are considered unlikely to occur on the campus due to lack of suitable habitat, negative results in biological surveys, or other conditions (see Table BIO-1).

Alameda whipsnake (*Coluber lateralis euryxanthus*), a federal and state threatened species, prefers coastal scrub or chaparral habitat with rocks for concealment and sunny basking sites. The eastern end of the campus contains such coastal scrub/shrub vegetation, including coyote brush, and contains critical habitat for this species. Recorded near the eastern edge of the campus in 2004 and south of the campus in 2008 (CDFW, 2024), the species primarily inhabits scrub and neighboring grasslands on slopes facing northeast to west, which are considered its core habitat. The species is known to traverse a variety of terrains, including woodlands and the edges of grasslands or woodlands across all slope directions, particularly when dispersing in fall and seeking mates in spring. There is moderate to high potential for the snake to be present in eastern and southern campus areas, and low to moderate potential in perimeter areas in the northern portion of the campus. Suitable species habitat is not present within the central, developed parts of the campus.

San Francisco dusky-footed woodrat *(Neotoma fuscipes annectens)* is a state species of special concern. Although not recorded on the campus, suitable woodland and forest habitat is present in Blackberry Canyon and Seaborg Glen. This species builds nests, or middens, of twigs and leaves in native vegetation such as poison oak, shrubs, or at the base of trees in forest and woodland areas. No woodrat middens were detected during the survey of the campus.

Monarch butterfly is a federal candidate species. This migratory butterfly overwinters in California within wind-protected groves of trees, primarily Monterey pine (*Pinus radiata*), Monterey cypress (*Hesperocyparis macrocarpa*), and eucalyptus, typically near water and nectar sources. The required host plant for this species is milkweed (*Asclepias* spp.), used for egg deposition, development, and nectar. The campus's mature eucalyptus trees are approximately 3 miles from the coast and could provide suitable overwintering habitat for monarch butterflies.

Peregrine falcon is a California Fully Protected species pursuant to California Fish and Game Code Section 3511, though it has been de-listed from federal and California endangered species lists. It nests on structures, including the Campanile (Sather tower) on the nearby UC Berkeley campus, and it preys on pigeons and other birds. Peregrines may forage at the Berkeley Lab campus but are not expected to nest on-site.

Several other raptors may nest on the campus, including red-tailed hawk, red-shouldered hawk, and great horned owl (*Bubo virginianus*), as well as other migratory special-status and common birds, such as cliff swallow (*Petrochelidon pyrrhonota),* which builds nests in structures. The federal Migratory Bird Treaty Act (MBTA) and California Fish and Game Code protect raptors and native migratory birds and breeding birds (see Section 4.3.3, below). The San Francisco Bay Area is an important migratory stopover for birds along the Pacific Flyway—one of the four major migratory routes in North America. Raptors, songbirds, shorebirds, and waterfowl stop in open spaces, including the Berkeley Lab campus and parts of the UC Berkeley campus during fall and spring migrations. Conifers, oaks, eucalyptus, and other trees, as well as outdoor parts of campus structures may provide nesting, foraging, or migratory rest habitat for birds, including special-status birds, along their migration route.

Bats and other non-game mammals are protected under the California Fish and Game Code. Tree-roosting bats, including western red bat, (*Lasiurus blossevillii*) a Western Bat Working Group (WBWG) high priority species, and hoary bat (*Lasiurus cinereus*), a WBWG medium priority species, and/or Townsend's big-eared bat (*Corynorhinus townsendii)*, a species of special concern, may roost in tree foliage; under exfoliating tree bark, including large eucalyptus; in tree cavities; under roof eaves; or inside disused building areas on the campus. More common species such as long-eared myotis *(Myotis evotis),* California myotis *(Myotis californicus)*, and big brown bat *(Eptesicus fuscus)* may also roost at the Lab. Collectively, common and special-status bat species have a moderate potential to roost on the campus.

Designated Critical Habitat

The USFWS designates critical habitat for certain species listed by the agency as threatened or endangered. "Critical habitat" is defined in Section 3(5)(A) of the federal Endangered Species Act (ESA) as those lands within a listed species' current range that contain the physical or biological features considered essential to the species' conservation, as well as areas outside the species' current range that are determined to be essential to its conservation.

In the easternmost area of the campus, a roughly 5-acre area east of Lab Buildings 74 and 84 lies within designated critical habitat for Alameda whipsnake (Unit 6, Caldecott Tunnel) (USFWS, 2006).

4.3.3 Regulatory Framework

Federal

Endangered Species Act

The federal Endangered Species Act (ESA) protects the fish and wildlife species, and their habitats that have been identified by the USFWS or National Marine Fisheries Service (NMFS) as threatened or endangered. The term "endangered" refers to species, subspecies, or distinct population segments that are in danger of extinction through all or a significant portion of their range. The term "threatened" refers to species, subspecies, or distinct population segments that are likely to become endangered in the near future.

Under Section 7 of the ESA, the federal agency conducting, funding, or permitting an action (the federal lead agency) must consult the USFWS and/or NMFS, as appropriate, to ensure that the proposed action will not jeopardize endangered or threatened species or destroy or adversely modify designated critical habitat. If a proposed project "may affect" a listed species or designated critical habitat, the lead agency is required to prepare a biological assessment evaluating the nature and severity of the expected effect. In response, the USFWS issues a biological opinion determining whether the proposed action (1) may either jeopardize the continued existence of one or more listed species (jeopardy finding) or result in the destruction or adverse modification of critical habitat (adverse modification finding), or (2) will not jeopardize the continued existence of any listed species (no jeopardy finding) or will not result in adverse modification of critical habitat (no adverse modification finding). Section 10 of the ESA provides exceptions for the take of listed plant and animal species resulting from activities that would otherwise be unlawful and prohibited to private (non-federal) parties affecting endangered or threatened species or critical habitat. The incidental take permit under Section 10 must be accompanied by a habitat conservation plan to ensure that the impacts of the authorized incidental take are adequately minimized and mitigated.

Under the ESA, the Secretary of the Interior (or the Secretary of Commerce, as appropriate) formally designates critical habitat for certain federally listed species and publishes these designations in the Federal Register. Critical habitat is not automatically designated for all federally listed species; so many listed species have no formally designated critical habitat. As noted above, there is designated critical habitat for Alameda whipsnake in the eastern portion of the campus.

Implementation of the proposed 2025 LRDP is not expected to require a take authorization from the USFWS under the ESA for any plant or wildlife species.

Migratory Bird Treaty Act

The federal MBTA (United States Code, Title 16, Section 703, Supplement I, 1989) prohibits taking, killing, possessing, or trading in migratory birds, except in accordance with regulations prescribed by the Secretary of the Interior. This act encompasses whole birds, parts of birds, and bird nests and eggs. The MBTA protects active nests of all species of birds that are included in the "List of Migratory Birds" published in the Federal Register in 1995.

As the implementation of the proposed 2025 LRDP would have the potential to disturb nesting birds, UC LBNL would require that nesting bird surveys be conducted for any vegetation removal work conducted during the bird nesting season (see Section 4.3.4).

Clean Water Act

Wetlands are ecologically complex habitats that support a variety of both plants and wildlife. The federal government defines wetlands and other waters in Section 404 of the CWA as "areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support (and do support, under normal circumstances) a prevalence of vegetation typically adapted for life in saturated soil conditions" (33 CFR 328.3[b] and 40 CFR 230.3). Dredging and deposition of fill in federally jurisdictional wetlands or navigable waters requires a permit under Section 404 of the CWA from the USACE. Impacts to water quality under the CWA require a permit under Section 401; the 401 permit pertains to state-issued certifications ensuring compliance with water quality standards for federally permitted activities.

Implementation of the proposed 2025 LRDP is not expected to involve filling jurisdictional wetlands or streams. However, if required, UC LBNL would obtain permits from the USACE and RWQCB for dredging, fill, or water quality impacts under the federal CWA Sections 401 and 404.

State

California Endangered Species Act

Under the California Endangered Species Act (CESA), the CDFW has the responsibility for maintaining a list of threatened and endangered species (California Fish and Game Code, Section 2070). The CDFW also maintains a list of "candidate species," which are species formally noticed as being under review for addition to either the list of endangered species or the list of threatened species. In addition, the CDFW maintains lists of "species of special concern," which serve as watch lists.

Pursuant to the requirements of the CESA, an agency reviewing a proposed project within its jurisdiction must determine whether any State-listed endangered or threatened species could be present in the project area and determine whether the proposed project could have a potentially significant impact on such species. In addition, the CDFW encourages informal consultation on any proposed project that could affect a candidate species. The CESA prohibits the take of plant and wildlife species designated by the Fish and Game Commission as either threatened or endangered in the State of California. "Take" in the context of the CESA means to hunt, pursue, kill, or capture a listed species, as well as any other actions that may result in adverse impacts on individuals of a listed species. Take prohibitions also apply to candidates for listing under the

CESA. However, the CDFW issues permits under Section 2081 of the CESA for incidental take of listed wildlife (Title 14, Section 786.9 of California Code applies to listed plants) for educational, scientific, or management purposes. Implementation of the proposed 2025 LRDP is not anticipated to require a take permit under CESA, unless a future project that is within the scope of the proposed 2025 LRDP is proposed in an area that has a high potential for Alameda whipsnake to occur, in which case a take permit under CESA may be required.

California Fish and Game Code

Under Section 3503 of the California Fish and Game Code, it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by the code or any regulation made pursuant thereto. Section 3503.5 of the code prohibits the take, possession, or destruction of any birds in the orders Falconiformes (hawks) or Strigiformes (owls), or of their nests and eggs. This protection covers all native migratory birds, not just endangered, threatened and other special-status species. Section 4150 protects nongame mammals, including roosting bats.

Fish and Game Code Sections 3511 (birds), 4700 (mammals), 5050 (reptiles and amphibians), and 5515 (fish) allow the designation of a species as fully protected. This is a greater level of protection than is afforded by CESA. While generally prohibited, CDFW may authorize the take of fully protected species for defined critical infrastructure projects.

Implementation of the proposed 2025 LRDP would comply with Fish and Game Code Sections 3503 and 4150 affecting migratory bird species and roosting bat species.

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act Section 13260 of the California Water Code requires “any person discharging waste, or proposing to discharge waste, in any region that could affect the waters of the state to file a report of discharge (an application for waste discharge requirements).” Under the Porter-Cologne Water Quality Control Act definition, the term “waters of the state” is defined as “any surface water or groundwater, including saline waters, within the boundaries of the state.” Although all waters of the United States that are within the borders of California are also waters of the state, the converse is not true—in California, waters of the United States represent a subset of waters of the state. Therefore, the State of California, through each of nine RWQCBs, retains authority to regulate discharges of waste into any waters of the State under CWA Section 401 permits, regardless of whether the USACE has concurrent jurisdiction to issue a permit under CWA Section 404.

Implementation of the proposed 2025 LRDP is not anticipated to involve work in jurisdictional waters. However, if needed, UC LBNL would obtain a permit from the San Francisco Bay RWQCB for water quality impacts under the federal CWA Section 401.

California Native Plant Protection Act

State listing of plant species began in 1977 with the passage of the California Native Plant Protection Act (NPPA), which directed the CDFW to carry out the legislature’s intent to “preserve, protect, and enhance endangered plants in this state.” The NPPA gave the California

Fish and Game Commission the power to designate native plants as endangered or rare and to require permits for collecting, transporting, or selling such plants. The CESA expanded on the original NPPA and enhanced legal protection for plants. The CESA established threatened and endangered species categories and grandfathered all rare animals—but not rare plants—into the act as threatened species. Three listing categories for plants are employed in California: rare, threatened, and endangered. As stated above, incidental take of listed plants may be authorized under California Code Section 786.9. Implementation of the proposed 2025 LRDP is not anticipated to require such a permit.

Sensitive Natural Communities

Sensitive natural communities are identified as such by the CDFW's Natural Heritage Division and include those that are naturally rare and those whose extent has been greatly diminished through changes in land use. The CNDDB tracks 135 such natural communities in the same way that it tracks occurrences of special-status species: information is maintained on each site in terms of its location, extent, habitat quality, level of disturbance, and current protection measures. The CDFW is mandated to seek the long-term perpetuation of the areas in which these communities occur. While there is no statewide law that requires protection of all sensitive natural communities, CEQA requires consideration of the potential impacts of a project on biological resources of statewide or regional significance, including sensitive natural communities. Natural communities that are identified as sensitive in the CNDDB are considered by the CDFW to be significant resources and fall under the *CEQA Guidelines* for addressing impacts. The proposed 2025 LRDP's potential impacts on sensitive natural communities are analyzed in this section.

CEQA Guidelines Section 15380

CEQA Guidelines Section 15380(b) provides that a species not included on the federal or State list of protected species may be considered rare or endangered if the species can be shown to meet certain criteria. This section was included in the CEQA Guidelines primarily for situations in which a public agency is reviewing a project that may have a significant effect on a candidate species that has not yet been listed by the CDFW or USFWS. CEQA provides the lead agency the ability to protect species from potential project impacts until the respective agencies have the opportunity to designate the species protection. There are no candidate species that have not yet been listed by the CDFW or USFWS that have moderate or higher potential to occur on the campus.

University of California

LBNL Vegetation Management Program

Since 1992, UC LBNL has instituted a Vegetation Management Program (VMP) intended to maintain a healthy landscape while diminishing the risk and consequences of wildland fires. The VMP includes annual fuel reduction efforts, including managed grazing, as well as more targeted strategies to meet seasonal on-the-ground conditions. In 2007, VMP activities were evaluated for their impacts in the 2006 LRDP EIR and since then VMP activities have been subject to practices and mitigation measures specified in the 2006 LRDP Final EIR.

In early 2021, to help inform the VMP, UC LBNL prepared a Vegetation Management Guide which provides a comprehensive framework for managing vegetation within the campus boundaries. The Guide applies to the design and execution of all work involving vegetation management. This Vegetation Management Guide promotes the following goals: 1) Reduce wildfire risk on and around the campus; 2) Reduce generalized risk of injury or death to Berkeley Lab employees and visitors (via debris; dead, dying, or falling vegetation; pedestrian trips, slips, falls, wildfire, etc.); 3) Establish landscape management practices to maintain and improve campus aesthetics; 4) Support and maintain the local environment; and 5) Support the Lab's sustainability goals, including water conservation. The Vegetation Management Guide is intended to align with the LRDP, future campus Physical Design Framework guidelines, and the LBNL Wildland Fire Management Plan. The Vegetation Management Guide includes legally required and best management practices in a number of categories, including pruning guidelines for wildfire prevention, eucalyptus management, herbicide use, and grazing (LBNL, 2024).

As noted in *Project Description* Section 3.9, the VMP is a related program and will continue to be implemented concurrently with campus development under the proposed 2025 LRDP. The environmental impacts of this related program are analyzed in this EIR. Upon the certification of this EIR, on-going VMP activities will be subject to mitigation measures specified in this EIR.

4.3.4 Impacts and Mitigation Measures

Significance Criteria

For purposes of this EIR, biological resource impacts would be considered significant if they would exceed the Standards of Significance discussed below, which are based on Appendix G of the *CEQA Guidelines*.

Would implementation of the LBNL 2025 LRDP:

a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service;

b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service;

c) Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;

e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or

f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan.

Criteria Not Analyzed

Based on the campus location, there would no impact related to the following topics (e and f) for the reasons described below:

- ***Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance***. Tree and vegetation removal would occur on the campus under the proposed 2025 LRDP as a result of clearing, excavation and grading activities for new building and other site development; and as part of continuation of its VMP. UC LBNL is exempt from local tree preservation policies and ordinances when using land under its control in furtherance of its research mission. Accordingly, there would be no impact related to a conflict with a local ordinance for the protection of biological resources.
- ***Conflict with Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan***. There is no adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan covering the Berkeley Lab campus. No impact would occur.

Approach to Analysis

Regulated biological resources within the Berkeley Lab campus were identified and evaluated based on 2024 biological reconnaissance surveys (see page 4.3-1) and data from the CDFW CNDDB (CDFW, 2024), (CNPS Electronic Inventory (CNPS, 2024), USFWS Information for Planning and Conservation database (USFWS, 2024); the 2006 LBNL LRDP Final EIR (LBNL, 2007), a Campus-wide Biological Assessment (WRA, 2019), and the Berkeley Lab Vegetation Management Guide (LBNL, 2021) and on-going VMP, which would be implemented as part of the proposed 2025 LRDP. Potential impacts from implementation of the proposed 2025 LRDP were evaluated based on the potential for plan area build-out to affect regulated biological resources.

Public Resources Code (PRC) Section 21001(c) states it is the policy of the state of California to "prevent the elimination of fish and wildlife species due to man's activities, ensure that fish and wildlife populations do not drop below self-perpetuating levels, and preserve for future generations representations of all plant and animal communities." Environmental impacts relative to biological resources may be assessed using impact significance criteria encompassing the *CEQA Guidelines* and federal, state, and local plans, regulations, and ordinances.

Impact Analysis

LRDP Impact BIO-1: Implementation of the LBNL 2025 LRDP and the related LBNL VMP would have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service. (*Potentially Significant; Less than Significant with Mitigation*)

As discussed above, the developed portions of the campus, which include Research and Academic Zone, Central Commons Zone, and Support Services Zone, do not contain any natural habitats that support special-status plant and wildlife species, and they comprise mainly landscaped/ornamental vegetation, non-native grassland, and existing development. The Perimeter Open Space Zone, however, is largely undeveloped and substantially in a natural state, and contains small areas of wetlands and seeps, coastal scrub and shrubland, as well as oak and conifer woodlands and non-native grassland (see Chapter 3, *Project Description*, Figure 3-7). Land development under the proposed 2025 LRDP would be concentrated within the existing developed portions of the campus.

Pursuant to proposed 2025 LRDP land use limitations, no major development—including construction of occupiable buildings—is anticipated to occur within the Perimeter Open Space Zone. Maintenance or replacement of existing uses, including utility infrastructure, roadways and parking, trails, sampling stations, storage units, and small support structures, is permitted to continue within the Perimeter Open Space Zone. Vegetation management under the Lab's VMP would occur within this zone during the time horizon of the proposed 2025 LRDP. Berkeley Lab's on-going VMP includes both "light" and "heavy" vegetation management activities. Light vegetation management has very little effect on the environment and may involve use of hand tools like loppers, clippers, hedge trimmers, electric saws, shovels, posthole diggers, and rakes, or use of grazers, to cut grass and to remove leaf litter, shrubs, and small, individual trees. Light vegetation management would also include work to maintain ornamental plants and trees planted amidst the paved and developed areas of the central campus. Heavy vegetation management activities can be more impactful and may involve large equipment such as vehicles, cranes, chippers, chain saws, and ground-clearing or excavation equipment. These would be used to clear large trees and/or multiple trees at a time, or to grade and modify the ground for large or multiple tree plantings. The potential for Lab development under the proposed 2025 LRDP and vegetation management activities under the VMP to significantly affect special-status plant and wildlife species and their habitat is analyzed below.

Special-Status Plant Species

Several rare plant species have been recorded in the Berkeley Lab campus and vicinity, including dark-eyed gilia (*Gilia millefoliata)*, Diablo helianthella (*Helianthella castanea)*, most beautiful jewelflower (*Streptanthus albidus* ssp. *peramoenus)*, and western leatherwood (*Dirca occidentalis)*. Habitat for these species, which prefer sandy soil, chaparral, or scrubland (or woodland, in the case of western leatherwood) is not present in the developed portions of the campus, as noted during the site survey and previous biological surveys described on page 4.3-1. The developed campus areas are largely unvegetated or feature non-native eucalyptus trees, landscaped vegetation, and non-native grasses; therefore, development under the proposed 2025 LRDP, which is anticipated to occur mostly within the Research and Academic, Central Commons, and Support Services Zones, would not result in any impacts to special-status plant species or to habitats that support these special-status plants.

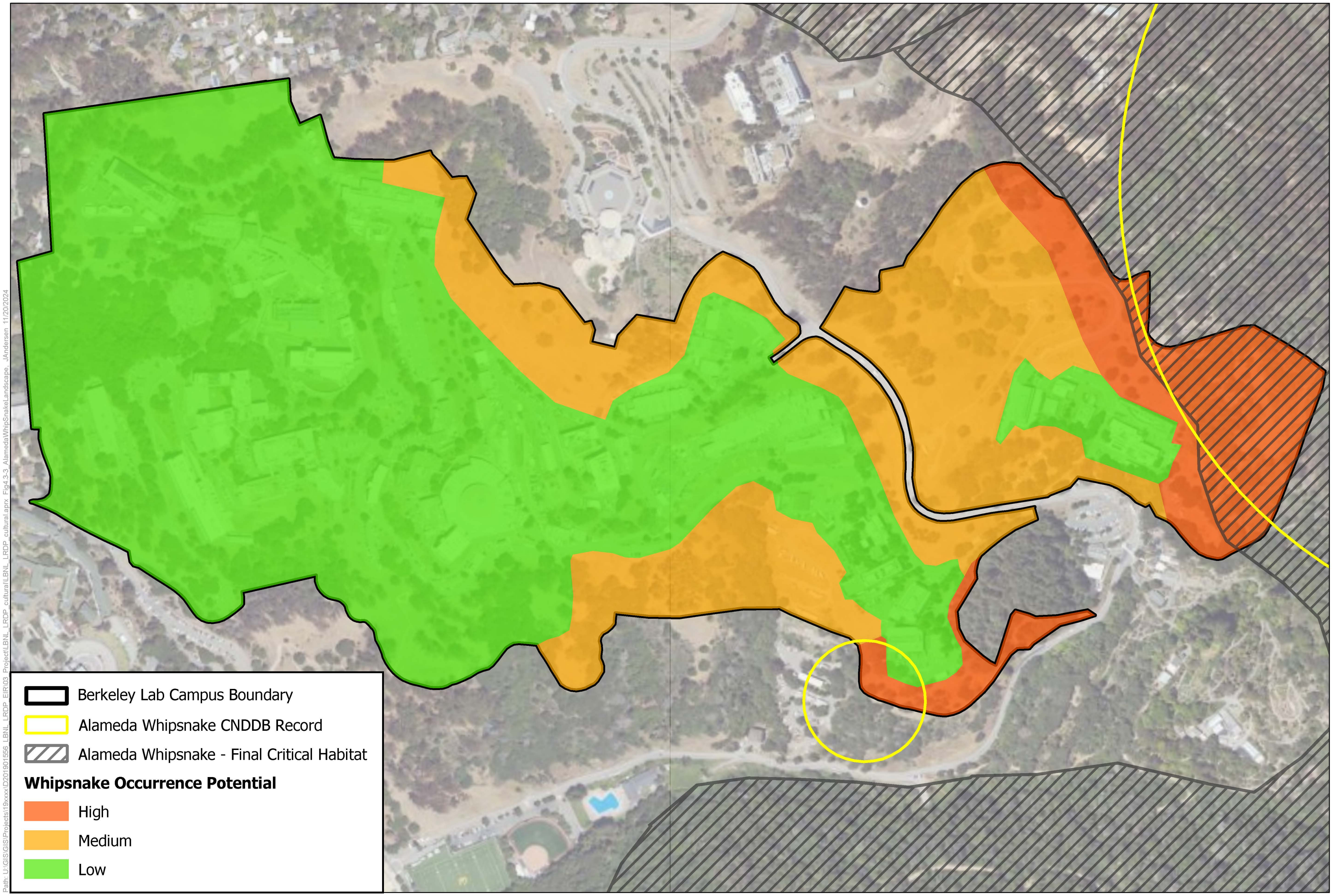
Work within the Perimeter Open Space Zone, such as vegetation management activities, may have an impact on special-status plants recorded nearby (see Figure 4.3-2). While dark-eyed gilia is presumed extirpated from the Berkeley hills, most beautiful jewelflower (blooms April-September) and Diablo helianthella (blooms March-June) herbs have potential to occur in grassland, scrubland, or woodland habitats. Western leatherwood, a woody shrub, has potential to occur within the campus's woodlands and forests. It has been recorded on the campus and its immediate vicinity from 1991 to 2021 (CDFW, 2024), in mixed bay forest with poison oak, coyote brush, and blackberry understory. The Berkeley Lab campus areas with potential to host this species include Blackberry canyon in the western campus along the North Fork of Strawberry Creek, and along the southern campus border adjacent to the UC Botanical Garden. Heavy vegetation management activities that would occur under the Lab's VMP, including eucalyptus removal, may occur in the wooded areas within the Perimeter Open Space Zone and areas of the development clusters immediately adjacent to this zone, or in chaparral, grassland or scrubland habitats. If utility improvements or heavy vegetation management actions were to occur in suitable habitat for special-status plants, a potentially significant impact could occur.

LRDP Mitigation Measure BIO-1a, Protection of Rare Plants, would require a rare plant survey in the Perimeter Open Space Zone in suitable habitat prior to construction during the blooming times for rare plants with potential to occur, and avoidance or relocation of the individual plants, if found. Implementation of this mitigation measure would reduce impacts on special-status plants to a less-than-significant level.

Special-Status Wildlife Species

Special-status wildlife with moderate potential to occur on the campus include Alameda whipsnake, San Francisco dusky-footed woodrat, raptors and other nesting birds, and roosting bats.

Alameda whipsnake. Alameda whipsnake is listed as threatened under ESA and CESA. Suitable habitat for Alameda whipsnake includes the mosaic of scrub communities, grassland, and open woodland habitat in the East Bay. Habitat with a high potential for the species to occur includes scrub and adjacent grassland on northeast, southeast, south, and southwest-facing slopes. Foraging and dispersal habitat includes woodland and grassland contiguous with scrub habitat. Closed canopy tree stands dominated by nonnative trees such as eucalyptus and Monterey pine are considered degraded or unsuitable habitat (UC Berkeley, 2021). As noted above, scrub, shrubland, and grasslands are present in the Perimeter Open Space Zone. The highest potential for this species to occur would be at the eastern end of the campus within and adjacent to its critical habitat (east of Centennial Drive and Calvin Road) or in suitable grassland habitat near the southern perimeter of the campus in proximity of where the species was recorded on adjacent UC Berkeley Hill Campus open space in 2008 (CDFW, 2024). **Figure 4.3-3** shows areas on the campus with high, medium and low potential for Alameda whipsnake to occur. Due to its location on the campus periphery, no facilities under the proposed 2025 LRDP are expected to be built on or near the designated critical habitat of the species, and there would be no loss of suitable habitat of the species. However, there is potential for this species to disperse or travel through other areas of the campus, including roadways, non-native grassland, and woodland adjacent to scrub or scrubland. If road widening or placement of utilities under the proposed 2025 LRDP or heavy vegetation management activities under the VMP are implemented in the Perimeter Open Space Zone in proximity of areas where the species has a high to moderate potential to occur, individual Alameda whipsnakes could disperse into the area of disturbance and could be harmed or killed by human activity or equipment use. Implementation of LRDP Mitigation Measure BIO-1b, Protection of Special-Status Terrestrial Species, below, would require pre-construction surveys for this species in specified work areas, and installation of exclusion fencing to prevent individuals from inadvertently entering the work area during construction or heavy equipment use. Implementation of this mitigation measure would reduce the impact on Alameda whipsnake to a less-than-significant level.



SOURCE: CNDDB 2024; ESA, 2024

LBNL LRDP EIR

Figure 4.3-3
Alameda Whipsnake Potential Occurrence Areas

ESA

San Francisco dusky-footed woodrat. This species is a state species of special concern and is found in forest and woodland areas, where it constructs nests of twigs and leaves (middens) at the base of trees or within shrubs. Habitat for this species is present within Blackberry Canyon in the western part of the campus (North Fork of Strawberry Creek) and in the northern portion of the campus in Seaborg Glen. These areas would not be expected to be developed with facilities under the proposed 2025 LRDP and therefore, there would be no loss of habitat for this species. Vegetation management activities under the Lab's VMP would likely be implemented in areas that contain suitable habitat for the species and may result in loss of habitat. However, the amount of suitable woodland on the campus is small (see Figure 4.3-1); thus, loss of habitat would be minor relative to the amount of suitable habitat for this species in the region, and the impact on habitat is considered less than significant. Nonetheless, there is potential for this species to cross roadways or grassland habitat near its nesting areas or it could occur within the areas where heavy vegetation management activities are underway. If dusky-footed woodrat were to be inadvertently injured or killed during project construction or during heavy vegetation management activities, this would be a significant impact. Impacts to this species would not be expected following construction.

Implementation of LRDP Mitigation Measure BIO-1b, Protection of Special-Status Terrestrial Species, below, would require pre-construction surveys for this species in specified work areas, and installation of exclusion fencing to prevent individuals from accessing the work area during construction. Implementation of this mitigation measure would reduce the impact on dusky-footed woodrats to a less-than-significant level.

Migratory and Other Nesting Birds and Special-Status Bats. Migratory birds, including raptor species, as well as smaller birds such as cliff swallow and house finch, are protected under federal and state law during nesting season. These birds may nest in trees, shrubs, or on structures within the campus. Western red bat, hoary bat, and other bat species may potentially roost in buildings, under eaves or in disused areas, or trees, within foliage, underneath exfoliating bark, and in tree cavities. Maternity or winter roosts may be present in isolated, disused building locations such as attics, or in large tree cavities. Land development under the proposed 2025 LRDP and vegetation management actions may require tree and vegetation removal and trimming in the oak woodland, coniferous forest, eucalyptus, and landscape trees and shrubs on the campus, as well as removal of buildings and other structures. These affected areas may support nesting migratory birds and roosting bats in season; eggs or young could be destroyed, killed, or injured during vegetation removal or demolition activities (breeding season for birds is February 1 to August 15 and for bats is March 1 and July 31).

Further, it is conservatively concluded that construction-generated noise and vibration as well as noise generated by vegetation management activities would have the potential to result in indirect effects on special-status bird and bat species within 500 feet of construction or vegetation management activities. Equipment used for clearing, excavation, grading, and other construction activities would generate elevated noise levels within this zone that could disturb nesting birds or roosting bats, raise stress levels or mask communication calls, and potentially lead to nest or roost abandonment (UC Berkeley, 2023).

As such, Project construction activities and heavy vegetation management activities could result in potentially significant impacts to nesting birds and roosting bats, including special-status species. Implementation of LRDP Mitigation Measure BIO-1c, Protection of Nesting Birds, and LRDP Mitigation Measure BIO-1d, Protection of Roosting Bats, would require pre-construction and pre-demolition nesting bird and roosting bat surveys, followed by establishment of nest buffers or bat-safe removal if suitable bat habitat is found. Implementation of these measures would reduce impacts on special-status bird and bat species to a less-than-significant level. In addition, please see Section 4.11, *Noise and Vibration*, LRDP Mitigation Measures NOI-1a and NOI-1b and LRDP Mitigation Measure NOI-3, which would limit construction hours and include implementation of a number of construction techniques and design features to further reduce construction noise and vibration effects to the extent feasible.

LRDP Mitigation Measure BIO-1a: Protection of Rare Plants

1) Prior to construction on suitably vegetated areas of the campus Perimeter Open Space Zone, a qualified biologist shall conduct a focused survey for rare plant species with potential to be present during their respective blooming periods (western leatherwood blooms January to March; Diablo helianthella blooms March to June; most beautiful jewelflower blooms April to September). Surveys should be conducted during the periods of identification for all species under consideration at each applicable development site. If no special-status plants are observed, no further action is required. If special-status plant species, including western leatherwood, are observed, the plants will be avoided with a suitable buffer, determined in coordination with CDFW. The buffer zone shall be clearly demarcated using exclusion fencing.
2) If establishing an avoidance buffer is not feasible, individual plants shall be transplanted to an area with suitable physical and biological conditions outside of the work area, according to a Rare Plant Relocation Plan to be prepared by UC LBNL or its contractor and reviewed and approved by CDFW. The Relocation Plan will include regular monitoring and weeding for a period of five years, as well as adaptive management criteria, including additional monitoring, weeding, watering, or replanting, if success criteria are not met after the five-year management period.

LRDP Mitigation Measure BIO-1b: Protection of Special-Status Terrestrial Species

1) At least fifteen (15) calendar days prior to the start of construction, a qualified biologist(s) shall conduct pre-construction surveys for Alameda whipsnake and San Francisco dusky-footed woodrat in all areas of suitable habitat. If Alameda whipsnake or San Francisco dusky-footed woodrat is found, it will be allowed to leave the area of its own accord, and USFWS and/or CDFW shall be notified.
2) UC LBNL shall minimize adverse effects to the Alameda whipsnake and San Francisco dusky-footed woodrat by limiting to the maximum extent possible the number of access routes; construction areas; equipment staging, storage, parking, and stockpile areas, and placing these outside of sensitive habitat for both species. Prior to initial ground disturbance at a project site, equipment staging areas, site access routes, construction equipment and personnel parking areas, debris store areas, and any other areas that may be disturbed will be identified, surveyed by a qualified biologist, and clearly marked with bright orange plastic construction fencing, or equivalent. The fencing shall be inspected regularly by the qualified biologist and maintained daily by the contractor until project completion.

3) Prior to commencement of construction or vegetation management activities with the potential to impact Alameda whipsnake and/or San Francisco dusky-footed woodrat, workers shall be trained in Alameda whipsnake and San Francisco dusky-footed woodrat avoidance, minimization, and conservation measures, legal protection, and other related issues. Training will be prepared and delivered under the guidance of a qualified biologist.

4) If a dusky-footed woodrat midden is identified in a work area, the contractor shall attempt to preserve the midden and maintain an intact dispersal corridor between the midden and undisturbed habitat. An adequate dispersal corridor would be considered to be a minimum of 50 feet wide and have greater than 70 percent vegetative cover. If dusky-footed woodrat midden(s) cannot be avoided, CDFW will be notified and information regarding the midden location(s) and a relocation plan will be provided. With approval from CDFW, a qualified biologist shall dismantle and relocate the midden material. No less than 10 days prior to the beginning of construction a qualified biologist shall deconstruct the midden by hand. Materials from the midden shall be dispersed into adjacent suitable habitat that is outside of the work area. During the deconstruction process, the biologist shall attempt to assess if there are juveniles in the midden. If immobile juveniles are observed, the deconstruction process shall be discontinued until a time when the biologist believes the juveniles are fully mobile. A 50-foot wide no-disturbance buffer will be established around the midden until the juveniles are mobile. The midden may be dismantled once the biologist has determined that adverse effects on the juveniles would not occur. All disturbances to woodrat middens will be documented in a construction monitoring report and submitted to CDFW.

5) In habitat with a high potential for the Alameda whipsnake to occur (see Figure 4.3-3), a biological monitor shall be present at project sites for the duration of work activities determined to be potentially harmful to the species. Each morning, prior to initiating excavation, construction, equipment or vehicle operation at project sites identified as having high potential for whipsnake occurrence, the project sites shall be surveyed by a designated monitor trained in Alameda whipsnake identification to ensure that no Alameda whipsnakes are present. All laydown and deposition areas, as well as other areas that might conceal or shelter snakes or other animals, shall be inspected each morning by the designated monitor to ensure that Alameda whipsnakes are not present. The designated monitor shall have the authority to halt construction or vegetation management activities in the event that a whipsnake is found within the construction footprint or work area until such time as threatening activities can be eliminated in the vicinity of the snake and it can be removed from the site by a biologist permitted to handle whipsnakes. USFWS and CDFW shall be notified within 24 hours of such event.

6) In habitats designated as having low to moderate potential for Alameda whipsnake to occur, a preconstruction survey shall be performed by a qualified biologist to identify presence of suitable habitat. If suitable habitat is observed, daily monitoring shall be provided during clearing and grubbing in suitable whipsnake habitat areas. Work areas shall be limited to the maximum extent possible as stated above in Number 2, and worker training shall be provided as stated in Number 3.

7) A litter control program shall be instituted at each project site to ensure that Alameda whipsnake predators, such as crows, ravens, and coyotes, are not attracted to the construction site by discarded food and trash. All workers will ensure their food

scraps, paper wrappers, food containers, cans, bottles, and other trash are deposited in covered trash or removed from the site each working day.

LRDP Mitigation Measure BIO-1c: Protection of Nesting Birds

1) To the extent feasible, removal of any tree and/or other vegetation suitable for bird nesting shall not occur during the bird breeding season of February 1 to August 15. If tree removal must occur during the bird breeding season, all trees to be removed shall be surveyed by a qualified biologist to verify the presence or absence of nesting raptors or other birds. Pre-removal surveys shall be conducted within 15 days prior to the start of work and shall be submitted to UC LBNL for review and approval.

2) For projects that do not involve tree removal but involve construction during the bird nesting season noted above, pre-construction nesting bird surveys shall be conducted on project sites that contain nesting habitat or are in proximity of suitable nesting habitat, 15 days prior to start of work. The area to be surveyed will be determined by a qualified biologist.

3) If the pre-removal or pre-construction nesting bird survey indicates the potential presence of nesting raptors or other birds, the biologist shall determine an appropriately sized buffer around the nest in which no work would be allowed until the young have successfully fledged. The size of the nest buffer will be determined by the biologist and will be based to a large extent on the nesting species and its sensitivity to disturbance. In general, buffer sizes of 200 feet for raptors and 50 feet for other birds should suffice to prevent noise, vibration, and visual disturbance to birds nesting in the urban environment, but these buffers may be increased or decreased, as appropriate, in consultation with CDFW, depending on the bird species and the level of disturbance anticipated near the nest.

LRDP Mitigation Measure BIO-1d: Protection of Roosting Bats

1) To the extent feasible, removal of any tree or other structure suitable for bat maternity roosting shall not occur during the bat breeding season of March 1 to July 31. Prior to project construction activities during the breeding season, a qualified bat biologist shall conduct a pre-construction survey for roosting bats in suitable trees to be removed or pruned and suitable structures to be demolished within the work area and within a 50-foot radius of the work area. If no roosting bats are found, no further action is required.

2) If a non-maternal roost of bats is found in a tree or structure to be removed or demolished as part of project construction, the individuals shall be safely evicted, under the direction of a qualified bat biologist, by opening the roosting area to allow airflow through the cavity. Removal or demolition should occur no sooner than at least two nights after the initial minor site modification (to alter airflow). This action allows bats to leave during darkness, thus increasing their chance of finding new roosts with a minimum of disturbance. Departure of the bats from the construction area shall be confirmed with a follow-up survey by a qualified bat biologist prior to start of construction.

3) If active maternity roosts are found in trees or structures that will be removed or demolished as part of project construction, tree removal or structure demolition shall commence and be completed before maternity roosting colonies form (generally before March 1), or those activities shall not commence until after the young are

flying (generally after July 31). Active maternity roosts shall not be disturbed between March 1 and July 31.

Significance after Mitigation: Less than Significant. The implementation of LRDP Mitigation Measures BIO-1a through -1d would reduce the impact to a less-than-significant level, because if any special-status species were identified during construction activities under the proposed 2025 LRDP or ongoing vegetation management activities under the VMP, these measures would avoid or minimize impacts on the species by delaying activities, completing surveys and monitoring, and implementing buffers.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the 2025 LRDP would be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario remains an appropriate and conservative basis for the evaluation of biological resources impacts. The majority of individual building projects identified in the Illustrative Development Scenario are posited to be located in previously developed sites, with the exception of Building S-13 (Building 71 Accelerator Tunnel) which would be sited in a currently undeveloped area which comprises non-native grasslands. Any building or other site improvements under Illustrative Development Scenario that would result in harm to special-status wildlife during construction or require the removal of special-status plants would be a significant impact. With incorporation of the LRDP Development Principles and Design Guidelines or future Campus Physical Design Framework, and implementation of LRDP Mitigation Measures BIO-1a, BIO-1b, BIO-1c, and BIO-1d, impacts on special-status plant and wildlife species under the Illustration Development Scenario would be reduced to a less-than-significant level.

LRDP Impact BIO-2: Implementation of the LBNL 2025 LRDP and the related LBNL VMP would have a substantial adverse effect on riparian habitat or other sensitive natural communities identified in local or regional plans, policies, and regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service. (*Potentially Significant; Less than Significant with Mitigation*)

Portions of the oak/bay woodland community occurring in riparian zones are considered a sensitive natural community. This riparian vegetation is located in the far western portion of the campus in Blackberry Canyon (Strawberry Creek North Fork); additional riparian vegetation is present in isolated patches surrounding open seeps and unculverted channels in the northern and southern/southwestern portions of the campus. Wetlands and seeps present on the campus are also considered a sensitive natural community. These include isolated wetlands surrounding horizontal drains (hydraugers) on the central campus, as well as in the northern portion of the campus around Seaborg Glen. Implementation of the proposed 2025 LRDP or heavy management activities under the VMP could result in a significant adverse impact to these sensitive natural communities if future land development or vegetation management activities cause temporary or permanent disturbance within or removal of these habitats. LRDP Mitigation Measure BIO-2, Habitat Restoration and Monitoring, would require avoidance of sensitive habitat as much as possible, and it would require restoration of unavoidably impacted areas following construction. Implementation of this mitigation measure would reduce impacts on sensitive riparian communities to a less-than-significant level.

LRDP Mitigation Measure BIO-2: Habitat Restoration and Monitoring

1) UC LBNL or its contractor shall avoid or minimize impacts on sensitive natural communities and potentially jurisdictional aquatic habitat, and project design shall minimize the extent of temporary and permanent loss of such areas. For any unavoidable permanent loss of sensitive habitat, including riparian, stream, or wetland areas, UC LBNL shall prepare and submit to the USACE for verification an aquatic resources delineation report.
2) For unavoidable temporary or permanent impacts, UC LBNL shall prepare a Habitat Restoration and Monitoring Plan. The Plan shall address the restoration of jurisdictional waters or protected habitats through the replacement or enhancement of a comparable amount of habitat area (i.e., a minimum 1:1 ratio based on acreage or linear feet of channel) at an agency-approved location within the same or nearby watershed. Ephemeral channels or sensitive habitats temporarily impacted by construction-related activity shall be replanted or reseeded with native plants from the watershed, under guidance from a qualified biologist.
3) The Habitat Restoration and Monitoring Plan shall include protocols for replanting of native vegetation removed prior to or during construction, and management and monitoring of the plants for a five-year period to ensure replanting success. The plan shall specify monitoring and performance criteria for the species planted, invasive species control criteria, as well as the best time of year for seeding to occur, pursuant to requirements of permits granted for the project. Appropriate performance standards may include, but are not limited to, a 75-percent survival rate of restoration plantings; absence of invasive plant species; and a viable, self-sustaining creek or wetland system at the end of the five-year monitoring period. The plan shall include adaptive management strategies if success criteria are not being met. The Habitat Restoration and Monitoring Plan shall include interim thresholds for replanting success and alternative management approaches, including weed control, supplementary watering, or additional replanting to undertake if performance thresholds are not met.

Significance after Mitigation: Less than Significant. The implementation of LRDP Mitigation Measure BIO-2 would reduce the impact to a less-than-significant level because if any sensitive riparian habitat is impacted during construction activities under the proposed 2025 LRDP or ongoing vegetation management activities under the VMP, this measure provides for sufficient restoration and monitoring of the sensitive communities.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the 2025 LRDP would be similar in intensity to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario remains an appropriate and conservative basis for the evaluation of impacts to biological resources.

The majority of individual building projects identified in the Illustrative Development Scenario are posed in previously-developed sites, with the exception of Building S-13 (Building 71 Accelerator Tunnel) that would be sited in a currently undeveloped area populated with non-native grasslands. Land development in the areas included in the Illustrative Development Scenario could result in removal of existing native and non-native vegetation but would be unlikely to impact sensitive riparian habitat or wetlands and seeps. In the unlikely event that implementation of any building or other site development shown under the Illustrative Development Scenario were to affect sensitive natural communities, for the reasons stated above, incorporation of the LRDP Design Guidelines or Physical Development Framework and LRDP Mitigation Measure BIO-2 would reduce the impact to a less-than-significant level.

LRDP Impact BIO-3: Implementation of the LBNL 2025 LRDP and the related LBNL VMP would have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means. (*Potentially Significant; Less than Significant with Mitigation*)

Potential jurisdictional waters of the U.S. and/or the State on the campus includes isolated wetlands surrounding the hydraugers on the central campus, open seeps and unculverted channels in the northern campus, and creek channels in the south-western and southern portions of the campus. Although vegetation management activities under the VMP are not expected to involve work in any jurisdictional waters, some work could potentially occur near or in jurisdictional areas. Construction of structures, roads, utilities or other elements under the proposed 2025 LRDP could result in adverse impacts to potential jurisdictional waters, including drainages and wetlands, at Berkeley Lab. Any 2025 LRDP land development project resulting in permanent or temporary fill of jurisdictional waters could be subject to provisions of Sections 401 and 404 of the Clean Water Act and Sections 1600 through 1616 of the California Fish and Game Code. Permits from the USACE, the RWQCB, and the CDFW would be obtained prior to project implementation, as applicable, and would contain conditions of approval designed to minimize adverse effects on wetland resources. The permits would include compensatory mitigation for any permanent impacts associated with construction. Also, during construction, as described in Section 4.9, *Hydrology and Water Quality*, UC LBNL would implement construction best management practices (BMPs), such as use of erosion control measures, to minimize the potential for accidental discharges of fill or other materials into jurisdictional waters. Active management of construction-related stormwater flows, which is a standard part of contract specifications on UC LBNL construction projects, would also be implemented. In addition, LRDP Mitigation Measure BIO-2, Habitat Restoration and Monitoring, described above, would be implemented to reduce impacts from temporary or permanent disturbance of wetlands or other waters to a less-than-significant level.

Mitigation: Implement LRDP Mitigation Measure BIO-2.

Significance after Mitigation: Less than Significant. The implementation of LRDP Mitigation Measure BIO-2 would reduce the impact to a less-than-significant level because if any jurisdictional wetland or waters are impacted during construction activities under the proposed 2025 LRDP or ongoing vegetation management activities under the VMP, this measure provides for restoration and monitoring of the wetlands or waters.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the 2025 LRDP would be similar in intensity to that portrayed in the scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario remains an appropriate and conservative basis for the evaluation of impacts to biological resources. The majority of individual building projects identified in the Illustrative Development Scenario are posed in previously-developed sites, with the exception of Building S-13 (Building 71 Accelerator Tunnel) which is shown to be sited in a currently undeveloped non-native grassland area. Development in these areas, including the Building S-13 site, would not impact any jurisdictional drainages and/or wetlands as none are present in these areas. In the unlikely event that any building or other site improvements shown under the Illustrative Development Scenario would adversely affect jurisdictional waters, or result in accidental discharges, for the reasons stated above, incorporation of the LRDP Design Guidelines or future campus Physical Design Framework and LRDP Mitigation Measure BIO-2 would reduce the impact on wetlands to a less-than-significant level.

LRDP Impact BIO-4: Implementation of the LBNL 2025 LRDP would interfere substantially with the movement of native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites. (*Potentially Significant; Less than Significant with Mitigation*)

The Berkeley Lab campus lacks perennial waterways to provide migratory corridors for fish. While its developed core is unwelcoming for dispersing terrestrial wildlife, mammals and reptiles may move through vegetated areas in the campus's Perimeter Open Space Zone. However, these areas do not constitute an essential wildlife corridor. The steep terrain, vehicular traffic, perimeter fencing required for Lab security, and human disturbance of the campus make it unfavorable for wildlife crossing. Surrounding habitat in the East Bay hills is considered essential connectivity habitat; these areas feature more open space and cover and less human disturbance than the campus (CDFW, 2024b). The East Bay hills provide habitat for numerous reptiles and amphibians, as well as for small and large mammals, including mountain lion (*Puma concolor)*, a state candidate species. Noise disturbance from construction activities under the proposed 2025 LRDP and noise from vegetation management activities is considered a less-than-significant effect on terrestrial wildlife, due to its intermittent and short-term nature, and the ability of wildlife species to relocate within nearby open space areas to escape disturbance. In addition, please see Section 4.11, *Noise and Vibration*, LRDP Mitigation Measures NOI-1a and NOI-1b and LRDP Mitigation Measure NOI-3, which would limit construction hours and construction noise.

While the campus does not constitute an aerial wildlife movement corridor, it serves as a regional rest stop for migratory birds. The San Francisco Bay area is an important migratory stopover for birds along the Pacific Flyway—one of the four major migratory routes in North America. Migratory birds utilizing the Pacific Flyway pass through Berkeley and Oakland during spring and fall migration, stopping in habitat areas for rest and forage. Within the East Bay hills, the campus is fringed by mature eucalyptus and oak/bay woodlands, including riparian woodlands, which may provide valuable stopover habitat during migration.

Bird flights close to man-made structures or utility lines risk collision or electrocution. Approximately 100 million to 1 billion birds die in North America as a result of building collisions each year (Seewagen, 2017). Existing campus buildings range from one to eight stories, with the majority being four stories or less. Proposed 2025 LRDP implementation would involve demolition of several existing buildings, vegetation removal, and construction of new buildings and site development, utilities extensions and other improvements. Considering the proposed demolition of 278,500 gsf of existing campus building space under the proposed 2025 LRDP, there would be a net increase of 295,500 gsf of new campus building development over the 20-year 2025 LRDP timespan. New buildings would be comparable in height and massing to existing campus development, and they would be largely located in infill and previously disturbed campus locations. Thus, bird strike potential would not be substantially increased over current conditions. Furthermore, the proposed 2025 LRDP would prioritize utility line undergrounding such that migratory birds would not face substantially increased risk of injury or mortality resulting from overhead power line collision or electrocution. Nevertheless, the increase in campus buildings and associated night lighting along with potential construction night lighting could attract migratory birds and increase the likelihood of strikes; this would be a potentially significant impact. Implementation of LRDP Mitigation Measure BIO-4, Bird Collision Reduction Measures, would reduce the potential adverse effect on resident and migrating birds to a less-than-significant level; this would be accomplished by reducing injuries associated with night lighting during construction and operation and by requiring design features in new structures to make buildings and utilities more visible to birds.

LRDP Mitigation Measure BIO-4: Bird Collision Reduction Measures

- If aboveground electrical lines and other improvements are proposed, bird-safe measures for utility lines based on APLIC recommendations (2006, 2012) shall be developed in consultation with a qualified expert based on site-specific conditions.
- Preliminary construction bird-safe measures may include, but not limited to, the following:
  - Construction areas requiring lights shall implement the following measures to the extent feasible:
    - Construction-related lighting shall be fully shielded and focused down to ensure no significant illumination passes beyond the immediate work area.
    - Yellow or orange light shall be used where possible.
    - Construction personnel shall reduce the amount of lighting to the minimum necessary to safely accomplish the work.

- To avoid long-term impacts, campus design shall:
  - Avoid installation of lighting in areas where not required for public safety.
  - Consider alternatives to all-night, floor-wide lighting when interior lights would be visible from the exterior or when exterior lights must be left on at night, including:
    - Installing motion-sensitive lighting
    - Installing task lighting
    - Installing programmable timers
    - Installing lower-wattage, sodium, and yellow-red spectrum lighting fixtures (if compatible with personnel safety requirements)
  - Use fully shielded exterior safety lights to contain and direct light away from the sky.
  - Employ glazing options such as use of either fritted glass, Dichroic glass, etched glass, translucent glass, or glass that reflects ultraviolet light in appropriate portions of the building façade.
  - Minimize light and glare resulting from the new building through the use of landscaping materials and choice of primary façade materials. Project design shall not include reflective metal walls and mirrored glass walls as primary building materials for facades.

Significance after Mitigation: Less than Significant. The implementation of LRDP Mitigation Measure BIO-4 would reduce the impact to a less-than-significant level by minimizing bird collision risk due to building design and reducing impact of light during construction under the proposed 2025 LRDP.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the scenario. Any of the hypothetical buildings that are included in the Illustrative Development Scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario remains an appropriate and conservative basis for the evaluation of biological resources impacts.

The Illustrative Development Scenario proposes buildings ranging in height between one and five stories and with comparable massing to existing campus development. Furthermore, new buildings would be largely located in infill and previously disturbed campus locations. Implementation of LRDP Mitigation Measure BIO-4, Bird Collision Reduction Measures, would reduce the potential adverse effect on resident and migrating birds to a less-than-significant level by reducing injuries associated with night lighting during construction and operation, and by requiring design features in new structures to make buildings and utilities more visible to birds.

Cumulative Impacts

LRDP Impact CUM-BIO-1: Implementation of the LBNL 2025 LRDP and the related LBNL VMP would result in cumulatively considerable impacts on biological resources, in combination with past, present, and reasonably foreseeable future projects in the vicinity of Berkeley Lab. (*Potentially Significant; Less than Significant with Mitigation*)

This section presents an analysis of the cumulative effects of the proposed 2025 LRDP and the related VMP when considered with other past, present, and reasonably foreseeable projects and plans. The geographic scope of potential cumulative biological resources impacts encompasses the Berkeley Lab campus and its surrounding natural habitat areas, including adjacent migration and movement corridors. The Berkeley Lab campus contains small amounts of surface waterways and wetlands, mature woodlands, and coastal scrub/shrubland, which is critical habitat for Alameda whipsnake. The campus also includes mature woodlands, which provide habitat for nesting birds and potential habitat for rare plants and San Francisco dusky-footed woodrat. Proposed 2025 LRDP and VMP implementation may result in potential impacts on biological resources, including special-status species, sensitive natural communities, wetlands and waters, and wildlife corridors; these impacts would be minimized by the application of mitigation measures identified herein.

Cumulative projects and plans are listed in Chapter 4 (Section 4.02). These include research, support, and infrastructure projects previously approved on the Berkeley Lab campus under its 2006 LRDP, UC Berkeley land use development envisioned under its 2021 LRDP, and vegetation management in the UC Berkeley Hill Campus pursuant to the Hill Campus Wildland Vegetative Fuel Management Plan (WVFMP). It also includes miscellaneous development within the City of Berkeley with minimal effect on biological resources. The UC Berkeley Hill Campus WVFMP FEIR identified several impacts on biological resources associated with its implementation, all of which would mitigated to a less-than-significant level over the life of the plan. Other cumulative projects were or will be subject to environmental review under CEQA and subject to regulations protective of biological resources, which would require reduction or compensation for impacts on sensitive resources.

Proposed 2025 LRDP implementation would take place over the next 20 years and would locate most new development within pre-existing development areas, resulting in low impact to biological resources. The ongoing VMP would continue to be implemented both within the developed campus and in the Perimeter Open Space Zone. As discussed above, with the implementation of LRDP Mitigation Measures BIO-1, BIO-1b, BIO-1c, BIO-1d, BIO-2, and BIO-4, all direct and indirect impacts of the proposed 2025 LRDP and the vegetation management activities under the VMP on special-status species, sensitive habitats, wetlands and waters, and migratory bird corridors would be reduced to less-than-significant levels. Thus, with these mitigation measures, implementation of the proposed 2025 LRDP and the ongoing VMP would not make a cumulatively considerable contribution to cumulative impacts on biological resources. The cumulative impact on biological resources would be less than significant.

> **Mitigation:** Implement LRDP Mitigation Measures BIO-1a, BIO-1b, BIO-1c, BIO-1d, BIO-2, and BIO-4.

Significance after Mitigation: Less than Significant. Implementation of LRDP Mitigation Measures BIO-1a through 1d, BIO-2, and BIO-4 would reduce the cumulative impact to a less-than-significant level, because if any special-status species, sensitive riparian habitat, jurisdictional wetlands, or wildlife corridors were affected during construction activities under the proposed 2025 LRDP or ongoing vegetation management activities under the VMP, these measures would avoid or minimize such impacts.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the 2025 LRDP is expected to be similar in intensity and character to that portrayed in the scenario. Accordingly, development that would occur as part of the Illustrative Development Plan would be similar to that which would occur under the proposed 2025 LRDP. Therefore, with the implementation of LRDP Mitigation Measures BIO-1a, BIO-1b, BIO-1c, BIO-1d, BIO-2, and BIO-4, development shown under the Illustrative Development Scenario would not have a cumulatively significant effect on biological resources.

4.3.5 References

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4.4 Cultural Resources, including Tribal Cultural Resources

4.4.1 Introduction

This section identifies and evaluates the potential for proposed LBNL 2025 LRDP implementation to result in significant impacts on cultural resources and tribal cultural resources, including archaeological, architectural, and Native American resources. The section describes the physical setting related to cultural resources; includes a summary of University plans and policies, and federal, State, and local laws and regulations, related to these resources; identifies the criteria used to evaluate the significance of potential impacts; provides an analysis of the potential cultural resources impacts, including tribal cultural resources, from proposed 2025 LRDP implementation; and identifies feasible mitigation measures to mitigate potentially significant impacts.

UC LBNL received scoping comments from the Native American Heritage Commission (NAHC) that recommended, pursuant to Public Resources Code (PRC) Section 21080.3 (Assembly Bill 52), that UC LBNL conduct consultation with tribes that are culturally affiliated with the Project site. The NAHC also recommended that UC LBNL conduct a cultural resources records search of the California Historical Resources Information System (CHRIS) and that an archaeological inventory survey report be prepared along with a search of the NAHC's Sacred Lands File (SLF).

4.4.2 Environmental Setting

Pre-Contact Setting

The natural marshland communities along the edges of bays[1] and channels were the principal source for subsistence and other activities during the prehistory of the San Francisco Bay region. Many of the original surveys of archaeological sites in the Bay region were conducted between 1906 and 1908 by U.C. Berkeley archaeologist N. C. Nelson. The surveys yielded the initial documentation of nearly 425 "earth mounds and shell heaps" along the littoral zone of the bay (Nelson, 1909). From these beginnings, the most notable sites in the Bay region were excavated scientifically, such as the Emeryville shellmound, the Ellis Landing Site in Richmond, and the Fernandez Site in Rodeo Valley (Moratto, 1984). These dense midden sites, such as CA-ALA-309, have been carbon-14 dated to 2,310 ± 220 years before present (BP), but other evidence from around the bay suggests that human occupation in the region is of greater antiquity, perhaps as early as 9,000 BP (Davis and Treganza, 1959, as cited in Moratto, 1984).

Archaeologists developed individual cultural chronological sequences tailored to the archaeology and material culture of each subregion of California. Each of these sequences is based principally on the presence of distinctive cultural traits and stratigraphic separation of deposits. Milliken et al. (2007) provide a framework for the interpretation of the San Francisco Bay Area. The authors divided human history in California into three periods: the *Early Period*, the *Middle Period*, and

1 Bays in this region include Suisun Bay, San Pablo Bay, Central Bay, and South Bay, which are sub-basins of the greater San Francisco Bay.

the *Late Period*. In many parts of California four periods are defined; the fourth being the *Paleoindian Period* (11500–8000 B.C.), characterized by big-game hunters occupying broad geographic areas. Evidence of human habitation during the Paleoindian Period has not yet been discovered in the San Francisco Bay Area. Economic patterns, stylistic aspects, and regional phases further subdivide cultural periods into shorter phases. This scheme uses economic and technological types, socio-politics, trade networks, population density, and variations of artifact types to differentiate between cultural periods.

During the Early Period (Lower Archaic, 8000–3500 B.C.), geographic mobility continued from the Paleoindian Period, which is characterized by the millingslab and handstone as well as large wide-stemmed and leaf-shaped projectile points. The first cut shell beads and the mortar and pestle are first documented in burials during the Early Period (Middle Archaic, 3500–500 B.C.), indicating the beginning of a shift to sedentism. During the Middle Period, which includes the Lower Middle Period (Initial Upper Archaic, 500 B.C.–A.D. 430), and Upper Middle Period (Late Upper Archaic, A.D. 430–1050), geographic mobility may have continued, although groups began to establish longer term base camps in localities from which a more diverse range of resources could be exploited. The first rich black middens are recorded from this period. The addition of milling tools, obsidian, and chert concave-base projectile points, as well as the occurrence of sites in a wider range of environments, suggest that the economic base was more diverse. By the Upper Middle Period, mobility was being replaced by the development of numerous small villages. Around A.D. 430, a dramatic cultural disruption occurred as evidenced by the sudden collapse of the *Olivella* saucer bead trade network. During the Initial Late Period (Lower Emergent, A.D. 1050–1550), social complexity developed toward lifeways of large, central villages with resident political leaders and specialized activity sites. Artifacts associated with the period include the bow and arrow, small corner-notched projectile points, and a diversity of beads and ornaments.

Ethnographic Setting

A compilation of ethnohistorical, historical, and archeological data indicates that the San Francisco Bay Area was inhabited by a cultural group known as the Ohlone before the arrival of Europeans (Milliken, 1995). While traditional anthropological literature portrayed the Ohlone peoples as having a static culture, it is better understood today that many variations of culture and ideology existed within and between villages. While these "static" descriptions of separations between native cultures of California make it an easier task for ethnographers to describe past behaviors, this approach masks Native adaptability and self-identity. California's Native Americans never saw themselves as members of larger "cultural groups," as described by anthropologists. Instead, they saw themselves as members of specific village communities, perhaps related to others by marriage or kinship ties, but viewing the village as the primary social unit.

Levy (1978) describes the language group spoken by the Ohlone (often referred to as "Costanoan" in the literature). This term is originally derived from a Spanish word designating the coastal peoples of Central California. Today Costanoan is used as a linguistic term that refers to a larger language family that included distinct sociopolitical groups that spoke at least eight languages of the Penutian language group. The Ohlone once occupied a large territory from San Francisco Bay in the north to the Big Sur and Salinas Rivers in the south.

In 1770, the Ohlone lived in approximately 50 separate and politically autonomous nations, and the number of Chochenyo speakers, who occupied the East Bay including the area in the vicinity of the Berkeley Lab campus, reached 2,000, substantially more than the typical size of other Ohlone groups, which ranged from 40 to 200 members. During the Mission Period (1770 to 1835), native populations, especially along the California coast, were brought—usually by force—to the missions by the Spanish missionaries to provide labor. The missionization caused the Ohlone people to experience cataclysmic changes in almost all areas of their life, particularly a massive decline in population caused by introduced diseases and declining birth rate, resulting in large part from colonization by the Spanish missionaries. Following the secularization of the missions by the Mexican government in the 1830s, most Native Americans gradually left the missions and established rancherias in the surrounding areas (Levy, 1978).

Economically, the Ohlone engaged in hunting and gathering. Their territory encompassed both coastal and open valley environments that contained a wide variety of resources, including grass seeds, acorns, bulbs and tubers, bear, deer, elk, antelope, a variety of bird species, and rabbit and other small mammals. The Ohlone acknowledged private ownership of goods and songs, and village ownership of rights to land and/or natural resources; they appear to have aggressively protected their village territories, requiring monetary payment for access rights in the form of clam shell beads, and even shooting trespassers if caught.

After European contact, Ohlone life ways were severely disrupted by missionization, disease, and displacement. Today the Ohlone continue to maintain a strong presence in the San Francisco Bay Area and participate in indigenous lifeways, music, religion, dance, language, and history.

Historic-era Setting

Exploration and Early Settlement (1772 – 1860)

The first Europeans to visit the East Bay area were the Spanish explorers Pedro Fages and Reverend Juan Crespi, who passed through in 1772. The Spanish established a series of missions, military installations, and secular towns throughout the area. The missions were the central feature of these settlements. The closest mission to the present-day Berkeley Lab campus was Mission San Francisco de Asis, located more than 15 miles away and across the San Francisco Bay. As such, there was little early Euroamerican settlement around the area that now comprises the campus. Any settlement was in the form of a land grant, called *ranchos,* given to prominent Spanish citizens. This included Rancho San Antonio, which was awarded to Sargeant Luis Peralta in 1820 (LBNL, 2013). This rancho included all of the present-day cities of San Leandro, Oakland, Alameda, Emeryville, Piedmont, Berkeley, and Albany. After Mexico won independence from Spain in 1821, the Mexican government affirmed Peralta's land grant. In 1841, Peralta divided his rancho between his four sons. The Berkeley Lab campus lands became part of the land given to Jose Domingo Peralta, where he had already established a home (BHS&M, 2024).

The discovery of gold in 1848 led to a huge population boom in California, with settlers from the United States and throughout the world establishing themselves on parts of the ranchos. The 1851 California Land Claims Act required Mexican landowners in California to prove the validity of their claim on land held under Mexican titles. Lands under rejected claims were deemed public and available for arriving settlers. As the average length of time required to prove ownership was 17 years after submitting a claim, many landowners were bankrupted and forced to sell large portions of their land to the settlers they had been attempting to evict (Rawls and Bean, 2002). Through the 1850s, Jose Domingo Peralta lost control of much of his grant as the shoreline area was developed by newly arrived speculators and squatters.

UC Berkeley

The University of California's inception was in 1868 when the private College of California in Oakland merged with the Agricultural, Mining, and Mechanical Arts College, a new land-grant institution, to form the University of California (UC Berkeley, 2024). At that time, the institution was located near downtown Oakland.[2] The University moved to its present site in 1873 with the completion of South Hall. At that time, the site and surrounding area were largely rural and unsettled. Enrollment consisted of just 200 students. The University joined with the growing residential areas around its periphery and the shoreline settlement of Ocean View in 1878 to incorporate as the Town of Berkeley (BHS&M, 2024). Over the next 50 years, the University would add numerous academic buildings along Strawberry Creek, in the heart of the campus. In 1930, it added its first residential hall, Bowles Hall, located at the eastern edge of the campus and overlooking the academic core. Up until this time, all development was located to the west where the topography was better suited to construction. However, by 1930, land was becoming scarce, and the University began to look further upslope for new development opportunities.

History of Lawrence Berkeley National Laboratory[3]

Lawrence Berkeley National Laboratory was founded in 1931 as the University of California Radiation Laboratory on the UC Berkeley main campus. The Radiation Laboratory was established as an accelerator laboratory by UC President Robert Gordon Sproul for physics professor Ernest Orlando Lawrence. A few years earlier (in 1929), on the UC Berkeley campus, Lawrence had built the world's first cyclotron, a roughly 5-inch circular particle accelerator. With the establishment of the Radiation Laboratory, located in the former Civil Engineering Test Lab building, Lawrence and his associates had the opportunity to expand their research. In the original Radiation Laboratory, Lawrence soon developed an 11-inch cyclotron in 1931 and advanced to a 27-inch cyclotron in 1933 followed by a 37-inch cyclotron just a few years later. Shortly thereafter in 1936, the Radiation Laboratory became an independent division of the Physics Department. Using the 37-Inch Cyclotron, Emilio Segre discovered the first artificial element, Technetium (atomic number 43). At that point, researchers were running out of research space. A 60-inch cyclotron was constructed in the Crocker laboratory, also located on the main campus, in 1938-39.

Also in 1939, Lawrence was awarded the Nobel Prize in Physics for the invention and development of the cyclotron, in recognition of the importance of his research and its effect on the field of physics and in the production of artificial radioactive elements. The success of the Radiation Laboratory, and its public recognition with the Nobel Prize in 1939, attracted chemists

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2 The original site of the College of California is a four-block area in Oakland bounded by 12th and 14th streets on the north and south, and by Franklin and Harrison streets on the east and west.

3 Unless otherwise noted, this section is summarized from D.W. Harvey's *Historic Context and Methodology to Conduct the Identification and Evaluation of Historic Buildings/Structures at the Ernest Orlando Lawrence Berkeley National Laboratory,* prepared in January 2002 for the United States Department of Energy.

and physicists from around the world to the UC Berkeley campus. The growing number of researchers and the rapidly increasing scale and scope of the Radiation Laboratory's experiments necessitated a larger facility. The physical constraints of the main campus forced campus planners to look at other suitable locations on their property, including further east to "Charter Hill" in the hills overlooking the campus.

In 1939, construction for the 184-Inch Cyclotron (Berkeley Lab Building 6) began on a small portion of the present-day Berkeley Lab campus. Berkeley Lab campus expansion accelerated as a result of World War II and the need for technological innovation, particularly with respect to uranium isotope separation to aid the Manhattan Project. In fact, the 184-Inch Cyclotron and its massive, 4,500-ton electromagnet were repurposed for isotope separation research before ever being used as a cyclotron accelerator. Berkeley Lab campus growth was also attributable to the fame and publicity Lawrence received for the Nobel Prize, which helped to attract research funding and top scientific talent. By the end of World War II, the Berkeley Radiation Lab campus was composed of more than 30 buildings and labs and employed nearly 1,200 individuals.

In the post-war period, it became clear that institutional and private funding was not going to support the scale and types of research required to further advance the atomic and sub-atomic sciences. Without government funding, most research would not be possible. During World War II, this funding came from a variety of government programs and agencies such as the Manhattan Engineer District (MED) of the U.S. Army Corps of Engineers and from the Manhattan Project specifically. In 1946, control of atomic research and development was transferred from the MED to the civilian Atomic Energy Commission (AEC). The Berkeley Radiation Laboratory became one of several laboratories funded by the AEC.

During the 1950s and 1960s, Berkeley Lab growth and development was guided mainly by high-energy physics research. New campus buildings were associated with the 184-Inch Cyclotron and other accelerators, including research labs, craft and maintenance shops, and offices. The Bevatron (Berkeley Lab Building 51), completed in 1954, was the Laboratory's largest accelerator at the time and the nation's leading high-energy physics facility. It "was in the vanguard of physics research because of its capacity to generate the highest energies produced by an accelerator of that period. The Bevatron was the most powerful accelerator in the world from 1954–1959 and dominated the field of high-energy physics until the early 1960s" (Harvey, 2002). It was the first building constructed on the 97-acre Frank Wilson Tract adjoining the original Berkeley Lab site on the south.

The Heavy Ion Linear Accelerator, or HILAC, located in Berkeley Lab Building 71, opened in 1957 and was one of the first accelerators built specifically for the study of heavy ions (ions heavier than helium). The HILAC underwent several modifications and upgrades during the 1960s to become the SuperHILAC. Several chemical elements were discovered in Building 71 research labs, including nobelium (102) and seaborgium (106). The 88-Inch Cyclotron (Berkeley Lab Building 88) was built between 1958 and 1962. It was used for heavy ion research and was one of the new generations of sector-focused cyclotrons built after 1960.

The late 1960s through the early 1970s was a period of reduced program activity at Berkeley Lab. Following 1973 and the oil embargo, the Lab's activities began to diversify, although the Lab still retained its importance in high-energy and nuclear physics research. In 1974, "the Bevatron was combined with the HILAC to form the Bevalac and Berkeley Lab regained its position as a world-leading accelerator facility, this time for heavy-ion nuclear physics research" (Harvey, 2003). By the late 1970s, multi-program research efforts at the Lab were divided into nine research divisions with the following major programs: Accelerator and Fusion Research, Applied Science (energy and environment), Biology and Medicine, Chemical Biodynamics, Computing, Earth Science, Materials and Molecular Research, Nuclear Science, and Physics. At present, the Laboratory includes over 20 divisions organized within the areas of Biosciences, Computing Sciences, Earth and Environmental Sciences, Energy Sciences, Energy Technologies, and Physical Sciences.

By 1980, 25 percent of the Laboratory's activity was in high-energy and nuclear physics, down from 75 percent 10 years earlier. Berkeley Lab had become a multi-program National Laboratory, with more emphasis on basic energy sciences and life sciences while maintaining historically important roles in high-energy and nuclear physics. The Advanced Light Source (ALS) accelerator, housed under the Building 6 dome that formerly held the 184-Inch Cyclotron, was installed and became operational in 1993. This accelerator and electron storage ring produce the world's brightest soft X-rays and ultraviolet light.

In the 1990s, Berkeley Lab became home to U.S. Department of Energy (DOE) programs in genome sciences. The rapid pace of this research required expansion to off-site buildings in the nearby city of Walnut Creek. In the early 2020s, the Walnut Creek facilities were disbanded and the functions moved back on campus to the Lab's new Integrative Genomics Building.

In 1996, DOE's National Energy Research Scientific Computing (NERSC) Center was moved to Berkeley Lab. This move included the establishment of one of the nation's "most powerful unclassified high-performance" computers (LBNL, 2013). Even more recently, in 2006 the Molecular Foundry, "a facility for the design, synthesis and characterization of nanoscale materials" opened to provide access to instruments, technical support, and scientific experts in the fields of nanoscience research.

Notable accomplishments by LBNL scientists since the 1930s include:

- Invention of the cyclotron, the linear accelerator, and the synchrotron;
- Receipt of 16 Nobel Prizes;
- Identification of 16 new chemical elements, including plutonium;
- Establishment of one of the world's major centers of heavy ion nuclear physics research;
- Operation of national facilities for nuclear physics, computational, and biomedical research;
- Founding of the science of nuclear medicine;
- Contributions to discoveries and developments in high-energy physics;
- Invention of the chemical laser;

- Discovery of the first antiproton and antineutron;
- COBE satellite recordation of the seeds of the early universe;
- Human Genome Project, in which the Lab was named one of two DOE centers for mapping and sequencing human genome;
- Discovery of "dark energy" by the Supernova Cosmology Project;
- Superconducting magnet that breaks the TESLA record;
- Identification of good and bad cholesterol; and
- Development of the Extra Cellular Matrix theory that links breast cancer development to the breakdown in the micro-environment surrounding breast cells.

Cultural Resources and Tribal Cultural Resources Identified within Berkeley Lab Campus

Identification of Known Cultural Resources

The research investigations completed for the proposed 2025 LRDP consisted of a records search of the Berkeley Lab campus and a 0.25-mile radius buffer, conducted at the Northwest Information Center (NWIC) located in Rohnert Park, California. The NWIC, an affiliate of the California Office of Historic Preservation (OHP), is the official state repository of cultural resource records and reports for Alameda County. ESA conducted the records search on May 1, 2024 (Records Search File No. 23-1561). As part of the records search, the following federal and State of California inventories were reviewed:

- California Inventory of Historic Resources;
- California Points of Historical Interest;
- California Historical Landmarks;
- Built Environment Resources Directory for Alameda County, including listings of the National Register of Historic Places; and
- Archaeological Determinations of Eligibility for Alameda County.

NWIC records indicate that 10 previous technical studies have been performed within the Berkeley Lab campus and pedestrian surveys have covered nearly the entire campus except for areas that are physically impossible to survey due to the steepness of the slope. These areas are unlikely to contain cultural resources as they are inaccessible for humans to reach. Roop (1986) covered all physically accessible portions of the Berkeley Lab campus. Roop (1986) did not specify the survey transect spacing although this report did state, "the steep hillsides were not examined intensively, although transects through accessible areas were made." Holman (1987) surveyed an area that was mostly outside of the Berkeley Lab campus, but did include a very small area along the southeast edge. Holman (1987) did not specify the survey transect spacing. Kielusiak (2000) surveyed the entire Berkeley Lab campus using variously spaced transects of a minimum of 10 meter spacing, with greater spacing based on terrain and vegetation. Kielusiak (2000) paid special attention, "to all areas of relatively flat land, rock outcroppings, and to the few small flat areas that exist adjacent to streams." URS Corporation (2006) and Cardenas et al.

(2013) surveyed an area that was mostly outside of the Berkeley Lab campus, but did include the northwestern boundary of the campus. Dexter and Cueller (2008) surveyed approximately 6 acres of the Berkeley Lab Campus where the Helios Energy Research Facility was to be constructed using transects spaced 5 meters apart. Windmiller (2003), McMorris (2015), Dobkin and Corbett (1992), and Losee (2016) are architectural resources reports that are focused on small parts of the Berkeley Lab campus and no archaeological survey was conducted as part of these surveys.

The records search also indicated that three cultural resources were previously recorded within the Berkeley Lab campus. Two of these cultural resources (Building 7 and Building 50) are buildings on the campus. One isolated obsidian fragment was recorded within the campus. The piece of obsidian does not appear to have been modified, or part of a tool-making process, but obsidian is not local to this area and so it was recorded, although it may have been brought to the site in modern times as part of fill or other construction material imported during the construction of Berkeley Lab campus buildings (Dexter and Cuellar, 2010). No other pre-contact or indigenous resources were identified within the campus or within 0.25 mile of the campus.

ISO-1 (P-01-011007)

As an isolated obsidian fragment that does not show evidence of cultural use besides its location outside of a known obsidian source, ISO-1 (P-01-011007) does not meet any of the criteria for inclusion in the California Register of Historical Resources (California Register). There is no event or process that the isolated obsidian fragment is associated with under Criterion 1.[4] Additionally, this item cannot be traced to a specific person and therefore is not eligible under Criterion 2. Nor is it of a unique type, design, or construction that would qualify the isolate for eligibility under Criterion 3. Finally, as an isolated artifact, this obsidian fragment does not have a significant data potential for inclusion under Criterion 4, that has not already been captured by its recordation. Therefore, ISO-1 (P-01-011007) is not eligible for inclusion in the California Register and is not considered a historical resource. Additionally, this isolate does not meet the criteria under CEQA Statute Section 21083.2, which defines unique archaeological resources, and therefore is not considered a unique archaeological resource.

Building 7 (P-01-0106946)

Building 7 was constructed in 1943 as a shop and laboratory building to support operations of the 184-inch Cyclotron. It was evaluated ca. 1992 and found to meet the eligibility criteria for the National Register but lack sufficient integrity to qualify for listing. It was subsequently demolished and is no longer extant.

Building 50 (P-01-010685)

Building 50 is a three-story office and laboratory complex designed in the International Style and constructed in 1944 for use as offices supporting the University of California Radiation Laboratory, the former name of Berkeley Lab. In 2003 it was evaluated for listing in the National Register and recommended eligible under Criterion A. In 2007, the California State Historic Preservation Officer (SHPO) disagreed with these findings and determined the resource was not eligible for the National Register. In 2016, an update to the 2003 evaluation updated the prior documentation

[4] There are four criteria for listing in the California Register. See Section 4.4.3 for more information.

to include evaluations of associated Buildings 50A-50F.[5] They were determined not eligible for listing in the National Register.[6]

Potential for Unknown Buried Cultural Resources

Berkeley Lab is located on steep slopes of the East Bay hills and has been disturbed by the construction of Berkeley Lab facilities and roads. The underlying geology of Berkeley Lab consists of bedrock from three formations. The northern portion of the campus is located on Pliocene to latest Miocene-age basalt from the Orinda Formation. The southern portion of the campus is located on marine deposits of clay shale of the Panoche formation that date to the Cretaceous period. The eastern edge of the campus intersects the Wildcat Fault, which is inactive within the campus. The portion of the campus to the east of this fault overlies middle Miocene-age siliceous shale from the Monterey formation (Dibble and Minch, 2005). Due to the steep slopes, soils on the campus are relatively shallow (1 to 2 feet in depth), except where fill was added, in the center of the campus, to create level areas for construction of Berkeley Lab facilities (USDA, 2024).

The steep slopes, shallow soil, and level of disturbance, as well as the lack of archaeological resources within and around the campus, indicate that Berkeley Lab has a low sensitivity for buried archaeological resources. Nevertheless, some possibility exists that buried archaeological deposits may be encountered during ground-disturbing activities on the campus.

No tribal cultural resources that are listed or eligible for listing in the California Register, or in a local register of historical resources as defined in PRC Section 5020.1(k), or determined by the lead agency to be tribal cultural resources were identified on or in the vicinity of the campus through outreach to the NAHC, the CHRIS records search, or tribal outreach. Therefore, it is anticipated that no tribal cultural resources, as defined by PRC Section 5020.1(k) or PRC Section 5024.1, are present on or in the vicinity of the Berkeley Lab campus.

Architectural Resources

DOE Policy P141.1 sets forth responsibilities for DOE facilities to ensure agency compliance with the National Historic Preservation Act (NHPA) Section 106 and Section 110, Title 36 Code of Federal Regulations (CFR) Part 800, and with DOE Guide 450.1-3 (approved September 22, 2004). In compliance with DOE Policy P141.1, UC LBNL follows a cultural resources management plan (CRMP) that guides ongoing cultural and historical resource identification. The CRMP was completed in 2013 and "governs the Department of Energy's identification, evaluation, and treatment of potential historic resources and facilities at Berkeley Lab. The CRMP further identifies how the DOE is to interact with the California SHPO and comply with national historic preservation laws and DOE regulations. Under the CRMP, outside contractors with appropriate, certified historical expertise are used to investigate, evaluate, and prepare reports and California

5 The 2016 documentation also confirmed that no changes had occurred to Building 50 and that it remained eligible for listing in the National Register. Because that finding had been previous negated by SHPO, no changes to the historic status of Building 50 were recorded and it remained not eligible for listing in the National Register. A copy of this determination is on file with Berkeley Labs.

6 Susan Stratton for Milford Wayne Donaldson (SHPO) to Audra Richards, August 8, 2007, Northwest Information Center, California Historical Information System.

Department of Parks and Recreation (DPR) forms for the remaining unevaluated structures on the campus. These reports are then compiled in UC LBNL's 'living' CRMP document. The DOE Bay Area Site Office uses these reports and the expert recommendations of UC LBNL Subject Matter Experts and contractor-historians to help determine when interaction with the California SHPO is warranted" (DOE, 2020). While no comprehensive update to the 2013 inventory has been completed, building evaluations are contracted on an as-needed basis to maintain an up-to-date assessment of the potential eligibility of Berkeley Lab buildings to be listed on the National Register of Historic Places (NRHP, or National Register).

As of 2024, 149 out of roughly 170 existing structures (approximately 90 buildings, 20 trailers, and 60 storage containers) at Berkeley Lab have been evaluated for eligibility for listing on the National Register. Sixty-one (61) have received concurrence on their status from SHPO (UC LBNL, 2024).[7] Sixty (60) buildings were determined to be not eligible, and one (1) building, the Center for Beam Physics (Berkeley Lab Building 71), has been determined eligible for listing on the National Register.[8] Because the CRMP is meant to guide compliance with Section 106 and Section 110 of the NHPA, it requires identification of federally eligible resources (eligible for the National Register). It does not require identification of potential historical resources that may be eligible for listing on the California or local registers.

Native American Contact

UC LBNL maintains a list of Native American tribes and tribal contacts for communications and consultations pursuant to AB 52. The NAHC provided a list of Tribes associated with the Berkeley Lab campus boundary on May 7, 2024. The NAHC list included 23 tribal representatives from 11 tribes. These tribes are: Amah Mutsun Tribal Band, Amah Mutsun Tribal Band of Mission San Juan Bautista, Confederated Villages of Lisjan Nation, Costanoan Rumsen Carmel Tribe, Guidiville Rancheria of California, Indian Canyon Mutsun Band of Costanoan, Muwekma Ohlone Indian Tribe of the SF Bay Area (Muwekma Ohlone), Northern Valley Yokut/Ohlone Tribe, The Ohlone Indian Tribe, Wilton Rancheria, and Wuksachi Indian Tribe/Eshom Vallen Band.

ESA contacted the NAHC on May 3, 2024 to request an SLF search with respect to Native American tribes who may have an interest in the proposed Project. The NAHC responded on May 7, 2024, stating that the file search was positive for sacred sites associated with the Amah Mutsun, the Confederated Villages of Lisjan Nation (Lisjan Nation), and the Northern Valley Yokut/Ohlone Tribe.

ESA, on behalf of UC LBNL, sent tribal consultation outreach emails on May 30, 2024, and letters via certified mail on June 3, 2024, to the 23 tribal representatives identified by the NAHC. On May 31, 2024, Chairperson Irene Zwierlein of the Amah Mutsun Tribal Band of Mission San Juan Bautista responded via email with non-project specific recommendations for tribal cultural resources identification methods. No request to be consulted or for additional information

[7] Concurrence from SHPO is a confirmation of the historic resource status recommendation made by the evaluating party. While consultants and individuals can provide an assessment of eligibility for listing on a historical register, only the agency that maintains the register can officially determine if the resource is eligible or not eligible for listing.

[8] This building was constructed in 1956 and determined eligible for the National Register in 2007.

was included. On June 12, 2024, Chairwoman Charlene Nijmeh and Executive Director Richard Massiatt of the Muwekma Ohlone Tribe responded via email with information about the Muwekma and tribal history. No request to be consulted or for additional information was included.

On June 26, 2024, the Lisjan Nation responded via email and requested to be consulted on the proposed Project. Representatives from UC LBNL, DOE, and ESA held a virtual meeting with Lisjan Nation representatives, including Corrina Gould, Tribal Chair, on July 17, 2024. During this meeting, UC LBNL provided an overview of the proposed Project and the results of past archaeological surveys conducted at Berkeley Lab. The Tribe indicated interest in an advance review of specified Draft EIR sections and in providing input on potential mitigation measures.

4.4.3 Regulatory Framework

Federal

National Historic Preservation Act

Under federal law, historical and archaeological resources are considered through the NHPA of 1966, as amended (54 U.S.C. 306108), and its implementing regulations. Before an "undertaking" (e.g., federal funding or issuance of a federal permit) is implemented, Section 106 of the NHPA requires federal agencies to consider the effects of the undertaking on historic properties (i.e., properties listed in or eligible for listing on the National Register) and to afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on any undertaking that would adversely affect properties eligible for listing in the National Register. Under the NHPA, a property is considered significant if it meets the National Register listing Criteria A through D, at 36 CFR 60.4, as follows:

> The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and that:
>
> a) Are associated with events that have made a significant contribution to the broad patterns of our history, or
>
> b) Are associated with the lives of persons significant in our past, or
>
> c) Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction, or
>
> d) Have yielded, or may be likely to yield, information important in prehistory or history.

For a resource to be eligible for listing on the National Register, it must also retain enough integrity to be recognizable as a historic property and to convey its significance. Resources that are less than 50 years old are generally not considered eligible for listing on the National Register.

Federal review of the effects of undertakings on significant cultural resources is carried out under Section 106 of the NHPA and is often referred to as "Section 106 review." This process is the responsibility of the federal lead agency and occurs when an undertaking involves federal funding or a federal approval action. Section 106 review typically involves a four-step procedure, which is described in detail in the implementing regulations of the NHPA (36 CFR 800):

- Define the Area of Potential Effects in which an undertaking could directly or indirectly affect historic properties;
- Identify historic properties in consultation with the State Historic Preservation Office and interested parties;
- Assess the significance of effects of the undertaking on historic properties; and
- Consult with the SHPO, other agencies, and interested parties to develop an agreement that addresses the treatment of historic properties and notify the Advisory Council on Historic Preservation and proceed with the project according to the conditions of the agreement.

As stated above, Berkeley Lab as a DOE facility is subject to DOE Policy P141.1. This policy sets forth responsibilities for DOE facilities to ensure agency compliance with NHPA Section 106 and Section 110, Title 36 CFR Part 800, and with DOE Guide 450.1-3 (approved September 22, 2004).

The Secretary of the Interior's Standards for the Treatment of Historic Properties

The *Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings* (Secretary's Standards) were published and codified as 36 CFR 68 in 1995 and updated in 2017.[9] The Secretary's Standards for rehabilitation have been adopted by government bodies across the country for reviewing proposed work on historic properties under local preservation ordinances. The Secretary's Standards provide a useful analytical tool for understanding and describing the potential impacts of changes to historic resources and are used to inform CEQA review. Developed by the National Park Service for reviewing certified rehabilitation tax credit projects, the rehabilitation standards provide guidance for reviewing work on historic properties. The rehabilitation standards are as follows:

1. A property will be used as it was historically or be given a new use that requires minimal change to its distinctive materials, features, spaces, and spatial relationships.
2. The historic character of a property will be retained and preserved. The removal of distinctive materials or alteration of features, spaces, and spatial relationships that characterize a property will be avoided.
3. Each property will be recognized as a physical record of its time, place, and use. Changes that create a false sense of historical development, such as adding conjectural features or elements from other historic properties, will not be undertaken.
4. Changes to a property that have acquired historic significance in their own right will be retained and preserved.

[9] U.S. Department of the Interior, National Park Service (Kay D. Weeks and Anne E. Grimmer), *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstruction Historic Buildings*, revised 2017, https://www.nps.gov/orgs/1739/secretary-standards-treatment-historic-properties.htm, accessed January 27, 2025.

5. Distinctive materials, features, finishes, and construction techniques or examples of craftsmanship that characterize a property will be preserved.
6. Deteriorated historic features will be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature will match the old in design, color, texture, and, where possible, materials. Replacement of missing features will be substantiated by documentary and physical evidence.
7. Chemical or physical treatments, if appropriate, will be undertaken using the gentlest means possible. Treatments that cause damage to historic materials will not be used.
8. Archaeological resources will be protected and preserved in place. If such resources must be disturbed, mitigation measures will be undertaken.
9. New additions, exterior alterations, or related new construction will not destroy historic materials, features, and spatial relationships that characterize the property. The new work will be differentiated from the old and will be compatible with the historic materials, features, size, scale, and proportion, and massing to protect the integrity of the property and its environment.
10. New additions and adjacent or related new construction will be undertaken in such a manner that, if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired.

Conformance with all rehabilitation standards does not determine whether a project would cause a substantial adverse change in the significance of a historical resource under CEQA. Rather, projects that comply with the standards benefit from a regulatory presumption that they would have a less-than-significant adverse impact on a historic resource. Projects that do not comply with the rehabilitation standards may or may not cause a substantial adverse change in the significance of a historic resource and would require further analysis to determine whether the historic resource would be "materially impaired" by the project under CEQA Guidelines Section 15064.5(b).

State

The State of California implements the NHPA of 1966, as amended, through its statewide comprehensive cultural resource surveys and preservation programs. The OHP, as an office of the California DPR, implements the policies of the preservation act on a statewide level. The OHP also maintains the California Historical Resources Inventory. The SHPO is an appointed official who implements historic preservation programs within the State's jurisdiction.

CEQA and the California Register of Historical Resources

The California Register is "an authoritative listing and guide to be used by state and local agencies, private groups, and citizens in identifying the existing historical resources of the state and to indicate which resources deserve to be protected, to the extent prudent and feasible, from substantial adverse change." (PRC Section 5024.1[a].) Certain resources are determined by the statute to be automatically included in the California Register, including those formally determined eligible for or listed in the National Register. (PRC Section 5024.1[d][1].) These resources are termed "historical resources."

Based on Section 15064.5(a) of the *CEQA Guidelines*, state historical resources include, but are not limited to, any object, building, structure, site, area, place, record, or manuscript that is historically or archaeologically significant or that is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California. Generally, a resource is considered by a lead agency to be “historically significant” if the resource meets the criteria for listing on the California Register (PRC Section 5024.1) or qualifies as a “unique historical resource” (PRC Section 21083.2).

To be eligible for listing on the California Register, a cultural resource must meet one or more of the following criteria:

1. Is associated with events that have made a significant contribution to the broad patterns of California’s history and cultural heritage;
2. Is associated with the lives of persons important in our past;
3. Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or
4. Has yielded, or may be likely to yield, information important in prehistory or history.

For a resource to be eligible for listing on the California Register, it must also retain enough integrity of location, design, setting, materials, workmanship, feeling, and association to be recognizable as a historical resource and to convey its significance. Resources that are less than 45 years old are generally not considered eligible for listing on the California Register.

CEQA impact assessment considers only historically significant cultural resources; that is, resources that meet CEQA criteria for California Register eligibility (historical resources) or that qualify as unique archaeological resources, as detailed below. Impacts on resources that do not meet these criteria are not considered in impact assessment under CEQA. Similarly, for projects with federal involvement, only resources that meet the criteria of eligibility for the National Register receive further consideration in impact analysis.

CEQA considers archaeological resources as an intrinsic part of the physical environment and thus requires that, for any project, the potential of the project to adversely affect archaeological resources be analyzed (CEQA Statute Section 21083.2). For a project that may have an adverse effect on a significant archaeological resource, CEQA requires preparation of an environmental impact report (CEQA Statute Section 21083.2 and *CEQA Guidelines* Section 15065). CEQA recognizes two different categories of significant archaeological resources: “unique” archaeological resource (CEQA Statute Section 21083.2) and an archaeological resource that qualifies as a “historical resource” under CEQA (CEQA Statute Section 21084.1 and *CEQA Guidelines* Section 15064.5).

Tribal Cultural Resources

Impacts on tribal cultural resources are considered under CEQA (PRC Section 21084.2). PRC Section 21074(a) defines a tribal cultural resource as any of the following:

- Sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American Tribe that are either of the following:
  - included or determined to be eligible for inclusion in the California Register; or

  - included in a local register of historical resources, as defined in PRC Section 5020.1(k).

- A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of PRC Section 5024.1. In applying these criteria, the lead agency would consider the significance of the resource to a California Native American Tribe.

California PRC Section 5097.98

PRC Section 5097.98 provides procedures in the event human remains of Native American origin are discovered during project implementation on non-federal land. PRC Section 5097.98 requires that no further disturbances occur in the immediate vicinity of the discovery, that the discovery is adequately protected according to generally accepted cultural and archaeological standards, and that further activities take into account the possibility of multiple burials. PRC Section 5097.98 further requires the NAHC, upon notification by a County Coroner, designate and notify a Most Likely Descendant (MLD) regarding the discovery of Native American human remains. The MLD has 48 hours from the time of being granted access to the site by the landowner to inspect the discovery and provide recommendations to the landowner for the treatment of the human remains and any associated grave goods.

PRC Section 5097.99, as amended, states that no person shall obtain or possess any Native American artifacts or human remains that are taken from a Native American grave or cairn. Any person who knowingly or willfully obtains or possesses any Native American artifacts or human remains is guilty of a felony, which is punishable by imprisonment. Any person who removes, without authority of law, any such items with an intent to sell or dissect or with malice or wantonness is also guilty of a felony, which is punishable by imprisonment.

California Native American Historic Resource Protection Act

The California Native American Historic Resource Protection Act of 2002 imposes civil penalties, including imprisonment and fines up to $50,000 per violation, for persons who unlawfully and maliciously excavate upon, remove, destroy, injure, or deface a Native American historic, cultural, or sacred site that is listed or may be listed in the California Register.

Health and Safety Code, Sections 7052 and 7050.5

Section 7052 of the Health and Safety Code states that the disturbance of Native American cemeteries is a felony. Section 7050.5 requires that construction or excavation be stopped in the vicinity of discovered human remains until the coroner can determine whether the remains are those of a Native American. If determined to be Native American, the coroner must contact the NAHC.

Other Relevant State Regulations

Sections of the Public Records Act (Government Code Sections 7927, 7927.005), Health and Safety Code (Section 7050.5), Penal Code (Section 622.5), and PRC (Section 622.5) provide guidance for protection of archaeological resources and human remains. These codes provide protection from unauthorized excavation, looting, or vandalism; guidance following discovery of human remains; penalty for injuring or destroying objects of historic or archaeological interest; and penalty for unauthorized disturbance or removal of archaeological or historical features.

University of California

The UC Board of Regents has developed its own set of guidelines and policies to guide development of Berkeley Lab. This includes design guidelines and requirements which were adopted concurrently with the 2006 LBNL LRDP. These documents outline guidelines and policies that would apply to historical resources and tribal cultural resources on the Berkeley Lab campus. Both are summarized below.

LNBL Design Guidelines

Simultaneously with the adoption of the 2006 LNBL LRDP, a set of Design Guidelines were adopted by the UC Regents for Berkeley Lab. These guidelines remain in effect and will be applicable to all projects proposed during the term of the proposed 2025 LRDP until such time that a Berkeley Lab campus Physical Design Framework is adopted to replace them. The LBNL Design Guidelines provide specific guidelines for site planning, landscape and building design to implement the LRDP's development principles as each new project is developed. The LRDP Design Guidelines provide the following specific planning and design guidance relevant to cultural resources to achieve the design objectives. The LBNL Design Guidelines are a living document and may be periodically updated.

Identity

Each Research Cluster, because of topography, historic buildings, plant palette, and so on will develop a unique identity.

Objective: Utilize artifacts to create identity and add interest to each cluster

- There are many interesting historic objects scattered around the Lab. These artifacts are important reminders of the Lab's legacy as well as items of interest which stimulate interaction. Placement of these artifacts at major pedestrian nodes and at prominent locations in each commons is encouraged.

Objective: Create consistency between buildings in individual clusters

- Designers shall examine the architectural precedents, especially of historic buildings, present in the Research Cluster where their project is to be located. A clear rationale based on precedent for the architectural expression of each project will be developed.

LBNL Design Requirements

In addition to the guidelines and objectives noted above, the LBNL Design Guidelines include design requirements for all new construction and modifications to existing buildings. Requirements that could influence historic architectural resources include:

- Modifications to existing buildings shall be compatible with the overall character of existing buildings in construction and finishes.

Local

Berkeley Lab is a federal facility operated by the University of California and conducting work within the University's mission on land that is owned by the Regents of the University of California. As such, UC LBNL is generally exempted by the federal and state constitutions from compliance with local land use regulations, including general plans and zoning. However, *CEQA Guidelines* Section 15064.5, that sets forth guidance on determining the significance of impacts on historical resources, states that for CEQA purposes, a historical resource includes not only resources that are determined to be eligible for the California Register, but also "a resource included in a local register of historical resources, as defined in section 5020.1(k) of the Public Resources Code or identified as significant in an historical resource survey meeting the requirements of section 5024.1(g) of the Public Resources Code." Because UC LBNL falls within the boundaries of the City of Berkeley and the City of Oakland, consideration of local resources includes both cities' definitions of historical resources.

Historical resources that are significant at the local level in the City of Berkeley include Berkeley Landmarks, Structures of Merit, and locally designated historic districts. In the City of Oakland, historical resources include City of Oakland Designated Landmarks, Areas of Primary Importance (APIs), or buildings assigned an "A" or "B" rating by the Oakland Cultural Heritage Survey. All of these categories of historical resources were reviewed to determine whether any of the existing buildings on Berkeley Lab are listed in these local registers of historical resources. None of the existing buildings on Berkeley Lab are listed in the City of Berkeley or Oakland lists of historical resources.

4.4.4 Impacts and Mitigation Measures

Significance Criteria

For purposes of this EIR, impacts to cultural resources, including tribal cultural resources, would be considered significant if they would exceed the Standards of Significance presented below, which are based on Appendix G of the *CEQA Guidelines*.

Would implementation of the LBNL 2025 LRDP:

a) Cause a substantial adverse change in the significance of a historical resource pursuant to Section 15064.5;

b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5;

c) Disturb any human remains, including those interred outside of dedicated cemeteries; or

d) Cause a substantial adverse change in the significance of a tribal cultural resource, defined in PRC Section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:

    i) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in PRC Section 5020.1(k), or

    ii) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of PRC Section 5024.1. In applying the criteria set forth in subdivision (c) of PRC Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.

Approach to Analysis

To evaluate the proposed 2025 LRDP's potential impacts on significant historical resources, including tribal cultural resources, a historical resources evaluation and analysis of the proposed Berkeley Lab campus was undertaken. This included a literature review, a Native American outreach effort, a geoarchaeological review, a reconnaissance-level architectural site visit of the campus, and a review of prior cultural resource and environmental compliance documentation for Berkeley Lab (DOE, 2020; ESA, 2007; Harvey, 2002; JRP, 2013; LBNL, 2023; LBNL, 2024; NWIC, 2024; USDA 2024). The purpose of these analyses was to identify any cultural resources, including tribal cultural resources, that may be present within the campus and to determine if these resources would be significantly impacted by campus development under the proposed 2025 LRDP.

Potential impacts on historical resources were assessed by identifying any activities (either during construction or operation) that could affect resources that have been identified as historical resources for the purposes of CEQA. Once a historical resource has been identified, it then must be determined whether the proposed Project would "cause a substantial adverse change in the significance" of the resource, as described above. As such, per *CEQA Guidelines* Section 15064.5(b)(2), the following analysis considers the potential for the proposed 2025 LRDP to materially impair the significance of a historical resource by causing direct or indirect changes to the physical characteristics of the resource that convey its historical significance. Mitigation for impacts on historical resources may involve avoidance of alterations to or demolition of the resource; revision of a project to minimize the effect; or, where avoidance or minimization is not feasible, documentation of the resource. However, documentation may not reduce impacts on a historical resource to a less-than-significant level.

Impacts on cultural resources and tribal cultural resources could result from Project-related ground-disturbing activities, including demolition, excavation, grading, trenching, vegetation clearance, the operation of heavy equipment, or other surface and sub-surface disturbance that could damage or destroy surficial or architectural resources, buried archaeological resources, including pre-contact and historic materials or human burials.

Impact Analysis

LRDP Impact CUL-1: Implementation of the LBNL 2025 LRDP could potentially cause a substantial adverse change in the significance of a historical resource pursuant to Section 15064.5. (*Potentially Significant; Significant and Unavoidable with Mitigation*)

The Berkeley Lab campus consists of nearly 1,000 facilities spread across 202 acres. It is estimated that approximately 170 structures are useable, comprised of roughly 90 buildings, 20 trailers, and 60 storage containers (See Chapter 3, *Project Description* for greater detail). A wide variety of uses are housed in the buildings and include offices, research laboratories, accelerators, food service, machine and electrical shops, medical services, communications, and storage. As discussed in Chapter 3, the conditions of these facilities is varied, with many considered obsolete due to age, poor condition, or poor seismic safety ratings.

Campus topography is such that buildings and parking areas are located on a series of terraces. The terraces are scattered across the campus, linked by narrow roads and separated mostly by steep slopes and canyons. Over time, buildings have been added to each of the terraced areas, creating separate zones of improvements that are known as "clusters." This clustered development pattern as well as surrounding landscaping help to limit the visibility of many of the Lab's facilities from the UC Berkeley campus, and surrounding Berkeley and Oakland neighborhoods. The overall aesthetic experience of the informally built environment, rugged hillside terrain, dramatic natural landscape, and panoramic views is a unique and characterizing aspect of the Berkeley Lab campus.

Approximately 301,500 gsf of building space was developed under the 2006 LRDP, for an estimated total of 2,061,000 gsf of existing development at Berkeley Lab, which is less than the 2,420,000 gsf of total building space that was projected under the 2006 LRDP. Remaining buildings to be completed on the campus that were approved under the 2006 LRDP include the Biological and Environmental Program Integration Center (BioEPIC) building, to be completed in early 2025; and the Collaboration Commons Building, planned for early 2027 completion.

The proposed 2025 LRDP would include demolition of several existing campus buildings so that their sites could be used for new building construction. Demolition is considered for buildings and structures that are: 1) seismically poor, 2) not compliant with modern fire, life-safety, and accessibility building codes, 3) not cost-effective to upgrade, 4) no longer suitable for modern science, 5) costly to maintain, and/or 6) represent inefficient uses of valuable campus building sites (LBNL, 2023). As of 2024, nearly 60 percent of Berkeley Lab buildings were more than 40 years old, and 15 percent were over 60 years old, beyond the effective age of a typical laboratory building. Additionally, many of these buildings on the campus were constructed as temporary structures but were never removed or replaced as originally intended. Rehabilitation and seismic retrofit of existing buildings—especially research buildings—is often not a cost-effective alternative to demolition and replacement and does not fulfill several of the principles articulated under Project Objective #1 (see EIR Section 3.5, *Project Objectives*).

As discussed in Section 4.4.2, *Environmental Setting*, as of 2024, 149 existing buildings at Berkeley Lab have been evaluated for eligibility for listing on the National Register, of which 61 buildings have received concurrence on their status from SHPO (UC LBNL, 2024). One building, the Center for Beam Physics (Berkeley Lab Building 71), has been determined eligible for listing on the National Register (there are no current plans or expectations for Building 71 demolition). With regard to local registers of historical resources, as noted in Section 4.4.3, *Regulatory Framework,* none of the existing buildings on Berkeley Lab are on any of the lists of historical resources maintained by the Cities of Berkeley and Oakland.

However, at this time not all historic-age buildings have been evaluated for their eligibility for listing on the National and California registers. Under DOE Policy P141.1, potential historic properties must be identified, but identification requires only an assessment of that property's National Register listing eligibility. As such, the CRMP does not require evaluation of the campus's potential historical resources for eligibility for listing on the California Register. Consequently, architectural historical resources that are not eligible for National Register listing may still be eligible for California Register listing and would therefore be considered historical resources for CEQA purposes. Additionally, the proposed 2025 LRDP may include demolition of or alterations to buildings that may reach the minimum age thresholds for consideration as potential historical resources during the LRDP's 20-year timeline. Thus, there is the potential for campus development under the proposed 2025 LRDP to impact architectural historical resources that have not yet been identified. Should any of the buildings be determined eligible for listing on the National or California registers, their demolition or alterations would result in a significant impact and mitigation would be required.

LRDP Mitigation Measure CUL-1a: Identification of Historical Resources

Prior to any major demolition work or significant alterations to any building or structure that would be 45 years old or older at the time of demolition or alteration activity commencement, UC LBNL shall ensure that the subject building is evaluated for eligibility for listing on the National and California registers. This evaluation shall be completed by a professional that meets the Secretary of the Interior's Professional Qualification Standards for history or architectural history. This evaluation shall follow the guidelines in the 2013 CRMP or the most recent update to that document, as well as current professional standards for documentation of historical resources to support CEQA compliance.

LRDP Mitigation Measure CUL-1b: Secretary of the Interior's Standards Compliance Analysis for Rehabilitation

Prior to any major demolition work or significant alterations to any building identified as a historical resource, UC LBNL shall conduct an analysis to determine if the identified building can be rehabilitated and reused in a manner that is consistent with the Secretary's Standards for Rehabilitation. This analysis shall be completed by a professional that meets the Secretary of the Interior's Professional Qualification Standards for architecture or historic architecture. The analysis shall be submitted to Campus Planning for review, concurrence, and approval for implementation.

LRDP Mitigation Measure CUL-1c: Documentation

Prior to any demolition work initiated under the 2025 LRDP that would remove or substantially alter an architectural historical resource as identified under LRDP Mitigation Measure CUL-1a, and if rehabilitation cannot be implemented in a manner compliant with the Secretary's Standards as determined by the analysis completed under LRDP Mitigation Measure CUL-1b, UC LBNL shall ensure that a qualified architectural historian who meets the Secretary of the Interior's Professional Qualification Standards thoroughly documents existing conditions of the building and associated landscaping and setting. Documentation shall record the building to the National Park Service's standards of the Historic American Buildings Survey (HABS), Historic American Engineering Record (HAER), or Historic American Landscape Survey (HALS), as appropriate. This documentation shall include accurate scaled maps and/or drawings, still photography, and written documentation. If available, scaled architectural plans will also be included. Photographs shall include large-format (4"x5") black-and-white negatives and 8"x10" enlargements. Digital photography may be substituted for large-format negative photography if approved by the UC LBNL Campus Planning Department. The record shall be accompanied by a report containing site-specific history and appropriate contextual information relying as much as possible on previous documentation. Copies of the records shall be submitted to the Northwest Information Center at Sonoma State University, UC Berkeley Environmental Design Archives, Berkeley History Room at the Berkeley Public Library and/or the Oakland History Center at the Oakland Public Library, and the UC LBNL Archives and Records Office (ARO).

LRDP Mitigation Measure CUL-1d: Salvage

Prior to any demolition work initiated under the 2025 LRDP that would remove or significantly alter an architectural historical resource as identified under LRDP Mitigation Measure CUL-1a, UC LBNL shall identify those character-defining features that convey the historical significance of the resource. These features may include equipment or instruments that are related to the historical function of the building, may include elements of the building fabric, or may include fixtures or internal design features that contribute to the historical importance of the building. Where feasibly possible and where permissible in accordance with DOE and UC procurement and EH&S rules, these features shall be considered for availability to other government agencies and/or to interested groups, individuals, and other members of the public. If public salvage is deemed permissible and desirable by UC LBNL, notification of the availability of these salvaged materials shall be provided in advance with a recommended minimum 30-day timeframe for collection of available features.

LRDP Mitigation Measure CUL-1e: Interpretation and Commemoration

Prior to any demolition work initiated under the 2025 LRDP that would remove or substantially alter an architectural historical resource as identified under LRDP Mitigation Measure CUL-1a, UC LBNL shall prepare a plan for interpretation and commemoration that details the historical significance of the building being demolished. The specific location, media, and other characteristics of such commemoration and interpretive display(s) shall be included in this plan. The plan shall be prepared in coordination with an architectural historian or historian who meets the Secretary of the Interior's Professional Qualification Standards and an exhibit designer or landscape architect with historical interpretation design experience. Commemoration and interpretive display(s) shall document the individually eligible resource to be demolished and its associated history. The commemorative plans should include both physical and digital elements that are freely accessible to the public. Given the limited public access to the Berkeley Lab campus, relevant and appropriate off-site locations for displays should be included. The plan should also explore contributing to digital platforms that are publicly accessible. A proposal describing the general parameters of the interpretive program and the substance, media, and other elements of such interpretive display shall be approved by the UC LBNL Campus Planning Department prior to commencement of any demolition activities. This mitigation measure may be superseded by State and/or federal historic interpretation and commemoration processes negotiated between UC LBNL and relevant State and/or federal agencies.

Significance after Mitigation: Significant and Unavoidable. LRDP Mitigation Measures CUL-1a through CUL-1e represent the range of reasonable mitigations that could be implemented. However, even with implementation of LRDP Mitigation Measures CUL-1a through CUL-1e, development under the proposed 2025 LRDP may still result in the loss of historically significant architectural historical resources. In the case of some structures, documentation and commemoration may not mitigate the loss to a less-than-significant level. Therefore, if demolition or significant alterations cannot be avoided, the impact would remain significant and unavoidable.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development on Berkeley Lab under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP would be similar in intensity and character to that portrayed in the Illustrative

Development Scenario. Any of the hypothetical buildings included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of impacts on architectural historical resources. The Illustrative Development Scenario poses the demolition of 39 buildings (**Table 4.4-1**) on the Berkeley Lab campus. As of 2024, none of these buildings have been recommended as eligible for listing on the National Register, either because they lack historical significance, lack sufficient integrity, or do not yet meet the minimum age threshold of 50 years (constructed in or prior to 1974) used to assess resources for National Register eligibility. However, nine of the 39 buildings meet the recommended 45-year age threshold (constructed in or prior to 1979) used for CEQA.[10] Another seven of these buildings would reach the 45-year threshold during the proposed 2025 LRDP's 20-year implementation period (constructed in or prior to 1999).

TABLE 4.4-1
BUILDINGS EXPECTED TO BE DEMOLISHED UNDER THE ILLUSTRATIVE DEVELOPMENT SCENARIO

Number	Name	Construction Date[a]	Historic Status[b]	Notes
17	**Shop - Assembly**	**1949**	Not eligible for NR	
27	**Dry lab & Offices**	**1948**	Not eligible for NR	
46	**Laboratory**	**1949**	Not eligible for NR	
47	**Offices**	**1957**	Not eligible for NR	
53	**Energy & Environment**	**1949**	Not eligible for NR	
55	**Life Sciences**	**1951**	Not eligible for NR	
56	*Biomedical Isotopes*	*1996*	Not eligible for NR	< 50 years old
58	**Heavy Ion Fusion Accelerator Research**	**1950**	Not eligible for NR	
60	**High Bay Laboratory**	**1979**	Not eligible for NR	< 50 years old
61	**Storage**	**1969**	Not eligible for NR	
63	**Accelerator & Fusion Research / Energy & Environment**	**1977**	Not eligible for NR	< 50 years old
64	**Life Science / Earth Sciences H-B**	**1951**	Not eligible for NR	
70	**Energy & Environment / Nuclear Science**	**1955**	Not eligible for NR	
83	**Life Sciences laboratory**	**1979**	Not eligible for NR	< 50 years old
31A	**Chicken Creek Barn / Office Trailer**	**1978**	Not eligible for NR	< 50 years old
46A	**Engineering Division Offices**	**1977**	Not eligible for NR	< 50 years old
46B	**AFR Office Trailer**	**1979**	Not eligible for NR	< 50 years old
50C	*Computing Sciences / NERSC*	*1980*	Not eligible for NR	< 50 years old
53B	Energy & Environment		Not eligible for NR	
55A	*NMR*	*1985*	Not eligible for NR	< 50 years old
58A	**Accelerator R&D Addition**	**1969**	Not eligible for NR	
62A	**Energy & Environment / Materials Sciences**	**1978**	Not eligible for NR	< 50 years old
65A	*DPS Office*	*1984*	Not eligible for NR	< 50 years old
65B	*DPS Office*	*1983*	Not eligible for NR	< 50 years old

10 The California SHPO recommends using a 45-year age threshold for the purposes of identification of historical resources under CEQA.

TABLE 4.4-1
BUILDINGS EXPECTED TO BE DEMOLISHED UNDER THE ILLUSTRATIVE DEVELOPMENT SCENARIO

Number	Name	Construction Date[a]	Historic Status[b]	Notes
6W	Temporary ALS Support - Tent Structure		Not eligible for NR	
71A	**Ion Beam Technology / Low Beta Lab**	**1963**	Not eligible for NR	
71C	**Environmental, Health, and Safety**	**1968**	Not eligible for NR	
71D	**Chemical Sciences**	**1970**	Not eligible for NR	
71F	**B-Factory**	**1974**	Not eligible for NR	< 50 years old
71J	**B-Factory**	**1978**	Not eligible for NR	< 50 years old
71K	**Accelerator Fusion Research / Chemical Sciences / B-Factory**	**1974**	Not eligible for NR	< 50 years old
71P	*B-Factory*	*1981*	Not eligible for NR	< 50 years old
71Q	*Restrooms*	*1996*	Not eligible for NR	< 50 years old
71T	EETC Windows Test Facility	2003	Not eligible for NR	< 50 years old
71W	Temporary Office	2007	Not eligible for NR	< 50 years old
71X	Temporary Office	2007	Not eligible for NR	< 50 years old
75B	**EH&S**	**1979**	Not eligible for NR	< 50 years old
7W	Temporary ALS Support - Tent Structure		Not eligible for NR	
83A	Laboratory Trailer		Not eligible for NR	

NOTES:
a. Buildings that currently meet the historic-age threshold of 45- years (as of 2024) are noted in **bold**. Those that will reach this threshold within the 20-year implementation timeline of the proposed 2025 LRDP are noted in *italics.*
b. The historic status of these buildings was last verified in 2020 by the DOE in compliance with DOE Policy P 141.1. Buildings that were less than 50 years old in 2020 include all buildings constructed before 1970. Since then, individual evaluations have been undertaken as necessary.

SOURCE: DOE, *An Assessment of Historic Properties and Preservation Activities at the U.S. Department of Energy,* (Washington, DC, 2020), pp. 63-65; UC LBNL, "Historic Designations," Excel file, April 22, 2024.

For the reasons stated above, potential individual projects identified in the Illustrative Development Scenario, including the demolition of existing buildings to facilitate construction of new buildings in the Bayview, Northside, Central Commons, and Charter Hill development clusters, could affect architectural resources in the same manner as would the proposed 2025 LRDP. For the reasons stated above, building demolition under the Illustrative Development Scenario could impact other buildings on the Berkeley Lab campus that might be deemed eligible for listing on the National or California registers in the future.

LRDP Mitigation Measures CUL-1a through CUL-1e represent the range of reasonable mitigations that could be implemented. In some instances, rehabilitation of historic resources in a manner that is consistent with the Secretary's Standards may not be feasible within the parameters necessary to support modern scientific research at the Berkeley Lab. This approach would be cost prohibitive and not result in facilities that meet the life, safety, or functional requirements for research activities. Consequently, even with the implementation of LRDP Mitigation Measures CUL-1a through CUL-1e, campus development per the Illustrative Development Scenario could still result in the loss of significant architectural historical resources. Documentation and commemoration would not mitigate this loss to a less-than-significant level.

Therefore, if demolition or significant alterations cannot be avoided, the impact would remain significant and unavoidable.

LRDP Impact CUL-2: Implementation of the LBNL 2025 LRDP may cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5. (*Potentially Significant; Less than Significant with Mitigation*)

No archaeological historical resources or unique archaeological resources have been identified on the Berkeley Lab campus based on the previous pedestrian surveys that were identified in the NWIC records search (NWIC, 2024). Additionally, the proposed campus has a low potential for buried archaeological resources based on the geology, soils, and history of the campus (NWIC, 2024; USDA, 2024). Nonetheless, there is a possibility that unknown archaeological resources may be encountered during ground disturbing activities and may be impacted by development under the proposed 2025 LRDP.

In the event that unknown archaeological resources are discovered during ground-disturbing activities required for the construction of projects under the proposed 2025 LRDP, significant impacts could occur. With the implementation of LRDP Mitigation Measure CUL-2a, which requires a cultural resources awareness training be completed for all Project personnel involved in ground-disturbance, and LRDP Mitigation Measure CUL-2b, which sets forth procedures to be implemented in the event of inadvertent discovery of archaeological materials, impacts to any newly-discovered historical or unique archaeological resources would be mitigated to a less-than-significant level.

LRDP Mitigation Measure CUL-2a: Cultural Resources Awareness and Tribal Cultural Resources Sensitivity Training Program

Before any major ground-disturbing and/or construction activities that could disturb native and/or previously unexcavated soils, an archaeologist meeting or under the supervision of an archaeologist meeting the Secretary of the Interior Standards (SOIS) for Archaeology shall conduct a virtual or in-person training program for all construction and field personnel involved in ground disturbance who have not received such training for work on the Berkeley Lab campus within the past year. On-site personnel shall attend a mandatory pre-Project or annual training that shall outline the general archaeological sensitivity of the area and the procedures to follow in the event an archaeological resource and/or human remains are inadvertently discovered. Consulting tribes will be offered the opportunity to attend and provide tribal cultural resources sensitivity training alongside the training conducted by the archaeologist. The consulting tribes may request that the tribal cultural resources sensitivity training be conducted in person.

LRDP Mitigation Measure CUL-2b: Inadvertent Discovery of Cultural Resources

If pre-contact or historic-era archaeological resources are encountered during implementation of the proposed 2025 LRDP, all construction activities within 100 feet shall halt, and a qualified archaeologist, defined as an archaeologist meeting the U.S. Secretary of the Interior's Professional Qualification Standards for Archaeology, shall inspect the find within 24 hours of discovery and notify UC LBNL of their initial assessment. Pre-contact archaeological materials might include obsidian and chert flaked-stone tools (e.g., projectile points, knives, scrapers) or toolmaking debris; culturally darkened soil ("midden") containing heat-affected rocks, artifacts, or shellfish remains; and stone milling equipment (e.g., mortars, pestles, handstones, or milling slabs); and battered stone tools, such as hammerstones and pitted stones. Historic-era materials might include building or structure footings and walls, and deposits of metal, glass, and/or ceramic refuse.

If UC LBNL determines, based on recommendations from a qualified archaeologist and a representative from consulting Native American tribes (if the resource is pre-contact), that the resource may qualify as a historical resource or unique archaeological resource (as defined in *CEQA Guidelines* Section 15064.5) or a tribal cultural resource (as defined in PRC Section 21080.3), the resource shall be avoided, if feasible. Consistent with *CEQA Guidelines* Section 15126.4(b)(3), this may be accomplished through planning construction to avoid the resource; incorporating the resource within open space; capping and covering the resource; or deeding the site into a permanent conservation easement.

If avoidance is not feasible, UC LBNL shall consult with consulting Native American tribes (if the resource is pre-contact), and other appropriate interested parties to determine treatment measures to avoid, minimize, or mitigate any potential impacts to the resource pursuant to PRC Section 21083.2, and *CEQA Guidelines* Section 15126.4. This shall include documentation of the resource and may include heritage recovery (according to PRC Section 21083.2), if deemed appropriate, or other actions such as treating the resource with culturally appropriate dignity and protecting the cultural character and integrity of the resource (according to PRC Section 21084.3).

Significance after Mitigation: Less than Significant. The implementation of LRDP Mitigation Measures CUL-2a and CUL-2b would reduce the impact to a less-than-significant level because if any cultural resources are identified during construction activities under the proposed 2025 LRDP, these measures establish a plan to evaluate the resource for eligibility and, if necessary, prepare a treatment plan to minimize and mitigate impacts to the resource.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP would be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of impacts to archaeological resources. For the reasons stated above, potential individual projects identified in the Illustrative Development Scenario, including the construction of new buildings in the Bayview, Northside, Central Commons, and Charter Hill development clusters, could affect archaeological resources. However, the likelihood of encountering unknown archaeological resources is low because of prior disturbance on the Berkeley Lab campus during the construction of existing buildings, as well as the underlying soils and geology. In the event that archaeological resources are encountered during ground disturbance for a potential project, such as those identified in the scenario, LRDP Mitigation Measures CUL-2a and CUL-2b would apply and would reduce any potential impacts relating to the possible inadvertent discovery of archaeological resources to a less-than-significant level.

LRDP Impact CUL-3: Implementation of the LBNL 2025 LRDP may disturb human remains, including those interred outside of designated cemeteries. (*Potentially Significant; Less than Significant with Mitigation*)

As described above, there is no indication that the Berkeley Lab campus has been used for human burial purposes in the recent or distant past. However, in the event that human remains are discovered, including those interred outside of formal cemeteries, the human remains could be inadvertently disturbed or damaged, which would be a significant impact under CEQA. Implementation of LRDP Mitigation Measure CUL-3 would ensure that any human remains encountered are appropriately addressed, thus reducing any potential impacts to a less-than-significant level.

LRDP Mitigation Measure CUL-3: Inadvertent Discovery of Human Remains

In the event of discovery or recognition of any human remains during construction activities, such activities shall cease within 100 feet of the find until the appropriate County Coroner has been contacted to determine that no investigation of the cause of death is required. The Native American Heritage Commission (NAHC) shall be contacted within 24 hours if the remains are determined to be Native American. The NAHC would then identify the person or persons it believes to be the most likely descendant of the deceased Native American, who in turn would make recommendations to UC LBNL for the appropriate means of treating the human remains and any associated funerary belongings. No photography or scientific testing of the remains will be allowed by persons employed or contracted by UC LBNL prior to the Coroner’s determination of ethnicity of the remains. If human remains were determined to be Native American, no photography or scientific testing on the identified human remains will be conducted by employees or persons contracted by UC LBNL except at the request and/or with permission of the most likely descendant identified by the NAHC.

Significance after Mitigation: Less than Significant. The specific state law/regulations regarding proper handling of previously unknown human remains encountered during construction are specified above and the proposed Project will comply with the state law to avoid significant impacts on human remains. With the implementation of LRDP Mitigation Measure CUL-3, in conjunction with the training and inadvertent discovery of cultural resources protocols in LRDP Mitigation Measures CUL-2a and CUL-2b, impacts to unknown human remains would be reduced to a less-than-significant level.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP would be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario remains an appropriate and conservative basis for the evaluation of impacts on human remains. For the reasons stated above, potential individual projects posed in the Illustrative Development Scenario, including the construction of new buildings in the Bayview, Northside, Central Commons, and Charter Hill development clusters, could affect human remains in the same manner as development would under the proposed 2025 LRDP. The likelihood of encountering human remains is low because of prior disturbance of the Berkeley Lab campus during the construction of existing buildings. In the event that human remains are encountered during ground disturbance for a potential project, such as those identified in the Illustrative Development Scenario, LRDP Mitigation Measure CUL-3 would apply, which would reduce any potential impact to human remains to a less-than-significant level.

LRDP Impact CUL-4: Implementation of the LBNL 2025 LRDP may cause a substantial adverse change to tribal cultural resources, as defined in Public Resources Code Section 20174. (*Potentially Significant; Less than Significant with Mitigation*)

The results of the records search found that there are no known pre-contact cultural resources within the Berkeley Lab campus. Cultural resource P-01-011007, an isolated fragment of obsidian, was identified within the campus, but this item had not been modified and may have been inadvertently brought to Berkeley Lab as part of imported fill materials during modern construction on the campus.

As detailed in Section 4.4.3, *Regulatory Framework,* above, there are federal and state regulations in place to protect tribal cultural resources, including archaeological resources and human remains. CEQA requires lead agencies to determine, prior to approval, if a project would have a significant impact on historical resources, tribal cultural resources, or unique archaeological resources and requires the lead agency to make provisions for the inadvertent discovery of historical resources or unique archaeological resources during construction, including tribal cultural resources.

As described previously in this section, AB 52 requires local governments to consult with tribes prior to CEQA project approval. In accordance with the requirements of AB 52, ESA, on behalf of UC LBNL, conducted Native American outreach and UC LBNL conducted consultation efforts. Outreach letters and emails were sent to 23 Native American representatives from 11 tribes that are listed on the UC LBNL's AB 52 consultation list and the tribal contact list provided by the NAHC as part of the SLF search.

As discussed in Section 4.4.1, within the 30-day AB 52 response period, UC LBNL received responses from two tribes: the Amah Mutsun Tribal Band of San Juan Bautista and the Confederated Villages of Lisjan (the Lisjan Tribe). UC LBNL received a response from the Amah Mutsun Tribal Band of San Juan Bautista via email on May 31, 2024. The letter included recommendations to conduct a NAHC SLF search. No request for consultation was made by the Amah Mutsun. On July 15, 2024, the Lisjan Tribe responded via email and requested to consult with UC LBNL to discuss the proposed 2025 LRDP. Representatives from UC LBNL, DOE, the Lisjan Tribe, and ESA's archaeologist met via a remote meeting on July 17, 2024. During the meeting UC LBNL summarized the proposed Project and the archaeological and tribal cultural resources research that had been undertaken for the EIR. The Lisjan Tribe requested an advance review of the draft cultural resources section of the Draft EIR and provided UC LBNL their recommended measures for tribal resources. On November 14, 2024, UC LBNL provided a memorandum to the Lisjan Tribe providing a summary of relevant excerpts from the draft Tribal Cultural Resources section of the Draft EIR for the Tribe's review. On December 13, 2024, the

Lisjan Tribe responded to the summary with comments on several areas of this section. Revisions based on these comments were incorporated into this section. On March 28, 2025, a revised version of relevant excerpts from the Cultural Resources, including Tribal Cultural Resources section of the Draft EIR was provided to the Lisjan Tribe with responses to all of the Lisjan Tribe's comments and an explanation of how the Lisjan Tribe's comments were addressed in the Draft EIR section.

Based on the results of the tribal outreach efforts, no known tribal cultural resources listed or determined eligible for listing in the California Register, or included in a local register of historical resources as defined in PRC Section 5020.1(k), pursuant to PRC Section 21074 (a)(1), would be impacted by the proposed Project. As a result, UC LBNL did not determine any resource that could potentially be impacted by the proposed Project to be a tribal cultural resource pursuant to criteria set forth in PRC Section 5024.1(c). Therefore, the proposed Project is not anticipated to impact any such resources.

However, if any previously unrecorded archaeological resources are encountered during ground-disturbing construction activities and are found to qualify as a tribal cultural resource pursuant to PRC Section 21074(a)(1) (determined to be eligible for listing in the California Register or in a local register of historical resources), any impacts of the proposed 2025 LRDP on the resource could be potentially significant. Any such potentially significant impacts would be reduced to a less-than-significant level by implementing LRDP Mitigation Measures CUL-2a, CUL-2b, and CUL-3.

Mitigation: Implement LRDP Mitigation Measures CUL-2a, CUL-2b, and CUL-3.

Significance after Mitigation: Less than Significant. Implementation of LRDP Mitigation Measures CUL-2a, CUL-2b, and CUL-3 would establish protocols to identify, evaluate, and address any potential impacts to previously unknown cultural resources, tribal cultural resources, and human remains if they are inadvertently discovered during construction activities. With implementation of these measures, any potential impacts of campus development under the proposed 2025 LRDP to tribal cultural resources would be reduced to a less-than-significant level.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP would be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of impacts to tribal cultural resources. For the reasons stated above, potential individual projects posited in the Illustrative Development Scenario, including the construction of new buildings in the Bayview, Northside, Central Commons, and Charter Hill development clusters, could affect tribal cultural resources in the same manner as described above under the proposed 2025 LRDP. The likelihood of encountering previously unknown tribal cultural resources (as unknown archaeological resources can also be tribal cultural resources) is low because of prior disturbance of the campus during the construction of existing buildings. In the event that a tribal cultural resource is identified during ground disturbance for a potential project such as those identified in the scenario, LRDP Mitigation Measures CUL-2a, CUL-2b, and CUL-3 would apply and would reduce any potential impacts to tribal cultural resources to a less-than-significant level.

Cumulative Impacts

LRDP Impact CUM-CUL-1: Implementation of the LBNL 2025 LRDP would not combine with other cumulative projects to result in an adverse change to the significance of historical resources that share historic significance with resources that could be affected at Berkeley Lab. (*Less than Significant*)

The geographic scope for the cumulative impacts analysis related to historical resources is the Berkeley Lab campus, the adjoining UC Berkeley campus, and adjacent neighborhoods. As discussed above under LRDP Impact CUL-1, implementation of the proposed 2025 LRDP could potentially involve the demolition of and/or significant alterations to buildings that might qualify as historical resources under CEQA, and that despite implementation of available mitigation measures, in some instances the impact from the removal or alteration of a historical resource could be significant and unavoidable. UC Berkeley also completed an evaluation of the impacts of its Long Range Development Plan Update (UC Berkeley LRDP) on historical resources and concluded that campus development under the UC Berkeley LRDP would result in significant and unavoidable impacts related to historical resources due to demolitions, alterations, and construction on, or adjacent to, architectural historical resources. These include the demolition of the University Garage, alterations and an addition to the Bechtel Engineering Center, alterations to the Greek Theater, alterations resulting from construction of Housing Project #2 within People's Park, construction of Heathcock Hall located adjacent to Latimer and Lewis halls, and potential alterations to the Anna Head School. None of the historic buildings or sites affected by UC Berkeley's cumulative development share a historical association with the buildings, people, or historically significant activities on the Berkeley Lab campus. None of resources impacted by the UC Berkeley LRDP are associated with scientific discovery or technological advancements made at Berkeley Lab, with the exception of the Bechtel Engineering Center. However, that building was constructed in 1980 and, therefore, does not meet the age threshold for a historical resource as defined by National, State, or local registers; neither does the Bechtel Engineering Center share historical overlap with the Berkeley Lab campus's scientific programs. Therefore, development under the proposed 2025 LRDP would not result in a cumulatively considerable contribution to the significant cumulative impact identified with the implementation of the UC Berkeley LRDP, nor would the impacts on historical resources on the Berkeley Lab campus combine with those on the UC Berkeley campus to result in a significant cumulative impact.

Other areas surrounding Berkeley Lab consist largely of residential development and open space and do not share a historical association with Berkeley Lab, which is a publicly inaccessible scientific and technological campus. Therefore, implementation of the proposed 2025 LRDP would not result in a considerable contribution to any existing significant impact that may be associated with development, demolition, or alteration of historic resources in the surrounding areas.

Mitigation: None required.

Individual Future Project/Illustrative Development Scenario. For the same reasons set forth above, future development posed in the Illustrative Development Scenario, when combined with other Berkeley Lab projects, and nearby development outside of the Berkeley Lab campus, would result in a cumulative impact on architectural historical resources that would be less than significant.

LRDP Impact CUM-CUL-2: Implementation of the LBNL 2025 LRDP could potentially combine with other cumulative projects to result in an adverse change to the significance of archaeological historical resources, unique archaeological resources, or tribal cultural resources. (*Potentially Significant; Less than Significant with Mitigation*)

The geographic scope for cumulative impacts on archaeological resources and tribal cultural resources is the immediate vicinity of the Berkeley Lab campus. This area of analysis is appropriate because the archaeological and historical resources within this vicinity are expected to be similar to those occurring on the campus. Their proximity, similar environments, landforms, and hydrology are expected to have resulted in similar land uses over time. Based on the results of tribal consultation and the records search, the campus vicinity may contain significant archaeological historical resources, unique archaeological resources, and/or tribal cultural resources that have not been documented or recorded. Therefore, this analysis conservatively assumes that the land within this area contains archaeological resources or tribal cultural resources that are not yet known.

There is no indication per the discussion in Section 4.4.2, *Environmental Setting*, or elsewhere in the Project record of any existing significant adverse condition related to archaeological resources or tribal cultural resources in the proposed Project's geographic area of cumulative consideration. Nonetheless, campus development under the proposed 2025 LRDP could result in a potentially significant impact to previously unknown archaeological resources and/or tribal cultural resources and therefore contribute to a cumulative impact. LRDP mitigation measures would require cessation of activities and buffering of finds in a manner that would substantially reduce the proposed Project's incremental contribution. Thus, even if it is conservatively assumed that a potentially significant cumulative effect exists, the negligible impact remaining after the implementation of recommended mitigation measures would not be cumulatively considerable. With implementation of the mitigation measures set forth above, the proposed Project's contribution to a potential significant cumulative impact on archaeological resources and tribal cultural resources would not be cumulatively considerable, and the impact would be reduced to a less-than-significant level.

Mitigation: Implement LRDP Mitigation Measures CUL-2a, CUL-2b, and CUL-3.

Significance after Mitigation: Less than Significant.

Individual Future Project/Illustrative Development Scenario. As discussed above, future development posed in the Illustrative Development Scenario, when combined with other Berkeley Lab projects and nearby development outside of the Berkeley Lab campus, would result in a cumulative impact on archeological resources and tribal cultural resources that would be less than significant with mitigation.

LRDP Impact CUM-CUL-3: Implementation of the LBNL 2025 LRDP would not combine with other cumulative projects to result in any significant impacts related to human remains, including those interred outside of designated cemeteries. (*Less than Significant*)

There is no indication of any existing significant adverse condition related to the discovery, disturbance, or damage of human remains in the geographic area of cumulative impacts to which development under the proposed 2025 LRDP could contribute. Furthermore, any potential impacts on human remains encountered during excavation and ground disturbance would be mitigated by the implementation of LRDP Mitigation Measure CUL-3. Therefore, campus development under the proposed 2025 LRDP would not make a considerable contribution to a cumulative impact related to the discovery or disturbance of human remains.

Mitigation: None required.

Individual Future Project/Illustrative Development Scenario. For the same reasons presented above, future development posed in the Illustrative Development Scenario, when combined with other Berkeley Lab projects and nearby development outside of the Berkeley Lab campus, would result in a cumulative impact related to human remains that would be less than significant with mitigation.

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4.5 Energy

4.5.1 Introduction

This section describes and evaluates the potential for proposed 2025 LRDP implementation to result in significant impacts related to energy. It discusses the existing energy-related profiles for the State and for the Berkeley Lab campus. The current regulatory and policy frameworks that aim to increase energy efficiency while reducing fossil fuel reliance are also described. This section examines the energy usage characteristics of potential development under the proposed 2025 LRDP (the Project) to determine whether the implementation of the proposed 2025 LRDP could result in any significant energy-related environmental impacts. The potential for the construction and operation of development under the Project to result in significant energy impacts is assessed based on Appendix G of the *CEQA Guidelines*. The section also includes an analysis of cumulative energy impacts.

4.5.2 Environmental Setting

State

Energy Profile

Total energy usage in California was 6,882 trillion British Thermal Units (Btu) in 2022, which equates to an average of 189 million Btu per capita. These figures place California 2nd among the nation's 50 states in total energy use and 48th in per capita consumption. Of California's total energy usage, the breakdown by sector is roughly 43 percent transportation, 23 percent industrial, 18 percent residential, and 17 percent commercial. California's electricity and natural gas are primarily consumed by stationary users such as residential, commercial, and industrial facilities, whereas petroleum-based fuels are generally consumed for transportation-related use (EIA, 2024a).

California relies on a regional power system composed of a diverse mix of natural gas, renewable, hydroelectric, and nuclear generation sources. Approximately 70 percent of the electrical power needed to meet California's demand is produced in the State; the balance, approximately 30 percent, is imported from the Pacific Northwest and the Southwest. In 2022, California's in-state electricity generation was derived from natural gas (47 percent); large hydroelectric resources (7 percent); nuclear sources (9 percent); renewable resources that include geothermal, biomass, small hydroelectric resources, wind, and solar (36 percent); coal (less than 1 percent); and petroleum coke/waste heat (less than 1 percent) (CEC, 2024b).

Electricity

In 2022, total system electric generation for California (in-state plus imports) was 287,220 gigawatt-hours (GWh), up 3.4 percent from 2021's total generation of 277,764 GWh. California's in-state generation increased by 4.5 percent from 194,127 GWh to 203,257 GWh. Net imports for 2022 (83,962 GWh) were virtually unchanged from 2021 levels (83,636 GWh) (CEC, 2024b).

In recent years, electricity demand has been relatively flat as energy efficiency programs have resulted in end-use energy savings and as customers install behind-the-meter solar photovoltaic (PV) systems that directly displace utility-supplied generation. In 2018 (the most recent year for which these specific data are available), behind-the-meter solar generation[1] was estimated to be 13,582 GWh, a 20 percent increase from 2017. The strong growth in solar PV has had a measurable impact on utility-served load and, consequently, on total system electric generation (CEC, 2019).

Increasingly, electricity is used in multiple transportation modes, including light-duty vehicles, transit buses, and light and heavy rail. In California, its use is forecast to emerge in battery-electric medium-duty trucks, battery-electric buses, catenary-electric port drayage trucks, and high-speed rail. The California Energy Commission (CEC) forecasts the statewide electricity demand for the transportation sector will increase from a 2017 level of 2,000 GWh annually to between approximately 12,000 and 18,000 GWh per year by 2030, depending on technology development and market penetration of the various vehicle types (CEC, 2018).

Natural Gas

Californians consumed about 11,711 million therms of natural gas in 2022, which is equal to 1,171,064,119 million Btu (MMBtu) (CEC, 2024c). The natural gas market is evolving and service options are expanding, and it is a viable alternative to petroleum fuels for use in cars, trucks, and buses. Nearly 45 percent of the natural gas burned in California is used for electricity generation, and most of the remainder is consumed in the residential (21 percent), industrial (25 percent), and commercial (9 percent) sectors. California depends on out-of-state imports for nearly 90 percent of its natural gas supply (CEC, 2024d).

Transportation Fuels

The energy consumed by the transportation sector accounts for roughly 43 percent of California's total energy consumption (EIA, 2024b). Gasoline and diesel, both derived from petroleum (also known as crude oil), are the two most common fuels used for vehicular travel. According to the U.S. Energy Information Administration, California relies on petroleum-based fuels for 98 percent of its transportation needs (EIA, 2022). Gasoline accounted for about 52 percent of California's total transportation sector energy consumption, 53 percent of California's total transportation sector petroleum consumption, and 6 percent of total U.S. energy transportation sector consumption (EIA, 2022). California is the largest consumer of gasoline in the U.S. Approximately 23 percent of California's crude oil is obtained from within the State, about 16 percent comes from Alaska, and the remaining 61 percent comes from foreign lands (CEC, 2024a) with minor amounts from North Dakota and Gulf Coast States.

In 2022, gasoline sales in California amounted to approximately 11.5 billion gallons, and diesel fuel sales amounted to approximately 1.8 billion gallons (CEC, 2024e). The CEC forecasts that California's gasoline demand will range from 12.1 billion to 12.6 billion gallons in 2030, with most of the demand generated by light-duty vehicles. While analytical models show an increase

[1] Behind-the-meter solar generation refers to on-site solar generation facilities that are designed for a single building or facility. Since the power is generated and used on-site, it is not connected to the regional power grid, and thus referred to as "behind the meter."

in light-duty vehicles along with population and income growth over the forecast horizon, total gasoline consumption is expected to decline, primarily due to increasing fuel economy (stemming from federal and State regulations) and gasoline displacement from the increasing market penetration of zero emission vehicles (ZEVs). For diesel, demand is forecast to increase modestly by 2030, following the growth of California's economy, but it would be tempered by increased fleet fuel economy and alternative fuels usage, most prominently by natural gas in the medium- and heavy-duty vehicle sectors (CEC, 2018).

California has about 3 percent of the nation's total crude oil reserves, and it is the seventh-largest crude oil producer among the states (EIA, 2024a). Crude oil is transported within California through a network of pipelines that carry it from both onshore and offshore oil wells to refineries in the San Francisco Bay Area, the Los Angeles area, and the Central Valley. Currently, 14 petroleum refineries operate in California, processing approximately 1.71 thousand barrels of crude oil per day (CEC, 2024f).

Other California transportation fuel sources include alternative fuels, such as methanol and denatured ethanol (alcohol mixtures that contain no less than 70 percent alcohol), natural gas (compressed or liquefied), liquefied petroleum gas, hydrogen, and fuels derived from biological materials (i.e., biogas).

Regional

Electricity and Natural Gas

The nine-county Bay Area, including the UC LBNL campus site, is served by PG&E, an investor-owned utility company. PG&E provides electricity and natural gas supplies and services throughout a 70,000-square-mile service area that extends from Eureka in the north to Bakersfield in the south and from the Pacific Ocean in the west to the Sierra Nevada in the east. The Berkeley Lab campus is served by electricity supplied by the Western Area Power Administration (WAPA) and delivered via PG&E lines. Natural gas is supplied by the Defense Fuel Supply Center via Pacific Gas & Electric pipes.

Electric Utility Operations

WAPA is one of four power marketing administrations within the U.S. Department of Energy (DOE) whose role is to market and transmit wholesale electricity from multi-use water projects. WAPA's service area encompasses a 15-state region of the central and western U.S. where a more than 17,000-circuit-mile transmission system carries electricity from 57 hydropower plants operated by the Bureau of Reclamation, U.S. Army Corps of Engineers, and the International Boundary and Water Commission. Together, these plants have an installed capacity of 10,504 megawatts. WAPA sells its power to preference customers such as federal and State agencies, cities and towns, rural electric cooperatives, public utility districts, irrigation districts, and Native American tribes.

PG&E provides "bundled" services (i.e., electricity generation, transmission, and distribution services) to most of the six million customers in its service territory, including residential, commercial, industrial, and agricultural consumers. Customers also can obtain unbundled electricity that is transmitted and distributed by PG&E, but is generated and provided by alternative providers such as Electric Service Providers registered with California Public Utilities Commission (CPUC) that are non-utility entities that offer electric service to customers within the service territory of an electric utility; or municipalities, or community choice aggregators as allowed under Assembly Bill 117, as well as from self-generation distributed resources, such as rooftop solar installations. Electricity provided by WAPA to the Berkeley Lab campus is governed by a separate agreement, outside of the typical “unbundled” rate structure.

Electricity Transmission

Transmission lines are high-voltage power lines that transmit electricity between electric substations. PG&E owns approximately 19,200 circuit miles of interconnected transmission lines operating at voltages ranging from 60 kilovolts (kV) to 500 kV. PG&E also operates approximately 92 electric transmission substations with a capacity of approximately 64,700 megavolt amperes (MVA). PG&E’s electric transmission system is interconnected with electric power systems in the Western Electricity Coordinating Council, which includes many western states, Alberta and British Columbia, and parts of Mexico (Macrotrends, 2024).

PG&E periodically upgrades substations and reconductors transmission lines to improve maintenance and system flexibility, reliability, and safety. PG&E also undertakes various new transmission projects to upgrade and expand the capacity of its transmission system to secure access to renewable generation resources, replace aging or obsolete equipment, and improve system reliability (PG&E, 2024a).

WAPA regularly upgrades its 17,000-circuit-mile transmission lines operating at voltages ranging from 115 kV to 500 kV across more than 1.3 million square miles in America. As of September 30, 2011, WAPA had interconnected more than 1,030 megawatts of renewable wind energy into its transmission system with 68 projects, totaling 11,200 MW, awaiting interconnection (WAPA, 2023).

Electricity Distribution

Distribution power lines are lower voltage power lines that transmit electricity from electric substations to end user, such as residential and other land use developments. PG&E’s electricity distribution network consists of approximately 106,681 circuit miles of distribution lines, and approximately 18,466 circuit miles of high voltage electric transmission lines (PG&E, 2024a).

Natural Gas Operations

PG&E provides natural gas transmission services to “core” customers and to “non-core” customers (i.e., industrial, large commercial, and natural gas-fired electric generation facilities) that are connected to its gas system in its service territory. Core customers can purchase natural gas procurement service (i.e., natural gas supply) from either PG&E or non-utility third-party gas procurement service providers (referred to as core transport agents). When core customers purchase gas supply from a core transport agent, PG&E still provides gas delivery, metering, and billing services to those customers. When PG&E provides both transmission and procurement services, PG&E refers to the combined service as “bundled” natural gas service.

PG&E does not provide procurement service to non-core customers, who must purchase their gas supplies from third-party suppliers. PG&E offers backbone gas transmission, gas delivery (local transmission and distribution), and gas storage services as separate and distinct services to its non-core customers. Access to PG&E's backbone gas transmission system is available for all natural gas marketers and shippers, as well as non-core customers. PG&E also delivers gas to off-system customers (i.e., outside of PG&E's service territory) and to third-party natural gas storage customers. In 2022, total consumption of natural gas in Alameda County was 377.31 million therms or 37,731,000 MMBtu (CEC, 2024c).

Transportation Fuels

Gasoline and diesel fuel are by far the largest transportation fuels used by volume in San Francisco Bay Area. The total estimated 2022 sales of gasoline in Alameda County was 473 million gallons, and the total estimated 2022 sales of diesel fuel in Alameda County was 57 million gallons (CEC, 2024e).

Other transportation fuel sources used in California include alternative fuels, such as methanol and denatured ethanol (alcohol mixtures that contain no less than 70 percent alcohol), natural gas (compressed or liquefied), liquefied petroleum gas (LPG), hydrogen, and fuels derived from biological materials (i.e., biomass).

Berkeley Lab Campus

Electricity

Electrical power at the Lab purchased from WAPA is delivered by the PG&E transmission system to the Lab's Grizzly Peak Substation located adjacent to Building 77. PG&E delivers power to Berkeley Lab on two overhead 115-kilovolt (kV), 3-phase, 60-Hertz (Hz) transmission lines with a joint capacity of approximately 100 megawatts (MW). Both transmission lines feed power from PG&E's El Sobrante switching station to the Grizzly Peak Substation. The Grizzly Peak Substation consists of two DOE-owned 120/12 kV power transformers with a combined capacity of 100 MW. This substation is for the exclusive use of Berkeley Lab. Grizzly Peak Substation contains two transformer banks that step down electricity to the campus's 12.47 kV distribution voltage. These transformers are connected to the main switch station SW-A1, which has a total capacity of 41 MW. The most recent peak campus usage was 21.5 MW, which occurred around 12:15 PM on September 8, 2022. In addition, if needed, power can be supplied to Berkeley Lab from UC Berkeley's Hill Area Substation, located adjacent to the Grizzly Peak Substation.

The campus's main power distribution system consists of a 12.47-kV underground network with six remote switching stations (A2-A7) and transformers that reduce voltage to 480/277 volts (V) or 208/120 V. The 12.47-kV distribution system has dual primary feeders to provide reliable power. Certain buildings are equipped with special voltage regulators to ensure that critical experiments will not be disrupted by transient voltage within the system. The Berkeley Lab campus consumed 132,397 megawatt-hour (MWh) of electricity in the Fiscal Year 2023 (Berkeley Lab, 2024).

Natural Gas

Natural gas is used at the campus for space and water heating in buildings, equipment, operations, and some experimental uses. Natural gas is currently supplied by NRG Energy, Inc. under rates negotiated by the Defense Logistics Agency and delivered by the PG&E system. The Lab's natural gas consumption in FY 2023 was 1.5 million therms or 1.2 million therms with weather-correction.

4.5.3 Regulatory Framework

Federal

Federal policies and regulations set broad energy efficiency standards and incentives for consumer products, automobile and fuel efficiency, etc. Such requirements, as those listed below, tend to be applicable to the manufacturing sector and are not directly applicable to the Project. Nonetheless they are listed here for informational purposes.

National Energy Conservation Policy Act

The National Energy Conservation Policy Act (NECPA) serves as the underlying authority for federal energy management goals and requirements. Signed into law in 1978, it has been regularly updated and amended by subsequent laws and regulations. This act is the foundation of most federal energy requirements. NECPA established energy-efficiency standards for consumer products and includes a residential program for low-income weatherization assistance, grants and loan guarantees for energy conservation in schools and hospitals, and energy-efficiency standards for new construction. Initiatives in these areas continue today.

National Energy Policy Act of 2005

The National Energy Policy Act of 2005 sets equipment energy efficiency standards and seeks to reduce reliance on nonrenewable energy resources and to provide incentives to reduce current demand on these resources. For example, under the Act, consumers and businesses can attain federal tax credits for purchasing fuel-efficient appliances and products, including hybrid vehicles; constructing energy-efficient buildings; and improving the energy efficiency of commercial buildings. Additionally, tax credits are available for the installation of qualified fuel cells, stationary microturbine power plants, and solar power equipment.

Energy Independence and Security Act of 2007

The Energy Independence and Security Act of 2007 sets federal energy management requirements in several areas, including energy reduction goals for federal buildings, facility management and benchmarking, performance and standards for new buildings and major renovations, high-performance buildings, energy savings performance contracts, metering, energy-efficient product procurement, and reduction in petroleum use, including by setting automobile efficiency standards, and increasing alternative fuel use. This act also amends portions of the NECPA.

Corporate Average Fuel Economy (I) Standards

Established by the U.S. Congress in 1975, the I standards reduce energy consumption by increasing the fuel economy of cars and light trucks. The National Highway Traffic Safety Administration

(NHTSA) and United States Environmental Protection Agency (EPA) jointly administer the I standards. The U.S. Congress has specified that I standards must be set at the "maximum feasible level" with consideration given to: (1) technological feasibility; (2) economic practicality; (3) effect of other standards on fuel economy; and (4) need for the nation to conserve energy.[2]

Title 42 United States Code

Section 6834 of Title 42 United States Code prescribes federal building energy standards that require new buildings be designed to achieve energy consumption levels that are at least 30 percent below the levels established in a version of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard as specified by 10 CFR 433, and sustainable design principles be applied to the siting, design, and construction of all new and replacement buildings.

Clean Energy for New Federal Buildings and Major Renovations of Federal Buildings Rule

In April 2024, the DOE issued the Clean Energy for New Federal Buildings and Major Renovations of Federal Buildings Rule acting on Congress's mandate to cut emissions from new or newly renovated federal buildings (DOE, 2024). This Rule requires federal agencies to phase out fossil fuel usage in new federal building construction or major renovation by achieving a 90 percent reduction in fossil fuel use for new projects started between fiscal years (FY) 2025 and 2029 and completely eliminating on-site fossil fuel usage in new projects beginning in 2030.

State

Warren-Alquist Act

The 1975 Warren-Alquist Act established the California Energy Resources Conservation and Development Commission, now known as the CEC. The act established a State policy to reduce wasteful, uneconomical, and unnecessary uses of energy by employing a range of measures.

California Energy Action Plan

California's *2008 Energy Action Plan Update* updates the *2005 Energy Action Plan II,* which is the State's principal energy planning and policy document. The plan maintains the goals of the original *Energy Action Plan*, describes a coordinated implementation plan for State energy policies, and identifies specific action areas to ensure that California's energy is adequate, affordable, technologically advanced, and environmentally sound. First-priority actions to address California's increasing energy demands are to promote energy efficiency, demand response (i.e., reducing customer energy usage during peak periods to address power system reliability and support the best use of energy infrastructure), and use of renewable power sources. To the extent that these strategies are unable to satisfy increasing energy and capacity needs, the plan supports clean and efficient fossil-fuel fired generation.

2 For more information on the Corporate Average Fuel Economy standards, refer to https://www.nhtsa.gov/laws-regulations/corporate-average-fuel-economy.

State of California Integrated Energy Policy

In 2002, the Legislature passed Senate Bill (SB) 1389, which required the CEC to develop an integrated energy plan biannually for electricity, natural gas, and transportation fuels, for the California Energy Report. SB 1389 requires the CEC to prepare a biennial Integrated Energy Policy Report (IEPR) that assesses major energy trends and issues facing the State's electricity, natural gas, and transportation fuel sectors and provides policy recommendations to conserve resources; protect the environment; ensure reliable, secure, and diverse energy supplies; enhance the State's economy; and protect public health and safety (PRC Section 25301[a]). The IEPR has replaced the Energy Action Plan as the chief program intended to provide a comprehensive statewide energy strategy to guide energy investments, energy-related regulatory efforts and GHG reduction measures.

Title 24 – California Energy Efficiency Standards

The Energy Efficiency Standards for residential and nonresidential buildings specified in Title 24, Part 6 of the California Code of Regulations were established in 1978 in response to a legislative mandate to reduce California's energy consumption. The standards are updated approximately every three years to allow for consideration and possible incorporation of new energy-efficiency technologies and methods. The current standards became effective on January 1, 2023.

SB 350 – Clean Energy and Pollution Reduction Act of 2015

SB 350, known as the Clean Energy and Pollution Reduction Act of 2015, was enacted on October 7, 2015, and provides a new set of objectives in clean energy, clean air, and pollution reduction by 2030. The objectives include the following:

- To increase from 33 percent to 50 percent by December 31, 2030, the procurement of the State's electricity from renewable sources.
- To double the energy efficiency savings in electricity and natural gas final end uses of retail customers through energy efficiency and conservation.

Senate Bill 100

On September 10, 2018, Governor Brown signed SB 100, establishing that 100 percent of all electricity in California must be obtained from renewable and zero-carbon energy resources by December 31, 2045. SB 100 also creates new standards for the RPS goals that were established by SB 350 in 2015. Specifically, the bill increases required energy from renewable sources for both investor-owned utilities and publicly owned utilities from 50 percent to 60 percent by 2030. Incrementally, these energy providers must also have a renewable energy supply of 33 percent by 2020, 44 percent by 2024, and 52 percent by 2027. The updated RPS goals are considered achievable, since many California energy providers are already meeting or exceeding the RPS goals established by SB 350.

On the same day that SB 100 was signed, Governor Brown signed Executive Order B-55-18 with a new statewide goal to achieve carbon neutrality (zero-net GHG emissions) by 2045 and to maintain net negative emissions thereafter.

Appliance Efficiency Regulations, California Code of Regulations Title 20

California's Appliance Efficiency Regulations (20 CCR Part 160-1608) contain standards for both federally regulated appliances and non-federally regulated appliances. The regulations are updated regularly to allow consideration of new energy efficiency technologies and methods. The current regulations were adopted by the CEC on November 18, 2009. The standards outlined in the regulations apply to appliances that are sold or offered for sale in California. More than 23 different categories of appliances are regulated, including refrigerators, freezers, water heaters, washing machines, dryers, air conditioners, pool equipment, and plumbing fittings.

Transportation Energy

AB 1007 (Pavley)-Alternative Fuel Standards

Assembly Bill 1007 (Pavley, Chapter 371, Statutes of 2005) required the CEC to prepare a state plan to increase the use of alternative fuels in California (State Alternative Fuels Plan). The CEC prepared the State Alternative Fuels Plan in partnership with CARB and in consultation with other State, federal, and local agencies. The final State Alternative Fuels Plan, published in December 2007, attempts to achieve an 80 percent reduction in GHG emissions associated with personal modes of transportation, even as California's population increases.

California Assembly Bill 1493 (AB 1493, Pavley)

In response to the transportation sector accounting for more than half of California's carbon dioxide (CO_2) emissions, AB 1493 (commonly referred to as CARB's Pavley regulations), enacted on July 22, 2002, requires CARB to set GHG emission standards for new passenger vehicles, light duty trucks, and other vehicles manufactured in and after 2009 whose primary use is non-commercial personal transportation. Phase I of the legislation established standards for model years 2009 through 2016 and Phase II established standards for model years 2017 through 2025 (CARB, 2017; U.S. EPA, 2012). Refer to Section 4.7, *Greenhouse Gas Emissions*, of this EIR for additional details regarding this regulation.

Executive Order S-1-07 and Update to the Low Carbon Fuel Standard

The Low Carbon Fuel Standard (LCFS), established in 2007 through Executive Order S-1-07 and administered by CARB, requires producers of petroleum-based fuels to reduce the carbon intensity of their products that started with a 0.25 percent reduction in 2011, and culminated in a 10 percent total reduction in 2020. In September 2018, CARB extended the LCFS program to 2030, making significant changes to the design and implementation of the program, including a doubling of the carbon intensity reduction to 20 percent by 2030.

Petroleum importers, refiners, and wholesalers can either develop their own low carbon fuel products or buy LCFS credits from other companies that develop and sell low carbon alternative fuels, such as biofuels, electricity, natural gas, and hydrogen.

Executive Order B-16-12 and Executive Order B-48-18 –Goal for Zero Emission Vehicles

In March 2012, Governor Brown issued an executive order establishing a goal of 1.5 million ZEVs on California roads by 2025. In addition to the ZEV goal, Executive Order B-16-12 stipulated that by 2015 all major cities in California will have adequate infrastructure and be 'zero-emission vehicle ready' so that by 2020 the State will have established adequate infrastructure to support 1 million ZEVs; and that by 2050, virtually all personal transportation in the State will be based on ZEVs, and GHG emissions from the transportation sector will be reduced by 80 percent below 1990 levels.

On January 26, 2018, Governor Brown issued an executive order establishing a goal of 5 million ZEVs on California roads by 2030 and to spur the installation and construction of 250,000 plug-in electric vehicle (EV) chargers, including 10,000 direct current fast chargers, and 200 hydrogen refueling stations by 2025.

CARB's Advanced Clean Car Program

The Advanced Clean Cars emissions-control program was approved by CARB in 2012 and is closely associated with the Pavley regulations (CARB, 2017). The program requires a greater number of zero-emission vehicle models for years 2015 through 2025 to control smog, soot, and GHG emissions. This program includes the Low-Emissions Vehicle regulations to reduce criteria pollutants and GHG emissions from light- and medium-duty vehicles; and the ZEV regulations to require manufactures to produce an increasing number of pure ZEV's (meaning battery and fuel cell electric vehicles) with the provision to produce plug-in hybrid electric vehicles (PHEV) between 2018 and 2025. The Advanced Clean Cars II regulations adopted in 2022 impose the next level of low-emission and zero-emission vehicle standards for model years 2026–2035 and require that by 2035 all new passenger cars, trucks, and SUVs sold in California be ZEVs (CARB, 2024a).

CARB's Mobile Source Strategy

The Mobile Source Strategy (2016) includes an expansion of the Advanced Clean Cars program (which further increases the stringency of GHG emissions for all light-duty vehicles, and 4.2 million zero-emission and plug-in hybrid light-duty vehicles by 2030). Statewide, the Mobile Source Strategy would result in a 50 percent reduction in the consumption of petroleum-based fuels. The 2020 Mobile Source Strategy is a framework that identifies the levels of cleaner technologies necessary to achieve California's goals for air quality, climate, and community risk reduction.

CARB's Advanced Clean Trucks Program

On June 25, 2020, CARB adopted the Advanced Clean Trucks rule, which requires truck manufacturers to transition from diesel vehicles to electric zero-emission vehicles beginning in 2024, with the goal of reaching 100 percent zero-emission vehicles by 2045. The goal of the legislation is to help California meet its climate targets of a 40 percent reduction in GHG emissions and 50 percent reduction in petroleum use by 2030, and an 80 percent reduction in GHG emissions by 2050.

Truck manufacturers will be required to sell zero-emission vehicles as an increasing percentage of their annual sales from 2024 through 2035. Companies with large distribution fleets (50 or more trucks) will be required to report information about their existing fleet operations in an effort to identify future strategies for increasing zero-emission fleets statewide (CARB, 2024b).

Zero-emission vehicles are two to five times more energy efficient than diesel vehicles. The Advanced Clean Trucks rule will reduce GHG emissions with the co-benefit of reducing dependence on petroleum fuels.

CARB's Advanced Clean Fleets Program

CARB's new Advanced Clean Fleets program aims to transition medium and heavy-duty trucks to zero-emissions technology by 2045 as part of CARB's overall strategy to accelerate a large-scale reduction in tailpipe emissions. It requires fleets that are well suited for electrification to transition to ZEVs through requirements to both phase-in the use of ZEVs for targeted fleets and requirements that manufacturers only manufacture ZEV trucks starting in the 2036 model year.

In November 2023, CARB had applied to the U.S. EPA for a federal waiver to enforce this regulation but in January 2025, CARB withdrew its waiver application. While CARB will not be enforcing the portions of this regulation that require a federal waiver or authorization, such as those that apply to high priority and drayage fleets, not all elements of the regulation require a federal waiver or authorization. The waiver withdrawal does not currently impact state and local government fleets which are still subject to the regulation and are required to comply with its requirements, which became effective as of January 1, 2024.

Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling

In 2004, CARB adopted the Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling to reduce public exposure to emissions of diesel particulate matter (California Code of Regulations [CCR] title 13, section 2485 [13 CCR section 2485]). The measure applies to diesel-fueled commercial vehicles with gross vehicle weight ratings greater than 10,000 pounds that are licensed to operate on highways, regardless of where they are registered. This measure prohibits diesel-fueled commercial vehicles from idling for more than five minutes at any given location. The primary goal of this regulation is to reduce public health impacts from diesel emissions, but compliance with the measure also results in energy savings in the form of reduced fuel consumption from unnecessary idling.

Airborne Toxic Control Measure for Stationary Compression Ignition Engines

In 2004, CARB adopted an airborne toxic control measure to reduce public exposure to emissions of diesel particulate matter and criteria pollutants from stationary diesel-fueled compression ignition engines (17 CCR section 93115). The measure applies to anyone who owns or operates a stationary compression ignition engine in California with a rated brake horsepower (hp) greater than 50 hp, or who either sells, offers for sale, leases, or purchases a stationary compression ignition engine. This measure outlines fuel and fuel additive requirements; emissions standards; recordkeeping, reporting, and monitoring requirements; and compliance schedules for compression ignition engines.

University of California

UC Policy on Sustainable Practices

The UC *Policy on Sustainable Practices*, developed in 2004 and updated as recently as April 2024, establishes goals in 13 areas of sustainable practices for both individual building projects and overall facilities operations at UC campuses, including Berkeley Lab: green building design; clean energy; climate protection; sustainable transportation; sustainable building and laboratory operations for campuses; zero waste; sustainable procurement; sustainable foodservices; sustainable water systems; sustainability at UC Health; general sustainability performance assessment; health and well-being; and diversity, equity, inclusion, and justice (UCOP, 2024). Most relevant to this discussion are the goals and policies related to energy use (i.e., green building design, clean energy, sustainable operations) and sustainability at UC locations.

The UC produces an annual report to track its progress toward achieving the system-wide goal of sustainability by 2045. The annual report outlines ongoing progress of the UC's comprehensive sustainability program, including advancement in all areas of the UC *Policy on Sustainable Practices*; research and education; Presidential Initiatives; and student, faculty, and staff engagement.

According to the UC *Policy on Sustainable Practices*, the University of California's system-wide goal is to achieve 90 percent reduction in total GHG emissions (scopes 1, 2, and 3) by 2045 relative to a 2019 baseline year. After 2045, residual emissions beyond the 90 percent reduction will need to be negated by carbon removal. The UC *Policy on Sustainable Practices* relies on the following strategies related to energy to help achieve these goals (UCOP, 2024):

- An average annual two percent reduction in energy use intensity;
- Cost-effective on-campus renewable energy installations;
- 100 percent clean electricity by 2025; and
- Transition of at least 20 percent of historic natural gas use to biomethane by 2025 with the use of biomethane as a transition fuel concluding by 2040.

Further policies include:

- The energy performance of new buildings other than acute care must exceed Title 24 requirements by 20 percent or meet the whole-building energy performance targets listed below in **Table 4.5-1**;
- No new fossil fuel combustion for space and water heating is allowed for buildings and retrofits after June 30, 2019, except those projects connected to an existing campus central thermal infrastructure;
- Achieve a LEED "Gold" certification or better for all new buildings and Parksmart "Silver" or better for new parking structures.[3]
- All new non-acute care facilities or major renovation projects to outperform California Energy Code, Title 24, requirements by at least 20 percent.

[3] For all building projects submitting Preliminary Drawings after January 1, 2024.

TABLE 4.5-1
THE WHOLE-BUILDING ENERGY PERFORMANCE TARGET

Calendar Years	Compliance Target	Stretch Target
2015-2016	65%	50%
2017-2018	60%	45%
2019-2020	55%	40%
2021-2022	50%	35%
2023-2024	45%	30%
2025 or after	40%	25%

SOURCE: UCOP, 2024, University of California – *Policy on Sustainable Practices*.

Sustainable Berkeley Lab

Sustainable Berkeley Lab (SBL) collaborates with other Berkeley Lab departments to reduce the Lab's climate, waste, and water footprint; improve operations and reduce waste; enable sustainable solutions; and apply Laboratory research. Berkeley Lab maintains a list of current sustainability targets and requirements based on federal, State, and UC requirements. **Table 4.5-2** summarizes the key quantitative targets that address energy efficiency.

TABLE 4.5-2
BERKELEY LAB'S SUSTAINABILITY REQUIREMENTS RELATED TO ENERGY

Target	Target Summary	Target Source
Energy Efficiency		
Two Percent Annual Efficiency Improvement	Improve facility energy efficiency at least two percent annually	UC *Policy on Sustainable Practices* Sec III.B.1
National Energy Research Scientific Computing (NERSC) Efficiency	Maintain NERSC Power Utilization Effectiveness (PUE) below 1.1	--
Whole Building Energy Performance Targets	Limit major new building energy use to 35-50 percent of an existing building baseline	Sustainability Standards for New Construction and Major Renovations
30 Percent better than Code	Outperform energy code by 30 percent - Design for energy consumption in major new construction at least 30 percent below the levels established by the ASHRAE 90.1 Standard	42 USC §6834 (a)(3)(A) and DOE Order 413.3B (App C, 5)

SOURCE: LBNL SBL, 2024a.

SBL initiatives to meet these targets are described in a strategic plan (Berkeley Lab *Net-Zero Vision and Roadmap*; LBNL, 2023), which is supported by Lab policies on the *Sustainable Standards for New Construction and Major Renovations* and *Sustainable Standards for Operations*.

Berkeley Lab Net-Zero Vision and Roadmap

Strategies in the Lab's *Net-Zero Vision and Roadmap* that relate to energy include:

- **Energy Efficiency:** Continual improvement in the efficiency of operations and new construction

- **Renewable Energy:** Shifting to 100 percent carbon-free electricity and increasing the hourly match between carbon-free supply and demand
- **Electrification:** Transitioning away from natural gas and fuel to electricity, provided by a decarbonized grid

The *Net-Zero Vision and Roadmap* includes 17 actions that are presented below in **Table 4.5-3** and include several that relate to energy. Actions are grouped using a Stop/Start/Continue framework indicating which existing activities the Lab will cease, commence as relatively new efforts, and proceed with and deepen based on mature initiatives.

TABLE 4.5-3
BERKELEY LAB'S NET-ZERO VISION AND ROADMAP ACTIONS

		Net-Zero Action
STOP	1	**Gas Heating**: Stop replacing natural gas heating systems like-for-like.
	2	**Fuel Vehicles and Equipment**: Stop leasing or buying fossil-driven fleet vehicles and operations equipment when there are reasonable zero-emission alternatives.
START	3	**Renewable Energy**: Start scaling up procurement of long-term renewable energy contracts.
	4	**Electrification of Existing Facilities** - Start transitioning to fully electric infrastructure in existing facilities, building on experience in new construction.
	5	**Electrification of Fleet:** Start accelerating the transition to zero-emission fleet vehicles.
	6	**Business Travel:** Start working to optimize business travel.
	7	**Carbon Removal:** Start cultivating long-term permanent carbon removal offsets to neutralize residual emissions.
	8	**Living Lab:** Start expanding support of applied infrastructure-scale research related to net-zero.
	9	**Equity and Justice:** Start taking specific steps to address equity and climate justice in the Lab's net-zero effort.
	10	**Upstream Emissions:** Start exploring upstream emissions from food and purchased goods and services, then capture near-term emission reduction opportunities.
	11	**Sustainable Procurement:** Start strengthening procurement practices to streamline processes, reduce energy and water consumption, and lower GHG emissions.
	12	**Time of Use Emissions:** Start exploring GHG emissions associated with electricity time-of-use.
CONTINUE	13	**Efficient Facilities:** Continue deepening energy and water savings in the operation of buildings and research facilities.
	14	**New Construction:** Continue strengthening sustainability standards for new construction.
	15	**Green Commutes:** Continue to support alternative commutes and expand electric vehicle charging.
	16	**Air, Water, and Materials:** Continue pursuing net-zero related sustainability strategies including conserving water, managing air quality in buildings, cultivating a circular economy, and diverting waste.
	17	**Sharing and Learning:** Continue sharing net-zero experiences to increase learning and climate action.

SOURCE: LBNL, 2023a.

Sustainability Standards for New Construction and Major Renovations

Included as part of the Requirements and Policies Manual[4] (RPM), this policy identifies sustainability standards for new campus construction and major renovation projects. This policy is intended to leverage opportunities to pursue integrated, performance-driven designs to minimize energy consumption and other environmental impacts associated with building construction and renovation at the lowest possible cost (LBNL, 2023b). The policy is accompanied by the *Implementation Guide to the Berkeley Lab Sustainability Standards for New Construction*, which includes information on setting and verifying energy efficiency for whole building performance targets and energy efficient lighting systems and compliance with the *Guiding Principles for Sustainable Federal Buildings*.

Sustainability Standards for Operations

The *Sustainable Standards for Operations* identifies policies, goals, and actions in the areas of energy and water management, GHG reduction (including electrification of buildings, fleet, and landscape equipment), use of environmentally preferred products, green cleaning, and pest control services (LBNL, 2023c).

4.5.4 Impacts and Mitigation Measures

Significance Criteria

For purposes of this EIR, energy impacts would be considered significant if they would exceed the Standards of Significance presented below, which are based on Appendix G of the *CEQA Guidelines*.

Would implementation of the LBNL 2025 LRDP:

a) Result in wasteful, inefficient, or unnecessary consumption of energy resources, during construction or operation; or

b) Conflict with or obstruct a State or local plan for renewable energy or energy efficiency.

Approach to Analysis

This impact analysis evaluates the potential for campus development under the proposed 2025 LRDP to result in the wasteful use of energy or wasteful use of energy resources, during both the construction and operation of new buildings and facilities. The evaluation takes into account existing use patterns and highlights features of the proposed 2025 LRDP that would promote energy conservation as well as applicable regulations, plans and policies aimed at increasing energy conservation, including federal, State and UC energy efficiency standards. As discussed earlier, there are several regulations, plans and policies at the federal, State, and UC levels to increase energy conservation and the use of renewable energy. Consistency of implementation of the proposed 2025 LRDP with respect to those plans and policies is also evaluated. Consistency with these regulations, plans and policies would also help ensure that campus development under the proposed 2025 LRDP would not result in the inefficient, wasteful, or unnecessary energy use.

[4] The Requirements and Policies Manual is a collection of Berkeley Lab's Laboratory-wide policies: https://commons.lbl.gov/display/rpm2/RPM

Energy use associated with construction and operation are estimated and provided for informational purposes. Construction energy estimates use the assumptions identified in Appendix AIR.

Construction Energy Use

Construction activities associated with the proposed 2025 LRDP would result in the consumption of energy, primarily in the form of transportation fuels (e.g., diesel and gasoline) used in haul trucks, heavy-duty construction equipment, and construction workers vehicles traveling to and from the Berkeley Lab campus. Electricity used to operate any electric powered construction equipment would be minimal in comparison to the amount of diesel and gasoline consumed. Natural gas-powered equipment is generally not used in construction.

Construction activities and associated energy use could vary substantially from day to day, depending on the phase and specific type of construction activity and the number of workers and vendors who would travel to the campus. The proposed 2025 LRDP would replace the current 2006 LRDP and include new population and building space projections through the year 2045. This analysis relies on the same data and assumptions regarding the types, number and level of usage of construction equipment for each activity consistent with the data and assumptions used for the air quality and GHG impact analyses in this EIR.

All off-road construction equipment is assumed to be diesel-fueled. With regard to on-road construction vehicles, it is assumed that light-duty automobiles and trucks used by commuting workers would be fueled by gasoline and that on-road construction vehicles, such as vendor and haul trucks for demolition debris, soil, and other material hauling, would use diesel fuel. This analysis assumes that no electric on-road vehicles would be used during construction activities associated with the proposed 2025 LRDP.

Operational Energy Use

Campus development under the proposed 2025 LRDP would result in an increase in the consumption of energy at Berkeley Lab, primarily in the form of electricity. As detailed in Chapter 3, *Project Description* and consistent with the UC *Policy on Sustainable Practices*, new buildings would have no natural gas infrastructure and all new facilities would be entirely powered by electricity to meet building energy needs. Demolition of existing buildings as part of the proposed 2025 LRDP would reduce campus natural gas use when compared to existing conditions. Electrification of the new facilities would increase electricity demand associated with building energy use for space and water heating. Existing (2023) and projected (2045) campus electricity and natural gas estimates used in this analysis were provided by SBL. Data on the Lab's non-electric vehicle fleet fuel, including gasoline, diesel and ethanol (E-85); non-fleet fuel used to power equipment, including diesel, gasoline and liquified petroleum gas (LPG); and energy used for employee commute through various modes were also provided by SBL. Electricity currently used by the Lab's EV fleet for vehicle charging is not tracked separately and is reported along with building energy use.

Consistency with Plans and Policies

As detailed in Section 4.5.3, *Regulatory Framework*, Berkeley Lab's activities are governed by several regulations, plans and policies at the federal and UC levels to improve energy efficiency, encourage energy conservation, and increase use of renewable sources of energy. Construction and operation of campus development under the proposed 2025 LRDP is evaluated for consistency with applicable plans and policies related to energy.

Impact Analysis

LRDP Impact ENE-1: Implementation of the LBNL 2025 LRDP would not result in wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation. (*Less than Significant*)

Construction Energy Use

Berkeley Lab campus energy usage levels would fluctuate depending on the energy intensity of construction activities underway during any particular time period. All equipment used in project construction would be subject to CARB's In-Use Off-Road Diesel Vehicle Regulation that applies to off-road diesel engines, vehicles, or equipment greater than 25 horsepower. The regulation imposes limits on idling so as to reduce unnecessary use of energy. Construction activities would use fuel-efficient equipment consistent with federal and State regulations, such as fuel efficiency regulations in CARB's Pavley Phase II standards; the anti-idling regulation in 13 CCR Section 2485; and fuel requirements for stationary equipment in 17 CCR Section 93115 (concerning the Airborne Toxic Control Measures). In accordance with 13 CCR Sections 2485 and 2449, idling by commercial vehicles over 10,000 pounds and off-road equipment over 25 horsepower would be limited to a maximum of five minutes. Though the intent of these regulations is to reduce construction emissions, compliance with the anti-idling and emission reduction regulations discussed above would also result in fuel savings from the more efficient use of equipment. Based on the total amount of demolition and new building space anticipated under the proposed 2025 LRDP and assuming that the demolition and construction activities would be spread evenly over the 20-year planning period, Project-related demolition and construction would result in the estimated consumption of approximately 1,612 gallons per year of diesel fuel and an average of approximately 712 gallons per year of gasoline over the planning period.

In addition to direct construction-related energy consumption, indirect construction-related energy use would be involved to produce electricity, refine fuels, and make the materials and components used in construction, including the energy used for extraction of raw materials, manufacturing, and transportation. Energy intensiveness of electricity generation, fuel refining, and materials, also referred to as the energy "lifecycle," is not addressed in this analysis because the California Natural Resources Agency (CNRA) has indicated that lifecycle analyses are not required under CEQA (CNRA, 2009). The CNRA explained in the context of GHG emissions that: (1) there exists no standard regulatory definition for lifecycle, and (2) even if a standard definition for lifecycle existed, the term might be interpreted to refer to emissions beyond those that could be considered 'indirect effects' as defined by CEQA Guidelines, and therefore, beyond what an EIR is required to estimate and mitigate (CNRA, 2009). This reasoning was reaffirmed in Section 15126.2(b) of the *CEQA Guidelines*, which cautions that the analysis of energy impacts is subject to the rule of reason and must focus on energy demand caused by the project, signaling that a full "lifecycle" analysis that would account for energy used in building materials and consumer projects will generally not be required (CNRA, 2018).

Nonetheless, recycling reduces indirect energy consumption associated with making materials and components, and it reduces the energy used for extraction of raw materials, manufacturing, and transportation. California has a statewide goal of 75 percent waste diversion. The UC *Policy on Sustainable Practices* includes waste reduction goals including a zero-waste goal to prioritize waste reduction through reducing, reusing, recycling and composting (or other forms of organic recycling), and diverting 90 percent of municipal solid waste and construction and demolition waste from the landfill. In compliance with the Lab's *Sustainable Standards for New Construction and Major Renovations*, waste materials generated from renovation and construction projects are to be diverted from the landfill to the maximum extent feasible. Subcontracts for renovation and new construction must incorporate waste reduction program requirements requiring a diversion of a minimum of 80 percent (by weight) of unregulated waste from the landfill. Construction contractors are required to work with a point of contact at the Lab in advance of the construction start regarding compliance with the specification, which defines a construction waste diversion plan and reporting requirements. These recycling efforts would reduce the effects of the proposed 2025 LRDP's indirect energy use. The Lab has shown significant progress towards these goals. The Lab's average waste diversion, excluding construction and demolition waste, for the last nine fiscal years has ranged from 58 percent to 75 percent. Diversion rates have been lower lately due to structural changes at the Lab, for example, not having an operating cafeteria, which decreases material diverted from the landfill to composting. The Lab's waste diversion in 2024 was at 67 percent with diversion from construction and demolition projects at 84 percent.

Overall, construction activities associated with proposed 2025 LRDP implementation would not result in a demand for energy resources that is unusual compared to overall local and regional demand for energy resources and construction would not involve characteristics that require equipment that would be less energy-efficient than at comparable construction sites in the region or State. Given that and in light of required compliance with rules and regulations in place, construction activities under the proposed 2025 LRDP would not result in the inefficient, wasteful, or unnecessary consumption of energy. Therefore, impact would be less than significant, and no mitigation is required.

Operational Energy Use

The main campus operational energy use is facility energy, which includes energy used in building mechanical systems, building lighting systems, plug loads, and process loads, which are loads that are associated with accelerator, computing, or other loads that support scientific processes. Additional minor operational energy uses include vehicle fleet operation; and non-fleet equipment such as generators, fire pumps, air compressors, and other heavy machinery; and employee commute through various modes of transportation. The annual operational energy use associated with existing (2024) sources and the sources at buildout of the proposed 2025 LRDP in 2045 is summarized in **Table 4.5-4**.

TABLE 4.5-4
EXISTING (2024) AND PROJECTED (2045) OPERATIONAL ENERGY USE WITH THE PROPOSED 2025 LRDP

Energy Use Type	Existing (2024) Operational Energy Use	2045 Operational Energy Use[a]
Electricity (MWh per year)		
Facility Energy	118,921	369,500
Employee Commute	555	2,000
Lab Vehicle Fleet	--[b]	1,600
Non-fleet Equipment	--[b]	300
Total Electricity Generation/Use	**119,476**	**373,400**
Natural Gas (MBTU per year)		
Building Energy	118,594	13,400
Total Natural Gas Use	**119,594**	**13,400**
Diesel (gallons per year)		
Employee Commute	171,859	--[c]
Non-fleet Equipment	56,389	12,000
Lab Vehicle Fleet	785	79[c]
Total Diesel Use	**229,033**	**12,079**
Gasoline (gallons per year)		
Employee Commute	398,809	12,400
Lab Vehicle Fleet	12,020	1,202[c]
Non-fleet Equipment	119	--[d]
Total Gasoline Use	**410,948**	**13,602**
Ethanol, E-85 (gallons per year)		
Lab Vehicle Fleet	11,565	1,157[c]
Total Ethanol Use	**11,565**	**1,157**
Liquified Petroleum Gas (gallons per year)		
Non-fleet Equipment	775	--
Total LPG Use	**775**	**--[d]**

NOTES:

a. 2045 energy projections based on data provided by SBL on assumptions used for the estimation of 2045 GHG emissions and is included as part of Appendix AIR.
b. Electricity use associated with these sources is captured in the facility electricity use
c. Regulatory requirements and market conditions are assumed to drive down fleet fuel consumption values by 90 percent from 2024 to 2045.
d. CARB zero-emission forklift requirements are assumed to drive gasoline and LPG consumption to zero by 2045.

SOURCE: LBNL SBL, 2024b.

Facility Energy: The proposed 2025 LRDP would enable and encourage the replacement of older, less efficient buildings with modern facilities that meet up-to-date, stringent codes for energy efficiency. In compliance with the UC *Policy on Sustainable Practices*, all new buildings added to the Lab under the proposed 2025 LRDP would be all-electric and natural gas would not be used for space or water heating. The remaining natural gas consumption in 2045 is due to space and water heating associated with existing minor buildings not covered by these requirements as well as a minimal amount of natural gas use associated with laboratories. At a minimum, all new buildings would be required to be designed, constructed, and commissioned to beat ASHRAE 90.1 by 30 percent as required by Section 6834 of Title 42 United States Code and meet the whole building energy performance compliance targets listed in Table 4.5-1. This approach also meets the requirement to outperform the California Building Code (CBC) energy-efficiency standards by at least 20 percent. All new buildings would at a minimum achieve a LEED "Gold" certification with a "Platinum" rating whenever possible within the constraints of program needs and standard budget parameters. The Lab currently does and will continue to implement energy efficiency actions in buildings and infrastructure systems to reduce its energy use intensity.

Fleet Fuel: The Lab currently uses gasoline, diesel, and ethanol to fuel its vehicle fleet. Energy use projections for 2045 assume electrification of federal fleet, driven by CARB Advanced Clean Fleets and Advanced Clean Cars regulations.

Non-Fleet Fuel: Equipment used at the Lab, such as generators, fire pumps, air compressors and other heavy machinery such as forklifts and aerial lifts, currently use diesel, gasoline and LPG. The Lab will be required to comply with various CARB requirements, including the CARB Zero-Emission Forklift and CARB Renewable Diesel Fuel which will result in increased electrification of its equipment and use of renewable fuels reducing fossil fuel use.

Employee Commute: Lab employees commute to the campus using various modes, including private vehicles, carpool and vanpool, and mass transit. For the estimation of 2045 energy use projections presented in Table 4.5-4, it is assumed that the number of available parking spaces is expected to remain constant and therefore miles commuted by personal vehicle are also assumed to remain constant. Projections assume that only 5 percent of total miles commuted by employees will use gasoline cars and the remaining 95 percent will use fully electric cars in 2045, given the high levels of EV sales in California, CARB's ban on the sale of internal combustion engine powered vehicles by 2035, and the incentives at Berkeley Lab, including convenient EV charging facilities. Projections for gasoline use are based on a fuel efficiency of 45 miles per gallon in 2045 based on 29 miles per gallon in 2024 and a two percent annual increase in fuel efficiency. EVs used for commuting are assumed to have an efficiency of 6 miles per kilowatt-hour in 2045. Approximately two percent of the 2024 miles commuted by personal vehicles were by diesel powered vehicles. This number is anticipated to reduce to zero by 2045.

The proposed 2025 LRDP Mobility and Circulation Element includes a number of transportation strategies to further improve multi-modal transportation and site access with the aim of reducing trips and VMT. Strategies include managing parking demand, reducing reliance on personal automobile commutes by providing viable and attractive options for regular and occasional commuters; improving and expanding Berkeley Lab's system of mobility "hubs" or shuttle stops, with additional locations throughout the campus and enhanced wayfinding maps, bicycle parking, bike charging, and other amenities; creating an expanded Transit Center within the Central Commons, adjacent to the Collaboration Commons; and improving the bicycle circulation network with delineated bicycle lanes and bicycle parking near most destinations. Berkeley Lab operates a robust shuttle bus system that circulates throughout the campus and connects the campus to off-campus destinations, including the UC Berkeley campus, the downtown Berkeley Bay Area Rapid Transit (BART) station, and the Lab's off-campus leased space. The shuttles are widely used to access facilities within the hilly campus, especially in the more remote campus areas. These strategies would also reduce energy use by reducing trips and VMT generated by campus development under the proposed 2025 LRDP.

The transition toward electric power sources for on-road vehicles, including the installation of additional EV charging stations, would result in an increase in the calculated total electricity usage. This increased electricity use associated with EVs would occur not only on the campus, but dispersed throughout the greater Berkeley and Oakland areas and beyond where the new employees would reside; this would not be expected to significantly impact overall electricity supply or infrastructure. While charging stations would be available to serve the Lab employees, the bulk of long-term charging is expected to occur at the vehicle owners' private residences or other off-site charging locations.

Based on the above analysis, the proposed 2025 LRDP would not result in wasteful, inefficient, or unnecessary consumption of fuel or energy. This impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the scenario. Any of the proposed buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of energy impacts. Campus development consistent with the Illustrative Development Scenario would be similar to that under the proposed 2025 LRDP. Thus, for the same reasons presented above, energy use associated with the Illustrative Development Scenario would not be considered wasteful or inefficient and this impact would be less than significant.

LRDP Impact ENE-2: Implementation of the LBNL 2025 LRDP would not conflict with or obstruct a state or local plan for renewable energy or energy efficiency. (*Less than Significant*)

Construction

As discussed above under LRDP Impact ENE-1, construction activities associated with proposed 2025 LRDP implementation would involve the use of fossil fuels, primarily gasoline and diesel. Construction equipment used for the project would be subject to CARB's In-Use Off-Road Diesel Vehicle Regulation that applies to certain off-road diesel engines, vehicles, or equipment greater than 25 horsepower. The regulation (1) imposes limits on idling, requires a written idling policy, and requires a disclosure when selling vehicles; (2) requires all vehicles to be reported to CARB (using the Diesel Off-Road Online Reporting System) and labeled; (3) restricts the adding of older vehicles into fleets starting on January 1, 2014; and (4) requires fleets to reduce their emissions by retiring, replacing, or repowering older engines or installing Verified Diesel Emission Control Strategies (i.e., exhaust retrofits). The fleet must either show that its fleet average index was less than or equal to the calculated fleet average target rate, or that the fleet has met the Best Achievable Control Technology requirements.

Construction activities would use fuel-efficient equipment consistent with federal and State regulations, such as fuel efficiency regulations in CARB's Pavley Phase II standards; the anti-idling regulation in 13 CCR Section 2485; and fuel requirements for stationary equipment in 17 CCR Section 93115 (concerning the Airborne Toxic Control Measures). In accordance with 13 CCR Sections 2485 and 2449, idling by commercial vehicles over 10,000 pounds and off-road equipment over 25 horsepower would be limited to a maximum of five minutes. The intent of these regulations is to reduce construction emissions; however, compliance with the anti-idling and emission reduction regulations discussed above would also result in fuel savings from the more efficient use of equipment.

Operation

Development pursuant to the proposed 2025 LRDP would be designed in a manner that would be consistent with all relevant energy conservation plans and policies resulting in the efficient use of energy resources and increased use of renewable energy. The Berkeley Lab's *Net-Zero Vision and Roadmap* identifies energy efficiency and renewable energy as two of the key building blocks in the Lab's efforts to reach net zero GHG emissions. All development proposed under the 2025 LRDP would be designed and constructed to be consistent with requirements in the *Sustainability Standards for New Construction and Major Renovations* in the RPM which implements federal energy efficiency requirements, the UC *Policy on Sustainable Practices* and the Berkeley Lab's *Net-Zero Vision and Roadmap*. It requires design teams to comply with whole-building energy performance targets to limit major new building energy use to 35 to 50 percent of an existing building baseline and comply with the California Energy Code (Title 24, Part 6 and reporting requirements in Title 24, Part 1) requirements. In addition, design for energy consumption in major new construction is required to be at least 30 percent below the levels established by the ASHRAE 90.1 Standard as required by 42 USC §6834 (a)(3)(A) and DOE Order 413.3B. The Lab will continue to improve facility energy efficiency consistent with the UC *Policy on Sustainable Practices* Section III.B.1. Old, inefficient building would be removed at the Lab, and all new construction under the proposed 2025 LRDP would be all electric and not use on-site fossil fuel combustion (for example, natural gas) for space heating, water heating, or cooking consistent with the Clean Energy for New Federal Buildings and Major Renovations of Federal Buildings Rule and the UC *Policy on Sustainable Practices*.

Consistent with the UC *Policy on Sustainable Practices*, the Lab plans to transition electricity supplied to development under the proposed 2025 LRDP to 100 percent carbon-free renewable electricity by 2030.

Based on the above analysis, the proposed 2025 LRDP would not conflict with or obstruct a State or local plan for renewable energy or energy efficiency. This impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the scenario. Any of the proposed buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of energy impacts. Campus development consistent with the Illustrative Development Scenario would be similar to that under the proposed 2025 LRDP and would not conflict with UC and Berkeley Lab's policy related to renewable energy or energy efficiency. For the reasons stated above, this impact would be less than significant.

Cumulative Impacts

LRDP Impact CUM-ENE-1: Campus development under the LBNL 2025 LRDP, combined with cumulative development in the Project vicinity and areawide, would not result in significant cumulative energy impacts with respect to wasteful, inefficient, or unnecessary consumption of energy resources, or conflict with or obstruction of a state or local plan for renewable energy or energy efficiency, during project construction or operation. (*Less than Significant*)

Given Berkeley Lab's implementation of goals in the UC *Policy on Sustainable Practices* and federal requirements that would serve to improve efficiency of existing buildings, require new buildings to surpass Title 24 energy efficiency standards and, at a minimum, attain LEED Gold certification, campus development under the proposed 2025 LRDP would not contribute to a significant cumulative impact related to the use of large amounts of fuel or energy in a wasteful or inefficient manner and the cumulative impact would be less than significant.

Project-related transportation fuel impacts could overlap with the transportation fuel impacts of previously approved past projects, as well as other present or future projects that would occur during the proposed 2025 LRDP's construction and operation. However, campus development under the proposed 2025 LRDP would comply with several requirements in the UC *Policy on Sustainable Practices* to move towards electrification of its fleet with no fossil fuel by 2045 and would comply with various CARB requirements, which would result in increased electrification of its fleet and equipment. Through its TDM program implementation, including access to transit services and limited parking supply, Berkeley Lab would continue to minimize the increase in vehicle trips and associated increase in transportation energy use. Therefore, the proposed 2025 LRDP's incremental impact associated with its transportation energy use would be less than significant.

Implementation of the proposed 2025 LRDP would be subject to energy efficiency targets in the *Sustainability Standards for New Construction and Major Renovations* in the RPM which implements federal energy efficiency requirements, the UC *Policy on Sustainable Practices,* and the Berkeley Lab's *Net-Zero Vision and Roadmap*. Other previously approved past projects, as well as other present or future projects that would occur during the proposed 2025 LRDP's construction and operation would also be subject to and be required to comply with applicable plans and policies. Therefore, there would not be a cumulative impact with respect to inconsistency with energy efficiency and renewable energy plans and policies that the proposed 2025 LRDP would contribute towards.

Based on the above analysis, the proposed 2025 LRDP would not involve wasteful, inefficient, or unnecessary consumption of fuel or energy or result in conflict with or obstruction of a state or local plan for renewable energy or energy efficiency and would therefore not make a cumulatively considerable contribution to a cumulative impact on energy resources. The 2025 LRDP's cumulative impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the scenario. Any of the proposed buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of energy impacts. As stated in the programmatic analysis above, the proposed 2025 LRDP would not involve wasteful, inefficient, or unnecessary consumption of fuel or energy or result in conflict with or obstruction of a state or local plan for renewable energy or energy efficiency and would not make a cumulatively considerable contribution to a cumulative impact on energy resources. Therefore, development consistent with the Illustrative Development Scenario would also not combine to result in a significant cumulative impact on energy resources. For the reasons stated above, this impact would be less than significant.

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4.6 Geology and Soils

4.6.1 Introduction

This section describes and evaluates the potential for the implementation of the proposed LBNL 2025 LRDP to result in significant impacts related to geology, soils, seismic hazards, and paleontological resources. The section contains a description of the existing regional and local conditions on the Berkeley Lab campus and the surrounding areas pertaining to geology, soils, seismic hazards, and paleontology; includes a summary of the University plans and policies, and federal, State, and local laws and regulations related to these resources; identifies criteria used to determine impact significance, and provides an analysis of the potential impacts related to geology, soils, and paleontological resources associated with proposed 2025 LRDP implementation as well as identifies feasible mitigation measures that could mitigate any potentially significant impacts.

The section is based on a review of published maps and data from the United States Geological Survey (USGS), California Geological Survey (CGS), and geotechnical investigation reports prepared for the campus.

4.6.2 Environmental Setting

Regional Setting

Berkeley Lab is located within the Coast Ranges geomorphic province,[1] which is characterized by marine sedimentary and volcanic rocks of the Franciscan Assemblage[2] occurring in northwest-trending ridges and valleys (California Geological Survey [CGS], 2002a). The present physiography and geology of the Coast Ranges are the result of deformation and faulting associated with the tectonic boundary between the North American and Pacific tectonic plates. Plate boundary movements are largely concentrated along the well-known fault zones, which, in the Bay Area, include the San Andreas, Hayward, and Calaveras fault zones, as well as other lesser-order faults. These faults run in a general northwest-southeast alignment and have helped form the subparallel northwest trending mountain ranges (typically ranging in elevation from 2,000 to 4,000 feet above sea level and occasionally 6,000 feet) and intervening valleys. The Coast Ranges province is bounded on the west by the Pacific Ocean and on the east by the Great Valley province where the bedrock units of the Coast Ranges dip below the thick alluvium sequences of that province.

The Coast Ranges are composed of thick sedimentary strata that are heavily deformed by tectonic forces. The northern and southern ranges are separated by a depression containing the San Francisco Bay. The northern Coast Ranges are dominated by irregular, knobby, landslide-topography of the Franciscan Assemblage, also referred to as the Franciscan Complex. In several areas, Franciscan rocks are overlain by volcanic cones and flows of the Quien Sabe, Sonoma, and Clear Lake volcanic fields. In some areas, the Great Valley Sequence is present. The dominant

1 A geomorphic province is a regional area that possesses similar bedrock, structure, history, and age.
2 The Franciscan Assemblage is a name applied to the various rock units that form the bulk of the Coast Range Mountains.

feature of the province, the San Andreas Fault Zone, is more than 600 miles long, extending from Point Arena to the Gulf of California.

Local Setting

Topography

Topographic elevations at Berkeley Lab range from approximately 450 to 1,100 feet above mean sea level (amsl). Although elevations generally decrease towards the west and south, a series of small canyons and ridgelines associated with surface water drainages results in a complex, varied topographic profile across the campus.

Geology

The campus is located on the western slopes of the East Bay hills within the central region of the Coast Ranges geomorphic province. As shown in **Figure 4.6-1**, Berkeley Lab is underlain primarily by northeast-dipping Cretaceous Period and Miocene Epoch sedimentary and volcanic bedrock units, and by paleo-landslide (ancient landslide) deposits composed of these units. Rocks of the Miocene Orinda Formation underly much of the central portion of the campus and are composed of poorly indurated (relatively soft), non-marine mudstone and sandstone. The western and southern portions of the campus are underlain by marine mudstone and sandstones deposited in the late Cretaceous Period Great Valley Sequence Group. Some of the higher elevation portions of the campus, as well as a portion of the eastern part of the campus, are underlain by paleo-landslide deposits composed of Moraga Formation rocks. These deposits are composed of andesitic breccia[3] with a small proportion of interbedded volcaniclastic sandstone and conglomerate. A small portion of the very eastern extent of the campus is underlain by the middle to late Miocene San Pablo Group Formation rocks, consisting of shallow marine sandstones, and the early to middle Miocene Claremont Formation rocks, consisting of well-consolidated, interbedded chert and shale with minor amounts of sandstone (A3GEO, 2020; CGS, 2002a; LBNL, 2024a,b).

Soils

Surficial units on the campus consist primarily of artificial fill, colluvium, alluvium, and recent landslide deposits overlying the rock units described above. Thicker soils on the campus are generally concentrated in the valleys between ridgelines where rock is typically at shallow depths (A3GEO, 2020; LBNL, 2024a, b).

Most of the soils on the campus are characterized as Xerorthens-Millsholm complex, with 30 to 50 percent slopes (NRCS, 2023). These are well-drained soils that generally allow for rapid runoff of precipitation and are highly susceptible to erosion, although rainwater runoff is known to be minimal in vegetated areas of the campus. The slopes on the southern-central portion of the campus are underlain by Altamont Clay, with 30 to 50 percent slopes. This is a deep, well-drained soil that has a high shrink-swell (expansive) and erosion potential. The southwest corner of the campus is underlain by Maymen loam, with 30 to 75 percent slope. Maymen loam is a

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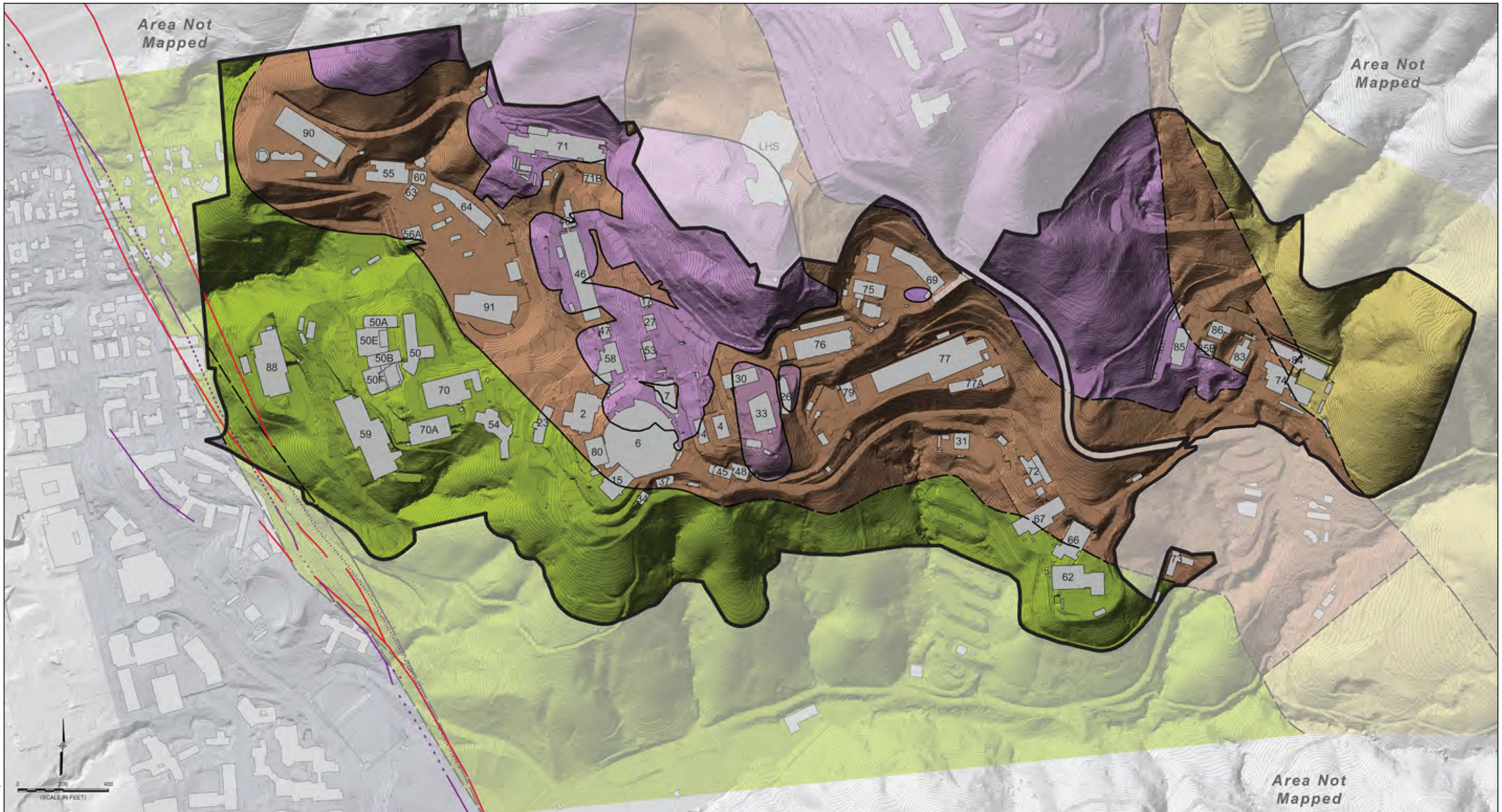
3 Andesite is an extrusive igneous rock. Breccia is a rock composed of large angular broken fragments of minerals or rocks cemented together by a fine-grained matrix.



Geologic Units [1]

- **Moraga Formation**[2] (late Miocene)
- **Orinda Formation** (late Miocene)
- **Claremont Formation**(late to middle Miocene)
- **Great Valley Sequen** (Cretaceous to Jurassic)
- **Franciscan Formation** (Cretaceous to Jurassic)

[1] Overlying fill, alluvium/colluvium and landslide deposits not shown
[2] Locally-interpreted Orinda Fm. interbeds and mixed units not shown

Hayward Fault Symbols

?•?• Lienkaemper; dashed where approximately located, dotted where concealed, queried where uncertain, hachures on downthrown block (Lienkaemper, 2006)

Alquist-Priolo Fault Traces (California Geological Survey, 2018)

Notes

1.Topographic contours and shading derived from LBNL-provided aerial LiDAR. Elevation contours at 5-foot vertical intervals.

Primary Sources

Marliave, Chester, 1949, "Preliminary Report Pertaining To The Bedrock Conditions In The Vicinity Of The Bevatron At The University Of California At Berkeley," report dated April 14, 1949 (LBNL File#097).

Harding Lawson Associates, 1982, "Geology of Lawrence Berkeley Laboratory," report dated September 28, 1982 (LBNL File #042).

Lawrence Berkeley National Laboratory, 2000, "Corrective Measures Study Report for the Lawrence Berkeley National Laboratory Environmental Restoration Program," report dated September 2000.

Alan Kropp & Associates, Inc. and William Lettis & Associates, Inc., 2010, "Geologic and Geotechnical Investigation Report, Building 85 Stabilization, Lawrence Berkeley National Laboratory, Berkeley, California," report dated April 2 (LBNL File #461).

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SOURCE: A3GEO, 2020

LBNL LRDP EIR

Figure 4.6-1
Bedrock Geologic Map of the Berkeley Lab Campus

ESA

shallow, fine-grained soil that exhibits rapid runoff and is highly susceptible to erosion. The eastern portion of the campus is partially underlain by Maymen-Los Gatos complex, with 30 to 75 percent slope. These are shallow to moderately deep soils that are highly susceptible to erosion. Soil characteristics at the campus vary somewhat from the above due to historic grading activities that have altered native soil profiles.

Groundwater

Depth to groundwater on the campus varies substantially from zero to approximately 100 feet below ground surface (LBNL, 2024a). Historic development at the campus has included the installation of hydraugers[4] to facilitate hillside drainage and minimize saturation of steep slopes; groundwater collected in hydraugers is subsequently directed both back out onto stable slopes at lower elevations, and into the campus's storm drain system.

Seismic Hazards

Fault Rupture

The campus lies within a region of California that contains many active and potentially active faults, as shown in **Figure 4.6-2**. Fault rupture is defined as the displacement that occurs along the surface of a fault during an earthquake. Based on criteria established by the CGS, faults are classified as either active, potentially active, or inactive. Faults are considered active when they have shown evidence of movement within the past 11,700 years (i.e., Holocene epoch) (CGS, 2018). Potentially active faults are those that have shown evidence of movement between 11,700 and 1.6 million years ago (Quaternary age). Faults showing no evidence of movement within the last 1.6 million years are considered inactive.

The Alquist-Priolo Earthquake Fault Zoning Act (formerly known as the Alquist-Priolo Special Studies Zones Act) established state policy to identify active faults and determine a boundary zone on either side of a known fault trace, called the Alquist-Priolo Earthquake Fault Zone. The delineated width of an Alquist-Priolo Earthquake Fault Zone is based on the location precision, complexity, or regional significance of the fault and can be between 200 and 500 feet in width on either side of the fault trace. If a project site lies within a designated Alquist-Priolo Earthquake Fault Zone, a geologic fault rupture investigation must be performed to demonstrate that a proposed building site is not threatened by surface displacement from the fault before development permits may be issued.

As illustrated in **Figure 4.6-3**, the Hayward Fault Alquist-Priolo Zone is a Holocene-active fault zone that traverses the western edge of the campus (A3GEO, 2020; ABAG, 2024a). The San Andreas Fault Alquist-Priolo Zone is located approximately 19 miles southwest of the campus.

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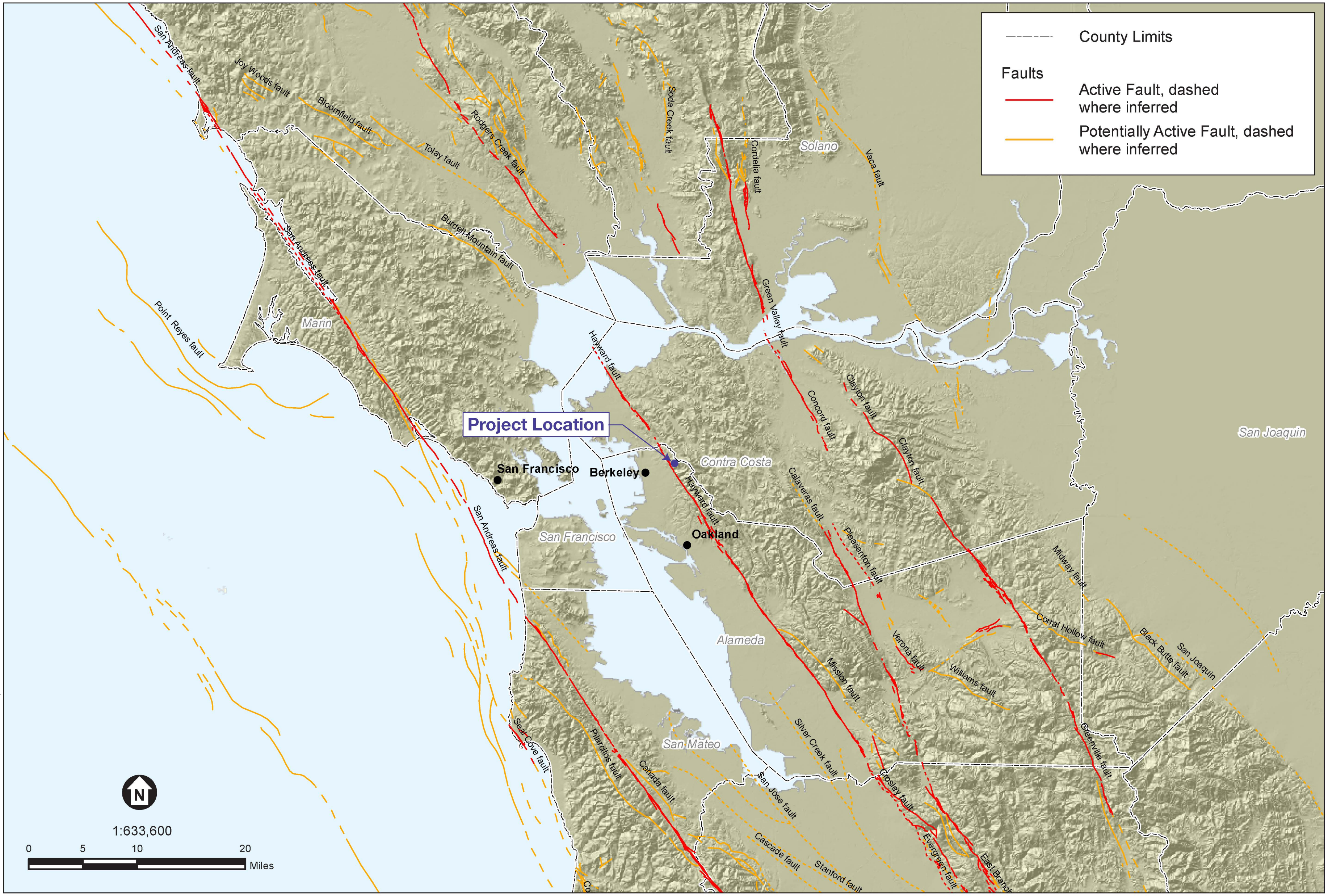
4 Hydraugers are horizontal drainpipes inserted into the hillside to draw off groundwater, some of which otherwise would eventually reach the natural drainage channels, and which could, if not drained by means of the hydraugers, result in slope instability when excessive moisture builds up in the soil.



4.6-5

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SOURCE: Fugro West, 2009

LBNL LRDP EIR

Figure 4.6-2
Active and Potentially Active Bay Area Earthquake Faults

ESA

Earthquake Fault Zone
(Alquist-Priolo zone)

Fault Trace

Technical Notes: *This reference map is based on maps published by the CGS.*

SOURCE: A3GEO, 2019

LBNL LRDP EIR

Figure 4.6-3
Hayward Fault - Alquist-Priolo Zone on the Berkeley Lab Campus

ESA

Two other faults, Wildcat Fault and the East Canyon Fault, traverse the eastern portion of the Berkeley Lab campus and run parallel to the Hayward Fault. Prior studies of these two faults have confirmed the absence of evidence needed to classify either of these faults within the campus as active (LBNL, 2007).

Ground Shaking

The intensity of seismic shaking experienced at a given location is dependent on the distance from the epicenter, the causative fault, and the underlying geotechnical characteristics of the onsite geology. The U.S. Geological Survey (USGS) Working Group on California Earthquake Probabilities (WGCEP) evaluated the likelihood of one or more earthquakes of moment magnitude (Mw) 6.7 or higher occurring in the San Francisco Bay Area.[5] The result of the most recent evaluation indicated a 72 percent likelihood that such an earthquake event will occur in the Bay Area sometime in the next 30 years. Within this 72 percent probability, the Hayward-Rodgers Creek and Calaveras fault systems are the two most likely fault systems to cause the event (WGCEP, 2015). The north and south Hayward faults together are capable of generating about a Mw 7.0 earthquake. An earthquake of this magnitude would generate very violent seismic shaking (Modified Mercalli Intensity [MMI] 9) at Berkeley Lab (ABAG, 2024b).

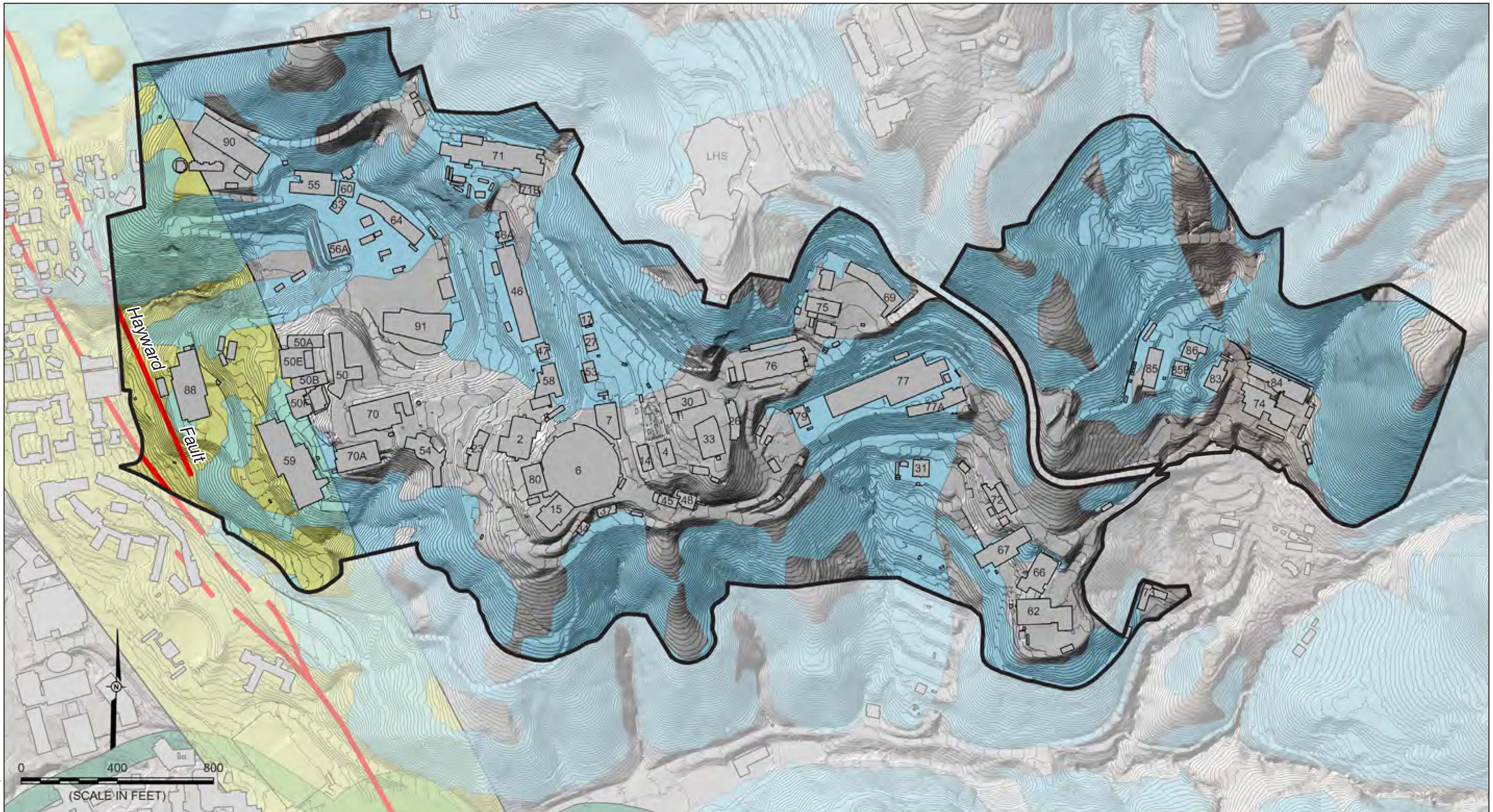
Landslides and Slope Stability

Slope failures, commonly referred to as landslides, include many phenomena that involve the downslope displacement and movement of material, and can occur due to a combination of any number of factors, including site slope, geology, precipitation amount and intensity, modification due to grading, or seismic events. A slope failure is a mass of rock, soil, and debris displaced downslope by sliding, flowing, or falling. Exposed rock slopes undergo rockfalls, rockslides, or rock avalanches, while soil slopes experience shallow soil slides, rapid debris flows, and deep-seated rotational slides. Approximately 60 percent of the campus has slopes greater than 25 percent and approximately 27 percent of the campus has slopes greater than 45 percent.

Figure 4.6-4 illustrates seismic hazard zones for earthquake-induced landslides on the campus as mapped by CGS.

Figure 4.6-5 depicts areas within the campus prone to slope instability and classifies the risk potential of these areas to experience landslide activity (high, medium, and low risk). In addition, Figure 4.6-5 identifies areas on the campus where the hillsides have been repaired and historic landslides have been stabilized. Most of the mapped landslides or potential landslides at the campus shown on Figure 4.6-5 are located within the earthquake-induced landslide hazard zones, as shown on Figure 4.6-4.

5 Moment magnitude is related to the physical size of a fault rupture and movement across a fault. The Richter magnitude scale reflects the maximum amplitude of a particular type of seismic wave. Moment magnitude provides a physically meaningful measure of the size of a faulting event (CGS, 2002b).



Liquefaction Zones

Areas where historical occurrence of liquefaction, or local geological, geotechnical and ground water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake-Induced Landslide Zones

Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resources Code Section 2693(c) would be required.

Earthquake Fault Zones

Zone boundaries are delineated by straight-line segments; the boundaries define the zone encompassing active faults that constitute a potential hazard to structures from surface faulting or fault creep such that avoidance as described in Public Resources Code Section 2621.5(a) would be required.

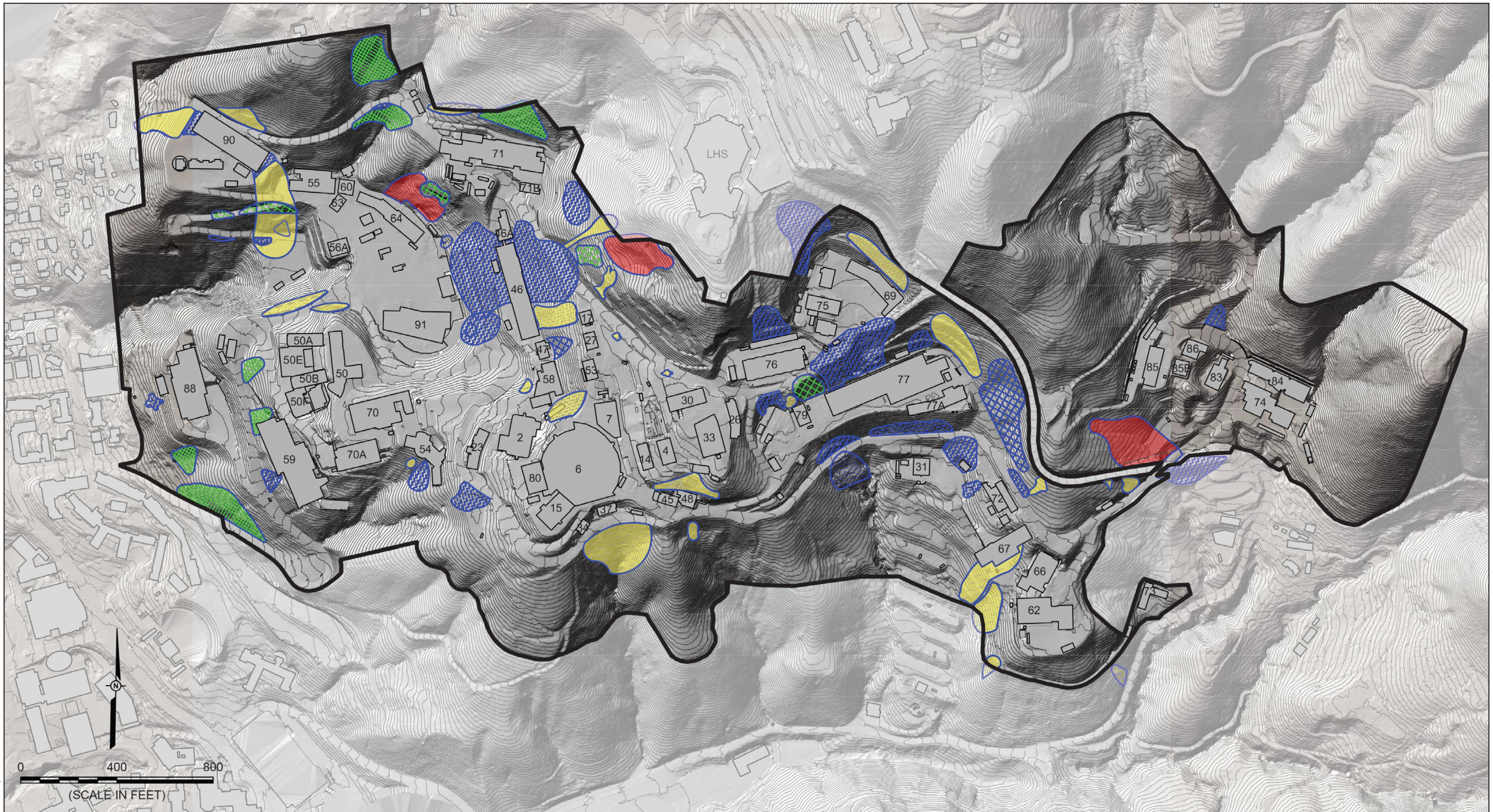
Active Fault Traces

Faults considered to have been active during Holocene time and to have potential for surface rupture: Solid Line where Accurately Located

Notes:

1. Base Map: California Geological Survey, Earthquake Zones Of Required Investigation, Richmond, Briones Valley, Oakland West and Oakland East, California Quadrangles, February 14, 2003

Figure 4.6-4
Seismic Hazard Zone Map of the Berkeley Lab Campus



Landslide Risk

Low Risk

Medium Risk

High Risk

Repaired

Notes:

1. Lawrence Berkeley National Laboratory (LBNL), 1999, "Slope Stability Evaluation Map, Lawrence Berkeley National Laboratory, University of California," drawn by C. Zack, date 8/94 (Revised 3/99)

Figure 4.6-5
Slope Stability Map of the Berkeley Lab Campus

Rockslides and earth slides are the most common type of wet-weather landslides that occur on the campus. Earth/debris flows are relatively rare, with only one documented case (in 1982). Of the landslides that have occurred historically in steep cut slopes, most involved rotational/transitional soil/rockslides. Since the mid-1980's, wet weather landsliding has become less severe and less frequent on the campus, with the only large landslide (the Wilson landslide) occurring in 2012, during a period of exceptionally heavy and prolonged early winter rains.

Liquefaction

Liquefaction is a form of earthquake-induced ground failure that occurs when relatively shallow, loose, granular, water-saturated soils behave similar to a liquid when subject to high-intensity ground shaking. Liquefaction occurs when three general conditions exist: (1) shallow [50 feet below ground surface (bgs) or less] groundwater; (2) low-density non-cohesive (granular) soils; and (3) high-intensity ground motion. Liquefaction is typified by a buildup of pore-water pressure in the affected soil layer to a point where a total loss of inherent shear strength occurs, thus causing the soil to behave like a liquid. Saturated, loose to medium-dense, near-surface non-cohesive soils and cohesive soils exhibit the highest liquefaction potential. Liquefaction usually results in horizontal and vertical movement of soils from lateral spreading (i.e., lateral displacement of gently sloping ground) of liquefied materials and post-earthquake settlement of liquefied materials. The effects of liquefaction on level ground include potential seismic settlement, sand boils, ground oscillation, and bearing capacity failures below structures.

The CGS has not designated any portion of the campus as a Seismic Hazard Zone for liquefaction, as shown on Figure 4.6-4. While liquefaction hazards can be present in areas underlain by shallow groundwater and poorly engineered fill or alluvial materials, the thin soil profile on hillside slopes and shallow bedrock serve to minimize potential liquefaction hazards on the campus.

Seismically Induced Settlement

Settlement of the ground surface can be accelerated and accentuated by earthquakes. During an earthquake, settlement can occur because of the relatively rapid compaction and settling of subsurface materials (particularly loose, uncompacted, and variable sandy sediments above the water table) due to the rearrangement of soil particles during prolonged ground shaking. Settlement can occur both uniformly and differentially (i.e., where adjoining areas settle at different amounts). Areas susceptible to earthquake-induced settlement would include those underlain by thick layers of colluvial material or artificial fill. The soil profile throughout the campus is relatively shallow due to steep slopes, although natural drainages contain thicker deposits of colluvial and, to a lesser degree, alluvial materials.

Other Geologic Hazards

Expansive Soils

Expansive soils are soils that exhibit what is described as "shrink-swell" behavior because they include clay minerals characterized by their ability to undergo significant volume change (shrink or swell) due to variation in moisture content. Typically, soils that exhibit expansive characteristics comprise the upper 5 feet of the surface. Sandy soils are generally not expansive, while clayey soils have a higher potential to be expansive. Changes in soil moisture content can result from rainfall, irrigation, pipeline leakage, perched groundwater, drought, or other factors. Volumetric change of expansive soils may cause excessive cracking and heaving of structures with shallow foundations, concrete slabs-on-grade, or pavements supported on these materials over long periods of cyclical changes in volume. Structural damage is usually the result of inadequate soil and foundation engineering or the placement of structures directly on expansive soils.

The soils that underlie the majority of the campus (Xerorthens-Millsholm complex) are not expansive soils, due to their low percentage of fine-grained materials (clays) (NRCS, 2023). Similarly, the soils that underlie the eastern and southwestern portions of the campus possess a low to moderate shrink-swell potential. However, the Altamont Clay that underlies much of the slopes on the southern-central portion of the campus is a highly expansive soil and shrink-swell hazards are present in this area (NRCS, 2023). It should be noted that no expansive soils have been encountered during construction of any prior developments on the campus.

Soil Erosion

Erosion is the wearing-away of soil and rock by processes such as mechanical or chemical weathering, mass wasting, and the action of waves, wind, and underground water. Excessive soil erosion can eventually lead to the damage of building foundations and roadways. In general, areas that are most susceptible to erosion are those that would be exposed during the construction phase when earthwork activities disturb soils and require stockpiling. Typically, soil erosion potential is reduced once the soil is graded and covered with concrete, structures, asphalt, or landscaping. However, changes in drainage patterns can also cause areas to be susceptible to the effects of erosion. Soils throughout the campus are highly susceptible to soil erosion due to the campus's steeply sloping topography, particularly when vegetation and surficial material is stripped for construction purposes.

Paleontological Resources and Unique Geologic Features

Paleontological resources are the mineralized (fossilized) remains of prehistoric plants and animals, including body fossils, such as bones, bark or wood, and shell, as well as trace fossils, such as shell, leaf, skin, or feather impressions, footprints, burrows, or other evidence of an organism's life or activity. These resources are located within sedimentary rocks or alluvium and are considered to be nonrenewable. Unique geologic features are distinctive and uncommon geologic features that provide a key piece of geologic information important in geology (e.g., the Grand Canyon or Devils Postpile).

The campus does not contain any known unique paleontological resources or unique geologic features (LBNL, 2007). During the course of past development on the campus, extensive excavations for buildings and infrastructure have not revealed the presence of unique paleontological or geologic resources.

4.6.3 Regulatory Framework

Federal

US Department of Energy

DOE-STD-1020-2016, Natural Phenomena Hazards Analysis and Design Criteria for DOE Facilities

U.S. Department of Energy (DOE) Standard (STD) 1020-2016, approved in December 2016, has three purposes: (1) provide criteria and guidance for meeting the natural phenomena hazard (NPH) requirements of DOE Order (O) 420.1C, Chg. 1, Facility Safety; (2) ensure that structures, systems, and components in DOE facilities will perform assigned safety functions during and after design basis NPH events; and (3) provide requirements and guidance in the use of industry building codes and voluntary consensus standards in meeting NPH requirements. This Standard is applicable to all government-owned and government-leased nuclear and non-nuclear facilities and sites. The provisions of this Standard apply to new facilities, major modifications of existing facilities, and modifications of existing facilities triggered by periodic NPH assessments. This Standard addresses earthquakes and other NPH such as extreme winds, floods, lightning, and precipitation. Other NPH phenomena not considered in this Standard that may require analysis at certain sites include landslides, subsidence, surface collapse, and uplift.

State

Alquist-Priolo Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act (Public Resources Code Section 2621) was enacted by the State of California in 1972 to address the hazard of surface faulting to structures for human occupancy. The primary purpose of the Alquist-Priolo Earthquake Fault Zoning Act is to prevent the construction of buildings intended for human occupancy on the surface traces of active faults. The Alquist-Priolo Earthquake Fault Zoning Act is also intended to provide the citizens with increased safety and to minimize the loss of life during and immediately following earthquakes by facilitating seismic retrofitting to strengthen buildings against ground shaking.

The Alquist-Priolo Earthquake Fault Zoning Act requires the State Geologist to establish regulatory “earthquake fault zones” around the surface traces of active faults and to issue appropriate maps to assist cities and counties in planning, zoning, and building regulation functions. The Alquist-Priolo Earthquake Fault Zoning Act and its regulations are presented in CGS Special Publication (SP) 42, Earthquake Fault Zones (CGS, 2018). As discussed previously, most of the campus is not located within an Alquist-Priolo Fault Zone. However, the Hayward Fault Alquist-Priolo Zone traverses the western edge of the campus.

Seismic Hazards Mapping Act

In order to address the effects of strong ground shaking, liquefaction, landslides, and other ground failures due to seismic events, the State of California passed the Seismic Hazards Mapping Act of 1990 (Public Resources Code Sections 2690-2699). Under the Seismic Hazards Mapping Act, the State Geologist is required to delineate “seismic hazard zones.” Improvements located within a liquefaction or seismically induced landslide hazard area are required to adhere to CGS SP 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California (CGS, 2008).

California Building Standards Code

The 2022 California Building Code (CBC), Title 24 of the California Code of Regulations, is a compilation of building standards, including seismic safety standards, for new buildings. CBC standards are based on building standards that have been adopted by State agencies without change from a national model code; building standards based on a national model code that have been changed to address particular California conditions; and building standards authorized by the California legislature but not covered by the national model code. The CBC applies to all occupancies in California, except where stricter standards have been adopted by local agencies. The CBC is published on a triennial basis, and supplements and errata can be issued throughout the cycle. The 2022 CBC became effective on January 1, 2023.

University of California

University of California Seismic Safety Policy and UC Seismic Program Guidelines

The University of California updated its Seismic Safety Policy on March 19, 2021. The policy applies to University of California facilities within California.[6] The purpose of this policy is to provide an acceptable level of earthquake safety for students, employees, and the public who occupy University facilities located in California. All campuses must seek to characterize ground motions and identify geologic hazards considered at the location of a proposed new building or existing building that is a candidate for retrofit, in accordance with one or more of the methodologies specified in the CBC and through the California Seismic Hazards Mapping Act. The design and construction of University facilities must, at a minimum, comply with the current seismic provisions of the CBC for new buildings and with University policies.

The *UC Facilities Manual, UC Seismic Program Guidelines* are a current and central source of information regarding guidance for UC Seismic Safety Policy compliance. The *UC Seismic Program Guidelines* highlight and clarify portions of the policy but are not intended to be used as a substitute for the policy.

University of California Seismic Performance Rating (SPR) System

The UC Seismic Performance Rating (SPR) System is a method for assessing the earthquake resiliency of UC buildings and assigning them ratings based on the CBC. The SPR ratings are prepared for University facilities in conformance with the UC Seismic Safety Policy. In June 2018, UC launched a systemwide initiative to update its SPRs for buildings across California using new technology, scientific advances, and best practices. The ratings are as follows:

- SPR I–IV: Seismic safety policy compliant

6 Exceptions include 1) those facilities under the regulatory authority of the Office of Statewide Hospital Planning and Development or 2) K-12 schools or community college facilities built after 2018 under the regulatory authority of the Division of the State Architect.

- SPR V: Requires further evaluation and, if confirmed, must be addressed
- SPR VI: High-priority for correction
- SPR VII: Must be unoccupied and access-restricted

The ratings are based on a variety of factors, including the building's location, construction type, occupancy, and other risk factors. A higher SPR rating indicates more risk.

With the exception of Buildings 23, 30, and 59, which are UC-owned buildings, most of Berkeley Lab buildings are owned by the DOE and are therefore not subject to the UC SPR, and the UC SPR system is viewed as advisory for DOE-owned buildings.

UC LBNL

Berkeley Lab Requirements and Policy Manual

The Berkeley Lab Requirements and Policy Manual (RPM) is a collection of policies from the University of California and LBNL that help define the laboratory's operation. RPM Facilities Management section, Seismic Safety Policy Statement, indicates that Berkeley Lab designs and constructs its physical plant and program facilities to prevent the loss of life and minimize the risk of personal injury, program interruption, and property damage due to earthquakes. The RPM includes design requirements for new buildings and structures, physical plant facilities, critical emergency facilities, and enclosures and systems containing radioactive and other hazardous dispersible materials; and specifies design criteria for programmatic facilities. The RPM also includes land use restrictions for buildings and other structures with SPR Level V or Level VI.

Construction Details and Design Requirements Manual

The UC LBNL Construction Details and Design Requirements (CDDR) manual provides mandatory design constraints for compliance with federal and state codes, rules, regulations and UC LBNL standards for all construction projects at Berkeley Lab. The CDDR is divided into 4 volumes: Volume 1 of the CDDR contains UC LBNL's Administrative and Design Requirements for the project; Volume 2 contains the UC LBNL Master Specifications; Volume 3 contains the UC LBNL's standard drawing details; and Volume 4 contains the LBNL's Resource Documents for policies and requirements.

4.6.4 Impacts and Mitigation Measures

Significance Criteria

For purposes of this EIR, impacts related to geology and soils would be considered significant if they would exceed the Standards of Significance presented below, which are based on Appendix G of the *CEQA Guidelines*.

Would implementation of the LBNL 2025 LRDP:

a) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:

i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map, issued by the State Geologist for the area or based on other substantial evidence of a known fault;

ii) Strong seismic ground shaking;

iii) Seismic-related ground failure, including liquefaction; or

iv) Landslides;

b) Result in substantial soil erosion or the loss of topsoil;

c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse;

d) Be located on expansive soils[7] creating substantial direct or indirect risks to life or property;

e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water; or

f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature.

Criteria Not Analyzed

Based on the campus location and proposed 2025 LRDP characteristics, there would no impacts related to the following topics for the reasons described below:

- ***Septic systems*** or ***alternative wastewater disposal systems*.** Development facilitated by the proposed 2025 LRDP would not require septic systems or alternative wastewater disposal systems. No impact would occur.
- ***Paleontological Resources or Unique Geologic Features***. As discussed in Section 4.6.2, *Environmental Setting*, the Berkeley Lab campus does not contain any known unique paleontological resources or unique geologic features. During the course of development at Berkeley Lab, extensive excavations for buildings and infrastructure have not revealed the presence of unique paleontological or geologic resources. No impact would occur.

Approach to Analysis

The potential for significant impacts related to geology and soils from the construction and operation of facilities developed pursuant to the proposed 2025 LRDP was determined based on a review of the existing conditions, informed by data compiled by USGS, CGS, ABAG, and other available sources.

Development under the proposed 2025 LRDP would be regulated by the various laws, regulations, and policies summarized above in Section 4.6.3, *Regulatory Framework*. Compliance with applicable federal and state laws and regulations and University policies is assumed in this analysis and federal and state agencies would be expected to continue to enforce applicable requirements to the extent that they do so now.

[7] The CBC, based on the International Building Code and the now defunct Uniform Building Code, no longer includes a Table 18-1-B. Instead, Section 1803.5.3 of the CBC describes the criteria for analyzing expansive soils.

After considering the proposed 2025 LRDP implementation described in Chapter 3, *Project Description*, and compliance with the required regulatory requirements, the environmental analysis below identifies if the defined significance thresholds would be exceeded and, therefore, a significant impact would occur. For those impacts considered to be significant, mitigation measures are identified to the extent feasible to reduce the identified impacts.

In 2015, the California Supreme Court held that CEQA generally does not require a lead agency to consider the impacts of the existing environment on the future residents or users of a project [*California Building Industry Association v. Bay Area Air Quality Management District* (2015) 62 Cal. 4th 369.]. However, if a project exacerbates a condition in the existing environment, the lead agency is required to analyze the impact of that exacerbated condition on the environment, which may include future occupants of the project. As stated in *Ballona Wetlands Land Trust v. City of Los Angeles* (2011) 201 Cal.App.4th 455, 473: "[T]he purpose of an EIR is to identify the significant effects of a project on the environment, not the significant effects of the environment on the project." The effects of preexisting hazards on users of the proposed 2025 LRDP development are thereby not considered environmental impacts under CEQA. Nevertheless, discussion related to potential increased exposure of people or structures to seismic risks and location of people or structures on unstable geologic units as a result of proposed 2025 LRDP development is included in this section for informational purposes.

Impact Analysis

LRDP Impact GEO-1: Implementation of the LBNL 2025 LRDP would directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault. (*Potentially Significant; Less than Significant with Mitigation*)

As discussed above in Section 4.6.2, *Environmental Setting*, the Hayward Fault Alquist-Priolo Zone traverses the western edge of the campus. There are no aspects of construction or operation that would occur under the proposed 2025 LRDP that would induce or exacerbate the potential for a rupture of this earthquake fault on the campus. Consequently, implementation of the LBNL 2025 LRDP would not directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault, and the impact would be less than significant. However, the proposed 2025 LRDP would increase the potential for new development and increase population within or in the vicinity of this fault zone, and the potential direct or indirect risks to people and structures are described herein.

Potential construction of any building for human occupancy on the campus under the proposed 2025 LRDP that may be located within the Hayward Fault Alquist-Priolo Zone would require the preparation of a Fault Rupture Hazard Investigation, in compliance with CGS Publication 49, *Guidelines for Evaluating the Hazard of Surface Fault Rupture* (CGS, 2002c). The proposed placement of an occupiable structure would be restricted based on the results of this study, which would effectively prevent the siting of occupiable structures on known, active traces of the Hayward Fault. Furthermore, the UC Seismic Safety Policy states that any geotechnical investigation for a University project must be performed by, or in consultation with a Consulting Geotechnical Engineer (CGE), and must include consideration of the potential for surface faulting. In addition, any existing campus building demolition or renovation, or new UC-owned building construction under the proposed 2025 LRDP would be subject to the seismic safety requirements of the UC Seismic Safety Policy. Any new building construction on the campus under the proposed 2025 LRDP that would be DOE-owned would be required to comply with DOE Order O 420.1C and Standard STD-1020, which also meet the seismic safety requirements of the UC Seismic Safety Policy. The Lab's compliance with the requirements of the CGS, Alquist-Priolo Act, UC Seismic Safety Policy, and any applicable DOE seismic policies and standards would ensure the potential for effects from fault rupture hazards on new building construction would be minimized.

Ancillary features such as parking lots, roadways, sidewalks, and utility infrastructure, however, are not bound by the restrictions of the Alquist-Priolo Act, or above-described UC and DOE building regulations. Construction of these features within the Hayward Fault Alquist-Priolo Zone under the proposed 2025 LRDP could result in significant hazards, primarily if they were to result in complications during emergency conditions. In the unlikely event that fault rupture occurred on the campus as a result of an earthquake on the Hayward Fault, potential damage could include damaged utilities, cracked pavement, or roadway failure on Cyclotron Road, which could hinder or prevent emergency access to Berkeley Lab through the Blackberry Gate. This would be considered a potentially significant impact; mitigation to address this impact is presented below.

As discussed in Section 4.6.2, *Environmental Setting,* the Wildcat and East Canyon faults traverse the eastern portion of Berkeley Lab. However, prior studies have classified these faults as not active. As a consequence, fault rupture associated with the Wildcat and East Canyon faults is considered unlikely.

LRDP Mitigation Measure GEO-1: Alternative Emergency Access Routes

Within six months of the adoption of the proposed 2025 LRDP, seismic emergency response and evacuation plans for Berkeley Lab shall be updated to address potential inaccessibility of the Blackberry Gate and identify alternative ingress and egress routes for emergency vehicles and facility employees in the event of Cyclotron Road failure from surface fault rupture.

Significance after Mitigation: Less than Significant. Implementation of the above mitigation measure would reduce the potential impact associated with surface fault rupture on the Hayward Fault to a less-than-significant level.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the 2025 LRDP is expected to be similar in intensity and character to that portrayed in this scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of seismic hazards such as fault rupture. The Illustrative Development Scenario does not place any new buildings within the Hayward Fault Alquist-Priolo Zone. As a result, there would be no impact related to potential fault rupture hazard associated with new building construction under the Illustrative Development Scenario. Similar to that described under the 2025 LRDP impact above, ingress and egress via Blackberry Gate could be affected by fault rupture on Hayward Fault. However, it would be mitigated to a less-than-significant level with implementation of LRDP Mitigation Measure GEO-1. Furthermore, all development and construction reflected in the Illustrative Development Scenario would be subject to compliance with applicable regulatory requirements ensuring risks from fault rupture would be minimized.

LRDP Impact GEO-2: Implementation of the LBNL 2025 LRDP would not directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking. (*Less than Significant*)

As discussed above in Section 4.6.2, the Bay Area region is considered seismically active and will likely experience a substantive regional earthquake within the time horizon of the proposed 2025 LRDP. There are no aspects of the proposed 2025 LRDP implementation itself that would cause or exacerbate seismic ground shaking hazards, and consequently this impact would be less than significant.

However, given the proximity of Berkeley Lab to the Hayward Fault and other regional faults, there is a potential for very violent ground shaking to occur within the campus associated with a substantial regional earthquake. The intensity of such an event would depend on the causative fault and the distance to the epicenter, the magnitude, the duration of shaking, and the nature of the geologic materials on which the new development under the proposed 2025 LRDP would be constructed. Intense ground shaking and high ground accelerations would affect the entire area and the primary and secondary effects of ground shaking could include damage to structural foundations, distortion or breaking of infrastructure, and placing people at risk of injury or death. Implementation of the proposed 2025 LRDP would result in 574,000 gross square feet (gsf) of gross new building development on the campus (and 295,500 gsf net building development, after 278,500 gsf of demolition), and an increase in adjusted daily population on the campus of approximately 1,200 persons, including staff and visitors. This new development and increased daily population would be subject to considerable seismic ground shaking from a substantive earthquake. Many of the existing Berkeley Lab buildings on the campus designated with a SPR V (formerly classified as “poor”) and SPR VI (formerly classified as “very poor”) seismic ratings under the UC SPR System would be candidates for demolition or seismic retrofitting under the proposed 2025 LRDP. This would serve to remove or reduce existing seismic risks on the campus that certain campus buildings currently pose, and consequently, there would be a beneficial effect.

As discussed in Section 4.6.3, *Regulatory Framework*, above, new construction under the proposed 2025 LRDP would be required to comply with the CBC, UC Seismic Safety Policy and UC Seismic Program Guidelines, LBNL CDDG, and applicable federal standards. In compliance with the CBC and LBNL CDDG, for all structural improvements and associated improvements that would occur under the proposed 2025 LRDP, design-level geotechnical evaluations would be required to be prepared and implemented prior to final design and construction of individual projects. The final design-level geotechnical evaluations would include any necessary recommendations for site preparations (e.g., compaction requirements, engineered fill criteria, and moisture limitations) and/or foundation systems necessary to reduce seismic-related hazards to less than significant levels consistent with the applicable seismic design criteria of the CBC. The CBC describes required standards for the construction, alteration, movement, replacement, location, and demolition of buildings, structures and associated appurtenances, including earthquake and structural design requirements. The geotechnical engineer for a building project, as a registered professional with the State of California, is required to comply with the CBC while applying standard engineering practice and the appropriate standard of care for anticipated seismic events.

With compliance with the applicable federal and State regulatory requirements and the implementation of geotechnical design recommendations consistent with seismic design criteria, the impact related to seismic ground shaking associated with earthquakes that may occur at the Berkeley Lab campus would be minimized and would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of seismic hazards such as ground shaking. Potential future projects, such as those hypothetically identified in the Illustrative Development Scenario, would expose people and structures to seismic hazards such as ground shaking for the reasons stated above. However, with regulatory requirements compliance and implementation of geotechnical design recommendations consistent with seismic design criteria, the impact related to seismic shaking that may occur at Berkeley Lab under development conditions shown in the Illustrative Development Scenario would be minimized and would be less than significant.

In addition, the majority of the existing Berkeley Lab buildings on the campus that have poor to very poor seismic ratings under the UC SPR System are expected to be demolished as reflected in the Illustrative Development Scenario, including, but not limited to, Buildings 60 and 64 (Life Sciences and Earth Sciences), Building 70 (Energy and Environmental / Nuclear Sciences), Building 46 (Laboratory and Engineering Division Offices), Building 58 (Heavy Ion Fusion Accelerator Research), Building 27 (Dry Lab and Offices), Building 17 (Shop Assembly), Building 53 (High Lab Shops and Offices), Building 75B (Environmental Health and Safety), and Building 83 (Life Sciences Laboratory). Other existing buildings on the campus with poor to very poor seismic ratings that would remain would be candidates for seismic renovation. This would serve to remove or reduce existing seismic risks on the campus that certain campus buildings currently pose, and consequently, there would be a beneficial effect.

LRDP Impact GEO-3: Implementation of the LBNL 2025 LRDP would not directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving earthquake-induced landsliding. (*Less than Significant*)

As discussed above in Section 4.6.2, *Environmental Setting,* Berkeley Lab contains areas designated by CGS as being within an earthquake-induced landslide zone. While there is no direct evidence of landsliding on the campus that has been triggered by an earthquake on any of the Bay Area faults (including the Hayward Fault, which has the greatest potential to produce future earthquake-induced landslides on the campus), these campus areas are nevertheless determined to be prone to slope instability from an earthquake. If new development is proposed in these areas, measures that are consistent with established practice would be required to reduce landsliding risk to acceptable levels.

As discussed above, individual projects under the proposed 2025 LRDP would be required to adhere to seismic design criteria of the CBC, as well as comply with UC Seismic Safety Policy and UC Seismic Program Guidelines, UC LBNL CDDG, and applicable federal standards. In addition, sites located within the CGS seismic hazard zone for landsliding would be subject to comply with CGS Publication 117A, *Guidelines for Evaluating and Mitigating Seismic Hazards*. Design-level geotechnical investigations for individual projects will be completed to identify both site preparation measures (e.g., slope stabilization procedures) and foundation design measures in a final design-level geotechnical report. Implementation of the recommendations in the final design-level report would ensure that any impacts from potential landsliding induced by seismic activity would be minimized.

As a result, the potential impacts of development under the proposed 2025 LRDP related to earthquake-induced landsliding would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of seismic hazards such as earthquake induced landsliding. The Illustrative Development Scenario poses several hypothetical new buildings within areas of the campus designated by CGS as being within an earthquake-induced landslide zone, including the proposed BioGEM Building, Bayview Buildings 4 and 5, Building 71 Expansion and Laser Linear Accelerator Tunnel, Modular General Purpose Computing Facility, Flex Building, and Modular Utility Plant (MUP). Such future projects would have the potential to expose people and structures to seismic hazards such as earthquake-induced landsliding for the reasons stated above. However, with compliance with the regulatory requirements and the implementation of geotechnical design recommendations consistent with seismic design criteria described above, the impact related to earthquake-induced landslides under conditions posed in the Illustrative Development Scenario would be less than significant.

LRDP Impact GEO-4: Implementation of the LBNL 2025 LRDP would not directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction. (*Less than Significant*)

As discussed in Section 4.6.2, *Environmental Setting*, Berkeley Lab is not located within a CGS Seismic Hazard Zone for liquefaction as defined by the Seismic Hazards Mapping Act. The thin soil profile on hillside slopes and shallow bedrock serve to minimize potential liquefaction hazards on the campus. Nevertheless, liquefaction hazards may be present on the campus in areas underlain by shallow groundwater and poorly engineered fill or alluvial materials.

If present and not addressed adequately during site preparation for new construction under the proposed 2025 LRDP, liquefiable subsurface materials can cause ground failures and differential settlement that can lead to substantive structural damage. Lateral spreading, a phenomenon related to liquefaction where liquefiable materials can be displaced on exposed slopes, can also occur. As discussed above, individual projects under the proposed 2025 LRDP would adhere to CBC seismic design criteria and would comply with the UC Seismic Safety Policy, UC Seismic Program Guidelines, and LBNL CDDR, as well as applicable federal standards. Therefore, design-level geotechnical investigations for individual projects would be completed to identify both site preparation measures (e.g., use of engineered fill or treatment of liquefiable soils) and foundation design measures in a final design-level geotechnical report. Implementation of the recommendations in the final design-level report would ensure that any potential for liquefaction as well as any associated ground failure induced by seismic activity would be minimized.

As a result, the potential impact of development under the proposed 2025 LRDP related to liquefaction or other seismic-related ground failure would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of seismic hazards such as seismic-related ground failure, including liquefaction. Potential future projects, such as those hypothetically identified in the Illustrative Development Scenario, would expose people and structures to seismic hazards such as seismic-related ground failure, including liquefaction, for the reasons stated above. However, with compliance with the regulatory requirements and the implementation of geotechnical design recommendations consistent with seismic design criteria described above, the impact related to seismic-related ground failure, including liquefaction, that may occur at Berkeley Lab under the Illustrative Development Scenario would be less than significant.

LRDP Impact GEO-5: Implementation of the LBNL 2025 LRDP would not have the potential to result in substantial erosion or the loss of topsoil. (*Less than Significant*)

The areas of Berkeley Lab, where the majority of proposed ground disturbing activities under the proposed 2025 LRDP would occur, are in areas that have already been developed and native topsoil is no longer present. However, the proposed 2025 LRDP would also involve excavation and grading, including for cut and fill activities, to accommodate building foundations, and for installation of utilities and other infrastructure. Erosion of exposed soils can occur because of the forces of wind or water and could be worsened during these ground disturbing activities.

Projects that disturb more than one acre of land during construction are required to file a Notice of Intent with the State Water Resources Control Board (SWRCB) to be covered under the NPDES CGP for discharges of stormwater associated with construction activity (discussed further in Section 4.9, *Hydrology and Water Quality*). For projects greater than one acre in size, the CGP requires the preparation and implementation of a Stormwater Pollution Prevention Plan (SWPPP), which would include erosion control measures in the form of best management practices (BMPs) that would be effective in reducing the potential for erosion during construction. BMPs would include, but would not be limited to, filtering runoff during construction, avoiding heavy grading and earthwork operations during the rainy season, and incorporating landscaping as early as possible. Once construction is completed for each project under the proposed 2025 LRDP, the area of disturbance would be either covered by a structure, road, or pathway, or landscaped such that the potential for erosion is minimized. Construction projects less than 1 acre in size at Berkeley Lab would be regulated under the UC LBNL's Industrial General Permit, which would similarly require the implementation of appropriate BMPs to minimize potential for erosion during construction.

Therefore, with adherence to existing regulatory requirements that would require implementation of erosion control BMPs during construction, the potential impact related to erosion or loss of topsoil would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of the potential for substantial erosion or the loss of topsoil. Potential future projects, such as those hypothetically identified in the Illustrative Development Scenario, have the potential to result in substantial erosion or the loss of topsoil, for the reasons stated above. However, with compliance with the regulatory requirements, the impact of development shown under the Illustrative Development Scenario related to substantial erosion or the loss of topsoil would be less than significant.

LRDP Impact GEO-6: Development under the LBNL 2025 LRDP would not be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse. (*Less than Significant*)

Implementation of the proposed 2025 LRDP would involve the development of individual projects on Berkeley Lab, primarily within areas that have already been developed. Existing structures within the campus range in age and were constructed under different stages of building code requirements and often involved undocumented site preparation measures. Underlying subsurface materials likely include a variety of geotechnical conditions that could include artificial fills and other compressible soils or conditions that are otherwise unsuitable for new construction or redevelopment without adequate site preparations. However, with conformance to the applicable regulatory requirements and a required design-level geotechnical report that includes recommendations for site preparation and foundation design, the potential impact related to unstable soils would be less than significant.

Unstable slopes could also be created by excavations for new development proposed under the proposed 2025 LRDP that could result in on- or off-site landslides. However, as noted above, all construction activities would be required to adhere to CBC requirements and the LBNL CDDG as well as to comply with applicable federal standards. As such, measures would be included to ensure that excavations are adequately protected from instability, largely through shoring requirements, that would be effective in minimizing the potential for on- or off-site landslides. Therefore, with conformance to the applicable regulatory requirements and a required design-level geotechnical report that includes recommendations for excavation stability, the potential impact related to landslides and sidewall stability would be less than significant.

Lateral spreading, a phenomenon related to liquefaction where liquefiable materials can be displaced on exposed slopes, and liquefaction are addressed in LRDP Impact GEO-4, above. Adherence to applicable CBC, UC and federal requirements, and implementation of the recommendations of the design-level geotechnical report would be sufficient to minimize the impact of lateral spreading and liquefaction hazards, if present, to a less-than-significant level. Similarly, implementation of design-level criteria to geotechnical site preparation and foundation design would ensure that the impact related to subsidence or collapse associated with unstable soils and/or geologic unit would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of the impact related to unstable soils that could potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse. Potential future projects, such as those hypothetically identified in the Illustrative

Development Scenario, could be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the projects, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse. However, with compliance with the regulatory requirements discussed above and the implementation of geotechnical design recommendations, the impact related to new development being located on unstable soils that could potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse would be less than significant.

LRDP Impact GEO-7: Development under the LBNL 2025 LRDP would be located on expansive soils but would not cause substantial direct or indirect risks to life or property. (*Less than Significant*)

As discussed in Section 4.6.2, *Environmental Setting*, most of the soils that underlie Berkeley Lab are not expansive, due to their low percentage of fine-grained materials (clays). However, clayey soils underlie much of the southern portion of the campus, which are highly expansive and present shrink-swell hazards.

Expansive soils are commonly addressed in required geotechnical evaluations of onsite geotechnical hazards, and past geotechnical investigations at the campus site have not revealed the presence of expansive soils. Furthermore, the University requires all new facilities to adhere to the current CBC, which includes detailed provisions to ensure that the design of new facilities is appropriate to site soil conditions, including requirements to address expansive and otherwise problematic soils. With adherence to applicable CBC, UC and federal requirements, the impact related to site soil conditions, including but not limited to expansive soils, would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP would be similar in intensity to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of expansive soils. Potential future projects such as those hypothetically identified in the Illustrative Development Scenario could be located on expansive soils. However, with compliance with the regulatory requirements as described above, and the implementation of geotechnical design recommendations, the impact related to new development being located on expansive soils would be less than significant.

Cumulative Impacts

LRDP Impact CUM-GEO-1: Implementation of the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, would not result in significant cumulative impacts related to geology and soils. (*Less than Significant*)

The geographic scope for the analysis of the cumulative impacts related to seismicity is the greater Bay Area. As noted above, the Bay Area is considered to have a high probability of a substantive earthquake occurring over the next 30 years. Development of the campus under the proposed 2025 LRDP along with the other cumulative projects in the Bay Area would not directly or indirectly exacerbate those seismic risks. However, current and future project development at Berkeley Lab and elsewhere in the entire Bay Area region could expose additional people and structures to potentially adverse effects associated with earthquakes, including seismic ground shaking, seismic related liquefaction, and seismically induced landslides.

For developments in the Bay Area cities, these hazards would be minimized through implementation of and compliance with adopted General Plan policies, building codes, and regulations. Site-specific geotechnical studies required by the local agencies that typically adopt CBC seismic requirements (and in the case of the adjacent UC Berkeley campus, additional UC seismic requirements) would determine how future development projects could be designed to minimize exposure of people to these impacts. Therefore, future development will be constructed, and current development is being constructed, in compliance with standards that provide greater protection than those governing older structures throughout the region. Other current and future Bay Area projects would similarly be required to adhere to the latest building standards based on the most current scientific and geotechnical understanding of seismic hazards. In this way, regional projects would minimize cumulative effects from seismic-related damage or injury.

Ground disturbing activities could expose soils in a manner that lead to increased erosion if not managed properly. Such erosion could cause unstable ground surfaces and result in eventual damage to roads, foundations, and other improvements. Cumulative effects of increased erosion on receiving water quality are addressed in Section 4.9, *Hydrology and Water Quality*, Impact CUM-HYD-1. Construction activities at Berkeley Lab, as well as other current and future cumulative projects greater than 1 acre in size, which would apply to the vast majority of the cumulative projects, would be required to comply with the NPDES Construction General Permit, which contains erosion control requirements that would minimize soil erosion potential. The NPDES program requires the preparation and implementation of construction activity SWPPPs that include BMPs that ensure construction erosion control measures. All cumulative projects, including the proposed 2025 LRDP, would be required to comply with these regulations, as would other nearby reasonably foreseeable development and other construction projects. In addition, once construction is completed, the cumulative projects generally include the cover of site soils with either landscaping or impervious surfaces, which limits the potential for erosion.

For the reasons stated above, the geology and soils-related cumulative impacts of the proposed 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. For the reasons stated above, future projects consistent with those identified in the Illustrative Development Scenario, when combined with other LRDP projects and other development in the region, would result in geology and soils-related cumulative impacts that would be less than significant.

4.6.5 References

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4.7 Greenhouse Gas Emissions

4.7.1 Introduction

This section describes and evaluates the potential for proposed 2025 LRDP implementation to result in significant impacts related to greenhouse gas (GHG) emissions and global climate change. The section includes a description of existing regional and local conditions; includes a summary of University plans and policies and applicable federal and State laws and regulations related to GHGs; presents the significance criteria used to evaluate the impact significance of the Project's GHG emissions; and presents the results of the impact assessment, including any significant impacts and associated feasible mitigation measures. The proposed Project is also evaluated for consistency with plans and policies of the State of California, the University of California, and *Plan Bay Area 2050* related to GHG emissions and climate change.

4.7.2 Environmental Setting

Climate Science

"Global warming" and "climate change" are common terms used to describe the increase in the average temperature of the earth's near-surface air and oceans since the mid-20th century and related changes in global climate. Natural processes and human actions have been identified as affecting the climate. The Intergovernmental Panel on Climate Change (IPCC) has concluded that variations in natural phenomena such as solar radiation and volcanoes produced most of the warming from pre-industrial times to 1950. However, increasing GHG concentrations resulting from human activity since the 19th century, such as fossil fuel combustion, deforestation, and other activities, have been demonstrated to be a major factor in causing global climate change. GHGs in the atmosphere naturally trap heat by impeding the exit of solar radiation that is received by the Earth and is reflected back into space—a phenomenon referred to as the "greenhouse effect." Some GHGs occur naturally and are necessary for keeping the Earth's atmosphere warm and its surface inhabitable. However, increases in the concentrations of these atmospheric gases during the last 100 years cause solar radiation to be trapped and decrease the amount of radiation that is reflected into space, intensifying the natural greenhouse effect, and resulting in the increase of global average temperature.

Greenhouse Gases

Carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6) are the principal GHGs. When concentrations of these gases exceed historical concentrations in the atmosphere, the greenhouse effect is intensified. CO_2, CH_4, and N_2O occur naturally and are also generated through human activity. Emissions of CO_2 are largely by-products of fossil fuel combustion, whereas CH_4 results from off-gassing, natural gas leaks from pipelines and industrial processes, and incomplete combustion associated with agricultural practices, landfills, energy providers, and other industrial facilities. N_2O emissions are also largely attributable to agricultural practices and soil management. Other human-generated GHGs such as HFCs, PFCs, and SF6 are byproducts of certain industrial processes.

CO_2 is the reference gas for climate change, as it is the GHG emitted in the highest volume. The effect that each of the GHGs have on global warming is the product of the mass of their emissions and their global warming potential (GWP). GWP indicates how much a gas is predicted to contribute to global warming relative to how much warming would be predicted to be caused by the same mass of CO_2. For example, CH_4 and N_2O are substantially more potent GHGs than CO_2, with GWPs of 25 and 298 times that of CO_2 respectively, which has a GWP of 1 (California Air Resources Board [CARB], 2024a).

In emissions inventories, GHG emissions are typically reported as metric tons (MT)[1] of CO_2 equivalent (CO_2e). CO_2e is calculated as the product of the mass emitted of a given GHG and its specific GWP. While CH_4 and N_2O have much higher GWPs than CO_2, CO_2 is emitted in higher quantities and it accounts for the majority of GHG emissions in CO_2e, both from land development and human activity in general.

Carbon Dioxide

CO_2 is a naturally occurring gas that enters the atmosphere through natural as well as anthropogenic (human) sources. Key anthropogenic sources include the burning of fossil fuels (e.g., oil, natural gas, and coal), solid waste, trees, wood products, and other biomass, as well as industrially relevant chemical reactions such as those associated with manufacturing cement. CO_2 sinks include vegetation and the ocean, which absorb CO_2 through sequestration and dissolution, and are two of the largest reservoirs of CO_2 sequestration. In other words, CO_2 is removed from the atmosphere when it is absorbed by plants and the ocean as part of the biological carbon cycle.

Methane

CH_4 is the main component of natural gas used for home heating and cooking and occurs naturally from decay of organic matter. Natural sources of CH_4 include wetlands, permafrost, oceans, and wildfires. Anthropogenic sources include fossil fuel production, biomass burning, animal husbandry (fermentation during manure management), and landfills.

Nitrous Oxide

N_2O is a colorless gas produced by microbial processes in soil and water, including those reactions that occur in nitrogen-rich fertilizers. In addition to agricultural sources, some industrial processes (i.e., nylon production, nitric acid production) also emit N_2O. During combustion, oxides of nitrogen emissions composed of nitrogen dioxide and nitrogen oxide are produced, which are air quality pollutants, but not the same as N_2O. Very small quantities of N_2O may be formed during fuel combustion by reaction of nitrogen and oxygen.

Effects of Global Climate Change

The scientific community's understanding of the fundamental processes responsible for global climate change has improved over the past decade, and its predictive capabilities are advancing. However, there remain scientific uncertainties in, for example, predictions of local effects of climate change, occurrence, frequency, and magnitude of extreme weather events, effects of

1 The term metric ton is commonly used in the U.S. to refer to the metric system unit, tonne, which is defined as a mass equal to 1,000 kilograms. A metric ton is approximately 1.1 short tons and approximately 2,204.6 pounds.

aerosols, changes in clouds, shifts in the intensity and distribution of precipitation, and changes in oceanic circulation. Due to the complexity of and inability to accurately model Earth's climate system, the uncertainty surrounding climate change may never be eliminated completely. Nonetheless, the IPCC's Sixth Assessment Report (AR6) states that is highly likely that the dominant cause of the observed warming since the mid-20th century is the anthropogenic increase in GHG concentrations (IPCC, 2023). The National Academies of Science from 80 countries have issued statements endorsing the consensus position that humans are the dominant cause for global warming since the mid-20th century (Cook et al., 2016).

The Fourth California Climate Change Assessment (Fourth Assessment), published in 2018, found that the potential impacts in California due to global climate change include: loss in snow pack; sea-level rise; more extreme heat days per year; more high ozone days per year; more extreme forest fires; more severe droughts punctuated by extreme precipitation events; increased erosion of California's coastlines and sea water intrusion into the Sacramento and San Joaquin Deltas and associated levee systems; and increased pest infestation (Office of Planning & Research [OPR], California Energy Commission [CEC], California Natural Resources Agency [CNRA], 2019). The Fourth Assessment's findings are consistent with climate change studies published by the CNRA since 2009, starting with the *California Climate Adaptation Strategy* (CNRA, 2009) as a response to the Governor's Executive Order (EO) S-13-2008. In 2014, the CNRA rebranded the first update of the 2009 adaptation strategy as the *Safeguarding California Plan* (CNRA, 2014). In 2016, the CNRA released *Safeguarding California: Implementation Action Plans* in accordance with EO B-30-15, identifying a lead agency to lead adaptation efforts in each sector (CNRA, 2016). The 2018 update to *Safeguarding California Plan* identifies hundreds of ongoing actions and next steps state agencies are taking to safeguard Californians from climate impacts within a framework of 81 policy principles and recommendations (CNRA, 2018).

In accordance with the 2009 *California Climate Adaptation Strategy*, the CEC was directed to develop a website on climate change scenarios and impacts that would be beneficial for local decision makers. The website, known as Cal-Adapt, has been operational since 2011. The information provided on the Cal-Adapt website represents a projection of potential future climate scenarios composed of local average values for temperature, sea-level rise, snowpack and other data representative of a variety of models and scenarios, including potential social and economic factors. Below is a summary of some of the potential effects that could be experienced in California as a result of global warming and climate change.

Temperature Increase

The primary effect of adding GHGs to the atmosphere has been a rise in the average global temperature. The impact of human activities on global temperature is readily apparent in the observational record.

Earth's average land and ocean surface temperature in 2023 was 2.12°F (Fahrenheit) above the 20th century—the highest global temperature among all years in NOAA's 1850-2023 climate record. It also beats the next warmest year, 2016, by a record-setting margin of 0.27°F. The 10 warmest years since 1850 have all occurred in the past decade and the average global temperature for 2023 exceeded the pre-industrial (1850–1900) average by 2.43°F. Looking ahead, the NOAA estimates there is a one-in-three chance that 2024 will be warmer than 2023, and a 99 percent chance that 2024 will rank among the top five warmest years (National Oceanic and Atmospheric Association [NOAA], 2024).

The contiguous U.S. average maximum (daytime) temperature for 2023 was 66.2°F, 2.2°F above the 20th century average, ranking eighth warmest in the historical record (NOAA, 2024). The California Climate Adaptation Strategy projects climate change impacts to California. Average annual temperature increases experienced over most of California have already exceeded 1°F, with some areas exceeding 2°F, when comparing the average from 1901-1960 to 1986-2016. The daily maximum average temperature, an indicator of extreme temperature shifts, is expected to rise 4.4°F–5.8°F by 2050 and 5.6°F–8.8°F by 2100. Heat-Health Events (HHEs), which better predict risks to populations vulnerable to heat, will worsen drastically throughout the state. By 2050, the Central Valley is projected to experience average HHEs that are two weeks longer, and HHEs could occur four to 10 times more often in the Northern Sierra region (CNRA, 2022).

With climate change, extreme heat conditions and heat waves are predicted to impact larger areas, last longer, and involve higher temperatures. Heat waves, defined as three or more days with temperatures above 90°F, are projected to occur more frequently by the end of the century. Extreme heat days and heat waves can negatively impact human health. Heat-related illnesses include a spectrum of illnesses ranging from heat cramps to severe heat exhaustion and life-threatening heat stroke (Red Cross Red Crescent Climate Centre [RCCC], 2019).

Wildfires

The hotter and drier conditions expected with climate change will make forests more susceptible to extreme wildfires. A recent study found that, if GHG emissions continue to rise, the frequency of extreme wildfires burning over approximately 25,000 acres would increase by nearly 50 percent, and the average area burned statewide each year would increase by 77 percent, by the year 2100. In the areas that have the highest fire risk, the cost of wildfire insurance is anticipated to rise by 18 percent by 2055 and the fraction of property insured would decrease (Westerling, 2018).

Air Quality Degradation

Higher temperatures, conducive to air pollution formation, could worsen air quality in California and make it more difficult for the state to achieve air quality standards. Climate change may increase the concentrations of ground-level ozone, which can cause breathing problems, aggravate lung diseases such as asthma, emphysema, chronic bronchitis, and cause chronic obstructive pulmonary disease (COPD) but the magnitude of the effect, and therefore, its indirect effects, are uncertain. Emissions from wildfires can lead to excessive levels of particulate matter, ozone, and volatile organic compounds (NOAA, n.d.). Additionally, severe heat accompanied by drier conditions and poor air quality could increase the number of heat-related deaths, illnesses, and asthma attacks throughout the state (RCCC, 2019).

Precipitation and Water Supply

There is a high degree of uncertainty with respect to the overall impact of global climate change on future water supplies in California. Studies indicate considerable variability in predicting precise impacts of climate change on California hydrology and water resources. Increasing uncertainty in the timing and intensity of precipitation will challenge the operational flexibility of California's water management systems. Warmer and wetter winters would increase the amount of runoff available for groundwater recharge; however, this additional runoff could occur at a time when some basins are either being recharged at their maximum capacity or are already full. Conversely, reductions in spring runoff and higher evapotranspiration because of higher temperatures could reduce the amount of water available for recharge (CNRA, 2018).

Climate change could alter water quality in a variety of ways, including through higher winter flows that reduce pollutant concentrations (through dilution) or increase erosion of land surfaces and stream channels, leading to higher sediment, chemical, and nutrient loads in rivers. Water temperature increases and decreased water flows can result in increasing concentrations of pollutants and salinity. Increases in water temperature alone can lead to adverse changes in water quality, even in the absence of changes in precipitation.

Hydrology and Sea Level Rise

Climate changes could potentially affect: the amount of snowfall, rainfall and snowpack; the intensity and frequency of storms; flood hydrographs (flash floods, rain or snow events, coincidental high tide and high runoff events); sea-level rise and coastal flooding; coastal erosion; and the potential for saltwater intrusion. Sea-level rise can be a product of global warming through two main processes: expansion of seawater as the oceans warm and melting of ice over land. A rise in sea levels could result in coastal flooding and erosion and could jeopardize California's water supply. Sea level has risen 8 to 9 inches since 1880. In 2023, global sea level set a new record high of 3.99 inches above 1993 levels. The rate of sea level rise is accelerating; it has more than doubled from 0.06 inches per year throughout most of the 20th century to 0.14 inches per year from 2006–2015. In many locations along the U.S. coastline, high-tide flooding is now 300 percent to more than 900 percent more frequent than it was 50 years ago. Models project that average sea level rise for the contiguous U.S. could be 2.2 meters (7.2 feet) by 2100 and 3.9 meters (13 feet) by 2150 (NOAA, 2023). Rising seas could impact transportation infrastructure, utilities, and regional industries.

Agriculture

California has a massive agricultural industry that represents over 13 percent of total U.S. agricultural revenue (California Department of Food and Agriculture [CDFA], n.d.). Higher CO_2 levels can stimulate plant production and increase plant water-use efficiency. However, a changing climate presents significant risks to agriculture due to changes in maximum and minimum temperatures, reduction of winter chill hours, extreme heat leading to additional costs for livestock cooling and losses in production, and declines in water quality, groundwater security, soil health, and pollinator species, and increased pest pressures (CNRA, 2018).

Ecosystems and Wildlife

Increases in global temperatures and the potential resulting changes in weather patterns could have ecological effects on a global and local scale. As stated in the *Safeguarding California Plan*, "species and ecosystems in California are valued both for their intrinsic worth and for the services they provide to society. Air purification, water filtration, flood attenuation, food provision, recreational opportunities such as fishing, hunting, wildlife viewing, and more are all services provided by ecosystems. These services can only be maintained if ecosystems are healthy and robust and continue to function properly under the impacts of climate change. A recent study examined the vulnerability of all vegetation communities statewide in California and found that 16 of 29 vegetation communities were highly or nearly highly vulnerable to climate change, including Western North American freshwater marsh, Rocky Mountain subalpine and high montane conifer forest, North American Pacific coastal salt marsh, and more. Soil moisture is likely to decline in many regions, and intense rainstorms are likely to become more frequent. With climate change, ecosystems and wildlife will be challenged by the spread of invasive species, barriers to species migration or movement in response to changing climatic conditions, direct impacts to species health, and mismatches in timing between seasonal life-cycle events such as species migration and food availability (CNRA, 2018).

Public Health

Global climate change is also anticipated to result in more extreme heat events. These extreme heat events increase the risk of death from dehydration, heart attack, stroke, and respiratory distress, especially with people who are ill, children, the elderly, and the poor, who may lack access to air conditioning and medical assistance. A warming planet is expected to bring more severe weather events, worsening wildfires and droughts, a decline in air quality, rising sea levels, increases in allergens and in vector-borne diseases, all of which present significant health and wellbeing risks for California populations (CNRA, 2018).

While the possible outcomes and the feedback mechanisms involved are not fully understood and much research remains to be done, the potential for substantial environmental, social, and economic consequences over the long term may be great. All of these impacts will have either direct or indirect negative effects for residents and businesses.

GHG Emissions Inventories

United States GHG Emissions

In 2022, the U.S. emitted about 6,343 million metric tons of CO_2 equivalent ($MMTCO_2e$), or 5,489 $MMTCO_2e$ after accounting for sequestration from the land use sector. Emissions increased by 1.3 percent from 2021 to 2022 (after accounting for sequestration from the land use sector). The increase was driven largely by an increase in CO_2 emissions from fossil fuel combustion, which increased by 1 percent relative to 2021. This increase in fossil fuel consumption emissions was due primarily to economic activity rebounding after the height of the COVID-19 pandemic. GHG emissions in 2022 (after accounting for sequestration from the land use sector) were 16.7 percent below 2005 levels. Of the major sectors nationwide, transportation accounts for the highest volume of GHG emissions (approximately 28 percent), followed by electricity (25 percent), industry (23 percent), commercial and residential (14 percent), and agriculture (10 percent) (United States Environmental Protection Agency [EPA], n.d.).

California GHG Emissions

CARB compiles GHG inventories for the state. Based on the 2022 GHG inventory data (the latest year for which data is available from CARB), emissions from GHG emitting activities statewide were 371.1 $MMTCO_2e$ (CARB, 2024b). This is 9.3 $MMTCO_2e$ (2.4 percent) lower than 2021 (380.4 $MMTCO_2e$), and 33.3 $MMTCO_2e$ (8.2 percent) lower than 2019 levels (404.4 $MMTCO_2e$). The 2022 emissions data shows that California is continuing its established long-term trend of GHG emissions declines, despite the anomalous emissions trends from 2019 through 2021, due in large part to the impacts of the COVID-19 pandemic.

Despite the population and economic growth in California between 1990 and 2022, CARB's 2022 statewide inventory indicated that California's net GHG emissions in 2022 were 59.9 $MMTCO_2e$ below the 2020 GHG Limit of 431 $MMTCO_2e$ codified in California Health and Safety Code Division 25.5, also known as the Global Warming Solutions Act of 2006 (Assembly Bill [AB] 32). **Table 4.7-1** identifies and quantifies statewide anthropogenic GHG emissions and sinks (e.g., carbon sequestration due to forest growth) in 1990 and 2022. As shown in the table, the transportation sector is the largest contributor to statewide GHG emissions at approximately 37.7 percent in 2022.

TABLE 4.7-1
CALIFORNIA GHG EMISSIONS INVENTORY

Category	Total 1990 Emissions Using IPCC AR4 ($MMTCO_2e$)	Percent of Total 1990 Emissions	Total 2022 Emissions Using IPCC AR4 ($MMTCO_2e$)	Percent of Total 2022 Emissions
Transportation	150.7	35%	139.9	37.7%
Electric Power	110.6	26%	59.8	16.1%
Commercial & Residential Fuel Use	44.1	10%	39.5	10.6%
Industrial	103.0	24%	72.7	19.6%
Recycling and Waste[a]	—	—	8.2	2.2%
High GWP/Non-Specified[b]	1.3	<1%	21.3	5.7%
Agriculture/Forestry	23.6	6%	29.8	8%
Forestry Sinks	-6.7	-2%	—[c]	—
Net Total (IPCC SAR)	**426.6**	**100%[e]**	**—**	**—**
Net Total (IPCC AR4)[d]	**431**	**100%[e]**	**371.1**	**100%[e]**

NOTES:

AR4 = Fourth Assessment Report; GWP = global warming potential; IPCC = Intergovernmental Panel on Climate Change; $MMTCO_2e$ = million metric tons of carbon dioxide equivalents

a. Included in other categories for the 1990 emissions inventory.
b. High GWP gases are not specifically called out in the 1990 emissions inventory.
c. Revised methods under development (not reported for 2021).
d. CARB revised the state's 1990-level GHG emissions using GWPs from the IPCC AR4.
e. Total of individual percentages may not add up to 100% due to rounding

SOURCES: CARB, 2007; CARB, 2024b.

Berkeley Lab Baseline GHG Emissions

Berkeley Lab, through its dedicated sustainability team (Sustainable Berkeley Lab, or SBL), conducts annual GHG inventories to assess its progress in reducing emissions and meeting its emissions targets. SBL reports the Lab's emissions based on a federal protocol and categorizes those emissions into "scopes," defined around the locational and operational control of emission sources.

- **Scope 1:** Direct GHG emissions from the combustion of natural gas and fuels used in Berkeley Lab buildings, vehicle fleet, and other on-site equipment, plus direct releases of climate-forcing refrigerants and process gases.
- **Scope 2:** Indirect GHG emissions related to the purchase of electricity.
- **Scope 3:** Other indirect GHG emissions from employee commutes, business travel (flights and ground transportation), solid-waste disposal, treatment of wastewater that is discharged to the sewer, and the electrical losses that occur during the transmission and distribution of electricity to the Berkeley Lab locations.

Table 4.7-2 summarizes GHG inventories for the Berkeley Lab campus by scope for 2024, the most recent year for which actual data is available. The table also presents 2019 emissions which is the baseline for comparison with GHG reduction targets in the UC *Policy on Sustainable Practices*, and includes estimated 1990 emissions which is the baseline for comparison with AB 1279's GHG reduction target for 2045. GHG Scope 1 and Scope 2 emissions for Berkeley Lab are submitted to and verified by the Climate Registry and DOE.

TABLE 4.7-2
BERKELEY LAB BASELINE GREENHOUSE GAS EMISSIONS INVENTORY

Scope	Source	GHG Emissions ($MTCO_2e$ per year)		
		1990 Emissions	2019 Emissions	2024 Emissions [a]
1	Natural Gas	6,933	7,760	6,294
1	Non-Fleet Vehicles & Equipment Fuel	--	36	583
1	Fleet Fuel	76	127	126
1	Fugitives and Process Gases	37	182	823
2	Electricity (Gridless Renewables)	40,061	27,135	19,119
2	Renewable Energy Credits – Avoided Emissions	--	-1,236	--
3	Business Air Travel	--	7,388	4,906
3	Business Ground Travel	--	406	331
3	Employee Commute	8,311	8,412	4,196
3	Transmission and Distribution Losses	--	1,787	1,107
3	Solid Waste Disposal	268	183	217
3	Wastewater Treatment	7	21	10
Total Scope 1 Emissions		7,046	8,106	7,826
Total Scope 2 Emissions		40,061	25,899	19,119
Total Scope 3 Emissions		8,586	18,198	10,768
Total GHG Emissions		**55,693**	**52,203**	**37,713**

NOTE: $MTCO_2e$ = metric tons of carbon dioxide equivalents
SOURCE : UC LBNL SBL, 2025

4.7.3 Regulatory Framework

Federal

U.S. Environmental Protection Agency "Endangerment" and "Cause or Contribute" Findings

In 2009, the U.S. Supreme Court held that the EPA must consider regulation of motor vehicle GHG emissions. In *Massachusetts v. Environmental Protection Agency* et al., 12 states and cities, including California, together with several environmental organizations sued to require the EPA to regulate GHGs as pollutants under the Clean Air Act (CAA) (127 S. Ct. 1438 (2007)). The Supreme Court ruled that GHGs fit within the CAA's definition of a pollutant and the EPA had the authority to regulate GHGs.

On December 7, 2009, the EPA Administrator signed two distinct findings regarding GHGs under Section 202(a) of the CAA:

- **Endangerment Finding:** The current and projected concentrations of the six key GHGs—CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6—in the atmosphere threaten the public health and welfare of current and future generations.
- **Cause or Contribute Finding:** The combined emissions of these GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution that threatens public health and welfare.

These findings did not, by themselves, impose any requirements on industry or other entities. However, these actions were a prerequisite for implementing GHG emissions standards for vehicles.

Vehicle Emissions Standards

In 1975, Congress enacted the Energy Policy and Conservation Act, which established the first fuel economy standards for on-road motor vehicles in the U.S. Pursuant to the act, the EPA and National Highway Traffic Safety Administration (NHTSA) are responsible for establishing additional vehicle standards. In August 2012, standards were adopted for model year 2017 through 2025 passenger cars and light-duty trucks. By 2025, vehicles are required to achieve both 54.5 miles per gallon (mpg) (if GHG reductions are achieved exclusively through fuel economy improvements) and 163 grams of CO_2 per mile. According to the EPA, a model year 2025 vehicle would emit one-half of the GHG emissions from a model year 2010 vehicle (EPA & NHTSA, 2010). Notably, the State of California harmonized its vehicle efficiency standards through 2025 with the federal standards (see Advanced Clean Car program below).

In January 2017, the EPA issued its Mid-Term Evaluation of the GHG emissions standards, finding that it would be practical and feasible for automakers to meet the model year 2022-2025 standards through several existing technologies. In August 2018, the EPA and the NHTSA proposed maintaining the 2020 corporate average fuel economy (CAFE) and CO_2 standards for model years 2021 through 2026.

On March 20, 2024, the EPA announced a final rule, *Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles*, that sets new, more protective standards to further reduce harmful air pollutant emissions from light-duty and medium-duty vehicles starting with model year 2027. The final rule builds upon EPA's final standards for federal GHG emissions standards for passenger cars and light trucks for model years 2023 through 2026 and leverages advances in clean car technology to improve public health, reduce climate pollution, and reduce fuel and maintenance costs. These standards will phase in over model years 2027 through 2032.

DOE Order O 413.3B Chg7 (LtdChg) – Program and Project Management for the Acquisition of Capital Assets

This Order, as updated on June 1, 2023, provides the DOE with program and project management direction for the acquisition of capital assets with the goal of delivering projects within the original performance baseline, cost and schedule, and fully capable of meeting mission performance, safeguards, and security, and environmental, safety, and health requirements unless impacted by a directed change.

The LBNL PM Framework for DOE Order 413.3B provides guidance to Berkeley Lab project directors, project managers, control account managers, project controls staff, and others needing to understand DOE Order 413.3B requirements for projects with budgets at $50M and above and how the process is implemented at Berkeley Lab. The framework details requirements for each Critical Decision phase, provides DOE templates and guidance documents, and shows examples of documentation from Berkeley Lab projects.

Clean Energy for New Federal Buildings and Major Renovations of Federal Buildings Rule

In April 2024, the DOE issued the Clean Energy for New Federal Buildings and Major Renovations of Federal Buildings Rule acting on Congress's mandate to cut emissions from new or newly renovated federal buildings (DOE, 2024). Measures in this rule will help advance the adoption of cleaner, more efficient technologies for buildings that will lead the way to achieving President Biden's Federal Sustainability Plan goal of net-zero emissions from all federal buildings by 2045. This rule implements the Energy Conservation and Production Act, as amended by the Energy Independence and Security Act of 2007 and requires federal agencies to phase out fossil fuel usage in new federal building construction or major renovation by achieving a 90 percent reduction in fossil fuel use for new projects started between fiscal years (FY) 2025 and 2029 and completely eliminating on-site fossil fuel usage in new projects beginning in 2030.

This rule strengthens progress to achieve net-zero emissions in federal buildings by 2045 by eliminating on-site fossil fuel emissions, also known as Scope 1 emissions. This rule amends the regulations governing energy efficiency in Federal buildings found in 10 CFR parts 433 and 435. The rule effectively prohibits the replacement of natural gas boiler plants with new natural gas plants, since any project in a federal (private) building exceeding a current cost threshold of $3.8M in 2024 must adhere to the 90 percent reduction requirement.

Title 42 United States Code

Section 6834 of Title 42 United States Code prescribes federal building energy standards that require new buildings be designed to achieve energy consumption levels that are at least 30 percent below the levels established in a version of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard as specified by 10 CFR 433, and sustainable design principles be applied to the siting, design, and construction of all new and replacement buildings.

State

California has promulgated a series of executive orders, laws, and regulations aimed at reducing both the level of GHGs in the atmosphere and emissions of GHGs within the state. The major components of California's climate protection initiative are reviewed below. CARB is the agency with regulatory authority over air quality issues in California. CARB adopts regulations designed to reduce criteria pollutants, toxic air contaminants, and GHG emissions; and establishes vehicle emission standards. As discussed earlier, CARB is responsible for preparing, adopting, and updating California's GHG inventory. Additional responsibilities of CARB with respect to specific State mandates are discussed below.

CEQA Guidelines

The *CEQA Guidelines* are embodied in the California Code of Regulations (CCR), Title 14, beginning with Section 15000. The current *CEQA Guidelines* Section 15064.4 states that "a lead agency shall make a good-faith effort, based to the extent possible on scientific and factual data, to describe, calculate, or estimate the amount of GHG emissions resulting from a project." Section 15064.4 further states:

> *A lead agency should consider the following factors, when determining the significance of impacts from greenhouse gas emissions on the environment:*
>
> *(1) The extent to which the project may increase or reduce greenhouse gas emissions as compared to the existing environmental setting.*
>
> *(2) Whether the project emissions exceed a threshold of significance that the lead agency determines applies to the project.*
>
> *(3) The extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of greenhouse gas emissions (see e.g., section 15183.5(b)).*

The *CEQA Guidelines* also state that a project's incremental contribution to a cumulative effect is not cumulatively considerable if the project will comply with the requirements in a previously approved plan or mitigation program (including plans or regulations for the reduction of GHG emissions) that provides specific requirements that will avoid or substantially lessen the cumulative problem within the geographic area in which the project is located (*CEQA Guidelines* Section 15064(h)(3)).

The *CEQA Guidelines* do not require or recommend a specific analytical method or provide quantitative criteria for determining the significance of GHG emissions, nor do they set a numerical threshold of significance for GHG emissions. Section 15064.7(c) clarifies that "when adopting or using thresholds of significance, a lead agency may consider thresholds of significance previously adopted or recommended by other public agencies or recommended by experts, provided the decision of the lead agency to adopt such thresholds is supported by substantial evidence."

When GHG emissions are found to be significant, *CEQA Guidelines* Section 15126.4(c) includes the following direction on measures to mitigate the impact of the GHG emissions:

> *Consistent with Section 15126.4(a), lead agencies shall consider feasible means, supported by substantial evidence and subject to monitoring or reporting, of mitigating the significant effects of greenhouse gas emissions. Measures to mitigate the significant effects of greenhouse gas emissions may include, among others:*
>
> *(1) Measures in an existing plan or mitigation program for the reduction of emissions that are required as part of the lead agency's decision.*
>
> *(2) Reductions in emissions resulting from a project through implementation of project features, project design, or other measures.*
>
> *(3) Off-site measures, including offsets that are not otherwise required, to mitigate a project's emissions.*
>
> *(4) Measures that sequester greenhouse gases.*
>
> *(5) In the case of the adoption of a plan, such as a general plan, long range development plan, or plans for the reduction of greenhouse gas emissions, mitigation may include the identification of specific measures that may be implemented on a project-by project basis. Mitigation may also include the incorporation of specific measures or policies found in an adopted ordinance or regulation that reduces the cumulative effect of emissions.*

State of California Executive Orders

Executive Order S-1-07 and Update to the Low Carbon Fuel Standard

EO S-1-07, signed by Governor Schwarzenegger in 2007, established a low carbon fuel standard (LCFS) with a goal to reduce the carbon intensity of transportation fuels sold in California by at least 10 percent by 2020. In September 2018, CARB extended the LCFS program to 2030, making significant changes to the program design and implementation, including a doubling of the carbon intensity reduction to 20 percent by 2030.

Executive Order B-16-12

In March 2012, Governor Brown issued an executive order establishing a goal of 1.5 million zero-emission vehicles (ZEVs) on California roads by 2025. In addition to the ZEV goal, EO B-16-12 stipulated that by 2015 all major cities in California would have adequate infrastructure and be "zero-emission vehicle ready"; that by 2020 the State would have established adequate infrastructure to support one million ZEVs; that by 2050, virtually all personal transportation in the State will be based on ZEVs; and that GHG emissions from the transportation sector will be reduced by 80 percent below 1990 levels.

Executive Order B-30-15

Governor Brown signed EO B-30-15 on April 29, 2015, which:

- Established a new interim statewide reduction target to reduce GHG emissions to 40 percent below 1990 levels by 2030;
- Ordered all State agencies with jurisdiction over sources of GHG emissions to implement measures to achieve reductions of GHG emissions to meet the 2030 and 2050 reduction targets; and

- Directed CARB to update the Climate Change Scoping Plan (Scoping Plan) to express the 2030 target in terms of $MMTCO_2e$.

Executive Order B-48-18

On January 26, 2018, Governor Brown issued an executive order establishing a goal of 5 million ZEVs on California roads by 2030.

Executive Order B-55-18

On September 10, 2018, Governor Brown signed EO B-55-18, committing California to total, economy-wide carbon neutrality by 2045. EO B-55-18 directs CARB to work with relevant State agencies to develop a framework to implement an accounting process to track progress toward this goal. AB 1395 would codify this carbon neutral target.

Executive Order N-79-20

On September 23, 2020, Governor Newsom signed EO N-79-20, which sets new statewide goals for phasing out gasoline-powered cars and trucks in California. EO N-79-20 requires that 100 percent of in-state sales of new passenger cars and trucks are to be zero-emission by 2035; 100 percent of in-state sales of medium- and heavy-duty trucks and buses are to be zero-emission by 2045 where feasible; and 100 percent of off-road vehicles and equipment sales are to be zero-emission by 2035 where feasible.

State of California Policy and Legislation

Assembly Bill 117 and Senate Bill 790

In 2002, the State of California passed AB 117, enabling public agencies and joint power authorities to form a Community Choice Aggregation (CCA). SB 790 strengthened it by creating a "code of conduct" that the incumbent utilities must adhere to in their activities relative to CCAs. CCAs allow a city, county, or group of cities and counties to pool electricity demand and purchase/generate power on behalf of customers within their jurisdictions in order to provide local choice. CCAs work with PG&E to deliver power to its service area. The CCA is responsible for the electric generation (procure or develop power) while PG&E is responsible for electric delivery, power line maintenance, and monthly billing.

Assembly Bill 32 and Senate Bill 32

The California Global Warming Solutions Act of 2006 (AB 32) required that statewide GHG emissions be reduced to 1990 levels by 2020. This reduction was to be accomplished by enforcing a statewide cap on GHG emissions that would be phased in starting in 2012. This act defines GHGs as CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6 and represents the first enforceable statewide program to limit emissions of these GHGs from all major industries with penalties for noncompliance. The law further requires that reduction measures be technologically feasible and cost effective. AB 32 assigned CARB the primary responsibility for reducing GHG emissions, by adopting rules and regulations directing State actions that would achieve GHG emissions reductions equivalent to 1990 statewide levels by 2020.

As required by AB 32, CARB approved the 1990 GHG emissions inventory, thereby establishing the emissions limit for 2020, originally set at 427 $MMTCO_2e$, using the GWP values from the

IPCC Second Assessment Report. CARB established the GHG emissions reduction target based on GWP values from the IPCC Fourth Assessment Report (AR4) and determined that the 1990 GHG emissions inventory and 2020 GHG emissions limit is 431 $MMTCO_2e$.

In 2016, SB 32 and its companion bill AB 197 amended Health and Safety Code Division 25.5, establishing a new climate pollution reduction target of 40 percent below 1990 levels by 2030, and included provisions to ensure that the benefits of State climate policies reach Environmental Justice (EJ) Communities.[2]

Assembly Bill 1279 (California Climate Crisis Act)

In August 2022, the California Legislature passed a package of significant climate legislation that includes a codification of the State's goal to reach net-zero by 2045. With the passage of AB 1279, California has locked in a pathway for it to reach net-zero by no later than 2045. This enables the legislature, communities, and businesses to start long-term planning with certainty about the future regulatory landscape at the state level. Critically, this goal requires California to cut GHG emissions by 85 percent compared to 1990 levels, ensuring the State uses all available solutions to sharply cut pollution from industrial facilities, vehicles, power plants and more. The Governor signed AB 1279 into law on September 16, 2022.

Climate Change Scoping Plan

A specific requirement of AB 32 was for CARB to prepare a Climate Change Scoping Plan for achieving the maximum technologically feasible and cost-effective GHG emission reduction by 2020. CARB developed and approved the initial scoping plan in 2008, outlining the regulations, market-based approaches, voluntary measures, policies, and other emission reduction programs that would be needed to meet the 2020 statewide GHG emission limit and initiate the transformations needed to achieve the State's long-range climate objectives (CARB, 2008).

CARB approved the *First Update to the Climate Change Scoping Plan* (2014 Scoping Plan) in May 2014 and built upon the 2008 Scoping Plan with new strategies and recommendations (CARB, 2014). Then, in response to the 2030 GHG reduction target, CARB adopted California's 2017 Climate Change Scoping Plan which outlines the proposed framework of actions for achieving the 2030 GHG target of 40 percent reduction in GHG emissions relative to 1990 levels (CARB, 2017). The 2017 Scoping Plan recommends statewide targets of no more than 6 $MTCO_2e$ per capita by 2030 and no more than 2 $MTCO_2e$ per capita by 2050.

To demonstrate how a local jurisdiction can achieve its long-term GHG goals at the community plan level, CARB recommends developing a geographically specific GHG reduction plan (i.e., climate action plan) consistent with the requirements of *CEQA Guidelines* Section 15183.5(b). A so-called "CEQA-qualified" GHG reduction plan, once adopted, can provide local governments with a streamlining tool for project-level environmental review of GHG emissions, provided there are adequate performance metrics for determining project consistency with the plan. Absent

2 A neighborhood or community, composed predominantly of persons of color or a substantial proportion of persons below the poverty line, that is subjected to a disproportionate burden of environmental hazards and/or experiences a significantly reduced quality of life relative to surrounding or comparative communities.

conformity with such a plan, CARB recommends "that projects incorporate design features and GHG reduction measures, to the degree feasible, to minimize GHG emissions."

In May 2022, CARB adopted the 2022 update to the Scoping Plan which assesses progress toward the statutory 2030 GHG reduction target, while laying out a path to achieving carbon neutrality no later than 2045. The 2022 Scoping Plan focuses on outcomes needed to achieve carbon neutrality by assessing paths for clean technology, energy deployment, natural and working lands, and others, and is designed to meet the state's long-term climate objectives and support a range of economic, environmental, energy security, environmental justice, and public health priorities (CARB, 2022).

The 2022 Scoping Plan expands on prior Scoping Plans and responds to more recent legislation by outlining a technologically feasible, cost-effective, and equity-focused path to achieve the State's climate target of reducing anthropogenic emissions to 85 percent below 1990 levels by 2045 and achieving carbon neutrality[3] by 2045 or earlier.

The major element of the 2022 Scoping Plan is the decarbonization of every sector of the economy. This requires rapidly moving to zero-emission transportation for cars, buses, trains, and trucks; phasing out the use of fossil gas for heating; clamping down on chemicals and refrigerants; providing communities with sustainable options such as walking, biking, and public transit to reduce reliance on cars; continuing to build out solar arrays, wind turbine capacity, and other resources to provide clean, renewable energy to displace fossil-fuel fired electrical generation; scaling up new options such as renewable hydrogen for hard-to-electrify end uses and biomethane where needed. "Successfully achieving the outcomes called for in the Scoping Plan would reduce demand for liquid petroleum by 94 percent and total fossil fuel by 86 percent by 2045 relative to 2022" (CARB, 2022).

Senate Bill 743

In 2013, Governor Brown signed SB 743, which added Public Resources Code Section 21099 to CEQA. SB 743 changed the way that transportation impacts are analyzed in Transit Priority Areas (TPAs)[4] under CEQA, better aligning local environmental review with statewide objectives to reduce GHG emissions, encourage infill mixed-use development in designated priority development areas (PDAs),[5] reduce regional sprawl development, and reduce vehicle miles traveled (VMT) in California.

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3 *Carbon neutrality* means "net zero" emissions of GHGs. In other words, it means that GHG emissions generated by sources such as transportation, power plants, and industrial processes must be less than or equal to the amount of carbon dioxide that is stored, both in natural sinks and through mechanical sequestration. AB 1279 uses the terminology net zero and the 2022 Scoping Plan uses the terminology carbon neutrality or carbon neutral. These terms mean the same thing and are used interchangeably.

4 A Transit Priority Area is defined in California Public Resource Code, Section 21099 as an area within one-half mile of a major transit stop that is existing or planned, if the planned stop is scheduled to be completed within the planning horizon included in a Transportation Improvement Program or applicable regional transportation plan.

5 Priority Development Areas are locally designated areas within existing communities that have been identified and approved by local cities or counties for future growth. These areas are typically accessible to transit, jobs, shopping, and other services. Over 70 local governments have voluntarily designated some 170 PDAs, which are proposed to absorb about 80 percent of new housing and over 60 percent of new jobs on less than five percent of the Bay Area's land. The result is a locally supported, compact and efficient growth pattern that meets CARB's GHG reduction targets and provides adequate housing for the Bay Area's growing population.

As required under SB 743, OPR developed potential metrics to measure transportation impacts that may include, but are not limited to, VMT, VMT per capita, automobile trip generation rates, or automobile trips generated. The VMT metric was developed to replace the use of automobile delay and level of service as the metric to analyze transportation impacts under CEQA.

In its 2018 *Technical Advisory on Evaluating Transportation Impacts in CEQA*, OPR recommends different thresholds of significance for projects depending on land use types (OPR, 2018). For example, residential and office space projects must demonstrate a VMT level that is 15 percent less than that of existing development to determine whether the mobile-source GHG emissions associated with the project are consistent with statewide GHG reduction targets. With respect to retail land uses, any net increase in VMT may be sufficient to indicate a significant transportation impact.

Senate Bill 350

SB 350, the Clean Energy and Pollution Reduction Act of 2015 (Chapter 547, Statutes of 2015), was approved by Governor Brown on October 7, 2015. SB 350 changed the standards of the California RPS program by requiring that the amount of electricity generated and sold to retail customers per year from eligible renewable energy resources be increased from 33 percent to 50 percent by December 31, 2030. The act requires the State Energy Resources Conservation and Development Commission to establish annual targets for statewide energy efficiency savings and demand reduction that will achieve a cumulative doubling of statewide energy efficiency savings in existing electricity and natural gas final end uses of retail customers by January 1, 2030.

Senate Bill 100

On September 10, 2018, Governor Brown signed SB 100, establishing that 100 percent of all electricity in California must be obtained from renewable and zero-carbon energy resources by December 31, 2045. SB 100 also creates new standards for the RPS goals that were established by SB 350 in 2015. Specifically, the law increases the percentage of energy that both investor-owned utilities and publicly-owned utilities must obtain from renewable sources from 50 percent to 60 percent by 2030. Incrementally, these energy providers must also have a renewable energy supply of 33 percent by 2020, 44 percent by 2024, and 52 percent by 2027. The updated RPS goals are considered achievable, because many California energy providers are already meeting or exceeding the RPS goals established by SB 350.

Advanced Clean Cars Program

In January 2012, CARB approved the Advanced Clean Cars Program, a new emissions-control program for model years 2017 through 2025. In response to a midterm review of the standards in March 2017, CARB directed staff to begin working on post-2025 model year vehicle regulations (Advanced Clean Cars II) to research additional measures to reduce air pollution from light-duty and medium-duty vehicles. Additionally, as described earlier, in September 2020, Governor Newsom signed EO N-79-20 that established a goal that 100 percent of California sales of new passenger car and trucks be zero-emission by 2035 and directed CARB to develop and propose regulations toward this goal. The primary mechanism for achieving these targets for passenger cars and light trucks is the Advanced Clean Cars II Program.

In 2022, CARB approved the Advanced Clean Cars II Program (CARB, 2023), for model years 2026 through 2035, which requires that all new passenger cars, trucks and SUVs sold in

California be zero emissions by 2035. The regulation amends the ZEV regulation to require an increasing number of ZEVs, and relies on advanced vehicle technologies, including battery-electric, hydrogen fuel cell electric and plug-in hybrid electric-vehicles, to meet air quality and climate change emissions standards, in support of EO N-79-20. This program also amended the Low-emission Vehicle Regulations to include increasingly stringent standards for gasoline cars and heavier passenger trucks to continue to reduce smog-forming emissions. By increasing the number of ZEVs on the road and continuing to clean up conventional internal combustion vehicles, the regulations will reduce exposure to vehicle pollution in communities throughout California, including EJ communities that are disproportionately exposed to vehicular pollution.

Mobile Source Strategy

In May 2016, CARB released the updated Mobile Source Strategy promoting a transition to zero-emission and low-emission vehicles, cleaner transit systems and reduction of VMT. The Mobile Source Strategy calls for 1.5 million ZEVs (including plug-in hybrid electric, battery-electric, and hydrogen fuel cell vehicles) by 2025 and 4.2 million ZEVs by 2030. The strategy also calls for more-stringent GHG requirements for light-duty vehicles beyond 2025 as well as GHG reductions from medium-duty and heavy-duty vehicles and increased deployment of zero emission trucks primarily for class 3 through 7 “last mile” delivery trucks in California. Statewide, the Mobile Source Strategy would result in a 45 percent reduction in GHG emissions from mobile sources and a 50 percent reduction in the consumption of petroleum-based fuels (CARB, 2016).

Similar to the 2016 Mobile Source Strategy, the 2020 Strategy is a framework that identifies the levels of cleaner technologies necessary to meet the many goals and high-level regulatory concepts that would allow the state to achieve the levels of cleaner technology. The 2020 Strategy will inform the development of other planning efforts including the State Implementation Plan (SIP) which will translate the concepts included into concrete measures and commitments for specific levels of emissions reductions, the 2022 Climate Change Scoping Plan (2022 Scoping Plan Update), and Community Emissions Reduction Plans (CERPs) required for communities selected as a part of CARB’s Community Air Protection Program. But the requirement continues (CARB, 2021). The 2020 Mobile Source Strategy illustrates that an aggressive deployment of ZEVs will be needed for the state to meet federal air quality requirements and the state’s climate change targets.

In June 2024, CARB approved for adoption the Zero-Emission Forklift Regulation. The measure was identified in CARB’s Mobile Source Strategy, State Implementation Plan, and Sustainable Freight Action Plan as one of several near-term actions intended to help California meet its air quality and climate goals through zero-emission technology. The regulation will achieve emission reductions of both criteria pollutants and GHG by requiring the phase-out of forklifts using engines operating on propane and gasoline and transitioning to the use of zero-emission forklifts, such as those that run on battery-electric and fuel-cell powertrains. The regulation includes requirements for forklift fleet operators, rental agencies, dealers, and manufacturers, and is expected to result in a significant shift of the forklift segment in California to zero-emission technology.

Advanced Clean Trucks Program

The Advanced Clean Trucks Regulation is part of a holistic approach to accelerate a large-scale transition of zero-emission medium-and heavy-duty vehicles. Starting with the 2024 model year, the Advanced Clean Trucks Regulation requires manufacturers to sell zero-emission trucks as an increasing percentage of their annual California sales from 2024 to 2035. In addition, large employers, including retailers, manufacturers, brokers, and others, are required to report information about shipments and shuttle services. Fleet owners, with 50 or more trucks, are required to report about their existing fleet operations. The goal of this regulation is to achieve nitrogen oxides (NOx) and GHG emission reductions through advanced clean technology, and to increase the penetration of the first wave of zero-emission heavy-duty technology into applications that are well suited to its use.

Advanced Clean Fleets Program

CARB's new Advanced Clean Fleets program aims to transition medium and heavy-duty trucks to zero-emissions technology by 2045. It complements the Advanced Clean Trucks rule, which mandates a significant increase in the number of medium- and heavy-duty ZEVs on California roads. Advanced Clean Fleets is part of CARB's overall strategy to accelerate a large-scale reduction in tailpipe emissions. It requires fleets that are well suited for electrification to transition to ZEVs through requirements to both phase-in the use of ZEVs for targeted fleets and requirements that manufacturers only manufacture ZEV trucks starting in the 2036 model year.

In November 2023, CARB had applied to the U.S. EPA for a federal waiver to enforce this regulation but in January 2025, CARB withdrew its waiver application. While CARB will not be enforcing the portions of this regulation that require a federal waiver or authorization, such as those that apply to high priority and drayage fleets, not all elements of the regulation require a federal waiver or authorization. The portions of the regulation applicable to state and local government fleets remain unaffected and will continue to contribute to CARB's efforts to reduce air pollution to protect public health.

In-Use Off-Road Diesel-Fueled Fleets Regulation

Originally adopted in 2007, the goal of the In-Use Off-Road Diesel-Fueled Fleets Regulation is to reduce particulate matter and NOx emissions from in-use (existing) off-road heavy-duty diesel vehicles in California. The regulation covers a wide scope of vehicle types used in (but not limited to) industries as diverse as construction, air travel, manufacturing, landscaping, and ski resorts.

Among other requirements, the Off-Road Diesel Regulation imposes limits on idling, requires a written idling policy, restricts the adding of older vehicles into fleets, requires the phase-out of the older more polluting equipment starting requires the procurement and use of renewable diesel (R99 or R100) starting January 1, 2024, with limited exceptions.

Senate Bill 1383 (Short-Lived Climate Pollutants)

SB 1383, enacted in 2016, requires statewide reductions in short-lived climate pollutants across various industry sectors. The climate pollutants covered under SB 1383 include CH_4, fluorinated gases, and black carbon—all GHGs with a much higher warming impact than CO_2 and with the potential to have detrimental effects on human health. SB 1383 requires CARB to adopt a strategy to reduce CH_4 by 40 percent, HFC gases by 40 percent, and anthropogenic black carbon by 50 percent below 2013 levels by 2030. The CH_4 emissions reduction goals include a 75 percent reduction in the level of statewide disposal of organic waste from 2014 levels by 2025.

Assembly Bill 1346

AB 1346 requires CARB, by July 1, 2022, consistent with federal law, to adopt cost-effective and technologically feasible regulations to prohibit engine exhaust and evaporative emissions from new small off-road engines, as defined by CARB. Such regulations apply to engines produced on or after January 1, 2024. The bill requires CARB to identify and, to the extent feasible, make available funding for commercial rebate or similar incentive funding as part of any updates to existing applicable funding program guidelines for local air districts to implement, to support the transition to zero-emission small off-road equipment operations.

Assembly Bills 341, 1826 and 827

AB 341, which became law in 2011, established a new statewide goal of 75 percent recycling through source reduction, recycling, and composting by 2020. AB 341 also requires all businesses and public entities that generate four cubic yards or more of waste per week and multifamily residential dwellings with five units or more to have a recycling program in place (California Legislative Information, 2011). The purpose of the law is to reduce GHG emissions by diverting commercial solid waste to recycling efforts and expand the opportunity for additional recycling services and recycling manufacturing facilities in California.

AB 1826 requires businesses that generate a specified amount of organic waste per week to arrange for recycling services for that waste. The law also requires jurisdictions to implement a recycling program to divert organic waste from businesses subject to the law, as well as report to CalRecycle on their progress in implementing an organic waste recycling program.

AB 827 requires businesses to provide organics and recycling containers for customers to collect waste generated from products purchased and consumed on the premises. These containers must be placed adjacent to trash and be visible, easily accessible, and clearly marked. AB 827 requirements were added to existing AB 341 and AB 1826 requirements. It targets businesses that sell products meant for immediate consumption and aims to educate and involve consumers in achieving the state's recycling goals.

State of California Building Codes

California Building and Energy Efficiency Standards (Title 24)

The California Energy Commission (CEC) first adopted Energy Efficiency Standards for Residential and Nonresidential Buildings (CCR Title 24, Part 6) in 1978 in response to a legislative mandate to reduce energy consumption in the State. Although the standards were not originally intended to reduce GHG emissions, increased energy efficiency and reduced consumption of electricity, natural gas, and other fuels would result in fewer GHG emissions from residential and non-residential buildings subject to the standard. The standards are updated periodically (typically every three years) to allow for the consideration and inclusion of new energy efficiency technologies and methods.

On August 11, 2021, the CEC adopted the 2022 Energy Code which was approved by the California Building Standards Commission (CBSC) for inclusion into the California Building Standards Code. This update to the building code provides crucial steps in the State's progress toward 100 percent carbon neutrality by midcentury (CEC, 2022). The 2022 Energy Code builds on

California's technology innovations, encouraging energy efficient approaches to encourage building decarbonization, emphasizing in particular heat pumps for space heating and water heating. This set of Energy Codes also strengthens ventilation standards to improve indoor air quality and extends the benefits of photovoltaic and battery storage systems and other demand flexible technology to work in combinations with heat pumps to enable California buildings to be responsive to climate change. Buildings whose permit applications are applied for on or after January 1, 2023, must comply with the 2022 Energy Code. The Energy Code includes measures that will reduce energy use in single family, multifamily, and nonresidential buildings. These measures will:

1. Affect newly constructed buildings by adding new prescriptive and performance standards for electric heat pumps for space conditioning and water heating, as appropriate for the various climate zones in California;
2. Require photovoltaic (PV) and battery storage systems for newly constructed multifamily and selected nonresidential buildings;
3. Update efficiency measures for lighting, building envelope, HVAC; and
4. Make improvements to reduce the energy loads of certain equipment covered by (i.e., subject to the requirements of) the Energy Code that perform a commercial process that is not related to the occupant needs in the building (such as refrigeration equipment in refrigerated warehouses, or air conditioning for computer equipment in data processing centers).

Regional

Bay Area Air Quality Management District

The Bay Area Air Quality Management District (BAAQMD) is the regional government agency that regulates stationary sources of air pollution in the nine San Francisco Bay Area counties. BAAQMD regulates GHG emissions through the following plans, programs, and guidelines.

Clean Air Plan

BAAQMD and other air districts prepare clean air plans in accordance with the federal and State Clean Air Acts. On April 19, 2017, BAAQMD Board of Directors adopted the 2017 *Clean Air Plan: Spare the Air, Cool the Climate*, an update to the 2010 Clean Air Plan (BAAQMD, 2017a). The Clean Air Plan is a comprehensive plan that focuses on the closely related goals of protecting public health and protecting the climate. Consistent with the State's GHG reduction targets, the plan lays the groundwork for a long-term effort to reduce Bay Area GHG emissions 40 percent below 1990 levels by 2030 and 80 percent below 1990 levels by 2050.

BAAQMD Climate Protection Program

In 2005, BAAQMD established a climate protection program to reduce pollutants that contribute to global climate change and affect air quality in the San Francisco Bay Area Air Basin. The climate protection program includes measures that promote energy efficiency, reduce VMT, and develop alternative sources of energy, all of which assist in reducing GHG emissions and reducing air pollutants that affect the health of residents. BAAQMD also seeks to support current climate protection programs in the region and to stimulate additional efforts through public education and outreach, technical assistance to local governments and other interested parties, and promotion of collaborative efforts among stakeholders.

BAAQMD CEQA Air Quality Guidelines

The BAAQMD CEQA Air Quality Guidelines were prepared to assist in the evaluation of air quality impacts of projects and plans proposed in the Bay Area. The guidelines also include recommended assessment methods for air toxics, odors, and GHG emissions. The 2017 update to the BAAQMD CEQA Air Quality Guidelines (BAAQMD, 2017b) included significance thresholds for GHG emissions based on the emission reduction goals for 2020 articulated by the California Legislature in AB 32. In April 2022, in response to SB 32 and 2017 Scoping Plan Update targets for 2030 and EO B-15 target for carbon neutrality no later than 2045, BAAQMD adopted updated CEQA significance thresholds for GHGs (BAAQMD, 2022) and included them in the 2022 update to the BAAQMD CEQA Air Quality Guidelines (BAAQMD, 2023).

For land use development projects, BAAQMD recommends using the approach endorsed by the California Supreme Court in *Center for Biological Diversity v. Department of Fish & Wildlife* (2015) (62 Cal.4th 204), which evaluates a project based on its effect on California's efforts to meet the State's long-term climate goals. As the Supreme Court held in that case, a project that would be consistent with meeting those goals can be found to have a less-than-significant impact on climate change under CEQA. If a project would contribute its "fair share" of what will be required to achieve those long-term climate goals, then a reviewing agency can find that the impact will not be significant because the project will help to solve the problem of global climate change (62 Cal.4th 220–223). Applying this approach, BAAQMD recommends that new land use development projects incorporate the following four BAAQMD-identified design elements to do their "fair share" of implementing the goal of carbon neutrality by 2045 (discussed in detail under *Significance Criteria* below).

The project-level GHG thresholds adopted by the BAAQMD are as follows:

A. Projects must include, at a minimum, the following project design elements:

   1. Buildings

      a. The project will not include natural gas appliances or natural gas plumbing (in both residential and non-residential development)

      b. The project will not result in any wasteful, inefficient, or unnecessary electrical usage as determined by the analysis required under CEQA Section 21100(b)(3) and Section 15126.2(b) of the State *CEQA Guidelines*.

   2. Transportation

      a. Achieve compliance with Electric Vehicle (EV) requirements in the most recently adopted version of CALGreen Tier 2

      b. Achieve a reduction in project generated VMT below the regional average consistent with the current version of the California Climate Change Scoping Plan (currently 15 percent)

         OR

         Meet a locally adopted Senate Bill 743 VMT target, reflecting the recommendations provided in the Governor's Office of Planning and Research's Technical Advisory on Evaluating Transportation Impacts in CEQA:

i. *Residential projects*: 15 percent below the existing VMT per capita
ii. *Office projects*: 15 percent below the existing VMT per employee
iii. *Retail projects*: no net increase in existing VMT

Alternately, a local government may prepare a qualified GHG reduction strategy that is consistent with SB 32 goals. If a project is consistent with an adopted qualified GHG reduction strategy and general plan that addresses the project's GHG emissions, it can be presumed that the project will not have significant GHG emissions under CEQA (BAAQMD, 2023).

Metropolitan Transportation Commission/Association of Bay Area Governments

Plan Bay Area / Sustainable Communities Strategy

Metropolitan Transportation Commission ("MTC") is the federally recognized Metropolitan Planning Organization for the nine-county Bay Area. In 2013, MTC adopted *Plan Bay Area* which included the region's Sustainable Communities Strategy, as required under SB 375, and the 2040 Regional Transportation Plan. A central GHG reduction strategy included in *Plan Bay Area* is the concentration of future growth in Priority Development Areas ("PDAs") and Transit Priority Areas ("TPAs"). To be eligible for PDA designation, an area must be within an existing community, near existing or planned fixed transit or served by comparable bus service and planned for more housing. A TPA is an area within 0.5 miles of an existing or planned major transit stop such as a rail transit station, a ferry terminal served by transit, or the intersection of two or more major bus routes (MTC & Association of Bay Area Governments [ABAG], 2013).

On July 26, 2017, MTC adopted *Plan Bay Area 2040*, a focused update that builds upon the growth pattern and strategies developed in the original Plan Bay Area but with updated planning assumptions that incorporate key economic, demographic, and financial trends since the original plan was adopted (MTC & ABAG, 2017).

On October 21, 2021, the MTC and the Executive Board of the ABAG jointly adopted *Plan Bay Area 2050* and its related supplemental reports. *Plan Bay Area 2050* connects the elements of housing, the economy, transportation and the environment through 35 strategies that will make the Bay Area more equitable for all residents and more resilient in the face of unexpected challenges. In the short-term, the plan's Implementation Plan identifies more than 80 specific actions for MTC, ABAG and partner organizations to take over the next five years to make headway on each of the 35 strategies (MTC & ABAG, 2021). It will be several years before the regional transportation model (and therefore county and local transportation models) are updated to reflect *Plan Bay Area 2050*; the models currently incorporate data from *Plan Bay Area 2040*.

University of California

UC Policy on Sustainable Practices

In 2007, the UC President adopted the *Policy on Sustainable Practices*, which committed UC to implementing actions intended to minimize the University's impact on the environment and reduce the University's dependence on non-renewable energy. The policy was most recently revised in April 2024 (University of California, 2024) and establishes goals in 13 areas of sustainable practices: green building, clean energy, climate action, transportation, sustainable operations, zero waste, procurement, food service, water, health care, performance assessment, health and well-being, and diversity, equity, inclusion, and justice.

By 2025, the policy requires each UC campus (including their associated Academic Health Centers), Berkeley Lab, and UCOP to set location-specific targets to reduce GHG emissions from a 2019 baseline. Before 2026, these locations are required to submit campus-adopted climate action plans to the Office of the President addressing:

Total Emissions

- Reduce total emissions (Scopes 1, 2, and 3) at least 90 percent by 2045.
- Negate any residual emissions remaining in 2045 through investments in carbon removal.

Scope 1 Emissions

- Set reduction targets relative to 2019 for 2030, 2035 and 2040 by January 1, 2025.
- Incrementally reduce annual GHG emissions from the on-site combustion of fossil fuels.
- In lieu of purchasing voluntary offsets, allocate funds equal to $25/MTCO2e for all remaining Scope 1 and Scope 2 emissions in 2025 through 2030 towards projects that achieve direct emissions reductions or support climate justice or community benefit programs.

Scope 3 Emissions

- Set Scope 3 emissions reduction targets relative to a 2019 baseline year for business travel, commuting, and treatment and disposal of solid waste in alignment with California's goals to achieve carbon neutrality by 2045 or sooner.

An annual report is presented to the Board of Regents and shared with the UC community each January detailing UC's progress toward meeting the goals in the *Policy on Sustainable Practices* as well as sustainability achievements in education, research, investments and public service.

Sustainable Berkeley Lab

SBL collaborates with other Berkeley Lab departments to reduce the Lab's climate, waste, and water footprint; improve operations and reduce waste; enable sustainable solutions; and apply Laboratory research. SBL initiatives are described in a strategic Plan (Berkeley Lab *Net-Zero Vision and Roadmap*), which is supported by Lab policies on *Sustainable Standards for New Construction and Major Renovations* and *Sustainability Standards for Operations*. The Vision and Roadmap and policies are described below.

Sustainability Targets and Requirements

Berkeley Lab maintains a list of current sustainability targets and requirements based on federal, State and UC requirements. **Table 4.7-3** summarizes the key quantitative targets that address climate, energy efficiency, water conservation, and waste minimization. Berkeley Lab implements policies and programs to address each of these targets that also translate into GHG reductions.

TABLE 4.7-3
BERKELEY LAB'S SUSTAINABILITY REQUIREMENTS

#	Target	Target Summary	Target Source
Climate			
1	Overall Climate Target	Achieve a straight-line reduction in Berkeley Lab's GHG emissions from a 2015 baseline to reach net-zero by no later than 2045, while achieving a direct 90% reduction in emissions from a 2019 baseline by no later than 2045	*Net-Zero Vision and Roadmap* and UC *Policy on Sustainable Practices*, Sec III.C
2	Scope 1 GHG Reduction Target	Reduce Scope 1 GHG emissions 25% by 2030, 60% by 2035, and 80% by 2040 from a 2019 baseline	Lab-specific target submitted as per UC *Policy on Sustainable Practices*, Sec III.C
3	Natural Gas Use Reduction	Do not install natural gas boiler plants in any federal new construction or retrofit project if the project cost exceeds a threshold currently set at $3.9M in 2025.	Federal Clean Energy Rule (Federal Law, U.S.C. § 6834(a)(3)(D))
4	Natural Gas Use Reduction	Do not install natural gas storage tank water heaters with a capacity of 75,000 BTU/hr or less that emit nitrogen oxides after January 1 2027, or natural gas boilers or water heaters with a capacity of 75,001 BTU/hr to 2,000,000 BTU/hr that emit nitrogen oxides after January 1, 2031. At the time of this writing, only electric options are available that meet this requirement.	BAAQMD Regulation 9, Rule 6
5	No On-site Combustion	Eliminate on-site fossil fuel use in new construction (beginning as of 2020)	UC *Policy on Sustainable Practices* Sec III.A.1.c
Energy Efficiency			
6	Two Percent Annual Efficiency Improvement	Improve facility energy efficiency at least two percent annually	UC *Policy on Sustainable Practices* Sec III.B
7	National Energy Research Scientific Computing (NERSC) Efficiency	Maintain NERSC Power Utilization Effectiveness (PUE) below 1.1	--
8	Whole Building Energy Performance Targets	Limit major new building energy use to 35-50 percent of an existing building baseline	Sustainability Standards for New Construction and Major Renovations
9	30 Percent better than Code	Outperform energy code by 30 percent - Design for energy consumption in major new construction at least 30 percent below the levels established by the ASHRAE 90.1 Standard	42 USC §6834 (a)(3)(A) and DOE Order 413.3B (App C, 5)
Water Conservation			
10	Water Consumption per Square Foot	Reduce water consumption per square foot 36 percent by 2025 from a 2007 baseline	42 USC §8253 and UC *Policy on Sustainable Practices*, Sec III.I
Waste Minimization			
11	Zero Waste	Achieve greater than 90 percent diversion of nonhazardous solid waste from the landfill through recycling or composting	UC *Policy on Sustainable Practices* Sec. III.F
12	LBNL Construction Waste Diversion	Divert 80 percent of construction and demolition waste from the landfill for major new construction	Sustainability Standards for New Construction and Major Renovations

SOURCE: LBNL SBL, 2024.

Berkeley Lab Net-Zero Vision and Roadmap

SBL has developed a *Net-Zero Vision and Roadmap* (LBNL, 2023a) for achieving net-zero GHG emissions from its operations driven by a series of federal, State, and University of California climate mitigation requirements. The actions outlined in this document are organized around a high-level target to achieve a straight-line reduction in Berkeley Lab's GHG emissions from a 2015 baseline to reach net-zero by no later than 2045. This corresponds to a 3.3 percent reduction of baseline emissions each year. This target includes emissions from natural gas, electricity, and fuels used for fleet, business travel, and commutes.

Although the *Net-Zero Vision and Roadmap* was originally designed to respond to the federal requirements of presidential EO 14057 which has been revoked, the *Net-Zero Vision and Roadmap* is aligned with the climate goals of the State of California, the University of California, the operator of Berkeley Lab for the DOE, and the City of Berkeley. It also aligns with the science of limiting global temperature rise to 1.5°C (Celsius). Berkeley Lab is using the Net-Zero Standard created by the Science-Based Targets Initiative to ensure this alignment. Achieving net-zero requires an absolute reduction of GHG emissions to zero or a residual level (90 percent or greater reduction from a baseline year) and negating any residual emissions through carbon removal.

Strategies identified to reach net-zero are categorized into five building blocks:

- **Energy Efficiency:** Continual improvement in the efficiency of operations and new construction
- **Renewable Energy:** Shifting to 100 percent carbon-free electricity and increasing the hourly match between carbon-free supply and demand
- **Electrification:** Transitioning away from natural gas and fuel to electricity, provided by a decarbonized grid
- **Individual Action:** Providing support for individual and collective action to optimize purchases, commutes, and flights
- **Innovation:** Collaborating with researchers to advance science, implementation and adoption

It includes the following 17 net-zero actions, presented below in **Table 4.7-4**. Actions are grouped using a Stop/Start/Continue framework indicating existing activities that the Lab will stop, activities that the Lab will start as relatively new efforts, and those that will continue and deepen based on mature initiatives.

Requirements and Policies Manual

The Berkeley Lab Requirements and Policy Manual (RPM) is a collection of policies from the University of California and LBNL that help define the Laboratory's operation.

TABLE 4.7-4
BERKELEY LAB'S NET-ZERO VISION AND ROADMAP ACTIONS

		Net-Zero Action
STOP	1	**Gas Heating**: Stop replacing natural gas heating systems like-for-like.
	2	**Fuel Vehicles and Equipment**: Stop leasing or buying fossil-driven fleet vehicles and operations equipment when there are reasonable zero-emission alternatives.
START	3	**Renewable Energy**: Start scaling up procurement of long-term renewable energy contracts.
	4	**Electrification of Existing Facilities** - Start transitioning to fully electric infrastructure in existing facilities, building on experience in new construction.
	5	**Electrification of Fleet:** Start accelerating the transition to zero-emission fleet vehicles.
	6	**Business Travel:** Start working to optimize business travel.
	7	**Carbon Removal:** Start cultivating long-term permanent carbon removal offsets to neutralize residual emissions.
	8	**Living Lab:** Start expanding support of applied infrastructure-scale research related to net-zero.
	9	**Equity and Justice:** Start taking specific steps to address equity and climate justice in the Lab's net-zero effort.
	10	**Upstream Emissions:** Start exploring upstream emissions from food and purchased goods and services, then capture near-term emission reduction opportunities.
	11	**Sustainable Procurement:** Start strengthening procurement practices to streamline processes, reduce energy and water consumption, and lower GHG emissions.
	12	**Time of Use Emissions:** Start exploring GHG emissions associated with electricity time-of-use.
CONTINUE	13	**Efficient Facilities:** Continue deepening energy and water savings in the operation of buildings and research facilities.
	14	**New Construction:** Continue strengthening sustainability standards for new construction.
	15	**Green Commutes:** Continue to support alternative commutes and expand electric vehicle charging.
	16	**Air, Water, and Materials:** Continue pursuing net-zero related sustainability strategies including conserving water, managing air quality in buildings, cultivating a circular economy, and diverting waste.
	17	**Sharing and Learning:** Continue sharing net-zero experiences to increase learning and climate action.

SOURCE: LBNL SBL, 2023a.

Sustainability Standards for New Construction and Major Renovations

This policy identifies sustainability standards for new construction and major renovation projects at Berkeley Lab to leverage opportunities presented by new facility construction and major renovations to pursue integrated, performance-driven designs to minimize energy consumption and other environmental impacts associated with buildings at the lowest possible cost (LBNL, 2023b). The purpose of this policy is to:

1. Identify minimum sustainability targets for new construction and major renovation projects.
2. Drive continuous improvement in the area of high-performance, low-cost building design.
3. Establish a practical path to comply with federal and UC sustainability requirements.
4. Minimize life-cycle costs within the constraints of capital budgets.
5. Demonstrate leadership in reducing GHG emissions and other environmental impacts.

The policy is accompanied by the *Implementation Guide to the Berkeley Lab Sustainability Standards for New Construction*. This includes information on setting and verifying energy efficiency – whole building performance targets; energy efficient lighting systems; compliance with the *Guiding Principles for Sustainable Federal Buildings*; construction waste diversion; and landscaping and vegetation management consistent with the *Lab Vegetation Maintenance Guide*.

Sustainability Standards for Operations

UC LBNL's commitment to energy and water efficiency is formalized in a sustainable policy as part of the RPM. *Sustainable Standards for Operations* policy applies to the Berkeley Lab community in general and is implemented by persons involved with Berkeley Lab operations such as building managers, Facilities personnel, and SBL, and subcontractors. It identifies policies, goals, and actions in the areas of energy and water management, GHG reduction (including electrification of buildings, fleet, and landscape equipment), use of environmentally preferred products, green cleaning, and pest control services (LBNL, 2023c).

4.7.4 Impacts and Mitigation Measures

Significance Criteria

For purposes of this EIR, impacts to GHG emissions would be considered significant if they would exceed the Standards of Significance presented below, which are based on Appendix G of the *CEQA Guidelines*.

Would implementation of the LBNL 2025 LRDP:

a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment; or

b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases.

The California Air Pollution Control Officers Association (CAPCOA) considers GHG impacts to be exclusively cumulative impacts (CAPCOA, 2008); therefore, assessment of significance is based on a determination of whether the GHG emissions from a project represent a cumulatively considerable contribution to the global atmosphere.

The *CEQA Guidelines* do not prescribe specific methods for performing an assessment, do not establish specific thresholds of significance, and do not mandate specific mitigation measures. Rather, the *CEQA Guidelines* emphasize the lead agency's discretion to determine the appropriate methods and thresholds of significance consistent with various factors prescribed by *CEQA Guidelines* Section 15064.4. The State of California has not adopted emissions-based thresholds for GHG emissions under CEQA. The OPR technical advisory titled *Discussion Draft CEQA and Climate Change Advisory* (OPR, 2018) states that:

> [N]either the CEQA statute nor the CEQA Guidelines prescribe thresholds of significance or particular methodologies for performing an impact analysis. This is left to lead agency judgment and discretion, based upon factual data and guidance from regulatory agencies and other sources where available and applicable. Even in the absence of clearly defined

> thresholds for GHG emissions, such emissions must be disclosed and mitigated to the extent feasible whenever the lead agency determines that the project contributes to a significant, cumulative climate change impact.

Furthermore, the advisory document indicates that "in the absence of regulatory standards for GHG emissions or other scientific data to clearly define what constitutes a 'significant impact, individual lead agencies may undertake a project-by-project analysis, consistent with available guidance and current CEQA practice." Section 15064.7(c) of the *CEQA Guidelines* specifies that "when adopting thresholds of significance, a lead agency may consider thresholds of significance previously adopted or recommended by other public agencies, or recommended by experts, provided the decision of the lead agency to adopt such thresholds is supported by substantial evidence."

For the purposes of analyzing the significance of the proposed Project's GHG impacts, the following significance criteria and thresholds are used in this EIR.

With respect to the CEQA checklist significance criterion a) above, any increase in GHG emissions above existing conditions (no net increase) is considered to result in a significant impact on the environment. Pursuant to *CEQA Guidelines* Section 15125, the environmental setting normally constitutes the baseline physical conditions by which an agency determines whether an impact is significant. The existing baseline for the evaluation of GHG impacts of campus growth and development pursuant to the proposed 2025 LRDP under CEQA is 2024 emissions. Therefore, for the purpose of this EIR, the proposed 2025 LRDP would result in a significant impact related to the Lab's GHG emissions if the proposed 2025 LRDP implementation were to increase GHG emissions above emissions under existing conditions (2024).

With respect to the CEQA checklist significance criterion b) above, the proposed Project would result in a significant GHG impact if the total campus emissions resulting at project buildout (2045) would not meet the carbon neutrality targets set forth in applicable plans and policies, which, for this EIR, include the UC *Policy on Sustainable Practices* and AB 1279.

Approach to Analysis

Change in the Amount of Annual GHG Emissions

Construction

Construction associated with implementation of the 2025 LRDP EIR include activities such as demolition, construction and renovation, along with excavation and grading. Construction GHG emissions (i.e., CO_2, CH_4, and N_2O) would be generated over the 20-year LRDP planning period: from 2026 to 2045. However, the proposed 2025 LRDP does not specify an implementation timeline for individual projects. Therefore, proposed 2025 LRDP construction emissions were estimated using the Illustrative Development Scenario (which is generally based on the proposed 2025 LRDP level of development). Construction emissions by year associated with the Illustrative Development Scenario were calculated using the California Emissions Estimator Model (CalEEMod), version 2022, as recommended by BAAQMD. Total emissions generated from construction (as estimated under the Illustrative Development Scenario) were averaged over the 20-year planning period to estimate average annual construction emissions associated with the implementation of the 2025 LRDP. **Appendix AIR** includes the details on the modeling assumptions for construction activities that would implement the proposed 2025 LRDP. Estimated construction emissions were amortized over the 20-year planning period and considered with the operational emissions in comparison to the "no net increase" threshold.

Operations

Estimated 2024 (existing) baseline emissions and projected GHG emissions for the buildout year 2045 were provided by SBL based on GHG reduction targets in each sector. A summary of the assumptions used to estimate emissions for the 2024 baseline and for the year 2045 with proposed 2025 LRDP buildout is included in **Appendix AIR**.

Projected 2045 emissions are compared to the 2024 baseline emissions to determine impacts using the no net increase threshold.

Conflict with Plans or Policies for Reducing GHG Emissions

GHG impacts are also evaluated by assessing whether the proposed 2025 LRDP would conflict with applicable GHG reduction plans and policies approved or adopted by CARB, ABAG, and UC. The 2022 Scoping Plan for Carbon Neutrality, ABAG's *Plan Bay Area 2050*, and plans and policies adopted by UC and Berkeley Lab are all intended to reduce GHG emissions to meet the Statewide targets for 2030 set forth in AB 32, as amended by SB 32, and the target to achieve carbon neutrality by 2045 pursuant to AB 1279. Thus, the significance of the Project's GHG emissions is evaluated consistent with *CEQA Guidelines* Section 15064.4(b)(2) by considering whether the proposed 2025 LRDP would conflict with these applicable plans, policies, and regulations adopted for the purpose of reducing GHG emissions. As the proposed 2025 LRDP's buildout year is well past the SB 32 compliance date of 2030, the analysis presented below focuses on consistency with the 2045 carbon neutrality target set by AB 1279 which is also the focus of the UC *Policy on Sustainable Practices*.

Impact Analysis

LRDP Impact GHG-1: Implementation of the LBNL 2025 LRDP would not generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment. (*Less than Significant*)

Both direct and indirect GHG emissions would result from proposed 2025 LRDP-related construction and operational activities.

Direct GHG emissions would be generated during project construction under the 2025 LRDP and would include emissions from fuel combustion (e.g., gasoline and diesel) in construction equipment and vehicles. GHG emissions would vary depending on the level of construction and demolition proposed for each year and the fleet emission rates for construction equipment and vehicles in that year. Emission rates are expected to progressively improve for both off-road construction equipment and on-road vehicles used for construction; this assumption is based on fleet turnover with new, cleaner technologies and phase-out of older equipment and vehicles in response to increasingly stringent emission standards.

The actual development schedule of individual projects under the proposed 2025 LRDP is not known at this time. However, the level of development envisioned under the 2025 LRDP would be similar to that analyzed for the Illustrative Development Scenario (detailed further below), for which emissions have been estimated. Similar to the Illustrative Development Scenario, the proposed 2025 LRDP would generate an average of approximately 127 $MTCO_2e$ per year through new construction over the 20-year implementation period–from FY 2025 to 2045. Construction emissions would be minimal when compared to the proposed 2025 LRDP's operational emissions inventory (shown below) and ongoing reductions. Nevertheless, the construction emissions are considered with the proposed 2025 LRDP's operational emissions for comparison with the no net increase threshold.

Table 4.7-5 presents the estimated annual GHG emissions associated with campus operations under the proposed 2025 LRDP in the buildout year of 2045. Operational GHG emissions would be generated under the proposed 2025 LRDP in all three scope categories.

TABLE 4.7-5
OPERATIONAL GREENHOUSE GAS EMISSIONS AT 2025 LRDP BUILDOUT IN 2045

Scope	Sector	Annual GHG Emissions ($MTCO_2e$ per year)		
		2024 Baseline Emissions	2045 Buildout Forecast[a]	Net Change from 2024 Baseline
1	Natural Gas	6,294	710	-5,584
1	Non-Fleet Vehicles & Equipment Fuel	583	57	-526
1	Fleet Fuel	126	13	-113
1	Fugitives and Process Gases	823	155	-668
2	Electricity (Gridless Renewables) and Avoided Emissions from RECs	19,119	950	-18,169
3	Business Air Travel	4,906	2,098	-2,808
3	Business Ground Travel	331	113	-218
3	Employee Commute	4,196	964	-3,232
3	Transmission and Distribution Losses	1,107	45	-1,062
3	Solid Waste Disposal	217	109	-108
3	Wastewater Treatment	10	6	-4
1	Scope 1 Total	7,826	935	-6,891
2	Scope 2 Total	19,119	950	-18,169
3	Scope 3 Total	10,768	3,335	-7,433
	Average Annual Construction Emissions	--	127	127
1,2, & 3	Total	37,713	5,347	-32,366
1,2, & 3	No Net Increase Threshold	37,713	37,713	0
1,2, & 3	Significant?	--	--	No

NOTES: $MTCO_2e$ = metric tons of carbon dioxide equivalents
a. Assumptions used in the estimation of 2045 GHG emissions are included in Appendix AIR)
SOURCE: LBNL SBL, 2025.

Scope 1 emissions are direct GHG emissions that are generated from sources that are controlled or owned by the Lab and include emissions in the following sectors.

Natural Gas Combustion: Projections of future natural gas combustion emissions assume that all new buildings will be all-electric and will not use natural gas for space heating, water heating, or cooking. Demolishing existing structures that currently use natural gas would reduce direct GHG emissions when compared to existing conditions. Projections also assume that the Lab will meet the federal building performance target to "Achieve zero scope 1 emissions from on-site fossil fuel use through building electrification for at least 30 percent of key facilities by 2030." Remaining gas consumption in 2045 is due to space and water heating needs associated with minor buildings not served by electrification of heating plants and minor amounts of natural gas used in laboratories for research purposes and is out of scope of this target.

Fuel Use in Non-Fleet Vehicles and Equipment: This source includes emissions from the use of fuel (such as liquid propane, diesel, and gasoline) in off-road equipment, including forklifts, emergency backup generators, aerial lifts, excavators, asphalt rollers, mobile air compressed units, and landscaping equipment. Estimates assume that the Lab will meet CARB requirements for CARB Zero-Emission Forklift and CARB Renewable Diesel Fuel, regulations.

Fuel Use in Fleet Vehicles: This source includes emissions from the use of fuel (such as gasoline, diesel, and ethanol) by the Lab's vehicle fleet assuming that the Lab would achieve 90 percent reduction from 2019 baseline due to electrification of federal fleet, driven by CARB Advanced Clean Fleets and Advanced Clean Cars regulations.

Fugitives and Process Gases: This source includes fugitive gases emitted from research activities at the Lab and includes GHG emissions such as SF_6, CO_2, CH_4, N_2O, and refrigerants primarily used in heating, ventilation, and air conditioning equipment. Future projections for this source assume the implementation of EPA's phasedown of HFC class of refrigerants.

Scope 2 emissions are indirect GHG emissions associated with the purchase of electricity, steam, heat, or cooling. Although Scope 2 emissions physically occur at the facility where they are generated, they are accounted for in an organization's GHG inventory because they are a result of the organization's energy use.

Electricity Use: This source includes emissions from electricity generated off-site and used on the campus and specific satellite locations that are under operational control of Berkeley Lab.[6] The emissions estimate includes renewable energy from a solar array located at Lawrence Livermore National Laboratory, of which Berkeley Lab purchases 20 percent of its annual output; incremental hydropower produced by the Central Valley Project (CVP); and community energy from MCE, used by a satellite location. Estimates account for the fact that all new construction will be all-electric and assume SB 100 is met, which is 100-percent decarbonized electricity grid by January 1, 2046.

Some emissions are currently reduced through renewable energy certificates (RECs). RECs are legal instruments used in renewable electricity markets to account for renewable electricity and its attributes whether that renewable electricity is installed on the organization's facility or purchased from elsewhere.

6 Although off-site satellite locations managed or operated by Berkeley Lab are not a part of the proposed 2025 LRDP, removing their electricity usage from the total Berkeley Lab electricity usage is not feasible. Therefore, off-site electricity usage in these facilities and associated GHG emissions are included in the estimates reported in this section.

Scope 3 emissions are the result of activities from assets not owned or controlled by the reporting organization, but that the organization indirectly affects in its value chain. An organization's value chain consists of both its upstream and downstream activities. Scope 3 emissions include all sources not within an organization's Scope 1 and 2 boundary. Scope 3 emissions, also referred to as value chain emissions, often represent the majority of an organization's total GHG emissions. Scope 3 emissions from the Lab are generated in the following categories.

Business Air Travel: This category includes emissions from the air transportation of employees for business-related activities in aircraft owned or operated by third parties. Business air travel emissions are based on miles traveled on flights for business purposes by flight segment length: short, medium, and long haul and utilize emission factors published by the U.S. EPA in the GHG Emission Factors Hub, consistent with federal calculations.

To project 2045 estimates, GHG intensity of air travel is assumed to improve 4 percent per year which corresponds to a 48 percent decrease by 2040 and 65 percent decrease by 2050. The 2045 forecast assumes that air travel patterns will not change at the Lab.

Business Ground Travel: This category includes emissions from the ground-based transportation of employees for business-related activities in vehicles owned or operated by third parties, such as trains, buses and passenger cars (e.g., business travel in rental cars or employee-owned vehicles other than employees commuting to and from work). Reported emissions are based on miles per trip or miles per gallon for business ground travel. Sub-categories include personal vehicles, rental cars, and mass transport, such as Bay Area Rapid Transit (BART). 2045 projections assume vehicle efficiency to improve 2 percent per year, based on historical trend of vehicle efficiency for cars and SUVs. Emissions reduction associated with EV adoption is based on the nationwide target of 50 percent EV sales by 2030 and 100 percent EV sales by 2040 linearly.

Employee Commute Emissions: This source accounts for emissions from the trips made by employees to commute to the Lab and includes all modes of transportation including private vehicles, shuttle buses, and public transport. Projections account for future emissions reductions from privately owned vehicles based on EV penetration projections from the 2021 consultant study for the campus and an overall increase in vehicle fuel efficiency for all modes.

Transmission and Distribution Losses: This accounts for emissions associated with the transmission and distribution losses that occur as electricity is transmitted and distributed to the Lab's facilities.

Waste Disposal: Proposed 2025 LRDP implementation would increase the Lab's population, thereby increasing municipal solid waste needing disposal in landfills, where CH_4 would be generated as the waste decomposes.

Wastewater Treatment: Lab-generated wastewater, which is served by the East Bay Municipal Utility District's Main Wastewater Treatment Plant, would increase along with campus population under the proposed 2025 LRDP. Off-site wastewater treatment generates GHG emissions.

As shown in Table 4.7-5, campus growth and development under the proposed 2025 LRDP would generate a decrease in GHG emissions at buildout when compared to existing conditions. This is due to increased energy and fuel efficiency, electrification of buildings and fleet, improvements in vehicle engine technology, and reductions from statewide implementation of

SB 100 renewable energy goals. Consequently, proposed 2025 LRDP implementation would not increase GHG emissions emitted by Berkeley Lab or contribute to existing cumulative emissions impacts. This impact would be less than significant.

While the analysis presented above is a program-level evaluation of the proposed 2025 LRDP using the no net increase threshold, it should be noted that the proposed 2025 LRDP would also be substantially consistent with the project-level design elements identified by BAAQMD as GHG project-level thresholds. The BAAQMD GHG thresholds rely on reducing GHG emissions from projects by targeting the two main sources of emissions – building energy use and transportation. To result in a less-than-significant impact, BAAQMD requires projects to show consistency with the following project design elements:

1. Building energy use
    a. The project will not include natural gas appliances or natural gas plumbing (in both residential and non-residential development)
    b. The project will not result in any wasteful, inefficient, or unnecessary electrical usage as determined by the analysis required under CEQA Section 21100(b)(3) and Section 15126.2(b) of the State CEQA Guidelines.
2. Transportation
    a. Achieve compliance with EV requirements in the most recently adopted version of CALGreen Tier 2
    b. Achieve a reduction in project generated VMT below the regional average consistent with the current version of the California Climate Change Scoping Plan (currently 15 percent)

       OR

       Meet a locally adopted Senate Bill 743 VMT target, reflecting the recommendations provided in the Governor’s Office of Planning and Research's Technical Advisory on Evaluating Transportation Impacts in CEQA:

       i. *Residential projects*: 15 percent below the existing VMT per capita
       ii. *Office projects*: 15 percent below the existing VMT per employee
       iii. *Retail projects*: no net increase in existing VMT

All new facilities constructed pursuant to the 2025 LRDP would be all electric with no natural gas infrastructure included in these facilities thus complying with BAAQMD GHG threshold 1(a) above. The Lab identifies energy efficiency and renewable energy as two important components of its *Net-Zero Vision and Roadmap* to reach net zero GHG emissions by 2045. As discussed in detail under LRDP Impact ENE-1, all development under the 2025 LRDP would be designed and constructed to be consistent with requirements in the *Sustainability Standards for New Construction and Major Renovations* in the RPM which implements federal and UC energy requirements. Therefore, the proposed 2025 LRDP would not result in any wasteful, inefficient, or unnecessary electrical usage and will be consistent with BAAQMD GHG threshold 1(b) above.

With respect to the transportation-related GHG thresholds, the Lab is not subject to CALGreen requirements. However, consistent with the intent of the BAAQMD GHG threshold 2(a) to provide EV charging infrastructure to facilitate transition to EV vehicles, the Lab's Transportation Demand Management (TDM) program will continue to support the use of EVs. Further, as discussed under LRDP Impact GHG-2 below, the Lab has provided EV charging since 2013 and plans to at least triple the number of EV charging sites across the campus to encourage and support the growth in EV use for both fleet vehicles and Laboratory staff vehicles. Therefore, campus development under the proposed 2025 LRDP would be consistent with the goal of BAAQMD GHG threshold 2(a). Lastly, as detailed under LRDP Impact GHG-2 below, while the proposed 2025 LRDP implementation would increase VMT due to increased Lab population, the VMT per worker would still be more than 15 percent below the regional average, consistent with BAAQMD GHG threshold 2(b).

In summary, campus development pursuant to the proposed 2025 LRDP would also be substantially consistent with BAAQMD's project-level thresholds.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in this scenario. As such, the Illustrative Development Scenario is an appropriate and conservative basis for the evaluation of impacts related to GHG emissions. Construction GHG emissions for this scenario were estimated using methodology consistent with the estimation of criteria air pollutant emissions in Section 4.2, *Air Quality.* CalEEMod, which was used to estimate criteria air pollutants, also generates GHG emission estimates. **Table 4.7-6** summarizes the estimated GHG emissions by each year of construction under the Illustrative Development Scenario and presents the average annual emissions over the 20 years of construction.

TABLE 4.7-6
2025 LRDP CONSTRUCTION GHG EMISSIONS

Construction Year	GHG Emissions ($MTCO_2e$ per year)
2026	31.8
2027	--
2028	324.4
2029	56.6
2030	405.3
2031	--
2032	158.3
2033	109.1
2034	305.6
2035	241.9
2036	95.5

TABLE 4.7-6
2025 LRDP CONSTRUCTION GHG EMISSIONS

Construction Year	GHG Emissions ($MTCO_2e$ per year)
2037	--
2038	--
2039	99.4
2040	--
2041	229.7
2042	224.6
2043	159.2
2044	--
2045	90.5
Project Total	2,532
Construction Duration (years)	20
Average Annual Emissions	127

SOURCE: Table compiled by ESA in 2024 based on Appendix AIR.

For the reasons stated above with respect to the proposed 2025 LRDP, development consistent with that portrayed in the Illustrative Development Scenario would not generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment, and this impact would be less than significant.

LRDP Impact GHG-2: Implementation of the LBNL 2025 LRDP would not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases. (*Less than Significant*)

A significant impact would occur if Berkeley Lab growth and development under the proposed 2025 LRDP would generate GHG emissions, either directly or indirectly, that would conflict with State goals and applicable regulatory plans and policies to reduce GHG emissions. Consistency of the proposed 2025 LRDP is evaluated with CARB's 2022 Scoping Plan for Carbon Neutrality at the State level, MTC's *Plan Bay Area 2050* at the regional level, and policies and initiatives of the UCOP and Berkeley Lab at the local level.

CARB 2022 Scoping Plan

AB 1279 requires the State of California to achieve two targets by 2045 or sooner: (1) carbon neutrality and (2) a reduction in statewide anthropogenic GHG emissions of 85 percent below 1990 levels. AB 1279 requires CARB to ensure that the 2022 Scoping Plan identifies and recommends measures to achieve carbon neutrality, and to identify and implement policies and strategies for CO_2 removal and carbon capture, utilization, and storage technologies.

Based on data provided by SBL and as shown in **Table 4.7-7** below, Berkeley Lab's estimated total GHG emissions in 1990 were 55,693 $MTCO_2e$. This estimate excludes business air and ground travel emissions, emissions from non-fleet equipment and transmission & distribution losses associated with electricity use as these were not tracked when the 1990 estimate was prepared. Even without accounting for these sectors in the 1990 baseline, total emissions at buildout of the proposed 2025 LRDP (5,220 $MTCO_2e$ in 2045 inclusive of emissions from all Scope 1, 2, and 3 sectors) would be 90.6 percent below the 1990 baseline and thus exceed the AB 1279's reduction target of 85 percent below 1990 levels.

TABLE 4.7-7
OPERATIONAL GHG EMISSIONS AT 2025 LRDP BUILDOUT IN 2045 RELATIVE TO 1990 BASELINE EMISSIONS

Sources	GHG Emissions ($MTCO_2e$ per year)		
	1990 Emissions	2045 Buildout Forecast	Percent below 1990 baseline
Total GHG Emissions	55,693[a]	5,220[b]	90.6

NOTES: $MTCO_2e$ = metric tons of carbon dioxide equivalents
a. Does not include business air and ground travel emissions, emissions from non-fleet equipment and transmission & distribution losses.
b. This total differs from the 2045 total presented in Table 4.7-5 as it does not include amortized construction emissions.
SOURCE : UC LBNL SBL, 2025

The 2022 Scoping Plan expands on prior scoping plans and recent legislation, such as AB 1279, by outlining a technologically feasible, cost-effective, and equity-focused path to achieve the State's climate target of reducing anthropogenic GHG emissions to 85 percent below 1990 levels and achieving carbon neutrality by 2045 or sooner (CARB, 2022). To achieve carbon neutrality by 2045, the 2022 Scoping Plan contains GHG emissions reductions, technology, and clean energy mandated by statutes; reduction of short-lived climate pollutants; and mechanical CO_2e capture and sequestration actions.

Appendix D of the 2022 Scoping Plan identifies the most effective GHG reduction actions at the local level to help ensure that local climate efforts align with the State's climate goals. It identifies three priority areas that address the state's largest sources of emissions that local governments have authority or influence over. These include:

1. Transportation electrification
2. VMT reduction
3. Building decarbonization

By prioritizing climate action in these three priority areas, local governments and entities such as Berkeley Lab can address the largest sources of GHGs within their jurisdiction. The proposed 2025 LRDP includes design elements and strategies to address reduction in GHG emissions in all three priority areas.

Transportation Electrification

Berkeley Lab's TDM program will continue to support the use of EVs. The Lab has provided EV charging since 2013 and has a goal of at least tripling the number of EV charging sites across the campus in order to support the anticipated growth in EV use for both fleet vehicles and Laboratory staff vehicles. Additional EV parking stalls are projected to be installed near Building

76 to support fleet vehicles. Additional EV charging stations are projected for other centralized locations across the campus, in particular a large central parking lot envisioned in the vicinity of the Central Commons. A separate electrical distribution system is planned to accommodate the new electrical load for EV charging stations and encourage transportation electrification. Electrification of the Lab's federal fleet, driven by CARB's Advanced Clean Fleets and Advanced Clean Cars regulations, is anticipated to result in approximately 90 percent reduction in emissions relative to 2019 emissions.

VMT Reduction

The proposed 2025 LRDP Mobility and Circulation Element includes a number of transportation strategies to improve multi-modal transportation and site access with the aim of reducing vehicle trips and VMT. Strategies include managing parking demand; reducing reliance on personal automobile commutes by providing viable and attractive options for regular and occasional commuters; improving and expanding Berkeley Lab's system of mobility "hubs" or shuttle stops, with additional locations throughout the campus and enhanced wayfinding maps, bicycle parking, bike charging, and other amenities; creating an expanded Transit Center within the Central Commons, adjacent to the planned Welcome Center; and improving the bicycle circulation network, such as with delineated bicycle lanes and bicycle parking near most destinations. Berkeley Lab operates a robust shuttle bus system that circulates throughout the campus and connects the campus to off-campus destinations, including the UC Berkeley campus, the downtown Berkeley BART station, and the Lab's off-campus leased space. The shuttles are widely used to access facilities within the hilly campus, especially in the more remote campus areas.

UC LBNL is currently constructing a transit center or mobility hub in the Central Commons development cluster, which will provide convenient access to many destinations including dining, conference, and event space as well as to Berkeley Lab's visitor quarters and leadership offices. Over time, during the proposed 2025 LRDP term, UC LBNL would continue to encourage the ongoing transition to non-auto alternate modes of transportation through the development of additional improvements at the Central Commons transit center, other mobility hubs/shuttle stops, co-locating bicycle and scooter parking, and ensuring good pedestrian connections. Over the proposed 2025 LRDP term, Berkeley Lab would continue to make improvements to the roadway network to encourage bicycle use. These proposed 2025 LRDP features would help reduce vehicle trips and VMT generated by encouraging alternate modes of transportation. While proposed 2025 LRDP implementation would increase total VMT generated by the Lab, the VMT per worker would be more than 15 percent below the regional average (please see 4.14, *Transportation,* for an analysis of the Project's VMT impact).

Building Decarbonization

All new construction that would occur under the proposed 2025 LRDP would be all-electric with no new natural gas infrastructure for space and water heating as well as cooking, thereby eliminating substantial new Scope 1 GHG emissions and reducing existing Scope 1 GHG emissions from the campus. The demolition of existing structures under the proposed 2025 LRPD that currently use natural gas would reduce direct GHG emissions when compared to existing conditions. The Lab will also meet the federal building performance target to "Achieve zero scope 1 emissions from on-site fossil fuel use through building electrification for at least

30 percent of key facilities by 2030." Consistent with federal requirements, UC LBNL would purchase 100 percent clean electricity from carbon-free sources by 2030. Therefore, the proposed 2025 LRDP would be consistent with the core strategy of the 2022 Scoping Plan related to building decarbonization.

Because the Project would result in 90 percent reduction in GHG emissions compared to 1990 levels thus exceeding the 85 percent reduction target and because development under the proposed 2025 LRDP would be consistent with the core strategies set forth in the 2022 Scoping Plan, the proposed 2025 LRDP would not conflict with the 2022 Scoping Plan.

Plan Bay Area 2050

The *Plan Bay Area 2050* was adopted as the Bay Area's Sustainable Communities Strategy pursuant to SB 375 and includes the regional transportation plan. The implementation of *Plan Bay Area 2050* is expected to reduce transportation-related GHG emissions as a result of transportation and land use changes that support active and shared modes of transportation. With all strategies of the plan implemented, the Bay Area would meet the state mandate of a 19 percent per-capita emissions reduction by 2035.

Plan Bay Area 2050 has identified focus areas for future housing and job growth in the Bay Area, which are classified as "growth geographies." These growth geographies are geographic areas used to guide where future growth in housing and jobs would be focused under the plan's strategies over the next 30 years. These growth geographies are categorized into four types: PDAs, priority production areas, transit-rich areas, and high-resource areas.

The Berkeley Lab campus is not located within any of these areas. Furthermore, Berkeley Lab does not plan for any housing development under the proposed 2025 LRDP. The proposed 2025 LRDP does not provide for substantial building space and population growth compared to existing conditions, nor does it involve a substantial expansion of the campus's development footprint. Rather, the proposed 2025 LRDP would allow moderate net growth and emphasizes the removal of aging buildings and construction of new and more efficient buildings and infrastructure within developed or previously disturbed campus areas. As noted above under the discussion of VMT reduction, the proposed 2025 LRDP includes several transportation strategies that would improve multi-modal transportation and site access and result in a reduction of LRDP-related vehicle trips and VMT. While proposed 2025 LRDP implementation would increase VMT generated due to increased Lab population, the VMT per worker would be more than 15 percent below the regional average. Therefore, development associated with the proposed 2025 LRDP would not conflict with the planning assumptions in *Plan Bay Area 2050*.

University of California and UC LBNL GHG Reduction Planning

The proposed 2025 LRDP is an overarching plan to guide long-term development at the Berkeley Lab campus governed by the policies and initiatives of the UCOP and Berkeley Lab, including applicable provisions of the UC *Policy on Sustainable Practices* and the Berkeley Lab *Net-Zero Vision and Roadmap*.

As identified in Section 4.7.3, *Regulatory Framework*, the Berkeley Lab *Net-Zero Vision and Roadmap* outlines strategies to achieve the federal, State, UCOP, and Berkeley Lab GHG reduction goals. Berkeley Lab's overall climate target to achieve net-zero emissions by 2045 outlined in the *Net-Zero Vision and Roadmap* is consistent with the targets identified in the UC *Policy on Sustainable Practices* to reduce total emissions (Scopes 1, 2, and 3) at least 90 percent by 2045 and negate any residual emissions remaining in 2045 through investments in carbon removal. Applicable provisions in the *Net-Zero Vision and Roadmap* include Green Building Design, the efficiency component of Clean Energy, Climate Action, Sustainable Transportation, Zero Waste, and Sustainable Water Systems. While some specific items in some sections may not apply to the Lab, most of these provisions reduce direct and/or indirect GHG emissions and are implemented through the Lab's *Sustainability Standards for New Construction* and *Major Renovations* and *Sustainability Standards for Operations*. It should be noted that over the proposed 2025 LRDP term, projects would be bound to the policies and plans in place at the time of project initiation.

Table 4.7-8 presents the estimated total annual GHG emissions associated with campus operations under the proposed 2025 LRDP in the buildout year of 2045 relative to emissions in the 2019 baseline year for UC target in the UC *Policy on Sustainable Practices.* As shown in the table, implementation of the proposed 2025 LRDP would achieve a 90.1 percent reduction target relative to 2019 consistent with the target in the UC *Policy on Sustainable Practices.*

TABLE 4.7-8
OPERATIONAL GHG EMISSIONS AT 2025 LRDP BUILDOUT IN 2045 RELATIVE TO 2019 EMISSIONS

	Annual GHG Emissions ($MTCO_2e$ per year)		
Scope	2019 Emissions	2045 Buildout Forecast[a]	Percent Change from 2019 Emissions
1, 2, & 3	52,203	5,220[b]	-90.1

NOTES: $MTCO_2e$ = metric tons of carbon dioxide equivalents
a. This total differs from the 2045 total presented in Table 4.7-5 as it does not include amortized construction emissions.
SOURCE: LBNL SBL, 2025.

In summary, campus growth and development per the proposed 2025 LRDP would not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. The impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in this scenario. As such, the Illustrative Development Scenario is an appropriate and conservative basis for the evaluation of impacts related to a conflict with an applicable plan for the reduction of GHG emissions. For the reasons stated above with respect to the proposed 2025 LRDP, development consistent with that portrayed in the Illustrative Development Scenario would also not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases, and this impact would be less than significant.

Cumulative Impacts

LRDP Impact CUM-GHG-1: Implementation of the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable projects, would not generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment or conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases. (*Less than Significant*)

Climate change is the cumulative effect of all natural and anthropogenic sources of GHGs accumulated on a global scale. The GHG emissions from an individual project or plan would not individually generate sufficient GHG emissions to measurably influence global climate change, and thus the assessment of the proposed 2025 LRDP's GHG emissions impacts presented above is inherently an analysis of its cumulative impact, or its contribution to a cumulatively significant global impact through its GHG emissions. While it is possible to examine the quantity of GHGs that would be emitted from individual projects and plans, it is not currently possible to link GHGs emitted from a specific source or location on the scale of the proposed 2025 LRDP to particular global climate change impacts.

Both BAAQMD and the CAPCOA consider GHG impacts to be exclusively cumulative impacts, in that no single project could, by itself, result in a substantial change in climate (BAAQMD, 2023; CAPCOA, 2008). Therefore, the evaluation of the proposed 2025 LRDP's GHG impacts presented above under LRDP Impacts GHG-1 and GHG-2 also analyze whether the proposed 2025 LRDP would make a considerable contribution to cumulative climate change effects. As detailed above, the analysis in LRDP Impact GHG-1 uses a threshold of no net increase over existing emissions; it would result in a less-than-significant impact with respect to generation of GHG emissions, either directly or indirectly, that may have a significant impact on the environment. Based on the evaluation provided under LRDP Impact GHG-2, the proposed 2025 LRDP would also be consistent with applicable plans, policies, or regulations adopted for the purpose of reducing GHG emissions and would meet the applicable reduction targets to achieve carbon neutrality. As such, the proposed 2025 LRDP's contribution to the cumulative GHG impact would not be cumulatively considerable. The cumulative GHG impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in this scenario. As such, the Illustrative Development Scenario is an appropriate and conservative basis for impact evaluation related to GHG emissions that may be associated with proposed 2025 LRDP implementation. Future development similar to that identified in the Illustrative Development Scenario, when combined with cumulative development, would, for the reasons stated above, result in GHG-related cumulative impacts that would be less than significant. For the reasons stated above, this impact would be less than significant.

4.7.5 References

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4.8 Hazards and Hazardous Materials

4.8.1 Introduction

This section describes and evaluates the potential for the implementation of the proposed LBNL 2025 LRDP (the Project) to result in significant impacts related to hazards and hazardous materials. The section contains a description of the existing regional and local conditions on the Berkeley Lab campus and the surrounding areas as it pertains to hazards and hazardous materials; includes a summary of the University plans and policies along with federal, State, and local regulations related to these resources; identifies criteria used to determine impact significance; and provides an analysis of the potential impacts related to hazards and hazardous materials associated with proposed 2025 LRDP implementation as well as identifies feasible mitigation measures that could mitigate any potentially significant impacts. Issues and impact analysis concerning air quality and air toxics are presented in Section 4.2, *Air Quality*. Issues and impact analysis concerning emergency response and evacuation plans and wildfire are presented in Section 4.16, *Wildfire*.

The section is based in part on hazardous materials and hazardous waste use, storage, and disposal information provided by UC LBNL and other relevant publicly available sources of information, including from responsible agencies.

4.8.2 Environmental Setting

Hazardous Materials and Waste

Definitions and Background

A hazardous material is defined as any material that, because of quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment (California Health and Safety Code [HSC] Chapter 6.95, Section 25501[n]). The term "hazardous materials" refers to both hazardous materials and hazardous wastes. Under federal and State laws, any material, including wastes, may be considered hazardous if it is specifically listed by statute as such, or if it is toxic (causes adverse human health effects), ignitable (has the ability to burn), corrosive (causes severe burns or damage to materials), or reactive (causes explosions or generates toxic gases).

Federal hazardous waste regulations adopted by U.S. Environmental Protection Agency (EPA) are found in Title 40, Code of Federal Regulations, (40 CFR), Parts 260-279. The federal regulations are implemented under the authority of Chapter 42, U.S. Code, (Resource Conservation and Recovery Act, also known as RCRA). California laws are outlined in the California Health & Safety Code (HSC), Division 20, Chapter 6.5 (Hazardous Waste Control Law). Regulations adopted from the HSC are found in the California Code of Regulations (CCR), Division 4.5, Title 22.

Hazardous wastes are hazardous substances that no longer have practical use, such as materials that have been spent, discarded, discharged, spilled, or contaminated, or that are being stored until they can be disposed of properly (Title 22 California Code of Regulations [22 CCR] Section 66261.10). Contaminated soil is a hazardous waste if it exceeds specific criteria established in Sections 66261.20 through 66261.24 of 22 CCR.

Mixed waste is defined as waste that contains both (1) hazardous waste that is either listed as hazardous waste in Subpart D of 40 CFR Part 261 or exhibits any of the characteristics identified in Subpart C of 40 CFR Part 261 and (2) source, special nuclear, or byproduct material subject to the Atomic Energy Act of 1954. Mixed wastes are subject to regulation by the EPA, the U.S. Department of Energy (DOE), and authorized state agencies.

Medical waste is waste generated as a result of diagnosis, treatment, or immunization of human beings or animals, or of the production or testing of biologicals; it is either a biohazardous waste or a sharps waste. Medical waste includes materials generated or produced from diagnosis, treatment, or immunization of human beings or animals, or research pertaining to those activities (HSC, Section 117690). The term "biologicals" means medicinal preparations made from living organisms and their products, including but not limited to serums, vaccines, antigens, and antitoxins (HSC, Section 117690). The term "sharps waste" refers to any device having acute rigid corners, edges, or protuberances capable of cutting or piercing, including but not limited to hypodermic needles and broken glass items (such as pipettes and vials) contaminated with biohazardous waste (HSC, Section 117755).

Hazardous materials are regulated by multiple agencies, as described in Section 4.8.3, *Regulatory Framework* below, and cleanup requirements of hazardous material releases are determined on a case-by-case basis according to the regulatory agency (e.g., EPA, California Department of Toxic Substances Control [DTSC] or Regional Water Quality Control Board [RWQCB]) with lead jurisdiction over a contaminated site.

Radioactive material or radionuclides are elements or atoms that contain excess numbers of either neutrons or protons, giving them excess nuclear energy and making them unstable. These atoms spontaneously decay and emit ionizing radiation in the form of alpha, beta, or gamma radiation. The rate at which radioactive materials emit radiation is measured in Curies (Ci); one Curie is defined as 37 billion disintegrations per second, or approximately the radioactivity of one gram of radium. The half-life is the time required for the disintegration of one-half of the radioactive atoms present when measurement begins.

The transportation, use, storage, treatment, and disposal of hazardous materials and hazardous wastes, as well investigation and remediation of historical releases of hazardous materials to the environment, are closely regulated under a permitting program administered by the DTSC.

Hazardous Materials

Numerous hazardous materials are stored and used at the Berkeley Lab campus for laboratory activities and/or facility operations (such as maintenance), including volatile organic compounds (VOCs), acids, solvents, petroleum products (e.g., gasoline, diesel, ethanol), and radioactive materials. The transportation, use, storage, treatment, and disposal of these materials can expose individuals or the environment to health and/or environmental hazards. UC LBNL complies with applicable federal, State, and local laws and regulations. Additional information regarding these materials, associated potential health hazards, and regulatory requirements is provided further below in Section 4.8.3, *Regulatory Framework*.

The calendar year 2023 inventory of hazardous materials, excluding radioactive materials, stored and used at Berkeley Lab is summarized in **Table 4.8-1** (LBNL, 2024a).

TABLE 4.8-1
HAZARDOUS MATERIALS (EXCLUDING RADIOACTIVE MATERIALS) STORED AND USED AT BERKELEY LAB[a,b]

Solids		
Stainless steel powder	Sodium arsenate (pesticide, antiseptic)	Blue dye
Red phosphorous	Sodium arsenite (pesticide, antiseptic)	Alum-etch 3 (cleaner-etchant)
Dry ice (carbon dioxide)	Black dye	
Liquids		
EDT (1,2-ethanedithiol, a reactant)	Formula 2310-lt and Formula 2353 (water scale and corrosion inhibitor)	Octafluorocyclobutane (deposition gas and etchant)
Isobutane (2-methyl propane, used as a propellant/aerating agent)	Formula 315 biocide	Phosphoric acid
5x supplement ez (amino acid solution)	Formula 3340 biocide	Polyethylene glycol mono(4-tert-octylphenyl) ether (detergent)
7423 microbiocide (antimicrobial)	Isopropanol	Potassium hydroxide
Acetone (solvent)	Durapoxy semi-gloss paint	Propadiene (fuel)
Acetonitrile (solvent)	Traffic marking paint	Liquid propane
Acryplex (paint)	Lead acid battery	Propylene glycol (water absorber)
Alcohol 200 proof	Liquid argon	PT-Polycold gas (refrigerant blend)
Aptek 2724-a-b (adhesive)	Liquid helium	Spray adhesive
Bleach	Liquid hydrogen	Silver paint
Chloroform (solvent)	Liquid nitrogen	Sodium hydroxide (lye)
Liquid carbon dioxide	Liquid oxygen	Sulfuric acid
D909 cleaner	Lubriplate gear and bearing oil	Surtec 650 ChromitAL (corrosion protectant)
Diesel fuel	MAPP gas (methylacetylene-propadiene propane, a fuel gas)	Tetrafluoromethane (refrigerant)
DTE 24 (hydraulic oil)	Methanol	Toluene (solvent)
E85 (flex fuel)	MOPS [3-(N-morpholino) propanesulfonic acid), a buffering agent	Trichloroacetic acid (protein-precipitating agent)
Erase (cleaner)	N,n-dimethylformamide (solvent)	Trimethylamine (warning agent)
Ethane	Gasoline	Vinylidene fluoride (propellant)
Ethylene	Nickel acetate	
Fast flash fuel	NucRed live647readyprobes reagent (nuclear staining agent)	
Gases		
Acetylene	Hydrogen	Perfluoromethylcyclohexane (synthesis reagent, heat transfer agent)
Argon	Krypton	Perfluoro-1,3-dimethylcyclohexane (synthesis reagent, heat transfer agent)
Carbon dioxide	Methane	Perfluorodimethylcyclobutane (synthesis reagent, heat transfer agent)
Chlorine	Neon	Refrigerants
Ethylene	Nitrite oxide	1 percent Silane in Argon

TABLE 4.8-1
HAZARDOUS MATERIALS (EXCLUDING RADIOACTIVE MATERIALS) STORED AND USED AT BERKELEY LAB[a,b]

Gases (cont.)		
Fluorine	Oxygen	Xenon
Helium	P-10 gas (mixture of methane and argon)	Mixtures of some of these gases

NOTES:
a. The table identifies those hazardous materials that exceed quantities of 55 gallons, 200 cubic feet, or 500 pounds aggregate in a single building, or meets the threshold planning quantity for extremely hazardous substances.
b. Some of the listed chemicals are trade names.

SOURCE: LBNL, 2024a.

Radioactive Materials

Radioactive materials are used in a variety of Berkeley Lab research activities, including studies that investigate the dynamics of living cells, trace the movement of chemicals through ecological systems, and determine how such materials react in the environment and the human body. In addition to research, radionuclides at the campus are present in analytical laboratories and in radioactive and mixed waste and are produced as a by-product of accelerator operations. Radiochemical and radiobiological studies performed at Berkeley Lab typically use small quantities of radionuclides, measured in millicuries (one-thousandth of a curie). A wide variety of radionuclides are used at Berkeley Lab and many of the radionuclides have multiple isotopes. The most common radionuclides stored, used, or produced at Berkeley Lab include carbon-11, fluorine-18, tritium actinide nuclides (e.g., uranium, thorium, plutonium, americium, etc.), strontium-90, cesium-137, cobalt-60, and technetium-99.

Hazardous, Radioactive, and Medical Waste

Waste Generation

Multidisciplinary research at Berkeley Lab results in the generation of a wide range of wastes. Chemical and material science research and engineering generate most of the hazardous and mixed waste at Berkeley Lab. Some of these Lab research activities produce corrosive and organic wastes used in extraction and cleaning processes. Other wastes include used or surplus laboratory reagents that cannot be re-used, solutions used in research experiments, process equipment wastes, and other wastes. The Lab’s particle accelerator facilities generate wastes from cleaning solutions and organic solvents used in accelerator operations and equipment maintenance. Lab engineering research and support activities can generate metallic wastes, spent solvents, and oils. Berkeley Lab’s High Vacuum Cleaning Facility and circuit board manufacturing activities generate sludge, waste etchant, acids, and caustic solutions (LBNL, 2022).

Wastes are also generated from infrastructure and support activities at the Lab such as building maintenance, carpentry, and painting. Environment, health, and safety activities typically generate small amounts of hazardous waste during monitoring and analysis activities. Occasionally, remediation projects, such as those involving soil excavation, may generate larger amounts of waste; these wastes are usually shipped off site for disposal directly from the areas where generated. Building demolition and renovation activities also occasionally generate hazardous wastes that are shipped off site for disposal directly from the generation area (LBNL, 2022).

Onsite Storage and Treatment

Hazardous and mixed wastes generated from the sources discussed above are first temporarily stored in the Lab's Satellite Accumulation Areas (SAAs) or in Waste Accumulation Areas (WAAs). As applicable, wastes from these locations are then packaged and transported to the Hazardous Waste Handling Facility (HWHF; Building 85) (LBNL, 2022). Berkeley Lab stores, treats, and prepares for disposal hazardous, radioactive, and mixed wastes at its HWHF; (see Figure 3-4 in Chapter 3, *Project Description*, for location). The current RCRA-equivalent Hazardous Waste Facility Permit for the HWHF (EPA Identification Number CA 4890008986, Permit No. 2022/23-HWM-12) issued by the DTSC became effective on June 9, 2023, and is valid until June 9, 2033 (DTSC, 2023). The management of hazardous and the hazardous component(s) of mixed waste at the HWHF is conducted pursuant to this permit, whereas the management of radioactive waste at the HWHF is conducted pursuant to DOE requirements.[1]

The DTSC permit authorizes storage and treatment of applicable hazardous materials and mixed wastes at 13 hazardous waste storage areas and 8 mixed waste storage areas within the Building 85 compound. The permit authorizes the HWHF to continue to store a maximum of 23,200 gallons of hazardous and mixed wastes and treat a maximum aggregate capacity of 718 gallons per day (LBNL, 2022).

Berkeley Lab has an additional hazardous waste permit to operate four fixed treatment units (FTUs) under a hazardous wastewater treatment permit issued by the City of Berkeley at the permit-by-rule and conditional authorization tiers (LBNL, 2024g). The FTUs are operated independently of the HWHF, and the City of Berkeley Toxics Management Division administers the FTU permitting program under its Certified Unified Program Agency (CUPA) program authority (see Section 4.8.3, *Regulatory Framework*). The type and location of each FTU is listed in **Table 4.8-2**; the buildings that house the FTUs are shown on Figure 3-4, in Chapter 3, *Project Description*.

Berkeley Lab also generates medical waste. Under the State's Medical Waste Management Program (Section 117705 of the HSC), Berkeley Lab is considered a large-quantity generator because it generates more than 91 kilograms (200 pounds) of medical waste each month.

TABLE 4.8-2
BERKELEY LAB FIXED TREATMENT UNITS (FTUS)

FTU	Building	Description of Treatment	Approximate Quantity of Wastewater Treated in 2023 (Gallons)
004	70A/70F	Acid neutralization by pH adjustment	511,675
005	2	Acid neutralization by pH adjustment	69,804
006	77	Metals precipitation and acid neutralization by pH adjustment, ion exchange, and evaporation	9,241 (100% recycled or evaporated with no discharge)
007	67	Acid and alkaline neutralization by pH adjustment	17,395

SOURCE: LBNL, 2024g.

1 The DOE also closely regulates the investigation and potential remediation of any historical releases of radioactive materials to the environment.

Offsite Disposal

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

Berkeley Lab sends medical waste (excluding biohazardous waste) to offsite permitted vendor facilities for incineration. Biohazardous wastes are sent off-site to be autoclaved[2] (LBNL, 2024g). The waste types and volumes transported in 2023 to off-site disposal facilities permitted to accept the wastes are summarized below in **Table 4.8-3**.

TABLE 4.8-3
OFFSITE HAZARDOUS WASTE DISPOSAL – CALENDAR YEAR 2023

Waste Type	Approximate Volume (in pounds)
Electronic Devices (Excluding CRT devices)	201,426
Universal Waste Batteries	2,601
Universal Waste Lamps	1,518
Aerosols (Non-Empty)	248
Mercury Containing Equipment	68
Cathode Ray Tubes (CRTs)	6 devices
Hazardous Waste	1,462,063
Low Level Radioactive Waste	12,348[a]
Mixed Waste	2,619[a]
Medical/Sharps Waste	12,685
Pathological	1,049
Pharmaceutical	77

NOTES:
a. The amounts of low-level radioactive waste and mixed waste generated at Berkeley Lab requiring off-site disposal can vary substantially each year. Consequently, a three-year average (2021-2023) of these waste streams is provided here.

SOURCE: LBNL, 2024f.

Aboveground and Underground Storage Tanks

Berkeley Lab has 48 aboveground storage tanks (ASTs), consisting of 31 diesel fuel ASTs, 15 ASTs containing compressed gases (nitrogen, argon, carbon dioxide, hydrogen, helium, and neon), one AST that contains E85 fuel (ethanol and gasoline), and one AST that contains ethyl bromoacetate with capacities ranging between 50 gallons and 7,650 gallons (LBNL, 2024c). The Lab also has storage drums associated with the Lab's WAAs and product distribution areas. The number of drums varies over time as the waste is accumulated and disposed of.

2 Biohazardous waste is placed inside the autoclave and air is evacuated from the vessel, creating a negative pressure. High-pressure, high-temperature steam is then introduced to kill the pathogens found in the waste.

Berkeley Lab has eight underground storage tanks (USTs) with capacities between 100 gallons and 10,000 gallons for gasoline, diesel, potassium phosphate, and TES[3] buffering agent (LBNL, 2024c).

Existing Structures

Existing buildings at Berkeley Lab range in age from less than 10 years to over 70 years old. Structural demolition or renovation in the older structures could involve exposure to hazardous building materials historically used or present in the structures, such as asbestos-containing materials (ACM), lead-based paint (LBP), polychlorinated biphenyls (PCBs), and/or radioactive materials.

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

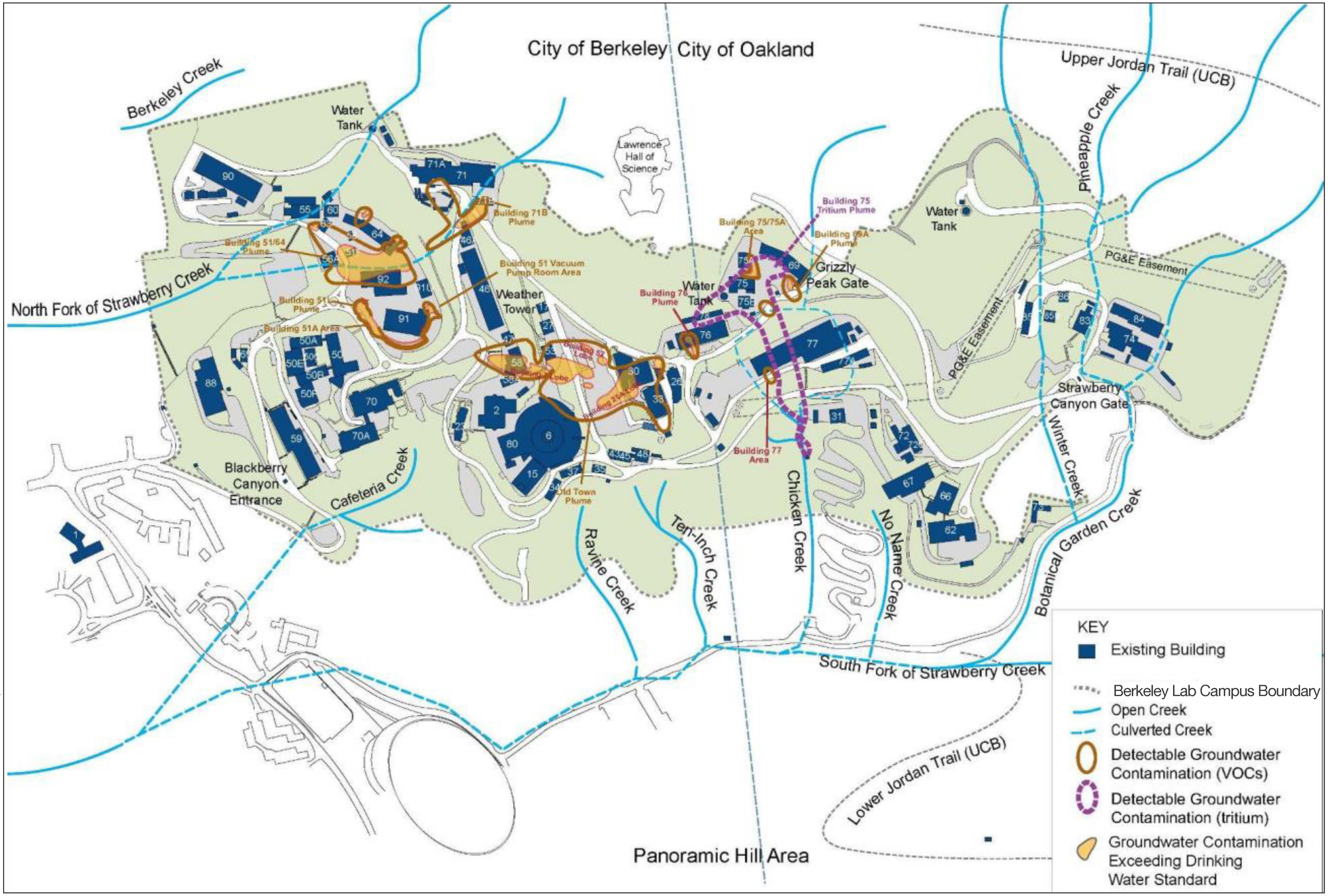
Soil and Groundwater Contamination

Berkeley Lab identified areas of soil and groundwater contamination that resulted from historical releases of hazardous materials into the environment. The primary chemical constituents of concern were: volatile organic compounds (VOCs), including solvents used to clean equipment; petroleum hydrocarbons; PCBs; and metals. The principal radioactive contaminant is tritium.

The Lab identified four principal plumes of VOC-contaminated groundwater on the campus: Old Town (i.e., Charter Hill area), Building 51/64, Building 51L, and Building 71B. In addition to the four principal plumes, VOC-contaminated groundwater is present in the six localized areas: former Building 51A, former Building 51 Vacuum Pump Room, Building 69A, Building 75/75A, Building 76, and Building 77 (see **Figure 4.8-1**). The primary VOCs detected in the groundwater are chlorinated VOCs (e.g., tetrachloroethylene, trichloroethylene, 1,1,1-trichloroethane, carbon tetrachloride) and their associated degradation products (LBNL, 2024b).

With respect to radioactive contamination, a plume of tritium-contaminated groundwater extends southward from the Building 75 area (Figure 4.8-1). The source of the plume was the former National Tritium Labeling Facility (NTLF), which ceased operation in December 2001. Since closure of the NTLF, concentrations of tritium detected in the groundwater have declined steadily, with concentrations below the drinking water standard of 20,000 pCi/L (picocuries per liter of air) since February 2005. The maximum concentration of tritium detected in 2023 was approximately 20 percent of the MCL (maximum contaminant levels) (LBNL, 2024b).

[3] [2-[Tris-(Hydroxymethyl)methyl amino]-1-ethane sulfonic acid], or $C_6H_{15}NO_6S$.



SOURCE: LBNL, 2024

LBNL LRDP EIR

Figure 4.8-1
Areas of Groundwater Contamination at the Berkeley Lab Campus

Low concentrations (well below MCLs for drinking water) of PCBs were detected in the groundwater in some areas on the campus (e.g., location of former Bevalac particle accelerator) (LBNL, 2024b).

Hazardous Materials Monitoring and Investigations

RCRA Corrective Action Program

Berkeley Lab is currently in the Corrective Measures Implementation phase of its RCRA Corrective Action Program. This phase consists of operating, maintaining, and monitoring the actions in the *Corrective Measures Study Report for Lawrence Berkeley National Laboratory* (LBNL, 2005) approved by the DTSC for cleaning up contaminated groundwater and soil in certain campus areas. Concentrations of VOCs in most areas described above have declined substantially, mainly as a result of the implemented corrective measures, which include in-situ soil flushing, groundwater capture, and treatment and monitored natural attenuation.

UC LBNL prepared a *Soil Management Plan for Lawrence Berkeley National Laboratory* (LBNL, 2017) and a *Groundwater Monitoring and Management Plan* (LBNL, 2006) which describe the controls used to reduce potential risk to human health and the environment from the contaminants, and the requirements for ongoing groundwater and surface water monitoring. In addition, the Soil Management Plan establishes policies and procedures to ensure that excavated soil does not adversely affect human health or the environment and is handled, stored, and reused on-site, or disposed of off-site in accordance with applicable laws and regulations.

UC LBNL monitors groundwater to assess the progress of the corrective actions toward achieving the required cleanup levels; and monitors groundwater and surface water for the potential migration of groundwater contaminants. The latest groundwater and surface water monitoring conducted at Berkeley Lab indicates the following (LBNL, 2024b):

- Corrective actions have substantially reduced the concentrations of chemicals of concern (COCs) in the groundwater, although concentrations appear to be above asymptotic levels in some areas;
- Groundwater plumes are stable or attenuating;
- Groundwater contamination is not migrating to surface water; and
- Groundwater COCs are not migrating off-site.

A summary of recent groundwater, surface water, wastewater and soil monitoring conducted on the campus and/or vicinity in accordance with the Corrective Action Program, and/or in compliance with applicable stormwater, wastewater and groundwater discharge permits and DOE requirements, is provided below.

Groundwater Monitoring

Currently, there are more than 170 groundwater monitoring wells at Berkeley Lab, including 10 wells that are used to monitor the potential migration of VOC-contaminated groundwater beyond the developed areas of Berkeley Lab, and one well to monitor the potential off-site migration of tritium. Locations where VOC concentrations remain above MCLs for drinking water are shown on Figure 4.8-1 (LBNL, 2024g).[4]

Groundwater Treatment Systems

Berkeley Lab continues to operate 10 granular activated carbon (GAC) treatment systems to treat extracted contaminated groundwater, which totaled approximately 6.96 million gallons for the 2023 calendar year. The cumulative volume of groundwater treated from 1991 through the end of 2023 was approximately 219 million gallons. The treated water is either injected into the subsurface, if needed for soil flushing, or discharged to the sanitary sewer system in accordance with the EBMUD permit for this type of discharge (LBNL, 2024g).

Surface Water Monitoring

UC LBNL evaluates surface water quality on and around the Berkeley Lab campus by sampling creek water and stormwater, as summarized below.

Creek Monitoring

UC LBNL monitors creek water on and around the campus for radiation associated with radiological activities, pursuant to the DOE requirements. The sampled creeks either flow through or originate within Berkeley Lab.[5] The creeks are normally sampled twice a year – once during the wet and dry seasons. In 2023, laboratory analysis reported 31 of the 45 creek water samples as below minimum detectable concentrations. Three samples had detectable concentrations of gross alpha,[6] six samples had detectable concentrations of gross beta,[7] and five samples had detectable Ra-226/Ra-228,[8] although none were gross detections above minimum detectable concentration (MDC) absent the context of background measurements. As such, naturally occurring radioactive materials, such as potassium-40, uranium-238, and thorium-232, as well as their naturally occurring decay products, are commonly measured in the environment, including at Berkeley Lab, and are considered to contribute the majority, if not all, of the detectable gross alpha, gross beta, and Ra-226/Ra-228 results. Tritium was not detected in any of the surface water samples (LBNL, 2024g).[9]

Stormwater Monitoring

Under the terms of the Industrial General Permit, Berkeley Lab must conduct stormwater sampling each reporting year during four storm events that meet a set of permit-specific conditions. There are three stormwater sampling locations on the campus. Berkeley Lab routinely conducts sitewide

4 Groundwater beneath Berkeley Lab is not used as a drinking water source by the Lab or by local utilities, and groundwater contamination is therefore not a threat to the local drinking water supply. The use of drinking water standards is included only as a reference point.

5 As illustrated in Figure 4.8-1, this includes the North Fork of Strawberry Creek, Cafeteria Creek, Ravine Creek, Ten-inch Creek, Chicken Creek, No Name Creek, Winter Creek, and Botanical Garden Creek.

6 Gross alpha measures the amount of radiation from radium, uranium, or radon in a sample.

7 Gross beta measures the total amount of radioactivity from beta-emitting elements in a sample.

8 Ra-226 is a radioactive isotope that is a decay product of uranium-238; Ra-228 is a radioactive isotope that is a product of thorium-232 decay.

9 Although Lab surface waters are not used as a source for public drinking water, Berkeley Lab evaluates creek water results against conservative maximum contaminant level (MCL) drinking water standards, as well as the water quality objectives stated in the Water Quality Control Plan for the San Francisco Bay Basin Plan.

pollutant source assessments (PSAs) to identify potential point source areas of industrial activity conditionally subject to the Industrial General Permit's monitoring requirements. Based on stormwater sampling results from the reporting year 2022/2023, Berkeley Lab did not exceed annual numeric action levels (NALs) established by the State Water Board. for each of the five parameters analyzed (aluminum, iron, pH, oil and grease and total suspended solids [TSS]). As a result, Berkeley Lab returned to baseline status for all parameters for reporting year 2023/2024. (LBNL, 2024g).

Wastewater Monitoring

As required by wastewater discharge permits issued by EBMUD, Berkeley Lab samples wastewater discharges at its two monitoring stations downstream of the campus.[10] The sitewide wastewater discharge permit is renewed periodically by EBMUD. This permit requires annual self-monitoring and annual certification by Berkeley Lab that it is in compliance with the radiological conditions of the permit.

Berkeley Lab collects two nonradiological samples from both downstream monitoring outfalls biannually in accordance with the self-monitoring sample collection schedule specified by the EBMUD permit. All metals and total identifiable chlorinated hydrocarbon results at the two monitoring stations were below EBMUD permit limits in 2023, and many were also below detection limits. All pH results were well above 5.5, as required by the permit. TSS and chemical oxygen demand do not have discharge limits and are measured to determine wastewater strength, which forms the basis for EBMUD's wastewater treatment charges.

In addition, in compliance with the EBMUD groundwater discharge permit, sampling of the hydrauger and extraction well discharge at Berkeley Lab is also conducted and analyzed for VOC to assess permit compliance. Sampling results have never exceeded the EBMUD permissible discharge limits at these locations.

The EBMUD sitewide permit also requires annual certification by Berkeley Lab to ensure that it is in compliance with the radiological conditions of the permit. For radiological monitoring, composite sampling is conducted semiannually at the Hearst and Strawberry outfalls. All 2023 results were well below the DOE Derived Concentration Standard (DCS) values (LBNL, 2024g).

Soil and Creek Sediment Monitoring

UC LBNL collects and analyzes soil and creek sediment samples on the campus and vicinity as required by DOE Order 458.1 and guidance (DOE, 2015). Based on sampling and analysis conducted in 2023, the radiological results for gross alpha, gross beta, and gamma emitters at each of the soil sampling locations were within background threshold values at the campus and similar to background levels that would be attributable to naturally occurring radioactive elements commonly found in soils. Tritium measurements at each soil sampling location were below the MDC. Most radionuclides measured in the creek sediments were not detected above MDC, all

[10] The Hearst Monitoring Station is located at the head of Hearst Avenue below the western edge of Berkeley Lab, immediately before the connection to the City of Berkeley's sewer main. The Strawberry Monitoring Station is located next to Centennial Drive in lower Strawberry Canyon.

remaining radionuclides result were indistinguishable from background per Berkeley Lab's natural background criteria (LBNL, 2024g).

Sensitive Receptors

Off-site sensitive receptors located within one-quarter mile of the Berkeley Lab campus boundary include single and/or multi-family housing located to the north and west within the City of Berkeley. The Orange House Family Child Care facility on LeRoy Avenue is also located within one-quarter mile west of the campus boundary.

Proximity to Schools

The UC Berkeley campus surrounds the Berkeley Lab campus to the southwest, south, east and north. There are no elementary, middle or high schools located within one-quarter mile of the Berkeley Lab campus.

Proximity to Airports

There are no airports located within 2 miles of Berkeley Lab. The nearest airport is Oakland International Airport, located about 9 miles to the south.

4.8.3 Regulatory Framework

Federal

Hazardous Materials

The primary federal agencies with responsibility for hazards and hazardous materials management include the EPA, the U.S. Department of Labor Occupational Safety and Health Administration (Fed/OSHA), the DOE, and the U.S. Department of Transportation (USDOT). Federal laws, regulations, and responsible agencies are summarized in **Table 4.8-4**.

Radioactive Materials

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

TABLE 4.8-4
FEDERAL LAWS AND REGULATIONS RELATED TO HAZARDOUS MATERIALS MANAGEMENT

Classification	Federal Law or Responsible Federal Agency	Description
Hazardous Materials and Hazardous Waste Management	Resource Conservation and Recovery Act of 1976 (RCRA); Title 40 Code of CFR Parts 239 – 282	Under RCRA, the EPA regulates the generation, transportation, treatment, storage, and disposal of hazardous waste from “cradle to grave.”
	Hazardous and Solid Waste Amendments to RCRA of 1984; 42 US Code 6901	Amended RCRA in 1984, affirming and extending the “cradle to grave” system of regulating hazardous wastes. The amendments specifically prohibit the use of certain techniques for the disposal of some hazardous wastes.
	Toxic Substances Control Act (TSCA) - Title 40 CFR Chapter 1, Subchapter R – Toxic Substances Control Act – Part 761 Polychlorinated Biphenyls (PCBs)	Covers the identification and sampling requirements for PCBs for disposal purposes.
	Community Right-to-Know Act of 1986 (also known as Title III of the Superfund Amendments and Reauthorization Act (SARA)	Imposes requirements to ensure that hazardous materials are properly handled, used, stored, and disposed of and to prevent or mitigate injury to human health or the environment in the event that such materials are accidentally released.
Hazardous Materials Transportation	49 CFR Transportation, Subtitle B, Chapter 1, Subchapter A, Hazardous Materials and Oil Transportation - US Department of Transportation (USDOT)	USDOT has the regulatory responsibility for the safe transportation of hazardous materials. The USDOT regulations govern all means of transportation except packages shipped by mail.
	Publication 52 - Hazardous, Restricted, and Perishable Mail; US Postal Service (USPS)	USPS regulations govern the transportation of hazardous materials shipped by mail.
Occupational Safety	Occupational Safety and Health Act of 1970; Title 29 CFR	Fed/OSHA sets standards for safe workplaces and work practices, including the reporting of accidents and occupational injuries.
Structural and Building Components (Hazardous Building Materials [ACM, LBP, and PCBs])	Toxic Substances Control Act of 1976; Title 40 CFR	Regulates the use and management of hazardous building materials and sets forth detailed safeguards to be followed during the disposal of such items.
	EPA; Title 40 CFR	The EPA monitors and regulates hazardous materials used in structural and building components and their effects on human health.

The DOE also regulates radioactive waste and the radioactive portion of mixed waste pursuant to the Atomic Energy Act and DOE Order 435.1, Radioactive Waste Management. Radioactive and mixed wastes are routinely generated from Berkeley Lab research activities involving radioisotopes. Routinely generated radioactive waste is staged in radioactive waste accumulation areas at individual generator sites, and subsequently transported to the HWHF for storage and management. Mixed waste is also subject to California hazardous waste regulations and is staged in a mixed waste SAA inside the radioactive material area and subsequently transported to the HWHF for storage and management. Radioactive and mixed waste is either managed on-site through a decay-in-place program or is shipped off-site to a licensed commercial or DOE treatment/disposal facility. Decayed mixed waste is then managed as hazardous waste and shipped off-site to a licensed commercial facility.

In 2000, the DOE established a moratorium on the release of volumetrically[11] contaminated metals from radiological areas[12] at DOE facilities and temporarily suspended the unrestricted release of scrap metal for recycling from such areas. The moratorium and suspension remain in place. Berkeley Lab applies the moratorium to former radiological areas at accelerators, where metals may have become activated by exposure to radiation beams (LBNL, 2007a).

Biosafety Standards

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

State

Hazardous Materials

The primary State agencies with responsibility for hazardous materials management in the state include the DTSC, State Water Resources Control Board (SWRCB)and RWQCB within the California Environmental Protection Agency (Cal EPA), California Occupational Safety and Health Administration (Cal/OSHA), California Department of Health Services (CDHS), CalFire-Office of the State Fire Marshal (OSFM), California Highway Patrol (CHP), and the California Department of Transportation (Caltrans). State laws, regulations, and responsible agencies are summarized in **Table 4.8-5**.

Medical Waste Management Act

Medical wastes must be managed as a biohazardous material, in accordance with the California HSC. The management of biohazardous materials must comply with United States Department of Health and Human Services (USDHHS) guidelines and California Department of Public Health (CDPH) regulations pertaining to such materials. Biohazardous medical waste is generally regulated in the same manner as hazardous waste, except that special provisions apply to storage, disinfection, containment and transportation. Within the regulatory framework of the Medical Waste Management Act (California HSC, Sections 117600-118360), the CDHS Medical Waste Management Program ensures the proper handling and disposal of medical waste by permitting and inspecting medical waste offsite treatment facilities and transfer stations throughout the state. The CDHS also oversees all medical waste transporters.

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

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

TABLE 4.8-5
STATE LAWS AND REGULATIONS RELATED TO HAZARDOUS MATERIALS MANAGEMENT

Classification	Law or Responsible State Agency	Description
Hazardous Materials and Hazardous Waste Management	Unified Hazardous Waste and Hazardous Materials Management Regulatory Program (Unified Program); CUPA (HSC Sections 25404 et seq)	Cal EPA adopted regulations in January 1996 that implemented the Unified Program at the local level. The agency responsible for implementation of the Unified Program is called the Certified Unified Program Agency (CUPA), which for Berkeley Lab is the City of Berkeley Toxics Management Division (TMD).
	California Fire Code, CCR Title 24, Part 9 CBC, CCR Title 24, Part 2, Volume 1	The California Fire Code regulates the storage and handling of hazardous materials, including the requirement for secondary containment, separation of incompatible materials, and preparation of spill response procedures.
	California Hazardous Materials Release Response Plan and Inventory Law of 1985; CUPA	The California Hazardous Materials Release Response Plan and Inventory Law of 1985 (Business Plan Act) requires that businesses that store hazardous materials onsite prepare a Hazardous Materials Business Plan (HMBP) and submit it to the local CUPA, which in this case is the Berkeley TMD.
	Aboveground Petroleum Storage Act (APSA), CCR Title 19, Division 1, Chapter 11.	CalFire-Office of the State Fire Marshal (OSFM) is responsible for ensuring the implementation of the APSA program element of the Unified Program, which regulates aboveground petroleum tank facilities.
	California Hazardous Waste Control Act; California HSC, Division 20, Chapter 6.5, Article 2, Section 25100, et seq.; DTSC	Under the California Hazardous Waste Control Act, the DTSC regulates the generation, transportation, treatment, storage, and disposal of hazardous waste in California. The hazardous waste regulations establish criteria for identifying, packaging, and labeling hazardous wastes; dictate the management of hazardous waste; establish permit requirements for hazardous waste treatment, storage, disposal, and transportation; and identify hazardous wastes that cannot be disposed of in landfills. The DTSC is also the administering agency for the California Hazardous Substance Account Act. California HSC, Division 20, Chapter 6.8, Sections 25300 et seq., also known as the State Superfund law, providing for the investigation and remediation of hazardous substances pursuant to State law.
Hazardous Materials Transportation	Titles 13, 22, and 26 of the CCR	Regulates the transportation of hazardous waste originating in and passing through the state, including requirements for shipping, containers, and labeling.
	California Vehicle Code, Chapter 5, Sections 31303 – 31309; CHP and Caltrans	These two state agencies are primary responsibility for enforcing federal and State regulations and responding to hazardous materials transportation emergencies.
Occupational Safety	Cal/OSHA regulations (Title 8 CCR); Cal/OSHA	Cal/OSHA has primary responsibility for developing and enforcing workplace safety regulations in California. Because California has a federally approved OSHA program, it is required to adopt regulations that are at least as stringent as those found in Title 29 of the CFR. Cal/OSHA standards are generally more stringent than federal regulations. Requires employee safety training, safety equipment, accident and illness prevention programs, hazardous substance exposure warnings, and emergency action and fire prevention plan preparation.
Construction Storm Water General Permit	Construction General Permit; Order 2022-0057-DWQ, National Pollutant Discharge Elimination System (NPDES) No. CAS000002; RWQCB	Dischargers whose project disturbs 1 or more acres of soil or where projects disturb less than 1 acre but are part of a larger common plan of development that in total disturbs 1 or more acres, are required to obtain coverage under the NPDES General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities (Construction General Permit; Order 2022-0057-DWQ, NPDES No. CAS000002). Construction activity subject to this permit includes clearing, grading, grubbing, and other disturbances to the ground such as excavation and stockpiling but does not include regular maintenance activities performed to restore

TABLE 4.8-5
STATE LAWS AND REGULATIONS RELATED TO HAZARDOUS MATERIALS MANAGEMENT

Classification	Law or Responsible State Agency	Description
		the original line, grade, or capacity of a facility. The Construction General Permit requires the development and implementation of a Stormwater Pollution Prevention Plan (SWPPP) that includes specific Best Management Practices (BMPs) designed to prevent sediment and pollutants from contacting stormwater from moving offsite into receiving waters. The BMPs fall into several categories, including erosion control, sediment control, waste management and good housekeeping, and are intended to protect surface water quality by preventing the off-site migration of eroded soil and construction-related pollutants from the construction area.
Municipal Separate Storm Sewer System (MS4) Permit NPDES No. CAS612008 and Order No. R2-2022-0018 (RWQCB 2022)	Municipal Separate Storm Sewer System (MS4) Permit NPDES No. CAS612008 and Order No. R2-2022-0018 (RWQCB 2022)	The San Francisco Bay Region Municipal Regional Stormwater NPDES Permit (MRP) requires permittees, which includes the Cities of Berkeley and Oakland and County of Alameda, to reduce pollutants and runoff flows from new development and redevelopment using BMPs to the maximum extent practical. The Alameda County MRP permittees, which includes the City of Berkeley, prepared the C.3 Technical Guidance Manual as a guide to for use by developers, builders, and project applicants to provide development standards, also known as Low Impact Development (LID)/post-construction standards that include a hydromodification element. The MRP requires specific design concepts for LID/post-construction BMPs in the early stages of a project during the entitlement and CEQA process and the development plan review process.
Underground Infrastructure	California Code of Regulations Section 4216-4216.9	Section 4216-4216.9 “Protection of Underground Infrastructure” requires an excavator to contact a regional notification center (e.g., Underground Services Alert or Dig Alert) at least two days prior to excavation of any subsurface installations. Any utility provider seeking to begin a project that could damage underground infrastructure can call Underground Service Alert, the regional notification center for northern California. Underground Service Alert will notify the utilities that may have buried lines within 1,000 feet of the project. Representatives of the utilities are then notified and are required to mark the specific location of their facilities within the work area prior to the start of project activities in the area.

Regulations Applicable to Hazardous Building Materials

The use and removal of hazardous building materials is subject to the following regulations, specifically related to the demolition and renovation of structures.

Asbestos-Containing Material (ACM)

Asbestos, a naturally occurring fibrous material, was used as a fireproofing and insulating agent in building construction before such uses were terminated due to liability concerns in the late 1970s. State-level agencies, in conjunction with the EPA and OSHA, regulate removal, abatement, and transport procedures for ACM. Releases of asbestos from industrial, demolition, or construction activities are prohibited by these regulations and monitoring is required for employees performing activities that could expose them to asbestos. Additionally, the regulations include warnings that must be heeded and practices that must be followed to reduce the risk for asbestos emissions and exposure. Finally, the Bay Area Air Quality Management District (BAAQMD) regulates the demolition and renovation of buildings and structures that may contain asbestos. BAAQMD must be notified prior to any renovation involving the removal of 100 square feet or more, 100 linear feet or more, or 35 cubic feet or more of asbestos; and prior to every demolition of load-bearing structures regardless of asbestos content. The following regulations apply to the removal and disposal of ACM: CFR Title 40, Part 61, Subpart M (Asbestos National Emission Standards for Hazardous Air Pollutants [NESHAP]); CCR Title 8, Sections 1529 and 5208; and BAAQMD Regulation 11, Rule 2. BAAQMD Rule 2 provides detailed requirements for the definition of materials that qualify as ACM, qualifications for ACM contractors, and procedures for testing, containment, removal, and disposal.

Lead-Based Paint

Among its numerous uses and sources, lead can be found in paint, water pipes, solder in plumbing systems, and in soils around buildings and structures painted with LBP. Old peeling lead-based paint (LBP) can contaminate near-surface soil, and exposure to residual lead can have adverse health effects, especially in children. Cal/OSHA's Lead in Construction Standard is contained in CCR Title 8, Section 1532.1. The regulations address all of the following areas: permissible exposure limits (PELs); exposure assessment; compliance methods; respiratory protection; protective clothing and equipment; housekeeping; medical surveillance; medical removal protection; employee information, training, and certification; signage; record keeping; monitoring; and agency notification. The following regulations apply to the removal and disposal of LBP: Title IV, Toxic Substances Control Act, Sections 402, 403, and 404; Title 8 CCR Section 1532.1; and BAAQMD Regulation 11, Rule 1. In addition, the CDPH requires that entities proposing LBP removal actions prepare and submit to that agency CDPH Form 8551: Abatement of Lead Hazards Notification and CDPH Form 8552: Lead Hazard Evaluation Report.

Polychlorinated Biphenyls

Polychlorinated Biphenyls (PCBs) are mixtures of 200-plus individual chlorinated compounds (known as congeners) (DTSC, 2022). PCBs were previously used in many applications such as coolants and lubricants in transformers, capacitors, and other electrical equipment. The manufacture of PCBs ended in the U.S. in the late 1970s because they can cause harmful effects to human health and the environment. PCBs can be found in sources such as electrical transformers, fluorescent light ballasts and electrical devices with PCB capacitors, hydraulic oils, and building materials. PCBs are toxic, highly persistent in the environment, and bioaccumulate. There are no known natural sources of PCBs.

The EPA prohibited the use of PCBs in the majority of new electrical equipment and fluorescent light ballasts starting in 1979 and initiated a phase-out for much of the existing PCB-containing equipment (U.S. EPA, 2021). The inclusion of PCBs in electrical equipment and the handling of those PCBs are regulated by the provisions of the TSCA, 15 U.S.C. Section 2601 et seq. Relevant regulations include labeling and periodic inspection requirements for certain types of PCB-containing equipment and outline highly specific safety procedures for their disposal. The State of California likewise regulates PCB-laden electrical equipment and materials contaminated above a certain threshold as hazardous waste; these regulations require that such materials be treated, transported, and disposed of accordingly. At lower concentrations for non-liquids, the RWQCB may exercise discretion over the classification of such wastes. The following regulations apply to the removal and disposal of PCBs: RCRA Act: 4 CFR 761; TSCA: U.S. Code Title 15, Section 2695; and 22 CCR Section 66261.24.

Mercury

Mercury may be present in mercury switches and compact fluorescent light bulbs (CFLs) and other tubes. A mercury switch is an electrical switch that opens and closes a circuit when a small amount of the liquid metal mercury connects metal electrodes to close the circuit. Since mercury is a toxic heavy metal, devices containing mercury switches must be treated as hazardous waste for disposal. Because of current regulations, most modern applications have eliminated mercury in switches. In the U.S., the EPA regulates the disposition and release of mercury. Individual states and localities may enact further regulations on the use or disposition of mercury. The following regulations apply to the removal and disposal of mercury switches: CCR, Title 22 Sections 66262.11, 66273 et seq., and 67426.1 through 67428.1.

Universal Waste

Universal waste is hazardous waste that has less stringent requirements for management and disposal. Common examples of universal waste include televisions, computers, computer monitors, batteries, and fluorescent lamps. Universal wastes are hazardous upon disposal but pose a lower risk to people and the environment than other hazardous wastes. State and federal regulations identify which unwanted products are universal wastes and provide simple rules for handling and recycling of them. Universal waste must be disposed of in accordance with the DTSC Universal Waste Rule. These regulations are found in the CCR, Title 22, Division 4.5, Chapter 23. Universal wastes, including those that contain mercury, must either be sent directly to an authorized recycling facility or to a universal waste consolidator for shipment to an authorized recycling facility. If the wastes are not to be recycled, then the waste must be managed as hazardous waste rather than as universal waste. This includes notifying the DTSC, using a manifest and a registered hazardous waste hauler, complying with shorter accumulation times, and shipping only to an authorized hazardous waste disposal facility.

Regional

East Bay Municipal Utility District

EBMUD is the public utility district that regulates all industrial and sanitary discharges to its wastewater treatment facilities. Berkeley Lab holds EBMUD wastewater discharge permits for the following activities on the campus:

- General sitewide wastewater (Wastewater Discharge Permit No. 06600791) (EBMUD, 2023);
- Treated groundwater from hydraugers (subsurface drains) and groundwater extraction wells (Wastewater Discharge Permit No. 50347891) (EBMUD, 2022); and
- "Zero-waste-discharge" treated rinse water recycled from the metal finishing operations in the Ultra-High Vacuum Cleaning Facility at Building 77 (Wastewater Discharge Permit No. 50238911) (EBMUD, 2018).

These permits specify standard terms and conditions, specific discharge limits and provisions, and monitoring and reporting requirements. Berkeley Lab submits periodic self-monitoring reports specified under each permit. As required by the EBMUD permits, Berkeley Lab samples wastewater discharges at its two monitoring stations downstream of the campus. Sampling is also conducted to assess permit compliance for discharges of treated water from hydraugers and groundwater extraction wells at eight locations. Berkeley Lab's sitewide wastewater discharge permit also requires annual certification by Berkeley Lab that it is in compliance with the radiological conditions of the permit (LBNL, 2024g).

Please see summary of the results of recent monitoring conducted in compliance with EBMUD waste discharge permits under *Hazardous Materials Monitoring and Investigations*, above.

University of California

Berkeley Lab Environment, Health and Safety Division

The Environment, Health and Safety Division (EH&S) oversees the Berkeley Lab's environment, health, and safety operations, including the management of hazardous materials and waste.[13] EH&S has primary responsibility for developing compliance strategies for federal, State, and local environmental laws and regulations, and for developing related LBNL policies and procedures. In conformance with applicable laws and regulations, EH&S establishes procedures for storage, handling, use, and disposal of hazardous and radioactive materials and medical wastes. These are described in LBNL PUB-3000 and in supporting documents referenced in that document. In addition, UC LBNL maintains a Hazardous Materials Business Plan that lists the hazardous materials stored in each building in quantities that meet or exceed the state's minimum reporting requirements; the plan also summarizes emergency plans, procedures, and training. EH&S also oversees the monitoring and remediation of soil and groundwater affected by historic hazardous material use at Berkeley Lab and ensures regulatory compliance.

EH&S subgroups include:

- *Environmental Services*, which manages the Lab's Environmental Management System; environmental permitting and compliance; environmental monitoring; environmental risk assessment, soil and groundwater restoration, and soil vapor risk assessment and mitigation;
- *Health Services*, which offers a series of clinical programs and services for Berkeley Lab employees as well as in support of Berkeley Lab research projects;
- *Industrial Hygiene*, which provides oversight on a range of industrial safety categories, including asbestos, lead, and beryllium safety; biosafety, chemical hygiene and safety, injury illness response and review; and controlled substances;
- *Occupational Safety*, including aviation safety and electrical safety;
- *Performance Support*, including the Berkeley Lab Training system;
- *Radiation Protection*, including radiological operations, engineering and shielding design; dosimetry services; radiation safety and transportation training; laser safety; radiological emergency response; and Radiation Authorization Reporting System (RADAR); and
- *Waste Management*, including identification, labeling, recycling, and storage of waste.

[13] Please note the Berkeley Lab Fire Marshal also has responsibility for some laws, codes, and standards related to hazardous material storage and use at Berkeley Lab.

Berkeley Lab Institutional Biosafety Committee

Berkeley Lab requires maintenance of a qualified Institutional Biosafety Committee (IBC) to perform key biosafety functions as required by and in accordance with its charter and the National Institute of Health (NIH), CDC, DOE, and Berkeley Lab standards. The IBC is responsible for oversight, administration, and review of Berkeley Lab policies and projects involving research with biological materials that may pose safety, health, or environmental risks. The IBC provides institutional assurance that research is conducted safely.

Berkeley Lab Radiation Safety Committee

The Berkeley Lab Radiation Safety Committee (RSC) is responsible for advising Berkeley Lab management on all matters related to occupational and environmental radiation safety. The RSC reviews and recommends approval of radiation safety policies and guides the EH&S and radiation user divisions in carrying out these programs. The RSC's scope is generally in issues of broad institutional concern and impact, or areas of potential high consequence either in terms of safety or institutional needs.

Berkeley Lab Requirements and Policy Manual

The Berkeley Lab Requirements and Policy Manual (RPM) is a collection of policies and environmental programs from the University of California and Berkeley Lab that help define the laboratory's operation. The RPM Environment, Safety and Health section includes a variety of topics, including EH&S Training, Environmental Protection Program (including Environmental Management System, Environmental Monitoring, Environmental Radiological Protection, FTUs, PCB Management, Soil and Groundwater Management Program, Spill Prevention Control and Countermeasures, and USTs); Incident Review and Reporting; Industrial Hygiene and Safety; Radiation Protection; and Hazard Analysis, and Safeguards and Security.

Berkeley Lab Environmental Management System

DOE Order 436.1A, Departmental Sustainability, requires DOE sites, such as Berkeley Lab, to develop and maintain an Environmental Management System (EMS) that conforms to the International Organization of Standardization (ISO) 14001 standard, Environmental Management Systems – Requirements with Guidance for Use. This standard establishes requirements for an organization from leadership to planning to operations to performance evaluation that are designed to seek continual improvement in environmental performance. Berkeley Lab's EMS is designed to reduce environmental impacts in a manner that is well managed, cost-effective, and compliant with environmental regulations. Berkeley Lab's EMS is managed by EH&S.

Berkeley Lab Chemical Hygiene and Safety Plan

The Berkeley Lab *Chemical Hygiene and Safety Plan* (CHSP) provides guidance to all Berkeley Lab employees, contractors, and visitors for the safe handling, use, and storage of hazardous materials in laboratory, shop and office settings. It identifies Berkeley Lab employee responsibilities and establishes procedures for identification, evaluation and control of hazardous materials. The CHSP includes the requirements of the Fed/OSHA "Hazard Communication Standard" (29 CFR 1910.1200) and "Occupational Exposures to Hazardous Materials in Laboratories" (29 CFR 1910.1450) for employees in laboratory-related settings, and informs employees who work with hazardous chemicals of the risks associated with those chemicals. Berkeley Lab combined both of these federal OSHA requirements into the CHSP in order to establish a standardized framework for chemical hygiene practices, information dissemination, and training at Berkeley Lab (LBNL, 2024d).

Berkeley Lab Radiation Protection Program

The DOE has established basic standards for occupational radiation protection in CFR, Title 10, Part 835, "Occupational Radiation Protection" (10 CFR 835), hereafter referred to as the "Rule." Section 835.101 of the Rule requires affected DOE activities to be conducted in compliance with a documented radiation protection program (RPP) that addresses each requirement of that regulation. Berkeley Lab conducts radiological work activities safely and in accordance with applicable regulations and DOE requirements. The Rule requires the Lab to have a DOE-approved RPP that describes the Lab's implementation methodology. The Lab maintains an RPP, the requirements of which have been integrated into the *Radiological Control Manual*, which provides Berkeley Lab personnel with a tool to support implementation of the RPP (LBNL, 2024e).

Berkeley Lab Biological Safety Program

EH&S operates a Biological Safety Program, the purpose of which is to protect workers, the public, and the environment from exposure to biological agents or materials that may cause adverse effects, to assist with compliance with regulations, standards and guidelines pertaining to biological research, and to promote sound microbiological work practices. The EH&S *Biosafety Manual* applies to worker safety, public health, agricultural protection, and environmental protection for work activities that also involve:

- Biological materials, agents, and other materials of biological origin (e.g., organisms, cells, viruses, and toxins) that pose different levels of risk to humans, animals, or plants; or
- Workers who may be exposed to disease-causing agents related to designated job duties (e.g., bloodborne pathogens and aerosol transmissible pathogens in health care)

Biosafety roles and responsibilities are implemented in accordance with the principles of *Integrated Safety Management*, *NIH* Guidelines *for Research Involving Recombinant or Synthetic Nucleic Acid Molecules* (*NIH Guidelines)*, *Biosafety in Microbiological and Biomedical Laboratories* (BMBL), and other standards. Berkeley Lab's Integrated Safety Management (ISM) principles, roles, and responsibilities are defined in a hierarchy of policies, including the RPM, the *Integrated Environment, Safety & Health Management Plan* (PUB-3140), and the *Health and Safety Manual* (PUB-3000).

Berkeley Lab Emergency Management

Berkeley Lab is subject to three types of emergencies: natural phenomena (e.g., lightning, seismic events, and wildland fires), human-caused (intentional action such as a chemical attack, biological attack, and cyber incident), and technological (e.g., process failure within the Lab through human error or failed controls that may result in a fire or explosion, and potentially result in a hazardous materials release, mass casualty, and/or significant infrastructure damage; or external events such as an aircraft crash).

The Berkeley Lab Emergency Management Program provides the Laboratory with planning and coordination functions necessary for responding to, reducing, and recovering from emergencies while protecting the health and safety of workers and the public and preventing damage to the environment. In case of an emergency, the Lab will activate its Emergency Operations Center (EOC), where members from different areas of the Lab coordinate to exchange information and make decisions on how to handle the disaster and how to return the Lab to normal operations. The EOC works with local law enforcement and fire agencies to ensure the Lab's employees and visitors, property, and other assets, are protected during an emergency.

The Berkeley Lab *Comprehensive Emergency Management Plan* (CEMP) describes the emergency management (EM) system used by the Lab in responding to emergencies. The CEMP covers missions, functions, responsibilities, and processes that relate to planning, preparedness, readiness assurance, and emergency response. Additionally, the CEMP describes the implementation of DOE Order 151.1D, Comprehensive Emergency Management System, at the Lab (LBNL, 2024h).

Please refer to Section 4.16, *Wildfire*, for additional information on Berkeley Lab plans and protocols for responding to emergencies, including those related to wildfires.

4.8.4 Impacts and Mitigation Measures

Significance Criteria

For purposes of this EIR, impacts related to hazards and hazardous materials would be considered significant if they would exceed the Standards of Significance presented below, which are based on Appendix G of the *CEQA Guidelines*.

Would implementation of the LBNL 2025 LRDP:

a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials;

b) 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;

c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school;

d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code § 65962.5 and, as a result, would it create a significant hazard to the public or the environment; or

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area.

f) Impair implementation or physically interfere with an adopted emergency response plan or emergency evacuation plan.

g) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires.

Thresholds f) and g) listed above are addressed in Section 4.16, *Wildfire*.

Criteria Not Analyzed

Based on the Berkeley Lab campus location, there would no impact related to the following topic for the reason described below:

- ***Safety Hazard due to proximity to airports:*** Berkeley Lab is not located within an airport land use plan and there are no airports located within 2 miles of Berkeley Lab. As discussed in Section 4.8.2, *Environmental Setting,* the nearest airport is Oakland International Airport located approximately 9 miles south of Berkeley Lab. Therefore, there would be no safety hazard impact relative to proximity to airports and this topic will not be evaluated further in this section.

Approach to Analysis

The analysis of the potential impacts related to hazards and hazardous materials from proposed 2025 LRDP implementation is based on review of site-specific conditions, literature and database research, and review of Berkeley Lab programs and procedures implemented to comply with regulatory permits and requirements, which themselves are designed to avoid or minimize impacts.

New facilities constructed pursuant to the proposed 2025 LRDP and their operations would be regulated by the various laws, regulations, and policies summarized above in Section 4.8.3, *Regulatory Framework*. Compliance with applicable federal, State, and local laws and regulations is assumed in this analysis, and local and state agencies would be expected to continue to enforce applicable requirements to the extent that they do so now. Compliance with many of the regulations would be a condition of permit approval.

A significant impact would occur if, after considering the proposed 2025 LRDP features described in Chapter 3, *Project Description*, and the required compliance with regulatory requirements, a threshold of significance would nevertheless be exceeded. For any impacts considered to be significant, mitigation measures are identified to reduce the identified impacts.

Impact Analysis

LRDP Impact HAZ-1: Campus development under the LBNL 2025 LRDP would not create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials or through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment. (*Less than Significant*)

Demolition and Renovation

The proposed 2025 LRDP includes the expected demolition and removal of up to 278,500 gsf of existing campus building space. In addition, up to 600,000 gsf of existing building space would be subject to renovation under the proposed 2025 LRDP. As of 2024, nearly 60 percent of the Berkeley Lab buildings were more than 40 years old, and 15 percent were over 60 years old. As discussed in Section 4.8.2, buildings that predate the late 1970s regulatory bans on the use of hazardous building materials may contain hazardous buildings materials such as ACM, LBP, PCBs, and mercury. Other buildings on the campus may contain low amounts of radioactivity (known as residual radioactivity[14]). If not managed appropriately, demolition and/or renovation of these buildings and structures could expose construction workers and the environment to hazardous building materials.

To address potential hazards when demolition or renovation is proposed, a survey and/or review of existing data is conducted to determine whether hazardous substances or radioactivity may be encountered in the building or subsurface underneath the building. Hazardous and radioactive substances are handled and, if necessary, removed in accordance with applicable regulations and Berkeley Lab procedures (e.g., as specified by Berkeley Lab's Asbestos Management, Lead Compliance, and Radiation Protection Programs).

The Berkeley Lab Facilities Division has developed detailed project specifications that are required of all employees and subcontractors performing various activities, including demolition and renovation (LBNL, 2007b). These specifications include requirements to meet applicable environmental, health, and safety regulations and LBNL requirements, and for subcontractors to receive an initial EH&S orientation prior to performing work. If required to work in certain areas, employees and subcontractors must attend more specific safety training sessions, for example, for work in radiation areas, and meet the requirements of the Lab's authorization documents, such as a Radiation Work Permit. Employees and subcontractors are also subject to requirements for reporting spills of hazardous substances or wastes to the UC LBNL project manager. UC LBNL project managers and/or assigned delegates periodically monitor subcontractor compliance with these and other EH&S requirements.

Building demolition and renovation activities that may occur at Berkeley Lab under the proposed 2025 LRDP may involve materials containing residual radioactivity, including shielding blocks, concrete floors, beamline components, and miscellaneous equipment. As is allowed by the regulations, materials with no detectable residual radioactivity would be sent off-site for disposal, reused, or recycled by government agencies and private sector parties without restrictions, with the exception of metals subject to the DOE metals moratorium discussed in Section 4.8.3*, Regulatory Framework*. Options for items that have detectable residual radioactivity include their being left in place, reused at Berkeley Lab, transferred to other DOE facilities for reuse, or shipped to a DOE-authorized facility for disposal as low-level radioactive waste.

The testing, handling, removal, and disposal of hazardous building materials under the proposed 2025 LRDP would be conducted in accordance with applicable federal, State, and local regulations and UC policies. Demolition or renovation activities that may disturb or require the removal of hazardous building materials are required to be inspected and/or tested for the presence of hazardous building materials. If present at concentrations above regulatory action levels, hazardous building materials must be managed and disposed of in accordance with the existing laws and regulations described in Section 4.8.3. The removal would be conducted by contractors licensed to handle, remove, and transport hazardous building materials. The hazardous building materials would be transported to disposal facilities permitted to accept the

14 Residual radioactivity means radioactivity above detection limits that has been added as a result of a DOE activity.

waste. Further, as described above, Berkeley Lab management protocols would ensure that waste materials from facilities containing radioactivity would be properly disposed or recycled in accordance with federal regulations, depending on the level of residual radioactivity.

The required compliance with the numerous laws and regulations that govern the transportation, use, handling, and disposal of hazardous building materials would reduce the potential for adverse effects to the public or environment from demolition and renovation activities, or create hazardous conditions due to the use or accidental release of hazardous materials; and accordingly, this impact would be less than significant.

Construction

During the construction phase of a project proposed under the 2025 LRDP, construction equipment and materials would include fuels, oils and lubricants, solvents and cleaners, cements and adhesives, paints and thinners, degreasers, cement and concrete, and asphalt mixtures, which are all commonly used in construction. The routine use or an accidental spill of these hazardous materials could result in inadvertent releases, which could adversely affect construction workers, the public, and the environment.

Construction activities would be required to comply with numerous hazardous materials regulations described in Section 4.8.3*,* designed to ensure that hazardous materials would be transported, used, stored, and disposed of in a safe and appropriate manner to protect worker safety, and to reduce the potential for a release of construction-related fuels or other hazardous materials into the environment, including into stormwater and downstream receiving water bodies. Contractors would be required to prepare and implement Hazardous Materials Business Plans (HMBPs) that would require that hazardous materials used for construction would be used properly and stored in appropriate containers with secondary containment to contain a potential release. The California Fire Code would also require measures for the safe storage and handling of hazardous materials.

As summarized in Section 4.8.3, a SWPPP would be required for construction activities involving 1 acre or more in compliance with the NPDES Construction General Permit requirements. The SWPPP would list the hazardous materials (including petroleum products) proposed for use during construction; describe spill prevention measures, equipment inspections, and equipment and fuel storage; establish protocols for responding immediately to spills; and describe BMPs for controlling site runoff. Stormwater management during construction in accordance with the NPDES Construction General Permit would control runoff and the migration of sediment and other pollutants from the work site. Construction projects less than 1 acre in size at Berkeley Lab would be regulated under the Berkeley Lab's Industrial General Permit, which would similarly require implementation of appropriate BMPs to minimize erosion potential and discharge of pollutants to surface waters during construction.

In addition, the transportation of hazardous materials would be regulated by the USDOT, Caltrans, and the CHP. Together, federal and State agencies determine driver-training requirements, load labeling procedures, and container specifications designed to minimize the risk of accidental release.

Finally, in the event of an accidental spill that could release hazardous materials, a coordinated response would occur at the federal, State, and local levels, including, but not limited to, the Alameda County Fire Department's Hazardous Materials Team, which is the Berkeley Lab campus's hazardous materials response team, to assess and respond to the situation, as needed.

Berkeley Lab's required compliance with the numerous, above-discussed laws and regulations governing the transportation, use, handling, and disposal of hazardous materials would limit the potential for adverse effects to the public and environment from construction activities and from the use or accidental release of hazardous materials; accordingly, this impact would be less than significant.

Operation

Berkeley Lab facilities expansion under the proposed 2025 LRDP, including research and lab facilities, would increase the quantity of hazardous materials used, stored, treated, and disposed of at the campus. Section 4.8.2 summarizes the existing and projected future quantities of Lab-generated hazardous wastes requiring disposal. As shown in **Table 4.8-6**, UC LBNL estimates the increase in campus hazardous waste, including low-level radioactive waste and mixed waste, and medical waste that would be generated under the proposed 2025 LRDP would be roughly proportional to the building space net increase over existing conditions, an approximate 17-percent increase.

TABLE 4.8-6
PROJECTED BERKELEY LAB HAZARDOUS WASTES TO BE DISPOSED UNDER THE PROPOSED 2025 LRDP

Waste Type	2023 Volume (in pounds)	Estimated Future Volume with 2025 LRDP Buildout (in pounds)
Electronic Devices (Excluding CRT devices)	201,426	235,668
Universal Waste Batteries	2,601	3,043
Universal Waste Lamps	1,518	1,776
Aerosols (Non-Empty)	248	290
Mercury Containing Equipment	68	80
Cathode Ray Tubes (CRTs)	6 devices	7 devices
Hazardous Waste	1,462,063	1,710,614
Low Level Radioactive Waste	12,348[a]	14,447
Mixed Waste	2,619[a]	3,064
Medical/Sharps Waste	12,685	14,841
Pathological	1,049	1,227
Pharmaceutical	77	90

NOTES:
a. The amounts of low-level radioactive waste and mixed waste generated at Berkeley Lab requiring off-site disposal can vary substantially each year. Consequently, a three-year average (2021-2023) of these waste streams is provided here.

SOURCE: LBNL, 2024f.

In addition, proposed new office and support facilities developed under the proposed 2025 LRDP would typically include common hazardous materials, such as toners, paints, and household cleaning products. Building, maintenance, and landscaping activities commonly use fuels, oils, paints and thinners, lubricants, solvents, and pesticides. These common types of hazardous materials are typically stored and used in small quantities in accordance with manufacturer recommendations and UC health and safety policies. As such, the routine transport, use, storage, and disposal of these materials would not be reasonably expected to cause an adverse impact to the public and the environment.

As with existing conditions, future Berkeley Lab operations would be required to comply with all hazardous material regulatory requirements for the storage, use, treatment, and disposal of hazardous materials and hazardous materials waste, as detailed in Section 4.8.3. Berkeley Lab would be required to comply with applicable health and safety practices, as well as federal and State regulations, and UC policies and programs that would minimize the potential for adverse health effects related to chemical, medical, and radioactive materials and waste. In addition, generated wastes would be segregated, handled, labeled, stored and transported in accordance with applicable regulations to minimize direct or indirect exposure of personnel. Future operations of Berkeley Lab's HWHF would continue to be subject to applicable DTSC and DOE regulations and reporting requirements. In addition, UC LBNL would continue to regularly report to the City of Berkeley on the types and quantities of such materials stored and used at the Lab in its annual HMBP. Compliance with existing hazardous materials and waste regulations and Berkeley Lab policies and procedures to manage hazardous materials and waste, as mandated by federal and State laws, would minimize hazards to workers, the public, and the environment, and therefore, the impact related to operational activities at Berkeley Lab involving hazardous materials would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the buildings and other site development that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, thus the scenario is an appropriate and conservative basis for the evaluation of hazards and hazardous materials impacts.

The Illustrative Development Scenario's building demolition scheme includes the demolition and removal of 39 existing campus buildings. Twenty-four of these buildings were built prior to the late 1970s (see Table 4.4-1 in Section 4.4, *Cultural Resources, including Tribal Cultural Resources*), and therefore they predate the late 1970s regulatory bans on the use of hazardous building materials and consequently may contain hazardous buildings materials. The Illustrative Development Scenario also proposes construction of up to 15 new buildings and other site development which would involve the storage and use of hazardous materials during construction. The required compliance with the numerous laws and regulations that govern the transportation, use, handling, and disposal of hazardous building materials would reduce the potential for adverse effects to the public or environment from construction, demolition, or renovation activities, including from accidental release, and the impact would be less than significant.

Potential operational effects associated with hazardous materials quantity increases at Berkeley Lab as analyzed under the Illustrative Development Scenario would be similar to those discussed above under the 2025 LRDP. Compliance with all applicable hazardous material regulatory requirements for the storage, use, treatment, and disposal of hazardous materials and hazardous materials waste during Berkeley Lab operation as analyzed under the Illustrative Development Scenario would be similar to that discussed above under the 2025 LRDP, and therefore, the impact related to operational hazardous materials use in Berkeley Lab facilities would similarly be less than significant.

LRDP Impact HAZ-2: Campus development under the LBNL 2025 LRDP would not emit hazardous emissions or involve handling hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school. (*Less than Significant*)

As discussed in Section 4.8.2, *Environmental Setting*, there are no elementary, middle, or high schools located within one-quarter mile of the Berkeley Lab campus. Therefore, Lab operations involving hazardous emissions or handling of hazardous materials would not adversely affect any existing or proposed school.

Other off-site sensitive receptors located within one-quarter mile of the Berkeley Lab campus include City of Berkeley residences located to the north and west, and the Orange House Family Child Care facility located within one-quarter mile west of the campus boundary. As discussed in Section 4.8.3, and further in LRDP Impact HAZ-1, the required compliance with the numerous laws and regulations that govern the use, storage, transportation, and disposal of hazardous materials would reduce the potential for adverse effects associated with emitting hazardous emissions or handling of hazardous and acutely hazardous materials, substances, or waste within the vicinity of nearby sensitive receptors. The off-site impacts from toxic air contaminant emissions are also analyzed in Section 4.2, *Air Quality*. The impact on off-site receptors would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the buildings and other site development that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, thus the scenario is an appropriate and conservative basis for the evaluation of hazards and hazardous materials impacts. The potential adverse effects associated with construction-related and operational hazardous emissions, along with the handling of hazardous and acutely hazardous materials, substances, or waste within the vicinity of nearby sensitive receptors under the Illustrative Development Scenario, would be as described above for the proposed 2025 LRDP. For the reasons discussed above, this impact would be less than significant.

LRDP Impact HAZ-3: Campus development under the LBNL 2025 LRDP would not be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code § 65962.5 and, as a result, would not create a significant hazard to the public or the environment. (*Less than Significant*)

Based on a search of all CalEPA databases that provide information regarding facilities and sites that meet Cortese List requirements, the Berkeley Lab campus is not included on a list of hazardous materials sites pursuant to Government Code § 65962.5 (also referred to as the Cortese List). Therefore, development under the proposed 2025 LRDP would not be located on a site that is on the Cortese List, and the impact would be less than significant.

However, as discussed in Section 4.8.2, some campus areas have been affected by past releases of chemicals to soil and groundwater, including areas affected by VOCs and one area affected by a tritium release. As described in Section 4.8.2, Berkeley Lab is currently in the Corrective Measures Implementation phase of its DTSC-approved RCRA Corrective Action Program for cleaning up VOC-contaminated groundwater in specified campus areas. The latest groundwater and surface water monitoring show that the corrective measures have substantially reduced VOC concentrations in the groundwater; groundwater plumes are stable or attenuating; groundwater contamination is not migrating to surface water; and groundwater VOCs are not migrating off-site. Tritium plume monitoring has also shown that the levels have declined to below the drinking water standard.

Demolition, Renovation, and Construction

If potential ground disturbance activities, including building foundation removal, excavation, and grading activities; removal of USTs or ASTs; installation of subsurface utilities; or dewatering during construction of future projects under the proposed 2025 LRDP were to occur in contaminated areas on the campus, it could result in the exposure of construction workers, the public, and the environment to hazardous materials.

Under the proposed 2025 LRDP, UC LBNL does not propose to conduct any new building or ground disturbance construction within the area of the identified tritium plume (see Figure 4.8-1). For any new building or ground disturbance within the VOC-impacted groundwater contaminant plume areas on the campus, per the *Groundwater Monitoring and Management Plan,* project-specific construction risk management plans are required to document procedures for site monitoring, spill contingency, and treatment and discharge requirements. If groundwater must be extracted from such construction excavations, or could be released to surface water courses or drain systems in the vicinity of the plumes, it must be captured and treated (e.g., use of extraction wells, sumps, or trenches, and construction of piping to an appropriate and permitted discharge point). Any discharges to the sanitary sewer must comply with the provisions of the EBMUD wastewater discharge permit. For groundwater plume areas where risk-based required cleanup levels are exceeded, project-specific construction risk management plans will be prepared to document construction worker protection and training requirements to mitigate potential health risks to construction workers (LBNL, 2006).

Furthermore, prior to any construction of any project under the 2025 LRDP involving ground disturbance at Berkeley Lab, including where groundwater may be encountered, UC LBNL requires that a Permit to Penetrate Ground or Existing Surfaces of LBNL Property be obtained from a Berkeley Lab Facilities Division Engineering Utilities specialist who reviews each request. If it is determined that soil and/or groundwater will be disturbed at a project site, the project location must be evaluated for the nature and extent of any contamination known or suspected to be present in the soil and groundwater. In addition, applicable worker protection or training requirements are required.

In addition, the *Soil Management Plan* includes requirements for the on-site management of soils generated during demolition, construction, maintenance, and other activities that disturb soil; and sampling and analysis requirements and criteria for the on-site reuse, on-site replacement, or off-site disposal of soils generated during activities that disturb soil (LBNL, 2017).

With respect to projects under the proposed 2025 LRDP that would require removal and/or replacement of USTs or ASTs on the campus, such activities would be carried out in compliance with applicable State tank regulations.

The required compliance with existing federal, State, and UC requirements, and the above-described DTSC-approved and required plans, would reduce the potential for Project-related ground-disturbance exposure of workers, the public, and the environment to contaminants from past releases, and the impact would be less than significant.

Operation

During operations, UC LBNL would continue to conduct groundwater cleanup in accordance with the *Corrective Measures Study Report for Lawrence Berkeley National Laboratory* approved by the DTSC for cleaning up contaminated groundwater and soil, and the *Soil Management Plan* and *Groundwater Monitoring and Management Plan*, which describe controls used to reduce potential risk to human health and the environment from the contaminants, and associated monitoring requirements (LBNL, 2024g).

As discussed above, under the proposed 2025 LRDP, UC LBNL does not provide for new building development within the area of the identified tritium plume on the campus. With respect to new buildings that might be proposed in the VOC plume areas, each building site would be fully evaluated for the contemporaneous VOC contamination levels, and if building vapor intrusion were determined to be a health and safety concern, specific design measures would be incorporated into the building project, including but not limited to, vapor barrier installation in the building foundation and/or the inclusion of a vapor recovery system, to protect the building occupants from VOC exposure. The required compliance with existing federal, State, and UC requirements, and the above-described DTSC-approved and required plans, would reduce the potential for 2025 LRDP-related campus development to expose the public and the environment to pre-existing contaminants, and the impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the buildings and other site development that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, thus the scenario is an appropriate and conservative basis for the evaluation of hazards and hazardous materials impacts. Several buildings analyzed under the Illustrative Development Scenario, including Bayview 4 building, BioGEM Building, Modular General Purpose Computing Facility, Accelerator and Engineering Support Building, and Chemical Sciences Building, would be located within campus VOC-impacted groundwater contaminant plume areas. However, potential effects related to hazards to the public or the environment from development on these sites would be as described above for the proposed 2025 LRDP. For the reasons discussed above, this impact would be less than significant.

Cumulative Impacts

Significant cumulative impacts related to hazards and hazardous materials could occur if the incremental impacts of campus development under the proposed 2025 LRDP combined with the incremental impacts of one or more of the cumulative projects. In this analysis, cumulative projects are those past, present, and reasonably foreseeable future projects in the proposed 2025 LRDP's geographic area of potential effect that, when considered together with the Project, would compound or increase environmental impacts. The cumulative projects considered in this EIR are summarized in Section 4.02, under *Cumulative Impact Analysis*. There are several cumulative projects located within the Berkeley Lab campus, as well as cumulative development projects on the UC Berkeley campus and in the City of Berkeley within one-half mile of the Berkeley Lab campus that would be implemented during the time horizon of the proposed 2025 LRDP.

The geographic area affected by the proposed 2025 LRDP and its potential to contribute to cumulative impacts varies based on the environmental resource under consideration. The geographic scope of analysis for cumulative hazards and hazardous materials impacts encompasses and is limited to the Berkeley Lab campus and its immediately adjacent area. This is because impacts relative to hazards and hazardous materials are generally site-specific and depend on the nature and extent of the hazardous materials release, along with existing and future soil and groundwater conditions. For example, hazardous materials incidents tend to be limited to a smaller and more localized area surrounding the immediate spill location and extent of the release and would typically be considered cumulative only if two or more hazardous materials releases spatially overlapped.

The timeframe during which campus development under the proposed 2025 LRDP could contribute to cumulative hazards and hazardous materials effects includes the construction and operations phases. For the proposed 2025 LRDP, the operations phase is permanent. However, similar to the geographic limitations discussed above, it should be noted that impacts relative to hazardous materials are generally time specific. Hazardous materials events would only be considered cumulative if two or more hazardous materials releases were to occur at the same time as well as overlap in the same general location.

LRDP Impact CUM-HAZ-1: Campus development under the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future development would not result in a cumulatively significant impact related to hazards and hazardous materials. (*Less than Significant*)

Cumulative Impacts during Demolition, Renovation and Construction

Cumulative impacts related to hazards and hazardous materials could occur if the incremental impacts of demolition, renovation, or construction projects under the proposed 2025 LRDP combined with the incremental impacts of one or more of the cumulative projects to substantially increase the risk that people or the environment would be exposed to hazardous materials. While there are certain UC LBNL cumulative projects anticipated within the campus, there are no reasonably foreseeable off-site cumulative projects located immediately adjacent to the Berkeley Lab campus.

The demolition, renovation, and construction activities for all cumulative projects would be subject to the same applicable regulatory requirements as discussed for the projects under the proposed 2025 LRDP, including for potential hazardous materials in building materials during demolition and renovation, accidental spill response, and constructing on sites with existing contaminated soil and/or groundwater. Cumulative projects involving hazardous building materials, or accidental spills of hazardous materials, and/or construction on sites with residual contamination would be required to remediate their respective work sites to applicable regulatory standards as would the projects under the proposed 2025 LRDP. The responsible party associated with each spill would be required to remediate site conditions to the same established regulatory standards. The residual less-than-significant effects of the proposed 2025 LRDP would not combine with the potential residual effects of cumulative projects to cause a potential significant cumulative impact because residual impacts would be highly site and timing specific, would not spatially overlap, and would be below regulatory standards. Accordingly, no significant cumulative impact with respect to the use of hazardous materials would result. For the above reasons, demolition, renovation, and construction activities under the proposed 2025 LRDP in combination with construction activities associated with cumulative projects would not cause or contribute to a cumulatively considerable impact with respect to the use of hazardous materials, and the impact would be less than significant.

Cumulative Impacts during Project Operations

Significant cumulative impacts related to operational hazards could occur if the incremental impacts of 2025 LRDP-related campus development combined with those of one or more of the above-listed cumulative projects to cause a substantial increase in risk that people or the environment would be exposed to hazardous materials used or encountered during the operations phase.

Other cumulative projects currently operate, are approved, or are proposed in and near Berkeley and the Lab campus. Given the extensive variety of hazardous materials used at Berkeley Lab, the variety and quantity of chemicals at cumulative projects is assumed to be similar to or less than those used at the Berkeley Lab campus. As with campus development under the proposed 2025 LRDP, it is assumed that such cumulative projects would store, use, and dispose of variable quantities of hazardous materials. Similar to campus development under the proposed 2025 LRDP, cumulative projects would also be required to comply with all of the same hazardous materials regulatory requirements as detailed in Section 4.8.3, *Regulatory Framework*, which includes the storage, use, and disposal of hazardous materials and waste. Cumulative projects would be required to comply with the same existing federal, State, and regional regulations, which would minimize the potential for adverse health effects related to hazardous materials and waste. Therefore, campus development under the proposed 2025 LRDP in combination with cumulative projects would not cause or contribute to a cumulatively significant impact with respect to the use of hazardous materials, and impacts would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the buildings and other site development that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, thus the scenario is an appropriate and conservative basis for the evaluation of hazards and hazardous materials impacts. Development of future projects, such as those analyzed in the Illustrative Development Scenario, would result in increased exposure to hazardous materials; however, such projects would not result in a considerable cumulative contribution to any cumulative increases in the use of or exposure to hazards or hazardous materials for the reasons stated above for the proposed 2025 LRDP. Therefore, this impact would be less than significant.

4.8.5 References

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4.9 Hydrology and Water Quality

4.9.1 Introduction

This section describes and evaluates the potential for implementation of the proposed LBNL 2025 LRDP (the Project) to result in significant impacts related to hydrology and water quality. The section contains a description of the existing regional and local conditions of the Berkeley Lab campus and the surrounding areas pertaining to hydrology and water quality; includes a summary of University plans and policies, and federal and State laws and regulations related to these resources; and identifies criteria used to determine impact significance, provides an analysis of the potential impacts related to hydrology and water quality associated with proposed 2025 LRDP implementation, and identifies feasible mitigation measures that could mitigate any potentially significant impacts.

4.9.2 Environmental Setting

Climate

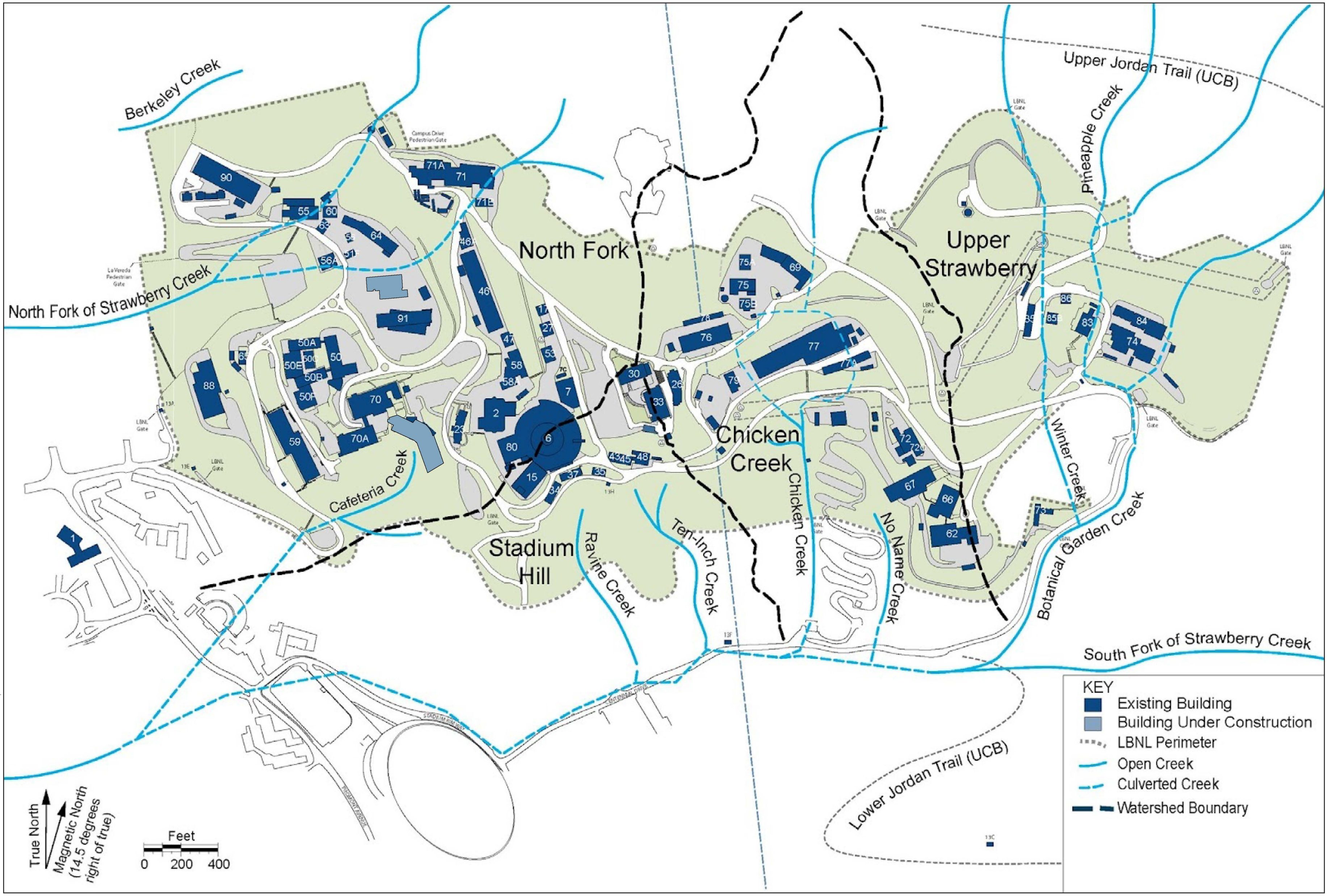
The average annual temperature at Berkeley Lab is in the mid-50's degrees Fahrenheit (°F), with temperatures typically ranging from 40°F to 70°F. Temperatures rarely exceed 90°F or fall below 32°F. The average annual precipitation, based on records dating back to the early 1960s, is approximately 29 inches of rain (with no record of measurable snow) for the water year. Hydrologists and climatologists use the term water year to represent rainfall occurring between October 1 of one year and September 30 of the next year because it characterizes California's seasonal rainfall cycle better than a calendar year. At Berkeley Lab, approximately 95 percent of the annual rainfall occurs between October and May. The wettest of these months are typically December through February (LBNL, 2024a).

Topographic Setting

Topographic elevations at Berkeley Lab range from approximately 450 to 1,100 feet above mean sea level (amsl). Berkeley Lab encompasses approximately 202 acres of steep, generally southern- and western-facing hillside terrain. Approximately two-thirds of the campus remains undeveloped, consisting mostly of steep slopes and vegetated areas.

Surface Water and Drainage

The campus lies within the 2,066-acre Strawberry Creek watershed, which extends from the East Bay hills to the San Francisco Bay. The Strawberry Creek watershed includes Berkeley Lab, other UC property, public streets of both the cities of Oakland and Berkeley, and private property. The portion of the Strawberry Creek watershed in the steeper hilly areas that include Berkeley Lab encompasses approximately 878 acres. Berkeley Lab is within an area characterized by three main canyons and related tributaries. **Figure 4.9-1** shows the areas drained by each of four sub-watersheds, consisting of Strawberry Creek North Fork, Stadium Hill, Chicken Creek and Upper Strawberry Creek sub-watersheds; and their associated creeks (LBNL, 2024c).



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SOURCE: LBNL, 2024

LBNL LRDP EIR

Figure 4.9-1
Berkeley Lab Campus Creeks and Watershed Boundaries

ESA

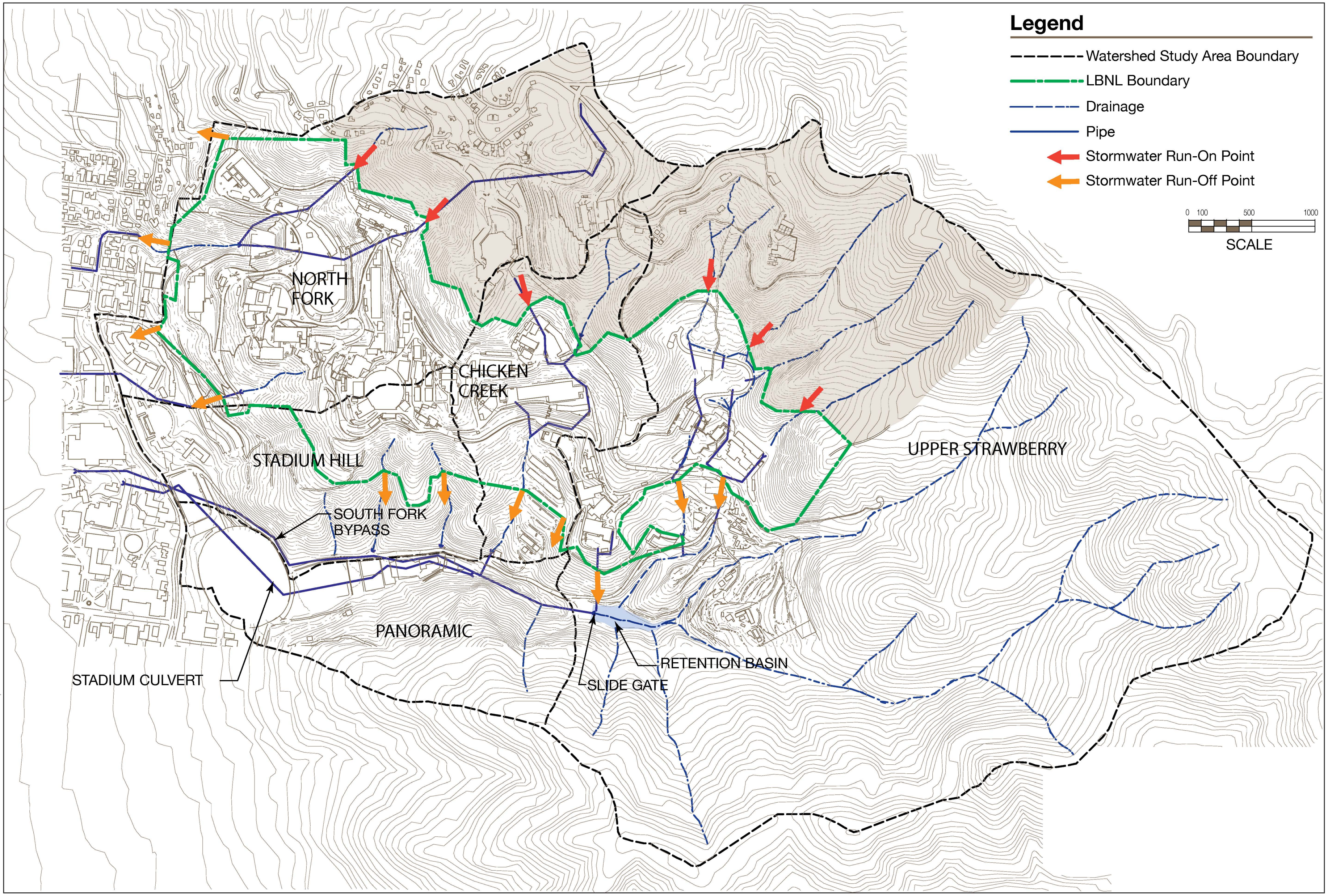
As shown in **Figure 4.9-2**, in addition to the 202-acre Berkeley Lab campus, Berkeley Lab also manages "run-on" flow from 186 acres upslope of the campus. These uphill areas are primarily undeveloped UC Berkeley Hill Campus East research and ecological study area land, University institutional development such as the Lawrence Hall of Science, and limited Berkeley residential development. As illustrated in Figure 4.9-2, run-on flows enter the Lab campus storm drain system at six locations. Due to the steep terrain and areas involved, energy dissipators and other controls have been installed to reduce peak flows onto the campus (LBNL, 2007).

The North Fork sub-watershed of Strawberry Creek watershed (also known as Blackberry Canyon) is approximately 170 acres, consisting of steep canyons and hillsides covered with brush, trees, and grass. This sub-watershed encompasses the northwestern portion of the campus, which includes Berkeley Lab buildings, parking lots, paved areas and other improvements.[1] Drainage from the North Fork sub-watershed upslope of and within the Berkeley Lab campus is conveyed west through the campus and then discharged to a 60-inch concrete culvert at the head of Le Conte Avenue in the City of Berkeley, which re-emerges as a surface stream on the UC Berkeley campus. The North Fork is a perennial creek and is partially supplied by campus hydrauger flows (please see discussion of hydraugers under *Groundwater*, below). A few tributary drainages contribute to the North Fork, including Cafeteria Creek and unnamed ephemeral streams (LBNL, 2007; LBNL,2024c).

The eastern and southern portions of the campus are within the Stadium Hill, Chicken Creek, and Upper Strawberry sub-watersheds, which consist mainly of steep canyons and natural hillsides. Berkeley Lab contains a range of buildings, roads, and infrastructure within these sub-watersheds. These southerly and easterly portions of Berkeley Lab discharge to Chicken Creek (a perennial stream), Ten-Inch Creek, Ravine Creek, and Cafeteria Creek, as well as to other small tributaries, and then to the South Fork of Strawberry Creek.

The South Fork of Strawberry Creek begins in the eastern end of Strawberry Canyon and flows west through a retention basin. Strawberry Creek is then diverted through 36- and 48-inch-diameter concrete pipes and emerges as a surface stream near the eastern end of the UC Berkeley Campus Park and downstream of Berkeley Lab. The North and South Forks of Strawberry Creek traverse the UC Berkeley campus and join at the western side of UC Campus Park. These waters are then directed into the City of Berkeley's Oxford and Center Streets culvert. Runoff from the entire upper Strawberry Creek watershed, including the UC Berkeley campus, is delivered to the entrance of this culvert. The runoff flows through the City of Berkeley's storm drainage system and empties into San Francisco Bay (LBNL, 2007; LBNL, 2024c). While the North Fork of Strawberry Creek runs through the Berkeley Lab campus, at no point does the South Fork traverse the Lab campus.

[1] The extreme northwest corner of the Berkeley Lab campus, approximately 2 acres, lies within the adjacent Lincoln/Schoolhouse Creek watershed; however this flow was diverted by the City of Berkeley and now also discharges into the North Fork of Strawberry Creek.



SOURCE: LBNL, 2007

LBNL LRDP EIR

Figure 4.9-2
Runoff from and Run-on to the Berkeley Lab Campus

Flooding

The Federal Emergency Management Agency (FEMA), through its Flood Insurance Rate Mapping (FIRM) program, designates areas where urban flooding could occur during 100-year and 500-year flood events. A 100-year flood event has a one-percent probability of occurring in a single year. A 500-year flood has a 0.2 percent probability of occurring in a single year. The campus does not lie within the 100- or 500-year flood zone of any stream (FEMA, 2009). There are no impounded water bodies upstream from Berkeley Lab, and therefore, flooding associated with failure of a dam is not anticipated to affect the campus (LBNL, 2007).

Berkeley Lab's hillside setting and moderate rainfall contribute to surface runoff from the Lab. A site-wide storm drain system at Berkeley Lab, designed and installed beginning in the 1960s, discharges into the North Fork of Strawberry Creek watershed on the north side of campus and into Strawberry Creek on the south side of the campus. This system, as initially built, had the capacity to handle storms with runoff intensities expected in a 25-year maximum-intensity storm. Recent upgrades or additions to the system are designed and constructed to handle runoff from the 100-year storm (LBNL, 2024c).

Groundwater

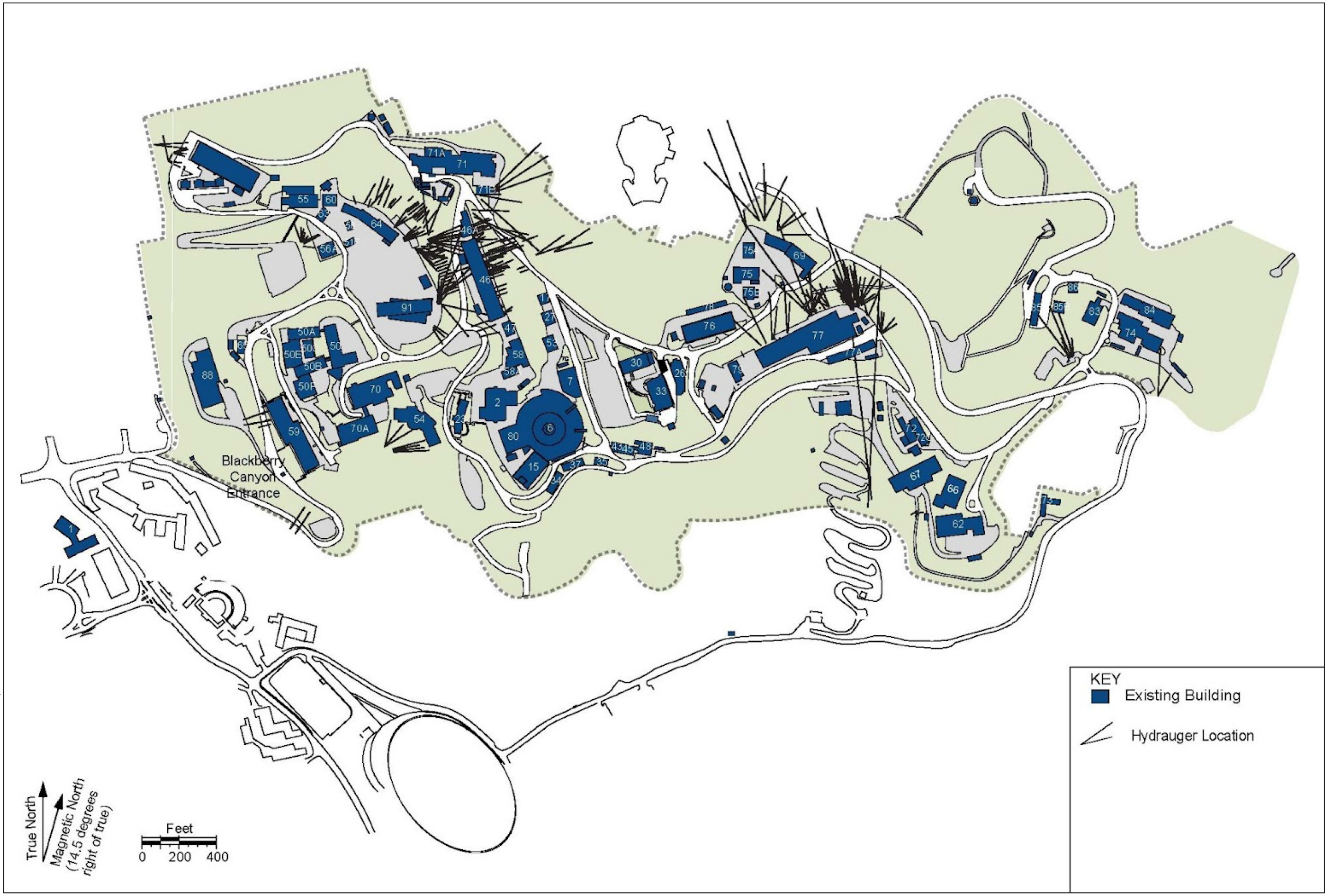
Berkeley Lab campus groundwater is controlled by its complex stratigraphy, faults, and fractures. Locally discontinuous and perched water-bearing zones are common and are indicated by springs, seasonal surface seeps, and variable water levels in wells. These conditions are caused by several factors, including low permeability claystone and siltstone interbeds, pervious sandstone lenses, and fractured volcanic rock. The depth to groundwater varies from approximately 0 to 90 feet below ground surface (bgs) (LBNL, 2024c).

Groundwater flow generally follows the surface topography, with groundwater underlying the northwestern portion of the campus flowing to the west, and groundwater underlying the other campus areas flowing south, or toward the drainage streams (Strawberry Creek and its tributaries) (LBNL, 2023; LBNL 2024a).

Figure 4.9-3 illustrates the hydrauger system at the Berkeley Lab campus. This system of horizontal subsurface drains has been installed on steep campus hills to facilitate hillside drainage, minimize saturation of steep slopes, and increase slope stability. Groundwater collected in hydraugers is subsequently directed both back out onto stable slopes at lower elevations, and into the campus's storm drain system (LBNL, 2007; LBNL, 2024c).

Surface Water Quality

Within the Berkeley Lab campus, potential point sources of stormwater pollutants are generally located in industrial use areas, and at sites of earthwork during construction and maintenance activities. Berkeley Lab has had a stormwater management program in place since 1992. This program includes a Stormwater Pollution Prevention Plan for Industrial Activities (SWPPP), along with periodic monitoring, inspecting, and reporting. More on this program is summarized in Section 4.9.3, *Regulatory Framework* (LBNL, 2024c).



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SOURCE: LBNL, 2024

LBNL LRDP EIR

Figure 4.9-3
Hydrauger System at the Berkeley Lab Campus

ESA

Under the terms of the Industrial General Permit (IGP), Berkeley Lab conducts stormwater sampling each reporting year during two storm events that meet a set of permit-specific conditions. There are three stormwater sampling locations within the campus. Berkeley Lab routinely conducts sitewide pollutant source assessments (PSAs) to identify potential point source areas of industrial activity conditionally subject to the IGP's monitoring requirements. The stormwater sampling program under the SWPPP for Industrial Activities includes collecting stormwater samples from one location at Building 76 Fuel Dispensing Station, and two locations at Building 85 Hazardous Waste Handling Facility. Stormwater sampling results from reporting years 2022/2023 and 2023/2024 show that Berkeley Lab did not exceed annual numeric action levels (NALs) established by the State Water Board for each of the five parameters analyzed (aluminum, iron, pH, oil and grease and total suspended solids [TSS]). As a result, Berkeley Lab returned to baseline status for all parameters for reporting year 2023/2024 (LBNL, 2024a).

Please refer to Section 4.8, *Hazards and Hazardous Materials*, for a description of UC LBNL's creek water and creek sediment monitoring conducted on and around the campus, for volatile organic compound (VOC) and radioactive contamination, pursuant to the State and U.S. Department of Energy (DOE) requirements.

Groundwater Quality

The following information is summarized from Section 4.8, *Hazards and Hazardous Materials*, of this Draft EIR; please refer to that section for greater detail.

Berkeley Lab identified areas of soil and groundwater contamination that resulted from historical releases of hazardous materials into the environment. Several plumes and localized areas of VOC-contaminated groundwater were identified on the campus. In addition, a plume of groundwater containing the radioactive nuclide tritium is present within the campus, however, on-going monitoring demonstrates that concentrations of this contaminant have steadily declined over time (LBNL, 2024a). UC LBNL is implementing corrective measures as part of its Resource Conservation and Recovery Act (RCRA) Corrective Action Program to reduce or eliminate the potentially adverse effects to human health or the environment caused by past releases of chemicals at Berkeley Lab. Department of Toxic Substances Control (DTSC)-approved corrective measures used to clean up contaminated groundwater at Berkeley Lab include in situ soil flushing, groundwater capture and treatment, and monitored natural attenuation. In addition, UC LBNL prepared a *Soil Management Plan for Lawrence Berkeley National Laboratory* and a *Groundwater Monitoring and Management Plan* that provide controls used to reduce potential risk to human health and the environment from the contaminants, and the requirements for ongoing groundwater and surface water monitoring.

UC LBNL monitors groundwater to assess the progress of the corrective actions toward achieving the required cleanup levels, and the Lab monitors groundwater and surface water for the potential migration of groundwater contaminants. The latest groundwater and surface water monitoring conducted at Berkeley Lab indicates the following (LBNL, 2024a):

- Corrective actions have substantially reduced the concentrations of chemicals of concern (COCs) in the groundwater, although concentrations appear to be above asymptotic levels in some areas;
- Groundwater plumes are stable or attenuating;
- Groundwater contamination is not migrating to surface water; and
- Groundwater COCs are not migrating off-site.

Groundwater Supply

Groundwater under the campus is not used as a drinking water source by Berkeley Lab or by local utilities. Groundwater is not extracted on the campus for any potable or non-potable uses; groundwater extraction at the Berkeley Lab campus is limited to that extracted as part of the Lab's ongoing groundwater cleanup program for VOCs. As discussed in more detail in Section 4.15, *Utilities and Service Systems*, the existing potable water supply for Berkeley Lab is provided by EBMUD.

Tsunamis, Seiches, and Sea Level Rise

Tsunamis are a series of waves generated by vertical movement of the sea floor, normally associated with earthquakes or volcanic eruptions. Seiches are oscillations of enclosed or semi-enclosed bodies of water that result from seismic events, wind stress, volcanic eruptions, underwater landslides, and local basin reflections of tsunamis. Locations along the Bay shoreline are exposed to elevated Bay water levels. Sea-level rise is expected to increase the elevation of Bay water levels and hence increase the potential risk of flooding. Given the location and elevation of Berkeley Lab, the campus is not subject to coastal hazards, including tsunami, seiche, sea level rise, or extreme high tides.

4.9.3 Regulatory Framework

Federal

Clean Water Act

The federal Clean Water Act (CWA) and subsequent amendments, under the enforcement authority of the U.S. Environmental Protection Agency (EPA), were enacted "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." The CWA is empowered to protect the nation's water quality and integrity by requiring states to develop and implement state water plans and policies. The CWA gave the EPA the authority to implement pollution control programs such as setting wastewater standards for industry. In California, implementation and enforcement of the National Pollutant Discharge Elimination System (NPDES) program is conducted through the California State Water Resources Control Board (SWRCB) and the nine Regional Water Quality Control Boards (RWQCBs). The CWA also sets water quality standards for surface waters and established the NPDES program to protect water quality through various sections of the CWA, including Sections 401 through 404 and 303(d) that are implemented and regulated by the SWRCB and the nine RWQCBs.

Section 303(d) and Total Maximum Daily Loads

In accordance with CWA Section 303(d), states must present the EPA with a list of impaired water bodies, defined as those water bodies that do not meet water quality standards. The CWA requires the development of total maximum daily loads (TMDLs) to improve the water quality of impaired water bodies. Impaired water bodies and TMDLs for the San Francisco Bay are presented below. Implementation of this program in the Bay Area is conducted by the RWQCB.

Section 402

The 1972 amendments to the Federal Water Pollution Control Act established the NPDES permit program to control discharges of pollutants from point sources (Section 402). The 1987 amendments to the CWA created a new section of the CWA devoted to stormwater permitting (Section 402[p]). Industrial stormwater discharges are regulated pursuant to CWA Section 402(p)(3)(A). NPDES is the primary federal program that regulates point-source and non-point-source discharges to waters of the United States.

Spill Prevention, Control and Countermeasure (SPCC) Rule

The SPCC Rule was originally published in 1973 under the authority of CWA Section 311, the Oil Pollution Prevention regulation that sets forth requirements for the prevention of, preparedness for, and response to oil discharges at specific non-transportation-related facilities. The goal of this regulation is to prevent oil from reaching navigable waters and adjoining shorelines, and to contain discharges of oil. The regulation requires the non-transportation-related facilities to develop and implement SPCC Plans and establishes procedures, methods, and equipment requirements (Subparts A, B, and C).

National Pollutant Discharge Elimination System (NPDES) Permit

The NPDES permit system was established in the CWA to regulate municipal and industrial point discharges to surface waters of the U.S. Each NPDES permit for point discharges contains limits on allowable concentrations of pollutants contained in discharges. Section 402 of the CWA contain general requirements regarding NPDES permits.

The CWA was amended in 1987 to require NPDES permits for non-point source (i.e., stormwater) pollutants in discharges. Stormwater sources are diffuse and originate over a wide area rather than from a definable point. The goal of NPDES stormwater regulations is to improve the quality of stormwater discharged to receiving waters to the “maximum extent practicable” through the use of structural and non-structural Best Management Practices (BMPs). BMPs can include the development and implementation of various practices, including educational measures (workshops informing public of what impacts results when household chemicals are dumped into storm drains), regulatory measures (local authority of drainage facility design), public policy measures, and structural measures (filter strips, grass swales, and detention ponds). The NPDES permits that apply to activities at Berkeley Lab are described under State regulations.

State

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act (Division 7 of the Water Code Sections 13000, et sec.) is the primary water quality control law in California. The Porter-Cologne Act established the State Water Resources Control Board and divided the state into nine regional basins, each overseen by a RWQCB. The nine RWQCBs have the primary responsibility for the coordination and control of water quality within their respective jurisdictional boundaries. The Porter-Cologne Act requires the RWQCBs to establish water quality objectives while acknowledging that water quality may be changed to some degree without unreasonably affecting beneficial uses. Water quality objectives are limits or levels of water quality constituents or characteristics established for the purpose of protecting beneficial uses. Designated beneficial uses, together with the corresponding water quality objectives, also constitute water quality standards under the federal CWA. Therefore, the water quality objectives form the regulatory references for meeting state and federal requirements for water quality control. Designated beneficial uses for water bodies in the Bay Area are described in the Basin Plan discussion below.

San Francisco Bay Water Quality Control Plan (Basin Plan)

The San Francisco Bay Basin (Region 2) Water Quality Control Plan (commonly referred to as the Basin Plan) was adopted by the San Francisco Bay RWQCB and has been amended as of 2023. The Basin Plan is the master water quality control planning document used to designate beneficial uses and surface and groundwater quality objectives. Berkeley Lab is located within Region 2's water quality control jurisdiction. Region 2 is tasked with implementing the adopted Basin Plan for the San Francisco Bay Basin through planning, permitting, and enforcement of established water quality objectives. In accordance with State Policy for Water Quality Control, Region 2 employs a range of beneficial use designations for surface waters (including creeks, streams, lakes and reservoirs), groundwaters, marshes, and mudflats that serve as the basis for establishing water quality objectives, discharge conditions, and prohibitions.

The Basin Plan has identified existing and potential beneficial uses supported by the key surface water drainages throughout its jurisdictional planning area. The designated beneficial uses for Strawberry Creek include Water Contact Recreation (REC-1), Noncontact Water Recreation (REC-2), Warm Freshwater Habitat (WARM), and Wildlife Habitat (WILD) (RWQCB, 2023).

Impaired Water Bodies and TMDLs

As discussed above, stormwater runoff from Berkeley Lab is ultimately discharged to the San Francisco Bay. The RWQCB has listed the Central San Francisco Bay as an impaired water body for the following pollutants: chlordane, dichloro-diphenyl-trichloroethane (DDT), dieldrin, dioxin compounds, furan compounds, mercury, polychlorinated biphenyls (PCBs), selenium, invasive species, and trash (SWRCB, 2024).

The EPA has approved TMDLs for PCBs and mercury in San Francisco Bay, and they have been officially incorporated into the Basin Plan. The RWQCB has adopted the San Francisco Bay Watershed Permit Order (Order No. R2-2017-0041) which addresses mercury and PCBs in municipal and industrial wastewater discharges (RWQCB, 2023).

Aboveground Petroleum Storage Act (APSA)

The APSA regulates tank facilities that are subject to the federal SPCC Rule or tank facilities with an aggregate storage capacity of 1,320 gallons or more of petroleum in aboveground storage containers or tanks with a shell capacity equal to or greater than 55 gallons. APSA also regulates tank facilities with less than 1,320 gallons of petroleum if they have one or more stationary tanks in an underground area (TIUGA) with a shell capacity of 55 gallons or more of petroleum, and, in this case, only the TIUGAs are subject to APSA, although there are exceptions.

NPDES Construction General Permit

In accordance with NPDES regulations, to minimize the potential effects of construction runoff on receiving water quality, the State requires that any construction activity affecting 1 acre or more obtain coverage under a Construction General Permit (CGP). *NPDES General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities (General Permit),* Order WQ 2022-0057-DWQ, NPDES No. CAS000002, was adopted by the SWRCB on September 8, 2022, and became effective on September 1, 2023. The permit regulates stormwater discharges associated with construction or demolition activities, such as clearing and excavation; construction of buildings; and linear underground projects, including installation of water pipelines and other utility lines.

CGP applicants are required to prepare and implement a SWPPP which includes implementing BMPs to reduce construction effects on receiving water quality, including erosion and sediment control measures and measures to reduce or eliminate non-stormwater discharges. Examples of typical construction BMPs in SWPPPs include, but are not limited to: using temporary mulching, seeding, or other suitable stabilization measures to protect uncovered soils; storing materials and equipment so as to ensure that spills or leaks cannot enter the storm drain system or surface water; developing and implementing a spill prevention and cleanup plan; and installing sediment control devices such as gravel bags, inlet filters, fiber rolls, or silt fences to reduce or eliminate sediment and other pollutants from discharging to the City drainage system or receiving waters.

The CGP includes what are known as Construction and Development rule requirements which have non-numeric effluent limitations that apply to all permitted discharges from construction sites (40 CFR 450.21). The effluent limitations are structured to require construction operators to first prevent the discharge of sediment and other pollutants through the use of effective planning and erosion control measures; and second, to control discharges that do occur through the use of effective sediment control measures. Operators must implement a range of pollution control and prevention measures to limit or prevent discharges of sediment and other pollutants, including those from dry weather discharges as well as wet weather (i.e., stormwater) (SWRCB, 2023).

NPDES Industrial General Permit

The *NPDES General Permit for Stormwater Discharges Associated with Industrial Activities* (Industrial General Permit [IGP], Order WQ 2014-0057-DWQ, as amended by Order WQ 2015-0122-DWQ and Order WQ 2018-0028-DWQ, NPDES Permit No. CAS000001) became effective on June 30, 2020. The IGP implements the federally required stormwater regulations in California for stormwater associated with industrial activities discharging to waters of the U.S. The IGP regulates discharges associated with nine federally defined categories of industrial activities. The nine categories include facilities subject to stormwater effluent limitations; manufacturing facilities; oil and gas mining facilities; hazardous waste treatment, storage, or disposal facilities; landfills, land application sites, and open dumps; recycling facilities; steam electric power generating facilities; transportation facilities, and sewage or wastewater treatment works. In addition to potential pollutant sources from industrial use areas, construction projects less than 1 acre in size at Berkeley Lab are regulated under the IGP, and require the implementation of appropriate BMPs to minimize the potential for mobilization of sediment and other potential pollutants in stormwater runoff.

The IGP requires dischargers to (SWRCB, 2018):

- Eliminate unauthorized non-stormwater discharges;
- Develop and implement SWPPPs that include BMPs;
- Implement minimum BMPs, and advanced BMPs as necessary, to achieve compliance with the effluent and receiving water limitations of the Industrial General Permit;
- Conduct monitoring, including visual observations and analytical stormwater monitoring for indicator parameters;
- Compare monitoring results for monitored parameters to applicable numeric action levels (NALs) derived from the U.S. EPA 2008 Multi-Sector General Permit for Storm Water Discharges Associated with Industrial Activity and other industrial stormwater discharge monitoring data collected in California;
- Perform the appropriate Exceedance Response Actions when there are exceedances of the NALs; and
- Certify and submit all permit-related compliance documents via the Stormwater Multiple Application and Report Tracking System (SMARTS). Dischargers shall certify and submit these documents which include, but are not limited to, Permit Registration Documents including Notices of Intent, No Exposure Certifications, and SWPPPs, as well as Annual Reports, Notices of Termination, Level 1 Exceedance Response Action Reports, and Level 2 Exceedance Response Action Technical Reports.

NPDES Municipal Regional Stormwater Permit

In Alameda County, stormwater discharge from 17 participating agencies, including the City of Berkeley, which ultimately receives stormwater runoff generated from within the Berkeley Lab campus, is regulated by the Alameda Countywide Clean Water Program (ACCWP), under a Municipal Regional Stormwater NPDES Permit (MRP) for the discharge of stormwater runoff from their municipal separate storm sewer systems (MS4s). *California Regional Water Quality Control Board San Francisco Bay Region Municipal Regional Stormwater NPDES Permit*, Order No. R2-2022-0018, NPDES Permit No. CAS612008 was adopted on May 11, 2022, and became effective on July 1, 2022. The permit prohibits discharge of non-stormwater (materials other than stormwater) into storm drain systems and watercourses. The municipal operations regulations include a number of requirements to control and reduce non-stormwater and polluted stormwater discharges to storm drains and watercourses during operation, inspection, and routine repair and maintenance activities of municipal facilities and infrastructure (RWQCB, 2022). Although

Berkeley Lab is not regulated by the MRP and is instead regulated under the IGP (see below), the Lab seeks to voluntarily comply with the spirit of the MRP.

East Bay Municipal Utility District

EBMUD is the public utility district that regulates all industrial and sanitary discharges to its wastewater treatment facilities. Berkeley Lab holds EBMUD wastewater discharge permits for the following activities on the campus:

- General sitewide wastewater (Wastewater Discharge Permit No. 06600791) (EBMUD, 2023);
- Treated groundwater from hydraugers (subsurface drains) and groundwater extraction wells (Wastewater Discharge Permit No. 50347891) (EBMUD, 2022); and
- “Zero-waste-discharge” treated rinse water recycled from the metal finishing operations in the Ultra-High Vacuum Cleaning Facility at Building 77 (Wastewater Discharge Permit No. 50238911) (EBMUD, 2018).

These permits specify standard terms and conditions, individual discharge limits and provisions, and monitoring and reporting requirements. Berkeley Lab submits periodic self-monitoring reports specified under each permit. As required by the EBMUD sitewide permit, Berkeley Lab samples wastewater discharges at three Fixed Treatment Units (FTU), each of which are located in research buildings. Sampling is also conducted to assess permit compliance for discharges of treated water from hydraugers and groundwater extraction wells at eight locations. Berkeley Lab’s sitewide wastewater discharge permit also requires annual certification by Berkeley Lab that it is in compliance with the radiological conditions of the permit (LBNL, 2024a).

University of California

Berkeley Lab’s Stormwater Pollution Prevention Plan for Industrial Activities

Stormwater within the Berkeley Lab campus is managed in conformance with the NPDES IGP, as discussed above. All post-construction activities at any project site must comply with the IGP. Oversight and enforcement of this permit is provided by the San Francisco Bay RWQCB with assistance from the City of Berkeley. Implementation of the permit requirements is detailed in Berkeley Lab’s Stormwater Pollution Prevention Plan for Industrial Activities. Additionally, Berkeley Lab complies with NPDES requirements associated with construction projects that involve 1 acre or more by applying for coverage under the NPDES CGP, as discussed above.

Berkeley Lab’s SWPPP for Industrial Activities describes BMPs used to protect stormwater quality. BMPs have been in place since the first general permit was issued by the state in 1992 and are regularly updated. Additionally, a master specification incorporating stormwater management among other environmental, health, and safety concerns is part of contract specifications on all construction projects undertaken by the campus. UC LBNL manages stormwater to address issues such as natural debris and sediment migration, slope stability and associated sedimentation issues, channel cutting and erosion, flow energy dissipation, run-on flow, and runoff retention, as described in more detail below.

Berkeley Lab's SWPPP for Industrial Activities lists potential sources of stormwater contaminants, including a comprehensive list of hazardous substances, chemicals, or other contaminants used throughout the campus. UC LBNL has implemented multiple source controls (such as containment systems for leak and spill control and maintenance of storm drains and streets to remove organic material and dirt) and management controls (such as preventive maintenance of equipment and the development of spill prevention and response programs) in order to minimize stormwater pollutants, as summarized below (LBNL, 2007; 2024c).

Stormwater Management

UC LBNL manages stormwater flows originating from sources upstream of the campus and from within the campus through engineering controls and management practices. Examples of engineering design features used to control surface water flow include (LBNL, 2007; 2024c):

- **Primary debris interceptors**. Structural steel tubes, evenly spaced and embedded in concrete across drainage channels that remove heavy, floating items such as logs, limbs, stumps, and brush from storm runoff entering the Berkeley Lab campus from upstream portions of the drainages. Primary debris interceptors prevent blockage of the storm system entrance and potential flooding; as debris collects on the interceptors, these features also function as local seasonal check dams by storing, slowing, and further dissipating energy of larger storm flows.
- **Secondary debris interceptors**. Heavy vertical grids of rebar spaced more closely together than primary debris interceptors to filter out smaller debris, constructed downstream from primary interceptors to further manage flows originating upstream of the campus as they enter Berkeley Lab. Fiber rolls (entirely composed of natural, biodegradable fiber) and similar instruments are typically placed seasonally at the secondary interceptors to help filter out suspended soil particles from runoff and act as smaller check dams, silting pools, and energy dissipators.
- **Rip-rap**. Sharp-edged cobblestone typically placed at all entrances and outfall points in the storm drain system. Rip-rap is frequently cemented together and both dissipates energy and protects slopes and channels.
- **Wing walls and headwalls**. Concrete walls used where open-channel flow enters a piping system to protect embankment and channel walls from erosion. Steel grates on the inlet structure also filter debris which may have bypassed the primary or secondary debris interceptors.
- **Concrete v-ditches**. Channels used in all earthwork projects along the tops of cut slopes and at intermediate benches on the face of the slope. V-ditches intercept surface runoff to keep the slope face from eroding and channeling.
- **Jute netting**. Jute netting is typically installed on all slopes exposed by construction or grading activities on slopes steeper than 2:1 to prevent erosion until hydroseeding and/or ground cover is well established.[2] Netting is pinned to the slope with long metal staples and typically reinforces the emerging grasslands for up to 7 years, until the netting almost completely biodegrades. Fiber rolls are staked at regular intervals across the faces of slopes to slow down and filter surface runoff.

[2] Berkeley Lab hydroseeds with a mixture of native grasses and forbs.

- **Down drains**. Pipes that convey water down the face of slopes from a collection point at the top of the slope to a lower elevation at a stable outfall point to prevent erosion and damage to the slope face.
- **Impervious, semi-pervious and pervious pavements, curbs, berms, and water dispersal systems**. Surfaces that convey and control storm runoff to prevent runoff from eroding otherwise unprotected surfaces or from flowing down unprotected slopes.

Stormwater management practices included in the Berkeley Lab's SWPPP for Industrial Activities are instituted as feasible and are also consistent with the Lab's *Construction Standards and Design Requirements,* and include:

- **Stormwater flow management**. Management and physical channeling maximize use of the mid-canyon retention basin for both flows originating from development and lands above the campus and flows generated within Berkeley Lab in order to minimize both localized and downstream impacts from storms.
- **General planning**. Opportunities to reduce stormwater flow impacts and further improve water quality are integrated into UC LBNL's overall planning. For example, to minimize impervious surface area per vehicle, UC LBNL encourages alternative transportation modes to further reduce parking needs and improve the Lab's Transportation Demand Management performance and shifts parking to lots (as opposed to roadside parking). Parking lots and structures integrate oil/water separators and allow for better management of off-site flows.
- **Project siting and design**. Evaluation of the quantity and quality of stormwater runoff is integrated into site planning and design so stormwater flows can be effectively managed. Residual increased flows from new impervious surfaces are ameliorated through project-related BMPs and use of the retention/management system.
- **Landscape management**. To improve slope stability and reduce erosion, the Lab's landscape management program improves the long-term health of tree stands and encourages native plants.
- **Slope stabilization**. Slope stabilization measures such as hydraugers and native vegetation reduce general sediment release and erosion and minimize slumps and resulting erosion and sediment production.
- **Seasonal controls**. Seasonal stormwater runoff controls, such as jute netting and fiber rolls, are installed to reduce sediment release and runoff along road edges and in the landscape. These are maintained by UC LBNL.
- **Construction project controls**. Active management of construction-related stormwater flows from development sites is a standard part of contract specifications on all construction projects undertaken by UC LBNL. Construction projects employ control measures and are monitored by UC LBNL to manage stormwater flows and potential discharge of pollutants.
- **Elimination of all cross-connections**. Labeling of stormwater inlets and minimization of sewer system infiltration have been undertaken to maintain clean stormwater flows.
- **Publicizing program information**. The Lab's annual Site Environmental Report is available to the public and provides an overview of recent actions and sampling results. UC LBNL also submits a stormwater annual report to the San Francisco Bay RWQCB and makes its SWPPP and SWMP available to the public.

- **Engagement with the community**. UC LBNL communicates with the community regarding Strawberry Creek water quality and coordinates with relevant UC Berkeley staff and management personnel on stormwater issues.
- **Pollution prevention**. UC LBNL actively promotes pollution prevention and good housekeeping for its Facilities Division operation and maintenance activities, and provides water quality training to Facilities personnel who regularly observe large portions of the campus or operate equipment that may potentially discharge liquid. UC LBNL cleans stormwater inlets prior to the winter storm season and utilizes concrete clean-out basins, responds to any spill of oil, gasoline, or hazardous materials, and applies other, similar BMPs on an ongoing basis. An annual general site inspection ensures the effectiveness of these efforts. UC LBNL also maintains a Spill Prevention, Control, and Countermeasure (SPCC) plan that covers oil-filled containers and oil-filled equipment. UC LBNL is also subject to applicable APSA requirements for storage of petroleum products.
- **Oil–water separators**. These are used where an extra measure of protection is advisable, and will continue to be deployed where they can be used effectively.
- **Permits**. As noted above, UC LBNL obtained a stormwater permit at the inception of the NPDES program. The Lab's program is based on appropriate BMPs, and plans are periodically updated to reflect evolving knowledge and practices in this field. These measures, which are meant to reduce the quantity and improve the quality of stormwater runoff, consist of:
  - Public education and outreach on stormwater impacts;
  - Public involvement and participation;
  - Illicit discharge detection and elimination;
  - Pollution prevention/good housekeeping for facilities operation and maintenance;
  - Construction site stormwater runoff control; and
  - Post-construction stormwater management in new development and redevelopment.

Berkeley Lab Requirements and Policy Manual

The Berkeley Lab Requirements and Policy Manual (RPM) is a collection of policies and environmental programs from the University of California and UC LBNL that help define the Laboratory's operation. The RPM Environment, Safety and Health section includes a variety of topics, including Soil and Groundwater Management Program, and Stormwater Pollution Prevention.

4.9.4 Impacts and Mitigation Measures

Significance Criteria

For purposes of this EIR, impacts to hydrology and water quality would be considered significant if they would exceed the Standards of Significance presented below, which are based on Appendix G of the *CEQA Guidelines*.

Would implementation of the LBNL 2025 LRDP:

a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality;

b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin;

c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:

   i) result in a substantial erosion or siltation on- or off-site;

   ii) substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite;

   iii) create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff; or

   iv) impede or redirect flood flows;

d) In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation; or

e) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan.

Criteria Not Analyzed

Based on the location of the Berkeley Lab campus, there would no impact related to the following topic for the reason described below:

- ***Flood hazard, tsunami, or seiche zones:*** As discussed in Section 4.9.2, *Environmental Setting,* Berkeley Lab is not located in an area susceptible to flood hazards, tsunamis, or seiches. Therefore, there would be no impact relative to flood hazards, tsunamis, or seiches and this topic will not be evaluated further in this section.

Approach to Analysis

This environmental analysis of the potential hydrology and water quality impacts from the construction and operation of campus development under the proposed 2025 LRDP is based on a review of site-specific investigations, literature and database research, and programs and procedures implemented at Berkeley Lab to comply with regulatory permits and requirements which are designed to avoid or minimize impacts.

The construction and operation of campus development under the proposed 2025 LRDP would be regulated by the various laws, regulations, and policies summarized above in Section 4.9.3, *Regulatory Framework*. Compliance with applicable federal and state laws and regulations is assumed in this analysis, and state and local agencies would be expected to continue to enforce applicable requirements to the extent that they do now. Note that compliance with many of the regulations would be a condition of permit approvals.

A significant impact would occur if, after considering the proposed 2025 LRDP features described in Chapter 3, *Project Description*, and the required compliance with regulatory requirements, a significance standard would nevertheless be exceeded. For any impacts considered to be significant, mitigation measures are identified to reduce the identified impacts.

Impact Analysis

LRDP Impact HYD-1: Implementation of the LBNL 2025 LRDP would not violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality. (*Less than Significant*)

Demolition, Renovation, and Construction

Projects developed under the proposed 2025 LRDP would include demolition, renovation, and construction involving ground-disturbing earthwork, including soil excavation and filling, trenching, and grading. These activities could increase the susceptibility of disturbed soil to erosion by wind or water. During construction, heavy equipment such as bulldozers, graders, earth movers, heavy trucks, trenching equipment, and other machinery is likely to be used. Such machinery could contribute pollutants to stormwater runoff in the form of sediment and other pollutants such as fuels, oil, lubricants, hydraulic fluid, or other contaminants. In addition, sediment, construction debris, and other pollutants, if mobilized during construction, could be transported to receiving waters such as Strawberry Creek. In the absence of runoff controls, exceedances of water quality standards could result. If not controlled and managed, construction-related impacts to water quality could be significant.

Individual projects developed under the proposed 2025 LRDP that involve 1 acre or more of ground disturbance would trigger the need for UC LBNL to apply for coverage under the State's NPDES CGP, which requires the preparation and implementation of a project-specific SWPPP. As part of the SWPPP, a project-specific erosion control plan would be included in the project design process and implemented during construction to reduce construction-related water quality impacts. The SWPPP would include the use of BMPs to minimize stormwater pollution from sediments and construction-related contaminants. Such BMPs would include, as appropriate:

- Covering of excavated materials;
- Erosion and sediment control practices, including installation of silt fences, straw wattles, sediment traps, and use of filter fabric, as appropriate, as measures to control erosion and sedimentation and prevent such materials from entering surface water discharges;
- Stormwater run-on and runoff controls;
- Truck and construction equipment maintenance and storage to minimize pollutants;
- Practices to reduce the tracking of sediment onto public and private roads;
- Construction and hazardous materials storage;
- Housekeeping measures;
- Prohibition of cement truck washout to drains and surfaces;
- Construction waste management and trash provisions; and
- Oversight throughout construction by Berkeley Lab engineers and environmental specialists.

Individual projects implemented under the proposed 2025 LRDP that would disturb less than 1 acre would be regulated under the Lab's NPDES IGP through its SWPPP for Industrial

Activities and *Construction Standards and Design Requirements*, which include construction project controls that are similar to and consistent with the requirements of the CGP.

As discussed in Section 4.8, *Hazards and Hazardous Materials, Environmental Setting*, there are some campus areas that have been affected by past chemical releases to soil and groundwater, including areas affected by VOCs and one area affected by a tritium release. As discussed under LRDP Impact HAZ-3 in Section 4.8, if potential ground disturbance activities or dewatering during future project construction under the proposed 2025 LRDP were to occur in contaminated campus areas, it could result in the exposure of construction workers, the public, and the environment to contaminated soils and groundwater. However, under the proposed 2025 LRDP, UC LBNL does not intend to conduct any new building or ground disturbance construction within the area of the identified tritium plume. In addition, any new building or ground disturbance within the campus's VOC-impacted groundwater contaminant plume areas would be subject to construction risk management plans per the *Groundwater Monitoring and Management Plan*. Any groundwater extracted from construction excavations must be captured and treated, and potential discharges to the sanitary sewer must comply with the provisions of the EBMUD wastewater discharge permit. Furthermore, prior to any construction of any project under the proposed 2025 LRDP involving ground disturbance at Berkeley Lab, including where groundwater may be encountered, UC LBNL requires that a Permit to Penetrate Ground or Existing Surfaces of LBNL Property be obtained. If it is determined that soil and/or groundwater would be disturbed at a project site, the project location must be evaluated for the nature and extent of any contamination known or suspected to be present in the soil and groundwater. In addition, applicable worker protection or training requirements would be implemented.

The required compliance with existing federal and State regulations, and the DTSC-approved and required plans, would ensure project construction under the proposed 2025 LRDP would not violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface water or groundwater quality, and the impact would be less than significant.

Operation

As with existing conditions, stormwater runoff from operation of new facilities at Berkeley Lab under the proposed 2025 LRDP could potentially generate pollutants common in urban runoff, including sediment, fuel, oil and grease, metals, pesticides, and litter. Given the net increase in development, including buildings, parking, and landscaping; and potential increase in campus research activity under the proposed 2025 LRDP, pollutant discharge into stormwater could increase over existing conditions. While it is not expected that there would be a substantive change in the type of pollutants associated with projects under the proposed 2025 LRDP compared to existing conditions, sediment and other pollutants in stormwater runoff from the Lab would nevertheless have the potential to violate water quality standards if the types and amounts are not adequately controlled or reduced.

Stormwater within the Berkeley Lab campus is currently managed in conformance with the NPDES IGP, discussed in Section 4.9.3, *Regulatory Framework*. All post-construction activities at any project site within Berkeley Lab under the proposed 2025 LRDP would be required to comply with the IGP. Oversight and enforcement of this permit is provided by the San Francisco Bay RWQCB with assistance from the City of Berkeley. Implementation of the permit requirements is detailed in Berkeley Lab's SWPPP for Industrial Activities.

The SWPPP for Industrial Activities requires long-term BMPs to be incorporated into the design of new development and redevelopment that prevent or minimize water quality impacts and to protect stormwater quality. In addition, a master specification incorporating stormwater management among other environmental, health, and safety concerns would be part of contract specifications on all construction projects undertaken at the campus under the proposed 2025 LRDP. Berkeley Lab manages stormwater to address issues such as debris and sediment migration, slope stability and associated sedimentation issues, channel cutting and erosion, flow energy dissipation, run-on flow, and runoff retention. Berkeley Lab's SWPPP for Industrial Activities also focuses on point sources of industrial activity that have the potential to contribute to stormwater pollutants which could affect stormwater quality, such as fueling stations, waste accumulation areas, hazardous materials storage, and cooling towers. The Lab has implemented multiple source controls (such as containment systems for leak and spill control and maintenance of storm drains and streets to remove organic material and dirt) and management controls (such as preventive maintenance of equipment and the development of spill prevention and response programs) in order to minimize discharge of stormwater pollutants.

As described in Section 4.9.3, examples of engineering design features used to control surface water flow include primary and secondary debris interceptors, rip-rap, wing walls and head walls at entrance and/or exit points in the storm drain system, and use of impervious, semi-pervious, and pervious pavements, curbs, berms, and water dispersal systems to convey and control stormwater runoff. Examples of Berkeley Lab's stormwater management practices implemented under its *Construction Standards and Design Requirements* include: proper project siting and design, landscape management to improve slope stability and reduce erosion, use of slope stabilization measures such as use of hydraugers and native vegetation to reduce sediment release, use of seasonal controls (e.g., install jute netting and fiber rolls along road edges during the wet season), elimination of stormwater cross-connections, preparation of the Lab's annual Site Environmental Report and stormwater reports, promotion of good housekeeping and water quality training to facilities personnel, completion of annual site inspections, and use of extra measures of water quality protection when advisable (e.g., oil–water separators).

Also, as discussed in Section 4.8 in more detail, UC LBNL would continue to conduct groundwater cleanup in accordance with the *Corrective Measures Study Report for Lawrence Berkeley National Laboratory* approved by the DTSC for cleaning up contaminated groundwater and soil, and the *Soil Management Plan* and *Groundwater Monitoring and Management Plan*, which describe controls used to reduce potential risk to human health and the environment from contaminants and associated monitoring requirements.

Lastly, as explained in Section 4.9.3, UC LBNL is not subject to the requirements of the NPDES MRP and ACCWP, for which the City of Berkeley is a participating agency, and which regulate stormwater runoff downstream of, and received from, the Berkeley Lab campus. However, under the proposed 2025 LRDP, UC LBNL would, to the extent feasible, seek to conform with the provisions of the ACCWP and NPDES MRP. The SWPPP for Industrial Activities is also consistent with the ACCWP, in that it requires structures be designed to result in stormwater runoff rates and volumes that are equal to or less than existing conditions.

The required compliance with existing federal and State requirements, and the above-described DTSC-approved and required plans, would ensure operations of new facilities under the proposed 2025 LRDP would not violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality, and the impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings and other site development that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of hydrology and water quality impacts. Potential future projects, such as development consistent with that portrayed in the Illustrative Development Scenario, would have the potential to degrade surface or ground water quality during construction or operation. The required compliance with the numerous laws and regulations that require controlling stormwater runoff, preventing erosion, and managing contaminated soil and groundwater would reduce the potential for adverse effects to the public or environment during construction and operation, and impacts from development consistent with that portrayed in the Illustrative Development Scenario would similarly be less than significant.

LRDP Impact HYD-2: Implementation of the LBNL 2025 LRDP would not substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin. (*Less than Significant*)

Demolition, Renovation, and Construction

As discussed in Section 4.9.2, the depth to groundwater on the campus varies from approximately 0 to 100 feet. Depending on location and depth of excavation that would be needed for individual projects under the proposed 2025 LRDP, dewatering may be required at development sites during construction. Given the limited and temporary construction dewatering that may be needed at development sites over the course of the 2025 LRDP, construction dewatering would not substantially decrease groundwater supplies or interfere substantially with groundwater recharge. Furthermore, Berkeley Lab is not located within an area covered by a sustainable groundwater management plan. Therefore, construction under the proposed 2025 LRDP would not impede sustainable groundwater management of the basin, and the impact would be less than significant.

Operation

Berkeley Lab does not currently contain any water supply wells, and none would be installed under the proposed 2025 LRDP. Campus groundwater is not used as a drinking water source by Berkeley Lab or by local utilities, nor would campus groundwater be sourced for any potable or non-potable uses under the proposed 2025 LRDP. In addition, as noted above, Berkeley Lab is not located within an area covered by a sustainable groundwater management plan.

Berkeley Lab campus non-construction related groundwater extraction is limited to that extracted as part of the Lab's ongoing groundwater treatment program for VOCs. Berkeley Lab utilizes a hydrauger system (subsurface drains) at the campus to facilitate hillside drainage, minimize saturation of steep slopes, and increase slope stability. Groundwater collected in certain hydraugers and from the groundwater extraction wells at the campus is treated and discharged to the sanitary sewer system, as regulated under an EBMUD wastewater discharge permit. Groundwater collected from other hydraugers is directed back out onto stable slopes at lower campus elevations. These activities would continue under the proposed 2025 LRDP.

As discussed in Chapter 3, *Project Description*, the proposed 2025 LRDP would result in the demolition of a number of existing buildings, construction of new buildings, and other site development, including surface parking lots, landscaping, and other features. In the absence of a site plan for the proposed 2025 LRDP, there is the potential for development under the proposed 2025 LRDP to result in an incremental net increase in pervious areas on the campus. However, any such increase is not be anticipated to be substantial, as the proposed 2025 LRDP posits new buildings and other site development largely within previously disturbed campus areas. Furthermore, pursuant to the SWPPP for Industrial Activities, new development under the proposed 2025 LRDP would include post-construction features such as bioswales that would promote infiltration of stormwater runoff.

Given the above factors, proposed 2025 LRDP implementation would not substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin, and the impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Based on analysis of the Illustrative Development Scenario, there would be an estimated net decrease in campus impervious area of approximately 138,000 square feet (Sherwood Engineers, 2024). Therefore, development consistent with that portrayed in the Illustrative Development Scenario would not interfere with groundwater recharge. Furthermore, similar to the 2025 LRDP, campus groundwater would not be extracted for potable or non-potable uses, and there would be no impact on groundwater supplies and groundwater basin from development consistent with that portrayed in the Illustrative Development Scenario. For the reasons discussed above, this impact would be less than significant.

LRDP Impact HYD-3: Implementation of the LBNL 2025 LRDP would not substantially alter the existing drainage pattern of the campus in a manner which would result in a substantial erosion or siltation on- or off-site; substantially increase the rate or amount of surface runoff such that it could result in flooding on- or off-site; create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems; provide substantial additional sources of polluted runoff; or impede or redirect flood flows. (*Less than Significant*)

Demolition, Renovation, and Construction

Ground disturbing activities associated with demolition and construction activities under the proposed 2025 LRDP, including clearing, excavation, and grading, have the potential to temporarily result in erosion or siltation and/or alter localized stormwater drainage patterns. However, as described under LRDP Impact HYD-1, demolition and construction activities would be required to comply with the NPDES CGP and/or IGP, as applicable; they would also need to comply with associated SWPPPs that include erosion and sediment control BMPs to minimize the potential for erosion and siltation in nearby storm drains, as well as to minimize temporary changes in drainage patterns. BMPs would also include, but not necessarily be limited to, filtering runoff during construction, avoiding heavy grading and groundwork operations during the rainy season, and incorporating landscaping as early as possible. BMPs would be implemented to control construction runoff, ensure proper stormwater control and treatment, and reduce the discharge of pollutants to the storm drain system. Therefore, with implementation of BMPs as required by NPDES permits, the potential increases in siltation and/or changes to drainage patterns during construction would have a less than significant impact related to on- and off-site flooding, erosion, or siltation.

Operation

As indicated in Section 4.9.2, the Berkeley Lab campus is not located within a 100-year flood zone of any stream or drainage. As discussed under LRDP Impact HYD-2 above, campus development under the proposed 2025 LRDP could incrementally increase impervious surfaces on the campus compared to existing conditions, and result in localized alteration of existing storm drainage patterns. Any minor changes in drainage patterns at development sites would not have the potential to increase erosion or siltation, because upon completion of construction, these areas would be developed with buildings, other paved surfaces, and/or landscaping. In addition, the design of the new buildings and other impervious surfaces would be required to comply with the Lab's SWPPP for Industrial Activities and *Construction Standards and Design Requirements* summarized in Section 4.9.3. The SWPPP for Industrial Activities requires that the rate and volume of peak stormwater runoff from new projects constructed under the proposed 2025 LRDP not exceed existing conditions. As such, project development under the proposed 2025 LRDP would not result in flooding on or off-site; or contribute runoff water that would exceed the capacity of stormwater drainage systems. With compliance with existing regulations, the impact relative to related flooding, storm drain capacity, erosion and sedimentation, or additional sources of pollutants would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario, although as discussed under LRDP Impact HYD-2, above, this scenario would result in an estimated net decrease in impervious campus area (Sherwood Engineers, 2024). Furthermore, as discussed above for the proposed 2025 LRDP, development consistent with that portrayed in the Illustrative Development Scenario would also be subject to the same post-construction requirements to address siltation, alterations in drainage and potential increases in peak flows as under the proposed 2025 LRDP. For the reasons discussed above, this impact would be less than significant.

LRDP Impact HYD-4: Implementation of the LBNL 2025 LRDP would not conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan. (*Less than Significant*)

Demolition, Renovation, and Construction

Commonly practiced BMPs, as required by the NPDES CGP, would be implemented under the proposed 2025 LRDP to control construction site runoff and reduce the discharge of sediment and other pollutants from stormwater and other nonpoint-source runoff to storm drain systems. As part of complying with permit requirements during ground-disturbing or other construction activities, water quality control measures and BMPs would be implemented to assist in achieving water quality standards, including water quality objectives that protect designated beneficial uses of surface water and groundwater, as defined in the Basin Plan. For construction sites less than 1 acre in size, requirements of the IGP would be implemented to control the discharge of sediment and other pollutants into the receiving waters.

As discussed above in Section 4.8, *Hazards and Hazardous Materials*, and under LRDP Impact HYD-1, some campus areas have been affected by past releases of chemicals to soil and groundwater, including areas affected by VOCs and one area affected by a tritium release. UC LBNL does not propose to conduct any new ground disturbance construction within the identified tritium plume area; and any disturbance within the VOC-impacted groundwater contaminant plume areas would be required to comply with the DTSC-approved and required plans for this impacted area.

Compliance with the NPDES CGP and IGP requirements, and other existing federal and State regulations would ensure that construction under the proposed 2025 LRDP would not result in substantial water quality degradation. Therefore, construction activities under the proposed

2025 LRDP would not conflict with or obstruct Basin Plan implementation, and the impact would be less than significant.

Operation

As discussed under LRDP Impact HYD-1, operation of campus facilities developed under the proposed 2025 LRDP would have a less-than-significant impact related to water quality standards and/or waste discharge requirements. New projects developed under the proposed 2025 LRDP may require as project design features stormwater treatment facilities that would help ensure proper treatment of project site flow before discharge into the storm drain system such that they would not violate water quality standards or waste discharge requirements. Therefore, campus operations under the proposed 2025 LRDP would not conflict with the Basin Plan, and the impact would be less than significant.

As discussed under LRDP Impact HYD-2, Berkeley Lab is not located within an area covered by a sustainable groundwater management plan. Therefore, campus operations under the proposed 2025 LRDP would not conflict with or obstruct the implementation of a sustainable groundwater management plan, and the impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings and other site development that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of impacts to hydrology and water quality. For the same reasons put forth above for campus development under the 2025 LRDP, development consistent with that portrayed in the Illustrative Development Scenario would not violate water quality standards and/or waste discharge requirements. Therefore, the construction and operation from development consistent with that portrayed in the Illustrative Development Scenario would be consistent with the Basin Plan, and the impact would be less than significant.

Cumulative Impacts

The proposed 2025 LRDP's geographic scope–or area of potential effect– and the potential for campus development to contribute to cumulative impacts varies based on the environmental resource under consideration. The geographic scope of analysis for cumulative hydrology and water quality impacts encompasses the Strawberry Creek watershed and includes areas both on and off of the Lab campus. In this analysis, cumulative projects are those past, present, and reasonably foreseeable future projects in the proposed 2025 LRDP's geographic area of potential effect that, when considered together with the Project, could result in impacts that could compound or increase the Project's environmental impacts. Potential cumulative impacts would involve the Project's contributions of construction and operation-related water quality degradation and/or the off-site discharge of pollutants or stormwater flows to those of other cumulative projects.

LRDP Impact CUM-HYD-1: Implementation of the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, would not result in significant cumulative impacts related to hydrology and water quality. (*Less than Significant*)

Cumulative impacts related to hydrology and water quality could occur if the incremental effects of demolition, renovation, construction, and operation of projects under the proposed 2025 LRDP combined with the incremental effects of one or more past, present, or reasonably foreseeable projects within the geographic area of effect were to substantially increase the discharge of sediment, other pollutants, or total stormwater volume entering the receiving waters. As discussed in Section 4.04, there are some reasonably foreseeable Berkeley Lab campus projects that are independent of the proposed 2025 LRDP. There are also several major development projects anticipated within the UC Berkeley campus and some smaller projects within the cities of Berkeley and Oakland near the Lab. Construction and operations of all cumulative projects would be subject to the same or equivalent applicable regulatory requirements as discussed below for the projects under the proposed 2025 LRDP.

As discussed under LRDP Impact HYD-1, compliance with the NPDES CGP and IGP during construction for 2025 LRDP projects would prevent the release of sediment and other pollutants during construction activities. The general permits would require the preparation and implementation of a SWPPP with BMPs to prevent the release of sediment and other pollutants in stormwater runoff. In addition, compliance with the design requirements of the Lab's IGP and *Construction Standards and Design Requirements* for projects constructed under the proposed 2025 LRDP would ensure the control and treatment of stormwater to prevent the release of sediment and other pollutants during operations. Similarly, other cumulative development would be subject to applicable NPDES general permits that would require the preparation and implementation of a SWPPP with appropriate BMPs to prevent the release of sediment and other pollutants in stormwater runoff. Compliance with these regulations by all parties would prevent cumulatively considerable impacts to water quality.

As discussed under LRDP Impact HYD-2, groundwater extraction at the Berkeley Lab campus would, as under existing conditions, be limited to that extracted as part of the Lab's ongoing groundwater treatment program. Any potential incremental increase in impervious campus areas associated with development under the proposed 2025 LRDP would be addressed by post-construction features that would promote infiltration (e.g. bioswales). Cumulative projects would also need to comply with the applicable post-construction requirements under the MRP or equivalent permit. Cumulative projects would similarly be required to address any increase in impervious surfaces by capturing and infiltrating stormwater to maintain or increase the existing amount of site recharge. The cumulative impact related to groundwater recharge would be less than significant.

As discussed under LRDP Impact HYD-3, projects implemented under the proposed 2025 LRDP would be required to comply with the NPDES CGP and/or IGP, as applicable, and implement SWPPPs that include BMPs to control construction runoff, ensure proper stormwater control and treatment, and reduce the discharge of pollutants to the storm drain system. Furthermore, compliance with existing regulations (e.g., MRP or equivalent permit) would regulate changes, if any, to drainages proposed by cumulative projects and minimize the impact. The cumulative impact related to flooding, storm drain capacity, erosion and sedimentation, or additional sources of pollutants would be less than significant.

As discussed in LRDP Impact HYD-4, construction and operation of projects implemented under the proposed 2025 LRDP would be consistent with the Basin Plan through compliance with permit requirements to ensure development under the proposed 2025 LRDP would not violate water quality standards or waste discharge requirements, and consequently, be consistent with the Basin Plan. Similarly, cumulative projects would be required to be consistent with the Basin Plan and if applicable, a groundwater sustainability plan. The cumulative impact related to the Basin Plan would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP and thus, the scenario is an appropriate and conservative basis for the evaluation of impacts to hazards and hazardous materials. For the reasons stated above with respect to the cumulative impacts of the proposed 2025 LRDP, development consistent with that portrayed in the Illustrative Development Scenario would not result in a considerable cumulative contribution to hydrology and water quality impacts. The cumulative impacts would be less than significant.

4.9.5 References

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SWRCB, 2024. *California 2020-2022 Integrated Report*. https://gispublic.waterboards.ca.gov/portal/apps/webappviewer/index.html?id=6cca2a3a1815465599201266373cbb7b. Accessed July 24, 2024.

4.10 Land Use and Planning

4.10.1 Introduction

This section describes and evaluates the potential for the implementation of the proposed 2025 LRDP to result in significant impacts related to land use and planning. The section describes existing land uses on and in the vicinity of the Berkeley Lab campus; includes a summary of the University plans and policies related to land use; identifies criteria used to determine impact significance, and provides an analysis of the potential for the proposed 2025 LRDP to result in land use impacts.

4.10.2 Environmental Setting

Existing Berkeley Lab Campus and Vicinity

The Berkeley Lab campus occupies an approximately 202-acre site within 1,232 acres of UC Regent-owned land in the San Francisco Bay Area's East Bay hills. The campus straddles the border between the cities of Berkeley and Oakland. Figure 3-3 in Chapter 3, *Project Description*, presents an aerial photograph identifying the campus and general features in the campus vicinity.

Berkeley Lab is surrounded on the west by UC Berkeley (Campus Park) and Hill Campus West, and City of Berkeley multi-unit residential developments; on the north by City of Berkeley residential neighborhoods and various UC Berkeley facilities (including the Lawrence Hall of Science, Space Sciences Laboratory, and Mathematical Sciences Research Institute); on the east by UC Berkeley Hill Campus East; and on the south by UC Berkeley's Hill Campus West and East (including various recreational fields and pools), Botanical Garden, and by the Strawberry Canyon open space. Regional open space lies beyond UC Berkeley Hill Campus, including the 2,000-acre Tilden Regional Park to the northeast and east, and the 205-acre Claremont Canyon Regional Preserve to the south. The Berkeley Lab campus is a fenced and secured site and is accessed by three controlled vehicular entrances.

Existing Campus Facilities and Land Uses

The University leases Berkeley Lab campus parcels to the U.S. Department of Energy (DOE) to support all major DOE-owned buildings, which comprise most of the campus's facilities and structures. Figure 3-4 in Chapter 3 illustrates existing Berkeley Lab campus facilities. Berkeley Lab's major research facilities have been developed within eight loosely organized development pads or clusters on the campus's few relatively flat terraces. As illustrated in Figure 3-6 in Chapter 3, these development clusters include the Blackberry, Central Commons, Bayview, Northside, Charter Hill, Support Services, Redwood, and Strawberry clusters. Most clusters tend toward a dominant research area or support function. Parking is mostly arranged in small lots or along roads, and other amenities are distributed throughout the clusters. There are currently 170 useable building facilities on the campus, consisting of approximately 90 buildings, 20 trailers, and 60 storage containers. These facilities provide space for research laboratories, accelerators, offices, machine and electrical shops, medical services, storage, food service, and communications. Many of these buildings are considered obsolete due to age, condition, or a poor seismic safety rating per the UC Seismic Performance Rating (SPR) System.

4.10.3 Regulatory Framework

University of California

Long Range Development Plan

UC campuses—including UC LBNL—are required to maintain and periodically update their LRDPs. An LRDP provides a high-level planning framework to guide land use, physical parameters, and capital investment in line with the campus's mission and strategic goals.[1] The LRDP provides adequate planning capacity for potential program and population growth and physical infrastructure that may be needed to support future campus development. However, an LRDP does not mandate growth or the provision of new facilities. Further, UC LRDPs do not expire and remain in effect until updated or replaced.

UC LRDPs include land use zoning and related guidance for UC campuses. A land use zoning map, along with descriptive zoning information, helps guide a campus's siting and land use decision-making and informs a campus as to what uses and activities are appropriate for each defined zone. The proposed 2025 LRDP designates four types of land use zones on the Berkeley Lab campus: Research and Academic, Central Commons, Support Services, and Perimeter Open Space Zones.

The current 2006 LRDP for Berkeley Lab was adopted in 2007 and projected Lab development through 2025. The proposed 2025 LRDP analyzed in this EIR would replace the current LRDP and would provide for Lab development through 2045.

LBNL Design Guidelines

The LBNL Design Guidelines were developed and adopted in parallel with the 2006 LRDP as a "living document" to be ultimately replaced by a forthcoming Physical Design Framework (PhDF), a UC-specific guide for campus design. (Following the adoption of the 2025 LRDP, Berkeley Lab expects to prepare a PhDF that would incorporate the same general design principles articulated in the Design Guidelines.) The LBNL Design Guidelines provide specific direction for site planning, landscape, and building design as a means to implement the LRDP's development principles as each new project is developed. The LBNL Design Guidelines include the following specific planning and design guidance relevant to land use:

The Land, Topography and Views

- Provide screening landscape elements to visually screen large buildings;
- Mass and site buildings to minimize their visibility;
- Respect view corridors; and
- Minimize further increases in impermeable surfaces at the Lab.

[1] An LRDP is defined by statute (Public Resources Code [PRC] 21080.09) as a "physical development and land use plan to meet the academic and institutional objectives for a particular campus or medical center of public higher education."

Research Clusters

- Create new Commons Spaces in clusters that currently lack them;
- Create as high a density and critical mass around commons spaces as possible;
- Segregate public entries and paths from service entries and paths where feasible; and
- Develop Research Clusters in a way that is mindful of future expansion.

Linkages

- Reduce the amount of impermeable surfaces at the Lab;
- Minimize visual and environmental impacts of new parking lots; and
- Site and design parking structures to integrate with the natural surroundings.

4.10.4 Impacts and Mitigation Measures

Significance Criteria

For purposes of this EIR, impacts related to land use and planning would be considered significant if they would exceed the Standards of Significance presented below, which are based on Appendix G of the *CEQA Guidelines*.

Would implementation of the LBNL 2025 LRDP:

a) Physically divide an established community; or

b) Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect.

Approach to Analysis

Land use and planning impact analysis considers the potential for the proposed 2025 LRDP to result in substantial adverse effects related to land use and planning, including physical division of an established community and the potential for proposed 2025 LRDP implementation to conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect.

While an EIR may provide information regarding land use and planning issues, CEQA does not consider land use plan and policy inconsistency to be a physical environmental effect unless the plan or policy was adopted for the purpose of avoiding or mitigating a significant environmental effect. Adverse physical effects on the environment that could result from proposed 2025 LRDP implementation, including the land use changes addressed in this section, are evaluated and disclosed in this EIR’s appropriate technical sections.

Impact Analysis

LRDP Impact LU-1: Implementation of the LBNL 2025 LRDP would not physically divide an established community. (*No Impact*)

The Berkeley Lab campus is surrounded by a mix of land uses, including open space, institutional uses, housing, and neighborhood commercial areas, in the cities of Berkeley and Oakland. The campus is largely buffered by undeveloped and sparsely developed land adjacent to the UC Berkeley Hill Campus East, whereas the Lab campus's northwestern corner is generally adjacent to City of Berkeley residential neighborhoods, and the Lab campus's southwestern corner is adjacent to academic and recreational uses within UC Berkeley Hill Campus West. Because all new development would occur within the area designated by the proposed 2025 LRDP as developable area, and because most new construction (and all existing buildings renovation) would occur on infill sites and locations adjacent to existing buildings, projects under the proposed 2025 LRDP would not physically divide an established community, and there would be no impact.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario remains an appropriate and conservative basis for the evaluation of impacts related to land use and planning. For the reasons stated above for the proposed 2025 LRDP, development consistent with that portrayed in the Illustrative Development Scenario would also not physically divide an established community, and there would be no impact.

LRDP Impact LU-2: Implementation of the LBNL 2025 LRDP would not cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect. (*Less than Significant*)

Berkeley Lab's campus grounds are owned by the UC Regents and building parcels on the Berkeley Lab campus are leased by the University to the DOE for all major DOE-constructed buildings. While the DOE owns most of the facilities and structures within the campus, Lab management and operations are provided by the University under a DOE/UC contract. As such, Berkeley Lab is considered a UC campus. UC LBNL is generally not subject to local policies, plans, or regulations. UC and the DOE are the only agencies with jurisdiction over development projects at the Lab. The proposed 2025 LRDP has been designed to minimize environmental impacts of future development on the campus as well as not conflict with any of the Lab's existing plans and policies that are designed to avoid environmental impacts, including but not limited to, Berkeley Lab's *Net Zero Vision and Roadmap* and the UC *Policy on Sustainable Practices* Thus, the potential land use impact resulting from campus development under the proposed 2025 LRDP from conflicts with applicable land use plans, policies, or regulations of an agency with jurisdiction over the project is considered less than significant.

The proposed 2025 LRDP would be consistent with the institutional land use designations for the campus in the Berkeley General Plan and Oakland General Plan even though such plans are not applicable to Berkeley Lab and are thereby not considered in the determination of CEQA impact significance. Although the future distribution of specific research-related uses could change with implementation of the proposed 2025 LRDP, the types of land use at Berkeley Lab would not, and UC LBNL would continue to operate as a scientific research institution. The proposed 2025 LRDP sets forth campus land uses that would also be similar to existing land uses in terms of building height, massing, and location within existing developed campus areas, and in terms of setback from the Lab boundary. Given these factors, implementation of the 2025 LRDP would not result in change with respect to compatibility with adjacent uses, either in Berkeley or Oakland.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario remains an appropriate and conservative basis for the evaluation of impacts related to land use and planning. For the reasons stated above with respect to the proposed 2025 LRDP, development consistent with that portrayed in the Illustrative Development Scenario would also not cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect, and the impact would be less than significant.

Cumulative Impacts

LRDP Impact CUM-LU-1: Campus development under the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, would not physically divide an established community or cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect. (*Less than Significant*)

The geographic context for this cumulative analysis includes the Berkeley Lab campus and areas proximate to the campus within the cities of Berkeley and Oakland. Proposed 2025 LRDP implementation combined with cumulative growth would not physically divide an established community. The campus is surrounded by other UC-related uses, including open space, and residential neighborhoods to the west that are largely built out. Growth at UC Berkeley pursuant to its approved 2021 LRDP Update would contribute to cumulative development in Berkeley and the vicinity. However, neither UC LBNL nor UC Berkeley would grow or expand in such a way that would alter the fundamental nature of the institutions or their relationship with surrounding communities; therefore, there would be no cumulative impact.

As discussed in LRDP Impact LU-2 above, Berkeley Lab is both a UC campus and a federal facility, and UC LBNL is therefore generally not subject to local policies, plans, or regulations.

Campus development under the proposed 2025 LRDP would not conflict with Lab and UC plans and policies that are designed to avoid and/or reduce environmental impacts. Further, the proposed 2025 LRDP would be consistent with the institutional land use designations for the campus in the Berkeley General Plan and Oakland General Plan. Off-site cumulative projects would be subject to separate environmental review and would be subject to municipal general plans, zoning regulations, and design review, and in the case of UC Berkeley projects, subject to UC policies and plans, thus ensuring consistency of such projects with respective applicable plans and regulations. Therefore, proposed 2025 LRDP implementation, together with the cumulative projects, would not cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect, and the cumulative impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the 2025 LRDP, and thus the Illustrative Development Scenario remains an appropriate and conservative basis for the evaluation of impacts related to land use and planning. For the reasons stated above with respect to the proposed 2025 LRDP, development consistent with that portrayed in the Illustrative Development Scenario, in combination with past, present, and reasonably foreseeable future projects, would not physically divide an established community or cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect. The cumulative impact would be less than significant.

4.11 Noise and Vibration

4.11.1 Introduction

This section describes and evaluates the potential for implementation of the proposed 2025 LRDP (the Project) to result in significant noise and vibration impacts. This section discusses the existing noise environment at and around the Berkeley Lab campus; includes a summary of University plans and policies and of federal, State, and local laws and regulations related to noise and vibration; identifies criteria used to determine impact significance; analyzes the potential for the Project to affect the existing noise and vibration environment during construction and operation; and identifies feasible mitigation measures that could mitigate potentially significant impacts. The analysis in this section is based on a review of existing applicable plans for Berkeley Lab, a noise monitoring survey conducted by ESA, and a review of the City of Berkeley general plan and regulations related to community noise. Although approximately half of the campus is located in the City of Oakland, there are no noise sensitive receptors located in the City of Oakland that are in the Lab campus vicinity. Therefore, City of Oakland general plan and regulations related to community noise are not presented herein.

Please also refer to Section 4.3, *Biological Resources*, for a discussion of potential noise impacts associated with implementation of the proposed LRDP on biological resources.

4.11.2 Environmental Setting

Noise Background

Sound is characterized by various parameters that describe the rate of oscillation (frequency) of sound waves, the distance between successive troughs or crests in the wave, the speed that the sound wave travels, and the pressure level or energy content of a given sound. The sound pressure level has become the most common descriptor used to characterize the loudness of an ambient sound, and the decibel (dB) scale is used to quantify sound intensity. Because sound can vary in intensity by over one million times within the range of human hearing, a logarithmic loudness scale is used to keep sound intensity numbers at a convenient and manageable level. Since the human ear is not equally sensitive to all sound frequencies within the entire spectrum, human response is factored into sound descriptions in a process called "A-weighting," expressed as "dBA." The dBA, or A-weighted decibel, refers to a scale of noise measurement that approximates the range of sensitivity of the human ear to sounds of different frequencies. On this scale, the normal range of human hearing extends from about 0 dBA to about 140 dBA. An increase of 10 dBA in the level of a continuous noise represents a perceived doubling of loudness. The noise levels presented in this section are expressed in terms of dBA, unless otherwise indicated. **Table 4.11-1** shows some representative noise sources and their corresponding noise levels in dBA (Caltrans, 2013).

Planning for acceptable noise exposure must take into account the types of activities and corresponding noise sensitivity in a specified location for a generalized land use type. Some general guidelines are as follows: sleep disturbance can occur at noise levels above 35 dBA; interference with human speech begins at about 60 dBA (FICAN, 1992). Hearing damage can result from prolonged exposure to noise levels in excess of 85 to 90 dBA as an 8-hour time weighted average (NIOSH, 2018).

TABLE 4.11-1
TYPICAL SOUND LEVELS MEASURED IN THE ENVIRONMENT

Common Outdoor Activities	Decibels (dBA)	Common Indoor Activities
Jet Flyover at 1,000 feet	110	Rock Band
Gas Lawnmower at 3 feet	90-100	--
Diesel Truck at 50 feet at 50 mph	85	Food Blender at 3 feet
Near Freeway Auto Traffic	80	Garbage Disposal at 3 feet
Noisy Urban Area, Daytime	75	
Gas Lawnmower at 100 feet	70	Vacuum Cleaner at 10 feet
	65	Normal Speech at 3 feet
Commercial Area Heavy Traffic at 300 feet	60	
	55	Large Business Office
Quiet Urban Daytime	50	Dishwasher in next room
Quiet Urban Nighttime	40	Theater, Large Conference Room Background
	30	Library
Quiet Rural Nighttime	25	Bedroom at Night

SOURCE: Caltrans, 2013.

Attenuation of Noise

Noise from line sources, such as roadway traffic, attenuates (lessens) at a rate of 3.0 to 4.5 dBA per doubling of distance from the source, based on the inverse square law and the equation for cylindrical spreading of noise waves over hard and soft surfaces.

Noise from point sources, including stationary mobile sources such as idling vehicles or onsite construction equipment, attenuates at a rate of 6.0 to 7.5 dBA per doubling of distance from the source, based on the inverse square law and the equations for spherical spreading of noise waves over hard and soft surfaces. Based on these attenuation properties of noise, for the purposes of this impact analysis, it is assumed that noise from line and point sources to a distance of 200 feet attenuates at rates of between 3.0 and 6.0 dBA per doubling of distance, and the noise from line and point sources at a distance greater than 200 feet attenuates at a rate of 4.5 to 7.5 dBA per doubling of distance, to account for the absorption of noise waves due to ground surfaces such as soft dirt, grass, bushes, and intervening structures (Caltrans, 2009).

Noise Descriptors

An individual's noise exposure is a measure of noise over a period of time. A noise level is a measure of noise over a given period of time. Community noise varies continuously over a period of time with respect to the contributing sound sources of the community noise environment. Community noise is primarily the product of many distant noise sources, which constitute a relatively stable background noise exposure, with the individual contributors unidentifiable. The background noise level changes throughout a typical day, but does so gradually, corresponding with the addition and subtraction of distant noise sources such as traffic. What makes community noise variable throughout the day, besides the slowly changing background noise, is the addition of short-duration, single-event noise sources (e.g., aircraft flyovers, motor vehicles, sirens), which are readily identifiable to the individual. These successive additions of sound to the community noise environment change the community noise level from instant to instant, requiring the measurement of noise exposure over a period of time to legitimately characterize a community noise environment and evaluate cumulative noise effects. This time-varying characteristic of environmental noise is described using statistical noise descriptors. The most frequently used noise descriptors are summarized below:

L_{eq}: The L_{eq}, or equivalent sound level, is used to describe noise over a specified period of time in terms of a single numerical value; the L_{eq} of a time-varying signal and that of a steady signal are the same if they deliver the same acoustic energy over a given time. The L_{eq} may also be referred to as the average sound level.

L_{max}: The maximum, instantaneous noise level experienced during a given period of time.

L_{90}: The level of noise exceeded 90 percent of the time is sometimes conservatively considered as the background ambient noise level for the purposes of assessing conformity with noise ordinance standards with respect to noise from stationary equipment or entertainment venues.

L_{dn}: Also termed the day-night average noise level (DNL), the L_{dn} is the average A-weighted noise level during a 24-hour day, obtained after an addition of 10 dB to measured noise levels between the hours of 10:00 PM to 7:00 AM to account for greater nighttime noise sensitivity.

CNEL: CNEL, or Community Noise Equivalent Level, is the average A-weighted noise level during a 24-hour day that is obtained after an addition of 5 dB to measured noise levels between the hours of 7:00 PM to 10:00 PM and after an addition of 10 dB to noise levels between the hours of 10:00 PM to 7:00 AM to account for greater noise sensitivity in the evening and nighttime, respectively.

Health Effects of Environmental Noise

The World Health Organization (WHO) is an existing source of current knowledge regarding the health effects of noise impacts because European nations have continued to study noise and its health effects, while the United States Environmental Protection Agency (EPA) all but eliminated its noise investigation and control program in the 1970s. According to WHO, sleep disturbance can occur when continuous indoor noise levels exceed 30 dBA or when intermittent interior noise levels (such as from traffic) reach 45 dBA, particularly if background noise is low. With a bedroom window slightly open (a reduction from outside to inside of 15 dB), the WHO criteria suggest that exterior continuous (ambient) nighttime noise levels should be 45 dBA or below, and short-term events should not generate noise in excess of 60 dBA. WHO also notes that maintaining noise levels within the recommended levels during the first part of the night is believed to be effective for the ability of people to initially fall asleep (WHO, 1999).

Short-term noise levels constituting the thresholds of pain and hearing damage are 120 dB and 140 dB, respectively (Kinsler, 1982). Typical daytime construction noise levels in the absence of pile driving are substantially below these thresholds of pain and hearing damage. The Occupational Safety and Health Administration requires hearing conservation plans when noise levels continuously exceed 85 dBA over an 8-hour period. Consequently, noise generated by short-term construction activities do not result in adverse health effects related to pain, the onset of hearing loss, or other significant health effects.

Other potential health effects of high noise levels identified by WHO include decreased performance for complex cognitive tasks, such as reading, attention span, problem solving, and memorization; physiological effects such as hypertension and heart disease (after many years of constant exposure, often of workers, to high noise levels); and hearing impairment (again, generally after long-term occupational exposure, although shorter-term exposure to very high noise levels, for example, exposure several times a year to concert noise at 100 dBA, can also damage hearing). Finally, noise can cause annoyance and can trigger emotional reactions like anger, depression, and anxiety. WHO reports that, during daytime hours, few people are seriously annoyed by activities with noise levels below 55 dBA or moderately annoyed with noise levels below 50 dBA.

Vehicle traffic and continuous sources of machinery and mechanical noise contribute to ambient noise levels. Short-term noise sources, such as truck backup beepers, the crashing of material being loaded or unloaded, and car doors slamming contribute very little to 24-hour noise levels but are capable of causing sleep disturbance and annoyance. The importance of noise to receptors depends on both time and context. For example, long-term high noise levels from large traffic volumes can make conversation at a normal voice level difficult or impossible, while short-term peak noise levels, if they occur at night, can disturb sleep.

Vibration Descriptors

Vibration is an oscillatory motion through a solid medium in which the motion's amplitude can be described in terms of displacement, velocity, or acceleration. Several different methods are used to quantify vibration. The peak particle velocity (PPV) is defined as the maximum instantaneous peak of the vibration signal. The PPV is most frequently used to describe physical vibration impacts on buildings and structures. Another useful vibration descriptor is known as vibration decibel or VdB. VdBs are generally used when evaluating human response to vibration, as opposed to damage to structures (for which PPV is the more commonly used descriptor). Vibration decibels are established relative to a reference quantity, typically 1×10^{-6} inches per second and are based on the root mean square velocity amplitude (FTA, 2018).

Typically, groundborne vibration generated by human activities attenuates rapidly with distance from the source of the vibration. Sensitive receptors to vibration include people (especially residents, the elderly, and sick people), structures (especially older masonry structures), and vibration-sensitive equipment.

The background vibration velocity levels in residential areas are typically 50 VdB or lower, and the threshold of perception for humans is approximately 65 VdB. A vibration level of 85 VdB in a residence can result in strong annoyance (FTA, 2018).

Existing Noise and Vibration Environment

Long-term environmental noise in urbanized areas is primarily influenced by vehicle traffic volumes and the mix of vehicle types. The existing ambient noise environment surrounding the Berkeley Lab campus is dominated by vehicular traffic on adjacent public streets–including Hearst Avenue, Cyclotron Road, and Centennial Drive–and on neighborhood roadways and surface parking. The existing ambient noise environment within the campus is dominated by vehicular traffic, particularly shuttle buses, on internal streets, including McMillan Road and

Lawrence Road; surface parking; loading areas; building heating, ventilation and air conditioning (HVAC) equipment; and machine shop and utility plant operations.

Aside from the ambient noise sources discussed above, as described in more detail in Section 4.11.4, UC LBNL and UC Berkeley conduct regular vegetation management program (VMP) activities within the Lab campus and adjacent UC Berkeley Hill Campus, respectively, to remove high hazard vegetative fuels and reduce wildfire risk. These vegetation management activities involve a range of tools and equipment that generate noise while in use.

Ambient Noise Measurements

Ambient long-term (24-hour) and short-term (15-minute) noise measurement data were collected on June 12 through June 14, 2024 to characterize noise conditions at the Berkeley Lab campus and its environs. Noise measurement locations are shown in **Figure 4.11-1**, and noise results for the long-term and short-term monitoring locations are summarized in **Table 4.11-2** and **Table 4.11-3**, respectively.

TABLE 4.11-2
LONG-TERM AMBIENT NOISE LEVELS IN THE BERKELEY LAB CAMPUS VICINITY

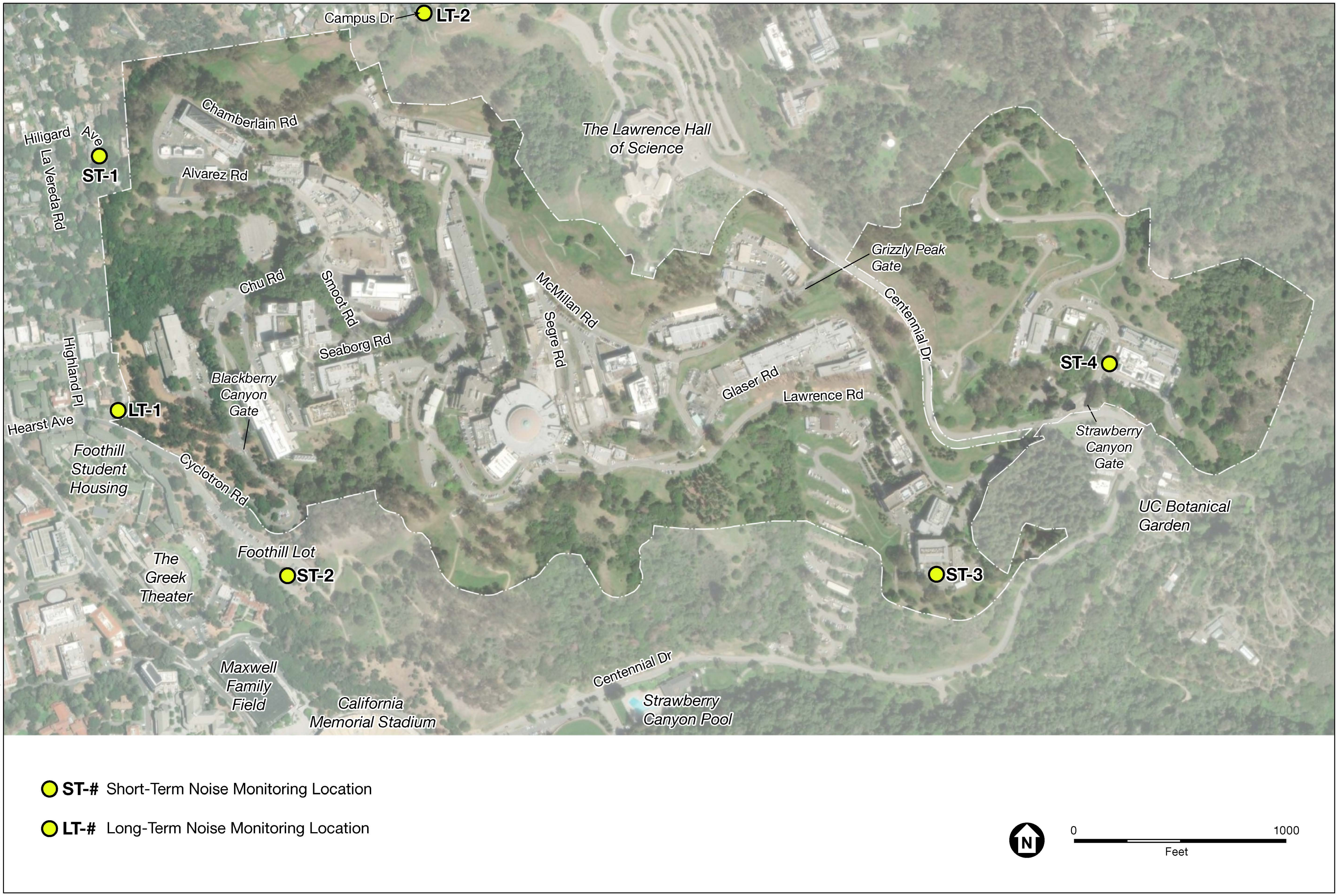
Measurement Location		Community Noise Exposure Level (CNEL)	Noise Levels in dBA	
			Daytime hourly average, L_{eq}	Nighttime hourly average, L_{eq}
LT-1	At Hearst Avenue / Highland Place adjacent to UC Berkeley Foothill Student Housing complex, west of Berkeley Lab campus	71	69	63
LT-2	Terminus of Campus Drive, north of Berkeley Lab campus	44	41	37

NOTE: See Figure 4.11-1 for noise measurement locations.
SOURCE: ESA, June 2024 (see Appendix NOI).

TABLE 4.11-3
SHORT-TERM AMBIENT NOISE LEVELS ON AND IN THE BERKELEY LAB CAMPUS VICINITY

Measurement Location		Time	Noise Levels in dBA	
			Hourly L_{eq}	L_{max}
ST-1	Terminus of Hilgard Avenue, west of Berkeley Lab campus boundary	11:01 AM	44.7	53.2
ST-2	UC Berkeley Foothill Parking Lot near Bowles Hall Residential College	10:30 AM	49.8	57.8
ST-3	Berkeley Lab campus south of Building 62	11:24 AM	52.2	68.2
ST-4	Berkeley Lab campus west of Building 74	10:57 AM	57.9	77.5

NOTE: See Figure 4.11-1 for noise measurement locations. L_{eq} represents the constant sound level; L_{max} is the maximum noise level. Noise levels at ST-1 and ST-2 were measured on June 12, 2024; noise levels at ST-3 and ST-4 were measured on June 14, 2024.
SOURCE: ESA, June 2024 (see Appendix NOI).



2019/D201901556.00 - LBNL LRDP EIR/05 Graphics-GIS-Modeling/Illustrator

SOURCE: ESA, 2024

LBNL LRDP EIR

Figure 4.11-1
Noise Monitoring Locations

ESA

Long-term monitoring location LT-1 is at the intersection of Hearst Avenue/Highland Place, adjacent to the UC Berkeley Foothill Student Housing complex. The noise environment at this location is affected by vehicle traffic on Hearst Avenue and, to a lesser extent, by vehicles on Highland Place. Long-term monitoring location LT-2 is at the terminus of Campus Drive, north of the Berkeley Lab campus. The noise environment at this location is relatively quiet and is dominated by bird vocalization. Noise levels at the LT-1 and LT-2 monitoring locations were 71 and 44 dBA, CNEL, respectively.

As illustrated in Figure 4.11-1, short-term monitoring location ST-1 is at the terminus of Hilgard Avenue, just west of the Berkeley Lab campus boundary; and ST-2 is in the UC Berkeley Foothill Parking lot near the Bowles Hall Residential College. Two on-campus locations were monitored: ST-3 located south of Building 62; and ST-4 west of Building 74.

Sensitive Receptors

Sensitive noise receptors are generally considered to include nursing homes, senior citizen centers, hospitals with overnight accommodations, schools, churches, libraries, childcare facilities, and residences. Land uses in the campus vicinity are described in detail in Section 4.10, *Land Use and Planning*.

Sensitive land uses surrounding Berkeley Lab include residences, day care facilities, open space areas, and student dormitories. The Berkeley Lab campus is bordered by residential areas within the City of Berkeley along its western and northern boundary. Nyingma Institute, a Buddhist center of learning and retreat, is located on Highland Place west of Berkeley Lab. Residential dormitories include the Foothill and Stern Residence Halls at 2700 Hearst Avenue west of the campus. The Orange House Family Child Care facility on LeRoy Avenue is also within one-quarter mile west of the campus boundary. No elementary, middle, or high schools are located within one-quarter mile of Berkeley Lab.

As discussed previously, there are no sensitive receptors located in the City of Oakland that are in the Lab campus vicinity. The nearest noise receptors in Oakland are residences approximately 1,500 feet south of the Berkeley Lab campus boundary. At this distance, neither construction nor operational noise generated on the Berkeley Lab campus would have the potential to substantially increase ambient noise levels such that a significant noise impact could occur.

There are several vibration-sensitive laboratories and scientific instruments at the Berkeley Lab campus. Potential vibration effects on these laboratories and instruments are managed through internal communication and project coordination and are, thus, not a subject in this EIR. This coordination would continue under the proposed 2025 LRDP.

4.11.3 Regulatory Framework

Federal

Federal Aviation Administration

The Federal Aviation Administration (FAA) develops noise exposure maps that use average annual CNEL noise contours around airports for land use compatibility as this is the primary noise descriptor for aviation-generated noise. The FAA states that all land uses are considered compatible when aircraft noise levels are less than 65 decibels (dB) CNEL. Oakland International Airport and San Francisco International Airport are located approximately 9 and 18 miles from Berkeley Lab, respectively. Berkeley Lab is outside the 55 dB CNEL noise contour of both airports (ACCDA, 2010; SFO, 2018).

State

State regulations include requirements for the construction of new hotels, motels, apartment houses, and dwellings other than detached single-family dwellings that are intended to limit the extent of noise transmitted into habitable spaces. These requirements are collectively known as the California Noise Insulation Standards and are found in Title 24 of the California Code of Regulations (CCR).

The 2016 California Building Code (CBC) included the most recent update to the sound transmission standards which (CBC, Title 24, Part 2 of the CCR) requires that walls and floor/ceiling assemblies separating dwelling units from each other, or from public or service areas, have a Sound Transmission Class (STC) of at least 50, meaning they can reduce noise by a minimum of 50 dB.[1] The CBC (Section 1207.4, Allowable Interior Noise Levels) also specifies a maximum interior noise limit of 45 dBA (Ldn or CNEL) in habitable rooms, and requires that common interior walls and floor/ceiling assemblies meet a minimum STC rating of 50 for airborne noise.

Local

As discussed in Chapter 1, *Introduction*, the University of California is constitutionally exempt from local governments' regulations, such as city and county general plans, land use policies, and zoning regulations, whenever using property under its control in furtherance of its educational purposes. As such, UC LBNL will not consider local policies and regulations in its evaluation of the environmental effects of the proposed Project unless UC LBNL expressly decides to use a local policy or regulation as a threshold or standard of significance. The western part of the Berkeley Lab campus is within the Berkeley city limits and the eastern part is within the Oakland city limits. As discussed above, there are off-site sensitive receptors located in the City of Berkeley that are in the Lab campus vicinity, and none that are in the City of Oakland. For the purposes of impact analysis, UC LBNL uses pertinent City of Berkeley noise standards. The City's noise standards are therefore described below.

1 State Building Code Section 1207.2.

City of Berkeley

Berkeley General Plan

The Berkeley General Plan Environmental Management Element contains guidelines for determining the compatibility of various land uses with different noise environments. Generally, the noise level for residential, hotel and motel uses is 60 dBA or less, while conditionally acceptable noise levels range from over 60 dBA to 75 dBA (may require insulation, etc.). Noise levels over 75 dBA are, in general, unacceptable.

Berkeley General Plan policies pertaining to noise include the following:

> **Environmental Management Objective 8:** Protect the community from excessive noise levels.
>
> > ***Policy EM-43: Noise Reduction.*** Reduce significant noise levels and minimize new sources of noise.
> >
> > ***Policy EM-44: Noise Prevention and Elimination.*** Protect public health and welfare by eliminating existing noise problems where feasible and by preventing significant future degradation of the acoustic environment.
> >
> > ***Policy EM-45: Traffic Noise.*** Work with local and regional agencies to reduce local and regional traffic, which is the single largest source of unacceptable noise in the city.
> >
> > ***Policy EM-46: Noise Mitigation.*** Require operational limitations and all feasible noise buffering for new uses that generate significant noise impacts near residential, institutional, or recreational uses.
> >
> > ***Policy EM-47: Land Use Compatibility.*** Ensure that noise-sensitive uses, including, but not limited to, residences, child-care centers, hospitals and nursing homes, are protected from detrimental noise levels.

Berkeley Community Noise Ordinance

The City of Berkeley Community Noise Ordinance (Chapter 13.40 of the Municipal Code) sets limits for permissible exterior noise levels during the day and night according to the zoning of the area. If ambient noise exceeds the standard, the ambient noise level becomes the allowable noise level. City of Berkeley areas adjacent to the northwest portion of Berkeley Lab are zoned R-1H,[2] and adjacent to the west of the Lab are zoned R-1H and R-3H. **Table 4.11-4** presents the City of Berkeley Community Noise Ordinance maximum allowable receiving noise standards for designated land uses.

For construction/demolition noise, with certain exceptions, the Community Noise Ordinance (Sec. 13.40.070[B][7] of the Municipal Code) prohibits operating tools and equipment used in these activities between 7:00 PM and 7:00 AM on weekdays and 8:00 PM and 9:00 AM on weekends or holidays such that the sound source generates noise in excess of the interior or exterior noise standards across a residential or commercial real property line. With respect to construction activities during daytime hours, the Community Noise Ordinance states that, "where technically and economically feasible," maximum weekday construction noise levels must be controlled so as not

2 "H" is a Hillside overlay district.

to exceed 75 dBA at the nearest properties for mobile equipment (“nonscheduled, intermittent, short-term operation [less than 10 days]”) and 60 dBA at the nearest properties for stationary equipment (“repetitively scheduled and relatively long-term operation [periods of 10 days or more]”), in R-1 and R-2 zoning districts; in the R-3 district and above, the permitted noise levels are 5 dBA higher. The noise standards are more restrictive on weekends, by 10 dBA for stationary equipment and 15 dBA for mobile equipment.

TABLE 4.11-4
CITY OF BERKELEY COMMUNITY NOISE ORDINANCE EXTERIOR NOISE LIMITS

Zoning District	Time Period	Noise Level (dBA)[a]
R-1, R-2, R-1A, R-2A, and ES-R	7:00 AM – 10:00 PM 10:00 PM – 7:00 AM	55 45
R-3 and above	7:00 AM – 10:00 PM 10:00 PM – 7:00 AM	60 55
Commercial	7:00 AM – 10:00 PM 10:00 PM – 7:00 AM	65 60
Industry	Anytime	70

NOTES:
R-1 = Single Family Residential; R-1A = Limited Two-Family Residential; R-2 = Restricted Two-Family Residential District; R-2A = Restricted Multiple Family Residential; R-5 = High-Density Residential District; ES-R = Environmental Safety -Residential District

a. Noise level not to be exceeded by more than thirty minutes any hour.

SOURCE: Berkeley Community Noise Ordinance No. 7122-NS, *Table 13.40-1 Exterior Noise Limits*, 2009.

4.11.4 Impacts and Mitigation Measures

Significance Criteria

For purposes of this EIR, impacts to noise and vibration would be considered significant if they would exceed the Standards of Significance presented below, which are based on Appendix G of the *CEQA Guidelines*.

Would LBNL 2025 LRDP implementation result in:

a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies;

b) Generation of excessive groundborne vibration or groundborne noise levels; or

c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels.

Criteria Not Analyzed

Based on the campus location, there would no impact related to the following topic for the reasons described below:

- ***For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use***

airport, would the project expose people residing or working in the project area to excessive noise levels. The proposed 2025 LRDP would not include the development of land uses near a private airstrip or a public airport as no airstrip or airport is within 2 miles of the Berkeley Lab campus. As discussed in Section 4.11.2, *Environmental Setting*, Oakland International Airport is approximately 9 miles south from the Berkeley Lab campus, and the Lab is outside the 55 dB CNEL noise contour of this airport. Consequently, the proposed 2025 LRDP would not expose people residing or working in the project area to excessive noise levels associated with this airport. No impact would occur, and this impact is not discussed further in this EIR.

Approach to Analysis

Although the State of California has provided land use noise compatibility guidance that municipalities and entities, such as UC, may use to guide land development so that the public is not exposed to excessive noise levels, there are no State or UC noise standards that can be used to evaluate the significance of estimated noise increases due to the proposed Project. Since the nearest off-site noise-sensitive receptors near Berkeley Lab are located in the City of Berkeley, UC LBNL has elected to use pertinent City of Berkeley noise standards to evaluate the significance of construction and operational noise increases due to the proposed Project. In instances where noise standards/thresholds are available from other federal or state entities (such as vibration thresholds from FTA and Caltrans), UC LBNL has elected to use those to evaluate those impacts.

Construction Noise and Vibration Impact Assessment

Construction Noise

The impact of Project construction noise is assessed relative to the restrictions established by Section 13.40.070 Berkeley Municipal Code. The Berkeley Municipal Code requires that construction noise not exceed 75 dBA for mobile equipment and 60 dBA for stationary equipment at the nearest receiving property line. To assess consistency with the City of Berkeley code requirements as a result of Project-related construction noise levels, modeled noise levels using Federal Transit Administration (FTA) methodology and published reference noise levels for standard construction equipment were compared to the code requirements to determine whether Project construction would generate projected noise levels in excess of these City standards.

The FTA methodology for general assessment of construction noise entails a process for calculating the hourly dBA L_{eq} for each stage of construction considering (1) the reference noise emission level at 50 feet for equipment to be used for each stage of construction, (2) the usage factor for each piece of equipment, and (3) the distance between construction centerline and receptors. This methodology entails estimating the resultant noise levels for the two noisiest pieces of equipment expected to be used in each stage of construction. For this programmatic analysis of the construction of facilities under the proposed 2025 LRDP, distances between potential construction areas and receptors are assumed based on the existing campus building envelopes and the nearest off-campus receptors.

The FTA does not publish a software noise model; as such, the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM) was used. The RCNM is used as the FHWA's national standard for predicting construction noise. The RCNM analysis includes the calculation of noise levels (L_{max} and L_{eq}) at incremental distances for a variety of construction equipment. The model inputs include acoustical use factors, L_{eq} values at various distances depending on the receptor location analyzed. Construction noise levels were calculated for standard construction phases (ESA, 2024; see **Appendix NOI**).

A California Supreme Court decision suggests that additional consideration be given to the resultant increase over ambient conditions. Specifically, in *King and Gardiner Farms LLC. v. County of Kern* (2020) 45 Cal.App.5th 814, 893, the California Supreme Court determined that the use of an absolute noise level as the exclusive threshold of significance violated CEQA. To determine noise impact significance, Kern County had relied solely on EIR projections showing whether the project would exceed the County General Plan's 65-decibels noise threshold. Based on prior case law, the Court concluded that the magnitude of the noise increase must also be addressed as part of impact significance determination. The Court found that the EIR had neither assessed the magnitude of change nor provided an explanation, supported by substantial evidence, as to why such magnitude-of-change analysis wasn't needed. Therefore, in addition to the assessment of construction noise relative to Section 13.40.070 of the Berkeley Municipal Code, this analysis assesses potential magnitude of noise changes: an increase of 10 dBA or more over existing noise levels at sensitive receptor locations is applied as a criterion for a significant construction noise impact. The 10 dBA threshold was selected, because such an increase is a perceived doubling of loudness (Caltrans, 2013).

Construction Vibration

The study area for construction vibration impacts encompasses the construction site and the nearest potentially affected sensitive receptors. Vibration levels are predicted at various distances for equipment reasonably expected to be involved with Project demolition and construction activities. Impacts to receptors are assessed based on methodology and criteria put forth by the California Department of Transportation (Caltrans) and FTA. Construction vibration impacts are analyzed in terms of the potential of Project-related vibrations to result in damage to nearby structures or buildings, based on thresholds put forth by Caltrans (Caltrans, 2020). The Caltrans thresholds for potential architectural damage due to groundborne vibrations are 0.5 in/sec PPV for new residential structures and modern commercial buildings and 0.25 in/sec PPV for historic and older buildings. With respect to human annoyance, Caltrans considers vibrations of 0.04 in/sec PPV to be strongly perceptible; this is the threshold applied for vibration impacts during sensitive nighttime hours when people are likely to be sleeping. The threshold for vibration-sensitive equipment is 65 VdB, as published by FTA (FTA, 2018).

Operational Noise Impact Assessment

Operational Stationary Source Noise

Operational stationary sources include mechanical equipment such as HVAC equipment and emergency backup generators. A specific inventory of future stationary equipment that might be installed under the proposed 2025 LRDP is not currently knowable. Consequently, this analysis considers documented reference noise levels of potential stationary noise sources associated with Berkeley Lab campus operations, such as mechanical equipment, outdoor maintenance areas, truck loading docks and delivery activities, and parking facilities. The analysis identifies existing code requirements that would serve to limit noise from these sources, and UC LBNL's intent to meet code requirements to the degree feasible. The City of Berkeley's operational noise standards are applied to the impact analysis as significance criteria. The City's Community Noise Ordinance maximum allowable receiving noise standards are presented in Table 4.11-4.

Operational Traffic Noise

Traffic noise modeling to analyze the noise effects of the traffic generated by campus growth and development under the proposed 2025 LRDP was completed using algorithms based on the FHWA Traffic Noise Model (Appendix NOI). Traffic noise impact significance was determined by comparing the increase in noise levels (traffic contribution only) to increments recognized by UC LBNL as representing a substantial permanent noise-level increase. Generally, a 5 dBA increase is considered to be a clearly perceptible increase (Caltrans, 2013) and is applied as significance threshold where existing noise levels meet land use compatibility criteria. However, in noise environments that are already noise impacted (existing noise levels exceed land use compatibility criteria) a more stringent criterion is appropriate. In these circumstances where non-Project-related noise levels already exceed relevant City of Berkeley Community Noise Ordinance standards presented in Table 4.11-4, a significant incremental noise increase is determined by UC LBNL to be 3 dBA or more. A 3 dBA or greater increase would be considered a substantial permanent increase with respect to traffic noise.

Impact Analysis

LRDP Impact NOI-1: Construction activities under the LBNL 2025 LRDP would generate a substantial temporary increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance applied as the relevant threshold of significance, or applicable standards of other agencies. (*Significant; Significant and Unavoidable with Mitigation*)

Construction Noise

Construction activities associated with projects developed under the proposed 2025 LRDP would include demolition and site preparation, grading, building construction, paving, and architectural coating. Equipment involved with campus grading and building construction at the campus would include graders, dozers, cranes, forklifts, generators, welders, tractors, loaders, backhoes, and trucks for delivering materials and for off-hauling soil and demolition debris. No pile driving or blasting activities are anticipated during construction of projects under the proposed 2025 LRDP. Alternate methods of drilled piers are appropriate for most Berkeley Lab locations, and pile driving is not considered likely for projects under the proposed 2025 LRDP.

Daytime Construction Noise

Table 4.11-5 shows typical noise levels produced at a reference distance of 50 feet by various types of construction equipment likely to be involved in the construction of projects under the proposed 2025 LRDP. Noise levels at and near campus construction sites would fluctuate depending on the particular type, number, and use duration of construction equipment used at any given time. As shown in Table 4.11-5, the estimated noise levels generated by typical equipment that would be used for Project-related construction could exceed the standards established in the City of Berkeley Community Noise Ordinance (Section 13.40.070) which restricts stationary construction equipment to 60 dBA during daytime hours at the nearest residential property line; and mobile construction equipment to 75 dBA at single-family residential uses. All off-campus sensitive receptors within 900 feet[3] of the Lab boundary are located in the City of Berkeley, thus Berkeley's construction noise standards are applicable to this analysis.

TABLE 4.11-5
TYPICAL NOISE LEVELS FROM CONSTRUCTION EQUIPMENT

Construction Equipment	Noise Level (dBA, Lmax at 50 Feet)
Air Compressor	78
Backhoe	78
Crane	81
Concrete Saw	90
Dozer	82
Drill Rig	84
Generator	81
Grader	85
Gradall (Forklift)	83
Loader	79
Paver	77
Paving Equipment	77
Roller	85
Scraper	80
Tractor	84
Welder	74
Concrete Truck	79
Flat Bed truck	74

SOURCE: FHWA, 2006.

In addition to estimating the noise increases from operating individual pieces of equipment as reported in the table below, consistent with the *General Assessment methodology* of the FTA, the total increase in noise from the concurrent/overlapping operation of the two noisiest pieces of equipment was calculated for major construction phases of future projects under the proposed 2025 LRDP. The FHWA RCNM was used to estimate noise levels for each stage of construction based on the equipment list provided by air quality modeling default assumptions. Distances-to-receptors input into the model include lateral distances, but conservatively the model does not consider any shielding attenuation from intervening topography, vegetation, and buildings.

Given the proposed 2025 LRDP's programmatic nature, specific locations of building demolition and construction that would occur at specific times under the LRDP are not presently known. However, the centers of existing building clusters within the developed areas of the Berkeley Lab campus are located as close as 300 feet to the nearest off-site receptors to the west. This distance along with the noise setting conditions were used to estimate noise levels that might be generated by demolition and construction of a worst-case proxy project under the proposed 2025 LDRP.

3 This distance accounts for typical construction noise levels, which attenuate to approximately 55 dBA at a distance of 900 feet if there is a direct line-of-sight between a noise source and a noise-sensitive receptor (i.e., based on assumed two pieces of equipment generating 85 dBA would attenuate to 55 dBA over a distance of 900 feet).

Consistent with the general assessment methodology of the FTA, the two noisiest pieces of construction equipment listed in Table 4.11-5 were assumed to operate simultaneously. Using the RCNM, the resultant noise level at the nearest receptor during construction or demolition activities could be as high as 68 dBA.

While noise levels from the construction and demolition activities under the proposed 2025 LRDP at the closest receptors would not exceed the City of Berkeley's 75 dBA daytime construction noise standard applicable to mobile equipment, at times when certain construction equipment is in use, the resultant noise levels at the nearest residential property line could exceed existing noise levels by more than 10 dBA (The existing noise level at residences adjacent to the western campus boundary is 44.7 dBA as presented in Table 4.11-3 whereas the noise level from nearby campus construction activities could be up to 68 dBA). Additionally, noise from stationary construction equipment, such as a generator, could exceed the 60 dBA daytime construction noise standard for stationary equipment. Further, future projects undertaken in specific locations near the Lab fence line, if construction activities were determined to be "repetitively scheduled and relatively long-term operations" of 10 days or more of stationary equipment, such activities could exceed the Berkeley Community Noise Ordinance. Therefore, the impact would be significant. To address the potential for significant demolition and construction noise impacts, LRDP Mitigation Measures NOI-1a and NOI-1b are identified.

Nighttime Construction Noise

Section 13.40.070(B)(7) of the City of Berkeley Community Noise Ordinance prohibits nighttime construction (i.e., between 7 00 PM and 7:00 AM) that would exceed the City's exterior or interior noise limits. For low- density residential properties, the exterior noise standard is 45 dBA during nighttime hours, unless a special permit or variance has been granted by the noise control officer or other authorized agent designated by the City Manager.

Although most construction work for future development under the proposed 2025 LRDP would be conducted during daytime hours, nighttime or non-business hour work could potentially occur in some rare and limited circumstances, such as during utility installations, road work, or continuous concrete slab pours. This can be necessary, for example, when certain construction activities require short-term road closures, electrical service disruption, or other unusual circumstances that might pose safety hazards or disruption to normal workday research and operations. Such activities can include transport of especially large pieces of equipment or material, continuous concrete slab pours that can exceed the duration of work hours, certain crane operations or felling of large trees near heavily populated campus areas, or use of heavy excavation or demolition equipment adjacent to buildings with vibration-sensitive research.

Any nighttime construction would be intermittent, temporary, and short-term. However, because of the proximity of existing off-site receptors west of the campus, noise levels from nighttime construction could exceed City of Berkeley allowable exterior and interior nighttime noise levels, which are 45 dBA and 40 dBA, respectively. Because of the noise reduction offered by standard building construction (typically about 15 dB with windows open), the more stringent of these nighttime standards is the 45 dBA exterior standard. Given that existing building clusters within the Berkeley Lab campus developed areas are located as close as 300 feet to the nearest off-site receptors to the west, nighttime work from concrete pours would produce a noise level of 81 dBA at 50 feet which could result in a noise level of 65 dBA at the nearest receptors. Therefore, for 2025 LRDP-related nighttime work performed in the vicinity of off-site residences, exterior noise levels at sensitive receptors could exceed 45 dBA on a temporary basis. Depending on intensity of construction noise levels, frequency of potential sleep disturbance, and duration, noise from temporary or periodic nighttime construction activities associated with Project-related future development could be potentially significant.

LRDP Mitigation Measure NOI-1a: Construction Noise Control Measures.

To reduce daytime noise impacts due to construction/demolition activities under the proposed 2025 LRDP, UC LBNL shall require construction/demolition contractors to implement noise reduction measures designed specifically to address the project being undertaken. Measures to be implemented shall include, but not be limited to, the following:

- Construction/demolition activities shall be limited, to the maximum extent feasible, to a schedule that minimizes disruption to uses surrounding the project site. Accordingly, such activities would be limited to the hours designated in the Berkeley Community Noise Ordinance, as applicable to the location of the project (e.g., when in the vicinity of city of Berkeley noise-sensitive receptors). This would eliminate or substantially reduce noise impacts that might otherwise occur during nighttime hours and on days when construction noise might be more disturbing.
- To the maximum extent feasible, equipment and trucks used for project construction shall utilize the best available noise control techniques (e.g., improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures, and acoustically-attenuating shields or shrouds).
- Stationary noise sources shall be located as far from off-site sensitive receptors as possible.
- At locations where noise may affect neighboring residential uses (e.g., within 500 feet), UC LBNL will develop a comprehensive construction noise control specification to implement construction/demolition noise controls, such as noise attenuation barriers, siting of construction laydown and vehicle staging areas, and community outreach, as appropriate to specific projects. The specification will include such information as general provisions, definitions, submittal requirements, construction limitations, requirements for noise and vibration monitoring and control plans, and noise control materials and methods. This document will be modified as appropriate for a particular construction project and included within the construction specification.
- At the discretion of UC LBNL environmental planners and community relations officials, and prior to the start of excavation, UC LBNL shall conduct outreach–including but not limited to written notification–to all potentially impacted neighbors within 500 feet of the construction site. Notification shall indicate the estimated duration and completion date of the construction, construction hours, and necessary contact information for potential complaints about construction noise (i.e., name, telephone number, and address of UC LBNL's chief community relations official). The notice shall indicate that noise complaints resulting from construction can be directed to the contact person identified in the notice.

LRDP Mitigation Measure NOI-1b: Construction Noise Control Measures for Large/Long term Projects.

For particularly large, long-term, or unusually noisy construction and demolition projects—such as the multi-year project like the Bevatron, or construction of large, multi-story research/office buildings—or projects expected to involve substantial nighttime work, and where such projects might occur within the vicinity of off-site noise-sensitive receptors, UC LBNL subject matter experts shall assess whether additional noise measures should be considered. In such cases, UC LBNL shall engage a qualified noise consultant to determine whether, based on the location of the site and the activities proposed, construction/demolition noise levels could approach the property-line receiving noise standards of the City of Berkeley (as applicable). If the consultant determines that the standards will not be exceeded, no further mitigation is required.

If the standards would be reached or exceeded absent further mitigation, one or more of the following additional measures shall be required, as determined necessary by the noise consultant.

- Stationary noise sources shall be muffled and enclosed within temporary sheds, shall incorporate insulation barriers, or shall employ other measures to the extent feasible.
- Impact tools (e.g., jack hammers, pavement breakers, and rock drills) used for project construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. However, where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used; this muffler can lower noise levels from the exhaust by up to about 10 dBA. External jackets on the tools themselves shall be used where feasible, and this could achieve a reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment, whenever feasible.
- Noise from idling trucks shall be kept to a minimum. To the maximum extent feasible, no trucks shall be permitted to idle for more than 10 minutes if waiting within 100 feet of a residential area.
- If determined necessary by the noise consultant, a set of site-specific noise attenuation measures shall be developed before construction begins. Possible measures might include erection of temporary noise barriers around the construction site, use of noise control blankets on structures being erected to reduce noise emission, and monitoring the effectiveness of noise attenuation measures by taking noise measurements.
- If determined necessary by the noise consultant, at least two weeks prior to the start of excavation, UC LBNL shall conduct outreach–including but not limited to written notification–to all potentially impacted neighbors within 500 feet of the construction site. The notification shall indicate the estimated duration and completion date of the construction, construction hours, and necessary contact information for potential complaints about construction noise (i.e., name, telephone number, and address of UC LBNL's chief community relations official). The notice shall indicate that noise complaints resulting from construction can be directed to the contact person identified in the notice. The name and phone number of the contact person also shall be posted outside the Berkeley Lab boundaries.

Significance after Mitigation: Significant and Unavoidable. Although in most instances, it can reasonably be anticipated that construction noise impacts on off-site receptors would less than significant or would be reduced to a less-than-significant level through implementation of the above mitigation measures, there may be individual construction and/or demolition projects undertaken during the term of the proposed 2025 LRDP that result in noise impacts that could not be fully mitigated. As discussed above, for future projects undertaken in specific locations near the Lab fence line, if construction activities were determined to be "repetitively scheduled and relatively long-term operations" of 10 days or more of stationary equipment, such activities could exceed the Berkeley Community Noise Ordinance limits within approximately 1,000 to 1,500 feet of a single-family residence, 500 to 1,000 feet from a multi-family residence, and 500 feet of a commercial/industrial land use. Where construction noise levels are substantial or where construction noise sources are elevated relative to receptors, the use of barriers could be infeasible and/or may not be sufficient to reduce levels to meet City of Berkeley standards.

Furthermore, occasionally work, such as continuous concrete pours or other work to maintain safety or avoid traffic impacts, may require nighttime activity in the vicinity of off-site residences which could generate noise levels that exceed Berkeley Community Noise Ordinance allowable exterior and interior nighttime noise levels at noise sensitive receptors on a temporary basis.

Assuming no other attenuating factors, and in cases where these circumstances are met, construction-generated noise from stationary and/or mobile construction equipment would be expected to exceed limits set forth in the local noise ordinance. Given the above, and for purposes of a conservative analysis, the impact of construction noise is considered to be significant and unavoidable.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus, the scenario is an appropriate and conservative basis for the evaluation of noise and vibration impacts.

To conservatively assess demolition and construction noise impacts, noise modeling using RCNM was conducted for various conceptual building demolition and construction projects[4] identified under the Illustrative Development Scenario that would be located closest to off-campus sensitive receptors. Accordingly, construction noise effects at off-campus residences north of Berkeley Lab on Campus Drive, and west of Berkeley Lab on La Vereda Road and Highland Place, and at the UC Berkeley Foothill Student Housing complex (see Figure 4.11-1 for locations of these sensitive receptors), were evaluated. Predicted noise values in **Table 4.11-6** represent a worst-case analysis when equipment would be in operation at the point of the construction site closest to the nearest off-campus receptor, as this would occur only for a short percentage of the overall construction period. Additionally, certain existing campus buildings (e.g., Buildings 59, 88, 90, and 71) that are not accounted for in the model would serve to partially shield noise from building demolition and new construction activities, primarily to the west, and therefore, the estimated noise levels at the nearest receptors are conservative.

4 This includes the following conceptual projects conceived under the Illustrative Development Scenario: demolition of Building 50C (Computing Sciences/NERSC), Building 55 (Life Sciences), Building 71A (Ion Beam Tech / Low Beta Lab) and Building 70 (Energy & Environmental / Nuclear Science); and construction of Building S-13 (Laser Linear Accelerator Tunnel), Building S-10 (Flex Building), and Building S-15 (Modular Mid-Range Computing Facility).

TABLE 4.11-6
ESTIMATED DAYTIME NOISE LEVELS AT NEAREST OFF-CAMPUS SENSITIVE RECEPTORS FROM DEMOLITION AND CONSTRUCTION ACTIVITIES UNDER THE ILLUSTRATIVE DEVELOPMENT SCENARIO

Representative Receptor[k]	Existing Daytime Noise Level (dBA, Leq)	Loudest Two Noise Sources	Reference Noise Level (dBA)[a]	Distance to Receptor[b] (feet)	Usage Factor	Adjusted L_{eq} Level (dBA)[c]	Increase over Existing Noise Level (dBA)
Building Demolition							
Campus Drive Residences[d]	44	Tractor, Concrete Saw	84, 80	500	40%, 20%	65	+21
La Vereda Road Residences[e]	48	Tractor, Concrete Saw	84, 80	700	40%, 20%	62	+14
Highland Place Residences[f]	69	Tractor, Concrete Saw	84, 80	790	40%, 20%	61	-8
Foothill Student Housing[g]	69	Tractor, Concrete Saw	84, 80	930	40%, 20%	59	-10
Construction - Site Preparation and Grading							
Campus Drive Residences[h]	44	Grader, Tractor	85, 81	440	40%, 40%	65	+21
La Vereda Road Residences[i]	48	Grader, Tractor	85, 81	675	40%, 40%	61	+13
Highland Place Residences[i]	69	Grader, Tractor	85, 81	750	40%, 40%	60	-9
Foothill Student Housing[j]	69	Grader, Tractor	85, 81	1,000	40%, 40%	58	-11
Building Construction							
Campus Drive Residences[h]	44	Gradall, Tractor	83, 81	440	40%, 40%	64	+20
La Vereda Road Residences[i]	48	Gradall, Tractor	83, 81	675	40%, 40%	60	+12
Highland Place Residences[i]	69	Gradall, Tractor	83, 81	750	40%, 40%	59	-10
Foothill Student Housing[j]	69	Gradall, Tractor	83, 81	1,000	40%, 40%	57	-12

NOTES:
a. L_{max} at 50-feet
b. Distance between approximate location of construction equipment and property line of off-campus sensitive receptor.
c. The L_{eq} level is adjusted for distance and percentage of usage of construction equipment.
d. Distance between the center of Building 71A (Ion Beam Tech / Low Beta Lab) demolition site and the nearest off-campus sensitive receptor.
e. Distance between the center of Building 55 (Life Sciences Building) demolition site and the nearest off-campus sensitive receptor.
f. Distance between the center of Building 50C (Computing Sciences/NERSC) demolition site and the nearest off-campus sensitive receptor.
g. Distance between the center of Building 70 (Energy & Environmental / Nuclear Science) demolition site and the nearest off-campus sensitive receptor.
h. Distance between the center of Building S-13 (Laser Linear Accelerator Tunnel) construction site and the nearest off-campus sensitive receptor.
i. Distance between the center of Building S-15 (Modular Mid-Range Computing Facility) construction site and the nearest off-campus sensitive receptor.
j. Distance between the center of Building S-10 (Flex Building) construction site and the nearest off-campus sensitive receptor.
k. Please see Figure 4.11-1 for location of local roadways referenced in this table.

SOURCE: Table compiled by ESA in 2024 based on FHWA, 2017 (see Appendix NOI).

As can be seen in Table 4.11-6, noise levels from the conceptual construction and demolition activities under the Illustrative Development Scenario at off-site sensitive receptors would not exceed the City of Berkeley's 75 dBA daytime construction noise standard applicable to mobile equipment. However, noise levels from demolition and construction activities at certain off-site sensitive receptors would exceed existing noise levels by more than 10 dBA which would be a significant impact. The implementation of LRDP Mitigation Measures NOI-1a and NOI-1b would reduce the effects of demolition and construction noise generated under Illustrative Development Scenario conditions to the extent feasible.

However, similar to the above discussion for the proposed 2025 LRDP, there may be circumstances where individual construction and/or demolition projects as depicted under the Illustrative Development Scenario may result in noise impacts that could not be fully mitigated (e.g., for "repetitively scheduled and relatively long-term operations" of 10 days or more of stationary equipment.). Where construction noise levels are substantial or where construction noise sources are elevated relative to receptors, the use of barriers may not be feasible or sufficient to reduce levels to meet City of Berkeley standards. In addition, similar to that discussed for the proposed 2025 LRDP, occasional nighttime work on conceptual projects consistent with the Illustrative Development Scenario conducted in the vicinity of off-site residences could temporarily exceed Berkeley Community Noise Ordinance allowable exterior and interior nighttime noise levels at noise sensitive receptors. Given the above, and for purposes of a conservative analysis, the impact of construction noise associated with the Illustrative Development Scenario is considered to be significant and unavoidable.

LRDP Impact NOI-2: Vegetation management activities under the VMP during the LBNL 2025 LRDP timeframe would generate a substantial temporary increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance as applied as the relevant threshold of significance, or applicable standards of other agencies. (*Significant; Significant and Unavoidable with Mitigation*)

Over the course of the proposed 2025 LRDP, UC LBNL would regularly conduct on-site vegetation management activities under its existing Vegetation Management Program (VMP). The Berkeley Lab VMP would involve both "heavy" and "light" vegetation management activities. Light vegetation management would include work required to maintain ornamental plants and trees planted amidst the paved and developed areas of the campus, as well as work in the Perimeter Open Space Zone to reduce fire fuel. Tree pruning and limbing and the removal of individual small-to-moderate sized trees would also fall under light vegetation management activities. Light vegetation management activities would involve the use of diggers and rakes, or use of grazers, to cut grass and to remove leaf litter, shrubs, as well as use of small, individual hand tools such as shovels, Pulaski hoes, McLeod fire tools, weed whips and weed wrenches, hand saws, mechanized brush cutters, machetes, pruning shears, and loppers, and noise-reduced power tools like electric chain saws and pole saws. Due to the type of equipment used, and the nature and location of activity, light vegetation management activities are not expected to generate high noise levels at off-site receptors. Heavy vegetation management activities, on the other hand, would be expected to generate higher noise levels as they would involve mechanical treatment methods, including large scale tree cutting, mowing, masticating (mulching), grubbing, and chipping. Heavy motorized equipment, such as cranes, feller-bunchers, chain saws, mowers, and masticators, specially designed to cut, tear, uproot, crush, compact, or chop target vegetation would be used to clear large trees and/or multiple trees at a time. Heavy vegetation management would take place throughout the Perimeter Open Space Zone, particularly in the southwestern, northwestern, and northeastern portions of the campus.

As discussed above, VMP activities would involve manual and mechanical treatment of existing vegetation on the campus. Manual treatment would involve the use of equipment that would generally not produce high noise levels. However, equipment such as gas-powered chain saws and wood chippers would temporarily elevate noise levels in the vicinity of the work. In particular, gas-powered chain saws, which are assumed to generate similar noise levels as concrete saws, generate reference noise levels of 90 dB Lmax and 86 dB Leq at 50 feet. Because multiple hand-operated power tools could be used concurrently during treatment, if it is conservatively assumed that three chainsaws would operate simultaneously in close proximity to each other, they would generate a combined noise level of 91 dB Leq at 50 feet. This combined noise level would attenuate to the City of Berkeley's Noise Ordinance standard of 75 dB Leq for single-family residences at a distance of 215 feet. Thus, when manual vegetation treatment would take place at distances less than 215 feet of residential land uses in the City of Berkeley, the local noise standards could be exceeded. Similarly, mechanical treatment of vegetation using masticators or tractors would temporarily elevate noise levels to approximately 81 dB Leq at 50 feet. This noise level would attenuate to the City of Berkeley's Noise Ordinance standard of 75 dB Leq for single-family residences at a distance of 87 feet. Thus, when mechanical treatment would take place less than 87 feet of residential uses in Berkeley, the local noise standards could be exceeded (LBNL, 2023).

Residential receptors in the vicinity of the northeastern area of the campus, and the residential receptors, the Nyingma Institute, and Foothill Student Housing in the vicinity of the southwestern area of the campus, would be close to the areas where heavy vegetation management activities would likely occur and could be exposed to noise levels in excess of the City's noise standards. However, noise exposure would be during normal working hours. At times, the Lab's VMP activities producing elevated noise may last only for several minutes and then cease, such as when removing small numbers of tree limbs or a single, small-to-moderately sized tree. On occasions, larger-scale VMP activities may occur in a defined area for one or two weeks at a time, and then the activity could change locations or cease. This could involve removal of tree groves and/or very large trees, along with associated cutting and chipping activities. LRDP Mitigation Measures NOI-1a and -1b would be implemented as applicable to reduce noise from vegetation management activities performed on the Berkeley Lab campus. However, in the case of some of the heavy vegetation management activities that occur near off-site sensitive receptors, the noise levels may not be reduced to levels below the City's noise standards, and Berkeley Lab VMP noise impacts would remain significant and unavoidable.

Mitigation: Implement LRDP Mitigation Measures NOI-1a and NOI-1b.

Significance after Mitigation: Significant and Unavoidable. No additional mitigation is available to mitigate this impact because use of noise barriers is infeasible for the vegetation management activities.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the Berkeley Lab VMP activities that would occur concurrently with campus development consistent with the Illustrative Development Scenario would be similar to those conducted concurrently with the proposed 2025 LRDP, and thus, the scenario is an appropriate and conservative basis for the evaluation of noise impacts. Implementation of LRDP Mitigation Measures NOI-1a and -1b for Berkeley Lab VMP treatment work would serve to reduce construction noise to the extent feasible. However, similar to the conclusion reached above, Berkeley Lab VMP noise impacts would remain significant and unavoidable with the concurrent implementation of the Illustrative Development Scenario.

LRDP Impact NOI-3: Construction activities under the LBNL 2025 LRDP could generate excessive groundborne vibration or groundborne noise levels. (*Potentially Significant; Less than Significant with Mitigation*)

The types of construction-related activities under the proposed 2025 LRDP that would propagate groundborne vibration would primarily include the use of jack hammers and bulldozers for demolition, the use of vibratory rollers for soil compacting, and drilling for pile installation for new building construction.[5] As discussed above, no pile driving or blasting activities are anticipated under the proposed 2025 LRDP as alternate methods of drilled piers are appropriate for most Berkeley Lab locations.

Architectural Damage Impact

As stated earlier in this section, the thresholds for potential architectural damage due to groundborne vibrations are 0.5 in/sec PPV for new residential structures and modern commercial buildings and 0.25 in/sec PPV for historic and older buildings. A matrix of vibration levels from various construction activities with distance is presented in **Table 4.11-7**. Of the potential vibration-generating equipment presented in Table 4.11-7, use of a vibratory roller would create the greatest vibration levels. However, as can be seen from Table 4.11-7, vibratory roller when used as close as 25 feet of a historic building would generate vibration (0.2 in/sec PPV) that would be below the more stringent threshold for architectural damage to a historic building (0.25 in/sec PPV).

5 This impact focuses on groundborne vibration, as opposed to groundborne noise. Groundborne noise refers to noise generated by vibrations from outside a structure but experienced inside the structure. Future development under the proposed 2025 LRDP would not include projects that would generate appreciable levels of groundborne noise, therefore, groundborne noise is not discussed.

TABLE 4.11-7
VIBRATION LEVELS FROM CONSTRUCTION ACTIVITY UNDER THE PROPOSED 2025 LRDP

Equipment	Estimated Peak Particle Velocity (inches per second)					
	At 5 Feet	At 15 Feet	At 25 Feet (reference)	At 50 Feet	At 75 Feet	At 100 Feet
Jackhammer	0.39	0.075	0.035	0.016	0.010	0.008
Loaded Trucks	0.85	0.016	0.076	0.035	0.023	0.017
Caisson Drilling	1.00	0.191	0.089	0.041	0.027	0.019
Large Bulldozer	1.00	0.191	0.089	0.041	0.027	0.019
Vibratory Roller	3.35	0.452	0.20	0.100	0.063	0.046

NOTE:
Shaded areas indicate the distances at which the damage criterion for historic structures or buildings that are documented to be structurally weakened would be exceeded.
SOURCES: Caltrans 2020; FTA 2018.

At the present time, there is one building on the campus, Building 71, that qualifies as a historical resource. Building 71A (non-historic) that may be demolished during the 2025 LRDP term is attached to Building 71. Based on information shown in Table 4.11-7, at 5 feet, vibration levels from the operation of a large bulldozer would exceed the 0.2 in/sec PPV threshold for damage to historic structures. LRDP Mitigation Measure NOI-3 would ensure that vibration avoidance and reduction measures are implemented to address this impact. With implementation of this mitigation measure, the impact related to groundborne vibration would be less than significant. It should be noted that the use of a large bulldozer at a distance at or greater than 15 feet from a historic building would produce vibrations that would be below the threshold for architectural damage to a historic building.

There is also the potential for the construction activities under the proposed 2025 LRDP to impact architectural resources that may reach the minimum age thresholds for consideration as potential historical resources during the 20-year implementation timeline of the plan. Should such future architectural historical resources be within 15 feet of a construction project, vibrations from the construction project could result in a potentially significant vibration impact. LRDP Mitigation Measure NOI-3 is set forth below to reduce such an impact to a less-than-significant level.

Human Annoyance and Sleep Disturbance Impact

The potential for human annoyance and sleep disturbance due to vibration are primarily a concern when substantial construction activities are proposed during the nighttime hours. Given the proposed 2025 LRDP's programmatic nature, specific locations of demolition and construction are not presently known. However, the existing buildings on the Berkeley Lab campus are located as close as 140 feet to off-site receptors adjacent to the western boundary. This distance and vibration setting conditions were used to estimate vibration levels for a worst-case proxy project that might be generated by demolition or construction under the proposed 2025 LDRP.

Demolition and construction activities under the proposed 2025 LRDP would be more than 140 feet from the nearest off-campus sensitive receptors. As Table 4.11-7 shows, vibrations at 100 feet would be at or below 0.04 PPV. At a distance of 140 feet or more, vibrations from vibratory rollers for compacting and drilling for pile installation would be below the human annoyance threshold of 0.04 PPV and, as a result, the impact would be less than significant.

LRDP Mitigation Measure NOI-3: Construction Vibration

- Prior to any demolition work within 15 feet and construction within 25 feet of a building or structure that is 45 years old or older at the time of work, UC LBNL shall ensure that the subject building is evaluated for eligibility for listing on the National, California, and applicable local register (refer to LRDP Mitigation Measure CUL-1a). If the structure is determined not to qualify for listing on the National or California Registers as a historic resource, no further mitigation is required.
- If the structure is determined to be a historic resource, prior to the demolition, grading, or construction near that structure, and unless otherwise specified by a qualified structural engineer, UC LBNL shall require that construction/demolition contractors use (non-vibratory) compaction wheels mounted on an excavator or back-hoe and/or small, smooth drum rollers for final compaction of any asphalt base and asphalt concrete within 25 feet of the historic structure. If needed to meet compaction requirements, smaller, non-seated vibratory rollers shall be used to minimize vibration levels during repaving activities where needed to meet a vibration standard of 0.25 PPV at adjacent historic or older structures.
- Avoid using a large bulldozer within 15 feet of a historic structure. Identify potential alternative equipment and techniques with lower vibration levels that could be implemented if construction vibration levels are observed in excess of the vibration standards (e.g., smaller, lighter equipment could be used in some cases, or vibration settings modified on some equipment).

Significance after Mitigation: Less than Significant.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the scenario. Any of the hypothetical buildings included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of vibration impacts. As discussed in LRDP Impact NOI-1, demolition and construction activities consistent with the Illustrative Development Scenario would be more than 440 feet from the nearest off-campus sensitive receptors. At these distances, vibrations from vibratory rollers for compacting and drilling for pile installation would be well below the 0.25 PPV threshold for damage to architectural historical resources and the 0.04 PPV threshold for human annoyance and sleep disturbance.

Similar to the impact under the proposed 2025 LRDP, there is potential for construction activities consistent with the Illustrative Development Scenario to impact architectural resources that meet the minimum age thresholds for consideration as potential historical resources in the future. Should such future architectural historical resources be within 15 feet of a demolition project and 25 feet of a construction project, vibrations from the demolition/construction project could result in a potentially significant vibration impact. LRDP Mitigation Measure NOI-3 is set forth above to reduce such an impact to a less-than-significant level. Implementation of LRDP Mitigation Measure NOI-3 in conjunction with the construction and demolition activities under the Illustrative Development Scenario would serve to reduce potential construction and demolition vibration impacts to less-than-significant levels.

LRDP Impact NOI-4: Operation of stationary noise sources under the LBNL 2025 LRDP could generate a substantial permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance as applied as the relevant threshold of significance, or applicable standards of other agencies. (*Potentially Significant; Less than Significant with Mitigation*)

Operation of campus development under the proposed 2025 LRDP would increase ambient noise levels on and in the campus vicinity, primarily from the operation of new stationary equipment such as HVAC systems, cooling towers, backup generators, and other mechanical systems installed on/near new buildings.

Because mechanical equipment is commonly available with noise-attenuating enclosures designed to meet local noise ordinance requirements, the noise generated by this equipment would generally not be expected to exceed the established standards in the City of Berkeley Municipal Code or General Plan policies. However, it may reasonably be expected that mechanical systems of some of the new buildings may be as close as 140 feet[6] from existing off-site receptors. **Table 4.11-8** presents reference noise levels for many of these stationary noise sources for informational purposes. Given the data in Table 4.11-8 and the possibility that existing receptors could be as close as 140 feet from a stationary noise source, the potential exists for unobstructed noise levels from mechanical systems to be 65 dBA or higher at the nearest receptor locations, which would exceed City of Berkeley exterior noise standards of 55 dBA (daytime) and 45 dBA (nighttime) at the nearest residential property line. This impact would be potentially significant and LRDP Mitigation Measure NOI-4, below, is identified to address this impact.

TABLE 4.11-8
REFERENCE NOISE LEVELS FOR POTENTIAL STATIONARY NOISE SOURCES ASSOCIATED WITH THE PROPOSED 2025 LRDP

Stationary Noise Source	Documented Sound Levels (dBA)	Distance at which sound levels would decrease to the residential threshold of 55 dBA (daytime) and 45 dBA (nighttime) for stationary sources
HVAC Equipment	72–78 dBA at 30 feet without acoustical treatments	450 feet daytime/1,500 feet nighttime
Standby Diesel Generator	75–90 dBA at 23 feet (size dependent) without acoustical enclosure	1,300 feet daytime (testing only)

NOTES: dBA = A-weighted decibels; ESA = Environmental Science Associates; HVAC = heating, ventilation and air conditioning
SOURCE: Trane, 2002; Cummings Power Generation, 2008. Data compiled by ESA in 2024.

6 This distance was conservatively selected based on the nearest Lab building (Building 90) to the residential receptors on Hilgard Avenue, as measured from the edge of the building.

LRDP Mitigation Measure NOI-4: Noise Controls for Stationary Noise Sources

Mechanical equipment shall be selected and building designs prepared for all future development projects pursuant to the proposed 2025 LRDP so that noise levels from future stationary source operations would not exceed the City of Berkeley Noise Ordinance exterior noise limits for commercial or residential areas as measured at the commercial or residential property line. Controls that would typically be incorporated to attain adequate noise reduction would include selection of quiet equipment, sound attenuators on fans, sound attenuator packages for cooling towers and emergency generators, acoustical screen walls, and equipment enclosures.

Significance after Mitigation: Less than Significant.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the scenario. Any of the hypothetical buildings included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of operational noise impacts.

There are no specifications for mechanical systems available at this time for conceptual new buildings that are depicted in the Illustrative Development Scenario. Therefore, it is not possible to provide specific estimates of the noise levels at individual receptor locations that would result from operation of stationary equipment. However, the nearest new conceptual building depicted in the Illustrative Development Scenario, as indicated in Table 4.11-6, would be 440 feet from the nearest receptor. Based on the noise estimates provided in Table 4.11-8, noise from HVAC systems installed on this conceptual building could exceed the City of Berkeley exterior noise standards of 55 dBA (daytime) and 45 dBA (nighttime) at the nearest residential property line. Hence, this impact would be potentially significant, but with the implementation of LRDP Mitigation Measure NOI-4, it would be mitigated to a less-than-significant level.

LRDP Impact NOI-5: Traffic generated by campus operation under the LBNL 2025 LRDP would not result in a substantial permanent increase in ambient noise levels in the vicinity of the project more than standards established in the local general plan or noise ordinance, or applicable standards of other agencies. (*Less than Significant*)

Traffic generated by campus development under the proposed 2025 LRDP would result in a significant impact if it caused a permanent increase in ambient noise levels greater than 5 dBA above levels existing without the project for areas that are in compliance with City of Berkeley land use compatibility standards or by 3 dBA above levels existing without the project for areas already impacted by noise. Increases in traffic noise levels due to project traffic were analyzed using the FHWA Traffic Noise Prediction Model and the traffic data provided by the transportation consultant for the Existing Conditions, Existing plus 2025 LRDP Conditions, and 2040 plus

2025 LRDP Conditions.[7] Peak hour intersection turning data[8] were used to calculate traffic increases and the resulting traffic-generated noise increases on roadway segments most affected by 2025 LRDP-related traffic. The roadway segments analyzed and the modeled noise levels are presented in **Table 4.11-9**. The table shows existing roadside traffic noise levels, identifies whether those levels already exceed noise compatibility standards, and provides the applicable increase in noise used as the threshold. All study roadways are flanked by residential receptors, which are the use with the most stringent noise-land use compatibility standard.

TABLE 4.11-9
PEAK-HOUR TRAFFIC NOISE LEVELS IN THE VICINITY OF THE BERKELEY LAB CAMPUS (CNEL DBA)

Roadway Segment[a,b]	(A) Existing	Does Existing Noise Exceed Residential Compatibility Standard?	Applicable Significance Threshold	(B) Existing Plus 2025 LRDP	(B-A) Difference between Existing Plus 2025 LRDP and Existing	(D) 2040 Plus 2025 LRDP	(D-A) Difference between 2040 Plus 2025 LRDP and Existing
Hearst Avenue between Euclid Avenue and Gayley Road	63.8	Yes	>3 dBA increase in an area <70 dBA Ldn	64.1	0.3	64.7	0.9
Hearst Avenue between Gayley Road and Cyclotron Road	61.7	Yes	>3 dBA increase in an area <70 dBA Ldn	62.8	1.1	63.3	2.2
Gayley Road between Stadium Rim Way and Hearst Avenue	64.8	Yes	>3 dBA increase in an area <70 dBA Ldn	65.0	0.2	65.6	0.8
Piedmont Avenue between Dwight Way and Channing Way	62.5	Yes	>3 dBA increase in an area <70 dBA Ldn	62.6	0.1	63.3	0.8

NOTES:
a. Road center to receptor distance is 15 meters (approximately 50 feet) for all roadway segments. Noise levels were determined using algorithms of the FHWA Traffic Noise Prediction Model.
b. Traffic speeds for all vehicle classes were set at 25 mph for all vehicle classes.

SOURCE: ESA, 2024 (see Appendix NOI).

As shown in Table 4.11-9, the increase in traffic noise in the vicinity of the Berkeley Lab campus under the Existing Plus 2025 LRDP Conditions compared to the Existing Conditions would be less than 3 dBA on all roadway segments. This is also true when the 2040 Plus 2025 LRDP Conditions are compared to Existing Conditions. Overall, proposed Project-related traffic noise

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7 As explained in Section 4.14, *Transportation*, although the proposed 2025 LRDP planning horizon is the year 2045, the future analysis for transportation is for the year 2040 because the latest version of the Alameda County Transportation Commission (CTC) Model goes out only to 2040. However, the 2040 land use database in the Alameda CTC Model accounts for the full development of Berkeley Lab under the proposed 2025 LRDP, full development of UC Berkeley under the 2021 LRDP, and other foreseeable land use changes in the surrounding areas that are expected between 2040 and 2045 (see Section 4.0, *Environmental Setting, Impacts, and Mitigation Measures*, starting on page 4.0-7, for a list of cumulative projects included in this analysis). Therefore, the difference of 5 years does not make the results any less conservative.

8 Because average daily traffic volumes and nighttime fraction data are not available for all the roadways analyzed, calculation of an Ldn value from available traffic volume data is speculative. This analysis uses peak hour Leq to determine the existing and with project traffic noise levels. Caltrans recognizes that the Ldn is typically approximately equal to the peak hour Leq (Caltrans, 2013).

increases along all study roadway segments in the campus vicinity would be less than 3 dBA, and consequently, the impact related to traffic noise would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the scenario. Any of the hypothetical buildings included in the scenario, might be constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of traffic noise impacts. The net new building space developed consistent with the Illustrative Development Scenario would be similar to development expected under the proposed 2025 LRDP. Consequently, traffic generated by campus development depicted in the Illustrative Development Scenario would be similar to that generated by campus development under the proposed 2025 LRDP and would result in traffic noise increases similar to those presented in Table 4.11-9. As a result, traffic noise increases due to campus development under the Illustrative Development Scenario at all study roadway segments analyzed in the campus vicinity would be less than 3 dBA, and consequently, the impact related to traffic noise would be less than significant.

Cumulative Impacts

LRDP Impact CUM-NOI-1: Implementation of the LBNL 2025 LRDP and the related VMP, combined with other concurrent construction projects in the project area, could generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance applied as the relevant threshold of significance, or applicable standards of other agencies. (*Potentially Significant; Significant and Unavoidable with Mitigation*)

Construction Noise

The geographic scope of analysis for cumulative construction noise and vibration impacts encompasses sensitive receptors within approximately 900 feet of individual construction sites under the proposed 2025 LRDP.[9] Beyond 900 feet, the noise contributions from non-Project-related construction activities (cumulative projects) would be greatly attenuated through both distance and intervening topography, vegetation, and structures; thus their expected contribution would be minimal. Section 4.0, *Introduction to Environmental Analysis*, presents the list of reasonably foreseeable future projects in the Project vicinity that could contribute to cumulative construction noise impacts.

9 This screening threshold distance was developed based on stationary source noise attenuation equations (Caltrans, 2013) and the combined noise level generated by typical construction phases for a given project (assuming multiple pieces of equipment) at a distance of 50 feet. This distance accounts for typical construction noise levels, which attenuate to approximately 55 dBA at a distance of 900 feet if there is a direct line-of-sight between a noise source and a noise-sensitive receptor (i.e., based on assumed two pieces of equipment generating 85 dBA would attenuate to 55 dBA over a distance of 900 feet.

As discussed in LRDP Impact NOI-1, noise levels from the construction and demolition activities under the proposed 2025 LRDP at the closest off-campus receptors in Berkeley could exceed existing noise levels by more than 10 dBA, and consequently the Project impact would be significant. LRDP Mitigation Measures NOI-1a and NOI-1b identified in this Draft EIR would ensure these construction noise effects associated with projects under the proposed 2025 LRDP would be mitigated to the extent possible, but would still be significant and unavoidable.

Some Berkeley Lab campus projects that were previously approved under the 2006 LRDP and analyzed in the *2006 LRDP Final EIR* are currently underway or yet to be constructed. Construction of such cumulative projects could overlap with new projects under the proposed 2025 LRDP and thus comprise part of the cumulative framework analyzed in this EIR. These previously approved projects include the Central Commons Building (currently under construction) and Transit Hub and Utilities Project (THUP) located in the Central Commons development cluster and anticipated to be completed in early 2027; the Linear Assets Modernization Project (LAMP), which involves campus-wide construction of various infrastructure improvements occurring over a span of 10 years beginning in 2026; and ALS-U Project, a major upgrade of the equipment inside Building 6, anticipated to be completed by 2029. Cumulative campus construction projects would be subject to similar or equivalent construction noise reduction measures as Project-related construction activities discussed above.

As discussed in Section 4.0, UC Berkeley will be implementing a number of new development projects within its campus and adjacent neighborhoods over the course of its *2021 Long Range Development Plan Update*. There are no notable UC Berkeley cumulative projects located within 900 feet of the Berkeley Lab campus. None of the notable approved Berkeley or Oakland development projects awaiting construction identified in Section 4.0 are located within 900 feet of the Berkeley Lab campus. Furthermore, all cumulative projects contemplated by UC Berkeley or the cities of Berkeley and Oakland would be subject to compliance with construction noise mitigation measures, best practices, and other construction noise controls as established by these jurisdictions.

Berkeley Lab's distance from potential off-campus cumulative project construction sites would limit the overlap that could potentially result in cumulative construction noise impacts. Nevertheless, it is possible that yet unknown construction activities in the surrounding area could combine in some instances with Project-related construction noise during the 20-year planning period to contribute considerably to cumulative construction noise impacts. Where construction noise levels are substantial or where construction noise sources are elevated relative to receptors, the use of barriers may not be feasible or sufficient to reduce levels to meet City standards. Therefore, the cumulative impact of construction noise is conservatively considered to be significant and unavoidable.

Vegetation Management Program Noise

With respect to sensitive receptors that could be affected by temporary, short-term noise from Berkeley Lab VMP implementation–particularly in the southwestern portion of the campus–certain cumulative construction projects must be considered for potential cumulative noise impacts. As discussed in Section 4.0, such projects include construction of the UC Berkeley

Heathcock Hall, and Berkeley Lab's Central Commons Building (currently under construction), ALS-U Project, and Air Cooling Heat Exchangers (ACHE) yard. These cumulative projects are more than 900 feet from the nearest noise-sensitive receptors such as Nyingma Center and Berkeley single-family homes, and there are intervening topography, vegetation, and structures between the receptors and cumulative construction projects. For those receptors, periodic Berkeley Lab VMP activity noise would not be expected to combine with cumulative project construction noise. However, receptors in the UC Berkeley Foothill Student Housing complex could potentially be exposed to combined noise from the Berkeley Lab VMP activities and the aforementioned cumulative projects, resulting in a significant cumulative noise impact.

With respect to the Berkeley Lab VMP work in other campus areas–particularly the northwestern and northeastern portions of the campus–there are no proximal cumulative construction projects that could result in cumulative construction noise impacts when combined with Berkeley Lab VMP-generated noise.

UC Berkeley Hill Campus Wildland Vegetative Fuel Management Plan implementation within the UC Berkeley Hill Campus area would be expected to generate similar types of noise as the Lab's VMP activities. Over the course of the proposed 2025 LRDP, there could be occasions of vegetation management activity overlap between UC LBNL and UC Berkeley in both proximity and schedule such that temporary cumulative noise would be generated in the vicinity of Nyingma Institute, residential uses along Highland Place, and Foothill Student Housing that could be significant.

While applicable noise reduction mitigation measures for their respective vegetation management activities would be implemented by both Berkeley Lab and UC Berkeley, their combined cumulative noise impacts may not be reduced to a less than significant level. As an example, while mitigation strategies implemented by each program may be sufficient to reduce the impacts at the project level to below a significance threshold, consistent with a required mitigation monitoring and reporting program, the combination of these two fully mitigated less than significant project impacts may still result in a cumulative impact at a given receptor. Consequently, this impact is conservatively concluded to be significant and unavoidable. This finding is consistent with that of the UC Berkeley LRDP Update Final EIR with respect to cumulative construction noise (UC, Berkeley, 2021).

Mitigation: Implement LRDP Mitigation Measures NOI-1a and NOI-1b.

Significance after Mitigation: Significant and Unavoidable. Implementation of LRDP Mitigation Measures NOI-1a and NOI-1b would reduce the cumulative impact of construction and VMP noise to the maximum extent feasible. However, for purposes of a conservative analysis, the cumulative effects of construction and VMP noise are considered significant and unavoidable.

Stationary Noise Sources

There are no reasonably foreseeable off-site cumulative projects within the geographic scope of the proposed 2025 LRDP that would generate substantial operational noise, thus cumulative operational noise would be limited to other Berkeley Lab-planned on-site projects. However, operation of these on-campus cumulative projects would similarly be subject to design controls and regulatory requirements to limit noise from stationary sources, as needed, and the projects pursuant to the proposed 2025 LRDP would be required to implement LRDP Mitigation Measure NOI-4. Consequently, the proposed Project's cumulative stationary source operational noise impact would be less than significant.

Traffic Noise

As shown in Table 4.11-9 above, the increase in traffic noise in the Berkeley Lab campus vicinity under the 2040 plus 2025 LRDP Conditions compared to the Existing Conditions would be less than 3 dBA on all roadway segments. Overall, traffic noise increases associated with the proposed 2025 LRDP and cumulative development along all analyzed roadway segments in the campus vicinity would be less than 3 dBA, and the cumulative impact related to cumulative traffic noise would be less than significant.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the scenario. Any of the hypothetical buildings included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of construction and operational noise and vibration impacts. Using the Illustrative Development Scenario as an analytical tool, a more precise albeit speculative analysis of Project-related construction and operational noise has been conducted, as provided above. Nevertheless, and as stated in the preceding programmatic analysis, uncertainties about future activities in the surrounding area cannot be fully accounted. During the proposed 2025 LRDP planning period, it cannot be stated with certainty that yet unknown future construction activities in the surrounding area would not combine with campus construction and VMP activity noise to contribute considerably to cumulative noise impacts. Where VMP noise levels are substantial or where VMP noise sources are elevated relative to receptors, the use of barriers may not be feasible or sufficient to reduce levels to meet City standards. Therefore, for purposes of a conservative analysis, even with implementation of LRDP Mitigation Measures NOI-1a and -1b, the cumulative noise impact from campus construction activities under the Illustrative Development Scenario combined with the noise from VMP activities is considered to be significant and unavoidable.

LRDP Impact CUM-NOI-2: Implementation of the LBNL 2025 LRDP, combined with cumulative construction in the project area, could generate excessive groundborne vibration or groundborne noise levels. (*Potentially Significant; Less than Significant with Mitigation*)

Potential cumulative construction vibration impacts would be limited to other on-site cumulative construction projects, as identified in LRDP Impact CUM-NOI-1, above. Other UC LBNL on-site cumulative projects would be subject to similar construction vibration reduction measures discussed above for the proposed Project. Architectural damage impacts to nearby off-campus buildings are not a cumulative concern because the proposed Project's potential construction sites are sufficiently distant from both off-campus cumulative construction projects and off-campus buildings. As a result, Project and cumulative project construction vibrations would not combine to create a significant cumulative architectural damage impact. Similarly, cumulative human annoyance and sleep disturbance impacts from construction vibrations are not a concern due to the distance of the residential receptors from the on-campus cumulative construction projects.

Consequently, cumulative vibration impacts of the construction projects under the proposed 2025 LRDP would be similar to those analyzed above in LRDP Impact NOI-3 and would be less than significant with implementation of LRDP Mitigation Measure NOI-3.

Mitigation: Implement LRDP Mitigation Measure NOI-3.

Significance after Mitigation: Less than Significant.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the scenario. Any of the hypothetical buildings included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of noise and vibration impacts. The construction sites posed under the Illustrative Development Scenario are sufficiently distant from off-site residences, buildings, and cumulative projects so as not to combine in a resulting significant cumulative human annoyance and sleep disturbance impact or a cumulative architectural damage impact. For the reasons stated above, cumulative vibration impacts of the construction projects posited under the Illustrative Development Scenario on on-campus potential historic structures t would be similar to those analyzed above in LRDP Impact NOI-3 and would be less than significant with implementation of LRDP Mitigation Measure NOI-3.

4.11.5 References

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4.12 Population and Housing

4.12.1 Introduction

This section describes and evaluates the potential for proposed 2025 LRDP implementation to result in significant impacts related to population and housing. The section contains a description of the existing regional and local conditions at the Berkeley Lab campus and in the surrounding areas as it pertains to population and housing; identifies criteria used to determine impact significance; and provides an analysis of campus development under the proposed 2025 LRDP to induce substantial unplanned population growth or displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere.

The primary information sources used to prepare this section include Berkeley Lab population projections and employee place-of-residence summaries provided by the Berkeley Lab Campus Planning Department, population and housing data prepared by the State of California Department of Finance, and regional growth projections prepared by the Association of Bay Area Governments (ABAG) and the Metropolitan Transportation Commission (MTC).

4.12.2 Environmental Setting

Existing Campus Population

As discussed in Chapter 3.0, *Project Description*, as of spring 2024, Berkeley Lab's total population or roster is about 9,550, and comprises three principal groups: Staff (employees: 3,350), Academics (faculty and students: 1,200), and Affiliates (registered guests, subcontractors, etc.: 5,000). The roster includes Staff, Academics, and Affiliates that are on or affiliated with the campus, and Staff, Academics, and Affiliates that are in or affiliated with off-campus leased space.

All of the Lab's population is not present on the campus on a typical workday, therefore, since 2006, Berkeley Lab's on-campus population has been expressed as "adjusted daily population" (ADP), which is the estimated Lab staff and others who might be present on the campus on a typical or average workday. In 2006, ADP was calculated as a function of full-time employee staff added to a fixed percentage of annual visitors, and based on that methodology, the ADP was projected to reach 4,650 by 2025. In fact, prior to the Coronavirus 2019 (COVID-19) pandemic, Berkeley Lab ADP was trending upward and had reached approximately 4,500 in 2019. However, during the pandemic, the Lab ADP plummeted. Post-pandemic, ADP increased but now has tapered.

Under the Lab's post-pandemic hybrid work model, far fewer staff and visitors are present on the campus on any given day, so the previous ADP methodology is no longer as useful. A new ADP methodology has been developed by UC LBNL that utilizes gate counts and badge-in data and reflects a newly established hybrid work model where a substantial number of staff telework from remote locations part- or full-time. This hybrid work model is expected to be the Lab's standard operational mode moving forward given the Lab's space constraints. Based on this new methodology, the baseline (2024) ADP is estimated at approximately 3,000.[1, 2]

Places of Residence for Berkeley Lab Employees

Berkeley Lab has no on-campus housing. Approximately 74 percent of Berkeley Lab employees live in Alameda and Contra Costa counties. Approximately 25 percent of Lab employees live in Berkeley, Albany, and Kensington, and 15 percent live in nearby Oakland, Emeryville, and Piedmont.[3] About 4 percent of employees live in San Francisco. About 8 percent are distributed throughout other Bay Area communities; and 15 percent of the employees reside outside the Bay Area, including in other areas of California (6 percent), other states in the U.S. (8 percent), and outside of the U.S. (less than 1 percent). **Table 4.12-1** shows the places of residence of Berkeley Lab employees.

TABLE 4.12-1
PLACES OF RESIDENCE OF BERKELEY LAB EMPLOYEES

Residential Location	Percent Distribution[a]
Berkeley, Albany, and Kensington[b]	25%
Emeryville, Oakland, and Piedmont[c]	15%
Other Alameda County Communities	9%
El Cerrito, Richmond, and San Pablo	7%
Concord, Martinez, Pleasant Hill, and Walnut Creek	7%
Lafayette, Moraga, and Orinda	4%
Other Contra Costa County Communities	7%
San Francisco	4%
Other Bay Area Communities	8%
Elsewhere in California	6%
Other States in U.S.	8%
International	<1%
Total	**100%**

NOTES:
a. Percent distribution of employees living in each location in 2024 based on 2024 headcount employment and distribution of employees by U.S. Postal Service zip code of residence.
b. Berkeley, Albany, and Kensington cannot be separately identified in employee place of residence data provided by zip code.
c. Emeryville, Oakland, and Piedmont cannot be separately identified in employee place of residence data provided by zip code.

SOURCE: LBNL, 2024. Campus Planning Department. Demographic Reporting Counts. August 21, 2024.

1 In addition, in 2024, there were approximately 305 LBNL staff working in UC Berkeley campus space and approximately 320 LBNL staff working in off-site leased space in other locations.
2 For space planning, ADP is continuously tracked based on gate counts, badge-in data, and the Lab's roster.
3 Place-of-residence data for Lab employees is tabulated by US Postal Service zip code. Some zip codes in Berkeley also cover Albany and Kensington, and some zip codes in Oakland also cover Emeryville and Piedmont.

Overnight Accommodations for Berkeley Lab Guests

Guests at Berkeley Lab include out-of-town visitors who require temporary lodging. The Berkeley Lab Guest House (see Building 23 on the Lab campus on Figure 3-4 in Chapter 3, *Project Description*) includes 57 guest rooms available to those associated with Berkeley Lab and UC Berkeley campus.

Recent Population and Housing Trends in the Bay Area

Recent population and housing trends in the nine-county Bay Area region continue a steady progression of growth that has occurred over several decades. Based on California Department of Finance statistics, the population of the Bay Area region as a whole increased from 7.2 million in 2010 to 7.6 million in 2024, an increase of approximately 6 percent. The population of Alameda County increased from 1.5 million in 2010 to 1.6 million in 2024, an increase of 8.7 percent. The population of Contra Costa County increased from 1 million in 2010 to 1.1 million in 2024, an increase of 9.3 percent. The number of housing units in Alameda County, Contra Costa County, and the Bay Area region as a whole increased by 11.4, 8.3, and 9.3 percent respectively during this same period. It is notable that population increases that are well above the approximately 6 percent average increase for the Bay Area region as a whole have occurred in the cities of Albany (9.6 percent increase), Berkeley (an 11.3 percent increase), and Emeryville (a 32 percent increase). In the case of Berkeley, the approximately 10 percent increase in housing units during this period has generally kept in pace with population and household growth. Population and housing trends for the Bay Area region between 2010 and 2024 are presented in **Table 4.12-2** and **Table 4.12-3**.

According to ABAG and MTC, housing growth in Bay Area cities with growing high-wage workforces has not kept pace with job growth, resulting in demand for homes and resultant higher housing costs throughout the region. This trend has been particularly challenging for lower-income workers. In addition, according to ABAG and MTC, a combination of factors, including zoning restrictions, geographic concentration of business, and employment proximity to transit has resulted in a substantial geographic imbalance of jobs and housing throughout the Bay Area. According to ABAG and MTC, generally, there is more housing than jobs in Alameda, Contra Costa, Solano, and Sonoma Counties, while there are more jobs than housing in Marin, Napa, San Francisco, San Mateo, and Santa Clara Counties. According to ABAG and MTC, this geographic imbalance of jobs and housing adds to several associated problems, including traffic congestion, transit overcrowding, and displacement of long-time residents from neighborhoods where home values and rents have spiked.[4]

[4] Association of Bay Area Governments and Metropolitan Transportation Commission, 2021. *Plan Bay Area 2050*, *A Vision for the Future, Final*, Released October 1, 2021.

TABLE 4.12-2
BAY AREA POPULATION TRENDS (2010-2024)

County/City	2010		2020		2024		Percent Change in Population 2010-2024	Percent Change in Households 2010-2024
	Population	Households	Population	Households	Population	Households		
Alameda County								
Albany	18,539	15,377	21,171	18,881	20,325	18,168	9.6	18.2
Berkeley	112,580	99,731	127,560	106,635	125,327	104,868	11.3	5.2
Emeryville	10,080	10,007	12,699	12,598	13,314	13,213	32.1	32.0
Oakland	390,724	382,586	433,148	423,344	425,093	415,289	8.8	8.5
Piedmont	10,667	10,664	11,268	11,264	10,782	10,778	1.1	1.1
County Total	1,510,271	1,469,752	1,682,353	1,628,926	1,641,869	1,591,002	8.7	8.2
Contra Costa County								
El Cerrito	23,549	23,456	25,979	25,841	25,700	25,562	9.1	9.0
Richmond	103,701	102,118	115,900	114,233	112,735	111,137	8.7	8.8
San Pablo	29,139	28,698	32,205	31,720	31,088	30,603	6.7	6.6
County Total	1,049,025	1,038,711	1,165,927	1,154,609	1,146,626	1,135,059	9.3	9.3
Other Bay Area								
San Francisco	805,235	779,453	873,965	841,159	843,071	811,082	4.7	4.1
Total Bay Area	**7,150,739**	**6,998,464**	**7,765,640**	**7,581,936**	**7,588,780**	**7,409,314**	**6.1**	**5.9**

SOURCES:
State of California, Department of Finance, E-5 Population and Housing Estimates for Cities, Counties, and the State — January 1, 2011-2020. Sacramento, California, May 2021.
State of California, Department of Finance, E-5 Population and Housing Estimates for Cities, Counties, and the State — January 1, 2021-2024. Sacramento, California, May 2024.

TABLE 4.12-3
BAY AREA HOUSING TRENDS (2010-2024)

County/City	2010 Housing Units	2020 Housing Units	2024 Housing Units	Percent Change in Housing Units 2010-2024
Alameda County				
Albany	6,712	7,907	8,051	19.9
Berkeley	49,454	52,331	54,438	10.1
Emeryville	6,646	7,525	8,356	25.7
Oakland	169,710	178,469	189,706	11.8
Piedmont	3,924	3,947	3,997	1.9
County Total	581,372	621,958	647,509	11.4
Contra Costa County				
El Cerrito	10,716	10,996	11,342	5.8
Richmond	39,328	40,375	40,950	4.1
San Pablo	9,571	9,941	10,001	4.5
County Total	400,263	423,342	433,574	8.3
Other Bay Area Counties				
San Francisco	376,162	406,628	420,416	11.8
Total Bay Area	**2,783,991**	**2,957,647**	**3,042,321**	**9.3**

SOURCES:
State of California, Department of Finance, E-5 Population and Housing Estimates for Cities, Counties, and the State — January 1, 2011-2020. Sacramento, California, May 2021.
State of California, Department of Finance, E-5 Population and Housing Estimates for Cities, Counties, and the State — January 1, 2021-2024. Sacramento, California, May 2024.

Regional Growth Projections

Plan Bay Area 2050, prepared by ABAG and MTC, is a long-range land use and transportation plan for the nine-county Bay Area region[5] that covers the period from 2020 to 2050.[6] Adopted by ABAG and MTC in October 2021, *Plan Bay Area 2050* provides a transportation and land use/housing strategy for the Bay Area region to address its transportation, mobility, and accessibility needs; land development concerns; and greenhouse gas (GHG) emission reduction requirements through 2050.[7]

Plan Bay Area 2050 regional growth forecasts for population, households, housing units, and employment are presented in **Table 4.12-4**. *Plan Bay Area 2050* estimates the Bay Area region will add 1.4 million new jobs, for a total of 5.4 million Bay Area workers by 2050. Household growth is anticipated to follow pace, adding slightly fewer than 1.4 million new households for a

5 The nine-county Bay Area region comprises Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma Counties.

6 Association of Bay Area Governments and Metropolitan Transportation Commission, 2021. *Plan Bay Area 2050, A Vision for the Future, Final*, Released October 1, 2021.

7 *Plan Bay Area 2050+* is a limited and focused update to *Plan Bay Area 2050*, adopted in October 2021. *Plan Bay Area 2050+* is slated to be approved by the Metropolitan Transportation Commission and the Association of Bay Area Governments in late 2025. See https://planbayarea.org/plan-bay-area-2050-plus for additional details.

total of 4 million households by 2050. This growth would bring the Bay Area's population to an estimated 10.3 million residents by 2050, an increase of approximately 2.4 million residents from approximately 7.9 million residents in 2020.

TABLE 4.12-4
PLAN BAY AREA 2050 REGIONAL GROWTH FORECAST

Item	2020	2025	2030	2035	2040	2045	2050
Population	7,940,000	8,230,000	8,560,000	9,010,000	9,490,000	9,930,000	10,330,000
Households	2,760,000	2,950,000	3,210,000	3,500,000	3,710,000	3,890,000	4,040,000
Housing Units	2,840,000	3,060,000	3,370,000	3,670,000	3,900,000	4,080,000	4,250,000
Employment	4,080,000	4,150,000	4,640,000	4,830,000	5,050,000	5,230,000	5,410,000

SOURCE: Association of Bay Area Governments and Metropolitan Transportation Commission, 2023, *Plan Bay Area 2050+, Plan Bay Area 2050 Draft Regional Growth Forecast*. November 19, 2023.

Plan Bay Area 2050 forecasts that the East Bay, composed of Alameda and Contra Costa Counties, is expected to take on another one-third of housing growth, distributed across urban and suburban growth geographies. The two counties combined are also projected to accommodate around one-third of the region's job growth. Alameda County is expected to have the second highest share of both household and job growth in the region after Santa Clara County. According to ABAG and MTC, the combined number of jobs in Berkeley, Albany, and Emeryville is expected to increase from 155,000 in 2015 to 162,000 in 2050, an increase of 7,000 jobs (or 5 percent). ABAG and MTC project the combined number of jobs in Oakland, Piedmont, and Alameda to increase from 275,000 in 2015 to 358,000 in 2050, an increase of 83,000 jobs (or 30 percent).[8] Because so much of the Bay Area's housing is already located in Alameda County, with many of its residents commuting to other counties for work, *Plan Bay Area 2050* notes that intensified job growth in Alameda County could help to address the jobs-to-housing imbalance and associated transportation challenges, such as congested roads and crowded trains.

4.12.3 Regulatory Framework

There are no federal or state laws and regulations related to population and housing that are applicable to the Berkeley Lab campus. There are no UC plans and policies that relate to population and housing. Further, as stated in Chapter 1, *Introduction*, Berkeley Lab is a federal facility conducting work within the University of California's mission and as such is generally exempted by the federal and State constitutions from compliance with local land use regulations, including general plans and zoning, whenever using property under its control in furtherance of its educational and research purposes. Therefore, local laws and regulations of the Cities of Berkeley and Oakland are not applicable to the campus.

8 Association of Bay Area Governments and Metropolitan Transportation Commission, 2021. *Plan Bay Area 2050 Final Blueprint Growth Pattern*, Updated January 21, 2021.

4.12.4 Impacts and Mitigation Measures

Significance Criteria

For the purposes of this EIR, impacts related to population and housing would be considered significant if they would exceed the Standards of Significance presented below, which are based on Appendix G of the *CEQA Guidelines*.

Would implementation of the LBNL 2025 LRDP:

a) Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure); or

b) Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere.

Approach to Analysis

The analysis of impacts related to population and housing is based on information obtained from Berkeley Lab employee place-of-residence summaries provided by the LBNL Campus Planning Department, population and housing data prepared by the State of California Department of Finance, and regional growth projections prepared by ABAG and MTC. The analysis evaluates the potential for the proposed 2025 LRDP to induce substantial unplanned population growth or displace substantial numbers of existing people or housing, thereby necessitating the construction of replacement housing elsewhere.

Impact Analysis

LRDP Impact POP-1: Implementation of the LBNL 2025 LRDP would not induce substantial unplanned population growth in an area, either directly or indirectly. (*Less than Significant*)

As previously noted, the 2024 Berkeley Lab on-campus daily population is estimated to be approximately 3,000 ADP and is projected to reach 4,200 ADP by the year 2045, the planning period of the proposed 2025 LRDP. This would be an increase of 1,200 ADP over existing conditions but lower than previous projections of on-campus population associated with the 2006 LRDP. The lower on-site population levels under current and projected conditions are attributable to adoption of the remote and hybrid work model that was developed during the COVID-19 pandemic.

The projected ADP increase of approximately 1,200 people would be attributable to different population categories, including staff (i.e., career, term/contract and limited employees), academics (i.e., faculty, post-doctoral students, and students), and affiliates and others (e.g., guests, contractors, delivery drivers, etc.). The ADP increase associated with staff and academics, amounting to an estimated 880 by LRDP buildout in 2045, would create a correlating increase in housing demand in the Bay Area. In contrast, since it is reasonable to assume additional affiliates and others, such as guests, contractors, and delivery drivers, would already be living locally or coming to the Lab for limited time periods from other states and/or other countries, they would not contribute to an increase in Bay Area housing demand.

As shown in **Table 4.12-5**, based on the place-of-residence pattern of existing Berkeley Lab employees presented in Section 4.12.2, *Environmental Setting*, the additional on-campus staff and academics added to Berkeley Lab as a result of campus development under the proposed 2025 LRDP would be dispersed over a number of communities in the Bay Area region, with the largest concentrations located in cities proximate to the Lab. As the table shows, up to 220 staff and academics and their households would likely be added to the Berkeley/Albany/Kensington area and up to 132 staff and academics and their households would be added to Emeryville/ Oakland/Piedmont area through the proposed 2025 LRDP's 20-year planning period.

TABLE 4.12-5
ASSUMED PLACES OF RESIDENCE OF INCREASED EMPLOYEES AND ACADEMICS DURING PROPOSED 2025 LRDP PLANNING PERIOD

Residential Location	Increase
Berkeley, Albany, and Kensington	220
Emeryville, Oakland, and Piedmont	132
Other Alameda County Communities	79
El Cerrito, Richmond, and San Pablo	62
Concord, Martinez, Pleasant Hill, and Walnut Creek	62
Lafayette, Moraga, and Orinda	35
Other Contra Costa County Communities	62
San Francisco	35
Other Bay Area Communities	70
Elsewhere in California	53
Other States in U.S.	70
International	--
Total	**880**

SOURCE: LBNL, 2024. Campus Planning Department.

At least some of the 880 new employees and academics are likely to already be living in the Bay Area at the time that they are hired. However, if it is conservatively assumed that all newly hired staff and academics would be new to the Bay Area, the projected increase of such employees and academics and their households[9] under the proposed 2025 LRDP would represent less than 0.1 percent of the projected Bay Area increase of 2.4 million residents by 2050.[10]

Population growth under the proposed 2025 LRDP would be consistent with adopted regional and local projections. Consequently, proposed 2025 LRDP implementation would not induce substantial unplanned population growth in an area, either directly or indirectly, and the impact would be less than significant.

Mitigation: None required.

9 Conservatively using an average household size in the Bay Area of 2.44 based on *Play Bay Area,* for both staff and academics.

10 Association of Bay Area Governments and Metropolitan Transportation Commission, 2021, *Plan Bay Area 2050, A Vision for the Future, Final,* Released October 1, 2021.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP would be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of impacts to population and housing. For the reasons stated above for the proposed 2025 LRDP, population growth and housing demand consistent with that portrayed under the Illustrative Development Scenario would be dispersed over a number of communities in the region, based on place-of-residence trends among existing Lab employees. Population growth consistent with that portrayed under the Illustrative Development Scenario would not be concentrated in any particular area and therefore would not amount to a significant impact on any one community. Consequently, development consistent with that portrayed in the Illustrative Development Scenario would not induce substantial unplanned population growth in an area, either directly or indirectly, and the impact would be less than significant.

LRDP Impact POP-2: Implementation of the LBNL 2025 LRDP would not displace substantial numbers of existing people or housing that could necessitate the construction of replacement housing elsewhere. (*Less than Significant*)

As previously noted, Berkeley Lab has no on-campus housing. No on-campus housing is proposed under the proposed 2025 LRDP, and construction of on-campus housing is not consistent with the objectives of the LRDP.

As discussed in Chapter 3, *Project Description*, the proposed 2025 LRDP projects the demolition and disposal of approximately 278,500 gross square feet (gsf) of campus buildings and structures due to poor condition and/or seismic safety considerations. Buildings that would be demolished or decommissioned would range from small or minimally used structures–including trailers and storage containers–to larger, currently occupied buildings. New construction under the proposed 2025 LRDP would largely replace outdated facilities with modern research and support buildings and infrastructure more suited to meet Berkeley Lab’s scientific mission. However, as noted above, no campus housing exists at Berkeley Lab and therefore no housing would be displaced under the proposed 2025 LRDP. Proposed 2025 LRDP implementation would not displace existing people or housing and would not necessitate the construction of replacement housing elsewhere. The impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP would be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of impacts to population and housing. For the reasons stated above for the proposed 2025 LRDP, development consistent with that portrayed in the Illustrative Development Scenario would also not displace substantial numbers of existing people or housing and would not necessitate the construction of replacement housing elsewhere, and the impact would be less than significant.

Cumulative Impacts

In this analysis, cumulative projects are those past, present, and reasonably foreseeable future projects in the proposed 2025 LRDP's geographic context that, when considered together with the Project, would be considerable and that would compound or increase other environmental impacts.

LRDP Impact CUM-POP-1: Campus development under the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, would not induce substantial unplanned population growth or displace substantial numbers of existing people or housing that could necessitate the construction of replacement housing elsewhere. (*Less than Significant*)

The geographic context for the evaluation of cumulative impacts related to population and housing is the nine-county Bay Area region[11] addressed in *Plan Bay Area 2050*, prepared by ABAG and MTC. In addition to the population growth associated with the proposed 2025 LRDP, other future growth in the Bay Area region would increase population totals. This future growth could be accommodated through both new development and through changes in the occupancy and use of existing housing and other building space. As discussed above under Section 4.12.2, *Regional Growth Projections*, Bay Area regional job growth under *Plan Bay Area 2050* is estimated to be 1.4 million new jobs, for a total of 5.4 million Bay Area workers by 2050. Household growth is anticipated to follow pace, adding slightly fewer than 1.4 million new households for a total of 4 million households by 2050. This growth would bring the Bay Area's population to an estimated 10.3 million residents by 2050, an increase of approximately 2.4 million residents from approximately 7.9 million residents in 2020. Growth projections provided by ABAG and MTC inform the planning processes and policies of counties and cities in the Bay Area region to ensure that infrastructure and government services are expanded accordingly. As discussed above in LRDP Impact POP-1, population growth at Berkeley Lab during the proposed 2025 LRDP planning period would represent a small fraction of the projected population growth in the Bay Area region and would be well within adopted regional and local projections. Consequently, proposed 2025 LRDP implementation, in combination with other development, would not induce unplanned population growth, and the cumulative impact would be less than significant.

[11] The nine-county Bay Area region comprises Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma Counties.

Cumulative projects in the Bay Area region must be found consistent with applicable plans and policies that address, avoid, or minimize displacement of existing people or housing. These consistency reviews include applicable land use plans, policies, and regulations in accordance with CEQA requirements; state zoning and planning laws; and the state Subdivision Map Act; all of which require findings of plan and policy consistency. Compliance with these requirements would ensure that the cumulative impact related to displacement of people and housing would be less than significant. Furthermore, proposed 2025 LRDP implementation would not contribute to the cumulative impact because no housing or residential population would be displaced by campus development, as none are present on the campus.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP would be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of impacts on population and housing. For the reasons stated above for the proposed 2025 LRDP, development consistent with that portrayed in the Illustrative Development Scenario, in combination with past, present, and reasonably foreseeable future projects, would not induce substantial unplanned population growth or displace substantial numbers of existing people or housing, thereby not necessitate the construction of replacement housing elsewhere. The cumulative impacts related to population and housing would be less than significant.

4.12.5 References

Association of Bay Area Governments and Metropolitan Transportation Commission (ABAG-MTC), 2021. *Plan Bay Area 2050, A Vision for the Future, Final*, Released October 1.

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State of California, Department of Finance (DOF), 2021. E-5 Population and Housing Estimates for Cities, Counties, and the State — January 1, 2011-2020. Sacramento, California. May.

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4.13 Public Services and Recreation

4.13.1 Introduction

This section describes and evaluates the potential for proposed LBNL 2025 LRDP (the Project) implementation to result in significant impacts on public services and recreational facilities. The section includes a description of the existing environmental setting as it relates to public services and recreational facilities and includes a summary of the University plans and policies, and federal and State laws and regulations related to these resources. The section identifies criteria used to determine impact significance, and provides an analysis of the potential public services and recreation impacts from Project implementation; and identifies feasible mitigation measures to mitigate potentially significant impacts.

4.13.2 Environmental Setting

Fire Protection Services

Alameda County Fire Department

Berkeley Lab campus fire protection services are provided by the Alameda County Fire Department (ACFD) under a contract with UC LBNL. The ACFD handles about 42,400 calls per year with 27 fire stations. On average, a typical ACFD station handles about 130 calls per month. The ACFD maintains Station 19 on the campus, which is located in Berkeley Lab Building 48 and staffed 24 hours per day. Station equipment includes one fire engine, a hazardous materials vehicle, and one Type VI wildland fire truck.

ACFD Station 19 also provides aid to the City of Berkeley through an automatic aid agreement, under which Station 19 is the first responder for a portion of north Berkeley, including portions of the UC Berkeley campus. Under the automatic aid agreement, Station 19 responds to all fire and medical emergency calls within its service area, whether on or off the Berkeley Lab campus. The ACFD also has mutual aid agreements with other communities, including the City of Oakland and the East Bay Regional Park District (EBRPD), which can be activated in the event of a major emergency. Mutual aid agreements allow ACFD Station 19 to respond to emergency calls in other jurisdictions if Station 19 is not already responding to another call.

The response time standard for ACFD Station 19 for Berkeley Lab on-campus calls is 5 minutes; most responses are made within 4 minutes. Approximately 90 percent of ACFD Station 19 responses are to Berkeley Lab campus locations while the remaining 10 percent are to off-site locations on the UC Berkeley campus or within the City of Berkeley. During FY 2023 (October 2022 to September 2023), there were approximately 74 calls received at ACFD Station 19 from on-campus locations. Of these, approximately 35 percent were unintentional or nuisance calls (aka false alarms), 22 percent were for medical services, 18 percent were for tripped alarms, three percent were for fire services, one percent were for hazardous materials-related incidents, and 21 percent for “other” incidents (Nunez, 2024).

City of Berkeley Fire Department

The City of Berkeley Fire Department (BFD) provides fire protection and emergency medical services to the City of Berkeley, UC Berkeley, and Berkeley Lab. Under the automatic aid agreement discussed above, if ACFD Station 19's fire engine has been dispatched to a call, and additional calls are received from within ACFD Station 19's service area, the BFD responds to the additional calls. The BFD also provides paramedic transport for Berkeley Lab; therefore, if a Berkeley Lab medical incident requires transport to a hospital, a City of Berkeley ambulance responds to the Lab. BFD also responds to complement structure fire assignments at the Berkeley Lab campus, as ACFD Station 19 does not have the resources and assets to fully meet this assignment, which requires four engines, one ladder, and one battalion chief.

The BFD has seven fire stations with seven engines, two ladder trucks, three ambulances, and specialized equipment, including a hazardous materials vehicle. Each engine and truck are staffed with three firefighters, and each ambulance is staffed with two paramedics. The BFD has a total of approximately 203 employees, of whom about 169 are firefighters and paramedics. The BFD responds to approximately 17,195 calls over the course of the year, approximately 60 percent of which are for rescue and emergency medical incidents and fewer than three percent of which are for fires, with the remainder being calls about hazardous materials, water problems, and false alarms (Sprague, 2024). On average, a typical BFD station handles about 200 calls per month. In FY 2023, there were 18 instances in which Berkeley Lab received automatic aid assistance from the BFD (Nunez, 2024).

The nearest BFD station to the Berkeley Lab campus is Station 2, which is in downtown Berkeley about one block north of the intersection of Shattuck and University Avenues, and about 1 mile from Berkeley Lab. Equipment at BFD Station 2 includes one fire engine, one fire truck, an ambulance, one Type IV wildland fire truck, and a hazardous materials vehicle (BFD, 2024).

City of Oakland Fire Department

The City of Oakland Fire Department (OFD) provides fire protection services to the City of Oakland. The OFD operates 26 fire stations that house 25 engine companies and seven ladder truck companies. The OFD employs 435 full-time equivalent firefighters and officers and 85 civilians (City of Oakland, 2023). The OFD is organized into four divisions and three battalions. While the divisions focus on department functions, the battalions, which are organized by geographical districts, provide requested fire and emergency medical services. Each battalion consists of seven to 10 stations. Battalion 2 serves the west and north Oakland areas, including the far eastern and southeastern portions of Berkeley Lab. The closest OFD station to Berkeley Lab campus is OFD Station 19, which is in north Oakland at 5776 Miles Avenue, approximately 3 miles from the campus. Equipment at OFD Station 19 includes one fire engine.

The OFD responded to 77,882 calls for service in 2023, of which 80 percent were calls for emergency medical services (OFD, 2024). The current citywide response time to fire and medical emergency calls is 6 minutes, 40 seconds. The OFD's response goal is to respond to 90 percent of all calls in 7 minutes or less. In 2023, OFD Station 19 responded to 1,093 calls for service (OFD, 2024).

In addition to firefighting and emergency medical response capabilities, the OFD has a hazardous materials unit that operates from OFD Station 3, which is in West Oakland at 1445 14th Street, and responds to emergencies involving hazardous materials.

Police Services

Police services at the Berkeley Lab campus are provided through a contract with the UC Berkeley Police Department (UCPD), while a private security firm is responsible for various on-site security needs, including Laboratory site access, property protection and traffic control. The UCPD has the legal authority to enforce the law, conduct criminal investigations, and make arrests, and its jurisdiction covers UC Berkeley, Berkeley Lab, and other University-owned properties. UCPD operates 24 hours a day, 7 days a week, coordinating closely with the City of Berkeley Police Department.

UC Berkeley Police Department

UCPD currently employs 48 sworn police officers and 50 professional staff (UC Berkeley, 2021). UCPD, located at 1 Sproul Hall on the UC Berkeley campus, has primary law enforcement jurisdiction on the UC Berkeley campus and associated UC properties, including Berkeley Lab. UCPD is organized into four divisions: Administration, Community Outreach and Emergency Services, Investigative and Support Services, and Patrol. UCPD is empowered as a full-service state law enforcement agency pursuant to Section 830.2(b) of the California Penal Code and fully subscribes to the standards of the California Commission on Peace Officer Standards and Training. Officers receive the same basic training as city and county peace officers throughout the state, plus additional training to meet the unique needs of a campus environment.

There is no service ratio goal established for UCPD; when services are requested or required, UCPD sends the appropriate resources to the Lab to address the situation and/or incident. The UCPD response time to the Lab is approximately 4.5 minutes. Generally, there are fewer than 100 calls annually from Berkeley Lab that require UCPD response and most of the calls are for routine or non-emergency events (Edwards, 2024a). This equates to less than eight to nine calls per month.

Berkeley Lab Security

Berkeley Lab Security and Emergency Services (SES) Division includes Berkeley Lab Site Security (along with Fire Prevention and Emergency Management). The on-site security staff at Berkeley Lab is approximately 32 personnel, who are divided into five to 12 personnel per shift during the weekdays and four to five personnel on the weekends (Edwards, 2024a). Staffing and resources consist of an on-site portfolio manager, two to three roving patrols 24 hours per day, and personnel managing gate access at the Blackberry Canyon gate 24 hours per day. The response time for on-site security staff is under three minutes for priority calls (Edwards, 2024a).

The Berkeley Lab physical security strategy uses a variety of intrusion-alarm devices in its various areas. Output signals from these devices are sent directly to the Blackberry Canyon gate dispatch center for response by a security officer.

Site Access Controls

Berkeley Lab has a perimeter fence with three vehicle entrance points. Access is controlled at the Laboratory gates by security personnel who visually inspect entering vehicles and check for proper access authorization for both vehicles and occupants. The Blackberry Canyon gate is always open. Two other gates are open at high-demand times during the normal work week. Vehicles may be searched randomly. Access control for areas within the campus is achieved by hardware lock-and- key sets at some critical doors and gates and by electronic card readers that selectively permit entry only to authorized card holders and others.

Schools, Parks, and Recreation

As further described in Section 4.12, *Population and Housing*, Berkeley Lab employees reside throughout the Bay Area, with a substantial number of employees living in Alameda and Contra Costa counties. Approximately 25 percent of Lab employees live in the cities of Berkeley, Albany, and Kensington and a combined 15 percent of Lab employees live in Oakland, Piedmont, and Emeryville. Another 9 percent of Lab employees live in other Alameda County cities while 25 percent of Lab employees live in Contra Costa County. Public schools, parks, and recreational facilities are discussed specifically for the cities of Berkeley and Oakland because of their adjacency to the Lab.

Public Schools

Berkeley Unified School District

The Berkeley Unified School District (BUSD) operates 11 public elementary schools, three middle schools, one comprehensive high school, and an alternative high school (BUSD, 2024). Total enrollment in elementary and secondary schools for the 2022-2023 academic year was 9,073 students (CDE, 2024a). This total enrollment was less than the total enrollment in the prior years, which were 9,177 and 9,409 students in the 2021-2022 and 2020-2021 academic years, respectively (CDE, 2024b; CDE, 2024c).

Oakland Unified School District

The Oakland Unified School District (OUSD) operates the public school system within the Oakland city limits. The OUSD administers 46 elementary schools, 11 middle schools, and seven high schools. It is also responsible for 12 charter schools (all grade ranges) (OUSD, 2024). Total school enrollment in the district in the 2022-2023 academic year was 45,741 (CDE, 2024d), showing a decline in enrollment from 46,600 students in 2020-2021 and 48,704 students in 2020-2021 (CDE, 2024e; CDE, 2024f).

Parks and Recreation

Regional Open Space

The EBRPD manages over 126,000 acres within Alameda and Contra Costa counties, including 73 regional parks, recreation areas, wilderness, shorelines, preserves, and land bank areas (EBRPD, 2024). EBRPD regional park properties in the vicinity of Berkeley Lab include Tilden Park and the Claremont Canyon Preserve that border the eastern Berkeley city limits and McLaughlin Eastshore State Park located on the San Francisco Bay. These regional parks are used extensively by Berkeley residents and provide open space and recreational facilities, including picnic areas, bicycle trails, swim areas, and environmental education centers. Within Oakland's city limits, EBRPD provides open space and recreational facilities, including the 271-acre Leona Canyon Regional Open Space Preserve, the 1,220-acre Martin Luther King, Jr. Regional Shoreline Park, the 660-acre Robert Sibley Volcanic Regional Preserve, and the 100-acre Roberts Regional Recreational Area.

City of Berkeley

The City of Berkeley Parks, Recreation and Waterfront Department owns and/or maintains 250 acres of parks and open space throughout Berkeley. Parks and recreational facilities within the city include 54 parks, 21 turf medians, triangles, and dividers, 44 parking and vacant lots, 75 paths, walks and steps, 40 undeveloped paths, and the Berkeley Marina (City of Berkeley, 2022). The City seeks to maintain a parks-to-population ratio of 2.0 acres of parkland per 1,000 persons that was established in the 1977 City of Berkeley Master Plan (City of Berkeley, 2002).

City of Oakland

The City of Oakland Parks, Recreation & Youth Development Department owns and/or maintains 149 parks that total 3,633 acres (City of Oakland, 2023). The City's General Plan Open Space, Conservation, and Recreation Element (OSCAR) sets a citywide goal of establishing 10 acres of total park land for each 1,000 residents, with 4 of those acres in local-serving parks (City of Oakland, 1996).

UC Berkeley

UC Berkeley manages parks and athletic and recreational facilities that serve the Berkeley campus and the wider community. Several UC Berkeley athletic and recreational facilities are located in Hill Campus West in proximity to Berkeley Lab, including Memorial Stadium, Maxwell Family Field, Witter Rugby Field, and the Strawberry Canyon Softball Field and Pool. The UC Botanical Garden is located in Hill Campus East adjacent to Berkeley Lab.

4.13.3 Regulatory Framework

Federal

U.S. Department of Energy (DOE) Orders and Standards

DOE Standard DOE-STD-1066-2016, *Fire Protection*, facilitates implementation of DOE Order 420.1C, *Facility Safety*, by providing criteria and guidance for a standard and acceptable approach to meet the DOE Order 420.1C requirements for fire protection programs (FPPs).[1] The Standard is approved for use by DOE and its contractors and provides guidance on several fire protection related topics, including wildland fire management at DOE sites (DOE, 2016). DOE Order 420.1C requires that each DOE site where wildfire risk exists create and implement an integrated, site-wide wildland fire management plan (WFMP) "in accordance with National Fire Protection Association (NFPA) 1143, *Standard for Wildland Fire Management*, 2014." The WFMPs describe the relationship of land management planning and wildland fire policy; provide wildland fire management strategies; identify wildland fire management strategies program

[1] At the time of this analysis, DOE is in the process of considering updated standards for LBNL, including DOE-STD-1066-2023 to update DOE-STD-1066-2016, and DOE O 420.1D to update DOE O 420.1C.

components; discuss organizational and budgetary parameters; and provide a framework for monitoring and evaluation (see Section 4.16, *Wildfire*, for further details).

State

California Master Mutual Aid Agreement

The California Master Mutual Aid Agreement is a framework agreement between the State of California and local governments for aid and assistance by the interchange of services and facilities, including but not limited to fire, police, medical and health, communication, and transportation services and facilities to cope with the problems of rescue, relief, evacuation, rehabilitation, and reconstruction.

Fire Regulations

California Health and Safety Code Sections 13000 et seq. set forth State fire regulations concerning building standards (as set forth in Title 24 of the California Building Code), fire protection and notification systems, fire protection devices (such as fire extinguishers and smoke alarms), high-rise building and childcare facility standards, and fire suppression training. California Fire Code Sections 401 et seq addresses public safety for both indoor and outdoor gatherings, including emergency vehicle ingress and egress, fire protection, emergency medical services, public assembly areas and the directing of both attendees and vehicles (including the parking of vehicles), vendor and food concession distribution, and the need for the presence of law enforcement, fire services, and emergency medical services at such events. The State Fire Marshal's office has delegated review and approval authority over all development proposals on the Berkeley Lab campus to the Lead Designated Campus Fire Marshal.

Schools

California Government Code Sections 53080, 65995, and 66001 set forth school impact fee requirements that apply to developers. The University, as a state entity, is not subject to school impact fee requirements.

UC LBNL

Berkeley Lab Requirements and Policy Manual

The Berkeley Lab Requirements and Policy Manual (RPM) articulates rules and requirements from DOE, the University of California, and Berkeley Lab that help define the laboratory's operation. The RPM Fire Prevention and Protection Program is established to ensure Berkeley Lab employees, visitors, and the surrounding public are not harmed by fires, as well as to protect property and preserve operations. This is achieved by adhering to applicable laws, regulations, and codes; developing and maintaining emergency procedures; providing fire protection equipment; overseeing the Hot Work Permit Program;[2] reviewing and approving all construction and renovation projects; and properly managing flammable and hazardous chemicals and materials.

[2] Berkeley Lab's Hot Work Permit Program reduces fire hazards by ensuring that any operation that produces flames, sparks, smoke, or heat has the proper controls in place before the hot work activity starts. Berkeley Lab's Hot Work Permit Program is strictly followed for all hot work activities on the Berkeley Lab property, such as cutting, grinding, welding/brazing and other work activities that produce or use a flame, spark smoke or heat.

4.13.4 Impacts and Mitigation Measures

Significance Criteria

For purposes of this EIR, impacts to public services and recreation would be considered significant if they would exceed the Standards of Significance presented below, which are based on Appendix G of the *CEQA Guidelines*.

Would the proposed 2025 LRDP implementation:

a) Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, or need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:

   - Fire protection
   - Police protection
   - Schools
   - Parks; or
   - Other public facilities;

b) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated;

c) Include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment.

Approach to Analysis

Implementation of the proposed 2025 LRDP could have a significant impact if (1) it would require the construction of new or physically altered governmental facilities in order to maintain acceptable levels of public services, and (2) the construction or alteration of such facilities would result in one or more significant adverse impacts on the environment.

In general, Berkeley Lab campus development under the proposed 2025 LRDP would increase demand for public services. While some impacts would result from on-campus activities, such as new buildings requiring additional fire coverage, other impacts would occur with the increase in campus population.

Public service providers that might be affected by changes in Project-related service demand were consulted to determine if new service-related facilities would need to be built, or if existing facilities would need to be expanded, in order to serve Lab development while maintaining current service levels, including response times, service ratios and other performance objectives. If new or altered public service facilities would be needed in response to new Berkeley Lab campus development, then the analysis evaluates whether construction of such facilities would have a significant physical impact on the environment. For example, if the ACFD determined that a new fire station would be required to maintain adequate fire protection service levels, the impact analysis would evaluate whether construction or operation of the new fire station would have significant environmental impacts.

For purposes of the impact analysis, it is assumed that all temporary and permanent improvements under the proposed 2025 LRDP would be designed and constructed in compliance with all applicable building and fire codes, which include requirements for fire alarms, security systems, smoke detectors, sprinkler systems, fire extinguishers, and the number and location of exits.

Impact Analysis

LRDP Impact PSR-1: Implementation of the LBNL 2025 LRDP would not result in the need for new or physically altered fire protection facilities in order to maintain acceptable service ratios, response times, or other performance objectives for fire protection, the construction of which could cause significant environmental impacts. (*Less than Significant*)

Berkeley Lab’s fire protection services are provided by the ACFD on a contract basis. During the span of the proposed 2025 LRDP, UC LBNL would continue its contract with ACFD (or a similar subcontractor) to ensure equipment, materials and training are sufficient to maintain campus fire protection service levels. As discussed in Section 4.13.2, *Environmental Setting*, ACFD Fire Station 19, located in campus Building 48, responds to calls at the Lab, as well as at UC Berkeley and other off-site locations, generally within the city of Berkeley. Currently, 90 percent of the Fire Station 19 responses are to locations at Berkeley Lab with the remaining 10 percent occurring off-site, while the BFD responds to the calls at Berkeley Lab less than twice a month.

The number of calls handled by campus Fire Station 19 is relatively light in comparison with typical Alameda County and Berkeley fire stations. As discussed in Section 4.13.2, the ACFD handles about 42,400 calls per year with 27 fire stations and BFD handles about 17,200 calls per year with seven fire stations. An average ACFD station handles about 130 calls per month and an average BFD station handles about 200 calls per month. By comparison, Fire Station 19 at Berkeley Lab currently handles about 74 calls per month, which is only about 37 percent to 57 percent of the Berkeley and Alameda County averages, respectively. Based on the above, it is expected that campus development under the proposed 2025 LRDP could be served without additional staff or facilities.

Further, assuming the increase in fire protection service calls under the proposed 2025 LRDP is proportional to the projected LRDP population increase (i.e., 40 percent), the number of ACFD responses would increase from the current 74 calls per year, or between six to seven calls per month, to up to, 104 calls per year, or eight to nine calls per month, by 2045. Based on this estimated demand for future campus fire protection services, Berkeley Lab does not anticipate the need for new or expanded facilities to provide adequate fire protection services under Project conditions (Nunez, 2025).

Additionally, all new structures built on the campus would comply with applicable building and fire code requirements, and DOE standards, which would include, for example, the installation of automatic fire-sprinkler systems. Under the proposed 2025 LRDP, UC LBNL would continue to expand as needed its Fire Prevention and Protection Program (e.g., maintaining emergency procedures, managing flammable materials and chemicals, Hot Work Permit Program, etc.) to minimize the potential for fires. Further, development under the proposed 2025 LRDP would largely replace existing older buildings that were built under less stringent fire-life safety codes.

The replacement of older structures with newer structures and the modest increase in building space on the campus would minimize the increase in demand for fire services under the proposed 2025 LRDP.

Development projects under the proposed 2025 LRDP would be located largely within developed areas of the campus and would avoid encroachment into undeveloped, heavily vegetated areas. Furthermore, UC LBNL would continue implementing its vegetation management program and Wildland Fire Management Plan, which are designed to minimize the campus's potential wildland fire risks–especially in the Perimeter Open Space Zone–including by removing flammable materials and creating fire breaks. While proposed 2025 LRDP implementation would result in the development of new structures in an area prone to wildfires, compliance with the applicable building standards and ongoing campus vegetation management would minimize any increase in fire services demand (see Section 4.16, *Wildfire* for a fuller discussion).

With respect to assistance from the City of Berkeley, it is expected that the BFD would continue to respond to less than two calls per month when considering that ACFD Fire Station 19 would be maintained on the campus; and as new construction on the campus under the proposed 2025 LRDP would be built according to the standards in the latest fire codes, and thus would be less prone to structure fires than the older structures it would replace. Therefore, the impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the scenario. Any of the hypothetical buildings that are portrayed in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of impacts to fire protection services. Potential individual projects, such as those analyzed in the Illustrative Development Scenario, would not result in the need for additional fire protection facilities or services, for the reasons noted above. Therefore, the impact of the projects on fire protection services would be less than significant.

LRDP Impact PSR-2: Implementation of the LBNL 2025 LRDP would not result in the need for new or physically altered police protection facilities in order to maintain acceptable service ratios, response times, or other performance objectives for police protection, the construction of which could cause significant environmental impacts. (*Less than Significant*)

As discussed in Section 4.13.2, police and security services to the Lab are provided by the UCPD and a private on-site security firm on a contract basis. The private security firm is responsible for various on-site security needs, including Lab site access, property protection, and traffic control, and it can respond to incidents on any accessible campus area within 5 minutes. The UCPD is responsible for sworn law enforcement duties and responds to Berkeley Lab service calls as needed, with a response time of less than 5 minutes. Generally, UCPD responds to fewer than 100 calls annually at the Lab and most of the calls are for routine events.

Assuming the increase in proposed 2025 LRDP-related police service calls are proportional to the increase in population under the plan (i.e., 40 percent), UCPD responses would increase from the historical average of less than 100 calls per year, or less than eight to nine calls per month, to up to 140 calls per year, or 11 to 12 calls per month, by 2045. The on-site security demand would also increase and would be addressed in the contract for services to ensure adequate protection. Based on the estimated demand for police services, Berkeley Lab SES does not anticipate that implementation of the proposed 2025 LRDP would result in the need for new or expanded facilities to provide adequate police services (Edwards, 2024b). Therefore, the impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings that are analyzed in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of impacts to police protection services. Potential individual projects, such as those analyzed in the Illustrative Development Scenario, would not result in the need for additional police facilities or services, for the reasons noted above. Therefore, the impact of the projects on police services would be less than significant.

LRDP Impact PSR-3: Implementation of the LBNL 2025 LRDP would not result in the need for new or physically altered school facilities in order to maintain acceptable performance objectives for school services, the construction of which could cause significant environmental impacts. (*Less than Significant*)

The proposed 2025 LRDP would not develop residential uses and therefore would not directly generate new student enrollment in the BUSD or OUSD (or other school districts). As a result, the Project's effect on schools would be indirect, resulting from an increase in Berkeley Lab's distributed residential population. The analysis below evaluates the indirect impact of Berkeley Lab's Project-related population growth on schools in the cities of Berkeley and Oakland as school-aged family members of new Berkeley Lab employees would attend local public schools.

Based on existing place-of-residence data for Berkeley Lab employees presented in Section 4.12, *Population and Housing*, the existing residential distribution for Berkeley Lab employees is 25 percent of total employees residing in Berkeley, Albany, and Kensington, and 15 percent residing in Oakland, Piedmont, and Emeryville. It is assumed the existing residential distribution would similarly apply to the increased Adjusted Daily Population (ADP) resulting from the proposed 2025 LRDP. To more conservatively assess worse-case effects of the proposed 2025 LRDP on the BUSD and OUSD, it is assumed that the 25 percent of new employees residing in Berkeley, Albany, and Kensington would be concentrated in Berkeley and the 15 percent of new employees residing in Oakland, Piedmont, and Emeryville would be concentrated in Oakland.

The proposed 2025 LRDP is anticipated to increase the overall Berkeley Lab ADP by 40 percent and as discussed in Section 4.12, the increase in ADP associated with the proposed staff and academics under the 2025 LRDP (conservatively considered to be all new to the Bay Area) would be 880 persons. Assuming one Berkeley Lab employee per household, the proposed 2025 LRDP would result in an increase of approximately 220 households in Berkeley and 132 households in Oakland.

Based on existing BUSD student generation rates,[3] the proposed 2025 LRDP would be expected to indirectly generate as many as 18 elementary-school children, nine middle-school children, and 16 high-school children in Berkeley, for a total of 43 school-age children by 2045 or approximately 2 to 3 new students per year. Similarly, based on existing OUSD student generation rates,[4] the proposed 2025 LRDP would be expected to indirectly generate up to 19 elementary-school children, eight middle-school children and 10 high-school children in Oakland, for a total of 37 school-age children by 2045 or approximately 1 to 2 new students per year.

The BUSD and OUSD have indicated that they do not have sufficient capacity to house additional students generated by future development as current classroom facilities require substantial capital investments (BUSD, 2023; OUSD, 2021). However, enrollment has been declining within the boundaries of the BUSD and OUSD recently. Students indirectly generated by the proposed 2025 LRDP would be gradually enrolled in Berkeley and Oakland schools over a 20-year period, and thus the addition of between approximately 1 to 3 students per year in each school district would not be expected to result in substantial deterioration of existing school faculties thus necessitating the need for new or upgraded school facilities. Furthermore, to the extent that new Berkeley Lab personnel may occupy new dwelling units as opposed to existing units, the developers of these new dwelling units would have paid school facility fees to be used by the school districts to maintain or upgrade existing facilities. Finally, it should be noted that school enrollment is affected by economic conditions and development, and it is currently unknown whether overcrowding in BUSD and OUSD would occur in the next 20 years.

The proposed 2025 LRDP's impact on other local school districts in the Bay Area beyond the BSD and OUSD is expected to diminish with distance corresponding to the distribution of the Berkeley Lab residential population, based on the assumption that the increased Adjusted Daily Population (ADP) resulting from the proposed 2025 LRDP would also have a residential

[3] Grades K-5 = 0.080 students per residential household; Grades 6-8 = 0.039 students per residential household; and Grades 9-12 = 0.072 students per residential household (BUSD, 2016).

[4] Grades K-5 = 0.141 students per residential household; Grades 6-8 = 0.060 students per residential household; and Grades 9-12 = 0.073 students per residential household (OUSD, 2016).

distribution that is generally the same as the current residential distribution of Lab employees. For example, as presented in Section 4.12, *Population and Housing*, based on the existing residential distribution of Berkeley Lab employees, nine percent of the total employees reside in other Alameda County communities compared to 25 percent of total employees residing in Berkeley, Albany, and Kensington, and 15 percent residing in Oakland, Piedmont, and Emeryville. Thus, assuming similar student generation rates used by school districts serving these communities as the rates used by BUSD and OUSD, even fewer Project-related school-age children would be introduced per year in districts that are further away, and thus the need for new or physically altered school facilities in more remote districts would not be reasonably expected.

For these reasons, the proposed 2025 LRDP would not, by itself, induce a substantial or immediate population increase that would result in the need for new or physically altered public school facilities. The proposed 2025 LRDP would, therefore, have a less than significant impact on schools.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings that are analyzed in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of impacts to schools. Potential individual projects, such as those analyzed in the Illustrative Development Scenario, would not result in the need for additional school facilities or services, for the reasons noted above. Therefore, the impact of the projects on schools would be less than significant.

LRDP Impact PSR-4: Implementation of the LBNL 2025 LRDP would not result in the need for new or physically altered parks and recreational facilities in order to maintain acceptable performance objectives for neighborhood and regional parks, the construction of which could cause significant environmental impacts, nor would it increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facilities would occur or be accelerated. (*Less than Significant*)

Implementation of the proposed 2025 LRDP would increase population on the Berkeley Lab campus. As noted above, the Lab's ADP would increase from about 3,000 persons at the present time to about 4,200 persons by 2045, an increase of 1,200 ADP, of which an estimated 880 staff and academics are conservatively estimated to be all new to the Bay Area. The direct and indirect effects of this population on recreational facilities are evaluated below.

Direct Effects on Recreational Facilities

Existing parks and recreational facilities are present nearby in the cities of Berkeley and Oakland, and new Berkeley Lab employees could utilize these facilities during off-hours. However, any incidental increase in the use of these facilities would be gradual over time as the Berkeley Lab employee population would increase incrementally over the 20-year planning period. If the employment increase is evenly spread over the 20-year planning period, the annual increase would be about 44 new employees. Further, due to the campus's somewhat remote location, it is unlikely that all the new employee and visitor population would make much use of nearby off-campus recreational facilities given the effort it would take to travel to these facilities for time-limited Lab staff and visitors. Additionally, other than hotel accommodations for visitors, there is no housing on the campus, and none would be added to the campus under the proposed 2025 LRDP, which makes it further unlikely that campus population would use nearby recreational facilities extensively. Therefore, any increase in the use of these local park and recreational facilities by Lab staff would not result in the substantial physical deterioration of the facilities due to overuse.

To the limited extent that new Berkeley Lab employees may use any nearby off-site recreational facilities, they would likely use facilities on the adjacent UC Berkeley Hill East and West Campuses, such as the UC Botanical Garden, the Lawerence Hall of Science, Jordan Fire Trail (for hiking) and Strawberry Canyon athletic facilities; on the UC Berkeley Campus Park; and at Tilden Park, owned and operated by the EBRPD. However, given the availability and convenience of scenic walking/jogging and bicycling opportunities on the Berkeley Lab campus, any increase in the use of facilities on the UC Berkeley Hill Campuses, UC Berkeley Campus Park, and Tilden Park would be small. Therefore, the proposed 2025 LRDP would be unlikely to result in substantial physical deterioration of nearby trails, parks, or recreational amenities that would require improvements, nor would it result in the need for the development of new trails, parks, or recreational amenities.

Indirect Effects on Recreational Facilities

The proposed Project would support an increase in employment on the campus. This employment growth would result in an increase in the number of Lab-related households who would reside in existing and new housing in nearby cities and thereby place a demand on city parks and recreational facilities. Based on the current residence patterns of Lab employees, of the 880 new employees, 25 percent or 220 new employee households would reside in the Berkeley, Albany, and Kensington area and 15 percent or 132 new employee households would reside in Oakland, Piedmont, and Emeryville. The exact distribution of these employee households within each of these cities, their usage of city parks, and the resulting need for new park facilities or the deterioration of existing facilities cannot be analyzed without speculation. However, it is reasonable to assume that the number of new employee households added to each city over the 20-year planning horizon of the proposed 2025 LRDP would not be large enough to result in substantial physical deterioration of park facilities or require the construction of new park facilities.

Further, some new Berkeley Lab employees would likely occupy new housing that has been built in the Bay Area in response to increased housing demand. New housing construction is anticipated in Berkeley, Oakland, and elsewhere in the nine-County Bay Area in the next 20 years, based on current projections by the Association of Bay Area Governments, which are relied upon in the preparation of city and county general plans. Under the City of Berkeley and the City of Oakland planning processes, planned residential uses in each city would be subject to municipal zoning ordinances and general plan policies, including requirements related to the provision of parks. Therefore, additional park facilities would be developed in each city concurrent with the development of new housing.

The environmental review processes of the cities of Berkeley and Oakland, and other jurisdictions would help ensure that environmental impacts associated with new residential development and associated recreational demand, as well as the development of recreational facilities themselves, are mitigated to the maximum extent feasible.

In summary, as demonstrated above, both the direct and indirect effects on parks and recreational resources from the implementation of the proposed 2025 LRDP would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of impacts to recreational facilities. Potential individual projects, such as those analyzed in the Illustrative Development Scenario, would not result in the need for additional parks and recreation facilities nor in substantial physical deterioration of existing facilities, for the reasons noted above. Therefore, the impact of such projects on parks and recreational facilities would be less than significant.

LRDP Impact PSR-5: The LBNL 2025 LRDP would support the development of new recreational facilities, the construction of which would not have an adverse impact on the environment. (*Less than Significant*)

Additional minor recreational facilities on the Berkeley Lab campus would be supported by the proposed 2025 LRDP, and they might include outdoor sports activity spaces, exercise facilities, and enhancements to the Lab's trail system. Compliance with mitigation measures and other construction-related regulatory requirements discussed in other sections of this Draft EIR, including Section 4.2, *Air Quality*; Section 4.3, *Biological Resources*; Section 4.6, *Geology and Soils*; Section 4.8, *Hazards and Hazardous Materials*; Section 4.9, *Hydrology and Water Quality*; Section 4.10, *Land Use and Planning*; Section 4.11, *Noise and Vibration*; and Section 4.14, *Transportation* would reduce construction-related effects of new recreational facilities on the Berkeley Lab campus to less-than-significant levels.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be comparable in intensity and character to that portrayed in the scenario. Any of the hypothetical development that is analyzed in the scenario might be similar to future development pursuant to the proposed 2025 LRDP, thus the scenario is an appropriate and conservative basis for the evaluation of impacts to the environment that could result from the construction of new campus recreational facilities. Potential individual projects, such as those identified in the Illustrative Development Scenario, would not result in significant impacts associated with the construction of new recreational facilities, for the reasons noted above. Therefore, the impact of the projects on the environment due to the construction of new recreational facilities would be less than significant.

Cumulative Impacts

LRDP Impact CUM-PSR-1: Campus development under the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, would not result in the need for new or physically altered public facilities in order to maintain acceptable service ratios, response times or other performance objectives, the construction of which could cause significant environmental impacts. (*Less than Significant*)

In this analysis, cumulative impacts would occur when impacts from cumulative development – past, present, and reasonably foreseeable future projects in the proposed 2025 LRDP’s geographic context – when considered together with Project impacts, would be considerable and may compound or increase other environmental impacts. The cumulative context is the Project’s geographic area of effect, which in direct cases is the adjacent cities of Berkeley and Oakland, but in indirect cases can include cities throughout the Bay Area in which Berkeley Lab staff and academic personnel reside.

Fire

Current service demands combined with reasonably foreseeable development in the East Bay could result in the increased regional need for new or altered fire protection facilities. ACFD Fire Station 19 is dedicated to providing fire protection to Berkeley Lab and provides service to a specific geographic area outside of the Lab’s boundaries that is heavily urbanized and thus built out. While Project-related campus development and population increases may cause on-site service call volume to increase slightly, the incremental increase in fire protection service demand can be accommodated by Fire Station 19 without additional facilities. Therefore, given that Fire Station 19 can accommodate an increase in on-campus service demand and off-campus service demand is not expected to substantially increase due to the built-out nature of the off-site service area, Fire Station 19 would adequately serve the cumulative development demand, and new or altered facilities would not be required. The proposed 2025 LRDP’s contribution to cumulative demand for fire protection services would not be cumulatively considerable, and this cumulative impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of development under the proposed 2025 LRDP. Any of the hypothetical development analyzed in the scenario might be similar to future development constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for evaluating environmental impacts that could result from the proposed Project. For the reasons stated above for the proposed 2025 LRDP, development consistent with that portrayed in the Illustrative Development Scenario, in combination with past, present, and reasonably foreseeable future projects in the geographic area of effect, would not result in the need for new or physically altered fire facilities or services in order to maintain acceptable service ratios, response times, or other performance objectives. The cumulative impact with respect to fire protection services would be less than significant.

Police

Current service demands combined with reasonably foreseeable East Bay development could result in the increased regional need for new or altered police protection facilities. However, UCPD serves the UC Berkeley campus along with the Berkeley Lab campus under contract, and its staffing level and facilities are planned to accommodate future growth on each campus. No new UCPD facilities are required to serve the two campuses. Furthermore, Berkeley Lab addresses most of its on-site security needs through contract with a private security firm; this arrangement allows for flexible increases in service as needed. Therefore, given that future police service needs on both the Lab and the UC Berkeley campus are accounted for in UCPD's future plans, the proposed 2025 LRDP's contribution to cumulative demand for police services would not be cumulatively considerable, and this cumulative impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of development under the proposed 2025 LRDP. Any of the hypothetical development analyzed in the scenario might be similar to future development constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for evaluating environmental impacts that could result from the Project. For the reasons stated above for the proposed 2025 LRDP, development consistent with that portrayed in the Illustrative Development Scenario, in combination with past, present, and reasonably foreseeable future projects in the geographic area of effect, would not result in the need for new or physically altered police facilities or services in order to maintain acceptable service ratios, response times, or other performance objectives. The cumulative impact with respect to police protection services would be less than significant.

Schools

As discussed under LRDP Impact PSR-3, the proposed 2025 LRDP would include no housing, and therefore the effect of implementing the proposed 2025 LRDP on schools would be indirect; that is, any increased demand for school facilities would derive from regionally dispersed residential development to serve Project-related campus population increases. Because the proposed 2025 LRDP would result in no direct impact on school facilities, and because the indirect effect would be gradual over a 20-year period, and thus minimal, proposed 2025 LRDP implementation would not result in a considerable contribution to any cumulative increase in the demand for school facilities. Furthermore, planned residential development in local jurisdictions where new Berkeley Lab employees might live, such as the cities of Berkeley or Oakland, would be subject to the local agency's zoning ordinance and general plan policies. Planned development would also be required to pay school impact fees that, under CEQA, are deemed as full and complete mitigation for effects on schools. Accordingly, the proposed 2025 LRDP would not result in a cumulatively considerable contribution to the demand for new or physically altered educational facilities under cumulative conditions. Therefore, the proposed 2025 LRDP's cumulative impact on public school facilities would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of development under the proposed 2025 LRDP. Any of the hypothetical development analyzed in the scenario might be similar to future development constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for evaluating environmental impacts that could result from the proposed Project. For the reasons stated above for the proposed 2025 LRDP, development consistent with that portrayed in the Illustrative Development Scenario, in combination with past, present, and reasonably foreseeable future projects in the geographic area of effect, would not result in a significant cumulative impact with respect to public school facilities.

Parks and Recreation

Proposed 2025 LRDP implementation along with cumulative local and regional development could result in an increased demand for parks and recreational facilities in both nearby Berkeley and Oakland and in more dispersed Bay Area locations. With a campus ADP growth of 880 staff and academics that would be new to the Bay Area within the 20-year Project timeframe, more individuals may use nearby parks and recreational amenities in adjacent areas, including on the UC Berkeley Hill Campuses, UC Berkeley Campus Park, and at Tilden Park. As further discussed under LRDP Impact PSR-4, the proposed 2025 LRDP does not include any housing, and therefore the effect of Project implementation on parks and recreational facilities may also be indirect. New Berkeley Lab personnel might establish residence in nearby communities but also in more remote Bay Area cities, which would increase park and recreational facility demand in such locations. As noted under LRDP Impact PSR-4, planned residential uses in each city occupied by new Lab staff would be subject to the local municipality's zoning ordinance and general plan policies, which would require that environmental impacts associated with the development of parks and recreational facilities are mitigated to the maximum extent feasible. Because the proposed 2025 LRDP's direct impact on local parks and recreational facilities and indirect impact on more distant park and recreational facilities would be minimal, implementation of the proposed 2025 LRDP would not result in a considerable contribution to any cumulative increase in the demand for parks and recreational facilities. Therefore, the proposed 2025 LRDP's cumulative impact on parks and recreational facilities would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of development under the proposed 2025 LRDP. Any of the hypothetical development analyzed in the scenario might be similar to future development constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for evaluating environmental impacts that could result from the proposed Project. For the reasons stated above for the proposed 2025 LRDP, development consistent with that portrayed in the Illustrative Development Scenario, in combination with past, present, and reasonably foreseeable future projects in the geographic area of effect, would result in less than significant cumulative impacts with respect to park and recreational facilities.

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4.14 Transportation

4.14.1 Introduction

This section describes and evaluates the potential for the implementation of the proposed 2025 LRDP (the Project) to result in significant impacts on transportation and circulation. The section includes a description of the existing transportation conditions in and around the Berkeley Lab campus for various travel modes, including transit, bicycles, pedestrians, and motor vehicles; discusses the State regulations and policies pertinent to transportation and circulation; assesses the potential transportation and circulation impacts of the proposed Project; and provides, where appropriate, mitigation measures to address significant impacts.

4.14.2 Environmental Setting

The existing transportation-related context in which the proposed 2025 LRDP would be implemented is described below, beginning with a description of the study area and the roadway network in and around the Berkeley Lab campus as of May 2024, the time that the NOP for this EIR was issued. Existing transit, bicycle, and pedestrian facilities are also described, as well as the vehicle miles traveled (VMT), transportation demand management (TDM) program, and mode shares for Berkeley Lab employee work commute to the campus.

Existing Roadway Network

Existing regional freeway access to the campus is provided via State Route 13 (SR 13), SR 24, and Interstates 80 and 580 (I-80 and I-580). Direct vehicular access to the campus is provided via local roadways: Hearst Avenue and Centennial Drive. The roadway network serving the Berkeley Lab campus is described below.

- *Interstates 80 and 580 (I-80 and I-580)* share the generally 10-lane freeway segment located approximately 3 miles west of Berkeley Lab. North of Berkeley, I-80 continues north through the cities of Richmond and Vallejo and continues northeast toward Sacramento and beyond. I-580 connects Berkeley with Richmond before crossing the Richmond-San Rafael Bridge and terminating at the US-101 interchange in Marin County. South of Berkeley, I-80 connects the East Bay to San Francisco via the San Francisco-Oakland Bay Bridge, and I-580 continues southeast through the cities of Oakland and San Leandro, then east through the cities of Dublin and Livermore before continuing over Altamont Pass into San Joaquin County. The primary access to the Berkeley Lab campus from I-80/I-580 is through ramps at Gilman Street, University Avenue, and Ashby Avenue. I-80/I-580 has an average annual daily traffic (AADT) volume of approximately 237,000 vehicles north of University Avenue (Caltrans, 2022).
- *State Route 24* (SR 24) is an eight-lane east-west freeway connecting I-580 in Oakland in the west and I-680 in Walnut Creek in the east. West of I-580, SR 24 continues as Interstate 980 (I-980). Access between the Berkeley Lab campus and SR 24 is through ramps at Telegraph Avenue, SR 13, and Fish Ranch Road. SR 24 has an AADT of approximately 172,000 vehicles east of SR 13 (Caltrans, 2022).
- *State Route 13* (SR 13, Ashby Avenue and Tunnel Road) connects I-580 in east Oakland to I-80 in Berkeley, with an interchange at SR 24. South of SR 24, SR 13 is a four lane north-

south freeway and north of SR 24, SR 13 is generally a two to four lane east-west arterial (Tunnel Road east of Domingo Avenue and Ashby Avenue west of Domingo Avenue). Telegraph Avenue, College Avenue, and the Gayley-Piedmont-Warring-Derby-Belrose-Claremont corridor connect SR 13 and the Berkeley Lab campus. SR 13 has an AADT of approximately 79,000 vehicles north of SR 24 (Caltrans, 2022).

- *Telegraph Avenue* is a north-south roadway that connects Broadway in Downtown Oakland in the south to Bancroft Way and UC Berkeley Campus Park in the north. In Berkeley, Telegraph Avenue is primarily a four-lane two-way roadway south of Dwight Way, and a two-lane one-way northbound roadway north of Dwight Way.
- *College Avenue* is a north-south roadway that connects Broadway in Oakland in the south and Bancroft Way and UC Berkeley Campus Park in the north. College Avenue is a two-lane roadway in its entirety.
- *Shattuck Avenue* is a north-south roadway that connects Telegraph Avenue in Oakland in the south and Indian Rock Avenue in the Berkeley Hill in the north. Near the Berkeley Lab campus, Shattuck Avenue is a four-lane roadway.
- *Bancroft Way* and *Durant Avenue* form an east-west, one-way couplet between Piedmont and Shattuck Avenues just south of the UC Berkeley Campus Park. Both roadways extend west of Shattuck Avenue as two-way streets, with Bancroft Way extending into West Berkeley and Durant Avenue extending to Milvia Street. Bancroft Way is a one-way westbound roadway with one mixed-flow travel lane, one transit-only lane, and a two-way cycletrack. Durant Avenue is a one-way eastbound two- to three-lane roadway.
- *University Avenue* is an east-west four-lane roadway that connects I-80/I-580 in the west to Oxford Street and UC Berkeley Campus Park in the east.
- *Gayley Road, Piedmont Avenue, Warring Street, Derby Street, Belrose Avenue, and Claremont Boulevard* collectively form a generally north-south, two-lane corridor west of the Berkeley Lab campus that extends between Hearst Avenue in the north and SR 13 (Ashby Avenue) in the south.
- *Dwight Way* is an east-west roadway that connects Fourth Street in the west to Sports Lane in the east in Berkeley. Dwight Way is a two-lane, two-way street west of Martin Luther King Jr. Way and east of Piedmont Avenue. Between Martin Luther King Jr. Way and Piedmont Avenue, Dwight Way is a two-lane, one-way eastbound roadway.
- *Stadium Rim Way and Centennial Drive* collectively are an east-west two-lane roadway that extends around the California Memorial Stadium and connects the UC Berkeley Campus Park in the west with Grizzly Peak Boulevard in the east. Strawberry Canyon and Grizzly Peak gates of the Berkeley Lab campus are located on Centennial Drive.
- *Hearst Avenue* is a generally two-lane east-west roadway that extends between Eastshore Highway in the west to Highland Place in the east. East of Highland Place, Hearst Avenue becomes Cyclotron Road and terminates at Berkeley Lab’s Blackberry Gate.
- *Grizzly Peak Boulevard* is a two-lane, two-way roadway generally west of Berkeley Lab. It extends between Skyline Boulevard in the Oakland hills in the south and Kenyon Avenue in Kensington in the north. Grizzly Peak Boulevard provides access between the Berkeley Lab campus and SR 24 through Fish Ranch Road.

Campus Access, Internal Circulation, and Parking

The Berkeley Lab campus is fenced and access is controlled and limited to Lab employees and authorized visitors. Berkeley Lab campus access is provided through the following three gates (LBNL, 2024a):

- *Blackberry Gate* is located at the east terminus of Cyclotron Road. This gate is staffed at all times and can be used by employees and visitors to enter and exit the campus at all times.
- *Strawberry Gate* is located on Centennial Drive just north of the UC Botanical Gardens. This gate is staffed on weekdays from 6:00 AM to 7:00 PM and can be used by employees and visitors to enter and exit the campus at these times.
- *Grizzly Peak Gate* is located on Centennial Drive just south of the Lawrence Hall of Science. This gate is staffed on weekdays from 5:00 to 10:00 AM and can be used by employees and visitors to enter and exit the campus at these times. Employees can exit through this gate at other times using their badges.

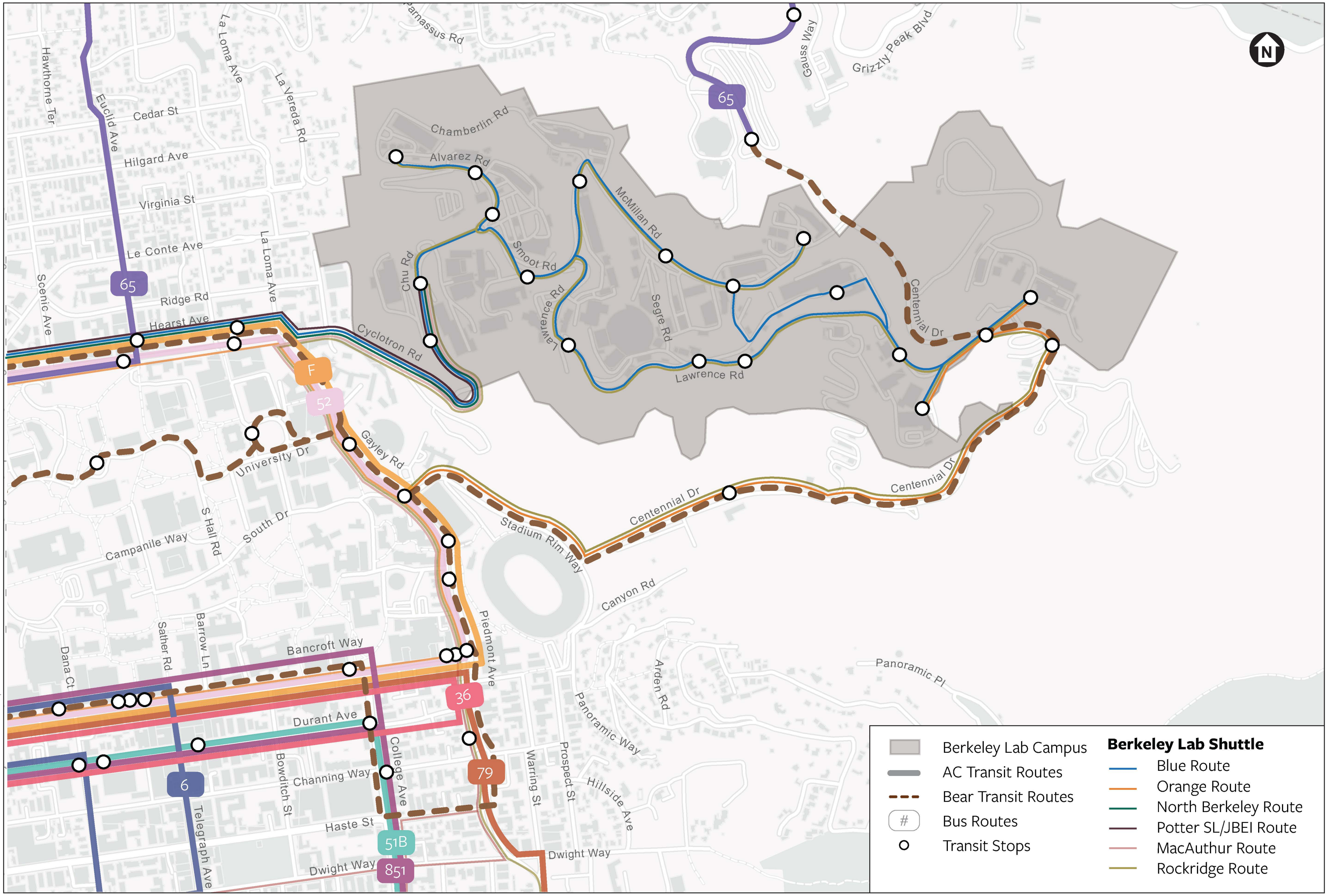
Based on UC LBNL data collected in April 2024, about 2,170 vehicles including shuttles, delivery trucks, and construction vehicles, enter the Lab on a typical weekday, with about 71 percent of vehicles entering through the Blackberry Gate, 16 percent through the Strawberry Gate, and 13 percent through the Grizzly Peak Gate (LBNL, 2024b).

The Berkeley Lab campus is primarily served by two east-west trending corridors that generally conform to the contours of the campus's topography and are connected by north-south roadways. Chamberlain and McMillan Roads form the "upper route," and Lawrence and Alvarez Roads form most of the "lower route." Most campus roadways provide two-way traffic and accommodate larger vehicles such as shuttles, trucks, and emergency access vehicles. However, at a few locations where road width cannot accommodate two-way travel, the roadway provides one-way travel only.

The Berkeley Lab campus provides about 2,200 parking spaces with about 1,700 parking spaces designated for staff and visitors, and the remainder used by campus fleet vehicles, service vehicles, equipment, and temporary storage. The parking spaces are dispersed in multiple parking lots of various sizes distributed throughout the campus as well as along the campus roadways. It is estimated that about 1,300 parking spaces, corresponding to an occupancy of about 76 percent of the overall staff/visitor parking spaces, are occupied on typical weekdays at peak times. Due to limited campus space opportunities, parking space distribution does not closely align with the areas of greatest demand (e.g., densest building locations). Consequently, occupancy of the campus's parking resources varies depending on parking location and proximity to user destinations.

Existing Transit Services

Transit service providers in the campus vicinity include the Alameda–Contra Costa Transit (AC Transit), which provides local and Transbay bus service, the Bay Area Rapid Transit (BART), which provides regional rail service, Berkeley Lab Shuttles, which provides free shuttle service for the Lab employees and visitors, and the UC Berkeley Bear Transit Shuttles, which provide shuttle service for the UC Berkeley community. The existing transit services provided in the campus vicinity are shown on **Figure 4.14-1** and described below.



SOURCE: Fehr & Peers, 2024

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Figure 4.14-1
Existing Transit Service

ESA

AC Transit

AC Transit is the primary bus service provider in 13 cities and adjacent unincorporated areas in Alameda and Contra Costa Counties, with transbay service to destinations in San Francisco, San Mateo, and Santa Clara Counties. AC Transit reports serving about 109,000 riders in Alameda County on a typical weekday in 2023 (AC Transit, 2024a).

Although AC Transit does not directly serve the Berkeley Lab campus, **Table 4.14-1** summarizes the AC Transit lines operating in the campus vicinity as of August 2024 (AC Transit, 2024b). The nearest AC Transit bus stops to the campus are:

- On eastbound Hearst Avenue at LeRoy Avenue (Lines 52 and F), about 0.4-mile walking distance from Blackberry Gate
- On both directions of Piedmont Avenue at Bancroft Way (Lines 36, 52 and F), about 0.8-mile walking distance from Blackberry Gate
- On southbound Centennial Drive at the Lawrence Hall of Science (Line 65), about 0.3-mile walking distance from the Grizzly Peak Gate
- On westbound Bancroft Way at College Avenue (Lines 36, 51B, 52, F, and 851), about 0.9-mile walking distance from Blackberry Gate

TABLE 4.14-1
AC TRANSIT LINES SERVING THE BERKELEY LAB CAMPUS[a]

Line	Neighborhoods Served by Line	Hours of Operation	Peak Period Headways (Minutes)	Off-Peak Headways (Minutes)	Nearest Bus Stops[b]
36	UC Berkeley Campus Park, Downtown and West Berkeley, Emeryville, West Oakland	6:00 AM to 12:00 AM	30	30	Northbound Piedmont Avenue at Bancroft Way (0.9 mile walk from Blackberry Gate)
51B	Rockridge, Elmwood, Downtown and West Berkeley	5:00 AM to 12:00 AM	<10	<15	Bancroft Way at College Avenue (0.9 mile walk from Blackberry Gate)
52	University Village, Albany, North and Downtown Berkeley	Weekdays: 6:00 AM to 11:00 PM Weekends: 8:00 AM to 8:00 PM	12-16	16-20	Eastbound Hearst Avenue at Le Roy Avenue (0.5 mile walk from Blackberry Gate)
65	Downtown Berkeley, Berkeley Hills, Lawrence Hall of Science	Weekdays: 7:00 AM to 8:00 PM	40	40	Southbound Centennial Drive at Lawrence Hall of Science (0.3 mile walk from Grizzly Peak Gate)
F	Downtown Berkeley, Berkeley Northside, South Berkeley, Bushrod, Emeryville, West Oakland, San Francisco	Weekdays: 6:15 AM to 1:00 AM Weekends: 6:30 AM to 1:00 AM	30	30	Eastbound Hearst Avenue at Le Roy Avenue (0.5 mile walk from Blackberry Gate)
851	Downtown and Southside Berkeley, Rockridge, Uptown and Downtown Oakland, Alameda, Fruitvale	12:00 AM to 5:00 AM	N/A	60	Bancroft Way at College Avenue (0.9 mile walk from Blackberry Gate)

NOTES:
a. Service description as of August 2024.SOURCE: AC Transit, 2024b; summarized by Fehr & Peers.

Bay Area Rapid Transit

BART provides regional rail service between San Francisco, northern San Mateo County, northern Santa Clara County, and the East Bay. The nearest BART station to Berkeley Lab is Downtown Berkeley Station, approximately 1 mile west of the campus. Downtown Berkeley BART Station is served by the Orange (Richmond-Berryessa/North San Jose) and Red (Richmond-Millbrae) Lines. The station is served by about 24 trains per hour during the weekday peak periods. Based on BART monthly ridership reports, about 10,400 weekday daily passengers (entries plus exits) were served at Downtown Berkeley Station in August 2024 (BART, 2024).

Several Berkeley Lab shuttle routes (Blue, Orange, and Potter Street/Joint BioEnergy Institute [JBEI]) connect the Lab to Downtown Berkeley BART Station. Lab shuttles also serve the following BART stations which are further away from the Lab: Ashby (Potter Street/JBEI route), MacArthur (MacArthur route), North Berkeley (North Berkeley route), and Rockridge (Rockridge route) stations.

Berkeley Lab Shuttles

Berkeley Lab shuttles provide weekday service connecting the various buildings within the campus as well as connecting the Lab to the UC Berkeley Campus Park, Downtown Berkeley BART Station, and various other destinations in the city of Berkeley and vicinity. Berkeley Lab shuttles are only open to Lab employees and authorized visitors and are not available to the public. **Table 4.14-2** summarizes the Berkeley Lab shuttle routes as of August 2024 and daily route ridership as of April 2024. The shuttle routes combined serve about 1,240 riders on a typical weekday (LBNL, 2024c).

UC Berkeley Bear Transit Shuttles

UC Berkeley operates the Bear Transit shuttles that connect the Campus Park to major transit facilities, parking facilities, surrounding neighborhoods, and other UC Berkeley sites, such as the Hill Campus. Bear Transit shuttles are available to the public. Although Bear Transit shuttles do not directly serve the Lab campus, several routes operate in the vicinity, including the Perimeter, Reverse Perimeter, and Central Campus Lines along Hearst Avenue and Gayley Road, and the Hill Line along Centennial Drive.

Existing Bicycle Network

The California Department of Transportation (Caltrans) classifies the following four distinct types of bikeway facilities:

- **Class I Multi-Use Path —** A completely separate right-of-way designated for exclusive use by bicyclists and pedestrians, with vehicle cross flow minimized.
- **Class II Bicycle Lane —** A restricted right-of-way designated for use by bicyclists, with a striped lane on the street. Vehicle parking and vehicle/pedestrian cross flow are permitted.
- **Class III Bicycle Route —** A right-of-way designated by signs or pavement markings for shared use with motor vehicles.
- **Class IV Separated Bikeway —** For the exclusive use of bicyclists, with physical separation between the bikeway and through vehicular traffic. The separation may include, but is not limited to, grade separation, flexible posts, inflexible posts, inflexible barriers, or on-street parking.

TABLE 4.14-2
BERKELEY LAB SHUTTLE SERVICE SUMMARY[a]

Route	Description	Hours of Operation and Headways	Daily Ridership[b]
Blue	Various locations throughout the Berkeley Lab campus through Blackberry Gate to Downtown Berkeley BART Station along the north side of the UC Berkeley Campus Park	6:15 AM – 8:35 PM: every 10 minutes 8:35 PM to 9:03 PM: every 13 minutes	730
MacArthur	Berkeley Lab campus through Blackberry Gate to MacArthur BART Station along Gayley Ave, College Ave, Dwight Way, and Telegraph Ave	7:00 AM – 11:10 AM: every 50 minutes 3:35 PM – 7:35 PM: every 60 minutes	50
North Berkeley	Berkeley Lab campus through Blackberry Gate to North Berkeley BART Station and Albany University Village along University Ave, San Pablo Ave, Solano Ave, and MLK Jr. Way	5:50 AM – 10:50 AM: every 60 minutes 3:30 PM to 7:30 PM: every 60 minutes	100
Orange	Berkeley Lab campus through Strawberry Gate to Downtown Berkeley BART Station, Ashby BART Station, Emeryville, and West Berkeley	6:00 AM – 7:20 PM: every 20 minutes	140
Potter St./ JBEI	Berkeley Lab campus through Strawberry Gate to Downtown Berkeley BART Station along Centennial Drive, and north side of the UC Berkeley Campus Park	7:00 AM – 7:30 PM: every 30 minutes	110
Rimway	Berkeley Lab campus through Blackberry Gate to Stadium Garage along Gayley Ave	5:30 AM – 6:30 AM: every 15 minutes 2:15 PM to 2:45 PM: every 15 minutes	40
Rockridge	Various locations throughout the Berkeley Lab campus through Strawberry Gate to Rockridge BART Station along College Ave, Claremont Ave, Piedmont Ave, and Centennial Way	6:15 AM – 11:15 AM: every 60 minutes 3:30 PM – 7:30 PM: every 60 minutes	60

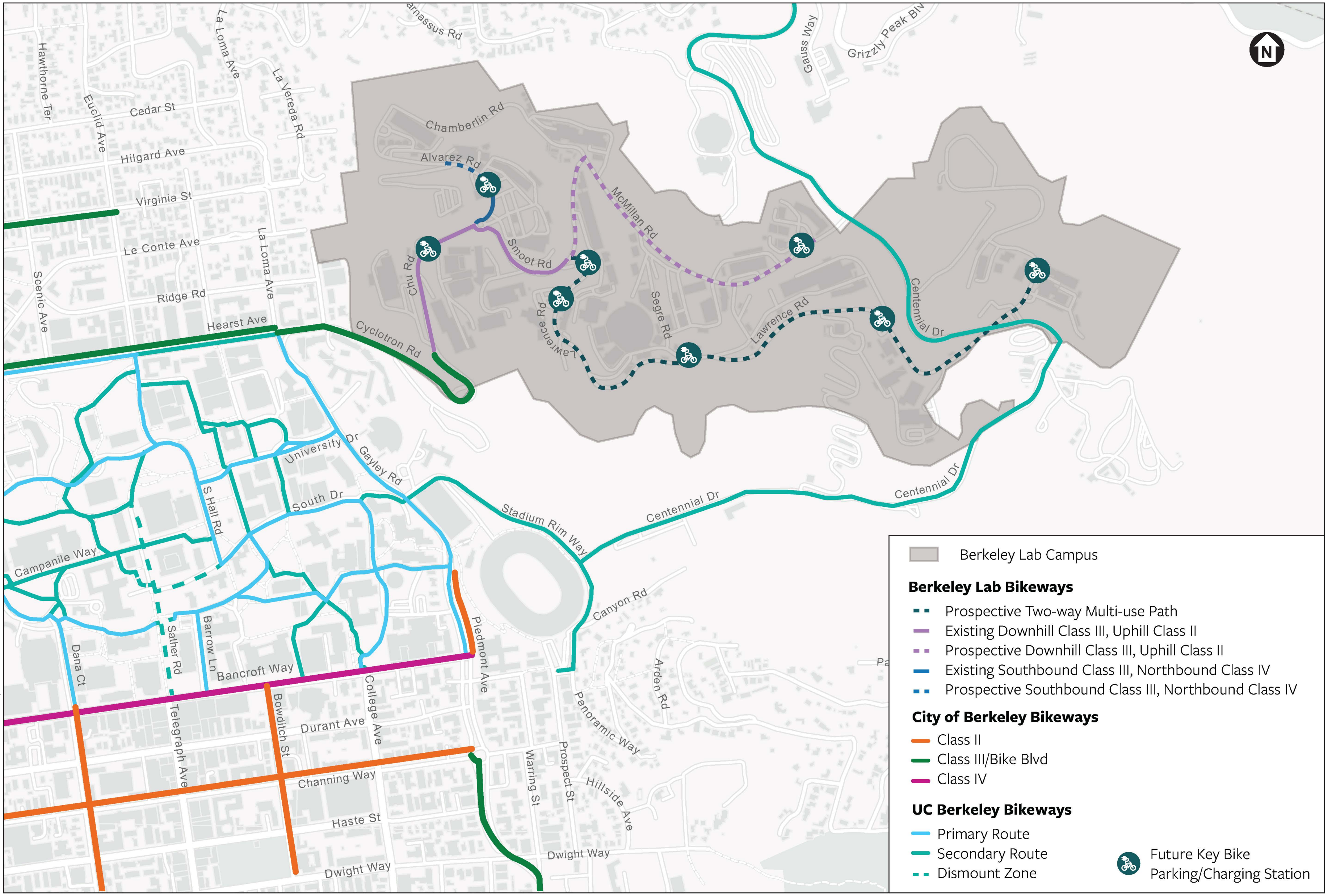
NOTES:
a. Service description as of August 2024.
b. Ridership as of April 2024

SOURCE: LBNL, 2024c and 2024d; summarized by Fehr & Peers.

Figure 4.14-2 shows the existing and prospective bicycle facilities within the Berkeley Lab campus and in the surrounding areas.

Bicyclists, including micromobility devices such as scooters and e-bikes, can access the campus through the three Lab gates. Bicyclists generally share the internal campus roadways with motor vehicles to travel to and from the various campus destinations. As shown in Figure 4.14-2, the campus roadways accommodate some designated bicycle facilities, generally consisting of uphill Class II bicycle lanes and downhill Class III bicycle routes, mostly on roadway segments in the western part of the campus.

Berkeley Lab accommodates bicycle parking, mostly in the form of bicycle racks, near most of the campus buildings. In addition, several Fix-It repair stations and shower facilities throughout the campus, as well as bike racks on Berkeley Lab shuttles, encourage Lab employees to bike to and from the campus. Outside of the campus, both Cyclotron Road/Hearst Avenue and Centennial Drive, which provide access to and from the Lab gates, are considered Class III bicycle routes.



SOURCE: Fehr & Peers, 2024

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Figure 4.14-2
Existing and Prospective Bicycle Network

ESA

Existing Pedestrian Network

Pedestrians can use all three gates to access the campus. Pedestrians accessing the Blackberry Gate can use intermittent but connected sidewalks, stairways, marked roadway shoulders with protective bollards, and marked crosswalks along Cyclotron Road/Hearst Avenue that connect the pedestrian network in the city of Berkeley and UC Berkeley and the Berkeley Lab campus. Although pedestrians can use Strawberry or Grizzly Peak Gates to access the campus, Centennial Drive adjacent to these gates does not provide designated pedestrian facilities and pedestrians use either the shoulder or the roadway.

Within the campus, a series of intermittent sidewalks, marked roadway shoulders with or without protective bollards, paved and unpaved paths, stairways, elevators, and marked crosswalks provide pedestrian connections between the various destinations, including buildings, parking facilities, and shuttle stops, throughout the campus.

Existing Vehicle Miles Traveled

Vehicle miles traveled (VMT) refers to the amount and distance of automobile travel attributable to a project. In 2013, Governor Jerry Brown signed Senate Bill (SB) 743, which added Public Resources Code Section 21099 to CEQA, to change the way that transportation impacts are analyzed under CEQA to better align local environmental review with statewide objectives to reduce greenhouse gas (GHG) emissions, encourage infill mixed-use development in designated priority development areas, reduce regional sprawl development, and reduce VMT in California. The Cities of Oakland and Berkeley adopted VMT thresholds in September 2016 and July 2020, respectively, to implement the directive from SB 743.

The Alameda County Transportation Commission (CTC) Countywide Travel Model is the primary tool used to estimate VMT in Alameda County. The Model includes year 2020, which approximates existing conditions. Since there is no existing or future housing anticipated on the Berkeley Lab campus, and the campus's current and future population comprises only employees and visitors, the applicable VMT metric for the proposed 2025 LRDP is the home-work (i.e., commute) VMT per worker, which measures all of the worker commute VMT by a motor vehicle on a typical weekday between homes and workplaces. Based on the Alameda CTC Model, the existing average home-work VMT per worker in the Bay Area region is 18.1, while the home-work VMT per worker in the Project transportation analysis zone (TAZ)1 is 12.9, about 29 percent lower than the regional average.

Existing Berkeley Lab Transportation Demand Management Measures

A Transportation Demand Management (TDM) program is a set of policies and programs that include incentives, information, and education to encourage employees to commute to work by modes other than driving alone. The LBNL 2006 LRDP Final EIR required the continuation and expansion of the TDM program which was in place at the time. The current Berkeley Lab TDM

[1] Transportation Analysis Zone (TAZ) is defined as a geographic polygon somewhat similar to a Census block group that is used in a travel model to represent an area of relatively homogenous travel behavior.

program includes strategies that encourage commuting options other than driving alone, such as public transit, shuttle service, biking, walking, and carpooling. The key measures of the current Berkeley Lab TDM program include (LBNL, 2024e):

- Free shuttle service for employees and visitors between the Berkeley Lab campus and various destinations in the city of Berkeley, including the UC Berkeley Campus Park, Downtown Berkeley BART Station (See Table 4.14-2 for more details on the shuttle routes);
- Pre-tax commuter incentives which allow employees to pay for transit expenses before taxes;
- Long-term and short-term bicycle parking and amenities such as Fix-It repair stations, showers, and bicycle racks on Berkeley Lab shuttles;
- Electric bike discount purchase program through the UC Office of the President;
- Discounted electric bike leasing through Ridepanda;
- Carpool matching and preferred on-site carpool parking;
- Guaranteed Ride Home through the Alameda County Transportation Commission;
- Regular employee outreach and education to employees about all their commuting options; and
- Remote and hybrid work for eligible employees.

Mode Shares

Periodically, Berkeley Lab conducts a survey of employees to understand commute characteristics, estimate travel mode shares, and adjust the TDM program to better meet the needs of the employees. **Table 4.14-3** summarizes the mode shares of current employees based on the latest survey, which was conducted in spring 2024. About 30 percent of the employees drive alone to work, about 2 percent carpool, 14 percent take the shuttle (with about 5 percent riding BART and 9 percent using other modes to access the shuttles), 3 percent bike, 1 percent walk, and 49 percent work remotely on a typical weekday (LBNL, 2025).

TABLE 4.14-3
BERKELEY LAB EMPLOYEE WORK COMMUTE MODE SHARES

Primary Access Mode	Percent[a]
Drive Alone	30%
Carpool	3%
Shuttle, accessed by BART	5%
Shuttle, accessed by other modes	9%
Bike	3%
Walk	1%
Remote Work	49%
Total	**100%**

NOTES:
a. Based on employee commute survey conducted by UC LBNL in spring 2024 and the number of employees working remotely provided by UC LBNL in spring 2024.
SOURCE: LBNL, 2025 summarized by Fehr & Peers.

4.14.3 Regulatory Framework

State

Senate Bill 743

On September 27, 2013, SB 743 was signed into law, building on legislative changes from SB 375, Assembly Bill (AB) 32, and AB 1358. SB 743 began the process to modify how impacts to the transportation system are assessed for purposes of CEQA compliance. SB 743 created a shift in transportation impact analysis under CEQA from a focus on automobile delay, as measured by level of service (LOS) and similar metrics, toward a focus on reducing VMT.

SB 743 also included amendments that revise the definition of "infill opportunity zones" to allow cities and counties to opt out of traditional LOS standards established by CMPs and required the Governor's Office of Planning and Research (OPR) to update the *CEQA Guidelines* and establish criteria for determining the significance of transportation impacts. The statute states that upon certification of the new criteria, automobile delay, as described solely by LOS or similar measures of vehicular capacity or traffic congestion, shall not be considered a significant impact on the environment under CEQA, except in certain locations specifically identified in the new criteria.

The new criteria, contained in *CEQA Guidelines* Section 15064.3, were certified and adopted in December 2018. Section 15064.3 states that VMT is the most appropriate metric to assess transportation impacts and that, with limited exceptions, a project's effect on automobile delay does not constitute a significant environmental impact.

University of California

The University of California Policy on Sustainable Practices

The University of California (UC) *Policy on Sustainable Practices* outlines sustainability goals and strategies for all UC campuses and medical centers, including Berkeley Lab; it covers climate and energy, transportation, water, green building, waste, food, and operations. Aligned with State goals, UC has a requirement for all campuses to achieve a 90-percent reduction in GHG emissions from all scope types by 2045 (from a 2019 baseline) and to neutralize any remaining emissions through carbon removal. UC recognizes that single-occupant vehicle (SOV) commuting is a primary contributor to commute GHG emissions and localized transportation impacts. Accordingly, UC has set the following goals related to transportation:

- By 2025, each location shall strive to reduce its percentage of employees and students commuting by SOV by 10 percent relative to its 2015 SOV commute rates.
- By 2050, each location shall strive to have no more than 40 percent of its employees and no more than 30 percent of all employees and students commuting to the location by SOV.
- Each location (campus) will develop a business-case analysis for any proposed parking structures serving University affiliates or visitors to the campus to document how a capital investment in parking aligns with each campus' Climate Action Plans and/or sustainable transportation policies.

University of California Facilities Manual

The UC updated its Facilities Manual that applies to all campuses, and which contains UC policies, procedures, and guidelines for campus facilities. The Facilities Manual stipulates that UC is the "authority having jurisdiction" for matters of code regulations on UC campus projects.

4.14.4 Impacts and Mitigation Measures

Significance Criteria

For purposes of this EIR, impacts related to transportation would be considered significant if they would exceed the following Standards of Significance, which are based on Appendix G of the *CEQA Guidelines*.[2]

Would the proposed 2025 LRDP implementation:

a) Conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities;

b) Conflict or be inconsistent with *CEQA Guidelines* Section 15064.3, subdivision (b);

c) Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment); or

d) Result in inadequate emergency access.

Approach to Analysis

Consistent with the *CEQA Guidelines*, this EIR's transportation impact analysis is primarily based on the evaluation of VMT per worker that would result from Project implementation. The methodology and assumptions used to estimate the VMT metrics for the proposed Project are presented below.

VMT Estimation Approach

Many factors affect travel behavior, including density of development, diversity of land uses, design of the transportation network, access to regional destinations, distance to high-quality transit, development scale, demographics, and transportation demand management. Typically, low-density development that is remote from other land uses and poorly served by non-single occupancy vehicle travel modes generates more automobile travel than high-density development in urban areas with a mix of land uses and alternative travel options.

Given these travel behavior factors, most areas of Berkeley and Oakland have lower VMT-per-capita and VMT-per-worker ratios than the nine-county San Francisco Bay Area region.

[2] Parking adequacy is not considered a significant environmental impact because effective in 2010, OPR eliminated parking adequacy from *CEQA Guidelines*. Accordingly, parking adequacy is not discussed in this EIR. However, other issues related to parking, including potential secondary physical impacts associated with adjustments in parking, are considered.

Typically, VMT is estimated using travel demand models to fully capture vehicular trip length as well as VMT behavior changes that may result from a project. This analysis uses the Alameda CTC Countywide Travel Demand Model, which is described below.

Alameda CTC Travel Model

The Alameda CTC Model represents neighborhoods in TAZs. The Alameda CTC Model includes approximately 119 TAZs in Berkeley and 369 TAZs in Oakland that vary in size from a few city blocks in the downtown cores, to multiple blocks in outer neighborhoods, to even larger geographic areas in lower density areas in the hills.

The Alameda CTC Model uses various socio-economic variables, such as number of households and residents by household type, number of jobs by employment category at a TAZ level, and transportation system characteristics such as street classification, number of lanes, major bicycle and pedestrian facilities, and transit service capacity and frequency to forecast various travel characteristics, such as daily and peak-hour travel volumes and VMT.

The Alameda CTC Model uses a four-step modeling process that consists of trip generation, trip distribution, mode split, and trip assignment. This process accounts for changes in travel patterns due to future growth and expected changes in the transportation network. The Alameda CTC Model assigns all predicted trips within, across, to, or from the nine-county San Francisco Bay Area region to the roadway network and transit system by mode (i.e., single-occupant or carpool vehicle, biking, walking, or transit) and transit carrier (i.e., bus, rail) for a given scenario. The VMT generated by each TAZ can be estimated by tracking the number of trips and the length of each trip generated by the TAZ.

The latest publicly available version of the Alameda CTC Model, released in May 2019, which incorporates land use data and transportation network improvements consistent with *Plan Bay Area 2040* (i.e., the Sustainable Communities Strategy), was used for this analysis.

The Alameda CTC Model outputs the home-work (i.e., commute) VMT per worker, which measures all of the worker commute VMT by a motor vehicle on a typical weekday between homes and workplaces. The home-work VMT per worker can be estimated by dividing the total commute VMT generated by the non-residential uses in a TAZ by the number of workers in that TAZ.

As a regional planning tool, the Alameda CTC Model was developed through an extensive model validation process. The Model is intended to replicate existing vehicular travel behavior and can provide a reasonable estimate of VMT generated in various geographic areas on a typical weekday. It also estimates future VMT that reflects planned local and regional land use and transportation system changes through 2040. The Alameda CTC Model's land use database was checked to confirm that the 2040 land use assumptions for the Project TAZ accurately reflect the anticipated Berkeley Lab population under the full development of the 2025 LBNL LRDP as well as

UC Berkeley population at full development under the UC Berkeley 2021 LRDP. Thus, the Alameda CTC Model was used to conduct the VMT assessment for the proposed Project.[3]

Impact Analysis

LRDP Impact TRANS-1: Implementation of the LBNL 2025 LRDP would not conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities. (*Less than Significant*)

Consistency with UC Policy on Sustainable Practices

The proposed 2025 LRDP is generally consistent with the transportation-related goals and policies in the UC *Policy on Sustainable Practices*. As shown in Table 4.14-3, Berkeley Lab employees currently have a drive-alone mode share of 30 percent. In comparison, a commute survey conducted in 2014 showed that Berkeley Lab employees had a drive-alone mode share of 58 percent. This is a 28 percent reduction and satisfies the *UC Policy on Sustainable Practices* goal to reduce the percentage of employees and students commuting by 2025 by SOV by 10 percent relative to the 2015 SOV commute rates.

By 2050, the UC *Policy on Sustainable Practices* strives to have no more than 40 percent of employees and no more than 30 percent of all employees and students commuting by SOV. The current 30 percent employee drive-alone mode share meets this goal. Berkeley Lab is expected to continue to meet this goal through the continued and potential expansion of the TDM measures already implemented at the campus, including remote and hybrid work policies.

In addition, the proposed 2025 LRDP would increase the “adjusted daily population” (ADP)–an estimate of Lab staff and other authorized persons who would be present on the campus on a typical weekday–from about 3,000 under current (year 2024) conditions to about 4,200 at the 2025 LRDP horizon (year 2045), which corresponds to an increase in ADP of about 1,200. However, the total parking supply available to Berkeley Lab staff and other authorized persons would remain similar to the current supply of 1,700 parking spaces (See Chapter 3, *Project Description,* for more information on campus parking supply). While some existing parking facilities would likely be removed to accommodate new buildings, and some existing buildings would be demolished and could be replaced with new surface parking lots, Berkeley Lab expects to maintain the current parking supply of approximately 1,700 on-site parking spaces available for staff and other authorized persons. Considering that there would be no increase in the total parking supply, only about 400 current parking spaces that are typically unoccupied would be available to accommodate the future parking demand generated by the 1,200 ADP increase. The limited available parking supply would mean that fewer staff and visitors would be able to drive to the campus and park. Thus, it is expected that the limited parking supply at the campus

[3] Although the planning horizon of the proposed 2025 LRDP is the year 2045, the cumulative analysis in this section is for the year 2040 because the latest version of the Alameda CTC Model, which is the primary tool used to develop traffic volume and VMT forecasts in the project area, goes out only to 2040. The 2040 land use database in the Alameda CTC Model accounts for the full development of the 2025 LBNL LRDP and the UC Berkeley 2021 LRDP and other foreseeable land use changes in the surrounding areas that are expected between 2040 and 2045 (see Section 4.0, *Environmental Setting, Impacts, and Mitigation Measures*, starting on page 4.0-7, for a list of cumulative projects included in this analysis). Therefore, the difference of 5 years does not make the results any less conservative.

combined with limited available parking outside of the campus would require a larger percentage of the staff and visitors to avoid driving and instead shift to other travel modes, which is consistent with the requirements of the UC *Policy on Sustainable Practices*.

Since, for the reasons above, the proposed 2025 LRDP would not conflict with the UC *Policy on Sustainable Practices*, the impact would be less than significant.

Consistency with Local Plans and Policies

As discussed in Chapter 1, *Introduction*, the University of California is constitutionally exempt from local governments' regulations, such as city and county general plans, land use policies, and zoning regulations, whenever using property under its control in furtherance of its educational purposes. UC LBNL nevertheless seeks to cooperate with local jurisdictions to reduce any physical consequences of potential land use conflicts to the extent feasible. In view of this cooperation, the following consistency analysis is provided only for informational purposes.

Berkeley's General Plan and Oakland's LUTE and Transit First and Alternative Modes Policy

City of Berkeley and Oakland policies both strongly encourage the use of non-automobile transportation modes, including transit. The proposed Project would encourage the use of transit by increasing employment at an existing employment site centrally located in the region, near an urban environment, and in the vicinity of multiple local and regional transit service providers.

The proposed 2025 LRDP would continue to maintain and potentially expand the current TDM measures at the Berkeley Lab campus. This includes maintaining the Lab's robust shuttle service for both internal campus travel and for connecting the campus to Downtown Berkeley BART Station and various other surrounding destinations. This shuttle service would continue to accommodate and encourage staff and visitors to use non-driving modes, such as BART and other shuttle-connecting transit services. UC LBNL is currently constructing a transit center, adjacent to central services such as dining, lodging, and conference/event spaces, to create a centralized transit hub in one central location. Under the proposed 2025 LRDP, UC LBNL would make further improvements at the transit center and other locations throughout the campus to co-locate shuttle stops with bicycle/micromobility parking and improved pedestrian connections.

The City of Berkeley General Plan states a strong preference for discouraging trucks from using residential streets. Consistent with the General Plan, the City of Berkeley has developed a truck route map to identify designated truck routes and the roadways where large trucks are prohibited. Construction and demolition activities at the Lab, as well as typical operation of the Lab, are expected to generate truck trips that would need to use streets within the City of Berkeley to travel to and from the campus. Considering the Berkeley Lab campus location and the roadway network serving the campus, trucks traveling to and from the Berkeley Lab campus are expected to primarily use the designated truck routes because they would provide the most direct routes between the campus and nearby freeways. Therefore, truck trips generated by the campus are not expected to use the prohibited roadways.

For these reasons, the proposed 2025 LRDP would not conflict with Berkeley's General Plan policies or Oakland's LUTE policies or Transit First and Alternative Modes Policy.

Berkeley and Oakland's Complete Streets Policies, Pedestrian Master Plans, and Bicycle Master Plans

City of Berkeley and Oakland policies both strongly encourage the use of non-automobile transportation modes, such as transit, bicycling, and walking. The proposed 2025 LRDP would encourage the use of non-automobile travel modes and is consistent with these policies and plans as described below.

Considering the very hilly terrain, limited access points, and somewhat isolated location of the Berkeley Lab campus, non-automobile travel modes, especially walking and biking, may not be a viable commuting option for many Lab employees and visitors. However, Berkeley Lab's TDM program, especially the shuttle network, successfully encourages the use of non-automobile travel modes. This is demonstrated by the relatively low drive-alone mode share (see Table 4.14-3) and lower-than-regional average commute VMT per worker (see *Existing Vehicle Miles Traveled* in Section 4.14.2) for Lab employees. These trends are expected to continue under the proposed 2025 LRDP as described below.

The proposed 2025 LRDP would increase the campus ADP by about 1,200. Since the proposed 2025 LRDP would not increase the parking supply available to staff and other authorized persons, only about 400 parking spaces that are currently unoccupied would be available for the additional on-site population of 1,200. The limited available parking would mean that fewer staff and other authorized persons would be able to drive to the campus and would be encouraged to use non-automobile travel modes.

The proposed 2025 LRDP would expand the pedestrian and bicycle infrastructure within the campus, as feasible, including with new or expanded bikeways, sidewalks and improved pedestrian crossings, off-street paths, mobility hubs and bicycle parking, and amenities such as e-bike charging and shower/locker facilities. Such improvements would encourage walking, biking, and the use of e-bikes and e-scooters for both intracampus trips and commute trips to and from the campus. The proposed 2025 LRDP envisions placing new buildings amidst existing development, which would further encourage walking within the campus.

The proposed 2025 LRDP would continue and potentially improve and expand upon current Berkeley Lab TDM measures, including free and frequent shuttle service to various on- and off-site destinations. This would continue to encourage the use of non-single occupant automobile travel modes and reduce the motor vehicle trips generated by the campus.

Although neither Berkeley nor Oakland's Pedestrian or Bicycle Master Plans identify any specific improvements adjacent or near the Berkeley Lab campus, the proposed 2025 LRDP would not make any modifications to the public right-of-way outside of the campus and would not adversely affect installation of potential future facilities.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025

LRDP is expected to be similar in intensity and character to that portrayed in the scenario. Any of the hypothetical buildings that are analyzed under the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of transportation impacts. The Illustrative Development Scenario posits the development of new bikeways, new pedestrian facilities such as new sidewalks and paths, shuttle system improvements, and new mobility hubs, which in combination would encourage walking, biking, and transit use within the campus. In addition, since the Illustrative Development Scenario does not provide increased on-site parking supply proportional to the ADP increase, a larger percentage of employees and visitors would be encouraged to avoid driving to the campus. Therefore, campus development consistent with the Illustrative Development Scenario would be consistent with the various UC and local plans and policies that discourage driving and encourage the use of non-automobile travel modes. For the reasons stated above, this impact would be less than significant.

LRDP Impact TRANS-2: Implementation of the LBNL 2025 LRDP would not conflict or be inconsistent with *CEQA Guidelines* Section 15064.3, subdivision (b). (*Less than Significant*)

CEQA Guidelines Section 15064.3, subdivision (b) refers to the discontinuation of vehicle level of service (LOS) as a transportation impact analysis metric and instead identifies VMT as the appropriate metric to evaluate a project's transportation impacts. A project would have a significant transportation impact if it would cause a substantial increase in VMT. To determine whether a project would cause a substantial increase in VMT, OPR's *Technical Advisory* recommends that the project's transportation efficiency (project VMT per resident for residential uses or project VMT per worker for employment-based uses) be compared with the transportation efficiency of existing regional development (existing regional VMT per resident or worker). This would determine whether the project would be more or less efficient than the overall existing development in the region.

Since Berkeley Lab is an employment center with no residential uses, and future campus development under the proposed 2025 LRDP would promote additional campus employment, VMT per worker is the appropriate metric to evaluate the proposed 2025 LRDP's transportation impacts.

According to OPR's *Technical Advisory*, the applicable threshold for the proposed Project, which is also consistent with both the cities of Berkeley and Oakland's VMT guidelines, is:

- For office uses, a project would cause substantial increase in VMT if it exceeds the existing regional VMT per worker minus 15 percent.

Consistent with OPR's *Technical Advisory*, screening criteria can be used to identify projects that can be expected to cause a less than significant impact without conducting a detailed evaluation. The OPR screening criterion applicable to the proposed Project is:

- **Low-VMT Areas:** The Project meets map-based screening criteria by being in an area that exhibits below-threshold VMT, or 15 percent or more below the regional average.

The application of this screening criterion to the proposed 2025 LRDP is discussed below.

Table 4.14-4 shows the 2020 and 2040 home-work VMT per worker for TAZ 50, the TAZ in which the proposed Project is located, as well as the applicable VMT thresholds of 15 percent below the Bay Area regional average. The 2020 and 2040 home-work VMT per worker in the Project TAZ are less than the Bay Area regional averages minus 15 percent. Thus, the proposed Project would satisfy this screening criterion.

TABLE 4.14-4
PROJECT VMT SCREENING SUMMARY

Geographic Area	Home-Work VMT per Worker (2020)	Home-Work VMT per Worker (2040)
Project TAZ (Alameda CTC Model TAZ 50)	12.9	13.4
Bay Area Regional Average	18.1	18.2
Bay Area Regional Average minus 15% (i.e., screening criterion)	15.4	15.5
Meet Screening Criterion?	Yes	Yes

NOTES:
a. Based on the results of the Alameda CTC Travel Demand Model as run by Fehr & Peers.
SOURCE: Fehr & Peers, 2024.

Since the proposed 2025 LRDP would satisfy the Low-VMT Areas screening criterion, it is presumed to not cause substantial increase in VMT, and therefore, would not conflict or be inconsistent with *CEQA Guidelines* Section 15064.3, subdivision (b). It thereby would have a less than significant impact on VMT.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of transportation impacts. As discussed above, this is a VMT-related impact. VMT is primarily based on project location and availability of various transportation modes. Campus development analyzed under the Illustrative Development Scenario would reach the same conclusions as the proposed 2025 LRDP analysis above, because the project site and projected population increase would be identical. Because the campus is in a Low-VMT Area under 2020 and 2040 conditions, this impact would be less than significant.

LRDP Impact TRANS-3: Implementation of the LBNL 2025 LRDP would not substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment). (*Less than Significant*)

The proposed 2025 LRDP would largely maintain the Berkeley Lab campus's current roadway network. Potential modification to the roadway network may include construction or realignment of driveways or access roads to serve new buildings or parking facilities, construction of new campus trails to improve pedestrian and bicycle connectivity, and improvements to the existing roadways to better accommodate shuttles, bicycles, and pedestrians. New or modified roadways would be designed consistent with applicable regulations and standards, including those related to roadway widths, design speed, and sight distance for the various travel modes.

The proposed 2025 LRDP does not identify specific projects or provide engineering designs. Any new or reconfigured roadway or trail would be subject to the UC Facilities Manual, which requires UC campus compliance with the California Building Standards Code, Parts 1 to 12, and all amendments. To the extent indicated in the *UC Facilities Manual*, UC LBNL would also need to follow applicable best practices in roadway design guidance such as the Caltrans Highway Design Manual and the California Manual on Uniform Traffic Control Devices, and NACTO publications.

The *UC Facilities Manual* identifies UC LBNL as the authority having jurisdiction (AHJ) for matters of campus code regulations (University of California, 2023). Nevertheless, local jurisdictions can review Berkeley Lab project-related emergency access plans with a focus on such items as road location, configuration, turning radius, and width. As the AHJ, UC LBNL would ensure that all proposed transportation network modifications on the campus meet the above-mentioned code requirements. UC LBNL would also work collaboratively with UC Berkeley, the City of Berkeley, and other jurisdictions as appropriate to ensure that transportation facilities, especially those with off-campus connections, are appropriately designed to minimize hazards. Therefore, campus development under the proposed 2025 LRDP would be subject to and constructed in accordance with applicable AHJ, City, State, federal, and/or industry standard roadway design and safety guidelines, and new or modified transportation facilities would not increase hazards.

The proposed 2025 LRDP is an overarching plan to guide long-term development of Berkeley Lab campus research and supporting uses; it would continue to provide similar uses at the campus and would not be expected to introduce an incompatible use, such that would result in a large number of trucks or farm equipment to use the campus roadways, with the potential to create a transportation hazard.

New campus development under the proposed 2025 LRDP would be designed based on the applicable design standards and would not substantially increase hazards due to geometric design features. In addition, campus development under the proposed 2025 LRDP would continue to support conventional, zone-compatible campus uses and would avoid incompatible uses. Therefore, the impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the scenario. Any of the buildings and transportation infrastructure analyzed in the scenario might be similar to future development constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of transportation impacts. Multimodal access and circulation for each specific building or infrastructure improvements posited in the Illustrative Development Scenario would be reviewed as part of the project development process, and the project would be designed consistent with the applicable regulations and standards in place at that time to minimize transportation hazards. For the reasons stated above, this impact would be less than significant.

LRDP Impact TRANS-4: Implementation of the LBNL 2025 LRDP would not result in inadequate emergency access. (*Less than Significant*)

Potential Project-related changes to the campus's roadway system are assessed to determine whether they would impair, hinder, or preclude adequate emergency vehicle access.

Under existing conditions, primary campus emergency services are provided through an on-site fire station (Fire Station No. 19 currently operated by Alameda County Fire Department and located in Building 48) and complemented by external agencies, such as the Berkeley Fire Department, as needed (See Section 4.13, *Public Services and Recreation*, for more information on fire protection services impacts). External agency emergency vehicles approach the Berkeley Lab campus through either Blackberry Gate on Cyclotron Road, or Strawberry or Grizzly Peak Gates on Centennial Drive.

Under the proposed 2025 LRDP, UC LBNL would continue to maintain the on-site fire station as well as the current campus vehicular circulation network, which would continue to provide emergency vehicle access throughout the campus, including through the existing gates. However, the existing campus roadways may be modified to provide better service for Lab drivers, bicyclists, and pedestrians. Roadway segments may be constructed to provide access to new buildings or parking facilities, and bicycle and pedestrian facilities may be improved or newly constructed. Future roadways and potential modifications to the existing roadways would be designed consistent with applicable regulations and standards, including those related to roadway widths, turning radii, and number of access points, to continue to accommodate emergency vehicle access throughout the campus.

All internal campus roadway reconfigurations would be designed and constructed in a manner consistent with the *UC Facilities Manual*, which requires that UC LBNL comply with the California Building Standards Code, Parts 1 to 12 and all amendments. UC LBNL would also comply with applicable federal, State, and local agency regulations related to roadway and transportation facility design. For example, as with all existing campus buildings and facilities, all new buildings and facilities constructed under the proposed 2025 LRDP would be made accessible from at least two points; thus, if one access point is blocked, emergency vehicles can approach the building or facility from at least one other direction.

UC LBNL would not modify public streets outside the campus under the proposed 2025 LRDP. Thus, any off-site and/or public streets would continue to accommodate emergency vehicles unimpeded by the proposed Project. As required by the California Vehicle Code, non-emergency vehicles would continue to yield the right-of-way to emergency vehicles on both the internal Lab roadway network and the external public streets serving the Lab campus.

In summary, the proposed 2025 LRDP would not make any changes to the adjacent public streets or include elements that would conflict with adopted codes regarding street widths and turning movements. Furthermore, the proposed Project would not include any design features that would hinder or preclude emergency vehicle access. Therefore, proposed 2025 LRDP implementation would not result in inadequate emergency access, and the impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the scenario. Any of the hypothetical buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of transportation impacts. Emergency vehicle access for each specific future project consistent with those analyzed in the Illustrative Development Scenario would be reviewed as part of each respective project development process. Furthermore, any future projects would be designed consistent with the applicable regulations and standards in place at the time to ensure that adequate emergency vehicle access would continue to be available throughout the campus. For the reasons stated above, this impact would be less than significant.

Cumulative Impacts

LRDP Impact CUM-TRANS-1: Implementation of the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, would not result in significant cumulative transportation impacts. (*Less than Significant*)

Cumulative transportation impacts consider impacts that would result from proposed 2025 LRDP implementation combined with the impacts resulting from other future land development and transportation changes anticipated to occur in and around the Berkeley Lab campus by 2045. The Project's contribution to cumulative impacts would be considerable if it were to worsen an existing or result in a new significant cumulative impact. Cumulative transportation impacts in the project area may result from other land development projects and/or transportation network changes that are reasonably expected to occur in the campus vicinity.

As noted under LRDP Impact TRANS-1, the Alameda CTC Model that was used to analyze the Project's VMT impact accounts for the full development of Berkeley Lab under the 2025 LBNL LRDP and UC Berkeley Campus under the UC Berkeley 2021 LRDP, and also accounts for cumulative projects identified in Section 4.0, *Environmental Setting, Impacts, and Mitigation Measures*. There are no other land development projects or transportation network changes identified in the Berkeley Lab campus vicinity, including on the UC Berkeley campus, or within the cities of Berkeley and Oakland, that would result in traffic increase and/or changing travel patterns on the transportation facilities within the campus vicinity. Therefore, impacts presented in LRDP Impacts TRANS-1 through TRANS-4 above also represent the proposed 2025 LRDP cumulative impacts and account for the past, present, and reasonably foreseeable future projects on the Berkeley Lab campus and vicinity, including on the UC Berkeley campus, and within the cities of Berkeley and Oakland, as described earlier in this section. Those impact analyses provide the following findings:

- The proposed 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, would not result in a conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities.
- The proposed 2025 LRDP would not result in a conflict or be inconsistent with CEQA Guidelines Section 15064.3, subdivision (b). Regarding cumulative VMT impacts, OPR's *Technical Advisory* notes that "[a] project that falls below an efficiency-based threshold that is aligned with long-term environmental goals and relevant plans would have no cumulative impact distinct from the project impact. Accordingly, a finding of a less than significant project impact would imply a less than significant cumulative impact, and vice versa." As this EIR uses an efficiency-based metric to analyze the proposed Project's effect, a separate analysis of cumulative VMT impact is not required. Nonetheless, LRDP Impact TRANS-2 includes an estimate of home-work VMT per worker for the Project under 2040 conditions, which accounts for past, present, and reasonably foreseeable future projects, as described earlier in this section. As shown in Table 4.14-4, the home-work VMT per worker under 2040 conditions would continue to be below the impact threshold.
- The proposed 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, would not substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).
- The proposed 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects would not result in inadequate emergency access.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in this scenario. As such, the Illustrative Development Scenario is an appropriate and conservative basis for the evaluation of transportation impacts. Future projects consistent with those analyzed under the Illustrative Development Scenario, when combined with other projects in the campus vicinity, would also, for the reasons stated above, result in cumulative impacts on transportation that would be less than significant. For the reasons stated above, this impact would be less than significant.

4.14.5 References

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4.15 Utilities and Service Systems

4.15.1 Introduction

This section assesses the potential for the implementation of the proposed LBNL 2025 LRDP to result in significant impacts on utilities and service systems. The section presents a description of the existing environmental setting as it relates to utilities and service systems; includes a summary of the University plans and policies and applicable federal, State, and local laws and regulations related to these resources; identifies significance criteria used to evaluate impacts on utilities and service systems; and presents the results of the impact assessment, including any significant impacts and associated mitigation measures. Project impacts on all utilities are addressed in this section except those on the Berkeley Lab stormwater collection and drainage system, which are addressed in Section 4.9, *Hydrology and Water Quality*.

The section relies in part on the results of a Water Supply Assessment (WSA) prepared by the East Bay Municipal Utility District (EBMUD) for the proposed 2025 LRDP (see **Appendix WSA**). Additional information to inform the analysis was obtained from the EBMUD *Urban Water Management Plan 2020* (UWMP) and California Department of Resources Recycling and Recovery (CalRecycle).

4.15.2 Environmental Setting

Water

The Berkeley Lab campus is served by existing water supplies, treatment facilities, and distribution systems, which are operated and managed by EBMUD as described below.

Water Supply

EBMUD provides potable water to approximately 1.4 million people throughout portions of Alameda and Contra Costa Counties, including the cities of Berkeley and Oakland. EBMUD obtains approximately 90 percent of its water from the Mokelumne River watershed and transports it through pipe aqueducts to temporary storage reservoirs in the East Bay hills. EBMUD has water rights and facilities to divert up to a daily maximum of 325 million gallons per day (MGD) from Mokelumne River. However, this allocation may be constrained by several factors, including upstream water use by prior water right holders, downstream water use, and other downstream obligations, including protection of public trust resources, drought, or less-than-normal rainfall for more than a year, and emergency outage. The remaining 10 percent of EBMUD's water supply originates as runoff from the protected watershed lands in the East Bay area and is stored in five terminal reservoirs within EBMUD's service area. The availability of water from local runoff depends on hydrologic conditions and terminal reservoir storage availability (EBMUD, 2021a).

EBMUD's water supply system consists of a network of reservoirs, aqueducts (pipelines), water treatment plants, pumping plants, and other distribution facilities and pipelines that convey Mokelumne River water to EBMUD customers. EBMUD's Mokelumne River supply is stored in the 2,260 acre-feet surface area, 209,950 acre-feet per year (AFY) permitted capacity Pardee

Reservoir, located 38 miles northeast of the City of Stockton. From the Pardee Reservoir, water from the Mokelumne River travels 10 miles downstream to the 7,470-acre surface area, 431,500 AFY permitted capacity Camanche Reservoir. Water is then transported to the Pardee Tunnel for further transportation across the Sacramento-San Joaquin Delta (Delta) to the Mokelumne Aqueduct System, the Lafayette Aqueduct System, and then to EBMUD's water treatment plants or one of EBMUD's five terminal reservoirs for later treatment (EBMUD, 2021a).

While the number of accounts in EBMUD's service area has increased steadily since 1970, the average daily water demand has not increased correspondingly; outside of droughts, demand has remained relatively stable. In 2020, the annual average daily water demand was approximately 181 MGD. This number represents potable water demand, when adjusted for reductions provided by water conservation and recycled water programs. The total adjusted potable water demand is projected to increase to 209 MGD by 2045 (EBMUD, 2021a).

Despite EBMUD's aggressive conservation and water recycling programs, Mokelumne River and the local watershed supply are not enough to meet the projected 2045 customer demands during multi-year droughts without substantial water use reductions. To meet projected water needs and address deficient supply during severe droughts, EBMUD is working to identify supplemental water supplies and additional recycled water programs. New water supplies will come from water transfers, groundwater storage, and regional supply projects (EBMUD, 2021a).

Additionally, recycled water treatment facilities have been constructed at EBMUD's wastewater treatment plant, located at the foot of the San Francisco-Oakland Bay Bridge. EBMUD stores the recycled water in a 1.5-million-gallon storage tank at the wastewater treatment plant and uses another 2.4 MGD at the plant for various industrial processes as well as landscape irrigation. EBMUD's Updated Recycled Water Master Plan identifies additional implementation programs, including planned expansions of the San Ramon Valley recycled water project, the East Bayshore recycled water project, and a satellite recycled water project at the Diablo Country Club. These are expected to increase recycled water production and use by approximately 1 MGD in 2025 (EBMUD, 2019).

In addition, EBMUD holds a water service contract with the U.S. Bureau of Reclamation (USBR) to receive water from the Central Valley Project (CVP) through the Freeport Regional Water Project in years when EBMUD's water supplies are relatively low. On February 28, 2020, EBMUD signed a contract with the USBR that "converted" its 2006 water service contract to a permanent repayment contract pursuant to the 2016 Water Infrastructure Improvements for the Nation Act (EBMUD, 2021b). Qualifying years for obtaining CVP water are those in which EBMUD's total stored water supply is forecast as of March 1, updated monthly through May 1, to be below 500 thousand acre-feet (TAF) on September 30 of that year. The contract enables EBMUD to receive up to 133 TAF of CVP water in a single qualifying year, not to exceed a total of 165 TAF over three consecutive qualifying years (EBMUD, 2021b). Because EBMUD relies on CVP deliveries during dry and critically dry periods, the CVP supply constitutes a critical component of EBMUD's water supply reliability.

Water Treatment Facilities

There are six water treatment plants in the EBMUD water supply and distribution system which have a combined treatment capacity of over 375 MGD. The Orinda Water Treatment Plant, which serves Oakland, including Berkeley Lab, has the largest output with a maximum capacity of 200 MGD. All water delivered to customers is filtered through sand and anthracite. Each water treatment plant also provides disinfection, fluoridation, and corrosion control (EBMUD, 2022a).

Water Distribution

EBMUD Water Distribution System

After water is treated at one of the water treatment plants, it is distributed throughout EBMUD's service area, which is divided into 125 pressure zones ranging in elevation from sea level to 1,450 feet. Approximately 50 percent of treated water is distributed to customers purely by gravity. The EBMUD water distribution network includes 4,200 miles of pipelines, 131 pumping plants, and 167 water distribution reservoirs (EBMUD, 2021a).

EBMUD provides the high-pressure city water (HPCW) supply for Berkeley Lab at two separate connections. The primary connection is to EBMUD's Shasta Pressure Zone, which provides water service to customers within an elevation range of 900 to 1,050 feet and is served by a reservoir (tank) with a two-million-gallon capacity. The second connection is to the Berkeley View Pressure Zone, which provides water service to customers within an elevation range of 1,050 to 1,250 feet and is served by a reservoir (tank) with a one-million-gallon capacity. The Shasta feed provides roughly 85 percent of the water used at Berkeley Lab, while the Berkeley View feed provides the remainder of the onsite supply.

The Lab receives its water through a 12-inch EBMUD meter on Campus Drive in the Shasta Pressure Zone and an 8-inch EBMUD meter on Summit Road from the Berkeley View Pressure Zone. Water passing through those meters also supplies water to the University of California Berkeley's Hill Campus East, including the Lawrence Hall of Science (above Berkeley Lab), and Botanical Garden (below Berkeley Lab). Recently, Berkeley Lab installed proprietary flow meters on each feed, plus a third meter at the point where water leaves the Lab distribution system at Strawberry Gate to supply the UC Botanical Garden. Together, data from those meters is used to determine the Lab's aggregate on-site water consumption, excluding water consumption by UC Berkeley facilities. In FY 2023, the Lab consumed approximately 42.6 million gallons of water (LBNL, 2024). Approximately 29.2 million gallons (68 percent) of water consumed in FY 2023 was used in the cooling towers on the campus.

Berkeley Lab Water Distribution System

The HPCW is distributed throughout Berkeley Lab by an extensive distribution system piping layout, providing domestic and fire protection water to the entire campus. The distribution system also supplies make-up water for cooling towers, irrigation water, and water for other miscellaneous uses. The system includes fire hydrants, fire department connections, and sprinkler services to almost all on-site buildings. In most Lab areas, the distribution system is looped and equipped with shut-off valves, which can be used to isolate portions of the system for repair or replacement while still maintaining full service to most Lab facilities. With the looped distribution system layout, other portions of the system can continue to be served from the other side of each loop.

Due to elevation differences throughout the Lab, there are five main pressure zones operating at the nominal pressure of 70 to 160 pounds per square inch (psi), prior to secondary pressure reduction at most service points (LBNL, 2020).[1] The water distribution system is entirely a gravity system, except for diesel-powered pumps installed at two of the three emergency fire protection system tanks. Most of the existing piping in the system is either cement mortar lined and coated steel pipe (CMLC) with welded joints or mortar lined ductile iron pipe with mechanical joints.[2] A couple of mains are constructed of high-density polyethylene (HDPE) pipe, specifically at the Lab's northeast corner. Pipes have been designed and installed to resist forces caused by earth movement due to slides and/or earthquakes, and/or located to avoid potential unstable earth areas.

Emergency Water Storage System

Berkeley Lab operates and maintains three water storage tanks (two 200,000-gallon tanks and one 230,000-gallon tank) on-site for emergency water supply in the event of an EBMUD service interruption. The first tank (Tank 82) is located near Building 82 in the Northside development cluster, the second tank (Tank 68) is located at Building 68 in the Support Services cluster, and the third tank (Tank 13J) is located above Building 85 in the Strawberry development cluster. Tanks 82 and 68 are each equipped with a diesel-powered pump and automatic controls to pressurize the distribution system if EBMUD service is interrupted. Tank 13J currently maintains water flow by gravity for fire protection during emergencies. In normal operation, water is slowly circulated from the Lab system through the tanks, so they are always filled with fresh potable water, and the full 630,000 gallons are always available if required.

If one or both EBMUD water supply pipelines are damaged, or if service to Berkeley Lab is otherwise temporarily interrupted, the storage tanks and fire pumps would have the capacity to temporarily maintain adequate water supply at adequate pressure to every building and fire hydrant on the campus. (There are around 90 fire hydrants located for optimum service distribution throughout the campus. Each hydrant has one 4-inch and two 2.5-inch valve connections.) Each pump would start automatically when it senses a drop in water pressure in the distribution system. Such pump activation is announced via the campus-wide fire alarm system at the fire dispatch center. The pumps can also be manually started or stopped from the control panel at each of the pump houses. In response to recommendations made in a fire water system study conducted in 2023, Berkeley Lab plans to replace the pumping systems at Tanks 68 and 82 with new diesel pumps and install a diesel pump station at Tank 13J to improve flow; construction is anticipated within the next couple of years (LBNL, 2023).

Wastewater

Wastewater from Berkeley Lab is conveyed through the City of Berkeley and treated at EBMUD facilities before discharge into the Bay. These services and existing infrastructure are described below.

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1 Pounds per square inch: the amount of operating pressure.
2 An impressed current cathodic protection (ICCP) system protects CMLC mains from corrosion.

Wastewater Collection

Wastewater generated at Berkeley Lab is collected and carried via a gravity flow collection system that is owned and operated by the Lab, and eventually discharged to the City of Berkeley's public sewer system. All effluent passes through one of two monitoring stations – one located at Hearst Avenue (Hearst Monitoring Station) and the other at Centennial Drive in Strawberry Canyon (Strawberry Monitoring Station) – which measure the volume of effluent on a continuous basis. In addition, samples of the effluent are taken at regular intervals and evaluated for radioactivity and other constituents as mandated in the Lab's wastewater discharge permit issued by EBMUD (See Section 4.8, *Hazardous Materials,* for detail on recent monitoring results).

The Lab's effluent from the Hearst Monitoring Station, which includes groundwater infiltration (GWI) and rainfall dependent inflow and infiltration (RDI/I), flows towards the intersection of Highland Place and Cyclotron Road, where it ties into the City of Berkeley's sewer system at City sanitary sewer sub-basin 17-013. Effluent from the Strawberry Monitoring Station, which also includes GWI and RDI/I and effluent from UC Berkeley Hill Campus facilities, including the Lawrence Hall of Science, and the Botanical Garden, flows through a UC Berkeley sewer line, which ties into the City of Berkeley's system at a manhole near the intersection of Stadium Rim Road and Canyon Road, located southeast of Memorial Stadium at City sanitary sewer sub-basin 17-503. The City of Berkeley's sewer system transports the effluent from both monitoring stations to EBMUD's north interceptor sewer, which terminates at the EBMUD Main Wastewater Treatment Plant (MWWTP) located in West Oakland. During FY 2023, uses on the Lab generated approximately 0.04 MGD of wastewater (LBNL, 2024) while an average daily flow of 0.14 MGD passed through both monitoring stations.

Wastewater Treatment Facilities

EBMUD provides domestic, commercial, and industrial wastewater treatment services to approximately 685,000 people in a service district known as Special District No. 1, an 83-square-mile area of Alameda and Contra Costa Counties. EBMUD owns and operates a network of 15 wastewater pumping stations (with 0.5- to 54.7-MGD capacity) and 8 miles of force mains that convey wastewater to the EBMUD MWWTP. Treated water is disinfected, dechlorinated, and discharged through an outfall 1.2 miles off the East Bay shore into the Bay. Solids are pumped to digesters for stabilization and are then dewatered and hauled offsite. Methane generated by the digesters is used to produce renewable energy.

The MWWTP provides primary treatment for up to a peak flow of 320 MGD and secondary treatment for a maximum flow of 168 MGD. Currently, the MWWTP treats an average dry weather flow of approximately 63 MGD (EDMUD, 2024). During peak wet weather flow conditions, storage basins provide plant capacity for a short-term hydraulic peak of 415 MGD. Wet weather flows in excess of the 320 MGD primary treatment capacity are stored on-site in an 11-million-gallon wet weather concrete storage basin and returned to the MWWTP when flows subside. The remainder of the primary effluent is diverted around the secondary treatment system, disinfected, and blended with secondary effluent prior to de-chlorination and discharge to central San Francisco Bay. This discharge occurs only when the maximum secondary treatment capacity of 168 MGD is exceeded. EBMUD also operates three wet weather treatment facilities that are used to store and manage flows during wet weather events.

EBMUD recycles water at its MWWTP and has done so since the early 1970s. Recycled water is suitable for land uses that do not require potable water, such as industrial uses and certain landscaped areas. According to the 2020 UWMP, EBMUD provided approximately 8.3 MGD of recycled water to customers in 2020 and aims to meet its 2040 goal of 20 MGD. Incentives used by EBMUD to encourage customers to utilize recycled water include subsidized costs and reduced rates on recycled water, long-term contracts, grants, and low-interest loans used to retrofit buildings so that they can accommodate recycled water.

Solid Waste

Republic Services (waste and recycling contractor) collects non-hazardous, solid waste generated at Berkeley Lab, and transports it to Golden Bear Transfer station or Organic Materials Processing Facility in Richmond, California. Landfill waste is processed and then delivered to the Keller Canyon Landfill, also in Richmond. Recycled waste, including materials such as scrap metal, cardboard, paper, aluminum, and glass, is also collected and transported to the Golden Bear Transfer station. There, recycled materials are sorted, baled, and transferred to recycling vendors (Mack, 2024). Compost materials, such as food waste, soiled paper, landscape materials, and scrap wood, are composted at the Organic Materials Processing Facility located adjacent to the Transfer station. Construction and demolition waste is landfilled or diverted to recycling or compost by Republic Services or by other contractors for large construction projects. During FY 2023, the Lab generated approximately 683 tons of municipal solid waste and 2,566 tons of construction waste. Of the municipal solid waste, 458 tons or 67 percent of the waste was recycled or composted. Of the construction waste, 2,001 tons or 78 percent, was recycled (Fulton, 2024).

Electricity Facilities

Electrical power at the Lab is purchased from the Western Area Power Administration and delivered by the Pacific Gas and Electric (PG&E) transmission system to the Lab's Grizzly Peak Substation located adjacent to Building 77. PG&E delivers power to Berkeley Lab via two overhead 115-kilovolt (kV), 3-phase, 60-Hertz (Hz) transmission lines with a joint capacity of approximately 100 megawatts (MW). Both transmission lines feed power from PG&E's El Sobrante switching station to the Grizzly Peak Substation. The Grizzly Peak Substation consists of two DOE-owned 120/12 kV power transformers with a combined capacity of 100 MW. This substation is for the exclusive use of Berkeley Lab. Grizzly Peak Substation contains two transformer banks that step down electricity to the campus's 12.47 kV distribution voltage. These transformers are connected to the main switch station SW-A1, which has a total capacity of 41 MW. The most recent peak usage at the Lab was 21.5 MW, which occurred around 12:15 PM on September 8, 2022. In addition, if needed, power can be supplied to Berkeley Lab from UC Berkeley's Hill Area Substation, located adjacent to the Grizzly Peak Substation.

The main power distribution system at the Lab consists of a 12.47-kV underground system with six remote switching stations (A2-A7) and transformers that reduce voltage to 480/277 V or 208/120 V. The 12.47-kV distribution system has dual primary feeders to provide reliable and redundant power. Certain buildings are equipped with special voltage regulators to ensure that critical experiments will not be disrupted by transient voltage within the system. Current baseline electrical peak demand at the Lab is 20 MW.

Natural Gas Facilities

Natural gas is used at the Lab for space and water heating in buildings, equipment, operations, and some experimental uses. The natural gas is currently supplied by NRG Business Marketing LLC. under rates negotiated by the Defense Logistics Agency and delivered by the PG&E system. Berkeley Lab's natural gas system receives its supply from a 6-inch PG&E line operating at 50 pounds per square inch gauge (psig).[3] The point of delivery is a meter vault in the hillside area above Cyclotron Road and below Building 88. A 6-inch gas line operating at 13.5 psig distributes high pressure natural gas from PG&E's metering vault to buildings throughout the Lab, with the exception of Buildings 73 and 73A. These buildings receive their gas supply directly from a PG&E supply line that runs up Centennial Drive to the Botanical Garden. This line is capped below Building 74.

Building gas service pressure generally ranges from 0.25 to 1.25 psig. The piping for Berkeley Lab's on-site natural gas system consists of two types: tape-wrapped steel with welded joints, and polyethylene (PE) with electro-fused joints. The system includes pipes, valves, fittings, pressure-reducing stations, earthquake emergency shut-off valves, meters, and appurtenances. Recently, Berkeley Lab installed a proprietary flow meter at the point where natural gas leaves the Lab distribution system to supply the UC Berkeley's Hill Campus East, including the Lawrence Hall of Science (above Berkeley Lab). Together, data from those meters is used to determine the Lab's aggregate on-site natural gas consumption, excluding natural gas consumed by UC Berkeley facilities. The Lab's natural gas consumption in FY 2023 was 1.5 million therms or 1.2 million therms with weather-correction.

Under Berkeley Lab's *Net-Zero Vision and Roadmap*, which describes actions needed to achieve net-zero greenhouse gas (GHG) emissions by no later than 2045, the campus expects to transition away from natural gas and fuel to electricity provided by a decarbonized grid during the term of the proposed 2045 LRDP. Consistent with the UC *Policy on Sustainable Practices*, no new development under the proposed 2025 LRDP will use natural gas for space and water heating.

Communications Facilities

The communication infrastructure at the Berkeley Lab campus consists of communication manholes, underground conduit, nodes, DFN (Distributed Fiber Node), fiber optic backbone cable and copper backbone cable, and building entrance facilities. The IT network consists of three zones of coverage (Zone 1, 2 and 3) to support individual services to buildings within these zones.

Other On-site Facilities

Berkeley Lab employs building-specific or site-wide utilities specific to Lab research or specialized equipment. A description of these utilities is provided below.

Compressed Air

The site-wide compressed air system provides compressed air to laboratories and shops for cleaning or driving hand-held tools and vacuum pumps. Additionally, some buildings have

[3] Pounds per square inch gauge: the amount of operating pressure.

pneumatic controls. Compressed air is produced in Building 43 and the generation system consists of three compressors, dryers, and one 1,500-gallon receiver tank that is located on the hillside adjacent to Building 43. There is an additional booster compressor adjacent to Building 77.

Liquid Nitrogen, Argon, and Helium

Liquid nitrogen (LN2), helium (He), and argon (Ar) are provided to various buildings at the campus via bulk tanks adjacent to the buildings where these elements are used.

Chilled Water

Most buildings accomplish hydronic cooling through a combination of rooftop package DX units, local chillers with cooling towers, air cooled chillers, and air source heat pumps (ASHPs). Building 91 and 92 are served from a neighborhood-level medium temperature chilled water plant in Building 91U.

Heating Hot Water and Steam Systems

The campus does not have a large centralized hot water or steam distribution system. Buildings are heated individually with local natural gas hot water boilers, air source heat pumps, or local steam boilers, as is the case in Building 50. Building 6 generates and distributes heating hot water to Building 15 and Building 80. There is a local steam boiler in Building 86 that generates steam for bulk sterilization.

Low-Conductivity Water

There are many small Low Conductivity Water (LCW) systems located within buildings or specific rooms throughout the Lab. The largest distributed system for LCW is the system at Building 37, which is used primarily to remove heat from the numerous magnets in the synchrotron and the beam lines of the Advanced Light Source (ALS). It is also used to cool programmatic equipment in Buildings 2, 46, 53, 58, and 58A.

Treated Water/Tower Water/Condenser Water

Most treated water and condenser water systems at the Lab are isolated systems that serve individual buildings. There is no large centralized distribution system. Most systems are small in capacity and limited to the building footprint except for a few locations. There are two cooling tower systems that serve clusters of buildings via a limited distribution network: (1) Treated water is generated at Building 02U and distributed to Building 2 and Building 43, (2) Tower water is generated at cooling towers south of Building 62 and distributed to Buildings 62, 66 and 72.

Planned Utility Improvements

Berkeley Lab will soon begin the process of implementing the previously approved Linear Assets Modernization Project (LAMP), which would assess, modernize, and upgrade existing sitewide utility systems at the Berkeley Lab campus. Utility systems to be modernized include water, sewer, and storm drain lines; electric and natural gas lines; compressed air lines; and communications cables.

Project work is anticipated to begin construction in 2026 and span approximately 10 years. It is an approved and funded project that would occur independently of the proposed 2025 LRDP. As a result, the LAMP is considered part of the established Lab setting insofar as impact analysis is concerned.

4.15.3 Regulatory Framework

Federal

Clean Water Act

The Clean Water Act (CWA) established the basic structure for regulating discharges of pollutants into the waters of the U.S. and gave the U.S. Environmental Protection Agency (EPA) the authority to implement pollution control programs, such as setting wastewater standards for industry. The CWA sets water quality standards for all contaminants in surface waters. The statute employs a variety of regulatory and non-regulatory tools to reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. Under Section 401 of the CWA, every applicant for a federal permit or license for any activity which may result in a discharge to a water body must obtain State Water Quality Certification that the proposed activity will comply with State water quality standards.

National Pollutant Discharge Elimination System

The National Pollution Discharge Elimination System (NPDES) is a nationwide program for permitting surface water discharges, including from municipal and industrial point sources. In California, NPDES permitting authority is delegated to and administered by the nine regional water quality control boards (RWQCB). The San Francisco Bay RWQCB has set standard conditions for each permittee in the Bay Area, including effluent limitation and monitoring programs.

Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA), Subtitle D, contained in Title 42 of the U.S. Code Section 6901 et seq. contains regulations for municipal solid waste landfills and requires states to implement their own permitting programs incorporating the federal landfill criteria. The federal regulations address the location, operation, design, groundwater monitoring, and closure of landfills. The EPA waste management regulations are codified in Title 40 of the Code of Federal Regulations (CFR) parts 239–282. The RCRA Subtitle D is implemented by Title 27 of the PRC, approved by the EPA.

State

Urban Water Management Planning Act

California Water Code Section 10610 et seq. requires all public water systems that provide water for municipal purposes to more than 3,000 customers, or that supply more than 3,000 AFY, to prepare an UWMP. UWMPs are key water supply planning documents for municipalities and water purveyors in California. UWMPs must be updated at least every 5 years on or before July 1, in years ending in 5 and 0. Details of EBMUD's UWMP are described below.

Senate Bill 610

The State of California adopted Senate Bill 610 (SB 610) effective January 1, 2002. SB 610 requires cities and counties, when evaluating large development and redevelopment projects, to request an assessment of the availability of water supplies from the water supply entity that will provide water to a project. The Water Supply Assessment (WSA) is performed in conjunction with the land use approval process associated with a project and must include an evaluation of the sufficiency of the water supplies available to the water supplier to meet existing and future demands, including the demand for a project over a 20-year time period that includes normal, single-dry, and multiple dry years. When a new development project is accounted for in the demand projections of an UWMP, the WSA can refer to the UWMP and no further analysis is necessary.

Water Code Section 10910 and 14 CCR 15155 (entitled "City or County Consultation with Water Agencies") apply only to cities and counties. Water Code Section 10910(a) states: "Any city or county that determines that a project, as defined in Section 10912, is subject to the California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) under Section 21080 of the Public Resources Code shall comply with this part."

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act authorizes the SWRCB, which, in turn, delegated certain authority to the several Regional Water Quality Control Boards (RWQCB) to issue and enforce NPDES permits. In addition, the SWRCB develops water quality standards and performs other functions to protect California's waters. The RWQCBs, pursuant to their delegated powers, carry out the SWRCB regulations and standards as well as issue and enforce permits. The EBMUD MWWTP and Interceptor Conveyance System is covered by a NPDES permit CA0037702 (RWQCB Order No. R2-2020-0024) adopted by the San Francisco Bay RWQCB in September 2020. The EBMUD wet weather facilities are covered by a NPDES permit CA00388440 (RWQCB Order No. R2-2020-0003) adopted by the San Francisco Bay RWQCB in February 2020.

See also Section 4.9, *Hydrology and Water Quality*, for a discussion of relevant NPDES permits related to stormwater generated at Berkeley Lab.

Senate Bill X7-7 (Water Conservation Act of 2009)

The Water Conservation Act of 2009 (Senate Bill X7-7) was enacted in November 2009 and requires that all water suppliers increase their water use efficiency. Water Code Section 10608 et seq. requires urban retail water suppliers to set and achieve water use targets that would help the State achieve a 20 percent per capita reduction in urban water use by December 31, 2020. SB X7-7 requires each urban retail water supplier to develop urban water use targets and an interim urban water use target, in accordance with specified requirements. The bill is intended to promote urban water conservation standards that are consistent with the California Urban Water Conservation Council's adopted best management practices and the requirements for demand management in California Water Code Section 10631 as part of UWMPs.

Executive Orders B-29-15 and B-37-16

In April 2015, Governor Brown issued Executive Order (EO) B-29-15, which called for mandatory water use reductions. The executive order requires cuts for public landscaping and institutions that typically use large amounts of water (e.g., golf courses), bans new landscape irrigation installation, and requires municipal agencies to implement conservation pricing, subsidize water-saving technologies, and implement other measures to reduce the State's overall urban water use by 25 percent. The order also requires local water agencies and large agricultural users to report their water use more frequently.

In May 2016, Governor Brown issued EO B-37-16, which made the mandatory water use reduction of 25 percent permanent and directed the California Department of Water Resources and SWRCB to strategize further water reduction targets. The order also made permanent the requirement that local agencies report their water use monthly. Additionally, certain wasteful practices such as sidewalk hosing and runoff-causing landscape irrigation were permanently outlawed, while local agencies must prepare plans to handle droughts lasting 5 years.

Senate Bill 606 and Assembly Bill 1668

SB 606 and AB 1668 set new requirements for urban water agencies to continue to increase water efficiency beyond the 2020 water use targets developed under SB X7-7. SB 606 and AB 1688 establish guidelines for efficient water use and a framework for the implementation and oversight of the new standards, which were required to be in place by 2022. The two bills strengthen the State's water resiliency in the face of future droughts with provisions that include:

- Establishing water use objectives and long-term standards for efficient water use that apply to urban retail water suppliers, composed of indoor residential water use, outdoor residential water use, commercial, industrial and institutional (CII) irrigation with dedicated meters, water loss, and other unique local uses.
- Providing incentives for water suppliers to recycle water.
- Identifying small water suppliers and rural communities that may be at risk of drought and water shortage vulnerability and providing recommendations for drought planning.
- Requiring both urban and agricultural water suppliers to set annual water budgets and prepare for drought.

Executive Order N-7-22

On March 28, 2022, Governor Newsom issued EO N-7-22 in response to intensifying drought conditions. Among other requirements, EO N-7-22 limits a county, city or other public agency's ability to permit modified or new groundwater wells and instructs the SWRCB to consider (1) requiring certain water conservation measures from urban water suppliers, and (2) banning non-functional or decorative grass at businesses and institutions.

Assembly Bill 939 (California Integrated Waste Management Act)

AB 939, enacted in 1989 and known as the California Integrated Waste Management Act (Public Resources Code Section 40050 et seq.), requires each city and county in the State to prepare a Source Reduction and Recycling Element to demonstrate a reduction in the amount of waste being disposed in landfills. The act required each local agency to divert at least 50 percent of all solid waste (from 1990 levels), beginning January 1, 2000, and at least 75 percent by 2010. Diversion includes waste prevention, reuse, and recycling. In 2006, SB 1016 revised the reporting requirements of AB 939 by implementing a per capita disposal rate based on a jurisdiction's population (or employment) and its disposal. The new per capita disposal and goal measurement system moves the emphasis from an estimated diversion measurement number to an actual disposal measurement number, along with an evaluation of program implementation efforts.

The Integrated Waste Management Act requires local agencies to maximize the use of all feasible source reduction, recycling, and composting options before using transformation (incineration of solid waste to produce heat or electricity) or land disposal. The act also resulted in the creation of the State agency now known as CalRecycle. Under the Integrated Waste Management Act, local governments develop and implement integrated waste management programs consisting of several types of plans and policies, including local construction and demolition ordinances. The act also set in place a comprehensive statewide system of permitting, inspections, and maintenance for solid waste facilities, and authorized local jurisdictions to impose fees based on the types and amounts of waste generated.

In 2011, AB 341 amended AB 939 to declare the policy goal of the State that no less than 75 percent of solid waste generated would be source reduced, recycled, or composted by the year 2020, and annually thereafter.

Regional

EBMUD

Urban Water Management Plan

As described above, EBMUD is required by the California Water Code to update and adopt an UWMP and submit a completed plan to the Department of Water Resources every 5 years. The EBMUD UWMP 2020 provides an assessment of EBMUD's water supply and demand, an overview of the recycled water and conservation programs, compliance with the Water Conservation Act of 2009, and includes EBMUD's Water Shortage Contingency Plan (WSCP, 2020). The UWMP is part of EBMUD's long-term planning to ensure water supply reliability for EBMUD customers, especially during drought periods. The EBMUD Board of Directors adopted the final UWMP 2020 and WSCP 2020 on June 22, 2021.

EBMUD's UWMP 2020 presents estimates of projected future water demand within EBMUD's service area in five-year increments, between the years 2025 and 2050. The water demand projections in the UWMP reflect historical water use, expected population increase and other growth, climatic variability, and other assumptions.

The WSCP 2020 describes EBMUD's actions to implement and enforce regulations and restrictions for managing a water shortage when it declares a water shortage emergency under the authority of the California Water Code. It also describes EBMUD's planned actions to manage supply and demand before and during a water shortage to ensure a reliable water supply.

EBMUD's water supply assessment is included in EBMUD's WSCP 2020. The assessment compares the total water supply sources available to EBMUD with the long-term total projected water use over the next 30 years, in five-year increments, for a normal water year, a single dry water year, and a drought lasting five consecutive years. As there is substantial uncertainty in forecasting into the future, EBMUD also considers a variety of scenarios in its long-term planning, including base conditions, high water demand scenario, extreme drought scenario, and five-year historical dry period.

Wastewater Discharge Permits

EBMUD regulates all industrial and sanitary discharges that are received at its wastewater treatment facilities. Berkeley Lab holds three wastewater discharge permits issued by EMBUD for the following activities at its campus:

- General sitewide wastewater (Wastewater Discharge Permit No. 06600791) (EBMUD, 2023);
- Treated groundwater from hydraugers (subsurface drains) and groundwater extraction wells (Wastewater Discharge Permit No. 50347891) (EBMUD, 2022b); and
- "Zero-waste-discharge" treated rinse water recycled from the metal finishing operations in the Ultra-High Vacuum Cleaning Facility at Building 77 (Wastewater Discharge Permit No. 50238911) (EBMUD, 2019b).

These permits specify standard terms and conditions, individual discharge limits and provisions, and monitoring and reporting requirements. Please also see Section 4.8, *Hazards and Hazardous Materials*, for a summary of the results of recent monitoring conducted in compliance with EBMUD waste discharge permits.

University of California

UC Policy on Sustainable Practices

The UC *Policy on Sustainable Practices*, developed in 2004 and updated as recently as May 2024, establishes goals in 13 areas of sustainable practices for both individual building projects and overall facilities operations at UC campuses and locations: green building design; clean energy; climate protection; sustainable transportation; sustainable building and laboratory operations for campuses; zero waste; sustainable procurement; sustainable foodservices; sustainable water systems; sustainability at UC Health; general sustainability performance assessment; health and well-being; and diversity, equity, inclusion and justice (UCOP, 2023). Not all requirements within the UC *Policy on Sustainable Practices* apply to Berkeley Lab; only those that apply to UC "locations" and not those that apply only to "campuses." Most relevant to this discussion are the goals and policies related to energy use (i.e., green building design, clean energy, climate action), solid waste (i.e., zero waste), and water supply (i.e., sustainable water systems).

Specifically, with regard to green building design, the Lab is committed to meeting UC system–wide goals of achieving LEED Gold certification or better for all new buildings and Parksmart Silver or better for new parking structures.[4] The policy also requires that all new non-acute care

[4] For all building projects submitting Preliminary Drawings after January 1, 2024.

facilities or major renovation projects outperform California Energy Code, Title 24, requirements by at least 20 percent and strive to outperform the requirements by 30 percent. The UC *Policy on Sustainable Practices* identifies the goal of a 20 percent reduction in growth-adjusted potable water consumption by 2020 and 36 percent by 2025 (compared to a 3-year average baseline of FY 2005–06, FY 2006–07, and FY 2007–08) (UCOP, 2023).

The UC produces an annual report to track its progress toward achieving its sustainability targets. The annual report outlines ongoing progress of UC's comprehensive sustainability program, including advancement in all areas of the UC *Policy on Sustainable Practices*; research and education; Presidential Initiatives; and student, faculty, and staff engagement.

4.15.4 Impacts and Mitigation Measures

Significance Criteria

For purposes of this EIR, impacts to utilities and service systems would be considered significant if they would exceed the following Standards of Significance, which are based on Appendix G of the *CEQA Guidelines*:

Would the proposed 2025 LRDP implementation:

a) Require or result in the relocation or construction of new or expanded water, wastewater treatment, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects;

b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years;

c) Result in a determination by the wastewater treatment provider, which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments;

d) Generate solid waste in excess of state or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals; or

e) Comply with federal, state, and local management and reduction statutes and regulations related to solid waste.

Approach to Analysis

The environmental impact analysis for utilities and service systems begins with an assessment of existing utility use and infrastructure services at Berkeley Lab. The projected utilities and infrastructure demand generated by proposed 2025 LRDP implementation are then calculated and compared to existing usage to estimate the resulting Project-related net increase. Typically, utility assessments focus on supply, treatment, or generation capacity and distribution or collection infrastructure capacity. For each utility, the analysis compares the Project-related net increase against the significance criteria set forth above. If the impact would be significant, the analysis identifies feasible mitigation measures that would eliminate the impact or reduce it to a less-than-significant level.

As the Lab is neither a city nor a county it is not subject to SB 610. However, the Lab requested a WSA from EBMUD to determine and demonstrate the sufficiency of the EBMUD's water supplies to satisfy the projected water demand of Berkeley Lab at full development under the proposed 2025 LRDP (see Appendix WSA). The proposed 2025 LRDP's impact on water supply discussed below is based on the analysis in the WSA provided by EBMUD.

Impact Analysis

LRDP Impact UTIL-1: Campus development under the LBNL 2025 LRDP would not require or result in the relocation or construction of new or expanded water, wastewater treatment, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects. (*Less than Significant*)

Construction

Utility improvements and/or extensions would be constructed at Berkeley Lab to serve increases in development anticipated under the proposed 2025 LRDP, including domestic and fire water, wastewater, electrical, natural gas, telecommunications, and other on-site utilities specific to Lab research or specialized equipment. The utility infrastructure improvements required to serve development anticipated under the proposed 2025 LRDP are summarized in Chapter 3, *Project Description*. All utility infrastructure improvements under the proposed 2025 LRDP would occur on the Berkeley Lab campus, and generally would be placed underground within existing or new utility duct banks and/or under campus roadways. These are in addition to near-term utility improvements that will be constructed under the already approved and funded LAMP project. No off-site improvements would be required.

Construction activities associated with utility improvements at Berkeley Lab under the proposed 2025 LRDP would have the potential to result in significant or potentially significant impacts. However, implementation of mitigation measures and compliance with other construction-related regulatory requirements discussed in other sections of this EIR, including Section 4.1, *Air Quality*; Section 4.2, *Biological Resources*; Section 4.3, *Cultural Resources, including Tribal Cultural Resources*; Section 4.6, *Geology and Soils*; Section 4.8, *Hazards and Hazardous Materials*; Section 4.9, *Hydrology and Water Quality*; Section 4.11, *Noise and Vibration*; and Section 4.15, *Transportation*, would reduce construction-related effects associated with the utility improvements to a less-than-significant level. Furthermore, the proposed 2025 LRDP would not involve the construction of any off-campus utility improvements. As a result, the impacts associated with the construction of new utilities to serve development under the proposed 2025 LRDP would be less than significant.

Operation

The proposed 2025 LRDP would increase Berkeley Lab development as well as daily on-site campus employees and visitors; there would be an accompanying increase in campus water use and wastewater generation. As discussed under LRDP Impact UTIL-2 below, campus water demand under 2025 LRDP conditions is estimated to reach about 0.4 MGD. This demand would represent approximately 0.2 percent of the existing water treatment capacity at EBMUD's Orinda Water Treatment Plant, which has a capacity of 200 MGD. With respect to wastewater treatment, as discussed under LRDP Impact UTIL-3 below, the EBMUD MWWTP has adequate capacity to accommodate the additional wastewater flows that would be generated at Berkeley Lab as a result of the proposed 2025 LRDP. For these reasons, implementation of the proposed 2025 LRDP would not require expansion of existing public water and wastewater treatment systems.

Operation of the proposed 2025 LRDP would not require or result in the need for new or expanded telecommunications facilities, as existing and soon-to-be-developed (under LAMP) campus telecommunication infrastructure would be adequate to meet future Berkeley Lab demand. Furthermore, operation of the proposed 2025 LRDP would not require or result in the need for new or expanded natural gas infrastructure, as natural gas demand on the campus is not expected to increase substantially in the future and in fact would likely decrease under Berkeley Lab's *Net-Zero Vision and Roadmap* program efforts. Finally, operation of the proposed 2025 LRDP would increase demand for electricity on the campus. A discussion of this demand is provided in Section 4.5, *Energy*. As discussed in Chapter 3.0, *Project Description*, the Grizzly Peak Substation does not have adequate capacity to serve the increase in demand for electricity on the campus under the proposed 2025 LRDP. As a result, the substation will need to be upgraded to meet future demand at the Lab. However, implementation of mitigation measures, such as LRDP Mitigation Measure AQ-2: Best Management Practices for Dust and Emissions Control, LRDP Mitigation Measure BIO-1a: Protection of Rare Plants, LRDP Mitigation Measure BIO-1b: Protection of Special-Status Terrestrial Species, LRDP Mitigation Measure BIO-1c: Protection of Nesting Birds, LRDP Mitigation Measure BIO-1d: Protection of Roosting Bats, LRDP Mitigation Measure BIO-2: Habitat Restoration and Monitoring, LRDP Mitigation Measure CUL-2a: Cultural Resources Awareness Training, LRDP Mitigation Measure CUL-2b: Inadvertent Discovery of Cultural Resources, LRDP Mitigation Measure CUL-3: Inadvertent Discovery of Human Remains, LRDP Mitigation Measure NOI-1a: Construction Noise Control Measures, and LRDP Mitigation Measure NOI-3: Construction Vibration, and compliance with other construction-related regulatory requirements discussed in other sections of this EIR would reduce construction-related effects associated with the utility improvements to a less-than-significant level.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Each of the proposed buildings and utility improvements that are included in the scenario might be constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of impacts associated with utility infrastructure. Individual projects, such as those hypothetically identified in the Illustrative Development Scenario, would not result in significant impacts related to utility infrastructure for the reasons described above.

LRDP Impact UTIL-2: Sufficient water supplies would be available from EBMUD to serve campus development under the LBNL 2025 LRDP and other reasonably foreseeable future development during normal, dry, and multiple dry years. (*Less than Significant*)

Construction

Construction associated with the proposed 2025 LRDP would result in a temporary increase in the demand for water on the Berkeley Lab campus. This would include water needed for purposes such as dust control, certain construction processes (e.g., shoring batch plant operations, application of fireproofing), hydrostatic testing of systems, initial landscaping installation, general cleaning, and worker restrooms and drinking water. The temporary water demand for each new campus project under the proposed 2025 LRDP would be comparable to that of other similarly sized construction projects of this nature. Given this would be a temporary demand for water, it would not have a long-term effect on available water supplies and as a result, the impact of this temporary demand would be considered less than significant.

Operation

Proposed 2025 LRDP implementation would result in increased operational water demand at the Berkeley Lab campus, which is supplied by EBMUD. The analysis herein evaluates whether: (1) sufficient water supplies would be available to serve anticipated development under the proposed 2025 LRDP and other reasonably foreseeable future development in EBMUD's service area in normal, dry, and multiple dry years, and (2) if anticipated development under the proposed 2025 LRDP would require substantial conservation, rationing, and/or the development of new or expanded water supply facilities by EBMUD, the construction of which could have significant environmental impacts.

EBMUD's water supply, primarily from the Mokelumne River system, far exceeds the potential demand of any single development project in EBMUD's service area. By itself, no single development project in EBMUD's service area would require the development of new or expanded water supply facilities or require EBMUD to take other actions, such as imposing a higher level of rationing across its service area in the event of a supply shortage in dry years. Therefore, a separate project-only analysis is not provided for this topic. The following analysis instead considers whether 2025 LRDP campus development in combination with both existing development and projected growth in the EBMUD service area through 2045 would be served by existing and planned supplies or would require new or expanded water supply facilities, the construction or relocation of which could have significant impacts on the environment.

Estimated Existing Water Demand

As shown in **Table 4.15-1**, Berkeley Lab consumed approximately 42.6 million gallons in FY 2023, or approximately 0.12 MGD, with approximately 68 percent used in cooling towers and about 13 percent accounted for a variety of other identified uses: domestic plumbing fixtures (7 percent), emergency building-level single-pass cooling (3 percent), laboratory equipment (3 percent), and commercial kitchen (0.1 percent). Other uses and leaks account for the balance (18 percent).

TABLE 4.15-1
EXISTING BERKELEY LAB WATER CONSUMPTION

Water End-Use	Estimated Annual Potable Water Consumption		
	Thousand Gallons/Year	**Million Gallons/Day**	**Percent**
Cooling Towers			
NERSC/Building 59	12,900	0.035	30
Other Towers	16,313	0.045	38
Domestic Plumbing Fixtures	2,980	0.008	7
Other Processes: Emergency Building Single Pass Cooling	1,378	0.004	3
Other Processes: Laboratory Water	1,200	0.003	3
Commercial Kitchen	58	<0.001	<1
Other/Leaks	778	0.002	18
Total	**42,607**	**0.117**	**100**

SOURCE: Berkeley Lab Water Assessment, 2024

Estimated Project Water Demand

As shown in **Table 4.15-2**, Berkeley Lab projects that campus water consumption under the proposed 2025 LRDP could increase to up to 145 million gallons per year (MGY) by 2045, or about 0.4 MGD. This increase would be largely due to the future cooling needs of LBNL's Building 59, which houses the National Energy Research Scientific Computing (NERSC) facility (and which presently consumes 12.9 MGY, approximately 30 percent of existing campus water consumption). NERSC and additional Building 59 computing capabilities are projected to require up to 83 MGY by buildout under the proposed 2025 LRDP in 2045. Furthermore, cooling needs for contemplated Information Technology (IT) uses under the proposed 2025 LRDP could potentially require 16 MGY if future upgrades are constructed.

TABLE 4.15-2
PROJECTED WATER CONSUMPTION UNDER PROPOSED 2025 LRDP

Water End-Use	Estimated Annual Potable Water Consumption		
	Thousand Gallons/Year	**Million Gallons/Day**	**Percent**
NERSC/Bldg. 59 Cooling Towers	83,000	0.227	57
IT Cooling Towers	16,000	0.044	11
All Other Uses	47,000	0.129	32
Total	**145,000**	**0.397**	**100**

SOURCE: LBNL, 2024

Impact Analysis

Based on the WSA prepared by EBMUD for the proposed 2025 LRDP, the water demand for the Berkeley Lab campus, including the development under the proposed 2025 LRDP, is included in the water demand projections presented in EBMUD's 2020 UWMP. EBMUD's projections reflect both increased density and changes in land use within certain existing classifications, such as commercial and residential. These modifications lead to a higher demand for EBMUD water. The 2020 UWMP forecasts water demands over time, considering estimated variations in usage, conservation efforts, and recycled water sources. **Table 4.15-3** shows projected water demand within EBMUD's service area through 2050, consistent with EBMUD's planning horizon.

TABLE 4.15-3
2050 WATER DEMAND PROJECTIONS IN EBMUD SERVICE AREA

	Average Annual Water Demand Forecast 2050 Demand Projects (MGD)						
	2020	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**
Forecasted Water Demand	238	245	254	264	277	287	297
Water Conservation	-48	-53	-58	-61	-63	-65	-66
Recycled Water	-5	-6	-6	-9	-13	-13	-13
Raw Water	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
Planning Level of Demand (Rounded)	181	186	190	194	201	209	218

SOURCE: EBMUD, 2021

Since the 1970s, water demand within EBMUD's service area has ranged from 200 to 220 million MGD in non-drought years. The 2050 forecasted demand of 218 MGD reflects effective water recycling and conservation programs as outlined in the 2020 UWMP. Current water demand within EBMUD's service area is lower than estimated in the 2020 UWMP due to recent droughts. This discrepancy arises because planning-level demand may differ from actual demand in any given year due to water use reductions during droughts. After droughts, a rebound effect is expected, where water demand returns to projected levels. Therefore, the demand in Table 4.15-3 remains a reasonable expectation for future years, as demand is anticipated to gradually increase back to projected levels as development and water use return to pre-drought conditions. The future development and operations under the proposed 2025 LRDP would not alter EBMUD's 2050 water demand projection (EBMUD, 2024).

EBMUD's primary water source is the Mokelumne River, from which it can receive up to 325 MGD, depending on runoff availability, senior water rights of other users, and downstream fishery flow requirements. Additionally, EBMUD has a Long-Term Renewal Contract with the USBR to obtain water from the CVP via the Freeport Regional Water Facility during periods of low water supply. In some dry years, EBMUD may also purchase water transfers to meet customer demands.

A summary of EBMUD's demand and supply projections, in five-year increments, for its 30-year planning horizon is provided in **Table 4.15-4**.

TABLE 4.15-4
EBMUD SUPPLY AND DEMAND ASSESSMENT, 2020-2050

	EBMUD Planning Level of Demand (PLOD)	2020	2025	2030	2035	2040	2045	2050
Normal Year	EBMUD Planning Level of Demand (PLOD) (MGD)	181	186	190	194	201	209	218
	Mokelumne Supply (MGD)	>181	>186	>190	>194	>201	>209	>218
	Need for Water (TAF)	0	0	0	0	0	0	0
Single Dry Year	Mokelumne Supply (MGD)	121	126	129	132	138	144	151
	CVP Supplies (MGD)	60	60	60	60	60	60	60
	Total Supplies (MGD)	*181*	*186*	*189*	*192*	*198*	*204*	*211*
	Voluntary Rationing (%)	0	0	1	1	2	2	3
	Need for Water (TAF)	0	0	0	0	0	0	0
Second Dry Year	Mokelumne Supply (MGD)	82	86	89	92	98	104	111
	CVP Supplies (MGD)	74	74	74	74	74	74	74
	Total Supplies (MGD)	*156*	*161*	*164*	*167*	*172*	*178*	*185*
	Mandatory Rationing (%)	13	13	13	14	14	14	15
	Need for Water (TAF)	0	0	0	0	0	0	0
Third Dry Year	Mokelumne Supply (MGD)	141	145	146	145	132	118	105
	CVP Supplies (MGD)	12	12	12	12	12	12	12
	Total Supplies (MGD)	*153*	*157*	*158*	*157*	*144*	*130*	*117*
	Mandatory Rationing (%)	15	15	15	15	15	15	15
	Need for Water – Base Condition (TAF)	0	0	0	0	28	52	75
	Need for Water – High Demand Scenario (TAF)	0	0	21	35	60	97	125
	Need for Water – Extreme Drought Scenario (TAF)	0	0	0	13	32	55	84

NOTES: MGD = millions gallons per day; MGY = million gallons per year; TAF – thousand acre feet
SOURCE: EBMUD, 2021.

EBMUD's assessment of water supply availability considers the diversions by both upstream and downstream water rights holders, as well as fishery releases on the Mokelumne River. These fishery releases are mandated by a 1998 Joint Settlement Agreement (JSA) between EBMUD, the U.S. Fish and Wildlife Service, and the California Department of Fish and Wildlife. The JSA requires EBMUD to release minimum flows from its reservoirs to the lower Mokelumne River to protect and enhance the river's fishery resources and ecosystem. Consequently, the water used for fishery releases is not available for EBMUD's customers.

EBMUD's 2020 UWMP concludes that EBMUD has sufficient water supplies to meet existing and projected demand within the Ultimate Service Boundary during normal and wet years. However, deficits are anticipated during multi-year droughts. In such cases, EBMUD may need to implement significant customer water use reductions and acquire supplemental supplies to meet demand.

EBMUD's Water Shortage Contingency Plan (WSCP), included as an attachment to the 2020 UWMP, outlines a coordinated response strategy for water shortages caused by events such as droughts, earthquakes, and other emergencies that could affect EBMUD's water supply. The WSCP guides EBMUD's planning and response efforts through careful assessment and management of the water supply.

As outlined in the WSCP, EBMUD's system storage generally enables it to continue serving customers during dry years. EBMUD typically imposes water use restrictions based on projected storage levels at the end of September and may also implement restrictions in response to State mandates. By imposing restrictions in the first year of a potential drought, EBMUD aims to minimize restrictions in subsequent years if the drought persists. Throughout dry periods, EBMUD must also meet its current and future fishery flow release requirements and obligations to downstream agencies.

The WSCP outlines Drought Management Program (DMP) guidelines that determine the level of water use restrictions EBMUD may implement under various conditions. According to these guidelines, restrictions are based on the projected Total System Storage (TSS) at the end of September. If state-mandated restrictions exceed those based on TSS projections, EBMUD will follow the state mandates. While EBMUD aims to keep water use reductions at or below 15 percent, severe drought conditions may necessitate mandatory reductions exceeding 15 percent.

Despite the water savings achieved through EBMUD's aggressive conservation and recycling programs, as well as the water use restrictions outlined in the DMP guidelines, supplemental supplies are still necessary during significant, severe, and critical droughts. Lab development under the proposed 2025 LRDP would be subject to the same drought restrictions as all EBMUD customers. Additionally, Berkeley Lab must comply with EBMUD's regulations promoting efficient water use, such as Sections 29 and 31 of EBMUD's Regulations Governing Water Service. Section 29, "Water Use Restrictions," encourages efficient water use by EBMUD customers and prohibits certain uses of potable water. Section 31, "Water Efficiency Requirements," specifies the types of water efficiency standards (e.g., maximum flow rates for flow control devices) required for water service.

To meet projected water needs and enhance water reliability, EBMUD's efforts focus on supplemental supplies, improving existing water supply facilities, water conservation, and recycled water programs. Supplemental sources include CVP water from the Freeport Regional Water Facility, operational since February 2011, and groundwater from the East Bay Plan Subbasin via the Bayside Groundwater project. Additional sources include, but are not limited to, Northern California water transfers, expansion of the Bayside Groundwater project expansion, and the expansion of Contra Costa Water District's Los Vaqueros Reservoir.

With respect to improving existing water supply facilities, EBMUD enhances resource utilization by continuously improving the delivery and transmission of available water supplies and investing in the safety of existing facilities. These initiatives, combined with emergency interties and planned water recycling and conservation efforts, aim to ensure a reliable water supply to meet the projected demands of current and future EBMUD customers within its service area.

As for water conservation, to achieve water use reduction goals and comply with restrictions, conservation strategies such as adherence to Sections 29 and 31 of EBMUD's Regulations Governing Water Service, discussed above, and all other legally mandated conservation requirements will be essential. California's new regulatory framework for urban water conservation, established by Senate Bill 606 and Assembly Bill 1668 in 2018, took effect on January 1, 2025. These bills set water use efficiency targets for urban water agencies, focusing on indoor residential use, outdoor use, and distribution systems. EBMUD will continue to comply with evolving state water conservation regulations.

Finally, the Lab is not currently a candidate for centralized recycled water. Because Berkeley Lab policy substantially restricts the use of landscape irrigation on the campus, there are few opportunities for use of a satellite treatment system. Nevertheless, as EBMUD continues to develop its recycled water program, the feasibility of supplying recycled water to Berkeley Lab may evolve.

Based on the information provided above, with demand reduction actions and conservation, sufficient water supply would be available from EBMUD to serve the development under the proposed 2025 LRDP and reasonably foreseeable future development under normal, dry and multi-dry years, and this impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the proposed buildings that are included in the scenario might be similar to development pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of impacts to water supply. Individual projects, such as those hypothetically identified in the Illustrative Development Scenario, would not result in significant impacts related to water supply for the reasons described above.

LRDP Impact UTIL-3: Campus development under the LBNL 2025 LRDP would not result in a determination by the wastewater treatment provider that it does not have adequate capacity to serve the project's projected demand in addition to the provider's existing commitments. (*Less than Significant*)

Construction

Berkeley Lab campus construction associated with the proposed 2025 LRDP would temporarily generate wastewater that would require treatment. For construction projects involving excavation, limited and temporary dewatering may be required. Effluent from the dewatering activities would be treated, if necessary, and then discharged to the Lab's sanitary sewer system, and then would be received at the EBMUD MWWTP for further treatment and discharge. Other sources of wastewater during construction that would be discharged to the EBMUD MWWTP would be associated with hydrostatic testing of systems, general cleaning, and construction worker restrooms. Given this would be a temporary generation of wastewater, it would not have any long-term effect on wastewater treatment capacity, and as a result, the impact associated with construction-phase wastewater discharge would be considered less than significant.

Operation

Campus operation under the proposed 2025 LRDP would result in increased wastewater discharge compared to existing campus conditions. As discussed above, Berkeley Lab under the LBNL 2025 LRDP would consume 145 MGY of water by 2045, or about 0.4 MGD. However, most of the water supply, greater than 68 percent or about 0.27 MGD, would be used for cooling and thus would be lost to evaporation. As a result, less than 32 percent or about 0.13 MGD of water consumed would end up as wastewater that would be discharged to the Lab's sanitary sewer system. Combined with the 0.10 MGD from GWI and RDI/I and effluent from UC Berkeley Hill Campus facilities that currently passes through the Hearst and Strawberry monitoring stations, a total of 0.23 MGB would be ultimately received at the EBMUD MWWTP for treatment.

The MWWTP has a primary treatment capacity of 320 MGD and a secondary treatment capacity of 168 MGD, and the average dry weather flows treated at the MWWTP at the present time are approximately 63 MGD. Wastewater that would pass through the Hearst and Strawberry monitoring stations under the proposed 2025 LRDP would represent less than 0.1 percent of the MWWTP's primary treatment capacity and about 0.14 percent of the secondary treatment capacity. Lab campus effluent would, therefore, be accommodated by the existing MWWTP, which is currently operating at approximately 17 percent of its primary treatment capacity and 32 percent of the secondary treatment capacity. As a result, implementation of the proposed 2025 LRDP would not result in a determination by EBMUD that it has inadequate dry weather capacity to serve development under the proposed 2025 LRDP, and the impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development scenario. Any of the proposed buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of impacts to wastewater treatment. Individual projects, such as those hypothetically identified in the Illustrative Development Scenario, would not result in significant impacts related to wastewater treatment for the reasons described above.

LRDP Impact UTIL-4: Campus development under the LBNL 2025 LRDP would not generate solid waste in excess of state or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals. (*Less than Significant*)

Construction

Berkeley Lab campus construction activities[5] under the proposed 2025 LRDP would generate waste and debris over the 20-year planning period. The total amount of construction waste over the 20-year planning period was estimated for this impact analysis. Based on EPA's posted nonresidential waste rates, the proposed 2025 LRDP would generate an estimated total of 26,323 tons of demolition, construction, and renovation activity waste (U.S. EPA, 2009).[6] As discussed in Section 4.15.2, Berkeley Lab currently recycles 78 percent of its construction solid waste. Assuming this rate would remain at least the same over the 20-year planning period, construction associated with the proposed 2025 LRDP would generate an estimated 5,791 tons of waste requiring landfill disposal.

Given the remaining capacity at the Keller Canyon Landfill, construction, renovation, and demolition activities during the 2025 LRDP planning period would not result in solid waste generation that exceeds the permitted capacity of the regional landfill that serves the Berkeley Lab campus. Therefore, this impact would be less than significant.

Operation

The proposed 2025 LRDP would result in an increased campus solid waste stream associated with an increase in operations (additional personnel and facilities). Under the proposed 2025 LRDP, campus adjusted daily population (ADP) would be expected to grow from 3,000 in 2024 to an estimated 4,200 in 2045. Basing the projected solid waste stream on the proportional increase in campus population, the 2025 LRDP would result in a campus solid waste increase from an existing 683 tons per year to an estimated 956 tons by 2045, a net increase of 273 tons per year. Employees and visitors would continue to participate in the Lab's recycling programs and other efforts to reduce the total amount of waste produced and/or requiring landfill disposal. Berkeley Lab currently recycles 67 percent of its municipal solid waste. Assuming this rate would remain at least the same over the 20-year planning period, future campus development would generate approximately 90 tons of solid waste per year requiring disposal at the Keller Canyon Landfill.

Keller Canyon Landfill's permitted daily capacity is 3,500 tons per day, thus the projected increase in waste generated by campus growth and development per the proposed 2025 LRDP would be less than 0.01 percent of the facility's permitted daily capacity. Finally, the Keller Canyon Landfill that serves the Lab is not expected to cease operation for at least 25 years. For a discussion of state and local standards or the attainment of solid waste reduction goals, see LRDP

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5 For the purposes of this EIR, the term "construction," unless specifically indicated otherwise, includes activities that involve construction of new facilities, and renovation and demolition of existing facilities.

6 Generation rates of 4.34 lb/ft^2 for new nonresidential construction, 12.7 lb/ft^2 of nonresidential renovation, and 158 lb/ft^2 for nonresidential demolition were used for this calculation. Construction: 545,000 new square feet * 4.34 lb/ft^2 / 2,000 lb/ton = 1,183 tons. Renovation = 600,000 sq. ft. * 12.7 lb/ft^2 / 2000 lb/ton = 3,810 tons. Demolition = 270,000 sq. ft. * 158 lb/ ft^2 / 2,000 lb/ton = 21,330 tons.

Impact UTIL-5 below. For these reasons, the proposed 2025 LRDP would not generate solid waste in excess of local infrastructure, and this impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the proposed buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of impacts related to solid waste disposal. Individual projects, such as those hypothetically identified in the Illustrative Development Scenario, would not result in significant impacts related to solid waste disposal for the reasons described above.

LRDP Impact UTIL-5: Campus development under the LBNL 2025 LRDP would comply with federal, state, and local management and reduction statutes and regulations related to solid waste. (*Less than Significant*)

Campus development pursuant to the proposed 2025 LRDP would be required to comply with federal, State, and local solid waste standards identified above in Section 4.15.3, *Regulatory Setting*, such as the California Integrated Waste Management Act, AB 341, and AB 939. Furthermore, campus development would have to comply with zero waste policies found in the UC *Policy on Sustainable Practices* and zero waste and waste reduction policies found in the Lab's Requirements and Policies Manual. Both regulations require Berkeley Lab to divert 90 percent of municipal solid generated on campus from local landfills. As discussed above in Impact UTIL-4, Berkeley Lab currently recycles 67 percent of its municipal solid waste, and is working to achieve the required 90 percent diversion rate. As a result, construction and operation of development under the proposed 2025 LRDP would not conflict with applicable waste reduction policies, and the impact regarding compliance with solid waste regulations would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development scenario. Any of the proposed buildings that are included in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of impacts related to compliance with solid waste regulations. Individual projects, such as those hypothetically identified in the Illustrative

Development Scenario, would not result in significant impacts related to compliance with solid waste regulations for the reasons described above.

Cumulative Impacts

LRDP Impact CUM-UTIL-1: Campus development under the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects in the vicinity of the Berkeley Lab campus, would not result in significant cumulative impacts related to utilities and service systems. (*Less than Significant*)

Utility Infrastructure

Campus development under the proposed 2025 LRDP, when combined with foreseeable growth and development on and in the vicinity of the Berkeley Lab campus, could increase the demand for utilities and service systems. There is no reasonably foreseeable planned cumulative development immediately north, east, or south of Berkeley Lab that would require construction of substantial new utility improvements. The area west of the campus is a densely developed urban area, and as a result, development in this vicinity would occur as replacement or in-fill on otherwise built-out sites. Nearby the City of Berkeley utility systems that serve the area have sufficient capacities to serve those sites and development anticipated under the proposed 2025 LRDP. As discussed above, implementation of the proposed 2025 LRDP would not require any off-campus improvements. To the extent that cumulative demands on water, wastewater, or stormwater conveyance systems from reasonably foreseeable growth on the adjacent UC Berkeley campus and in the City of Berkeley would require the construction of new or expansion of existing conveyance systems, such construction may have the potential to cause environmental impacts. However, in general, impacts would be minimal as the improvements would be located in previously disturbed areas and would be limited to temporary construction effects that would be minimized by best practices and standard conditions of approval that are routinely imposed by UC Berkeley and the City on all development, including infrastructure projects. As a result, the cumulative impact on utility infrastructure would be less than significant.

Water Supply

As described above, the analysis conducted in LRDP Impact UTIL-2, and the WSA which supports it, examined the proposed 2025 LRDP's water demand within the context of the overall cumulative water demand within EBMUD's service area. As noted in LRDP Impact UTIL-2, with supplemental supplies, conservation, and recycling efforts, sufficient water supply would be available from EBMUD to serve campus development under the proposed 2025 LRDP and reasonably foreseeable future development within its service area under normal, dry, and multi-dry years, and thus the cumulative impact with regard to water supply would be less than significant.

Wastewater Treatment

Campus development under the proposed 2025 LRDP, when combined with foreseeable growth on and in the vicinity of the Berkeley Lab campus, would increase the demand for wastewater treatment facilities. Reasonably foreseeable cumulative projects would need to meet the wastewater pre-treatment requirements of EBMUD and SWRCB. The areas served by the MMWTP are largely built out. Any future development in the service area would likely consist of replacement or in-fill on otherwise built-out sites. As stated above under LRDP Impact UTIL-3, the MMWTP is currently operating at 17 percent of its primary treatment capacity and 32 percent of the total secondary treatment capacity, and thus there is enough capacity to serve development envisioned under the proposed 2025 LRDP and reasonably foreseeable future redevelopment and infill development in the service area. Therefore, the cumulative impact with regard to wastewater treatment capacity would be less than significant.

Solid Waste Disposal

Campus development under the proposed 2025 LRDP, when combined with foreseeable growth and development on and in the vicinity of the Berkeley Lab campus, would increase demand for solid waste disposal. Increased waste generation from reasonably foreseeable cumulative projects would be partially offset by existing State and local ordinances and policies regarding waste reduction. As discussed above, based on remaining capacity, the Keller Canyon Landfill is not expected to cease operation for at least 25 years, and the proposed 2025 LRDP would be less than 0.01 percent of the Keller Canyon Landfill's permitted daily capacity. Thus, there is enough capacity to serve development envisioned under the proposed 2025 LRDP along with reasonably foreseeable future cumulative development. Therefore, cumulative impacts regarding solid waste disposal capacity would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the scenario. As such, the Illustrative Development Scenario is an appropriate and conservative basis for impact evaluation related to utilities that may be associated with proposed 2025 LRDP implementation. Future development is similar to that identified in the Illustrative Development Scenario, when combined with cumulative development, would for the reasons stated above, result in cumulative impacts that would be less than significant. For the reasons stated above, this impact would be less than significant.

4.15.5 References

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4.16 Wildfire

4.16.1 Introduction

This section assesses the potential for proposed 2025 LRDP (the Project) implementation to result in significant impacts with respect to wildfire. The section includes a description of the existing environmental setting as it relates to wildfire; includes a summary of related Berkeley Lab plans and policies, local collaborative programs, and applicable federal and State laws and regulations; identifies significance criteria used to evaluate wildfire-related impacts; and presents the results of the impact assessment, including any significant impacts and associated mitigation measures.

4.16.2 Environmental Setting

Wildfire Background

The degree of wildfire hazard for an area depends on three major components: (1) the natural setting of the wildland or developed area, (2) the degree of human use and occupancy of the wildland or developed area, and (3) the ability of public services to respond to fires that do occur. Berkeley Lab is located within an interface between wildlands and developed lands in the East Bay hills, which is referred to as the Wildland-Urban Interface (WUI). Development within the WUI can exacerbate the risks associated with wildland fire by increasing: (1) the number of ignition sources; (2) potential fire spread due to the proximity of flammable structures; (3) smoke toxicity from the addition of burning manufactured materials and chemicals; and (4) fire management challenges by requiring additional and more costly fire protection resources to ensure an appropriate, safe, and effective response.

The approximately 202-acre Berkeley Lab campus is similar in character to other partially developed hillside areas in the Bay Area as it comprises developed lands, groves and individual trees, and non-irrigated grasslands. Dry summers desiccate plant materials–particularly annuals–and make them more prone to burning. A “fire season” is declared by the State each summer and fall (usually extending from June/July through October/November). During brief periods of the fall months, fire risk is even more pronounced when strong, dry winds, often called “Diablo winds,” occur in the East Bay hills. These offshore winds further desiccate fuel material and can drive fire fronts and fire brands at extreme speeds.

Fire History

Wildfires occur with a regular frequency in the Bay Area. Large historic wildfires have occurred in 1923, 1961, 1962, 1964, 1965, 1970, 1981, 1985, 1988, and 1991. A substantial wildfire occurred in 1923 on what now includes the Berkeley Lab campus, but this fire predated the Laboratory by 17 years. The Oakland-Berkeley Hills Fire of October 1991 burned 1,520 acres, killed 25 people, and damaged or destroyed 3,469 houses and apartments, with losses totaling approximately $1.5 billion. This fire occurred less than 1 mile to the south of the Berkeley Lab boundary, in an area with similar Diablo-wind conditions and topographic characteristics as Berkeley Lab (i.e., steep wooded canyons with highly flammable vegetation) (LBNL, 2023).

Smaller fires have impacted the Laboratory in recent history. In August 2017, a small wildland fire was ignited through arson on UC Berkeley land to the east of Centennial Road. Favorable winds and quick response resulted in rapid extinguishment of this fire with only approximately 20 acres burned. In June 2020, a small wildland fire ignited on Centennial Road, just below Blackberry Gate. This fire, which spread through mulch and leaf litter, was substantially limited by previous fire prevention efforts such as goat grazing and removal of low hanging tree branches (LBNL, 2023).

Figure 4.16-1 illustrates fire history, including year, location, and size, in the East Bay hills between 1900 and present.

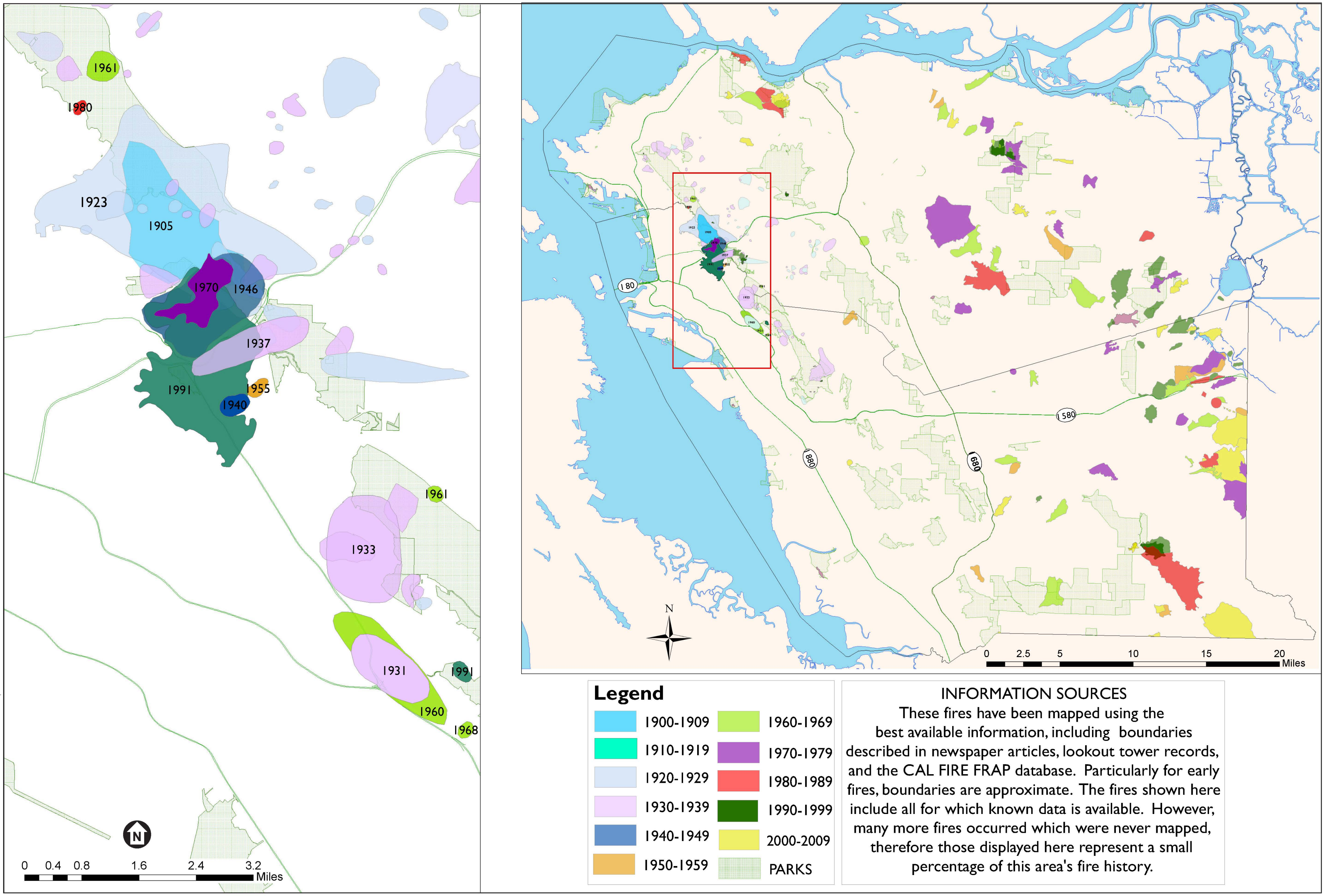
Vegetation Management

UC LBNL first instituted a vegetation management program (VMP) in 1992 in response to the 1991 Oakland-Berkeley Hills Fire. This on-going program aims to minimize potential wildland fire risk on and around the campus; it is continually refined and updated over time. Annual VMP practices for fire safety include grassland management, removal of "ladder fuels" such as brush and lower tree limbs to a minimum of 6 to 8 feet from the ground and built-up leaf litter, and removal of potentially hazardous trees. Fire-resistant plant species are selected for landscaping near development, and native plants known for their drought tolerance and fire resistance are planted or maintained throughout the campus.

Under the VMP, grasses are grazed and mowed throughout most areas of the campus on an annual basis. Steep slopes are grazed with managed goat herds, whereas hand-held string mowers are used in locations near buildings and in areas where goat grazing is impractical. Fuel reduction work begins in the late spring after the last rains and after most growth has stopped. Particular attention is paid to areas that expose Berkeley Lab and the surrounding community to the highest likelihood of fire and wildfire damage. Other vegetation management activities administered by the UC LBNL Facilities Division include removing tall grass and brush around hydrants; reducing ladder fuels within 100 feet of structures; trimming tree branches that overhang roofs; clearing leaf litter from roofs and drains; and trimming trees to provide adequate clearance for fire response vehicles. In addition, several trees are cut and removed each year because they are dead or have the potential to fall and cause damage (LBNL, 2023).

In addition to the annual activities that take place throughout the campus, the VMP focuses on higher priority areas for more intensive vegetation management. This includes area-specific efforts to address built up leaf litter, invasive brush, ladder fuels, and problematic trees, such as those that might fall across exit roads during a wildfire. **Figure 4.16-2** presents such vegetation management priority areas for the Berkeley Lab campus, with Priority 1 representing the highest priority areas.

UC LBNL prepared a Vegetation Management Guide (last updated in 2024) which provides a comprehensive framework for managing campus vegetation with a focus on wildfire risk reduction. The Guide applies to the design and execution of all work involving vegetation management.



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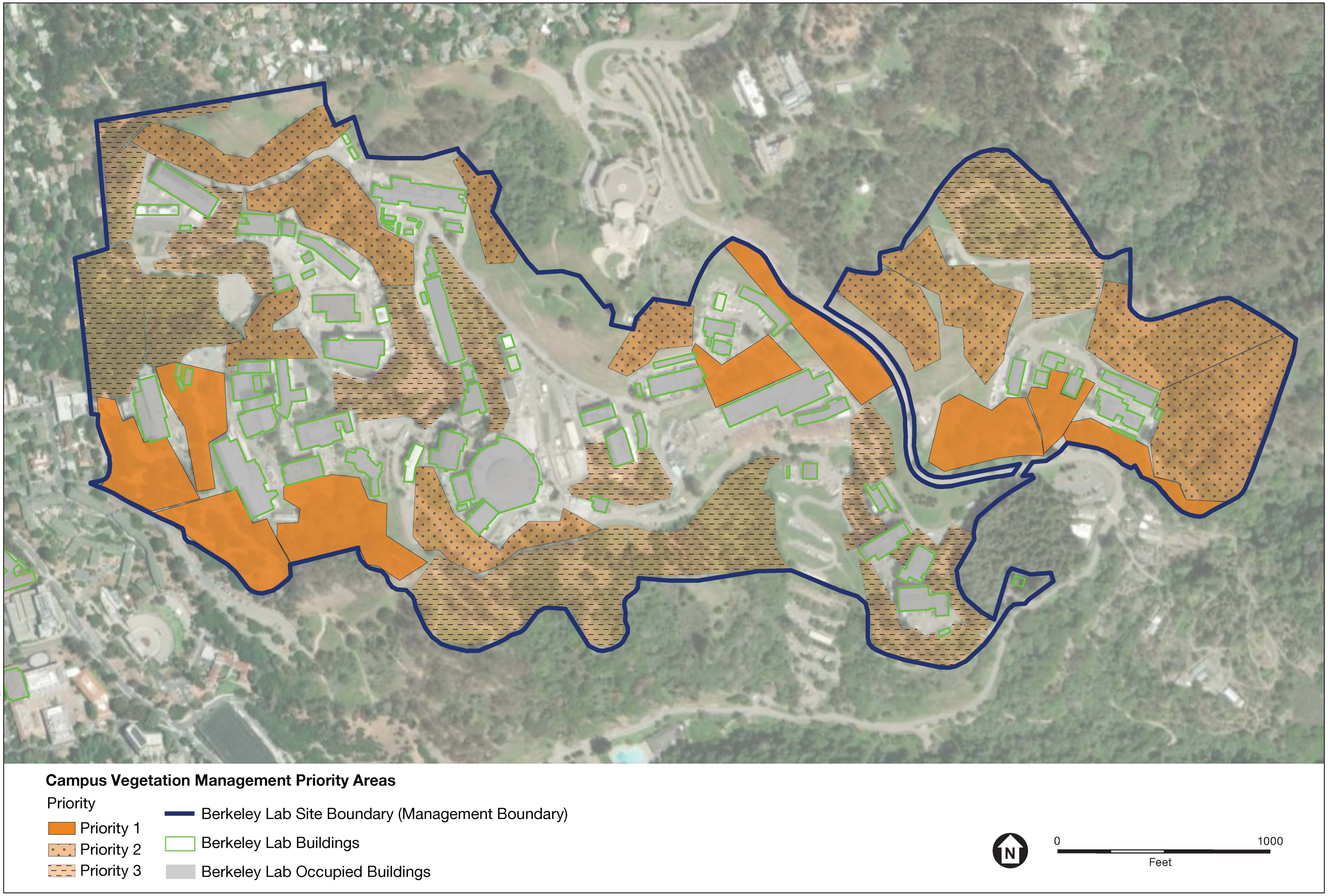
SOURCE: EBRPD, 2023

LBNL LRDP EIR

Figure 4.16-1
Fire History in the East Bay Hills

ESA



SOURCE: LBNL, 2024

Figure 4.16-2
Campus Vegetation Management Priority Areas

Fire Protection Responsibility

The entirety of the Berkeley Lab campus is designated as a Local Responsibility Area (LRA) by the California Department of Forestry and Fire Protection (CalFire). The same is true of nearby portions of UC Berkeley and the cities of Berkeley and Oakland located within the East Bay hills.

Alameda County Fire Department (ACFD) provides Berkeley Lab with fire protection services and maintains an on-site fire station. This station, Alameda County Station 19, is in Lab Building 48 and staffed 24 hours per day. Equipment at Station 19 includes one fire engine, a hazardous materials vehicle, and one Type VI wildland fire truck[1] (see Section 4.13, *Public Services and Recreation* for a fuller discussion).

In addition to its own fire protection services, ACFD has entered into various cooperative and fire assistance agreements with other federal, State, and local jurisdictions within the region and state, such as the California Master Mutual Air Agreement. Based on these agreements, most wildfire events and other large-scale incidents include response from multiple agencies. These agencies operate under an incident command structure, which oversees the command, control, and coordination of emergency response resources from multiple agencies. In such instances, ACFD personnel and equipment will respond to incidents outside of the District's formal area of responsibility. Conversely, other emergency services organizations throughout the region and state will respond to incidents within ACFD's area of responsibility if needed.

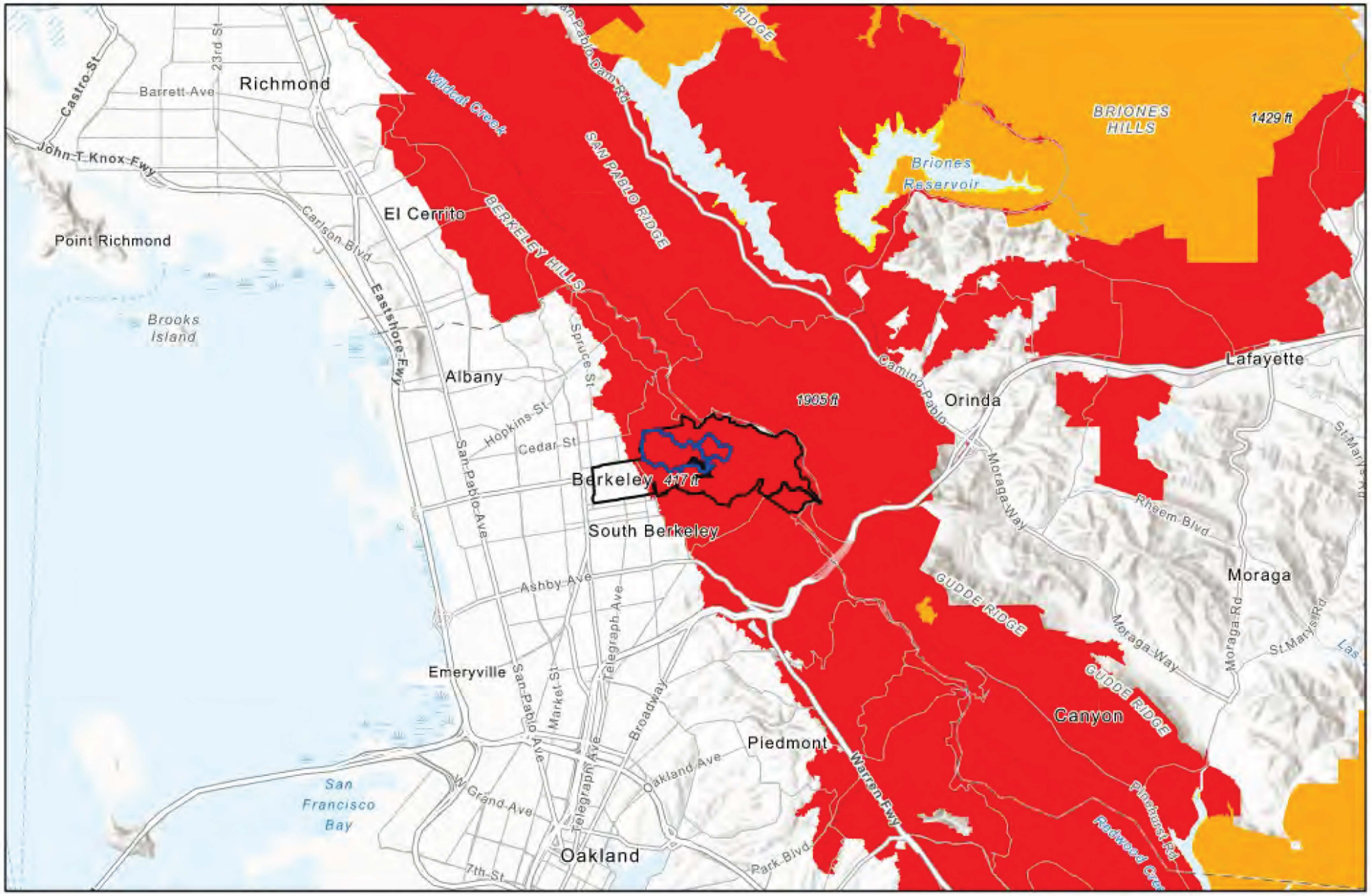
Fire Protection & Engineering Services Group

The Fire Protection & Engineering Services Group within the Security & Emergency Services Division at Berkeley Lab is charged with ensuring the safety of the laboratory's employees, visitors, and the surrounding community. Their main responsibilities include: (1) ensuring compliance with federal, state, and local fire safety regulations; (2) creating and maintaining procedures to handle fire emergencies effectively; (3) overseeing the installation and maintenance of fire protection systems and equipment; (4) regulating activities that involve open flames or sparks to prevent accidental fires; (5) assessing and approving all construction and renovation projects to ensure fire safety standards are met; and (6) managing the storage and use of flammable and hazardous materials to minimize fire risks. The group manages the implementation of DOE Standard DOE-STD-1066-2016 and DOE Order DOE O-420.1C and UC LBNL's WFMP and Vegetation Management Guide, discussed below.

Fire Hazard Severity and Wildfire Risk

As part of its Fire and Resources Assessment Program (FRAP), CalFire has mapped areas of significant fire hazards throughout the state. The maps classify lands into fire hazard severity zones based on localized factors such as fire history, vegetative fuel loading, terrain, and weather. **Figure 4.16-3** illustrates CalFire's severity zoning on the Lab campus and surrounding areas. As shown in Figure 4.16-3, the entire Berkeley Lab campus has been designated under the FRAP as a Very High Fire Hazard Severity Zone (VHFHSZ) (LBNL, 2023). It is noted that CalFire Local

1 Type VI wildland engines respond to wildfires and have the ability to drive in rough terrain to respond to a fire or rescue.



California Fire Hazard Severity Zones 2023 Update

- Very High
- High
- Moderate

University of California Lands

- University of California Lands
- Berkeley Lab Boundary

0 1.5 3 Kilometers

N W E S

SOURCE: LBNL Emergency Management GIS, 2023

Figure 4.16-3
CalFire Fire Hazard Severity Zones

ESA

Responsibility Area fire hazard severity maps are in the process of being updated. Draft maps indicate that the Berkeley Lab campus may be redesignated as being within Moderate to High Fire Hazard Severity Zones.[2]

Berkeley Lab Emergency Access/Evacuation Routes

During emergencies, access and evacuation routes often intersect with fire crews moving toward an advancing fire and residents, workers, and visitors traveling away from it. At the Berkeley Lab campus, access is limited due to geographic features and security measures. Only three gates provide campus ingress and egress: Blackberry Gate on Cyclotron Road in Berkeley; and Strawberry and Grizzly Peak Gates on Centennial Drive in Oakland (LBNL, 2023).

From these three gates, UC LBNL identifies several potential evacuation routes from the Berkeley Lab campus. From the Blackberry Gate, the evacuation route is westward via Cyclotron Road and Hearst Avenue into Downtown Berkeley. Both the Strawberry and Grizzly Peak Gates would evacuate downhill or uphill on Centennial Drive. The downhill evacuation route is westward via Centennial Drive, Stadium Rim Way, Piedmont Avenue, and Bancroft Avenue into Downtown Berkeley. The uphill evacuation route is to the north on Centennial Drive, and hence, either 1) northwest on Grizzly Peak Boulevard and west on Marin Avenue into Downtown Albany; 2) southeast on Grizzly Peak Boulevard and Fish Ranch Road to State Route (SR) 24 in unincorporated Contra Costa County; or 3) north on Golf Course Drive, and then east via Shasta Road and Wildcat Canyon Road (which is temporarily closed and will reopen in 2027), and southeast on Camino Pablo to SR 24 in unincorporated Contra Costa County. Please note that depending on the path of the fire, either downhill or uphill evacuation may not be available during wildland fire events for safety reasons.

As Centennial Drive serves two of the three campus gates, any disruption to this roadway could impact both egress from and fire department response to Berkeley Lab and nearby communities (LBNL, 2023).

Berkeley Lab Emergency Management Zones and Wildfire Temporary Refuge Buildings

Protective actions are taken to minimize the consequences of emergencies and to protect the health and safety of workers, responders, and the public. Common protective actions in emergency events include shelter-in-place, lockdown, and evacuation. During emergency events, Berkeley Lab protective action decisions are quickly made by responsible Lab authorities and then must be communicated to affected employees immediately–no later than 10 minutes after the protective actions have been identified. The dissemination of protective actions at Berkeley Lab is accomplished through a variety of methods including alarm systems, two-way radios, public address systems, UC LBNL’s status.lbl.gov website, and LabAlert, which messages interactively through email, SMS text, and automated phone calls (LBNL, 2024a).

[2] https://osfm.fire.ca.gov/what-we-do/community-wildfire-preparedness-and-mitigation/fire-hazard-severity-zones

Emergency Management Zones

To facilitate protective action implementation, the Berkeley Lab campus has been divided into six distinct emergency management zones (see **Figure 4.16-4**). The emergency management zones were determined using the campus site's natural geography. Segregating the campus into zones allows for better population management and for the ability to focus on personnel in areas most impacted by an emergency event. Zone management helps prevent the unnecessary movement of unaffected personnel, reducing injury risk and lessening impact to Lab operations. For campuswide evacuations, the zones can be useful for systematic movement of the Lab population, where personnel most impacted by an event can evacuate first, while other zones may then evacuate or shelter in place (LBNL, 2024a).

Wildfire Temporary Refuge Buildings

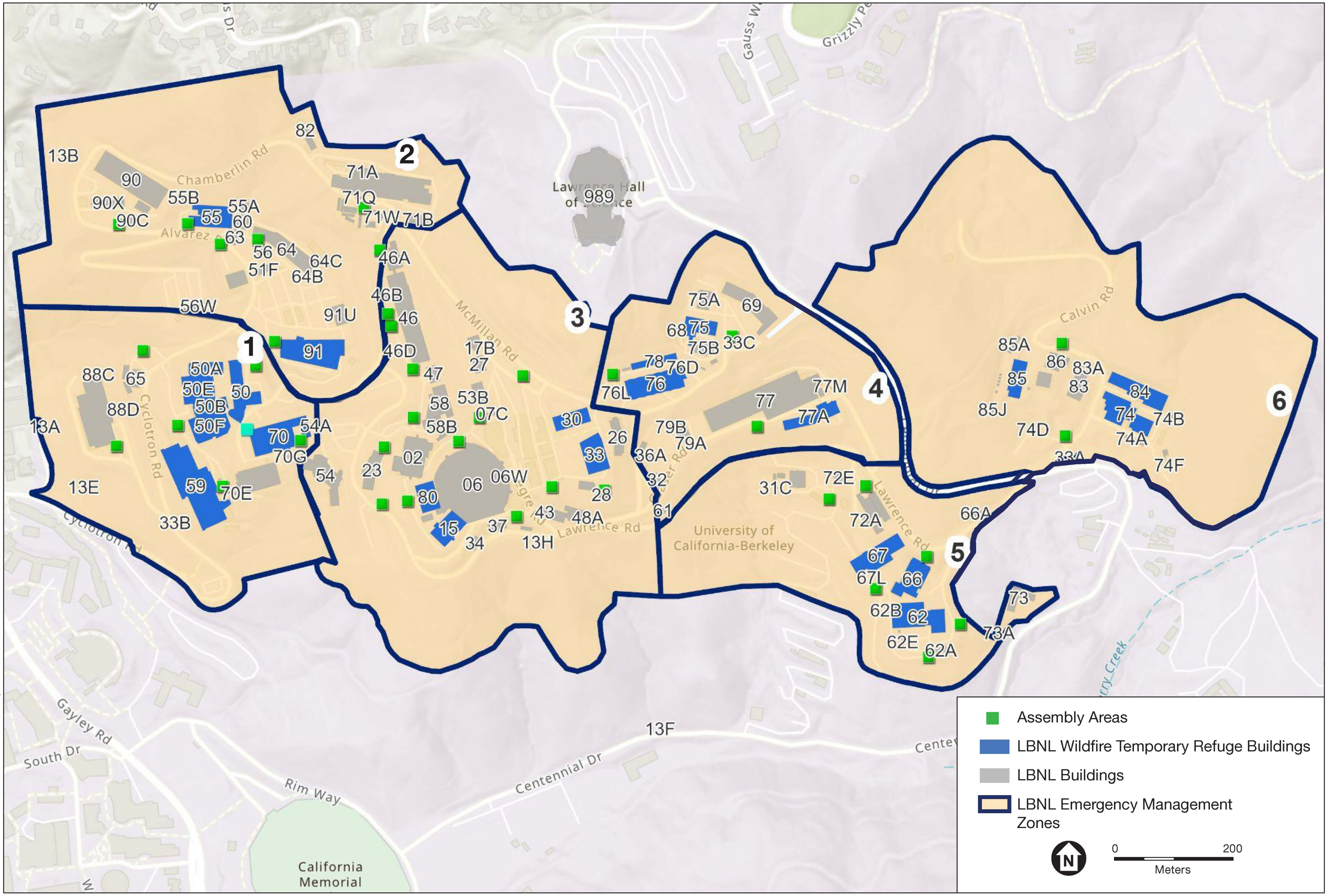
Given the limited access points to and from the Lab, the campus topography, and the possible need for immediate personnel protection, such as during a rapid-onset wildland fire or an active shooter event, campus evacuation may not always be possible. Timely evacuation can be further exacerbated by the presence of dense populations immediately downhill from the Laboratory.

Accordingly, the Lab has designated several campus Wildfire Temporary Refuge Buildings (WTRBs) that staff and visitors may occupy instead of attempting to drive or walk off the campus. These buildings are built out of non-combustible materials (concrete or steel) and have defensible space around the exterior. As such, these buildings are intended to serve as temporary refuges as wildfire passes. Figure 4.16-4 and **Table 4.16-1**, identify the campus WTRBs (LBNL, 2024a; 2024b).

TABLE 4.16-1
BERKELEY LAB WILDFIRE TEMPORARY REFUGE BUILDINGS, BY ZONE

Zone 1	Zone 3	Zone 5
Buildings 50, 50A, 50B (Laboratory Administration and Physics/Computing Sciences)	Building 15 (ALS User Support Building)	Buildings 62 (Chemical and Materials Sciences)
Building 59 (Shyh Wang Hall)	Building 30 (Solar Energy Research Center [SERC])	Building 66 (Center For Advance Math/ Math Science / Catalysis Lab)
Building 70 (Energy & Environmental / Nuclear Science)	Building 33 (General Purpose Lab [GPL])	Building 67 (Molecular Foundry)
Zone 2	**Zone 4**	**Zone 6**
Building 55 (Life Sciences)	Building 75 (EH&S Radiological Service)	Building 74 (Life Sciences Laboratory Annex)
Building 91/91U (Integrative Genomics Building (IGB) and IGB Modular Utility Plant (MUP)	Building 76 (Facilities Offices)	Building 84 (Human Genome Lab)
	Building 77A (Ultra-High Vacuum Assembly Facility)	Building 85 (Hazardous Waste Handling Facility)

NOTES: Please see Figure 4.16-4 for the location of Wildfire Temporary Refuge Buildings.
SOURCE: LBNL, 2024b.



SOURCE: LBNL, 2022

LBNL LRDP EIR

Figure 4.16-4
Berkeley Lab Emergency Management Zones and Wildfire Temporary Refuge Buildings

ESA

4.16.3 Regulatory Framework

Federal

U.S. Department of Energy (DOE) Orders and Standards

DOE Standard DOE-STD-1066-2016, *Fire Protection*, facilitates implementation of DOE Order 420.1C, *Facility Safety*, by providing criteria and guidance for a standard and acceptable approach to meet the DOE O 420.1C requirements for fire protection programs (FPPs).[3] The Standard is approved for use by DOE and its contractors and provides guidance on several fire protection related topics, including wildland fire management at DOE sites (DOE, 2016). DOE Order 420.1C requires that each DOE site where wildfire risk exists create and implement an integrated, site-wide wildland fire management plan (WFMP) "in accordance with National Fire Protection Association (NFPA) 1143, *Standard for Wildland Fire Management*, 2014."[4] The WFMPs describe the relationship of land management planning and wildland fire policy; provide wildland fire management strategies; identify wildland fire management strategies program components; discuss organizational and budgetary parameters; and provide a framework for monitoring and evaluation.

State

California Department of Forestry and Fire Protection

Title 14 of the California Code of Regulations (CCR), Division 1.5, establishes regulations for CalFire in SRAs where CalFire is responsible for wildfire protection. These regulations constitute the basic wildland fire protection standards of the California Board of Forestry and Fire Protection. They have been prepared and adopted for the purpose of establishing minimum wildfire protection standards in conjunction with building, construction, and development in SRAs. Additionally, Title 14, Division 1.5, Chapter 7, Subchapter 2 sets forth the minimum standards for emergency access and egress (Article 2), signage (Article 3), water supply (Article 4), and fuel modification standards (Article 5) for lands within SRAs. As indicated above, the entire Berkeley Lab campus is in an LRA and is therefore not under the responsibility of CalFire for wildfire protection. However, since Berkeley Lab is in a Mutual Threat Zone, CalFire would respond to a wildfire at the campus as needed.

Emergency Services Act

Under the Emergency Services Act, Government Code Section 8550, et seq., the State developed an emergency response plan to coordinate emergency services provided by federal, State, and local agencies. Rapid response to incidents involving wildfire and other natural and/or human-caused incidents is an important part of the plan, which is administered by the Governor's Office of Emergency Services (OES). The office coordinates the responses of other agencies, including the California Environmental Protection Agency (CalEPA), the California Highway Patrol

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[3] At the time of this analysis, DOE is in the process of considering updated standards for LBNL, including DOE-STD-1066-2023 to update DOE-STD-1066-2016, and DOE O 420.1D to update DOE O 420.1C.

[4] Please note that NFPA 1140, *Standard for Wildland Fire Protection*, 2022, incorporates NFPA 1143 and a number of other NFPA standards.

(CHP), regional water quality control boards, air quality management districts, and county disaster response offices.

California Building Code

The California Building Code (CBC), found in Title 24, Part 2 of the CCR, outlines essential building design standards, particularly related to fire safety. Specifically, Chapter 7A of the CBC focuses on materials and construction methods for buildings in a Fire FHSZ. Its purpose is to establish minimum standards for protecting life and property by enhancing a building's ability to resist flames or embers projected by a vegetation fire within a WUI area.

California Fire Code

The California Fire Code (CFC), found in Title 24, Part 9 of the CCR, addresses critical aspects related to fire safety and emergency planning. Specifically, Chapter 49 of the CFC outlines minimum requirements to mitigate conditions that could lead to a fire originating in a structure to ignite vegetation in a WUI area. Conversely, it also addresses the risk of wildfire in a WUI area spreading to nearby buildings. These requirements generally align with those outlined in Chapter 7A of the CBC.

California Government Code

Defensible Space – Government Code Section 51182

California Government Code Section 51182 outlines requirements for maintaining defensible space around structures in areas designated as very high fire hazard severity zones. Property owners must maintain a defensible space of 100 feet around structures. This involves managing vegetation to reduce the risk of fire spreading to the structure.

California Public Resources Code

Fire Hazards Severity Zones – Public Resources Code Sections 4201-4204

California Public Resources Code (PRC) Sections 4201 through 4204 require CalFire to prepare fire hazard severity zone maps for all lands within State Responsibility Areas. Each zone is to embrace relatively homogeneous lands and shall be based on fuel loading, slope, fire weather, and other relevant factors present, including areas where winds have been identified as a major cause of wildfire spread. CalFire adopted the latest Fire Hazard Severity Zone maps for State Responsibility Areas in 2023, which became effective on April 1, 2024. As noted above, the CalFire Local Responsibility Area fire hazard severity zone maps are in the process of being updated but the final maps have not been issued as of March 2025.

Defensible Space –Public Resources Code Section 4291

California PRC Section 4291 mandates that individuals who own, lease, control, operate, or maintain a building or structure in, upon, or adjoining mountainous areas, forest-covered lands, brush-covered lands, grass-covered lands, or land with flammable material must maintain a defensible space of 100 feet on each side, as well as on the front and rear of the building or structure.

Wildfire Prevention and Safety – Public Resources Code Section 4442

California PRC Section 4442 outlines requirements regarding internal combustion engines that use hydrocarbon fuels on forest-covered land, brush-covered land, or grass-covered land. Internal combustion engines, like those used in construction, must be equipped with a spark arrester, which withholds carbon and other flammable particles from the exhaust flow. These engines must be maintained in effective working order or be constructed, equipped, and maintained for fire prevention.

University of California

Berkeley Lab Emergency Management

Berkeley Lab is subject to three types of emergencies: natural phenomena (e.g., lightning, seismic events, and wildland fires), human-caused (intentional action such as a chemical attack, biological attack, and cyber incident), and technological (e.g., process failure within the Lab through human error or failed controls that may result in a fire or explosion, and potentially result in a hazardous materials release, mass casualty, and/or significant infrastructure damage; or external events such as an aircraft crash).

The Berkeley Lab Emergency Management Program provides the Laboratory with planning and coordination functions necessary for responding to, reducing, and recovering from emergencies while protecting the health and safety of workers and the public and preventing damage to the environment. In case of an emergency, the Lab activates its Emergency Operations Center (EOC), where members from different Lab areas coordinate to exchange information and make decisions on how to handle the disaster and return the Lab to normal operations. The EOC works with local law enforcement and fire agencies to ensure the Lab's people, property, and other assets are protected during an emergency.

The Berkeley Lab *Comprehensive Emergency Management Plan* (CEMP) describes the Lab's emergency management (EM) system. The CEMP covers missions, functions, responsibilities, and processes that relate to planning, preparedness, readiness assurance, and emergency response. Additionally, the CEMP describes the implementation of DOE Order 151.1D, Comprehensive Emergency Management System, at the Lab (LBNL, 2024a).[5]

Lawrence Berkeley National Laboratory Wildland Fire Management Plan

UC LBNL's wildland fire risk reduction program is articulated in its WFMP, dated August 2023. The WFMP identifies the program's goals as: (1) protect human health and safety; (2) protect Berkeley Lab facilities and research; (3) enhance community protection; (4) diminish risk and consequences of wildland fires; and (5) maintain the health of the ecosystem. The WFMP identifies ways Berkeley Lab can meet these goals using fire prevention, fire suppression, and post-fire rehabilitation (LBNL, 2023). This includes managing fuels to limit wildland fire intensity and spread. The Lab's fuel reduction program seeks to limit fuels to those that burn with a slow spread rate and, more importantly, that produce a flame length of less than 2 feet. This results in low-intensity, slow moving fires requiring minimal emergency response. UC LBNL

[5] At the time of this analysis, DOE is considering an update of DOE Order 151.1D at LBNL with DOE Order 151.1E.

implements its fuel reduction program goals through its on-going vegetation management program, as described above.

Lawrence Berkeley National Laboratory Vegetation Management Guide

The LBNL Vegetation Management Guide, dated October 2024, provides a comprehensive framework for managing vegetation within the Berkeley Lab campus boundaries. The Guide identifies best practices and direction applicable to the design and execution of all work involving campus vegetation management. The Guide's vegetation management program goals are to: (1) reduce wildfire risk on and around the Berkeley Lab property; (2) reduce generalized risk of injury or death to Lab employees and visitors (via debris; dead, dying, or falling vegetation; pedestrian trips, slips, falls, wildfire, etc.); (3) establish landscape management practices to maintain and improve campus aesthetics; (4) support and maintain the local environment; and (5) support the Lab's sustainability goals, including water conservation (LBNL, 2021).

UC Berkeley Wildland Vegetative Fuel Management Plan

The UC Berkeley Wildland Vegetative Fuel Management Plan outlines a strategy to reduce wildfire risks in the Hill Campus East and Hill Campus West zones of the UC Berkeley campus, portions of which adjoin Berkeley Lab. The plan includes implementation of four vegetation treatment types: (1) evacuation support treatments, (2) temporary refuge areas, (3) fuel break treatments, and (4) fire hazard reduction treatments. To implement the four vegetation treatment types, the plan includes five different vegetation treatment activities: (1) manual treatment, (2) mechanical treatment, (3) prescribed broadcast burning, (4) managed herbivory (livestock grazing), and (5) targeted ground application of herbicides. By implementing these treatments, the plan aims to minimize the impact of wildfires on the UC Berkeley campus and its surrounding areas. Berkeley Lab works closely with UC Berkeley, given adjacent management areas.

Local

Berkeley Lab is a federal facility operated by the University of California and conducting work within the University's mission on land that is owned by the Regents of the University of California. As such, UC LBNL is generally exempted by the federal and state constitutions from compliance with local land use regulations, including general plans and zoning. Therefore, this section presents multi-jurisdictional coalitions and forums as well as local plans and programs of Alameda County, Contra Costa County, the City of Berkeley, and the City of Oakland that are focused on (1) minimizing wildfire hazards in the East Bay hills, and (2) addressing wildfire emergencies, as and when those occur. These are presented for informational purposes only to provide context as they influence regional conditions related to wildfire and related emergency response.

East Bay Wildfire Coalition

East Bay Wildfire Coalition Berkeley Lab is a Technical Advisory member of the East Bay Wildfire Coalition (EBWC) of Governments. The EBWC member agencies include Berkeley Lab, Alameda and Contra Costa Counties, a number of local cities, and the Rodeo-Hercules Fire Protection District. The EBWC coordinates to strengthen fire codes, support regional priority-setting and implementation of vegetation management, address regional gaps in evacuation and responses, identify funding, and support advocacy (EBWC, 2025).

Hills Emergency Forum

The Hills Emergency Forum member agencies include Berkeley Lab, UC Berkeley, CalFire, East Bay Municipal Utility District, East Bay Regional Park District, the County of Alameda, and a number of local cities. The Hills Emergency Forum coordinates the collection, assessment, and sharing of information pertaining to East Bay Hills fire hazards. It provides a forum for building interagency consensus on the development of fire safety standards and codes, incident response and management protocols, public education programs, multi-jurisdictional training, and fuel reduction strategies (Hills Emergency Forum, 2025).

Alameda County Community Wildfire Protection Plan

The Alameda County Community Wildfire Protection Plan (CWPP), updated March 2015, is a comprehensive document that addresses wildfire hazards and risks in the wildland-urban interface (WUI) areas of Alameda County. Developed in collaboration with various stakeholders, the CWPP serves as a guiding document for implementing mitigation efforts over multiple years. The CWPP aims to reduce wildfire hazards by increasing information and education about wildfires, promoting hazardous fuels reduction, addressing structural vulnerability, and enhancing emergency preparedness and fire suppression efforts. The CWPP is a living document that requires annual updates and adjustments after significant events (e.g., wildfires, floods, insect infestations) or major developments.

Alameda County Emergency Operations Plan

The Alameda County Emergency Operations Plan (EOP), dated December 2012, provides an overview of the County's approach to emergency operations, including actions to take in the event of wildfire. It includes an assessment of numerous hazards associated with natural and man-made disasters and outlines emergency response policies, describes the response and recovery organization, and assigns specific roles and responsibilities to County departments, agencies, and community partners.

Berkeley Local Hazard Mitigation Plan

The Berkeley Local Hazard Mitigation Plan (LHMP), adopted December 2019, is a comprehensive analysis of natural hazards that can impact Berkeley, including earthquakes, wildfires, and poor air quality. The 2019 LHMP serves three functions: (1) it documents Berkeley's vulnerability to each hazard; (2) presents the mitigation strategy to the City's hazard vulnerabilities; and (3) by fulfilling requirements of the 2000 Disaster Mitigation Act, it ensures that Berkeley will remain eligible to apply for mitigation grants before disasters, and to receive federal mitigation funding and additional State recovery funding after disasters.

The 2019 LHMP highlights wildfire as one of Berkeley's most significant hazards. Key mitigation strategies outlined in the Berkeley LHMP include enforcing development regulations for prevention, managing vegetation to protect natural resources, enhancing access and egress routes, and maintaining infrastructure to support first responders in their efforts to reduce fire spread.

Oakland Local Hazard Mitigation Plan

The Oakland LHMP, adopted in June 2021, focuses on mitigating risks associated with hazards such as earthquakes, floods, extreme heat, and wildfire. The LHMP provides an inventory of potential hazards to the city, assesses the risks to residents, buildings, and critical facilities, and includes a mitigation strategy that reduces exposure risk and enables an organized recovery after disasters.

The Oakland LHMP involves reauthorizing the Wildfire Prevention Assessment District, establishing the Defensible Space Vegetation Program to manage wildfire hazards, and incorporating a fire-safe combining zone into the Oakland Planning Code as part of current fire prevention strategies.

Oakland Vegetation Management Plan

The Oakland VMP, adopted in May 2024, is a 10-year plan that aims to manage fuel loads and vegetation on over 1,900 acres of City property and along approximately 300 miles of roadside within the VHFHSZ. Key components of the plan include: (1) goat grazing on nine sites covering about 1,300 acres; (2) vegetation clearing along 16 roadways (58 miles); (3) monitoring for vegetation clearance along 300 miles of road; and (4) clearing brush on critical City-owned properties (332 acres). The plan is designed to reduce the risk of catastrophic wildfires, like the 1991 Oakland Hills Fire, by actively managing vegetation in high-risk areas.

4.16.4 Impacts and Mitigation Measures

Significance Criteria

For purposes of this EIR, impacts related to wildfire would be considered significant if they would exceed the Standards of Significance presented below, which are based on Appendix G of the *CEQA Guidelines.*

Would LBNL 2025 LRDP implementation:

a) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires;

b) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan; or

c) If located in or near state responsibility areas or lands classified as very high fire hazard severity zones:

    i. Substantially impair an adopted emergency response plan or emergency evacuation plan;

    ii. Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire;

    iii. Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment; or

iv. Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes.

Thresholds a) and b) above are from Appendix G, Section IX, *Hazards and Hazardous Materials.* Because they relate to wildfire, they are more appropriate addressed in this section of the EIR. Furthermore, as thresholds b) and c) i both concern the potential for a proposed project to interfere with an evacuation or emergency response plan, they are addressed together in LRDP Impact WF-2 below.

Approach to Analysis

Impacts associated with wildfire are evaluated within the context of the effectiveness of standard wildfire risk abatement methods as they relate to the development of new structures and the addition of 1,200 adjusted daily population (ADP) anticipated on the campus under the proposed 2025 LRDP by 2045. If wildfire risk from new, Project-related campus development and population growth can be effectively lessened through regulatory compliance (e.g., compliance with the Berkeley Lab's Emergency Management Program, WFMP, Vegetation Management Guide, CEMP, and PRC Sections 4201-4204, 4291, and 4442, and other applicable adopted plans), then the impact would be considered less than significant.

Impact Analysis

LRDP Impact WF-1: Implementation of the LBNL 2025 LRDP would not expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires. (*Less than Significant*)

The proposed 2025 LRDP articulates a policy framework that would guide Berkeley Lab's future land development, facility operations, site circulation, open space, and infrastructure. An overarching development theme in the proposed 2025 LRDP is one of modernization: over the next 20 years, UC LBNL seeks to modernize its aging facilities and infrastructure and realize a more orderly and sustainable campus. The proposed 2025 LRDP does not provide for substantial building space growth compared to existing conditions, nor does it involve substantial expansion of the campus's development footprint. Furthermore, campus ADP would increase up to an estimated 40 percent over baseline conditions (but would remain below pre-pandemic levels). Rather, the proposed 2025 LRDP emphasizes the removal of aging buildings and construction of new and more efficient buildings. Further, each new facility that is constructed would adhere to the applicable safety standards and building and fire codes in place at the time of construction. This would include CBC Chapter 7A, which establishes minimum standards for protecting life and property by enhancing a building's ability to resist flames or embers projected by a vegetation fire within a WUI area. Future design and construction would comply with the CCR Title 24, Part 7, after the January 1, 2026 effective date. In addition, the Lab's Vegetation Management Guide specifies defensible building perimeter standards, and DOE restricts new buildings of over 5,000 square feet to be of Type I or Type II construction.

As discussed in Chapter 3, *Project Description*, most new construction and renovations under the proposed 2025 LRDP would take place in infill and previously developed areas, often on the sites of demolished buildings. The Perimeter Open Space land use zone, depicted in Figure 3-7 in

Chapter 3, would continue to be managed to minimize wildland fire risks. Future development in this zone would be limited to minor maintenance, support structures, or pathways, while preserving the open, wooded, or grassland character of the hillside site as much as possible. Ongoing implementation of the Lab's VMP would help minimize wildland fire risk and potential damage from wildland fire. Implementation of the VMP would continue to thin overly dense tree groves and transition eucalyptus and non-native pine woodlands and groves to less flammable, more dispersed and sustainable coast live oak woodlands. Ladder fuels, invasive brush, leaf litter, and potentially dangerous trees and overhanging tree limbs would continue to be removed, as would annual grasslands through grazing. Modernization of campus facilities utilizing current fire building standards would tend to lessen overall fire risk.

For these reasons, proposed 2025 LRDP implementation would not expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires, and this impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development that could occur under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings analyzed in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of impacts related to wildfire exposure. For the same reasons put forth above for the proposed LRDP, individual projects consistent with those analyzed in the Illustrative Development Scenario would not expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires, and this impact would be less than significant.

LRDP Impact WF-2: Implementation of the LBNL 2025 LRDP could substantially impair implementation of an adopted emergency response plan or emergency evacuation plan. (*Potentially Significant; Less than Significant with Mitigation*)

Campus development under the proposed 2025 LRDP would increase campus building space and daily on-site population. The analysis below evaluates the effects of the increased building space and campus population on the Lab's emergency response plans as well as effects on emergency evacuation in the area surrounding the campus.

Effect on the Lab's Emergency Response Plan

Berkeley Lab maintains its own Emergency Management Program, which coordinates emergency preparations, response, and recovery activities related to wildfire through its Security and Emergency Services division. The missions, functions, responsibilities, and processes that relate to planning, preparedness, readiness assurance, and emergency response are laid out in the CEMP. In an emergency, the Lab activates its EOC, where members from different Lab areas coordinate to exchange information and make decisions on how to handle the emergency and how to return the Lab to normal operations. The EOC works with local law enforcement and fire agencies to ensure the Lab's people, property, and other assets are protected. The Lab's Emergency Management Program ensures efficient resource allocation for employee and visitor protection during emergencies, including wildfires that involve evacuation.

As discussed in Section 4.16.2, *Environmental Setting*, above, Berkeley Lab has defined six campus emergency management zones to better manage the campus population during an emergency and provide for particular focus on personnel in the area most impacted by an emergency event. These zones prevent the unnecessary movement of personnel, which reduces the risk of injury and lessens the impact to Lab operations. For campus evacuations, the zones are used to systematically evacuate the Lab population, allowing for personnel most impacted by the event to evacuate first, while personnel in other zones may then evacuate or shelter in place.

In addition, Berkeley Lab has identified several potential evacuation routes from the campus's three gates that provide access to points in Downtown Berkeley, Downtown Albany, and points in unincorporated Contra Costa County. Berkeley Lab has designated several buildings within each campus emergency management zone that can serve as WTRBs in the event of a wildfire or other emergencies—a temporary refuge for employees and visitors. These buildings are built out of non-combustible materials, have defensible space around the exterior, and can provide clean air inside the building during a fire event. It is noted that Berkeley Lab is currently re-evaluating and updating its inventory of WTRBs that can be used as temporary refuge in the event of a wildfire but has provided the most up-to-date list available in this EIR. Replacement of outdated and less defensible structures with new buildings compliant with contemporaneous codes under the proposed Project would increase the availability of potential WTRBs. Future improvements to harden existing buildings may also be considered to augment the WTRB program.

Berkeley Lab's existing emergency response and evacuation plans and procedures—as augmented by LRDP Mitigation Measures WF-1 and WF-2, below—would continue to serve the campus under the proposed 2025 LRDP. New buildings are expected to be constructed as infill development within the existing campus development clusters. Additionally, each new building would be required to adhere to relevant fire prevention and safety regulations, including the CBC and CFC. These regulations require that adequate egress capability be provided, and that evacuation routes and areas are clearly identified. Further, the proposed 2025 LRDP does not involve realignment of the existing roadway network. Therefore, ingress and egress from each development cluster and from the campus would not be altered or impeded in any way that could interfere with emergency response by the on-campus fire station or off-campus fire resources, nor interfere with the evacuation of employees and visitors. To the extent that temporary road closures are required for the construction of a specific building project, the construction project would trigger the preparation and implementation of a traffic management plan to avoid any closures that could interfere with emergency response and evacuation. In summary, campus development under the proposed 2025 LRDP would not interfere with the Lab's emergency response and evacuation plans.

Effect on Off-Campus Evacuation Efforts

The proposed 2025 LRDP would support an increase in the Lab's ADP. This population growth would increase commuting to the campus, including by personal vehicles. Personal vehicle use at Berkeley Lab is controlled by restricted gate pass/parking pass issuance and the availability of limited employee parking spaces. As discussed in Section 4.14, *Transportation*, the proposed 2025 LRDP would maintain and not increase the parking supply serving employees and visitors. This would help discourage, but not completely prevent, an increase in the number of single-occupant vehicle (SOV) travel to and from the campus on a typical workday. Project implementation is, therefore, expected to result in an incrementally increased number of personal vehicles that could evacuate the campus in an emergency event. Under a full campus evacuation due to a regional emergency, such as a wildfire, these additional Lab vehicles could add traffic to off-site roadways that may already be heavily in use. Such roadways, especially Hearst Avenue and Centennial Drive, could be additionally congested with traffic generated by residents, students, employees, and visitors who may be evacuating simultaneously from nearby areas.

As described in Section 4.16.2, *Regulatory Framework*, Berkeley Lab actively participates in two forums – Hills Emergency Forum and EBWC – which focus on building interagency cooperation on such issues as wildfire incident response and management protocols, public education programs, multi-jurisdictional training, and fuel reduction strategies. These efforts are anticipated to improve East Bay hills evacuation protocols in East Bay hills. In addition, the City of Berkeley is in the process of updating the fire evacuation plan for its hill neighborhoods. The updated plan is expected to develop measures to address congestion during fire-related evacuation, including possible back-up power and signal timing adjustments at key intersections to facilitate traffic flow. Although on-going regional efforts described above as well as Berkeley Lab's on-going emergency response programs and evacuation procedures would help alleviate the potential for congestion on city streets, additional Project-related vehicles leaving the campus have the potential to substantially impair off-site evacuation efforts and thereby impair implementation of an evacuation plan. This would be considered a potentially significant impact. Berkeley Lab would implement the mitigation measures presented below to reduce this impact to below a level of significance.

LRDP Mitigation Measure WF-2a: High Fire Risk Warning Period Reduced Campus ADP

During applicable National Weather Service Red Flag Warning periods as determined by Berkeley Lab's Safety and Emergency Services (SES) Division management, Berkeley Lab shall reduce on-campus population to below 3,000 ADP for the duration of the high-risk period. This will be achieved by visitor and guest restrictions, managed remote work instructions to non-essential Lab personnel, and noticing of all Lab staff regarding potential emergency conditions prior to such periods.

All Lab personnel—including vendors, contractors, and other campus-based affiliates—shall be notified (whenever possible, at least 24 hours in advance) of applicable Red Flag Warning periods and of any other days considered to be of notable fire risk as determined by SES management. In advance of all applicable high fire risk days, all non-essential Lab personnel shall be advised to avoid the Lab campus through such measures as teleworking or remote working on other non-campus sites not subject to high-risk conditions. Teleworking and remote working on such days shall be enabled and encouraged by Lab line supervisors, division directors, and the Laboratory Directorate and instituted as Lab policy in the Laboratory's Requirements and Policies Manual. In addition, in advance of applicable high fire risk days, Lab visitors and guest lists shall be reviewed and, wherever practical, visits shall be rescheduled for alternate dates. Laboratory ADP on high fire risk days shall be regularly monitored to determine the effectiveness of the above described measures and to determine if and when mandatory work-at-home measures should be imposed to minimize campus population on such days and to keep the Lab campus ADP at or below baseline levels (i.e., 3,000 ADP) during above-described notable fire risk conditions.

LRDP Mitigation Measure WF-2b: Enhanced Wildfire Temporary Refuge Building Program

Berkeley Lab shall complete and institute its enhanced Wildfire Temporary Refuge Building (WTRB) Program that will provide at least two WTRBs that meet all applicable code requirements in each of the campus's six emergency management zones. The program will also clearly define the protocols and procedures for Lab personnel to use WTRBs in case of a fire emergency requiring on-campus shelter-in-place. WTRBs will be clearly marked on the outside for ease of identification, made highly accessible for all users, and located such that they may be quickly accessed by users throughout the Lab campus. Furthermore, the Lab will offer education and outreach throughout the Lab community to increase awareness of WTRBs and to encourage the use of such facilities as an alternative to evacuation, especially under conditions determined by SES management where shelter-in-place may be safer than evacuation. Efforts to enhance the WTRB Program are currently underway and shall be completed within one year of 2025 LRDP adoption.

Significance after Mitigation: Less than Significant. With the implementation of LRDP Mitigation Measure WF-1, fewer than 3,000 personnel would be expected on the campus on Red Flag or similar high-risk days compared to 3,000 ADP under baseline conditions and 4,200 ADP under project conditions. As a result, the same number or fewer vehicles would require evacuation than under baseline operating conditions. Moreover, with the convenient availability and encouraged use of WTRBs, a further reduced number of vehicles would likely be involved in a campus-wide wildfire-related evacuation, and nearby adopted emergency response and/or emergency evacuation plans would not be substantially impaired.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development that could occur under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings analyzed in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of impacts related to impairing an adopted emergency response plan or emergency evacuation plan. For the reasons described above for the proposed 2025 LRDP, individual future projects consistent with those analyzed in the Illustrative Development Scenario would cause campus ADP to increase and potentially result in an increase in vehicle travel to the campus. This would result in a potentially significant impact related to impairment of an adopted emergency response plan or emergency evacuation plan, and the same mitigation measures listed above would be required to mitigate the impact to a less-than-significant level.

LRDP Impact WF-3: Implementation of the LBNL 2025 LRDP would not exacerbate wildfire risks and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire due to slope, prevailing winds, and other factors. (*Less than Significant*)

As discussed in Section 4.16.2, above, the Berkeley Lab campus experiences strong offshore winds for short durations in the fall. These relatively warm, dry winds increase wildfire risk to the landscape that is already desiccated during the summer months. While Project-related campus development would not alter these winds, should an on-site wildfire occur, fire-related air pollution originating on the campus could potentially be carried by these winds to project occupants as well as to neighboring areas.

As described in Section 4.16.3, *Regulatory Framework,* above, there are several plans, policies, regulations, and programs in place to minimize wildfire risks at the Berkeley Lab campus and in the surrounding areas. These include the Berkeley Lab Fire Protection Program, UC Berkeley Wildland Vegetative Fuel Management Plan, Alameda County's CWPP and EOP, as well as the LHMPs of the City of Berkeley and the City of Oakland. These comprehensive plans aim to reduce and respond to wildfire hazards on a regional scale. Additionally, existing regulatory requirements and policies that address wildfire risks overall would help minimize people's potential exposure to air pollutants resulting from wildfires, especially considering prevailing winds.

Other factors, such as vegetation, can also significantly exacerbate wildfire risks. The grassland and non-native pine and eucalyptus woodlands on the Berkeley Lab campus are particularly susceptible to ignition. During late summer and fall, open space vegetation becomes highly flammable, making wildfires a serious concern in areas with extensive, unirrigated greenery. However, as the proposed 2025 LRDP is implemented, the Lab would continue to manage campus vegetation according to its WFMP and VMP, which would ensure that timely steps are implemented to reduce wildfire hazards, especially in the Priority 1 areas identified in Figure 4.16-2. Additionally, any future development under the proposed 2025 LRDP would be required to submit grading plans and construction drawings to the LBNL Fire Marshal for review and comply with the CBC, CFC, and PRC Sections 4201 through 4204, 4291, and 4442. Modernization of campus buildings as a result of the 2025 LRDP would also reduce wildfire risks.

For these reasons, proposed 2025 LRDP implementation would not exacerbate wildfire risks and thereby not expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire due to slope, prevailing winds, and other factors, and this impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development that could occur under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings analyzed in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of impacts related to the exposure of project occupants to pollutant concentrations from wildfire. For the reasons described above for the proposed 2025 LRDP, individual future projects consistent with those analyzed in the Illustrative Development Scenario would also not result in significant impacts related to the exposure of project occupants to pollutant concentrations from wildfire.

LRDP Impact WF-4: While implementation of the LBNL 2025 LRDP would require the installation or maintenance of associated utility infrastructure, the installation and maintenance of this infrastructure would not substantially exacerbate fire risk or result in temporary or ongoing impacts to the environment. (*Less than Significant*)

As described in Chapter 3, and in addition to the on-going LAMP project, the proposed 2025 LRDP would include upgrades and improvements to aging infrastructure to ensure that utilities can adequately support new planned development and an increase in campus ADP. These infrastructure upgrades would involve the replacement of degraded and high-risk water mains and the replacement or rehabilitation of degraded or undersized sewers and storm drains. In addition, to address existing deficiencies and future growth in demand, a variety of electrical systems upgrades (including undergrounding of electrical systems) would be required during the proposed 2025 LRDP planning period. These types of improvements would result in minor changes to the existing built environment and would involve temporary construction. The installation of new roads, fuel breaks, or emergency water sources would not be required.

The Berkeley Lab campus site is prone to a greater risk of wildfire due to its location within a Very High FHSZ and the WUI. Any development or redevelopment within the Very High FHSZ and the WUI would be required to comply with building design standards within the CBC and Chapter 49 of the CFC, which would reduce the risk of wildfire due to installation and maintenance of infrastructure. Construction activities would be required to comply with PRC Section 4442, which regulates the use of internal combustion engines that use hydrocarbon fuels on forest-covered land, brush-covered land, and grass-covered land and requires spark arresters. Operation and maintenance of overhead power lines would be required to comply with fire safety regulations pertaining to electric utilities, including 14 CCR Sections 1250 et seq., which provide requirements for vegetation clearance around poles, towers, and wires.

For these reasons, while proposed 2025 LRDP implementation would require the installation or maintenance of associated utility infrastructure, the installation and maintenance of this infrastructure would not substantially exacerbate fire risk or result in temporary or ongoing impacts to the environment, and this impact would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development that could occur under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings analyzed in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of impacts related to the exacerbation of fire risk due to the installation or maintenance of associated infrastructure. For the reasons described above for the proposed 2025 LRDP, individual projects consistent with those analyzed in the Illustrative Development Scenario would also not result in significant impacts related to the exacerbation of fire risk due to the installation or maintenance of associated infrastructure.

LRDP Impact WF-5: Implementation of the LBNL 2025 LRDP would not expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes. (*Less than Significant*)

Catastrophic wildfire can create favorable conditions for other hazards, such as flooding and landslides during the rainy season. A project would result in a significant impact if, due to slopes, drainage changes, or post-fire slope instability, it would expose people or structures to significant risks from landsides, debris flows, or flooding following a wildfire.

As discussed in Section 4.6 *Geology and Soils*, some portions of the Berkeley Lab campus are susceptible to landslides and debris flows. However, almost all development under the proposed 2025 LRDP would take place on infill sites and previously developed areas, which are flat and plumbed with storm drains and thus not prone to landsliding. The proposed 2025 LRDP also includes infrastructure upgrades, which would likely result in minor changes to the existing built environment within the Berkeley Lab campus. Construction activities, such as vegetation clearing, grading, and excavation, could temporarily increase erosion and sedimentation in the construction area. However, all construction activities would be required to comply with applicable regulations mitigating erosion and drainage changes, such as those under the National Pollutant Discharge Elimination System (NPDES) and Construction General Permit (described in detail in Section 4.9, *Hydrology and Water Quality*). For example, potential future development and redevelopment that involves the disturbance of 1 or more acre of land would be subject to NPDES construction permit requirements. Among these requirements is preparation of a Stormwater Pollution Prevention Plan, which includes best management practices to limit sediment and non-storm water discharges.

As discussed above under LRDP Impact WF-3, as the proposed 2025 LRDP is implemented, the Lab would continue to manage campus vegetation, especially in the Perimeter Open Space Zone, according to its WFMP and VMP. This would help ensure that proper care is taken to reduce wildfire hazards across the campus. As a result of the Lab's fire fuel reduction efforts, the likelihood of a wildfire that would burn vegetation on slopes across the campus is low, thus reducing the potential of post-fire slope instability. Furthermore, in the immediate aftermath of any wildfire that might affect campus slopes, Berkeley Lab would evaluate the slope conditions and implement measures to stabilize and protect the affected area from post-fire slope instability and landsliding during future wet weather.

The on-site slopes that have the most potential to affect off-site receptors in the event of post-fire slope instability are along the western portion of the campus near Buildings 88 and 90. These slopes are mostly vegetated with annual grasses and in the aftermath of a fire, areas evaluated and identified as unstable would be treated with jute netting or other erosion control measures as outlined in Section 4.9. Thus, slope conditions may be temporarily affected after a fire but would not affected severely enough for the slope to become unstable. The only area along the western portion of the campus that has potential for post-fire landslides is a small, heavily-vegetated drainage between Buildings 88 and 90. However, the slopes in the drainage are oriented in a north-south direction, thus any sliding that could occur post-fire would not be in the direction of off-site receptors to the west.

Given the reasons above, Project-related impacts related to downslope or downstream flooding or landslides as a result of runoff or post-fire slope instability would be less than significant.

Mitigation: None required.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of potential development that could occur under the proposed 2025 LRDP. Actual overall development that is approved and constructed pursuant to the proposed 2025 LRDP is expected to be similar in intensity and character to that portrayed in the Illustrative Development Scenario. Any of the hypothetical buildings analyzed in the scenario might be similar to future buildings constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for the evaluation of impacts related to the exposure of people or structure to significant risks as a result of runoff, post-fire slope instability, or drainage changes. For the reasons described above for the proposed 2025 LRDP, individual projects consistent with those analyzed in the Illustrative Development Scenario would also not result in significant impacts related to the exposure of people or structure to significant risks as a result of runoff, post-fire slope instability, or drainage changes.

Cumulative Impacts

LRDP Impact CUM-WF-1: Implementation of the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, could result in significant cumulative impacts related to wildfire. (*Potentially Significant; Less than Significant with Mitigation*)

This section presents an analysis of Project-related cumulative effects when considered with other past, present, and reasonably foreseeable projects and plans. The geographic scope of potential cumulative impacts related to wildfire encompasses the Berkeley Lab campus as well as the

UC Berkeley Hill Campus and future development in the cities of Berkeley and Oakland that is within or near lands in the SRA or in a Very High FHSZ.

Proposed developments by Berkeley Lab and other entities in the cumulative impact area could increase cumulative wildfire risks. UC Berkeley has some projects (see Chapter 4, *Introduction to the Environmental Analysis*) that might add to these risks. UC Berkeley's Hill Campus, adjacent to the Lab and in the Very High FHSZ, is characterized by steep terrain and dense vegetation. Cumulative projects within this area, which include the Cal Softball Field Renovation, may require construction, infrastructure extension, and increased maintenance, all of which could potentially increase fire risk. Additionally, future projects in the cities of Berkeley and Oakland, which include nearby multi-family residential development near the SRA or Very High FHSZ may further amplify these risks throughout the proposed Project's 20-year planning horizon. In general, this increase in development within or near the SRA or Very High FHSZ could result in a cumulatively significant impact. However, with the exception of evacuation, the proposed Project's contribution to cumulative wildfire impacts would not be cumulatively considerable. As discussed above, most new construction and renovations under the proposed 2025 LRDP would take place in infill and previously developed areas and thus would not intrude on fire prone areas of the campus. Furthermore, the Lab would continue to manage campus vegetation according to its WFMP and VMP, which would reduce the incidence risk and potential damage from wildfire. Finally, new buildings on the campus would comply with CBC and CFC design standards, which would further reduce fire risk.

In the event of a major East Bay hills wildfire, local and regional roadways would likely be congested with evacuating Berkeley Lab staff along with Berkeley and Oakland residents and nearby UC Berkeley students, faculty, and staff. Adding more vehicles associated with a Project-related campus population increase to these roads could result in impairment of an adopted emergency response plan or emergency evacuation plan. However, as discussed above under LRDP Impact WF-2, with the implementation of LRDP Mitigation Measure WF-2a, which would reduce the campus population for the duration of Red Flag Warning periods and high fire risk days, and LRDP Mitigation Measure WF-2b, which would require the Lab to implement an enhanced WTRB program, the Project would not increase congestion on city streets during an evacuation event, i.e., the Project's contribution would not be considerable. As a result, the cumulative impact with respect to impairment of adopted emergency response and/or emergency evacuation plans would be less than significant.

Mitigation: Implement LRDP Mitigation Measures WF-2a and WF-2b.

Significance after Mitigation: Less than Significant.

Individual Future Projects/Illustrative Development Scenario. The Illustrative Development Scenario is a conceptual portrayal of development that could occur under the proposed 2025 LRDP. Any of the hypothetical development analyzed in the scenario might be similar to future development constructed pursuant to the proposed 2025 LRDP, and thus the scenario is an appropriate and conservative basis for evaluating Project-related cumulative environmental impacts. For the reasons stated above for the proposed 2025 LRDP, development consistent with that portrayed in the Illustrative Development Scenario, in combination with past, present, and reasonably foreseeable future projects in the geographic area of effect, would generally result in less-than-significant cumulative impacts with respect to wildfire. Furthermore, with the implementation of LRDP Mitigation Measure WF-2a and LRDP Mitigation Measure WF-2b, contribution of the Illustrative Development Scenario to congestion on area roadways would not be cumulatively considerable, and the cumulative impact with respect to evacuation in the event of a wildfire would also be less than significant.

4.16.5 References

California Department of Forestry and Fire Protection (CAL FIRE), 2008. Very High *Fire Hazard Severity Zones in LRA, Alameda County*. Available online: September 3, 2008, https://34c031f8-c9fd-4018-8c5a-4159cdff6b0d-cdn-endpoint.azureedge.net/-/media/osfm-website/what-we-do/community-wildfire-preparedness-and-mitigation/fire-hazard-severity-zones/fire-hazard-severity-zones-map/upload-1/fhszl_map1.pdf. Accessed August 1, 2024.

East Bay Wildfire Coalition (EBWC), 2025. https://eastbaywildfire.org/. Accessed January 27, 2025.

Hills Emergency Forum, 2025. http://www.hillsemergencyforum.org/Index.html. Accessed January 27, 2025.

Lawrence Berkeley National Laboratory (LBNL), 2023. *Wildland Fire Management Plan*, August 3.

LBNL, 2024a. *Comprehensive Emergency Management Plan*. May 6.

LBNL, 2024b. *Safe Buildings,* https://securityandemergencyservices.lbl.gov/resource/emergency-management-resources/safe-buildings/. September 24.

4.17 Effects Found Not to Be Significant

According to *CEQA Guidelines* Section 15128, an EIR shall contain a statement briefly indicating the reasons that various possible significant effects of a project were determined not to be significant and were therefore not discussed in detail in the EIR.

This section presents information for certain environmental topic areas that, based on review by UC LBNL, were determined to have no Project impact, including Agriculture and Forestry Resources and Mineral Resources. The following sections present brief summaries of the Project effects that were found not to be significant, including a discussion of reasons why they would not be significant. Please also refer to the other impact sections in this Chapter 4 of the EIR for other environmental impacts that were found not to be significant.

4.17.1 Agriculture and Forestry Resources

The California Department of Conservation (DOC), Division of Land Resource Protection, has established the Farmland Mapping and Monitoring Program (FMMP), which monitors the conversion of the state's farmland to and from agricultural use. Four categories of farmland – Prime Farmland, Farmland of Statewide Importance, Unique Farmland, and Farmland of Local Importance – are considered valuable, and are collectively titled Important Farmland. No agricultural uses are located on or in the vicinity of the Berkeley Lab campus and the campus is designated for urban uses on maps prepared pursuant to the FMMP (DOC, 2024). As no land on the campus is designated as Important Farmland, campus development under the proposed 2025 LRDP would have no impact related to conversion of Important Farmland to a nonagricultural use. In addition, no portion of the Berkeley Lab campus is zoned for agricultural use; as a result, the proposed 2025 LRDP would not conflict with any zoning for agricultural use, and there would be no impact in this regard.

The California Land Conservation Act of 1965, commonly referred to as the Williamson Act, enables local governments to designate agricultural preserves and enter into contracts with private landowners for restricting specific parcels of land to agricultural, or related open space use. Lands on the Berkeley Lab campus and its vicinity are not under any Williamson Act contracts or within any agricultural preserve.

With respect to forestry resources, no forest land or existing timber harvest uses are located on or in the vicinity of Berkeley Lab campus. No areas of the campus are zoned for timberland. As such, implementation of the proposed 2025 LRDP would not result in the loss of forest land or conversion of forest land to non-forest uses, or conflict with existing zoning for timberland, and therefore would have no impact on forest land or timberland.

4.17.2 Mineral Resources

The Berkeley Lab campus is located on land classified by the DOC Division of Mines and Geology as Mineral Resource Zone 1 (MRZ-1), an area where adequate geologic information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence. This zone is applied where well developed lines of reasoning, based on economic-geologic principles and adequate data, indicate that the likelihood for occurrence of significant mineral deposits is nil or slight (DOC, 1987; 2000). There are no known significant mineral resources on the Berkeley Lab campus or in the vicinity of the campus.

No mineral extraction activities currently occur or have historically occurred on the Lab, and mineral extraction is not included as an activity allowed under the proposed 2025 LRDP. Implementation of the proposed 2025 LRDP would not result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state; and would not result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan. As a result, approval of the proposed 2025 LRDP would not interfere with any mineral extraction operations and would not result in the loss of land designated for mineral resources. No impact on mineral resources would occur.

4.17.3 References

California Department of Conservation (DOC) Division of Mines and Geology, 1987. *Special Report 146 Part II, Mineral Land Classification: Aggregate Materials in the San Francisco-Monterey Bay Area.* Available: https://ia902602.us.archive.org/35/items/minerallandclass00stin/minerallandclass00stin.pdf.

DOC, 2000. *Guidelines for Classification and Designation of Mineral Lands.* Available: https://www.conservation.ca.gov/smgb/Guidelines/Documents/ClassDesig.pdf. Accessed July 23, 2024.

DOC, 2024. California Important Farmland Finder. Available online: https://maps.conservation.ca.gov/DLRP/CIFF/. Accessed July 23, 2024.

CHAPTER 5

CEQA Statutory Sections

5.1 Introduction

Section 15126 of the *CEQA Guidelines* requires that when evaluating a project's impact on the environment all phases of the project must be considered, including planning, construction, and operation, taking account of the impacts both in the short term and long term. More specifically, Section 15126.2 requires disclosure of (1) Significant Environmental Effects Which Cannot be Avoided if the Proposed Project is Implemented [*CEQA Guidelines* Section 15126.2(c)], (2) Significant Irreversible Environmental Changes Which Would be Caused by the Proposed Project Should it be Implemented [*CEQA Guidelines* Section 15126.2(d)], and (3) Growth-Inducing Impact of the Proposed Project [*CEQA Guidelines* Section 15126.2(e)]. In addition, Section 15128 of the *CEQA Guidelines* also notes that "an EIR shall contain a statement briefly indicating the reasons that various possible significant effects of a project were determined not to be significant and were therefore not discussed in detail in the EIR."

Chapter 2, *Summary*, and Chapter 4, Sections 4.1 through 4.16 present the potential environmental effects that could result from 2025 LRDP implementation, proposed mitigation measures, and conclusions regarding the level of significance of each impact before and after mitigation. Section 4.17 presents those impacts that were determined not to be significant and therefore are not discussed in detail in the EIR. Other CEQA-required analyses described above are presented below.

5.2 Significant and Unavoidable Impacts

Section 15126.2(c) of the *CEQA Guidelines* requires that an EIR describe any significant impacts that cannot be avoided, even with the implementation of feasible mitigation measures. The environmental effects of the proposed Project on various aspects of the environment are discussed in detail in Chapter 4, *Environmental Setting, Impacts, and Mitigation Measures*. Significant impacts of the Project that cannot be avoided if it is approved as proposed are summarized in **Table 5-1**, below.

Section 15126.2(c) also requires: "Where there are impacts that cannot be alleviated without imposing an alternative design, their implications and reasons why the project is being proposed, notwithstanding their effect, should be described." The discussion of the feasibility of alternatives to address significant impacts of the proposed Project is presented in Chapter 6, *Alternatives*.

TABLE 5-1
SIGNIFICANT AND UNAVOIDABLE IMPACTS OF THE PROPOSED 2025 LRDP

Impacts
LRDP Impact CUL-1: Implementation of the LBNL 2025 LRDP could potentially cause a substantial adverse change in the significance of a historical resource pursuant to Section 15064.5.
LRDP Impact NOI-1: Construction activities under the LBNL 2025 LRDP would generate a substantial temporary increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance applied as the relevant threshold of significance, or applicable standards of other agencies.
LRDP Impact NOI-2: Vegetation management activities under the VMP during the LBNL 2025 LRDP timeframe would generate a substantial temporary increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance applied as the relevant threshold of significance, or applicable standards of other agencies.
LRDP Impact CUM-NOI-1: Implementation of the LBNL 2025 LRDP and the related VMP, combined with other concurrent construction projects in the project area, could generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance applied as the relevant threshold of significance, or applicable standards of other agencies.

5.3 Significant Irreversible Environmental Effects

Under CEQA, an EIR must analyze the extent to which a project's primary and secondary effects would commit future generations to the allocation of nonrenewable resources and to irreversible environmental damage (*CEQA Guidelines* Section 15126.2(d)). Specifically, Section 15126.2(d) states:

> Uses of nonrenewable resources during the initial and continued phases of the project may be irreversible, since a large commitment of such resources makes removal or nonuse thereafter unlikely. Primary impacts and, particularly, secondary impacts (such as highway improvement which provides access to a previously inaccessible area) generally commit future generations to similar uses. Also, irreversible damage can result from environmental accidents associated with the project. Irretrievable commitments of resources should be evaluated to assure that such current consumption is justified.

Generally, a project would result in significant irreversible environmental changes if:

- The primary and secondary impacts would generally commit future generations to similar uses;
- The project would involve a large commitment of nonrenewable resources;
- The proposed consumption of resources is not justified (e.g., the project involves the wasteful use of energy); and/or
- The project would involve uses in which irreversible damage could result from any potential environmental accidents associated with the project.

With respect to the potential of the proposed 2025 LRDP (the Project) to commit future generations to similar uses, Berkeley Lab is a federally funded national laboratory of the U.S. Department of Energy (DOE) Office of Science. The Lab conducts unclassified research to deliver scientific solutions to challenges of national and international significance that are beyond the capabilities of most university and private sector research institutions. The Berkeley Lab campus has developed and evolved in its present location for over 85 years and is developed with roads, infrastructure, and approximately 170 building facilities supporting over 3,000 daily staff and visitors. The proposed Project would serve to continue but not alter the types of land uses and activities conducted at the Berkeley Lab campus.

With respect to the commitment of non-renewable resources and resource consumption, these would occur during both construction and operation of Lab facilities under the proposed 2025 LRDP. Project construction activities would require the use of fossil fuels, construction materials, and water. During operation, the new campus buildings and facilities added under the proposed 2025 LRDP would require an irreversible commitment of energy and resources, primarily in the form of fossil and alternative fuels to operate vehicles and equipment; electricity for building heating and cooling; and potable and non-potable water for human consumption, landscaping, cooling, and other uses.

However, as discussed in Section 4.5, *Energy*, all new Project-related construction would be all-electric and not use natural gas for space or water heating, in compliance with the UC *Policy on Sustainable Practices*. The remaining natural gas consumption in 2045 would be due to space and water heating associated with existing minor buildings not covered by these requirements, as well as a minimal amount of natural gas use associated with laboratories. At minimum, all new buildings shall be designed, constructed, and commissioned to beat ASHRAE 90.1 by 30 percent as required by Section 6834 of Title 42 United States Code and meet the whole building energy performance compliance targets. This approach also meets the requirement to outperform the California Building Code energy-efficiency standards by at least 20 percent. All new buildings shall, at a minimum, achieve a LEED "Gold" certification with a "Platinum" rating whenever possible within the constraints of program needs and standard budget parameters. The Lab currently does and will continue to implement energy efficiency actions in buildings and infrastructure systems to reduce its energy use intensity.

In addition, as described further in Section 4.14, *Transportation*, future average daily vehicle miles traveled (VMT) per worker under the proposed 2025 LRDP would not increase substantially compared to existing conditions, because the analysis shows that even with the addition of Project-related traffic, the area that includes the Lab would continue to exhibit below-threshold VMT, or VMT that is 15 percent or more below the regional average. As a result, mobile fuel use per worker associated with the proposed 2025 LRDP is presumed to be lower than mobile fuel use per worker regionwide. Given the above considerations, the Project-related consumption of resources would not be unjustified or involve the wasteful use of energy or nonrenewable resources.

In addition, as described in Section 4.7, *Greenhouse Gas Emissions*, campus growth and development under the proposed 2025 LRDP would result in a decrease in GHG emissions at buildout when compared to existing conditions. This would be due to increased energy and fuel efficiency, buildings and fleet electrification, vehicle engine technology improvements, and reductions from statewide implementation of SB 100 renewable energy goals. Further, the Lab's total emissions at LRDP buildout would be more than 90 percent below the 1990 emissions and the Lab's 2019 emissions. Therefore, the proposed 2025 LRDP would be consistent with the carbon neutrality targets included in the UC *Policy on Sustainable Practices* and AB 1279, as well as core strategies of both the California Air Resources Board (CARB)'s *2022 Scoping Plan* and *Plan Bay Area 2050,* and thus would not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing greenhouse gas emissions.

With respect to irreversible environmental damage that could result from a Project-related accident, the potential for such effects is discussed in detail in Section 4.8, *Hazards and Hazardous Materials*. Construction and operation of facilities pursuant to the proposed 2025 LRDP would involve the transport, handling, storage, and disposal of varied quantities of hazardous materials, including chemical, medical, and radioactive materials and waste. If not handled properly, spills and accidents could result, with hazardous releases affecting residents, workers, the public, and/or the environment. However, under the proposed Project, the Lab would continue to comply with hazardous storage and transportation regulations and maintain programs and controls currently in place to manage safety and hazardous material handling, as mandated by State and federal laws and Lab policies. Consequently, the potential impact to workers, residents, visitors, and the environment would be reduced to a less-than-significant level and no irreversible damage would result.

5.4 Growth-Inducing Effects

As required under CEQA, an EIR must include a discussion of the ways in which the proposed Project could directly or indirectly foster economic or population growth, or the construction of additional housing, and how such growth would, in turn, affect the surrounding environment (*CEQA Guidelines* Section 15126.2(e)). Growth can be induced in a number of ways, including by the elimination of obstacles to growth or through the stimulation of economic activity within the region. Removing growth obstacles includes reducing infrastructure limitations–for example through extending roads or utility lines with excess capacity–or reducing regulatory constraints so as to spur population growth or development unforeseen at the time of project approval. Under CEQA, growth by itself is not necessarily considered beneficial, detrimental, or of particular environmental significance.

5.4.1 Direct Employment Growth

Neither the current Berkeley Lab campus nor the proposed 2025 LRDP includes any provision for residential uses or future on- or off-site housing construction. There would be no increase in the housing stock or number of residents expected in the immediate project area as a result of the Project. However, the proposed 2025 LRDP would result in an expansion of campus worker facilities, and there would be an associated increase in on-campus population. As discussed in Section 4.12, *Population and Housing*, by the 2045 horizon year, the facilities built under the proposed 2025 LRDP would accommodate an additional on-campus Adjusted Daily Population (ADP) of 1,200 people compared to existing conditions. An estimated 880 of these would be staff and academics, which for purposes of conservative analysis are considered to be newly employed under the proposed Project-and new to the Bay Area. Nevertheless, the Lab's employment growth would not be substantial in comparison to the projected and planned growth for Alameda County (315,000) and the Bay Area counties (1.4 million) between 2015 and 2050 (ABAG, 2021).

The potential physical environmental impacts associated with Project-related campus ADP growth are evaluated in this EIR's environmental analysis sections (e.g., Section 4.1, *Air Quality*; Section 4.5, *Energy*; Section 4.12, *Population and Housing*; Section 4.13, *Public Services and Recreation*; Section 4.14, *Transportation*; and Section 4.15, *Utilities and Service Systems*). As the analysis in those sections shows, the environmental impact of the projected employment growth would be less than significant or less than significant with mitigation.

5.4.2 Indirect and Induced Employment Growth

In addition to the direct employment and campus ADP growth associated with the proposed 2025 LRDP development, additional local employment could be generated through the "multiplier effect," which applies to indirect and induced employment that is generated as a result of the spending by the place of primary employment (i.e., the Lab) and by the new employees at the Lab. Indirect jobs are jobs created in an economy as a result of the good and services purchased by an entity such as the Lab, whereas induced jobs are created by the spending of wage income by the new employees on goods and services.

For example, if the Lab were to purchase new equipment to install in new buildings constructed pursuant to the proposed 2025 LRDP, any resulting employment associated with those purchases would be classified as indirect employment generated by the Lab. On the other hand, if a Lab employee hired under the proposed 2025 LRDP were to eat lunch off-site, the lunch-server's job would be classified as an as induced job caused or supported by the Project.

The multiplier effect tends to be greater in regions with larger, diverse economies (such as the Bay Area) due to a decrease in the requirement to import goods and services from outside the region, as compared to the effects of spending in smaller economies where goods and services must be imported from elsewhere.

The number of indirect and induced jobs generated by an institution is commonly calculated by applying a ratio, or job multiplier, to the number of jobs provided directly by the institution. As noted above, the projected increase in direct jobs under the proposed 2025 LRDP is approximately 1,200 positions. Using a job multiplier of 0.73[1], at full implementation of the proposed 2025 LRDP, an estimated 876 indirect and induced jobs could be created in the Bay Area by the proposed 2025 LRDP. This indirect and induced employment growth is also well within the job growth projections for the Bay Area in *Plan Bay Area 2050.*

5.4.3 Environmental Effects of Indirect and Induced Employment Growth

The residence locations of people working in future indirect and induced jobs cannot be known at this time. It would be speculative to state where such workers would reside in the Bay Area (and beyond), or to determine any associated environmental effects. Further, indirect and induced

[1] Multipliers identified in studies of other college campuses range from 0.33 to 1.36 (Stanford, 2017). At 0.73 indirect and induced workers per University of San Francisco (USF) worker, the study conducted for USF may provide the best "order of magnitude" estimate for regional impacts of the proposed Project, as it is in the same Bay Area region with the same range of available local goods and services.

employment growth due to the proposed 2025 LRDP would likely be distributed throughout the greater Bay Area region (and beyond). As with residential impacts, the precise nature, location, and impact magnitude of indirect and induced employment growth cannot be determined in advance.

It can be reasonably expected, however, that the indirect and induced jobs associated with the proposed 2025 LRDP (about 876 jobs added to the Bay Area over a period of 20 years) would likely result in a very small increase in overall demand for housing, commercial and industrial space, and associated infrastructure in the region. Potential effects could include increases in traffic congestion; air pollutant emissions; and public utilities and service demands, such as for fire and police protection, water, recycled water, wastewater, solid waste, energy, and natural gas. An increase in Bay Area employment and housing demand could also require governmental services including, but not limited to, schools, libraries, and parks to serve new commercial and residential development.

Given the expected small and distributed increase in indirect and induced employment, the proposed Project would not contribute to a substantial loss of open space through conversion of undeveloped land to urban uses for housing, commercial space, and infrastructure.

5.4.4 Removal of Obstacles to Growth

The elimination of physical obstacles to growth is considered a growth-inducing effect. The proposed Project would result in additional facilities–most of them occupiable–on the Berkeley Lab campus. The proposed 2025 LRDP would include infrastructure improvements designed to accommodate Project-related growth and modernization. Proposed improvements include new or upgraded underground pipelines, electrical transmission lines, and water supply infrastructure. Roadway improvements would be undertaken, including widening for bike lanes and driveway extensions into new buildings, and new parking lots would be developed.

Proposed 2025 LRDP campus facility improvements would not create growth-inducing conditions. The Lab campus is fenced and gated and not open to the public, so internal improvements do not provide increased capacity or other opportunities for surrounding communities. New buildings would be offset in part by demolition of older, less mission-capable buildings, and development would primarily take place in already developed areas. Land use changes would create more perimeter open space and less developable space. Building and utility infrastructure capacity would be sized and designed to serve the proposed Project: DOE's national laboratory funding model does not support creation of excess capacity. No new campus gates or roadways would be constructed. Lab roadway and parking facilities improvements would be intended to better serve the Lab's current and expected Project-related population; no increase in vehicle or parking capacity is otherwise accommodated under the Plan. Thus the proposed 2025 LRDP would not remove an obstacle to growth in the cities of Berkeley and Oakland.

5.5 References

Association of Bay Area Governments (ABAG), 2021. Forecasts & Projections 2050. Available: https://abag.ca.gov/our-work/land-use/forecasts-projections. Accessed October 18, 2024.

Stanford University, 2017. *2018 General Use Permit Application*, Technical Data to Address Population and Associated Housing Demand. July 25.

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CHAPTER 6
Alternatives

6.1 Introduction

An EIR must present a range of reasonable alternatives to a proposed project that might feasibly accomplish most of the basic project objectives and avoid or substantially lessen one or more of the project's significant effects. This chapter describes the CEQA requirements for an alternatives analysis, presents the proposed 2025 LRDP Project objectives, summarizes the significant effects of the proposed Project that cannot be avoided or reduced to a less-than-significant level with mitigation, and describes the alternatives, including those that were considered but dismissed from further evaluation. The chapter then presents the comparative effects of each alternative relative to those of the proposed Project and evaluates the ability of the alternative to meet most of the Project objectives. As required under *CEQA Guidelines* Section 15126.6(e), an environmentally superior alternative is identified at the end of this chapter.

6.1.1 CEQA Requirements for Alternatives Analysis

CEQA requires that an EIR describe and evaluate a range of reasonable alternatives to the proposed project, or to the location of the proposed project, and evaluate the comparative merits of the alternatives (*CEQA Guidelines* Section 15126.6(a), (d)). The "range of alternatives" is governed by the "rule of reason," which requires description and consideration of only those alternatives necessary to permit informed public participation and an informed and reasoned choice by the decision-making body (*CEQA Guidelines* Section 15126.6(a), (f)).

The range of alternatives must include alternatives that could feasibly attain most of the basic project objectives and avoid or substantially lessen any of the significant effects of the project (*CEQA Guidelines* Section 15126.6(a)-(c)). CEQA generally defines "feasible" to mean an alternative that is capable of being accomplished in a successful manner within a reasonable time period, taking into account economic, environmental, social, technological, and legal factors. In addition, the following may be taken into consideration when assessing alternatives feasibility: site suitability; economic viability; availability of infrastructure; general plan consistency; other plans or regulatory limitations; jurisdictional boundaries; and the ability of the proponent to attain site control (*CEQA Guidelines* Section 15126.6(f)(1)). If the lead agency concludes that no feasible alternative locations exist, it must disclose and include the reasons for this conclusion in the EIR (*CEQA Guidelines* Section 15126.6(f)(2)(B)).

The alternatives description or evaluation does not need to be exhaustive, and an EIR need not consider alternatives for which the effects cannot be reasonably determined and for which implementation is remote or speculative. An EIR need not describe or evaluate the environmental effects of alternatives in the same level of detail as the proposed project, but it must include enough information to allow meaningful evaluation, analysis, and comparison with the proposed project (*CEQA Guidelines* Section 15126.6(d)).

The "no project" alternative must be evaluated. The no project analysis is required to include a discussion of the continuation of the existing conditions, as well as what could be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services (*CEQA Guidelines* Section 15126.6(e)(2)). When a project involves revision of an existing land use plan, the no project alternative will include the continuation of that existing plan into the future (*CEQA Guidelines* Section 15126.6(e)(3)(a)).

CEQA also requires that an environmentally superior alternative be selected from among the alternatives analyzed in the EIR. The environmentally superior alternative is that with the fewest or least severe adverse environmental impacts. If the "no project" alternative is the environmentally superior alternative, the EIR must also identify an environmentally superior alternative from among the other alternatives (*CEQA Guid*elines Section 15126.6(e)(2)).

6.2 Alternatives Selection

As noted above, the selection of alternatives for consideration in an EIR depends on whether the possible alternative can feasibly meet most of the basic project objectives and avoid or substantially lessen any significant project impacts. The Project objectives presented in Chapter 3, *Project Description,* and the significant unavoidable Project impacts identified in Chapter 4, *Environmental Setting, Impacts, and Mitigation Measures* are listed below.

6.2.1 2025 LRDP Project Objectives

The objectives for the proposed 2025 LRDP are as follows:

1. Strengthen Berkeley Lab's ability to perform transformative, mission-directed scientific research.
   - Provide the Berkeley Lab campus with modern, sound, mission-capable scientific facilities and support space.
   - Prioritize removing buildings that are obsolete or not mission capable, or that are highly inefficient, environmentally unsound, or that fail to meet UC seismic standards.
   - Renovate, expand, modernize, or repurpose outdated facilities to meet research needs, where feasible and economical.
   - Provide for population and building space growth necessary to flexibly accommodate Berkeley Lab's programmatic and operational needs.
   - Outfit the Berkeley Lab campus with modern, mission-capable infrastructure and utilities. Design scientific and support facilities to be readily adaptable to a wide variety of uses and changing conditions.
   - Prepare the campus to consolidate personnel and functions from off-site leased space, with a focus on collaboration and efficiency, while retaining flexible use of off-site space as needed.

- Configure indoor and outdoor spaces to encourage collaboration and to support Team Science.[1]
- Design and leverage the Berkeley Lab campus to attract investment, initiatives, and scientific talent.

2. Guide Berkeley Lab's development towards achieving an identifiable and fully realized UC Research Campus.
   - Realize a cohesive UC research campus with a unique sense of identity.
   - Reinforce the campus cluster development scheme when siting buildings and hardscape.
   - Improve wayfinding and user orientation throughout the campus.
   - Improve campus circulation network and mobility opportunities for all campus users.
   - Develop and reinforce attractive and sustainable outdoor areas throughout the campus.
   - Locate facilities and outdoor activities to capitalize on existing opportunities and minimize land use conflicts.
   - Organize the campus to optimize maintenance and day-to-day management.
3. Maintain and strengthen Berkeley Lab's responsible stewardship of public and natural resources.
   - Factor efficiency and cost-effectiveness into campus design and development.
   - Preserve, maintain, and improve the campus natural environment.
   - Promote a sustainable campus by maximizing efficiency and minimizing natural resource consumption and environmental impacts.
   - Consider conservation of energy, material, and water in all LBNL development.
   - Emphasize sitewide safety and security through campus design.
   - Design and manage campus developed areas to minimize wildland fire risk, maintain defensive building perimeters, and ensure safe egress/entry routes.
   - Manage outlying and natural campus vegetation areas to minimize wildland fire risk and intensity.
   - Plan and implement vegetation management program. Select drought tolerant and fire-smart plants and trees for landscaping areas.
4. Promote a welcoming campus that values and supports its community, neighbors, and the public.
   - Provide a widely distributed, full range of people-serving campus facilities.
   - Improve access and personal mobility throughout the campus.
   - Minimize land use conflicts and foster good relations with nearby residences and communities, to the extent feasible.
   - Reinforce the campus as a location of regional interest and education.

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[1] Attributed to Berkeley Lab founder EO Lawrence, Team Science is a multidisciplinary approach to scientific research that involves researchers from different institutions and disciplines working together to achieve shared goals.

6.2.2 Summary of Significant and Unavoidable Environmental Effects of the Proposed 2025 LRDP Project

As described above, proposed Project alternatives must substantially lessen or avoid one or more of the significant project-level and/or cumulative environmental impacts. **Table 6-1**, below, summarizes the Project's significant and unavoidable impacts identified in Chapter 4 of this EIR.

TABLE 6-1
SIGNIFICANT AND UNAVOIDABLE IMPACTS OF THE PROPOSED 2025 LRDP

Impacts
LRDP Impact CUL-1: Implementation of the LBNL 2025 LRDP could potentially cause a substantial adverse change in the significance of a historical resource pursuant to Section 15064.5.
LRDP Impact NOI-1: Construction activities under the LBNL 2025 LRDP would generate a substantial temporary increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies.
LRDP Impact NOI-2: Vegetation management activities under the VMP during the LBNL 2025 LRDP timeframe would generate a substantial temporary increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance as applied as the relevant threshold of significance, or applicable standards of other agencies.
LRDP Impact CUM-NOI-1: Implementation of the LBNL 2025 LRDP and the related VMP, combined with other concurrent construction projects in the project area, could generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance applied as the relevant threshold of significance, or applicable standards of other agencies.

6.3 Alternatives Selected for Further Evaluation

The alternatives identified for detailed evaluation and designed to inform public participation and reasoned choice by decision-makers are:

Alternative 1: No Project

Alternative 2: Reduced Growth

Alternative 3: Partial Off-Site Growth

This paragraph summarizes the screening process for the alternatives analysis below. The proposed Project's significant and unavoidable impacts were considered in developing these alternatives for detailed evaluation. Evaluation of a No Project Alternative is mandated under CEQA and that alternative was therefore analyzed in detail. The Reduced Growth Alternative and the Partial Off-site Growth Alternative were carried forth for detailed evaluation as both alternatives would reduce all of the significant and unavoidable impacts of the proposed Project, including cultural and noise impacts.

As discussed in Section 6.3 below, a preservation alternative intended to avoid the proposed Project's significant and unavoidable impact on historical resources was considered but found to be infeasible. Finally, given the location of nearby noise-sensitive receptors and the existing layout of Berkeley Lab, it was determined that there is no feasible alternative that would completely eliminate the Project's significant construction noise impacts on off-campus receptors.

Table 6-2, below, provides a summary comparison of the principal differences between the proposed Project and its alternatives, and the sections that follow describe each alternative in detail, how its impacts compare to those of the proposed Project, and whether the alternative would or would not achieve most of the proposed Project's objectives.

6.3.1 Alternative 1: No Project

Description

Under the No Project Alternative, it is assumed that the proposed 2025 LRDP would not be approved by the decision makers and therefore it would not be implemented, and future Berkeley Lab campus development would continue to occur pursuant to the existing 2006 LRDP. Although the planning period of the 2006 LRDP extended only through 2025, for purposes of the No Project Alternative analysis, it is assumed that the 2006 LRDP would continue to direct campus growth and development through 2045, the same as the proposed Project.

The 2006 LRDP envisioned that at full development, the total amount of campus building space would increase to 2,420,000 gross square feet (gsf) and the on-campus population would increase to a total of 4,650 adjusted daily population (ADP). Consequently, net new building space (including flex space created) at Berkeley Lab under the No Project Alternative would increase by 358,500 gsf over existing (2024) conditions - the same as the increase that would occur under the proposed 2025 LRDP. It is assumed that the amount of new building construction and new demolition of existing buildings under the No Project Alternative would be roughly similar to that which would occur under the proposed 2025 LRDP.

Although the 2006 LRDP assumed that at buildout, the campus ADP would be about 4,650, however for purposes of the No Project Alternative, it is assumed that the ADP in 2045 would be 4,200, which is the same as the ADP anticipated under the proposed 2025 LRDP. The use of the lower ADP of 4,200 for the No Project Alternative (and not the 4,650 ADP in the 2006 LRDP) is considered reasonable because this ADP is based on more recent roster data and gate counts and it also assumes that hybrid and remote work will continue to be an element of Lab operations in the future.

The 2006 LRDP assumed that a total of approximately 2,300 parking spaces would be provided for employees and visitors by buildout. Consequently, this would amount to an increase of 600 parking spaces for employees and visitors under the No Project Alternative over existing conditions. By comparison, as stated in Section 3.6.2, there would be no increase in the on-campus parking supply under the proposed 2025 LRDP.

Any future development under the No Project Alternative would continue to be subject to the goals and strategies of the 2006 LRDP and its elements, including land use; development framework; vehicle access, circulation and parking; pedestrian circulation; open space and landscape; and utilities and infrastructure. Furthermore, existing building height zones that are applicable to the 2006 LRDP development would apply to future development under the No Project Alternative. Future development under the No Project Alternative would also be subject to the mitigation measures identified in the 2006 LRDP Final EIR, as amended.

TABLE 6-2
COMPARISON SUMMARY OF EXISTING, PROPOSED 2025 LRDP AND ALTERNATIVES CHARACTERISTICS

	Existing (2024)	Proposed 2025 LRDP	Alternative 1: No Project	Alternative 2: Reduced Growth	Alternative 3: Partial Off-site Growth
		Change from Existing			
Building Space	2,061,500 gsf				
New Building Construction		+574,000 gsf	Assume similar to proposed 2025 LRDP	+382,670 gsf	+382,670 gsf (on-site) +191,330 gsf (off-site) +574,000 gsf total
Building Demolition		-278,500 gsf	Assume similar to proposed 2025 LRDP	-185,670 gsf	-185,670 gsf (on-site)
Net New Building Space		+295,500 gsf +63,000 gsf flex space +358,500 gsf	+358,500 gsf	+197,000 gsf +42,000 gsf flex space +239,000 gsf	+197,000 gsf (on-site) +42,000 gsf flex space (on-site) +239,000 gsf (on-site)
Parking Spaces for Employees/Visitors	1,700 spaces	+0 spaces	+600	+0 spaces	+0 spaces (on-site)
Campus Population	3,000 ADP	+1,200 ADP	+1,200 ADP	+800 ADP	+800 ADP (on-site) +400 ADP (off-site) +1,200 ADP total

	Existing (2024)	Proposed 2025 LRDP	Alternative 1: No Project	Alternative 2: Reduced Growth	Alternative 3: Partial Off-site Growth
		Total (2045)			
Total Building Space	2,061,500 gsf	2,420,000 gsf	2,420,000 gsf	2,200,500 gsf	2,200,500 gsf (on-site) 191,330 gsf (off-site)
Total Parking Spaces for Employees/ Visitors	1,700 spaces	1,700 spaces	2,300 spaces	1,700 spaces	1,700 spaces (on-site)
Total Campus Population	3,000 ADP	4,200 ADP	4,200 ADP	3,800 ADP	4,200 ADP (3,800 ADP on-site)

NOTES:
gsf = gross square feet
ADP = adjusted daily population

Consequently, new improvements identified in the land use, mobility and circulation, open space and landscape, and utility infrastructure elements of the proposed 2025 LRDP that are not a continuation of those improvements identified in the 2006 LRDP, and new mitigation measures identified in this EIR, would not be implemented under the No Project Alternative.

Projects that have been approved pursuant to the 2006 LRDP that are either currently under construction (Biological and Environmental Program Integration Center [BioEPIC], Collaboration Commons Building/Transit Hub and Utilities Project [THUP]) or in planning/design (Air Cooling Heat Exchangers [ACHE] Yard, ALS-U, and Linear Assets Modernization Project [LAMP]) would continue to be completed and operated under the No Project Alternative.

Comparison of Effects of the No Project Alternative to Effects of the Proposed 2025 LRDP

Aesthetics

The proposed 2025 LRDP would result in less-than-significant Project and cumulative impacts on scenic vistas and regulations governing scenic quality; and a significant but mitigable impact from new sources of light and glare.

Under the No Project Alternative, remaining development under the previously approved 2006 LRDP would be implemented and up to 385,000 gsf of net new building development (17 percent increase over existing conditions) would occur on the campus by 2045, the same as under the proposed Project. In addition, similar to the proposed Project, new building and other site development under the No Project Alternative would largely occur as infill in existing campus development clusters. Furthermore, since the building height zones in the 2006 LRDP are the same as those proposed under the 2025 LRDP, new building heights under this alternative would not change from those under the proposed 2025 LRDP. In addition, vegetation management activities that would occur on the campus concurrently with the No Project Alternative would be the same as those that would occur concurrently with the proposed Project. However, the 2006 LRDP envisioned more new development in the eastern portion of the campus, and generally planned for less setback from the campus boundary, as reflected by the Illustrative Development Scenario in the 2006 LRDP Final EIR and related visual simulations. As the No Project Alternative represents the continued implementation of the 2006 LRDP, the visual effects of the alternative would be the same as those in the 2006 LRDP Final EIR. Those effects are summarized below and compared with the impacts of the proposed Project.

Scenic Vistas

The 2006 LRDP Final EIR held that aesthetic impacts are inherently subjective and conservatively concluded that given the totality of potential development (even though many individual buildings would not have a substantial effect), implementation of the 2006 LRDP would potentially have a substantial adverse effect on scenic vistas, and thus the visual impact was considered significant and unavoidable. In contrast, under the proposed 2025 LRDP, limited new development is envisioned in the east side of the campus, more clustering of new development is planned, and greater setbacks from the campus boundary (particularly along the south side of the campus) are planned. This would provide more visual screening from intervening topography, buildings/structures, trees, and other vegetation, thus tempering noticeable visual changes associated with building removal and new building development as seen from off-site public vantage points. On these and other bases discussed in the *Aesthetics* section of this 2025 LRDP EIR, the potential effect of the proposed 2025 LRDP on scenic vistas is determined to be less than significant. Thus, campus development under the No Project Alternative would result in a greater impact on scenic vistas than campus development under the proposed Project.

Visual Character

The 2006 LRDP Final EIR found that campus development under the 2006 LRDP would have a significant impact on visual character, indicating that visual impacts of some buildings would appear visually intrusive and substantial to some viewers, citing as an example the buildings assumed in the Illustrative Development Scenario in the east portion of the campus near Centennial Drive. The 2006 LRDP Final EIR concluded that the change in visual character from development could alter the site's character in a substantial and adverse manner, which would be a significant and unavoidable impact on visual character. It should be noted, however, that the applicable *CEQA Guidelines* Appendix G checklist significance criteria for visual character at the time of 2006 LRDP Final EIR preparation (i.e., whether a project would substantially degrade the existing visual character of quality of the site and its surroundings) was subsequently revised (whether a project located in an urbanized area would conflict with applicable zoning and other regulations governing scenic quality). As discussed in this EIR, UC LBNL is generally exempted under the federal and State constitutions from compliance with local zoning and land use regulations related to scenic quality. Accordingly, the 2006 LRDP would be the overarching planning guideline document for the Berkeley Lab campus for the No Project Alternative. If applying the current *CEQA Guidelines* significance criteria for visual character to the No Project Alternative, the No Project Alternative would not conflict with the 2006 LRDP's principles and strategies governing scenic quality, and as such, would not conflict with applicable zoning and other regulations governing scenic quality, and the impact on visual character would therefore be less than significant. Based on the foregoing, campus development under the No Project Alternative would result in a greater or comparable impact on scenic quality as campus development under the proposed Project.

Light and Glare

The 2006 LRDP Final EIR found that campus development under the 2006 LRDP would have a significant impact related to light and glare. However, the impact would be less than significant with implementation of the 2006 LRDP Final EIR's light/glare reduction mitigation measures. The impact of the No Project Alternative related to light and glare would be comparable to that of the proposed Project.

In summary, the No Project Alternative would result in an impact on scenic vistas that would be greater than the impact under the proposed Project. All other visual impacts would be comparable and less than significant or reduced to a less-than-significant level with mitigation.

Air Quality

The proposed 2025 LRDP would result in less-than-significant Project and cumulative impacts related to conflict with the applicable air quality plan, increases in criteria air pollutants, exposure of sensitive receptors to substantial pollutant concentrations, and generation of odors; and significant but mitigable Project and cumulative impacts associated with localized increases in fugitive dust emissions during construction.

Conflict with Air Quality Plans

The No Project Alternative would implement the remaining development under the 2006 LRDP. Campus development under the 2006 LRDP was found in the 2006 LRDP Final EIR to be generally consistent with and supportive of the *2005 Ozone Strategy* and its Transportation Control Measures and consequently, the 2006 LRDP's project-level and cumulative impacts relating to conflict with or obstruction of the applicable air quality plan were determined less than significant. For the same reasons that are set forth for the proposed Project, it is also expected that campus development under the 2006 LRDP would be generally consistent with and supportive of the *2017 Clean Air Plan* control measures and primary goals, resulting in a less-than-significant impact. Thus, the impact of the No Project Alternative would be similar to the impact of the proposed 2025 LRDP.

Pollutant Emissions

Criteria air pollutant emissions generated by construction activities under the 2006 LRDP were found in the 2006 LRDP Final EIR to result in a significant impact that would be mitigated to a less-than-significant level with implementation of construction equipment exhaust reduction measures. In contrast, construction-generated criteria air pollutant emissions under the proposed 2025 LRDP were estimated in this EIR to be below Bay Area Air Quality Management District (BAAQMD) thresholds and the impact was found to be less than significant without need for mitigation.

Fugitive dust emissions associated with the 2006 LRDP campus development were determined to be mitigated to a less-than-significant level with implementation of BAAQMD-recommended dust minimization measures as identified in the 2006 LRDP Final EIR. This is the same conclusion reached in this EIR for the proposed 2025 LRDP.

A plan-level analysis of the 2006 LRDP conducted in the 2006 LRDP Final EIR determined that it would not result in employment in excess of the *2005 Ozone Strategy* projections and would not result in VMT increase greater than the Lab's employment increase, and consequently, criteria air-pollutant emissions resulting from the 2006 LRDP implementation were determined to be less than significant. With respect to the proposed 2025 LRDP, as explained in Section 4.2 in this EIR, the expected vehicle trip generation would be proportional to campus population growth, and consequently, the percentage increase in vehicle trip generation under the proposed 2025 LRDP over existing conditions would not be greater than the percent increase in ADP. As the increase in ADP under the No Project Alternative would be the same as the increase under the proposed Project, the impact of both the proposed 2025 LRDP and the No Project Alternative due to increases in operational criteria air pollutants would be less than significant.

Pollutant Concentrations/Health Risks

The 2006 LRDP Final EIR included an assessment of potential exposure to toxic air contaminants (TACs) that was informed by a project-level health risk assessment (HRA) of construction and operation consistent with that EIR's campus Illustrative Development Scenario. Based on that HRA, the 2006 LRDP Final EIR determined that operation of campus development under the 2006 LRDP would result in a cancer risk in excess of 10 in one million at one on-campus worker receptor location, which was concluded to be a significant impact that would be mitigated to a less-than-significant level by adjusting a diesel generator's exhaust system near Building 90. In contrast, as discussed in Section 4.2, both the plan-level and the project-level health risk assessments of the TAC and $PM_{2.5}$ emissions associated with campus development under the proposed 2025 LRDP concluded that campus development would result in less-than-significant human health risk impacts and no mitigation would be required.

Odors

The 2006 LRDP EIR concluded that campus development under the 2006 LRDP would not involve new sources of odors during construction and operation that would adversely affect large numbers of people, and consequently, the impact related to odors would be less than significant. The analysis in this EIR also concludes that the impact from proposed 2025 LRDP implementation related to odors would be less than significant.

Cumulative Air Quality Impacts

The 2006 LRDP was determined to result in a less-than-significant cumulative impact related to criteria air quality pollutants. The 2006 LRDP was conservatively determined to result in a significant and unavoidable cumulative impact on exposure to TACs in the 2006 LRDP Final EIR because some emissions, primarily diesel particulates, related to Lab operations would contribute to existing and future exceedances of TACs; and because the 2006 LRDP would contribute to regional exposure levels. In contrast, since the proposed 2025 LRDP's impact related to exposure to TAC sources was determined in this EIR to be less than significant, it was also determined to not make a cumulatively considerable contribution to the cumulative impact, and the cumulative impact was therefore, less than significant.

In summary, based on the comparative analysis above, campus development under the No Project Alternative would result in three significant air quality impacts that would be mitigated to less-than-significant levels with mitigation, and one impact that would remain significant and unavoidable. By comparison, campus development under the proposed Project would result in one significant air quality impact that would be mitigated to a less-than-significant level, and it would not result in any significant and unavoidable air quality impact.

Biological Resources

Proposed 2025 LRDP implementation would result in potentially significant but mitigable Project and/or cumulative impacts to special-status plant and wildlife species, riparian habitat, sensitive natural communities, jurisdictional wetlands, and wildlife movement.

Campus development pursuant to the 2006 LRDP was analyzed in the 2006 LRDP Final EIR for its impacts on biological resources, and all impacts were found to be less than significant or less than significant with mitigation. The No Project Alternative would implement the remaining development under the 2006 LRDP, which would result in a similar amount of building demolition and new building construction activities on the campus through 2045 as under the proposed Project. In addition, similar to the proposed Project, new building and other site development under the 2006 LRDP would largely occur as infill in existing campus development clusters, although more development could potentially occur in the eastern portion of the campus under the 2006 LRDP. In addition, campus vegetation management activities under the ongoing Vegetation Management Program (VMP) would be comparable to that which would occur concurrently with the proposed 2025 LRDP development. Consequently, impacts to special-status plant and wildlife species, riparian habitat, sensitive natural communities, and jurisdictional wetlands would be potentially significant but mitigable to a less-than-significant level with implementation of mitigation measures identified in the 2006 LRDP Final EIR. In addition, while not identified as an environmental issue for analysis at the time of the 2006 LRDP Final EIR, campus development under the 2006 LRDP would pose a similar risk to bird collisions as that discussed for the 2025 LRDP development. This risk would be similarly mitigated to a less-than-significant level with implementation of bird collision reduction measures similar to those identified in this EIR.

In summary, biological resources impacts of the No Project Alternative would be comparable to or slightly greater than those of the proposed Project and similar mitigation measures would be required to reduce the impacts to less-than-significant levels.

Cultural Resources, including Tribal Cultural Resources

Proposed 2025 LRDP implementation would result in potentially significant and unavoidable Project and/or cumulative impacts to historical resources; and significant but mitigable Project and/or cumulative impacts on archaeological resources, human remains, and tribal cultural resources.

Campus development pursuant to the 2006 LRDP was analyzed in the 2006 LRDP Final EIR for its impacts on cultural resources, and all impacts except one were found to be less than significant with mitigation. The impact on historical resources was found to be significant and unavoidable. The No Project Alternative would implement the remaining development under the 2006 LRDP and result in a similar amount of building demolition, new building construction and ground disturbance activities on the campus through 2045 as under the proposed Project. Also, similar to the proposed Project, new building and other site development under the 2006 LRDP would largely occur as infill in existing campus development clusters. It is likely that Building 71, which has been determined eligible for listing on the National Register, would not be demolished under the No Project Alternative, similar to the case under the proposed Project. However, other buildings on the campus would reach the minimum age thresholds for consideration as potential historical resources during the timeline of the No Project Alternative, similar to the proposed 2025 LRDP. If demolition or significant alterations to these historical resources cannot be avoided under the No Project Alternative, the impact to these historic resources would remain significant and unavoidable.

Under the No Project Alternative, which would continue 2006 LRDP implementation, project impacts to archaeological resources, human remains, and tribal cultural resources would be potentially significant but mitigable to a less-than-significant level, similar to the proposed Project.

In summary, cultural resources (including tribal cultural resources) impacts of the No Project Alternative would be comparable to those of the proposed Project and all impacts except one would be less than significant with mitigation. One impact would remain significant and unavoidable in both cases.

Energy

Proposed 2025 LRDP implementation would result in less-than-significant Project and cumulative impacts with respect to the non-wasteful, inefficient or unnecessary consumption of energy resources as well as conflicts with state or local plans for renewable energy or energy efficiency.

The No Project Alternative, which would implement the remaining development under the 2006 LRDP, would result in the same amount of campus demolition and new building construction as the proposed Project. Construction-related energy consumption under both the Project and the No Project Alternative would therefore be similar. Further, the No Project Alternative campus population increase of 1,200 ADP by 2045 would be same as the 1,200 ADP by 2045 under the proposed 2025 LRDP. As a result, expected energy consumption during No Project Alternative operation would be comparable to that under the proposed 2025 LRDP, including mobile energy use. Thus, the No Project Alternative would also result in less-than-significant project and cumulative impacts with respect to energy resource consumption as the use would not be wasteful, inefficient, or unnecessary. The No Project Alternative would not conflict with state or local plan for renewable energy or energy efficiency, similar to the proposed Project.

In summary, energy impacts of the No Project Alternative would be comparable to those of the proposed Project and less than significant.

Geology and Soils

Proposed 2025 LRDP implementation would result in a potentially significant but mitigable Project impact related to rupture of a known earthquake fault; and less-than-significant Project and cumulative impacts associated with risk from strong seismic ground shaking, earthquake-induced landsliding, seismic-related ground failure including liquefaction, and potential erosion, unstable soils, and expansive soils.

The No Project Alternative, which would implement the remaining development under the 2006 LRDP, would result in the same amount of ground disturbance on the campus during construction as the proposed Project. Consequently, impacts related to soil erosion during construction would be similar to that of the proposed 2025 LRDP and likewise less than significant with compliance with best management practices (BMPs). 2006 LRDP BMPs included implementation of a Stormwater Pollution Prevention Plan (SWPPP), as required under the National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP).

As under the proposed Project, the No Project Alternative could include ancillary features (e.g., roadways, parking lots, etc.) that may be developed within the Hayward Fault Zone. Such features could potentially pose a significant hazard if they were to result in complications during emergency conditions, such as roadway failure as a result of surface fault rupture. Like the proposed Project, this impact would be mitigated to a less-than-significant level by ensuring Berkeley Lab seismic emergency response and evacuation plans account for alternative ingress and egress routes in the event of roadway failure from surface fault rupture.

The No Project Alternative would result in a comparable amount of new building construction at the campus as the proposed Project. Similar to the proposed Project, new building and other site development under the No Project Development would occur as infill in existing campus development clusters. As a result, building development under the No Project Alternative would be expected to result in impacts associated with risk from strong seismic ground shaking, earthquake-induced landsliding, seismic-related ground failure including liquefaction, erosion, unstable soils, and expansive soils that would be the same as proposed 2025 LRDP Project impacts; the No Project Alternative impacts would likewise be less than significant with compliance with the applicable federal and State regulatory requirements and with the implementation of geotechnical design evaluation for each individual project.

As under the proposed Project, geologic construction and operational hazards associated with cumulative projects would be minimized through implementation of and compliance with applicable General Plan policies, buildings codes, and regulations, and similarly would be less than significant.

In summary, geology and soils impacts of the No Project Alternative would be the same as those of the proposed Project and would be either less than significant or less than significant with mitigation.

Greenhouse Gas Emissions

Proposed 2025 LRDP implementation would result in less-than-significant Project and cumulative impacts with respect to greenhouse gas (GHG) emissions and conflicts with applicable plans, policies, or regulations related to reducing GHG emissions.

The No Project Alternative would implement the remaining development under the 2006 LRDP. The impact of campus GHG emissions under the 2006 LRDP were analyzed in a Supplement to the 2006 LRDP EIR in 2017.[2] That analysis, which used methodology and significance thresholds applicable at that time, concluded that GHG emissions from campus operations through 2025 would result in a significant GHG impact that would be reduced to a less-than-significant level with mitigation. The adopted mitigation included purchase of offsets, if necessary, to ensure that GHG emissions did not increase above a threshold level. That prior analysis is now dated. Based on currently applicable methodology and thresholds, it would be inaccurate to conclude that the No Project Alternative would result in a significant impact that

2 Building 59 Upgrade & Installation and Operation of NERSC-9 (Including Supplementation of the 2006 LRDP EIR with respect to Greenhouse Gas Emissions and Energy Impacts) Final EIR (SCH No. 2016062007).

requires mitigation. The No Project Alternative is re-evaluated below using the same approach and thresholds as are used in this EIR for the proposed Project.

The No Project Alternative would result in the same amount of new demolition and new building construction on the campus as the proposed Project, thus the alternative would result in a similar amount of construction-related GHG emissions as the proposed Project. As for campus population growth to the horizon year 2045, the No Project Alternative would also involve the same ADP of 4,200 (1,200 more persons compared to baseline) by 2045 as the proposed Project. As a result, mobile source GHG emissions during operation of No Project Alternative would be comparable to those under the proposed Project. Therefore, the No Project Alternative would also result in less-than-significant project and cumulative impacts with respect to the generation of GHG emissions; and due to conflicts with applicable plans, policies, or regulations adopted for the purpose of reducing GHG emissions—including the *CARB 2022 Scoping Plan*, *Plan Bay Area 2050*, and UC *Policy on Sustainable Practices* and the *Berkeley Lab Net-Zero Vision and Roadmap*—similar to the proposed 2025 LRDP.

In summary, GHG impacts of the No Project Alternative would be comparable to those of the proposed Project and less than significant.

Hazards and Hazardous Materials

Proposed 2025 LRDP implementation would result in less-than-significant Project and cumulative impacts associated with hazards and hazardous materials. This would include environmental hazards caused by the routine transport, use, or disposal of hazardous materials or through reasonably foreseeable upset and accident conditions involving hazardous material release into the environment; hazardous emissions or handling of hazardous or acutely hazardous materials within one-quarter mile of a school; or creation of a significant hazard associated with a hazardous materials site pursuant to Government Code § 65962.5.

Campus development pursuant to the 2006 LRDP was analyzed in the 2006 LRDP Final EIR for impacts related to hazards and hazardous materials, and all impacts were found to be less than significant due to compliance with applicable laws and regulations. The No Project Alternative, which would implement the remaining development under the 2006 LRDP, would result in the same amount of campus demolition and new building construction as the proposed Project. During operation, the No Project Alternative would have the same amount of net new campus development and similar land use types as the proposed Project. As with the proposed Project, the No Project Alternative's required compliance with the numerous laws and regulations that govern the transportation, storage, use, treatment, and disposal of hazardous materials and hazardous materials waste would ensure the potential for adverse effects to the public or environment during construction and operation, or creation of hazardous conditions due to the use or accidental release of hazardous materials, would be reduced to a less-than-significant level both on campus and within the vicinity of nearby off-site sensitive receptors. In addition, with respect to campus areas that have been affected by past releases of chemicals to soil and groundwater, the required compliance of the No Project Alternative with existing federal, State, and UC requirements, and the DTSC-approved and required plans (including *Groundwater Monitoring and Management Plan* and *Soil Management Plan)* would reduce the potential for new campus development under the No Project Alternative to expose the public and the environment to pre-existing contaminants, and the impact would be less than significant.

In summary, hazards and hazardous materials impacts of the No Project Alternative would be the same those of the proposed Project and less than significant.

Hydrology and Water Quality

Proposed 2025 LRDP implementation would result in less-than-significant Project and cumulative impacts associated with: violation of water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality; decrease groundwater supplies or interfere substantially with groundwater recharge; alter the existing drainage pattern of the campus in a manner which would result in a substantial erosion or siltation on- or off-site; substantially increase the rate or amount of surface runoff such that it could result in flooding on- or off-site; create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems; impede or redirect flood flows; or conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan.

Campus development pursuant to the 2006 LRDP was analyzed in the 2006 LRDP Final EIR for its impacts on hydrology and water quality, and all impacts were found to be less than significant due to compliance with applicable laws and regulations. The No Project Alternative, which would implement the remaining development under the 2006 LRDP, would result in the same amount of ground disturbance on the campus during construction as the proposed Project. Consequently, project impacts related to temporary increases in siltation and pollutants in stormwater runoff during construction would be the same as those of the proposed Project, and similarly, less than significant with implementation of BMPs included in a SWPPP as required under the NPDES CGP. In addition, all post-construction activities within the campus under this alternative would be required to comply with the Berkeley Lab's SWPPP for Industrial Activities as required under its Industrial General Permit (IGP). As a result, potential No Project Alternative impacts related to violation of water quality standards or waste discharge requirements would be less than significant, similar to the proposed Project.

New building and other site development under the No Project Alternative would largely occur as infill in existing campus development clusters. As the same amount of new building development would occur, This alternative would result in a comparable increase in campus impervious surfaces as under the proposed Project. Similar to the conclusion reached for the proposed Project, potential project impacts related to decrease in groundwater supply or groundwater recharge, and/or conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan under this alternative would be less than significant. Project impacts related to alteration of drainage patterns, which could lead to increases in surface runoff and flooding, an exceedance of the capacity of stormwater drainage systems, or additional sources of polluted runoff, would also be less than significant, as this alternative would be required to comply with the Lab's SWPPP for Industrial Activities and *Construction Standards and Design Requirements,* similar to the proposed 2025 LRDP.

In summary, hydrology and water quality impacts of the No Project Alternative would be similar to those of the proposed Project and less than significant.

Land Use and Planning

Proposed 2025 LRDP implementation would result in less-than-significant Project and cumulative impacts associated with physical division of an established community; or conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect.

Campus development pursuant to the 2006 LRDP was analyzed in the 2006 LRDP Final EIR for its land use impacts, and all impacts were found to be less than significant. The No Project Alternative would implement the remaining development under the 2006 LRDP. Similar to the proposed Project, all new development under the No Project Alternative would occur within the area designated by the 2006 LRDP as developable area and on infill sites, and consequently, projects under the No Project Alternative would not physically divide an established community, and there would be no impact. UC LBNL is not subject to local policies, plans, or regulations, and consequently potential land use impact resulting from campus development under the No Project Alternative with respect to conflicts with applicable land use plans, policies, or regulations of an agency with jurisdiction over the project would be considered less than significant. Also, similar to the proposed 2025 LRDP, No Project Alternative implementation would not result in development that would be incompatible with adjacent uses, either in Berkeley or Oakland.

In summary, land use and planning impacts of the No Project Alternative would be the same as those of the proposed Project and less than significant.

Noise and Vibration

Proposed 2025 LRDP implementation would result in significant and unavoidable Project and cumulative impacts from substantial temporary increases in ambient noise levels in the campus vicinity in excess of City of Berkeley noise standards associated with construction and on-going VMP activities; significant but mitigable Project and cumulative groundborne vibration impacts during construction; significant but mitigable impacts associated with permanent increases in ambient noise levels in the campus vicinity in excess of City of Berkeley noise standards during operation; and less-than-significant Project and cumulative impacts associated with permanent increases in operation noise levels associated with traffic increases.

Campus development pursuant to the 2006 LRDP was analyzed in the 2006 LRDP Final EIR for its noise impacts, and all impacts except two were found to be less than significant. The 2006 LRDP EIR concluded that noise from construction activities would result in significant project and cumulative impacts on nearby residential receptors that would not be mitigated to a less-than-significant level with feasible mitigation measures and would remain significant and unavoidable impacts. The No Project Alternative would implement the remaining development under the 2006 LRDP. The No Project Alternative would result in the same amount of building demolition and new building construction on the campus through 2045 as under the proposed Project. In addition, similar to the proposed Project, new building and other site development under the No Project Alternative would largely occur as infill in existing campus development clusters.

As a result, construction noise impacts under the No Project Alternative would be similar to those associated with the proposed Project. Similar to the conclusion reached for the proposed Project, there may be individual construction and/or demolition projects undertaken during the term of the No Project Alternative that result in noise impacts that could not be fully mitigated; therefore, project construction noise impacts would remain significant and unavoidable. Potentially significant project groundborne vibration levels during construction of the No Project Alternative would be comparable to that under the proposed Project, and similarly would be mitigated to a less-than-significant level.

Campus vegetation management activities under the VMP related to the No Project Alternative would also be similar to those that would occur related to the proposed Project. For heavy and/or noise-elevated vegetation management occurring nearer to sensitive receptors, the noise levels may not be reduced to levels below the City of Berkeley's noise standards, thus VMP noise impacts during the term of the No Project Alternative would remain significant and unavoidable as they would be during the term of the proposed Project.

Potentially significant permanent increases in ambient noise levels in the campus vicinity in excess of City of Berkeley noise standards as a result of No Project Alternative operations would be comparable to those generated under the proposed Project and similarly mitigatable to a less-than-significant level. Since the No Project Alternative would have a comparable population increase as the proposed Project, permanent increases in operation noise levels associated with traffic increases would be similar to those under the proposed Project, and would be less than significant.

In summary, noise impacts of the No Project Alternative would be comparable to those of the proposed Project, and the No Project Alternative would also result in significant and unavoidable project and cumulative impacts due to construction and VMP noise.

Population and Housing

Proposed 2025 LRDP implementation would result in less-than-significant Project and cumulative impacts associated with substantial unplanned population growth inducement; and displacement of substantial numbers of existing people or housing that would necessitate replacement housing elsewhere.

Campus development pursuant to the 2006 LRDP was analyzed in the 2006 LRDP Final EIR for population and housing impacts, and all impacts were found to be less than significant. The No Project Alternative would implement the remaining development under the 2006 LRDP. Under the No Project Alternative, the campus ADP would increase by the same number as under the proposed Project Therefore, similar to the proposed Project, it would represent less than one percent of the projected Bay Area increase of 2.4 million residents by 2050. Since this population growth would be consistent with adopted regional and local projections, similar to the proposed Project, the No Project Alternative would not induce substantial unplanned population growth in an area, either directly or indirectly, and the impact would be less than significant.

As with the proposed Project, no campus housing exists, so the No Project Alternative would neither displace existing housing nor necessitate the construction of replacement housing elsewhere; thus, the impact would be less than significant.

In summary, population and housing impacts of the No Project Alternative would be comparable to those of the proposed Project and less than significant.

Public Services and Recreation

Proposed 2025 LRDP implementation would result in less-than-significant Project and cumulative impacts associated with the need for new or physically altered fire protection, police protection, school, and park and recreational facilities.

Campus development pursuant to the 2006 LRDP was analyzed in the 2006 LRDP Final EIR for impacts on public services and recreation, and all impacts were found to be less than significant. The No Project Alternative would implement the remaining development under the 2006 LRDP. Assuming the increase in fire and police protection service calls is proportional to the projected population increase, the No Project Alternative would increase calls for fire and police protection service by the same amount as would occur under the proposed Project. As with the proposed Project, this additional increase in calls under the No Project Alternative would not result in the need for new or expanded facilities to provide adequate fire and police protection services, and the impact would be less than significant.

An increase in Lab staff and academics population under the No Project Alternative would also be expected to generate a similar increase in school-age children as generated by the proposed Project. As with the proposed Project, new students under the No Project Alternative would be accommodated in affected school district facilities, including the Oakland Unified School District (OUSD) and Berkeley Unified School District (BUSD), so new school construction would not be required, and the impact would be less than significant.

Lastly, the No Project Alternative would be expected to generate a similar increase in demand for parks and recreation facilities as would be generated under the proposed Project. As with the proposed Project, the availability of Berkeley Lab campus recreational opportunities would minimize any increase in East Bay Regional Parks District (EBRPD) and UC Berkeley trails use by the Lab population under the No Project Alternative. Thus, this alternative would be unlikely to result in substantial physical deterioration of nearby trails, parks, or recreational amenities requiring improvements or the need for additional recreational amenity development, and these impacts would be less than significant.

In summary, public services and recreation impacts of the No Project Alternative would be comparable to those of the proposed Project and also less than significant.

Transportation

Proposed 2025 LRDP implementation would result in less-than-significant Project and cumulative impacts associated with conflicts with plans and policies addressing the circulation system; conflicts with *CEQA Guidelines* Section 15064.3(b); increases in hazards due to geometric design features; and emergency access.

The No Project Alternative would implement the remaining development under the 2006 LRDP. Campus development pursuant to the 2006 LRDP was analyzed in the 2006 LRDP Final EIR for its impacts on transportation, and some impacts were found to be less than significant. However, project and cumulative level of service (LOS) impacts were found to be significant and unavoidable. As traffic congestion and LOS impacts are no longer considered environmental impacts under CEQA, the transportation impacts of the remaining development under the 2006 LRDP are re-evaluated below using the current State-recommended CEQA approach to transportation impact analysis.

The No Project Alternative, similar to the proposed Project, would not involve aspects that would be in conflict with the UC *Policy on Sustainable Practices*. Consequently, the No Project Alternative would have a less-than-significant impact related to this issue.

The No Project Alternative would generate vehicular traffic that would be comparable to that generated under the proposed Project. However, since the alternative would provide more parking per ADP compared to the proposed Project, it would generate incrementally more vehicle trips and VMT per person than the proposed Project. However, like the proposed Project, the No Project Alternative would meet the Low-VMT Areas screening criterion; therefore, would have less-than-significant project and cumulative impacts related to VMT.

Since the No Project Alternative would have similar campus transportation infrastructure as the proposed Project, impacts associated with geometric design feature hazards, incompatible use hazards, and inadequate emergency access would be less than significant under this alternative, same as under the proposed Project.

In summary, transportation impacts of the No Project Alternative would be comparable to those of the proposed Project and also less than significant.

Utilities and Service Systems

Proposed 2025 LRDP implementation would result in less-than-significant Project and cumulative impacts associated with relocation or construction of new or expanded utility facilities; water supply sufficiency; wastewater capacity; and solid waste capacity and solid waste goals consistency.

The No Project Alternative would implement the remaining development under the 2006 LRDP. Campus development pursuant to the 2006 LRDP was analyzed in the 2006 LRDP Final EIR for its impacts on utilities and service systems. As concluded in that EIR, the impact related to construction of utility improvements would be less than significant with implementation of construction-related mitigation measures and regulatory requirements. Consequently, the impact would be less than significant, similar to the conclusion reached for the proposed Project. All other impacts on utilities, including water supply, were determined to be less than significant.

Given that the net increase in campus development and ADP under the No Project Alternative would be the same as that under the proposed Project, and the types of land uses that would be developed under the respective plans would be similar, the impact related to EMBUD water sufficiency to serve the campus and other reasonably foreseeable development under this alternative during normal, dry, and multiple dry years would also be less than significant.

Similarly, the impact on the EBMUD Main Wastewater Treatment Plant wastewater capacity to serve the projected wastewater volume under the No Project Alternative would be less than significant. For the same reason, impacts on solid waste capacity and consistency with solid waste goals would also be less than significant.

In summary, utilities and service systems impacts of the No Project Alternative would be comparable to those of the proposed Project and would also be less than significant.

Wildfire

Proposed 2025 LRDP implementation would result in potentially significant but mitigable Project and cumulative impacts related to impairment of an adopted emergency evacuation plan; and less-than-significant Project and cumulative impacts associated with risk of loss, injury, or death involving wildland fires; exposure to pollutant concentrations from a wildfire or uncontrolled spread of a wildfire; fire risk or impacts to the environment from installation or maintenance of utility infrastructure; and risk from downslope or downstream flooding or landslides as a result of runoff, post-fire slope instability, or drainage changes.

Under the No Project Alternative, the campus ADP would increase by 1,200 in 2045, which is the same increase as under the proposed Project. However, under the No Project Alternative, campus parking supply for employees and visitors would increase by 600 spaces by 2045. As a result, this alternative would result in higher vehicle trip generation than the proposed Project. Consequently, in the event of a full evacuation from the campus, compared to the proposed Project, the No Project Alternative would add more of Lab-related vehicle traffic to nearby off-site roadways that could be additionally congested with traffic generated by people simultaneously evacuating from nearby areas. As such, this alternative may potentially interfere more with the City's evacuation plan for the area than the proposed Project, and this impact would also be potentially significant. As under the proposed Project, the implementation of LRDP Mitigation Measures WF-2a and WF-2b would be required and would similarly mitigate this impact to a less than significant level.

Building space growth under the No Project Alternative would be the same as under the proposed Project, and new development under this alternative would be subject to the same applicable safety standards and building and fire codes. As with the proposed Project, the Lab's VMP would also be implemented concurrently with the No Project Alternative. As a result of these factors, impacts associated with risk of loss, injury, or death involving wildland fires under the No Project Alternative would be similar to those under the proposed Project, and less than significant as well. In addition, since other plans, policies, regulations, and programs would continue to be implemented, including the Berkeley Lab Fire Protection Program (FPP) and Wildland Fire Management Plan (WFMP), as well as the Alameda County Community Wildfire Protection Plan (CWPP) and Emergency Operations Plan (EOP), and the Cities of Berkeley and Oakland Local Hazard Mitigation Plans (LHMPs), this alternative would not exacerbate wildfire risks and thereby not expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire due to slope, prevailing winds, and other factors, and this impact would be less than significant. Also, as potential upgrades and improvements to aging campus infrastructure under the No Project Alternative would be generally similar to those under the proposed Project and would comply with the same applicable building design standards and fire safety regulations, the fire risk or impacts to the environment from installation of maintenance of utility infrastructure would similarly be less than significant.

New development under the No Project Alternative would be implemented largely on infill sites not prone to landsliding, similar to the proposed Project. In addition, with fire fuel reduction effort implemented under the Lab's VMP, the likelihood of a wildfire that would burn vegetation on slopes across the campus is low, thus reducing the potential of post-fire slope instability. As such, impacts related to downslope or downstream flooding or landslides as a result of runoff or post-fire slope instability under the No Project Alternative would be similar to those under the proposed Project and also less than significant.

In summary, wildfire impacts of the No Project Alternative would be comparable to those of the proposed Project and would also be less than significant with mitigation.

Relationship of No Project Alternative to Project Objectives

As described above, the No Project Alternative would implement the remaining development under the 2006 LRDP. It would accommodate the same level of net new building space increase (358,500 gsf) and a comparable campus population increase of 1,200 ADP as under the proposed Project. However, because the 2006 LRDP does not include the well-articulated goals and strategies that are included in the proposed 2025 LRDP, this alternative would only partially meet objectives of the proposed 2025 LRDP.

This alternative would not meet several provisions of Project Objective 1, which is to strengthen Berkeley Lab's ability to perform transformative, mission-directed scientific research. For the past 20 years, Berkeley Lab has fully realized the 2006 LRDP demolition projection that was also analyzed in the 2006 LRDP EIR. Consequently, and without the new demolition projection provided in the Project, the No Project Alternative affords no opportunity for substantial new demolition. Without demolishing several substandard campus buildings, Berkeley Lab would not create space for new construction. In addition, without new demolition to partially offset new construction totals, the No Project Alternative could not achieve the Project's anticipated construction levels before reaching the No Project Alternative's maximum 2.42 million gsf projection. Furthermore, by adhering to a 2006-era campus planning model whereby a larger proportion of the Lab population is stationed on the campus, the No Project Alternative would limit the utilization of building space for research purposes.

The No Project Alternative would partially meet Project Objective 2, which is to guide Berkeley Lab's development towards achieving an identifiable and fully realized UC Research Campus. In particular, it would fall short on the supporting principles related to realizing a cohesive UC research campus with a unique sense of identity, improving wayfinding and user orientation throughout the campus, and improving the campus circulation network and mobility opportunities for all campus users. With its reliance on the 2006 LRDP's outdated campus vision and its lower emphasis on cohesive wayfinding and an accessible mobility network, the No Project Alternative would lack the goals and emphasis on finding opportunities to enhance the campus that are promoted under the proposed 2025 LRDP.

Project Objective 3, which calls for maintaining and strengthening Berkeley Lab's responsible stewardship of public and natural resources, and all of its supporting principles would be fully met by this alternative.

Project Objective 4 is to promote a welcoming campus that values and supports its community, neighbors, and the public. Overall, there is a greater emphasis in the 2025 LRDP than in the 2006 LRDP on creating a more accessible campus with better wayfinding and pedestrian opportunities, recreational amenities, and a more fully developed campus commons. For reasons noted above, this alternative would not fully meet Objective 4's supporting principle that calls for access and personal mobility throughout the campus. Also compared with the proposed Project, this alternative would likely provide fewer opportunities for a "widely distributed, full range of people-serving campus facilities," as development resources would be committed to the greater demand for office space under this alternative.

6.3.2 Alternative 2: Reduced Growth

Description

The Reduced Growth Alternative would realize Berkeley Lab campus development at a lower intensity than would occur under the proposed 2025 LRDP. Specifically, this alternative would result in a one-third lower increase in both campus building space and population than the increases that would occur under the proposed 2025 LRDP by the 2045 horizon year. Accordingly, net new building space developed on the campus (including flex space created) would increase by 239,000 gsf (one-third less than the 358,000 gsf increase under the proposed 2025 LRDP) for a total of 2,200,500 gsf by 2045. The on-campus population under the Reduced Growth Alternative would increase by 800 ADP (one-third less than the 1,200 ADP increase under the proposed 2025 LRDP) for a total of 3,800 ADP by 2045. Similar to the proposed 2025 LRDP, there would be no increase in the parking supply for employees and visitors at Berkeley Lab under the Reduced Growth Alternative.

It is assumed that future development under the Reduced Growth Alternative would be subject to goals and strategies of the proposed 2025 LRDP and its elements, including land use, mobility and circulation, open space and landscape, and utility infrastructure elements, albeit the 2025 LRDP would be modified, as needed, to reflect the reduced growth of this alternative.

Projects that have been approved pursuant to the 2006 LRDP that are either currently under construction (BioEPIC, Collaboration Commons Building/THUP) or in planning/design (ACHE Yard, ALS-U, LAMP) would continue to be implemented under the Reduced Growth Alternative.

Comparison of Effects of the Reduced Growth Alternative to Effects of the Proposed 2025 LRDP

Aesthetics

Compared with the proposed 2025 LRDP, the Reduced Growth Alternative has a lower intensity development program, and as discussed below, would likewise result in less-than-significant impacts on scenic vistas and applicable zoning and regulations governing scenic quality, and a less-than-significant impact from new sources of light and glare with mitigation.

Scenic Vistas

Under the Reduced Growth Alternative, one-third less net new building development would occur on the campus through 2045 compared to the proposed Project. Similar to the proposed Project, new building and other site development under the Reduced Growth Alternative would largely occur as infill in existing campus development clusters. Furthermore, with no changes to building height zones, the heights of new buildings under this alternative would be similar to those developed under the proposed Project. Given these factors, any noticeable visual changes associated with existing building removal and new building development as seen from off-site public vantage points under the Reduced Growth Alternative would likely be marginally less than under the proposed Project and would be similarly tempered by topographical variations on the campus, intervening buildings/structures, trees and other vegetation, and setbacks of developable areas. Lastly, vegetation management activities that would occur on the campus concurrently with the Reduced Growth Alternative would be the same as those that would occur concurrently with the proposed Project, and consequently, visual changes related to the campus VMP under the Reduced Growth Alternative would be the same as under proposed Project. Accordingly, overall effects on scenic vistas under the Reduced Growth Alternative would be somewhat less than the effects under the proposed Project and would be similarly less than significant.

Scenic Quality

Campus development under the Reduced Growth Alternative would be subject to, and consistent with, the principles and strategies regarding scenic quality in the LRDP; such development would also be required to comply with LRDP land use zoning, the LBNL Design Guidelines, and the forthcoming Physical Design Framework. Given these considerations, the impact related to conflicts with zoning and other regulations governing scenic quality under the Reduced Growth Alternative would be similar to that of the proposed Project, and similarly, less than significant.

Light and Glare

Given that less net new building and site development would occur under the Reduced Growth Alternative, potential effects of new sources of light and glare from building and site development on day or nighttime views under this alternative would be somewhat less than under the proposed Project, and similarly would be mitigated to a less-than-significant level with implementation of the same light/glare reduction mitigation measures.

In summary, compared to the proposed Project, the Reduced Growth Alternative would result in slightly reduced less-than-significant scenic vista and scenic quality impacts and a slightly reduced but significant light and glare impact that would be mitigated to a less-than-significant level with the same mitigation measures.

Air Quality

Conflict with Air Quality Plans

The Reduced Growth Alternative, similar to the proposed Project, would be generally consistent with and supportive of the *2017 Clean Air Plan* control measures and primary goals. Consequently, this alternative's Project and cumulative impacts relating to conflict with or obstruction of the *2017 Clean Air Plan* would be less than significant.

Pollutant Emissions

Under the Reduced Growth Alternative, total building demolition and new building construction at the campus would be one-third less than under the proposed Project. Consequently, project and cumulative increases in localized fugitive dust generated during construction under the Reduced Growth Alternative would be less than that generated under the proposed Project but would still result in a significant impact that would be similarly mitigated to a less-than-significant level with implementation of BAAQMD-recommended dust minimization measures. Project and cumulative impacts from construction-generated criteria air pollutants under the Reduced Growth Alternative would also be less than that under the proposed Project, and accordingly, less than significant.

During campus operation under the Reduced Growth Alternative, the campus population increase of 800 ADP by 2045 would be one-third less than the population increase of 1,200 ADP by 2045 under the proposed Project. Expected vehicle trip generation under the Reduced Growth Alternative would be proportional to campus population growth, and consequently, the increase in vehicle trips under the Reduced Growth Alternative over existing conditions would be less than proposed Project increases. Accordingly, the project and cumulative impacts associated with operational criteria air pollutant increases under the Reduced Growth Alternative would be less than the proposed Project impacts and less than significant, which is the same conclusion reached for the proposed Project.

Pollutant Concentrations/Health Risks

The amount of new development under the Reduced Growth Alternative would be one-third less than that developed under the proposed Project, and the Reduced Growth Alternative would not result in new buildings that would emit TACs or $PM_{2.5}$ in close proximity to existing sensitive uses, freeways, or high-volume roadways. Consequently, the Reduced Growth Alternative would result in less-than-significant project and cumulative impacts associated with exposure of sensitive receptors to substantial pollutant concentrations, similar to the proposed Project.

Odors

The Reduced Growth Alternative, similar to the proposed Project, would not involve new sources of odors during construction and operation that would adversely affect large numbers of people, and consequently, this impact would be less than significant.

Cumulative Air Quality Impacts

The cumulative air quality impacts of the Reduced Growth Alternative would be comparable or slightly less than those of the proposed Project.

In summary, air quality impacts of the Reduced Growth Alternative would be slightly reduced compared to those of the proposed Project and the same mitigation measures would be required to reduce the significant impacts to less-than-significant levels.

Biological Resources

The Reduced Growth Alternative would result in one-third less new building demolition and new building construction activities on the campus by 2045 as under the proposed Project. Similar to the proposed Project, new building and other site development under the Reduced Growth Alternative would largely occur as infill in existing campus development clusters. In addition, campus vegetation management activities as part of the VMP that would be implemented concurrently with the Reduced Growth Alternative would be comparable to those that would occur under the proposed Project. Consequently, potentially significant project and/or cumulative impacts to special-status plant and wildlife species, riparian habitat, other sensitive natural communities, jurisdictional wetlands, and wildlife movement under the Reduced Growth Alternative would be overall less than that which would occur under the proposed Project, and similarly would be mitigated to less-than-significant level with implementation of the same mitigation measures.

In summary, biological resource impacts of the Reduced Growth Alternative would be slightly less or comparable to those of the proposed Project and the same mitigation measures would be required to reduce the significant impacts to less-than-significant levels.

Cultural Resources, including Tribal Cultural Resources

The Reduced Growth Alternative would result in one-third less campus building demolition, new building construction, and ground disturbance activities through 2045 compared with the proposed Project. Similar to the proposed Project, new building and other site development under the Reduced Growth Alternative would largely occur as infill in existing campus development clusters. It is likely that Building 71, which has been determined eligible for listing on the National Register, would not be demolished under the Reduced Growth Alternative. However, other buildings on the campus may reach the minimum age thresholds for consideration as potential historical resources during the timeline of the Reduced Growth Alternative. As such, if demolition or significant alterations to these historical resources could not be avoided under the Reduced Growth Alternative, the project and cumulative impacts to any of these historic resources would remain significant and unavoidable.

Project and/or cumulative impacts to archaeological resources, human remains, and tribal cultural resources would be less than the impacts under the proposed Project but still would be potentially significant, and mitigation measures would be required to reduce the significant impacts to less-than-significant levels.

In summary, cultural resource impacts of the Reduced Growth Alternative would be slightly less than those of the proposed Project and the same mitigation measures would be required to reduce the significant impacts to less-than-significant levels. The significant and unavoidable impact on historic resources would not be avoided.

Energy

The Reduced Growth Alternative would result in one-third less building demolition and new building construction compared to the proposed Project, and as a result, would have a reduced construction energy use impact compared to the proposed Project. The Reduced Growth

Alternative would also introduce one-third less net new building space and ADP on the campus and consequently would involve consumption of less energy during operation. Compared with the proposed Project, this alternative would result in reduced less-than-significant project and/or cumulative impacts associated with energy resource consumption—i.e., energy use that would be wasteful, inefficient, or unnecessary—and it would result in less potential conflict with a state or local plan for renewable energy or energy efficiency.

In summary, energy impacts of the Reduced Growth Alternative would be slightly reduced compared to those of the proposed Project and less than significant.

Geology and Soils

The Reduced Growth Alternative would result in less ground disturbance at the campus during construction compared to the proposed Project. Consequently, impacts related to soil erosion during construction would be reduced and similarly less than significant with the implementation of BMPs included in a SWPPP as required under the NPDES CGP.

The Reduced Growth Alternative could include ancillary features (e.g., new driveways, building service roads, parking lots, etc.) that may be developed within the Hayward Fault Zone and potentially pose a significant hazard if they were to result in complications such as roadway failure during emergency conditions. Similar to the proposed Project, this impact would be mitigated to a less-than-significant level by having Berkeley Lab seismic emergency response and evacuation plans account for alternative ingress and egress routes in the event of roadway failure from surface fault rupture.

The Reduced Growth Alternative would result in one-third less new building construction on the campus compared to the proposed Project. New building and other site development under the Reduced Growth Alternative would largely occur as infill in existing campus development clusters, similar to that which would occur under the proposed Project. As a result, the potential Reduced Growth Alternative impacts associated with risk from strong seismic ground shaking; earthquake-induced landsliding, seismic-related ground failure including liquefaction, erosion, unstable soils, and expansive soils would be somewhat less than under the proposed Project. Reduced Growth Alternative impacts would similarly be less than significant with compliance with the applicable federal and State regulatory requirements and the implementation of geotechnical design evaluation for each individual project.

In summary, geology and soils impacts of the Reduced Growth Alternative would be slightly reduced compared to those of the proposed Project and would also be less than significant or reduced to less than significant with the same mitigation measures.

Greenhouse Gas Emissions

The Reduced Growth Alternative would result in one-third less campus building demolition and new building construction than under the proposed Project and thus would generate a lower amount of GHG emissions during construction. During campus operation under the Reduced Growth Alternative, the on-campus population would increase by 800 ADP by 2045 (one-third less than the 1,200 ADP increase under the proposed Project). As a result, GHG emissions generated during operation of Reduced Growth Alternative would be lower than under the proposed Project due to reduced mobile source emissions. Nonetheless, as with the proposed Project, the Reduced Growth Alternative would result in less-than-significant project and cumulative impacts with respect to GHG emissions and conflicts with applicable plans, policies, or regulations adopted for the purposed of reducing GHG emissions, including the *CARB 2022 Scoping Plan*, *Plan Bay Area 2050*, and UC *Policy on Sustainable Practices* and the Berkeley Lab *Net-Zero Vision and Roadmap*.

In summary, GHG impacts of the Reduced Growth Alternative would be slightly reduced compared to those of the proposed Project and would also be less than significant.

Hazards and Hazardous Materials

The Reduced Growth Alternative would result in one-third less campus building demolition and new building construction than under the proposed Project. There would be one-third less net new campus development under this alternative, but with similar land use types, as compared to the proposed Project. As with the proposed Project, the Reduced Growth Alternative would include compliance with the numerous laws and regulations that govern the transportation, storage, use, treatment, and disposal of hazardous materials and hazardous materials waste. This would ensure the potential for adverse effects to the public or environment during construction and operation, or creation of hazardous conditions due to the use or accidental release of hazardous materials, would be reduced to a less-than-significant level both on campus and within the vicinity of nearby off-site sensitive receptors. In addition, with respect to campus areas that have been affected by past releases of chemicals to soil and groundwater, necessary compliance with existing federal, State, and UC requirements, and the DTSC-approved and required plans (including *Groundwater Monitoring and Management Plan* and *Soil Management Plan)* would reduce the potential for new campus development under the Reduced Growth Alternative to expose the public and the environment to pre-existing contaminants, and the impact would be less than significant.

In summary, hazards and hazardous materials impacts of the Reduced Growth Alternative would be slightly reduced compared to those of the proposed Project and would also be less than significant.

Hydrology and Water Quality

The Reduced Growth Alternative would result in less ground disturbance on the campus during construction compared to the proposed Project. Consequently, project and cumulative impacts related to temporary increases in siltation and pollutants in stormwater runoff during construction would be somewhat less than under the proposed Project, and similarly, less than significant with the implementation of BMPs included in a SWPPP as required under the NPDES CGP. In addition, all post-construction activities on the campus under this alternative would be required to comply with the Berkeley Lab's SWPPP for Industrial Activities as required under the IGP. As a result, potential project and cumulative impacts of this alternative related to violation of water quality standards or waste discharge requirements would be less than significant, similar to the proposed Project.

New building and other site development under the Reduced Growth Alternative would largely occur as infill in existing campus development clusters, similar to the proposed Project. Based on its smaller development footprint, this alternative could result in an incrementally smaller increase in impervious surfaces on the campus compared to the proposed Project. As a result, potential project and cumulative impacts related to decrease in groundwater supply or groundwater recharge, and/or conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan under this alternative would be incrementally less than under the proposed Project, and similarly less than significant. For the same reasons, project and/or cumulative impacts related to alteration of drainage patterns, which could lead to increases in surface runoff and flooding, an exceedance of the capacity of stormwater drainage systems, or additional sources of polluted runoff, would also be less than significant, as this alternative would be required to comply with the Lab's SWPPP for Industrial Activities and *Construction Standards and Design Requirements,* similar to the proposed Project.

In summary, hydrology and water quality impacts of the Reduced Growth Alternative would be slightly reduced compared to those of the proposed Project and would also be less than significant.

Land Use and Planning

As with the proposed Project, all new development under the Reduced Growth Alternative would occur within the proposed 2025 LRDP designated developable areas and on infill sites and would not physically divide an established community. There would be no impact.

UC LBNL is not subject to local policies, plans, or regulations, and consequently potential land use impacts resulting from campus development under the Reduced Growth Alternative with respect to conflicts with applicable land use plans, policies, or regulations of an agency with jurisdiction over the project would be considered less than significant. Nevertheless, similar to the proposed Project, Reduced Growth Alternative implementation would not result in development that would be incompatible with adjacent uses, either in Berkeley or Oakland.

In summary, land use and planning impacts of the Reduced Growth Alternative would be similar to those of the proposed Project and less than significant.

Noise and Vibration

The Reduced Growth Alternative would result in less campus building demolition and new building construction compared to the proposed Project. Similar to the proposed Project, new building and other site development under the Reduced Growth Alternative would largely occur as infill in existing campus development clusters. With reduced demolition and construction, construction noise impacts under the Reduced Growth Alternative would be less than those under the proposed Project. Similar to the proposed Project, there may be individual construction and/or demolition projects undertaken during the LRDP period that result in noise impacts that could not be fully mitigated; therefore, project and cumulative construction noise impacts under this alternative would remain significant and unavoidable. Potentially significant project and cumulative groundborne vibration levels during Reduced Growth Alternative construction activities would be less than that under the proposed Project, but they would still be significant and the same mitigation measures would be required to reduce them to a less-than-significant level.

Campus vegetation management activities under the VMP would be similar to the activities that would occur concurrently with the proposed Project. For heavy and/or noise-elevated vegetation management occurring nearer to sensitive receptors, noise levels may not be reduced to below the City's noise standards, thus VMP noise impacts during the term of the Reduced Growth Alternative similarly would remain significant and unavoidable.

Under the Reduced Growth Alternative, a permanent increase in operational noise levels exceeding City of Berkeley noise standards in the campus vicinity would be somewhat less than that expected under the proposed Project, because fewer new buildings with HVAC and other stationary noise sources would be added to the campus. However, the operational noise impact would still be potentially significant and similarly mitigated to a less-than-significant level. In addition, the increase in vehicle trips under this alternative would be less than that under the proposed Project. Consequently, project and cumulative permanent increases in operation noise levels associated with traffic increases under the Reduced Growth Alternative would be less than under the proposed Project, and similarly less than significant.

In summary, noise impacts of the Reduced Growth Alternative would be somewhat reduced compared to those of the proposed Project. The operational noise impacts and groundborne vibration impacts would be either less than significant or reduced to less than significant with the same mitigation measures. The construction noise impacts and VMP noise impacts, although reduced, would still be potentially significant and would not be reduced to less than significant with available mitigation.

Population and Housing

Under the Reduced Growth Alternative, the campus population increase of 800 ADP by 2045 would be one-third less than the population increase under the proposed Project. Similar to the proposed Project, this would represent well less than one percent of the projected Bay Area increase of 2.4 million residents by 2050. Since this population growth would be consistent with adopted regional and local projections, similar to the proposed Project, the Reduced Growth Alternative would not induce substantial unplanned population growth in an area, either directly or indirectly, and the impact would be less than significant.

Similar to the proposed Project, since no campus housing exists, the Reduced Growth Alternative would not displace existing people or housing and would not necessitate the construction of replacement housing elsewhere, thus the impact would be less than significant.

In summary, population and housing impacts of the Reduced Growth Alternative would be slightly reduced compared to those of the proposed Project and less than significant.

Public Services and Recreation

Based on the assumption that fire and police protection service calls are proportional to campus population and building space, the Reduced Growth Alternative would increase calls for fire and police protection service by approximately one-third less than that which would occur under the proposed Project. As with the proposed Project, this increase in calls under the Reduced Growth

Alternative would not result in the need for new or expanded facilities to provide adequate fire and police protection services.

The Reduced Growth Alternative would generate an expected one-third fewer school-age children than the proposed Project. As with the proposed Project, it is expected that the new students under the Reduced Growth Alternative could be accommodated in existing local school district facilities, including the OUSD and BUSD, and the construction of new school facilities would not be required.

The Reduced Growth Alternative would generate an expected increase in demand for parks and recreation facilities at a rate one-third less than the demand generated under the proposed Project. However, given the availability of recreational opportunities at the Berkeley Lab campus, any increase in the use of EBRPD and UC Berkeley trails would be small, and the Reduced Growth Alternative would be unlikely to result in substantial physical deterioration of nearby trails, parks, or recreational amenities requiring improvements or the need for the development of additional recreational amenities.

In summary, public services and recreation impacts of the Reduced Growth Alternative would be slightly reduced compared to those of the proposed Project and less than significant.

Transportation

The Reduced Growth Alternative, similar to the proposed Project, would not conflict with the UC *Policy on Sustainable Practices*. Consequently, similar to the proposed Project, the Reduced Growth Alternative would have a less-than-significant impact related to conflict with transportation plans.

The Reduced Growth Alternative would result in one-third less campus building space and population than the proposed Project. However, since the campus parking supply under this alternative would remain at current levels, and it would serve a smaller population compared to the proposed Project, an incrementally higher percentage of the employees and visitors could drive to and from the campus under this alternative. The VMT per person would incrementally increase under this Reduced Growth Alternative compared to the proposed Project, because a higher percentage of employees and visitors would drive to the campus. However, the Reduced Growth Alternative would still meet the Low-VMT Areas screening criterion, and like the proposed Project, would have less-than-significant project and cumulative impacts on VMT.

Since the Reduced Growth Alternative would have similar campus transportation infrastructure as the proposed Project, the impacts associated with a substantial increase in hazards due to inadequate emergency access or to a geometric design feature or incompatible uses would also be less than significant under this alternative, which is the same as under the proposed Project.

In summary, transportation impacts of the Reduced Growth Alternative would be comparable to those of the proposed Project and less than significant.

Utilities and Service Systems

As with the proposed Project, the Reduced Growth Alternative would not result in significant impacts related to construction of utility improvements with implementation of construction related mitigation measures and other construction-related regulatory requirements. Consequently, this impact would be less than significant, similar to the conclusion reached for the proposed Project.

Given the net increase in development that would occur under the Reduced Growth Alternative would be one-third less than under the proposed Project, and the types of land uses that would be developed would be similar, effects on EMBUD water sufficiency to serve the campus and other reasonably foreseeable development under this alternative during normal, dry, and multiple dry years would be less than under the proposed Project and similarly less than significant. Effects on EBMUD Main Wastewater Treatment Plant wastewater capacity to serve the projected volume of wastewater under the Reduced Growth Alternative would be less than under the proposed Project and also less than significant. For the same reason, effects on solid waste capacity and consistency with solid waste goals would be less than significant as well.

In summary, utilities impacts of the Reduced Growth Alternative would be slightly reduced compared to those of the proposed Project and less than significant.

Wildfire

Under the Reduced Growth Alternative, the campus population increase would be one-third less than the population increase under the proposed Project. However, parking supply for employees and visitors at the campus under the Reduced Growth Alternative would be the same as under the proposed Project. Consequently, in the event of a full evacuation of the campus, the Reduced Growth Alternative would add a similar amount of Lab-related traffic as the proposed Project to nearby off-site roadways. These roads could be additionally congested with traffic generated by people simultaneously evacuating from other nearby areas. As such, the Reduced Growth Alternative would potentially interfere with the City's evacuation plan for the area at a similar level as the proposed Project, and result in the same potentially significant impact. As under the proposed Project, the implementation of LRDP Mitigation Measures WF-2a and WF-2b would similarly mitigate this impact to a less-than-significant level.

Campus building space growth under the Reduced Growth Alternative would be one-third less than under the proposed Project. New development under this alternative would be subject to the same applicable safety standards and building and fire codes, and the Lab's VMP would also be fully implemented. As such, impacts associated with risk of loss, injury, or death involving wildland fires under the Reduced Growth Alternative may be somewhat less than under the proposed Project, and similarly, less than significant. In addition, other plans, policies, regulations, and programs would continue to be implemented, including the Berkeley Lab FPP and WFMP, the Alameda County CWPP and EOP, and the Cities of Berkeley and Oakland LHMPs. As a result, this alternative would not exacerbate wildfire risks and thus not expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire due to slope, prevailing winds, and other factors, and this impact would be less than significant. Also, given the lesser building space growth, potential upgrades and improvements to aging campus utility infrastructure under the Reduced Growth Alternative may be somewhat less than under the proposed Project, but in any case, would comply with the same applicable building design standards and fire safety regulations. Consequently, the fire risk or impacts to the environment from installation of maintenance of utility infrastructure under this alternative would similarly be less than significant.

Similar to the proposed Project, campus development under this alternative would be located largely on infill sites not prone to landsliding. In addition, with fire fuel reduction effort implemented under the Lab's VMP, the likelihood of a wildfire that would burn vegetation on slopes across the campus is low, thus reducing the potential of post-fire slope instability. As such, impacts related to downslope or downstream flooding or landslides as a result of runoff or post-fire slope instability under the Reduced Growth Alternative may be somewhat less than under the proposed Project and would be similarly less than significant.

In summary, wildfire impacts of the Reduced Growth Alternative would be somewhat reduced or comparable to those of the proposed Project and would be less than significant or rendered less than significant with mitigation.

Relationship of Reduced Growth Alternative to Project Objectives

As described above, the Reduced Growth Alternative would consist of a one-third lower increase in both campus population and building space than the increases that would occur under the proposed 2025 LRDP by the 2045 horizon year. By accommodating a lower campus building space and population increase, this alternative would partially fulfill, but not fully realize the 2025 LRDP Project objectives.

This alternative would not fully meet Project Objective 1, which is to strengthen Berkeley Lab's ability to perform transformative, mission-directed scientific research. In particular, it would fall short with respect to supporting principles that would provide the Berkeley Lab campus with modern, mission-capable scientific facilities and support space, and outfit the Berkeley Lab campus with modern, mission-capable infrastructure and utilities. It would not provide adequate building space or campus population to accommodate Berkeley Lab's programmatic and operational needs, nor would it prepare the campus to consolidate personnel and functions from off-site leased space, with a focus on collaboration and efficiency. During the next 20 years, the campus would lose a substantial amount of existing research space due to age, obsolescence, and seismic deficiencies, but it would not be able to fully restore those spaces and functions with modern, mission-capable laboratories and research facilities under reduced growth parameters. This alternative would find the Lab regressing and not driving forward in its capabilities as a research campus.

The Reduced Growth Alternative would not fully meet Project Objective 2, which calls for achieving an identifiable and fully realized UC Research Campus, and its supporting principle to realize a cohesive UC research campus with a unique sense of identity. Opportunities for new buildings, facilities, and outdoor spaces intended to enhance the campus experience with collaborative, social, recreational, wayfinding, and aesthetic features would likely be deprioritized under this alternative's more austere development program. Seeking to replace as much lost research space as possible would likely become the Lab's chief development priority.

Project Objective 3, which calls for maintaining and strengthening Berkeley Lab's responsible stewardship of public and natural resources, and all of its supporting principles would be fully met by this alternative.

Project Objective 4, which is to promote a welcoming campus that values and supports its community, neighbors, and the public, would not be fully met by this alternative. For reasons mentioned above, reducing the Lab's development opportunities would mean prioritizing research buildings at the expense of developing the campus with "people-serving campus facilities."

6.3.3 Alternative 3: Partial Off-Site Growth

Description The Partial Off-site Growth Alternative would realize most of proposed 2025 LRDP growth and development at the Berkeley Lab campus with the remaining portion of the proposed growth and development to occur off-site at the Richmond Field Station (RFS) (also known as the UC Richmond Bay Campus) located in Richmond. Accordingly, net new building space developed on the Berkeley Lab campus (including flex space created) would increase by 239,000 gsf (one-third less than the 358,000 gsf increase under the proposed 2025 LRDP) for a total of 2,300,500 gsf building space by 2045. At the RFS, approximately 191,330 gsf of building space would be developed, which would correspond to about two to three medium to large research buildings. It is assumed these research buildings at RFS would be either DOE-owned buildings or UC-owned buildings that would be leased to the DOE.

Corresponding with this pattern of building space development under this alternative, about 2/3rds of the projected campus ADP increase (about 800 ADP) would occur at Berkeley Lab and 1/3rd of the projected ADP increase (about 400 ADP) would occur at the RFS.

Similar to the proposed 2025 LRDP, there would be no increase in the parking supply for employees and visitors at Berkeley Lab under the Partial Off-site Growth Alternative. New parking would be developed at the RFS to serve the two to three new research buildings under this alternative.

It is assumed that future development at Berkeley Lab under the Partial Off-site Growth Alternative would be subject to goals and strategies of the proposed 2025 LRDP and its elements, including land use, mobility and circulation, open space and landscape, and utility infrastructure elements, albeit the 2025 LRDP would be modified, as needed, to reflect the reduced growth at Berkeley Lab under this alternative.

Projects that have been approved pursuant to the 2006 LRDP at the Berkeley Lab campus that are either currently under construction (BioEPIC, Collaboration Commons Building/THUP) or in planning/design (ACHE Yard, ALS-U, LAMP) would continue to be implemented under the Partial Off-site Growth Alternative. To provide context for the RFS, a brief description of existing physical characteristics of, and background information for, the RFS is provided below.

Richmond Field Station Campus Description and Background

The approximately 134-acre RFS site is located at 1301 South 46th Street in the South Shoreline area of the City of Richmond, approximately 5 miles northwest of the UC Berkeley and Berkeley Lab campuses. The RFS site is composed of three University-owned parcels: a 109.8-acre RFS parcel composed of 96.8 acres of uplands; a 13 acre-parcel of Western Stege Marsh and a transition zone; and a 24.0-acre developed parcel along Regatta Boulevard immediately west of the RFS upland area. Land uses surrounding the RFS site include industrial and office uses, Interstate 580 and railroad lines, and low- to medium-density residential neighborhoods.

The existing buildings at the RFS site total to over 1 million gsf of floor space. These buildings range from older buildings that are remnants of previous operations on the site to newer structures that have been purpose-built for current research activities. Utilities providers that serve the RFS include East Bay Municipal Utility District (EBMUD) for potable water; the Richmond Municipal Sewer District (RMSD) for storm and sanitary sewer infrastructure; and PG&E for electrical power and natural gas.

The RFS includes a number of natural areas, including coastal terrace prairie grasslands, Western Stege Marsh, and Meeker Slough. The Western Stege Marsh is located at the southern edge of the RFS and consists of approximately 9 acres of waterlogged land, including mudflats and tidal wetlands. Meeker Slough flows from the west and bends southward at Western Stege Marsh where it drains to San Francisco Bay. UC Berkeley has completed extensive remediation and restoration of the Western Stege Marsh and monitoring of these natural areas continues. Western Stege Marsh and Meeker Slough provide habitat for a number of special-status bird and bat species. The RFS also contains several stands of eucalyptus trees which provide habitat for raptors and wintering monarch butterflies.

The University of California certified the *Richmond Bay Campus Long Range Development Plan Final EIR* (RBC LRDP Final EIR) and adopted the *Richmond Bay Campus Long Range Development Plan* (RBC LRDP) in May 2014 (UC, 2014; UC Berkeley, 2014a). The RBC LRDP accommodates a net increase in occupied building space at the RFS of 4,350,000 gsf of research and development facilities, from 1,050,000 gsf in 2013 to 5,400,000 gsf in 2050; and includes demolition of approximately 750,000 gsf of existing buildings. The RBC LRDP also anticipates the daily population to increase from approximately 300 in 2013 to approximately 10,000 in 2050. Under the RBC LRDP, 107.6 acres in the north, west and east portion of the RFS are designated as Research, Education and Support, and 25.0 acres in the central and south portions of the campus (including the coastal prairie grasslands and Western Stege Marshlands) are designated as Natural Open Space.

None of the major development projected under the RBC LRDP and analyzed in the RBC LRDP Final EIR has occurred at the RFS site, and for this reason, the conclusions reached in the RBC LRDP Final EIR are considered conservative.

Comparison of Effects of the Partial Off-site Growth Alternative to Effects of the Proposed 2025 LRDP

The increases in development and population that would occur at the Berkeley Lab campus under the Partial Off-site Growth Alternative would be similar to that which would occur at the Lab under the Reduced Project Alternative described above. Correspondingly, the comparative environmental impacts that would occur at the Berkeley Lab campus under the Partial Off-site Growth Alternative would be similar to those impacts that would occur at the Lab under the Reduced Project Alternative. Accordingly, the impacts at Berkeley Lab campus described above for the Reduced Project Alternative are not repeated herein.

The analysis below focuses on environmental impacts that would occur at the RFS under this alternative, and also provides a summary comparison of this alternative to the proposed Project.

Aesthetics

Scenic Vistas

The RBC LRDP Final EIR determined that the impact of new RFS development on scenic vistas would be less than significant. Given the proposed two to three new research buildings that would be developed at the RFS under this alternative would be within the scope of development envisioned at the RFS and of a scale and height as other RFS development, the new development would only alter a very small portion of scenic vistas of the Bay and other natural areas as viewed from surrounding publicly available areas, and views would not be obstructed by campus development. Consequently, the impact on scenic vistas from the new research buildings that would be developed at the RFS under this alternative would be less than significant.

Visual Character

As discussed above, under the Partial Off-site Growth Alternative, two to three research buildings and supporting parking would be developed at the RFS. The research buildings would be similar in height to other buildings commonly constructed at the campus under the RBC LRDP, typically consisting of four to five stories.

The RBC LRDP Final EIR indicated that building development that would occur under the RBC LRDP may be perceived as visually intrusive and substantial to some observers as viewed from off-site vantage points. The RBC LRDP Final EIR concluded that the change in visual character from development under the RBC LRDP could alter the campus's visual quality and character in a potentially significant manner. The RBC LRDP Final EIR identified RBC LRDP Mitigation Measure AES-1, which required the University to develop and implement a Physical Design Framework in which the scale, density and height of new building development would be addressed in [the *Richmond Bay Campus Physical Design Framework* (RBC PhDF)] was adopted in May 2014) (UC Berkeley, 2014b). The RBC PhDF includes best management practices and articulated design review processes for new buildings and development. As such, with implementation of RBC LRDP Mitigation Measure AES-1, impacts on visual character from development under the RBC LRDP would be reduced to a less than significant level. The two to three research buildings that would be developed at the RFS under this Partial Off-site Growth

Alternative would be subject to these mitigation measures, ensuring their impact on visual quality would be less than significant.

It should also be noted that the applicable *CEQA Guidelines* Appendix G checklist significance criteria for visual character at the time of RBC LRDP Final EIR preparation (i.e., whether a project would substantially degrade the existing visual character of quality of the site and its surroundings) was subsequently revised (whether a project located in an urbanized area would conflict with applicable zoning and other regulations governing scenic quality). Accordingly, the RBC LRDP would be the overarching planning guideline document for development at the RFS. If applying the current *CEQA Guidelines* significance criteria for visual character to the two to three research building at the RFS under the Partial Off-site Growth Alternative development, they would not conflict with the RBC LRDP's principles and strategies governing scenic quality, and as such, would not conflict with applicable zoning and other regulations governing scenic quality, and the impact would be less than significant.

Light and Glare

The RBC LRDP Final EIR determined that the impact of new RFS development on light and glare would be less than significant. In addition, the RBC LRDP Final EIR identified RBC LRDP Environmental Protection Practices AES-3a to-3c that could be implemented to further reduce potential light and glare effects. Given that that the two to three new research buildings that would be constructed at the RFS under this alternative would be in an area planned for research and development with existing similar uses in the vicinity, these new buildings would similarly not create new sources of substantial light or glare that could have adverse impacts on day- or nighttime views, and the impact would be less than significant.

Lastly, the RBC LRDP Final EIR determined that all potential cumulative aesthetic impacts of new RFS development would be less than significant. As the minor new development that would be constructed at the RFS under this alternative is within the scope of development analyzed in that EIR, this alternative would not affect this conclusion.

In summary, the Partial Off-site Growth Alternative would result in somewhat reduced visual impacts at the Berkeley Lab campus and additional visual impacts at the RFS. However, as with the proposed Project, all visual impacts would be less than significant.

Air Quality

Pollutant Emissions

The RBC LRDP Final EIR determined that while construction and demolition activities under the RBC LRDP would not violate an air quality standard or contribute substantially to an existing or projected air quality violation, operational activities under the RBC LRDP would exceed the applicable CEQA thresholds for certain criteria air pollutants. The RBC LRDP Final EIR found that this impact would remain significant and unavoidable for NO_x, PM_{10} and $PM_{2.5,}$ even with implementation of mitigation measures specifying campus-wide controls, and stationary and source control measures (RBC LRDP Mitigation Measure AIR-2). However, as the two to three research buildings that would be developed at the RFS under this alternative would not increase the total development capacity at RFS under the RBC LRDP, it would not exacerbate this plan impact, and these buildings would be subject to the same mitigation measures identified RBC LRDP Final EIR to minimize operational criteria air pollutants to the extent feasible.

Pollutant Concentrations/Health Risks

The RBC LRDP Final EIR determined, based on a human health risk assessment, that construction and demolition activities under the RBC LRDP would not expose people to substantial levels of TACs or expose sensitive receptors to substantial pollutant concentrations in excess of applicable BAAQMD CEQA thresholds. However, the RBC LRDP Final EIR found that operational activities under the RBC LRDP would result in an acute hazard index for on-site worker that would exceed the applicable hazard index threshold of 1.0, and result in an annual PM_{10} concentration that would occur off-site that would exceed the applicable threshold of 0.3 μg/m3, which would be a significant and unavoidable impact even with implementation of mitigation measures identified in the RBC LRDP Final EIR to minimize the operational emissions of $PM_{2.5}$ from mobile and stationary sources and TAC emissions from on-site stationary sources (RBC LRDP Mitigation Measures AIR-4a to -4b). Regardless, the two to three research buildings that would be developed under this alternative would not increase the total building development capacity at the RFS under the RBC LRDP, so would not exacerbate this plan impact, and these building projects would be subject to the same mitigation measures identified RBC LRDP Final EIR to minimize operational health risks to the extent feasible.

The RBC LRDP Final EIR also determined that the emissions from the use of radioactive materials in RFS laboratories developed pursuant to the RBC LRDP would have a less than significant impact. The two to three research buildings that would be developed under this alternative at the RFS to be owned and operated by the DOE would be subject to applicable standards in Subpart H of the National Emission Standards for Hazardous Air Pollutants regulation, which would limit radionuclide emissions from DOE facilities and requires emissions sampling, monitoring, and dose calculations to determine compliance with the standard, and ensure that emissions from the use of radioactive materials would be less than significant.

Conflict with Air Quality Plans

The RBC LRDP Final EIR determined that although RFS development under the RBC LRDP would not conflict with the applicable clean air plan at that time (*2010 Clean Air Plan*) under the criteria provided by the BAAQMD, it would nonetheless result in operational emissions of criteria pollutants that would exceed the applicable BAAQMD CEQA thresholds even after mitigation, and would therefore interfere with the attainment of air quality standards, which would be a significant and unavoidable impact for the reasons discussed above under *Pollutant Emissions*. For the same reasons, it is also expected that campus development under the RBC LRDP would interfere with the attainment of air quality standards of the current air quality plan (*2017 Clean Air Plan*), resulting in a significant and unavoidable impact. However, the two to three research buildings that would be developed under this alternative would not increase the total development capacity at RFS under the RBC LRDP, so they would not exacerbate this plan impact, and these research buildings would be subject to the same mitigation measures identified RBC LRDP Final EIR discussed above to minimize operational criteria air pollutants to the extent feasible.

Odors

The RBC LRDP Final EIR determined that development under the RBC LRDP would not create objectionable odors affecting a substantial number of people. Since the research uses that would be developed at the RFS under this alternative would be similar to other research uses developed at the RFS, and would be subject to similar odor controls, such as ventilation systems and fume hoods, the impact to odors would similarly be less than significant.

Cumulative Air Quality Impacts

The RBC LRDP Final EIR determined that because the plan's operational criteria pollutant emissions would exceed the applicable BAAQMD CEQA thresholds, the RFS at full development under the RBC LRDP would make a cumulatively considerable contribution to the significant cumulative impact on regional air quality, and the impact would be significant, even with implementation of identified mitigation measures. However, the two to three research buildings that would be developed under this alternative would not increase the total development capacity at the RFS under the RBC LRDP, so would not exacerbate this cumulative impact, and these buildings would be subject to the same mitigation measures identified RBC LRDP Final EIR to minimize operational criteria air pollutants to the extent feasible.

The RBC LRDP Final EIR determined, based on a cumulative human health risk assessment, that the cumulative impact related to $PM_{2.5}$ emissions from RBC LRDP construction and operation would be significant and unavoidable. The RBC LRDP Final EIR identified cumulative mitigation to ensure that as new TAC sources are added to the RFS, each site's impact on the community is evaluated and appropriate TAC controls are added to the projects or existing sources retrofitted so that the RFS site does not contribute substantially to a significant human health effect on or in the vicinity of the RFS site. The RBC LRDP Final EIR concluded, however, that even with implementation of the RFS project air quality mitigation described above, and cumulative air quality mitigation (RBC Cumulative Mitigation Measures AIR-2a and -2b), the impact related to $PM_{2.5}$ concentrations would remain significant and unavoidable. Regardless, the two to three research buildings that would be developed under this alternative would not increase the total building development capacity at the RFS under the RBC LRDP, so would not exacerbate this plan impact, and these buildings would be subject to the same mitigation measures identified RBC LRDP Final EIR to minimize construction and operational health risks to the extent feasible.

In summary, the Partial Off-site Growth Alternative would result in somewhat reduced air quality impacts at the Berkeley Lab campus and would result in significant air quality impacts at the RFS that would require mitigation. While most air quality impacts would be fully mitigated by the available mitigation, under this alternative, the cumulative impact at the RFS related to human health would remain significant and unavoidable.

Biological Resources

The RBC LRDP Final EIR determined that development under the RBC LRDP would not have a substantial adverse effect on special-status plant species, the monarch butterfly, wildlife movement and migratory corridors, and conflicts with applicable policies protecting biological resources, or conflict with the provisions of an adopted Habitat Conservation Plan, Natural

Community Conservation Plan, or other applicable habitat conservation plan. Similar to other building development at the RFS, the two to three research buildings that would be developed under this alternative would be located within the area of the RFS designated as Research, Education and Support, and thereby avoid the portion of the campus designated as Natural Open Space. In addition, RFS's continued implementation of applicable RBC LRDP Environmental Protection Practice BIO-4 for successional tree planting would ensure the availability of monarch butterfly wintering habitat at the campus despite planned removal of eucalyptus trees. For these reasons, the two to three research buildings that would be developed at the RFS under this alternative would similarly result in less-than-significant impacts to these resource areas.

In addition, the RBC LRDP Final EIR determined that development under the RBC LRDP would have a potentially significant impact on nesting birds and roosting bats that would be mitigated to a less-than-significant level with implementation of surveys and other identified protocols described in RBC LRDP Mitigation Measures BIO-2 and BIO-3. Since the two to three research buildings that would be developed at the RFS under this alternative would be subject to this mitigation, the impacts would similarly be mitigated to a less-than-significant level.

The RBC LRDP Final EIR also determined that development under the RBC LRDP would have a potentially significant impact on sensitive natural communities (coastal prairie grassland habitat) and jurisdictional wetlands that would be mitigated to a less-than-significant level with implementation of a Coastal Terrace Management Plan (RBC LRDP Mitigation Measure BIO-5), and avoidance measures/wetland mitigation plan (RBC LRDP Mitigation Measure BIO-6). Since the two to three research buildings that would be developed at the RFS under this alternative would be subject to this mitigation, the impacts would similarly be mitigated to a less than significant level.

Lastly, the RBC LRDP Final EIR development under the RBC LRDP together with cumulative development in the region would not result in significant cumulative impacts on biological resources. As the two to three research buildings that would be developed at the RFS under this alternative are within the scope of development analyzed in that EIR, this alternative would not change that conclusion.

In summary, the Partial Off-site Growth Alternative would result in somewhat reduced biological resources impacts at the Berkeley Lab campus and would result in additional biological resource impacts at the RFS that would require mitigation. However, as with the proposed Project, all biological resource impacts would be reduced to less-than-significant levels.

Cultural Resources, including Tribal Cultural Resources

The RBC LRDP Final EIR determined that development under the RBC LRDP would result in significant impacts on two historic buildings[3] at the campus through demolition or visual intrusion from new building construction; and potentially significant impacts on historic structures that have not been identified or that would become of historic age over the life of the RBC LRDP—even with implementation of mitigation measures to complete historic documentation pursuant to

[3] These two historic buildings still exist at the campus.

the Secretary of the Interior's Standards for architectural history for those resources (RBC LRDP Mitigation Measures CR-2 and CR-3). Since the siting for the 2 to 3 research buildings that would be developed at the RFS under this alternative have not been determined, their construction could similarly result in a potentially significant impact to either the two historic buildings at the campus or historic structures that have not been identified or that would become of historic age over the life of the RBC LRDP. However, the two to three research buildings that would be developed under this alternative would not increase the total building development capacity at RFS under the RBC LRDP, so would not exacerbate this plan impact, and these buildings would be subject to the same mitigation measures identified in the RFS LRDP Final EIR to minimize impacts to historic resources to the extent feasible. Nevertheless, the impact to historic resources under this alternative would remain significant and unavoidable.

The RBC LRDP Final EIR also determined that development under the RBC LRDP could result in significant impacts on previously undiscovered, unevaluated, or unrecorded archaeological resources or human remains during construction and clearing that would be mitigated to a less-than-significant level with implementation of surveys and other identified protocols described in RBC LRDP Mitigation Measure CR-1. Since the two to three research buildings that would be developed at the RFS under this alternative would be subject to this mitigation, the impacts would similarly be mitigated to a less-than-significant level.

Lastly, the RBC LRDP Final EIR found that development under the RBC LRDP together with regional cumulative development would result in a cumulatively minor cultural resources impact, and the impact would therefore be less than significant. As the two to three research buildings that would be developed at the RFS under this alternative are within the scope of development analyzed in that EIR, this alternative would not change that conclusion.

Since there would be one-third less campus building demolition, new building construction, and ground disturbance activities at the Berkeley Lab campus under this alternative, the Partial Off-site Growth Alternative would result in somewhat reduced cultural resources impacts at the Berkeley Lab campus. However this alternative would result in additional cultural resource impacts at the RFS that would require mitigation. As with the proposed Project, this alternative would also have the potential to result in significant and unavoidable impacts on historical resources.

Energy

The RBC LRDP Final EIR determined that development under the RBC LRDP would not result in wasteful, inefficient, or unnecessary energy use. The two to three research buildings that would be developed under this alternative would not increase the total development capacity at the RFS under the RBC LRDP. Given the limited scale of the new research building development that would be developed at RFS under this alternative, the construction and operation of these buildings would result in less-than-significant project and/or cumulative impacts associated with energy resource consumption—i.e., energy use that would be wasteful, inefficient, or unnecessary—and it would result in less potential conflict with a state or local plan for renewable energy or energy efficiency.

In summary, the Partial Off-site Growth Alternative would result in somewhat reduced energy impacts at Berkeley Lab and additional energy impacts at the RFS. However, as with the proposed Project, the use of energy would not be wasteful nor conflict with state or local plans related to energy.

Geology and Soils

The RBC LRDP Final EIR determined that development under the RBC LRDP would have no impact associated with the risk of loss, injury, or death involving either rupture of a known earthquake fault or landsliding at the RFS. In addition, the RBC LRDP Final EIR determined that development under the RBC LRDP would not expose people and structures to substantial adverse effects from seismic hazards such as ground shaking and earthquake-induced ground failure at RFS, and these impacts would therefore be less than significant. The two to three research buildings that would be developed at the RFS under this alternative would be subject to compliance with the requirements of the CGS, Alquist-Priolo Act, UC Seismic Safety Policy, and DOE seismic policies and standards, as applicable, that would ensure that the impact related to ground shaking and earthquake-induced ground failure would similarly be less than significant.

The RBC LRDP Final EIR determined that development under the RBC LRDP would result in a potentially significant impact related to construction on soils that could be subject to erosion and instability. The RBC LRDP Final EIR also determined that soil swelling and shrinking as well as soil settlement from compaction of unconsolidated materials could pose problems with building foundations. The RBC LRDP Final EIR found that this impact would be reduced to a less-than-significant level as each new building project would be required to complete a design-level geotechnical investigation to minimize potential soil hazards and would be subject to applicable construction best management practices to control and minimize erosion (RBC LRDP Mitigation Measures GEO-2a to -2c). Since the two to three research buildings that would be developed at the RFS under this alternative would also be subject to this mitigation identified RBC LRDP Final EIR, the impacts would similarly be mitigated to a less-than-significant level.

Lastly, the RBC LRDP Final EIR found that development under the RBC LRDP together with regional cumulative development would not result in significant cumulative impacts related to geology and soil. As the two to three research buildings that would be developed at the RFS under this alternative are within the scope of development analyzed in that EIR, this alternative would not change that conclusion.

In summary, the Partial Off-site Growth Alternative would result in somewhat reduced geology and soils impacts at the Lab and in additional geology and soils impacts at the RFS. However, as with the proposed Project, all of the impacts would either be less than significant or reduced to a less-than-significant level with mitigation.

Greenhouse Gas Emissions

The RBC LRDP Final EIR determined that development under the RBC LRDP would generate operational GHG emissions that would result in a significant impact on the environment because the annual GHG emissions at full RBC LRDP buildout would exceed the significance threshold (based on Executive Order [EO] S-3-05) that was used at that time to evaluate the significance of the emissions. The RBC LRDP Final EIR found that even with implementation of RBC LRDP Mitigation Measure GHG-1 that required development of a Climate Action Plan that would include target emission rates per service person that are consistent with AB 32 and EO S-3-05 emissions targets, and implementation of specific control measures and programs to achieve these targets, the impact was conservatively concluded to remain significant. The RBC LRDP Final EIR also determined that since development under the RBC LRDP would conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions (EO S-3-05), even with implementation of RBC LRDP Mitigation Measure GHG-1, the impact would remain significant. Regardless, the two to three research buildings that would be developed at the RFS under this alternative would not increase the total development capacity at the RFS, and consequently, would not exacerbate these identified plan impacts.

It is noted that the prior analysis is now dated. New methodology and thresholds are applied in current CEQA documents that are substantially changed from those used in 2014 for the analysis in the RBC LRDP Final EIR. For instance, the BAAQMD has developed four criteria that may be used to determine whether a land development project, such as the two to three research buildings at the RFS, would result in substantial GHG emissions. However, were those criteria used, the impact of these building projects would be potentially significant. As discussed under Transportation, below, this alternative would have a higher home-work VMT per worker than the proposed Project because RFS is in an area with less transit service and lower pedestrian and bicycle connectivity than the Berkeley Lab campus. Although RBC LRDP Mitigation Measure TRA-1 would be implemented to reduce the home-work VMT per worker at the RFS, its effectiveness cannot be quantified and it is considered likely that the VMT impact would be significant (i.e., home-work VMT per worker would not be 15 percent below regional average which is one of BAAQMD project-level criterion for GHG impact). Also, it would be unlikely that the projects would fully satisfy the BAAQMD criterion for EV charging because the criterion involves satisfaction of a Calgreen standard which requires a very high percentage of a project’s parking spaces to be EV ready. Berkeley Lab is not subject to CALGreen, and while it would provide EV charging as part of the building projects, provision of the required high percentage of EV ready spaces would likely not be cost-effective. Further, for reasons presented under Transportation, below, the building projects could be found to result in conflicts with applicable plans, policies, or regulations adopted for the purpose of reducing GHG emissions, including the UC *Policy on Sustainable Practices,* the Berkeley Lab *Net-Zero Vision and Roadmap,* and *CARB 2022 Scoping Plan*.

In summary, GHG impacts of the Partial Off-site Growth Alternative would be reduced at the Berkeley Lab campus compared to the proposed Project and less than significant, but the impact would be greater and potentially significant and unavoidable at the RFS.

Hazards and Hazardous Materials

The RBC LRDP Final EIR determined that development under the RBC LRDP would not create a significant project or cumulative hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials, or through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment; and would not emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school.

The RBC LRDP Final EIR also determined that, even though the RFS was included on a list of hazardous waste sites compiled pursuant to the California Government Code Section 65962.5, development under the RBC LRDP would not create a significant hazard to the public or the environment. This was achieved through compliance with applicable federal and State regulations, and implementation of UC Berkeley and Berkeley Lab safety plans, programs, practices, and procedures governing hazardous materials and would ensure these impacts would be less than significant. In addition, the RBC LRDP Final EIR discussed that RBC LRDP Environmental Protection Practice HAZ-1 requires that UC Berkeley and Berkeley Lab continue the same (or equivalent) health and safety plans, programs, practices and procedures related to the use, storage, disposal, and transportation of hazardous materials and wastes (including chemical, radioactive, and bio-hazardous materials and waste) at RFS that are currently practiced at the Berkeley Lab campus and UC Berkeley main campus. Since the two or three research buildings that would be developed at RFS under this alternative would also be subject to these regulations and requirements as applicable, the impact to hazards and hazardous materials from construction and operation of these buildings would similarly be less than significant.

The RBC LRDP Final EIR further determined that development under the RBC LRDP would have a less-than-significant impact related to the impairment of implementation of, or physical interference with, an adopted emergency response plan or emergency evacuation plan. The Final EIR explained that UC Berkeley and Berkeley Lab would coordinate with state and local authorities to develop a site-specific emergency response plan for the proposed new RFS facilities. The Final EIR added that UC Berkeley Environmental Health and Safety Emergency Response Team and Berkeley Lab responders would be capable of responding to most RFS incidents and, if necessary, may arrange for appropriate assistance from the City of Richmond Fire Department, the LBNL Fire Department, and outside emergency response contractors. The two to three research buildings that would be developed at the RFS under this alternative would not increase the total development capacity or total population at the RFS, and consequently, would not change the conclusion regarding emergency response capabilities.

Lastly, the RBC LRDP Final EIR found that development under the RBC LRDP in conjunction with other reasonably foreseeable future development in the project vicinity would not result in a significant cumulative public or environmental hazard through reasonably foreseeable upset and accidental conditions involving the release of hazardous materials into the environment, and the impact would therefore be less than significant. As the two to three research buildings that would be developed at the RFS under this alternative are within the scope of development analyzed in that EIR, this alternative would not change that conclusion.

In summary, the Partial Off-site Growth Alternative would result in somewhat reduced hazards impacts at Berkeley Lab and additional hazards impacts at the RFS. However, as with the proposed Project, all of the impacts would be less than significant due to compliance with applicable laws and regulations.

Hydrology and Water Quality

The RBC LRDP Final EIR determined that development under the RBC LRDP would not create a significant project or cumulative impact related to a violation of water quality standards from stormwater runoff and dewatering; would not substantially deplete groundwater supplies or interfere substantially with groundwater recharge; would not substantially alter the existing drainage pattern of the RFS area resulting in substantial erosion/siltation or flooding on-or off-site; would not contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems; and would not expose people or structures to inundation by seiches, tsunamis, or mudflows. This was achieved through compliance with existing federal and State requirements (e.g., the implementation of BMPs included in a SWPPP as required under the NPDES CGP, use of LID in stormwater infrastructure design, etc.). Accordingly, these impacts were concluded to be less than significant. Since the two to three research buildings that would be developed at the RFS under this alternative would also be subject to the same regulations and requirements as applicable, the impacts to hydrology and water quality from construction and operation of these buildings would similarly be less than significant.

In addition, the RBC LRDP Final EIR determined that development under the RBC LRDP, in conjunction with other foreseeable development, would result in a less than significant impact related to cumulative increases in the amount of impermeable surfaces and resultant stormwater discharge to Meeker Slough and Western Stege Marsh. As the two to three research buildings that would be developed at RFS under this alternative are within the scope of development analyzed in that EIR, this alternative would not change that conclusion.

In summary, the Partial Off-site Growth Alternative would result in somewhat reduced hydrology and water quality impacts at Berkeley Lab and additional hydrology and water quality impacts at the RFS. However, as with the proposed Project, all of the impacts would be less than significant due to compliance with applicable laws and regulations.

Land Use and Planning

The RBC LRDP Final EIR determined that development under the RBC LRDP would have no impact related to a physical division of an established community. The RBC LRDP Final EIR also determined that development under the RBC LRDP would not conflict with the RBC LRDP, and as such would have a less-than-significant impact related to conflict with applicable land use plans. Since the two to three research buildings that would be developed at the RFS under this alternative would also be subject to the same policies and requirements of the RBC LRDP as applicable, this alternative's impact related to consistency with plans and policies would similarly be less than significant. Lastly, the RBC LRDP Final EIR found that development under the RBC LRDP together with other reasonably foreseeable regional growth, would not result in development that would conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project, and the cumulative impact would, therefore, be less than significant. As the two or three research buildings that would be developed at the RFS under this alternative are within the scope of development analyzed in that EIR, this alternative would not change that conclusion.

In summary, the Partial Off-site Growth Alternative would result in somewhat reduced land use impacts at Berkeley Lab and additional land use impacts at the RFS. However, as with the proposed Project, all of the impacts would be less than significant.

Noise and Vibration

The RBC LRDP Final EIR determined that construction activities associated with development under the RBC LRDP, and contribution to cumulative construction activities, could generate and expose people to noise levels exceeding Richmond Community Noise Ordinance standards, which would be potentially significant project and cumulative impacts. The RBC LRDP Final EIR concluded these impacts would be mitigated to a less-than-significant level with RBC LRDP Mitigation Measures NOI-1a to -1c, which required construction to occur in accordance with the Richmond Municipal Code’s specified maximum sound levels and construction equipment noise reduction measures, and implementation of construction noise notification requirements. In addition, the RBC LRDP Final EIR also determined that construction activities would result in less-than-significant impacts related to groundborne vibration.

Furthermore, the RBC LRDP Final EIR determined that operation of campus development under the RBC LRDP, including building stationary equipment and off-site traffic, and contribution to cumulative increases in ambient noise levels would not generate and expose people to noise levels exceeding Richmond Community Noise Ordinance standards or result in a substantial permanent increase in ambient project vicinity noise levels. Accordingly, these impacts were concluded in the RBC LRDP Final EIR to be less than significant. Since the two to three research buildings that would be developed at the RFS under this alternative are within the scope of development analyzed in that EIR and they would be subject to the same noise mitigation identified in the RBC LRDP Final EIR as applicable, the noise impacts associated with construction and operation of these buildings would similarly be mitigated to a less-than-significant level.

In summary, the Partial Off-site Growth Alternative would result in somewhat reduced construction and operational noise and vibration impacts at Berkeley Lab due to the reduction in the amount of development on the Lab campus but the significant and unavoidable construction noise impact would still occur. Construction of two to three research buildings at the RFS would result additional construction and operational noise and vibration impacts at the RFS. However, the construction noise impact at the RFS would be less than significant with mitigation. Thus, overall, this alternative would reduce the proposed Project’s significant and unavoidable construction noise impacts (both project and cumulative) but would not completely eliminate those impacts.

Population and Housing

Under the Partial Off-site Growth Alternative, two to three research buildings would be developed at the RFS that otherwise would be built at the Berkeley Lab campus under the proposed Berkeley Lab 2025 LRDP. Consequently, this alternative would not generate an increase in population in the Bay Area greater than that estimated under the proposed 2025 LRDP.

The RBC LRDP Final EIR determined that development under the RBC LRDP would incrementally increase the RFS population to about 10,000 persons over its approximately 40-year planning period but would not induce substantial population growth. The two to three research buildings that would be developed at the RFS under this alternative would add about 400 employees to the RFS which would be well within the projected total population anticipated at the campus under the RBC LRDP, and accordingly, this alternative would not affect this less-than-significant impact determination.

The RBC LRDP Final EIR also determined that while development under the RBC LRDP together with cumulative regional development would induce population growth in the City of Richmond and the Bay Area, the contribution of the RBC LRDP to this impact would not be cumulatively considerable, and the impact would therefore be less than significant. As the two to three research buildings that would be developed at the RFS under this alternative are within the scope of development analyzed in that EIR, this alternative would not change that conclusion.

In summary, the Partial Off-site Growth Alternative would result in somewhat reduced population impacts at Berkeley Lab and additional population impacts at the RFS. However, as with the proposed Project, all of the impacts would be less than significant.

Public Services and Recreation

The RBC LRDP Final EIR determined that development under the RBC LRDP would increase the demand for fire and police services and may result in the construction of new or expanded fire and police facilities. However, the impacts of construction of a new fire station or police facilities would be less than significant. The two to three research buildings that would be developed under this alternative would not increase the total development capacity or total population anticipated at the RFS under the RBC LRDP, so this alternative would not exacerbate these plan impacts. In addition, the RBC LRDP Final EIR also determined that development under the RBC LRDP would not result in the need for new or physically altered public school facilities, and the impact would be therefore less than significant. Since the two to three research buildings that would be developed under this alternative would not increase the total population anticipated at RFS under the RBC LRDP, and hence, would not change the anticipated increase in school age children and associated enrollment in the West Contra Costa School District, this alternative would not exacerbate this plan impact. The RBC LRDP Final EIR also determined that development under the RBC LRDP would not trigger construction, substantially increase demand, or substantially degrade parks and recreational facilities, and the impacts would be less than significant. Since the two to three research buildings that would be developed under this alternative would not increase the total population anticipated at the RFS under the RBC LRDP, this alternative would not exacerbate this plan impact.

Lastly, development under the RBC LRDP, in conjunction with other regional growth, could increase the demand for public service facilities but would not result in significant environmental impacts related to construction or expansion of such facilities. As the two to three research buildings that would be developed at the RFS under this alternative are within the scope of development analyzed in that EIR, this alternative would not change that conclusion.

In summary, the Partial Off-site Growth Alternative would result in somewhat reduced public services and recreation impacts at Berkeley Lab and additional public services and recreation impacts at the RFS. However, as with the proposed Project, all of the impacts would be less than significant.

Transportation

Campus development pursuant to the RBC LRDP was analyzed in the LRDP Final EIR for its impacts on transportation. The RBC LRDP Final EIR identified project and cumulative level of service (LOS) impacts at several study area intersections and one freeway segment to be significant and unavoidable. As traffic congestion and LOS impacts are no longer considered environmental impacts under CEQA, the transportation impacts of the Partial Off-site Growth Alternative are re-evaluated below using the current State-recommended CEQA approach to transportation impact analysis.

The Partial Off-site Growth Alternative, unlike the proposed Project, may conflict with the UC *Policy on Sustainable Practices* because the RFS is in an area with less transit service and lower pedestrian and bicycle connectivity than the Berkeley Lab campus. As a result, the Partial Off-site Growth Alternative may have a higher percentage of employees and visitors driving to and from the RFS and may not meet the single-occupant vehicle (SOV) mode split goals established by the UC *Policy on Sustainable Practices.* The RBC LRDP Final EIR identified RBC LRDP Mitigation Measure TRA-1, which included preparation and implementation of a robust TDM Plan and enhancing transit service in the RFS area, to reduce the vehicle trips generated at the RFS. Although the Partial Off-site Growth Alternative would implement this mitigation measure, the specific components of the mitigation measure cannot be known at this time, and their effectiveness in reducing vehicle trips cannot be quantified. Therefore, the Partial Off-site Growth Alternative may result in a significant and unavoidable impact related to conflict with applicable plans and policies.

The RBC LRDP Final EIR did not evaluate the impacts on VMT because CEQA did not require the evaluation of VMT at the time that the RBC LRDP EIR was prepared. Although the collective amount of new development and population at Berkeley Lab and RFS under the Partial Off-site Growth Alternative would be similar to the total development and population increase under the proposed 2025 LRDP at Berkeley Lab, the Partial Off-site Growth Alternative would have a higher home-work VMT per worker than the proposed Project because RFS is in an area with less transit service and lower pedestrian and bicycle connectivity than the Berkeley Lab campus. As described above, the Partial Off-site Growth Alternative would implement RBC LRDP Mitigation Measure TRA-1 which would reduce the home-work VMT per worker at the RFS. Since the specific components of the mitigation measure cannot be known at this time and their effectiveness in reducing vehicle trips cannot be quantified, the Partial Off-site Growth Alternative may result in a significant and unavoidable VMT impact.

The RBC LRDP Final EIR determined that the RBC LRDP would not increase hazards due to a design feature or incompatible use, create unsafe conditions for pedestrians or bicycles, or result in inadequate emergency access, and as a result, this impact was found to be less than significant. The two to three research buildings that would be developed at the RFS under this alternative would not alter this conclusion. As with other new developments at the RFS and similar to developments at the Berkeley Lab campus under the proposed Project, the potential developments at the RFS under this alternative would be designed consistent with the applicable regulations and standards in place at that time. As a result, the Partial Off-site Growth Alternative would similarly result in a less-than-significant impact related to traffic hazards and emergency access.

The RBC LRDP Final EIR determined construction traffic associated with the RBC LRDP campus facilities construction would temporarily and intermittently adversely affect the road network near the RFS, which was considered to be a potentially significant impact. However, the RBC LRDP Final EIR identified mitigation (RBC LRDP Mitigation Measure TRA-7) which included preparation and implementation of a construction traffic management plan for each RFS construction project, which would reduce this impact to a less-than-significant level. Since the two to three research buildings that would be developed at the RFS under this alternative would be subject to the same mitigation measures identified in the RBC LRDP Final EIR, as applicable, the construction traffic impact associated with construction of these buildings would similarly be mitigated to a less-than-significant level.

In summary, the Partial Off-site Growth Alternative would result in somewhat reduced transportation impacts at Berkeley Lab and additional transportation impacts at the RFS. Unlike the proposed Project's less-than-significant transportation impacts, due to the location of the RFS, the alternative's VMT impact and the impact related to consistency with plans and policies would potentially be significant and unavoidable.

Utilities and Service Systems

The RBC LRDP Final EIR determined that campus development under the RBC LRDP would not result in the need for new or expanded water supply entitlements, and consequently, there would be a less-than-significant impact. A Water Supply Assessment (WSA) prepared in support of the RBC LRDP by EMBUD reflected full UC's estimates of water demand based on bioscience programs demand and consumption. The two to three research buildings that would be developed at the RFS under this alternative are consistent with the uses assumed in the RFS WSA. Furthermore, the research buildings would not increase the total development capacity at the RFS under the RBC LRDP. As a result, this alternative would not result in any change in the previously-estimated campus-wide WSA results at RFS, and for that reason, EBMUD would have sufficient water supplies available to serve the RFS and reasonably foreseeable development during normal, dry and multiple dry years. Consequently, this alternative would continue to result in a less-than-significant impact on water supply at RFS. Similarly, effects of RBC LRDP development on new or expanded water treatment facilities, and new or expanded water delivery systems were also determined to be less than significant, and the two to three research buildings at the RFS under this alternative would not change those conclusions.

The RBC LRDP Final EIR determined that campus development under the RBC LRDP would require the construction of new or expanded wastewater treatment facilities, the construction of which would be mitigated to a less-than-significant level with implementation of RBC LRDP Mitigation Measure UTL-4. This mitigation measure requires coordination between the University and City of Richmond in the evaluation of the effects of projects on sewer mains and at RMSD Wastewater Treatment Plant, with compensation by the University for the cost of on- and/or off-campus improvements required to reduce infiltration and inflows, and peak flows to sewer mains during wet weather. In addition, the RBC LRDP Final EIR concluded that development under the RBC LRDP would require the construction of new or expanded wastewater conveyance facilities, the construction of would not result in significant environmental effects. The two to three research buildings that would be developed at the RFS under this alternative are consistent with the land uses at the RFS as it relates to estimated wastewater flows and needs for treatment. Furthermore, the two to three research buildings that would be developed under this alternative would not increase the total development capacity at RFS under the RBC LRDP. As a result, this alternative would not result in any change in the previous less-than-significant conclusions reached regarding the impacts on wastewater treatment and conveyance.

The RBC LRDP Final EIR determined that campus development under the RBC LRDP would require the construction of new or expanded stormwater drainage facilities, the construction of which would not result in significant environmental effects. The two to three research buildings that would be developed at the RFS under this alternative would not increase the total development capacity at RFS under the RBC LRDP. As a result, this alternative would not result in any change in the previous less-than-significant conclusions reached regarding the impact on stormwater drainage.

The RBC LRDP Final EIR determined that campus development under the RBC LRDP would require the construction of new or expanded electrical and natural gas distribution facilities, the construction of which would not result in significant environmental effects. The two to three research buildings that would be developed under this alternative would not increase the total development capacity at the RFS under the RBC LRDP. As a result, this alternative would not result in any change in the previous less-than-significant conclusions reached regarding the impact on electrical and natural gas distribution facilities.

The RBC LRDP Final EIR determined that campus development under the RBC LRDP would not require new or expanded permitted landfill capacity and would comply with all applicable federal, State, and local statutes and regulations related to solid waste. While no mitigation was required, the RBC LRDP Final EIR identified that implementation of LRDP Environmental Protection Practice UTIL-7, which requires the development and implementation of a plan to maximize diversion of construction and demolition materials from landfill disposal, would further help to achieve waste diversion goals included in the UC *Policy on Sustainable Practices*. The two to three research buildings that would be developed under this alternative would not increase the total development capacity at the RFS under the RBC LRDP. As a result, this alternative would not result in any change in the previous less-than-significant impact conclusions reached regarding the adequacy of permitted landfill capacity and compliance with applicable regulations related to solid waste.

Lastly, the RBC LRDP Final EIR determined that the campus development under the RFS LRDP, in conjunction with other regional growth, could increase the demand for utilities, service systems, the construction of which may result in significant environmental impacts. The RBC LRDP Final EIR concluded that with implementation of RBC LRDP Cumulative Mitigation

Measure UTIL-1, which required that the University pay its proportional share of the environmental mitigation measures costs associated with required wastewater service improvements, this impact would be less than significant. The two to three research buildings that would be developed under this alternative would not change this conclusion.

In summary, the Partial Off-site Growth Alternative would result in somewhat reduced utility impacts at Berkeley Lab and additional utility impacts at the RFS. However, as with the proposed Project, practically all of the impacts would be less than significant, and one cumulative impact would be less than significant with mitigation.

Wildfire

The RBC LRDP Final EIR determined that campus development under the RBC LRDP would have a less-than-significant impact related to exposure of people or structures to risk involving wildland fires. The RBC LRDP Final EIR explained that the RFS is not near wildlands and the risk of wildland fires is low. The Final EIR further added that the numerous open space and wetland areas at the RFS are not considered moderate or high-risk for wildland fires due to their limited and non-contiguous setting away from large open or natural areas that are susceptible to wildland fires. The two to three research buildings that would be developed at the RFS under this alternative would not change that conclusion.

Subsequent to publication of the RBC LRDP Final EIR, the *CEQA Guidelines* Appendix G significance criteria related to wildfire was expanded to include additional criteria for conditions where a project is located in or near state responsibility areas or lands classified as very high fire hazard severity zones. Since the RFS is not located in or near a state responsibility area or land classified as very high fire hazard severity zone, neither the RBC LRDP nor the two to three research buildings that would be developed at the RFS under this alternative, would result in a significant impact to wildfire under these additional criteria.

In summary, the Partial Off-site Growth Alternative would result in somewhat reduced wildfire impacts at Berkeley Lab and less-than-significant wildfire impacts at the RFS. Thus, overall, this alternative would reduce the proposed Project's potentially significant wildfire impacts but would not completely eliminate those impacts, and mitigation would still be required.

Relationship of Partial Off-site Growth Alternative to Project Objectives

As described above, similar to the Reduced Project Alternative, the Partial Off-site Growth Alternative would consist of the development of 2/3rds of the LRDP building space at Berkeley Lab by 2045 and there would be an associated population increase that is 2/3rds of the increase under the proposed Project. As such, by accommodating a lower campus building space and population increase at Berkeley Lab, this alternative, similar to the Reduced Project Alternative would partially fulfill, but not fully realize the 2025 LRDP Project objectives as they relate to the Berkeley Lab campus. Specifically, it would not fully meet Project Objectives 1, 2 and 4, but would meet Project Objective 3. (Please refer to the *Relationship of Reduced Project Alternative to the Project Objectives* discussion presented above for detail.)

The remaining one-third of development and growth under the proposed 2025 LRDP would occur off-site at the RFS under this alternative. This alternative would therefore serve to supplement the amount of proposed facilities required for scientific research for Berkeley Lab, albeit at a remote campus. However, since it is expected that there would be inherent inefficiencies associated with managing and operating research facilities split between two campuses, it would limit the effectiveness of this alternative in meeting Objectives 1, 2, and 4.

In addition, because a substantial amount of new building space under the proposed 2025 LRDP involves demolition and redevelopment on existing building sites utilizing the available infrastructure, the development on Berkeley Lab would be more cost effective than building the same space on the RFS where the new buildings would also require the construction of infrastructure improvements and parking, which would add to the cost of the building projects. Further, the distance between the Lab and the Richmond Bay Campus would reduce interdisciplinary collaboration between Berkeley Lab divisions and reduce operational efficiency and effectiveness by splitting Lab uses between different locations; as well as reduce the ready access that researchers at Berkeley Lab have to major user facilities such as ALS and NERSC. Requiring high levels of daily vehicular travel between the two sites would be at odds with Project objective supporting principles promoting sustainability, minimizing natural resource consumption and environmental impacts, and promoting good relations with neighbors and nearby communities. Lastly, courts have ruled that an offsite alternative may not be feasible when the primary objective of the project is a modification of an existing facility (*California Native Plant Society v. City of Santa Cruz* (2009), which is the case with the proposed 2025 LRDP that is focused on updating and improving the existing Berkeley Lab campus.

6.4 Alternatives Considered but Dismissed from Detailed Evaluation

CEQA Guidelines Section 15126.6(c) requires an EIR to identify and briefly discuss any alternatives that were considered by the lead agency but were rejected as infeasible during the scoping process. In selecting alternatives for detailed evaluation, primary consideration was given to alternatives that could reduce significant impacts while still meet most of the basic project objectives. Alternatives that did not reduce impacts or did not meet most of the basic project objectives were dismissed from detailed evaluation.

6.4.1 Preservation Alternative with UC LBNL Use of Historical Resources

This potential alternative would retain and reuse structures at the Berkeley Lab campus that are determined to be historical resources under CEQA in the future, and not demolish them, thereby avoid the potential significant and unavoidable impact of the proposed Project. UC LBNL finds that adaptive reuse of buildings on the campus determined to be historical resources under CEQA in the future may not be feasible in all cases due to economic and/or technical reasons. As an example, the Bevatron building could not be adaptively reused and had to be demolished. In addition, adaptive reuse of older buildings often require major structural and interior renovations to create needed space for modern scientific research and to comply with seismic codes. Such overhauls often impinge upon or destroy the building elements that provide the building's historic significance. Accordingly, UC LNBL determines that impacts to historical resources under this potential alternative would continue to be potentially significant and unavoidable, as they would be with the proposed Project. As this alternative would not avoid the significant impact on historical resources, the alternative is rejected from detailed evaluation.

6.4.2 No Growth Alternative

This potential alternative would include no growth in both on-campus population and building space at Berkeley Lab. Continuation of existing and new research activities would only occur under this potential alternative if they would not require an increase in on-campus population or building demolition/construction; and no parking would be increased on the campus. UC LBNL finds that while this alternative would avoid all significant environmental impacts related to an increase in intensity of development and population, it would not meet the majority of fundamental project objectives, including to "Strengthen Berkeley Lab's ability to perform transformative, mission-directed scientific research;" "Guide Berkeley Lab's development towards achieving an identifiable and fully realized UC Research Campus;" and "Promote a welcoming campus that values and supports its community, neighbors, and the public." It would neither allow for sitewide modernization nor for the substantial removal and replacement of seismically deficient buildings. On this basis, UC LBNL rejected this potential alternative from detailed evaluation.

6.5 Summary Comparison of Alternatives

Table 6-3 provides a summary comparison of impacts of the proposed 2025 LRDP and the alternatives evaluated in detail and indicates whether the impacts of the alternatives would be more or less severe than those of the proposed 2025 LRDP. For more information about the methodology used to evaluate potential impacts of the proposed 2025 LRDP and an explanation of the resulting impact conclusions, please see Chapter 4*, Environmental Setting, Impacts, and Mitigation Measures*.

6.6 Environmentally Superior Alternative

Section 15126.6(e)(2) of the *CEQA Guidelines* requires the identification of an environmentally superior alternative to the proposed project. If the environmentally superior alternative is the "no project" alternative, the EIR shall also identify an environmentally superior alternative among the other alternatives.

Of the alternatives evaluated in detail in this EIR, the environmentally superior alternative is the Reduced Project Alternative. This alternative would not avoid the proposed 2025 LRDP's significant and unavoidable environmental impacts, including the project impact on historical resources and the project/cumulative construction noise and VMP management noise impacts. However, given the one-third reduction in increases in campus development and population under Reduced Project Alternative compared to the proposed 2025 LRDP, this alternative would result in reduced construction and operational environmental effects in 17 of the significant but mitigable project and/or cumulative impacts compared to the proposed Project. However, the Reduced Project Alternative would partially fulfill, but not fully realize the 2025 LRDP project objectives. In particular, this alternative would not meet the Lab's key objective of modernizing and provisioning the campus with new research facilities to meet the Lab's programmatic needs.

When considering, the Partial Off-site Growth Alternative, similar to the Reduced Project Alternative, would also comprise one-third reduction in increases in building space and population at Berkeley Lab compared to the proposed 2025 LRDP, and consequently, it would also result in reduced construction and operational environmental effects in 17 of the significant but mitigable project and/or cumulative impacts generated at the Lab compared to the proposed Project. However, the additional development of two to three research buildings at the RFS under this alternative would result in a shift in a number of construction and operational impacts to the RFS that would otherwise occur at Berkeley Lab under the proposed Project. As discussed above, since the RFS is in an area with less transit service and lower pedestrian and bicycle connectivity than the Berkeley Lab campus, and as a result, may have a higher percentage of employees and visitors driving to and from this campus, and resulting in a home-work VMT per worker that is not 15 percent below the regional average and this alternative may not meet the single-occupant vehicle (SOV) mode split goals established by the UC *Policy on Sustainable Practices.* On this basis, this alternative is identified as likely to result in new potentially significant and unavoidable impacts related to conflict with a program, plan, ordinance, or policy addressing the circulation system; and conflict with *CEQA Guidelines* Section 15064.3, subdivision (b) related to VMT, even with implementation of mitigation measures identified in the RBC LRDP Final EIR. This alternative is also identified as likely to result in a new potentially significant GHG impact. Further, this alternative would partially fulfill, but not fully realize the 2025 LRDP Project objectives.

When considering the No Project Alternative, which is the continued implementation of the 2006 LRDP, this alternative would also not avoid any of the significant and unavoidable impacts of the proposed 2025 LRDP. Furthermore, the No Project Alternative would involve two additional potentially significant and unavoidable impacts that would not occur under the proposed 2025 LRDP; specifically, effects on scenic vistas and cumulative health risk exposure to TAC's. Lastly, this alternative would not fully meet the majority of the project objectives of the proposed 2025 LRDP.

Therefore, for the reasons set forth above, the Reduced Project Alternative is considered the environmentally superior alternative.

TABLE 6-3
COMPARISON OF IMPACTS OF THE PROPOSED 2025 LRDP AND ALTERNATIVES

Impact	Proposed Project	Alternative 1: No Project	Alternative 2: Reduced Growth	Alternative 3: Partial Off-site Growth	
				Berkeley Lab	RFS
4.1 Aesthetics					
LRDP Impact AES-1: Implementation of the LBNL 2025 LRDP would not result in substantial adverse visual effects related to construction activities.	LTS	=LTS	-LTS	-LTS	LTS
LRDP Impact AES-2: Implementation of the LBNL 2025 LRDP would not have a substantial adverse effect on a scenic vista.	LTS	+SU	-LTS	-LTS	LTS
LRDP Impact AES-3: Implementation of the LBNL 2025 LRDP would occur within an urbanized area, and would not conflict with applicable zoning and other regulations governing scenic quality.	LTS	+LTS	-LTS	-LTS	LTSM
LRDP Impact AES-4: Implementation of the LBNL 2025 LRDP could create a new source of substantial light or glare which would adversely affect day or nighttime views in the area.	LTSM	=LTSM	-LTSM	-LTSM	LTS
LRDP Impact CUM-AES-1: Implementation of the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, would not result in significant cumulative impacts related to aesthetics.	LTS	=LTS	=LTS	=LTS	LTS
4.2 Air Quality					
LRDP Impact AQ-1: Implementation of the LBNL 2025 LRDP would not conflict with or obstruct implementation of the applicable air quality plan.	LTS	=LTS	-LTS	-LTS	LTS
LRDP Impact AQ-2: Implementation of the LBNL 2025 LRDP would not result in a cumulatively considerable net increase of any criteria pollutant for which the Project region is non-attainment under an applicable federal or state ambient air quality standard, but would result in significant localized dust emissions.	LTSM	+LTSM	-LTSM	-LTSM	LTSM
LRDP Impact AQ-3: Implementation of the LBNL 2025 LRDP would not expose sensitive receptors to substantial pollutant concentrations.	LTS	+LTSM	-LTS	-LTS	LTSM
LRDP Impact AQ-4: Implementation of the LBNL 2025 LRDP would not generate odors adversely affecting a substantial number of people.	LTS	=LTS	=LTS	=LTS	LTS
LRDP Impact CUM-AQ-1: Implementation of the LBNL 2025 LRDP would not result in a cumulatively considerable net increase of criteria pollutants for which the Project region is non-attainment under an applicable federal or state ambient air quality standard.	LTS	=LTS	-LTS	-LTS	LTSM
LRDP Impact CUM-AQ-2: Implementation of the LBNL 2025 LRDP, in combination with existing sources at the Berkeley Lab campus, would not expose sensitive receptors to substantial pollutant concentrations.	LTS	+SUM	-LTS	-LTS	LTSM

SUM Significant and Unavoidable with Mitigation
LTSM Less than Significant with Mitigation
LTS Less than Significant impact
NI No Impact

\- Lesser impact than that of the proposed 2025 LRDP
= Same (or similar) impact as that of the proposed 2025 LRDP
-/= Less or similar impact to that of the proposed 2025 LRDP
-/+ Less or greater impact as the proposed 2025 LRDP
=/+ Similar or greater impact to that of the proposed 2025 LRDP

TABLE 6-3 (CONTINUED)
COMPARISON OF IMPACTS OF THE PROPOSED 2025 LRDP AND ALTERNATIVES

Impact	Proposed Project	Alternative 1: No Project	Alternative 2: Reduced Growth	Alternative 3: Partial Off-site Growth	
				Berkeley Lab	RFS
4.3 Biological Resources					
LRDP Impact BIO-1: Implementation of the LBNL 2025 LRDP and the related LBNL VMP would have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.	LTSM	+LTSM	-LTSM	-LTSM	LTSM
LRDP Impact BIO-2: Implementation of the LBNL 2025 LRDP and the related LBNL VMP would have a substantial adverse effect on riparian habitat or other sensitive natural communities identified in local or regional plans, policies, and regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.	LTSM	=LTSM	-LTSM	-LTSM	LTSM
LRDP Impact BIO-3: Implementation of the LBNL 2025 LRDP and the related LBNL VMP would have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.	LTSM	=LTSM	-LTSM	-LTSM	LTSM
LRDP Impact BIO-4: Implementation of the LBNL 2025 LRDP would interfere substantially with the movement of native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites.	LTSM	=LTSM	-LTSM	-LTSM	LTS
LRDP Impact CUM-BIO-1: Implementation of the LBNL 2025 LRDP and the related LBNL VMP would result in cumulatively considerable impacts on biological resources, in combination with past, present, and reasonably foreseeable future projects in the vicinity of Berkeley Lab.	LTSM	=LTSM	-LTSM	-LTSM	LTS
4.4 Cultural Resources, including Tribal Cultural Resources					
LRDP Impact CUL-1: Implementation of the LBNL 2025 LRDP could potentially cause a substantial adverse change in the significance of a historical resource pursuant to Section 15064.5.	SUM	=SUM	-SUM	-SUM	SUM
LRDP Impact CUL-2: Implementation of the LBNL 2025 LRDP may cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5.	LTSM	=LTSM	-LTSM	-LTSM	LTSM
LRDP Impact CUL-3: Implementation of the LBNL 2025 LRDP may disturb human remains, including those interred outside of designated cemeteries.	LTSM	=LTSM	-LTSM	-LTSM	LTSM
LRDP Impact CUL-4: Implementation of the LBNL 2025 LRDP may cause a substantial adverse change to tribal cultural resources, as defined in Public Resources Code Section 20174.	LTSM	=LTSM	-LTSM	-LTSM	LTSM
LRDP Impact CUM-CUL-1: Implementation of the LBNL 2025 LRDP would not combine with other cumulative projects to result in an adverse change to the significance of historical resources that share historic significance with resources that could be affected at Berkeley Lab.	LTS	=LTS	-LTS	-LTS	LTS

SUM Significant and Unavoidable with Mitigation
LTSM Less than Significant with Mitigation
LTS Less than Significant impact
NI No Impact

\- Lesser impact than that of the proposed 2025 LRDP
= Same (or similar) impact as that of the proposed 2025 LRDP
-/= Less or similar impact to that of the proposed 2025 LRDP
-/+ Less or greater impact as the proposed 2025 LRDP
=/+ Similar or greater impact to that of the proposed 2025 LRDP

TABLE 6-3 (CONTINUED)
COMPARISON OF IMPACTS OF THE PROPOSED 2025 LRDP AND ALTERNATIVES

Impact	Proposed Project	Alternative 1: No Project	Alternative 2: Reduced Growth	Alternative 3: Partial Off-site Growth	
				Berkeley Lab	RFS
4.4 Cultural Resources, including Tribal Cultural Resources (cont.)					
LRDP Impact CUM-CUL-2: Implementation of the LBNL 2025 LRDP could potentially combine with other cumulative projects to result in an adverse change to the significance of archaeological historical resources, unique archaeological resources, or tribal cultural resources.	LTSM	=LTSM	-LTSM	-LTSM	LTS
LRDP Impact CUM-CUL-3: Implementation of the LBNL 2025 LRDP would not combine with other cumulative projects to result in any significant impacts related to human remains, including those interred outside of designated cemeteries.	LTS	=LTS	-LTS	-LTS	LTS
4.5 Energy					
LRDP Impact ENE-1: Implementation of the LBNL 2025 LRDP would not result in wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation or conflict with or obstruct a state or local plan for renewable energy or energy efficiency.	LTS	+LTS	-LTS	-LTS	LTS
LRDP Impact CUM-ENE-1: Campus development under the LBNL 2025 LRDP, combined with cumulative development in the Project vicinity and areawide, would not result in significant cumulative energy impacts.	LTS	+LTS	-LTS	-LTS	LTS
4.6 Geology and Soils					
LRDP Impact GEO-1: Implementation of the LBNL 2025 LRDP would directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving rupture of a known earthquake fault.	LTSM	=LTSM	-LTSM	-LTSM	NI
LRDP Impact GEO-2: Implementation of the LBNL 2025 LRDP would not directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking.	LTS	+LTSM	-LTS	-LTS	LTS
LRDP Impact GEO-3: Implementation of the LBNL 2025 LRDP would not directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving earthquake-induced landsliding.	LTS	=LTS	-LTS	-LTS	LTS
LRDP Impact GEO-4: Implementation of the LBNL 2025 LRDP would not directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving seismic-related ground failure, including liquefaction.	LTS	=LTS	-LTS	-LTS	LTS
LRDP Impact GEO-5: Implementation of the LBNL 2025 LRDP would not have the potential to result in substantial erosion or the loss of topsoil.	LTS	=LTS	-LTS	-LTS	LTSM
LRDP Impact GEO-6: Development under the LBNL 2025 LRDP would not be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the Project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse.	LTS	=LTS	-LTS	-LTS	LTSM

SUM Significant and Unavoidable with Mitigation
LTSM Less than Significant with Mitigation
LTS Less than Significant impact
NI No Impact

\- Lesser impact than that of the proposed 2025 LRDP
= Same (or similar) impact as that of the proposed 2025 LRDP
-/= Less or similar impact to that of the proposed 2025 LRDP
-/+ Less or greater impact as the proposed 2025 LRDP
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TABLE 6-3 (CONTINUED)
COMPARISON OF IMPACTS OF THE PROPOSED 2025 LRDP AND ALTERNATIVES

Impact	Proposed Project	Alternative 1: No Project	Alternative 2: Reduced Growth	Alternative 3: Partial Off-site Growth	
				Berkeley Lab	RFS
4.6 Geology and Soils (cont.)					
LRDP Impact GEO-7: Development under the LBNL 2025 LRDP would be located on expansive soils but would not cause substantial direct or indirect risks to life or property.	LTS	=LTS	-LTS	-LTS	LTSM
LRDP Impact CUM-GEO-1: Implementation of the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, would not result in significant cumulative impacts related to geology and soils.	LTS	=LTS	-LTS	-LTS	LTSM
4.7 Greenhouse Gas Emissions					
LRDP Impact GHG-1: Implementation of the LBNL 2025 LRDP would not generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment.	LTS	+LTS	-LTS	-LTS	SUM
LRDP Impact GHG-2: Implementation of the LBNL 2025 LRDP would not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases	LTS	=LTS	=LTS	=LTS	SUM
LRDP Impact CUM-GHG-1: Implementation of the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable projects, would not generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment or conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases.	LTS	+LTS	-LTS	-LTS	SUM
4.8 Hazards and Hazardous Materials					
LRDP Impact HAZ-1: Campus development under the LBNL 2025 LRDP would not create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials or through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment.	LTS	=LTS	-LTS	-LTS	LTS
LRDP Impact HAZ-2: Campus development under the LBNL 2025 LRDP would not emit hazardous emissions or involve handling hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school.	LTS	=LTS	-LTS	-LTS	LTS
LRDP Impact HAZ-3: Campus development under the LBNL 2025 LRDP would not be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code § 65962.5 and, as a result, would not create a significant hazard to the public or the environment.	LTS	=LTS	-LTS	-LTS	LTS
LRDP Impact CUM-HAZ-1: Campus development under the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future development would not result in a cumulatively significant impact related to hazards and hazardous materials.	LTS	=LTS	-LTS	-LTS	LTS

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LTSM Less than Significant with Mitigation
LTS Less than Significant impact
NI No Impact

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TABLE 6-3 (CONTINUED)
COMPARISON OF IMPACTS OF THE PROPOSED 2025 LRDP AND ALTERNATIVES

Impact	Proposed Project	Alternative 1: No Project	Alternative 2: Reduced Growth	Alternative 3: Partial Off-site Growth	
				Berkeley Lab	RFS
4.9 Hydrology and Water Quality					
LRDP Impact HYD-1: Implementation of the LBNL 2025 LRDP would not violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality.	LTS	=LTS	-LTS	-LTS	LTS
LRDP Impact HYD-2: Implementation of the LBNL 2025 LRDP would not substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin.	LTS	=LTS	-LTS	-LTS	LTS
LRDP Impact HYD-3: Implementation of the LBNL 2025 LRDP would not substantially alter the existing drainage pattern of the campus in a manner which would result in a substantial erosion or siltation on- or off-site; substantially increase the rate or amount of surface runoff such that it could result in flooding on- or off-site; create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems; provide substantial additional sources of polluted runoff; or impede or redirect flood flows.	LTS	=LTS	-LTS	-LTS	LTS
LRDP Impact HYD-4: Implementation of the LBNL 2025 LRDP would not conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan.	LTS	=LTS	-LTS	-LTS	LTS
LRDP Impact CUM-HYD-1: Implementation of the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, would not result in significant cumulative impacts related to hydrology and water quality.	LTS	=LTS	-LTS	-LTS	LTS
4.10 Land Use and Planning					
LRDP Impact LU-1: Implementation of the LBNL 2025 LRDP would not physically divide an established community.	NI	=NI	-NI	=NI	NI
LRDP Impact LU-2: Implementation of the LBNL 2025 LRDP would not cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect.	LTS	=LTS	-LTS	LTS	LTS
LRDP Impact CUM-LU-1: Campus development under the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, would not physically divide an established community or cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect.	LTS	=LTS	-LTS	-LTS	LTS

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TABLE 6-3 (CONTINUED)
COMPARISON OF IMPACTS OF THE PROPOSED 2025 LRDP AND ALTERNATIVES

Impact	Proposed Project	Alternative 1: No Project	Alternative 2: Reduced Growth	Alternative 3: Partial Off-site Growth	
				Berkeley Lab	RFS
4.11 Noise and Vibration					
LRDP Impact NOI-1: Construction activities under the LBNL 2025 LRDP would generate a substantial temporary increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance applied as the relevant threshold of significance, or applicable standards of other agencies.	SUM	SUM	-SUM	-SUM	LTSM
LRDP Impact NOI-2: Vegetation management activities under the VMP during the LBNL 2025 LRDP timeframe would generate a substantial temporary increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance as applied as the relevant threshold of significance, or applicable standards of other agencies.	SUM	=SUM	=SUM	=SUM	NA
LRDP Impact NOI-3: Construction activities under the LBNL 2025 LRDP could generate excessive groundborne vibration or groundborne noise levels.	LTSM	=LTSM	-LTSM	-LTSM	LTS
LRDP Impact NOI-4: Operation of stationary noise sources under the LBNL 2025 LRDP could generate a substantial permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance as applied as the relevant threshold of significance, or applicable standards of other agencies.	LTSM	=LTSM	-LTSM	-LTSM	LTS
LRDP Impact NOI-5: Traffic generated by campus operation under the LBNL 2025 LRDP would not result in a substantial permanent increase in ambient noise levels in the vicinity of the project more than standards established in the local general plan or noise ordinance, or applicable standards of other agencies.	LTS	+LTS	-LTS	-LTS	LTS
LRDP Impact CUM-NOI-1: Implementation of the LBNL 2025 LRDP and the related VMP, combined with other concurrent construction projects in the project area, could generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance applied as the relevant threshold of significance, or applicable standards of other agencies applied as the relevant threshold of significance.	SUM	=SUM	-SUM	-SUM	LTSM
LRDP Impact CUM-NOI-2: Implementation of the LBNL 2025 LRDP, combined with cumulative construction in the project area, could generate excessive groundborne vibration or groundborne noise levels.	LTSM	=LTSM	-LTSM	-LTSM	LTS
4.12 Population and Housing					
LRDP Impact POP-1: Implementation of the LBNL 2025 LRDP would not induce substantial unplanned population growth in an area, either directly or indirectly.	LTS	+LTS	-LTS	-LTS	LTS
LRDP Impact POP-2: Implementation of the LBNL 2025 LRDP would not displace substantial numbers of existing people or housing that could necessitate the construction of replacement housing elsewhere.	LTS	=LTS	=LTS	=LTS	LTS

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TABLE 6-3 (CONTINUED)
COMPARISON OF IMPACTS OF THE PROPOSED 2025 LRDP AND ALTERNATIVES

Impact	Proposed Project	Alternative 1: No Project	Alternative 2: Reduced Growth	Alternative 3: Partial Off-site Growth	
				Berkeley Lab	RFS
4.12 Population and Housing (cont.)					
LRDP Impact CUM-POP-1: Campus development under the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, would not induce substantial unplanned population growth or displace substantial numbers of existing people or housing that could necessitate the construction of replacement housing elsewhere.	LTS	+LTS	-LTS	-LTS	LTS
4.13 Public Services					
LRDP Impact PSR-1: *Fire Protection*. Implementation of the LBNL 2025 LRDP would not result in need for new or physically altered fire protection facilities in order to maintain acceptable service ratios, response times, or other performance objectives for fire protection, the construction of which could cause significant environmental impacts.	LTS	+LTS	-LTS	-LTS	LTS
LRDP Impact PSR-2: *Police Protection*. Implementation of the LBNL 2025 LRDP would not result in need for new or physically altered police protection facilities in order to maintain acceptable service ratios, response times, or other performance objectives for police protection the construction of which could cause significant environmental impacts.	LTS	+LTS	-LTS	-LTS	LTS
LRDP Impact PSR-3: *School Services*. Implementation of the LBNL 2025 LRDP would not result in the need for new or physically altered school facilities in order to maintain acceptable performance objectives for school services, the construction of which could cause significant environmental impacts.	LTS	+LTS	-LTS	-LTS	LTS
LRDP Impact PSR-4: *Parks and Recreational Facilities.* Implementation of the LBNL 2025 LRDP would not result in the need for new or physically altered parks and recreational facilities in order to maintain acceptable performance objectives for neighborhood and regional parks, the construction of which could cause significant environmental impacts, nor would it increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facilities would occur or be accelerated.	LTS	+LTS	-LTS	-LTS	LTS
LRDP Impact PSR-5: The LBNL 2025 LRDP would support the development of new recreational facilities, the construction of which would not have an adverse impact on the environment.	LTS	=LTS	-LTS	-LTS	LTS
LRDP Impact CUM-PSR-1: Campus development under the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, would not result in the need for new or physically altered public facilities in order to maintain acceptable service ratios, response times or other performance objectives, the construction of which could cause significant environmental impacts.	LTS	+LTS	-LTS	-LTS	LTS

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TABLE 6-3 (CONTINUED)
COMPARISON OF IMPACTS OF THE PROPOSED 2025 LRDP AND ALTERNATIVES

Impact	Proposed Project	Alternative 1: No Project	Alternative 2: Reduced Growth	Alternative 3: Partial Off-site Growth	
				Berkeley Lab	RFS
4.14 Transportation					
LRDP Impact TRANS-1: Implementation of the LBNL 2025 LRDP would not conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities.	LTS	=/+LTS	=/+LTS	=/+LTS	SUM
LRDP Impact TRANS-2: Implementation of the LBNL 2025 LRDP would not conflict or be inconsistent with *CEQA Guidelines* Section 15064.3, subdivision (b).	LTS	=/+LTS	=/+LTS	=/+LTS	SUM
LRDP Impact TRANS-3: Implementation of the LBNL 2025 LRDP would not substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment).	LTS	=LTS	=LTS	=LTS	LTS
LRDP Impact TRANS-4: Implementation of the LBNL 2025 LRDP would not result in inadequate emergency access.	LTS	=LTS	=LTS	=LTS	LTS
LRDP Impact CUM-TRANS-1: Implementation of the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, would not result in significant cumulative transportation impacts.	LTS	=/+LTS	=/+LTS	=/+LTS	SUM
4.15 Utilities and Service Systems					
LRDP Impact UTIL-1: Campus development under the LBNL 2025 LRDP would not require or result in the relocation or construction of new or expanded water, wastewater treatment, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects.	LTS	=LTS	-LTS	-LTS	LTS
LRDP Impact UTIL-2: Sufficient water supplies would be available from EBMUD to serve campus development under the LBNL 2025 LRDP and other reasonably foreseeable future development during normal, dry, and multiple dry years.	LTS	+LTS	-LTS	-LTS	LTS
LRDP Impact UTIL-3: Campus development under the LBNL 2025 LRDP would not result in a determination by the wastewater treatment provider that it does not have adequate capacity to serve the project's projected demand in addition to the provider's existing commitments.	LTS	+LTS	-LTS	-LTS	LTSM
LRDP Impact UTIL-4: Campus development under the LBNL 2025 LRDP would not generate solid waste in excess of state or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals.	LTS	+LTS	-LTS	-LTS	LTS
LRDP Impact UTIL-5: Campus development under the LBNL 2025 LRDP would comply with federal, state, and local management and reduction statutes and regulations related to solid waste.	LTS	=LTS	=LTS	=LTS	LTS

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TABLE 6-3 (CONTINUED)
COMPARISON OF IMPACTS OF THE PROPOSED 2025 LRDP AND ALTERNATIVES

Impact	Proposed Project	Alternative 1: No Project	Alternative 2: Reduced Growth	Alternative 3: Partial Off-site Growth	
				Berkeley Lab	RFS
4.15 Utilities and Service Systems (cont.)					
LRDP Impact CUM-UTIL-1: Campus development under the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects in the vicinity of the Berkeley Lab campus, would not result in significant cumulative impacts related to utilities and service systems.	LTS	+LTS	-LTS	-LTS	LTSM
4.16 Wildfire					
LRDP Impact WF-1: Implementation of the LBNL 2025 LRDP would not expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires.	LTS	=LTS	-LTS	-LTS	LTS
LRDP Impact WF-2: Implementation of the LBNL 2025 LRDP could substantially impair an adopted emergency response plan or emergency evacuation plan.	LTSM	+LTSM	=LTSM	=LTSM	LTS
LRDP Impact WF-3: Implementation of the LBNL 2025 LRDP would not exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire due to slope, prevailing winds, and other factors.	LTS	=LTS	-LTS	-LTS	LTS
LRDP Impact WF-4: While implementation of the LBNL 2025 LRDP would require the installation or maintenance of associated utility infrastructure, the installation and maintenance of this infrastructure would not substantially exacerbate fire risk or result in temporary or ongoing impacts to the environment.	LTS	=LTS	-LTS	-LTS	LTS
LRDP Impact WF-5: Implementation of the LBNL 2025 LRDP could not expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes.	LTS	=LTS	-LTS	-LTS	LTS
LRDP Impact CUM-WF-1: Implementation of the LBNL 2025 LRDP, in combination with past, present, and reasonably foreseeable future projects, could result in significant cumulative impacts related to wildfire.	LTSM	+LTSM	-LTSM	-LTSM	LTS

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LTSM Less than Significant with Mitigation
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=/+ Similar or greater impact to that of the proposed 2025 LRDP

6.7 References

University of California (UC), 2014. *Richmond Bay Campus Long Range Development Plan Final EIR*. April.

UC Berkeley, 2014a. *Richmond Bay Campus Long Range Development Plan*. May.

UC Berkeley, 2014b. *Richmond Bay Campus Physical Design Framework*. May.

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CHAPTER 7
Report Preparation

7.1 Report Authors

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1 Cyclotron Road
Berkeley, CA 94720

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7.2 Persons and Agencies Consulted

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Appendix A
Notice of Preparation

May 6, 2024

State of California
Office of Planning and
Research 1400 Tenth Street
Sacramento, CA 95814

NOTICE OF PREPARATION OF A
DRAFT ENVIRONMENTAL IMPACT REPORT

Project Title: 2025 UC Lawrence Berkeley National Laboratory Long Range Development Plan

Lead Agency: The University of California

Project Location: Lawrence Berkeley National Laboratory, One Cyclotron Road, Berkeley, CA 94720

County: Alameda County

This Notice of Preparation (NOP) hereby informs agencies and the public that the University of California (UC or the University), Lawrence Berkeley National Laboratory (LBNL, Berkeley Lab, or the Lab) will prepare an Environmental Impact Report (EIR) that will analyze and disclose the environmental impacts from the adoption of the Berkeley Lab's 2025 Long Range Development Plan (LRDP or the "proposed Project"). UC policy stipulates that EIRs must be prepared for all campus LRDPs.

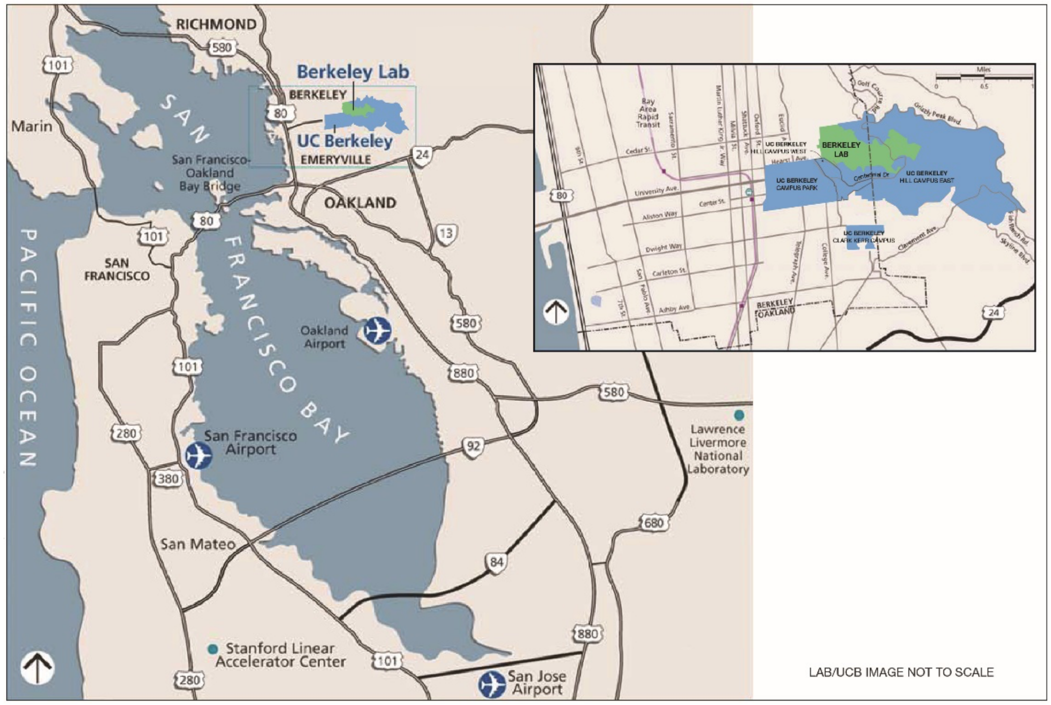
Each UC campus—including LBNL—periodically prepares an LRDP, which provides a high-level planning framework to guide land use, physical parameters, and capital investment in line with the campus's mission and strategic goals. Berkeley Lab's current 2006 LRDP forecasted campus development through the year 2025. The forthcoming 2025 LRDP would replace the current LRDP and forecast campus development through the year 2045.

UC LBNL is the Lead Agency for the proposed Project and will prepare an EIR as required by Public Resources Code (PRC) Section 21080.09. The LRDP EIR will function as a Program EIR (pursuant to CEQA Guidelines section 15168) that can be used in the environmental review of subsequent campus development projects.

Campus Location and Characteristics

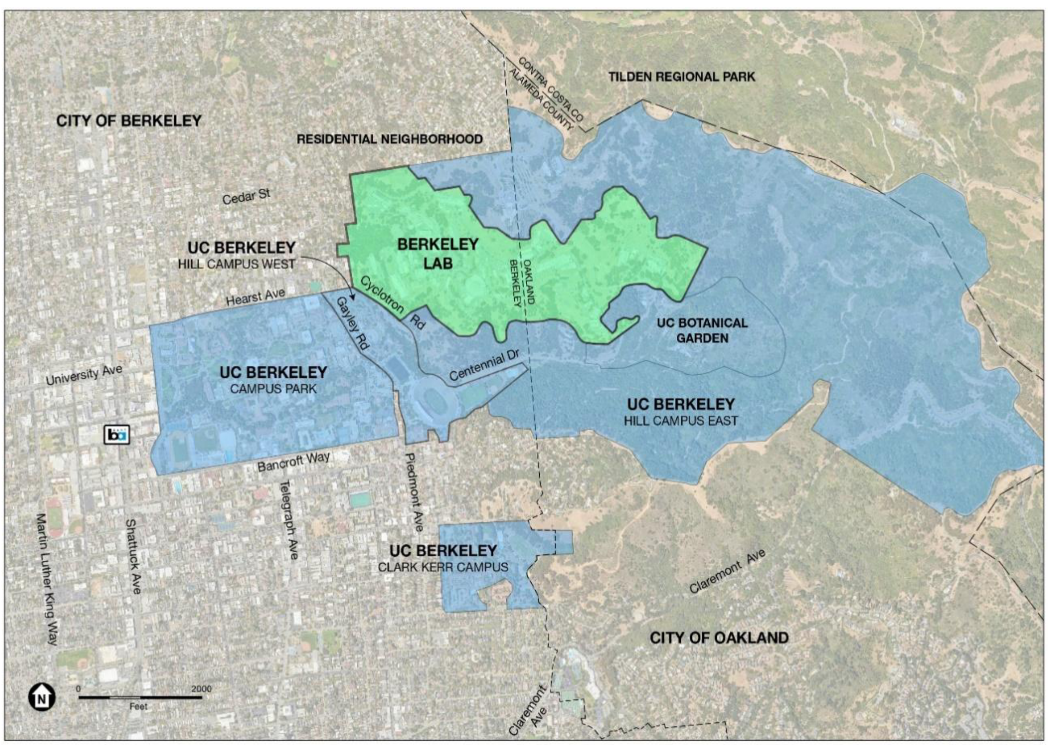
The Berkeley Lab campus occupies a 202-acre site (the campus) within 1,232 acres of land owned by the UC Regents in the East Bay hills of the San Francisco Bay Area (see regional location in

Figure 1). The campus straddles the border between the cities of Berkeley and Oakland (see Project location in **Figure 2**).



SOURCE: LBNL, ESA 2024

Figure 1
Regional Location Map



SOURCE: ESA, Google Earth 2024

Figure 2
Project Location

The campus is surrounded on the west by the UC Berkeley main campus (Hill Campus West and Campus Park) and City of Berkeley multi-unit residential developments; on the north by City of Berkeley residential neighborhoods and various UC Berkeley facilities (including the Lawrence Hall of Science, Space Sciences Laboratory, and Mathematical Sciences Research Institute); on the east by UC Berkeley's Hill Campus East; and on the south by the UC Berkeley Hill Campus West and East (including various recreational fields and pools) and Botanical Garden, and by Strawberry Canyon open space. The Berkeley Lab campus is a fenced and secured site and is accessed by three controlled vehicular entrances (see **Figure 3**).

SOURCE: Flad, 2023

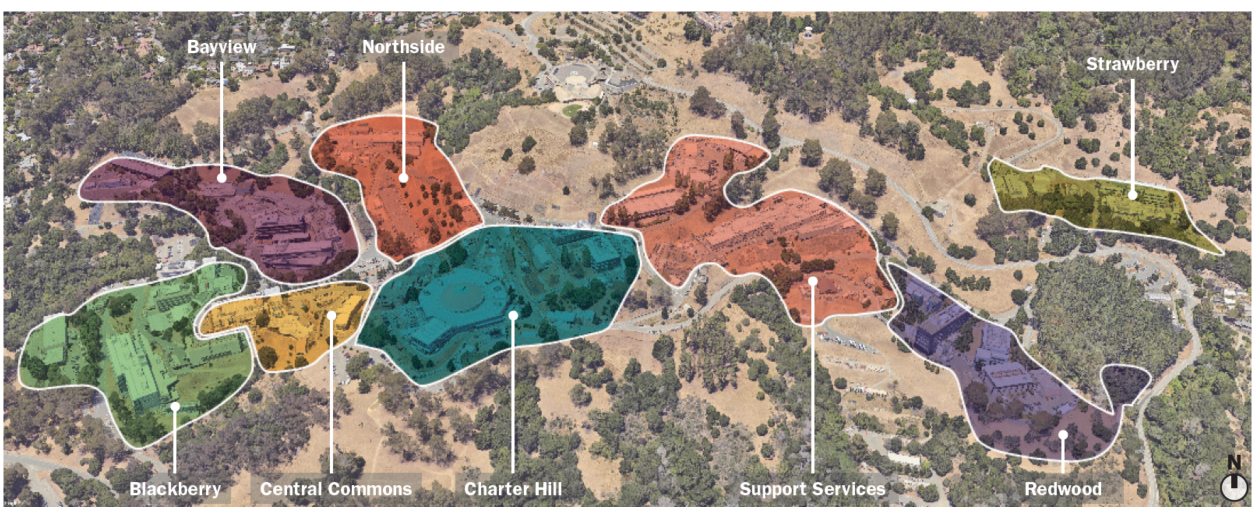
Figure 3
Existing Site Plan

Approximately two-thirds of the Berkeley Lab campus remains undeveloped; such areas often contain challenging features such as steep slopes, soil stability issues, or riparian habitat. Campus elevations range from approximately 450 feet above sea level (asl) to approximately 1,100 feet asl. The hillside topography includes a natural pattern of radiating ridges, knolls, and valleys formed by local seasonal creek drainages. Approximately 60 percent of the campus has slopes greater than 25 percent, and about 27 percent of the campus has slopes greater than 45 percent. The campus slopes support multiple ephemeral and intermittent drainages or streams, many of which have been partially culverted under adjoining development areas. Perennial streams on the campus site include the North Fork of Strawberry Creek and Chicken Creek. The Hayward fault is located along the campus's western edge.

The campus supports a wide variety of native and non-native vegetation. Non-native annual grasses dominate on the campus. Tree species include stands of native trees such as coast live oak, California bay, and redwood; non-native species include blue-gum eucalyptus, Monterey pine, Torrey pine, and Canary Island pine. The campus lies within a Very High Hazard Severity Zone as designated by the California Department of Forestry and Fire Protection (CalFire). Over 120 species of birds, mammals, reptiles, and amphibians are found on the campus.

The University leases Berkeley Lab campus parcels to the U.S. Department of Energy (DOE) to support all major DOE-owned buildings, which comprise most of the campus's facilities and structures. Berkeley Lab operation is managed by the University under a prime contract with DOE. Berkeley Lab also occupies off-site space on the adjoining UC Berkeley campus and in other off-site leased spaces, mostly in the cities of Berkeley, Oakland, Richmond, and Emeryville. Off-site facilities will be acknowledged but are not considered to be within the scope of the LRDP and therefore will not be analyzed in the LRDP EIR.

The Lab's major research facilities have been developed within eight loosely organized development pads or clusters that occupy most of the campus's relatively flat terraces. As illustrated in **Figure 4**, these include the Blackberry, Central Commons, Bayview, Northside, Charter Hill, Support Services, Redwood, and Strawberry clusters. Most clusters tend to have a dominant research area or support function. Parking–most often arranged in small lots or along roads–and other amenities are distributed throughout the clusters. There are currently 170 usable building facilities on the campus. These consist of approximately 90 buildings, 20 trailers, and 60 storage containers totaling about 2,145,000 gross square feet (gsf). These facilities provide space for research laboratories, accelerators, offices, machine and electrical shops, medical services, storage, food service, and communications. Many of these buildings are considered obsolete due to age, condition, or a poor seismic safety rating per the UC Seismic Performance Rating (SPR) System.



SOURCE: Page, 2023

Figure 4
Development Clusters on LBNL Campus

Project Description—the 2025 Long Range Development Plan

UC LRDPs are typically updated or renewed at approximately 10- or 20-year intervals. As the 2006 LRDP approaches its 20-year milestone, Berkeley Lab is working to define its campus development vision for the next 20 years. A new LRDP would present the strategic vision for the campus site and facilities, and it would articulate a policy framework to guide the Lab's evolution in land and facility use, site circulation, open space, and infrastructure.

An overarching development theme in the forthcoming 2025 LRDP is one of modernization: in the next 20 years of development, Berkeley Lab seeks to modernize its facilities and infrastructure and realize a more orderly and sustainable campus. The proposed LRDP does not provide for substantial population growth or expansion of the campus's development footprint. Preliminary LRDP principles are included below and will be further developed for the LRDP document, along with goals and strategies to put these principles into action:

- **Principle of Scientific Mission:** Berkeley Lab's principal purpose is to perform transformative, mission-directed scientific research.
- **Principle of Campus Identity:** Berkeley Lab should be a unique and fully-realized UC campus.
- **Principle of Stewardship:** Berkeley Lab is a responsible steward of public and natural resources.
- **Principle of Community:** Berkeley Lab values and supports its community and the public.

Land Use

The current 2006 LRDP designates four land use zones that guide the siting of new campus buildings and site improvements. *Research and Academic zone* encompasses the majority of Berkeley Lab's developable area and largely corresponds with, or is adjacent to, the already developed portions of the campus. This zone includes almost all of the Laboratory's existing research functions and is primarily intended for similar uses. The *Central Commons zone* is centered around the Lab's cafeteria and outdoor gathering areas. Primary uses include food services, short-term accommodations, gatherings and meetings, mass transit hub, and other shared activities. The *Support Services zone* provides consolidated locations for the Lab's plant operations and support activities, such as machine shops, environmental services, corporation yards, central mail distribution, waste handling, and maintenance. The *Perimeter Open Space* zone is generally undeveloped and primarily reserved for trails, maintenance roads, power supply and utilities equipment and distribution, as well as for minor structures that support those functions. The 2025 LRDP would include the same four land use zones and would likely involve only minor adjustments to zone areas. The 2025 LRDP is expected to maintain the current overall land use patterns on the campus.

Population Growth Projections

Berkeley Lab campus population is expressed as "adjusted daily population" (ADP), which is a function of total Lab staff and registered guests that accounts for daily fluctuations in attendance. The current 2006 LRDP projected a campus ADP of 4,650 at full development. Immediately prior to the COVID-19 pandemic, Berkeley Lab campus ADP had reached approximately 4,500. During the pandemic, the Lab ADP plummeted. The 2024 post-pandemic campus population is estimated to be approximately 3,000 ADP, reflecting a hybrid work model where a substantial number of staff work remotely part or full time.

Under the 2025 LRDP, campus population is projected to reach 4,200 ADP by the year 2045. This would be an increase of 1,200 ADP over existing conditions, which for CEQA purposes is the time at which this NOP is issued. The 2025 LRDP ADP projection is nevertheless lower than pre-pandemic ADP levels and below the 4,650 ADP identified in the 2006 LRDP. These lower on-site population levels are attributable to continuation of the remote and hybrid work model developed during the COVID-19 pandemic.

Proposed Building Demolition

Approximately 40 existing campus buildings and structures totaling approximately 270,000 gsf are envisioned to be demolished under the proposed 2025 LRDP due to poor condition and/or safety considerations. These buildings range from small or minimally used structures–including trailers and storage containers–to larger, currently occupied buildings.

New Building Development

New construction under the 2025 LRDP would largely replace outdated facilities with modern research and support buildings and infrastructure more suited to meet the Lab's scientific mission. Such new facilities would be more efficient and sustainable, safer, and adaptable to cutting-edge research. New buildings would be constructed in infill and previously-developed areas, often in the footprints of demolished buildings.

Under the 2025 LRDP, approximately 545,000 gsf of new building space would be constructed on the campus. Subtracting out the estimated 270,000 gsf of demolition identified above, the resulting net new building space under the proposed 2025 LRDP would be about 275,000 gsf. Added to the Lab's existing building space (2,145,000 gsf), full campus development under the proposed 2025 LRDP would be 2,420,000 gsf, an increase of approximately 13 percent over existing conditions.

Table 1 provides a summary of existing (2024) campus population and building space, as well as previous (2006 LRDP) and prospective (2025 LRDP) campus population and space program projections. As shown, the total projected campus population under the proposed 2025 LRDP would be less than that previously anticipated under the 2006 LRDP. In addition, there would be no increase in total building space projected under the proposed 2025 LRDP as compared with the 2006 LRDP; both identify the same total building space projection of 2,420,000 gsf.

TABLE 1
SUMMARY OF POPULATION AND SPACE PROJECTIONS AT LBNL CAMPUS (2024-2045)

	Existing 2024	Projected 2025 (per 2006 LRDP)	Projected 2045 (per 2025 LRDP)	Project Increase over Existing Conditions (for CEQA Analysis)	2025 LRDP parameters change from 2006 LRDP parameters
Population (ADP)[a]	3,000 ADP	4,650 ADP	4,200 ADP	1,200 ADP	– 450 ADP
Building Space (gsf)[b]	2,145,000 gsf	2,420,000 gsf	2,420,000 gsf	275,000 gsf	0 gsf

NOTE:
a. ADP = Adjusted Daily Population
b. gsf = gross square feet

SOURCE: UC LBNL, 2024

The LRDP does not mandate on-going growth or the development of new facilities; it is a planning guide and not an implementation plan. Varying factors affect campus population levels, which might fluctuate differently from the pace of facilities development. The LRDP does not determine the campus's ultimate population or space capacity. Further, UC LRDPs do not expire, but remain in effect until updated or replaced.

Environmental Review—LRDP EIR

In July 2007, The Board of Regents of the University of California (The Regents) certified the LBNL 2006 LRDP Final Environmental Impact Report (Final EIR) and adopted the LBNL 2006 LRDP. The 2006 LRDP Final EIR has been updated since 2007 with two supplements and an addendum.

UC LBNL has determined that an EIR shall be prepared for the proposed 2025 LRDP. As provided under Section 15060 of the CEQA Guidelines (Title 14 Cal. Code Regs.), Berkeley Lab has not prepared an Initial Study and will instead begin work directly on the EIR. Upon certification by the UC Regents—anticipated to be in 2025—the 2006 LRDP EIR would be replaced by the new 2025 LRDP EIR.

The 2025 LRDP EIR will use 2024 as its baseline year to reflect existing environmental conditions. For additional context, pre-pandemic years may be referenced to illustrate long-term growth trends. As required, the 2025 LRDP EIR will focus on the significant effects of the proposed Project and will document the reasons for concluding that other effects will be less than significant. Where significant or potentially significant environmental impacts are identified, the EIR will identify feasible mitigation measures to avoid or reduce impacts. The EIR will also analyze a reasonable range of potentially feasible alternatives designed to meet most of the Project's objectives and reduce significant impacts. The 2025 LRDP EIR will evaluate the potential environmental effects of the proposed Project in a wide range of CEQA environmental issue areas, including:

- Aesthetics
- Agriculture and Forestry Resources
- Air Quality
- Biological Resources
- Cultural Resources, including Tribal Cultural Resources
- Energy
- Geology and Soils
- Greenhouse Gas Emissions
- Hazards and Hazardous Materials
- Hydrology and Water Quality
- Greenhouse Gas Emissions
- Hazards and Hazardous Materials
- Hydrology and Water Quality
- Land Use and Planning
- Mineral Resources
- Noise and Vibration
- Population and Housing
- Public Services
- Recreation
- Transportation
- Utilities and Services Systems
- Wildfire
- Cumulative Impacts
- Alternatives
- Growth Inducement

Construction Program

The timing and intensity of demolition, construction of new buildings and infrastructure, and other large-scale construction activities envisioned under the 2025 LRDP would depend on funding availability and DOE priorities. Based on the historical pattern of Lab development, it is anticipated that such activities would be ongoing throughout the 20-year LRDP period. Consequently, the EIR will analyze the environmental impacts from construction under the 2025 LRDP as an on-going activity based on estimated annual average amounts of demolition and new building development.

Impact Analysis and Illustrative Development Scenario

The 2025 LRDP will identify key parameters—notably campus construction, demolition, and population—in aggregate terms. Future building dimensions and footprints are currently speculative at best and not within the LRDP scope. However, aggregated data does not allow for much detailed analysis in an EIR. For this reason, the 2025 LRDP EIR will include an analysis of an Illustrative Development Scenario (IDS), a conceptual portrayal of potential campus development at full 2025 LRDP development. The IDS will portray new buildings and infrastructure that could potentially be built under the 2025 LRDP parameters based on current trends and development patterns. Berkeley Lab planners will help inform the potential locations, footprints, and dimensions of such future buildings, along with other key campus development data (utility infrastructure, roads and parking lots, demolition, etc.). The IDS will thereby allow the LRDP EIR to conduct a full and detailed environmental impact analysis of potential 2025 LRDP development. The analysis would likely be conservative, as actual 2025 LRDP development would be funding dependent and thereby may be less intense than portrayed in the IDS. A similar IDS approach was used in the 2006 LRDP EIR.

CEQA and LRDP Schedule

The Project's CEQA public scoping period is from May 6, 2024 to June 6, 2024. Draft EIR preparation is anticipated to take place through the remainder of 2024. The Draft EIR is expected to become available for public review in early 2025 with an accompanying public comment period and public hearing. The Draft LRDP also would be available for public viewing during this time. A Final EIR that includes responses to public comments on the Draft EIR is expected to become available around the fall of 2025. Thereafter, the proposed 2025 LRDP and the Final EIR would be submitted to the UC Regents for their consideration and approval decision at their next available meeting (UC Regents meetings typically occur every other month).

Public Review and Comment

Availability of Information

A webpage dedicated to the 2025 LRDP and CEQA process is available at: **https://gcr.lbl.gov/community/long-range-development-plan.** This webpage includes information about the 2025 LRDP and EIR schedule, document availability, and opportunities for the public to provide comments.

This NOP is available for downloading at the above-referenced webpage.

Public Scoping Meeting

As part of the 2025 LRDP EIR CEQA process, UC LBNL will host an online public scoping meeting on May 22, 2024, beginning at **5:30** PM, via Zoom. Those interested in participating should register at: **https://lbnl.zoom.us/meeting/register/tJIrfu6oqzksE9OWF-rIIX4fCUCtp9gYqn4i#/registration**

The public scoping meeting will include brief presentations by Berkeley Lab followed by an opportunity for the public to provide comments on the scope of the EIR.
The public scoping meeting is an opportunity for the community to provide oral feedback pertinent to the scope of the forthcoming EIR. This allows UC LBNL to learn about potential concerns early, as well as to further define the issues, feasible alternatives, and potential mitigation measures that may warrant in-depth analysis in the environmental review process. The meeting will be recorded and a transcript prepared by a court reporter to become part of the Project's public record.

Public Comment

UC LBNL requests comments and guidance on the scope and content of the EIR from interested public agencies, organizations, and members of the public. With respect to the comments from Responsible and Trustee Agencies, UC LBNL requests the agency provide comments related to those environmental issues that are germane to the agency's statutory responsibilities with respect to the proposed Project.

Due to time limits mandated by State law, public comments should be sent at the earliest possible date, but no later than the close of the 30-day scoping period. To be considered in the preparation of the Program EIR, **all comments must be received or postmarked by 5:00 PM on June 6, 2024**. All comments should be directed to the attention of Jeff Philliber and may be provided as follows:

- Oral comments may be delivered at the May 22, 2024 public scoping meeting described above.
- E-mailed comments may be sent to: Planning@lbl.gov
- Hard-copy comments may be mailed to:

  Jeff Philliber
  Sr. Site & Environmental Planner
  1 Cyclotron Road, M/S 50A1148
  Berkeley, CA 94720

For questions about document availability or this Project's CEQA process, please consult the Project webpage at https://gcr.lbl.gov/community/long-range-development-plan or contact Jeff Philliber or Patricia Jung at Planning@lbl.gov.

Appendix B
Responses to Notice of Preparation

EAST BAY
MUNICIPAL UTILITY DISTRICT

July 16, 2024

Jeff Philliber
Lawrence Berkeley National Laboratory
Senior Site & Environmental Planner
One Cyclotron Road, M/S 50A1148
Berkeley, CA 94720

Re: Notice of Preparation of a Draft Environmental Impact Report – 2025 UC Lawrence Berkeley National Laboratory Long Range Development Plan, Berkeley

Dear Mr. Philliber:

East Bay Municipal Utility District (EBMUD) appreciates the opportunity to comment on the Notice of Preparation of a Draft Environmental Impact Report (EIR) for the 2025 University of California (UC) Lawrence Berkeley National Laboratory (LBNL) Long Range Development Plan (LRDP) located in the Cities of Oakland and Berkeley. EBMUD has the following comments.

WATER SERVICE

Pursuant to Section 15155 of the California Environmental Quality Act Guidelines and Sections 10910-10915 of the California Water Code, a Water Supply Assessment (WSA) will be required as the project exceeds the threshold requirement for an assessment of water supply availability based on the amount of water this project would require (greater than a 250,000-square-foot commercial office building). EBMUD received a request to prepare a WSA for the proposed development on June 10, 2024 which is scheduled for EBMUD Board action on August 13, 2024.

EBMUD's Berryman, Summit, Shasta, and Berkeley View Pressure Zones, with service elevations between 200 and 400 feet, 500 and 700 feet, 900 and 1050 feet, and 1050 and 1250 feet, respectively, will serve the proposed development. The property currently has water service. If additional water service is needed, the project sponsor should contact EBMUD's New Business Office and request a water service estimate to determine costs and conditions for providing additional water service to the existing parcel. Engineering and installation of water services require substantial lead time, which should be provided for in the project sponsor's development schedule.

WASTEWATER SERVICE

EBMUD's Main Wastewater Treatment Plant (MWWTP) and interceptor system are anticipated to have adequate dry weather capacity to accommodate the proposed wastewater flows from this project and to treat such flows provided that the wastewater generated by the project meets the requirements of the EBMUD Wastewater Control Ordinance. However, wet weather flows are a concern. The East Bay regional wastewater collection system experiences exceptionally high peak flows during storms due to excessive infiltration and inflow (I/I) that enters the system through cracks and misconnections in both public and private sewer lines. EBMUD has historically operated three Wet Weather Facilities (WWFs) to provide primary treatment and disinfection for peak wet weather flows that exceed the treatment capacity of the MWWTP. Due to reinterpretation of applicable law, EBMUD's National Pollutant Discharge Elimination System (NPDES) permit now prohibits discharges from EBMUD's WWFs. Additionally, the seven wastewater collection system agencies that discharge to the EBMUD wastewater interceptor system ("Satellite Agencies") hold NPDES permits that prohibit them from causing or contributing to WWF discharges. These NPDES permits have removed the regulatory coverage the East Bay wastewater agencies once relied upon to manage peak wet weather flows.

A federal consent decree, negotiated among EBMUD, the Satellite Agencies, the Environmental Protection Agency (EPA), the State Water Resources Control Board (SWRCB), and the Regional Water Quality Control Board (RWQCB), requires EBMUD and the Satellite Agencies to eliminate WWF discharges by 2036. To meet this requirement, actions will need to be taken over time to reduce I/I in the system. The consent decree requires EBMUD to continue implementation of its Regional Private Sewer Lateral Ordinance (www.eastbaypsl.com), construct various improvements to its interceptor system, and identify key areas of inflow and rapid infiltration over a 22-year period. Over the same time period, the consent decree requires the Satellite Agencies to perform I/I reduction work including sewer main rehabilitation and elimination of inflow sources. EBMUD and the Satellite Agencies must jointly demonstrate at specified intervals that this work has resulted in a sufficient, pre-determined level of reduction in WWF discharges. If sufficient I/I reductions are not achieved, additional investment into the region's wastewater infrastructure would be required, which may result in significant financial implications for East Bay residents.

To ensure that the proposed project contributes to these legally required I/I reductions, it would be prudent for the lead agency to require the following mitigation measures for the proposed project: (1) replace or rehabilitate any existing sanitary sewer collection systems, including sewer lateral lines to ensure that such systems and lines are free from defects or, alternatively, disconnected from the sanitary sewer system, and (2) ensure any new wastewater collection systems, including sewer lateral lines, for the project are constructed to prevent I/I to the maximum extent feasible while meeting all requirements contained in the Regional Private Sewer Lateral Ordinance and applicable municipal codes or Satellite Agency ordinances.

WATER RECYCLING

EBMUD's Policy 9.05 requires that customers use non-potable water, including recycled water, for non-domestic purposes when it is of adequate quality and quantity, available at reasonable cost, not detrimental to public health and not injurious to plant, fish and wildlife to offset demand on EBMUD's limited potable water supply. Appropriate recycled water uses include landscape irrigation, commercial and industrial process uses, toilet and urinal flushing in non-residential buildings, and other applications.

The project is not currently a candidate for recycled water, however, and depending on the project's implementation schedule and water demand, a potential future recycled water pipeline expansion could potentially serve various components of the project. Recycled water is appropriate for outdoor landscape irrigation and EBMUD is evaluating options of recycled water for in-building non-potable use. As EBMUD further plans its recycled water program, feasibility of providing recycled water to this area may change. EBMUD encourages the project sponsor to continue to coordinate closely with EBMUD during the planning of the project to further explore the options and requirements relating to recycled water use.

WATER CONSERVATION

The proposed project presents an opportunity to incorporate water conservation measures. EBMUD requests that the project sponsor comply with Assembly Bill 325, "Model Water Efficient Landscape Ordinance," (Division 2, Title 23, California Code of Regulations, Chapter 2.7, Sections 490 through 495). The project sponsor should be aware that Section 31 of EBMUD's Water Service Regulations requires that water service shall not be furnished for new or expanded service unless all the applicable water-efficiency measures described in the regulation are installed at the project sponsor's expense.

If you have any questions concerning this response, please contact Timothy R. McGowan, Senior Civil Engineer, Major Facilities Planning Section at (510) 287-1981.

Sincerely,

David J. Rehnstrom

David J. Rehnstrom
Manager of Water Distribution Planning

DJR:WTJ:djr
wdpd24_088 UC Berkeley Lawrence Laboratory LRDP.docx

bcc: Serge Terentieff
Timothy McGowan
Winnie Jiang
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NATIVE AMERICAN HERITAGE COMMISSION

NAHC HEADQUARTERS
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May 14, 2024

Jeff Philliber
University of California, Lawrence Berkely National Laboratory
1 Cyclotron Road
M/S 50A1148
Berkley CA 94720

Re: 2024050545, UC LBNL 2025 Long Range Development Plan EIR Project, Alameda County

Dear Mr. Philliber:

The Native American Heritage Commission (NAHC) has received the Notice of Preparation (NOP), Draft Environmental Impact Report (DEIR) or Early Consultation for the project referenced above. The California Environmental Quality Act (CEQA) (Pub. Resources Code §21000 et seq.), specifically Public Resources Code §21084.1, states that a project that may cause a substantial adverse change in the significance of a historical resource, is a project that may have a significant effect on the environment. (Pub. Resources Code § 21084.1; Cal. Code Regs., tit.14, §15064.5 (b) (CEQA Guidelines §15064.5 (b)). If there is substantial evidence, in light of the whole record before a lead agency, that a project may have a significant effect on the environment, an Environmental Impact Report (EIR) shall be prepared. (Pub. Resources Code §21080 (d); Cal. Code Regs., tit. 14, § 5064 subd.(a)(1) (CEQA Guidelines §15064 (a)(1)). In order to determine whether a project will cause a substantial adverse change in the significance of a historical resource, a lead agency will need to determine whether there are historical resources within the area of potential effect (APE).

CEQA was amended significantly in 2014. Assembly Bill 52 (Gatto, Chapter 532, Statutes of 2014) (AB 52) amended CEQA to create a separate category of cultural resources, "tribal cultural resources" (Pub. Resources Code §21074) and provides that a project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource is a project that may have a significant effect on the environment. (Pub. Resources Code §21084.2). Public agencies shall, when feasible, avoid damaging effects to any tribal cultural resource. (Pub. Resources Code §21084.3 (a)). **AB 52 applies to any project for which a notice of preparation, a notice of negative declaration, or a mitigated negative declaration is filed on or after July 1, 2015.** If your project involves the adoption of or amendment to a general plan or a specific plan, or the designation or proposed designation of open space, on or after March 1, 2005, it may also be subject to Senate Bill 18 (Burton, Chapter 905, Statutes of 2004) (SB 18). **Both SB 18 and AB 52 have tribal consultation requirements**. If your project is also subject to the federal National Environmental Policy Act (42 U.S.C. § 4321 et seq.) (NEPA), the tribal consultation requirements of Section 106 of the National Historic Preservation Act of 1966 (154 U.S.C. 300101, 36 C.F.R. §800 et seq.) may also apply.

The NAHC recommends consultation with California Native American tribes that are traditionally and culturally affiliated with the geographic area of your proposed project as early as possible in order to avoid inadvertent discoveries of Native American human remains and best protect tribal cultural resources. Below is a brief summary of portions of AB 52 and SB 18 as well as the NAHC's recommendations for conducting cultural resources assessments.

Consult your legal counsel about compliance with AB 52 and SB 18 as well as compliance with any other applicable laws.

AB 52

AB 52 has added to CEQA the additional requirements listed below, along with many other requirements:

1. Fourteen Day Period to Provide Notice of Completion of an Application/Decision to Undertake a Project: Within fourteen (14) days of determining that an application for a project is complete or of a decision by a public agency to undertake a project, a lead agency shall provide formal notification to a designated contact of, or tribal representative of, traditionally and culturally affiliated California Native American tribes that have requested notice, to be accomplished by at least one written notice that includes:

- **a.** A brief description of the project.
- **b.** The lead agency contact information.
- **c.** Notification that the California Native American tribe has 30 days to request consultation. (Pub. Resources Code §21080.3.1 (d)).
- **d.** A "California Native American tribe" is defined as a Native American tribe located in California that is on the contact list maintained by the NAHC for the purposes of Chapter 905 of Statutes of 2004 (SB 18). (Pub. Resources Code §21073).

2. Begin Consultation Within 30 Days of Receiving a Tribe's Request for Consultation and Before Releasing a Negative Declaration, Mitigated Negative Declaration, or Environmental Impact Report: A lead agency shall begin the consultation process within 30 days of receiving a request for consultation from a California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project. (Pub. Resources Code §21080.3.1, subds. (d) and (e)) and prior to the release of a negative declaration, mitigated negative declaration or Environmental Impact Report. (Pub. Resources Code §21080.3.1(b)).

- **a.** For purposes of AB 52, "consultation shall have the same meaning as provided in Gov. Code §65352.4 (SB 18). (Pub. Resources Code §21080.3.1 (b)).

3. Mandatory Topics of Consultation If Requested by a Tribe: The following topics of consultation, if a tribe requests to discuss them, are mandatory topics of consultation:

- **a.** Alternatives to the project.
- **b.** Recommended mitigation measures.
- **c.** Significant effects. (Pub. Resources Code §21080.3.2 (a)).

4. Discretionary Topics of Consultation: The following topics are discretionary topics of consultation:

- **a.** Type of environmental review necessary.
- **b.** Significance of the tribal cultural resources.
- **c.** Significance of the project's impacts on tribal cultural resources.
- **d.** If necessary, project alternatives or appropriate measures for preservation or mitigation that the tribe may recommend to the lead agency. (Pub. Resources Code §21080.3.2 (a)).

5. Confidentiality of Information Submitted by a Tribe During the Environmental Review Process: With some exceptions, any information, including but not limited to, the location, description, and use of tribal cultural resources submitted by a California Native American tribe during the environmental review process shall not be included in the environmental document or otherwise disclosed by the lead agency or any other public agency to the public, consistent with Government Code §6254 (r) and §6254.10. Any information submitted by a California Native American tribe during the consultation or environmental review process shall be published in a confidential appendix to the environmental document unless the tribe that provided the information consents, in writing, to the disclosure of some or all of the information to the public. (Pub. Resources Code §21082.3 (c)(1)).

6. Discussion of Impacts to Tribal Cultural Resources in the Environmental Document: If a project may have a significant impact on a tribal cultural resource, the lead agency's environmental document shall discuss both of the following:

- **a.** Whether the proposed project has a significant impact on an identified tribal cultural resource.
- **b.** Whether feasible alternatives or mitigation measures, including those measures that may be agreed to pursuant to Public Resources Code §21082.3, subdivision (a), avoid or substantially lessen the impact on the identified tribal cultural resource. (Pub. Resources Code §21082.3 (b)).

7. Conclusion of Consultation: Consultation with a tribe shall be considered concluded when either of the following occurs:

a. The parties agree to measures to mitigate or avoid a significant effect, if a significant effect exists, on a tribal cultural resource; or

b. A party, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached. (Pub. Resources Code §21080.3.2 (b)).

8. Recommending Mitigation Measures Agreed Upon in Consultation in the Environmental Document: Any mitigation measures agreed upon in the consultation conducted pursuant to Public Resources Code §21080.3.2 shall be recommended for inclusion in the environmental document and in an adopted mitigation monitoring and reporting program, if determined to avoid or lessen the impact pursuant to Public Resources Code §21082.3, subdivision (b), paragraph 2, and shall be fully enforceable. (Pub. Resources Code §21082.3 (a)).

9. Required Consideration of Feasible Mitigation: If mitigation measures recommended by the staff of the lead agency as a result of the consultation process are not included in the environmental document or if there are no agreed upon mitigation measures at the conclusion of consultation, or if consultation does not occur, and if substantial evidence demonstrates that a project will cause a significant effect to a tribal cultural resource, the lead agency shall consider feasible mitigation pursuant to Public Resources Code §21084.3 (b). (Pub. Resources Code §21082.3 (e)).

10. Examples of Mitigation Measures That, If Feasible, May Be Considered to Avoid or Minimize Significant Adverse Impacts to Tribal Cultural Resources:

a. Avoidance and preservation of the resources in place, including, but not limited to:

i. Planning and construction to avoid the resources and protect the cultural and natural context.

ii. Planning greenspace, parks, or other open space, to incorporate the resources with culturally appropriate protection and management criteria.

b. Treating the resource with culturally appropriate dignity, taking into account the tribal cultural values and meaning of the resource, including, but not limited to, the following:

i. Protecting the cultural character and integrity of the resource.

ii. Protecting the traditional use of the resource.

iii. Protecting the confidentiality of the resource.

c. Permanent conservation easements or other interests in real property, with culturally appropriate management criteria for the purposes of preserving or utilizing the resources or places.

d. Protecting the resource. (Pub. Resource Code §21084.3 (b)).

e. Please note that a federally recognized California Native American tribe or a non-federally recognized California Native American tribe that is on the contact list maintained by the NAHC to protect a California prehistoric, archaeological, cultural, spiritual, or ceremonial place may acquire and hold conservation easements if the conservation easement is voluntarily conveyed. (Civ. Code §815.3 (c)).

f. Please note that it is the policy of the state that Native American remains and associated grave artifacts shall be repatriated. (Pub. Resources Code §5097.991).

11. Prerequisites for Certifying an Environmental Impact Report or Adopting a Mitigated Negative Declaration or Negative Declaration with a Significant Impact on an Identified Tribal Cultural Resource: An Environmental Impact Report may not be certified, nor may a mitigated negative declaration or a negative declaration be adopted unless one of the following occurs:

a. The consultation process between the tribes and the lead agency has occurred as provided in Public Resources Code §21080.3.1 and §21080.3.2 and concluded pursuant to Public Resources Code §21080.3.2.

b. The tribe that requested consultation failed to provide comments to the lead agency or otherwise failed to engage in the consultation process.

c. The lead agency provided notice of the project to the tribe in compliance with Public Resources Code §21080.3.1 (d) and the tribe failed to request consultation within 30 days. (Pub. Resources Code §21082.3 (d)).

The NAHC's PowerPoint presentation titled, "Tribal Consultation Under AB 52: Requirements and Best Practices" may be found online at: http://nahc.ca.gov/wp-content/uploads/2015/10/AB52TribalConsultation_CalEPAPDF.pdf

SB 18

SB 18 applies to local governments and requires local governments to contact, provide notice to, refer plans to, and consult with tribes prior to the adoption or amendment of a general plan or a specific plan, or the designation of open space. (Gov. Code §65352.3). Local governments should consult the Governor's Office of Planning and Research's "Tribal Consultation Guidelines," which can be found online at: https://www.opr.ca.gov/docs/09_14_05_Updated_Guidelines_922.pdf.

Some of SB 18's provisions include:

1. Tribal Consultation: If a local government considers a proposal to adopt or amend a general plan or a specific plan, or to designate open space it is required to contact the appropriate tribes identified by the NAHC by requesting a "Tribal Consultation List." If a tribe, once contacted, requests consultation the local government must consult with the tribe on the plan proposal. **A tribe has 90 days from the date of receipt of notification to request consultation unless a shorter timeframe has been agreed to by the tribe.** (Gov. Code §65352.3 (a)(2)).
2. No Statutory Time Limit on SB 18 Tribal Consultation. There is no statutory time limit on SB 18 tribal consultation.
3. Confidentiality: Consistent with the guidelines developed and adopted by the Office of Planning and Research pursuant to Gov. Code §65040.2, the city or county shall protect the confidentiality of the information concerning the specific identity, location, character, and use of places, features and objects described in Public Resources Code §5097.9 and §5097.993 that are within the city's or county's jurisdiction. (Gov. Code §65352.3 (b)).
4. Conclusion of SB 18 Tribal Consultation: Consultation should be concluded at the point in which:
- **a.** The parties to the consultation come to a mutual agreement concerning the appropriate measures for preservation or mitigation; or
- **b.** Either the local government or the tribe, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached concerning the appropriate measures of preservation or mitigation. (Tribal Consultation Guidelines, Governor's Office of Planning and Research (2005) at p. 18).

Agencies should be aware that neither AB 52 nor SB 18 precludes agencies from initiating tribal consultation with tribes that are traditionally and culturally affiliated with their jurisdictions before the timeframes provided in AB 52 and SB 18. For that reason, we urge you to continue to request Native American Tribal Contact Lists and "Sacred Lands File" searches from the NAHC. The request forms can be found online at: http://nahc.ca.gov/resources/forms/.

NAHC Recommendations for Cultural Resources Assessments

To adequately assess the existence and significance of tribal cultural resources and plan for avoidance, preservation in place, or barring both, mitigation of project-related impacts to tribal cultural resources, the NAHC recommends the following actions:

1. Contact the appropriate regional California Historical Research Information System (CHRIS) Center (https://ohp.parks.ca.gov/?page_id=30331) for an archaeological records search. The records search will determine:
- **a.** If part or all of the APE has been previously surveyed for cultural resources.
- **b.** If any known cultural resources have already been recorded on or adjacent to the APE.
- **c.** If the probability is low, moderate, or high that cultural resources are located in the APE.
- **d.** If a survey is required to determine whether previously unrecorded cultural resources are present.

2. If an archaeological inventory survey is required, the final stage is the preparation of a professional report detailing the findings and recommendations of the records search and field survey.
- **a.** The final report containing site forms, site significance, and mitigation measures should be submitted immediately to the planning department. All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum and not be made available for public disclosure.

b. The final written report should be submitted within 3 months after work has been completed to the appropriate regional CHRIS center.

3. Contact the NAHC for:

a. A Sacred Lands File search. Remember that tribes do not always record their sacred sites in the Sacred Lands File, nor are they required to do so. A Sacred Lands File search is not a substitute for consultation with tribes that are traditionally and culturally affiliated with the geographic area of the project's APE.

b. A Native American Tribal Consultation List of appropriate tribes for consultation concerning the project site and to assist in planning for avoidance, preservation in place, or, failing both, mitigation measures.

4. Remember that the lack of surface evidence of archaeological resources (including tribal cultural resources) does not preclude their subsurface existence.

a. Lead agencies should include in their mitigation and monitoring reporting program plan provisions for the identification and evaluation of inadvertently discovered archaeological resources per Cal. Code Regs., tit. 14, §15064.5(f) (CEQA Guidelines §15064.5(f)). In areas of identified archaeological sensitivity, a certified archaeologist and a culturally affiliated Native American with knowledge of cultural resources should monitor all ground-disturbing activities.

b. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the disposition of recovered cultural items that are not burial associated in consultation with culturally affiliated Native Americans.

c. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the treatment and disposition of inadvertently discovered Native American human remains. Health and Safety Code §7050.5, Public Resources Code §5097.98, and Cal. Code Regs., tit. 14, §15064.5, subdivisions (d) and (e) (CEQA Guidelines §15064.5, subds. (d) and (e)) address the processes to be followed in the event of an inadvertent discovery of any Native American human remains and associated grave goods in a location other than a dedicated cemetery.

If you have any questions or need additional information, please contact me at my email address: Cody.Campagne@NAHC.ca.gov.

Sincerely,

Cody Campagne

Cody Campange
Cultural Resources Analyst

cc: State Clearinghouse

From: Lewis J Feldman <ljfeldman@berkeley.edu>
Date: Tue, 28 May 2024 11:18:38 -0700
Subject: From the Executive Director of the UC Botanical Garden
To: planning@lbl.gov
Cc: Seamus Wilmot <swilmot@berkeley.edu>

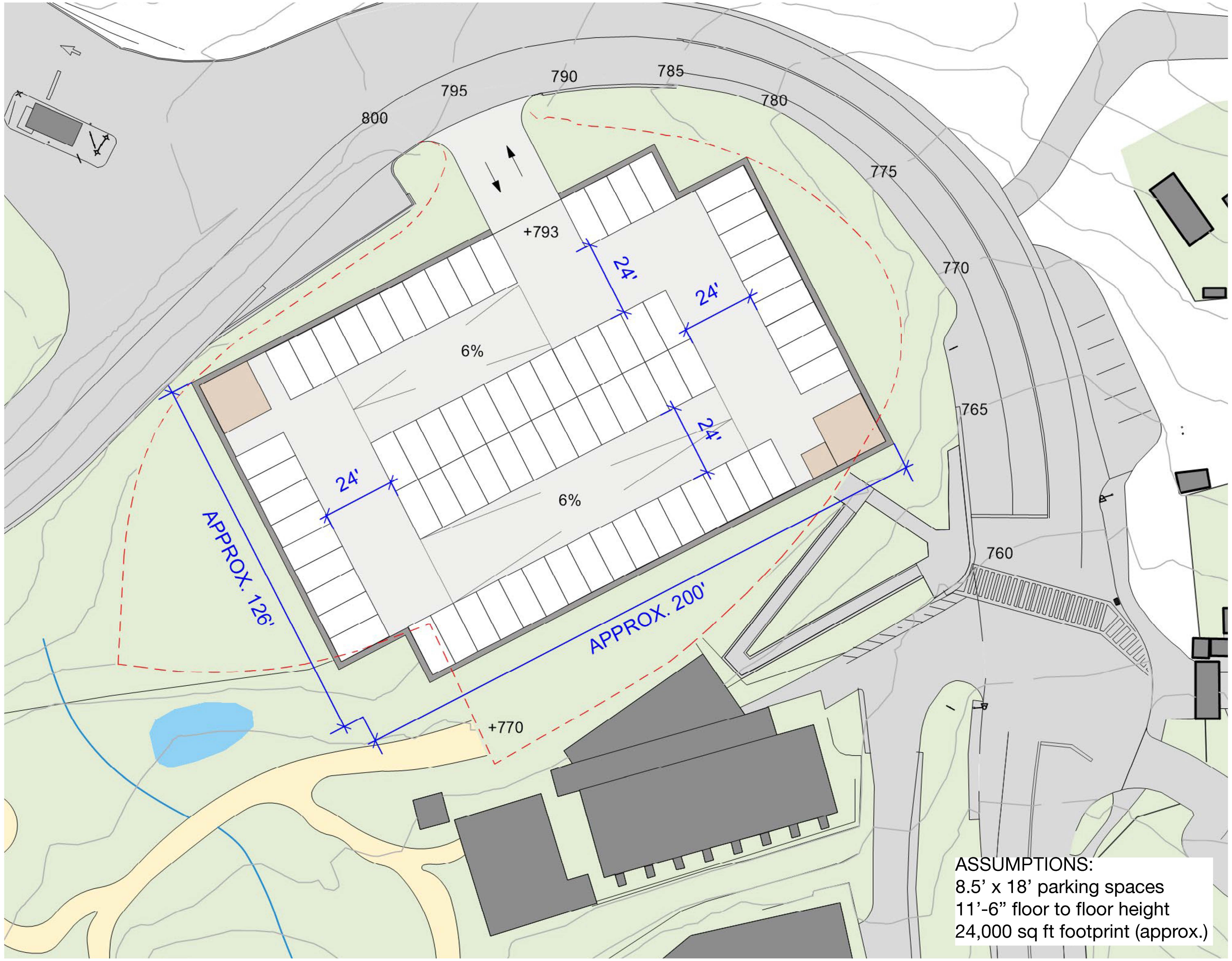
As an immediate neighbor to LBL, the UC Botanical Garden has a strong interest in maintaining a cooperative approach with LBL. I am writing as Executive Director of the UC Botanical Garden to offer thoughts and advice for your consideration in the Long Range Development Plan.

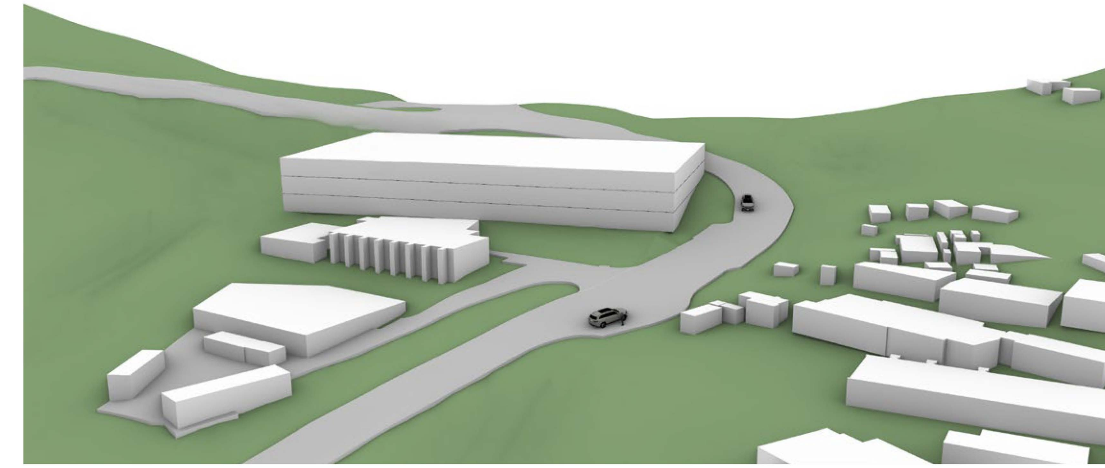
In particular, I want to comment about the parking lot directly adjacent to the Botanical Garden and its increased use by LBL employees. As there is no public transportation to the Botanical Garden, all visitors depend on driving and on the availability of parking. The lifeblood of the Garden is visitorship, including the requirement for nearby access to parking for visiting seniors, families with small children *and the disabled.* Unfortunately, we are finding increased use of this parking by LBL staff who arrive early in the morning and enter LBL on foot through the Strawberry gate. With the future growth of LBL I am deeply concerned about the further erosion of parking available to the visiting public.

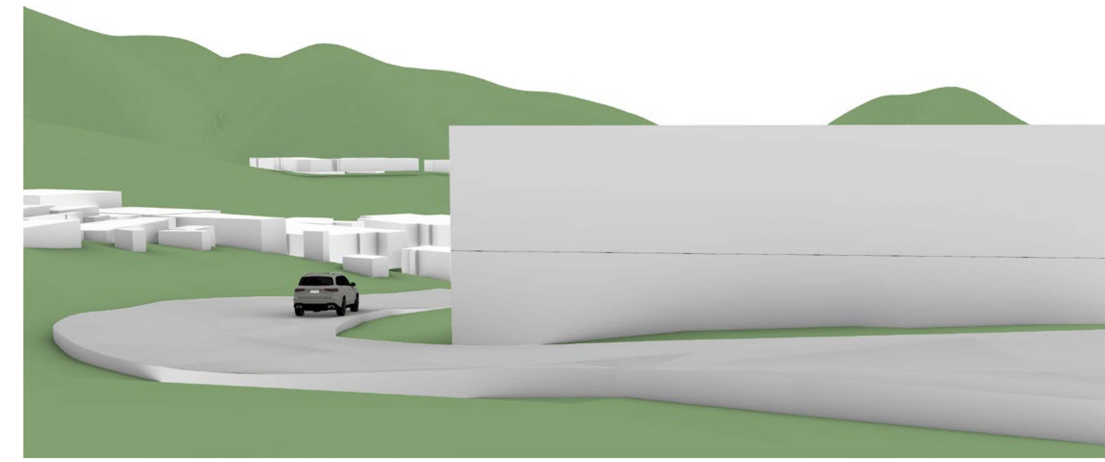
I therefore STRONGLY encourage the developers of the new LBL Long Range Plan to work with the University of California to expand this lot, including consideration of constructing a multi-tiered lot on the footprint of the current lot. Moreover, given that parking is being impacted (reduced) on the Central Campus (e.g., the loss of the Dwinelle parking lot), an expanded parking lot at the Strawberry Gate LBL Entrance could serve both the campus and LBL.

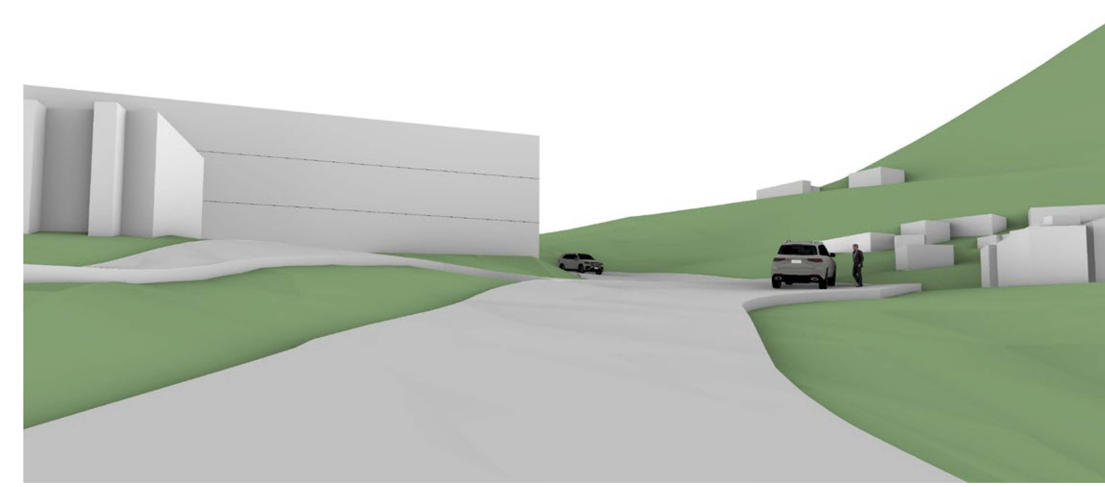
Sincerely,
Lewis Feldman
Professor of Plant Biology and
Executive Director UC Botanical Garden

(TWO ATTACHMENTS)









SCALE:
1"=40'
0' 10' 30' 50' 100' 150'

EXISTING ENTRANCE LOCATION RETAINED
RECOMMEND MAXIMUM PARKING GARAGE ROOF ELEVATION OF +805'

2 STORIES = 140 - 150 PARKING SPACES
PLANT RETAIL / NURSERY ON ROOF LEVEL

NOTE:
ALL FOOTPRINTS, FLOOR LAYOUTS, AND PARKING SPACE ESTIMATES ARE APPROXIMATE. FULL DESIGN BY CIVIL ENGINEER OR QUALIFIED PARKING CONSULTANT REQUIRED.

PARKING STRUCTURE STUDY

UC BERKELEY BOTANICAL GARDEN
PWP LANDSCAPE ARCHITECTURE

Architects • Engineers • Parking Planners

WATRY DESIGN, INC.

The Garagenator

Project: Botanical Garden Parking Structure
By: JJM
Date: 10/31/2022

Opinion of Probable Construction Cost
Your Parking Structure is located in or near the city of **Berkeley**, in the state of **California**, USA.

Project Data:

Total number of Levels:	3
Number of levels below grade:	2
Structural System:	Long Span
Lateral System:	Shear Walls
Seismic Zone:	Very High
Type of Foundation:	Deep Foundation
Facade / Finish (Minimal 1 to 10 higher cost):	10
Number of Stalls:	140
Efficiency:	540 sq. ft. per stall
Photovoltaic (PV) Panels (% of roof area):	None
Total Building Area:	75,600 sq.ft.

Cost Data:

Current Construction Market Condition:	Impacted
Base Construction Cost:	$10,266,204.00
Misc. Project Cost: (15.00 % x $10,266,204.00)	$1,539,931.00
GC + OH&P + Insurance: (20.00 % x $11,806,135.00)	$2,361,227.00
Design Contingency: (30.00 % x $14,167,362.00)	$4,250,209.00
Escalation: (0.00 % x $18,417,571.00)	$0.00
Total Construction Cost:	$18,417,571.00
Cost per square foot:	$243.62
Cost per Stall:	$131,554.08

Note: 1. escalation not included. project may be 10 years or more in the future. 2. efficiency accounts for top level without parking to accommodate retail use. 3. below grade levels accounts for cutting into very steep hillside.

IT'S NOT THE JOURNEY, IT'S THE PARKING.

Appendix C

Berkeley Lab Principles, Strategies and LBNL Design Guidelines

APPENDIX C

Berkeley Lab Principles, Strategies and LBNL Design Guidelines

I. LRDP Plan Principles

Preserve and enhance the environmental qualities of the site as a model of resource conservation and environmental stewardship.

As a leader in energy and environmental research and the stewards of this extraordinary site the Laboratory has an opportunity and responsibility with each new project to be a model for environmentally responsible development. Construction of new facilities will take place on land within already developed areas of the site to allow undisturbed open space to remain at the site's perimeter. Sensitive habitats and riparian areas are protected and stands of screening trees will be protected and expanded to screen views to Laboratory buildings from all directions.

New buildings will be constructed to meet or exceed the UC Presidential Policy for Green Building Design. Whenever possible, new building elements and/or design strategies developed by University of California researchers will be showcased in new projects as a way to reinforce a "culture of sustainability" at Berkeley Lab. All of this will be done in a way that enriches the unique sense of place that is Berkeley Lab.

Build a safe, efficient, cost effective scientific infrastructure capable of long-term support to evolving scientific missions.

Life Safety is a top priority at Berkeley Lab. New facilities will provide state of the art protection against potential occupational hazards and will address the two natural hazards common to the East Bay region—wildland fires and seismic activity. Future development and landscape improvements will continue and strengthen the Laboratory's existing fire protection and vegetation management strategies that have served as a model to the region. The replacement of older facilities with new ones built to modern life safety standards will significantly reduce the threat to life safety in the event of fire and earthquakes as well as the potential occupational hazards of scientific research.

The efficient, long-term operation of a research institution where scientific needs are constantly changing is a challenge that demands a high degree of flexibility in the way new projects are planned and designed. Accordingly, the Plan provides the flexibility needed to meet both known and unforeseen programmatic needs in a cost effective way without compromising the environmental assets of the site.

Operational efficiency is also strengthened by bringing researchers and their programs closer together. Whenever possible, new projects will be located in close proximity to facilities with common activities and/or related research interests to capitalize on the benefits of collaboration and shared use of specialized equipment and facilities.

Build a more campus-like research environment.

Berkeley Lab's scientific endeavors rely on the healthy exchange of ideas sustained through formal and informal social interaction among scientists, engineers, students, and support staff. To build an environment that fosters this valuable social interaction, the design of new Laboratory projects will draw inspiration from university campus type settings. Future development at the Laboratory will place an emphasis on the pedestrian experience both indoors and outdoors to create a setting conducive to interaction and collaboration.

New projects will be planned to segregate pedestrian and vehicular circulation. Buildings, built at greater densities than they are now, will better define outdoor spaces between them. Future development will build upon the informal character of the Laboratory and lead it in a direction where buildings are not thought of as individual objects, but work in concert to weave the Laboratory site into a coherent whole.

Improve access and connections to enhance scientific and academic collaboration and interaction.

As the Laboratory takes on new challenges it will increasingly rely on the rapid innovation that emerges from interdisciplinary collaboration. Whether at the scale of individual researchers, or a consortium of public and private institutions working together, clear and convenient access to and around the Laboratory is vital to the work and culture of team science at Berkeley Lab. The Laboratory is committed to providing access in the safest, most environmentally responsible way possible. In 2006 nearly half of the Laboratory's adjusted daily population commuted to the main site on its shuttle system which has connections to UC Berkeley and regional mass transit systems. New and improved pedestrian routes will provide safe and direct linkages between on-site shuttle stops, facilities, and parking. The improved walkways will offer an outdoor amenity that not only provides a sense of connection to the natural setting and views but also promotes chance meetings along the way.

II. LRDP Planning Strategies

Land Use Plan Strategies

The Land Use Plan will guide future planning decisions; it has been configured to manifest four strategies that derive from an appreciation of the site's existing assets and constraints, the Laboratory's scientific vision and goals, and the planning principles that underlie this LRDP.

- Protect and enhance the site's natural and visual resources, including native habitats, riparian areas and mature tree stands by focusing future development primarily within the already developed areas of the site
- Provide flexibility in the identification of land uses and in the siting of future facilities to accommodate the continually evolving scientific endeavor
- Configure and consolidate uses to improve operational efficiencies, adjacencies and ease of access
- Minimize the visibility of Laboratory development from neighboring areas

Development Framework Strategies

The Development Framework defines the rationale for where and how new development should occur within the zones defined in the Land Use Plan and provides a means to implement these six strategies:

- Increase development densities within areas corresponding to existing clusters of development to preserve open space, enhance operational efficiencies and access
- To the extent possible, site new projects to replace existing outdated facilities and ensure the best use of limited land resources
- To the extent possible, site new projects adjacent to existing development where existing utility and access infrastructure may be utilized
- Create a more "collegial" environment that encourages and facilitates interaction among the variety of Berkeley Lab employees and guests
- Site and design new facilities in accordance with University of California Presidential Policy for Green Building Design to reduce energy, water and material consumption and provide improved occupant health, comfort and productivity
- Exhibit the best practices of modern sustainable development in new projects as a way to foster a greater appreciation of sustainable practices at the Laboratory

Vehicle Access, Circulation and Parking Strategies

The Vehicle Circulation and Parking Framework is based on a series of strategies designed to improve transit, access, circulation, parking, and safety at the Laboratory.

- Increase use of alternate modes of transit through improvements to the Laboratory's shuttle bus service
- Promote transportation demand management strategies such as vanpools and employee ride share programs.
- Improve efficiency and security of Laboratory access through improvements to existing gates and the creation of new gates
- Create a better linkage between parking, shuttle stops, and pedestrian circulation on site
- Provide separated routes of travel wherever possible for pedestrians and vehicles
- Promote use of bicycles by providing additional storage racks and shower facilities

- Eliminate parking from the sides of major roadways, thereby improving safety and allowing one-way roads to be converted to two-way traffic
- Maintain or reduce the percentage of parking spaces relative to the adjusted daily population
- Consolidate parking into larger lots and/or parking structures; locate these facilities near Laboratory entrances to reduce traffic within the main site
- Remove parking from areas targeted for outdoor social spaces and service areas
- Consolidate service functions wherever possible in the Corporation Yard

Pedestrian Circulation Strategies

The Pedestrian Circulation Framework incorporates the following strategies:

- Use pedestrian routes to connect the various developed terraces of the site which host the central and research clusters
- Improve the pedestrian spaces at the heart of the research clusters and adjacent to research facilities so as to support interaction among Laboratory users
- Separate pedestrians and vehicles whenever possible
- Retain and improve walkways as appropriate throughout the open space portions of the site, carefully integrating these pathways to minimize intrusion in the natural environment
- Improve pedestrian access and safety throughout the Laboratory site by developing new routes and enhancing existing routes
- Improve wayfinding through a comprehensive and coordinated signage system and through the naming of buildings and research clusters
- Improve the path providing access to and from the UC Berkeley campus

Open Space and Landscape Strategies

Both the Open Space Framework and the Landscape Framework are based on strategies that aim to preserve the environmental quality and enhance the overall experience of the Laboratory main site.

- Preserve and enhance the native rustic landscape and protect sensitive habitats
- Develop new campus-like outdoor spaces such as plazas within clusters of facilities and improve those that already exist
- Maintain and enhance tree stands to reduce the visibility of Laboratory buildings from significant public areas in neighboring communities
- Improve the overall appearance and experience of the Laboratory through improvements to the main entry gates, and the landscape areas associated with roadways, parking lots, and pedestrian pathways
- Continue to use sustainable practices in selection of plant materials and maintenance procedures

- Develop all new landscape improvements in accordance with the Laboratory's vegetation management program to minimize the threat of wildland fire damage to facilities and personnel
- Utilize native, drought-tolerant plant materials to reduce water consumption; focus shade trees and ornamental plantings at special outdoor use areas
- Minimize impervious surfaces to reduce storm water run-off and provide landscape elements and planting to stabilize slopes, reduce erosion and sedimentation

Utilities and Infrastructure Strategies

The Utilities Framework incorporates the following strategies:

- Maintain a safe and reliable utility infrastructure capable of sustaining the Laboratory's scientific endeavors.
- Consolidate utility distribution into centralized utility corridors that generally coincide with major roadways
- Ensure that utility infrastructure improvements accommodate future facility expansion and alterations in the most cost effective means possible
- Design infrastructure improvements to embody sustainable practices

III. LRDP Lab Design Guidelines

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

The Land, Topography and Views

The landscape of the Lab is divided conceptually into five broad categories, as defined in the LRDP: Screening Trees, the Rustic Landscape, the Rustic Riparian Landscape, The Ornamental Landscape, and the Significant Ornamental Landscape.

Objective: Provide screening landscape elements to visually screen large buildings

- The large stands of screening trees at the Lab provide critical visual screening of facilities and operations. Tree stands that provide important visual screening, as well as zones identified for new stands of trees, have been identified in the LRDP.

- Whenever possible new plantings will be introduced to provide visual screening for future building sites, where shown on the LRDP Landscape Framework Map.

- Every effort to preserve important screening trees (as identified) will be taken when siting new facilities. In the event that screening trees must be removed for new projects new plantings of a species with adequate density, height and life-span will be strategically located as to provide visual screening of new and existing facilities.

- New screening tree species shall be compatible with the tree species already existing at the Laboratory**.**

Objective: Projects or portions of projects which fall within the Rustic Landscape zones identified on the LRDP Landscape Framework Map shall provide new plantings consistent with this zone.

- The Rustic Landscape is the natural setting of the Oakland and Berkeley Hills that the Lab as a whole sits within. This landscape zone forms an important perimeter buffer for the Lab as well as dividing belts between Research Clusters.

- Plant palettes for new plantings within the Rustic Landscape Zone shall be of species native to the bay area costal range. The plant material should be drought tolerant, non-invasive and low maintenance.

Objective: Projects or portions of projects which fall within the Rustic Riparian Landscape zones identified on the LRDP Landscape Framework Map shall provide new plantings consistent with this zone.

- The Rustic Riparian Landscape is those portions of the Rustic Landscape that have riparian habitats. These areas are identified on the LRDP Landscape Framework Map and are in many cases protected from development.

- Plant palettes for new plantings within the Rustic Riparian Landscape Zone shall be of species native to the bay area costal range. The plant material should be drought tolerant, non-invasive and low maintenance.

Objective: Within the Ornamental Landscape zones identified on the LRDP Landscape Framework Map provide new plantings consistent with this zone.

- The Ornamental landscape zones at the Lab are the areas of landscaping in and immediately around the Research Cluster development areas. Here a more ornamental palette of plantings can be used that is intentionally distinct from the Rustic Landscape.

- Plant Palettes within the Ornamental Planting Zones shall consist of ornamental trees, shrubs, and groundcovers planted within the commons area and in visual proximity to pedestrian walkways and parking lots.

- A comprehensive planting plan will assign a unique palatte to each developed cluster and special places like Laboratory entries and the Cafeteria Commons. The planting plan is intended to provide enhancements for the grounds, visual screening and orientation.

Objective: Provide a special feeling of arrival at Significant Ornamental Zones using distinctive landscape plantings and elements

- A handful of areas at the Lab have been identified as locations where significant, special planting and landscape treatments should occur, including the entrances to the Lab and the two major public commons spaces (see LRDP).
- Plantings and landscape treatments within the Significant Ornamental Zones shall be of a special, highly-designed nature.

Common Landscape Elements

Objective: Create a cohesive identity across the Lab as a whole by following established precedents for new landscape elements

- Landscape elements common across the Laboratory such as signage, lighting, outdoor furniture, fencing and visual screening shall be designed to provide a cohesive identity across the laboratory.
- To improve orientation and wayfinding, site-wide design themes for landscape elements may vary to express the identity of each Research Cluster.
- Special attention will be given to environmental art installations across the Laboratory site. Installations will enhance the experience of the Laboratory while providing practical assets that screen views to service areas, enhance wayfinding, provide walkway and retention structures.

Objective: Provide appropriate Site Lighting for safety and security

- For all new projects lighting of streets and parking lots will provide the necessary light levels to ensure safety and security while limiting impacts to the neighboring land uses.
- Pathway lighting will only be located on pedestrian spines connecting major commons areas and within commons areas. Use low height bollards of a design compatible with landscape design themes.
- Unique lighting treatments should be provided in selected areas of the site. These include the main entry gates, critical arrival points, landmarks and service entries. Site entry lighting will only be used to light the identity signage at the Blackberry and Strawberry Gates. In maintenance yards and equipment lay-down areas lighting may be pole mounted. All lighting will be cut-off type lighting designed to contain light in the work area without "spillover."

Landforms, Buildings, and Massing

New projects will be sited and designed to minimize the impacts to the existing hillside terrain and to minimize visibility from other parts of the lab and from surrounding communities.

Objective: Minimize impacts of Disturbed Slopes

- To the degree practicable cut and fill slopes will be minimized. Cut and fill slopes exposed to view shall be promptly restored, using best management practices to minimize erosion.

New vegetation should be planted in a manner to return the visual quality of the slope to a condition similar to its original state or better.

- Building footprints shall be designed with long-narrow aspect ratios in parallel to natural terrain to the degree consistent with program needs.

Objective: Create landform elements consistent with design on the Hill

- Given the dominant hillside site conditions of the Laboratory, site retention structures are a pervasive design element in the landscape. Design and placement of site retention structures shall integrate with the design of adjacent buildings and commons areas. Where possible retention structures should be used to minimize the impacts of new fill slopes.

Objective: Mass and site buildings to minimize their visibility

- To the degree feasible, the massing of new buildings will be configured to minimize their visibility when viewed from equal and lower elevations, and to complement the hillside terrain.
- Large buildings shall be designed to reduce their perceived mass and impart a human scale to the site. Buildings with a horizontal dimension greater than 200' or a vertical dimension greater than four stories shall incorporate changes in both façade plane and vertical height to reduce its perceived scale and bulk.
- Building heights for all new buildings are typically limited to four stories. However in locations where the site's topography creates a natural backdrop or provides appropriate visual screening building heights may be increased. New buildings shall conform to the height limits indicated on the building height map.

Objective: Screen Roofscapes

- Rooftops of Laboratory buildings are highly visible to residents and institutions at higher elevations. Attention shall be given to the design of rooftop surfaces and elements to minimize the visual impacts. Building and research support equipment shall be rooftop mounted only when required for the proper operation of the intended use of the equipment such as ventilators, lab vent stacks and scrubbers. Visual screening devices shall be used to screen views of such equipment from public view points at higher elevations. Rooftop screening devices and equipment shall be designed as elements integral to overall building design themes.

Objective: Respect View Corridors

- New buildings shall be configured as to preserve valuable distant views from commons, courts and key public spaces within neighboring buildings. Attention shall be given to create special "framed" and foreground views between pedestrian spaces that provide visual interest and orientation.

Objective: Integrate buildings into the overall landscape using appropriate materials

- The palette of exterior building materials allowed for new buildings shall be of a color and texture that integrates well with the natural environment and is consistent with the most durable and cost effective building assemblies for laboratory and office buildings.
- The base of new buildings—where building forms, slope retention structures, and outdoor plazas meet the hillside terrain—shall be cast in place or pre-cast concrete of a natural color and a texture consistent for base elements.

- Exterior wall materials will primarily consist of, but not be limited to, concrete, metal panel and glass curtainwall systems with featured accents of stone, wood and tile where appropriate. The color and texture of these materials shall integrate with the natural surroundings to reduce the visibility of buildings in distant views. A consistent palate of color and texture will be used to ensure a cohesive image and enhance orientation. Highly reflective materials and elements shall not be allowed unless they are deemed necessary to support mission needs.

Research Clusters

A key element of the Conceptual Framework established to guide development at the Lab is the concept of the Research Cluster. The Lab has been conceptually divided into six discreet Research Clusters – concentrated, dense developments of research buildings, each having its own subtly unique character and social structure. The creation of these Research Clusters will help to fulfill two of the four basic principles contained in the Vision of the Laboratory site and facilities;

- **Build a "campus-like" research environment**—one with a coherent development pattern and image conducive to team science; and
- **Enhance scientific and academic collaboration** with public and private initiates by improving access and connections.

Research Clusters will develop over time as the aggregate result of multiple development projects. It is important that each development respect the long-range development concept for each cluster and build on the efforts of its predecessors to work together towards a common, coherent goal. There are a number of fundamental parts of the Research Cluster concept.

The Commons

In order to encourage informal interaction within each Research Cluster, activities and new development in each Cluster will focus on a central campus-like collegial space called The Commons. Analogous to how a town square functions within a civic community or to a quad in a campus community, the Commons will form the social heart of each Research Cluster, creating a strong focal point, gathering space, and Sense of Place. Each Commons will have a unique scale, configuration, and character, depending on existing conditions and development scenarios.

Objective: Create new Commons Spaces in clusters that currently lack them

- New building sites and locations of new Commons Spaces shall be defined by Lab Planning, and new projects shall conform to the given footprints.
- New buildings shall be located and designed to create well-defined, campus-like pedestrian commons and courts between buildings that provide pedestrian access to buildings.

Objective: Stimulate pedestrian activity and interaction in the Commons Spaces

- Building facades facing commons and courts should provide exterior building spaces such as covered porches at main entries and covered walkways to provide exterior places of interaction weather protection.

- Major entrances to buildings shall be located on the Commons space when possible, or on major pedestrian routes where not possible.
- Seeing one's colleagues at work is an important stimulus to interaction. Therefore, the ground floors of buildings enfronting Commons spaces shall be made as transparent as possible to create a visible connection between inside and outside.
- Social and collegial spaces such as lounges, informal meeting spaces, journal rooms, etc shall be located either directly off of or overlooking commons spaces and shall be visible and made prominent from the outside.
- The use of arcades or covered walks where buildings form the edges of commons spaces shall be considered.
- Outdoor commons, courts and pedestrian pathways will have a hard surface appropriate to their function. Special outdoor spaces will feature patterned concrete and or brick inlay in a design consistent with building design themes. Pedestrian pathways are currently and will remain paved surfaces. Joint detailing and saw cuts may be used as a cost effective method of providing scale to these surfaces. Where possible permeable surfaces such as planting pavers shall be employed to increase the permeable surface areas in parking lots and plazas.

Objective: Allow light to reach the Commons Spaces

- Buildings facing outdoor commons shall be scaled to admit sunlight and impart a comfortable human scale to these places. Additionally, new building massing shall be configured to allow solar access for adjacent buildings to the degree feasible.

Objective: Create as high a density and critical mass around commons spaces as possible

- Buildings shall be massed with their greatest population density in proximity to the Commons spaces.
- Buildings within Research Clusters shall be built to as great a density as possible within the allowable development envelopes.

Identity

Each Research Cluster, because of topography, historic buildings, plant palette, and so on will develop a unique identity.

Objective: Create new Keystone Structures in clusters that currently lack them

- Over time, each developed cluster shall include a "keystone structure" the most visually significant structure in the cluster. Keystone structures will typically be the largest building in the group of buildings and will feature building elements of a scale and design that signify the unique character for the cluster to reinforce identity and orientation.

Objective: Utilize artifacts to create identity and add interest to each Cluster

- There are many interesting historic objects scattered around the Lab. These artifacts are important reminders of the Lab's legacy as well as items of interest which stimulate interaction. Placement of these artifacts at major pedestrian nodes and at prominent locations in each commons is encouraged.

Objective: Create consistency between buildings in individual clusters.

- Designers shall examine the architectural precedents, especially of historic buildings, present in the Research Cluster where their project is to be located. A clear rationale based on precedent for the architectural expression of each project will be developed.

Function

Objective: Segregate public entries and paths from service entries and paths where feasible

- Main building entries and service entries will be clearly separated. Main building entries shall face onto pedestrian spaces with common access to other buildings.
- Building entries and plazas shall be distinguished as a place by design treatment- paving, lighting, furnishings and shall incorporate provisions for disabled access.

Objective: Where segregation is not possible, and service and public access overlap in accessing buildings, design service courts to intelligently serve both

- Pathways to main entances shall be clearly marked and protective measures for pedestrians shall be designed.
- Multi-use pedestrian and service access courts and routes shall be designed to slow vehicle traffic using articulated paving, bollards, or other devices.

Objective: Develop Research Clusters in a way that is mindful of future expansion

- Identify and reserve areas for future expansion on each building project.

Linkages

The Hill Site is characterized by its steep topography which creates separate research clusters located on a series of hillside terraces and ridges. The topography is such that one can never get a comprehensive view of the place. Rather, one’s experience of the site is defined by the movement from area to area, from terrace to ridge to valley. Views are constantly shifting, changing, and opening anew. The pathways that link various areas together, both vehicular and pedestrian, are important linkages, both for the experience of the place and for encouraging people to move from place to place, to visit, and to explore. The design guidelines in this section are intended to ensure pedestrian and vehicular access is provided in a way that creates a campus-like experience unique to the Lab while providing safe and efficient access to all Laboratory facilities.

Pedestrian Access

The Hill site is an intricate network of stairs, roads, and paths that negotiate the steep topography of the site. As each new project is developed adjustments may be made to the existing network of pedestrian pathways as necessary to provide direct access between each cluster commons, parking lots and Laboratory gateways.

Objective: Design Pathway Layouts that support pedestrian flow and encourage casual interaction

- Development of new pathways and improvements to existing ones shall provide a natural appearing unobtrusive network with structural elements artfully placed and designed as landscape features.
- Pedestrian pathways providing access between cluster commons currently, and will continue to vary in width. The main pedestrian spines, between major commons areas shall be constructed of a width of approximately 8'-0" allowing two pairs of pedestrians to pass comfortably. Pathways along roadways and between all other commons areas shall remain at their current width.
- Pathway intersections, view platforms and stair landings provide opportunities for outdoor interaction spaces. The design of new walkways shall incorporate such spaces to the extent possible.

Objective: Materials utilized in walkway construction should be appropriate for their location and intended use.

- Material choices for walking surfaces may include, but are not limited to asphalt, stabilized aggregate, concrete pavers and patterned/colored concrete. Within new projects Pathway materials and colors shall be consistent with surfaces provided in commons and plaza areas.

Objective: Construct new walkway structures such as stairs, bridges, slope retention for walkways and guardrails of materials compatible with the surrounding landscape

- Use concrete, wood or core-ten steel.
- Design themes for these structures should be coordinated with adjacent building design themes, designs for shuttle stop shelters, signage and lighting to provide a comprehensive visual identity across the laboratory site.

Guideline: Use buildings to overcome the topography and provide ease of pedestrian flow and disabled access

- Where possible, design interior and exterior circulation to provide pathways from lower elevations to higher elevations, using elevators to overcome large differences that can't be accommodated by ramps.

Vehicular Access – Roads

Objective: Design all new streets to accommodate two-way vehicle traffic flow as well as pedestrian access

- Streets shall primarily be no greater than 24'-0".
- Curbs and sidewalks shall be provided where appropriate for pedestrian safety and erosion control.

Objective: Create service yards with sufficient room and in a manner that controls polluted runoff.

- Service yards and access roads shall be of a width necessary to maneuver delivery trucks and emergency vehicles. Surfaces shall be asphalt with concrete pads as necessary to provide a durable truck staging area at loading docks. Surface drainage in these areas will be directed away from landscaped areas and into collection intakes to reduce seepage of contaminating oils and other chemicals.

Objective: Reduce the amount of impermeable surfaces at the Lab

- Permanent roadways will be surfaced with asphalt or other materials that will prevent seepage of contaminating oils and sediments. Roadways shall be constructed to support truck loads as specified in Lab road standards. Access roadways intended for limited access and emergency access only may be constructed with landscape pavers to increase permeable surfaces.

Vehicular Access – Parking Lots and Plazas

The intent of the Parking Design Guidelines to integrate parking into overall site appearance through measures that minimize visual impact, protect water quality, limit the negative effects of associated noise lights and utilize materials that result in the least environmental impact.

Objective: Minimize visual and environmental impacts of new parking lots

- New parking and improvements to existing lots shall be sited and designed to minimize their visual impacts to off-site locations, visitors and Laboratory staff.
- New parking lots shall be designed to follow the existing terrain and shall be terraced to minimize slope retention and cut and fill of the site.
- Drainage from the parking areas will be contained by natural materials that can be used as edge treatments to guide drainage to filtered outlets and control erosion at the pavement edge. Gutters and or wheel stops shall be used to keep cars out of swale and other surrounding areas.
- Parking areas shall be screened in a way appropriate to location of the parking lot on the site and the characteristics of the surrounding area. Native trees and shrubs within parking lots will be maintained and planted to provide shade and screen distant views to lots from both on and off-site locations. Native shrubs and small trees will be planted at the lot's perimeter to cause the parking and its screening to recede into the natural surroundings. Provide shade trees interspersed throughout to break up large parking areas.

Objective: Create parking plazas to accommodate multiple functions where restricted sites do not allow for them to be segregated

- Parking plazas are a multi-use space capable of providing space for delivery, emergency access and reserved parking in conjunction with safe pedestrian access routes to building entries within constrained spaces.
- Reduce parking density within the plaza to allow free pedestrian movement and generous landscape plantings.
- Provide barriers such as raised planting beds, bollards, and ramped walkways to slow traffic and allow a protected zone for pedestrian movement.
- Provide plaza surfaces that resemble that of pedestrian-only spaces to reinforce the pedestrian use of the space and slow traffic.

Vehicular Access – Parking Structures

Objective: Site and design parking structures to integrate with the natural surroundings.

- Configure parking layouts to allow floor plate aspect ratios and massing that is fitted to the specific conditions of the site—long, narrow structures (1-2 aisles) on hillside sites and square structures (3-4 aisle) on level sites.
- Configure efficient parking layouts to reduce the area dedicated to circulation by allowing entry points from multiple levels of the site.
- Parking structures and associated site retention structures shall be constructed of cast-in-place and/or pre-cast concrete. Surface texture shall be compatible with adjacent architectural design themes. Finish color will be compatible with surrounding buildings and is intended to blend with the natural surroundings. Enclosed lobbies, and stairwells may be clad in glass.
- To the degree possible incorporate shade trees and plantings that the building's perimeter and top level exposed to view. Provide adequate tree coverage at the top level to shade cars, reduce glare, and minimize visual impacts. Continuous planting beds at each level may be incorporated into the structure's façade to further integrate the structure into the surrounding landscape.

Building Specific Guidelines

The intent of the Building Specific Guidelines is to establish a building design aesthetic at Berkeley Lab that is sympathetic to the Laboratory's hillside setting and the Guideline to build a UC quality campus experience through each new project. An overriding Guideline is to minimize the visual impact of buildings to the extent consistent with program needs while also providing flexible facilities that can accommodate expansion and alterations.

Building Organization

Objective: Create buildings that are flexible, modular, and expandable

- Each new building shall be configured to accommodate a broad range of functions in both the long and short term. In general a building width of between 60' and 80' can accommodate a variety of office, lab and support space layouts. Structural grids shall be based on dimensions compatible with industry standards for laboratory equipment and furniture and office modules to ensure future flexibility.
- Each new building shall have a floor-to-floor height of at least 15'-0" in order to accommodate a wide range of research functions and the infrastructure they require. A greater height on the ground floor may be provided to accommodate large public assembly spaces and or high-bay laboratory spaces.

Objective: Create buildings that encourage interaction among their inhabitants

- Circulation, both vertical and horizontal shall be designed to foster communication by being enjoyable places, provide access to daylight and views.
- Active public spaces such as lobbies, meeting and break rooms, display areas shall be located adjacent to outdoor spaces and pedestrian routes and pathways.

Objective: Organize service functions to minimize conflicts and visual impacts

- Service entries and associated equipment and activities shall be located to minimize visibility. All bulk trash containers, building and support equipment shall be concealed within enclosures designed as integral elements of the architecture. Loading docks shall be concealed and secured when not in use.

Architectural Expression

Objective: Ensure each new building contributes to cohesive and coherent architectural expression through the Laboratory site

- Each building shall be a coherent architectural composition and shall employ a single unifying vocabulary of forms, details and materials on all building facades. Design themes for new building facades shall be designed to integrate new development into the natural and built context and to provide a cohesive Laboratory image. The architectural expression of each new building will promote the enduring architectural themes of each cluster that contributes to the cohesiveness of the overall visual fabric of the Laboratory.
- The design of building facades shall consider treatments that respond to the characteristics of each exposure with respect to heat, light, ventilation and view. Provide shading devices to reduce solar heat gain and glare particularly on the larger southern and western exposures directed toward distant bay views. Employ devices and design strategies to allow natural ventilation and air flow to the degree feasible. Use larger glazed exposures to the north and east for natural light.

Appendix AIR
Air Quality Appendix

Existing Generator TAC Emissions

Existing Boiler and Heater TAC Emissions

2024 Chemical Use Inventory per Building

Existing (2024) Lab Emissions per Building

New LRDP Generators TAC Emissions

New LRDP Lab TAC Emissions

CalEEMod and HARP Output Files

Existing Generator TAC Emissions

AERMOD Point and Volume Source Representations - LRDP Scenario
Lawrence Berkeley National Laboratory, Berkeley, California

Hours per year (BAAQMD 2022 CEQA Guidelines) 150

Point Sources							
Source Description	**Building**	**Stack ID (LBNL)**	**DPM Emissions (lb/yr)**	Assumed MY and Engine Tier	Emission Factor (g/hp-hr)	HP	DPM Emissions (lb/yr)
Emgcy Generator	2	02EG068	7.96				
Emergency Generator	30	30EG114	1.78	2015 or newer/Tier 4F	0.01	538	1.78
Emergency Generator	31	31EG108	0.33	2015 or newer/Tier 4F	0.02	50	0.33
Emergency Generator	33U	33UEG113	7.49	2014/Tier 4F	0.03	755	7.49
Emgcy Generator	37	37EG120	1.53	2015 or newer/Tier 4F	0.01	463	1.53
Emergency Generator	37	37EG111	0.76	2014/Tier 4F	0.01	230	0.76
Emgcy Generator	48	48EG100	6.11				
Emergency Generator	48 Complex	48FP	0.79	2015 or newer/Tier 4F	0.01	238	0.79
Emgcy Generator	50A	50AEG101	49.60	1998/Tier 1	0.4	375	49.60
Emergency Generator	50B	50BEG095	13.17				
Emgcy Generator	50B	50BEG096	36.64	1996/Tier 1	0.4	277	36.64
Emergency Generator	59	59EG115	15.40	2015 or newer/Tier 4F	0.02	2328	15.40
Emergency Generator	62	62EG102	3.42				
Emgcy Generator	62	62BEG081	2.23				
Emgcy Generator	66	66EG109	4.87				
Emergency Generator	67A	67AEG001	1.99	2014/Tier 4F	0.01	602	1.99
Emergency Generator	69	CCRF_EG	0.32	2015 or newer/Tier 4F	0.02	49	0.32
Emgcy Generator	70	70EG106	5.33				
Emergency Generator	70A	70AEGxxx	9.48				
Emgcy Generator	72	72EG098	3.52				
Emergency Generator	75	75EG089	17.86	1992/Tier 1	0.4	135	17.86
Emergency Generator	77	77EG094	10.77				
Emgcy Generator	84	84BEG099	3.12				
Emergency Generator	84	84EG112	37.45	2009/Tier 2	0.15	755	37.45
Emgcy Generator	85	85EG096	27.81				
Emergency Generator	85	85EG	3.10	2015 or newer/Tier 4F	0.02	469	3.10
Emergency Generator	88	88EG090	0.38	2014/Tier 4F	0.01	115	0.38
Emgcy Generator	90	55EG069	20.95				
Emergency Generator	91	91UEG001	1.77	2014/Tier 4F	0.01	535	1.77
Emergency Generator	Bayview	91EGxxx	19.33	2015 or newer/Tier 4F	0.02	2922	19.33
Emergency Generator	Portable	76EG122	1.43	2015 or newer/Tier 4F	0.01	433	1.43
Emergency Generator	Portable	76EG123	1.43	2015 or newer/Tier 4F	0.01	433	1.43
Emergency Generator	Portable	76EG124	1.43	2015 or newer/Tier 4F	0.01	433	1.43
B82 Fire Pump	82	FP-1-82	11.71				
B68 Fire Pump	68	B68FP	8.65				
Portable	Portable	76EG116	1.43	2015 or newer/Tier 4F	0.01	433	1.43
Portable	Portable	76EG117	1.43	2015 or newer/Tier 4F	0.01	433	1.43
compressor	Portable	SWMC001	7.43				

Existing Boiler and Heater TAC Emissions

	Building	AERMOD Source ID	2-Methylnaphthalene	3-Methylcholanthrene	7,12-Dimethylbenz(a)anthracene	Benz(a)anthracene	Benzene	Dichlorobenzene	Fluoranthene	Formaldehyde	Hexane	Naphthalene	Toluene	Lead	Arsenic	Barium	Beryllium	Cadmium	Chromium (total)	Cobalt	Copper	Manganese	Mercury	Nickel	Selenium	Vanadium	Zinc
Boilers	2	02BR001	9.8E-06	7.4E-07	6.6E-06	7.4E-07	8.6E-04	4.9E-04	1.2E-06	3.1E-02	7.4E-01	2.5E-04	1.4E-03	2.0E-04	8.2E-05	1.8E-03	4.9E-06	4.5E-04	5.7E-04	3.4E-05	3.5E-04	1.6E-04	1.1E-04	8.6E-04	9.8E-06	9.4E-04	1.2E-02
	2	02BR002	9.8E-06	7.4E-07	6.6E-06	7.4E-07	8.6E-04	4.9E-04	1.2E-06	3.1E-02	7.4E-01	2.5E-04	1.4E-03	2.0E-04	8.2E-05	1.8E-03	4.9E-06	4.5E-04	5.7E-04	3.4E-05	3.5E-04	1.6E-04	1.1E-04	8.6E-04	9.8E-06	9.4E-04	1.2E-02
	6	06BR004	7.9E-06	5.9E-07	5.3E-06	5.9E-07	6.9E-04	3.9E-04	9.8E-07	2.5E-02	5.9E-01	2.0E-04	1.1E-03	1.6E-04	6.6E-05	1.4E-03	3.9E-06	3.6E-04	4.6E-04	2.8E-05	2.8E-04	1.2E-04	8.5E-05	6.9E-04	7.9E-06	7.5E-04	9.5E-03
	6	06BR005	7.9E-06	5.9E-07	5.3E-06	5.9E-07	6.9E-04	3.9E-04	9.8E-07	2.5E-02	5.9E-01	2.0E-04	1.1E-03	1.6E-04	6.6E-05	1.4E-03	3.9E-06	3.6E-04	4.6E-04	2.8E-05	2.8E-04	1.2E-04	8.5E-05	6.9E-04	7.9E-06	7.5E-04	9.5E-03
	6	06BR006	4.71E-05	3.53E-06	3.14E-05	3.53E-06	4.12E-03	2.35E-03	5.88E-06	1.47E-01	3.53E+00	1.20E-03	6.67E-03	9.80E-04	3.92E-04	8.63E-03	2.35E-05	2.16E-03	2.75E-03	1.65E-04	1.67E-03	7.45E-04	5.10E-04	4.12E-03	4.71E-05	4.51E-03	5.69E-02
	6	06BR007	4.71E-05	3.53E-06	3.14E-05	3.53E-06	4.12E-03	2.35E-03	5.88E-06	1.47E-01	3.53E+00	1.20E-03	6.67E-03	9.80E-04	3.92E-04	8.63E-03	2.35E-05	2.16E-03	2.75E-03	1.65E-04	1.67E-03	7.45E-04	5.10E-04	4.12E-03	4.71E-05	4.51E-03	5.69E-02
	26	B26BRS1	1.2E-05	8.8E-07	7.8E-06	8.8E-07	1.0E-03	5.9E-04	1.5E-06	3.7E-02	8.8E-01	3.0E-04	1.7E-03	2.5E-04	9.8E-05	2.2E-03	5.9E-06	5.4E-04	6.9E-04	4.1E-05	4.2E-04	1.9E-04	1.3E-04	1.0E-03	1.2E-05	1.1E-03	1.4E-02
	30	30BR001	4.71E-05	3.53E-06	3.14E-05	3.53E-06	4.12E-03	2.35E-03	5.88E-06	1.47E-01	3.53E+00	1.20E-03	6.67E-03	9.80E-04	3.92E-04	8.63E-03	2.35E-05	2.16E-03	2.75E-03	1.65E-04	1.67E-03	7.45E-04	5.10E-04	4.12E-03	4.71E-05	4.51E-03	5.69E-02
	30	30BR002	4.71E-05	3.53E-06	3.14E-05	3.53E-06	4.12E-03	2.35E-03	5.88E-06	1.47E-01	3.53E+00	1.20E-03	6.67E-03	9.80E-04	3.92E-04	8.63E-03	2.35E-05	2.16E-03	2.75E-03	1.65E-04	1.67E-03	7.45E-04	5.10E-04	4.12E-03	4.71E-05	4.51E-03	5.69E-02
	31	31BR001	4.71E-05	3.53E-06	3.14E-05	3.53E-06	4.12E-03	2.35E-03	5.88E-06	1.47E-01	3.53E+00	1.20E-03	6.67E-03	9.80E-04	3.92E-04	8.63E-03	2.35E-05	2.16E-03	2.75E-03	1.65E-04	1.67E-03	7.45E-04	5.10E-04	4.12E-03	4.71E-05	4.51E-03	5.69E-02
	33	33BR001	4.71E-05	3.53E-06	3.14E-05	3.53E-06	4.12E-03	2.35E-03	5.88E-06	1.47E-01	3.53E+00	1.20E-03	6.67E-03	9.80E-04	3.92E-04	8.63E-03	2.35E-05	2.16E-03	2.75E-03	1.65E-04	1.67E-03	7.45E-04	5.10E-04	4.12E-03	4.71E-05	4.51E-03	5.69E-02
	33	33BR002	4.71E-05	3.53E-06	3.14E-05	3.53E-06	4.12E-03	2.35E-03	5.88E-06	1.47E-01	3.53E+00	1.20E-03	6.67E-03	9.80E-04	3.92E-04	8.63E-03	2.35E-05	2.16E-03	2.75E-03	1.65E-04	1.67E-03	7.45E-04	5.10E-04	4.12E-03	4.71E-05	4.51E-03	5.69E-02
	47	47BR003	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
	50	50BR006	3.5E-05	2.6E-06	2.4E-05	2.6E-06	3.1E-03	1.8E-03	4.4E-06	1.1E-01	2.6E+00	9.0E-04	5.0E-03	7.4E-04	2.9E-04	6.5E-03	1.8E-05	1.6E-03	2.1E-03	1.2E-04	1.3E-03	5.6E-04	3.8E-04	3.1E-03	3.5E-05	3.4E-03	4.3E-02
	50	50BR007	3.5E-05	2.6E-06	2.4E-05	2.6E-06	3.1E-03	1.8E-03	4.4E-06	1.1E-01	2.6E+00	9.0E-04	5.0E-03	7.4E-04	2.9E-04	6.5E-03	1.8E-05	1.6E-03	2.1E-03	1.2E-04	1.3E-03	5.6E-04	3.8E-04	3.1E-03	3.5E-05	3.4E-03	4.3E-02
	50	50BR008	4.71E-05	3.53E-06	3.14E-05	3.53E-06	4.12E-03	2.35E-03	5.88E-06	1.47E-01	3.53E+00	1.20E-03	6.67E-03	9.80E-04	3.92E-04	8.63E-03	2.35E-05	2.16E-03	2.75E-03	1.65E-04	1.67E-03	7.45E-04	5.10E-04	4.12E-03	4.71E-05	4.51E-03	5.69E-02
	50	50ABR001	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
	50	50BBR001	3.5E-05	2.6E-06	2.4E-05	2.6E-06	3.1E-03	1.8E-03	4.4E-06	1.1E-01	2.6E+00	9.0E-04	5.0E-03	7.4E-04	2.9E-04	6.5E-03	1.8E-05	1.6E-03	2.1E-03	1.2E-04	1.3E-03	5.6E-04	3.8E-04	3.1E-03	3.5E-05	3.4E-03	4.3E-02
	54	54BR001	7.1E-06	5.3E-07	4.7E-06	5.3E-07	6.2E-04	3.5E-04	8.8E-07	2.2E-02	5.3E-01	1.8E-04	1.0E-03	1.5E-04	5.9E-05	1.3E-03	3.5E-06	3.2E-04	4.1E-04	2.5E-05	2.5E-04	1.1E-04	7.6E-05	6.2E-04	7.1E-06	6.8E-04	8.5E-03
	56	56BR001	3.5E-06	2.6E-07	2.4E-06	2.6E-07	3.1E-04	1.8E-04	4.4E-07	1.1E-02	2.6E-01	9.0E-05	5.0E-04	7.4E-05	2.9E-05	6.5E-04	1.8E-06	1.6E-04	2.1E-04	1.2E-05	1.3E-04	5.6E-05	3.8E-05	3.1E-04	3.5E-06	3.4E-04	4.3E-03
	62	62BL3	7.5E-05	5.6E-06	5.0E-05	5.6E-06	6.6E-03	3.8E-03	9.4E-06	2.4E-01	5.6E+00	1.9E-03	1.1E-02	1.6E-03	6.3E-04	1.4E-02	3.8E-05	3.5E-03	4.4E-03	2.6E-04	2.7E-03	1.2E-03	8.2E-04	6.6E-03	7.5E-05	7.2E-03	9.1E-02
	66	66BR001	6.5E-05	4.9E-06	4.3E-05	4.9E-06	5.7E-03	3.2E-03	8.1E-06	2.0E-01	4.9E+00	1.6E-03	9.2E-03	1.3E-03	5.4E-04	1.2E-02	3.2E-05	3.0E-03	3.8E-03	2.3E-04	2.3E-03	1.0E-03	7.0E-04	5.7E-03	6.5E-05	6.2E-03	7.8E-02
	70	BL158	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
	70	BL177	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
	72	72BR001	1.2E-05	8.8E-07	7.8E-06	8.8E-07	1.0E-03	5.9E-04	1.5E-06	3.7E-02	8.8E-01	3.0E-04	1.7E-03	2.5E-04	9.8E-05	2.2E-03	5.9E-06	5.4E-04	6.9E-04	4.1E-05	4.2E-04	1.9E-04	1.3E-04	1.0E-03	1.2E-05	1.1E-03	1.4E-02
	74	BL56	3.2E-05	2.4E-06	2.1E-05	2.4E-06	2.8E-03	1.6E-03	4.0E-06	1.0E-01	2.4E+00	8.1E-04	4.5E-03	6.7E-04	2.7E-04	5.9E-03	1.6E-05	1.5E-03	1.9E-03	1.1E-04	1.1E-03	5.1E-04	3.5E-04	2.8E-03	3.2E-05	3.1E-03	3.9E-02
	74	BL94_01	4.0E-05	3.0E-06	2.7E-05	3.0E-06	3.5E-03	2.0E-03	5.0E-06	1.3E-01	3.0E+00	1.0E-03	5.7E-03	8.3E-04	3.3E-04	7.3E-03	2.0E-05	1.8E-03	2.3E-03	1.4E-04	1.4E-03	6.3E-04	4.3E-04	3.5E-03	4.0E-05	3.8E-03	4.8E-02
	74	BL94_02	2.8E-05	2.1E-06	1.9E-05	2.1E-06	2.5E-03	1.4E-03	3.5E-06	8.8E-02	2.1E+00	7.2E-04	4.0E-03	5.9E-04	2.4E-04	5.2E-03	1.4E-05	1.3E-03	1.6E-03	9.9E-05	1.0E-03	4.5E-04	3.1E-04	2.5E-03	2.8E-05	2.7E-03	3.4E-02
	75	75BR001	4.2E-05	3.2E-06	2.8E-05	3.2E-06	3.7E-03	2.1E-03	5.3E-06	1.3E-01	3.2E+00	1.1E-03	6.0E-03	8.8E-04	3.5E-04	7.8E-03	2.1E-05	1.9E-03	2.5E-03	1.5E-04	1.5E-03	6.7E-04	4.6E-04	3.7E-03	4.2E-05	4.1E-03	5.1E-02
	77	77BR009	1.2E-04	9.2E-06	8.2E-05	9.2E-06	1.1E-02	6.2E-03	1.5E-05	3.8E-01	9.2E+00	3.1E-03	1.7E-02	2.6E-03	1.0E-03	2.3E-02	6.2E-05	5.6E-03	7.2E-03	4.3E-04	4.4E-03	1.9E-03	1.3E-03	1.1E-02	1.2E-04	1.2E-02	1.5E-01
	77	77BR010	1.2E-04	9.2E-06	8.2E-05	9.2E-06	1.1E-02	6.2E-03	1.5E-05	3.8E-01	9.2E+00	3.1E-03	1.7E-02	2.6E-03	1.0E-03	2.3E-02	6.2E-05	5.6E-03	7.2E-03	4.3E-04	4.4E-03	1.9E-03	1.3E-03	1.1E-02	1.2E-04	1.2E-02	1.5E-01
	77	77BR003	4.71E-05	3.53E-06	3.14E-05	3.53E-06	4.12E-03	2.35E-03	5.88E-06	1.47E-01	3.53E+00	1.20E-03	6.67E-03	9.80E-04	3.92E-04	8.63E-03	2.35E-05	2.16E-03	2.75E-03	1.65E-04	1.67E-03	7.45E-04	5.10E-04	4.12E-03	4.71E-05	4.51E-03	5.69E-02
	77	77BR004	4.71E-05	3.53E-06	3.14E-05	3.53E-06	4.12E-03	2.35E-03	5.88E-06	1.47E-01	3.53E+00	1.20E-03	6.67E-03	9.80E-04	3.92E-04	8.63E-03	2.35E-05	2.16E-03	2.75E-03	1.65E-04	1.67E-03	7.45E-04	5.10E-04	4.12E-03	4.71E-05	4.51E-03	5.69E-02
	77	77BR005	4.71E-05	3.53E-06	3.14E-05	3.53E-06	4.12E-03	2.35E-03	5.88E-06	1.47E-01	3.53E+00	1.20E-03	6.67E-03	9.80E-04	3.92E-04	8.63E-03	2.35E-05	2.16E-03	2.75E-03	1.65E-04	1.67E-03	7.45E-04	5.10E-04	4.12E-03	4.71E-05	4.51E-03	5.69E-02
	83	83BR001	5.9E-06	4.4E-07	3.9E-06	4.4E-07	5.1E-04	2.9E-04	7.4E-07	1.8E-02	4.4E-01	1.5E-04	8.3E-04	1.2E-04	4.9E-05	1.1E-03	2.9E-06	2.7E-04	3.4E-04	2.1E-05	2.1E-04	9.3E-05	6.4E-05	5.1E-04	5.9E-06	5.6E-04	7.1E-03
	84	84BL14	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
	85	85BR001	1.2E-05	8.8E-07	7.8E-06	8.8E-07	1.0E-03	5.9E-04	1.5E-06	3.7E-02	8.8E-01	3.0E-04	1.7E-03	2.5E-04	9.8E-05	2.2E-03	5.9E-06	5.4E-04	6.9E-04	4.1E-05	4.2E-04	1.9E-04	1.3E-04	1.0E-03	1.2E-05	1.1E-03	1.4E-02
	88	88BR001	5.3E-05	4.0E-06	3.5E-05	4.0E-06	4.6E-03	2.6E-03	6.6E-06	1.7E-01	4.0E+00	1.3E-03	7.5E-03	1.1E-03	4.4E-04	9.7E-03	2.6E-05	2.4E-03	3.1E-03	1.9E-04	1.9E-03	8.4E-04	5.7E-04	4.6E-03	5.3E-05	5.1E-03	6.4E-02
Heaters	6	06GH001	5.1E-06	3.8E-07	3.4E-06	3.8E-07	4.4E-04	2.5E-04	6.4E-07	1.6E-02	3.8E-01	1.3E-04	7.2E-04	1.1E-04	4.2E-05	9.3E-04	2.5E-06	2.3E-04	3.0E-04	1.8E-05	1.8E-04	8.0E-05	5.5E-05	4.4E-04	5.1E-06	4.9E-04	6.1E-03
	6	06GH002	5.1E-06	3.8E-07	3.4E-06	3.8E-07	4.4E-04	2.5E-04	6.4E-07	1.6E-02	3.8E-01	1.3E-04	7.2E-04	1.1E-04	4.2E-05	9.3E-04	2.5E-06	2.3E-04	3.0E-04	1.8E-05	1.8E-04	8.0E-05	5.5E-05	4.4E-04	5.1E-06	4.9E-04	6.1E-03
	6	06GH003	5.1E-06	3.8E-07	3.4E-06	3.8E-07	4.4E-04	2.5E-04	6.4E-07	1.6E-02	3.8E-01	1.3E-04	7.2E-04	1.1E-04	4.2E-05	9.3E-04	2.5E-06	2.3E-04	3.0E-04	1.8E-05	1.8E-04	8.0E-05	5.5E-05	4.4E-04	5.1E-06	4.9E-04	6.1E-03
	6	06GH004	5.1E-06	3.8E-07	3.4E-06	3.8E-07	4.4E-04	2.5E-04	6.4E-07	1.6E-02	3.8E-01	1.3E-04	7.2E-04	1.1E-04	4.2E-05	9.3E-04	2.5E-06	2.3E-04	3.0E-04	1.8E-05	1.8E-04	8.0E-05	5.5E-05	4.4E-04	5.1E-06	4.9E-04	6.1E-03
	6	06GH005	5.1E-06	3.8E-07	3.4E-06	3.8E-07	4.4E-04	2.5E-04	6.4E-07	1.6E-02	3.8E-01	1.3E-04	7.2E-04	1.1E-04	4.2E-05	9.3E-04	2.5E-06	2.3E-04	3.0E-04	1.8E-05	1.8E-04	8.0E-05	5.5E-05	4.4E-04	5.1E-06	4.9E-04	6.1E-03
	6	06GH006	5.1E-06	3.8E-07	3.4E-06	3.8E-07	4.4E-04	2.5E-04	6.4E-07	1.6E-02	3.8E-01	1.3E-04	7.2E-04	1.1E-04	4.2E-05	9.3E-04	2.5E-06	2.3E-04	3.0E-04	1.8E-05	1.8E-04	8.0E-05	5.5E-05	4.4E-04	5.1E-06	4.9E-04	6.1E-03
	7	07GH002	2.4E-06	1.8E-07	1.6E-06	1.8E-07	2.1E-04	1.2E-04	2.9E-07	7.4E-03	1.8E-01	6.0E-05	3.3E-04	4.9E-05	2.0E-05	4.3E-04	1.2E-06	1.1E-04	1.4E-04	8.2E-06	8.3E-05	3.7E-05	2.5E-05	2.1E-04	2.4E-06	2.3E-04	2.8E-03
	17	17GH001	1.8E-06	1.3E-07	1.2E-06	1.3E-07	1.5E-04	8.8E-05	2.2E-07	5.5E-03	1.3E-01	4.5E-05	2.5E-04	3.7E-05	1.5E-05	3.2E-04	8.8E-07	8.1E-05	1.0E-04	6.2E-06	6.3E-05	2.8E-05	1.9E-05	1.5E-04	1.8E-06	1.7E-04	2.1E-03
	46	46GH006	1.8E-06	1.3E-07	1.2E-06	1.3E-07	1.5E-04	8.8E-05	2.2E-07	5.5E-03	1.3E-01	4.5E-05	2.5E-04	3.7E-05	1.5E-05	3.2E-04	8.8E-07	8.1E-05	1.0E-04	6.2E-06	6.3E-05	2.8E-05	1.9E-05	1.5E-04	1.8E-06	1.7E-04	2.1E-03
	46	46GH007	1.4E-06	1.1E-07	9.4E-07	1.1E-07	1.2E-04	7.1E-05	1.8E-07	4.4E-03	1.1E-01	3.6E-05	2.0E-04	2.9E-05	1.2E-05	2.6E-04	7.1E-07	6.5E-05	8.2E-05	4.9E-06	5.0E-05	2.2E-05	1.5E-05	1.2E-04	1.4E-06	1.4E-04	1.7E-03
	46	46GH008	1.4E-06	1.1E-07	9.4E-07	1.1E-07	1.2E-04	7.1E-05	1.8E-07	4.4E-03	1.1E-01	3.6E-05	2.0E-04	2.9E-05	1.2E-05	2.6E-04	7.1E-07	6.5E-05	8.2E-05	4.9E-06	5.0E-05	2.2E-05	1.5E-05	1.2E-04	1.4E-06	1.4E-04	1.7E-03
	46	46GH009	6.4E-05	4.8E-06	4.3E-05	4.8E-06	5.6E-03	3.2E-03	8.0E-06	2.0E-01	4.8E+00	1.6E-03	9.1E-03	1.3E-03	5.4E-04	1.2E-02	3.2E-05	2.9E-03	3.7E-03	2.2E-04	2.3E-03	1.0E-03	7.0E-04	5.6E-03	6.4E-05	6.2E-03	7.8E-02
	46	46GH013	2.1E-06	1.6E-07	1.4E-06	1.6E-07	1.8E-04	1.1E-04	2.6E-07	6.6E-03	1.6E-01	5.4E-05	3.0E-04	4.4E-05	1.8E-05	3.9E-04	1.1E-06	9.7E-05	1.2E-04	7.4E-06	7.5E-05	3.3E-05	2.3E-05	1.8E-04	2.1E-06	2.0E-04	2.5E-03
	46	46GH015	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
	46	46GH016	1.4E-06	1.1E-07	9.4E-07	1.1E-07	1.2E-04	7.1E-05	1.8E-07	4.4E-03	1.1E-01	3.6E-05	2.0E-04	2.9E-05	1.2E-05	2.6E-04	7.1E-07	6.5E-05	8.2E-05	4.9E-06	5.0E-05	2.2E-05	1.5E-05	1.2E-04	1.4E-06	1.4E-04	1.7E-03
	46	46GH017	1.6E-06	1.2E-07	1.1E-06	1.2E-07	1.4E-04	8.1E-05	2.0E-07	5.1E-03	1.2E-01	4.1E-05	2.3E-04	3.4E-05	1.4E-05	3.0E-04	8.1E-07	7.4E-05	9.5E-05	5.7E-06	5.8E-05	2.6E-05	1.8E-05	1.4E-04	1.6E-06	1.6E-04	2.0E-03
	46	46GH018	1.6E-06	1.2E-07	1.1E-06	1.2E-07	1.4E-04	8.1E-05	2.0E-07	5.1E-03	1.2E-01	4.1E-05	2.3E-04	3.4E-05	1.4E-05	3.0E-04	8.1E-07	7.4E-05	9.5E-05	5.7E-06	5.8E-05	2.6E-05	1.8E-05	1.4E-04	1.6E-06	1.6E-04	2.0E-03
	46	46GH019	4.7E-06	3.5E-07	3.1E-06	3.5E-07	4.1E-04	2.4E-04	5.9E-07	1.5E-02	3.5E-01	1.2E-04	6.7E-04	9.8E-05	3.9E-05	8.6E-04	2.4E-06	2.2E-04	2.7E-04	1.6E-05	1.7E-04	7.5E-05	5.1E-05	4.1E-04	4.7E-06	4.5E-04	5.7E-03
	46	46GH020	4.7E-06	3.5E-07	3.1E-06	3.5E-07	4.1E-04	2.4E-04	5.9E-07	1.5E-02	3.5E-01	1.2E-04	6.7E-04	9.8E-05	3.9E-05	8.6E-04	2.4E-06	2.2E-04	2.7E-04	1.6E-05	1.7E-04	7.5E-05	5.1E-05	4.1E-04	4.7E-06	4.5E-04	5.7E-03
	55	55GH001	2.7E-05	2.0E-06	1.8E-05	2.0E-06	2.4E-03	1.4E-03	3.4E-06	8.5E-02	2.0E+00	6.9E-04	3.9E-03	5.7E-04	2.3E-04	5.0E-03	1.4E-05	1.2E-03	1.6E-03	9.5E-05	9.6E-04	4.3E-04	2.9E-04	2.4E-03	2.7E-05	2.6E-03	3.3E-02
	65	65GH002	5.3E-06	4.0E-07	3.5E-06	4.0E-07	4.6E-04	2.6E-04	6.6E-07	1.7E-02	4.0E-01	1.3E-04	7.5E-04	1.1E-04	4.4E-05	9.7E-04	2.6E-06	2.4E-04	3.1E-04	1.9E-05	1.9E-04	8.4E-05	5.7E-05	4.6E-04	5.3E-06	5.1E-04	6.4E-03
	65	65GH003	5.3E-06	4.0E-07	3.5E-06	4.0E-07	4.6E-04	2.6E-04	6.6E-07	1.7E-02	4.0E-01	1.3E-04	7.5E-04	1.1E-04	4.4E-05	9.7E-04	2.6E-06	2.4E-04	3.1E-04	1.9E-05	1.9E-04	8.4E-05	5.7E-05	4.6E-04	5.3E-06	5.1E-04	6.4E-03
	72	72GH002	3.5E-06	2.6E-07	2.4E-06	2.6E-07	3.1E-04	1.8E-04	4.4E-07	1.1E-02	2.6E-01	9.0E-05	5.0E-04	7.4E-05	2.9E-05	6.5E-04	1.8E-06	1.6E-04	2.1E-04	1.2E-05	1.3E-04	5.6E-05	3.8E-05	3.1E-04	3.5E-06	3.4E-04	4.3E-03
	75	75GH004	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
	75	75GH007	6.2E-05	4.6E-06	4.1E-05	4.6E-06	5.4E-03	3.1E-03	7.7E-06	1.9E-01	4.6E+00	1.6E-03	8.8E-03	1.3E-03	5.1E-04	1.1E-02	3.1E-05	2.8E-03	3.6E-03	2.2E-04	2.2E-03	9.8E-04	6.7E-04	5.4E-03	6.2E-05	5.9E-03	7.5E-02
	75	75GH009	7.4E-05	5.6E-06	4.9E-05	5.6E-06	6.5E-03	3.7E-03	9.3E-06	2.3E-01	5.6E+00	1.9E-03	1.1E-02	1.5E-03	6.2E-04	1.4E-02	3.7E-05	3.4E-03	4.3E-03	2.6E-04	2.6E-03	1.2E-03	8.0E-04	6.5E-03	7.4E-05	7.1E-03	9.0E-02
	72C	72CGH003	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
	77H	77HGH002	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
	15	015WH001	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
	2	02WH001	7.1E-05	5.3E-06	4.7E-05	5.3E-06	6.2E-03	3.5E-03	8.8E-06	2.2E-01	5.3E+00	1.8E-03	1.0E-02	1.5E-03	5.9E-04	1.3E-02	3.5E-05	3.2E-03	4.1E-03	2.5E-04	2.5E-03	1.1E-03	7.6E-04	6.2E-03	7.1E-05	6.8E-03	8.5E-02
	6	06WH003	2.4E-06	1.8E-07	1.6E-06	1.8E-07	2.1E-04	1.2E-04	2.9E-07	7.4E-03	1.8E-01	6.0E-05	3.3E-04	4.9E-05	2.0E-05	4.3E-04	1.2E-06	1.1E-04	1.4E-04	8.2E-06	8.3E-05	3.7E-05	2.5E-05	2.1E-04	2.4E-06	2.3E-04	2.8E-03
	7	07WH004	8.0E-07	6.0E-08	5.3E-07	6.0E-08	7.0E-05	4.0E-05	1.0E-07	2.5E-03	6.0E-02	2.0E-05	1.1E-04	1.7E-05	6.7E-06	1.5E-04	4.0E-07	3.7E-05	4.7E-05	2.8E-06	2.8E-05	1.3E-05	8.7E-06	7.0E-05	8.0E-07	7.7E-05	9.7E-04
	26	26WH006	9.4E-07	7.1E-08	6.3E-07	7.1E-08	8.2E-05	4.7E-05	1.2E-07	2.9E-03	7.1E-02	2.4E-05	1.3E-04	2.0E-05	7.8E-06	1.7E-04	4.7E-07	4.3E-05	5.5E-05	3.3E-06	3.3E-05	1.5E-05	1.0E-05	8.2E-05	9.4E-07	9.0E-05	1.1E-03
	27	27WH001	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
	30	30WH001	9.4E-05	7.1E-06	6.3E-05	7.1E-06	8.2E-03	4.7E-03	1.2E-05	2.9E-01	7.1E+00	2.4E-03	1.3E-02	2.0E-03	7.8E-04	1.7E-02	4.7E-05	4.3E-03	5.5E-03	3.3E-04	3.3E-03	1.5E-03	1.0E-03	8.2E-03	9.4E-05	9.0E-03	1.1E-01
	31	31WH001	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
	33	33WH001	9.4E-05	7.1E-06	6.3E-05	7.1E-06	8.2E-03	4.7E-03	1.2E-05	2.9E-01	7.1E+00	2.4E-03	1.3E-02	2.0E-03	7.8E-04	1.7E-02	4.7E-05	4.3E-03	5.5E-03	3.3E-04	3.3E-03	1.5E-03	1.0E-03	8.2E-03	9.4E-05	9.0E-03	1.1E-01
	46	46WH005	4.7E-05	3.5E-06	3.1E-05	3.5E-06	4.1E-03	2.4E-03	5.9E-06	1.5E-01	3.5E+00	1.2E-03	6.7E-03	9.8E-04	3.9E-04	8.6E-03	2.4E-05	2.2E-03	2.7E-03	1.6E-04	1.7E-03	7.5E-04	5.1E-04	4.1E-03	4.7E-05	4.5E-03	5.7E-02
	47	47WH001	1.0E-06	7.6E-08	6.7E-07	7.6E-08	8.9E-05	5.1E-05	1.3E-07	3.2E-03	7.6E-02	2.6E-05	1.4E-04	2.1E-05	8.4E-06	1.9E-04	5.1E-07	4.6E-05	5.9E-05	3.5E-06	3.6E-05	1.6E-05	1.1E-05	8.9E-05	1.0E-06	9.7E-05	1.2E-03
	48	48WH002	2.4E-06	1.8E-07	1.6E-06	1.8E-07	2.1E-04	1.2E-04	2.9E-07	7.4E-03	1.8E-01	6.0E-05	3.3E-04	4.9E-05	2.0E-05	4.3E-04	1.2E-06	1.1E-04	1.4E-04	8.2E-06	8.3E-05	3.7E-05	2.5E-05	2.1E-04	2.4E-06	2.3E-04	2.8E-03
	50	50WH002	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
	50A	50AWH001	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
	50B	50BWH001	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
	53	53WH003	4.7E-05	3.5E-06	3.1E-05	3.5E-06	4.1E-03	2.4E-03	5.9E-06	1.5E-01	3.5E+00	1.2E-03	6.7E-03	9.8E-04	3.9E-04	8.6E-03	2.4E-05	2.2E-03	2.7E-03	1.6E-04	1.7E-03	7.5E-04	5.1E-04	4.1E-03	4.7E-05	4.5E-03	5.7E-02
	54	54WH003	4.7E-05	3.5E-06	3.1E-05	3.5E-06	4.1E-03	2.4E-03	5.9E-06	1.5E-01	3.5E+00	1.2E-03	6.7E-03	9.8E-04	3.9E-04	8.6E-03	2.4E-05	2.2E-03	2.7E-03	1.6E-04	1.7E-03	7.5E-04	5.1E-04	4.1E-03	4.7E-05	4.5E-03	5.7E-02
	55	55WH006	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
	55	55WH007	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
	55A	55AWH001	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
	56	56WH002	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
	58	58WH003	4.7E-05	3.5E-06	3.1E-05	3.5E-06	4.1E-03	2.4E-03	5.9E-06	1.5E-01	3.5E+00	1.2E-03	6.7E-03	9.8E-04	3.9E-04	8.6E-03	2.4E-05	2.2E-03	2.7E-03	1.6E-04	1.7E-03	7.5E-04	5.1E-04	4.1E-03	4.7E-05	4.5E-03	5.7E-02
	62	62WH003	4.7E-05	3.5E-06	3.1E-05	3.5E-06	4.1E-03	2.4E-03	5.9E-06	1.5E-01	3.5E+00	1.2E-03	6.7E-03	9.8E-04	3.9E-04	8.6E-03	2.4E-05	2.2E-03	2.7E-03	1.6E-04	1.7E-03	7.5E-04	5.1E-04	4.1E-03	4.7E-05	4.5E-03	5.7E-02
	63	63WH001	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
	64	64WH001	4.7E-05	3.5E-06	3.1E-05	3.5E-06	4.1E-03	2.4E-03	5.9E-06	1.5E-01	3.5E+00	1.2E-03	6.7E-03	9.8E-04	3.9E-04	8.6E-03	2.4E-05	2.2E-03	2.7E-03	1.6E-04	1.7E-03	7.5E-04	5.1E-04	4.1E-03	4.7E-05	4.5E-03	5.7E-02
	65	65WH003	1.4E-04	1.1E-05	9.4E-05	1.1E-05	1.2E-02	7.1E-03	1.8E-05	4.4E-01	1.1E+01	3.6E-03	2.0E-02	2.9E-03	1.2E-03	2.6E-02	7.1E-05	6.5E-03	8.2E-03	4.9E-04	5.0E-03	2.2E-03	1.5E-03	1.2E-02	1.4E-04	1.4E-02	1.7E-01

66	66WH003	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
66	66WH004	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
69	69WH001	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
70	70WH001	4.7E-05	3.5E-06	3.1E-05	3.5E-06	4.1E-03	2.4E-03	5.9E-06	1.5E-01	3.5E+00	1.2E-03	6.7E-03	9.8E-04	3.9E-04	8.6E-03	2.4E-05	2.2E-03	2.7E-03	1.6E-04	1.7E-03	7.5E-04	5.1E-04	4.1E-03	4.7E-05	4.5E-03	5.7E-02
70A	70AWH001	4.7E-05	3.5E-06	3.1E-05	3.5E-06	4.1E-03	2.4E-03	5.9E-06	1.5E-01	3.5E+00	1.2E-03	6.7E-03	9.8E-04	3.9E-04	8.6E-03	2.4E-05	2.2E-03	2.7E-03	1.6E-04	1.7E-03	7.5E-04	5.1E-04	4.1E-03	4.7E-05	4.5E-03	5.7E-02
71	71WH010	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
71	71WH011	2.7E-06	2.0E-07	1.8E-06	2.0E-07	2.3E-04	1.3E-04	3.4E-07	8.4E-03	2.0E-01	6.8E-05	3.8E-04	5.6E-05	2.2E-05	4.9E-04	1.3E-06	1.2E-04	1.6E-04	9.4E-06	9.5E-05	4.2E-05	2.9E-05	2.3E-04	2.7E-06	2.6E-04	3.2E-03
71B	71BWH007	7.1E-05	5.3E-06	4.7E-05	5.3E-06	6.2E-03	3.5E-03	8.8E-06	2.2E-01	5.3E+00	1.8E-03	1.0E-02	1.5E-03	5.9E-04	1.3E-02	3.5E-05	3.2E-03	4.1E-03	2.5E-04	2.5E-03	1.1E-03	7.6E-04	6.2E-03	7.1E-05	6.8E-03	8.5E-02
72	72WH003	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
74	74WH008	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
74	74WH009	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
74	74WH010	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
75	75WH002	4.7E-05	3.5E-06	3.1E-05	3.5E-06	4.1E-03	2.4E-03	5.9E-06	1.5E-01	3.5E+00	1.2E-03	6.7E-03	9.8E-04	3.9E-04	8.6E-03	2.4E-05	2.2E-03	2.7E-03	1.6E-04	1.7E-03	7.5E-04	5.1E-04	4.1E-03	4.7E-05	4.5E-03	5.7E-02
75B	75BWH001	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
76	76WH001	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
77	77WH010	4.7E-05	3.5E-06	3.1E-05	3.5E-06	4.1E-03	2.4E-03	5.9E-06	1.5E-01	3.5E+00	1.2E-03	6.7E-03	9.8E-04	3.9E-04	8.6E-03	2.4E-05	2.2E-03	2.7E-03	1.6E-04	1.7E-03	7.5E-04	5.1E-04	4.1E-03	4.7E-05	4.5E-03	5.7E-02
80	80WH001	1.2E-06	8.8E-08	7.8E-07	8.8E-08	1.0E-04	5.9E-05	1.5E-07	3.7E-03	8.8E-02	3.0E-05	1.7E-04	2.5E-05	9.8E-06	2.2E-04	5.9E-07	5.4E-05	6.9E-05	4.1E-06	4.2E-05	1.9E-05	1.3E-05	1.0E-04	1.2E-06	1.1E-04	1.4E-03
83	83WH001	1.7E-06	1.3E-07	1.1E-06	1.3E-07	1.5E-04	8.5E-05	2.1E-07	5.3E-03	1.3E-01	4.3E-05	2.4E-04	3.5E-05	1.4E-05	3.1E-04	8.5E-07	7.8E-05	9.9E-05	5.9E-06	6.0E-05	2.7E-05	1.8E-05	1.5E-04	1.7E-06	1.6E-04	2.0E-03
84	84WH001	7.1E-05	5.3E-06	4.7E-05	5.3E-06	6.2E-03	3.5E-03	8.8E-06	2.2E-01	5.3E+00	1.8E-03	1.0E-02	1.5E-03	5.9E-04	1.3E-02	3.5E-05	3.2E-03	4.1E-03	2.5E-04	2.5E-03	1.1E-03	7.6E-04	6.2E-03	7.1E-05	6.8E-03	8.5E-02
85	85WH001	4.7E-06	3.5E-07	3.1E-06	3.5E-07	4.1E-04	2.3E-04	5.9E-07	1.5E-02	3.5E-01	1.2E-04	6.6E-04	9.8E-05	3.9E-05	8.6E-04	2.3E-06	2.1E-04	2.7E-04	1.6E-05	1.7E-04	7.4E-05	5.1E-05	4.1E-04	4.7E-06	4.5E-04	5.7E-03
85B	85BWH001	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
86	86WH001	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
88	88WH001	1.7E-06	1.3E-07	1.1E-06	1.3E-07	1.5E-04	8.4E-05	2.1E-07	5.2E-03	1.3E-01	4.2E-05	2.4E-04	3.5E-05	1.4E-05	3.1E-04	8.4E-07	7.7E-05	9.7E-05	5.8E-06	5.9E-05	2.6E-05	1.8E-05	1.5E-04	1.7E-06	1.6E-04	2.0E-03
90	90WH004	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
90	90WH001	2.4E-05	1.8E-06	1.6E-05	1.8E-06	2.1E-03	1.2E-03	2.9E-06	7.4E-02	1.8E+00	6.0E-04	3.3E-03	4.9E-04	2.0E-04	4.3E-03	1.2E-05	1.1E-03	1.4E-03	8.2E-05	8.3E-04	3.7E-04	2.5E-04	2.1E-03	2.4E-05	2.3E-03	2.8E-02
77A	77AWH001	2.0E-06	1.5E-07	1.3E-06	1.5E-07	1.7E-04	9.8E-05	2.4E-07	6.1E-03	1.5E-01	5.0E-05	2.8E-04	4.1E-05	1.6E-05	3.6E-04	9.8E-07	9.0E-05	1.1E-04	6.8E-06	6.9E-05	3.1E-05	2.1E-05	1.7E-04	2.0E-06	1.9E-04	2.4E-03

2024 Chemical Use Inventory per Building

CAS_NO	BUILDING_NUMBER	Sum of Liters per Year	Sum of Liters per Year2	% Liters per Bldg	Calculated Emissions for Current Inventory (lb/yr)	Emissions per Bldg (lb/yr)
100-41-4	066	0.049	11.92%	11.92%	0.070	0.008
	067	0.007	1.74%	1.74%		0.001
	070	0.038	9.16%	9.16%		0.006
	978	0.318	77.18%	77.18%		0.054
100-41-4 Total		**0.412**	**0.00%**			
100-42-5	006	0.196	3.90%	3.90%	0.425	0.017
	030	0.447	8.89%	8.89%		0.038
	033	0.005	0.10%	0.10%		0.000
	066	1.026	20.39%	20.39%		0.087
	067	0.736	14.63%	14.63%		0.062
	070	2.522	50.11%	50.11%		0.213
	978	0.100	1.98%	1.98%		0.008
100-42-5 Total		**5.034**	**0.02%**	0.02%		
100-44-7	006	0.002	2.36%	2.36%	0.002	0.000
	067	0.017	18.94%	18.94%		0.000
	070	0.017	18.82%	18.82%		0.000
	070A	0.030	33.62%	33.62%		0.001
	978	0.023	26.25%	26.25%		0.000
100-44-7 Total		**0.088**	**0.00%**	0.00%		
101-68-8	067	0.139	100.00%	100.00%	#N/A	
101-68-8 Total		**0.139**	**0.00%**	0.00%		
106-42-3	006	0.011	0.76%	0.76%	0.296	0.002
	062	1.000	67.51%	67.51%		0.200
	067	0.470	31.71%	31.71%		0.094
	978	0.000	0.01%	0.01%		0.000
106-42-3 Total		**1.481**	**0.01%**	0.01%		
106-46-7	062	0.125	100.00%	100.00%	#N/A	
106-46-7 Total		**0.125**	**0.00%**	0.00%		
106-88-7	006	0.068	99.84%	99.84%	#N/A	
	070	0.000	0.16%	0.16%		
106-88-7 Total		**0.068**	**0.00%**	0.00%		
106-89-8	070	1.907	100.00%	100.00%	0.408	0.408
106-89-8 Total		**1.907**	**0.01%**	0.01%		
106-93-4	002	0.075	37.16%	37.16%	0.266	0.099
	067	0.127	62.84%	62.84%		0.167
106-93-4 Total		**0.202**	**0.00%**	0.00%		
106-99-0	006	0.019	26.27%	26.27%	0.098	0.026
	070	0.009	12.77%	12.77%		0.013
	978	0.045	60.95%	60.95%		0.060
106-99-0 Total		**0.074**	**0.00%**	0.00%		
107-02-8	006	0.007	0.93%	0.93%	7.7E-01	7.2E-03
	026	0.500	64.53%	64.53%		5.0E-01
	064	0.001	0.14%	0.14%		1.1E-03
	066	0.007	0.93%	0.93%		7.2E-03
	070	0.259	33.48%	33.48%		2.6E-01
107-02-8 Total		**0.775**	**0.00%**	0.00%		
107-06-2	002	0.028	0.30%	0.30%	4.1E+00	1.2E-02
	006	0.211	2.26%	2.26%		9.3E-02
	055	0.144	1.54%	1.54%		6.4E-02
	056	0.180	1.93%	1.93%		8.0E-02
	058A	0.091	0.97%	0.97%		4.0E-02
	062	1.612	17.24%	17.24%		7.1E-01
	066	1.365	14.60%	14.60%		6.0E-01
	067	4.284	45.83%	45.83%		1.9E+00
	070	0.040	0.43%	0.43%		1.8E-02
	070A	0.352	3.76%	3.76%		1.6E-01
	077	0.042	0.45%	0.45%		1.8E-02
	080	0.056	0.60%	0.60%		2.5E-02
	978	0.944	10.10%	10.10%		4.2E-01
107-06-2 Total		**9.347**	**0.04%**	0.04%		
107-13-1	030	0.013	8.75%	8.75%	3.9E-02	3.4E-03
	062	0.004	2.70%	2.70%		1.1E-03
	066	0.008	5.46%	5.46%		2.1E-03
	067	0.019	13.08%	13.08%		5.1E-03
	070	0.101	70.01%	70.01%		2.7E-02
107-13-1 Total		**0.144**	**0.00%**	0.00%		
107-21-1	002	0.369	0.98%	0.98%	1.6E-02	1.5E-04
	006	0.589	1.57%	1.57%		2.4E-04

CAS_NO	BUILDING_NUMBER	Sum of Liters per Year	Sum of Liters per Year2	% Liters per Bldg	Calculated Emissions for Current Inventory (lb/yr)	Emissions per Bldg (lb/yr)
107-21-1	015	0.462	1.23%	1.23%		1.9E-04
	026	0.203	0.54%	0.54%		8.4E-05
	030	0.525	1.40%	1.40%		2.2E-04
	033	2.746	7.32%	7.32%		1.1E-03
	050B	0.462	1.23%	1.23%		1.9E-04
	062	0.234	0.62%	0.62%		9.7E-05
	066	2.485	6.62%	6.62%		1.0E-03
	067	18.020	48.01%	48.01%		7.5E-03
	070	5.914	15.76%	15.76%		2.5E-03
	070A	0.686	1.83%	1.83%		2.9E-04
	077	0.047	0.13%	0.13%		2.0E-05
	084	0.195	0.52%	0.52%		8.1E-05
	088	1.141	3.04%	3.04%		4.7E-04
	978	3.452	9.20%	9.20%		1.4E-03
107-21-1 Total		**37.530**	**0.16%**	0.16%		
107-98-2	002	0.111	35.03%	35.03%	6.5E-02	2.3E-02
	062	0.020	6.14%	6.14%		4.0E-03
	066	0.002	0.66%	0.66%		4.3E-04
	067	0.078	24.47%	24.47%		1.6E-02
	070	0.001	0.26%	0.26%		1.7E-04
	070A	0.003	0.94%	0.94%		6.2E-04
	074	0.086	27.13%	27.13%		1.8E-02
	978	0.017	5.35%	5.35%		3.5E-03
107-98-2 Total		**0.318**	**0.00%**	0.00%		
108-05-4	006	0.032	38.85%	38.85%	9.7E-02	3.8E-02
	070	0.050	61.15%	61.15%		6.0E-02
108-05-4 Total		**0.082**	**0.00%**	0.00%		
108-38-3	006	0.000	0.00%	0.00%	3.7E+00	6.8E-05
	066	0.040	0.17%	0.17%		6.1E-03
	067	24.359	99.83%	99.83%		3.7E+00
108-38-3 Total		**24.400**	**0.10%**	0.10%		
108-88-3	002	0.905	0.43%	0.43%	3.8E+01	1.6E-01
	006	3.031	1.45%	1.45%		5.5E-01
	015	0.614	0.29%	0.29%		1.1E-01
	026	0.086	0.04%	0.04%		1.5E-02
	030	4.030	1.92%	1.92%		7.3E-01
	033	1.911	0.91%	0.91%		3.4E-01
	055	0.372	0.18%	0.18%		6.7E-02
	062	44.854	21.42%	21.42%		8.1E+00
	064	1.109	0.53%	0.53%		2.0E-01
	066	10.934	5.22%	5.22%		2.0E+00
	067	117.197	55.97%	55.97%		2.1E+01
	070	15.971	7.63%	7.63%		2.9E+00
	070A	1.754	0.84%	0.84%		3.2E-01
	074	3.686	1.76%	1.76%		6.6E-01
	088	0.126	0.06%	0.06%		2.3E-02
	978	2.795	1.33%	1.33%		5.0E-01
108-88-3 Total		**209.375**	**0.88%**	0.88%		
108-90-7	002	0.105	0.66%	0.66%	2.6E+00	1.7E-02
	006	0.346	2.18%	2.18%		5.6E-02
	015	0.161	1.02%	1.02%		2.6E-02
	026	0.008	0.05%	0.05%		1.4E-03
	030	2.479	15.62%	15.62%		4.0E-01
	062	1.723	10.86%	10.86%		2.8E-01
	066	0.036	0.23%	0.23%		5.8E-03
	067	9.626	60.64%	60.64%		1.6E+00
	070	1.172	7.38%	7.38%		1.9E-01
	070A	0.159	1.00%	1.00%		2.6E-02
	077	0.057	0.36%	0.36%		9.3E-03
108-90-7 Total		**15.874**	**0.07%**	0.07%		
108-95-2	006	0.017	0.64%	0.64%	#N/A	
	026	0.201	7.64%	7.64%		
	066	0.005	0.17%	0.17%		
	070	0.092	3.51%	3.51%		
	070A	0.106	4.03%	4.03%		
	084	0.008	0.29%	0.29%		
	978	2.204	83.72%	83.72%		
108-95-2 Total		**2.633**	**0.01%**	0.01%		

CAS_NO	BUILDING_NUMBER	Sum of Liters per Year	Sum of Liters per Year2	% Liters per Bldg	Calculated Emissions for Current Inventory (lb/yr)	Emissions per Bldg (lb/yr)
109-86-4	002	0.261	7.67%	7.67%	3.0E-01	2.3E-02
	006	0.153	4.49%	4.49%		1.4E-02
	015	0.127	3.74%	3.74%		1.1E-02
	030	2.081	61.20%	61.20%		1.9E-01
	055	0.137	4.04%	4.04%		1.2E-02
	062	0.137	4.03%	4.03%		1.2E-02
	067	0.264	7.77%	7.77%		2.4E-02
	070	0.169	4.96%	4.96%		1.5E-02
	978	0.071	2.09%	2.09%		6.3E-03
109-86-4 Total		**3.400**	**0.01%**	0.01%		
110-54-3	002	0.226	0.03%	0.03%	7.5E+02	2.5E-01
	006	1.113	0.17%	0.17%		1.2E+00
	015	0.087	0.01%	0.01%		9.6E-02
	026	0.055	0.01%	0.01%		6.1E-02
	030	8.480	1.26%	1.26%		9.4E+00
	033	4.639	0.69%	0.69%		5.2E+00
	055	1.070	0.16%	0.16%		1.2E+00
	062	86.659	12.87%	12.87%		9.6E+01
	064	0.141	0.02%	0.02%		1.6E-01
	066	17.405	2.59%	2.59%		1.9E+01
	067	172.304	25.60%	25.60%		1.9E+02
	070	26.024	3.87%	3.87%		2.9E+01
	070A	9.454	1.40%	1.40%		1.1E+01
	074	0.761	0.11%	0.11%		8.5E-01
	077	0.156	0.02%	0.02%		1.7E-01
	084	1.558	0.23%	0.23%		1.7E+00
	978	343.030	50.96%	50.96%		3.8E+02
110-54-3 Total		**673.164**	**2.82%**	2.82%		
110-80-5	067	0.199	79.01%	79.01%	1.5E-02	1.2E-02
	070	0.053	20.99%	20.99%		3.2E-03
110-80-5 Total		**0.252**	**0.00%**	0.00%		
111-15-9	070	0.216	100.00%	100.00%	#N/A	
111-15-9 Total		**0.216**	**0.00%**	0.00%		
111-30-8	006	0.048	1.15%	1.15%	#N/A	
	015	0.004	0.10%	0.10%		
	033	0.001	0.03%	0.03%		
	062	0.002	0.04%	0.04%		
	064	0.088	2.13%	2.13%		
	066	0.001	0.02%	0.02%		
	067	3.356	80.90%	80.90%		
	070	0.484	11.66%	11.66%		
	070A	0.007	0.17%	0.17%		
	074	0.025	0.61%	0.61%		
	080	0.029	0.70%	0.70%		
	084	0.002	0.05%	0.05%		
	978	0.101	2.44%	2.44%		
111-30-8 Total		**4.149**	**0.02%**	0.02%		
111-42-2	002	0.044	5.75%	5.75%	2.9E-06	1.7E-07
	015	0.000	0.02%	0.02%		7.2E-10
	064	0.005	0.61%	0.61%		1.8E-08
	067	0.019	2.49%	2.49%		7.2E-08
	070A	0.044	5.82%	5.82%		1.7E-07
	978	0.649	85.30%	85.30%		2.5E-06
111-42-2 Total		**0.760**	**0.00%**	0.00%		
111-76-2	070A	0.001	0.41%	0.41%	1.1E-04	4.4E-07
	084	0.197	99.59%	99.59%		1.1E-04
111-76-2 Total		**0.198**	**0.00%**	0.00%		
1120-71-4	067	0.247	82.35%	82.35%	#N/A	
	978	0.053	17.65%	17.65%		
1120-71-4 Total		**0.300**	**0.00%**	0.00%		
115-07-1	978	0.026	100.00%	100.00%	#N/A	
115-07-1 Total		**0.026**	**0.00%**	0.00%		
117-81-7	062	0.138	57.97%	57.97%	#N/A	
	070	0.100	42.03%	42.03%		
117-81-7 Total		**0.238**	**0.00%**	0.00%		
121-44-8	030	0.095	2.31%	2.31%	2.6E+00	6.1E-02
	033	0.028	0.67%	0.67%		1.8E-02
	055	0.161	3.89%	3.89%		1.0E-01

CAS_NO	BUILDING_NUMBER	Sum of Liters per Year	Sum of Liters per Year2	% Liters per Bldg	Calculated Emissions for Current Inventory (lb/yr)	Emissions per Bldg (lb/yr)
121-44-8	062	0.524	12.68%	12.68%		3.3E-01
	066	0.368	8.89%	8.89%		2.3E-01
	067	1.909	46.20%	46.20%		1.2E+00
	070	0.706	17.07%	17.07%		4.5E-01
	070A	0.014	0.33%	0.33%		8.6E-03
	080	0.036	0.87%	0.87%		2.3E-02
	978	0.293	7.09%	7.09%		1.9E-01
121-44-8 Total		**4.133**	**0.02%**	0.02%		
123-91-1	002	0.062	0.40%	0.40%	7.3E+00	2.9E-02
	030	0.119	0.77%	0.77%		5.6E-02
	055	0.164	1.06%	1.06%		7.7E-02
	062	0.127	0.82%	0.82%		6.0E-02
	066	1.406	9.08%	9.08%		6.6E-01
	067	3.838	24.80%	24.80%		1.8E+00
	070	0.287	1.86%	1.86%		1.4E-01
	070A	0.119	0.77%	0.77%		5.6E-02
	978	9.357	60.45%	60.45%		4.4E+00
123-91-1 Total		**15.479**	**0.06%**	0.06%		
127-18-4	067	0.713	32.73%	32.73%	5.1E-01	1.7E-01
	070A	1.464	67.27%	67.27%		3.5E-01
127-18-4 Total		**2.177**	**0.01%**	0.01%		
1310-73-2	002	0.006	0.00%	0.00%	#N/A	
	006	0.002	0.00%	0.00%		
	015	0.000	0.00%	0.00%		
	026	0.251	0.09%	0.09%		
	030	1.547	0.58%	0.58%		
	033	0.011	0.00%	0.00%		
	055	0.008	0.00%	0.00%		
	056	0.291	0.11%	0.11%		
	062	2.360	0.89%	0.89%		
	064	0.082	0.03%	0.03%		
	066	0.388	0.15%	0.15%		
	067	4.066	1.53%	1.53%		
	070	0.577	0.22%	0.22%		
	070A	69.959	26.38%	26.38%		
	074	0.668	0.25%	0.25%		
	077A	111.925	42.20%	42.20%		
	084	0.000	0.00%	0.00%		
	978	73.066	27.55%	27.55%		
1310-73-2 Total		**265.206**	**1.11%**	1.11%		
1313-99-1	062	0.002	100.00%	100.00%	#N/A	
1313-99-1 Total		**0.002**	**0.00%**	0.00%		
1330-20-7	002	0.964	5.45%	5.45%	1.9E+01	1.1E+00
	015	0.403	2.28%	2.28%		4.4E-01
	030	8.011	45.32%	45.32%		8.8E+00
	055	0.831	4.70%	4.70%		9.2E-01
	062	1.501	8.49%	8.49%		1.7E+00
	066	0.161	0.91%	0.91%		1.8E-01
	067	1.424	8.06%	8.06%		1.6E+00
	070	2.555	14.45%	14.45%		2.8E+00
	070A	0.154	0.87%	0.87%		1.7E-01
	077	0.710	4.02%	4.02%		7.8E-01
	080	0.056	0.31%	0.31%		6.1E-02
	084	0.010	0.06%	0.06%		1.1E-02
	088	0.000	0.00%	0.00%		4.9E-05
	978	0.898	5.08%	5.08%		9.9E-01
1330-20-7 Total		**17.679**	**0.07%**	0.07%		
1333-82-0	062	0.127	86.71%	86.71%	#N/A	
	070	0.019	13.29%	13.29%		
1333-82-0 Total		**0.147**	**0.00%**	0.00%		
1634-04-4	066	0.262	6.89%	6.89%	2.6E+00	1.8E-01
	067	2.694	70.86%	70.86%		1.9E+00
	070	0.132	3.47%	3.47%		9.1E-02
	978	0.714	18.78%	18.78%		4.9E-01
1634-04-4 Total		**3.802**	**0.02%**	0.02%		
302-01-2	002	0.031	7.63%	7.63%	6.8E-02	5.2E-03
	006	0.010	2.43%	2.43%		1.6E-03
	055	0.004	0.98%	0.98%		6.6E-04

CAS_NO	BUILDING_NUMBER	Sum of Liters per Year	Sum of Liters per Year2	% Liters per Bldg	Calculated Emissions for Current Inventory (lb/yr)	Emissions per Bldg (lb/yr)
302-01-2	062	0.064	15.73%	15.73%		1.1E-02
	066	0.186	46.00%	46.00%		3.1E-02
	067	0.067	16.53%	16.53%		1.1E-02
	070	0.014	3.36%	3.36%		2.3E-03
	070A	0.030	7.34%	7.34%		5.0E-03
302-01-2 Total		**0.404**	**0.00%**	0.00%		
50-00-0	006	0.072	0.72%	0.72%	2.6E+00	1.9E-02
	015	0.040	0.41%	0.41%		1.1E-02
	026	0.336	3.38%	3.38%		8.7E-02
	033	0.090	0.91%	0.91%		2.3E-02
	055	0.000	0.00%	0.00%		2.5E-05
	056	5.684	57.21%	57.21%		1.5E+00
	062	0.994	10.01%	10.01%		2.6E-01
	066	0.019	0.20%	0.20%		5.1E-03
	067	0.128	1.29%	1.29%		3.3E-02
	070	0.459	4.62%	4.62%		1.2E-01
	070A	0.274	2.76%	2.76%		7.1E-02
	080	0.036	0.36%	0.36%		9.4E-03
	084	0.595	5.99%	5.99%		1.5E-01
	978	1.207	12.15%	12.15%		3.1E-01
50-00-0 Total		**9.935**	**0.04%**	0.04%		
51-79-6	031	0.471	83.83%	83.83%	7.7E-04	6.4E-04
	062	0.018	3.14%	3.14%		2.4E-05
	064	0.003	0.62%	0.62%		4.7E-06
	070	0.024	4.33%	4.33%		3.3E-05
	074	0.045	8.07%	8.07%		6.2E-05
51-79-6 Total		**0.562**	**0.00%**	0.00%		
540-88-5	067	0.007	100.00%	100.00%	#N/A	
540-88-5 Total		**0.007**	**0.00%**	0.00%		
55-18-5	070	0.003	100.00%	100.00%	#N/A	
55-18-5 Total		**0.003**	**0.00%**	0.00%		
56-23-5	002	0.059	2.30%	2.30%	2.7E+00	6.2E-02
	006	0.008	0.31%	0.31%		8.3E-03
	030	1.000	38.92%	38.92%		1.0E+00
	055	0.105	4.07%	4.07%		1.1E-01
	066	0.095	3.71%	3.71%		9.9E-02
	070	1.149	44.71%	44.71%		1.2E+00
	070A	0.025	0.99%	0.99%		2.6E-02
	075	0.039	1.51%	1.51%		4.0E-02
	978	0.090	3.48%	3.48%		9.3E-02
56-23-5 Total		**2.570**	**0.01%**	0.01%		
62-53-3	006	0.427	60.27%	60.27%	3.1E-03	1.9E-03
	015	0.072	10.14%	10.14%		3.1E-04
	062	0.004	0.58%	0.58%		1.8E-05
	066	0.023	3.28%	3.28%		1.0E-04
	067	0.069	9.77%	9.77%		3.0E-04
	978	0.113	15.95%	15.95%		4.9E-04
62-53-3 Total		**0.708**	**0.00%**	0.00%		
62-75-9	070	0.001	100.00%	100.00%	3.8E-04	3.8E-04
62-75-9 Total		**0.001**	**0.00%**	0.00%		
67-56-1	002	5.430	0.06%	0.06%	1.1E+04	6.0E+00
	006	15.098	0.16%	0.16%		1.7E+01
	015	1.052	0.01%	0.01%		1.2E+00
	030	146.408	1.53%	1.53%		1.6E+02
	033	19.077	0.20%	0.20%		2.1E+01
	050B	0.300	0.00%	0.00%		3.3E-01
	055	5.123	0.05%	0.05%		5.6E+00
	062	81.417	0.85%	0.85%		9.0E+01
	064	3.892	0.04%	0.04%		4.3E+00
	066	37.326	0.39%	0.39%		4.1E+01
	067	63.843	0.67%	0.67%		7.0E+01
	070	99.621	1.04%	1.04%		1.1E+02
	070A	1143.311	11.97%	11.97%		1.3E+03
	072	78.523	0.82%	0.82%		8.7E+01
	074	2.757	0.03%	0.03%		3.0E+00
	077	3.746	0.04%	0.04%		4.1E+00
	080	0.442	0.00%	0.00%		4.9E-01
	081	0.758	0.01%	0.01%		8.4E-01

CAS_NO	BUILDING_NUMBER	Sum of Liters per Year	Sum of Liters per Year2	% Liters per Bldg	Calculated Emissions for Current Inventory (lb/yr)	Emissions per Bldg (lb/yr)
67-56-1	084	0.688	0.01%	0.01%		7.6E-01
	088	1.494	0.02%	0.02%		1.6E+00
	091	0.018	0.00%	0.00%		2.0E-02
	978	7839.971	82.09%	82.09%		8.6E+03
67-56-1 Total		**9550.295**	**39.99%**	39.99%		
67-63-0	002	56.763	0.88%	0.88%	7.1E+03	6.3E+01
	006	21.743	0.34%	0.34%		2.4E+01
	007	0.128	0.00%	0.00%		1.4E-01
	015	21.354	0.33%	0.33%		2.4E+01
	026	0.017	0.00%	0.00%		1.9E-02
	030	145.304	2.25%	2.25%		1.6E+02
	033	5.604	0.09%	0.09%		6.2E+00
	046	9.698	0.15%	0.15%		1.1E+01
	050A	1.409	0.02%	0.02%		1.6E+00
	050B	0.491	0.01%	0.01%		5.4E-01
	053	0.513	0.01%	0.01%		5.7E-01
	055	52.263	0.81%	0.81%		5.8E+01
	056	0.668	0.01%	0.01%		7.4E-01
	058A	0.122	0.00%	0.00%		1.3E-01
	062	143.217	2.22%	2.22%		1.6E+02
	064	19.113	0.30%	0.30%		2.1E+01
	066	54.755	0.85%	0.85%		6.0E+01
	067	3422.305	53.10%	53.10%		3.8E+03
	070	250.523	3.89%	3.89%		2.8E+02
	070A	957.138	14.85%	14.85%		1.1E+03
	071	0.247	0.00%	0.00%		2.7E-01
	071B	112.926	1.75%	1.75%		1.2E+02
	072	8.654	0.13%	0.13%		9.5E+00
	074	1.280	0.02%	0.02%		1.4E+00
	076	3.337	0.05%	0.05%		3.7E+00
	077	34.355	0.53%	0.53%		3.8E+01
	077A	0.037	0.00%	0.00%		4.1E-02
	080	0.788	0.01%	0.01%		8.7E-01
	084	3.260	0.05%	0.05%		3.6E+00
	088	200.249	3.11%	3.11%		2.2E+02
	091	18.512	0.29%	0.29%		2.0E+01
	978	898.125	13.94%	13.94%		9.9E+02
67-63-0 Total		**6444.899**	**26.99%**	26.99%		
67-66-3	002	0.498	0.30%	0.30%	1.3E+02	3.9E-01
	006	2.455	1.46%	1.46%		1.9E+00
	015	0.232	0.14%	0.14%		1.8E-01
	026	0.363	0.22%	0.22%		2.8E-01
	030	19.615	11.70%	11.70%		1.5E+01
	033	12.822	7.65%	7.65%		9.9E+00
	055	1.277	0.76%	0.76%		9.9E-01
	062	12.147	7.24%	7.24%		9.4E+00
	064	0.031	0.02%	0.02%		2.4E-02
	066	9.796	5.84%	5.84%		7.6E+00
	067	21.100	12.58%	12.58%		1.6E+01
	070	14.564	8.69%	8.69%		1.1E+01
	070A	0.594	0.35%	0.35%		4.6E-01
	074	0.702	0.42%	0.42%		5.5E-01
	080	0.171	0.10%	0.10%		1.3E-01
	084	0.082	0.05%	0.05%		6.4E-02
	978	71.247	42.49%	42.49%		5.5E+01
67-66-3 Total		**167.696**	**0.70%**	0.70%		
71-43-2	006	2.289	15.08%	15.08%	5.9E+00	9.0E-01
	015	0.013	0.09%	0.09%		5.3E-03
	026	0.512	3.37%	3.37%		2.0E-01
	030	1.000	6.59%	6.59%		3.9E-01
	033	0.442	2.91%	2.91%		1.7E-01
	055	0.029	0.19%	0.19%		1.1E-02
	056	0.006	0.04%	0.04%		2.3E-03
	062	2.498	16.45%	16.45%		9.8E-01
	066	3.432	22.60%	22.60%		1.3E+00
	067	1.041	6.86%	6.86%		4.1E-01
	070	0.532	3.50%	3.50%		2.1E-01
	074	3.147	20.72%	20.72%		1.2E+00

CAS_NO	BUILDING_NUMBER	Sum of Liters per Year	Sum of Liters per Year2	% Liters per Bldg	Calculated Emissions for Current Inventory (lb/yr)	Emissions per Bldg (lb/yr)
71-43-2	080	0.047	0.31%	0.31%		1.8E-02
	978	0.195	1.29%	1.29%		7.6E-02
71-43-2 Total		**15.183**	**0.06%**	0.06%		
71-55-6	002	0.599	45.64%	45.64%	2.7E-01	1.2E-01
	006	0.101	7.68%	7.68%		2.1E-02
	015	0.009	0.70%	0.70%		1.9E-03
	066	0.038	2.88%	2.88%		7.8E-03
	070	0.004	0.31%	0.31%		8.5E-04
	070A	0.377	28.72%	28.72%		7.8E-02
	077	0.185	14.07%	14.07%		3.8E-02
71-55-6 Total		**1.312**	**0.01%**	0.01%		
7439-92-1	070A	0.007	100.00%	100.00%	#N/A	
7439-92-1 Total		**0.007**	**0.00%**	0.00%		
7439-96-5	070	0.105	31.13%	31.13%	#N/A	
	070A	0.233	68.87%	68.87%		
7439-96-5 Total		**0.339**	**0.00%**	0.00%		
7439-97-6	055	0.110	22.21%	22.21%	1.1E-05	2.5E-06
	067	0.040	7.99%	7.99%		9.0E-07
	077	0.067	13.43%	13.43%		1.5E-06
	083	0.280	56.37%	56.37%		6.4E-06
7439-97-6 Total		**0.497**	**0.00%**	0.00%		
7440-02-0	062	0.026	4.15%	4.15%	#N/A	
	070	0.379	59.33%	59.33%		
	070A	0.233	36.53%	36.53%		
7440-02-0 Total		**0.639**	**0.00%**	0.00%		
7440-38-2	002	0.011	4.36%	4.36%	#N/A	
	064	0.008	3.09%	3.09%		
	070A	0.233	92.55%	92.55%		
7440-38-2 Total		**0.252**	**0.00%**	0.00%		
7440-43-9	070A	0.538	99.98%	99.98%	#N/A	
	074	0.000	0.02%	0.02%		
7440-43-9 Total		**0.538**	**0.00%**	0.00%		
7440-48-4	070A	3.042	100.00%	100.00%	#N/A	
7440-48-4 Total		**3.042**	**0.01%**	0.01%		
7440-50-8	064	0.001	0.20%	0.20%	#N/A	
	067	0.029	7.63%	7.63%		
	070	0.119	31.10%	31.10%		
	070A	0.233	61.07%	61.07%		
7440-50-8 Total		**0.382**	**0.00%**	0.00%		
7440-62-2	067	0.024	76.96%	76.96%	#N/A	
	070A	0.007	23.04%	23.04%		
7440-62-2 Total		**0.031**	**0.00%**	0.00%		
74-83-9	033	0.096	6.22%	6.22%	#N/A	
	070A	1.454	93.78%	93.78%		
74-83-9 Total		**1.550**	**0.01%**	0.01%		
75-15-0	002	0.242	8.34%	8.34%	3.8E+00	3.2E-01
	006	0.044	1.52%	1.52%		5.8E-02
	015	0.652	22.44%	22.44%		8.6E-01
	062	1.000	34.44%	34.44%		1.3E+00
	066	0.035	1.21%	1.21%		4.6E-02
	067	0.115	3.95%	3.95%		1.5E-01
	070	0.817	28.11%	28.11%		1.1E+00
75-15-0 Total		**2.905**	**0.01%**	0.01%		
75-21-8	006	0.037	100.00%	100.00%	4.8E-02	4.8E-02
75-21-8 Total		**0.037**	**0.00%**	0.00%		
75-35-4	006	0.000	100.00%	100.00%	5.5E-04	5.5E-04
75-35-4 Total		**0.000**	**0.00%**	0.00%		
75-56-9	006	0.066	7.08%	7.08%	1.2E+00	8.7E-02
	030	0.025	2.71%	2.71%		3.3E-02
	066	0.005	0.52%	0.52%		6.3E-03
	067	0.009	0.94%	0.94%		1.1E-02
	070	0.635	68.58%	68.58%		8.4E-01
	978	0.187	20.17%	20.17%		2.5E-01
75-56-9 Total		**0.926**	**0.00%**	0.00%		
7631-86-9	002	1.000	15.31%	15.31%	#N/A	
	033	0.170	2.59%	2.59%		
	067	3.440	52.65%	52.65%		
	070	0.840	12.85%	12.85%		

CAS_NO	BUILDING_NUMBER	Sum of Liters per Year	Sum of Liters per Year2	% Liters per Bldg	Calculated Emissions for Current Inventory (lb/yr)	Emissions per Bldg (lb/yr)
7631-86-9	070A	0.410	6.28%	6.28%		
	072	0.083	1.27%	1.27%		
	074	0.223	3.41%	3.41%		
	077	0.368	5.63%	5.63%		
	080	0.001	0.01%	0.01%		
7631-86-9 Total		**6.533**	**0.03%**	0.03%		
7647-01-0	002	9.012	2.78%	2.78%	9.9E+01	2.7E+00
	006	0.078	0.02%	0.02%		2.4E-02
	015	17.846	5.50%	5.50%		5.4E+00
	026	0.796	0.25%	0.25%		2.4E-01
	030	20.694	6.38%	6.38%		6.3E+00
	033	0.880	0.27%	0.27%		2.7E-01
	055	0.246	0.08%	0.08%		7.5E-02
	056	0.131	0.04%	0.04%		4.0E-02
	062	37.784	11.64%	11.64%		1.1E+01
	064	2.602	0.80%	0.80%		7.9E-01
	066	1.759	0.54%	0.54%		5.3E-01
	067	21.811	6.72%	6.72%		6.6E+00
	070	14.007	4.32%	4.32%		4.3E+00
	070A	175.884	54.19%	54.19%		5.3E+01
	074	2.543	0.78%	0.78%		7.7E-01
	077	0.032	0.01%	0.01%		9.9E-03
	080	0.034	0.01%	0.01%		1.0E-02
	084	0.708	0.22%	0.22%		2.2E-01
	088	0.167	0.05%	0.05%		5.1E-02
	978	17.537	5.40%	5.40%		5.3E+00
7647-01-0 Total		**324.550**	**1.36%**	1.36%		
7664-38-2	002	1.183	2.31%	2.31%	1.5E-02	3.4E-04
	006	0.015	0.03%	0.03%		4.2E-06
	030	9.158	17.90%	17.90%		2.6E-03
	033	0.021	0.04%	0.04%		6.0E-06
	055	0.176	0.34%	0.34%		5.0E-05
	062	0.457	0.89%	0.89%		1.3E-04
	064	0.068	0.13%	0.13%		1.9E-05
	066	0.511	1.00%	1.00%		1.5E-04
	067	0.195	0.38%	0.38%		5.6E-05
	070	1.149	2.25%	2.25%		3.3E-04
	070A	7.142	13.96%	13.96%		2.0E-03
	074	0.533	1.04%	1.04%		1.5E-04
	077	7.479	14.62%	14.62%		2.1E-03
	080	0.299	0.58%	0.58%		8.6E-05
	084	0.272	0.53%	0.53%		7.8E-05
	978	22.493	43.97%	43.97%		6.4E-03
7664-38-2 Total		**51.152**	**0.21%**	0.21%		
7664-39-3	002	2.051	0.81%	0.81%	2.4E+00	1.9E-02
	006	0.226	0.09%	0.09%		2.1E-03
	030	0.274	0.11%	0.11%		2.6E-03
	055	0.082	0.03%	0.03%		7.7E-04
	062	0.655	0.26%	0.26%		6.1E-03
	066	0.308	0.12%	0.12%		2.9E-03
	067	16.749	6.62%	6.62%		1.6E-01
	070	0.475	0.19%	0.19%		4.4E-03
	070A	232.011	91.65%	91.65%		2.2E+00
	074	0.024	0.01%	0.01%		2.3E-04
	077	0.178	0.07%	0.07%		1.7E-03
	088	0.126	0.05%	0.05%		1.2E-03
7664-39-3 Total		**253.159**	**1.06%**	1.06%		
7664-41-7	002	2.043	1.71%	1.71%	7.1E+01	1.2E+00
	030	4.741	3.96%	3.96%		2.8E+00
	062	8.721	7.29%	7.29%		5.2E+00
	066	0.300	0.25%	0.25%		1.8E-01
	067	96.446	80.57%	80.57%		5.7E+01
	070A	0.048	0.04%	0.04%		2.9E-02
	074	0.174	0.15%	0.15%		1.0E-01
	077	0.000	0.00%	0.00%		3.4E-06
	978	7.225	6.04%	6.04%		4.3E+00
7664-41-7 Total		**119.700**	**0.50%**	0.50%		
7664-93-9	002	2.265	0.04%	0.04%	3.3E+01	1.4E-02

CAS_NO	BUILDING_NUMBER	Sum of Liters per Year	Sum of Liters per Year2	% Liters per Bldg	Calculated Emissions for Current Inventory (lb/yr)	Emissions per Bldg (lb/yr)
7664-93-9	006	0.008	0.00%	0.00%		4.7E-05
	026	378.400	7.10%	7.10%		2.4E+00
	030	0.374	0.01%	0.01%		2.3E-03
	033	0.076	0.00%	0.00%		4.7E-04
	055	0.111	0.00%	0.00%		6.9E-04
	056	0.046	0.00%	0.00%		2.9E-04
	062	3.020	0.06%	0.06%		1.9E-02
	064	1.154	0.02%	0.02%		7.2E-03
	066	2.784	0.05%	0.05%		1.7E-02
	067	82.338	1.54%	1.54%		5.1E-01
	070	6.985	0.13%	0.13%		4.3E-02
	070A	4651.598	87.24%	87.24%		2.9E+01
	074	1.215	0.02%	0.02%		7.5E-03
	077A	111.925	2.10%	2.10%		7.0E-01
	084	2.568	0.05%	0.05%		1.6E-02
	088	0.052	0.00%	0.00%		3.2E-04
	978	86.861	1.63%	1.63%		5.4E-01
7664-93-9 Total		**5331.781**	**22.33%**	22.33%		
7697-37-2	002	5.231	1.90%	1.90%	6.1E+01	1.2E+00
	006	0.019	0.01%	0.01%		4.2E-03
	030	58.568	21.23%	21.23%		1.3E+01
	033	1.938	0.70%	0.70%		4.3E-01
	055	3.461	1.25%	1.25%		7.7E-01
	056	0.091	0.03%	0.03%		2.0E-02
	062	4.878	1.77%	1.77%		1.1E+00
	064	0.316	0.11%	0.11%		7.0E-02
	066	1.524	0.55%	0.55%		3.4E-01
	067	4.630	1.68%	1.68%		1.0E+00
	070	6.186	2.24%	2.24%		1.4E+00
	070A	95.634	34.66%	34.66%		2.1E+01
	072	0.311	0.11%	0.11%		6.9E-02
	074	19.141	6.94%	6.94%		4.2E+00
	075	0.139	0.05%	0.05%		3.1E-02
	077	0.034	0.01%	0.01%		7.5E-03
	088	0.251	0.09%	0.09%		5.6E-02
	978	73.570	26.66%	26.66%		1.6E+01
7697-37-2 Total		**275.923**	**1.16%**	1.16%		
7782-49-2	006	0.005	16.19%	16.19%	#N/A	
	067	0.023	83.81%	83.81%		
7782-49-2 Total		**0.028**	**0.00%**	0.00%		
7782-50-5	006	0.140	12.28%	12.28%	1.5E+00	1.9E-01
	066	0.225	19.71%	19.71%		3.0E-01
	070A	0.775	68.01%	68.01%		1.0E+00
7782-50-5 Total		**1.139**	**0.00%**	0.00%		
7803-51-2	088	0.002	100.00%	100.00%	#N/A	
7803-51-2 Total		**0.002**	**0.00%**	0.00%		
78-59-1	066	0.000	0.03%	0.03%	2.8E-02	9.3E-06
	067	0.755	99.92%	99.92%		2.8E-02
	070	0.000	0.05%	0.05%		1.4E-05
78-59-1 Total		**0.756**	**0.00%**	0.00%		
78-93-3	006	0.241	5.25%	5.25%	1.4E+00	7.2E-02
	027	0.028	0.61%	0.61%		8.4E-03
	033	1.032	22.45%	22.45%		3.1E-01
	055	0.000	0.00%	0.00%		1.6E-05
	056	0.097	2.12%	2.12%		2.9E-02
	062	0.536	11.65%	11.65%		1.6E-01
	064	0.292	6.35%	6.35%		8.7E-02
	066	0.018	0.39%	0.39%		5.4E-03
	067	0.193	4.20%	4.20%		5.8E-02
	070	0.345	7.51%	7.51%		1.0E-01
	070A	0.043	0.94%	0.94%		1.3E-02
	071	0.001	0.03%	0.03%		4.5E-04
	076	1.493	32.49%	32.49%		4.5E-01
	978	0.275	5.99%	5.99%		8.2E-02
78-93-3 Total		**4.595**	**0.02%**	0.02%		
79-00-5	015	0.002	2.73%	2.73%	2.2E-02	6.1E-04
	066	0.081	97.27%	97.27%		2.2E-02
79-00-5 Total		**0.083**	**0.00%**	0.00%		

CAS_NO	BUILDING_NUMBER	Sum of Liters per Year	Sum of Liters per Year2	% Liters per Bldg	Calculated Emissions for Current Inventory (lb/yr)	Emissions per Bldg (lb/yr)
79-34-5	067	0.247	100.00%	100.00%	2.0E-01	2.0E-01
79-34-5 Total		**0.247**	**0.00%**	0.00%		
8014-95-7	067	0.258	100.00%	100.00%	#N/A	
8014-95-7 Total		**0.258**	**0.00%**	0.00%		
822-06-0	067	0.022	72.85%	72.85%	2.5E-04	1.8E-04
	070	0.008	27.15%	27.15%		6.8E-05
822-06-0 Total		**0.031**	**0.00%**	0.00%		
85-44-9	978	0.005	100.00%	100.00%	#N/A	
85-44-9 Total		**0.005**	**0.00%**	0.00%		
91-20-3	070	1.159	99.97%	99.97%	#N/A	
	978	0.000	0.03%	0.03%		
91-20-3 Total		**1.159**	**0.00%**	0.00%		
95-47-6	002	0.307	18.41%	18.41%	1.8E-01	3.3E-02
	006	0.083	4.98%	4.98%		8.8E-03
	066	1.018	61.07%	61.07%		1.1E-01
	067	0.066	3.96%	3.96%		7.0E-03
	978	0.193	11.59%	11.59%		2.1E-02
95-47-6 Total		**1.667**	**0.01%**	0.01%		
Grand Total		**23878.819**	**100.00%**			

Existing (2024) Lab Emissions per Building

BASELINE (From inventory)

CAS_NO	Chemical Name	BUILDING NUMBER	Emissions per Bldg (lb/yr)
106-93-4	Ethylene dibromide {EDB}	002	9.9E-02
107-06-2	Ethylene dichloride [EDC]	002	1.2E-02
107-21-1	Ethylene glycol	002	1.5E-04
107-98-2	Propylene glycol monomethyl ether	002	2.3E-02
108-88-3	Toluene	002	1.6E-01
108-90-7	Chlorobenzene	002	1.7E-02
109-86-4	Ethylene glycol monomethyl ether	002	2.3E-02
110-54-3	Hexane	002	2.5E-01
111-42-2	Diethanolamine	002	1.7E-07
123-91-1	1,4-Dioxane	002	2.9E-02
1330-20-7	Xylenes (mixed isomers)	002	1.1E+00
302-01-2	Hydrazine	002	5.2E-03
56-23-5	Carbon tetrachloride	002	6.2E-02
67-56-1	Methanol	002	6.0E+00
67-63-0	Isopropyl alcohol	002	6.3E+01
67-66-3	Chloroform	002	3.9E-01
71-55-6	Methyl chloroform [1,1,1-TCA]	002	1.2E-01
75-15-0	Carbon disulfide	002	3.2E-01
7647-01-0	Hydrochloric acid	002	2.7E+00
7664-38-2	Phosphoric acid	002	3.4E-04
7664-39-3	Hydrogen fluoride	002	1.9E-02
7664-41-7	Ammonia	002	1.2E+00
7664-93-9	Sulfuric acid	002	1.4E-02
7697-37-2	Nitric acid	002	1.2E+00
95-47-6	o-Xylene	002	3.3E-02
100-42-5	Styrene	006	1.7E-02
100-44-7	Benzyl chloride	006	4.5E-05
106-42-3	p-Xylene	006	2.3E-03
106-99-0	1,3-Butadiene	006	2.6E-02
107-02-8	Acrolein	006	7.2E-03
107-06-2	Ethylene dichloride [EDC]	006	9.3E-02
107-21-1	Ethylene glycol	006	2.4E-04
108-05-4	Vinyl acetate	006	3.8E-02
108-38-3	m-Xylene	006	6.8E-05
108-88-3	Toluene	006	5.5E-01
108-90-7	Chlorobenzene	006	5.6E-02
109-86-4	Ethylene glycol monomethyl ether	006	1.4E-02
110-54-3	Hexane	006	1.2E+00
111-30-8	GLUTARALDEHYDE	006	5.3E-02
302-01-2	Hydrazine	006	1.6E-03
50-00-0	Formaldehyde	006	1.9E-02
56-23-5	Carbon tetrachloride	006	8.3E-03
62-53-3	Aniline	006	1.9E-03
67-56-1	Methanol	006	1.7E+01
67-63-0	Isopropyl alcohol	006	2.4E+01
67-66-3	Chloroform	006	1.9E+00
71-43-2	Benzene	006	9.0E-01
71-55-6	Methyl chloroform [1,1,1-TCA]	006	2.1E-02
75-15-0	Carbon disulfide	006	5.8E-02
75-21-8	Ethylene oxide	006	4.8E-02
75-35-4	Vinylidene chloride	006	5.5E-04
75-56-9	Propylene oxide	006	8.7E-02
7647-01-0	Hydrochloric acid	006	2.4E-02
7664-38-2	Phosphoric acid	006	4.2E-06
7664-39-3	Hydrogen fluoride	006	2.1E-03
7664-93-9	Sulfuric acid	006	4.7E-05
7697-37-2	Nitric acid	006	4.2E-03
7782-50-5	Chlorine	006	1.9E-01
78-93-3	Methyl ethyl ketone [2-Butanone]	006	7.2E-02
95-47-6	o-Xylene	006	8.8E-03
67-63-0	Isopropyl alcohol	007	1.4E-01
107-21-1	Ethylene glycol	015	1.9E-04
108-88-3	Toluene	015	1.1E-01
108-90-7	Chlorobenzene	015	2.6E-02
109-86-4	Ethylene glycol monomethyl ether	015	1.1E-02
110-54-3	Hexane	015	9.6E-02
111-30-8	GLUTARALDEHYDE	015	4.7E-03
111-42-2	Diethanolamine	015	7.2E-10
1330-20-7	Xylenes (mixed isomers)	015	4.4E-01
50-00-0	Formaldehyde	015	1.1E-02
62-53-3	Aniline	015	3.1E-04
67-56-1	Methanol	015	1.2E+00
67-63-0	Isopropyl alcohol	015	2.4E+01
67-66-3	Chloroform	015	1.8E-01
71-43-2	Benzene	015	5.3E-03
71-55-6	Methyl chloroform [1,1,1-TCA]	015	1.9E-03
75-15-0	Carbon disulfide	015	8.6E-01
7647-01-0	Hydrochloric acid	015	5.4E+00
79-00-5	1,1,2-Trichloroethane	015	6.1E-04

BASELINE (From inventory)

CAS_NO	Chemical Name	BUILDING NUMBER	Emissions per Bldg (lb/yr)
107-02-8	Acrolein	026	5.0E-01
107-21-1	Ethylene glycol	026	8.4E-05
108-88-3	Toluene	026	1.5E-02
108-90-7	Chlorobenzene	026	1.4E-03
110-54-3	Hexane	026	6.1E-02
50-00-0	Formaldehyde	026	8.7E-02
67-63-0	Isopropyl alcohol	026	1.9E-02
67-66-3	Chloroform	026	2.8E-01
71-43-2	Benzene	026	2.0E-01
7647-01-0	Hydrochloric acid	026	2.4E-01
7664-93-9	Sulfuric acid	026	2.4E+00
78-93-3	Methyl ethyl ketone [2-Butanone]	027	8.4E-03
100-42-5	Styrene	030	3.8E-02
107-13-1	Acrylonitrile	030	3.4E-03
107-21-1	Ethylene glycol	030	2.2E-04
108-88-3	Toluene	030	7.3E-01
108-90-7	Chlorobenzene	030	4.0E-01
109-86-4	Ethylene glycol monomethyl ether	030	1.9E-01
110-54-3	Hexane	030	9.4E+00
121-44-8	Triethylamine	030	6.1E-02
123-91-1	1,4-Dioxane	030	5.6E-02
1330-20-7	Xylenes (mixed isomers)	030	8.8E+00
56-23-5	Carbon tetrachloride	030	1.0E+00
67-56-1	Methanol	030	1.6E+02
67-63-0	Isopropyl alcohol	030	1.6E+02
67-66-3	Chloroform	030	1.5E+01
71-43-2	Benzene	030	3.9E-01
75-56-9	Propylene oxide	030	3.3E-02
7647-01-0	Hydrochloric acid	030	6.3E+00
7664-38-2	Phosphoric acid	030	2.6E-03
7664-39-3	Hydrogen fluoride	030	2.6E-03
7664-41-7	Ammonia	030	2.8E+00
7664-93-9	Sulfuric acid	030	2.3E-03
7697-37-2	Nitric acid	030	1.3E+01
51-79-6	Urethane	031	6.4E-04
100-42-5	Styrene	033	4.2E-04
107-21-1	Ethylene glycol	033	1.1E-03
108-88-3	Toluene	033	3.4E-01
110-54-3	Hexane	033	5.2E+00
111-30-8	GLUTARALDEHYDE	033	1.2E-03
121-44-8	Triethylamine	033	1.8E-02
50-00-0	Formaldehyde	033	2.3E-02
67-56-1	Methanol	033	2.1E+01
67-63-0	Isopropyl alcohol	033	6.2E+00
67-66-3	Chloroform	033	9.9E+00
71-43-2	Benzene	033	1.7E-01
7647-01-0	Hydrochloric acid	033	2.7E-01
7664-38-2	Phosphoric acid	033	6.0E-06
7664-93-9	Sulfuric acid	033	4.7E-04
7697-37-2	Nitric acid	033	4.3E-01
78-93-3	Methyl ethyl ketone [2-Butanone]	033	3.1E-01
67-63-0	Isopropyl alcohol	046	1.1E+01
67-63-0	Isopropyl alcohol	053	5.7E-01
107-06-2	Ethylene dichloride [EDC]	055	6.4E-02
108-88-3	Toluene	055	6.7E-02
109-86-4	Ethylene glycol monomethyl ether	055	1.2E-02
110-54-3	Hexane	055	1.2E+00
121-44-8	Triethylamine	055	1.0E-01
123-91-1	1,4-Dioxane	055	7.7E-02
1330-20-7	Xylenes (mixed isomers)	055	9.2E-01
302-01-2	Hydrazine	055	6.6E-04
50-00-0	Formaldehyde	055	2.5E-05
56-23-5	Carbon tetrachloride	055	1.1E-01
67-56-1	Methanol	055	5.6E+00
67-63-0	Isopropyl alcohol	055	5.8E+01
67-66-3	Chloroform	055	9.9E-01
71-43-2	Benzene	055	1.1E-02
7439-97-6	Mercury	055	2.5E-06
7647-01-0	Hydrochloric acid	055	7.5E-02
7664-38-2	Phosphoric acid	055	5.0E-05
7664-39-3	Hydrogen fluoride	055	7.7E-04
7664-93-9	Sulfuric acid	055	6.9E-04
7697-37-2	Nitric acid	055	7.7E-01
78-93-3	Methyl ethyl ketone [2-Butanone]	055	1.6E-05
107-06-2	Ethylene dichloride [EDC]	056	8.0E-02
50-00-0	Formaldehyde	056	1.5E+00
67-63-0	Isopropyl alcohol	056	7.4E-01
71-43-2	Benzene	056	2.3E-03
7647-01-0	Hydrochloric acid	056	4.0E-02

BASELINE (From inventory)

CAS_NO	Chemical Name	BUILDING NUMBER	Emissions per Bldg (lb/yr)
7664-93-9	Sulfuric acid	056	2.9E-04
7697-37-2	Nitric acid	056	2.0E-02
78-93-3	Methyl ethyl ketone [2-Butanone]	056	2.9E-02
106-42-3	p-Xylene	062	2.0E-01
107-06-2	Ethylene dichloride [EDC]	062	7.1E-01
107-13-1	Acrylonitrile	062	1.1E-03
107-21-1	Ethylene glycol	062	9.7E-05
107-98-2	Propylene glycol monomethyl ether	062	4.0E-03
108-88-3	Toluene	062	8.1E+00
108-90-7	Chlorobenzene	062	2.8E-01
109-86-4	Ethylene glycol monomethyl ether	062	1.2E-02
110-54-3	Hexane	062	9.6E+01
111-30-8	GLUTARALDEHYDE	062	2.0E-03
121-44-8	Triethylamine	062	3.3E-01
123-91-1	1,4-Dioxane	062	6.0E-02
1330-20-7	Xylenes (mixed isomers)	062	1.7E+00
302-01-2	Hydrazine	062	1.1E-02
50-00-0	Formaldehyde	062	2.6E-01
51-79-6	Urethane	062	2.4E-05
62-53-3	Aniline	062	1.8E-05
67-56-1	Methanol	062	9.0E+01
67-63-0	Isopropyl alcohol	062	1.6E+02
67-66-3	Chloroform	062	9.4E+00
71-43-2	Benzene	062	9.8E-01
75-15-0	Carbon disulfide	062	1.3E+00
7647-01-0	Hydrochloric acid	062	1.1E+01
7664-38-2	Phosphoric acid	062	1.3E-04
7664-39-3	Hydrogen fluoride	062	6.1E-03
7664-41-7	Ammonia	062	5.2E+00
7664-93-9	Sulfuric acid	062	1.9E-02
7697-37-2	Nitric acid	062	1.1E+00
78-93-3	Methyl ethyl ketone [2-Butanone]	062	1.6E-01
107-02-8	Acrolein	064	1.1E-03
108-88-3	Toluene	064	2.0E-01
110-54-3	Hexane	064	1.6E-01
111-30-8	GLUTARALDEHYDE	064	9.8E-02
111-42-2	Diethanolamine	064	1.8E-08
51-79-6	Urethane	064	4.7E-06
67-56-1	Methanol	064	4.3E+00
67-63-0	Isopropyl alcohol	064	2.1E+01
67-66-3	Chloroform	064	2.4E-02
7647-01-0	Hydrochloric acid	064	7.9E-01
7664-38-2	Phosphoric acid	064	1.9E-05
7664-93-9	Sulfuric acid	064	7.2E-03
7697-37-2	Nitric acid	064	7.0E-02
78-93-3	Methyl ethyl ketone [2-Butanone]	064	8.7E-02
100-41-4	Ethyl benzene	066	8.4E-03
100-42-5	Styrene	066	8.7E-02
107-02-8	Acrolein	066	7.2E-03
107-06-2	Ethylene dichloride [EDC]	066	6.0E-01
107-13-1	Acrylonitrile	066	2.1E-03
107-21-1	Ethylene glycol	066	1.0E-03
107-98-2	Propylene glycol monomethyl ether	066	4.3E-04
108-38-3	m-Xylene	066	6.1E-03
108-88-3	Toluene	066	2.0E+00
108-90-7	Chlorobenzene	066	5.8E-03
110-54-3	Hexane	066	1.9E+01
111-30-8	GLUTARALDEHYDE	066	8.0E-04
121-44-8	Triethylamine	066	2.3E-01
123-91-1	1,4-Dioxane	066	6.6E-01
1330-20-7	Xylenes (mixed isomers)	066	1.8E-01
1634-04-4	Methyl tert-butyl ether	066	1.8E-01
302-01-2	Hydrazine	066	3.1E-02
50-00-0	Formaldehyde	066	5.1E-03
56-23-5	Carbon tetrachloride	066	9.9E-02
62-53-3	Aniline	066	1.0E-04
67-56-1	Methanol	066	4.1E+01
67-63-0	Isopropyl alcohol	066	6.0E+01
67-66-3	Chloroform	066	7.6E+00
71-43-2	Benzene	066	1.3E+00
71-55-6	Methyl chloroform [1,1,1-TCA]	066	7.8E-03
75-15-0	Carbon disulfide	066	4.6E-02
75-56-9	Propylene oxide	066	6.3E-03
7647-01-0	Hydrochloric acid	066	5.3E-01
7664-38-2	Phosphoric acid	066	1.5E-04
7664-39-3	Hydrogen fluoride	066	2.9E-03
7664-41-7	Ammonia	066	1.8E-01
7664-93-9	Sulfuric acid	066	1.7E-02
7697-37-2	Nitric acid	066	3.4E-01

BASELINE (From inventory)

CAS_NO	Chemical Name	BUILDING NUMBER	Emissions per Bldg (lb/yr)
7782-50-5	Chlorine	066	3.0E-01
78-59-1	Isophorone	066	9.3E-06
78-93-3	Methyl ethyl ketone [2-Butanone]	066	5.4E-03
79-00-5	1,1,2-Trichloroethane	066	2.2E-02
95-47-6	o-Xylene	066	1.1E-01
100-41-4	Ethyl benzene	067	1.2E-03
100-42-5	Styrene	067	6.2E-02
100-44-7	Benzyl chloride	067	3.6E-04
106-42-3	p-Xylene	067	9.4E-02
106-93-4	Ethylene dibromide {EDB}	067	1.7E-01
107-06-2	Ethylene dichloride [EDC]	067	1.9E+00
107-13-1	Acrylonitrile	067	5.1E-03
107-21-1	Ethylene glycol	067	7.5E-03
107-98-2	Propylene glycol monomethyl ether	067	1.6E-02
108-38-3	m-Xylene	067	3.7E+00
108-88-3	Toluene	067	2.1E+01
108-90-7	Chlorobenzene	067	1.6E+00
109-86-4	Ethylene glycol monomethyl ether	067	2.4E-02
110-54-3	Hexane	067	1.9E+02
110-80-5	Ethylene glycol monoethyl ether	067	1.2E-02
111-30-8	GLUTARALDEHYDE	067	3.7E+00
111-42-2	Diethanolamine	067	7.2E-08
121-44-8	Triethylamine	067	1.2E+00
123-91-1	1,4-Dioxane	067	1.8E+00
127-18-4	Perchloroethylene {Tetrachloroethene}	067	1.7E-01
1330-20-7	Xylenes (mixed isomers)	067	1.6E+00
1634-04-4	Methyl tert-butyl ether	067	1.9E+00
302-01-2	Hydrazine	067	1.1E-02
50-00-0	Formaldehyde	067	3.3E-02
62-53-3	Aniline	067	3.0E-04
67-56-1	Methanol	067	7.0E+01
67-63-0	Isopropyl alcohol	067	3.8E+03
67-66-3	Chloroform	067	1.6E+01
71-43-2	Benzene	067	4.1E-01
7439-97-6	Mercury	067	9.0E-07
75-15-0	Carbon disulfide	067	1.5E-01
75-56-9	Propylene oxide	067	1.1E-02
7647-01-0	Hydrochloric acid	067	6.6E+00
7664-38-2	Phosphoric acid	067	5.6E-05
7664-39-3	Hydrogen fluoride	067	1.6E-01
7664-41-7	Ammonia	067	5.7E+01
7664-93-9	Sulfuric acid	067	5.1E-01
7697-37-2	Nitric acid	067	1.0E+00
78-59-1	Isophorone	067	2.8E-02
78-93-3	Methyl ethyl ketone [2-Butanone]	067	5.8E-02
79-34-5	1,1,2,2-Tetrachloroethane	067	2.0E-01
822-06-0	Hexamethylene-1,6-diisocyanate	067	1.8E-04
95-47-6	o-Xylene	067	7.0E-03
100-41-4	Ethyl benzene	070	6.4E-03
100-42-5	Styrene	070	2.1E-01
100-44-7	Benzyl chloride	070	3.6E-04
106-89-8	Epichlorohydrin	070	4.1E-01
106-99-0	1,3-Butadiene	070	1.3E-02
107-02-8	Acrolein	070	2.6E-01
107-06-2	Ethylene dichloride [EDC]	070	1.8E-02
107-13-1	Acrylonitrile	070	2.7E-02
107-21-1	Ethylene glycol	070	2.5E-03
107-98-2	Propylene glycol monomethyl ether	070	1.7E-04
108-05-4	Vinyl acetate	070	6.0E-02
108-88-3	Toluene	070	2.9E+00
108-90-7	Chlorobenzene	070	1.9E-01
109-86-4	Ethylene glycol monomethyl ether	070	1.5E-02
110-54-3	Hexane	070	2.9E+01
110-80-5	Ethylene glycol monoethyl ether	070	3.2E-03
111-30-8	GLUTARALDEHYDE	070	5.3E-01
121-44-8	Triethylamine	070	4.5E-01
123-91-1	1,4-Dioxane	070	1.4E-01
1330-20-7	Xylenes (mixed isomers)	070	2.8E+00
1634-04-4	Methyl tert-butyl ether	070	9.1E-02
302-01-2	Hydrazine	070	2.3E-03
50-00-0	Formaldehyde	070	1.2E-01
51-79-6	Urethane	070	3.3E-05
56-23-5	Carbon tetrachloride	070	1.2E+00
62-75-9	N-Nitrosodimethylamine	070	3.8E-04
67-56-1	Methanol	070	1.1E+02
67-63-0	Isopropyl alcohol	070	2.8E+02
67-66-3	Chloroform	070	1.1E+01
71-43-2	Benzene	070	2.1E-01
71-55-6	Methyl chloroform [1,1,1-TCA]	070	8.5E-04

BASELINE (From inventory)

CAS_NO	Chemical Name	BUILDING NUMBER	Emissions per Bldg (lb/yr)
75-15-0	Carbon disulfide	070	1.1E+00
75-56-9	Propylene oxide	070	8.4E-01
7647-01-0	Hydrochloric acid	070	4.3E+00
7664-38-2	Phosphoric acid	070	3.3E-04
7664-39-3	Hydrogen fluoride	070	4.4E-03
7664-93-9	Sulfuric acid	070	4.3E-02
7697-37-2	Nitric acid	070	1.4E+00
78-59-1	Isophorone	070	1.4E-05
78-93-3	Methyl ethyl ketone [2-Butanone]	070	1.0E-01
822-06-0	Hexamethylene-1,6-diisocyanate	070	6.8E-05
67-63-0	Isopropyl alcohol	071	2.7E-01
78-93-3	Methyl ethyl ketone [2-Butanone]	071	4.5E-04
67-56-1	Methanol	072	8.7E+01
67-63-0	Isopropyl alcohol	072	9.5E+00
7697-37-2	Nitric acid	072	6.9E-02
107-98-2	Propylene glycol monomethyl ether	074	1.8E-02
108-88-3	Toluene	074	6.6E-01
110-54-3	Hexane	074	8.5E-01
111-30-8	GLUTARALDEHYDE	074	2.8E-02
51-79-6	Urethane	074	6.2E-05
67-56-1	Methanol	074	3.0E+00
67-63-0	Isopropyl alcohol	074	1.4E+00
67-66-3	Chloroform	074	5.5E-01
71-43-2	Benzene	074	1.2E+00
7647-01-0	Hydrochloric acid	074	7.7E-01
7664-38-2	Phosphoric acid	074	1.5E-04
7664-39-3	Hydrogen fluoride	074	2.3E-04
7664-41-7	Ammonia	074	1.0E-01
7664-93-9	Sulfuric acid	074	7.5E-03
7697-37-2	Nitric acid	074	4.2E+00
56-23-5	Carbon tetrachloride	075	4.0E-02
7697-37-2	Nitric acid	075	3.1E-02
67-63-0	Isopropyl alcohol	076	3.7E+00
78-93-3	Methyl ethyl ketone [2-Butanone]	076	4.5E-01
107-06-2	Ethylene dichloride [EDC]	077	1.8E-02
107-21-1	Ethylene glycol	077	2.0E-05
108-90-7	Chlorobenzene	077	9.3E-03
110-54-3	Hexane	077	1.7E-01
1330-20-7	Xylenes (mixed isomers)	077	7.8E-01
67-56-1	Methanol	077	4.1E+00
67-63-0	Isopropyl alcohol	077	3.8E+01
71-55-6	Methyl chloroform [1,1,1-TCA]	077	3.8E-02
7439-97-6	Mercury	077	1.5E-06
7647-01-0	Hydrochloric acid	077	9.9E-03
7664-38-2	Phosphoric acid	077	2.1E-03
7664-39-3	Hydrogen fluoride	077	1.7E-03
7664-41-7	Ammonia	077	3.4E-06
7697-37-2	Nitric acid	077	7.5E-03
107-06-2	Ethylene dichloride [EDC]	080	2.5E-02
111-30-8	GLUTARALDEHYDE	080	3.2E-02
121-44-8	Triethylamine	080	2.3E-02
1330-20-7	Xylenes (mixed isomers)	080	6.1E-02
50-00-0	Formaldehyde	080	9.4E-03
67-56-1	Methanol	080	4.9E-01
67-63-0	Isopropyl alcohol	080	8.7E-01
67-66-3	Chloroform	080	1.3E-01
71-43-2	Benzene	080	1.8E-02
7647-01-0	Hydrochloric acid	080	1.0E-02
7664-38-2	Phosphoric acid	080	8.6E-05
67-56-1	Methanol	081	8.4E-01
7439-97-6	Mercury	083	6.4E-06
107-21-1	Ethylene glycol	084	8.1E-05
110-54-3	Hexane	084	1.7E+00
111-30-8	GLUTARALDEHYDE	084	2.4E-03
111-76-2	Ethylene glycol monobutyl ether	084	1.1E-04
1330-20-7	Xylenes (mixed isomers)	084	1.1E-02
50-00-0	Formaldehyde	084	1.5E-01
67-56-1	Methanol	084	7.6E-01
67-63-0	Isopropyl alcohol	084	3.6E+00
67-66-3	Chloroform	084	6.4E-02
7647-01-0	Hydrochloric acid	084	2.2E-01
7664-38-2	Phosphoric acid	084	7.8E-05
7664-93-9	Sulfuric acid	084	1.6E-02
107-21-1	Ethylene glycol	088	4.7E-04
108-88-3	Toluene	088	2.3E-02
1330-20-7	Xylenes (mixed isomers)	088	4.9E-05
67-56-1	Methanol	088	1.6E+00
67-63-0	Isopropyl alcohol	088	2.2E+02
7647-01-0	Hydrochloric acid	088	5.1E-02

BASELINE (From inventory)

CAS_NO	Chemical Name	BUILDING NUMBER	Emissions per Bldg (lb/yr)
7664-39-3	Hydrogen fluoride	088	1.2E-03
7664-93-9	Sulfuric acid	088	3.2E-04
7697-37-2	Nitric acid	088	5.6E-02
67-56-1	Methanol	091	2.0E-02
67-63-0	Isopropyl alcohol	091	2.0E+01
100-41-4	Ethyl benzene	978	5.4E-02
100-42-5	Styrene	978	8.4E-03
100-44-7	Benzyl chloride	978	5.0E-04
106-42-3	p-Xylene	978	3.1E-05
106-99-0	1,3-Butadiene	978	6.0E-02
107-06-2	Ethylene dichloride [EDC]	978	4.2E-01
107-21-1	Ethylene glycol	978	1.4E-03
107-98-2	Propylene glycol monomethyl ether	978	3.5E-03
108-88-3	Toluene	978	5.0E-01
109-86-4	Ethylene glycol monomethyl ether	978	6.3E-03
110-54-3	Hexane	978	3.8E+02
111-30-8	GLUTARALDEHYDE	978	1.1E-01
111-42-2	Diethanolamine	978	2.5E-06
121-44-8	Triethylamine	978	1.9E-01
123-91-1	1,4-Dioxane	978	4.4E+00
1330-20-7	Xylenes (mixed isomers)	978	9.9E-01
1634-04-4	Methyl tert-butyl ether	978	4.9E-01
50-00-0	Formaldehyde	978	3.1E-01
56-23-5	Carbon tetrachloride	978	9.3E-02
62-53-3	Aniline	978	4.9E-04
67-56-1	Methanol	978	8.6E+03
67-63-0	Isopropyl alcohol	978	9.9E+02
67-66-3	Chloroform	978	5.5E+01
71-43-2	Benzene	978	7.6E-02
75-56-9	Propylene oxide	978	2.5E-01
7647-01-0	Hydrochloric acid	978	5.3E+00
7664-38-2	Phosphoric acid	978	6.4E-03
7664-41-7	Ammonia	978	4.3E+00
7664-93-9	Sulfuric acid	978	5.4E-01
7697-37-2	Nitric acid	978	1.6E+01
78-93-3	Methyl ethyl ketone [2-Butanone]	978	8.2E-02
95-47-6	o-Xylene	978	2.1E-02
67-63-0	Isopropyl alcohol	050A	1.6E+00
107-21-1	Ethylene glycol	050B	1.9E-04
67-56-1	Methanol	050B	3.3E-01
67-63-0	Isopropyl alcohol	050B	5.4E-01
107-06-2	Ethylene dichloride [EDC]	058A	4.0E-02
67-63-0	Isopropyl alcohol	058A	1.3E-01
100-44-7	Benzyl chloride	070A	6.4E-04
107-06-2	Ethylene dichloride [EDC]	070A	1.6E-01
107-21-1	Ethylene glycol	070A	2.9E-04
107-98-2	Propylene glycol monomethyl ether	070A	6.2E-04
108-88-3	Toluene	070A	3.2E-01
108-90-7	Chlorobenzene	070A	2.6E-02
110-54-3	Hexane	070A	1.1E+01
111-30-8	GLUTARALDEHYDE	070A	7.8E-03
111-42-2	Diethanolamine	070A	1.7E-07
111-76-2	Ethylene glycol monobutyl ether	070A	4.4E-07
121-44-8	Triethylamine	070A	8.6E-03
123-91-1	1,4-Dioxane	070A	5.6E-02
127-18-4	Perchloroethylene {Tetrachloroethene}	070A	3.5E-01
1330-20-7	Xylenes (mixed isomers)	070A	1.7E-01
302-01-2	Hydrazine	070A	5.0E-03
50-00-0	Formaldehyde	070A	7.1E-02
56-23-5	Carbon tetrachloride	070A	2.6E-02
67-56-1	Methanol	070A	1.3E+03
67-63-0	Isopropyl alcohol	070A	1.1E+03
67-66-3	Chloroform	070A	4.6E-01
71-55-6	Methyl chloroform [1,1,1-TCA]	070A	7.8E-02
7647-01-0	Hydrochloric acid	070A	5.3E+01
7664-38-2	Phosphoric acid	070A	2.0E-03
7664-39-3	Hydrogen fluoride	070A	2.2E+00
7664-41-7	Ammonia	070A	2.9E-02
7664-93-9	Sulfuric acid	070A	2.9E+01
7697-37-2	Nitric acid	070A	2.1E+01
7782-50-5	Chlorine	070A	1.0E+00
78-93-3	Methyl ethyl ketone [2-Butanone]	070A	1.3E-02
67-63-0	Isopropyl alcohol	071B	1.2E+02
67-63-0	Isopropyl alcohol	077A	4.1E-02
7664-93-9	Sulfuric acid	077A	7.0E-01

New LRDP Generators TAC Emissions

New LRDP EIR Building	New Comparison Bldg Backup Generator Size (kW)	New Comparison Bldg Backup Generator Size (HP)	PM10 (g/bhp-hr)	ROG (g/bhp-hr)	NO_x (g/bhp-hr)	PM10 (lb/yr)	ROG (lb/yr)	NOx (lb/yr)	PM10 (lb/day)	ROG (lb/day)	NOx (lb/day)	PM10 (ton/yr)	ROG (ton/yr)	NOx (ton/yr)	
BioGEM	1,750	2345	0.02	0.14	0.5	15.5	108.6	387.7	0.04	0.30	1.06	0.008	0.054	0.194	
Bayview Bldg 4	850	1139	0.02	0.14	0.5	7.5	52.7	188.3	0.02	0.14	0.52	0.004	0.026	0.094	
Bayview Bldg 5	700	938	0.02	0.14	0.5	6.2	43.4	155.1	0.02	0.12	0.42	0.003	0.022	0.078	
FLEX Bldg.	600	804	0.02	0.14	0.5	5.3	37.2	132.9	0.01	0.10	0.36	0.003	0.019	0.066	
A&E Bldg	1,000	1340	0.02	0.14	0.5	8.9	62.0	221.6	0.02	0.17	0.61	0.004	0.031	0.111	
AMDB	1,000	1340	0.02	0.14	0.5	8.9	62.0	221.6	0.02	0.17	0.61	0.004	0.031	0.111	built by 2031
Chem Sci Bldg	1,000	1340	0.02	0.14	0.5	8.9	62.0	221.6	0.02	0.17	0.61	0.004	0.031	0.111	built by 2031
B62 Highbay Building	100	134	0.015	0.14	0.3	0.7	6.2	13.3	0.00	0.02	0.04	0.000	0.003	0.007	
								TOTAL	0.2	1.2	4.2	0.0	0.2	0.8	
								2031 generator emissions	0.05	0.34	1.21	0.01	0.06	0.22	

Note: lb/yr calculation assumes 50 hours per year of testing and 100 hours per year of emergency use.

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EPA Tier 4 Emission Standards

Maximum Engine Power	Emission Limits (g/kW-hour)			
	NMHC [1]	NO_x	CO	PM [2]
19 ≤ kW < 56	4.7		5.0	0.03
56 ≤ kW < 130	0.19	0.40	5.0	0.02
130 ≤ kW ≤ 560	0.19	0.40	3.5	0.02
kW >560	0.19	0.67	3.5	0.03

Notes:
1. Non-methane hydrocarbons
2. As measured by United States EPA Method 5 (filterable portion only)

Maximum Engine Power	Emission Limits (g/bhp-hour)			
	NMHC	NO_x	CO	PM
50 ≤ HP < 75	3.5		3.7	0.022
75 ≤ HP < 175	0.14	0.30	3.7	0.015
175 ≤ HP < 750	0.14	0.30	2.6	0.015
HP > 750	0.14	0.50	2.6	0.022

New LRDP Lab TAC Emissions

LRDP Bldg.	CAS		Comparable Existing Bldg.	Baseline Emissions (lb/yr)	Scaling Factor from Baseline	Emissions per Bldg (lb/yr)
BioGEM	100-41-4	Ethyl benzene	978	5.4E-02	1.5	8.1E-02
BioGEM	100-42-5	Styrene	978	8.4E-03	1.5	1.3E-02
BioGEM	100-44-7	Benzyl chloride	978	5.0E-04	1.5	7.5E-04
BioGEM	106-42-3	p-Xylene	978	3.1E-05	1.5	4.6E-05
BioGEM	106-99-0	1,3-Butadiene	978	6.0E-02	1.5	9.0E-02
BioGEM	107-06-2	Ethylene dichloride [EDC]	978	4.2E-01	1.5	6.3E-01
BioGEM	107-21-1	Ethylene glycol	978	1.4E-03	1.5	2.2E-03
BioGEM	107-98-2	Propylene glycol monomethyl ether	978	3.5E-03	1.5	5.2E-03
BioGEM	108-88-3	Toluene	978	5.0E-01	1.5	7.5E-01
BioGEM	109-86-4	Ethylene glycol monomethyl ether	978	6.3E-03	1.5	9.5E-03
BioGEM	110-54-3	Hexane	978	3.8E+02	1.5	5.7E+02
BioGEM	111-30-8	GLUTARALDEHYDE	978	1.1E-01	1.5	1.7E-01
BioGEM	111-42-2	Diethanolamine	978	2.5E-06	1.5	3.7E-06
BioGEM	121-44-8	Triethylamine	978	1.9E-01	1.5	2.8E-01
BioGEM	123-91-1	1,4-Dioxane	978	4.4E+00	1.5	6.6E+00
BioGEM	1330-20-7	Xylenes (mixed isomers)	978	9.9E-01	1.5	1.5E+00
BioGEM	1634-04-4	Methyl tert-butyl ether	978	4.9E-01	1.5	7.4E-01
BioGEM	50-00-0	Formaldehyde	978	3.1E-01	1.5	4.7E-01
BioGEM	56-23-5	Carbon tetrachloride	978	9.3E-02	1.5	1.4E-01
BioGEM	62-53-3	Aniline	978	4.9E-04	1.5	7.4E-04
BioGEM	67-56-1	Methanol	978	8.6E+03	1.5	1.3E+04
BioGEM	67-63-0	Isopropyl alcohol	978	9.9E+02	1.5	1.5E+03
BioGEM	67-66-3	Chloroform	978	5.5E+01	1.5	8.3E+01
BioGEM	71-43-2	Benzene	978	7.6E-02	1.5	1.1E-01
BioGEM	75-56-9	Propylene oxide	978	2.5E-01	1.5	3.7E-01
BioGEM	7647-01-0	Hydrochloric acid	978	5.3E+00	1.5	8.0E+00
BioGEM	7664-38-2	Phosphoric acid	978	6.4E-03	1.5	9.7E-03
BioGEM	7664-41-7	Ammonia	978	4.3E+00	1.5	6.4E+00
BioGEM	7664-93-9	Sulfuric acid	978	5.4E-01	1.5	8.1E-01
BioGEM	7697-37-2	Nitric acid	978	1.6E+01	1.5	2.4E+01
BioGEM	78-93-3	Methyl ethyl ketone [2-Butanone]	978	8.2E-02	1.5	1.2E-01
BioGEM	95-47-6	o-Xylene	978	2.1E-02	1.5	3.1E-02
Bayview 4	100-42-5	Styrene	033	4.2E-04	2.17	9.2E-04
Bayview 4	107-21-1	Ethylene glycol	033	1.1E-03	2.17	2.5E-03
Bayview 4	108-88-3	Toluene	033	3.4E-01	2.17	7.5E-01
Bayview 4	110-54-3	Hexane	033	5.2E+00	2.17	1.1E+01
Bayview 4	111-30-8	GLUTARALDEHYDE	033	1.2E-03	2.17	2.7E-03
Bayview 4	121-44-8	Triethylamine	033	1.8E-02	2.17	3.8E-02
Bayview 4	50-00-0	Formaldehyde	033	2.3E-02	2.17	5.1E-02
Bayview 4	67-56-1	Methanol	033	2.1E+01	2.17	4.6E+01
Bayview 4	67-63-0	Isopropyl alcohol	033	6.2E+00	2.17	1.3E+01
Bayview 4	67-66-3	Chloroform	033	9.9E+00	2.17	2.2E+01
Bayview 4	71-43-2	Benzene	033	1.7E-01	2.17	3.8E-01
Bayview 4	7647-01-0	Hydrochloric acid	033	2.7E-01	2.17	5.8E-01
Bayview 4	7664-38-2	Phosphoric acid	033	6.0E-06	2.17	1.3E-05
Bayview 4	7664-93-9	Sulfuric acid	033	4.7E-04	2.17	1.0E-03
Bayview 4	7697-37-2	Nitric acid	033	4.3E-01	2.17	9.3E-01
Bayview 4	78-93-3	Methyl ethyl ketone [2-Butanone]	033	3.1E-01	2.17	6.7E-01
Bayview 4	100-41-4	Ethyl benzene	066	8.4E-03	2.17	1.8E-02
Bayview 4	100-42-5	Styrene	066	8.7E-02	2.17	1.9E-01
Bayview 4	107-02-8	Acrolein	066	7.2E-03	2.17	1.6E-02
Bayview 4	107-06-2	Ethylene dichloride [EDC]	066	6.0E-01	2.17	1.3E+00
Bayview 4	107-13-1	Acrylonitrile	066	2.1E-03	2.17	4.7E-03
Bayview 4	107-21-1	Ethylene glycol	066	1.0E-03	2.17	2.2E-03
Bayview 4	107-98-2	Propylene glycol monomethyl ether	066	4.3E-04	2.17	9.4E-04
Bayview 4	108-38-3	m-Xylene	066	6.1E-03	2.17	1.3E-02
Bayview 4	108-88-3	Toluene	066	2.0E+00	2.17	4.3E+00
Bayview 4	108-90-7	Chlorobenzene	066	5.8E-03	2.17	1.3E-02
Bayview 4	110-54-3	Hexane	066	1.9E+01	2.17	4.2E+01
Bayview 4	111-30-8	GLUTARALDEHYDE	066	8.0E-04	2.17	1.7E-03
Bayview 4	121-44-8	Triethylamine	066	2.3E-01	2.17	5.1E-01
Bayview 4	123-91-1	1,4-Dioxane	066	6.6E-01	2.17	1.4E+00
Bayview 4	1330-20-7	Xylenes (mixed isomers)	066	1.8E-01	2.17	3.9E-01
Bayview 4	1634-04-4	Methyl tert-butyl ether	066	1.8E-01	2.17	3.9E-01
Bayview 4	302-01-2	Hydrazine	066	3.1E-02	2.17	6.8E-02

LRDP Bldg.	CAS		Comparable Existing Bldg.	Baseline Emissions (lb/yr)	Scaling Factor from Baseline	Emissions per Bldg (lb/yr)
Bayview 4	50-00-0	Formaldehyde	066	5.1E-03	2.17	1.1E-02
Bayview 4	56-23-5	Carbon tetrachloride	066	9.9E-02	2.17	2.2E-01
Bayview 4	62-53-3	Aniline	066	1.0E-04	2.17	2.2E-04
Bayview 4	67-56-1	Methanol	066	4.1E+01	2.17	8.9E+01
Bayview 4	67-63-0	Isopropyl alcohol	066	6.0E+01	2.17	1.3E+02
Bayview 4	67-66-3	Chloroform	066	7.6E+00	2.17	1.6E+01
Bayview 4	71-43-2	Benzene	066	1.3E+00	2.17	2.9E+00
Bayview 4	71-55-6	Methyl chloroform [1,1,1-TCA]	066	7.8E-03	2.17	1.7E-02
Bayview 4	75-15-0	Carbon disulfide	066	4.6E-02	2.17	1.0E-01
Bayview 4	75-56-9	Propylene oxide	066	6.3E-03	2.17	1.4E-02
Bayview 4	7647-01-0	Hydrochloric acid	066	5.3E-01	2.17	1.2E+00
Bayview 4	7664-38-2	Phosphoric acid	066	1.5E-04	2.17	3.2E-04
Bayview 4	7664-39-3	Hydrogen fluoride	066	2.9E-03	2.17	6.3E-03
Bayview 4	7664-41-7	Ammonia	066	1.8E-01	2.17	3.8E-01
Bayview 4	7664-93-9	Sulfuric acid	066	1.7E-02	2.17	3.8E-02
Bayview 4	7697-37-2	Nitric acid	066	3.4E-01	2.17	7.3E-01
Bayview 4	7782-50-5	Chlorine	066	3.0E-01	2.17	6.4E-01
Bayview 4	78-59-1	Isophorone	066	9.3E-06	2.17	2.0E-05
Bayview 4	78-93-3	Methyl ethyl ketone [2-Butanone]	066	5.4E-03	2.17	1.2E-02
Bayview 4	79-00-5	1,1,2-Trichloroethane	066	2.2E-02	2.17	4.7E-02
Bayview 4	95-47-6	o-Xylene	066	1.1E-01	2.17	2.4E-01
Bayview 5	100-42-5	Styrene	033	4.2E-04	1.81	7.6E-04
Bayview 5	107-21-1	Ethylene glycol	033	1.1E-03	1.81	2.1E-03
Bayview 5	108-88-3	Toluene	033	3.4E-01	1.81	6.2E-01
Bayview 5	110-54-3	Hexane	033	5.2E+00	1.81	9.3E+00
Bayview 5	111-30-8	GLUTARALDEHYDE	033	1.2E-03	1.81	2.2E-03
Bayview 5	121-44-8	Triethylamine	033	1.8E-02	1.81	3.2E-02
Bayview 5	50-00-0	Formaldehyde	033	2.3E-02	1.81	4.2E-02
Bayview 5	67-56-1	Methanol	033	2.1E+01	1.81	3.8E+01
Bayview 5	67-63-0	Isopropyl alcohol	033	6.2E+00	1.81	1.1E+01
Bayview 5	67-66-3	Chloroform	033	9.9E+00	1.81	1.8E+01
Bayview 5	71-43-2	Benzene	033	1.7E-01	1.81	3.1E-01
Bayview 5	7647-01-0	Hydrochloric acid	033	2.7E-01	1.81	4.8E-01
Bayview 5	7664-38-2	Phosphoric acid	033	6.0E-06	1.81	1.1E-05
Bayview 5	7664-93-9	Sulfuric acid	033	4.7E-04	1.81	8.6E-04
Bayview 5	7697-37-2	Nitric acid	033	4.3E-01	1.81	7.8E-01
Bayview 5	78-93-3	Methyl ethyl ketone [2-Butanone]	033	3.1E-01	1.81	5.6E-01
Bayview 5	100-41-4	Ethyl benzene	066	8.4E-03	1.81	1.5E-02
Bayview 5	100-42-5	Styrene	066	8.7E-02	1.81	1.6E-01
Bayview 5	107-02-8	Acrolein	066	7.2E-03	1.81	1.3E-02
Bayview 5	107-06-2	Ethylene dichloride [EDC]	066	6.0E-01	1.81	1.1E+00
Bayview 5	107-13-1	Acrylonitrile	066	2.1E-03	1.81	3.9E-03
Bayview 5	107-21-1	Ethylene glycol	066	1.0E-03	1.81	1.9E-03
Bayview 5	107-98-2	Propylene glycol monomethyl ether	066	4.3E-04	1.81	7.8E-04
Bayview 5	108-38-3	m-Xylene	066	6.1E-03	1.81	1.1E-02
Bayview 5	108-88-3	Toluene	066	2.0E+00	1.81	3.6E+00
Bayview 5	108-90-7	Chlorobenzene	066	5.8E-03	1.81	1.1E-02
Bayview 5	110-54-3	Hexane	066	1.9E+01	1.81	3.5E+01
Bayview 5	111-30-8	GLUTARALDEHYDE	066	8.0E-04	1.81	1.4E-03
Bayview 5	121-44-8	Triethylamine	066	2.3E-01	1.81	4.2E-01
Bayview 5	123-91-1	1,4-Dioxane	066	6.6E-01	1.81	1.2E+00
Bayview 5	1330-20-7	Xylenes (mixed isomers)	066	1.8E-01	1.81	3.2E-01
Bayview 5	1634-04-4	Methyl tert-butyl ether	066	1.8E-01	1.81	3.3E-01
Bayview 5	302-01-2	Hydrazine	066	3.1E-02	1.81	5.6E-02
Bayview 5	50-00-0	Formaldehyde	066	5.1E-03	1.81	9.2E-03
Bayview 5	56-23-5	Carbon tetrachloride	066	9.9E-02	1.81	1.8E-01
Bayview 5	62-53-3	Aniline	066	1.0E-04	1.81	1.8E-04
Bayview 5	67-56-1	Methanol	066	4.1E+01	1.81	7.4E+01
Bayview 5	67-63-0	Isopropyl alcohol	066	6.0E+01	1.81	1.1E+02
Bayview 5	67-66-3	Chloroform	066	7.6E+00	1.81	1.4E+01
Bayview 5	71-43-2	Benzene	066	1.3E+00	1.81	2.4E+00
Bayview 5	71-55-6	Methyl chloroform [1,1,1-TCA]	066	7.8E-03	1.81	1.4E-02
Bayview 5	75-15-0	Carbon disulfide	066	4.6E-02	1.81	8.4E-02
Bayview 5	75-56-9	Propylene oxide	066	6.3E-03	1.81	1.1E-02
Bayview 5	7647-01-0	Hydrochloric acid	066	5.3E-01	1.81	9.7E-01
Bayview 5	7664-38-2	Phosphoric acid	066	1.5E-04	1.81	2.6E-04

LRDP Bldg.	CAS		Comparable Existing Bldg.	Baseline Emissions (lb/yr)	Scaling Factor from Baseline	Emissions per Bldg (lb/yr)
Bayview 5	7664-39-3	Hydrogen fluoride	066	2.9E-03	1.81	5.2E-03
Bayview 5	7664-41-7	Ammonia	066	1.8E-01	1.81	3.2E-01
Bayview 5	7664-93-9	Sulfuric acid	066	1.7E-02	1.81	3.1E-02
Bayview 5	7697-37-2	Nitric acid	066	3.4E-01	1.81	6.1E-01
Bayview 5	7782-50-5	Chlorine	066	3.0E-01	1.81	5.4E-01
Bayview 5	78-59-1	Isophorone	066	9.3E-06	1.81	1.7E-05
Bayview 5	78-93-3	Methyl ethyl ketone [2-Butanone]	066	5.4E-03	1.81	9.8E-03
Bayview 5	79-00-5	1,1,2-Trichloroethane	066	2.2E-02	1.81	3.9E-02
Bayview 5	95-47-6	o-Xylene	066	1.1E-01	1.81	2.0E-01
FLEX	100-41-4	Ethyl benzene	070	6.4E-03	0.62	4.0E-03
FLEX	100-42-5	Styrene	070	2.1E-01	0.62	1.3E-01
FLEX	100-44-7	Benzyl chloride	070	3.6E-04	0.62	2.2E-04
FLEX	106-89-8	Epichlorohydrin	070	4.1E-01	0.62	2.5E-01
FLEX	106-99-0	1,3-Butadiene	070	1.3E-02	0.62	7.8E-03
FLEX	107-02-8	Acrolein	070	2.6E-01	0.62	1.6E-01
FLEX	107-06-2	Ethylene dichloride [EDC]	070	1.8E-02	0.62	1.1E-02
FLEX	107-13-1	Acrylonitrile	070	2.7E-02	0.62	1.7E-02
FLEX	107-21-1	Ethylene glycol	070	2.5E-03	0.62	1.5E-03
FLEX	107-98-2	Propylene glycol monomethyl ether	070	1.7E-04	0.62	1.1E-04
FLEX	108-05-4	Vinyl acetate	070	6.0E-02	0.62	3.7E-02
FLEX	108-88-3	Toluene	070	2.9E+00	0.62	1.8E+00
FLEX	108-90-7	Chlorobenzene	070	1.9E-01	0.62	1.2E-01
FLEX	109-86-4	Ethylene glycol monomethyl ether	070	1.5E-02	0.62	9.3E-03
FLEX	110-54-3	Hexane	070	2.9E+01	0.62	1.8E+01
FLEX	110-80-5	Ethylene glycol monoethyl ether	070	3.2E-03	0.62	2.0E-03
FLEX	111-30-8	GLUTARALDEHYDE	070	5.3E-01	0.62	3.3E-01
FLEX	121-44-8	Triethylamine	070	4.5E-01	0.62	2.8E-01
FLEX	123-91-1	1,4-Dioxane	070	1.4E-01	0.62	8.4E-02
FLEX	1330-20-7	Xylenes (mixed isomers)	070	2.8E+00	0.62	1.7E+00
FLEX	1634-04-4	Methyl tert-butyl ether	070	9.1E-02	0.62	5.6E-02
FLEX	302-01-2	Hydrazine	070	2.3E-03	0.62	1.4E-03
FLEX	50-00-0	Formaldehyde	070	1.2E-01	0.62	7.4E-02
FLEX	51-79-6	Urethane	070	3.3E-05	0.62	2.1E-05
FLEX	56-23-5	Carbon tetrachloride	070	1.2E+00	0.62	7.4E-01
FLEX	62-75-9	N-Nitrosodimethylamine	070	3.8E-04	0.62	2.4E-04
FLEX	67-56-1	Methanol	070	1.1E+02	0.62	6.8E+01
FLEX	67-63-0	Isopropyl alcohol	070	2.8E+02	0.62	1.7E+02
FLEX	67-66-3	Chloroform	070	1.1E+01	0.62	7.0E+00
FLEX	71-43-2	Benzene	070	2.1E-01	0.62	1.3E-01
FLEX	71-55-6	Methyl chloroform [1,1,1-TCA]	070	8.5E-04	0.62	5.3E-04
FLEX	75-15-0	Carbon disulfide	070	1.1E+00	0.62	6.7E-01
FLEX	75-56-9	Propylene oxide	070	8.4E-01	0.62	5.2E-01
FLEX	7647-01-0	Hydrochloric acid	070	4.3E+00	0.62	2.6E+00
FLEX	7664-38-2	Phosphoric acid	070	3.3E-04	0.62	2.0E-04
FLEX	7664-39-3	Hydrogen fluoride	070	4.4E-03	0.62	2.8E-03
FLEX	7664-93-9	Sulfuric acid	070	4.3E-02	0.62	2.7E-02
FLEX	7697-37-2	Nitric acid	070	1.4E+00	0.62	8.5E-01
FLEX	78-59-1	Isophorone	070	1.4E-05	0.62	8.5E-06
FLEX	78-93-3	Methyl ethyl ketone [2-Butanone]	070	1.0E-01	0.62	6.4E-02
FLEX	822-06-0	Hexamethylene-1,6-diisocyanate	070	6.8E-05	0.62	4.2E-05
A&E	107-06-2	Ethylene dichloride [EDC]	077	1.8E-02	1.01	1.9E-02
A&E	107-21-1	Ethylene glycol	077	2.0E-05	1.01	2.0E-05
A&E	108-90-7	Chlorobenzene	077	9.3E-03	1.01	9.4E-03
A&E	110-54-3	Hexane	077	1.7E-01	1.01	1.8E-01
A&E	1330-20-7	Xylenes (mixed isomers)	077	7.8E-01	1.01	7.9E-01
A&E	67-56-1	Methanol	077	4.1E+00	1.01	4.2E+00
A&E	67-63-0	Isopropyl alcohol	077	3.8E+01	1.01	3.8E+01
A&E	71-55-6	Methyl chloroform [1,1,1-TCA]	077	3.8E-02	1.01	3.9E-02
A&E	7439-97-6	Mercury	077	1.5E-06	1.01	1.5E-06
A&E	7647-01-0	Hydrochloric acid	077	9.9E-03	1.01	1.0E-02
A&E	7664-38-2	Phosphoric acid	077	2.1E-03	1.01	2.2E-03
A&E	7664-39-3	Hydrogen fluoride	077	1.7E-03	1.01	1.7E-03
A&E	7664-41-7	Ammonia	077	3.4E-06	1.01	3.4E-06
A&E	7697-37-2	Nitric acid	077	7.5E-03	1.01	7.5E-03
AMDB	100-42-5	Styrene	030	3.8E-02	1.53	5.8E-02
AMDB	107-13-1	Acrylonitrile	030	3.4E-03	1.53	5.2E-03

LRDP Bldg.	CAS		Comparable Existing Bldg.	Baseline Emissions (lb/yr)	Scaling Factor from Baseline	Emissions per Bldg (lb/yr)
AMDB	107-21-1	Ethylene glycol	030	2.2E-04	1.53	3.3E-04
AMDB	108-88-3	Toluene	030	7.3E-01	1.53	1.1E+00
AMDB	108-90-7	Chlorobenzene	030	4.0E-01	1.53	6.2E-01
AMDB	109-86-4	Ethylene glycol monomethyl ether	030	1.9E-01	1.53	2.8E-01
AMDB	110-54-3	Hexane	030	9.4E+00	1.53	1.4E+01
AMDB	121-44-8	Triethylamine	030	6.1E-02	1.53	9.3E-02
AMDB	123-91-1	1,4-Dioxane	030	5.6E-02	1.53	8.6E-02
AMDB	1330-20-7	Xylenes (mixed isomers)	030	8.8E+00	1.53	1.4E+01
AMDB	56-23-5	Carbon tetrachloride	030	1.0E+00	1.53	1.6E+00
AMDB	67-56-1	Methanol	030	1.6E+02	1.53	2.5E+02
AMDB	67-63-0	Isopropyl alcohol	030	1.6E+02	1.53	2.5E+02
AMDB	67-66-3	Chloroform	030	1.5E+01	1.53	2.3E+01
AMDB	71-43-2	Benzene	030	3.9E-01	1.53	6.0E-01
AMDB	75-56-9	Propylene oxide	030	3.3E-02	1.53	5.1E-02
AMDB	7647-01-0	Hydrochloric acid	030	6.3E+00	1.53	9.6E+00
AMDB	7664-38-2	Phosphoric acid	030	2.6E-03	1.53	4.0E-03
AMDB	7664-39-3	Hydrogen fluoride	030	2.6E-03	1.53	3.9E-03
AMDB	7664-41-7	Ammonia	030	2.8E+00	1.53	4.3E+00
AMDB	7664-93-9	Sulfuric acid	030	2.3E-03	1.53	3.6E-03
AMDB	7697-37-2	Nitric acid	030	1.3E+01	1.53	2.0E+01
ChemSci	100-42-5	Styrene	030	3.8E-02	1.53	5.8E-02
ChemSci	107-13-1	Acrylonitrile	030	3.4E-03	1.53	5.2E-03
ChemSci	107-21-1	Ethylene glycol	030	2.2E-04	1.53	3.3E-04
ChemSci	108-88-3	Toluene	030	7.3E-01	1.53	1.1E+00
ChemSci	108-90-7	Chlorobenzene	030	4.0E-01	1.53	6.2E-01
ChemSci	109-86-4	Ethylene glycol monomethyl ether	030	1.9E-01	1.53	2.8E-01
ChemSci	110-54-3	Hexane	030	9.4E+00	1.53	1.4E+01
ChemSci	121-44-8	Triethylamine	030	6.1E-02	1.53	9.3E-02
ChemSci	123-91-1	1,4-Dioxane	030	5.6E-02	1.53	8.6E-02
ChemSci	1330-20-7	Xylenes (mixed isomers)	030	8.8E+00	1.53	1.4E+01
ChemSci	56-23-5	Carbon tetrachloride	030	1.0E+00	1.53	1.6E+00
ChemSci	67-56-1	Methanol	030	1.6E+02	1.53	2.5E+02
ChemSci	67-63-0	Isopropyl alcohol	030	1.6E+02	1.53	2.5E+02
ChemSci	67-66-3	Chloroform	030	1.5E+01	1.53	2.3E+01
ChemSci	71-43-2	Benzene	030	3.9E-01	1.53	6.0E-01
ChemSci	75-56-9	Propylene oxide	030	3.3E-02	1.53	5.1E-02
ChemSci	7647-01-0	Hydrochloric acid	030	6.3E+00	1.53	9.6E+00
ChemSci	7664-38-2	Phosphoric acid	030	2.6E-03	1.53	4.0E-03
ChemSci	7664-39-3	Hydrogen fluoride	030	2.6E-03	1.53	3.9E-03
ChemSci	7664-41-7	Ammonia	030	2.8E+00	1.53	4.3E+00
ChemSci	7664-93-9	Sulfuric acid	030	2.3E-03	1.53	3.6E-03
ChemSci	7697-37-2	Nitric acid	030	1.3E+01	1.53	2.0E+01
ALS Support	107-06-2	Ethylene dichloride [EDC]	077	1.8E-02	0.29	5.3E-03
ALS Support	107-21-1	Ethylene glycol	077	2.0E-05	0.29	5.7E-06
ALS Support	108-90-7	Chlorobenzene	077	9.3E-03	0.29	2.7E-03
ALS Support	110-54-3	Hexane	077	1.7E-01	0.29	5.0E-02
ALS Support	1330-20-7	Xylenes (mixed isomers)	077	7.8E-01	0.29	2.3E-01
ALS Support	67-56-1	Methanol	077	4.1E+00	0.29	1.2E+00
ALS Support	67-63-0	Isopropyl alcohol	077	3.8E+01	0.29	1.1E+01
ALS Support	71-55-6	Methyl chloroform [1,1,1-TCA]	077	3.8E-02	0.29	1.1E-02
ALS Support	7439-97-6	Mercury	077	1.5E-06	0.29	4.4E-07
ALS Support	7647-01-0	Hydrochloric acid	077	9.9E-03	0.29	2.9E-03
ALS Support	7664-38-2	Phosphoric acid	077	2.1E-03	0.29	6.2E-04
ALS Support	7664-39-3	Hydrogen fluoride	077	1.7E-03	0.29	4.8E-04
ALS Support	7664-41-7	Ammonia	077	3.4E-06	0.29	9.8E-07
ALS Support	7697-37-2	Nitric acid	077	7.5E-03	0.29	2.2E-03
NCEM Addn	106-42-3	p-Xylene	062	2.0E-01	0.12	2.4E-02
NCEM Addn	107-06-2	Ethylene dichloride [EDC]	062	7.1E-01	0.12	8.6E-02
NCEM Addn	107-13-1	Acrylonitrile	062	1.1E-03	0.12	1.3E-04
NCEM Addn	107-21-1	Ethylene glycol	062	9.7E-05	0.12	1.2E-05
NCEM Addn	107-98-2	Propylene glycol monomethyl ether	062	4.0E-03	0.12	4.8E-04
NCEM Addn	108-88-3	Toluene	062	8.1E+00	0.12	9.7E-01
NCEM Addn	108-90-7	Chlorobenzene	062	2.8E-01	0.12	3.4E-02
NCEM Addn	109-86-4	Ethylene glycol monomethyl ether	062	1.2E-02	0.12	1.5E-03
NCEM Addn	110-54-3	Hexane	062	9.6E+01	0.12	1.2E+01
NCEM Addn	111-30-8	GLUTARALDEHYDE	062	2.0E-03	0.12	2.4E-04

LRDP Bldg.	CAS		Comparable Existing Bldg.	Baseline Emissions (lb/yr)	Scaling Factor from Baseline	Emissions per Bldg (lb/yr)
NCEM Addn	121-44-8	Triethylamine	062	3.3E-01	0.12	4.0E-02
NCEM Addn	123-91-1	1,4-Dioxane	062	6.0E-02	0.12	7.2E-03
NCEM Addn	1330-20-7	Xylenes (mixed isomers)	062	1.7E+00	0.12	2.0E-01
NCEM Addn	302-01-2	Hydrazine	062	1.1E-02	0.12	1.3E-03
NCEM Addn	50-00-0	Formaldehyde	062	2.6E-01	0.12	3.1E-02
NCEM Addn	51-79-6	Urethane	062	2.4E-05	0.12	2.9E-06
NCEM Addn	62-53-3	Aniline	062	1.8E-05	0.12	2.2E-06
NCEM Addn	67-56-1	Methanol	062	9.0E+01	0.12	1.1E+01
NCEM Addn	67-63-0	Isopropyl alcohol	062	1.6E+02	0.12	1.9E+01
NCEM Addn	67-66-3	Chloroform	062	9.4E+00	0.12	1.1E+00
NCEM Addn	71-43-2	Benzene	062	9.8E-01	0.12	1.2E-01
NCEM Addn	75-15-0	Carbon disulfide	062	1.3E+00	0.12	1.6E-01
NCEM Addn	7647-01-0	Hydrochloric acid	062	1.1E+01	0.12	1.4E+00
NCEM Addn	7664-38-2	Phosphoric acid	062	1.3E-04	0.12	1.6E-05
NCEM Addn	7664-39-3	Hydrogen fluoride	062	6.1E-03	0.12	7.4E-04
NCEM Addn	7664-41-7	Ammonia	062	5.2E+00	0.12	6.2E-01
NCEM Addn	7664-93-9	Sulfuric acid	062	1.9E-02	0.12	2.3E-03
NCEM Addn	7697-37-2	Nitric acid	062	1.1E+00	0.12	1.3E-01
NCEM Addn	78-93-3	Methyl ethyl ketone [2-Butanone]	062	1.6E-01	0.12	1.9E-02
B62 Highbay	106-42-3	p-Xylene	062	2.0E-01	0.07	1.4E-02
B62 Highbay	107-06-2	Ethylene dichloride [EDC]	062	7.1E-01	0.07	5.0E-02
B62 Highbay	107-13-1	Acrylonitrile	062	1.1E-03	0.07	7.4E-05
B62 Highbay	107-21-1	Ethylene glycol	062	9.7E-05	0.07	6.8E-06
B62 Highbay	107-98-2	Propylene glycol monomethyl ether	062	4.0E-03	0.07	2.8E-04
B62 Highbay	108-88-3	Toluene	062	8.1E+00	0.07	5.7E-01
B62 Highbay	108-90-7	Chlorobenzene	062	2.8E-01	0.07	2.0E-02
B62 Highbay	109-86-4	Ethylene glycol monomethyl ether	062	1.2E-02	0.07	8.6E-04
B62 Highbay	110-54-3	Hexane	062	9.6E+01	0.07	6.7E+00
B62 Highbay	111-30-8	GLUTARALDEHYDE	062	2.0E-03	0.07	1.4E-04
B62 Highbay	121-44-8	Triethylamine	062	3.3E-01	0.07	2.3E-02
B62 Highbay	123-91-1	1,4-Dioxane	062	6.0E-02	0.07	4.2E-03
B62 Highbay	1330-20-7	Xylenes (mixed isomers)	062	1.7E+00	0.07	1.2E-01
B62 Highbay	302-01-2	Hydrazine	062	1.1E-02	0.07	7.5E-04
B62 Highbay	50-00-0	Formaldehyde	062	2.6E-01	0.07	1.8E-02
B62 Highbay	51-79-6	Urethane	062	2.4E-05	0.07	1.7E-06
B62 Highbay	62-53-3	Aniline	062	1.8E-05	0.07	1.3E-06
B62 Highbay	67-56-1	Methanol	062	9.0E+01	0.07	6.3E+00
B62 Highbay	67-63-0	Isopropyl alcohol	062	1.6E+02	0.07	1.1E+01
B62 Highbay	67-66-3	Chloroform	062	9.4E+00	0.07	6.6E-01
B62 Highbay	71-43-2	Benzene	062	9.8E-01	0.07	6.8E-02
B62 Highbay	75-15-0	Carbon disulfide	062	1.3E+00	0.07	9.2E-02
B62 Highbay	7647-01-0	Hydrochloric acid	062	1.1E+01	0.07	8.0E-01
B62 Highbay	7664-38-2	Phosphoric acid	062	1.3E-04	0.07	9.2E-06
B62 Highbay	7664-39-3	Hydrogen fluoride	062	6.1E-03	0.07	4.3E-04
B62 Highbay	7664-41-7	Ammonia	062	5.2E+00	0.07	3.6E-01
B62 Highbay	7664-93-9	Sulfuric acid	062	1.9E-02	0.07	1.3E-03
B62 Highbay	7697-37-2	Nitric acid	062	1.1E+00	0.07	7.6E-02
B62 Highbay	78-93-3	Methyl ethyl ketone [2-Butanone]	062	1.6E-01	0.07	1.1E-02

CalEEMod and HARP Output Files

These files are part of the administrative record as *Appendix AIR Supplement* and available for review if requested.

Appendix BIO
Biological Resources Appendix

TABLE BIO-1
SPECIAL-STATUS SPECIES POTENTIAL ON LBNL CAMPUS

Taxonomy	Common Name *Scientific Name*	Status Federal/ State/CNPS Status	Habitat	Blooming Period	Potential to Occur
Plants	minute pocket moss *Fissidens pauperculus*	-/-/1B.2	North coast coniferous forest.	-	**Unlikely**. Species was recorded onsite in 1994 (CDFW 2024), but remaining habitat is patchy and marginal.
	adobe sanicle *Sanicula maritima*	-/CR/1B.1	Meadows and seeps, valley and foothill grassland, chaparral, coastal prairie.	February-May	**Unlikely.** Remaining habitat onsite is patchy and marginal.
	alkali milk-vetch *Astragalus tener var. tener*	-/-/1B.2	Species is found in alkali playa, valley and foothill grassland, and vernal pools.	March-June	**Absent.** No suitable habitat present on the campus.
	beach layia *Layia carnosa*	FT/CE/1B.1	Coastal dunes, coastal scrub.	March-July	**Absent.** No suitable habitat present on the campus.
	bent-flowered fiddleneck *Amsinckia lunaris*	-/-/1B.2	Species is found in cismontane woodland, valley and foothill grassland, and coastal bluff scrub.	March-June	**Unlikely**. Species recorded in Berkeley including Tilden Park (Calflora 2024); but remaining habitat onsite is patchy and marginal.
	blue coast gilia *Gilia capitata ssp. chamissonis*	-/-/1B.1	Coastal dunes, coastal scrub.	April-July	**Absent.** No suitable habitat present on the campus.
	Bolander's water-hemlock *Cicuta maculata var. bolanderi*	-/-/2B.1	Species is found in marshes and swamps.	July-September	**Absent.** No suitable habitat present on the campus.
	California seablite *Suaeda californica*	FE/-/1B.1	Marshes and swamps.	July-October	**Absent.** No suitable habitat present on the campus.
	Carquinez goldenbush *Isocoma arguta*	-/-/1B.1	Valley and foothill grassland.	August-December	**Unlikely.** Remaining habitat onsite is patchy and marginal.
	Choris' popcornflower *Plagiobothrys chorisianus var. chorisianus*	-/-/1B.2	Chaparral, coastal scrub, coastal prairie.	March-June	**Unlikely.** Suitable habitat onsite is patchy and marginal.
	coastal bluff morning-glory *Calystegia purpurata ssp. saxicola*	-/-/1B.2	Species is found in coastal dunes, coastal scrub, coastal bluff scrub, and north coast coniferous forest.	April-September (March)	**Unlikely.** Suitable habitat onsite is patchy and marginal.
	congested-headed hayfield tarplant *Hemizonia congesta ssp. congesta*	-/-/1B.2	Valley and foothill grassland.	April-November	**Unlikely.** Remaining habitat onsite is patchy and marginal.
	dark-eyed gilia *Gilia millefoliata*	-/-/1B.2	Coastal dunes.	April-July	**Absent.** Historical record in hills, but presumed extirpated from the area.
	Diablo helianthella *Helianthella castanea*	-/-/1B.2	Broadleafed upland forest, chaparral, cismontane woodland, coastal scrub, riparian woodland, valley and foothill grassland.	March-June	**Moderate.** Species recorded on or near the site in the Berkeley Hills and Tilden Park; remaining habitat onsite is patchy and marginal
	Franciscan thistle *Cirsium andrewsii*	-/-/1B.2	Species is found in coastal bluff scrub, broadleafed upland forest, coastal scrub, and coastal prairie.	March-July	**Unlikely.** Suitable habitat onsite is patchy and marginal.

TABLE BIO-1
SPECIAL-STATUS SPECIES POTENTIAL ON THE CAMPUS

Taxonomy	Common Name *Scientific Name*	Status Federal/ State/CNPS Status	Habitat	Blooming Period	Potential to Occur
	Jepson's coyote-thistle *Eryngium jepsonii*	-/-/1B.2	Species found in vernal pools, and valley and foothill grassland.	April-August	**Unlikely.** Suitable habitat onsite is patchy and marginal.
	Kellogg's horkelia *Horkelia cuneata var. sericea*	-/-/1B.1	Closed-cone coniferous forest, coastal scrub, coastal dunes, chaparral.	April-September	**Unlikely.** Suitable habitat onsite is patchy and marginal. Possibly extirpated
	Loma Prieta hoita *Hoita strobilina*	-/-/1B.1	Chaparral, cismontane woodland, riparian woodland.	May-July (August-October)	**Unlikely.** Suitable habitat onsite is patchy and marginal. Possibly extirpated
	long-styled sand-spurrey *Spergularia macrotheca var. longistyla*	-/-/1B.2	Marshes and swamps, meadows and seeps.	February-May	**Absent.** No suitable habitat present on the campus.
	most beautiful jewelflower *Streptanthus albidus ssp. peramoenus*	-/-/1B.2	Chaparral, valley and foothill grassland, cismontane woodland.	(March) April-September (October)	**Moderate.** Recorded in East Oakland (Joaquin Miller Park); suitable habitat onsite is patchy and marginal.
	Oregon meconella *Meconella oregana*	-/-/1B.1	Coastal prairie, coastal scrub.	March-April	**Absent.** No suitable habitat present on the campus.
	oval-leaved viburnum *Viburnum ellipticum*	-/-/2B.3	Chaparral, cismontane woodland, lower montane coniferous forest.	May-June	**Unlikely.** Recorded onsite in 1914 (CDFW 2024) but remaining habitat onsite is patchy and marginal.
	pallid manzanita *Arctostaphylos pallida*	FT/CE/1B.1	Species is found in broadleafed upland forest, closed-cone coniferous forest, chaparral, cismontane woodland, and coastal scrub.	December-March	**Unlikely.** Recorded in Tilden Park but suitable habitat onsite is patchy and marginal.
	Point Reyes salty bird's-beak *Chloropyron maritimum ssp. palustre*	-/-/1B.2	Species is found in coastal salt marsh.	June-October	**Absent.** No suitable habitat present on the campus.
	Presidio clarkia *Clarkia franciscana*	FE/CE/1B.1	Species is found in coastal scrub and valley and foothill grassland.	May-July	**Unlikely.** Suitable habitat onsite is patchy and marginal.
	robust spineflower *Chorizanthe robusta var. robusta*	FE/-/1B.1	Species is found in cismontane woodland, coastal dunes, coastal scrub, and chaparral.	April-September	**Unlikely.** Recorded in 1894 in East Oakland but suitable habitat onsite is patchy and marginal. Possibly extirpated.
	rose leptosiphon *Leptosiphon rosaceus*	-/-/1B.1	Coastal bluff scrub.	April-July	**Absent.** No suitable habitat present on the campus.
	saline clover *Trifolium hydrophilum*	-/-/1B.2	Marshes and swamps, valley and foothill grassland, vernal pools.	April-June	**Unlikely.** Suitable habitat onsite is patchy and marginal.
	San Francisco Bay spineflower *Chorizanthe cuspidata var. cuspidata*	-/-/1B.2	Species is found in coastal bluff scrub, coastal dunes, coastal prairie, and coastal scrub.	April-July (August)	**Absent.** No suitable habitat present on the campus.
	San Francisco popcornflower *Plagiobothrys diffusus*	-/CE/1B.1	Valley and foothill grassland, coastal prairie.	March-June	**Unlikely.** Suitable habitat onsite is patchy and marginal.

TABLE BIO-1
SPECIAL-STATUS SPECIES POTENTIAL ON THE CAMPUS

Taxonomy	Common Name *Scientific Name*	Status Federal/ State/CNPS Status	Habitat	Blooming Period	Potential to Occur
	San Joaquin spearscale *Extriplex joaquinana*	-/-/1B.2	Chenopod scrub, alkali meadow, playas, valley and foothill grassland.	April-October	**Absent.** No suitable habitat present on the campus.
	Santa Cruz tarplant *Holocarpha macradenia*	FT/CE/1B.1	Coastal prairie, coastal scrub, valley and foothill grassland.	June-October	**Unlikely.** Suitable habitat onsite is patchy and marginal.
	Tiburon buckwheat *Eriogonum luteolum var. caninum*	-/-/1B.2	Species found in chaparral, valley and foothill grassland, cismontane woodland, and coastal prairie.	May-September	**Unlikely.** Suitable habitat onsite is patchy and marginal.
	western leatherwood *Dirca occidentalis*	-/-/1B.2	Species is found in broadleafed upland forest, chaparral, closed-cone coniferous forest, cismontane woodland, north coast coniferous forest, riparian forest, and riparian woodland.	January-March(April)	**Moderate.** Suitable woodland habitat is present in patches onsite and species have been recorded on edge of campus and in the vicinity from 1991 through 2021 (CDFW 2024).
	woodland woollythreads *Monolopia gracilens*	-/-/1B.2	Chaparral, valley and foothill grassland, cismontane woodland, broadleafed upland forest, North Coast coniferous forest.	(February)March-July	**Unlikely.** Suitable habitat onsite is patchy and marginal.
	Lassics lupine *Lupinus constancei*	-/CE/1B.1	Lower montane coniferous forest.	July	**Unlikely.** Suitable habitat onsite is patchy and marginal.
	bristly sedge *Carex comosa*	-/-/2B.1	Species is found in marshes and swamps, coastal prairie, and valley and foothill grassland.	May-September	**Unlikely.** Suitable habitat onsite is patchy and marginal.
	fragrant fritillary *Fritillaria liliacea*	-/-/1B.2	Coastal scrub, valley and foothill grassland, coastal prairie, cismontane woodland.	February-April	**Unlikely.** Suitable habitat onsite is patchy and marginal.
	Mt. Diablo fairy-lantern *Calochortus pulchellus*	-/-/1B.2	Species is found in chaparral, cismontane woodland, riparian woodland, and valley and foothill grassland.	April-June	**Unlikely.** Suitable habitat onsite is patchy and marginal.
	northern slender pondweed *Stuckenia filiformis ssp. alpina*	-/-/2B.2	Marshes and swamps.	May-July	**Absent.** No suitable habitat present on the campus.
	water star-grass *Heteranthera dubia*	-/-/2B.2	Marshes and swamps.	July-October	**Absent.** No suitable habitat present on the campus.
Amphibians	California red-legged frog *Rana draytonii*	FT/-/-	Lowlands and foothills in or near permanent sources of deep water with dense, shrubby or emergent riparian vegetation.	-	**Absent.** No suitable habitat present on the campus.
	California tiger salamander - central California DPS *Ambystoma californiense pop. 1*	FT/CT/-	Species lives in vacant or mammal-occupied burrows throughout most of the year in grassland, savanna, or open woodland habitats.	-	**Absent.** Suitable habitat is lacking, and campus is outside species' known range.
	foothill yellow-legged frog - central coast DPS *Rana boylii pop. 4*	PT/CE/-	Species prefers rocky, sunny headwater streams and is rarely found away from water.	-	**Unlikely.** No suitable habitat remaining on the campus.

TABLE BIO-1
SPECIAL-STATUS SPECIES POTENTIAL ON THE CAMPUS

Taxonomy	Common Name *Scientific Name*	Status Federal/ State/CNPS Status	Habitat	Blooming Period	Potential to Occur
Birds	Alameda song sparrow *Melospiza melodia pusillula*	-/-/CSC	Resident of salt marshes bordering south arm of San Francisco Bay.	-	**Absent.** No suitable habitat present on the campus.
	American peregrine falcon *Falco peregrinus anatum*	FD/CD/CFP	Near wetlands, lakes, rivers, or other water; on cliffs, banks, dunes, mounds; also, human-made structures.	-	**Moderate**. A breeding pair of falcons is resident on UCB campanile; campus may be too close for another pair to nest. Likely to occur while foraging.
	bald eagle *Haliaeetus leucocephalus*	FD/CE/CFP	Ocean shore, lake margins, and rivers for both nesting and wintering. Most nests within 1 mile of water.	-	**Unlikely.** Suitable nesting and foraging habitat not present in campus.
	burrowing owl *Athene cunicularia*	-/CC,CSC	Species is found in open, dry annual or perennial grasslands, deserts, and scrublands characterized by low-growing vegetation.	-	**Unlikely.** Suitable low grassland with burrowing mammals for nesting is lacking in campus.
	California black rail *Laterallus jamaicensis coturniculus*	-/CT/CFP	Inhabits freshwater marshes, wet meadows and shallow margins of saltwater marshes bordering larger bays.	-	**Absent.** No suitable habitat present on the campus.
	California least tern *Sternula antillarum browni*	FE/CE/CFP	Nests along the coast from San Francisco Bay south to northern Baja California.	-	**Absent.** No suitable nesting habitat present on the campus.
	California Ridgway's rail *Rallus obsoletus obsoletus*	FE/CE/CFP	Salt water and brackish marshes traversed by tidal sloughs in the vicinity of San Francisco Bay.	-	**Absent.** No suitable habitat present on the campus.
	golden eagle *Aquila chrysaetos*	-/-/CFP	Species is found in rolling foothills, mountain areas, sage-juniper flats, and desert.	-	**Unlikely.** Suitable nesting and foraging habitat not present in campus.
	northern harrier *Circus hudsonius*	-/-/CSC	Species is found in coastal salt and freshwater marsh. Species nests and forages in grasslands, from salt grass to mountain cienagas.	-	**Unlikely.** Suitable nesting and foraging habitat not present in campus.
	saltmarsh common yellowthroat *Geothlypis trichas sinuosa*	-/-/CSC	Resident of the San Francisco Bay region, in fresh and salt water marshes.	-	**Absent.** No suitable nesting habitat present on the campus.
	San Pablo song sparrow *Melospiza melodia samuelis*	-/-/CSC	Resident of salt marshes along the north side of San Francisco and San Pablo bays.	-	**Absent.** No suitable habitat present on the campus.
	Suisun song sparrow *Melospiza melodia maxillaris*	-/-/CSC	Resident of brackish-water marshes surrounding Suisun Bay.	-	**Absent.** Campus outside of species' range.
	white-tailed kite *Elanus leucurus*	-/-/CFP	Rolling foothills and valley margins with scattered oaks and river bottomlands or marshes next to deciduous woodland.	-	**Unlikely.** Preferred open foraging habitat not present in campus, but suitable woodland habitat for nesting is present on the periphery.
	yellow rail *Coturnicops noveboracensis*	-/-/CSC	Species is a summer resident in eastern Sierra Nevada in Mono County.	-	**Absent.** No suitable habitat present on the campus.

TABLE BIO-1
SPECIAL-STATUS SPECIES POTENTIAL ON THE CAMPUS

Taxonomy	Common Name *Scientific Name*	Status Federal/ State/CNPS Status	Habitat	Blooming Period	Potential to Occur
	yellow-headed blackbird *Xanthocephalus xanthocephalus*	-/-/CSC	Nests in freshwater emergent wetlands with dense vegetation and deep water. Often along borders of lakes or ponds.	-	**Absent.** No suitable habitat present on the campus.
	western yellow-billed cuckoo *Coccyzus americanus occidentalis*	FT/CE/-	Species is a riparian forest nester, along the broad, lower flood-bottoms of larger river systems.	-	**Absent.** No suitable habitat present on the campus.
Invertebrates	vernal pool fairy shrimp *Branchinecta lynchi*	FT/-/-	Species is endemic to the grasslands of the Central Valley, Central Coast mountains, and South Coast mountains, in astatic rain-filled pools.	-	**Absent.** No suitable habitat present on the campus.
	Bay checkerspot butterfly *Euphydryas editha bayensis*	FT/-/-	Restricted to native grasslands on outcrops of serpentine soil in the vicinity of San Francisco Bay.	-	**Absent.** Campus outside of species' range.
	Crotch bumble bee *Bombus crotchii*	-/-/-	Species is found from Coastal California east to the Sierra-Cascade crest and south into Mexico, more common in hot dry areas..	-	**Unlikely**. One record in Berkeley (CDFW 2024) but range has declined in recent years.
	monarch - California overwintering population *Danaus plexippus plexippus pop. 1*	FC/-/-	Species' winter roost sites extend along the coast from northern Mendocino to Baja California, Mexico.	-	**Moderate.** This species overwinters in eucalyptus trees along coast, typically closer to water but suitable large eucalyptus present in campus.
	western bumble bee *Bombus occidentalis*	-/-/-	Species has declined precipitously in California and is now limited to Sierra foothills and Cascades.	-	**Unlikely.** Recorded in vicinity prior to 2000 (CDFW 2024), but species' range has declined precipitously.
Mammals	Alameda Island mole *Scapanus latimanus parvus*	-/-/CSC	Only known from Alameda Island. Found in a variety of habitats, especially annual and perennial grasslands.	-	**Absent.** No suitable habitat present on the campus.
	American badger *Taxidea taxus*	-/-/CSC	Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils.	-	**Unlikely.** Marginal habitat for this species is present at the periphery of the campus.
	big free-tailed bat *Nyctinomops macrotis*	-/-/CSC	Low-lying arid areas in Southern California.	-	**Absent.** No suitable habitat present on the campus.
	mountain lion *Puma concolor*	-/CC/CSC	Temperate redwood forest, coniferous / deciduous forest, coastal chaparral, foothills and mountains, wherever ungulates are present.	-	**Unlikely.** May occasionally forage or transit through the periphery of the campus.
	pallid bat *Antrozous pallidus*	-/-/CSC	Species is found in deserts, grasslands, shrublands, and woodlands and forests. Species is most common in open, dry habitats with rocky areas for roosting.	-	**Unlikely.** Marginal habitat for this species is present at the periphery of the campus.

TABLE BIO-1
SPECIAL-STATUS SPECIES POTENTIAL ON THE CAMPUS

Taxonomy	Common Name *Scientific Name*	Status Federal/ State/CNPS Status	Habitat	Blooming Period	Potential to Occur
	salt-marsh harvest mouse *Reithrodontomys raviventris*	FE/CE/CFP	Only in the saline emergent wetlands of San Francisco Bay and its tributaries.	-	**Absent.** No suitable habitat present on the campus.
	salt-marsh wandering shrew *Sorex vagrans halicoetes*	-/-/CSC	Salt marshes of the south arm of San Francisco Bay.	-	**Absent.** No suitable habitat present on the campus.
	San Francisco dusky-footed woodrat *Neotoma fuscipes annectens*	-/-/CSC	Forest habitats of moderate canopy and moderate to dense understory. May prefer chaparral and redwood habitats.	-	**Moderate.** Marginal habitat for this species is present on the campus and it has been recorded in the vicinity (CDFW 2024).
	San Pablo vole *Microtus californicus sanpabloensis*	-/-/CSC	Saltmarshes of San Pablo Creek, on the south shore of San Pablo Bay.	-	**Absent.** No suitable habitat present on the campus.
	Townsend's big-eared bat *Corynorhinus townsendii*	-/-/CSC	Species is found throughout California in a wide variety of habitats. Most common in mesic sites.	-	**Unlikely.** Habitat for this species is present in the canyon at the periphery of the campus.
Reptiles	Alameda whipsnake *Masticophis lateralis euryxanthus*	FT/CT/-	Typically found in chaparral and scrub habitats but will also use adjacent grassland, oak savanna and woodland habitats.	-	**Moderate.** Recorded historically onsite but remaining habitat is marginal on the periphery of the property. Species may occasionally transit across site.
	northwestern pond turtle *Actinemys marmorata*	FPT/-/CSC	A thoroughly aquatic turtle of ponds, marshes, rivers, streams and irrigation ditches, usually with aquatic vegetation, below 6000 ft elevation.	-	**Absent.** No suitable habitat present on the campus.

KEY TO STATUS CODES:

Federal

Candidate = FC
Delisted = FD
Endangered = FE
None = -
Proposed Endangered = FPE
Proposed Threatened = FPT
Threatened = FT

State

Candidate = CC
Delisted = CD
Endangered = CE
None = -
Rare = CR
Threatened = CT
Fully Protected = CFP

Other

CNPS Rank Categories:
1A = Plants presumed extirpated in California and either rare or extinct elsewhere
1B = Plants Rare, Threatened, or Endangered in California and elsewhere
2A = Plants presumed extirpated in California, but more common elsewhere
2B = Plants Rare, Threatened, or Endangered in California, but more common elsewhere
3 = Plants about which more information is needed - A Review List
4 = Plants of limited distribution - A Watch List

CNPS Code Extensions:
.1 = Seriously endangered in California (over 80% of occurrences threatened/high degree and immediacy of threat)
.2 = Fairly endangered in California (20U+002d80% occurrences threatened)
.3 = Not very endangered in California (less than 20% of occurrences threatened or no current threats known)

SOURCES: CNPS 2024; USFWS 2024; CDFW 2024

Appendix GHG

Greenhouse Gas Emissions Appendix

Berkeley Lab GHG calcs for FY19 (actuals), FY23 (actuals), FY24 (actuals), and FY45 (projected)

2/20/2025

Scope	Subcategories	Description	Annual Greenhouse Gas (GHG) emissions [MTCO2e/year]			
			FY 2019 actuals	FY 2023 actuals	FY 2024 actuals	FY 2045 projected - used in LRDP
1	Natural Gas	Natural gas combusted on site, primarily used for space and water heating but also used for scientific processes (such as benchtop use).	7,760	7,887	6,294	710
1	Non-fleet Vehicles & Equipment Fuel	Forklifts powered by liquid propane, emergency/backup diesel generators, and other equipment such as aerial lifts, bobcat, excavator, asphalt roller, mobile compressed air unit, and landscaping equipment.	36	378	583	57
1	Fleet Fuel	Gasoline, E-85, and diesel fuel consumed by lab vehicles.	127	126	126	13
1	Fugitives & Process Gas	Includes fugitive gases emitted from research use such as SF6, methane (CH4), CO2, and nitrous oxide and refrigerants primarily used in HVAC equipment.	182	219	823	155
2	Electricity	Electricity generated offsite and used on the main hill site and specific satellite locations where LBNL directly pays utility bills. Includes renewable energy from a solar array located at LLNL, of which LBNL purchases 20% of its annual output; incremental hydropower produced by the Central Valley Project (CVP), and community energy from MCE, used by a satellite location.	27,135	23,861	19,119	950
2	Avoided Emissions - RECs	Purchased Renewable Energy Credits (RECs) for unbundled electricity.	-1,236	-3,631		0
3	Business Air Travel	Flights taken by Lab employees for business purposes.	7,388	4,985	4,906	2,098
3	Business Ground Travel	Trips taken via car, bus, or public transport by Lab employees for business purposes to sites other than the Lab.	406	320	331	113
3	Commute	Trips taken via car, shuttle bus, or public transport by Lab employees to the Lab Hill site.	8,412	3,762	4,196	964
3	T and D Losses	Transmission and distribution losses from electricity traveling from source to the Lab.	1,787	1,307	1,107	45
3	Waste Disposal	Municipal solid waste disposal, sent to offsite landfill for the Lab's main Hill site.	183	196	217	109
3	Wastewater Treatment	Offsite wastewater treatment	21	7	10	6
Subtotals	Scope 1		8,106	8,610	7,826	935

	Scope 2		25,899	20,230	19,119	950
	Scope 3		18,198	10,577	10,768	3,335
	Scope 1 & 2		34,005	28,840	26,945	1,885
Total	**Scope 1, 2, & 3**		**52,203**	**39,416**	**37,713**	**5,220**

Inputs and Assumptions

2/20/2025

Scope	Subcategories	FY 2019 actuals	FY 2023 actuals	FY 2024 actuals	FY 2045 projected - used in LRDP
1	Natural Gas	Actual natural gas consumed in FY2019	Actual natural gas consumed in FY2023	Actual natural gas consumed in FY2024	Assumes all new construction will be all-electric and not use natural gas for space or water heating. Assumes electrified boiler plant replacements in line with replacement of aging plants and meeting UC Scope 1 reduction targets. This corresponds to an average of 3 projects every 5 years. Also assumes that electrification of small end uses such as domestic hot water proceeds upon replacement. Remaining gas consumption in 2045 is due to space and water heating that is out of scope of this target.
1	Non-fleet Vehicles & Equipment Fuel	Actual fuel consumption of non-fleet vehicles (forklifts only) and equipment (diesel generators only).	Actual fuel consumption of non-fleet vehicles such as forklifts and aerial lifts and equipment such as diesel generators and tractors.	Actual fuel consumption of non-fleet vehicles such as forklifts and aerial lifts and equipment such as diesel generators and tractors.	Current targets include various CARB and other requirements in progress including the following: (1) CARB Zero-Emission Forklift and (2) CARB Renewable Diesel Fuel To reflect compliance with these policies, assumed straight-line reduction through 2045, with a baseline of average emissions from FY21 to FY23. Straight-line reduction only applies to the following: 1) the portion of baseline average (about 35% of total) which is not associated with diesel generators (i.e. everything other than diesel used in generators will phase out over time) 2) half of the portion of baseline average (half of remaining 65%) which is associated with diesel generators (i.e. only half of the diesel used in generators will phase out over time)
1	Fleet Fuel	Actual fuel consumed by fleet vehicles for fuel types: ethanol, gasoline, diesel	Actual fuel consumed by fleet vehicles for fuel types: ethanol, gasoline, diesel	Assumed same value as FY23, due to unavailability of data. Fuel consumption data is usually available in late February of each year.	Assumes 90% reduction from 2019 baseline due to electrification of federal fleet, driven by CARB Advanced Clean Fleets and Advanced Clean Cars regulations.
1	Fugitives & Process Gas	Fugitive emissions from refrigerants and other fugitive gases, such as CO2, CH4, NOx, SF6	Fugitive emissions from refrigerants and other fugitive gases, such as CO2, CH4, NOx, SF6	Fugitive emissions from refrigerants and other fugitive gases, such as CO2, CH4, NOx, SF6	Current applicable target is the EPA phasedown of hydrofluorocarbon (HFC) class of refrigerants. Assumptions: In an attempt to track changes associated with these regulations, the estimate assumes: Straight-line reduction meeting a 50% decrease in emissions by 2045 then flat, with a baseline of average emissions from FY21 to FY23.
2	Electricity	Actual electricity consumption FY2019. GHG accounting follows protocol-based market-based accounting method.	Actual electricity consumption FY2023. GHG accounting follows protocol-based market-based accounting method. See FY 2023 electricity actuals for details.	Actual electricity consumption FY2024. GHG accounting follows protocol-based market-based accounting method. Number already discounts REC purchases for FY24. Actual purchase of 5,000 MWh of RECs. Emissions factor is eGRID 2022 CAMX baseload factor of 0.2308000 MTCO2e/MWh.	Uses a higher "Scenario 1 Conceivable" forecast, which assumes stakeholder forecasts given aspirational funding levels. Includes future NERSC 11 systems. IT load growth is low scenario, delayed 2 years with the exception of B92 server room. NERSC average power is 14.9 MW in FY30, 27.6 MW in FY31, and 29.5 MW FY34-50. All new construction will be all electric. Assumes California State Bill SB 100 is met, which is 100% decarbonized electricity grid by January 1, 2046. Since FY 2045 is October 1, 2044 through September 30, 2045, the grid will still have small, but non-zero emissions factor, which is why the scope 2 emissions are non-zero. Assumes that the Lab will procure 60 MW of clean and/or renewable electricity in 2045.
2	Avoided Emissions - RECs	Actual purchase of 5,141 MWh of RECs. Emissions factor is eGRID 2016 CAMX baseload factor of 0.2403491 MTCO2e/MWh.	Actual purchase of 15,000 MWh of RECs. Emissions factor is eGRID 2021 CAMX baseload factor of 0.242068 MTCO2e/MWh.	Included in the Electricity row above.	Assumes no unbundled RECs are purchased.
3	Business Air Travel	Based on miles traveled on flights for business purposes by flight segment length: short, medium, and long haul. Utilizes emission factors published by the EPA in 2014, consistent with federal calculation. See EPA Emission Factors Hub.	Based on miles traveled on flights for business purposes by flight segment length: short, medium, and long haul. Utilizes emission factors published by the EPA in 2014, consistent with federal calculation. See EPA Emission Factors Hub.	Based on miles traveled on flights for business purposes by flight segment length: short, medium, and long haul. Utilizes emission factors published by the EPA in 2024, consistent with federal calculation. See EPA Emission Factors Hub.	GHG intensity of air travel is assumed to improve 4% per year, selected between lower and upper bound estimates • Lower bound estimate of GHG intensity of air travel reduction is 2.2% per year, based on historical trends (including short, medium, and long haul) of improvements in emission factors. This corresponds to a 30% reduction by 2045. • Upper bound estimate is based on an Alaska airlines website statement (no longer up) of 60%-80% reduction by 2040. A second reference: Alaska Airlines expects a 60% reduction of GHG intensity in flying by 2040, said by Courtney Unruh, ESG & Sustainability Program Manager, Alaska Airlines, Seattle, WA, At Verge 23 Conference in San Jose, CA: Oct 26, 2023). 60% by 2040 corresponds to a 5.5% annual improvement. • An additional reference is European regulations for aviation fuel supplied at EU airports: 70% SAF by 2050. This is roughly 65% reduction by 2050, as described in https://www.iata.org/en/iata-repository/pressroom/fact-sheets/fact-sheet-sustainable-aviation-fuels/ • 2045 estimate is based on a 4% annual improvement which corresponds to a 48% decrease by 2040 and 65% decrease by 2050. • Forecast does not assume that air travel patterns will change at the Lab.
3	Business Ground Travel	Based on miles per trip or miles per gallon for business ground travel. Sub-categories include personal vehicle, rental cars, and mass transport, such as BART.	Based on miles per trip or miles per gallon for business ground travel. Sub-categories include personal vehicle, rental cars, and mass transport, such as BART.	Based on miles per trip or miles per gallon for business ground travel. Sub-categories include personal vehicle, rental cars, and mass transport, such as BART.	Vehicle efficiency is assumed to improve 2% per year, based on historical trend of vehicle efficiency for cars and SUVs. Emissions reduction for EV adoption is based on the nationwide target of 50% EV sales by 2030 linearly. Then assumes 100% EV sales by 2040 linearly.
3	Commute	Based on number of miles commuted to the Lab's Hill site. Sub-categories such as single occupancy vehicles, carpool, and mass transit. Calculated using commute survey inputs and HR population data.	Based on number of miles commuted to the Lab's Hill site. Sub-categories such as single occupancy vehicles, carpool, and mass transit. Calculated using actual badge-in data and commute survey inputs.	Based on number of miles commuted to the Lab's Hill site. Sub-categories such as single occupancy vehicles, carpool, and mass transit. Calculated using actual badge-in data and commute survey inputs.	Vehicle efficiency is assumed to improve 2% per year (according to observations from the 2023 EPA Automotive Trends Report data). Emissions reduction also scale based on EV adoption using projections from a 2021 consultant study for the Lab, although the rate of EV adoption was lowered to produce a conservative (higher) estimate of future emissions. Assumptions are only applicable to 94% of the baseline emission number (i.e. only for POV commute modes). Remainder 6% for mass transit is assumed to have a straight-line reduction to zero by 2045.
3	T and D Losses	Emissions associated with transmission and distribution losses in electricity supply to the Lab using eGRID 2016 grid gross loss rate	Emissions associated with transmission and distribution losses in electricity supply to the Lab using eGRID 2021 grid gross loss rate	Emissions associated with transmission and distribution losses in electricity supply to the Lab using eGRID 2022 grid gross loss rate	Calculated emissions associated with transmission and distribution losses in grid electricity supply to the Lab using a 4.5% factor, an average of the grid gross loss factor for CAMX for calendar years 2021, 2022, and 2023.
3	Waste Disposal	Emissions associated with quantity of municipal solid waste sent to off-site landfill.	Emissions associated with quantity of municipal solid waste sent to off-site landfill.	Emissions associated with quantity of municipal solid waste sent to off-site landfill.	Target: 75% diversion by 2030. Assumptions: Baseline is average emissions for FY 2022 and FY 2023 FY24 to FY30 follow the target of achieving 75% Diversion by 2030 (linearly). FY31 to FY45 follows an additional assumption of 1% reduction per year in municipal solid waste generated, while maintaining 75% diversion.
3	Wastewater Treatment	Emissions associated with wastewater treatment, based on site population served by the off-site wastewater treatment plant of the utility.	Emissions associated with wastewater treatment, based on site population served by the off-site wastewater treatment plant of the utility.	Emissions associated with wastewater treatment, based on site population served by the off-site wastewater treatment plant of the utility.	No explicit target. Baseline is average of FY21-FY23. Assumption is that this will remain flat.

Comparison of 2045 emissions relative to 1990

2/28/2025

The Lab did not maintain a greenhouse gas emissions inventory in FY 1990. However, in 2016, a consultant, Illingworth & Rodkin, Inc., prepared an estimate of the Lab's FY 1990 GHG emissions for Impact Sciences to support the Lab's 2016 Draft Focused Environmental Impact Report SCH# 2016062007. This was based on actual electricity and fossil gas consumption in FY 1990 (which was tracked by the Lab) and estimates scaled off of available data as described in the consultant memo on pages 238-247 in the linked EIR. This table does not include every emissions category that Berkeley Lab currently tracks and reports. It includes on the emissions categories availabe for FY 1900 in the linked EIR.

		Annual Greenhouse Gas (GHG) emissions [MTCO2e/year]			Percent change from FY 1990 to FY 2024	Percent change from FY 1990 to FY 2045
Scope	**Subcategories**	**FY 1990 estimate**	**FY 2024 actuals**	**FY 2045 projected**		
1	Natural Gas	6,933	6,294	710	-9%	-90%
1	Fleet Fuel	76	126	13	66%	-83%
1	Fugitives & Process Gas	37	823	155	2123%	319%
2	Electricity	40,061	19,119	950	-52%	-98%
3	Commute	8,311	4,196	964	-50%	-88%
3	Waste Disposal	268	217	109	-19%	-59%
3	Wastewater Treatment	7	10	6	37%	-14%
Subtotals	Scope 1	7,046	7,243	878	3%	-88%
	Scope 2	40,061	19,119	950	-52%	-98%
	Scope 3	8,586	4,423	1,079	-48%	-87%
Total	**Scope 1, 2, & 3**	**55,693**	**30,786**	**2,907**	-45%	-95%
Total	**Scope 1, 2, & 3**	55,693	37713	5347	-32%	-90%

Appendix NOI
Noise and Vibration Appendix

RCNM Outputs for Construction Noise

Traffic Noise Model

Noise Monitoring

RCNM Outputs for Construction Noise

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/18/2024
Case Description: Demolition

---- Receptor #1 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Campus Drive Residences	Residential	55	55	50

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Tractor	No	40	84		500	0
Concrete Saw	No	20		89.6	500	0

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Tractor		64	60	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Concrete Saw		69.6	62.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	69.6	64.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
La Vereda Road Residences	Residential	55	55	50

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Tractor	No	40	84		700	0
Concrete Saw	No	20		89.6	700	0

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Tractor		61.1	57.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Concrete Saw		66.7	59.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	66.7	61.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #3 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Highland Place Residecnes	Residential	55	55	50

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Tractor	No	40	84		790	0
Concrete Saw	No	20		89.6	790	0

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Tractor		60	56	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Concrete Saw		65.6	58.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	65.6	60.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #4 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Foothill Student Housing	Residential	55	55	50

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Tractor	No	40	84		930	0
Concrete Saw	No	20		89.6	930	0

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Tractor		58.6	54.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Concrete Saw		64.2	57.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	64.2	59.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/18/2024
Case Description: Site Preparation and Grading

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Campus Drive Residences	Residential	55	55	50

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85		440	0
Tractor	No	40	84		440	0

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Grader		66.1	62.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor		65.1	61.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	66.1	64.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
La Vereda Road Residences	Residential	55	55	50

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85		675	0
Tractor	No	40	84		675	0

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Grader		62.4	58.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor		61.4	57.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	62.4	61	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #3 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Highland Place Residecnes	Residential	55	55	50

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85		750	0
Tractor	No	40	84		750	0

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Grader		61.5	57.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor		60.5	56.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	61.5	60	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #4 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Foothill Student Housing	Residential	55	55	50

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85		1000	0
Tractor	No	40	84		1000	0

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Grader		59	55	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor		58	54	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	59	57.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 12/18/2024
Case Description: Building Construction

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Campus Drive Residences	Residential	55	55	50

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Gradall	No	40		83.4	440	0
Tractor	No	40	84		440	0

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Gradall		64.5	60.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor		65.1	61.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	65.1	63.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
La Vereda Road Residences	Residential	55	55	50

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Gradall	No	40		83.4	675	0
Tractor	No	40	84		675	0

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Gradall		60.8	56.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor		61.4	57.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	61.4	60.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #3 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Highland Place Residecnes	Residential	55	55	50

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Gradall	No	40		83.4	750	0
Tractor	No	40	84		750	0

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Gradall		59.9	55.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor		60.5	56.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	60.5	59.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #4 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Foothill Student Housing	Residential	55	55	50

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Gradall	No	40		83.4	1000	0
Tractor	No	40	84		1000	0

Results

		Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
				Day		Evening		Night		Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Gradall		57.4	53.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor		58	54	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	58	56.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Traffic Noise Model

Existing

ROAD SEGMENT	from:	to:	TOTAL # VEHICLES	VEHICLE TYPE % Auto %	Auto	MT %	MT	HT %	HT	VEHICLE SPEED Auto	k/h	MT	k/h	HT	k/h	NOISE LEVEL (dBA) Auto	MT	HT	CALCULATED NOISE LEVEL (15 meters from roadway center)	Receptor Dist. from Roadway Center (m.)	Adjusted Noise Level (dBA)	Distance from Roadway to 65 dBA (m.)	Distance from Roadway to 65 dBA (ft)
Hearst Avenue	Euclid Avenue	Gayley Road	593	92.1	546	5	31.33	2.6	15.67	25	40	25	40	25	40	57.5	56.7	61.3	63.8	40	59.5	11.3	37.2
Hearst Avenue	Gayley Road	Cyclotron Road	268	88.1	236	8	21.33	4	10.67	25	40	25	40	25	40	53.8	55.0	59.7	61.7	40	57.5	7.1	23.2
Gayley Road	Stadium Rim Way	Hearst Avenue	888	93.7	832	4	37.33	2.1	18.67	25	40	25	40	25	40	59.3	57.5	62.1	64.8	40	60.6	14.4	47.3
Piedmont Avenue	Dwight Way	Channing Way	833	97.1	809	2	16	1	8	25	40	25	40	25	40	59.2	53.8	58.4	62.5	40	58.2	8.4	27.5

Assumptions: AM peak hour traffic data from Fehr & Peers

Existing + Project

ROAD SEGMENT	from:	to:	TOTAL # VEHICLES	VEHICLE TYPE % Auto %	Auto	MT %	MT	HT %	HT	VEHICLE SPEED Auto	k/h	MT	k/h	HT	k/h	NOISE LEVEL (dBA) Auto	MT	HT	CALCULATED NOISE LEVEL (15 meters from roadway center)	Receptor Dist. from Roadway Center (m.)	Adjusted Noise Level (dBA)	Distance from Roadway to 65 dBA (m.)	Distance from Roadway to 65 dBA (ft)
Hearst Avenue	Euclid Avenue	Gayley Road	633	92.1	582.83	5	33.45	2.6	16.72	25	40	25	40	25	40	57.8	57.0	61.6	64.1	40	59.8	12.1	39.7
Hearst Avenue	Gayley Road	Cyclotron Road	342	88.1	301.16	8	27.22	4	13.61	25	40	25	40	25	40	54.9	56.1	60.7	62.8	40	58.5	9.0	29.6
Gayley Road	Stadium Rim Way	Hearst Avenue	919	93.7	861.05	4	38.64	2.1	19.32	25	40	25	40	25	40	59.5	57.6	62.3	65.0	40	60.7	14.9	48.9
Piedmont Avenue	Dwight Way	Channing Way	858	97.1	833.28	2	16.48	1	8.24	25	40	25	40	25	40	59.3	53.9	58.6	62.6	40	58.3	8.6	28.3

Assumptions: AM peak hour traffic data from Fehr & Peers

2040 + Project

ROAD SEGMENT	from:	to:	TOTAL # VEHICLES	VEHICLE TYPE % Auto %	Auto	MT %	MT	HT %	HT	VEHICLE SPEED Auto	k/h	MT	k/h	HT	k/h	NOISE LEVEL (dBA) Auto	MT	HT	CALCULATED NOISE LEVEL (15 meters from roadway center)	Receptor Dist. from Roadway Center (m.)	Adjusted Noise Level (dBA)	Distance from Roadway to 65 dBA (m.)	Distance from Roadway to 65 dBA (ft)
Hearst Avenue	Euclid Avenue	Gayley Road	734	92.1	675.65	5	38.77	2.6	19.39	25	40	25	40	25	40	58.4	57.6	62.3	64.7	40	60.5	14.0	46.1
Hearst Avenue	Gayley Road	Cyclotron Road	388	88.1	341.28	8	30.85	4	15.43	25	40	25	40	25	40	55.4	56.6	61.3	63.3	40	59.1	10.2	33.5
Gayley Road	Stadium Rim Way	Hearst Avenue	1070	93.7	1002.5	4	44.98	2.1	22.49	25	40	25	40	25	40	60.1	58.3	62.9	65.6	40	61.4	17.4	56.9
Piedmont Avenue	Dwight Way	Channing Way	1000	97.1	970.81	2	19.2	1	9.6	25	40	25	40	25	40	60.0	54.6	59.2	63.3	40	59.0	10.0	32.9

Assumptions: AM peak hour traffic data from Fehr & Peers

Noise Monitoring

Summary

File Name on Meter	831_Data.122.s
File Name on PC	831_0002783-20240612 110151-831_Data.122.ldbin
Serial Number	0002783
Model	Model 831
Firmware Version	2.403
User	Nick Reynoso
Location	ST-1: End of Hilgard Avenue, west of LNBL campus
Job Description	LBNL LRDP
Note	

Measurement

Description	
Start	2024-06-12 11:01:51
Stop	2024-06-12 11:16:52
Duration	00:15:00.7
Run Time	00:15:00.7
Pause	00:00:00.0
Pre-Calibration	2024-06-12 10:27:10
Post-Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting			
Peak Weight	Z Weighting			
Detector	Slow			
Preamplifier	PRM831			
Microphone Correction	Off			
Integration Method	Linear			
OBA Range	Low			
OBA Bandwidth	1/1 and 1/3			
OBA Frequency Weighting	Z Weighting			
OBA Max Spectrum	Bin Max			
Gain	0.0 dB			
Overload	142.8 dB			
	A	**C**	**Z**	
Under Range Peak	75.2	72.2	**77.2**	dB
Under Range Limit	**25.9**	26.1	31.2	dB
Noise Floor	16.8	17.0	22.0	dB
	First	**Second**	**Third**	
Instrument Identification				

Results

LAeq	44.7		
LAE	74.2		
EA	2.948 µPa²h		
LZpeak (max)	2024-06-12 11:05:18	87.5	dB
LASmax	2024-06-12 11:08:34	53.2	dB
LASmin	2024-06-12 11:15:32	41.7	dB
SEA	-99.9 dB		

	Exceedance Counts	**Duration**
LAS > 65.0 dB	0	0.0 s
LAS > 85.0 dB	0	0.0 s
LZpeak > 135.0 dB	0	0.0 s
LZpeak > 137.0 dB	0	0.0 s
LZpeak > 140.0 dB	0	0.0 s

	Ldn	**LDay 07:00-22:00**	**LNight 22:00-07:00**	**Lden**	**LDay 07:00-19:00**	**LEvening 19:00-22:00**	**LNight 22:00-07:00**	
Community Noise	44.7	44.7	-99.9	44.7	44.7	-99.9	-99.9	dB

LCeq	58.7 dB
LAeq	44.7 dB
LCeq - LAeq	14.0 dB
LAIeq	48.4 dB
LAeq	44.7 dB
LAIeq - LAeq	3.7 dB

	A		**C**		**Z**	
	dB	**Time Stamp**	**dB**	**Time Stamp**	**dB**	**Time Stamp**
Leq	44.7		58.7		64.2	
LS(max)	53.2	2024/06/12 11:08:34	64.1	2024/06/12 11:05:38	74.1	2024/06/12 11:14:07
LF(max)	58.2	2024/06/12 11:05:18	65.3	2024/06/12 11:12:16	78.0	2024/06/12 11:14:07
LI(max)	63.6	2024/06/12 11:05:18	67.2	2024/06/12 11:12:15	80.3	2024/06/12 11:14:07
LS(min)	41.7	2024/06/12 11:15:32	56.9	2024/06/12 11:15:43	60.7	2024/06/12 11:13:13
LF(min)	41.0	2024/06/12 11:15:48	54.4	2024/06/12 11:14:03	57.9	2024/06/12 11:02:12
LI(min)	41.5	2024/06/12 11:15:54	57.4	2024/06/12 11:16:47	61.8	2024/06/12 11:03:00
LPeak(max)	87.1	2024/06/12 11:05:18	85.8	2024/06/12 11:05:18	87.5	2024/06/12 11:05:18

Overload Count	0
Overload Duration	0.0 s
OBA Overload Count	0
OBA Overload Duration	0.0 s

Summary

File Name on Meter	831_Data.121.s
File Name on PC	831_0002783-20240612 103043-831_Data.121.ldbin
Serial Number	0002783
Model	Model 831
Firmware Version	2.403
User	Nick Reynoso
Location	ST-2: Behind Bowles Hall in Foothill Lot
Job Description	LBNL LRDP
Note	

Measurement

Description	
Start	2024-06-12 10:30:43
Stop	2024-06-12 10:45:43
Duration	00:15:00.9
Run Time	00:15:00.9
Pause	00:00:00.0
Pre-Calibration	2024-06-12 10:27:16
Post-Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting
Peak Weight	Z Weighting
Detector	Slow
Preamplifier	PRM831
Microphone Correction	Off
Integration Method	Linear
OBA Range	Low
OBA Bandwidth	1/1 and 1/3
OBA Frequency Weighting	Z Weighting
OBA Max Spectrum	Bin Max
Gain	0.0 dB
Overload	142.8 dB

	A	C	Z	
Under Range Peak	75.2	72.2	**77.2**	dB
Under Range Limit	**25.9**	26.1	31.2	dB
Noise Floor	16.8	17.0	22.0	dB

	First	Second	Third
Instrument Identification			

Results

LAeq	49.8		
LAE	79.3		
EA	9.522 µPa²h		
LZpeak (max)	2024-06-12 10:42:24	90.9	dB
LASmax	2024-06-12 10:38:11	57.8	dB
LASmin	2024-06-12 10:32:47	47.4	dB
SEA	-99.9 dB		

	Exceedance Counts	Duration
LAS > 65.0 dB	0	0.0 s
LAS > 85.0 dB	0	0.0 s
LZpeak > 135.0 dB	0	0.0 s
LZpeak > 137.0 dB	0	0.0 s
LZpeak > 140.0 dB	0	0.0 s

Community Noise	Ldn	LDay 07:00-22:00	LNight 22:00-07:00	Lden	LDay 07:00-19:00	LEvening 19:00-22:00	LNight 22:00-07:00	
	49.8	49.8	-99.9	49.8	49.8	-99.9	-99.9	dB

LCeq	62.9 dB
LAeq	49.8 dB
LCeq - LAeq	13.2 dB
LAIeq	51.0 dB
LAeq	49.8 dB
LAIeq - LAeq	1.2 dB

	A		C		Z	
	dB	Time Stamp	dB	Time Stamp	dB	Time Stamp
Leq	49.8		62.9		66.8	
LS(max)	57.8	2024/06/12 10:38:11	68.1	2024/06/12 10:42:24	73.1	2024/06/12 10:30:43
LF(max)	59.5	2024/06/12 10:39:08	75.1	2024/06/12 10:42:24	78.8	2024/06/12 10:42:24
LI(max)	63.6	2024/06/12 10:39:08	78.9	2024/06/12 10:42:24	83.1	2024/06/12 10:42:24
LS(min)	47.4	2024/06/12 10:32:47	60.8	2024/06/12 10:32:42	64.3	2024/06/12 10:32:42
LF(min)	46.8	2024/06/12 10:32:47	58.8	2024/06/12 10:39:21	61.1	2024/06/12 10:39:21
LI(min)	47.2	2024/06/12 10:32:47	61.2	2024/06/12 10:32:09	65.7	2024/06/12 10:32:48
LPeak(max)	76.0	2024/06/12 10:42:24	87.4	2024/06/12 10:42:24	90.9	2024/06/12 10:42:24

Overload Count	0
Overload Duration	0.0 s
OBA Overload Count	0
OBA Overload Duration	0.0 s

Summary

File Name on Meter	831_Data.124.s
File Name on PC	831_0002783-20240614 112405-831_Data.124.ldbin
Serial Number	0002783
Model	Model 831
Firmware Version	2.403
User	Nick Reynoso
Location	ST-3: Behind Building 62, Lot T2
Job Description	LBNL LRDP
Note	

Measurement

Description	
Start	2024-06-14 11:24:05
Stop	2024-06-14 11:39:06
Duration	00:15:00.7
Run Time	00:15:00.7
Pause	00:00:00.0
Pre-Calibration	2024-06-14 10:52:28
Post-Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting
Peak Weight	Z Weighting
Detector	Slow
Preamplifier	PRM831
Microphone Correction	Off
Integration Method	Linear
OBA Range	Low
OBA Bandwidth	1/1 and 1/3
OBA Frequency Weighting	Z Weighting
OBA Max Spectrum	Bin Max
Gain	0.0 dB
Overload	143.2 dB

	A	**C**	**Z**	
Under Range Peak	75.7	72.7	**77.7**	dB
Under Range Limit	**26.1**	26.3	31.7	dB
Noise Floor	17.0	17.2	22.3	dB

	First	**Second**	**Third**
Instrument Identification			

Results

LAeq	52.2		
LAE	81.8		
EA	16.767 µPa²h		
LZpeak (max)	2024-06-14 11:27:17	96.4	dB
LASmax	2024-06-14 11:25:47	68.2	dB
LASmin	2024-06-14 11:24:05	48.6	dB
SEA	-99.9 dB		

	Exceedance Counts	**Duration**
LAS > 65.0 dB	1	2.5 s
LAS > 85.0 dB	0	0.0 s
LZpeak > 135.0 dB	0	0.0 s
LZpeak > 137.0 dB	0	0.0 s
LZpeak > 140.0 dB	0	0.0 s

Community Noise	**Ldn**	**LDay 07:00-22:00**	**LNight 22:00-07:00**	**Lden**	**LDay 07:00-19:00**	**LEvening 19:00-22:00**	**LNight 22:00-07:00**	
	52.2	52.2	-99.9	52.2	52.2	-99.9	-99.9	dB

LCeq	64.7 dB
LAeq	52.2 dB
LCeq - LAeq	12.5 dB
LAIeq	54.8 dB
LAeq	52.2 dB
LAIeq - LAeq	2.5 dB

	A		**C**		**Z**	
	dB	**Time Stamp**	**dB**	**Time Stamp**	**dB**	**Time Stamp**
Leq	52.2		64.7		74.8	
LS(max)	68.2	2024/06/14 11:25:47	76.0	2024/06/14 11:37:36	87.3	2024/06/14 11:27:18
LF(max)	72.6	2024/06/14 11:25:47	78.9	2024/06/14 11:37:18	91.9	2024/06/14 11:27:17
LI(max)	73.6	2024/06/14 11:25:47	82.6	2024/06/14 11:37:18	94.6	2024/06/14 11:27:17
LS(min)	48.6	2024/06/14 11:24:05	60.8	2024/06/14 11:37:00	64.5	2024/06/14 11:37:01
LF(min)	48.4	2024/06/14 11:24:21	58.9	2024/06/14 11:24:12	62.3	2024/06/14 11:24:49
LI(min)	48.6	2024/06/14 11:24:21	61.5	2024/06/14 11:37:00	65.4	2024/06/14 11:36:59
LPeak(max)	84.5	2024/06/14 11:29:04	87.6	2024/06/14 11:37:18	96.4	2024/06/14 11:27:17

Overload Count	0
Overload Duration	0.0 s
OBA Overload Count	0
OBA Overload Duration	0.0 s

Summary

File Name on Meter	831_Data.123.s
File Name on PC	831_0002783-20240614 105701-831_Data.123.ldbin
Serial Number	0002783
Model	Model 831
Firmware Version	2.403
User	Nick Reynoso
Location	ST-4: In front of Buildings 74 and 84, Lot U1
Job Description	LBNL LRDP
Note	

Measurement

Description	
Start	2024-06-14 10:57:01
Stop	2024-06-14 11:12:26
Duration	00:15:25.3
Run Time	00:15:25.3
Pause	00:00:00.0
Pre-Calibration	2024-06-14 10:52:29
Post-Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting
Peak Weight	Z Weighting
Detector	Slow
Preamplifier	PRM831
Microphone Correction	Off
Integration Method	Linear
OBA Range	Low
OBA Bandwidth	1/1 and 1/3
OBA Frequency Weighting	Z Weighting
OBA Max Spectrum	Bin Max
Gain	0.0 dB
Overload	143.2 dB

	A	C	Z	
Under Range Peak	75.7	72.7	**77.7**	dB
Under Range Limit	**26.1**	26.3	31.7	dB
Noise Floor	17.0	17.2	22.3	dB

	First	Second	Third
Instrument Identification			

Results

LAeq	57.9	
LAE	87.5	
EA	62.850 µPa²h	
LZpeak (max)	2024-06-14 11:03:34	99.1 dB
LASmax	2024-06-14 11:03:34	77.5 dB
LASmin	2024-06-14 10:59:36	44.9 dB
SEA	-99.9 dB	

	Exceedance Counts	Duration
LAS > 65.0 dB	6	41.3 s
LAS > 85.0 dB	0	0.0 s
LZpeak > 135.0 dB	0	0.0 s
LZpeak > 137.0 dB	0	0.0 s
LZpeak > 140.0 dB	0	0.0 s

Community Noise	Ldn	LDay 07:00-22:00	LNight 22:00-07:00	Lden	LDay 07:00-19:00	LEvening 19:00-22:00	LNight 22:00-07:00	
	57.9	57.9	-99.9	57.9	57.9	-99.9	-99.9	dB

LCeq	67.6 dB
LAeq	57.9 dB
LCeq - LAeq	9.7 dB
LAIeq	62.0 dB
LAeq	57.9 dB
LAIeq - LAeq	4.1 dB

	A		C		Z	
	dB	Time Stamp	dB	Time Stamp	dB	Time Stamp
Leq	57.9		67.6		70.6	
LS(max)	77.5	2024/06/14 11:03:34	85.7	2024/06/14 11:02:52	85.9	2024/06/14 11:02:52
LF(max)	83.8	2024/06/14 11:03:34	88.3	2024/06/14 11:02:52	88.4	2024/06/14 11:02:52
LI(max)	86.8	2024/06/14 11:03:34	89.3	2024/06/14 11:02:52	89.5	2024/06/14 11:02:52
LS(min)	44.9	2024/06/14 10:59:36	60.0	2024/06/14 10:59:29	64.4	2024/06/14 11:07:10
LF(min)	44.3	2024/06/14 10:59:12	58.0	2024/06/14 10:59:26	61.7	2024/06/14 11:06:44
LI(min)	44.7	2024/06/14 11:04:57	60.7	2024/06/14 11:01:30	65.8	2024/06/14 11:06:25
LPeak(max)	98.4	2024/06/14 11:03:34	97.1	2024/06/14 11:03:34	99.1	2024/06/14 11:03:34

Overload Count	0
Overload Duration	0.0 s
OBA Overload Count	0
OBA Overload Duration	0.0 s

Summary

File Name on Meter	LxT_Data.187.s
File Name on PC	LxT_0004437-20240612 110000-LxT_Data.187.ldbin
Serial Number	0004437
Model	SoundTrack LxT®
Firmware Version	2.404
User	Nick Reynoso
Location	LT-1: Behind Foothill Student Housing, where Hearst Avenue meets Highland Place
Job Description	LBNL LRDP
Note	

Measurement

Description	
Start	2024-06-12 11:00:00
Stop	2024-06-14 11:00:00
Duration	48:00:00.0
Run Time	48:00:00.0
Pause	00:00:00.0
Pre-Calibration	2024-06-12 07:01:32
Post-Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting			
Peak Weight	Z Weighting			
Detector	Slow			
Preamplifier	PRMLxT2B			
Microphone Correction	Off			
Integration Method	Linear			
Overload	142.7 dB			
	A	**C**	**Z**	
Under Range Peak	98.9	95.9	**100.9**	dB
Under Range Limit	**37.3**	36.9	43.6	dB
Noise Floor	28.2	27.7	34.5	dB
	First	**Second**	**Third**	
Instrument Identification				

Results

LAeq	66.1	
LAE	118.5	
EA	78.178 mPa²h	
EA8	13.030 mPa²h	
EA40	65.149 mPa²h	
LZpeak (max)	2024-06-13 06:56:28	126.5 dB
LASmax	2024-06-14 06:56:33	100.2 dB
LASmin	2024-06-13 02:23:21	45.7 dB
SEA	141.0 dB	

	Exceedance Counts	**Duration**
LAS > 85.0 dB	70	319.4 s
LAS > 115.0 dB	0	0.0 s
LZpeak > 135.0 dB	0	0.0 s
LZpeak > 137.0 dB	0	0.0 s
LZpeak > 140.0 dB	0	0.0 s

LCeq	73.4 dB
LAeq	66.1 dB
LCeq - LAeq	7.3 dB
LAIeq	68.2 dB
LAeq	66.1 dB
LAIeq - LAeq	2.1 dB

	A		**C**		**Z**	
	dB	**Time Stamp**	**dB**	**Time Stamp**	**dB**	**Time Stamp**
Leq	66.1		73.4			
Ls(max)	100.2	2024/06/14 6:56:33				
Ls(min)	45.7	2024/06/13 2:23:21				
LPeak(max)					126.5	2024/06/13 6:56:28

Overload Count	0
Overload Duration	0.0 s

Calculated Ldn from Long-Term Noise Monitoring Data

Meter 4437
6/13/2024
Thursday

	TIME	dBA	Numbers...	10 dBA More Numbers...	5 dBA
Midnight	0 / 24	53.8	239312	2393123	756772
am 1:00	100	50.8	121315	1213154	383633
2:00	200	48.7	74988	749882	237134
3:00	300	52.5	178357	1783565	564013
4:00	400	60.0	992919	9929194	3139887
5:00	500	67.3	5397579	53975789	17068643
6:00	600	70.5	11228532	112285325	35507737
7:00	700	71.3	13629063	136290630	43098882
8:00	800	70.8	11920652	119206517	37696411
9:00	900	68.5	7161022	71610219	22645139
10:0C	1000	69.1	8043888	80438877	25437006
11:0C	1100	70.4	10904280	109042801	34482361
12:0C	1200	69.4	8677168	86771679	27439614
pm 1:00	1300	69.0	7997127	79971271	25289136
2:00	1400	65.8	3799269	37992686	12014342
3:00	1500	63.9	2466096	24660961	7798481
4:00	1600	63.3	2136259	21362595	6755446
5:00	1700	66.6	4524317	45243167	14307146
6:00	1800	62.9	1940354	19403541	6135939
7:00	1900	64.1	2582278	25822780	8165880
8:00	2000	63.9	2462981	24629807	7788629
9:00	2100	61.7	1486076	14860759	4699385
10:0C	2200	60.8	1208840	12088405	3822689
pm 11:0C	2300	57.9	613717	6137168	1940743

Leq Nighttime 10:00 p.m.-7:00 a.m. (not penalized)
63 dBA

Leq Daytime 7:00 am-10:00 p.m.
69 dBA

Leq 24-Hour
67 dBA

Ldn: 10 dBA penalty for noise between 10:00 p.m. and 7:00 a.m.
71 dBA

CNEL: 5 dBA penalty for noise between 7:00p.m. and 10:00 p.m., and 10 dBA penalty for noise between 10:00 p.m. and 7:00 a.m.
71 dBA

CNEL - Ld 0.2063074

Summary				
File Name on Meter	LxT_Data.144.s			
File Name on PC	LxT_0004337-20240612 100000-LxT_Data.144.ldbin			
Serial Number	0004337			
Model	SoundTrack LxT®			
Firmware Version	2.404			
User	Nick Reynoso			
Location	LT-2: End of Campus Drive, north side of LBNL campus			
Job Description	LBNL LRDP			
Note				

Measurement	
Description	
Start	2024-06-12 10:00:00
Stop	2024-06-14 10:00:00
Duration	48:00:00.0
Run Time	48:00:00.0
Pause	00:00:00.0
Pre-Calibration	2024-06-12 07:02:16
Post-Calibration	None
Calibration Deviation	---

Overall Settings				
RMS Weight	A Weighting			
Peak Weight	Z Weighting			
Detector	Slow			
Preamplifier	PRMLxT2B			
Microphone Correction	Off			
Integration Method	Linear			
Overload	131.2 dB			
	A	**C**	**Z**	
Under Range Peak	87.5	84.5	**89.5**	dB
Under Range Limit	**28.4**	27.7	33.1	dB
Noise Floor	19.3	18.6	23.9	dB
	First	**Second**	**Third**	
Instrument Identification				

Results			
LAeq	46.3		
LAE	98.6		
EA	810.338 µPa²h		
EA8	135.056 µPa²h		
EA40	675.281 µPa²h		
LZpeak (max)	2024-06-12 10:22:11	108.8	dB
LASmax	2024-06-12 10:22:11	82.7	dB
LASmin	2024-06-13 00:08:56	32.9	dB
SEA	-99.9 dB		

	Exceedance Counts	**Duration**
LAS > 85.0 dB	0	0.0 s
LAS > 115.0 dB	0	0.0 s
LZpeak > 135.0 dB	0	0.0 s
LZpeak > 137.0 dB	0	0.0 s
LZpeak > 140.0 dB	0	0.0 s

LCeq	54.6 dB
LAeq	46.3 dB
LCeq - LAeq	8.3 dB
LAIeq	49.0 dB
LAeq	46.3 dB
LAIeq - LAeq	2.7 dB

	A		**C**		**Z**	
	dB	**Time Stamp**	**dB**	**Time Stamp**	**dB**	**Time Stamp**
Leq	46.3		54.6			
Ls(max)	82.7	2024/06/12 10:22:11				
Ls(min)	32.9	2024/06/13 0:08:56				
LPeak(max)					108.8	2024/06/12 10:22:11

Overload Count	0
Overload Duration	0.0 s

Calculated Ldn from Long-Term Noise Monitoring Data

Meter 4337
6/13/2024
Thursday

	TIME	dBA	Numbers...	10 dBA More Numbers...	5 dBA
Midnight	0 / 24	35.2	3348	33479	10587
am 1:00	100	35.4	3485	34852	11021
2:00	200	35.5	3546	35463	11215
3:00	300	35.3	3379	33787	10685
4:00	400	35.4	3471	34710	10976
5:00	500	38.0	6269	62687	19823
6:00	600	36.4	4411	44111	13949
7:00	700	37.3	5341	53406	16888
8:00	800	37.6	5714	57139	18069
9:00	900	37.5	5672	56724	17938
10:0C	1000	38.5	7113	71133	22494
11:0C	1100	38.6	7304	73043	23098
12:0C	1200	39.6	9203	92025	29101
pm 1:00	1300	39.3	8564	85640	27082
2:00	1400	41.4	13759	137588	43509
3:00	1500	38.2	6556	65564	20733
4:00	1600	39.8	9497	94969	30032
5:00	1700	40.5	11253	112533	35586
6:00	1800	40.2	10574	105739	33438
7:00	1900	39.4	8737	87367	27628
8:00	2000	41.4	13881	138806	43894
9:00	2100	41.6	14356	143559	45397
10:0C	2200	39.8	9459	94586	29911
pm 11:0C	2300	38.3	6745	67448	21329

Leq Nighttime 10:00 p.m.-7:00 a.m. (not penalized)
37 dBA

Leq Daytime 7:00 am-10:00 p.m.
41 dBA

Leq 24-Hour
39 dBA

Ldn: 10 dBA penalty for noise between 10:00 p.m. and 7:00 a.m.
44 dBA

CNEL: 5 dBA penalty for noise between 7:00p.m. and 10:00 p.m., and 10 dBA penalty for noise between 10:00 p.m. and 7:00 a.m.
44 dBA

CNEL - Ld 0.5620362

Appendix WSA
Water Supply Assessment

EAST BAY
MUNICIPAL UTILITY DISTRICT

August 13, 2024

Jeff Philliber
Senior Site and Environmental Planner
Lawrence Berkeley National Laboratory
1 Cyclotron Road, M/S 50A1148
Berkeley, CA 94720

Re: Water Supply Assessment - Lawrence Berkeley National Laboratory 2025 Long Range Development Plan

Dear Mr. Philliber:

This letter is in response to your request made on June 10, 2024, for water agency consultation (Enclosure 1) concerning the Water Supply Assessment (WSA) for the Lawrence Berkeley National Laboratory (LBNL) 2025 Long Range Development Plan (LRDP), located in the Cities of Berkeley and Oakland, which is within East Bay Municipal Utility District's (EBMUD's) Ultimate Service Boundary. EBMUD appreciates the opportunity to provide this response.

A WSA for the LBNL 2005 LRDP was approved by EBMUD Board of Directors on November 23, 2004, followed by two revised WSAs for the 2006 LRDP that were approved by the EBMUD Board of Directors on January 22, 2008 and April 28, 2015. The 2015 revised WSA determined that EBMUD had sufficient water supply to meet LBNL's water demand. The 2025 LRDP supersedes the 2006 LRDP and proposes to add a net new building square footage of approximately 275,000 square feet over existing conditions consisting predominantly of office, laboratory, and research and development office spaces based on the Notice of Preparation of a Draft Environmental Impact Report for the 2025 LRDP.

Pursuant to Sections 10910-10915 of the California Water Code, the 2025 LRDP meets the threshold requirement for an assessment of water supply availability because the 2025 LRDP proposes commercial development of more than 250,000 square feet of floor space.

Please note this WSA addresses the issue of water supply only and is not a guarantee of service; future water service is subject to the rates and regulations in effect at that time.

Project Demand

The water demand for the 2025 LRDP is accounted for in EBMUD's water demand projections, as published in EBMUD's Urban Water Management Plan (UWMP) 2020 (see https://www.ebmud.com/water/about-your-water/water-supply/urban-water-management-plan/). EBMUD's water demand projections account for anticipated future water demands within EBMUD's service boundaries and for variations in demand-attributed changes in development patterns. The existing land use consists of office, laboratory, and research and development (R&D) office space with a historical water use of approximately 191,000 gallons per day (GPD). The 2025 LRDP will include similar land uses consisting of approximately 275,000 square feet of new net building spaces over existing conditions. The estimated water use at 2045 build-out is approximately 400,000 GPD.

EBMUD's demand projections indicate both densification and land use changes in a few existing land use classifications, including commercial and residential land use areas. These changes increase demand for EBMUD water. EBMUD's UWMP 2020 projects water demands over time, accounting for estimated variations in demand usage minus conservation and recycled supply sources, as noted in the UWMP 2020, Table 3-1, 2050 Demand Projections (Table 1). Typically, EBMUD prepares a full demand study every ten years; the most recent version, the 2050 Demand Study, was completed in 2020, and the study results are incorporated into the UWMP 2020. For planning purposes, water demands are estimated in five-year increments, but it is recognized that actual incremental amounts may occur stepwise in shorter time increments. An increase in usage by one customer in a particular customer class does not require a strict gallon-for-gallon increase in conservation by other customers in that class, as, in actuality, the amount of potable demand, conservation and recycled water use EBMUD-wide will vary somewhat.

Table 1
2050 Demand Projections (UWMP 2020, Table 3-1)

TABLE 3-1

AVERAGE ANNUAL WATER DEMAND FORECAST
2050 DEMAND PROJECTIONS (MGD)

	2020	2025	2030	2035	2040	2045	2050
FORECASTED WATER DEMAND	238	245	254	264	277	287	297
WATER CONSERVATION[1]	-48	-53	-58	-61	-63	-65	-66
RECYCLED WATER[1]	-5	-6	-6	-9	-13	-13	-13
RAW WATER	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
PLANNING LEVEL OF DEMAND (ROUNDED)	181	186	190	194	201	209	218

1. See Chapters 6 and 5 for more specific program details on conservation and water recycling, respectively. The goals reflected in this table take into account uncertainty as described in Section 5.2.3 and Section 6.1.3.

Project Area

The 2025 LRDP is in the Cities of Berkeley and Oakland, adjacent to the University of California (UC), Berkeley campus, and consists of approximately 200 acres.

EBMUD Water Demand Projections

Since the 1970s, water demand within EBMUD's service area has ranged from 200 to 220 million gallons per day (MGD) in non-drought years. Section 3.1 of the UWMP 2020 outlines past and current EBMUD water demand, including Figure 3-1 which shows historic water use (including metered and unmetered demands) within EBMUD's service area, along with the number of customer accounts. The 2050 water demand forecast of 297 MGD for EBMUD's service area can be reduced to 218 MGD with the successful implementation of water recycling and conservation programs, as outlined in the UWMP 2020. Current demand is lower than estimated in the 2050 Demand Study as a result of recent droughts. The difference is because the planning level of demand may differ from the actual demand in any given year due to water use reductions that typically occur during droughts. After droughts, a rebound effect is expected wherein demand rises back to projected levels. Thus, the 2050 Demand Study still reflects a reasonable expectation for demands in future years, as the demands are expected to gradually increase back to 2050 projected demand levels as development and water use return to pre-drought conditions. The proposed 2025 LRDP future development and operations will not change EBMUD's 2050 demand projection.

EBMUD Water Supply, Water Rights and the UWMP 2020

EBMUD has water right permits and licenses that allow for water delivery from the Mokelumne River to the East Bay, subject to the availability of Mokelumne River runoff and the senior water rights of other users. EBMUD's position in the hierarchy of Mokelumne River water users is determined by a variety of agreements between Mokelumne River water right holders and the terms of the appropriative water right permits and licenses.

Conditions that could, depending on hydrology, restrict EBMUD's ability to receive its full entitlement include:

- Upstream water use by senior water right holders.
- Downstream water use by riparian and senior appropriators and other downstream obligations, including protection of public trust resources.
- Variability in precipitation and runoff.
- Curtailments by State Water Resources Control Board.

During prolonged severe droughts, the Mokelumne River supply cannot meet EBMUD's projected customer demands. To address this, EBMUD has completed construction of the Freeport Regional Water Facility and is evaluating future local groundwater projects in the East Bay Plain Subbasin (EBP Subbasin) as part of a Groundwater Sustainability Plan (GSP), which are discussed below in the Supplemental Water Supply and Demand Management section of this assessment. EBMUD has obtained and continues to seek supplemental supplies.

The UWMP 2020, adopted on June 22, 2021, by EBMUD's Board of Directors under Resolution No. 35234-21, is a long-range planning document used to assess current and projected water usage, water supply planning, and conservation and recycling efforts. The Water Shortage Contingency Plan (WSCP) 2020, also adopted on July 22, 2021, by EBMUD's Board of Directors under Resolution No. 35235-21 for inclusion as Attachment 1 within the UWMP 2020, is a document used to develop a coordinated response for when water shortages occur (for example, due to drought, earthquakes, and other emergencies that could impact EBMUD's ability to supply water to customers), and to guide EBMUD's planning and response through thoughtful assessment and management of the water supply.

EBMUD's water supply sources are discussed in Section 1.4.3 of the UWMP 2020. EBMUD's main water supply is the Mokelumne River, and EBMUD has rights to receive up to 325 MGD of water from this source subject to the availability of runoff, senior water rights of other users, and downstream fishery flow requirements. EBMUD also has a Long-Term Renewal Contract (Contract No. 14-06-200-5183A-LTR1) with the United States (U.S.) Bureau of Reclamation to receive water from the Central Valley Project (CVP) through the Freeport Regional Water Facility in years when EBMUD's water supplies are relatively low (for more details, see Section 1.4.3 of the UWMP 2020). During some dry years, EBMUD may purchase water transfers to help meet customer demands. Section 4.2 of the UWMP 2020 discusses EBMUD's water transfer program.

EBMUD maintains a biennial budget and five-year capital improvement program to optimize investments and maximize drinking water quality, and the reliability, safety, flexibility, and overall efficiency of the water supply system. EBMUD's most recently adopted budget, which includes capital expenditures for the delivery of water supplies to its customers, can be found at http://www.ebmud.com/about-us/investors/budget-and-rates/.

EBMUD complies with applicable local, state, and federal regulations in the operation of its water supply system. Figure 1-4 of the UWMP 2020 illustrates the numerous local, state, and federal agencies that may regulate EBMUD's facilities and operations.

A summary of EBMUD's demand and supply projections, in five-year increments, for a 30-year planning horizon is provided in UWMP 2020 Attachment 1, WSCP, Table W-3, Supply and Demand Assessment, 2020-2050 (**Table 2**).

Table 2
Supply and Demand Assessment, 2020-2050
(UWMP 2020, WSCP Table W-3)

TABLE W-3 SUPPLY & DEMAND ASSESSMENT, 2020-2050

EBMUD PLANNING LEVEL OF DEMAND (PLOD)		2020	2025	2030	2035	2040	2045	2050
NORMAL YEAR	MOKELUMNE SUPPLY (MGD)	>181	>186	>190	>194	>201	>209	>218
	EBMUD PLANNING LEVEL OF DEMAND (PLOD) (MGD)	181	186	190	194	201	209	218
	NEED FOR WATER (TAF)	0	0	0	0	0	0	0
SINGLE DRY YEAR	MOKELUMNE SUPPLY (MGD)	121	126	129	132	138	144	151
	CVP SUPPLIES (MGD)	60	60	60	60	60	60	60
	TOTAL SUPPLIES (MGD)	181	186	189	192	198	204	211
	VOLUNTARY RATIONING (%)	0	0	1	1	2	2	3
	NEED FOR WATER (TAF)	0	0	0	0	0	0	0
SECOND DRY YEAR	MOKELUMNE SUPPLY (MGD)	82	86	89	92	98	104	111
	CVP SUPPLIES (MGD)	74	74	74	74	74	74	74
	TOTAL SUPPLIES (MGD)	156	161	164	167	172	178	185
	MANDATORY RATIONING (%)	13	13	13	14	14	14	15
	NEED FOR WATER (TAF)	0	0	0	0	0	0	0
THIRD DRY YEAR	MOKELUMNE SUPPLY (MGD)	141	145	146	145	132	118	105
	CVP SUPPLIES (MGD)	12	12	12	12	12	12	12
	TOTAL SUPPLIES (MGD)	153	157	158	157	144	130	117
	MANDATORY RATIONING (%)	15	15	15	15	15	15	15
	NEED FOR WATER - BASE CONDITION (TAF)	0	0	0	0	28	52	75
	NEED FOR WATER - HIGH DEMAND SCENARIO (TAF)	0	0	21	35	60	97	125
	NEED FOR WATER - EXTREME DROUGHT SCENARIO (TAF)	0	0	0	13	32	55	84

EBMUD's evaluation of water supply availability accounts for the diversions of both upstream and downstream water right holders and fishery releases on the Mokelumne River. Fishery releases are based on the requirements of a 1998 Joint Settlement Agreement (JSA) between EBMUD, U.S. Fish and Wildlife Service, and the California Department of Fish and Wildlife. The JSA requires EBMUD to make minimum flow releases from its reservoirs to the lower Mokelumne River to protect and enhance the fishery resources and ecosystem of the river. As this water is released downriver, it is, therefore, not available for use by EBMUD's customers.

The available supply and demand shown in **Table 2** were derived from EBMUD's baseline hydrologic model with the following assumptions:

- Customer demand values are based on the 2050 Demand Study, and planning-level demands account for projected savings from water recycling and conservation programs.
- EBMUD Drought Planning Sequence assumes water years 1976, 1977 and a modified 1978 hydrology.
- Total system storage is depleted by the end of the third year of the drought.
- EBMUD will implement its Drought Management Program (DMP) when necessary.

- The diversions by Amador and Calaveras Counties upstream of Pardee Reservoir will increase over time, eventually reaching the full extent of their senior rights.
- Releases are made to meet the requirements of senior downstream water right holders and fishery releases, as required by the JSA.
- EBMUD allocation of CVP supply, as available each drought year based on model results generated by the Department of Water Resources, is available the first year of a drought and subsequent drought years, according to the U.S. Bureau of Reclamation's (USBR) Municipal and Industrial Shortage Policy. However, in some severe dry years, USBR could make a determination of insufficient CVP water supplies and therefore limit further the allocation amounts that EBMUD would receive. During the 2014-2016 drought, EBMUD's CVP allocation went as low as 25 percent, and the extreme drought scenario in Table 2 reflects this reduced allocation.

The UWMP 2020 concludes that EBMUD has, and will have, adequate water supplies to serve existing and projected demand within the Ultimate Service Boundary during normal and wet years, but that deficits are projected for multi-year droughts. During multi-year droughts, EBMUD may require significant customer water use reductions and may also need to acquire supplemental supplies to meet customer demand.

As discussed in the UWMP 2020 WSCP, EBMUD's system storage generally allows EBMUD to continue serving its customers during dry-year events. EBMUD typically imposes water use restrictions based on the projected storage available at the end of September and may also implement water use restrictions in response to a State of California mandate. By imposing water use restrictions in the first dry year of potential drought periods, EBMUD attempts to minimize water use restrictions in subsequent years if a drought persists. Throughout dry periods, EBMUD must continue to meet its current and subsequent-year fishery flow release requirements and obligations to downstream agencies.

The UWMP 2020 WSCP includes DMP Guidelines that establish the level of water use restrictions EBMUD may implement under varying conditions. Under the DMP Guidelines, water use restrictions may be determined based upon projected end-of-September Total System Storage (TSS). When state-mandated water use restrictions exceed the reductions that would otherwise be called for based upon end-of-September TSS, EBMUD's water use reduction requirements may be guided by the applicable state mandates. Under either scenario, while EBMUD strives to keep water use reductions at or below 15 percent, if the drought is severe, mandatory water use reductions could exceed 15 percent.

Despite water savings from EBMUD's aggressive conservation and recycling programs and water use restrictions called for in the DMP Guidelines, supplemental supplies are still needed in significant, severe, and critical droughts. The 2025 LRDP will be subject to the same drought restrictions that apply to all EBMUD customers. In addition, the 2025 LRDP will be subject to EBMUD's regulations aimed at encouraging efficient water use, such as Sections 29 and 31 of EBMUD's Regulations Governing Water Service. Section 29, "Water Use Restrictions," promotes efficient water use by EBMUD customers and prohibits certain uses of potable water. Section 31, "Water Efficiency Requirements," identifies the types of water efficiency requirements (i.e., maximum flow rates for flow control devices) for water service.

Supplemental Water Supply and Demand Management

The goals of meeting projected water needs, and increased water reliability rely on supplemental supplies, improving reliability of existing water supply facilities, water conservation, and recycled water programs. Chapter 4 of the UWMP 2020 describes potential supplemental water supply projects that could be implemented to meet projected long-term water demands during multi-year drought periods.

The Freeport Regional Water Facility became operational in February 2011. EBMUD's ability to take delivery of CVP water through the Freeport Regional Water Facility is based on its Long Term Renewal Contract (LTRC) with the U.S. Bureau of Reclamation. The LTRC provides for up to 133,000 acre feet of CVP supply in a single dry year, not to exceed a total of 165,000 acre feet in three consecutive dry years. Under the LTRC, the CVP supply is available to EBMUD only in dry years when EBMUD's total stored water supply is forecast to be below 500,000 total acre feet on September 30 of each year.

EBMUD is the Groundwater Sustainability Agency (GSA) for the portion of the East Bay Plain Subbasin underlying its service area, and as a GSA, is implementing a Groundwater Sustainability Plan (GSP) that was approved by the California Department of Water Resources in July 2023 and includes the first phase of the Bayside Groundwater Project. Construction of the first phase (Bayside Groundwater Project Phase 1) was completed in 2010, allowing EBMUD to pilot injection of treated potable water into a deep aquifer in the South East Bay Plain Groundwater Basin for later extraction, treatment, and use during severe droughts. A permit from the Department of Public Health is required before groundwater extraction can be piloted for municipal use. Additional information on the Bayside Groundwater Project can be found in Section 4.1.1 and the WSCP of the UWMP 2020. As part of the GSP management actions, EBMUD will collect additional data and use science-based decision making to inform whether future expansion of Bayside or other groundwater projects are necessary.

Chapter 4 of the UWMP 2020 also lists other potential supplemental water projects, including Northern California water transfers, Bayside Groundwater Project Expansion, expansion of Contra Costa Water District's Los Vaqueros Reservoir, and others that could be implemented to meet the projected long-term water supplemental need during multi-year drought periods. The UWMP 2020 identifies a broad mix of projects, with inherent scalability and the ability to adjust implementation schedules for particular components, which will allow EBMUD to pursue the necessary supplemental supplies while minimizing the risks associated with future uncertainties, such as project implementation challenges, evolving regulatory requirements, and global climate change. The Environmental Impact Report that EBMUD certified for the Water Supply Management Program 2040 examined the impacts of pursuing these supplemental supply projects at a program level. Separate project-level environmental documentation will be prepared, as appropriate, for specific components as they are developed in further detail and implemented in accordance with EBMUD's water supply needs.

In addition to pursuing supplemental water supply sources, EBMUD also maximizes resources through continuous improvements in the delivery and transmission of available water supplies and investments in ensuring the safety of its existing water supply facilities. These programs, along with emergency interties and planned water recycling and conservation efforts, would ensure a reliable water supply to meet projected demands for current and future EBMUD customers within the current service area.

Water Conservation and Recycled Water Considerations

The 2025 LRDP presents opportunities to incorporate water conservation measures. Conditions of approval for the implementation of the 2025 LRDP should require that the LBNL comply with the California Model Water Efficient Landscape Ordinance (Division 2, Title 23, California Code of Regulations, Chapter 2.7, Sections 490 through 495). EBMUD staff would appreciate the opportunity to meet with LBNL to discuss conservation measures. This meeting will explore early opportunities to expand water conservation via EBMUD's conservation programs and best management practices applicable to the 2025 LRDP.

Conservation strategies will be required to achieve water use reduction goals and restrictions, including compliance with Sections 29 and 31, described above, of EBMUD's Regulations Governing Water Service, and all other legally mandated water conservation requirements. The State of California has established a new regulatory framework for urban water conservation based on two policy bills, Senate Bill 606 and Assembly Bill 1668, passed in 2018 which become effective on January 1, 2025. These bills established water use efficiency targets for urban water agencies based on indoor residential water use, outdoor water use, and distribution systems. EBMUD will continue to comply with State water conservation regulations as they are developed.

The 2025 LRDP is not currently a candidate for centralized recycled water; however, depending on potential irrigation demands, the site may be a candidate for a satellite treatment system. As EBMUD further plans its recycled water program, the feasibility of providing recycled water to LBNL may change. EBMUD encourages LBNL to continue to coordinate closely with EBMUD during the planning of the 2025 LRDP to further explore the options and requirements relating to recycled water use.

LBNL should contact Jennifer L. McGregor, Senior Civil Engineer, at (510) 287-1030 for further information.

Sincerely,

David J. Rehnstrom
Manager of Water Distribution Planning Division

DJR:JLM:kn
wdpd24_108 WSA 24-002 LBNL 2025 LRDP District Response

Enclosure: 1. Letter of Request for Water Supply Assessment dated June 10, 2024

cc: Board of Directors

Enclosure

BERKELEY LAB

June 10, 2024

David Rehnstrom
Manager of Water Distribution Planning
East Bay Municipal Utility District
375 11th Street, M/S 701
Oakland, California 94607

Subject: Water Supply Assessment for Lawrence Berkeley National Laboratory

Dear Mr. Rehnstrom:

This letter is to formally request that the East Bay Municipal Utility District (EBMUD or "the District") prepare a Water Supply Assessment (WSA) for the Lawrence Berkeley National Laboratory (LBNL or Berkeley Lab) 2025 Long Range Development Plan (LRDP) and Environmental Impact Report (EIR).

The District previously prepared a WSA for Berkeley Lab's 2006 LRDP and EIR, followed by two revised WSAs that accounted for subsequent changes in water use projections: one in 2007 and another in 2015. The revised 2015 WSA determined that EBMUD had sufficient water supply to meet Berkeley Lab's water demand of 92.5 million gallons per year (MGY) through 2025.

The Berkeley Lab campus presently consumes less than half the water projected in the 2015 WSA. In FY 2023, Berkeley Lab consumed 42.6 MGY, with approximately 69% used in cooling towers and about 13% accounted for with a variety of other identified uses: domestic plumbing fixtures (7%), emergency building-level single-pass cooling (3%), laboratory equipment (3%), and commercial kitchen (0.1%). Leaks and unknown uses account for the balance (18%) (see Table 1).

Berkeley Lab projects that campus water consumption under the proposed 2025 LRDP could increase to up to 145 MGY by 2045. This increase would be largely due to the cooling needs of LBNL's Building 59, which houses the campus's National Energy Research Scientific Computing (NERSC) facility (and which presently consumes 12.9 MGY–approximately 30% of campus water consumption). NERSC and additional Building 59 computing capabilities are projected to require up to 83 MGY by 2045. Furthermore, LBNL cooling needs for contemplated Information Technology (IT) uses could potentially require an additional 16 MGY if future upgrades are constructed (see Table 2).

Berkeley Lab is committed to minimizing water consumption and maximizing water efficiency in both existing and new buildings. All future projects will be designed with the highest sustainability principles and environmental standards practicable. For example, to reduce NERSC and Building 59 cooling needs, the Lab expects to install at least three air-cooled heat exchangers, also known as dry coolers, which can reject process heat without consuming water. Furthermore, Berkeley Lab increasingly uses sophisticated custom data analytics to monitor water consumption, including custom alerts on various water submeters across the site. These analytics allow the Lab to track performance and to identify opportunities for improvement.

Please e-mail me at jgphilliber@lbl.gov or call me at 510-499-4012 if you or your staff have any questions about our new development or wish to discuss this request. We look forward to hearing back from you, and we appreciate your continuing consideration of Lawrence Berkeley National Laboratory's water service needs.

Sincerely,

Jeff Philliber
Sr. Site & Environmental Planner

TABLE 1
FY 2023 WATER CONSUMPTION

Water End-Use	Estimated Annual Potable Water Consumption	
	Thousand gallons/year	**Percent**
Cooling Towers		
NERSC/Building 59	12,900	30
Other Towers	16,313	38
Domestic Plumbing Fixtures	2,980	7
Other Processes: Emergency Building Single-pass Cooling	1,378	3
Other Processes: Laboratory Water	1,200	3
Commercial Kitchen	58	< 1
Leaks/Unknown	7,778	18
Total	**42,607**	**100**
SOURCE: Berkeley Lab Water Assessment, 2024		

TABLE 2
PROJECTED FY 2045 WATER CONSUMPTION UNDER 2025 LRDP

Water End-Use	Estimated Annual Potable Water Consumption	
	Thousand gallons/year	**Percent**
NERSC/Bldg. 59 Cooling Towers	83,000	57
IT Cooling Towers	16,000	11
All Other Uses	47,000	32
Total	**145,000**	**100**
SOURCE: LBNL, 2024		