

*University of California  
Lawrence Berkeley National Laboratory*

**BUILDING 59 UPGRADE &  
INSTALLATION AND OPERATION  
OF NERSC – 9**

**Draft Focused Environmental Impact Report  
SCH# 2016062007**



Prepared By:  
University of California  
Lawrence Berkeley National Laboratory  
One Cyclotron Road  
Berkeley, California 94720

October 2016

# **Building 59 Upgrade & Installation and Operation of NERSC - 9**

## **Draft Focused Environmental Impact Report**

**(Including Supplementation of the 2006 LRDP EIR with respect to  
Greenhouse Gas Emissions and Energy Impacts)**

**SCH # 2016062007**

**Prepared for:**

University of California, Lawrence Berkeley National Laboratory  
One Cyclotron Road  
Berkeley, California 94720

**Prepared by:**

Impact Sciences, Inc.  
505 14<sup>th</sup> Street, Suite 1230  
Oakland, California 94612

**October 2016**

# TABLE OF CONTENTS

Section	Page
1.0 INTRODUCTION.....	1.0-1
1.1 Purpose of this EIR.....	1.0-1
1.2 Summary of the Proposed Project .....	1.0-2
1.3 Relationship Between LBNL, University of California, and the U.S. Department of Energy .....	1.0-3
1.4 Environmental Review Process.....	1.0-4
1.5 Report Organization .....	1.0-6
2.0 EXECUTIVE SUMMARY .....	2.0-1
2.1 Purpose.....	2.0-1
2.2 Project Location .....	2.0-1
2.3 Project Description.....	2.0-2
2.4 Project Objectives .....	2.0-3
2.5 Topics of Known Concern.....	2.0-4
2.6 Impact Summary .....	2.0-4
2.7 Alternatives to the Proposed Project .....	2.0-6
Alternative 1: No Project .....	2.0-6
Alternative 2: Modified NERSC-9 Alternative.....	2.0-6
2.8 Issues to be Resolved/Areas of Controversy .....	2.0-7
2.9 Supplementation of the LBNL 2006 LRDP EIR.....	2.0-8
3.0 PROJECT DESCRIPTION.....	3.0-1
3.1 Introduction .....	3.0-1
3.2 Project Background, Need and Objectives.....	3.0-1
3.3 Project Location and Surrounding Uses .....	3.0-2
3.4 Project Characteristics .....	3.0-5
3.5 Infrastructure and Utilities .....	3.0-10
3.6 Access, On-Site Circulation, and Parking .....	3.0-11
3.7 Hazardous Materials On-Site .....	3.0-12
3.8 Project Population.....	3.0-12
3.9 Project Construction and Schedule.....	3.0-12
3.10 2006 LRDP EIR Mitigation Measures .....	3.0-13
3.11 Project Approvals.....	3.0-14
4.0 ENVIRONMENTAL IMPACT ANALYSIS .....	4.0-1
4.0.1 Introduction .....	4.0-1
4.0.2 Levels of Significance .....	4.0-1
4.0.3 Approach to Impact Analysis.....	4.0-1
4.1 Greenhouse Gas Emissions.....	4.1-1
4.1.1 Introduction.....	4.1-1
4.1.2 Environmental Setting.....	4.1-1
4.1.3 Regulatory Considerations.....	4.1-8
4.1.4 Impacts and Mitigation Measures .....	4.1-25
4.1.5 References .....	4.1-34
4.2 Tribal Cultural Resources .....	4.2-1
4.2.1 Introduction.....	4.2-1

4.2.2	Environmental Setting.....	4.2-1
4.2.3	Regulatory Considerations.....	4.2-2
4.2.4	Impacts and Mitigation Measures.....	4.2-3
4.2.5	References.....	4.2-6
4.3	Energy.....	4.3-1
4.3.1	Introduction.....	4.3-1
4.3.2	Environmental Setting.....	4.3-1
4.3.3	Regulatory Considerations.....	4.3-3
4.3.4	Impacts and Mitigation Measures.....	4.3-7
4.3.5	Alternatives.....	4.3-14
4.3.6	Unavoidable Adverse Effects.....	4.3-14
4.3.7	Irreversible Commitment of Resources.....	4.3-14
4.3.8	Short-term Gains and Long-term Impacts.....	4.3-14
4.3.9	Growth Inducing Effects.....	4.3-15
4.3.10	References.....	4.3-15
5.0	ALTERNATIVES.....	5.0-1
5.1	Introduction.....	5.0-1
5.2	Alternatives to the Project.....	5.0-3
5.3	Environmentally Superior Alternative.....	5.0-8
6.0	OTHER CEQA CONSIDERATIONS.....	6.0-1
6.1	Significant Unavoidable Effects.....	6.0-1
6.2	Growth-Inducing Impacts.....	6.0-1
6.3	Effects Found Not to be Significant.....	6.0-3
7.0	REPORT PREPARATION.....	7.0-1
7.1	Lead Agency.....	7.0-1
7.2	EIR Consultant.....	7.0-1
7.3	Technical Consultants.....	7.0-1
	SUPPLEMENT TO THE 2006 LBNL LRDP EIR.....	S-1

**Appendices for the NERSC-9 EIR**

- 1.0 Notice of Preparation (NOP), Initial Study, and comments on the NOP
- 4.1 NERSC Scope 2 Greenhouse Gas Emissions Memorandum  
Berkeley Lab GHG Forecasts – GHG Emissions Methodology Memorandum

**Appendices for the Supplement to the 2006 LBNL LRDP EIR**

- S-1 LBNL GHG Emissions-Partial Forecast Memorandum

## LIST OF FIGURES

Figure	Page
3.0-1 Regional and Local Location.....	3.0-3
3.0-2 Project Site Location.....	3.0-4
3.0-3 Project Plan View.....	3.0-7
3.0-4 Project Section.....	3.0-8

## LIST OF TABLES

Table	Page
2.0-1 Summary of NERSC-9 Project Impacts and Mitigation Measures .....	2.0-5
2.0-2 Summary Comparison of NERSC-9 Project Alternatives .....	2.0-7
2.0-3 Updated 2006 LRDP GHG and Energy Impacts and Mitigation Measures .....	2.0-8
3.0-1 Current and Proposed Conditions .....	3.0-9
3.0-2 Project Schedule.....	3.0-13
4.1-1 LBNL Combined Scope 1 and Scope 2 GHG Emissions .....	4.1-7
4.1-2 LBNL Hill Site FY2015 Scope 3 Emissions .....	4.1-8
4.1-3 Estimated NERSC-9 Operational GHG Emissions .....	4.1-30
4.3-1 Off-Road Construction Equipment Diesel Fuel Consumption .....	4.3-9
4.3-2 Construction Worker Vehicle Gasoline Consumption.....	4.3-10
4.3-3 Data Center PUE Values.....	4.3-11
5.0-1 Summary Comparison of NERSC-9 Project Alternatives .....	5.0-8
S-1 LBNL Combined Scope 1 and Scope 2 GHG Emissions .....	S-6
S-2 LBNL Hill Site FY2015 Scope 3 Emissions .....	S-7
S-3 Estimated 2006 LRDP Operational GHG Emissions .....	S-13
S-4 Estimated Increase in LBNL Hill Site GHG Emissions .....	S-14
S-5 Required Mitigation.....	S-16
S-6 Baseline and Projected Natural Gas and Electricity Use.....	S-24
S-7 Baseline and Projected Petroleum-based Fuel Usage.....	S-25

# 1.0 INTRODUCTION

---

This Draft Focused Environmental Impact Report (EIR) has been prepared to provide an assessment of the potentially significant environmental effects of the proposed Building 59 Upgrade & Installation and Operation of NERSC-9 project (herein after referred to as the “NERSC-9 project” or “proposed project”), located at the Lawrence Berkeley National Laboratory (“LBNL” or “Berkeley Lab”), in Berkeley, California. In addition to serving as a project-level EIR for the NERSC-9 project, this document supplements the EIR prepared in 2006 for LBNL’s Long Range Development Plan (LRDP), and updates the program-level analysis of impacts from greenhouse gas (GHG) emissions that would result from the implementation of the LRDP as a whole and also presents an updated energy impact analysis.

As required by the California Environmental Quality Act (“CEQA”), this Draft Focused EIR: (1) assesses the potentially significant environmental effects of the proposed project, including cumulative impacts of the proposed project in conjunction with other reasonably foreseeable development; (2) identifies feasible means of avoiding or substantially lessening significant adverse impacts; and (3) evaluates a range of reasonable alternatives to the proposed project, including the No Project alternative. The University of California (the University) is the “lead agency” for the project evaluated in this Draft Focused EIR. The Board of Regents of the University of California (“The Regents”), its delegated committee, or its delegated administrative official, has the principal responsibility for approving this project.

## 1.1 PURPOSE OF THIS EIR

The University of California, Lawrence Berkeley National Laboratory (UC LBNL) has prepared this EIR on the NERSC-9 project for the following purposes:

- To inform the general public; the local community; and responsible, trustee, and other public agencies of the nature of the proposed project, its potentially significant environmental effects, feasible measures to mitigate those effects, and its reasonable and feasible alternatives;
- To enable the University to consider the environmental consequences of approving the NERSC-9 project;
- For consideration by responsible agencies in issuing permits and approvals for the proposed project; and
- To satisfy CEQA requirements.

As described in CEQA and the *State CEQA Guidelines*, public agencies are charged with the duty to avoid or substantially lessen significant environmental effects, where feasible. In discharging this duty, a public agency has an obligation to balance the project’s significant effects on the environment with its benefits,

including economic, social, technological, legal, and other benefits. This EIR is an informational document, the purpose of which is to identify the potentially significant effects of the proposed project on the environment and to indicate the manner in which those significant effects can be avoided or significantly lessened; to identify any significant and unavoidable adverse impacts that cannot be mitigated; and to identify reasonable and feasible alternatives to the proposed project that would eliminate any significant adverse environmental effects or reduce the impacts to a less than significant level.

The University is required to consider the information in the EIR, along with any other relevant information, in making its decisions on the proposed project. Although the EIR does not determine the ultimate decision that will be made regarding implementation of the project, CEQA requires the University to consider the information in the EIR and make findings regarding each significant effect identified in the EIR. The Regents, its delegated committee, or administrative official will certify the Final EIR prior to taking any action approving the proposed project. Other agencies may also use this EIR in their review and approval processes.

## 1.2 SUMMARY OF THE PROPOSED PROJECT

The National Energy Research Scientific Computing (NERSC) program, located in Shyh Wang Hall (formerly known as the “Computational Research and Theory” [CRT] facility, and also referred to currently as “Building 59”) on the LBNL hill site, is the primary scientific computing facility for the U.S. Department of Energy (“DOE”), Office of Science, which supports basic and applied research across multiple scientific disciplines. UC LBNL proposes to install and operate NERSC-9, a next generation high-performance computing (“HPC”) system in the existing Building 59.

UC LBNL would install the NERSC-9 system in the space to be vacated by an existing high-performance computing system (NERSC-7). Operation of the NERSC-9 supercomputing system would help support the continually increasing needs of scientists for complex simulation and data analysis. Along with the new high performance computing system, additional power, cooling, and distribution equipment would be installed to augment existing building systems. These system augmentations would be necessary to accommodate operation of NERSC-9 in tandem with the newly installed, fully operational, NERSC-8 supercomputer. These facility upgrades would increase the capacity of building electrical, water, and cooling systems beyond levels reviewed in the CRT EIR (SCH#2007072106, April 2008) that was prepared and certified for the construction of Building 59 and the establishment of Building 59 as the primary computing facility on the LBNL hill site. All upgrades would be located within the existing building and associated cooling infrastructure areas, and the project would not make any changes to the facility’s

building structure. The project would not increase the number of employees and visitors that would be present in the building over the numbers previously evaluated in the CRT EIR.

In addition, this EIR provides an updated program-level analysis for the 2006 LRDP as a whole related to impacts from GHG emissions that would be generated as a result of the implementation of the 2006 LRDP as well as energy impacts.

### **1.3 RELATIONSHIP BETWEEN LBNL, UNIVERSITY OF CALIFORNIA, AND THE U.S. DEPARTMENT OF ENERGY**

LBNL is a federally funded research and development center operated and managed by the University under a U.S. Department of Energy (DOE)/UC contract. The LBNL main site, or “hill site,” is in the Berkeley-Oakland hills; LBNL includes approximately 12 leased facilities such as the Potter Street facility in Berkeley and the Oakland Scientific Facility in Oakland. The LBNL hill site is on approximately 200 acres owned by The Board of Regents of the University of California (hereinafter referred to as “The Regents”). The federal government leases land at the LBNL hill site from The Regents and constructs federally owned buildings on the leased lands. The University conducts research, service, and training work within the University’s mission<sup>1</sup> at LBNL.

DOE’s overarching mission is to advance the national, economic, and energy security of the United States, and to promote scientific and technological innovation in support of that mission. LBNL’s programs advance four distinct goals for DOE and the nation:

- To perform leading multidisciplinary research in the computing sciences, physical sciences, energy sciences, biosciences, and general sciences in a manner that ensures employee and public safety and protection of the environment;
- To develop and operate unique national experimental facilities for qualified investigators;
- To educate and train future generations of scientists and engineers by promoting national science and education; and
- To transfer knowledge and technological innovations and to foster productive relationships among the LBNL research programs, universities, and industry in order to promote national economic competitiveness.

Classified research is not conducted at the LBNL hill site.

---

<sup>1</sup> The phrase LBNL hill site is used throughout this EIR to refer to the LBNL 200-acre campus to distinguish it from other properties leased by LBNL.

Because The Regents could re-acquire full responsibility for the lands should the federal government end its lease of the LBNL hill site, and for effective ongoing management, The Regents holds itself accountable for the stewardship of the LBNL hill site. The Regents require and approve the University-defined Long Range Development Plan (LRDP) and require that its approval be consistent with the University's policy that an LRDP undergo CEQA review and approval. The Regents certified the LBNL 2006 LRDP EIR and adopted the 2006 LRDP in July 2007; the 2006 LRDP is currently the governing land use plan for the LBNL hill site.

## 1.4 ENVIRONMENTAL REVIEW PROCESS

UC LBNL has filed a Notice of Completion (NOC) with the Governor's Office of Planning and Research, State Clearinghouse indicating that this Draft Focused EIR has been completed and is available for review and comment by the public.

This Draft Focused EIR has been made available for review by the public and interested parties, agencies, and organizations for a review period of 45 days, as mandated by California law. In reviewing the Draft Focused EIR, reviewers should focus on the document's adequacy in identifying and analyzing significant effects on the environment and ways in which the significant effects of the project might be avoided or mitigated. To ensure inclusion in the Final EIR and full consideration by the University, comments on the Draft Focused EIR must be received during the public review period at the following address:

Lawrence Berkeley National Laboratory  
One Cyclotron Road, MS 76-234A  
Berkeley, California 94720  
Contact: Jeff Philliber, Chief Environmental Planner  
planning@lbl.gov

UC LBNL will accept e-mail comments in lieu of traditional mailed comments; nevertheless, reviewers are encouraged to follow up on any e-mail comments with letters. Following the close of the review period, responses to comments on the Draft Focused EIR will be prepared and published as a separate document. The Draft Focused EIR text and appendices, together with responses to comments and any text changes made to the original Draft Focused EIR will constitute the Final EIR.

The Regents is the decision-making body for the University. The Regents, either directly or through delegation to an appropriate body or University official, will review the UC LBNL's NERSC-9 Final EIR for adequacy and consider it for certification pursuant to the requirements of Section 15090 of the *State CEQA Guidelines*. If it certifies the Final EIR, then The Regents will consider separately whether to approve the project. If The Regents elects to approve the project, findings on the feasibility of reducing or

avoiding significant environmental effects will be made and, if necessary, a Statement of Overriding Considerations will be prepared. If The Regents approves the project, a Notice of Determination (NOD) will be prepared and will be filed with the State Clearinghouse. The NOD will include a description of the project, the date of approval, an indication of whether the Findings were prepared and a Statement of Overriding Considerations was adopted, and the address where the Final EIR and record of project approval are available for review.

### 1.4.1 Type of EIR

This document is a Draft Focused EIR, as per CEQA Guidelines §15063(c)(3), which evaluates potential impacts on a limited number of environmental issue areas that the University determined to be potentially significant. These issues were determined to be potentially significant based on the proposed project's Initial Study. The EIR also recommends feasible mitigation measures, where possible, that would reduce or eliminate adverse environmental effects.

The environmental topics addressed in this Draft Focused EIR include:

- Greenhouse Gas Emissions
- Tribal Cultural Resources
- Energy

Because NERSC-9 is a project under the 2006 LRDP, relevant mitigation measures from the 2006 LRDP EIR are included in and a part of the proposed NERSC-9 project and will not be readopted. These mitigation measures are listed in each resource subsection of the Initial Study and **Section 4.0, Environmental Setting, Impacts, and Mitigation Measures**, as appropriate. The analysis presented in **Section 4.0** evaluates environmental impacts that would result from project implementation after the application of these mitigation measures as part of the project.

### 1.4.2 Public and Agency Review

On June 1, 2016, a Notice of Preparation (NOP), including an Initial Study, was published for the NERSC-9 EIR. The 30-day comment period ended on June 30, 2016. A copy of the NOP and the Initial Study are included in **Appendix 1.0**. All comments received on the NOP are available on file with UC LBNL.

An EIR scoping meeting was held at the North Berkeley Senior Center on June 21, 2016. The purpose of this meeting was to inform the public and interested agencies of the proposed project, solicit comments, and identify areas of concern.

Copies of this Draft Focused EIR are available for review online at <http://www.lbl.gov/community/planning-environmental-construction-information/> or at the following location:

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

### 1.4.3 Intended Uses of this EIR

This document serves two purposes. The Regents, its delegated committee, or administrative official will use this EIR to evaluate the environmental implications of approving the NERSC-9 project for implementation. Secondly, this document may be used as a source of information by responsible agencies with permitting or approval authority over the project.

## 1.5 REPORT ORGANIZATION

This Draft Focused EIR is organized into the following sections:

**Section 1.0, Introduction**, provides an introduction and overview describing the purpose and scope of topics addressed in this EIR and the environmental review process.

**Section 2.0, Executive Summary**, summarizes environmental consequences that would result from the proposed project, provides a summary table that denotes anticipated significant environmental impacts, describes identified mitigation measures, and indicates the level of significance of impacts before and after mitigation.

**Section 3.0, Project Description**, describes the proposed project.

**Section 4.0, Environmental Setting, Impacts, and Mitigation Measures**, describes the environmental setting, including applicable plans and policies; provides an analysis of the potential environmental impacts of the proposed project; and identifies mitigation measures to reduce their significance. It also includes an evaluation of the project's cumulative impacts.

**Section 5.0, Alternatives**, summarizes alternatives to the proposed project and the comparative environmental consequences of each alternative. This section includes an analysis of the No Project Alternative, among others, as required by CEQA.

**Section 6.0, Other CEQA Considerations**, provides a discussion of the project's significant and unavoidable impacts, the potential for the project to result in growth inducement, and a brief description

of the environmental effects that were found not to be significant and, therefore, not evaluated in further detail.

**Section 7.0, Report Preparation**, provides a list of the individuals involved in the preparation of this EIR.

**Supplement to the 2006 LRDP EIR**, provides an updated analysis of the greenhouse gas emissions that are projected to result from LBNL growth through 2025 under the 2006 LRDP, and an evaluation of the significance of the impact from the estimated emissions. It also presents an updated evaluation of energy impacts from the implementation of the 2006 LRDP.

## 2.0 EXECUTIVE SUMMARY

---

### 2.1 PURPOSE

This Draft Focused EIR evaluates the potential for significant environmental impacts from the Building 59 Upgrade & Installation and Operation of NERSC-9 project (“NERSC-9 project”) proposed by the University of California Lawrence Berkeley National Laboratory (“UC LBNL”). In addition to serving as a project-level EIR for the NERSC-9 project, this document supplements the EIR prepared in 2006 for LBNL’s Long Range Development Plan (LRDP). It further updates the program-level analysis of impacts from greenhouse gas (GHG) emissions that would result from the implementation of the LRDP as a whole and also presents an updated energy impact analysis.

It is the intent of this Executive Summary to provide the decision makers, responsible agencies, and the public with a clear, simple, and concise description of the proposed project and its potential significant environmental impacts. Section 15123 of the *California Environmental Quality Act (CEQA) Guidelines* requires that the summary identify each significant effect, applicable mitigation measure(s), and alternatives that would minimize or avoid potential significant impacts. The summary is also required to identify areas of controversy known to the lead agency, including issues raised by agencies and the public and issues to be resolved. These issues include the choice among alternatives and whether or how to mitigate significant effects. This section focuses on the major areas of importance in the environmental analysis for the proposed project and utilizes non-technical language to promote understanding.

### 2.2 PROJECT LOCATION

The proposed NERSC-9 project would be located in the western portion of the LBNL site within the existing Shyh Wang Hall (formerly known as the “Computational Research and Theory” [CRT] facility, and also referred to as “Building 59”). Building 59 is an approximately 140,000-gsf building with 32,000 gsf of high-performance computing (HPC) space on one floor, and office space on two floors. A mechanical floor is located beneath the HPC floor and an electrical room is also located adjacent to the HPC space. The building is located on the hillside adjacent to the Blackberry Canyon Gate entrance to the LBNL hill site. The facility entrance is on Perlmutter Road and the building is within walking distance, or a short shuttle bus trip, of the UC Berkeley Physical and Computer Science Departments.

Chu Road and LBNL’s Building 50 complex, which is composed of a large lecture hall, a library, and buildings for computing, research, and office space, are located to the north-east. LBNL’s Building 70 complex, consisting mainly of laboratory space, is located to the east. Other surrounding land uses include: Cyclotron Road and UC Berkeley Campus athletic, academic, and recreational facilities to the

south; and Cyclotron Road, the Blackberry Canyon entrance gate, and Building 88, which houses LBNL's Cyclotron facility, to the west. Multi-family residential neighborhoods in the City of Berkeley and UC Berkeley student housing are also located further to the west.

### 2.3 PROJECT DESCRIPTION

The proposed project includes the installation and operation of a new high-performance computing system called NERSC-9, up to three cooling towers, a backup generator, water pumps, water distribution piping, heat exchangers, electrical substations, electrical distribution panels, air handling units, an additional uninterruptible power supply panel, and exhaust fans. All upgrades and improvements would take place inside the existing Building 59 or within an exterior area adjacent to the southeastern corner of the building. The proposed project would not involve construction of or exterior modifications to any buildings. Up to three new cooling towers would be installed adjacent to four existing cooling towers; these would be partially visible from some off-site areas near the LBNL hill site. The project would not increase the number of employees and visitors that would be present in the building. The project components are described below.

#### **High-Performance Computing System**

The proposed NERSC-9 high-performance computing system would be installed on the HPC floor of Building 59. In order to operate seamlessly while upgrading high performance computing systems, the building was designed and constructed to accommodate simultaneous operation of two systems. This allows the current generation high-performance computing system to continue to operate when a next generation is installed and phased into operation. Currently, NERSC-7 system is operating in Building 59 and the installation of NERSC-8 system has recently been completed and is fully operational. After NERSC-7 is phased out and then removed, NERSC-9 would be installed and gradually phased in.

The building interior itself would not undergo major structural modification, as the 32,000-gsf HPC floor is contiguous and largely column-free and has headroom to maximize flexibility in configuring supercomputer arrays. It includes a raised-floor system that provides access for data and electrical cable and mechanical piping; it also serves as a supply air chase for air-cooled equipment.

#### **Cooling Towers**

Cooling to the HPC floor and office space is currently provided by a bank of four high-efficiency evaporative cooling towers, approximately 30 feet high, located near the exterior southeastern corner of the HPC portion of Building 59. The cooling towers are located on a concrete pad/foundation and the pad is enclosed by a concrete wall. A fifth cooling tower, which was approved as part of the previously

approved CRT project but has not been installed yet, would be installed in conjunction with the NERSC-9 project. This already-approved fifth cooling tower is conservatively considered a part of this project for CEQA analysis purposes. In addition to this already approved, fifth cooling tower, the proposed NERSC-9 project would add up to two additional cooling towers for a total of up to three new cooling towers. All three would occupy the existing concrete cooling tower foundation/pad that currently accommodates four cooling towers, and which was designed for the installation of up to seven cooling towers. The current system along with the three proposed new cooling towers would serve liquid cooled computational equipment and the air handling and roof top HVAC units. The cooling towers would operate at full capacity only during the warmest days of the year, typically in August.

### **Backup Generator and Fuel Tank**

Building 59 is currently equipped with a 1.25 megawatt (MW) standby generator. To accommodate the planned high-performance computing installation, the proposed project may also install a second 1.25 MW standby generator or multiple smaller generators with equivalent combined capacity, adjacent to the existing unit. Additionally, diesel fuel would be stored in a new, approximately 2,300 gallon above-ground fuel tank to service the new standby generator(s).

### **Other Equipment**

Up to six electrical substations would be installed in the building's electrical rooms, and six water pumps, three heat exchangers, up to four air handling units, and additional uninterruptable power supply (UPS) equipment would be installed on the mechanical level.

## **2.4 PROJECT OBJECTIVES**

Key objectives of the proposed project are to:

- Upgrade the high-performance computing system in Building 59 to leverage improving technology to maximize computational capacity in order to best meet the rapidly increasing demands of science.
- Upgrade Building 59 facility power and cooling capability to accommodate the NERSC-9 supercomputer system.
- Flexibly accommodate data sharing between NERSC-9 and the existing NERSC-8 system and provide for highly efficient access to Building 59 facility storage and high-bandwidth.
- Operate project computing power and cooling systems with exceptional energy efficiency.
- Provide Building 59 facility upgrades and operations in a cost-effective and timely manner.

## 2.5 TOPICS OF KNOWN CONCERN

To determine which environmental topics should be addressed in this Draft Focused EIR, UC LBNL prepared an Initial Study and circulated it along with a Notice of Preparation (NOP) in order to receive input from interested public agencies and members of the public. Only one comment letter from East Bay Municipal Utility District (EBMUD) was received in response to the NOP. The letter does not articulate any particular concerns about the proposed NERSC-9 project; rather, it provides standard guidance and suggestions for any project on the Lab hill site. Copies of the NOP, Initial Study, and the letter from EBMUD are presented in **Appendix 1.0** of this Draft Focused EIR. Based on the Initial Study, this Draft Focused EIR addresses the following environmental topics in depth:

- Greenhouse Gas Emissions
- Tribal Cultural Resources
- Energy

## 2.6 IMPACT SUMMARY

A detailed discussion regarding the proposed project's potential environmental impacts is provided in **Section 4.0, Environmental Setting, Impacts, and Mitigation Measures**, and in the Initial Study. In accordance with the *State CEQA Guidelines*, a summary of the NERSC-9 project's impacts is provided in **Table 2.0-1, Summary of Impacts and Mitigation Measures**, presented below. Although the impact of the proposed NERSC-9 project related to GHG emissions would be potentially significant, the proposed mitigation measures would reduce the impact to a less than significant level. All other impacts of the proposed project would be less than significant and no mitigation measures are required.

**Table 2.0-1  
Summary of NERSC-9 Project Impacts and Mitigation Measures**

Environmental Topic and Impact		Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
<b>4.1 Greenhouse Gas Emissions</b>				
<b>NERSC Impact GHG-1</b>	The proposed project would generate greenhouse gas emissions, either directly or indirectly, that could have a significant impact on the environment.	Significant	<b>NERSC Mitigation Measure GHG-1:</b>  Berkeley Lab shall monitor GHG emissions each year and develop or purchase renewable energy (RE) and/or purchase renewable energy certificates (REC) or other verifiable GHG offsets in the amount of at least 35,092 MTCO <sub>2</sub> e/year by the end of FY 2021 to reduce GHG emissions from Building 59.	Less than significant
<b>NERSC Impact GHG-2</b>	Operation of the proposed project could conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions.	Significant	<b>NERSC Mitigation Measure GHG-2:</b>  Implement NERSC Mitigation Measure GHG-1.	Less than significant
<b>4.2 Tribal Cultural Resources</b>				
<b>NERSC Impact TCR-1</b>	The proposed project would not cause a substantial adverse change in the significance of a Tribal Cultural Resource as defined in Section 21074.	Less than significant	No mitigation measures are required.	NA
<b>4.3 Energy</b>				
<b>NERSC Impact EN-1</b>	Construction and operation of the proposed project would increase the use of energy resources on the project site but would not result in wasteful, inefficient or unnecessary consumption of energy resources.	Less than significant	No mitigation measures are required.	NA

## 2.7 ALTERNATIVES TO THE PROPOSED PROJECT

The alternatives evaluated in this Draft Focused EIR focus on reducing the project's impacts related to GHG emissions and energy use. Project alternatives that are analyzed include the following:

**Alternative 1: No Project Alternative.** CEQA requires that a "No Project" alternative be considered. A No Project alternative is required to describe the consequences of not approving and implementing a proposed project. Under the No Project Alternative, the NERSC-9 HPC system would not be installed. The current NERSC-7 system would not be replaced but would continue to operate, as would the recently installed and fully functional NERSC-8. No upgrades to the building systems would be made and the electricity use in Building 59 would remain at the current level of about 9 MW. A previously approved fifth cooling tower would be installed.

**Alternative 2: Modified NERSC-9 Alternative.** Under the Modified NERSC-9 Alternative, previously approved building system upgrades would be implemented, including installation of a fifth cooling tower and additional substations so that Building 59 would be set up to operate at up to 17 MW of power. Under this alternative, the NERSC-8 system would operate at full utilization and NERSC-7 would be removed and replaced with a new high-performance computing system that could operate within the constraints of 17 MW of power for the entire building. Although this HPC system ("modified NERSC-9") would not match the computational capabilities of the proposed NERSC-9, it would be newer technology than NERSC-7 and therefore would provide improved computational capabilities and better energy efficiency compared to the No Project Alternative, described above.

The comparative merits of these alternatives are presented in **Section 5.0** of this Draft Focused EIR. **Table 2.0-2, Summary Comparison of Project Alternatives**, presents a comparison of the significant environmental impacts of each alternative to those that are expected to result from the proposed project.

Based on the analysis presented in the Draft Focused EIR, Alternative 2, Modified NERSC-9 Alternative, is identified as the Environmentally Superior Alternative (see **Section 5.0** of this Draft Focused EIR).

**Table 2.0-2  
Summary Comparison of NERSC-9 Project Alternatives**

NERSC-9 Project Impact		Proposed NERSC-9 Project (Before Mitigation)	No Project Alternative	Modified NERSC-9 Alternative
<b>4.1 Greenhouse Gas Emissions</b>				
<b>NERSC Impact GHG-1</b>	The proposed project would generate greenhouse gas emissions, either directly or indirectly, that could have a significant impact on the environment.	Significant	No Impact  Less than the proposed project	Significant  Reduced impact compared to proposed project
<b>NERSC Impact GHG-2</b>	Operation of the proposed project could conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions.	Significant	Less than significant  Less than the proposed project	Significant  Reduced impact compared to proposed project
<b>4.2 Tribal Cultural Resources</b>				
<b>NERSC Impact TCR-1</b>	The proposed project would not cause a substantial adverse change in the significance of a Tribal Cultural Resource as defined in Section 21074.	Less than significant	Less than significant  Similar to the proposed project	Less than significant  Similar to the proposed project
<b>4.3 Energy</b>				
<b>NERSC Impact EN-1</b>	Construction and operation of the proposed project would increase the use of energy resources on the project site but would not result in wasteful, inefficient or unnecessary consumption of energy resources.	Less than significant	Less than significant  Less energy efficient than the proposed project	Less than significant  Similar to the proposed project in energy efficiency

## 2.8 ISSUES TO BE RESOLVED/AREAS OF CONTROVERSY

This EIR addresses environmental issues associated with the proposed project that are known to the lead agency. One comment letter that was received in response to the NOP does not raise any issues. No public comments were received at the scoping meeting conducted for the project. No issues to be resolved or areas of controversy were identified for the proposed project during the scoping process.

## 2.9 SUPPLEMENTATION OF THE LBNL 2006 LRDP EIR

In addition to serving as a project-level EIR for the NERSC-9 project, this document supplements the prior EIR prepared in 2006 for LBNL's Long Range Development Plan (LRDP), and updates the program-level analysis of GHG and energy impacts that would result from the implementation of the LRDP as a whole. GHG and energy impacts of the 2006 LRDP are summarized in **Table 2.0-3, Updated 2006 LRDP GHG and Energy Impacts and Mitigation Measures**.

**Table 2.0-3  
Updated 2006 LRDP GHG and Energy Impacts and Mitigation Measures**

Environmental Topic and Impact		Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
<b>4.1 Greenhouse Gas Emissions</b>				
<b>LRDP Impact GHG-1</b>	Growth at Berkeley Lab under the 2006 LRDP would result in greenhouse gas emissions, either directly or indirectly, that could have a significant impact on the environment.	Significant	<p><b>LRDP Mitigation Measure GHG-1:</b></p> <p>Berkeley Lab shall set a goal to reduce its net Scope 1, 2, and 3 GHG emissions to 20 percent below its FY1990 GHG emissions by the end of FY2025. For Berkeley Lab, this corresponds to net GHG emissions below 44,800 MTCO<sub>2e</sub>/year (20 percent below the Lab's 1990 emissions of 56,002 MTCO<sub>2e</sub>) by the end of FY2025.</p> <p>Reductions in emissions would be achieved in a manner consistent with the federal sustainability executive order. This includes targeting reductions in Scope 1 and 2 GHG emissions so that by the end of FY2025 they are 50 percent from a FY2008 baseline, and reducing Scope 3 GHG emissions 25 percent by the end of FY2025 from a FY2008 baseline.</p> <p>Berkeley Lab shall monitor GHG emissions each year, monitor upcoming projects at LBNL for their potential to increase the Lab's GHG emissions, and implement project-specific and Lab-wide GHG reduction measures to reduce Berkeley Lab's GHG emissions in accordance with the</p>	Less than significant

Environmental Topic and Impact		Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
			<p>44,800 MTCO<sub>2</sub>e/year goal for 2025. The Lab-wide GHG reduction measures may include further enhancements to LBNL's TDM program, and additional energy efficiency measures.</p> <p>In the event that adequate reduction is not achieved by these measures, Berkeley Lab will develop or purchase renewable energy or purchase renewable energy credits, or other verifiable GHG offsets to keep the Lab's net emissions at or below 44,800 MTCO<sub>2</sub>e.</p>	
<b>LRDP Impact GHG-2</b>	Implementation of the 2006 LRDP could conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions.	Significant	<p><b>LRDP Mitigation Measure GHG-2:</b></p> <p>Implement <b>NERSC-9 Mitigation Measure GHG-1</b> and <b>LRDP Mitigation Measure GHG-1.</b></p>	Less than significant
<b>LRDP Impact EN-1</b>	Implementation of the 2006 LRDP would increase the use of energy resources at Berkeley Lab but would not result in wasteful, inefficient, or unnecessary consumption of energy resources.	Less than significant	No mitigation measures are required.	NA

## 3.0 PROJECT DESCRIPTION

---

### 3.1 INTRODUCTION

The University of California, Lawrence Berkeley National Laboratory (“UC LBNL”) proposes to install and operate NERSC-9, a next generation high-performance computing (“HPC”) system, in the existing Shyh Wang Hall (also referred to as “Building 59”; formerly known as the “Computational Research and Theory” [CRT] facility) at the Lawrence Berkeley National Laboratory hill site in Berkeley, Alameda County, California. The National Energy Research Scientific Computing Center (“NERSC”) program at LBNL is the primary scientific computing program for the U.S. Department of Energy (“DOE”), Office of Science, which supports basic and applied research across multiple scientific disciplines. This project is officially titled: “Building 59 Upgrade & Installation and Operation of NERSC-9” (hereinafter referred to as the “NERSC-9 project” or “proposed project”). NERSC-9 would be the ninth generation of this type of HPC system. Along with the new high performance computing system, additional power, cooling, and distribution equipment would be installed to augment and upgrade existing building systems.

This section presents proposed NERSC-9 project details in terms of project need and objectives, project components and design features, and proposed construction schedule and activities.

### 3.2 PROJECT BACKGROUND, NEED AND OBJECTIVES

As noted above, UC LBNL proposes to install and operate a next generation HPC system in Building 59, which was formerly known as the Computational Research and Theory (“CRT”) facility.

The construction of Building 59 and the development of the NERSC facility at the Building 59 site were evaluated under the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA), in an EIR and an EA respectively. Upon completion of CEQA and NEPA review, Building 59 was constructed and the existing NERSC HPC system (NERSC-7) that was housed off-site at the LBNL Oakland Scientific Facility (“OSF”) was gradually moved to the new building. A new HPC system – NERSC-8 – was installed in Building 59 between 2015 and 2016. During this time, UC LBNL determined that due to the researchers’ need for greater computing power and speed, a next-generation HPC system was needed. UC LBNL has identified NERSC-9 as the new HPC system that would be acquired and installed to replace the older NERSC-7 system.

The purpose of the NERSC-9 project is to provide additional computing capacity to help meet the increasing needs of scientists for computational resources for simulation of physical phenomena as well as data analysis of sensor and experimental data. In addition to providing additional computing capacity,

NERSC-9 would be 4.5 times more energy efficient than NERSC-7. It will use approximately 5.5 times the energy on average, and deliver approximately 25 times the performance of NERSC-7.

System capacity to allow simultaneous operation of HPC systems (e.g., NERSC-8 and NERSC-9) is a necessary feature of Building 59 and the NERSC program: it allows a retired HPC system (e.g., NERSC-7, or Edison) to be phased out, shut down, and removed and a new system (e.g., NERSC-9) to be installed in its place and gradually phased in without interruption to NERSC's computational functions (i.e., NERSC-8 would continuously function during this period).

The proposed project is consistent with the overarching mission of DOE, which is to advance the national, economic, and energy security of the United States and to promote scientific and technological innovation in support of that mission at its national laboratories, including LBNL.

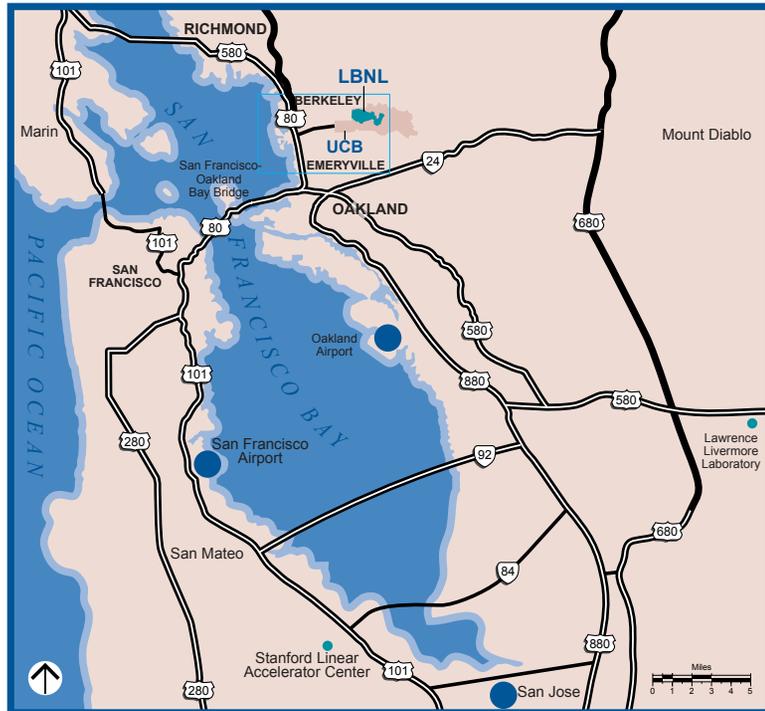
Key objectives of the proposed project are to:

- Upgrade the high-performance computing system in Building 59 to leverage improving technology to maximize computational capacity in order to best meet the rapidly increasing demands of science.
- Upgrade Building 59 facility power and cooling capability to accommodate the NERSC-9 supercomputer system.
- Flexibly accommodate data sharing between NERSC-9 and the existing NERSC-8 system and provide for highly efficient access to Building 59 facility storage and high-bandwidth.
- Operate project computing power and cooling systems with exceptional energy efficiency.
- Provide Building 59 facility upgrades and operations in a cost-effective and timely manner.

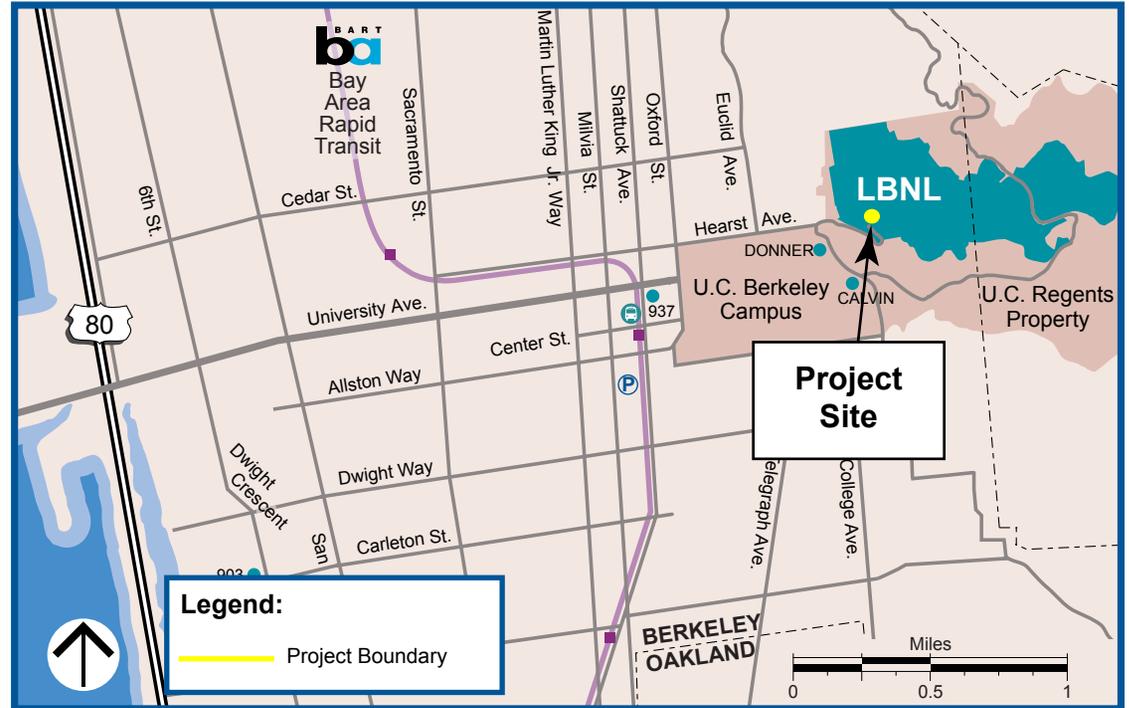
### 3.3 PROJECT LOCATION AND SURROUNDING USES

LBNL is situated in the eastern hills of the cities of Berkeley and Oakland in Alameda County; it is located on approximately 200 acres that are owned by the University of California (see **Figure 3.0-1, Regional and Local Location**). The LBNL hill site is surrounded by open space, institutional uses, and residential and neighborhood commercial areas. UC Berkeley's main campus and its Hill Campus, including the Strawberry Canyon open space areas, lie south of the LBNL hill site. Residential neighborhoods and a small neighborhood commercial area in the City of Berkeley lie to the west, and regional open space, including the 2,000-acre Tilden Regional Park, lies to the northeast.

The proposed NERSC-9 project would be located in the western portion of the LBNL site, primarily within the existing Building 59 (see **Figure 3.0-2, Project Site Location**) and also at an exterior area adjacent to the southeast corner of the building. Building 59 is an approximately 140,000-gsf building



LBNL Regional Location



LBNL Local Location



SOURCE: Lawrence Berkeley National Laboratory

FIGURE 3.0-1



SOURCE: Lawrence Berkeley National Laboratory

FIGURE 3.0-2

Project Site Location

with 32,000 gsf of HPC space on one floor, and office space on two floors. A mechanical level is located beneath the HPC floor and electrical rooms are located adjacent to the HPC space. The building is located on the hillside adjacent to the Blackberry Canyon Gate entrance to the LBNL hill site. The facility entrance is on Perlmutter Road and the building is within walking distance, or a short shuttle bus trip, of the UC Berkeley Physical and Computer Science Departments.

LBNL's Building 50 complex, which is composed of a large lecture hall, a library, and buildings for computing, research, and office space, and Chu Road are located to the north east. LBNL's Building 70 complex, consisting mainly of laboratory space, is located to the east. Other surrounding land uses include: Cyclotron Road and UC Berkeley Campus athletic, academic, and recreational facilities to the south; and Cyclotron Road, the Blackberry Canyon entrance gate, and Building 88, which houses LBNL's Cyclotron facility, to the west. City of Berkeley multi-family residential neighborhoods and UC Berkeley student housing are also located further to the west.

### 3.4 PROJECT CHARACTERISTICS

HPC facilities such as Building 59 and other data centers primarily contain electronic equipment used for data processing (servers), data storage (storage equipment), and communications (network equipment). Collectively, this equipment processes, stores, and transmits digital information and is known as "information technology" (IT) equipment. These facilities also usually contain specialized power conversion and backup equipment to maintain reliable, high-quality, power as well as environmental control equipment to maintain the proper temperature and humidity for the IT equipment. Building 59 currently houses two HPC systems, NERSC-7 and NERSC-8, and related power and environmental control equipment.

The proposed project includes the installation and operation of a new high-performance computing system (NERSC-9), up to three cooling towers, a backup generator, water pumps, water distribution piping, heat exchangers, electrical substations, electrical distribution panels, air handling units, an additional uninterruptable power supply (UPS) panel, and exhaust fans. (See **Figure 3.0-3, Project Plan View** and **Figure 3.0-4, Project Section**.) All upgrades and improvements would take place inside the existing Building 59 or within an exterior area adjacent to the southeast corner of the building. The proposed project would not involve construction of or exterior modifications to any buildings. Up to three new cooling towers would be installed adjacent to four existing cooling towers; these would be partially visible from some off-site areas near the LBNL hill site. The project would not increase the number of employees and visitors that would be present in the building. The project components are described below.

## High-Performance Computing System

The proposed NERSC-9 high-performance computing system would be installed on the HPC floor of Building 59. In order to operate seamlessly while upgrading high performance computing systems, the building was designed and constructed to accommodate simultaneous operation of two systems. This allows the current generation high-performance computing system to continue to operate when a next generation is installed and phased into operation. Presently, NERSC-7 and the newly installed NERSC-8 system are both fully operational and would operate simultaneously until NERSC-9 is installed in 2020. NERSC-9 would be installed and gradually phased in after phase-out and removal of NERSC-7.

The building interior itself would not undergo major structural modification, as the 32,000-gsf HPC floor is contiguous and largely column-free and has headroom to maximize flexibility in configuring supercomputer arrays. It includes approximately 21,000 gsf of raised-floor that provides access for data and electrical cabling and piping, and it also serves as a supply air chase for air-cooled equipment.

## Cooling Towers

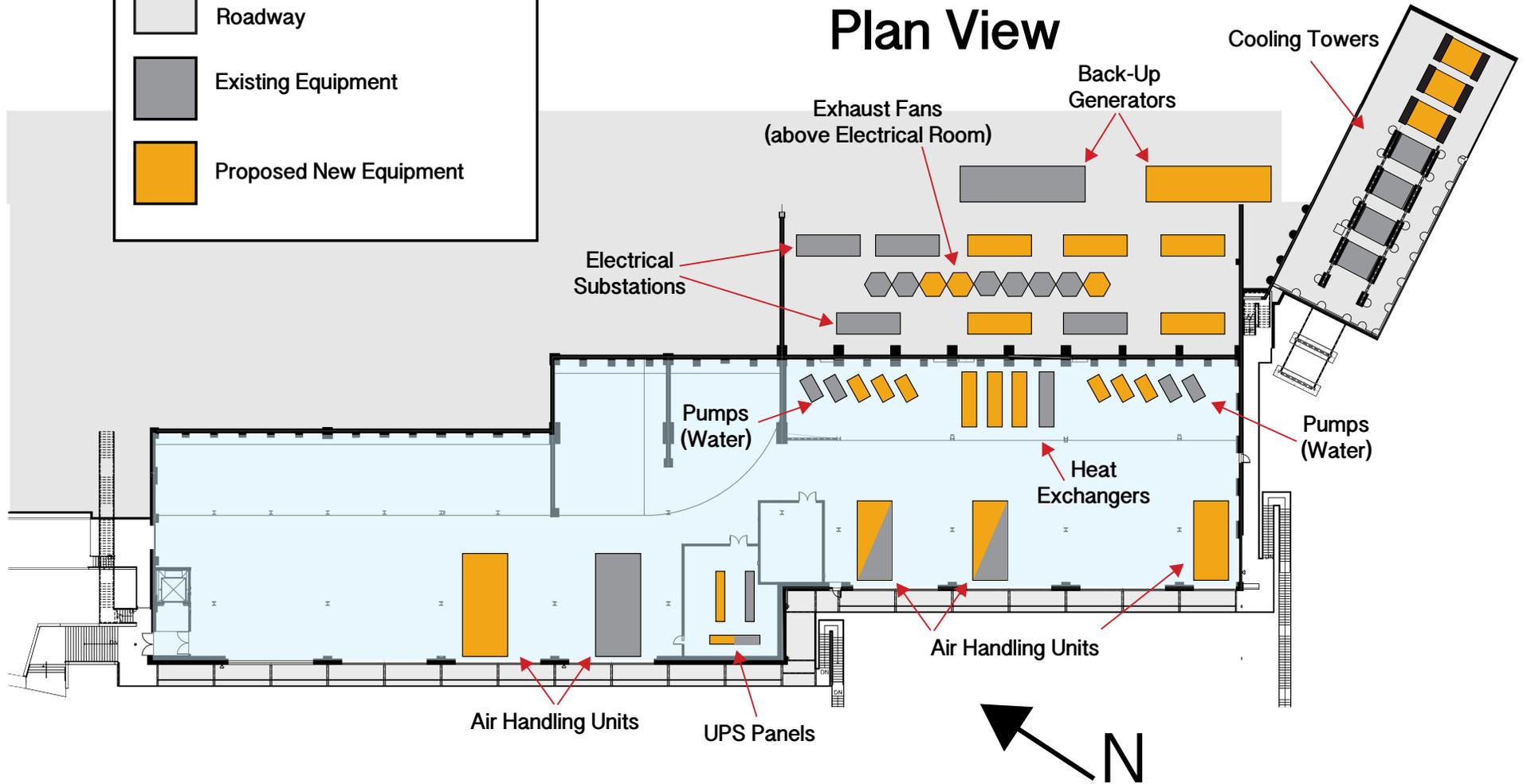
Cooling to the HPC floor and office space is currently provided by a bank of four high-efficiency evaporative cooling towers, approximately 30 feet high, near the exterior southeast corner of Building 59. The cooling towers are located on a concrete pad/foundation, and the area is enclosed by a concrete wall. A fifth cooling tower, which was approved as part of the previously approved CRT project but has not been installed yet, would be installed in conjunction with the NERSC-9 project. This already-approved fifth cooling tower was conservatively considered a part of this project for CEQA analysis purposes. In addition to this already approved, fifth cooling tower, the proposed NERSC-9 project would add up to two additional cooling towers for a total of up to three new cooling towers. All three would occupy the existing concrete cooling tower foundation/pad that currently accommodates four cooling towers, and was designed for the installation of up to seven cooling towers. The current system along with the three proposed new cooling towers would serve liquid-cooled computational equipment and the air handling and roof-top HVAC units. The cooling towers would operate at full capacity only during the warmest days of the year, typically in August.

## Backup Generator and Fuel Tank

Building 59 is currently equipped with a 1.25 megawatt (MW) standby generator. To accommodate the planned high-performance computing installation, the proposed project includes the installation of a second 1.25 MW standby generator or multiple smaller generators with equivalent combined capacity, adjacent to the existing unit. Additionally, diesel fuel would be stored in a new, approximately 2,300 gallon above-ground fuel tank to service the new standby generator (s).

# Bldg 59 NERSC 9 Upgrades: Plan View

	Bldg. 59 Interior (Mechanical Level)
	Exterior Concrete Pad / Roadway
	Existing Equipment
	Proposed New Equipment

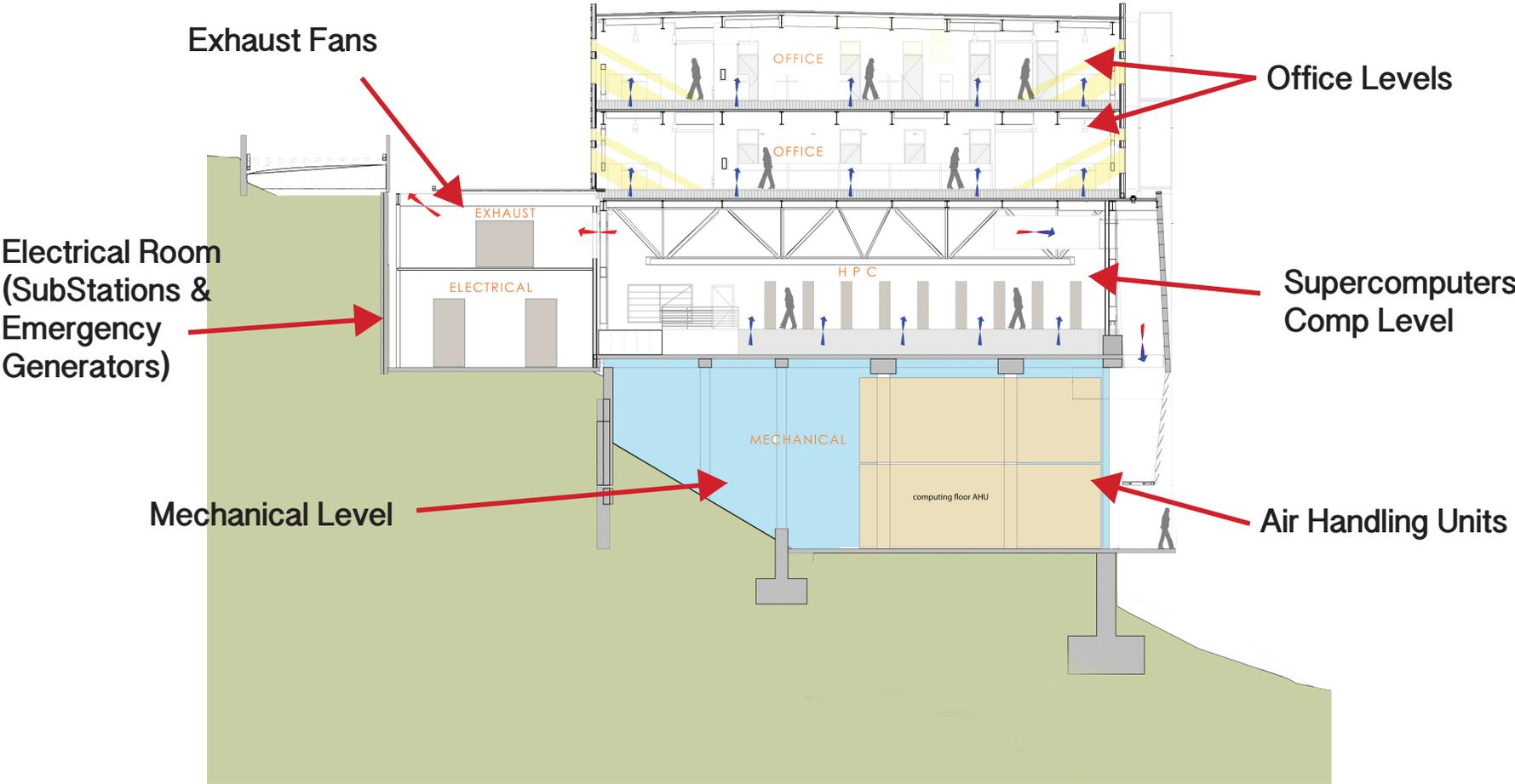


Proposed equipment sizes and locations are approximate, schematic, and not to scale. For illustrative purposes. Some of the above identified proposed new equipment are already approved in previous NEPA/CEQA decision; others are exclusive to the proposed NERSC-9 project.

SOURCE: Lawrence Berkeley National Laboratory

FIGURE 3.0-3

**Bldg 59 NERSC 9  
Upgrades: Plan View  
(Looking Southeast)**



Proposed equipment sizes and locations are approximate, schematic, and not to scale. For illustrative purposes.

SOURCE: Lawrence Berkeley National Laboratory

FIGURE 3.0-4

## Other Equipment

Up to six electrical substations would be installed in the building's electrical rooms, and six water pumps, three heat exchangers, up to four air handling units, and additional Uninterruptable Power Supply (UPS) equipment would be installed within the mechanical level.

**Table 3.0-1  
Current and Proposed Conditions**

<b>Item</b>	<b>Building 59 Current Use (FY2016)</b>	<b>NERSC-9 Project<sup>a</sup></b>	<b>Building 59 Projected Use at full Project Operation (FY2021)<sup>b</sup></b>
Average Electrical Power (MW)	7.5	13.1 (NERSC-9) <sup>c</sup>	13.1 (NERSC-9) 5.7 (Rest of B59) Total 18.8
Peak Electrical Power (MW)	8.9	15.4 (NERSC-9) <sup>c</sup>	15.4 (NERSC-9) 6.7 (Rest of B59) Total 22.1
Average Water Use (MGY)	15	40	55
Number of Cooling Towers	4	3	7
Capacity (MW) of substations	12.5	15	27.5
Capacity (MW) of standby generators	1.25 MW	1.25 MW	2.50 MW
Number of Air Handling Units	3	4	7
Number of Heat Exchangers	1	3	4
Number of Exhaust Fans	6	3	9
Number of Building Occupants	300	0	300

<sup>a</sup> Some project components are subject to minor changes as design undergoes value engineering and refinement.

<sup>b</sup> While the facility is not currently operating at its fully approved capacity, it is steadily ramping up to full operations. Therefore, in some of the above table categories, 2020-21 use levels are projected to be somewhat higher than can be achieved by adding project operations to current conditions.

<sup>c</sup> The reported number is average/peak electricity use for NERSC-9 plus supporting mechanical load to cool the system.

### 3.5 INFRASTRUCTURE AND UTILITIES

Each of the new components listed above would require integration into the existing building utility and infrastructure systems.

#### Water Supply

Building 59 connects to an 8-inch high-pressure water main located beneath Seaborg Road for water supply. No changes to the water main are required. Current water consumption (2016) for the Building 59 Facility is estimated at approximately 15 million gallons per year (mgy) or an average of about 14,000 gallons per day (gpd). At peak project buildout and operation, estimated water consumption in Building 59 would be approximately 55 mgy or an average of about 151,000 gpd. This includes demand for domestic water, fire suppression water, and cooling tower water. The proposed project would include recirculation of cooling water, which would reduce water demand.

#### Sanitary Sewer System

Sanitary sewer service is currently provided by a connection to the sewer main beneath Cyclotron Road. Improvements to the sanitary sewer system would not be required as the project would not increase the amount of wastewater discharged from the site.

#### Storm Drainage

The existing Building 59 storm drain system includes roof drains, overflow drains, and interior downspouts that connect to the onsite storm drain system. Improvements to the storm drain system would not be required as no new impervious surface (e.g., additional buildings or equipment pads) is proposed that could result in increased runoff from the project site. The existing storm drain system at the project site has sufficient capacity to meet the current needs of the drainage area.

#### Electricity

Electrical power is provided by the Western Area Power Administration (WAPA) and delivered to the LBNL site (Grizzly Peak substation) via Pacific Gas and Electric's (PG&E's) distribution system. From there, electricity is delivered to Building 59 through a medium-voltage underground duct bank. At the present time, the peak power load of Building 59 is 8.9 MW. While Building 59 previously was approved to operate at a peak electrical energy demand of 17 MW, following the installation of NERSC-9 the peak electrical demand of Building 59 would increase to a maximum of 22.1 MW at full operation in 2021, and an average electrical demand of 18.8 MW (see **Table 3.0-1** above). To provide this power to the facility, as noted above, up to six electrical substations would be added to the building's mechanical room.

No off-site improvements to LBNL's site-wide electrical distribution system are proposed as part of this project. The Grizzly Peak substation is expected to be upgraded over the next few years as part of ongoing utility modernization and planning efforts. These Grizzly Peak substation improvements would occur independently from any decision on the proposed Building 59 upgrade.

Backup power requirements at the present time are served by a 1.25 MW diesel-powered backup generator. As part of the proposed project, a second 1.25 MW diesel-powered backup generator, or multiple smaller generators with equivalent combined capacity, would be installed in the building's electrical room.

Building 59 has been designed with a Power Usage Effectiveness (PUE) of 1.1. PUE is a metric that is used to benchmark the energy performance of an HPC facility. PUE values can range from 1.0 to greater than 1. Although the proposed project would generate a substantial demand for electricity, Building 59 would still maintain a PUE of 1.1 following the installation of NERSC-9, and would represent a highly efficient facility. It would exceed the PUE goal set forth by the federal government for data centers.

Additionally, the existing Building 59 meets LEED Gold standards. In order to achieve green building principles and to be consistent with the 2006 LRDP, the design of the proposed facility integrated the building into the hillside. High performance glazing was installed and shading used to reduce the effects of afternoon heat gains. The building includes numerous measures to minimize electricity use, including a cool roof, natural ventilation, daylighting, use of exhaust heat produced by high performance computers to help meet the building's heating needs, etc. The facility also includes high efficiency evaporative cooling towers and high efficiency electrical fixtures.

### **Natural Gas**

Natural gas is not used in Building 59 and demand for natural gas would not increase due to the proposed project.

### **3.6 ACCESS, ON-SITE CIRCULATION, AND PARKING**

Automobile access to Building 59 is available from Cyclotron Road and Purlmutter Road. Approximately four parking spaces are provided for disabled guests near Building 59. Additional, limited-time parking spaces are provided for use by delivery and maintenance vehicles. Staff parking is provided in the existing parking lots. The building is within 500 feet of both the Horseshoe Parking Lot F to the south and Blackberry Canyon Parking Lot D to the north. The facility also includes parking for approximately 30 bicycles. Public transportation is available through the LBNL shuttle system.

### 3.7 HAZARDOUS MATERIALS ON-SITE

The proposed 1.25 MW backup generator would be tested monthly and would thereby create relatively small amounts of diesel exhaust. These emissions would be vented through an exhaust system specifically designed to disperse and prevent re-entrainment of exhaust into Building 50 or other nearby buildings. Chemicals that might be used and stored during the operational phase of the project would include diesel fuel stored in the new fuel tank used to service the new backup generator. This above-ground storage tank would be secured with spill-prevention and secondary containment systems to prevent any accidental, uncontrolled releases.

Research that is conducted in Building 59 is limited to computing and computing-related operations and does not involve radioactive materials, hazardous chemicals, hazardous organic or inorganic materials, nano-scale materials, or genetically modified/transgenic plant materials and microorganisms. Additionally, no “wet” laboratories are located in the building.

### 3.8 PROJECT POPULATION

The existing Building 59 accommodates approximately 300 employees, of which approximately 225 are LBNL staff and 75 are UC Berkeley staff and students. As the proposed project involves an in-kind replacement of an older high-performance computing system, there would be no increase in the number of persons working in or conducting research in Building 59 as a result of the proposed project.

The high-performance computing systems in Building 59 are used not only by the 300 employees noted above, but also by a large number of external users who utilize NERSC’s computational and storage resources. UC LBNL estimates that approximately 5,760 persons use the facility in this manner each year. NERSC also hosts scientific databases for the Joint Genome Institute (JGI), the Materials Project and other programs; these resources have been accessed by additional thousands of individuals over the Internet. Furthermore, NERSC provides computational support for processing of large-scale experimental data from programs such as JGI, ALICE (an ion experiment at the Large Hadron Collider), and the Advanced Light Source. The number of these external users is estimated to be about 24,000 persons per year.

### 3.9 PROJECT CONSTRUCTION AND SCHEDULE

#### **Construction Access, Staging, and Schedule**

Project construction would occur in two phases. The first phase, which would commence in 2017 and end in 2019, would include installation of the electrical and mechanical infrastructure (e.g., substations, cooling towers, pumps, and other equipment). In the second phase, beginning in 2019, the sub-floor piping and cabling would be installed. NERSC-7 would be removed and NERSC-9 installed during the

second phase as well. It is anticipated that NERSC-9 would be fully operational in 2021. A breakdown of the project schedule is shown in **Table 3.0-2** below.

As the table indicates, at peak, the construction of the project would generate up to 40 daily construction worker trips and up to 3 daily truck trips.

Construction equipment would include delivery and light construction vehicles, cranes, generators, and hand-held tools. Deliveries and construction staging would take place on either the loading dock at the Building 59 north end or on the paved area to the east of Building 59 and the project is not expected to use any unpaved land adjacent to the building during construction. However, a large crane (or cranes) would likely be used to lift and place heavy equipment such as the cooling towers into place. The crane(s) may be temporarily placed on a paved area or on an area of compacted, unpaved land, such as the area immediately north of the existing cooling tower pad. This is within the area that was previously disturbed during the construction of Building 59.

**Table 3.0-2  
Project Schedule**

#	Project Phase	Starting Timeframe	Ending Timeframe	Peak Number of onsite construction workers	Avg. number of daily onsite construction truck trips (round trips)
1	Additions to Building 59 Facility: Electrical and Mechanical Infrastructure	2017	2019 (24 months)	40	3
2	Installation of distribution piping, cabling, and NERSC-9 System	2019	2020 (18 months)	20	2
3	Full operation of NERSC-9	2021			

### 3.10 2006 LRDP EIR MITIGATION MEASURES

Because the proposed project is an element of the growth projected under the 2006 LRDP, mitigation measures adopted by The Regents in conjunction with the approval of the 2006 LRDP that are relevant to the proposed project are included in and a part of the NERSC-9 project. The full text of the mitigation measures is provided in the Initial Study (**Appendix 1.0**). The analysis presented in the Initial Study evaluates environmental impacts that would result from project implementation with the application of the 2006 LRDP EIR mitigation measures. These mitigation measures are a part of the proposed project and would not be readopted.

### 3.11 PROJECT APPROVALS

The NERSC-9 project would be conducted on land owned by the University within the boundaries of the LBNL hill site. The Board of Regents is the University's decision-making body and is responsible for approving projects to be built on University-owned land. The Regents, either directly or through delegation to an appropriate body or University official, will review and consider this EIR in conjunction with the review and consideration of the NERSC-9 project.

This EIR will also provide information to other agencies with permitting or approval authority over the proposed project. Other potential approvals that the project may need include the following:

- An Authority to Construct and a Permit to Operate from the Bay Area Air Quality Management District for the emergency generator and fuel tank included in the proposed project.

## 4.0 ENVIRONMENTAL SETTING, IMPACTS, AND MITIGATION MEASURES

---

### 4.0.1 INTRODUCTION

This section of the Draft Focused Environmental Impact Report (EIR) presents potential environmental impacts of the proposed NERSC-9 project. The scope of the analysis and key attributes of the analytical approach are presented below to assist readers in understanding the manner in which the impact analysis has been conducted in this Draft Focused EIR.

### 4.0.2 LEVELS OF SIGNIFICANCE

EIRs use a variety of terms to describe the levels of significance of adverse impacts identified during the course of the environmental analysis. The following are definitions of terms used in EIRs:

- **Significant and Unavoidable Impact.** Impacts that exceed the defined standards of significance and cannot be eliminated or reduced to a less than significant level through the implementation of feasible mitigation measures.
- **Significant Impact.** Impacts that exceed the defined standards of significance and that can be eliminated or reduced to a less than significant level through the implementation of feasible mitigation measures.
- **Potentially Significant Impact.** Significant impacts that may ultimately be determined to be less than significant; the level of significance may be reduced in the future through implementation of policies or guidelines (that are not required by statute or ordinance), or through further definition of the project detail in the future. Potentially Significant Impacts may also be impacts about which there is not enough information to draw a firm conclusion; however, for the purpose of this Draft Focused EIR, they are considered significant. Such impacts are equivalent to Significant Impacts and require the identification of feasible mitigation measures.
- **Less Than Significant Impact.** Impacts that are adverse but that do not exceed the specified standards of significance.
- **No Impact.** The project would not create an impact.

### 4.0.3 APPROACH TO IMPACT ANALYSIS

- The preparation of this Draft Focused EIR was preceded by an Initial Study (included in **Appendix 1.0**), which determined that the NERSC-9 project would not result in significant or potentially significant impacts on certain resource areas. This Draft Focused EIR evaluates impacts in two (Greenhouse Gas Emissions, and Tribal Cultural Resources) of the 17 resource areas on the Appendix G CEQA checklist as well as project impacts on energy resources.

- For the three resource areas evaluated in the sections that follow, the EIR describes the existing environmental setting, the potential for the proposed project to significantly affect the existing resources, and recommended mitigation measures that could reduce or avoid potentially significant impacts.
- The environmental setting sections describe the baseline environmental conditions. Much of the environmental setting information is incorporated by reference from the 2006 Long Range Development Plan (LRDP) EIR. The setting sections describe the study area for impact analysis.
- For purposes of the analyses in this EIR, the year 2016 is used to establish the baseline or existing conditions. Impacts are evaluated in terms of environmental changes as a result of implementation of the NERSC-9 project as compared to existing conditions in 2016. Where 2016 data were not available, 2015 data were used in the EIR to represent existing conditions.
- The proposed project is an element of the growth projected under the 2006 LRDP and was evaluated in the 2006 LRDP EIR. Relevant mitigation measures adopted by The Regents in conjunction with the approval of the 2006 LRDP are included in and a part of the proposed NERSC-9 project. The impact analysis presented in the subsequent sections as well as in the Initial Study (**Appendix 1.0**) evaluates environmental impacts that would result from project implementation after the application of the 2006 LRDP mitigation measures.
- Long-term cumulative impacts associated with development of the LBNL hill site under the LBNL 2006 LRDP through 2025, including Building 59, were analyzed in the 2006 LRDP EIR. The 2006 LRDP EIR analysis considered growth at the LBNL hill site under the LBNL 2006 LRDP, growth of the UC Berkeley campus under the UC Berkeley 2020 LRDP, and development in the neighboring cities of Berkeley and Oakland under the current city general plans. As stated in **Section 3.0, Project Description**, the proposed project would replace an older HPC system with a new HPC system. While the project would increase the energy and water use on the LBNL hill site, it would not increase the hill site's building space or population. Therefore, the proposed project will not result in additional traffic or contribute to growth-related cumulative impacts previously analyzed in the LRDP EIR. With respect to cumulative impacts related to electricity and water use, those are addressed in the Initial Study (**Appendix 1.0**).
- The cumulative impacts related to greenhouse gas emissions associated with the development of the LBNL hill site under the LBNL 2006 LRDP through 2025 have been reevaluated and supplemented in this Draft Focused EIR. That supplementation of the prior LRDP EIR analysis is presented in **Section 7.0** of this EIR.

## 4.1 GREENHOUSE GAS EMISSIONS

---

### 4.1.1 INTRODUCTION

This section discusses the existing global, national, and statewide conditions related to greenhouse gases (GHG) and global climate change and evaluates the potential impacts on global climate from the implementation of the proposed project. The section also provides a discussion of the applicable federal, state, regional, and local agencies that regulate, monitor, and control GHG emissions.

Information presented in this section is based on GHG emissions estimated for the proposed project by Sustainable Berkeley Lab (LBNL's sustainability group) and Illingworth & Rodkin, Inc. The memoranda documenting the methodology used to estimate emissions are included in **Appendix 4.1** of this Draft Focused EIR.

No comment letters related to GHG impacts were received in response to the Notice of Preparation (NOP) published for this Draft Focused EIR.

### 4.1.2 ENVIRONMENTAL SETTING

#### 4.1.2.1 Background

Global climate change refers to any significant change in climate measurements, such as temperature, precipitation, or wind, lasting for an extended period (i.e., decades or longer) (US EPA 2013). Climate change may result from:

- Natural factors, such as changes in the sun's intensity or slow changes in the Earth's orbit around the sun;
- Natural processes within the climate system (e.g., changes in ocean circulation, reduction in sunlight from the addition of GHG and other gases to the atmosphere from volcanic eruptions); and
- Human activities that change the atmosphere's composition (e.g., through burning fossil fuels) and the land surface (e.g., deforestation, reforestation, urbanization, desertification).

In recent decades, changes in climate have caused impacts on natural and human systems on all continents and across the oceans. Impacts are due to observed climate change, irrespective of its cause, indicating the sensitivity of natural and human systems to changing climate (IPCC 2013). Continuing changes to the global climate system and ecosystems, and to California, are projected to include:

- Rapidly diminishing sea ice and mountain snowpack levels, thereby increasing sea levels and sea surface evaporation rates with a corresponding increase in tropospheric water vapor due to the atmosphere's ability to hold more water vapor at higher temperatures (IPCC 2013);
- Rising average global sea levels primarily due to thermal expansion and the melting of glaciers, ice caps, and the Greenland and Antarctic ice sheets;
- Changing weather patterns, including changes to precipitation, ocean salinity, and wind patterns, and more energetic aspects of extreme weather, including droughts, heavy precipitation, heat waves, extreme cold, and the intensity of tropical cyclones;
- Changing levels in snowpack, river flow and sea levels indicating that climate change is already affecting California's water resources (Cal EPA 2010);
- An increasing number of days conducive to ozone formation by 25 to 85 percent (depending on the future temperature scenario) in high ozone areas located in the Southern California area and the San Joaquin Valley by the end of the 21st century (Cal EPA 2006);
- Increasing potential for erosion of California's coastlines and sea water intrusion into the Sacramento and San Joaquin Delta and associated levee systems due to the rise in sea level (Cal EPA 2006);
- Dry seasons that start earlier and end later, evoking more frequent and intense wildland fires (Cal EPA 2013); and
- Increasing demand for electricity due to rising temperatures (Cal EPA 2013).

The natural process through which heat is retained in the troposphere<sup>1</sup> is called the "greenhouse effect." The greenhouse effect traps heat in the troposphere through a threefold process as follows: (1) short-wave radiation in the form of visible light emitted by the Sun is absorbed by the Earth as heat; (2) long-wave radiation is re-emitted by the Earth; and (3) GHGs in the upper atmosphere absorb or trap the long-wave radiation and re-emit it back towards the Earth and into space. This third process is the focus of current climate change actions.

While water vapor and carbon dioxide (CO<sub>2</sub>) are the most abundant GHGs, other trace GHGs have a greater ability to absorb and re-radiate long-wave radiation. To gauge the potency of GHGs, scientists

---

<sup>1</sup> The troposphere is the bottom layer of the atmosphere, which varies in height from the Earth's surface from 6 to 7 miles).

have established a Global Warming Potential (GWP) for each GHG based on its ability to absorb and re-emit long-wave radiation over a specific period. The GWP of a gas is determined using CO<sub>2</sub> as the reference gas, which has a GWP of 1 over 100 years (IPCC 1996). For example, a gas with a GWP of 10 is 10 times more potent than CO<sub>2</sub> over 100 years. The use of GWP allows GHG emissions to be reported using CO<sub>2</sub> as a baseline.

GHG emissions are reported in metric tons of carbon dioxide equivalent (MTCO<sub>2</sub>e). The carbon dioxide equivalent for a gas is derived by multiplying the tons of the gas by the associated GWP, such that MTCO<sub>2</sub>E = (metric tons of a GHG) × (GWP of the GHG). For example, the GWP for methane is 21. This means that the emission of one metric ton of methane is equivalent to the emission of 21 metric tons of CO<sub>2</sub>. One metric ton equals 1,000 kilograms (kg) or 2,204.6 pounds.

#### 4.1.2.2 Greenhouse Gases

State law defines GHGs to include the following six compounds:

- **Carbon Dioxide (CO<sub>2</sub>).** Carbon dioxide primarily is generated by fossil fuel combustion from stationary and mobile sources. Due to the emergence of industrial facilities and mobile sources over the past 250 years, the concentration of carbon dioxide in the atmosphere has increased 35 percent (US EPA 2008b). Carbon dioxide is the most widely emitted GHG and is the reference gas (GWP of 1) for determining the GWP of other GHGs. In 2004, 82.8 percent of California's GHG emissions were carbon dioxide (California Energy Commission 2007).
- **Methane (CH<sub>4</sub>).** Methane is emitted from biogenic sources (i.e., resulting from the activity of living organisms), incomplete combustion in forest fires, landfills, manure management, and leaks in natural gas pipelines. In the United States, the top three sources of methane are landfills, natural gas systems, and enteric fermentation (US EPA n.d.[a]). Methane is the primary component of natural gas, which is used for space and water heating, steam production, and power generation. The GWP of methane is 21.
- **Nitrous Oxide (N<sub>2</sub>O).** Nitrous oxide is produced by natural and human-related sources. Primary human-related sources include agricultural soil management, animal manure management, sewage treatment, mobile and stationary combustion of fossil fuel, adipic acid production, and nitric acid production. The GWP of nitrous oxide is 310.
- **Hydrofluorocarbons (HFCs).** HFCs typically are used as refrigerants in both stationary refrigeration and mobile air conditioning. The use of HFCs for cooling and foam blowing is growing particularly as the continued phase-out of chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) gains momentum. The GWP of HFCs ranges from 140 for HFC-152a to 6,300 for HFC-236fa.
- **Perfluorocarbons (PFCs).** Perfluorocarbons are compounds consisting of carbon and fluorine. They are primarily created as a byproduct of aluminum production and semiconductor manufacturing. Perfluorocarbons are potent GHGs with a GWP several thousand times that of

carbon dioxide, depending on the specific PFC. Another area of concern regarding PFCs is their long atmospheric lifetime (up to 50,000 years) (Energy Information Administration 2007). The GWPs of PFCs range from 5,700 to 11,900.

- **Sulfur Hexafluoride (SF<sub>6</sub>).** Sulfur hexafluoride is a colorless, odorless, nontoxic, nonflammable gas. It is most commonly used as an electrical insulator in high voltage equipment that transmits and distributes electricity. Sulfur hexafluoride is the most potent GHG that has been evaluated by the Intergovernmental Panel on Climate Change with a GWP of 23,900. However, its global warming contribution is not as high as the GWP would indicate due to its low mixing ratio, as compared to carbon dioxide (4 parts per trillion [ppt] in 1990 versus 365 parts per million [ppm] of CO<sub>2</sub>) (US EPA n.d.[b]).

#### 4.1.2.3 Scope 1, 2, and 3 Emissions

To achieve consistency in reporting across different geographies, GHG emissions are classified into three categories based on the nature and source of the emissions.

- Scope 1 GHG emissions include direct emissions that are emitted on the project site/facility and are associated with on-site combustion of natural gas, fuel use in vehicle fleets, and fugitive emissions of gases used for refrigeration and scientific research. Fugitive gases include hydrofluorocarbon gases, perfluorocarbon gases, and sulfur hexafluoride (SF<sub>6</sub>).
- Scope 2 GHG emissions include indirect emissions associated with the consumption of purchased energy from off-site sources. Scope 2 electricity emissions reflect emissions from all energy used at the electricity-generating power plant, but exclude transmission and distribution losses, which are reported under Scope 3.
- Scope 3 GHG emissions include indirect emissions not covered in Scope 2, including GHG emissions from employee commuting, business air and ground travel, electricity transmission and distribution losses, off-site wastewater treatment, and off-site municipal solid waste disposal.

These definitions of Scope 1, 2 and 3 emissions are used at LBNL to gather and report GHG emissions data annually.

Note that CEQA requires an evaluation of direct and indirect emissions. With the exception of business air and ground travel, all of the Scope 1, 2, and 3 emission sources listed above must be addressed in a CEQA document. In addition, CEQA requires that the estimated project emissions include emissions from the supply, treatment, and distribution of water used by the project.

#### 4.1.2.4 Contributions to Greenhouse Gas Emissions

##### *Global*

Worldwide anthropogenic (manmade) GHG emissions are tracked for developed nations and nations with economies in transition (referred to as Annex I and Annex II) and developing nations (referred to as

Non-Annex I). Man-made GHG emissions for Annex I and Annex II nations are available through 2012. The sum of these emissions totaled approximately 23,093 million metric tons of CO<sub>2</sub> equivalents (MMTCO<sub>2</sub>e). It should be noted that global emissions inventory data may vary depending on the source of the emissions inventory data. The top five countries (China, United States, Russian Federation, India, and Japan) and the European Union accounted for approximately 68 percent of the total global GHG emissions based on 2012 data.

### ***United States***

Based on 2012 data, United States was the number two producer of global GHG emissions. The primary GHG emitted by human activities in the United States was CO<sub>2</sub>, representing approximately 82 percent of the total US GHG emissions (US EPA 2014). Carbon dioxide from fossil fuel combustion, the largest source of GHG emissions, accounted for approximately 78 percent of US GHG emissions (US EPA 2014).

### ***State of California***

The California Air Resources Board (CARB) compiles GHG inventories for the State of California. Based on the current 2000-2014 GHG inventory data (published June 2016), in 2014 California emitted 441.5 MMTCO<sub>2</sub>e, including emissions resulting from imported electrical power (CARB 2016).

The primary contributors to GHG emissions in California are transportation, electric power production from both in-state and out-of-state sources, industry, agriculture and forestry, and other sources, which include commercial and residential activities

Between 1990 and 2015, the population of California grew by approximately 9.3 million (from 29.8 to 39.1 million) (DOF 2005; DOF 2015). This represents an increase of approximately 30 percent from 1990 population levels. In addition, the California economy, measured as gross state product, grew from \$773 billion in 1990 to \$2.5 trillion in 2015, representing an increase of approximately 225 percent (over twice the 1990 gross state product) (DOF 2016). Despite the population and economic growth, California's net GHG emissions grew by only 4.8 percent (approximately) between 1990 and 2014 (CARB 2016).

#### **4.1.2.5 LBNL GHG Emissions**

Berkeley Lab conducts a wide variety of unclassified scientific research for the US Department of Energy (DOE) Office of Science. Berkeley Lab has approximately 3,200 employees and several thousand affiliates, annual facility users, and visiting researchers. Organized into six research areas (Computing Sciences, Biosciences, Environmental and Earth Sciences, Energy Sciences, Physical Sciences, and Energy Technologies), Berkeley Lab addresses the world's most urgent scientific challenges, advancing sustainable energy, protecting human health, creating new materials, and revealing the origin and fate of

the universe. Berkeley Lab includes approximately 2.3 million gross square feet of research and support space located at its main 202-acre site in the hills above UC Berkeley and in leased laboratory and office space at other locations in the San Francisco Bay Area.

Berkeley Lab strives to extend its leadership in sustainability-related research to the sustainability of its operations. Sustainable Berkeley Lab, the team leading these efforts at the Lab, works collaboratively with partners across LBNL to reduce the Lab's environmental footprint, engage research to meet sustainability challenges, and improve institutional practices. With this approach, Berkeley Lab engages broadly to advance sustainability while considering environmental, social and institutional, and economic factors.

Berkeley Lab's reported GHG emissions and GHG emissions reduction efforts are described below. The Lab prepares an annual Site Sustainability Plan (SSP). Performance data are reported in the latest SSP for fiscal year 2015 (FY 2015), covering the period from October 2014 through September 2015. The SSP also includes a summary of sustainability accomplishments and initiatives underway, plans for the upcoming year to support federal sustainability goals, and responses to several additional sustainability-related information requests from DOE.

### *Scope 1 and Scope 2 Emissions*

Berkeley Lab's latest reported combined Scope 1 and 2 GHG emissions from the LBNL hill site and off-site facilities are presented in **Table 4.1-1, LBNL Combined Scope 1 and Scope 2 GHG Emissions**, below. As the table shows, the 2015 emissions were 13 percent lower than the emissions in 2008.

The last column in **Table 4.1-1** reports data for the LBNL hill site only (i.e., excludes off-site facilities). To estimate these values, electricity and gas emissions were split between hill and off-site facilities using actual bill data. Emissions for fuel use and fugitive gases in fleet were scaled proportionally between the hill site and off-site facilities using hill site adjusted daily population (ADP) and off-site ADP.<sup>2</sup> All LBNL renewable energy credits acquired by LBNL in FY 2015 were attributed solely to the hill site.

---

<sup>2</sup> For example, total FY 2015 fugitive gas emissions were 65 MTCO<sub>2e</sub>. In FY 2015, 85 percent of employees were located on the hill site and 15 percent were located offsite. Thus, 85 percent of the fugitive gas emissions were attributed to the hill site, or 55 MTCO<sub>2e</sub>, and 15 percent to the offsite facilities, or 10 MTCO<sub>2e</sub>.

**Table 4.1-1**  
**LBNL Combined Scope 1 and Scope 2 GHG Emissions<sup>a</sup>**

Scope 1 & Scope 2 Emissions Category	Baseline FY 2008 <sup>b</sup>	Actual FY 2013	Actual FY 2014	Actual FY 2015	FY2015 LBNL Hill Site Only <sup>b</sup>
Electricity	35,170	39,695	38,503	40,974	22,984
Natural Gas Use	9,551	8,994	8,938	8,302	6,551
Fuel Use in Fleet	698	583	164	135	115
Fugitive Emissions	1,022	216	218	65	55
<b>Total Scope 1 &amp; 2 Emissions</b>	<b>46,441</b>	<b>49,488</b>	<b>47,823</b>	<b>49,476</b>	<b>29,705</b>
Renewable Energy Credits	0	(9,039)	(9,895)	(9,249) <sup>c</sup>	(9,249)
<b>Net Scope 1 &amp; 2 Emissions</b>	<b>46,441</b>	<b>40,449</b>	<b>37,928</b>	<b>40,227</b>	<b>20,456</b>
Percent Change from Baseline		-13%	-18%	-13%	

Source: Lawrence Berkeley National Laboratory 2016 (SSP for FY 2016)

a - All figures represent MTCO<sub>2e</sub>

b- For this analysis, FY2015 emissions were split into hill site and offsite.

c- All FY2015 LBNL RECs are attributed to the hill site.

To date, Berkeley Lab has pursued a range of energy efficiency projects, installed some small renewable energy projects, purchased renewable energy delivered by the Western Area Power Administration, and purchased renewable energy credits (RECs) to support the goals related to Scope 1 and 2 GHG emissions provided in federal Executive Order 13693 (see **Section 4.1.3.2** below). Sustainable Berkeley Lab is working with the LBNL Facilities Division to continue to expand a range of energy management, commissioning, and building retrofit activities. Berkeley Lab has also made significant progress in reducing releases of SF<sub>6</sub> from its activities. The Lab also emphasizes very energy-efficient new construction and is pursuing a strategy that over time relocates programs from less energy-efficient buildings into new, more-controllable, energy-efficient buildings.

### Scope 3 Emissions

**Table 4.1-2, LBNL Hill Site FY2015 Scope 3 Emissions**, presents the LBNL hill site's reported FY2015 Scope 3 emissions. Similar to Scope 1 fuel use and fugitive emissions, Scope 3 emissions were estimated by proportionally scaling between the hill site and off-site facilities using hill site ADP and off-site ADP. UC LBNL also reports Scope 3 business air travel and Scope 3 business ground travel emissions, which are not included in **Table 4.1-2** as those emissions sources are not typically analyzed under CEQA. In contrast, UC LBNL does not report Scope 3 water supply emissions; however, those emissions are included in **Table 4.1-2** since guidance put forth by BAAQMD and CARB states that GHG emissions from

supply, treatment, and distribution of water used by a proposed project should be included in the estimated GHG emissions under CEQA.

**Table 4.1-2**  
**LBNL Hill Site FY2015 Scope 3 Emissions<sup>a</sup>**

Source	2015 Emissions
Employee Commute	10,002
Water Supply	24 <sup>b</sup>
Off-Site Wastewater Treatment	10
Off-Site Solid Waste Disposal	404

*Source: Lawrence Berkeley National Laboratory 2016*

*a - all figures represent MTCO<sub>2e</sub>*

*b - emissions associated with water supply are not reported in the SSP; they were estimated based on the total amount of water used at the Lab in FY2015.*

As of FY2015, Berkeley Lab had reduced its transportation-related GHG emissions to 14 percent below the 2008 baseline (see **Section 4.1.3.2** below regarding transportation-related emission goals in the Executive Order 13693). Berkeley Lab continues to implement transportation demand programs to minimize commuting emissions. To minimize water use, Berkeley Lab is implementing a series of projects that includes restroom retrofits to reduce water use, elimination of irrigation for landscaping, and metering of cooling towers to detect leaks and optimize maintenance.

### 4.1.3 REGULATORY CONSIDERATIONS

#### 4.1.3.1 Intergovernmental Panel on Climate Change

The World Meteorological Organization (WMO) and United Nations Environmental Program (UNEP) established the IPCC in 1988. The goal of the IPCC is to evaluate the risk of climate change caused by human activities. Rather than performing research or monitoring climate, the IPCC relies on peer-reviewed and published scientific literature to make its assessment. While not a regulatory body, the IPCC assesses information (i.e., scientific literature) regarding human-induced climate change and the impacts of human-induced climate change, and recommends options to policy makers for the adaptation and mitigation of climate change. The IPCC reports its evaluations in special reports called “assessment

reports.” The latest assessment report (i.e., Fifth Assessment Report, consisting of three working group reports and a synthesis report based on the first four reports) was published in 2013.<sup>3</sup> In its 2013 report, the IPCC stated that “Each of the last three decades has been successively warmer at the Earth’s surface than any preceding decade since 1850. In the Northern Hemisphere, 1983-2012 was *likely* the warmest 30-year period of the last 1,400 years” (IPCC 2013).

#### 4.1.3.2 Federal Laws and Regulations

In *Massachusetts vs. EPA*, in April 2007 the Supreme Court held that the US Environmental Protection Agency (US EPA) has the statutory authority under Section 202 of the Clean Air Act (CAA) to regulate GHGs from new motor vehicles. The court did not hold that the US EPA was required to regulate GHG emissions; however, it indicated that the agency must decide whether GHGs from motor vehicles cause or contribute to air pollution that is reasonably anticipated to endanger public health or welfare. Upon the final decision, the President signed Executive Order 13432 on May 14, 2007, directing the US EPA, along with the Departments of Transportation, Energy, and Agriculture, to initiate a regulatory process that responded to the Supreme Court’s decision.

#### *Energy Independence and Security Act*

Signed on December 19, 2007 by President Bush, the Energy Independence and Security Act of 2007 (EISA) was enacted “[t]o move the United States toward greater energy independence and security, to increase the production of clean renewable fuels, to protect consumers, to increase the efficiency of products, buildings, and vehicles, to promote research on and deploy greenhouse gas capture and storage options, and to improve the energy performance of the Federal Government, and for other purposes.”

As stated in an EPA summary, “EISA reinforces the energy reduction goals for federal agencies put forth in Executive Order 13423, as well as introduces more aggressive requirements” (US EPA 2016). Key EISA provisions include the Corporate Average Fuel Economy standards, the combined fuel economy average standards, the renewable fuel standards, the appliance/lighting efficiency standards, and repeal of oil and gas tax incentives. Highlights of these key provisions include the following:

- Corporate Average Fuel Economy (CAFE). The law authorized the Secretary of the Department of Transportation to establish a corporate average fuel economy (CAFE) trading program that allows manufacturers whose automobiles exceed prescribed average fuel economy standards to

---

<sup>3</sup> The IPCC’s Fifth Assessment Report is available online at <https://www.ipcc.ch/report/ar5/>

earn credits that can be sold to other manufacturers or applied within their fleets to categories of automobiles that fail to achieve such standards.

- Combined fuel economy standard. The law required the combined fuel economy average for model year 2020 to be at least 35 miles per gallon for the total fleet of passenger and non-passenger automobiles manufactured in the US for that model year.
- Renewable Fuels Standard (RFS). The RFS program is a national policy that requires a certain volume of renewable fuel to replace or reduce the quantity of petroleum-based transportation fuel, heating oil or jet fuel. The program applies to refiners or importers of gasoline or diesel fuel. The law set a modified standard for total renewable fuels that starts at 11.1 billion gallons in 2009 and rises to 36 billion gallons by 2022.
- Energy Efficiency Equipment Standards. The law includes a variety of new standards for lighting and for residential and commercial appliance equipment. The equipment includes residential refrigerators, freezers, refrigerator-freezers, metal halide lamps, and commercial walk-in coolers and freezers.
- Repeal of Oil and Gas Tax Incentives. The law includes repeal of two tax subsidies in order to offset the estimated cost to implement the CAFE provision (Congressional Research Service 2007). (US EPA 2016)

### *Executive Order 13514*

On October 5, 2009, the President signed Executive Order (EO) 13514, which provided a strategy for sustainability and greenhouse gas reductions for federal agencies. That EO has since been revoked and replaced by EO 13693, which is described in detail below.

### *Clean Air Act*

On December 7, 2009, the US EPA Administrator signed two distinct findings regarding GHGs under section 202(a) of the Clean Air Act:

- **Endangerment Finding:** The Administrator found that the current and projected concentrations of the six key well-mixed GHGs (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride) in the atmosphere threaten the public health and welfare of current and future generations.
- **Cause or Contribute Finding:** The Administrator found that the combined emissions of these well-mixed greenhouse gases from new motor vehicles and new motor vehicle engines contribute to the greenhouse gas pollution which threatens public health and welfare.

While these findings did not impose additional requirements on industry or other entities, this action was a prerequisite to finalizing the US EPA's proposed GHG emissions standards for light-duty vehicles, which were jointly proposed by the US EPA and DOT. On April 1, 2010, the US EPA and NHTSA issued

final rules requiring that by the 2016 model-year, manufacturers must achieve a combined average vehicle emission level of 250 grams of CO<sub>2</sub> per mile, which is equivalent to 35.5 miles per gallon as measured by US EPA standards. These agencies are currently in the process of developing similar regulations for the 2017 through 2025 model years.

### ***Executive Order 13693***

On 19 March 2015, the President signed Executive Order (EO) 13693, *Planning for Federal Sustainability in the Next Decade*. The overarching goal of EO 13693 is to maintain Federal leadership in sustainability and greenhouse gas emission reductions.

A partial list of the primary goals of EO 13693 includes:

- 50 percent reduction in greenhouse gas emissions from electricity and natural gas (2008 baseline)
- 25 percent reduction in energy use intensity (2015 baseline)
- 30 percent of electricity supply from renewable energy
- 25 percent of energy supply (electricity and natural gas) from renewable energy
- 25 percent reduction in transportation-related greenhouse gas emissions (2008 baseline)
- 30 percent reduction in fleet petroleum use (2014 baseline)
- 36 percent reduction in potable water use intensity (2007 baseline)
- New buildings to be zero net energy (and where feasible, zero net waste and water) that enter the design process after 2020

The EO presents the following additional details that are relevant to the proposed project:

The head of each agency shall, where life-cycle cost-effective, beginning in fiscal year 2016, unless otherwise specified:

- (a) promote building energy conservation, efficiency, and management by
  - (ii) improving data center energy efficiency at agency facilities by:
    - (A) ensuring the agency chief information officer promotes data center energy optimization, efficiency, and performance;
    - (B) installing and monitoring advanced energy meters in all data centers by fiscal year 2018; and

- (C) establishing a power usage effectiveness target of 1.2 to 1.4 for new data centers and less than 1.5 for existing data centers.”
- (b) ensure that at a minimum, the following percentage of the total amount of building electric energy and thermal energy shall be clean energy, accounted for by renewable electric energy and alternative energy:
  - (i) not less than 10 percent in fiscal years 2016 and 2017;
  - (ii) not less than 13 percent in fiscal years 2018 and 2019;
  - (iii) not less than 16 percent in fiscal years 2020 and 2021;
  - (iv) not less than 20 percent in fiscal years 2022 and 2023; and
  - (v) not less than 25 percent by fiscal year 2025 and each year thereafter.”
- (f) improve agency water use efficiency and management, including stormwater management by:
  - (i) reducing agency potable water consumption intensity measured in gallons per gross square foot by 36 percent by fiscal year 2025 through reductions of 2 percent annually through fiscal year 2025 relative to a baseline of the agency's water consumption in fiscal year 2007
  - (ii) installing water meters and collecting and utilizing building and facility water balance data to improve water conservation and management;
  - (iii) reducing agency industrial, landscaping, and agricultural (ILA) water consumption measured in gallons by 2 percent annually through fiscal year 2025 relative to a baseline of the agency's ILA water consumption in fiscal year 2010; and
  - (iv) installing appropriate green infrastructure features on federally owned property to help with stormwater and wastewater management.”
- (g) if an agency operates a fleet of at least 20 motor vehicles, they will improve agency fleet and vehicle efficiency and management by:

- (ii) taking actions that reduce fleet-wide per-mile greenhouse gas emissions from agency fleet vehicles, relative to a baseline of emissions in fiscal year 2014, to achieve the following percentage reductions:
  - (A) less than 4 percent by the end of fiscal year 2017;
  - (B) not less than 15 percent by the end of fiscal year 2021; and
  - (C) not less than 30 percent by the end of fiscal year 2025.

### 4.1.3.3 State Laws and Regulations

#### *Title 24 Building Standards Code*

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. Although 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 nonresidential buildings subject to the standard. The standards are updated periodically to allow for the consideration and inclusion of new energy efficiency technologies and methods. The latest revisions were adopted in 2013 and became effective on July 1, 2014.

Part 11 of the Title 24 Building Standards Code is referred to as the California Green Building Standards Code (CALGreen Code). The purpose of the CALGreen Code is to “improve public health, safety and general welfare by enhancing the design and construction of buildings through the use of building concepts having a positive environmental impact and encouraging sustainable construction practices in the following categories: (1) Planning and design; (2) Energy efficiency; (3) Water efficiency and conservation; (4) Material conservation and resource efficiency; and (5) Environmental air quality (California Building Standards Commission 2010). The CALGreen Code is not intended to substitute or be identified as meeting the certification requirements of any green building program that is not established and adopted by the California Building Standards Commission (CBSC). Part 11 was last updated in 2013 and the updated CALGreen Code became effective July 1, 2015. Unless otherwise noted in the regulation, all newly constructed buildings in California are subject of the requirements of the CALGreen Code.

### ***Assembly Bill 1493***

In response to the transportation sector's contribution of more than half of California's CO<sub>2</sub> emissions, Assembly Bill 1493 (AB 1493, Pavley) was enacted on July 22, 2002. AB 1493 requires CARB to set GHG emission standards for passenger vehicles, light-duty trucks, and other vehicles whose primary use is noncommercial personal transportation. CARB adopted the standards in September 2004. The new standards will be phased in during the 2009 through 2016 model years. When fully phased in, the near term (2009–2012) standards will result in a reduction of about 22 percent in GHG emissions compared to the emissions from the 2002 fleet, while the midterm (2013–2016) standards will result in a reduction of about 30 percent.

Before these regulations may go into effect, the US EPA must grant California a waiver under the federal CAA, which ordinarily preempts state regulation of motor vehicle emission standards. On June 30, 2009, the US EPA formally approved California's waiver request. However, in light of the September 15, 2009, announcement by the US EPA and NHTSA regarding the national program to reduce vehicle GHG emissions, California and states adopting California emissions standards have agreed to defer to the proposed national standard through model year 2016 if granted a waiver by the US EPA. The 2016 endpoint of the two standards is similar, although the national standard ramps up slightly more slowly than required under the California standard. The Pavley standards require additional reductions in CO<sub>2</sub> emissions beyond 2016 (referred to as Phase II standards). While the Phase II standards have yet to be fully developed, CARB has made it clear that the state intends to pursue additional reductions from motor vehicles in the 2017 through 2025 timeframe under AB 32.

### ***Executive Order S-3-05 and the Climate Action Team***

In June 2005, Governor Schwarzenegger established California's GHG emissions reduction targets in Executive Order S-3-05. The Executive Order established the following goals: GHG emissions should be reduced to 2000 levels by 2010, 1990 levels by 2020, and 80 percent below 1990 levels by 2050. The Secretary of Cal/EPA is required to coordinate efforts of various agencies in order to collectively and efficiently reduce GHGs. Some of the agency representatives involved in the GHG reduction plan include the Secretary of the Business, Transportation, and Housing Agency; the Secretary of the Department of Food and Agriculture; the Secretary of the Resources Agency; the Chairperson of CARB; the Chairperson of the CEC; and the President of the Public Utilities Commission.

### ***Assembly Bill 32***

In furtherance of the goals established in Executive Order S-3-05, the legislature enacted Assembly Bill 32 (AB 32, Nuñez and Pavley), the California Global Warming Solutions Act of 2006, which Governor

Schwarzenegger signed on September 27, 2006. AB 32 represents the first enforceable statewide program to limit GHG emissions from all major industries with penalties for noncompliance. AB 32 requires the state to undertake several actions. The major requirements are discussed below.

### **CARB Early Action Measures**

CARB is responsible for carrying out and developing the programs and requirements necessary to achieve the goal of AB 32—the reduction of California's GHG emissions to 1990 levels by 2020. The first action under AB 32 resulted in CARB's adoption of a report listing three specific early-action greenhouse gas emission reduction measures on June 21, 2007. On October 25, 2007, CARB approved six additional early-action GHG reduction measures under AB 32. CARB has adopted regulations for all early action measures. The early-action measures are divided into three categories:

- Group 1 – GHG rules for immediate adoption and implementation
- Group 2 – Several additional GHG measures under development
- Group 3 – Air pollution controls with potential climate co-benefits

The first three early-action regulations, adopted June 21, 2007, meeting the narrow legal definition of “discrete early-action GHG reduction measures” are:

- A low-carbon fuel standard to reduce the “carbon intensity” of California fuels;
- Reduction of refrigerant losses from motor vehicle air conditioning system maintenance to restrict the sale of “do-it-yourself” automotive refrigerants; and
- Increased methane capture from landfills to require broader use of state-of-the-art methane capture technologies.

The six additional early-action regulations, adopted on October 25, 2007, also meeting the narrow legal definition of “discrete early-action GHG reduction measures,” are:

- Reduction of aerodynamic drag, and thereby fuel consumption, from existing trucks and trailers through retrofit technology;
- Reduction of auxiliary engine emissions of docked ships by requiring port electrification;
- Reduction of perfluorocarbons from the semiconductor industry;
- Reduction of propellants in consumer products (e.g., aerosols, tire inflators, and dust removal products);
- The requirement that all tune-up, smog check and oil change mechanics ensure proper tire inflation as part of overall service in order to maintain fuel efficiency; and

- Restrictions on the use of sulfur hexafluoride (sf6) from non-electricity sectors if viable alternatives are available.

### **State of California Greenhouse Gas Inventory and 2020 Limit**

As required under AB 32, on December 6, 2007, CARB approved the 1990 greenhouse gas emissions inventory, thereby establishing the emissions limit for 2020. The 2020 emissions limit was set at 427 MMTCO<sub>2</sub>e. CARB also projected the state's 2020 GHG emissions under "business as usual" (BAU) conditions—that is, emissions that would occur without any plans, policies, or regulations to reduce GHG emissions. CARB used an average of the state's GHG emissions from 2002 through 2004 and projected the 2020 levels based on population and economic forecasts. The projected net emissions totaled approximately 596 MMTCO<sub>2</sub>e. Therefore, CARB established that the state must reduce its 2020 BAU emissions by approximately 29 percent in order to meet the 1990 target.

### **CARB Mandatory Reporting Requirements**

In addition to the 1990 emissions inventory, on December 6, 2007 CARB adopted regulations requiring the mandatory reporting of GHG emissions for large facilities. The mandatory reporting regulations require annual reporting from the largest facilities in the state, which account for approximately 94 percent of point source GHG emissions from industrial and commercial stationary sources in California. About 800 separate sources fall under the reporting rules and include electricity-generating facilities, electricity retail providers and power marketers, oil refineries, hydrogen plants, cement plants, cogeneration facilities, and industrial sources that emit over 25,000 tons of carbon dioxide each year from on-site stationary combustion sources.

### **AB 32 Climate Change Scoping Plan**

AB 32 requires CARB to adopt a scoping plan indicating how reductions in significant GHG sources will be achieved through regulations, market mechanisms, and other actions. After receiving public input on their draft scoping plan, the CARB Governing Board approved the Climate Change Scoping Plan on December 11, 2008. Key elements of the Scoping Plan include these recommendations:

- Expanding and strengthening existing energy efficiency programs and building and appliance standards;
- Achieving a statewide renewable energy mix of 33 percent;
- Developing a California cap-and-trade program that links with other Western Climate Initiative partner programs to create a regional market system;

- Establishing targets for transportation-related GHG emissions for regions throughout California and pursuing policies and incentives to achieve those targets;
- Adopting and implementing measures pursuant to existing state laws and policies, including California’s clean car standards, goods movement measures, and the Low Carbon Fuel Standard; and
- Creating targeted fees, including a public goods charge on water use, fees on high global warming potential gases, and a fee to fund the administrative costs of the state’s long-term commitment to AB 32 implementation.

Under the Scoping Plan, approximately 85 percent of the state’s emissions are subject to a cap-and-trade program where covered sectors are placed under a declining emissions cap. The cap-and-trade program is a market-based approach wherein the government determines an overall emission target or “cap” for a particular set of facilities. It is expected that emission reduction from this cap-and-trade program will account for a large portion of the reductions required by AB 32.

#### ***Senate Bill 97 (State CEQA Guidelines)***

In August 2007, the legislature enacted SB 97 (Dutton), which directed the Governor’s Office of Planning and Research (OPR) to develop guidelines under the California Environmental Quality Act (CEQA) for the mitigation of GHG emissions. To formulate CEQA Guideline Amendments for GHG emissions, OPR submitted the *Proposed Draft CEQA Guideline Amendments for Greenhouse Gas Emissions* to the Secretary for Natural Resources on April 13, 2009. The Natural Resources Agency conducted formal rulemaking procedures in 2009 and adopted the CEQA Guideline Amendments on December 30, 2009. They became effective in March 2010.

#### ***Senate Bill 375***

The California legislature passed SB 375 (Steinberg) on September 1, 2008. SB 375 requires CARB to set regional GHG reduction targets after consultation with local governments. The target must then be incorporated within that region’s regional transportation plan (RTP), which is used for long-term transportation planning, in a Sustainable Communities Strategy (SCS). SB 375 also requires each region’s regional housing needs assessment (RHNA) to be adjusted based on the Sustainable Communities Strategy in its RTP. Additionally, SB 375 reforms the environmental review process to create incentives to implement the strategy, especially transit priority projects. The governor signed SB 375 into law on September 30, 2008.

### ***Executive Order B-30-15***

In April 2015, Governor Brown signed Executive Order B-30-15, which provides the state a mid-term target. The executive order establishes a target for the state to reduce its GHG emissions such that the state's 2030 emissions are 40 percent of the 1990 emissions. According to the state, California is on track to meet or exceed the current target of reducing GHG emissions to 1990 levels by 2020, as established in AB 32. The new emission reduction target of 40 percent below 1990 levels by 2030 will make it possible to reach the ultimate goal of reducing emissions 80 percent under 1990 levels by 2050, established by Executive Order S-3-05.

### ***Senate Bill 350***

On October 7, 2015, Senate Bill 350: Clean Energy and Pollution Reduction Act (SB 350) was signed into law, establishing new clean energy, clean air and greenhouse gas reduction goals for 2030 and beyond. Building off of AB 32, SB 350 established California's 2030 greenhouse gas reduction target of 40 percent below 1990 levels. To achieve this goal, SB 350 set ambitious 2030 targets for energy efficiency and renewable electricity, among other actions aimed at reducing greenhouse gas emissions. SB 350 increases California's renewable electricity procurement goal from 33 percent by 2020 to 50 percent by 2030. This will increase the use of Renewables Portfolio Standard (RPS) eligible resources, including solar, wind, biomass, geothermal, and others. In addition, SB 350 requires the state to double statewide energy efficiency savings in electricity and natural gas end uses by 2030.

### ***Senate Bill 32***

Senate Bill 32 (SB 32) was signed into law on August 31, 2016. This bill requires CARB to adopt rules and regulations to ensure that statewide GHG emissions are reduced to 40 percent below the 1990 level by 2030.

### ***Assembly Bill 197***

On September 8, 2016, Assembly Bill 197 (AB 197) was signed into law. This bill requires CARB to make available online, and update annually, data on emissions of greenhouse gases, criteria pollutants, and toxic air contaminants for each facility that reports to CARB and air districts. In addition, this bill requires CARB to report at least annually on emissions of greenhouse gases, criteria pollutants, and toxic air contaminants throughout the state to a joint legislative committee on climate change policies.

#### 4.1.3.4 Regional Programs

##### *Bay Area Air Quality Management District*

On June 2, 2010, the Bay Area Air Quality Management District (BAAQMD) adopted updated *CEQA Air Quality Guidelines* (BAAQMD Guidelines). These guidelines contain GHG operational emissions significance thresholds and recommended methodologies and models to be used for assessing the impacts of project-specific GHG emissions on global climate change. The updated BAAQMD Guidelines state that thresholds of significance for GHG emissions should be related to AB 32's GHG reduction goals or the state's strategy to achieve the 2020 GHG emissions limit, and also include measures for reducing GHG emissions from land use development projects and stationary sources.

The significance thresholds under the BAAQMD Guidelines for criteria pollutant emissions – but not those for GHG emissions – were challenged by the California Building Industry Association. That litigation continued for several years and in December 2015 the Supreme Court ruled that CEQA does not require an analysis of the environment's impact on a project except to the extent that project impacts exacerbate pre-existing environmental conditions. The decision was remanded to the Appellate Court. On August 12, 2016, the Court of Appeal ruled that the receptor thresholds cannot be used by a lead agency to require an EIR or to impose mitigation measures solely because the occupants or users of a new project would be subjected to contaminant levels above the Air District's thresholds. As the litigation is not fully resolved, the BAAQMD is not recommending the use of any particular significance thresholds to determine the significance of GHG impacts. Instead, the BAAQMD recommends that the lead agency should "determine appropriate air quality thresholds of significance based on substantial evidence in the record." The Court did not rule on or question the adequacy of the evidentiary basis supporting the significance thresholds that are contained in the BAAQMD Guidelines and the BAAQMD-recommended impact assessment methodologies. Therefore, a lead agency has the discretion to use the significance thresholds and methodology for analyzing air quality impacts, including GHG impacts, under CEQA based on the evidence and technical studies supporting the guidelines, which Berkeley Lab has reviewed. Furthermore, the GHG thresholds in the BAAQMD guidance were not the subject of the lawsuit, and their use was continued by most lead agencies in the Bay Area while the litigation was underway. Recently, in *Center for Biological Diversity v. California Department of Fish and Wildlife*, S217763, the California Supreme Court cited to the BAAQMD GHG thresholds as valid criteria in evaluating the significance of potential GHG impacts of a project.

### Bay Area Air Quality Management District - GHG Thresholds of Significance

BAAQMD Guidelines contain three thresholds of significance that may be used to evaluate the significance of the operational GHG emissions of a land development project (excluding emissions from stationary sources for which the guidelines include a separate numeric threshold of 10,000 metric tons of CO<sub>2</sub>e per year [MTCO<sub>2</sub>e/year]). These thresholds of significance can be used by a lead agency to determine whether the project exceeds the first GHG significance criterion from Appendix G of the *State CEQA Guidelines*, i.e., whether the project generates GHG emissions, "either directly or indirectly, that may have a significant impact on the environment." The three thresholds are:

- A bright-line threshold of 1,100 MTCO<sub>2</sub>e/yr. Projects that have operational emissions below 1,100 metric tons of CO<sub>2</sub>e per year are considered to have less than significant GHG emissions.
- An efficiency threshold of 4.6 metric tons CO<sub>2</sub>e/service person/year. For projects that result in operational emissions that exceed the bright-line threshold, the BAAQMD guidelines include a GHG efficiency threshold of 4.6 metric tons CO<sub>2</sub>e/service person/year (where service persons are project residents and employees). Projects that have operational emissions below 4.6 metric tons of CO<sub>2</sub>e/service person/year are considered to have less than significant GHG emissions.
- Compliance with a Qualified GHG Reduction Strategy. A project's GHG impact may also be evaluated in terms of the project's compliance with a qualified GHG Reduction Strategy (BAAQMD 2010, p. 2-4; Table 2.1). Section 4.1 of BAAQMD's CEQA Air Quality Guidelines lays out the standards for a qualified GHG Reduction Strategy. A qualified GHG Reduction Strategy must:
  - Quantify GHG emissions, both existing and projected, over a specified time period, resulting from activities within a defined geographic area;
  - Establish a level, based on substantial evidence, below which the contribution to GHG emissions from activities covered by the plan would not be cumulatively considerable;
  - Identify and analyze the GHG emissions resulting from specific actions or categories of actions anticipated within the geographic area;
  - Specify measures or a group of measures, including performance standards that substantial evidence demonstrates, if implemented on a project-by-project basis, would collectively achieve the specified emissions level;
  - Monitor the plan's progress; and
  - Adopt the GHG Reduction Strategy in a public process following environmental review (BAAQMD 2011).

If a project is located in a community with an adopted qualified GHG Reduction Strategy, the impact of a project's GHG emissions may be considered less than significant if the project is consistent with the GHG

Reduction Strategy. However, a project must demonstrate its consistency by identifying and implementing all applicable feasible measures and policies from the GHG Reduction Strategy into the project (BAAQMD 2011). This approach is consistent with Section 15183.5 of the *State CEQA Guidelines*, which provides for tiering of GHG emissions analysis from a programmatic-level planning document, such as a qualified GHG Reduction Strategy, to project-specific CEQA analysis.

Berkeley Lab does not have a qualified GHG Reduction Strategy. However, Berkeley Lab consistently uses the methodologies and numeric thresholds in the BAAQMD Guidelines in its environmental documents.

#### **4.1.3.5 Local Plans and Policies**

##### ***University of California Plans and Policies***

The NERSC-9 project involves DOE facilities at the LBNL hill site operated by the University of California (UC). The plans and policies that are applicable to the proposed project are plans developed by the University specifically for the LBNL hill site and UC policies that apply to LBNL.

UC, under Article IX, Section 9 of the California Constitution, is exempt from local land use regulation, including general plans and zoning. UC nevertheless seeks to cooperate with local jurisdictions to reduce any physical consequences of potential land use conflicts to the extent feasible. Because the western part of the LBNL hill site is within the Berkeley city limits, and the eastern part is within the Oakland city limits, this section also summarizes programs and policies, adopted by Alameda County and the cities of Berkeley and Oakland to address climate change.

##### **UC Policy on Sustainable Practices**

The UC Policy on Sustainable Practices is one of the most comprehensive and far-reaching institutional sustainability commitments in the nation. Emission reduction strategies instituted under this policy include practices related to green building design, clean energy, climate protection, transportation, operations, recycling and waste management, and environmentally preferable procurement.

The campuses, the LBNL hill site, and the UC Office of the President are charged with developing strategies for meeting the UC Policy on Sustainable Practices. Goals that are applicable to Berkeley Lab are presented below.

## *Green Building Design*

### New Buildings

1. All new building projects, other than acute care facilities, shall be designed, constructed, and commissioned to outperform the CBC energy-efficiency standards by at least 20% or meet the whole-building energy performance targets listed in Table 1 of Section V.A.3. The University will strive to design, construct, and commission buildings that outperform CBC energy efficiency standards by 30% or more, or meet the stretch whole-building energy performance targets listed in Table 1 of Section V.A.3, whenever possible within the constraints of program needs and standard budget parameters.
2. Standards for energy efficiency for acute care facilities will be developed in consultation with campuses and medical centers.
3. All new buildings will achieve a USGBC LEED “Silver” certification at a minimum. All new buildings will strive to achieve certification at a USGBC LEED “Gold” rating or higher, whenever possible within the constraints of program needs and standard budget parameters.
4. The University of California will design, construct, and commission new laboratory buildings to achieve a minimum of LEED “Silver” certification as well as meeting at least the prerequisites of the Laboratories for the 21st Century (Labs21) Environmental Performance Criteria (EPC)2. Laboratory spaces in new buildings also shall meet at least the prerequisites of Labs21 EPC. Design, construction, and commissioning processes shall strive to optimize the energy efficiency of systems not addressed by the CBC energy efficiency standards.
5. All new building projects will achieve at least two points within the available credits in LEED-BD+C’s Water Efficiency category.

### Building Renovations

6. Major Renovations of buildings are defined as projects that require 100% replacement of mechanical, electrical and plumbing systems and replacement of over 50% of all non-shell areas (interior walls, doors, floor coverings and ceiling systems) shall at a minimum comply with III.A.3 or III.A.4, above. Such projects shall outperform CBC Title 24, Part 6, currently in effect, by 20%. This does not apply to acute care facilities.
7. Renovation projects with a project cost of \$5 million or greater (CCCI 5000) that do not constitute a Major Renovation as defined in item III.A.6. shall at a minimum achieve a LEED-ID+C Certified

rating and register with the utilities' Savings by Design program, if eligible. This does not apply to acute care facilities.

### ***Sustainable Transportation***

The University will implement transportation programs and GHG emission reduction strategies that reduce the environmental impacts from commuting, fleet and business air travel related to achieving the Climate Protection section of this Policy.

2. The University recognizes that single-occupant vehicle (SOV) commuting is a primary contributor to commute GHG emissions and localized transportation impacts.
  - a. By 2025, each location shall strive to reduce its percentage of employees and students commuting by SOV by 10% relative to its 2015 SOV commute rates;
  - b. By 2050, each location shall strive to have no more 40% of its employees and no more than 30% of all employees and students commuting to the location by SOV.
3. Consistent with the State of California goal of increasing alternative fuel – specifically electric – vehicle usage, the University shall promote purchases and support investment in alternative fuel infrastructure at each location.
  - a. By 2025, each location shall strive to have at least 4.5% of commuter vehicles be ZEV.
  - b. By 2050, each location shall strive to have at least 30% of commuter vehicles be ZEV.
4. Each location will develop a business-case analysis for any proposed parking structures serving University affiliates or visitors to campus to document how a capital investment in parking aligns with each campus' Climate Action Plans and/or sustainable transportation policies.

### ***Sustainable Water Systems***

With the overall intent of achieving sustainable water systems and demonstrating leadership in the area of sustainable water systems, the University has set the following goals applicable to all locations:

1. In line with the Federal Government's Executive Order, locations will reduce growth-adjusted potable water consumption 20% by 2020 and 36% by 2025, when compared to a three-year average baseline of FY2005/06, FY2006/07, and FY2007/08. Locations that achieve this target early are encouraged to set more stringent goals to further reduce potable water consumption. Medical Centers shall also strive to reduce potable water use and will identify a separate reduction target

by June 2016. Each Campus shall strive to reduce potable water used for irrigation by converting to recycled water, implementing efficient irrigation systems, drought tolerant planting selections, and/or by removing turf.

2. Each location will develop and maintain a Water Action Plan that identifies long term strategies for achieving sustainable water systems. The next update of the plan shall be completed in December 2016.
  - a. Campuses will include in this update quantification of total square feet of used turf and under-used turf areas on campus as well as a plan for phasing out un-used turf irrigated with potable water.
4. New equipment requiring liquid cooling shall be connected to an existing recirculated building cooling water system, new local chiller vented to building exhaust or outdoors, or to the campus chilled water system through an intervening heat exchange system if available.
  - a. Once through or single pass cooling systems shall not be allowed for soft-plumbed systems using flexible tubing and quick connect fittings for short term research settings.
  - b. If no alternative to single pass cooling exists, water flow must be automated and controlled to avoid water waste.

### **Lawrence Berkeley National Laboratory Site Sustainability Plan**

In accordance with EO 13693, *Planning for Federal Sustainability in the Next Decade*, Berkeley Lab prepares an annual Site Sustainability Plan (SSP) that provides updates on performance at LBNL with respect to more than 30 sustainability goals. This executive order, issued in March 2015, builds on sustainability goals that have been in place since 2009 under EO 13514, but significantly raises and expands sustainability goals, inspired by an “opportunity to reduce federal agency direct greenhouse gas emissions by at least 40 percent over the next decade.” The specific goals adopted by DOE in response to the executive order include a series of quantified goals, most to be achieved by 2025. A partial list of these goals is provided above in **Section 4.1.3.2**.

Additionally, Berkeley Lab is pursuing seven sustainability initiatives designed to build institutional capacity and reach sustainability goals. These initiatives include:

- Better Buildings: Build high-value buildings that support science, target deep efficiency, and minimize fossil fuel use

- Building Tune-Up: Deploy a multi-year, financed program for energy use reduction in our key building portfolio
- Green Grid: Access renewable power, supporting a smart grid for greater penetration of renewables
- Water Wise: Respond to drought conditions and meet a 36% reduction in potable water use by 2025
- Low-Carbon Commutes: Enable staff EV charging and advocate for improvements to low-impact commute alternatives
- Employee Action: Engage staff to institutionalize practices that reduce footprint and overcome barriers
- Rethinking Stuff: Reduce the generation of unproductive waste and the use of toxic or non-renewable materials

#### 4.1.4 IMPACTS AND MITIGATION MEASURES

##### 4.1.4.1 Significance Criteria

The impacts related to GHG emissions from the implementation of the proposed project would be considered significant if they would exceed the following significance criteria, in accordance with Appendix G of *State CEQA Guidelines*:

- 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 GHGs.

Section 15064.4 of the *State CEQA Guidelines* states that, when making a GHG emissions significance determination, a lead agency shall have discretion to determine whether to: (1) Use a model or methodology to quantify greenhouse gas emissions resulting from a project, and which model or methodology to use; or (2) Rely on a qualitative analysis or performance based standards.

Section 15064.4 also states that a lead agency should consider these factors when assessing the significance of GHG 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 significance threshold that the lead agency determines applies to the project; and (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 GHG emissions.

The project's impact relative to the first Appendix G criterion may be evaluated by calculating the proposed project's direct and indirect GHG emissions and comparing the emissions with the available significance thresholds. Operational GHG emissions significance thresholds are provided in the BAAQMD Guidelines. (There are no significance thresholds for construction emissions of GHGs, although BAAQMD Guidelines state that emissions be quantified, reported, and evaluated). As noted earlier, due to ongoing litigation the BAAQMD is not recommending that lead agencies use the thresholds in its guidelines. However because the litigation does not relate to the validity of the GHG thresholds, Berkeley Lab has determined that it will continue to use the thresholds and methodology presented in the guidelines.

A project's operational emissions can result from two classes of sources: (1) stationary sources such as generators, and (2) non-stationary sources which include area sources such as fireplaces, boilers and other combustion sources; mobile sources such as vehicles used by residents and employees associated with a project; the consumption of electricity and water; and the generation of wastewater and solid waste. According to the BAAQMD Guidelines, stationary source GHG emissions are to be assessed separately from non-stationary source emissions associated with a project's operation.

#### ***Threshold for Operational Emissions from Stationary Sources***

The significance threshold for stationary source operational emissions in the BAAQMD Guidelines is an emission rate of 10,000 MTCO<sub>2e</sub> per year.

#### ***Threshold for Operational Emissions from Non-Stationary Sources***

The significance thresholds for non-stationary source operational GHG emissions in the BAAQMD Guidelines are the following:

- A bright-line threshold of 1,100 MTCO<sub>2e</sub>/year, or
- An efficiency threshold of 4.6 MTCO<sub>2e</sub>/service person/year (where service persons are residents plus employees).

The BAAQMD thresholds were developed specifically for the Bay Area after considering the Bay Area GHG inventory and the effects of AB 32 scoping plan measures that would reduce regional emissions. By using these thresholds, the BAAQMD intended to achieve GHG reductions from new land use developments to close the gap between projected regional emissions and the AB 32 targets. However, the thresholds were designed for compliance with AB 32 which has a target date of 2020.

Based on the current schedule, the proposed NERSC-9 improvements would be operational in 2021. A GHG efficiency threshold for years after 2020 has not been put forth by the BAAQMD and Berkeley Lab has determined that development of a new GHG efficiency threshold for any year after 2020 would entail speculation regarding the projected emissions and required reductions. Therefore, this EIR relies only on the bright-line threshold of 1,100 MTCO<sub>2e</sub>/year to evaluate the impact from the non-stationary source emissions that would result from the implementation of the NERSC-9 project. It is acknowledged that the bright-line threshold was also developed by the BAAQMD based on the gap analysis noted above, and it is possible that this threshold could also change for the period beyond 2020 once the BAAQMD conducts another evaluation of the Bay Area's projected emissions and required reductions. However, this threshold is a number that is also used in other air basins as a bright-line threshold to separate minor projects from projects that would be major GHG emitters and hence must mitigate their emissions. It is among the lowest non-zero bright-line thresholds put forth by any agency in the state.

A project's impact relative to the second Appendix G criterion may be evaluated by demonstrating compliance with plans, policies, or regulations adopted by local governments to curb GHG emissions. According to the Natural Resources Agency:

*Provided that such plans contain specific requirements with respect to resources that are within the agency's jurisdiction to avoid or substantially lessen the agency's contributions to GHG emissions, both from its own projects and from private projects it has approved or will approve, such plans may be appropriately relied on in a cumulative impacts analysis (Natural Resources Agency 2009).*

Similarly, the BAAQMD Guidelines also note that a project's GHG impact may be evaluated by demonstrating the project's compliance with a Qualified GHG Reduction Strategy,

As noted above, Berkeley Lab has developed an SSP, which establishes emissions reduction measures for Berkeley Lab that will assist DOE in making progress toward GHG emissions reduction targets it has established pursuant to EO 13693. Although, the plan is not a Qualified GHG Reduction Strategy that has been reviewed under CEQA, the proposed project's consistency with the SSP and other federal and state laws are evaluated below to determine whether the project would conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs.

#### 4.1.4.2 Methodology

The proposed project involves the installation of an HPC system in the existing Building 59 on the LBNL hill site. The project does not require the construction of new building space nor does it involve an increase in the number of employees and visitors who would travel to and from Building 59 in order to work in or use the facility. The primary sources of GHG emissions associated with the proposed project

include (1) electricity that would be used to operate the new HPC system, (2) water that would be used to operate three new cooling towers, and (3) an emergency generator that would be installed to provide additional back-up electricity.

GHG emissions that would result from the use of electricity were calculated for the federal fiscal year FY2021 by multiplying the forecasted average annual electricity consumption for NERSC systems on the LBNL hill site (174,971,899 kWh/year) with 0.29610 MTCO<sub>2</sub>e/MWh, which is the eGrid 2012 CAMX region emission factor. The use of this 2012 emission factor provides a conservative estimate of the project's FY2021 GHG emissions because the factor is expected to be lower in future years as more renewable energy sources are developed in the region. For more details on the methodology used to estimate GHG emissions from electricity, see **Appendix 4.1**.

GHG emissions that would result from increased water use in the new cooling towers were calculated by multiplying the estimated average annual water use by an electricity use factor from CalEEMod and an electricity emission rate for 2020 published by PG&E.

GHG emissions from the testing of the new generator were calculated by assuming that the generator would be tested for up to 50 hours per year. CARB emissions factors were used to estimate generator testing GHG emissions.

#### 4.1.4.3 Project Impacts and Mitigation Measures

**NERSC Impact GHG-1:**            **The proposed project would generate greenhouse gas emissions, either directly or indirectly, that could have a significant impact on the environment. (*Significant; Less than Significant with Mitigation*)**

##### *Construction GHG Emissions*

During construction, the proposed project would directly contribute to climate change through its contribution of GHG emissions from the exhaust of construction equipment, construction trucks, and construction workers' vehicles. Upstream emissions generated during the manufacture of products used for construction (e.g., cement, steel, and transport of materials to the region) would indirectly contribute to climate change. The upstream GHG emissions for the proposed project, which may also include perfluorocarbons and sulfur hexafluoride, are not estimated in this impact analysis because they are not within the control of the LBNL and a lack of data precludes their quantification without speculation.

As described in **Section 3.9**, project construction would occur in two phases. The first phase, which would commence in 2017 and end in 2019, would include installation of the electrical and mechanical

infrastructure (e.g., substations, cooling towers, pumps, and other equipment). With the exception of the new cooling towers which would be installed outside Building 59 on an existing cooling tower pad, all other equipment would be installed inside the building. In the second phase, beginning in 2019, the distribution piping and cabling would be installed, NERSC-7 would be removed, and NERSC-9 installed, with all the work taking place inside the existing building. As there would be limited construction activities, the proposed project would generate no more than three daily truck trips and only a few pieces of construction equipment would be used. As a result, the construction activities would not generate substantial GHG emissions. The impact would be *less than significant*.

### ***Operational GHG Emissions***

Building 59 currently houses two HPC systems, and is served by four cooling towers and a 1.3 MW emergency generator. In addition, some of the HPC functions are currently located in the LBNL Oakland Scientific Facility (OSF), and as of its baseline measurements in early/mid 2016, OSF generated approximately 4,450 MTCO<sub>2e</sub>/year of GHG emissions from its use of electricity and natural gas. **Table 4.1-3, Estimated NERSC-9 Operational GHG Emissions**, below presents existing GHG emissions associated with the operation of Building 59, as well as GHG emissions associated with the OSF.

As noted above in **Section 4.1.4.2 Methodology**, the proposed project includes the installation of NERSC-9, three new cooling towers, and an emergency generator in the existing Building 59. The increase in GHG emissions due to these new sources is estimated below.

### **Stationary Source Impact**

The estimated routine emissions from the new 1.25 MW emergency generator are reported in **Table 4.1-3**. The generator would result in approximately 43 MTCO<sub>2e</sub>/year of GHG emissions. These emissions are substantially below the threshold value of 10,000 MTCO<sub>2e</sub>/year that is applicable to a stationary source such as a generator. The impact from generator emissions would be *less than significant*.

### **Non-Stationary Source Impact**

The installation of NERSC-9 would increase the electricity usage in Building 59 and the operation of the new cooling towers would increase the total amount of water used in Building 59. **Table 4.1-3** presents the estimated emissions associated with the operation of Building 59 once NERSC-7 is removed and NERSC-9 is installed and fully operational in 2021 (Prior to that point in time, OSF will cease operations).

As the table shows, with the complete decommissioning of OSF and the full operation of NERSC-9, GHG emissions associated with Building 59 would increase by approximately 35,092 MTCO<sub>2e</sub>/year compared

to baseline conditions. The primary source of the increase in GHG emissions with the installation of NERSC-9 is electricity use in Building 59. The increases due to other GHG sources (i.e., water use) would be relatively small. The increase in GHG emissions of 35,092 MTCO<sub>2</sub>e/year is substantially over the threshold of 1,100 MTCO<sub>2</sub>e/year used in this EIR to evaluate the impact from the project's non-stationary source emissions. The impact is considered *significant*. NERSC Mitigation Measure GHG-1 is presented below to mitigate this significant impact.

**Table 4.1-3**  
**Estimated NERSC-9 Operational GHG Emissions (in MTCO<sub>2</sub>e/year)**

GHG Emissions Source		Building 59 Baseline Emissions (FY2016)	Building 59 with NERSC- 9 Emissions (FY2021)	Increase from Existing to FY2021 Emissions
<b>Direct Sources</b>				
Stationary Sources		45 <sup>c</sup>	88	43
Scope 1	Area Sources <sup>a</sup>	168	168	0
<b>Subtotal</b>		<b>213</b>	<b>256</b>	<b>43</b>
<b>Indirect Sources</b>				
Scope 3	Mobile Sources <sup>b</sup>	435	435	0
Scope 2	Electricity	7,891	51,808	43,917
	Water Supply	1	26	25
Scope 3	Wastewater	<1	<2	<1
<b>Subtotal</b>		<b>8,328</b>	<b>52,271</b>	<b>43,943</b>
<b>All Sources</b>				
<b>Total</b>		<b>8,541</b>	<b>52,527</b>	<b>43,986</b>
OSF Emissions		4,447 <sup>d</sup>	(4,447)	
<b>Net Total</b>		<b>12,988</b>	<b>48,080</b>	<b>35,092</b>

Source: LBNL 2016 Memo and I&R Spreadsheet included in Appendix 4.1

Notes:

- No changes in area sources as part of N9 upgrade
- No increase in employees and employee trips as part of N9 upgrade
- One existing 1,300 kw generator
- OSF emissions baseline values from 2016; OSF emissions will cease prior to full project implementation.

### Mitigation Measures:

**NERSC MM GHG-1** Berkeley Lab shall monitor GHG emissions each year and develop or purchase renewable energy (RE) and/or purchase renewable energy certificates (REC) or other verifiable GHG offsets in the amount of at least 35,092 MTCO<sub>2</sub>e/year by the end of FY 2021 to reduce GHG emissions from Building 59.

**Significance after Mitigation:** As the primary source of new emissions associated with the NERSC-9 project is electricity consumption, Berkeley Lab has determined that the project's electricity (Scope 2) emissions can be reduced through the purchase of renewable energy (RE) and/or renewable energy certificates/credits (RECs). A REC is a market-based instrument that represents the property rights to the environmental, social and other non-power attributes of renewable electricity generation. RECs are issued when one megawatt-hour (MWh) of electricity is generated and delivered to the electricity grid from a renewable energy resource (US EPA n.d).<sup>4</sup>

The Lab has determined that while the availability of RE may potentially be limited, adequate RECs are available and therefore it is feasible to procure the needed mitigation. With implementation of **NERSC Mitigation Measure GHG-1**, the proposed project's GHG impact would be reduced to a *less than significant* level.

---

**NERSC Impact GHG-2:**                    **Operation of the proposed project could conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. (Significant; Less than Significant with Mitigation)**

Implementation of the proposed project would result in a significant impact related to GHG emissions if the project were in conflict with an applicable plan, policy, or regulation concerning GHG emissions reductions. The project's potential to conflict with applicable plans and regulations is evaluated below.

#### ***LBNL Site Sustainability Plan***

As noted above, Berkeley Lab has developed an SSP, which establishes emissions reduction measures for Berkeley Lab that will assist DOE in reaching its GHG emissions reduction targets pursuant to Executive Order 13693. The SSP targets the achievement of the following goals that apply to all activities and sources of GHG emissions at Berkeley Lab by 2025.

- 50 percent reduction in greenhouse gas emissions from electricity and natural gas (2008 baseline)
- 25 percent reduction in energy use intensity (2015 baseline)
- 30 percent of electricity supply from renewable energy
- 25 percent of energy supply (electricity and natural gas) from renewable energy

---

<sup>4</sup> [www.epa.gov/greenpower/renewable-energy-certificates-recs](http://www.epa.gov/greenpower/renewable-energy-certificates-recs)

- 25 percent reduction in transportation-related greenhouse gas emissions (2008 baseline)
- 30 percent reduction in fleet petroleum use (2014 baseline)
- 36 percent reduction in potable water use intensity
- New buildings to be zero net energy (and where feasible, zero net waste and water) that enter the design process after 2020

The SSP does not require each new project to meet the goals listed above; these goals apply to the Lab as a whole. Sustainability standards for new projects at Berkeley Lab are identified in the Lab's Sustainability Standards for New Construction. New projects are reviewed closely during the planning and design stages to ensure that sustainability features are incorporated into each project as appropriate so that the Lab can continue to make progress towards the attainment of these goals.

As noted above, the proposed project involves the installation of an HPC system in the existing Building 59 on the LBNL hill site. The project does not require the construction of new building space nor does it involve an increase in the number of employees and visitors who would travel to and from Building 59 in order to use the facility. Therefore, as shown in **Table 4.1-3** above, GHG emissions from mobile sources (commuting) and area sources (building) would not increase above existing conditions. The primary sources of GHG emissions associated with the proposed project include (1) electricity that would be used to operate the new HPC system, (2) water that would be used to operate three new cooling towers, and (3) an emergency generator that would be installed to provide back-up electricity.

Building 59 was designed and constructed to minimize Scope 1, 2, and 3 emissions and to achieve LEED (Leadership in Energy and Environmental Design) Gold Certification. Building 59 is currently in the USGBC (US Green Building Council) certification review process. Although not yet certified, Building 59 was designed and built to exceed the state's energy efficiency standards for residential and nonresidential buildings established under Title 24, Part 6 of the California Code of Regulations. Building 59 includes numerous measures to minimize electricity use, including a cool roof, natural ventilation, daylighting, use of high performance computer exhaust heat to warm up the office space, etc. In order to achieve green building principles and to be consistent with the 2006 LRDP, the design of the proposed facility integrated the building into the hillside. High performance glazing was installed and shading used to reduce the effects of afternoon heat gains. The facility also includes high-efficiency evaporative cooling towers, high-efficiency fixtures, waterless urinals, and rain harvesting, all of which reduce water demand and GHG emissions from use of electricity associated with water supply. Building 59 provides parking for approximately 30 bicycles and does not provide automobile parking spaces with the purpose of discouraging single occupant vehicle trips. The facility includes showers for bike users, transit service, and a TDM program.

In addition, as noted above, NERSC-9 has been designed with a Power Usage Effectiveness (PUE) of 1.1. PUE is a metric that was developed by the Green Grid Association to benchmark the infrastructure energy efficiency of HPC facilities and data centers. The PUE of a facility is calculated by dividing the facility's total electricity load by the load used to operate the IT equipment. PUE values can range from 1.0 to greater than 1. A PUE value at 1.0 would indicate that all energy is used by IT equipment only. Based on a number of studies conducted by the Green Grid and LBNL, facilities with PUE values of 1.2 and below represent highly efficient facilities (Also refer to **Section 4.3** in this Draft Focused EIR for more information on PUE). With a PUE of 1.1, following the installation of NERSC-9, Building 59 would represent a highly efficient facility. The project's PUE is lower than the target PUE of 1.2 to 1.4 stipulated in EO 13693 for new federal data centers.

These energy and water use minimization measures notwithstanding, as reported in **Impact GHG-1** above, the proposed project would result in a substantial increase in GHG emissions from the generation and transmission of electricity that would be used in Building 59 to operate the proposed HPC system. This increase would have the potential to affect Berkeley Lab's ability to meet the goal of reducing Berkeley Lab's 2025 GHG emissions from electricity and natural gas to be 50 percent of 2008 baseline emissions. However, with the implementation of **NERSC Mitigation Measure GHG-1**, the new emissions would be fully offset by RE and RECs and Berkeley Lab would be able to continue its progress toward meeting the goals in the SSP.

#### *UC Policy on Sustainable Practices*

The applicable portions of the UC Policy on Sustainable Practices are reproduced above in **Section 4.1.3.5**. The proposed project would not conflict with any of the applicable goals and requirements of the UC Policy. The requirements related to Green Building design are not applicable to the proposed project because Building 59 has already been designed and constructed to achieve LEED Gold Certification and is currently in the USGBC certification review process. Similarly the requirements related to Sustainable Transportation are not applicable to the project because the project will not increase the population in Building 59. Furthermore, Berkeley Lab already implements a transportation demand management program and controls parking in order to minimize vehicle trips to the hill site. The proposed project would comply with Sustainable Water use requirements. Furthermore, the Lab would implement **NERSC Mitigation Measure GHG-1** and purchase RE and RECs in the amount of the increase in GHG emissions that would occur due to the proposed project. Therefore, the proposed project does not conflict with the applicable provisions of the current UC Policy.

**AB 32, Executive Order S-3-05, SB 350, and SB 32**

AB 32 established the goal for the reduction of California's GHG emissions to 1990 levels by 2020. Prior to that, Executive Order S-3-05 established the goal of reducing California's emissions 80 percent under 1990 levels by 2050. In 2016, SB 350 and SB 32 were signed into law, establishing the state's mid-term target for 2030 emissions to be 40 percent below the 1990 emissions.

All of these targets are applicable to the state as a whole, and an individual project is not required to meet these targets. However, individual projects are required to minimize their GHG emissions so that the state's target can be attained. The proposed project would substantially increase GHG emissions at Berkeley Lab over existing conditions, and would have the potential to conflict with the state goals, and the impact would be *significant*. However, with the implementation of the proposed mitigation, the project would not conflict with the state's goals to reduce GHG emissions, and the impact is therefore less than significant.

**Mitigation Measures:**

NERSC MM GHG-2                      Implement NERSC Mitigation Measure GHG-1.

**Significance after Mitigation:** Less than significant

---

#### 4.1.5 REFERENCES

- Association of Bay Area Governments (ABAG). 2013. *Bay Area Plan*.
- Bay Area Air Quality Management District. 2011. *CEQA Air Quality Guidelines*. May. <http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES.aspx>
- California Air Resources Board (CARB). 2014. *First Update to the AB 32 Scoping Plan*. <http://www.arb.ca.gov/cc/scopingplan/document/updatedscopingplan2013.htm>
- California Air Resources Board (CARB). 2016. *California Greenhouse Gas Inventory for 2000-2014 – by Category as Defined in the 2008 Scoping Plan*. [www.arb.ca.gov/cc/inventory/data/data.htm](http://www.arb.ca.gov/cc/inventory/data/data.htm).
- CARB. 2010. *California Greenhouse Gas 2000–2012 Inventory by Scoping Plan Category – Summary*. [http://www.arb.ca.gov/cc/inventory/pubs/reports/ghg\\_inventory\\_00-12\\_report.pdf](http://www.arb.ca.gov/cc/inventory/pubs/reports/ghg_inventory_00-12_report.pdf)
- California Building Standards Commission. 2010. *2010 Draft California Green Building Standards Code*.
- California Building Standards Commission. 2013. *2013 California Green Building Standards Code*.

- California Energy Commission. 2007. *Revisions to the 1990–2004 Greenhouse Gas Emissions Inventory Report, Published in December 2006.* [http://www.energy.ca.gov/2006publications/CEC-600-2006-013/2007-01-23\\_GHG\\_INVENTORY\\_REVISIONS.PDF](http://www.energy.ca.gov/2006publications/CEC-600-2006-013/2007-01-23_GHG_INVENTORY_REVISIONS.PDF)
- California Energy Commission. 2012. *Building Energy Efficiency Standards- Frequently Asked Questions.* May.
- California Environmental Protection Agency (Cal EPA), Climate Action Team. 2006. *Climate Action Team Report to Governor Schwarzenegger and the Legislature.*
- California Natural Resources Agency. 2009. *Final Statement of Reasons for Regulatory Action: Amendments to the State CEQA Guidelines Addressing Analysis and Mitigation of Greenhouse Gas Emissions Pursuant to SB-97.*
- Energy Information Administration. 2007. *“Other Gases: Hydrofluorocarbons, Perfluorocarbons, and Sulfur Hexafluoride.”* [http://www.eia.doe.gov/oiaf/1605/ggrpt/summary/other\\_gases.html](http://www.eia.doe.gov/oiaf/1605/ggrpt/summary/other_gases.html)
- Intergovernmental Panel on Climate Change (IPCC). 2007. *Climate Change 2007: The Physical Science Basis, Summary for Policymakers.*
- IPCC. 2013. *“Climate Change 2013: The Physical Science Basis.”* <http://www.climatechange2013.org/>
- Legislative Analyst Office. 2014. *“California is the World’s Eighth Largest Economy.”* <http://www.lao.ca.gov/LAOEconTax/Article/Detail/1>
- State of California, Governor’s Office of Planning and Research (OPR). 2008. *CEQA and Climate Change: Addressing Climate Change Through California Environmental Quality Act (CEQA) Review.*
- OPR. 2009. *Draft CEQA Guideline Amendments for Greenhouse Gas Emissions.*
- US Census Bureau. 2000. *“Census 2000 Data for the State of California.”* <https://www.census.gov/census2000/states/ca.html>
- US Environmental Protection Agency (US EPA). 2009. *Proposed Mandatory Greenhouse Gas Reporting Rule.* [http://www2.epa.gov/sites/production/files/2015-06/documents/rule\\_e9-5711.pdf](http://www2.epa.gov/sites/production/files/2015-06/documents/rule_e9-5711.pdf)
- US EPA. 2014. *Inventory of US Greenhouse Gas Emissions and Sinks 1990–2012.* <http://www.epa.gov/climatechange/ghgemissions/usinventoryreport.html>
- US EPA. n.d.(a) *“High GWP Gases and Climate Change.”* <http://www.epa.gov/highgwp/scientific.html#sf6>
- US EPA. n.d.(b) *“Methane: Sources and Emissions.”* <http://www.epa.gov/methane/sources.html>

## 4.2 TRIBAL CULTURAL RESOURCES

---

### 4.2.1 INTRODUCTION

This section evaluates the potential impacts to Tribal Cultural Resources (TCRs) associated with implementation of the proposed NERSC-9 project.

No comment letters related to impacts on TCRs were received in response to the Notice of Preparation (NOP) published for this Draft Focused EIR.

### 4.2.2 ENVIRONMENTAL SETTING

Native Americans began to occupy the present-day Northern California (i.e., San Francisco Bay region) around 2,000 B.C. Linguistic evidence suggests that the Native Americans that lived in the area spoke Chochenyo, one of the Costanoan<sup>1</sup> languages. In 1770, the Costanoan-speaking people lived in approximately 50 separate and politically autonomous nations or tribelets. Records from early Spanish diaries document a number of small villages along the foothills of the East Bay area. A settlement named Huchium may have been situated in the general vicinity of the present city of Berkeley as indicated by ethnographic sources (Kroeber 1925). During the mission period, 1770 through 1835, the Costanoan people experienced cataclysmic changes in almost all areas of their lives, particularly a massive decline in population due to introduced diseases and declining birth rate. Following the secularization of the missions by the Mexican government in the 1830s, most Native Americans gradually left the missions to work as manual laborers on the ranchos that were established in the surrounding areas (LBNL 2007).

Field surveys and archival research at the California Historical Resources Information System's Northwest Information Center have been undertaken numerous times to determine whether any archaeological resources have been discovered at LBNL. The Northwest Information Center has indicated there is a "low potential for Native American sites in the project area" and thus "a low possibility of identifying Native American or historic-period archaeological deposits in the project area." Additionally, field studies conducted at various times at Berkeley Lab have not encountered any archaeological resources. Native American archaeological sites in this portion of Alameda County tend to be situated on terraces along ridgetops, midslope terraces, alluvial flats, near ecotones<sup>2</sup>, and near sources of water,

---

<sup>1</sup> "Costanoan" is derived from the Spanish word Costanos meaning "coast people." No native name of the Costanoan people as a whole existed in prehistoric times as the Costanoan were neither a single ethnic group nor a political entity.

<sup>2</sup> Ecotones are transitional zones occurring between two or more "biomes," or areas with distinct biological communities.

including springs. Berkeley Lab is situated on a steep slope adjacent to Strawberry Creek. Therefore, there is a low-to-moderate potential for Native American sites on the project site (LBNL 2007).

### 4.2.3 REGULATORY CONSIDERATIONS

#### 4.2.3.1 Federal Laws and Regulations

No federal laws, regulations, or policies apply to TCRs and the proposed project.

#### 4.2.3.2 State Laws and Regulations

##### *Assembly Bill (AB) 52*

AB 52, which was approved in September 2014 and became effective on July 1, 2015, requires that CEQA lead agencies consult with a California Native American tribe that is traditionally and culturally affiliated with the geographic area of a proposed project, if so requested by the tribe. A provision of the bill, chaptered in CEQA Section 21084.2, also specifies that a project with an effect that may cause a substantial adverse change in the significance of a TCR is a project that may have a significant effect on the environment.

Defined in Section 21074(a) of the Public Resources Code, TCRs are:

1. Sites, features, places, cultural landscapes, sacred places and objects with cultural value to a California Native American tribe that are either of the following:
  - a. Included or determined to be eligible for inclusion in the California Register of Historical Resources; or
  - b. Included in a local register of historical resources as defined in subdivision (k) of Section 5020.1.
2. 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 Section 5024.1. In applying the criteria set forth in subdivision (c) of Section 5024.1 for the purposes of this paragraph, the lead agency shall consider the significance of the resource to a California Native American tribe.

TCRs are further defined under Section 21074 as follows:

- a. A cultural landscape that meets the criteria of subdivision (a) is a TCR to the extent that the landscape is geographically defined in terms of the size and scope of the landscape; and
- b. A historical resource described in Section 21084.1, a unique archaeological resource as defined in subdivision (g) of Section 21083.2, or a “non-unique archaeological resource” as defined in subdivision (h) of Section 21083.2 may also be a TCR if it conforms with the criteria of subdivision (a).

Mitigation measures for TCRs must be developed in consultation with the affected California Native American tribe pursuant to newly chaptered Section 21080.3.2, or according to Section 21084.3. Section 21084.3 identifies mitigation measures that include avoidance and preservation of TCRs and treating TCRs with culturally appropriate dignity, taking into account the tribal cultural values and meaning of the resource.

#### **4.2.4 IMPACTS AND MITIGATION MEASURES**

##### **4.2.4.1 Significance Criteria**

The impacts related to TCRs resulting from the implementation of the proposed project would be considered significant if the proposed project would:

- Cause a substantial adverse change in the significance of a Tribal Cultural Resource as defined in Section 21074 of the Public Resources Code.

##### **4.2.4.2 Methodology**

According to AB 52, it is the responsibility of the tribes to formally request of a lead agency that they be notified of projects in the lead agency’s jurisdiction so that they may request consultation related to TCRs. Nevertheless, UC LBNL proactively sent out letters to tribes in Alameda County notifying them of the proposed project at the same time that the NOP was issued on July 6, 2016.

The following mitigation measures, adopted as part of the 2006 LRDP EIR certification, are required for all Berkeley Lab projects and are thus an integral part of the proposed project. The analysis presented below evaluates environmental impacts that would result from project implementation following the application of these mitigation measures. The mitigation measures that are included in the proposed project would be monitored pursuant to the Mitigation Monitoring and Reporting Plan that will be adopted for the proposed project.

**LRDP MM CUL-3:** If an archaeological artifact is discovered on site during construction under the proposed LRDP, all activities within a 50-foot radius shall be halted and a qualified archaeologist shall be summoned within 24 hours to inspect the site. If the find is determined to be significant and to merit formal recording or data collection, adequate time and funding shall be devoted to salvage the material. Any archaeologically important data recovered during monitoring shall be cleaned, catalogued, and analyzed, with the results presented in a report of finding that meets professional standards.

**LRDP MM CUL-4:** In the event that human skeletal remains are uncovered during construction or ground-breaking activities resulting from implementation of the 2006 LRDP at the LBNL site, *CEQA Guidelines* Section 15064.5(e)(1) shall be followed:

- In the event of the accidental discovery or recognition of any human remains in any location other than a dedicated cemetery, the following steps should be taken:
  - (1) There shall be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent human remains until:
    - (A) The coroner of the county in which the remains are discovered must be contacted to determine that no investigation of the cause of death is required, and
    - (B) If the coroner determines the remains to be Native American: (1) The coroner shall contact the Native American Heritage Commission within 24 hours; (2) The Native American Heritage Commission shall identify the person or persons it believes to be the most likely descended from the deceased Native American. (3) The most likely descendent may make recommendations to the landowner or the person responsible for the excavation work, for means of treating or disposing of, with appropriate dignity, the human remains and any associated grave goods as provided in Public Resources Code Section 5097.98, or
  - (2) Where the following conditions occur, the landowner or his authorized representative shall rebury the Native American human remains and associated grave goods with appropriate dignity on the property in a location not subject to further subsurface disturbance.
    - (A) The Native American Heritage Commission is unable to identify a most likely descendent or the most likely descendent failed to make a recommendation within 24 hours after being notified by the commission;

- (B) The descendant identified fails to make a recommendation; or
- (C) The landowner or his authorized representative rejects the recommendation of the descendant, and the mediation by the Native American Heritage Commission fails to provide measures acceptable to the landowner.

#### 4.2.4.3 Project Impacts and Mitigation Measures

**NERSC Impact TCR-1: The proposed project would not cause a substantial adverse change in the significance of a Tribal Cultural Resource as defined in Section 21074. (*Less than Significant*)**

As previously discussed, UC LBNL sent out notification letters on July 6, 2016 to the five tribes that indicated an interest in receiving such notification for projects proposed at Berkeley Lab. According to AB 52, the tribes had 30 days from the receipt of the letter to request consultation with UC LBNL. On July 6, 2016, Ann Marie Sayers, representing the Indian Canyon Mutsun Band of Costanoan, responded to the notification letter. After subsequent communications between Ms. Sayers and UC LBNL, Ms. Sayers confirmed that there would be no need for Tribal consultation. On July 8, 2016, Irenne Zwierlein representing the Amah Mutsun Tribal Band of Mission San Juan Bautista similarly contacted UC LBNL. Based on ensuing communications, Ms. Zwierlein confirmed that Tribal consultation would not be needed. No request for formal consultation was received by UC LBNL from the other three tribes as of the publication of this Draft Focused EIR. UC LBNL further communicated with the state Native American Heritage Commission to ensure that the tribal notification process had been conducted appropriately.

The geographic area of the project site is not known or expected to contain any TCRs. As noted in **Section 3.0, Project Description**, the proposed project does not involve the construction of new buildings or any major ground disturbing activities. As noted in the Initial Study (**Appendix 1.0**), with respect to archaeological resources and human remains that may be present in the limited area, only very minor ground disturbance would be possible (and only if special anchoring of cranes were to be needed). LRDP mitigation measures set forth above, including monitoring, would be implemented to ensure that should resources be encountered during such occurrences, they would be protected, documented, and preserved, as appropriate. Therefore, while no TCRs are expected to be affected by the proposed project, the mitigation measures would further ensure that any resources encountered would not be adversely affected.

Accordingly, the proposed project is not expected to result in a substantial adverse change in the significance of TCRs, and this impact is considered less than significant.

**Mitigation Measures:** No mitigation measures are required.

---

#### 4.2.4.4 Cumulative Impacts and Mitigation Measures

As LRDP mitigation measures would be implemented, the proposed project would result in a less than significant impact on TCRs, and therefore it would not make a cumulatively considerable contribution to a cumulative impact on TCRs. There would be no impact. No mitigation is required.

#### 4.2.5 REFERENCES

Kielusiak, C. 2000. Archaeological Survey of 70 Acres of Land and Recordation and Evaluation of Four Historic Resources at the Lawrence Berkeley National Laboratory, February.

Kroeber, A.L. 1925. *Handbook of the Indians of California*. Bureau of American Ethnology, Bulletin 78, Smithsonian Institution, Washington, DC. (Reprint by Dover Publications, Inc., New York, 1976)

Lawrence Berkeley National Laboratory. 2007. 2006 Long Range Development Plan Final Environmental Impact Report. SCH No. 200102046. July.

### 4.3.1 INTRODUCTION

This section evaluates potential impacts associated with the consumption of energy that would result from the implementation of the NERSC-9 project. The section follows the guidance for the evaluation of energy impacts provided in Appendix F, Energy Conservation, of the *State CEQA Guidelines*.

No comment letters related to energy consumption and energy-related impacts were received in response to the Notice of Preparation (NOP) published for this Draft Focused EIR.

### 4.3.2 ENVIRONMENTAL SETTING

#### 4.3.2.1 Electricity Supply

Electrical power to the Lawrence Berkeley National Laboratory (LBNL or Berkeley Lab) hill site is provided by the Western Area Power Administration (WAPA). 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 14 multi-use water resource projects and one coal-fired plant and to purchase electricity on the wholesale market. WAPA's service area encompasses a 15-state region of the central and western U.S. where WAPA's more than 17,000-circuit-mile high-voltage transmission system carries electricity from 56 hydropower plants operated by the Bureau of Reclamation, U.S. Army Corps of Engineers, and the International Boundary and Water Commission. With a combined capacity of 10,504 MW from all its plants, WAPA sells 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.

The electrical power provided by WAPA is delivered to the LBNL hill site via PG&E's distribution system. PG&E delivers power to LBNL on two overhead 115-kilovolt (kV), 3-phase, 60-Hertz (Hz) transmission lines with a joint capacity of approximately 100 megawatts (MW). Both of these transmission lines feed power from PG&E's El Sobrante switching station to the Grizzly Peak substation on the LBNL hill site. 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 LBNL. In addition, LBNL's power can be supplied from UC Berkeley's Hill Area Substation, located adjacent to the Grizzly Peak substation.

The main power distribution system at the LBNL hill site consists of a 12.47-kV underground system with smaller substations 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 regulation in order to ensure that critical experiments will not be disrupted by transient voltage within the system. Total electrical power consumption at the LBNL hill site in FY2015 was 86,627 megawatt hours (MWh) (LBNL 2016).

LBNL also has a number of stationary and portable emergency power generators, including a 1.3 MW generator in Building 59. These generators start automatically in the event of a power failure and are used to provide an emergency power supply for certain critical services (e.g., for laboratory exhaust fans, exit lights, the fire station, Radio Communications Facility, and the Health Services Building) and other important activities at LBNL. The generators are powered either by diesel, gasoline, or natural gas. The total generating capacity of these emergency generators is approximately 6,250 kilowatts.

#### 4.3.2.2 Natural Gas

Natural gas is used at Berkeley Lab for heating buildings and process loads. The natural gas supply is provided by the Defense Logistics Agency Energy (DLA Energy)<sup>1</sup> in Oregon and delivered by the PG&E system. In 1990, DLA Energy's mission was expanded to include the supply and management of natural gas in addition to basic petroleum and coal products. Currently, DLA Energy serves as the Department of Defense's central procurement agency to competitively acquire direct supply natural gas. The natural gas program includes more than 20 industry suppliers delivering approximately 40 million dekatherms annually to more than 200 Department of Defense and federal civilian customers (DLA Energy 2014).

The LBNL natural gas system receives its supply from a 6-inch PG&E line operating at 50 pounds per square inch gauge (psig). 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 the buildings throughout the Lab. Natural gas usage at the LBNL hill site in 2015 was approximately 1.2 million Therms (LBNL 2016). Building 59 neither receives nor uses any natural gas.

---

<sup>1</sup> Previously known as Defense Fuel Supply Center.

### 4.3.3 REGULATORY CONSIDERATIONS

#### 4.3.3.1 Federal Laws and Regulations

##### *Energy Independence and Security Act*

In 2007, Energy Independence and Security Act (EISA) was signed into law. EISA aims to increase building, product, and vehicle efficiency; accelerate clean renewable fuel production; and institute other measures aimed at increasing U.S. energy independence and security. For more information on this Act, please see **Section 4.1.3**.

##### *Executive Order 13693*

On 19 March 2015, the President signed Executive Order (EO) 13693, *Planning for Federal Sustainability in the Next Decade*. The overarching goal of EO 13693 is to maintain Federal leadership in sustainability and greenhouse gas emission reductions. Among other goals, the EO includes the following goals related to energy:

- 25 percent reduction in energy use intensity (2015 baseline)
- 30 percent of electricity supply from renewable energy
- 25 percent of energy supply (electricity and natural gas) from renewable energy
- 25 percent reduction in transportation-related greenhouse gas emissions (2008 baseline)
- 30 percent reduction in fleet petroleum use (2014 baseline)
- New buildings to be zero net energy (and where feasible, zero net waste and water) that enter the design process after 2020

The EO also includes the following requirements related to building energy use:

- “Federal Agencies shall, where life-cycle cost-effective, beginning in fiscal year 2016, unless otherwise specified, promote building energy conservation, efficiency, and management by reducing agency building energy intensity measured in British thermal units per gross square foot by 2.5 percent annually through the end of fiscal year 2025, relative to the baseline of the agency’s building energy use in fiscal year 2015 and taking into account agency progress to date.”

The EO also states that Federal Agencies shall, where life-cycle cost-effective, beginning in fiscal year 2016, unless otherwise specified, improve data center energy efficiency at agency facilities by:

- ensuring the agency chief information officer promotes data center energy optimization, efficiency, and performance;
- installing and monitoring advanced energy meters in all data centers by fiscal year 2018; and
- establishing a power usage effectiveness target of 1.2 to 1.4 for new data centers and less than 1.5 for existing data centers.”

#### 4.3.3.2 State Laws and Regulations

##### *Title 24*

Title 24, Part 6, of the California Code of Regulations contains the California Energy Commission's Energy Efficiency Standards for Residential and Nonresidential Buildings. Title 24 was first established in 1978, in response to a legislative mandate to reduce California's energy consumption. Since that time, Title 24 has been updated periodically to allow for consideration and possible incorporation of new energy efficiency technologies and methods.

On April 23, 2008, the California Energy Commission (CEC) adopted the 2008 standards, which applied to projects that submitted an application for a building permit on or after January 1, 2010. The CEC adopted the 2008 standards for a number of reasons: (1) to provide California with an adequate, reasonably priced, and environmentally sound supply of energy; (2) to respond to Assembly Bill 32 (AB 32; the Global Warming Solutions Act of 2006), which requires California to reduce its greenhouse gas emissions to 1990 levels by 2020; (3) to pursue the statewide policy that energy efficiency is the resource of choice for meeting California's energy needs; (4) to act on the findings of California's Integrated Energy Policy Report, which indicate that the 2008 Standards are the most cost-effective means to achieve energy efficiency, reduce the energy demand associated with water supply, and reduce greenhouse gas emissions; (5) to meet the West Coast Governors' Global Warming Initiative commitment to include aggressive energy efficiency measures in the update of all state building codes; and (6) to meet the Executive Order in the Green Building Initiative to improve the energy efficiency of nonresidential buildings through aggressive standards.<sup>2</sup> In 2013, updates were made to the 2008 Title 24 standards (effective January 1, 2014).

The California Green Building Standards Code, which is Part 11 of the Title 24 Building Standards Code, is commonly referred to as the CALGreen Code. The 2008 edition, the first edition of the CALGreen Code, contained only voluntary standards. Part 11 was last updated in 2013 and the updated CALGreen Code became effective July 1, 2015. The 2013 CALGreen Code is a code with mandatory requirements for

---

<sup>2</sup> See <http://www.energy.ca.gov/title24/2008standards/index.html>, 2013.

new residential and nonresidential buildings (including buildings for retail, office, public schools, and hospitals) throughout California. The 2013 CALGreen Code contains requirements for construction site selection, stormwater control during construction, construction solid waste reduction, indoor water use reduction, building material selection, natural resource conservation, site irrigation conservation, and more. Additionally, this code encourages buildings to achieve exemplary performance in the area of energy efficiency. For the purposes of energy efficiency standards, the CEC believes a green building should achieve at least a 15 percent reduction in energy usage when compared to California's mandatory energy efficiency standards.

### ***AB 32, Executive Order S-3-05, Executive Order B-30-15, and SB 32***

In addition to Title 24, a number of state laws and regulations including AB 32, Executive Order S-3-05, Executive Order B-30-15, and SB 32 are anticipated to result in the future regulation of energy resources in California. (See **Section 4.1, Greenhouse Gas Emissions**, for additional information on AB 32, SB 32, and the two executive orders.) In order to achieve the GHG emission reductions targeted under AB 32, SB 32, and the two executive orders, it is generally accepted that California will need to improve its overall energy efficiency as well as further increase the use of renewable energy resources. Pursuant to AB 32 and SB 32, the California Air Resources Board (CARB) will work with other state agencies (including the CEC), to implement feasible programs and regulations that reduce emissions and improve energy efficiency.<sup>3</sup>

### ***Other Energy Related Statutes and Executive Orders***

Additional legislation and executive orders focused on energy efficiency in California are highlighted briefly below:

- Assembly Bill 1613: This legislation, also known as the Waste Heat and Carbon Emissions Reduction Act, was designed to encourage the development of new combined heat and power systems in California with a generating capacity of up to 20 MW.
- Senate Bill 1: This legislation enacted the Governor's Million Solar Roofs program and has an overall objective of installing 3,000 MW of solar photovoltaic systems.
- Senate Bill 1389: This legislation requires the CEC to prepare a biennial integrated energy policy report that contains an assessment of 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.

---

<sup>3</sup> See <http://www.arb.ca.gov/cc/ghgsectors/ghgsectors.htm#electric>, September 13, 2013 (highlights targeted improvements for the energy sector).

- Executive Order S-14-08: This order established accelerated RPS targets—specifically 33 percent by 2020.
- Executive Order S-21-09: This order requires CARB to adopt regulations, by July 31, 2010, increasing California's RPS to 33 percent by 2020.

### 4.3.3.3 Local Plans and Policies

#### *University of California Plans and Policies*

The NERSC-9 project involves DOE facilities at the LBNL hill site operated by the University of California (UC). The plans and policies that are applicable to the proposed project are plans developed by the University specifically for the LBNL hill site and UC policies that apply to LBNL.

#### UC Policy on Sustainable Practices

The UC Policy on Sustainable Practices is one of the most comprehensive and far-reaching institutional sustainability commitments in the nation. Energy related guidance in the UC Policy applicable to the Berkeley Lab includes the following:

#### *Green Building Design*

##### New Buildings

1. All new building projects, other than acute care facilities, shall be designed, constructed, and commissioned to outperform the CBC energy-efficiency standards by at least 20% or meet the whole-building energy performance targets listed in Table 1 of Section V.A.3. The University will strive to design, construct, and commission buildings that outperform CBC energy efficiency standards by 30% or more, or meet the stretch whole-building energy performance targets listed in Table 1 of Section V.A.3, whenever possible within the constraints of program needs and standard budget parameters.
2. Standards for energy efficiency for acute care facilities will be developed in consultation with campuses and medical centers.
3. All new buildings will achieve a USGBC LEED “Silver” certification at a minimum. All new buildings will strive to achieve certification at a USGBC LEED “Gold” rating or higher, whenever possible within the constraints of program needs and standard budget parameters.
4. The University of California will design, construct, and commission new laboratory buildings to achieve a minimum of LEED “Silver” certification as well as meeting at least the prerequisites of

the Laboratories for the 21st Century (Labs21) Environmental Performance Criteria (EPC)2. Laboratory spaces in new buildings also shall meet at least the prerequisites of Labs21 EPC. Design, construction, and commissioning processes shall strive to optimize the energy efficiency of systems not addressed by the CBC energy efficiency standards.

5. All new building projects will achieve at least two points within the available credits in LEED-BD+C's Water Efficiency category.

### **Lawrence Berkeley National Laboratory Site Sustainability Plan**

In accordance with EO 13693, *Planning for Federal Sustainability in the Next Decade*, Berkeley Lab prepares an annual Site Sustainability Plan (SSP) that provides updates on performance at LBNL with respect to more than 30 sustainability goals (see **Section 4.1** for more details). The specific targets in the SSP pertaining to energy include:

- 50 percent reduction in greenhouse gas emissions from electricity and natural gas (2008 baseline)
- 25 percent reduction in energy use intensity (2015 baseline)
- 30 percent of electricity supply from renewable energy
- 25 percent of energy supply (electricity and natural gas) from renewable energy
- 30 percent reduction in fleet petroleum use (2014 baseline)
- New buildings to be zero net energy (and where feasible, zero net waste and water) that enter the design process after 2020

## **4.3.4 IMPACTS AND MITIGATION MEASURES**

### **4.3.4.1 Significance Criteria**

A threshold of significance for evaluating a project's energy conservation impacts can be derived from Appendix F of the *State CEQA Guidelines* and PRC Section 21100(b)(3)), which focus on reducing "the wasteful, inefficient, and unnecessary consumption of energy." The proposed project would have a potentially significant impact on energy resources if it would:

- Involve the wasteful, inefficient, and unnecessary consumption of energy, especially fossil fuels such as coal, natural gas, and oil, associated with project design, project location, the use of electricity and/or natural gas, and/or the use of fuel by vehicles anticipated to travel to and from the project.

Appendix F of the *State CEQA Guidelines* describes the means of achieving the goal of conserving energy to include:

- Decreasing overall per capita energy consumption,
- Decreasing reliance on natural gas and oil, and
- Increasing reliance on renewable energy sources.

#### 4.3.4.2 Methodology

Appendix F requires an EIR to present the total energy required by a project by fuel type and end use, during construction, operation and removal of the project. The methodology used to estimate the construction-phase energy use is described in **NERSC Impact EN-1** below.

With respect to energy use during operation, the proposed NERSC-9 project includes the installation of a next generation high-performance computing (HPC) system to replace an older existing HPC in Building 59, as well as the installation of related cooling and electrical infrastructure needed to operate the new system. Because the new HPC would provide improved processing power and speed, the power consumption, air conditioning, and cooling demands of Building 59 would increase. The increased electricity demand (peak and average) of Building 59 following the installation of NERSC-9 was estimated by Berkeley Lab based on the energy and cooling needs of NERSC-9.

As noted in **Section 3.0**, the NERSC-9 project would not increase the use of natural gas on the LBNL hill site because high performance computer exhaust heat would be used to heat office space. In addition, the proposed project would replace an older HPC system with a newer HPC system; it would not increase the number of persons who would work in Building 59 where NERSC-9 would be installed and there would be no increase in daily vehicle trips to the project site. Therefore, increases in the consumption of petroleum-based fuel and natural gas were not calculated for the proposed project.

#### 4.3.4.3 Project Impacts and Mitigation Measures

**NERSC Impact EN-1: Construction and operation of the proposed project would increase the use of energy resources on the project site but would not result in wasteful, inefficient, or unnecessary consumption of energy resources. (*Less than Significant*)**

## Construction

During construction of the proposed project, energy would be consumed mainly by generators and petroleum-based fuels used to power vehicles that would transport the high-performance computing system and related equipment onto the project site. Construction worker travel to and from the project site would also involve use of petroleum-based fuel to operate worker vehicles.

As described in **Section 3.9**, project construction would occur in two phases and both phases would consist of limited construction activities. For the purpose of this analysis, it is assumed that both phases of construction would use the same number and type of equipment as both phases would entail installation activities. As shown in **Table 4.3-1, Off-Road Construction Equipment Diesel Fuel Consumption**, and **Table 4.3-2, Construction Worker Gasoline Consumption**, an estimated 29,700 gallons of diesel fuel and 19,200 gallons of gasoline would be consumed over the project construction period, or approximately 710 gallons of diesel fuel and 460 gallons of gasoline per month.

In 2012, California consumed a total of 1.3 billion gallons of diesel fuel and 12.24 billion gallons of gasoline, or about 108 million gallons of diesel fuel and 1.02 billion gallons of gasoline per month. Thus, the project's monthly consumption of petroleum-based fuel during construction would represent approximately 0.001 percent of the statewide diesel consumption and far less than 0.001 percent of the statewide gasoline consumption.

**Table 4.3-1**  
**Off-Road Construction Equipment Diesel Fuel Consumption**

Equipment Type	Units	Hours	Horse Power*	Load Factor*	Ave Daily Factor*	Number of Days	Fuel Usage/ HP/hr*	Diesel Usage (in gallons)
Off-Highway Trucks	3	1	400	0.38	0.6	912	0.05	12,476
Cranes	1	4	208	0.29	0.6	500	0.05	3,619
Generator Set	1	8	84	0.74	0.6	912	0.05	13,606
							<b>Project Total</b>	<b>29,701</b>

Source: Impact Sciences 2016

\* Factors obtained from CalEEmod emissions modeling program.

**Table 4.3-2  
Construction Worker Vehicle Gasoline Consumption**

Phase	Number of Daily Trips	Number of Days	Average Round-Trip Commute Distance (in miles)	Fuel Usage (mpg) <sup>1</sup>	Gasoline Usage (in gallons)
1	40	523	12.4	18.6	13,947
2	20	392	12.4	18.6	5,227
				<b>Project Total</b>	<b>19,174</b>

Source: Impact Sciences 2016

Notes:

mpg – miles per gallon

<sup>1</sup> This is a conservatively estimated total, as it assumes no electric, hybrid or other alternate fuel use vehicles in the fleet mix.

As shown in the tables above, construction of the proposed project would require minimal construction equipment, construction truck trips, and worker trips. Construction would account for a nominal percentage of energy consumption when considering the state as a whole. Furthermore, contractors have a strong financial incentive to avoid wasteful, inefficient, and unnecessary consumption of energy during construction.

For these reasons listed above, the proposed project would not involve the inefficient, wasteful, and unnecessary use of energy resources during construction and the construction-phase energy impact would be *less than significant*.

### **Operation**

Appendix F requires an EIR to evaluate the proposed project's energy requirements by fuel type, energy efficiencies, as well as the project's effect on peak and base period demand. The proposed project would not increase population at the LBNL hill site. Therefore, project implementation would not increase the number of vehicle trips and would subsequently not result in an increased consumption of petroleum-fuel related to vehicular travel (quantified as vehicle miles travelled [VMT] to and from the project site). There would be no impact related to increased gasoline and diesel consumption. Furthermore, natural gas is not used in Building 59 and demand for natural gas would not increase due to the proposed project because the project would use the high performance computer exhaust heat to warm up the office space.

Average electricity use in Building 59, including the use from the operation of the existing HPCs, is about 7.6 MW, while at peak the usage is about 9 MW. Once NERSC-9 is installed and fully operational (anticipated in 2021), Building 59 average electrical energy demand is expected to be about 18.8 MW, with about 13.1 MW of that energy demand associated with the NERSC-9 HPC system. The project's peak

electrical demand would typically occur during the month of August when the need for cooling of the HPC systems is the highest. At peak, Building 59's electrical energy demand would be about 22.1 MW, with about 15.4 MW of energy demand associated with the NERSC-9 HPC system. Although the energy requirements of the NERSC-9 project would be substantial, they would not represent an inefficient or wasteful use of energy for the reasons presented below.

- Building 59 has been designed with a Power Usage Effectiveness (PUE) of 1.1. PUE is a metric that is used to benchmark the energy performance of datacenters as it provides insight into the efficiency of the datacenter's power and cooling systems.<sup>4</sup> PUE values can range from 1.0 to greater than 1. **Table 4.3-3, Data Center PUE Values**, presents industry-accepted PUE values and corresponding levels of efficiency of datacenters. PUE values of 3.0 and above represent very inefficient facilities, whereas PUE values of 1.2 and below represent highly efficient facilities.

---

**Table 4.3-3**  
**Data Center PUE Values**

PUE	Level of Efficiency
3.0	Very Inefficient
2.5	Inefficient
2.0	Average
1.5	Efficient
1.2	Very Efficient
1.0	Ideal

*Source: Green Grid, 2008 UC NAM Data Center Audit, 2009 UCSD/SDSC NAM Data Center Audit, 2010 SDSC/McGill University Joint Data Center Design*

---

In a study conducted by LBNL, the 22 data centers that were evaluated were found to have PUE values in the 1.3 to 3.0 range (Green Grid 2012). Therefore, the 22 data centers studied at that time represented facilities that were less than highly efficient by current standards. According to an analysis conducted by UCSD Supercomputer Center staff in 2011, the average PUE of computing facilities at UC campuses was 1.75, and that for the UCSD Supercomputing Center was 1.35

---

<sup>4</sup> PUE is the industry-preferred metric for measuring infrastructure energy efficiency for data centers. The metric has its limitations as it does not provide an assessment of the energy efficiency of the IT equipment. Additional metrics are currently being developed by the Green Grid and other institutes (LBNL 2016). These are, however, not available for use at this time in this Draft Focused EIR.

(UCSD 2011). A recent 2016 LBNL study indicates that the average PUE of data centers in the United States at the present time is about 1.8 to 1.9 (LBNL 2016). By comparison, following the installation of NERSC-9, Building 59 would continue to have a PUE of 1.1, which indicates a highly efficient facility. Furthermore, it would exceed the PUE goal set forth by the federal government for federal agency data centers. As noted above, EO 13693 states that federal agencies shall improve data center energy efficiency at agency facilities by establishing a PUE target of 1.2 to 1.4 for new data centers and less than 1.5 for existing data centers. With the installation of NERSC-9, Building 59 with a PUE of 1.1 would represent a highly energy efficient HPC facility.

Furthermore, as noted in **Section 3.0, Project Description**, NERSC-9 is 4.5 times more energy efficient than NERSC-7. It will use approximately 5.5 times the energy on average, and deliver approximately 25 times the performance of NERSC-7.

- Additionally, the existing Building 59 meets LEED Gold standards, as a result of which the non-HPC electricity consumption in the building is 30 percent better than the state's energy efficiency standards for residential and nonresidential buildings established under Title 24, Part 6 of the California Code of Regulations. The building includes numerous measures to minimize electricity use, including a cool roof, natural ventilation, daylighting, use of high performance computer exhaust heat to warm up the office space, etc. In order to achieve green building principles and to be consistent with the 2006 LRDP, the design of the proposed facility integrated the building into the hillside. High performance glazing was installed and shading used to reduce the effects of afternoon heat gains. The facility also includes high-efficiency evaporative cooling towers and high-efficiency electrical fixtures. Building 59 provides parking for approximately 30 bicycles and does not provide automobile parking spaces with the purpose of discouraging single occupant vehicle trips. The facility includes showers for bike users, transit service, and a Transportation Demand Management program.
- Given the high cost of energy, HPC facilities and datacenters continue to evaluate and implement improved IT power management and efficiency improvements to reduce energy use. According to a 2016 data center energy use report prepared by LBNL, servers are improving in their power scaling abilities, thus reducing power draw during idle periods or when at low utilization. Physical parts of the server such as the microprocessor, cooling fan, and power supply are also improving in energy efficiency, thus further reducing server power consumption per unit of computing output. Storage devices are becoming more efficient on a per-drive basis. Increased attention to data center infrastructure operations (e.g., cooling) is resulting in improved efficiency

(LBNL 2016). As a premier HPC facility, Building 59 is expected to continue to make similar and other advanced improvements to its operating systems and continue to improve energy efficiency on a per unit of computing output basis.

- Lastly, if the NERSC-9 system were not to be installed in Building 59 and the computational capabilities of the facility were to remain at their current level, researchers who require greater computing power and/or speed would need to run their programs at other facilities. Therefore, the usage of HPCs at other national and international laboratories would increase, with a concomitant increase in energy use at those facilities, which may not be as energy efficient as the proposed project.

In essence, energy use in Building 59 would increase substantially compared to existing conditions as a result of the proposed project. However, the project would not involve the wasteful use of energy resources as the NERSC-9 system as well as Building 59 itself would be highly energy efficient for a facility of its type, and the new HPC system would be 4.5 times more energy efficient than the system it would replace. The project's use of energy would also not be considered unnecessary as the data processing and computing functions of NERSC-9 would serve not only LBNL researchers but also other national and worldwide users. High performance computing is the application of parallel processing for running advanced application programs efficiently, reliably and quickly compared to standard computers that would either not be capable of handling the data and analysis, or would take too long. To the extent that another standard computer or another data center is able to provide the computational service, it would likely involve greater energy use than the NERSC-9 system. Furthermore, as noted in **NERSC Impact GHG-1**, Berkeley Lab would implement **NERSC Mitigation Measure GHG-1**, which involves purchasing renewable energy (RE) and/or renewable energy credits (REC) so that the environmental impacts from the project's electricity use are fully offset.

Appendix F also requires an EIR to evaluate the proposed project's impact on energy resources, local and regional energy supplies, and the need for new generation capacity. As mentioned above, WAPA provides electrical power to the LBNL site, including Building 59. Berkeley Lab does not anticipate any problem in purchasing the needed power from WAPA. WAPA contracts with multiple sources for electricity. The electricity needed by the proposed project may be even generated out of state. Due to the vast energy resources in western US to which WAPA has access, it cannot reasonably be predicted where the supply sources would be located or to evaluate the environmental consequences from the construction and operation of power generation facilities. Furthermore, if new power generation facilities were to be needed and would be located in California, they would be subject to environmental review and would be required to avoid or minimize their environmental impacts.

In summary, although the proposed project would consume a substantial amount of electricity, as noted above, Building 59 would be a highly energy efficient facility compared to similar HPC labs and data centers. Its energy use would not be considered a wasteful or inefficient use of energy resources. The impact would be less than significant.

**Mitigation Measures:** No mitigation is required.

---

#### 4.3.5 ALTERNATIVES

Appendix F states that alternatives should be compared in terms of overall energy consumption and in terms of measures to reduce energy use. The energy use and impacts of alternatives to the proposed project are presented in **Section 5.0, Alternatives**, of this Draft Focused EIR. The alternatives evaluated in **Section 5.0** include alternatives that would involve lower energy use than the proposed project.

#### 4.3.6 UNAVOIDABLE ADVERSE EFFECTS

Appendix F requires that the EIR report any unavoidable adverse impacts associated with the project's energy use. The analysis presented in **NERSC Impact EN-1** above shows that the proposed project would not result in a significant unavoidable impact associated with a wasteful use of energy resources.

#### 4.3.7 IRREVERSIBLE COMMITMENT OF RESOURCES

Appendix F states that an irreversible commitment of resources could occur if the project preempts future energy development or future energy conservation. The proposed NERSC-9 project would be installed in an existing building and would not preempt future energy development at the project site or elsewhere on Berkeley Lab or the state. It would also not preempt future energy conservation as Berkeley Lab continues to evaluate options to reduce its energy use and reduce the costs associated with procurement of energy.

#### 4.3.8 SHORT-TERM GAINS AND LONG-TERM IMPACTS

Appendix F suggests that the project's short-term gains and long-term impacts can be evaluated by calculating the project's energy cost over the project's lifetime. The NERSC-9 system would operate with an estimated average energy demand of 13 MW. While this would represent a relatively large amount of energy use for a single location, the proposed project would result in beneficial impacts in the area of energy conservation. Specifically, the proposed project would make progress towards achieving the energy conservation goal articulated in CEQA Guidelines Appendix F.

CEQA Guidelines Appendix F (Energy Conservation) identifies as a goal “the wise and efficient use of energy.” As a means of achieving this goal, it advocates for decreasing per-capita energy consumption, decreasing reliance on fossil fuels, and increasing use of renewable energy sources. The proposed project would provide state-of-the-art energy efficiency in its computational services to users not only at Berkeley Lab, but also throughout the nation and internationally. Without this project, these users would necessarily use less advanced, less energy efficient HPC systems, including NERSC-7. By providing thousands of users this energy efficient alternative, the proposed project would substantially decrease per-capita energy consumption for such users. It follows, then, that the proposed project would also make a positive contribution towards decreasing reliance on fossil fuels. Furthermore, as discussed elsewhere in this Draft EIR, Berkeley Lab and Building 59 are making positive strides towards using alternative energy sources. Consequently, the proposed project would help achieve the short-term gains while lowering long-term impacts in the area of energy conservation.

#### 4.3.9 GROWTH INDUCING EFFECTS

Appendix F states that growth inducing effects may include the energy consumption of the growth induced by the project. As stated in **Section 6, Other CEQA Considerations**, the proposed project would not induce any population or employment growth, and therefore there would be no energy consumption related to growth induced by the proposed project.

#### 4.3.10 REFERENCES

- California Energy Commission (CEC). 2015. *Energy Almanac, Total Electricity System Power*. [http://www.energyalmanac.ca.gov/electricity/total\\_system\\_power.html](http://www.energyalmanac.ca.gov/electricity/total_system_power.html)
- California Public Utilities Commission (CPUC). 2013. *Natural Gas and California*. <http://www.cpuc.ca.gov/PUC/energy/Gas/natgasandCA.htm>
- CEC. 2015a. *Energy Almanac, Retail Fuel Report and Data for California*. [http://energyalmanac.ca.gov/gasoline/piira\\_retail\\_survey.html](http://energyalmanac.ca.gov/gasoline/piira_retail_survey.html)
- CEC. 2015b. *Energy Almanac, Retail Gasoline Sales by County*. [http://energyalmanac.ca.gov/gasoline/retail\\_fuel\\_outlet\\_survey/retail\\_gasoline\\_sales\\_by\\_county.html](http://energyalmanac.ca.gov/gasoline/retail_fuel_outlet_survey/retail_gasoline_sales_by_county.html)
- CEC. 2015c. *Energy Almanac, Retail Diesel Sales by County*. [http://energyalmanac.ca.gov/gasoline/retail\\_fuel\\_outlet\\_survey/retail\\_diesel\\_sales\\_by\\_county.html](http://energyalmanac.ca.gov/gasoline/retail_fuel_outlet_survey/retail_diesel_sales_by_county.html)
- CEC. n.d. *Energy Almanac, Overview of Natural Gas in California, Natural Gas Supply*. <http://energyalmanac.ca.gov/naturalgas/overview.html>
- Defense Logistics Agency Energy (DLA Energy). 2014. Fact Book. <http://www.dla.mil/Energy.aspx>
- Lawrence Berkeley National Laboratory. 2016. United States Data Center Energy Usage Report. June.

The Green Grid. 2012. PUE: A Comprehensive Examination of the Metric.

University of California, San Diego. 2011. Greening Data Centers (PowerPoint). March.

## 5.0 ALTERNATIVES

---

### 5.1 INTRODUCTION

The California Environmental Quality Act (CEQA) requires that an Environmental Impact Report (EIR) contain an analysis describing a range of reasonable alternatives to a project that could feasibly attain most of the basic objectives of the project while avoiding or substantially lessening any significant impacts. The analysis must evaluate the comparative merits of the alternatives (*State CEQA Guidelines* Section 15126.6). Alternatives that avoid or substantially reduce significant impacts should be considered, even if these alternatives would impede to some degree the attainment of project objectives or would be more costly to the project proponent (*State CEQA Guidelines* Section 15126.6(b)). The alternatives do not need to consider less than significant impacts identified for the proposed project. An EIR need not consider every conceivable alternative to a project, but rather, it must consider a reasonable range of potentially feasible alternatives that will foster informed decision-making and public participation (*State CEQA Guidelines* Section 15126.6(a)).

The analysis in this section is intended to inform the public and decision makers of alternatives to the project and to provide a meaningful evaluation, analysis, and comparison of these alternatives with the proposed project. As required by CEQA, this section also includes an analysis of the No Project alternative.

#### 5.1.1 Project Background

As described in **Section 3.0, Project Description**, UC LBNL proposes to install and operate a next generation high-performance computing (HPC) system in existing Building 59, which was formerly known as the “Computational Research and Theory” (CRT) facility.

The construction of Building 59 and the development of the NERSC program at this site were evaluated in an EIR (CRT EIR SCH#2007072106, April 2008) and a National Environmental Policy Act (NEPA) EA/FONSI in 2010. Upon completion of review under CEQA and NEPA, Building 59 was constructed and the existing NERSC HPC system (NERSC-7) operating off-site at LBNL’s Oakland Scientific Facility and the new NERSC-8 system were gradually moved to the new building between 2015 and 2016. During this time, UC LBNL determined that due to the researchers’ need for greater computing power and speed, an older HPC system should be replaced with a next-generation HPC system. UC LBNL has identified NERSC-9 as the new HPC system that should replace the older NERSC-7 system.

UC LBNL would install NERSC-9 in the space to be vacated by the existing NERSC-7. Operation of the NERSC-9 HPC system would help support the continually increasing needs of scientists for complex simulation and data analysis. Along with the new HPC system, additional power, cooling, and distribution equipment would be installed to augment existing building systems. These system augmentations would be necessary to accommodate NERSC-9 operating in tandem with the newly installed and fully operational NERSC-8. All upgrades would be located within the existing building and associated cooling infrastructure areas, and the project would not make any changes to the building structure. The project would not increase the number of employees and visitors that would be present in the building on a daily basis over the numbers previously evaluated in the CRT EIR.

However, the electrical, water and cooling systems upgrades required to operate Building 59 once NERSC-9 is installed would be above levels evaluated in the CRT EIR and previously approved for this building. The building is currently approved for the use of up to 17 MW of electrical power, and the use of about 29 million gallons of water per year, as per the CRT Final EIR. With NERSC-9, the building's average electricity use would increase to 18.8 MW and the peak use would be 22.1 MW of electricity. With the NERSC-9 project, the average water use in Building 59 would be 55 million gallons per year of water. As the proposed project would not require any new building construction, and the analysis in the Initial Study (**Appendix 1.0**) shows that the project's water use is consistent with long-range planning coordination between UC LBNL and EBMUD and is within LBNL's water supply assessment, the analysis in **Section 4.0** of this Draft Focused EIR shows that the project's environmental impacts stem mainly from the increased consumption of electricity.

### 5.1.2 Project Objectives

Key objectives of the proposed project are to:

- Upgrade the high-performance computing system in Building 59 to leverage improving technology to maximize computational capacity in order to best meet the rapidly increasing demands of science.
- Upgrade the high-performance computing system in Building 59 to accommodate rapidly increasing computational demands.
- Upgrade Building 59 facility power and cooling capability to accommodate the NERSC-9 supercomputer system.
- Flexibly accommodate data sharing between NERSC-9 and the existing NERSC-8 system and provide for highly efficient access to Building 59 facility storage and high-bandwidth.
- Operate project computing power and cooling systems with exceptional energy efficiency.

- Provide Building 59 facility upgrades and operations in a cost-effective and timely manner.

### 5.1.3 Impacts of the Proposed Project

To develop project alternatives, UC LBNL considered the project objectives and reviewed the impacts of the proposed project, identified those impacts that could substantially be avoided or reduced through an alternative, and developed the appropriate range of alternatives to be analyzed. **Section 4.0, Environmental Setting, Impacts, and Mitigation Measures**, of this Draft Focused EIR evaluates the potential for the proposed project to result in significant impacts to the following resource areas: greenhouse gas (GHG) emissions, tribal cultural resources, and energy. The analysis in **Sections 4.1 and 4.3** shows that even though the proposed project would involve an increased consumption of electricity above levels that are used in the facility under existing conditions (and above levels previously evaluated for the building in the CRT EIR), the project's energy impacts would be less than significant. However, the impact from the project's GHG emissions would be significant. The proposed project would not result in any impacts on tribal cultural resources. In all other resource areas, as shown by the analysis in the Initial Study, the project would result in either no impacts or impacts that would be less than significant.

## 5.2 ALTERNATIVES TO THE PROJECT

Alternatives were considered but not evaluated in detail are described below, followed by alternatives that were analyzed in detail because they would meet most of the project objectives and would avoid or reduce the project's environmental impacts. **Table 5.0-1, Summary Comparison of Project Alternatives**, presented at the end of this section, compares the alternatives to the proposed project focusing on whether or not the alternative would avoid or reduce the project's significant impacts.

### 5.2.1 Alternatives Considered But Not Evaluated in Detail

This section discusses alternatives that were considered for the project but not evaluated in detail because they did not meet several key project objectives, or that were found to be infeasible for technical, environmental, or social reasons.

#### *Alternative Location*

Under this alternative, the proposed NERSC-9 HPC system would be installed at a different location, either at the LBNL hill site or elsewhere (e.g., another government facility, university, or commercial co-location facility, including the LBNL Oakland Scientific Facility).

This alternative was not evaluated in detail because it would not meet any of the key objectives of the proposed project, which include: accommodating shared data between a new high-performance

computing system and the existing NERSC-8 system and utilizing the high-bandwidth access provided within Building 59; and operating a new high-performance computing system with exceptional energy efficiency in a cost-effective and timely manner to accommodate rapidly changing technology and computational demands. A facility as energy efficient and as compatible with NERSC user needs as Building 59 likely does not exist in the region and the development of another facility would likely involve major new construction or retro-fitting, which would result in greater environmental impacts, potentially higher energy use, higher costs, and delays. Furthermore, distance is a factor in providing adequately high band-width data from NERSC-9 (if it were located elsewhere) to Building 59 storage facilities and NERSC-8. At this time, the technology does not exist that could provide such enormous bandwidth in an economical manner. For these reasons, this alternative was considered infeasible and was not evaluated in detail in this Draft Focused EIR.

### ***No Tandem Computing Systems***

Under this alternative, Building 59 would be upgraded to operate such that the peak electrical demand would remain at or under 17 MW of power, which is the level that was previously evaluated in the CRT EIR and approved. The proposed NERSC-9 HPC system would then be installed in Building 59, but it would not be phased in during simultaneous operation of NERSC-8 (or any other previously operating high-performance computing system). This would allow Building 59's full power and cooling capacity to be devoted to NERSC-9 over its operating lifetime.

The NERSC program is committed to providing seamless computational service to LBNL and DOE's HPC users. An interruption of several weeks or months needed to deactivate an older HPC system and to then ramp up a new HPC system would not meet the program's needs or the project key objective of providing simultaneous operation of NERSC HPC systems. Researchers all over the world who rely on NERSC's continual services would be impacted. For these reasons, this alternative was considered infeasible and was not evaluated in detail in this Draft Focused EIR.

### ***Cloud Based Computing Services***

Under this alternative, instead of installing a new high-performance computing system, UC LBNL would use remote "cloud" based computing services to satisfy DOE's scientific computational needs. Although this would avoid direct environmental impacts at the LBNL hill site, there is no current cloud computing resource that provides adequate computing capabilities for large-scale scientific simulations. Furthermore, technology does not yet exist that would provide band-width data access speed sufficient to meet LBNL's current and future demand for high-performance computation. For these reasons, this alternative was considered not feasible and was not evaluated in detail in this Draft Focused EIR.

## 5.2.2 Alternatives Considered in Detail

As noted earlier in this section, the proposed project would result in environmental impacts that would be less than significant. However, because the proposed project involves a substantial increase in the amount of electrical power that would be used in Building 59 and associated GHG emissions, the focus of this alternatives analysis is on the ability of the alternatives presented below to minimize the increase in the electrical demand for Building 59, and thereby further reduce the project's less than significant GHG and energy impacts.

### *Alternative 1: No Project Alternative*

CEQA requires that a "No Project" alternative be considered. A No Project alternative is required to describe the consequences of not approving and implementing a proposed project. The current NERSC-7 system would not be replaced but would continue to operate, as would the recently installed and fully functional NERSC-8. No upgrades to the building systems would be made and the electricity use in Building 59 would remain at the current peak level of about 9 MW. A previously approved fifth cooling tower would be installed.

Given that the computational capabilities of the HPC systems in Building 59 would remain largely as they are under existing conditions, researchers who require greater computing power and/or speed would need to run their programs at other less energy efficient facilities. These researchers have exhibited continually increasing needs for computational resources. Therefore under this alternative, the usage of HPCs at other national and international laboratories would increase, with a greater increase in energy use at those facilities in comparison to the energy use if the computers were located within Building 59 at LBNL.

### *Relationship to Project Objectives*

The No Project Alternative would not achieve any of the project objectives.

### *Comparative Analysis of Impacts*

#### **Greenhouse Gas Emissions**

Under the No Project Alternative, there would be no increase in GHG emissions compared to existing conditions because there would be no new construction and no increase in electricity consumption or water consumption associated with Building 59 compared to existing conditions. With respect to plans, policies, and regulations for minimizing GHG emissions, this alternative would not conflict with such

plans because it would not result in any new GHG emissions. There would be no impacts related to GHG emissions. The proposed project's significant GHG impact would be avoided.

### **Tribal Cultural Resources**

Under the No Project Alternative, no improvements would be constructed, and there would be no potential to affect TCRs. The proposed project's less than significant impact on TCRs would be avoided.

### **Energy**

Under the No Project Alternative, NERSC-9 would not be installed and NERSC-7 would continue to be used along with NERSC-8. Therefore instead of up to 22.1 MW of electrical power at peak, about 9 MW would be used in Building 59 at peak (the corresponding average electricity use would be 7.5 MW for the No Project Alternative compared to 18.8 MW for the proposed project). Although NERSC-7 is a less energy-efficient HPC system compared to NERSC-9, overall on average, about 60 percent less energy would be used under this alternative. The impacts related to energy resources of this alternative would be less than the impacts of the proposed project.

### ***Alternative 2: Modified NERSC-9 Alternative***

Under the Modified NERSC-9 Alternative, previously approved building system upgrades would be implemented, including installation of a fifth cooling tower and additional substations so that Building 59 would be set up to operate at up to 17 MW of power. Under this alternative, the NERSC-8 system would operate at full utilization and NERSC-7 would be removed and replaced with a new high-performance computing system that could operate within the constraints of 17 MW of power for the entire building. Although this HPC system ("modified NERSC-9") would not match the computational capabilities of the proposed NERSC-9, it would be newer technology than NERSC-7 and therefore would provide improved computational capabilities and better energy efficiency compared to the No Project Alternative, described above.

### ***Relationship to Project Objectives***

This alternative would achieve some of the project objectives, but would not allow NERSC-9 to function at its full potential and efficiency.

## *Comparative Analysis of Impacts*

### **Greenhouse Gas Emissions**

GHG emissions from construction activities under the Modified NERSC-9 Alternative would be generally comparable to or slightly lower than under the proposed project since additional equipment and a new HPC would similarly be installed. As with the proposed project, the impact of the construction-phase emissions of this alternative would be less than significant.

This alternative would result in the generation of increased GHG emissions from the operation of Building 59 because instead of a maximum electricity use of about 9 MW, which is the current peak consumption level, this alternative would involve up to 17 MW. The increase in GHG emissions under this alternative would exceed the BAAQMD threshold of 1,100 MTCO<sub>2e</sub>/year, and this alternative would result in a significant GHG emissions impact. However, the magnitude of this significant impact would be lower by about 23 percent compared to the proposed project. The same type of mitigation that is proposed for the NERC-9 project would also be required for this project. With respect to conflict with plans, policies, and regulations for minimizing GHG emissions, this alternative would be similar to the proposed project. Overall, this alternative would result in slightly decreased GHG impacts as compared to the proposed project.

### **Tribal Cultural Resources**

Under the Modified NERSC-9 Alternative, the previously approved building system upgrades would be made and a modified NERSC-9 would be installed. Similar to the proposed project, this alternative does not involve the construction of new buildings or any major ground disturbing activities, although some minor ground disturbance associated with the use of a crane may occur during the emplacement of the new cooling tower. As noted in **Section 4.2**, no TCRs are present in the area, and the tribes consulted pursuant to AB 52 have not expressed any concern regarding the project. Furthermore, **LRDP Mitigation Measure CUL-1** and **LRDP Mitigation Measure CUL-3** would be implemented to ensure that any resources encountered would not be adversely affected. Therefore, as with the proposed project, impacts to TCRs under this alternative would also be less than significant.

### **Energy**

Under this alternative, a modified NERSC-9 would be installed and system upgrades would occur but the peak power usage of Building 59 would remain at or below 17 MW, lower than the peak energy use of 22.1 MW associated with the proposed project. The energy impact of this alternative would be greater

than the impact described above for the No Project Alternative but less than the energy impact of the proposed project. As with the proposed project, the impact would be less than significant.

### 5.3 ENVIRONMENTALLY SUPERIOR ALTERNATIVE

**Table 5.0-1** presents a summary comparison of the alternatives with the proposed project with the purpose of highlighting whether the alternatives would result in similar, greater, or lesser environmental impacts than the proposed project.

The No Project Alternative would avoid the environmental impacts of the proposed project. This alternative would therefore be the environmentally superior alternative. It would, however, not meet any of the proposed project's objectives.

If the No Project Alternative is the environmentally superior alternative, State *CEQA Guidelines* Section 15126(d) (2) requires that an EIR identify an environmentally superior alternative from amongst the other alternatives evaluated in the EIR.

The Modified NERSC-9 (Alternative 2) would have lesser GHG and energy impacts than the proposed project and would be considered the environmentally superior alternative. While it would provide more computation resources, it would still not meet the project's objectives.

**Table 5.0-1  
Summary Comparison of NERSC-9 Project Alternatives**

NERSC-9 Project Impact		Proposed NERSC-9 Project (Before Mitigation)	No Project Alternative	Modified NERSC-9 Alternative
<b>4.1 Greenhouse Gas Emissions</b>				
<b>NERSC Impact GHG-1</b>	The proposed project would generate greenhouse gas emissions, either directly or indirectly, that could have a significant impact on the environment.	Significant	No Impact  Less than the proposed project	Significant  Reduced impact compared to proposed project
<b>NERSC Impact GHG-2</b>	Operation of the proposed project could conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions.	Significant	Less than significant  Less than the proposed project	Significant  Reduced impact compared to proposed project

<b>4.2 Tribal Cultural Resources</b>				
<b>NERSC Impact TCR-1</b>	The proposed project would not cause a substantial adverse change in the significance of a Tribal Cultural Resource as defined in Section 21074.	Less than significant	Less than significant  Similar to the proposed project	Less than significant  Similar to the proposed project
<b>4.3 Energy</b>				
<b>NERSC Impact EN-1</b>	Construction and operation of the proposed project would increase the use of energy resources on the project site but would not result in wasteful, inefficient or unnecessary consumption of energy resources.	Less than significant	Less than significant  Less energy efficient than the proposed project	Less than significant  Similar to the proposed project in energy efficiency

## 6.0 OTHER CEQA CONSIDERATIONS

---

Section 15126 of the *California Environmental Quality Act (CEQA) Guidelines* states that an environmental impact report (EIR) must include a discussion of the following topics:

- Significant environmental effects which cannot be avoided if the proposed project is implemented
- Growth-inducing impacts of the proposed project

In addition, Section 15128 of the *State CEQA Guidelines* requires a brief statement of the reasons that various possible effects of a project have been determined not to be significant and therefore, are not evaluated in the EIR.

The following sections address each of these types of impacts based on the analyses included in **Section 4.0, Environmental Setting, Impacts, and Mitigation Measures**.

### 6.1 SIGNIFICANT UNAVOIDABLE EFFECTS

As detailed in **Section 4.0**, with mitigation, implementation of the NERSC-9 project would not result in any significant and unavoidable impacts.

### 6.2 GROWTH-INDUCING IMPACTS

This section evaluates the potential for growth inducement as a result of the proposed project implementation. Section 15126.2(d) of the *State CEQA Guidelines* requires that an EIR include a discussion of the potential for a proposed project to foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment.

The *State CEQA Guidelines* do not provide specific criteria for evaluating growth inducement and state that it must not be assumed that growth in an area is necessarily beneficial, detrimental, or of little significance to the environment. Growth inducement is generally not quantified, but is instead evaluated as either occurring, or not occurring, with implementation of a project. The identification of growth-inducing impacts is generally informational, and mitigation of growth inducement is not required by CEQA. It must be emphasized that the *State CEQA Guidelines* require that an EIR to “discuss the ways” a project could be growth inducing and to “discuss the characteristics of some projects that may encourage...activities that could significantly affect the environment.” However, the *State CEQA Guidelines* do not require that an EIR predict or speculate specifically where such growth would occur, in what form it would occur, or when it would occur.

For the purposes of this analysis, the proposed project would be considered growth inducing if it meets either of the following criteria:

- The project removes an obstacle to population growth (for example, through the expansion of public services or utilities into an area that does not presently receive these services), or through the provision of new access to an area, or a change in a restrictive zoning or General Plan land use designation.
- The project causes economic expansion and population growth through employment expansion, and/or the construction of new housing.

Generally, growth-inducing projects are either located in isolated, undeveloped, or underdeveloped areas, necessitating the extension of major infrastructure such as sewer and water facilities or roadways, or are projects that encourage premature or unplanned growth. An evaluation of the NERSC-9 project and how it is related to these growth-inducing criteria is provided below.

### **Removal of an Obstacle to Population Growth**

Population growth in an area may result from the removal of physical impediments. This could include non-existent or inadequate access to an area, a lack of essential public services and utilities (e.g., water supply), or restrictions to growth, as well as the removal of planning impediments resulting from land use plans and policies, including restrictive zoning and/or general plan designations.

The NERSC-9 project is not expected to remove any obstacle to growth. The proposed project site is located on the LBNL hill site, which is already fully served by infrastructure, including utilities, public services and pedestrian and vehicular access. As described in the Initial Study prepared for this EIR, project implementation would not require an expansion of infrastructure facilities that would provide capacity for future projects surrounding the project site. These infrastructure facilities include the East Bay Municipal Utility District's (EBMUD) wastewater treatment or conveyance facilities, water supply, and solid waste facilities. The proposed utilities and infrastructure upgrades would serve only the project and the existing building; further, there would be no increase in the number of persons working in or conducting research in Building 59 as a result of the proposed project. Therefore, the utility improvements included in the proposed project would not cause any growth in the LBNL hill site population. Implementation of the project would not directly remove an obstacle to population growth.

### **Direct and Indirect Population and Employment Growth**

The existing Building 59 accommodates approximately 300 employees, of which approximately 225 are LBNL staff and 75 are UC Berkeley staff and students. As the proposed project involves an in-kind replacement of an older high-performance computing system, there would be no increase in the number

of persons working in or conducting research in Building 59. Therefore, the proposed project would not induce substantial population growth in the City of Berkeley or elsewhere in the region, either directly or indirectly.

The proposed project would generate a small number of short-term construction jobs that would be filled by the labor force available in the greater Bay Area. Construction workers are generally dispersed throughout the region and are expected to commute to the project site from their existing residences and are not expected to relocate into any community in the Bay Area in order to work on the project's short-term construction activities. Therefore the project's construction activities would not induce an increase in the population of any Bay Area community. In summary, the proposed project would not result in growth inducing impacts.

### 6.3 EFFECTS FOUND NOT TO BE SIGNIFICANT

Section 15128 of the *State CEQA Guidelines* requires an EIR to briefly describe any potential environmental effects that were determined not to be significant during the Initial Study and EIR scoping process and were, therefore, not discussed in detail in the Focused EIR. Following is an examination of the proposed project's less-than-significant potential effects on aesthetics, air quality, agricultural resources, biological resources, cultural resources, geology and soils, hazards and hazardous materials, hydrology and water quality, land use and planning, mineral resources, noise, population and housing, public services, recreation, transportation and traffic, and utilities and service systems, including energy. Other impacts found to be less than significant in the EIR are discussed in detail in **Section 4.0, Environmental Setting, Impacts, and Mitigation Measures**, and summarized in **Section 2.0, Executive Summary**.

#### Aesthetics

*Would the project:*

- Have a substantial adverse effect on a scenic vista?
- Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?
- Substantially degrade the existing visual character or quality of the site and its surroundings?
- Create a new source of substantial light or glare, which would adversely affect day or nighttime views in the area?

The proposed project would not involve any exterior building modifications. The majority of the project's physical implementation would involve installation of equipment within the existing Building 59.

Exterior work would involve emplacing up to three cooling towers adjacent to four existing cooling towers on an existing foundation pad. The project would not impact scenic vistas or resources, nor substantially degrade the existing visual character or create a new source of substantial light or glare. Therefore, implementation of the proposed project would not significantly impact aesthetics or nearby visual resources.

## **Agricultural Resources**

*Would the project:*

- Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?
- Conflict with existing zoning for agricultural use, or a Williamson Act contract?
- Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)) or timberland (as defined in Public Resources Code section 4526)?
- Result in the loss of forest land or conversion of forest land to non-forest use?
- Involve other changes in the existing environment, which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?

The project site is located in a developed area. There are no farmlands, agricultural uses, Williamson Act Contracts, or forest lands within its boundaries. The project would not result in the conversion of farmland to a non-agricultural use or the conversion of forest land to non-forest use; there would be no agricultural or forest land impacts.

## **Air Quality**

*Would the project:*

- Conflict with or obstruct implementation of the applicable air quality plan?
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation?
- 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 (including releasing emissions, which exceed quantitative thresholds for ozone precursors)?
- Expose sensitive receptors to substantial pollutant concentrations?

- Create objectionable odors affecting a substantial number of people?
- Expose people to substantial levels of toxic air contaminants (TACs), such that the exposure could cause an incremental human cancer risk greater than 10 in one million or exceed a hazard index of one for the maximally exposed individual?

The project site is located in the San Francisco Bay Area Air Basin (SFBAAB), which is currently designated a non-attainment area for PM<sub>10</sub>, PM<sub>2.5</sub>, and ozone. Project construction activities would be limited to installing equipment inside Building 59 or on existing pads and paved areas adjacent to the building. No grading of undeveloped land or major exterior construction would be involved. Therefore, construction emissions would be minimal and would not violate any air quality standard. Furthermore, the project would implement LRDP Mitigation Measures AQ-1a and AQ-1b.

Installation of NERSC-9 and accompanying equipment would not significantly add to short- and long-term emissions of criteria air pollutants from mobile and stationary sources. This includes PM<sub>10</sub>, PM<sub>2.5</sub>, and the ozone precursors ROG and NO<sub>x</sub> for which the air basin is in nonattainment. The proposed project would not expose sensitive receptors to substantial CO concentrations as the proposed project would not add any new vehicle trips. There is no history of odor complaints from the LBNL hill site and the proposed project is not expected to create nuisance or objectionable odors that would affect on-site or off-site receptors. The project would not generate toxic air contaminants that would violate applicable standards or that would affect sensitive receptors (e.g., those located approximately 685 to 700 feet to the southwest and west of the project site).

Consequently, implementation of the proposed project would result in less than significant air quality impacts.

## Biological Resources

*Would the project:*

- 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 Game or U.S. Fish and Wildlife Service?
- 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 Game or U.S. Fish and Wildlife Service?
- Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

- 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?
- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

Due to the project site's history of disturbance and the absence of habitat, implementation of the proposed project would not have direct or indirect adverse effects on any rare, threatened, or endangered species. There are no existing drainages, jurisdictional wetlands, water courses, or other sensitive communities on the NERSC-9 project site. The proposed project would not conflict with any plans, polices, or ordinance protecting biological resources. Further, the project would implement LRDP Mitigation Measures BIO-1a, BIO-1b, and Mitigation Measures BIO-5c through 5f and project construction crews who might work in unpaved areas as required for crane placement would undergo required Alameda whipsnake awareness training. Therefore, implementation of the proposed project would result in less than significant impacts on biological resources.

## Cultural Resources

*Would the project:*

- Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?
- Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?
- Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?
- Disturb any human remains, including those interred outside of formal cemeteries?

The proposed project would not demolish or alter existing buildings, and there are no known or suspected subsurface cultural resources in the project site vicinity. With no project-related excavation, there would be no reasonable potential that undiscovered archaeological resources or human remains could be discovered. Moreover, no cultural resources were encountered at the project site during the construction of Building 59. Also, during the course of development at LBNL, including at the project site, extensive excavation for buildings and infrastructure had not revealed the presence of unique paleontological or geologic resources. In any event, the project would implement LRDP Mitigation

Measures CUL-3, and CUL-4, which would ensure the protection, proper evaluation, and preservation of such resources should any be encountered. Therefore, implementation of the proposed project would result in less than significant impacts to cultural resources.

## Geology and Soils

*Would the project:*

- Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving
  - 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? Refer to Division of Mines and Geology Special Publication 42.
  - Strong seismic ground shaking?
  - Seismic-related ground failure, including liquefaction?
  - Landslides?
- Result in substantial soil erosion or the loss of topsoil?
- 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?
- Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?
- Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?

Although Building 59 falls within the Hayward Fault zone, as defined by the Alquist-Priolo Earthquake Fault Zoning Map, the site of the building does not contain any active faults, and fault rupture is not a concern. The entire LBNL hill site is likely to experience strong ground shaking during large-magnitude earthquakes in the Bay Area region, but Building 59 was designed and constructed in accordance with recommendations of a site-specific geotechnical investigation. In this way, impacts related to seismic-related ground failure and damage were addressed prior to and during the construction of the building. The proposed project would install the NERSC-9 supercomputing system and associated equipment in Building 59 and adjacent exterior cooling tower enclosure. No new buildings are planned. Thus, there would be no impacts related to seismic-related ground failure.

There would be no construction activities that would increase rates of erosion. All installation of NERSC-9 and related equipment would be on paved or heavily disturbed, compacted areas; no excavation or major soil disturbances would occur.

Building 59, where the proposed project would be located, was designed in accordance with the site-specific geotechnical investigation and is in compliance with building standards and codes. Therefore, no impacts related to ground instability or location on expansive soils would occur.

The project site is currently developed and sewers are available for the disposal of wastewater. Therefore, implementation of the project would not require the construction of septic tanks for wastewater disposal. Implementation of the proposed project would result in less than significant impacts related to geology and soils.

## **Hazards and Hazardous Materials**

*Would the project:*

- Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?
- Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?
- Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?
- Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?
- For a project located within an airport land use plan or, where such plan has not been adopted, within 2 miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?
- For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?
- Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?
- Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wild lands?

Research-related chemicals are not used in Building 59. Any wastes generated in Building 59 following the installation of NERSC-9 would be similar to current wastes that include only small amounts of office-related chemicals and chemicals used in building machinery and cooling systems. A new above-ground storage tank would be secured with spill-prevention and secondary containment systems to prevent any accidental, uncontrolled releases; this protection system would be regularly inspected by the jurisdictional fire marshal. Therefore, the fuel tank would not create a significant hazard. There are no public or private elementary, middle, or high schools within one-quarter mile of the LBNL hill site. Building 59 is not located on any listed hazardous materials sites. The project site is not located in the vicinity of a public airport or private airstrip. The project would not impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan. The project would not expose any new structures or persons to a significant risk from wildland fires.

Therefore, implementation of the proposed project would result in less than significant impacts related to hazards and hazardous materials.

## Hydrology and Water Quality

*Would the project:*

- Violate any water quality standards or waste discharge requirements?
- Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner, that would result in substantial erosion or siltation on or off site?
- Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner, that would result in flooding on or off site?
- 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?
- Otherwise substantially degrade water quality?
- Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?
- Place within a 100-year flood hazard area structures, which would impede or redirect flood flows?

- Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?
- Inundation by seiche, tsunami, or mudflow?

The proposed project would not change the amount of impervious surfaces associated with the project site and would not result in an increase in runoff (or a reduction in infiltration) compared to existing conditions. Off-site flooding or hydromodification-related erosion impacts would not occur. There would be no building construction or ground disturbing activities that would increase rates of erosion. The proposed project would not require any groundwater withdrawal. Recharge of the groundwater table would not be affected by implementation of the proposed project because the project would not add any new impervious surfaces to the site. No additional structures would be constructed and no grading or excavation would occur. The project site is not located within a flood zone, and there is no potential for flooding from a seiche or tsunami, and given the developed nature of the project vicinity, there is minimal potential for mudflows.

Therefore, implementation of the proposed project would result in less than significant impacts related to hydrology and water quality.

## Land Use and Planning

*Would the project:*

- Physically divide an established community?
- Conflict with applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?
- Conflict with any applicable habitat conservation plan or natural community conservation plan?

The project site is located in an area of the LBNL hill site in an area currently developed with institutional research and support uses. As discussed in the NERSC-9 Initial Study, the proposed project is consistent with the projections, land use designations, and objectives of the 2006 LBNL LRDP, which is the project's applicable land use plan. The project site is not within the purview of any habitat conservation plan or natural community conservation plan, nor would the proposed activity or development affect any area so designated, directly or indirectly. Therefore, implementation of the proposed project would not cause any land use or planning related impacts.

## Mineral Resources

*Would the project:*

- Result in the loss of availability of a known mineral resource that would be of future value to the region and the residents of the state?
- 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?

According to the State of California Department of Mines and Geology, Mineral Resource Zones and Resource Sectors map, the project site is located in an area designated as MRZ-1. This designation refers to an area “where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.” Therefore, implementation of the proposed project would not impact mineral resources.

## Noise

*Would the project result in:*

- Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?
- Exposure of persons to or generation of excessive ground borne vibration or ground borne noise levels?
- A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?
- For a project located within an airport land use plan or, where such a plan has not been adopted, within 2 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?
- For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

The proposed project would not result in significant increases or changes in noise levels from sources such as construction activities, operation of buildings and infrastructure, and increased vehicular traffic. Furthermore, LRDP Mitigation Measure Noise-4, which is a part of the proposed project and would be implemented, requires that noise from stationary sources such as cooling towers meet the Berkeley noise ordinance limits. The project site is not located within an airport land use plan, or within two miles of a

public airport or private airstrip. Therefore, implementation of the proposed project would result in less than significant noise impacts.

## Population and Housing

*Would the project:*

- Induce substantial 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)?
- Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?
- Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?

The proposed project does not include residential uses, and would not require extension of roads or other infrastructure that could indirectly induce substantial population growth. The LBNL site does not include housing or long-term residential uses, and no housing would be displaced with implementation of the proposed project. Therefore, implementation of the proposed project would not impact population and housing.

## Public Services

*Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, 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?
- Other public facilities?

The incremental increase in demand for fire and police services would not result in the need for new facilities, staff, or equipment to provide adequate fire and police protection. There would no new households associated with the proposed project, and therefore would be no increase in the demand for

school, park, or other public facilities in the Bay Area communities. Thus, implementation of the proposed project would not impact public services.

## Recreation

*Would the project:*

- 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?
- Include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment?

The proposed project would not include recreational facilities. Further, there would be no population increase associated with the proposed project. Therefore, there would be no increase in demand for recreational facilities that could cause physical deterioration of recreational facilities as a result of the proposed project, and there would be no impact to recreational facilities.

## Transportation/Traffic

*Would the project:*

- Conflict with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?
- Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?
- Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?
- Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?
- Result in inadequate emergency access?
- Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?

The proposed project would not increase vehicle trips to the project area since no additional buildings or persons would be added. Construction would result in a small temporary increase in traffic associated

with equipment deliveries, and construction worker commute trips. However, the 2006 LRDP EIR identified existing construction management “best practices” routinely undertaken at LBNL to limit otherwise potentially adverse construction-related impacts and set these forth as LBNL Best Practices 6a through 6c, which would be implemented during all phases of project construction. LBNL also manages all construction-related truck trips through a construction trip coordinator to ensure that all heavy truck trips entering or leaving the Berkeley Lab hill site do not exceed impact thresholds. The proposed project would not affect the air traffic patterns at any of the regional airports. The proposed project would not change on-site circulation, surrounding roadways and intersections or emergency access. The project would not impact public transit, bicycle, or pedestrian facilities. Therefore, implementation of the proposed project would result in less than significant impacts related to transportation or traffic.

## Utilities and Service Systems

*Would the project:*

- Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?
- Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?
- Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?
- Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new and expanded entitlements needed?
- Result in the need for increased chilled water or steam generation capacity or major distribution improvements?
- 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?
- Be served by a landfill with sufficient permitted capacity to accommodate the project’s solid waste disposal needs?
- Comply with federal, state, and local statutes and regulations related to solid waste?
- Require or result in the construction or expansion of electrical or natural gas facilities which would cause significant environmental impacts?
- Require or result in the construction or expansion of telecommunication facilities, which would cause significant environmental impacts?

The project would not require infrastructure improvements for wastewater service at LBNL since there would be no increase in building space or population. Increased water use would not result in increased sanitary sewer flow as the cooling towers consume water through evaporation and do not create effluent. Therefore, the NERSC-9 project would not contribute to the need for additional wastewater treatment facilities. The proposed project would not increase the amount of impervious area on the project site; there would be no increase in runoff and no impact on storm water drainage facilities.

There would be sufficient water supplies available to serve the project from existing entitlements and resources. The proposed project would increase the demand for water used for cooling by an estimated 40 million gallons/year (mgy) over the 2016 water consumption level. Total Building 59 water use is projected to increase to approximately 55 mgy, and overall LBNL water use to approximately 92 mgy by 2020. This is consistent with long-range planning coordination between UC LBNL and the East Bay Municipal Utility District (EBMUD) and is within LBNL's water supply assessment.

Implementation of the proposed project would result in an increased demand for cooling water. This demand would be met by the proposed installation of additional cooling towers and cooling systems.

The proposed project would not result in an increased waste stream since no new personnel or building space would be added to the project site.

Operation of the proposed project would draw upon relatively large amounts of electrical energy to power the existing and proposed high-performance computers and their support systems. However, LBNL works closely with its energy providers (WAPA for energy supply and PG&E for distribution) to forecast future aggregate needs. It is anticipated that, by its fully operational date of 2020, the proposed project would not require the construction or expansion of electrical or natural gas facilities that would cause significant impacts.

The proposed project would not affect telecommunication facilities and no impact would occur.

Therefore, implementation of the proposed project would result in less than significant impacts to utilities or service systems.

## 7.0 REPORT PREPARATION

---

### 7.1 LEAD AGENCY

#### **Lawrence Berkeley National Laboratory**

Jeff Philliber, LBNL Chief Environmental Planner  
Sheree Swanson, Project Director, Facilities Division  
James Haslam, Project Manager, Facilities Division  
John Elliott, LBNL Chief Sustainability Officer  
Deirdre Carter, LBNL Energy and Sustainability Manager  
Nancy Ware, LBNL Senior Counsel

### 7.2 EIR CONSULTANT

#### **Impact Sciences, Inc.**

Shabnam Barati, Managing Principal  
Angela Pan, Project Planner

### 7.3 TECHNICAL CONSULTANTS

#### **Illingworth & Rodkin, Inc.**

James Reyff, Principal

# **Supplement to the 2006 LBNL LRDP EIR**

**With Respect to Greenhouse Gas Emissions and Energy Impacts**

**SCH # 2000102046**

**Prepared for:**

University of California, Lawrence Berkeley National Laboratory  
One Cyclotron Road  
Berkeley, California 94720

**Prepared by:**

Impact Sciences, Inc.  
505 14<sup>th</sup> Street, Suite 1230  
Oakland, California 94612

**October 2016**

# SUPPLEMENT TO THE 2006 LBNL LRDP EIR

---

## A. INTRODUCTION

Lawrence Berkeley National Laboratory (“LBNL” or “Berkeley Lab”) is a federal facility managed and operated by the University of California under a U.S. Department of Energy (“DOE”)/UC contract. The research, service, and training work conducted at LBNL is within the University’s mission. The LBNL main site (referred to as the “hill site” in this EIR) is located on land owned by The Regents of the University of California. The federal government leases land at the hill site from The Regents and constructs federally owned buildings on the leased lands. The University is a Management and Operating (M&O) contractor of LBNL as defined under DOE Acquisition Regulations. As Berkeley Lab’s M&O Contractor, the University is responsible for providing the intellectual leadership and management expertise necessary and appropriate to manage, operate, and staff LBNL; accomplish the missions and activities assigned and funded by DOE to Berkeley Lab; administer the U.S. DOE/UC Prime Contract; and provide University oversight of Berkeley Lab’s contract compliance and performance.

Because The Regents may re-acquire full responsibility for the lands should the federal government close LBNL, and for effective ongoing management, The Regents hold themselves accountable for the stewardship of LBNL within the State of California. The Regents require and approve the University-defined Long Range Development Plan (LRDP) for LBNL and require that its approval be consistent with the University’s policy that an LRDP undergo CEQA review and approval. Therefore, in 2003, the University of California, Lawrence Berkeley National Laboratory (“UC LBNL”) commenced the preparation of a new LRDP for LBNL. The Regents certified the 2006 LRDP EIR (State Clearinghouse No. 2000102046) and adopted the 2006 LRDP in July 2007. The 2006 LRDP is a comprehensive land use plan to guide physical development at LBNL through 2025.

The 2006 LRDP Final EIR included an evaluation of the potential impacts from greenhouse gas (GHG) emissions that would be generated from the implementation of the 2006 LRDP. The Final EIR noted that the LRDP included numerous provisions that would substantially lessen LBNL’s contribution to climate change. These provisions included that the Lab would institute emission strategies through continuation of existing LBNL programs that reduce GHG emissions, comply with the UC Policy on Sustainable Practices, and comply with existing and future emission reduction strategies set forth by the State of California. Accordingly, the 2006 LRDP Final EIR concluded that Berkeley Lab’s contribution to GHG emissions from implementation of the LRDP would not be cumulatively considerable and the impact would therefore be less than significant.

At the time of the 2006 LRDP EIR analysis, the requirements imposed by Executive Order S-3-05 (which was signed in 2005) and AB 32 (which was signed in 2006) were still unclear and there was limited state guidance as to estimating and evaluating a project's GHG emissions. Neither the Bay Area Air Quality Management District ("BAAQMD") nor any other agency had, as of 2007, put forth any guidance on the evaluation of impacts from a project's GHG emissions, including significance criteria or methodologies for estimating a project's GHG emissions. However, since the certification of the 2006 LRDP EIR, a substantial amount of guidance related to GHG impact analysis has been put forth by state and local agencies. This includes, among other materials:

Guidance provided by the BAAQMD;

Changes to the CEQA Appendix G checklist which require a lead agency to evaluate the impact from the direct and indirect GHG emissions associated with a proposed project, as well as the project's potential to conflict with plans, policies, and regulations for reducing GHG emissions; and

Executive Order B-3-15 and SB 32 both of which established a mid-term (2030) GHG reduction target for the state.

In view of this information, UC LBNL finds this opportunity to reevaluate the impact from GHG emissions that would result from the implementation of the 2006 LRDP.

An updated analysis was undertaken, as described in further detail in **Section B.2** below, which concluded that GHG emissions from LBNL growth under the 2006 LRDP would exceed the applicable thresholds. However, with the implementation of a mitigation measure set forth below, Berkeley Lab's GHG emissions from the implementation of the 2006 LRDP would be reduced to a level below the applicable threshold, and the impact would be reduced to a less than significant level.

In addition, UC LBNL has determined that on account of the NERSC-9 project, the total projected energy use at LBNL hill site under the LRDP through 2025 would be greater than the energy use previously considered and evaluated in the 2006 LRDP EIR. UC LBNL has prepared an updated energy analysis which is presented in **Section B.3** below.

The 2006 LRDP EIR is hereby amended to include the updated GHG impact consistent with current emissions thresholds and analyses through the year 2025 on a project-specific and cumulative basis, and to include an updated energy analysis. Thus, this document supplements the 2006 LRDP EIR, and the text of the 2006 LRDP EIR as amended is set forth below in **Sections B.1, B.2, and B.3**.

## **B. REVISIONS TO THE LBNL 2006 LRDP EIR**

### **B.1 GHG Impact Analysis in the 2006 LRDP EIR**

The following excerpt presents the GHG impact analysis from Section IV, Comments on the Draft EIR and Responses to Comments, on pages IV-7 to IV-9 of the LBNL 2006 LRDP Final EIR. The text below is replaced in its entirety by the text presented in **Section B.2**, which provides the results of the supplemental analysis of GHG impacts from LBNL growth under the 2006 LRDP.

“Implementation of the 2006 LRDP would contribute to long-term cumulative increases in GHGs as a result of traffic increases (mobile sources) and building heating (area sources), as well as indirectly, through electricity generation. These sources would represent the great majority of GHGs that would be produced in association with the proposed project, because the Lab does not, and would not, emit industrial or agricultural gases, and thus would generate little in the way of GHGs other than carbon dioxide. While certain research activities may incorporate other GHGs, their use typically results in minimal emissions. Moreover, while some refrigeration units at LBNL use a hydrofluorocarbon chemical, such as HFC-134a, this class of chemical is a U.S. EPA-acceptable alternative to the more harmful ozone depleting substances (chlorofluorocarbons) that were banned in the 1990s. The Lab’s refrigeration units are closed-loop systems that do not emit during normal operation. When work is performed on these systems, EPA-certified refrigerant recovery equipment is used, which effectively eliminates emissions.

On-road transportation sources (i.e., automobiles, trucks, and buses), would represent the largest source of GHG emissions, consistent with existing Bay Area and statewide patterns of GHG emissions, as described in the setting. Electricity generation (both from in-state and out-of-state power plants) would be the second largest source of GHG emissions under the proposed 2006 LRDP (although, as noted, some of this would occur outside the Bay Area).

The [LRDP] project’s incremental increases in GHG emissions associated with traffic increases, increased energy demand, and space heating would contribute to regional and global increases in GHG emissions and associated climate change effects. The project would not have a project-specific impact, but will make some contributions to cumulative emissions of greenhouse gasses. Neither the BAAQMD nor any other agency has adopted significance criteria or methodologies for estimating a project’s contribution of GHGs or evaluating its significance. Further, technical reports on climate change conclude that climate models do not yet reflect local land use changes,

so in addition to the lack of regulatory guidance or methodology, there is not yet a scientific basis for quantitatively determining the significance of emissions pursuant to a plan such as an LRDP.<sup>1</sup>

Thus, no quantitative significance determination can be made at this time. Nevertheless, it is clear that GHGs and their contribution to global climate change pose a serious worldwide challenge.

Qualitatively, however, the proposed LRDP includes numerous provisions that will substantially lessen the LBNL's contribution to global climate change. The proposed LRDP would encourage use of transit and alternative transportation modes (such as through implementation of the Lab's Transportation Demand Management Program), which could help reduce transportation-related GHG emissions, relative to what would otherwise occur. New construction at the Lab would so be required to meet California Energy Efficiency Standards in the state Building Code, helping to reduce future energy demand as well as reduce the project's contribution to regional GHG emissions.

Moreover, subsequent individual projects under the 2006 LRDP would implement GHG emission reduction strategies through compliance with the UC Policy on Sustainable Practices and the Guidelines for implementation of this policy. Emission reduction strategies instituted under this policy include practices related to green building design, clean energy, climate protection, transportation, operations, recycling and waste management, and environmentally preferable procurement.<sup>2</sup> The Lab would also expect reductions in GHG emissions from any regulatory requirements affecting existing sources as well. Because projects would implement emissions reduction, implementation of the LRDP would not interfere with implementation of AB 32 and Berkeley Lab's emission reduction strategies may assist in meeting AB 32 goals, once ARB adopts regulations for achieving those goals.

---

<sup>1</sup> e.g., National Research Council, *Radiative Forcing of Climate Change: Expanding the Concept and Addressing Uncertainties* (Washington, D.C., 2005) p. 125; Intergovernmental Panel on Climate Change, *IPCC Meeting on Current Understanding of the Processes Affecting Terrestrial Carbon Stocks and Human Influences Upon Them* (Geneva 2003) pp. 2-3; see also, *Pacific Institute, Climate Change and California Water Resources: A Survey and Summary of the Literature* (California Energy Commission, Sacramento 2003) p. 5.

<sup>2</sup> The UC Policy on Sustainable Practices is periodically updated and expanded. The full text of the current policy can be found at <http://policy.ucop.edu/doc/3100155/> or obtained through the University wide Policy Office, Office of the President, 1111 Franklin Street, 12th Floor, Oakland, CA 94607.

In summary, implementation of the 2006 LRDP would result in increased GHG emissions associated with construction and operation, particularly from the operation of vehicles. However, the Lab would institute emission reduction strategies through continuation of existing programs that reduce GHG emissions, compliance with the UC Policy on Sustainable Practices, and compliance with existing and future emission reduction strategies set forth by the State of California. Together, these emission reduction practices would substantially lessen LBNL's contribution to global climate change. Thus, the Lab's contribution to GHG emissions from buildout under the 2006 LRDP would not be cumulatively considerable, and the cumulative impact of the project would therefore be less than significant."

## **B.2 Updated LRDP GHG Impact Analysis**

### **ENVIRONMENTAL SETTING**

Sections 4.1.2 through 4.1.3.5 of the Draft Focused EIR for the Building 59 Upgrade & Installation and Operation of NERSC-9 project (hereinafter referred to as the "NERSC-9 project"), which are incorporated by reference, present background information regarding the impacts of GHG emissions on global climate; the federal, state, and local programs that have been developed to reduce GHG emissions; and LBNL GHG emissions. The discussion on LBNL GHG emissions is repeated below.

#### **LBNL GHG Emissions**

Berkeley Lab conducts a wide variety of unclassified scientific research for the US Department of Energy (DOE) Office of Science. Berkeley Lab has approximately 3,200 employees and several thousand affiliates, annual facility users, and visiting researchers. Organized into six research areas (Computing Sciences, Biosciences, Environmental and Earth Sciences, Energy Sciences, Physical Sciences, and Energy Technologies), Berkeley Lab addresses the world's most urgent scientific challenges, advancing sustainable energy, protecting human health, creating new materials, and revealing the origin and fate of the universe. Berkeley Lab includes approximately 2.3 million gross square feet of research and support space located at its main 200-acre site in the hills above UC Berkeley and in leased laboratory and office space at other locations in the San Francisco Bay Area.

Berkeley Lab strives to extend its leadership in sustainability-related research to the sustainability of its operations. Sustainable Berkeley Lab, the team leading these efforts at the Lab, works collaboratively with partners across LBNL to reduce the Lab's environmental footprint, engage research to meet sustainability challenges, and improve institutional practices. With this approach, Berkeley Lab engages broadly to advance sustainability while considering environmental, social and institutional, and economic factors.

Berkeley Lab's reported GHG emissions and GHG emissions reduction efforts are described below. The Lab prepares an annual Site Sustainability Plan (SSP). Performance data are reported in the latest SSP for fiscal year 2015 (FY 2015), covering the period from October 2014 through September 2015. The SSP also includes a summary of sustainability accomplishments and initiatives underway, plans for the upcoming year to support federal sustainability goals, and responses to several additional sustainability-related information requests from DOE.

### *Scope 1 and Scope 2 Emissions*

Berkeley Lab's latest reported combined Scope 1 and 2 GHG emissions from the LBNL hill site and off-site facilities are presented in **Table S-1 LBNL Combined Scope 1 and Scope 2 GHG Emissions**, below. As the table shows, the 2015 emissions were 13 percent lower than the baseline emissions in 2008.

The last column in **Table S-1** reports data for the LBNL hill site only (i.e., excludes LBNL's off-site facilities). To estimate these values, electricity and gas emissions were split between the hill site and off-site facilities using actual bill data. Emissions from fuel use in fleet and fugitive gases were scaled proportionally between the hill site and off-site facilities using the hill site adjusted daily population (ADP) and off-site ADP.<sup>1</sup> All LBNL renewable energy credits acquired by LBNL in FY 2015 were attributed solely to the hill site.

**Table S-1**  
**LBNL Combined Scope 1 and Scope 2 GHG Emissions<sup>a</sup>**

<b>Scope 1 &amp; Scope 2 Emissions Category</b>	<b>Baseline FY 2008<sup>b</sup></b>	<b>Actual FY 2013</b>	<b>Actual FY 2014</b>	<b>Actual FY 2015</b>	<b>FY2015 LBNL Hill Site Only<sup>b</sup></b>
Electricity	35,170	39,695	38,503	40,974	22,984
Natural Gas Use	9,551	8,994	8,938	8,302	6,551
Fuel Use in Fleet	698	583	164	135	115
Fugitive Emissions	1,022	216	218	65	55
<b>Total Scope 1 &amp; 2 Emissions</b>	<b>46,441</b>	<b>49,488</b>	<b>47,823</b>	<b>49,476</b>	<b>29,705</b>
Renewable Energy Credits	0	(9,039)	(9,895)	(9,249) <sup>c</sup>	(9,249)
<b>Net Scope 1 &amp; 2 Emissions</b>	<b>46,441</b>	<b>40,449</b>	<b>37,928</b>	<b>40,227</b>	<b>20,456</b>
Percent Change from Baseline		-13%	-18%	-13%	

*Source: Lawrence Berkeley National Laboratory 2016 (SSP for FY 2016)*

<sup>1</sup> For example, total FY2015 fugitive gas emissions were 65 MTCO<sub>2e</sub>. In FY2015, 85 percent of employees were located on the hill site and 15 percent were located off site. Thus, 85 percent of the fugitive gas emissions were attributed to the hill site, or 55 MTCO<sub>2e</sub>, and 15 percent to the off-site facilities, or 10 MTCO<sub>2e</sub>.

Scope 1 & Scope 2 Emissions Category	Baseline FY 2008 <sup>b</sup>	Actual FY 2013	Actual FY 2014	Actual FY 2015	FY2015 LBNL Hill Site Only <sup>b</sup>
--------------------------------------	-------------------------------	----------------	----------------	----------------	---

a - All figures represent MTCO<sub>2e</sub>  
 b- For this analysis, FY2015 emissions were split into hill site and offsite.  
 c- All FY2015 LBNL RECs are attributed to the hill site.

To date, Berkeley Lab has pursued a range of energy efficiency projects, installed some small renewable energy projects, purchased renewable energy delivered by the Western Area Power Administration, and purchased renewable energy credits (RECs) to support the goals related to Scope 1 and 2 GHG emissions provided in federal Executive Order 13693. Sustainable Berkeley Lab is working with the Facilities Division to continue to expand a range of energy management, commissioning, and building retrofit activities. Berkeley Lab has also made significant progress in reducing releases of SF<sub>6</sub> from its activities. The Lab also emphasizes very energy efficient new construction and is pursuing a strategy that relocates programs from less energy-efficient buildings into new, more-controllable, energy-efficient buildings over time.

**Scope 3 Emissions**

**Table S-2** presents the LBNL hill site’s reported FY2015 Scope 3 emissions. Similar to Scope 1 fuel use and fugitive emissions, Scope 3 emissions for the hill site were estimated by proportionally scaling between the hill site and off-site facilities using the hill site ADP and off-site ADP. UC LBNL also reports Scope 3 business air travel and Scope 3 business ground travel emissions, which are not included in **Table S-2** as those emissions sources are not typically analyzed under CEQA. In contrast, UC LBNL does not report water supply emissions; however, those emissions are included in **Table S-2 LBNL Hill Site FY2015 Scope 3 Emissions**, since guidance put forth by BAAQMD and CARB state that GHG emissions from supply, treatment, and distribution of water used by a proposed project should be included in the estimated GHG emissions under CEQA.

**Table S-2  
 LBNL Hill Site FY2015 Scope 3 Emissions<sup>a</sup>**

Source	2015 Emissions
Employee Commute	10,002
Water Supply	24 <sup>b</sup>
Off-Site Wastewater Treatment	10
Off-Site Solid Waste Disposal	404

Source	2015 Emissions
--------	----------------

Source: Lawrence Berkeley National Laboratory 2016

*a* - all figures represent MTCO<sub>2e</sub>

*b* - emissions associated with water supply are not reported in the SSP; they were estimated based on the total amount of water used at the Lab in FY2015.

As of FY2015, Berkeley Lab had reduced its transportation-related GHG emissions to 14 percent below the 2008 baseline. Berkeley Lab continues to implement transportation demand programs to minimize commuting emissions. To minimize water use, Berkeley Lab is implementing a series of projects that includes restroom retrofits to reduce water use, elimination of irrigation for landscaping, and metering of cooling towers to detect leaks and optimize maintenance.

## 2006 LRDP IMPACTS AND MITIGATION MEASURES

### Significance Criteria

The impacts related to GHG emissions from the implementation of the 2006 LRDP would be considered significant if they would exceed the following significance criteria, in accordance with Appendix G of the *State CEQA Guidelines*:

- 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 GHGs.

The impact relative to the first criterion above may be evaluated by calculating the direct and indirect GHG emissions from the implementation of the 2006 LRDP and comparing the emissions with the available significance thresholds. As discussed in the NERSC-9 Draft Focused EIR, in 2010, the Bay Area Air Quality Management District (BAAQMD) adopted updated *CEQA Air Quality Guidelines* (BAAQMD Guidelines) that set forth guidance for the evaluation of a project's GHG impact, including significance thresholds and methodologies that may be used by a lead agency in the Bay Area to evaluate GHG impacts of projects and plans. As noted in **Section 4.1.3.4** of the NERSC-9 Draft Focused EIR, due to ongoing litigation the BAAQMD is not recommending that lead agencies use the thresholds in its guidelines. However because the litigation does not relate to the validity of the GHG thresholds, Berkeley Lab has determined that it will continue to use the thresholds and methodology presented in the guidelines. The thresholds are set forth below and used in this EIR.

### ***Threshold for Operational Emissions from Stationary Sources***

BAAQMD Guidelines contain a threshold of 10,000 MTCO<sub>2</sub>e/year that may be used to evaluate the significance of GHG emissions from a stationary source. That threshold is used in the analysis below to evaluate the significance of the stationary source emissions that would result from the implementation of the 2006 LRDP.

### ***Threshold for Operational Emissions from Non-Stationary Sources***

BAAQMD Guidelines contain three thresholds of significance that may be used to evaluate the significance of the operational GHG emissions from non-stationary sources associated with a land development project. BAAQMD's GHG thresholds include a bright-line threshold of 1,100 MTCO<sub>2</sub>e/year. For projects that result in operational emissions that exceed the bright-line threshold, the BAAQMD Guidelines provide a GHG efficiency threshold of 4.6 MTCO<sub>2</sub>e/service person/year (where service persons are residents and employees associated with the proposed project). The GHG efficiency threshold of 4.6 metric tons CO<sub>2</sub>e/service person/year was developed by the BAAQMD to address the AB 32 mandate of reducing the Bay Area's GHG emissions to 1990 levels by 2020, and therefore is appropriate for use to evaluate the GHG impacts of projects that would be operational by or before 2020. However, the horizon year for the 2006 LRDP is 2025. A GHG efficiency threshold for years after 2020 has not been put forth by the BAAQMD and Berkeley Lab has determined that development of a new GHG efficiency threshold for 2025 would entail some amount of speculation regarding the projected emissions and required reductions. Therefore, this EIR relies only on the bright-line threshold of 1,100 MTCO<sub>2</sub>e/year to evaluate the significance of the impact from the non-stationary source emissions that would result from the implementation of the 2006 LRDP. It is acknowledged that the bright-line threshold was also developed by the BAAQMD based on the gap analysis noted above, and it is possible that this threshold could also change for the period beyond 2020 once the BAAQMD conducts another evaluation of the Bay Area's projected emissions and required reductions. However, this threshold is a number that is also used in other air basins as a bright-line threshold to separate minor projects from projects that would be major GHG emitters and hence must mitigate their emissions, and is among the lowest non-zero bright-line thresholds put forth by any agency in the state. Therefore, the Berkeley Lab believes that this threshold is conservative and appropriate to use to evaluate the significance of the project's GHG impact.

The project's impact relative to the second Appendix G criterion above may be evaluated by demonstrating compliance with plans, policies, or regulations adopted by local governments to curb GHG emissions. As noted above, Berkeley Lab has developed an SSP that is focused on emissions reduction measures for Berkeley Lab that will assist DOE in working toward the GHG emissions reduction targets it has established pursuant to the federal executive order. The proposed project's

consistency with the SSP, other federal and state laws, and applicable UC policies are evaluated below to determine whether the project would conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs.

## **Methodology**

The 2006 LRDP is a comprehensive land use plan to guide physical development at LBNL through 2025. The 2006 LRDP describes a development program of approximately 980,000 gross square feet of new research and support space construction and 320,000 gross square feet of demolition of existing facilities that are or may become obsolete or that pose safety hazards, for a total of approximately 660,000 gross square feet of net new occupiable space for the site through 2025. The program also provides for approximately 585,000 square feet of parking space (of which an estimated 372,000 square feet [64 percent] would be in parking structures for a net gain of 500 new parking spaces). The 2006 LRDP also estimates and reports the adjusted daily population (ADP) that is expected to be present on the LBNL hill site in 2025. According to the 2006 LRDP, an ADP of 5,000 persons is projected for the LBNL hill site the year 2025. Implementation of the 2006 LRDP would result in the removal of old buildings, construction of new buildings, a growth in Berkeley Lab programs and population, and an associated increase in GHG emissions that are associated with LBNL.

The sections that follow describe the methodology and assumptions used to estimate the historical (FY1990), existing (FY2015), and the future (FY2025) GHG emissions that would result from LBNL hill site operations. The 2025 GHG emissions were estimated based on the projected growth in operations at the LBNL hill site under the 2006 LRDP.

### **Stationary Sources**

Berkeley Lab maintains an inventory of generators that have been installed on the LBNL hill site to produce electricity in the event of a power outage. The inventory lists the generators by size and fuel type. To calculate GHG emissions from the existing generators, it was assumed that only diesel generators would be routinely tested and that each of those generators would be operated (for testing) 50 hours per year, which is the maximum allowable amount by State law. Gasoline engines, which are mostly small compared to the diesel engines, were assumed to have negligible emissions because they do not require testing and would be much smaller. GHG emissions from the testing of the new generators that are projected to be added to the hill site between FY2015 and FY2025 were also calculated by assuming that each generator would be tested for up to 50 hours per year. CARB emissions factors were used to estimate generator testing GHG emissions.

### **Area Sources**

Area source emissions are mostly the result of natural gas combustion on the LBNL hill site and were assumed to be the only area source emissions. Note that there could be negligible emissions from other area sources that were not included in this assessment. GHG emissions from natural gas combustion were computed by Sustainable Berkeley Lab based on the amount of natural gas used on the LBNL hill site in FY2015 and an emission factor of 0.053115 MTCO<sub>2</sub>e/MMBtu. Emissions were also calculated for the year FY2025 based on the projected increase in the use of natural gas on the LBNL hill site and for the year FY1990 based on past natural gas usage records.

### **Fleet Vehicles and Fugitive Emissions**

Berkeley Lab's fleet emissions for 2015 were calculated by inputting gallons of gas equivalent used by fuel type in the Federal Automotive Statistical Tool (FAST). Fleet emissions for FY1990 were estimated by multiplying the 2015 emissions by the ratio of the number of 1990 employees to 2015 employees and the EMFAC2014 1990 emission rates to the EMFAC2014 2015 emission rates. The FY2015 emissions were computed in the same manner using 2015 data and 2025 projections and emission rates.

Fugitive gas emissions of sulfur hexafluoride, carbon dioxide, methane, and nitrous oxide used on Berkeley Lab were calculated on an annual basis. This calculation was derived by subtracting the quantity of each gas returned to the supplier from the original amount purchased during the fiscal year. All of the gas not returned is conservatively considered to have been emitted to the atmosphere.

### **Employee Vehicles**

Sustainable Berkeley Lab computed GHG emissions associated with worker travel for year 2015 based on the number of employees and visitors to the hill site. For years 1990 and future year 2025, the emissions were computed assuming the same travel distance as was used by Sustainable Berkeley Lab. Emissions from motor vehicles are changing as fuels are reformulated, vehicles become more fuel-efficient, and zero emission vehicles become more popular. So, emission factors using the EMFAC2014 motor vehicle emission factor model made available by the California Air Resources Board were applied to the projection of vehicle use. Essentially, the emissions were estimated by multiplying the 2015 emissions with the ratio of the number of employees to the EMFAC2014 emission factor for the year of analysis. Emission factors used in EMFAC2014 were based on Alameda County travel mixes, assuming all commute vehicles are either light-duty autos or light-duty trucks.

## Electricity

Sustainable Berkeley Lab computed GHG emissions that would result from LBNL's use of electricity by multiplying the Lab's average annual electricity consumption with an emissions factor of 0.29610 MTCO<sub>2</sub>e/MWh, which is the eGrid 2012 CAMX region emission factor. The use of this 2012 emission factor provides a conservative estimate of Berkeley Lab's 2025 GHG emissions because the factor is expected to be lower in future years as more renewable energy sources are developed in the region. Since CAMX region emission factors are not available for 1990, a CAMX region emission factor for 1996 was used to calculate 1990 emissions. This factor was applied to historical electricity use for the LBNL hill site in 1990 to estimate the 1990 emissions.

## Water

GHG emissions that would result from increased water use at the LBNL hill site in 2025 were calculated by multiplying LBNL's projected average annual water usage by an electricity use factor from CalEEMod. This use factor represents the amount of electricity necessary to supply, treat, and distribute water. Because this energy is consumed outside of the LBNL hill site, an electricity emission rate from PG&E was used. PG&E publishes emission factors for past and future years (out to 2020).<sup>2</sup>

## Wastewater and Solid Waste

GHG emissions from wastewater and solid waste generated at the LBNL hill site were computed by Sustainable Berkeley Lab for existing conditions (i.e., 2015). Historical emissions (i.e., 1990) and future emissions were computed by applying the ratio of the number of persons (ADP) for past or future years to the 2015 ADP.

## **Impacts and Mitigation Measures**

**LRDP Impact GHG-1: Growth at Berkeley Lab under the 2006 LRDP would result in greenhouse gas emissions, either directly or indirectly, that could have a significant impact on the environment. (*Significant; Less than Significant with Mitigation*)**

Implementation of the 2006 LRDP would contribute to long-term cumulative increases in GHG emissions as a result of traffic increases (mobile sources), building heating (area sources), and electricity consumption especially in Berkeley Lab HPC facilities, water use, wastewater generation, and solid waste generation. These sources would represent the great majority of GHGs that would be produced in association with the proposed project, because Berkeley Lab does not, and would not, emit industrial or

---

<sup>2</sup> *ibid.*

agricultural gases; thus, the Lab would generate little in the way of GHGs other than carbon dioxide. While certain research activities may incorporate other GHGs, their use typically results in minimal emissions. Moreover, while some refrigeration units at LBNL use a hydrofluorocarbon chemical, such as HFC-134a, this class of chemical is a U.S. EPA-acceptable alternative to the more harmful ozone depleting substances (chlorofluorocarbons) that were banned in the 1990s. The Lab's refrigeration units are closed-loop systems that do not emit during normal operation. When work is performed on these systems, EPA-certified refrigerant recovery equipment is used, which effectively eliminates emissions.

**Table S-3, Estimated 2006 LRDP Operational GHG Emissions**, presents the historical (1990), existing (FY2015), and projected (FY2025) GHG emissions for Berkeley Lab as a whole. The FY2025 emissions reflect business-as-usual growth of Berkeley Lab under the 2006 LRDP, including the increase in GHG emissions as a result of the NERSC-9 project, which is evaluated in **Section 4.1** of the NERSC-9 Draft Focused EIR, and excluding measures that may be implemented in support of the federal sustainability executive order. As shown in **Table S-3**, electricity consumption is currently the primary source of GHG emissions at Berkeley Lab, followed by employee vehicles, and combustion of natural gas for heating and other uses.

**Table S-3**  
**Estimated 2006 LRDP Operational GHG Emissions (in MTCO<sub>2</sub>e/year)**

GHG Emissions Source		Historic FY 1990 Emissions	Existing FY 2015 Emissions	Future FY 2025 Emissions
<b>Direct Sources</b>				
	Stationary Sources <sup>a</sup>	190 <sup>b</sup>	190	233
Scope 1	Area Sources <sup>c</sup>	6,933	6,551	7,129
Scope 1	Fleet Vehicles and Fugitive Gas Emissions	113	170	200
	<b>Total Direct</b>	<b>7,236</b>	<b>6,911</b>	<b>7,562</b>
<b>Indirect Sources</b>				
Scope 2 and 3	Electricity Consumption <sup>d</sup>	40,061	24,557	67,970
Scope 3	Employee Vehicles	8,311	10,002	7,899
	Water Supply	71	24	43
Scope 3	Wastewater Treatment	8	10	13
Scope 3	Solid Waste	315	404	525
	<b>Total Indirect</b>	<b>48,766</b>	<b>34,997</b>	<b>76,450</b>
<b>All Sources<sup>e</sup></b>				
	<b>Total (direct and indirect)</b>	<b>56,002</b>	<b>41,908</b>	<b>84,012</b>

GHG Emissions Source	Historic FY 1990 Emissions	Existing FY 2015 Emissions	Future FY 2025 Emissions
Less RE, RECs and EE <sup>f</sup>	-	(9,249)	
<b>Grand Total</b>	<b>56,002</b>	<b>32,659</b>	<b>84,012</b>

Notes:

- a. Back-up/emergency generators.
- b. The FY1990 emissions were assumed to be the same as FY2015 emissions as it is not possible to determine how many generators were on the Lab in FY1990.
- c. Area source emissions based on natural gas combustion on the Lab.
- d. Includes T&D losses
- e. UC LBNL also reports Scope 3 business air travel and Scope 3 business ground travel emissions, which are not included in this table as those emissions sources are not typically analyzed under CEQA. In contrast, UC LBNL does not report Scope 3 water supply emissions; however, those emissions are included in this table since guidance put forth by BAAQMD and CARB state that GHG emissions from supply, treatment, and distribution of water used by a proposed project should be included in the estimated GHG emissions under CEQA.
- f. Based on Federal mitigation targets for Scope 1 and 2 emissions.

As **Table S-3** above shows, the total emissions of Berkeley Lab declined from 55,002 MTCO<sub>2</sub>e in 1990 to 41,980 MTCO<sub>2</sub>e in 2015, which translates to an annual decrease in emissions of about 563.76 MTCO<sub>2</sub>e/year. This annual decrease was used to estimate the Lab’s GHG emission for the year 2003, which is the baseline year used in the 2006 LRDP EIR. **Table S-4** below reports the hill site’s estimated 2003 GHG emissions. The estimated 2025 GHG emissions were compared to the 2003 baseline emissions to estimate the total increase in emissions from implementation of the 2006 LRDP.

**Table S-4**  
**Estimated Increase in LBNL Hill Site GHG Emissions (in MTCO<sub>2</sub>e/year)**

GHG Emissions Source	Historic FY 1990 Emissions	FY 2003 Emissions <sup>a</sup>	Future FY 2025 Emissions	Increase between FY2003 and FY2025
<b>Total (direct and indirect)</b>	<b>56,002</b>	<b>48,673</b>	<b>84,012</b>	<b>35,339</b>

Notes:

- a. 2003 emissions were estimated based on the annual decrease in emissions of about 563.76 MTCO<sub>2</sub>e/year from the 1990 level to 2015 level. The 2015 emission level used to estimate the annual decrease does not include the reduction due to EE, RE and RECs procured in 2015.

The 2006 LRDP includes numerous provisions that will substantially reduce the LBNL’s contribution to global GHG emissions. The LRDP encourages use of transit and alternative transportation modes (such as through implementation of Berkeley Lab’s transportation demand management program), which has helped and will continue to reduce transportation-related GHG emissions, relative to the emissions that would occur otherwise. New construction at the Lab is required to be 30 percent better than ASRAE 90.1

which means that new construction would substantially exceed California Energy Efficiency Standards in the state Building Code, helping to reduce future energy demand as well as reduce the Lab's contribution to regional GHG emissions. Moreover, individual projects under the 2006 LRDP would implement GHG emission reduction strategies consistent with the applicable provisions of the UC Policy on Sustainable Practices, which include green building design, sustainable transportation, and sustainable water systems.<sup>3</sup> Berkeley Lab also expects reductions in GHG emissions from existing sources as a result of more stringent regulatory requirements that are put forth by the federal and state governments. In addition, Berkeley Lab will continue to implement the numerous initiatives that it has developed under the SSP to reduce GHG emissions in order to assist DOE in complying with federal executive order related to sustainability. Therefore, it is reasonable to assume that the increase in annual emissions due to LRDP implementation would be much lower than the numbers reported in **Table S-4**.

However, as **Table S-4** above shows, implementation of the 2006 LRDP is estimated to almost double GHG emissions between FY2003 and FY2025. This increase in GHG emissions for Berkeley Lab as a result of LRDP implementation is substantially greater than the bright-line threshold of 1,100 MTCO<sub>2</sub>e/year used in this supplement to evaluate the significance of the impact. Furthermore, as the table also shows, the Berkeley Lab's total 2025 emissions would be substantially higher than the Berkeley Lab's FY1990 emissions and therefore the Lab's growth under the 2006 LRDP could conflict with SB 32, which has set forth a goal for California to reduce its 2030 GHG emissions to 40 percent below the FY1990 levels. This impact is considered *significant* before mitigation.

A substantial portion of the increased 2025 GHG emissions for Berkeley Lab as a whole is a result of the addition of the NERSC-9 project, which would, by itself, increase the Lab's average electricity consumption by about 13 MW over existing conditions. Of the 35,339 increase in MTCO<sub>2</sub>e emissions for the Lab as a whole between 2003 and 2025, approximately 35,092 MTCO<sub>2</sub>e of GHG emissions would result from the implementation of the NERSC-9 project. As discussed in **Section 4.1** of the **NERSC-9 Draft Focused EIR**, upon approval of the NERSC-9 project, Berkeley Lab would implement **NERSC Mitigation Measure GHG-1** to mitigate the GHG impact of the NERSC-9 project. Pursuant to the mitigation measure, Berkeley Lab would monitor GHG emissions each year and develop or purchase renewable energy (RE) and/or purchase renewable energy credits (RECs) or other verifiable GHG offsets to reduce GHG emissions from Building 59 by 35,092 MTCO<sub>2</sub>e/year by 2021. If the offsets achieved by the implementation of **NERSC Mitigation Measure GHG-1** (35,092 MTCO<sub>2</sub>e/year) are deducted from the increase in emissions between 2003 and 2025 (35,339 MTCO<sub>2</sub>e/year), the remaining emissions would be

---

<sup>3</sup> The UC Policy on Sustainable Practices is periodically updated and expanded. The current full text can be viewed on-line at <http://www.ucop.edu/ucophomc/coordrev/policy/PP032207ltr.pdf> or obtained through the University-wide Policy Office, Office of the President, 1111 Franklin Street, 12th Floor, Oakland, CA 94607.

247 MTCO<sub>2</sub>e/year, well below the bright-line threshold of 1,100 MTCO<sub>2</sub>e/year, and the impact is therefore considered *less than significant*.

In addition, Berkeley Lab has determined that it will implement additional measures to demonstrate substantial progress towards meeting and achieving consistency with SB 32 and Executive Order S-3-05 goals. AB 32 set a goal that state 2020 GHG emissions be reduced to equal the state’s 1990 emissions; SB 32 set a goal to bring the state’s 2030 emissions to 40 percent below 1990 emissions. Based on interpolation between the AB 32 goal for 2020 and the SB 32 goal for 2030, the goal for the LRDP study year of 2025 is to achieve reductions so that the 2025 emissions are 20 percent below 1990 GHG emissions. **Table S-5, Required Mitigation**, below presents the Lab’s 1990 emissions and a 2025 target emissions level of 44,800 MTCO<sub>2</sub>e/year, which is 20 percent below the Lab’s 1990 emissions. The table also presents the Lab’s estimated 2025 emissions and the net emissions after application of **NERSC Mitigation Measure GHG-1**. As the table shows, with the implementation of the NERSC-9 project-specific mitigation measure, a substantial portion of the Lab’s new GHG emissions would be offset. However about 48,980 MTCO<sub>2</sub>e/year would remain. These emissions exceed the Lab target for 2025 per SB 32 (44,800 MTCO<sub>2</sub>e/year) by about 4,120 MTCO<sub>2</sub>e/year. A mitigation measure is set forth below to ensure that the GHG emissions associated with LRDP development would be further reduced such that the Lab’s 2025 emissions would be at least 20 percent below the Lab’s 1990 emissions.

**Table S-5  
Required Mitigation (in MTCO<sub>2</sub>e/year)**

	<b>Emissions</b>	<b>Emissions in Excess of SB32 Target/Required Mitigation</b>
FY 1990	56,002	
Lab Target for 2025 per SB 32	44,800	
FY 2025	84,012	
NERSC-9 Mitigation	(35,092)	
Net Emissions after NERSC-9 Mitigation	48,980	4,180

**Mitigation Measures:**

**LRDP MM GHG-1** Berkeley Lab shall set a goal to reduce its net Scope 1, 2, and 3 GHG emissions to 20 percent below its FY1990 GHG emissions by the end of FY2025. For Berkeley Lab, this corresponds to net GHG emissions below 44,800 MTCO<sub>2</sub>e/year (20 percent below the Lab’s 1990 emissions of 56,002 MTCO<sub>2</sub>e) by the end of FY2025.

Reductions in emissions would be achieved in a manner consistent with the federal sustainability executive order. This includes targeting reductions in Scope 1 and 2 GHG emissions so that by the end of FY2025 they are 50 percent from a FY2008 baseline and reducing Scope 3 GHG emissions 25 percent by the end of FY2025 from a FY2008 baseline.

Berkeley Lab shall monitor GHG emissions each year, monitor upcoming projects at LBNL for their potential to increase the Lab's GHG emissions, and implement project-specific and Lab-wide GHG reduction measures to reduce Berkeley Lab's GHG emissions in accordance with the 44,800 MTCO<sub>2</sub>e/year goal for 2025. The Lab-wide GHG reduction measures may include further enhancements to LBNL's TDM program, and additional energy efficiency measures.

In the event that adequate reduction is not achieved by these measures, Berkeley Lab will develop or purchase renewable energy or purchase renewable energy credits, or other verifiable GHG offsets to keep the Lab's net emissions at or below 44,800 MTCO<sub>2</sub>e.

**Significance after Mitigation:** As shown in **Table S-5**, Berkeley Lab's FY2025 emissions would be reduced or offset by an additional 4,120 MTCO<sub>2</sub>e/year so that the Lab's 2025 emissions are at or below 44,800 MTCO<sub>2</sub>e. The Lab has committed to meeting this target level by implementing various GHG reduction measures, and if needed it would acquire renewable energy (RE), renewable energy credits (REC) or other verifiable GFG offsets. The Lab has been purchasing RE and RECs since FY2007 to meet the federal sustainability executive order reduction requirements for Scope 1 and Scope 2 emissions and has determined that it is feasible to purchase the required RE and RECs .

Therefore, with the implementation of **NERSC Mitigation Measure GHG-1** and **LRDP Mitigation Measure GHG-1**, the LBNL hill site's FY2025 emissions would be well below the BAAQMD significance threshold of 1100 MT CO<sub>2</sub>e and at least 20 percent lower than FY1990 emissions, and the impact would be *less than significant*.

**Project Variant.** Under the project variant, the ADP on the hill site would increase by approximately 1,350, rather than 1,000 as anticipated under the 2006 LRDP. The project variant would not result in additional building space on the hill site, and the additional LBNL staff would be accommodated within the 660,000 gsf of occupiable (research and support) building space included in the 2006 LRDP. Because the project variant would not result in additional new building space, it is expected that it would result in

minimal incremental GHG emissions in excess of the GHG emissions estimated for the development under the 2006 LRDP. The analysis of the GHG impact noted above for the 2006 LRDP would be applicable to the variant, and would be *significant*. It would also require the implementation of the same mitigation measures that are set forth for the 2006 LRDP, which would reduce the impact 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 2006 LRDP. Actual overall development that was approved and would be constructed pursuant to the 2006 LRDP would be less intense than portrayed in the scenario. The scenario was developed before the 2006 LRDP was reduced in scope in response to comments from the City of Berkeley, and thus the scenario includes an overall level of potential development that is greater than was approved and could be developed under the 2006 LRDP. Each of the proposed buildings that is included in the scenario, however, might be constructed pursuant to the 2006 LRDP, and thus the scenario remains an appropriate and conservative basis for the evaluation of impacts related to GHG emissions. With mitigation set forth below, individual projects as identified in the Illustrative Development Scenario would result in *less than significant* impacts related to GHG emissions.

---

**LRDP Impact GHG-2: Implementation of the 2006 LRDP could conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. (Significant; Less than Significant with Mitigation)**

Implementation of the 2006 LRDP would result in a significant impact related to GHG emissions if the project were in conflict with an applicable plan, policy, or regulation concerning GHG emissions reductions. The project's potential to conflict with applicable plans and regulations is evaluated below.

***LBNL Site Sustainability Plan***

As discussed above, Berkeley Lab has developed an SSP, which sets forth emissions reduction measures that Berkeley Lab will implement to assist DOE in achieving the GHG emissions reduction targets it established pursuant to Executive Order 13693. The SSP targets the achievement of several goals for Berkeley Lab as a whole (including off-site operations) by 2025, including a goal to achieve a 50 percent reduction in greenhouse gas emissions from electricity and natural gas relative to a 2008 baseline. The SSP does not require each new project to meet the goals listed above, and these goals apply to the Lab as a whole.

As noted above, implementation of the 2006 LRDP would result in the removal of old buildings, construction of new buildings, and a growth in LBNL programs and population. Consequently, as shown in **Table S-1** above, GHG emissions from direct and indirect sources on the LBNL hill site would increase above baseline (2003) and 2015 conditions. The primary sources of GHG emission increases would be electricity and natural gas consumption (Scope 1 and 2 emissions). Scope 3 emissions are not expected to increase above current conditions. Concurrent with the growth in GHG emissions, pursuant to the SPP, Berkeley Lab will implement energy efficiency programs to reduce emissions from existing sources; continue to review projects at Berkeley Lab closely during the planning and design stages to ensure that sustainability features are incorporated into each project as appropriate. These GHG minimization measures notwithstanding, as reported in **LRDP Impact GHG-1** above, LRDP growth would result in a substantial increase in GHG emissions, especially Scope 1 and 2 emissions. This increase would have the potential to affect Berkeley Lab's ability to meet the federal goal of reducing Berkeley Lab's 2025 GHG emissions from electricity and natural gas to be 50 percent of 2008 baseline emissions. However, the Lab has committed to implement **NERSC Mitigation Measure GHG-1** and **LRDP Mitigation Measure GHG-1**, which require the Lab to purchase RE and RECs, ensure that the 2025 emissions are below 1990 levels by at least 20 percent, and to achieve this in a manner that allows the Lab to also meet its obligation under the federal executive order. As a result, with the implementation of both mitigation measures, Berkeley Lab would continue its progress toward meeting the goals in the SSP.

#### *UC Policy on Sustainable Practices*

The applicable portions of the UC Policy on Sustainable Practices (UC Policy) are reproduced in **Section 4.1.3.5** of the **NERSC-9 Draft Focused EIR**. Lab growth under the 2006 LRDP would not conflict with any of the applicable goals and requirements of the UC Policy. New buildings and renovations would comply with the requirements related to Green Building design in the UC Policy at the time that they are designed or modified. With respect to the requirements related to Sustainable Transportation, Berkeley Lab already implements a transportation demand management program and controls parking in order to minimize single-occupant vehicle trips to the hill site. Lab growth would also comply with the Sustainable Water use requirements. Therefore, the proposed project would not conflict with the applicable provisions of the UC Policy.

#### *AB 32, Executive Order S-3-05, and SB 32*

AB 32 established the goal for the reduction of California's GHG emissions to 1990 levels by 2020. Prior to that, Executive Order S-3-05 established the goal of reducing California's emissions 80 percent below 1990 levels by 2050. In September 2016, the state legislature passed SB 32 which set forth the state's interim goal that the state's GHG emissions in 2030 should be 40 percent of the 1990 emissions.

As discussed in the analysis in **LRDP Impact GHG-1** above, the additional GHG emissions from the implementation of the 2006 LRDP would be substantial. This increase would have the potential to conflict with the state goals, and the impact would be considered *significant*. However, with the implementation of the proposed mitigation measures, Lab growth under the 2006 LRDP would not conflict with the state's goals to reduce GHG emissions, and the impact would be reduced to less than significant.

**Mitigation Measures:**

**LRDP MM GHG-2**     Implement **NERSC-9 Mitigation Measure GHG-1** and **LRDP Mitigation Measure GHG-1**.

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

**Project Variant.** Under the project variant, the ADP on the hill site would increase by approximately 1,350, rather than 1,000 as anticipated under the 2006 LRDP. The project variant would not result in additional building space on the hill site, and the additional LBNL staff would be accommodated within the 660,000 gsf of occupiable (research and support) building space included in the 2006 LRDP. Because the project variant would not result in additional new building space, it is expected that it would result in minimal incremental GHG emissions in excess of the GHG emissions estimated for the development under the 2006 LRDP. The analysis of the GHG impact noted above for the 2006 LRDP would be applicable to the variant, and would be *significant*. It would also require the implementation of the same mitigation measures that are set forth for the 2006 LRDP, which would reduce the impact 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 2006 LRDP. Actual overall development that was approved and would be constructed pursuant to the 2006 LRDP would be less intense than portrayed in the scenario. The scenario was developed before the 2006 LRDP was reduced in scope in response to comments from the City of Berkeley, and thus the scenario includes an overall level of potential development that is greater than was approved and could be developed under the 2006 LRDP. Each of the proposed buildings that is included in the scenario, however, might be constructed pursuant to the 2006 LRDP, and thus the scenario remains an appropriate and conservative basis for the evaluation of impacts related to GHG emissions. With mitigation set forth below, individual projects as identified in the Illustrative Development Scenario would result in *less than significant* impacts related to GHG emissions.

### B.3 Updated LRDP Energy Impact Analysis

As noted in **Section A, Introduction**, above, on account of the NERSC-9 project, the total projected energy use at the LBNL hill site under the LRDP through 2025 would be greater than the energy use previously considered and evaluated in the 2006 LRDP EIR. Therefore, UC LBNL prepared an updated energy analysis which showed that the increased energy use under the 2006 LRDP would not result in a new significant energy impact or require the implementation of a new mitigation measure. In the absence of a new significant impact and/or the need for a new mitigation measure, this energy analysis does not meet the criteria for “substantial new information” under CEQA and therefore does not need to be circulated for agency and public review. UC LBNL has, however, elected to circulate this analysis as part of this Supplement to the 2006 LRDP EIR for disclosure and informational purposes only.

### ENVIRONMENTAL SETTING

**Sections 4.3.2** through **4.3.3.3** of the NERSC-9 project Draft Focused EIR, which are incorporated by reference, present background information regarding current energy consumption at Berkeley Lab and the federal, state, and local programs that have been developed in relation to energy use. The discussion on LBNL energy consumption is repeated below.

#### Electricity Supply

Electrical power to the Berkeley Lab hill site is provided by the Western Area Power Administration (WAPA). 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 14 multi-use water resource projects and one coal-fired plant and to purchase electricity on the wholesale market. WAPA’s service area encompasses a 15-state region of the central and western U.S. where WAPA’s more than 17,000-circuit-mile high-voltage transmission system carries electricity from 56 hydropower plants operated by the Bureau of Reclamation, U.S. Army Corps of Engineers, and the International Boundary and Water Commission. With a combined capacity of 10,504 MW from all its plants, WAPA sells 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.

The electrical power provided by WAPA is delivered to the LBNL hill site via PG&E’s distribution system. PG&E delivers power to LBNL on two overhead 115-kilovolt (kV), 3-phase, 60-Hertz (Hz) transmission lines with a joint capacity of approximately 100 megawatts (MW). Both of these transmission lines feed power from PG&E’s El Sobrante switching station to the Grizzly Peak substation on the LBNL hill site. 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 LBNL. In

addition, LBNL's power can be supplied from UC Berkeley's Hill Area Substation, located adjacent to the Grizzly Peak substation.

The main power distribution system at the LBNL hill site consists of a 12.47-kV underground system with smaller substations 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 regulation in order to ensure that critical experiments will not be disrupted by transient voltage within the system. Total electrical power consumption at the LBNL hill site in FY2015 was 86,627 megawatt hours (MWh) (LBNL 2016).

LBNL also has a number of stationary and portable emergency power generators, including a 1.3 MW generator in Building 59. These generators start automatically in the event of a power failure and are used to provide an emergency power supply for certain critical services (e.g., for laboratory exhaust fans, exit lights, the fire station, Radio Communications Facility, and the Health Services Building) and other important activities at LBNL. The generators are powered either by diesel, gasoline, or natural gas. The total generating capacity of these emergency generators is approximately 6,250 kilowatts.

## Natural Gas

Natural gas is used at Berkeley Lab for heating buildings and process loads. The natural gas supply is provided by the Defense Logistics Agency Energy (DLA Energy)<sup>4</sup> in Oregon and delivered by the PG&E system. In 1990, DLA Energy's mission was expanded to include the supply and management of natural gas in addition to basic petroleum and coal products. Currently, DLA Energy serves as the Department of Defense's central procurement agency to competitively acquire direct supply natural gas. The natural gas program includes more than 20 industry suppliers delivering approximately 40 million dekatherms annually to more than 200 Department of Defense and federal civilian customers (DLA Energy 2014).

The LBNL natural gas system receives its supply from a 6-inch PG&E line operating at 50 pounds per square inch gauge (psig). 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 the buildings throughout the Lab. Natural gas usage at the LBNL hill site in 2015 was approximately 1.2 million Therms (LBNL 2016).

---

<sup>4</sup> Previously known as Defense Fuel Supply Center.

## 2006 LRDP IMPACTS AND MITIGATION MEASURES

### Significance Criteria

A threshold of significance for evaluating a project's energy conservation impacts can be derived from Appendix F of the *State CEQA Guidelines* and PRC Section 21100(b)(3)), which focus on reducing "the wasteful, inefficient, and unnecessary consumption of energy." The proposed project would have a potentially significant impact on energy resources if it would:

- Involve the wasteful, inefficient, and unnecessary consumption of energy, especially fossil fuels such as coal, natural gas, and oil, associated with project design, project location, the use of electricity and/or natural gas, and/or the use of fuel by vehicles anticipated to travel to and from the project.

Appendix F of the *State CEQA Guidelines* describes the means of achieving the goal of conserving energy to include:

- Decreasing overall per capita energy consumption,
- Decreasing reliance on natural gas and oil, and
- Increasing reliance on renewable energy sources.

### Methodology

Appendix F requires an EIR to present the total energy required by a project by fuel type and end use, during construction, operation and removal of the project.

The 2006 LRDP is a multi-year growth program for the Berkeley Lab and is not a specific construction project. The total amount of energy resources that would be consumed during the demolition or modifications to existing Lab facilities or during the construction of new Lab facilities cannot be estimated without speculation because it is not known if and when specific building projects under the 2006 LRDP would be constructed.

With respect to energy consumption during occupancy/operation, the increased electricity and natural gas demand associated with the operation of the development under the 2006 LRDP were forecasted by Sustainable Berkeley Lab (SBL) (LBNL GHG Emissions-Partial Forecast Memorandum in **Appendix S-1**). In addition, as the population of the Berkeley Lab would increase above baseline (2003) conditions and 2015 conditions, there would be an associated increase in daily vehicle trips to and from the Lab due to typical employee commutes. The increase in the consumption of petroleum-based fuel was calculated for the Berkeley Lab as a whole based on vehicle miles travelled (VMT). Estimated VMT upon buildout of the

Lab under the 2006 LRDP were projected using data collected from a 2014 employee commuting survey and the estimated number of LBNL employees for FY1990, FY2015, and FY2025.

## Impacts and Mitigation Measures

**LRDP Impact EN-1: Implementation of the 2006 LRDP would increase the use of energy resources at Berkeley Lab but would not result in wasteful, inefficient, or unnecessary consumption of energy resources. (Less than Significant)**

### Construction

Construction activities, including demolition, would occur intermittently at different sites on the Berkeley Lab throughout the approximately 19-year period (2006 through 2025) over which projects under the 2006 LRDP would be implemented. Construction activities under the 2006 LRDP would result in an increase of energy use, which, as noted earlier, cannot be reasonably estimated. However, each construction project under the 2006 LRDP would be reviewed under CEQA and would be evaluated to determine whether or not it would result in inefficient, wasteful, and unnecessary use of energy resources.

### Operation

**Table S-6, LBNL Baseline and Projected Natural Gas and Electricity Use**, presents the baseline (2003) energy use associated with the operation of the Berkeley Lab, the projected (FY2025) natural gas use and electricity use associated with the Berkeley Lab by FY2025, and the increase in energy use over the period of the 2006 LRDP. As shown in **Table S-6**, there would be a 5.7 percent increase in natural gas use and a 162 percent increase in electricity demand from FY2003 to FY2025.

**Table S-6  
Baseline and Projected Natural Gas and Electricity Use**

Source	2003	2025	Numeric Increase from 2003 to 2025	Percent Increase from 2003 to 2025
Natural Gas (Therms)	1,269,965	1,342,134	72,169	5.7%
Electricity (kWh)	87,934,974	230,000,000	142,065,026	162%

Source: LBNL GHG Emissions-Partial Forecast Memorandum in **Appendix S-1; Impact Sciences 2016**

The increase in natural gas use would be relatively small and would not be considered a wasteful use of energy. There would be a substantial increase in electricity use, mainly attributed to the implementation of the NERSC-9 project. The NERSC-9 project would account for 135,000,000 kWh of electricity demand,

which is approximately 95 percent of the increase in demand from 2003 to 2025. The energy efficiency analyses for the NERSC-9 project, detailed in Section 4.3 of the NERSC-9 project Draft Focused EIR, concluded that the NERSC-9 project would not result in a wasteful or inefficient use of energy resources. Furthermore, as noted in Section 4.1 of the NERSC-9 project Draft Focused EIR, Berkeley Lab would implement mitigation measures that would involve purchasing renewable energy (RE) and/or renewable energy credits (REC) or other verifiable GHG offsets so that the environmental impacts from the NERSC-9 project's electricity use would be fully offset. Thus, implementation of the 2006 LRDP EIR similarly would not involve the inefficient, wasteful, and unnecessary use of energy resources during operations and the impact would be *less than significant*.

Additionally, new buildings at LBNL constructed under the 2006 LRDP would comply with the UC Policy, which requires new construction meet a minimum standard of LEED-NC Silver and strive for LEED-NC Gold when possible and requires 20 percent better energy performance than Title 24 (and strives to achieve 30 percent).

Title 24 represents the state policy on building energy efficiency. The goals of the Title 24 standards are to improve energy efficiency of residential and non-residential buildings, minimize impacts during peak energy-usage periods, and reduce impacts on state energy needs. As mentioned above, projects at the Berkeley Lab under the 2006 LRDP would be required to achieve 20 percent better energy performance than Title 24, and therefore would be energy efficient.

### **Petroleum-Based Fuel**

Implementation of projects under the 2006 LRDP would result in the consumption of petroleum-fuel related to vehicular travel (quantified as VMT) to and from LBNL. **Table S-7, Baseline and Projected Petroleum-based Fuel Usage**, below, presents the projected (FY2025) consumption of approximately 217,138 gallons of diesel and 1,472,158 gallons of gasoline per year, or a total of 1,689,296 gallons of petroleum-based fuels per year based on an annual estimate of 32,832,309 VMT.<sup>5</sup> This would represent an approximately 33 percent increase in fuel usage from FY2003 to FY2025.

---

<sup>5</sup> VMT for FY2025 was estimated by taking ratio of the recorded VMT for FY2015 and the increase in employees from FY2015 to FY2025.

**Table S-7  
Baseline and Projected Petroleum-based Fuel Usage**

Source	Fleet Mix <sup>a</sup>	Generation Factor <sup>b, c</sup>	Annual Consumption (in gallons)
<b>Mobile Emissions FY2003</b>			
Diesel (gallons)	16.6%	24,719,446/25.1 mpg	163,483
Gasoline (gallons)	83.4%	24,719,446/18.6 mpg	1,108,388
		<i>Total</i>	<b>1,271,871</b>
<b>Mobile Emissions FY2025</b>			
Diesel (gallons)	16.6%	32,832,309/25.1 mpg	217,138
Gasoline (gallons)	83.4%	32,832,309/18.6 mpg	1,472,158
		<i>Total</i>	<b>1,689,296</b>
		<b>Percent Increase from 2003 to 2025</b>	<b>33%</b>

Source: Impact Sciences 2016

Notes:

mpg = miles per gallon

a Data Source: FHWA OHPI, Highway Statistics, Fuel Consumption by State and Type  
<http://www.fhwa.dot.gov/policyinformation/pubs/hf/pl11028/chapter5.cfm>

b Data Source: California Department of Transportation, 2007 California Motor Vehicle Stock, Travel and Fuel Forecast,  
<http://www.energy.ca.gov/2008publications/CALTRANS-1000-2008-036/CALTRANS-1000-2008-036.PDF>

c Diesel-powered vehicles typically get 30-35% more miles per gallon than comparable vehicles powered by gasoline. US Department of Energy, Fuel Economy Guide, <http://www.fueleconomy.gov/feg/pdfs/guides/FEG2013.pdf>

The fuel use presented in **Table S-7** is a conservative estimate, given that it assumes no electric, hybrid, or other alternate fuel use vehicles in the fleet mix. Furthermore, this level of annual consumption is based on fuel efficiency rates (miles per gallon) shown in **Table S-7**. Federal and state laws and regulations will continue to require further improvements in fuel efficiency in motor vehicles produced and/or sold in the U.S. and total annual consumption of petroleum-based fuel is expected to decrease over time. Furthermore, UC LBNL will continue to comply with the 2006 LRDP that limits the total amount of parking that would be added to the Berkeley Lab and also continue to implement its TDM program to minimize single-occupant vehicle trips to and from the Lab, so that use of petroleum-based fuels is minimized.

For the reasons listed above, implementation of the 2006 LRDP would not involve the inefficient, wasteful, and unnecessary use of energy and the energy impact would be *less than significant*.

**Mitigation Measures:** No mitigation measures are required.

**Project Variant.** Under the project variant, the ADP on the hill site would increase by approximately 1,350, rather than 1,000 as anticipated under the 2006 LRDP. The project variant would not result in additional building space on the hill site, and LBNL staff would be accommodated within the new

660,000 gsf of occupiable (research and support) building space included in the 2006 LRDP. Because the project variant would not result in new building space, it is expected that it would result in minimal incremental demand for electricity and natural gas at the hill site in excess of the demand generated by the 2006 LRDP. The project variant would also include ongoing energy conservation efforts at the hill site, including the continued use of energy-efficient equipment, such as transformers and motors, variable frequency drives for on-demand power, and automatic climatic controls. For reasons noted above, the project variant would also result in a *less than significant* impact related to energy use.

**Individual Future Projects/Illustrative Development Scenario.** The Illustrative Development Scenario is a conceptual portrayal of potential development under the 2006 LRDP. Actual overall development that was approved and would be constructed pursuant to the 2006 LRDP would be less intense than portrayed in the scenario. The scenario was developed before the 2006 LRDP was reduced in scope in response to comments from the City of Berkeley, and thus the scenario includes an overall level of potential development that is greater than would be developed under the 2006 LRDP. Each of the proposed buildings that is included in the scenario, however, might be constructed pursuant to the 2006 LRDP, and thus the scenario remains an appropriate and conservative basis for the evaluation of impacts related to electricity and natural gas. Individual projects as identified in the Illustrative Development Scenario would result in *less than significant* impacts related to electricity and natural gas supply for the reasons described above for the 2006 LRDP development.

---

**APPENDIX 1.0**

---

**Notice of Preparation (NOP), Initial Study, and Comments on the NOP**



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:** Building 59 Upgrade & Installation and Operation of NERSC-9

**Lead Agency:** University of California, Lawrence Berkeley National Laboratory

**Project Location:** One Cyclotron Road, Berkeley, CA 94720

**Contact Person:** Jeff Philliber, Chief Environmental Planner.  
One Cyclotron Road, MS 76-234A, Berkeley, CA 94720

### Project Description

The University of California, Lawrence Berkeley National Laboratory (UC LBNL) proposes to install and operate a next generation high-performance computing (“supercomputing”) system in the existing Wang Hall at the Lawrence Berkeley National Laboratory main hill site in Berkeley, Alameda County, California. (Hereinafter, the new high-performance computing system to be installed is referred to as “NERSC-9<sup>1</sup>,” and this project is referred to as the “NERSC-9 project” or the “proposed project.” Wang Hall, which was formerly known as the “Computational Research and Theory” [CRT] facility, is also referred to as “Building 59.” Lawrence Berkeley National Laboratory is referred to as “LBNL” or “Berkeley Lab.”)

UC LBNL would install the NERSC-9 supercomputer in the space to be vacated by an existing high-performance computing system (NERSC-7). Operation of the NERSC-9 high-performance computing system would help support the continually increasing needs of scientists for complex simulation and data analysis. Along with the new supercomputer, additional power, cooling, and distribution equipment would be installed to augment existing building systems. These system augmentations would be necessary to accommodate NERSC-9 operating in tandem with the existing (though not yet fully installed and operational) NERSC-8 supercomputer. These facility upgrades would increase the capacity of building electrical, water, and cooling systems beyond levels reviewed in the CRT EIR (SCH#2007072106, April 2008). All upgrades would be located within the existing building and associated cooling infrastructure areas, and the project would not make any changes to the facility’s building structure. The project would not increase the number of employees and visitors that would be present in the building.

---

<sup>1</sup> NERSC stands for “National Energy Research Scientific Computing Center.”

## Environmental Review Process

The University of California (UC or "the University") will be the Lead Agency and will prepare an Environmental Impact Report (EIR) for the proposed project. An Initial Study has been prepared in accordance with the California Environmental Quality Act (CEQA), the *CEQA Guidelines*, and the *University of California Procedures for Implementation of CEQA* to identify potential environmental impacts that will be addressed in the EIR. The attached Initial Study includes a description of the proposed project. It is anticipated that the EIR will address environmental impacts in the following resource area: greenhouse gas emissions.

A copy of this Notice of Preparation (NOP), Initial Study (IS), and public scoping meeting announcement are available on the following website: <http://www.lbl.gov/community/env-rev-docs.html>. UC LBNL will hold a public scoping meeting for the EIR on June 21, 2016 at the North Berkeley Senior Center. More information regarding the scoping meeting is provided in Attachment A.

This notice is to solicit your views on the scope and contents of the forthcoming NERSC-9 project EIR. We request that any comments be received no later than 5:00 PM on June 30, 2016. Your name and a mailing address should be included with your comments. Please direct your comments to the attention of Jeff Philliber at the address noted above. Comments may also be submitted via email to the following address: [planning@lbl.gov](mailto:planning@lbl.gov). If you have any questions regarding this NOP, please contact Jeff Philliber at the above address or via email at [planning@lbl.gov](mailto:planning@lbl.gov).

Signature: Reva Nickelson Date: 8/1/16  
Reva Nickelson, Director, Facilities Division  
Lawrence Berkeley National Laboratory

cc: UC LBNL CEQA Agency and Public Mailing List

## ATTACHMENT A: PUBLIC SCOPING MEETING

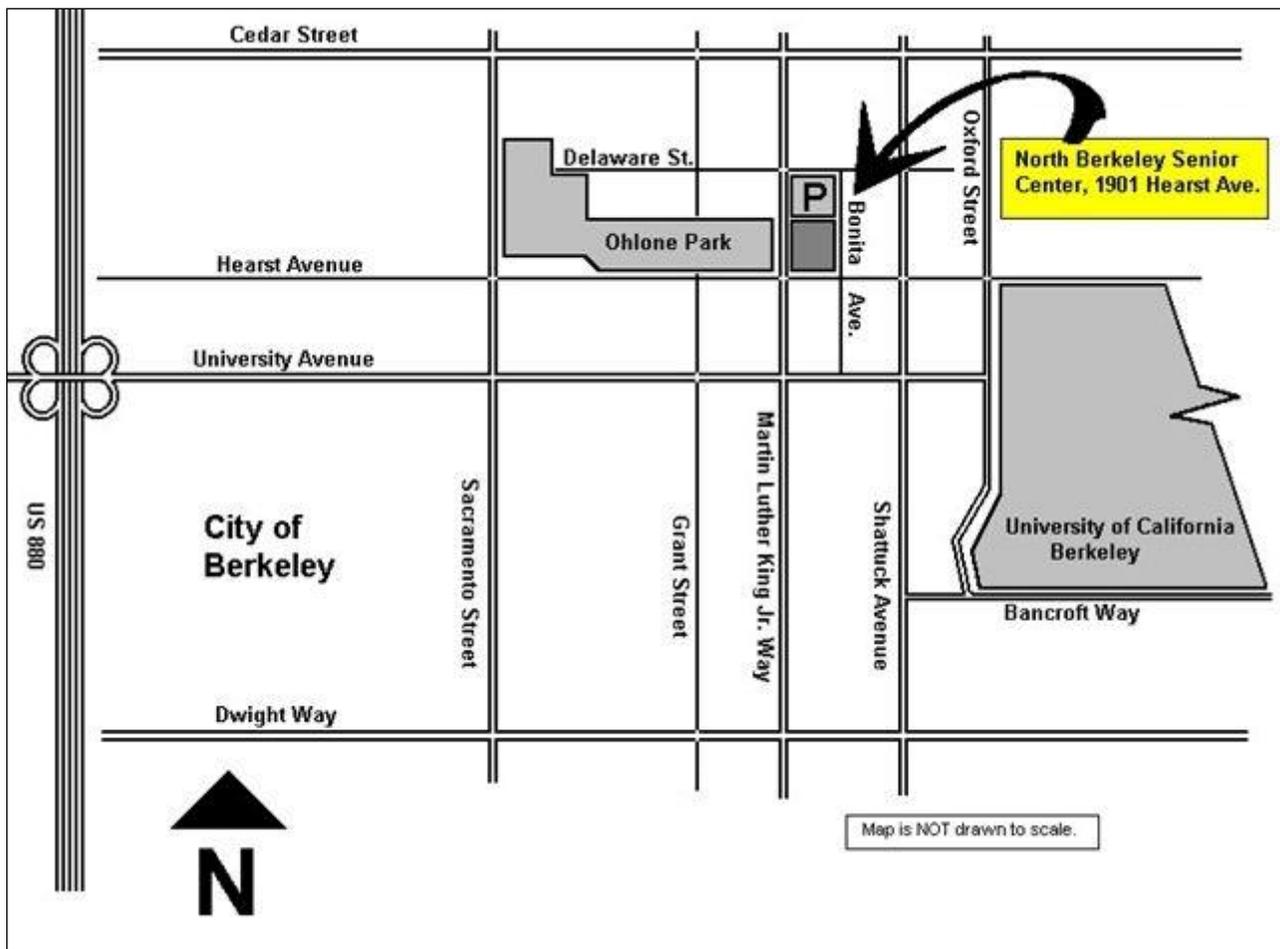
UC LBNL will hold a public scoping meeting open to all interested agencies and members of the public. The meeting is intended to present a brief overview of the Building 59 Upgrade & Installation and Operation of NERSC-9 project (“NERSC-9 project”), to identify environmental resource areas to be analyzed in the Draft EIR, and to invite public comments on the scope of the EIR analysis.

**What:** Scoping Meeting for the NERSC-9 project EIR

**When:** June 21, 2016 from 6:30 PM to 8:30 PM

**Where:** North Berkeley Senior Center, 1901 Hearst Street, Berkeley

**Parking:** Parking is available at the Senior Center and on surrounding streets (see map below)



**BUILDING 59 UPGRADE &  
INSTALLATION AND OPERATION OF NERSC-9**

**INITIAL STUDY**

## TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1 ENVIRONMENTAL CHECKLIST/INITIAL STUDY .....	6
2 INTRODUCTION .....	7
3 PROJECT DESCRIPTION .....	9
4 ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED: .....	18
5 DETERMINATION .....	19
6 EVALUATION OF ENVIRONMENTAL IMPACTS .....	20
7 REFERENCES .....	80
8 REPORT PREPARERS .....	81

## LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1 PROJECT LOCATION .....	11
2 SITE PLAN .....	12

## 1. ENVIRONMENTAL CHECKLIST/INITIAL STUDY

- Project Title:** Building 59 Upgrade & Installation and Operation of NERSC-9  
("NERSC-9 project")
- Lead Agency:** The University of California, Lawrence Berkeley National Laboratory
- Location:** Lawrence Berkeley National Laboratory main hill site  
One Cyclotron Road  
Berkeley, California 94720
- Applicant:** See Lead Agency above
- Existing LRDP Designation:** Research and Academic
- Existing On-site Land Use:** The project site is (and would continue to be) occupied by LBNL Building 59 (Wang Hall).
- Surrounding Land Uses:** Surrounding land uses include Chu Road and LBNL's Building 50 complex to the north; LBNL's Building 70 complex to the east; Cyclotron Road and UC Berkeley Campus athletic, academic, and recreational facilities to the south; and Cyclotron Road and the Blackberry Canyon entrance gate to the west. LBNL's Cyclotron facility, City of Berkeley multi-family residential neighborhoods, and UC Berkeley student housing are further to the west.
- Description of Project:** See Project Description in Section 3 of this Initial Study.
- Interested and Responsible Agencies:**
- Bay Area Air Quality Management District

## 2. INTRODUCTION

### 2.1 Initial Study

Pursuant to Section 15063 of the *California Environmental Quality Act (CEQA) Guidelines* (Title 14, California Code of Regulations, Sections 15000 et seq.), an Initial Study is a preliminary environmental analysis that is used by the lead agency as a basis for determining whether an EIR, a Mitigated Negative Declaration, or a Negative Declaration is required for a project. The *CEQA Guidelines* require that an Initial Study contain a project description; a description of environmental setting; an identification of environmental effects by checklist or other similar form; an explanation of environmental effects; a discussion of mitigation for significant environmental effects; an evaluation of the project's consistency with existing, applicable land use controls; and the names of persons who prepared the study.

### 2.2 EIR Process

This environmental analysis is an Initial Study for the proposed Building 59 Upgrade & Installation and Operation of NERSC-9 project (also referred to as the "NERSC-9 project" or the "proposed project" throughout this document). The purpose of this Initial Study is to evaluate the potential environmental impacts of the proposed project to determine what level of additional environmental review, if any, is appropriate.

This environmental analysis incorporates by reference the Lawrence Berkeley National Laboratory (LBNL) 2006 Long Range Development Plan (LRDP) EIR (SCH No. 2000102046), the 2007 Computational Research and Theory (CRT) Facility EIR (SCH No. 2007072106), and the 2010 CRT Environmental Assessment/FONSI in accordance with Section 15150 of the *CEQA Guidelines*.

The analysis contained in this Initial Study concludes that the proposed project would result in the following categories of impacts, depending on the environmental issue involved: no impact; less-than-significant impact; or a potentially significant impact. As shown in the Determination form in Section 6 of this document and based on the analysis contained in this Initial Study, it has been determined that the proposed project may result in potentially significant impacts. Therefore, an EIR will be prepared after circulation of this Initial Study and Notice of Preparation (NOP).

### 2.3 Public and Agency Review

This Initial Study and NOP are being circulated for public and agency review from June 1, 2016 to June 30, 2016. Copies of this document are available for review at the following locations and online at <http://www.lbl.gov/community/NERSC-9-project/>. Copies of the 2006 LRDP, the 2006 LRDP EIR, the 2007 CRT Facility EIR, and 2010 CRT Facility Environmental Assessment/FONSI are also available for review online at <http://www.lbl.gov/community/planning/ldrp/> or at the following location:

- Berkeley Public Library, 2090 Kittredge Street, 2<sup>nd</sup> Floor Reference Desk, Berkeley, CA 94704

Comments on this Initial Study/NOP pertinent to the scope of the forthcoming NERSC-9 project EIR must be received by 5:00 PM on June 30, 2016 and should be sent to:

Jeff Philliber, Chief Environmental Planner  
Lawrence Berkeley National Laboratory  
One Cyclotron Road, MS 76-225  
Berkeley, CA 94720

Or by e-mail to [planning@lbl.gov](mailto:planning@lbl.gov).

## 2.4 Project Approvals

As a public agency principally responsible for approving or carrying out the proposed project, the University of California is the Lead Agency under CEQA and is responsible for certifying the adequacy of the environmental document and approving the proposed project. It is anticipated that the Board of Regents of the University of California (The Regents) or its delegated authority will consider approval of the proposed project in late 2016.

## 2.5 Organization of the Initial Study

This Initial Study is organized into the following sections:

**Section 1** - Project Information: provides summary background information about the proposed project, including project location, lead agency, and contact information.

**Section 2** - Introduction: summarizes the scope of the document, the project's review and approval processes, and the document's organization.

**Section 3** - Project Description: presents a description of the proposed project, including the need for the project, the project's objectives, and the elements included in the project.

**Section 4** - Environmental Factors Potentially Affected: addresses whether this Initial Study identifies any environmental factors that involve a significant or potentially significant impact that cannot be reduced to a less-than-significant level.

**Section 5** - Determination: indicates whether impacts associated with the proposed project would be significant and what, if any, additional environmental documentation is required.

**Section 6** - Evaluation of Environmental Impacts: contains the Environmental Checklist form for each resource area. The checklist is used to assist in evaluating the potential environmental impacts of the proposed project. This section also presents a background summary for each resource area, and an explanation of all checklist answers.

**Section 7** - References: lists references used in the preparation of this document.

**Section 8** - Report Preparers: lists the names of individuals involved in the preparation of this document.

### 3. PROJECT DESCRIPTION

#### 3.1 Project Summary

The National Energy Research Scientific Computing Center (NERSC) program, located at the LBNL main hill site, is the primary scientific computing facility for the Department of Energy (DOE) Office of Science, which supports basic and applied research across multiple scientific disciplines. Such research enhances the United States competitiveness and maintains U. S leadership in science and technology. The NERSC-9 project is the proposed installation of a next generation supercomputer referred to as NERSC-9 in the existing Wang Hall (aka Building 59 or CRT Facility) on the LBNL main hill site as a replacement for an existing high-performance computing system called “Edison” (also referred to herein as “NERSC-7”) that would be phased out. Along with the new supercomputer, additional power, cooling, and distribution equipment would be installed in Building 59 to augment existing building systems. These system augmentations would be necessary to accommodate NERSC-9 operating in tandem with the existing (though not yet fully installed and operational) NERSC-8 supercomputer<sup>2</sup>. These facility upgrades would increase the capacity of building electrical, water, and cooling systems beyond levels originally reviewed in the CRT EIR (SCH#2007072106, April 2008). All upgrades would be located within the existing building and associated cooling infrastructure areas, and the project would not make any changes to the CRT building structure. The project would not increase the number of employees and visitors that would be present in the building.

#### 3.2 Project Purpose

The purpose of the Building 59 Upgrade & Installation and Operation of NERSC-9 project is to provide additional computing capacity to help meet the continually increasing needs of scientists for computational resources for simulation of physical phenomena as well as data analysis of sensor and experimental data. The NERSC-9 system is intended to provide 16-to-30 times the performance of NERSC-7, which it would replace, while improving energy efficiency by approximately 200 percent. System capacity to allow simultaneous operation of NERSC-9 and NERSC-8 systems is a necessary feature of CRT and the NERSC program: it allows a retired high-performance computing system (e.g., NERSC-7, or Edison) to be phased out, shut down, and removed and a new system (e.g., NERSC-9) to be installed in its place and gradually phased in without interruption to NERSC’s computational functions (i.e., NERSC-8 would continuously function during this period).

#### 3.3 Project Location and Surrounding Uses

The LBNL hill site is situated in the eastern hills of the cities of Berkeley and Oakland in Alameda County; it occupies approximately 200 acres that are owned by the University of California. Existing buildings at the LBNL hill site are used for wet, dry, and “heavy” laboratories, office space, and associated uses. The eastern portion of the LBNL hill site is in the city of Oakland while the western portion of the LBNL hill site is in the city of Berkeley.

---

<sup>2</sup> Some building system improvements are currently underway or planned to accommodate full operations of NERSC-8; these improvements have already been reviewed in the CRT EIR (SCH#2007072106; certified by the UC Regents in April 2008) and approved. Such improvements are not considered to be part of this proposed project; nevertheless, some of these future improvements will be conservatively analyzed as if they were part of the project for the purposes of this CEQA analysis (e.g., the already-approved, fifth cooling tower).

The LBNL hill site is surrounded by a mix of land uses, including open space, institutional uses, and residential and neighborhood commercial areas. The University of California, Berkeley, including the Strawberry Canyon open space areas, is south and southeast of the LBNL hill site. Residential neighborhoods and a small neighborhood commercial area in the city of Berkeley are to the north and northwest, and regional open space, including the 2,000-acre Tilden Regional Park, is to the northeast.

### 3.4 Project Site

The proposed NERSC-9 project would be located in the western portion of the LBNL site within the existing Wang Hall (Building 59) (see **Figure 1, Project Site**). Building 59 is an approximately 140,000-gsf building with 32,000 gsf of high-performance computing (HPC) space on one floor and office space on two floors. A mechanical room is located beneath the HPC floor and an electrical room is also located adjacent to the mechanical room. The building is located on the hillside adjacent to the Blackberry Gate entrance to the LBNL hill site. The facility entrance is on Perlmutter Road and the building is within walking distance or a short shuttle bus trip of the UC Berkeley Physical and Computer Science Departments.

Chu Road and LBNL's Building 50 complex, which is composed of a large lecture hall, a library, and buildings for computing, research, and office space, are located to the north. LBNL's Building 70 complex, consisting mainly of laboratory space, is located to the east. Other surrounding land uses include: Cyclotron Road and UC Berkeley Campus athletic, academic, and recreational facilities to the south; and Cyclotron Road, the Blackberry Canyon entrance gate, and Building 88, which houses LBNL's Cyclotron facility, to the west. City of Berkeley multi-family residential neighborhoods and UC Berkeley student housing are also located further to the west.

### 3.5 Project Components

The proposed project includes the installation and operation of a new high-performance computing system (NERSC-9), up to three cooling towers, a backup generator, water pumps, heat exchangers, electrical substations, air handling units, UPS panel, and exhaust fans. (See **Figure 2, Site Plan**). The project components are described below.

#### High-Performance Computing System

The proposed NERSC-9 high-performance computing system would be installed on the HPC floor of Building 59. In order to operate seamlessly while upgrading high performance computing systems, the building was designed and constructed to accommodate simultaneous operation of two systems. This allows the current generation high-performance computing system to continue to operate when a next generation is installed and phased into operation. Currently, NERSC-7 is operating while NERSC-8 is being installed and phased in. NERSC-8 is partially operational and will be fully operational by mid-2016. After NERSC-7 is phased out and then removed, NERSC-9 would be installed and gradually phased in.

The building interior itself would not undergo major structural modification, as the 32,000-gsf HPC floor is contiguous and largely column-free and has headroom to maximize flexibility in configuring supercomputer arrays. It includes a raised-floor system that provides access to data and electrical cabling, and it also serves as a supply air chase for air-cooled equipment.

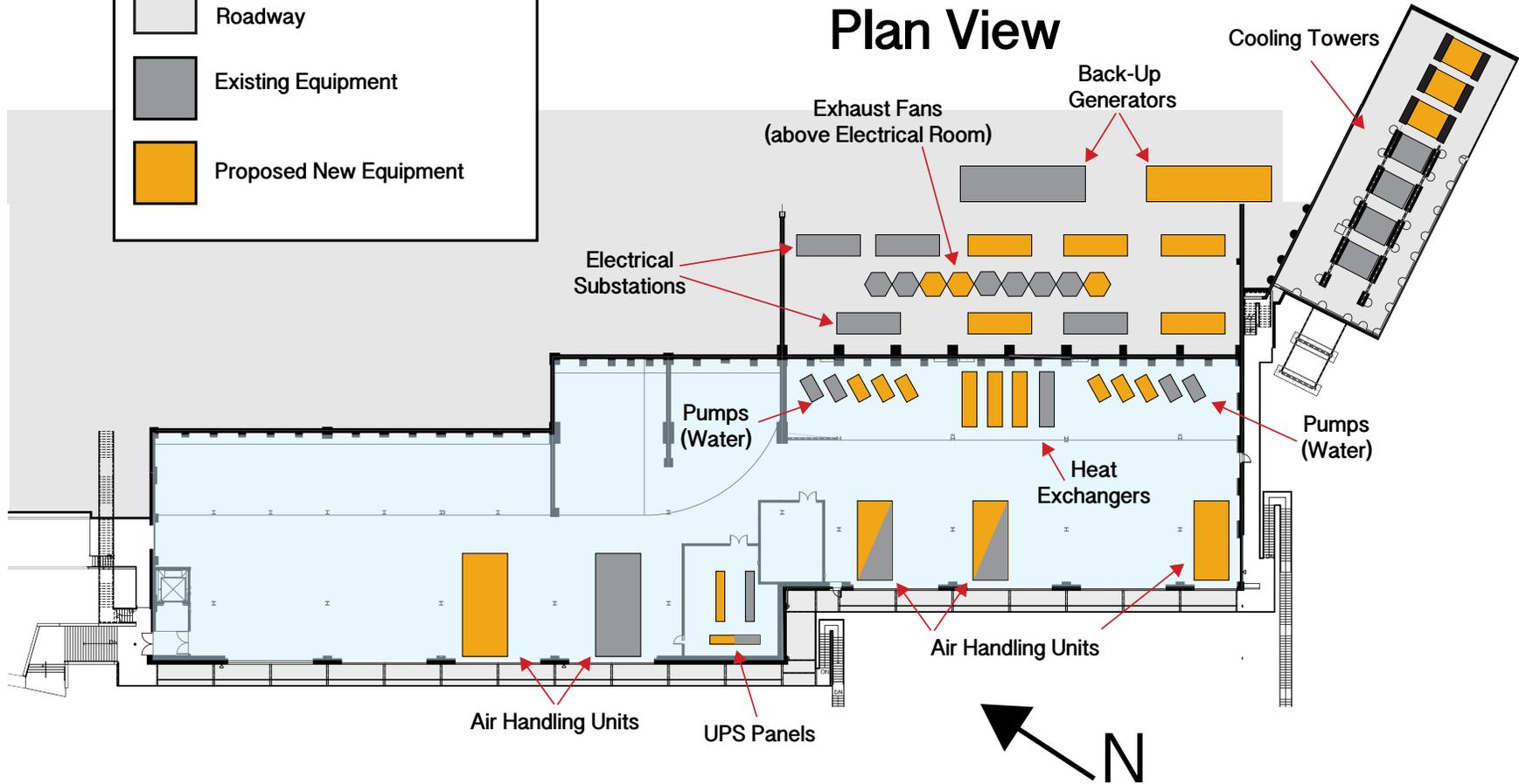


SOURCE: Lawrence Berkeley National Laboratory

FIGURE 1

# Bldg 59 NERSC 9 Upgrades: Plan View

	Bldg. 59 Interior (Mechanical Level)
	Exterior Concrete Pad / Roadway
	Existing Equipment
	Proposed New Equipment



Proposed equipment sizes and locations are approximate, schematic, and not to scale. For illustrative purposes. Some of the above identified proposed new equipment are already approved in previous NEPA/CEQA decision; others are exclusive to the proposed NERSC-9 project.

SOURCE: Lawrence Berkeley National Laboratory

## Cooling Towers

Cooling to the HPC floor and office space is currently provided by a bank of four high-efficiency evaporative cooling towers, approximately 15 feet high, and a chiller outbuilding located near the exterior southeast corner of the HPC portion of Building 59. The cooling towers are located on a concrete pad/foundation and the area is enclosed by a concrete wall. A fifth cooling tower was approved as part of the previously approved CRT project but has not been installed yet and is planned to be installed in conjunction with the NERSC-9 project. Although it is intended to be installed whether or not the proposed project moves forward, this already-approved fifth cooling tower will conservatively be considered a part of this project for CEQA analysis purposes. In addition to this already approved, fifth cooling tower, the proposed NERSC-9 project would add up to two additional cooling towers for a total of up to three new cooling towers (**Table 1**). All three would occupy the existing concrete cooling tower foundation/pad that was designed for the installation of additional cooling towers. The current system along with the (up to) three proposed cooling towers would serve liquid and air-cooled computational equipment. The cooling towers would operate at full capacity only during the warmest days of the year, typically in August.

## Backup Generator and Fuel Tank

Building 59 is currently equipped with a 1.25 megawatt (MW) standby generator. To accommodate the planned high-performance computing installation, the proposed project may also install a second 1.25 MW standby generator or multiple smaller generators with equivalent combined capacity, adjacent to the existing unit. Additionally, diesel fuel would be stored in a new, approximately 2,300 gallon above-ground fuel tank to service the new standby generator.

## Other Equipment

Up to six electrical substations would be installed in the building's electrical rooms, and six water pumps, three heat exchangers, up to four air handling units, and additional uninterruptible power supply (UPS) equipment would be installed inside the mechanical room.

### 3.6 Infrastructure and Utilities

Each of the new components listed above would require integration into the existing building utility and infrastructure systems.

#### Water Supply

Building 59 connects to an 8-inch high-pressure water main located beneath Seaborg Road for water supply. No changes to the water main are required. Current water consumption for the Wang Hall Facility is estimated at approximately 35 million gallons per year (mgy) or an average of about 96,000 gallons per day (gpd). At peak project buildout and operation, estimated water consumption would be approximately 55 mgy or an average of about 151,000 gpd. This includes demand for domestic water, fire suppression water, and cooling tower water. The proposed project would include recirculation of cooling water, which would reduce water demand.

**Table 1**  
**Current and Proposed Conditions**

<b>Item</b>	<b>Building 59 Current Use (2016)</b>	<b>NERSC-9 Project<sup>a</sup></b>	<b>Building 59 Projected Use at full Project Operation (2020)<sup>b</sup></b>
Average Electrical Power (MW)	7.5	13.5	-
Peak Electrical Power (MW)	8.9	10.5	27.5
Average Water Use (MGY)	35	20	55
Number of Cooling Towers	4	3	7
Capacity (MW) of substations	12.5 MW	15 MW	27.5 MW
Capacity (MW) of standby generators	1.25 MW	1.25 MW	2.5 MW
Number of Air Handling Units	3	4	7
Number of Heat Exchangers	1	3	4
Number of Exhaust Fans	6	3	9
Number of Building Occupants	300	0	300

<sup>a</sup>—Some project components are subject to minor changes as design undergoes value engineering and refinement.

<sup>b</sup>—While the facility is not currently operating at its fully approved capacity, it is steadily ramping up to full operations. Therefore, in some of the above table categories, 2020 use levels are projected to be somewhat higher than can be achieved by adding project operations to current conditions.

### **Sanitary Sewer System**

Sanitary sewer service is currently provided by a connection to the sewer main beneath Cyclotron Road. Improvements to the sanitary sewer system would not be required as the project would not increase the amount of wastewater discharged from the site.

### **Storm Drainage**

The existing Building 59 storm drain system includes roof drains, overflow drains, and interior downspouts that connect to the onsite storm drain system. Improvements to the storm drain system would not be required as no new impervious surface (e.g., additional buildings or equipment pads) is proposed that could result in increased runoff from the project site. The existing storm drain system at the project site has sufficient capacity to meet the current needs of the drainage area.

### **Electricity**

Electrical power is provided by the Western Area Power Administration (WAPA) and delivered to the LBNL site (Grizzly Peak substation) via PG&E's distribution system. From there, electricity is delivered to Building 59 through a medium-voltage underground duct bank. At the present time, the peak power load of Building 59 is 8.9 MW (which is steadily increasing as NERSC-8 comes on line up to a full electrical distribution capacity of 12.5 MW). While Building 59 was previously expected to result in a peak electrical energy demand of 17 MW, with the installation of NERSC-9 in 2020, peak electrical demand would increase to a maximum 27.5 MW. To provide this power to the facility, as noted above, up to six electrical substations would be added to the building's mechanical room.

No off-site improvements to LBNL's site-wide electrical distribution system are proposed as part of this project. The Grizzly Peak substation is expected to be upgraded over the next few years as part of ongoing utility modernization and planning efforts. These Grizzly Peak substation improvements would occur independently from any decision on the proposed CRT upgrade.

Backup power requirements at the present time are served by a 1.25 MW diesel-powered backup generator. As part of the proposed project, a second 1.25 MW diesel-powered backup generator, or multiple smaller generators with equivalent combined capacity, would be installed in the building's electrical room.

### **Natural Gas**

Natural gas is not used in Building 59 and demand for natural gas would not increase due to the proposed project.

## **3.7 Access, On-Site Circulation, and Parking**

Automobile access to Building 59 is available from Cyclotron Road and Seaborg Road. Approximately four parking spaces are provided for disabled guests near Building 59. Additional, limited-time parking spaces are provided for use by delivery and maintenance vehicles. Staff parking is provided in the existing parking lots. The building is within 500 feet of both the Horseshoe Parking Lot F to the south and Blackberry Canyon Parking Lot D to the north. The facility also includes parking for approximately 30 bicycles. Public transportation is available through the LBNL shuttle system.

### 3.8 Hazardous Materials On-Site

The proposed 1.25 MW backup generator would be tested monthly and would thereby create relatively small amounts of diesel exhaust. These emissions would be vented through an exhaust system specifically designed to disperse and prevent re-entrainment of exhaust into Building 50 or nearby buildings. Chemicals that might be used and stored during the operational phase of the project would include diesel fuel stored in the new fuel tank used to service the new backup generator. This above-ground storage tank would be secured with spill-prevention and secondary containment systems to prevent any accidental, uncontrolled releases.

Research that is conducted in Wang Hall is limited to computing and computing-related operations and does not involve radioactive materials, hazardous chemicals, hazardous organic or inorganic materials, nano-scale materials, or genetically modified/transgenic plant materials and microorganisms. Additionally, no “wet” laboratories are located in the building.

### 3.9 Project Population

The existing Wang Hall accommodates approximately 300 employees, of which approximately 225 are LBNL staff and 75 are UC Berkeley staff and students. As the proposed project involves an in-kind replacement of an older high-performance computing system, there would be no increase in the number of persons working in or conducting research in Wang Hall as a result of the proposed project.

### 3.10 Construction and Schedule

Project construction would occur in two phases. The first phase, which would commence in 2017 and end in 2019, would include installation of the electrical and mechanical infrastructure (e.g., substations, cooling towers, pumps, and other equipment). In the second phase, beginning in 2019, the distribution piping and cabling would be installed. NERSC -7 would be removed and NERSC 9 installed during the second phase as well. It is anticipated that NERSC 9 would be fully operational in 2021. A breakdown of the project schedule is shown in **Table 2** below.

As the table indicates, at peak, the construction of the project would generate up to 40 daily construction worker trips and up to 3 truck trips.

Construction equipment would include delivery and light construction vehicles, a crane, generators, and hand-held tools. Deliveries and construction staging would take place on either the loading dock at the Building 59 north end or on the paved area to the east of Building 59 and the project is not expected to use any unpaved land adjacent to the building during construction. However, a large crane (or cranes) would likely be used to lift and place heavy equipment such as the cooling towers into place. The crane(s) may be temporarily placed on a paved area or on an area of compacted, unpaved land (such as the area immediately north of the existing cooling tower pad. This is within the area that was previously disturbed during the construction of Building 59).

**Table 2  
Project Schedule**

#	Project Phase	Starting Timeframe	Ending Timeframe	Peak Number of onsite construction workers	Avg. number of daily onsite construction truck trips (round trips)
1	Additions to Bldg. 59 Facility: Electrical, Mechanical Infrastructure	2017	2019 (24 months)	40	3
2	Installation of piping, cabling, and NERSC-9 System	2019	2020 (18 months)	20	2
3	Full operation of NERSC-9	2021			

### 3.11 Consistency with the LRDP

The 2006 LRDP is the land use plan applicable to the proposed project. The project would be located in the existing Wang Hall building, which is located in the southeastern portion of the Berkeley Lab main hill site on land designated as Research and Academic. The existing uses in the building are consistent with this land use designation.

The proposed project would not change the uses in or function of the building. The project would not add building space to LBNL nor increase the Laboratory's population. The NERSC-9 project would not cause an increase in Wang Hall's occupancy, which was evaluated in the CRT EIR as being up to 300 persons.

Wang Hall would continue to operate in the manner described, reviewed, and approved in the CRT EIR. It would continue to remain consistent with the stated and previously analyzed land use designation; space, population, and parking projections; and policy objectives, and goals of the 2006 LRDP.

**4. ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:**

As identified in Section 15063(c) of the State CEQA Guidelines, the purpose of this Initial Study is to: (1) inform responsible agencies and the public of the nature of the proposed project and its location, (2) identify impacts that would clearly not result or would clearly be less than significant and therefore will not be discussed in the EIR, and (3) provide a general description of the topics intended to be addressed in the EIR.

The environmental factors checked below could be potentially affected by implementation of the proposed project and/or by cumulative impacts resulting from implementation of the proposed project in conjunction with other expected developments. These factors will be evaluated in the project EIR.

	Aesthetics		Agricultural and Forest
	Air Quality		Biological Resources
	Cultural Resources		Geology and Soils
	Hazards and Hazardous Materials	X	Greenhouse Gas Emissions
	Land Use and Planning		Hydrology and Water Quality
	Noise		Mineral Resources
	Public Services		Population and Housing
	Transportation/Traffic		Recreation
	Utilities and Service Systems, including Energy	X	Mandatory Findings of Significance

## 5. DETERMINATION

On the basis of this initial evaluation:

- I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.
- I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the proposed proponent. EITHER A MITIGATED NEGATIVE DECLARATION OR ENVIRONMENTAL IMPACT REPORT will be prepared.
- I find that the proposed project MAY have a significant effect on certain environmental factors beyond those covered in previous CEQA analysis, and a FOCUSED ENVIRONMENTAL IMPACT REPORT is required.
- I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measure based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT will be prepared.

Signature: \_\_\_\_\_



Jeff Philliber, UC LBNL Chief Environmental Planner

Date: \_\_\_\_\_

MAY 31, 2016

## 6. EVALUATION OF ENVIRONMENTAL IMPACTS

### Introduction

Appendix G of the State CEQA Guidelines provides a suggested format to use when preparing an Initial Study. The Environmental Checklist used in this document adopts a slightly different format with respect to response column headings, while still addressing the Appendix G checklist questions for each environmental issue area.

### Project-specific and Cumulative Impacts

The attached Environmental Checklist uses the following response headings to identify potential environmental effects that will be addressed in the Building 59 Upgrade & Installation and Operation of NERSC-9 project EIR:

**Impact to be Analyzed in the EIR:** An effect that may or may not be significant that will be addressed in the project EIR. The effect may be a less than significant impact that will be addressed to provide a more comprehensive analysis, an impact for which further analysis is necessary or desirable before a determination about significance can be made, an impact that is potentially significant but may be reduced to a less than significant level with the adoption of mitigation measures, or an impact that may be significant and unavoidable.

**No Additional Analysis Required:** An effect that would either not occur or would clearly be less than significant impact under CEQA criteria, and no additional analysis beyond that provided in the Initial Study is necessary.

## **6.1 Aesthetics**

### **6.1.1 Background**

#### **LBNL**

The LBNL hill site is located on the steeply sloping hillsides of the Berkeley-Oakland hills, rising from elevation 500 feet above mean sea level (msl) near the Blackberry Canyon Gate to about 1,000 feet above msl at the northern border of the site. The hills provide a semi-natural, vegetated open space backdrop to the LBNL hill site. The hills are wooded with native stands of oaks and California bay or with introduced eucalyptus or conifers. The entire LBNL hill site cannot be viewed from any one single off-site vantage point. However, portions of the LBNL hill site are visible from residential neighborhoods, public roadways, and public vantage points in the areas that adjoin LBNL. Views of individual buildings or groups of buildings are available from public vantage points such as the Memorial Stadium, the Lawrence Hall of Science, and Grizzly Peak Road. As described in the 2006 LRDP EIR, portions of the LBNL hill site are visible in medium range views (less than 1 mile) from nearby elevated off-site locations such as the residential neighborhoods in the north and northwestern portions of the City of Berkeley. Long-range views (greater than 1 mile) are available from downtown Berkeley and the Berkeley Marina.

The visual character of LBNL's built environment is eclectic. Many buildings display an industrial look and utilitarian quality. Many buildings are painted in neutral colors to blend with the natural setting. Some of the buildings are recognizable landmarks, including Building 50 and the Advanced Light Source, both of which are also visible from off-site locations.

Some amount of nighttime lighting is produced on the LBNL hill site as a result of interior and exterior lighting associated with LBNL buildings, roadways and parking lots. All buildings and parking areas are equipped with downward-directed light fixtures for nighttime lighting.

#### **Project Site**

The NERSC-9 project would be located in the existing Building 59, located in the western portion LBNL hill site, immediately upslope of LBNL's Blackberry Gate main entrance. All upgrades and improvements would take place inside the existing Building 59 or within an exterior area adjacent to the southeast corner of the building. The proposed project would not involve construction of any buildings and would not be visible from off-site areas near the LBNL hill site.

### 6.1.2 Environmental Checklist and Discussion

	Impact to be Analyzed in the EIR	No Additional Analysis Required
<b>AESTHETICS</b> - Would the project:		
a. Have a substantial adverse effect on a scenic vista?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b. Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c. Substantially degrade the existing visual character or quality of the site and its surroundings?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d. Create a new source of substantial light or glare, which would adversely affect day or nighttime views in the area?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

#### DISCUSSION:

- a. **No Additional Analysis Required.** The proposed project would not involve any exterior building modifications. The majority of the project would involve installation of equipment within the existing Building 59. Exterior work would involve installing up to three cooling towers adjacent to four existing cooling towers, using an existing foundation pad. This pad is located southeast of Building 59 and surrounded by mature trees to the south. Both the building and trees block off-site views of the existing and proposed new cooling towers. Laydown area for building work would largely take place on the paved areas immediately east of Building 59, and the building would screen views of the laydown area from the surrounding off-site areas. Although a large crane may be used to install outdoor equipment such as the cooling towers and would be visible from off-site locations, the crane would be present for only a limited portion of the construction duration and much of it would be screened from views by intervening trees on the hillside surrounding Wang Hall. Therefore, the temporary impact of the project during construction would be less than significant and there would be no long term impact of the project on scenic vistas. Further analysis is not required.
- b. **No Additional Analysis Required.** The nearest state highways to the project site are Interstate 80, Interstate 580, Highway 24, and Highway 13. None of the highways are very close to the project site and the portions of these highways that are within the vicinity of the project site are not designated or eligible as scenic routes. There are no other scenic resources located on the project site that would be affected by the implementation of the proposed project. Therefore, there would be no impact to scenic resources on-site or within the vicinity of a designated state scenic highway. Further analysis is not required.
- c. **No Additional Analysis Required.** As noted above, the proposed project would not involve any building construction. Installation activities would be temporary in nature and would mainly occur within the existing Building 59. Exterior work would involve installing (up to) three cooling towers

adjacent to existing cooling towers within the existing cooling tower enclosure. As a result, there would be no permanent impact to the existing visual character of the project site or its surroundings as a result of the proposed project. Further analysis is not required.

- d. **No Additional Analysis Required.** The project would not add any new sources of light and glare. Further analysis is not required.

### 6.1.3 Cumulative Impacts

Because there would be no long-term project impact on aesthetics, the project would not contribute to any cumulative impacts regarding aesthetics. Furthermore, cumulative visual impacts of the 2006 LRDP are addressed under LRDP Impact VIS-5 (page IV.A-30) of the EIR. The 2006 LRDP EIR concluded that implementation of the 2006 LRDP, in conjunction with cumulative development, would alter the visual character of, and change views of, the Oakland-Berkeley hills in the vicinity of Berkeley Lab. The EIR concluded that because the 2006 LRDP development (with mitigation) would not result in significant visual or light and glare impacts, because little other development is expected that could result in overlapping (cumulative) visual impacts, and because the 2006 LRDP would not result in adverse impacts that would occur in combination with the UC Berkeley projects, the cumulative aesthetic effects of the 2006 LRDP would be less than significant. The proposed project is within the scope of the development described and evaluated in the 2006 LRDP EIR. Therefore, the proposed project's cumulative aesthetic effects are adequately addressed under LRDP Impact VIS-5 and would be less than significant. No conditions have changed and no new information has become available since certification of the 2006 LRDP EIR that would alter this previous analysis. Further analysis is not required.

## 6.2 Agricultural and Forest Resources

### 6.2.1 Background

The LBNL hill site does not contain any designated or actively farmed land. Public Resources Code Section 12220 defines forest land as land that can support 10 percent native tree cover of any species, including hardwoods, under natural conditions, and that allows for management of one or more forest resources, including timber, aesthetics, fish and wildlife, biodiversity, water quality, recreation, and other public benefits.

#### Project Site

The project site is considered “Urban and Built-Up” by the California Department of Conservation Farmland Mapping and Monitoring Program (FMMP). The project site and surrounding areas are currently developed and there are no agricultural uses. Although there may be forested areas in some portions of the LBNL site that qualify as forest land, the project vicinity does not contain forest land.

### 6.2.2 Environmental Checklist and Discussion

	Impact to be Analyzed in the EIR	No Additional Analysis Required
<b>AGRICULTURAL AND FOREST RESOURCES - Would the project:</b>		
a. Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b. Conflict with existing zoning for agricultural use, or a Williamson Act contract?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c. Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)) or timberland (as defined in Public Resources Code section 4526)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d. Result in the loss of forest land or conversion of forest land to non-forest use?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e. Involve other changes in the existing environment, which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to nonforest use?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

#### DISCUSSION:

**a.-e. No Additional Analysis Required.** The project site is located in an urbanized area. According to the FMMP, there is no Farmland within the boundaries of LBNL hill site. The project would not result in the

conversion of farmland to a non-agricultural use on-site and off-site because there is no farmland within the LBNL hill site or in the vicinity of the Berkeley Lab. There is also no forest land on the project site. Therefore, implementation of the proposed project would not impact agricultural and forest resources, and no further analysis is required.

### **6.2.3 Cumulative Impacts**

Because there would be no project impact on agricultural and forest resources, the project would not contribute to any cumulative impacts on these resources. Further analysis is not required.

## 6.3 Air Quality

### 6.3.1 Background

The project area is subject to air quality planning programs developed in response to both the Federal Clean Air Act (CAA) and the California Clean Air Act (CCAA). Within the San Francisco Bay Area, air quality is monitored, evaluated, and regulated by the U.S. Environmental Protection Agency (EPA), the California Air Resources Board (CARB), and Bay Area Air Quality Management District (BAAQMD).

#### **LBNL**

LBNL is located in Alameda County, which, along with eight other counties, is within the San Francisco Bay Area Air Basin (SFBAAB or Basin).

Air pollutants are emitted by a variety of sources, including mobile sources such as automobiles; stationary sources such as manufacturing facilities, power plants, and laboratories; and area sources such as homes and commercial buildings. While some of the air pollutants that are emitted need to be examined at the local level, others are predominantly an issue at the regional level. For instance, ozone is formed in the atmosphere in the presence of sunlight by a series of chemical reactions involving oxides of nitrogen (NO<sub>x</sub>) and reactive organic gases (ROG). Because these reactions are broad-scale in effects, ozone typically is analyzed at the regional level (i.e., in the Basin) rather than the local level. On the other hand, other air pollutants such as sulfur dioxide (SO<sub>2</sub>), respirable particulate matter (PM<sub>10</sub>), fine particulate matter (PM<sub>2.5</sub>), carbon monoxide (CO), lead (Pb), and toxic air contaminants (TAC) are a potential concern in the immediate vicinity of the pollutant source because the pollutants are emitted directly or are formed close to the source. Therefore, the study area for emissions of SO<sub>2</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>, CO, Pb, and TAC is the local area nearest the source, such as in the vicinity of congested intersections, whereas the study area for regional pollutants such as NO<sub>x</sub> and ROG is the entire Basin.

Air pollutants typically are categorized as criteria pollutants or TACs. The criteria pollutants are those regulated at the federal level by US EPA and at the state level by CARB. These include ozone, PM<sub>10</sub>, PM<sub>2.5</sub>, CO, NO<sub>2</sub>, SO<sub>2</sub>, and Pb. Ozone is a secondary pollutant formed during photochemical reactions with precursor pollutants. As such, ozone is measured by assessing emissions of its precursors, Reactive Organic Gases (ROG) and NO<sub>2</sub>. Both US EPA and CARB have established federal and state ambient air quality standards for these criteria pollutants. The primary sources of criteria pollutants at the LBNL hill site include automobiles and heating equipment.

TACs are airborne pollutants for which there are no air quality standards but that are known to have adverse human health effects. Examples include aromatic and chlorinated hydrocarbons, certain metals, and asbestos. Adverse health effects can be carcinogenic, short-term (acute) noncarcinogenic, and long-term (chronic) noncarcinogenic. TACs are generated by a number of sources, including stationary sources such as dry cleaners, gas stations, combustion sources, and laboratories; mobile sources such as automobiles and trucks, particularly diesel-fueled vehicles; and area sources, such as farms, landfills, construction sites, and residential areas. Sources of TACs around the LBNL hill site include diesel buses and trucks; laboratory vent emissions; boilers in individual buildings; standby generators; and painting operations.

Air quality in the Basin is monitored by the BAAQMD and CARB. Based on pollutant concentrations measured at monitoring stations within the Basin, the SFBAAB is classified as being in attainment or non-

attainment of federal and state air quality standards. The Basin is in attainment or unclassified for all federal and state standards except for the state and federal ozone standards and the state standards for particulate matter. Specifically, the SFBAAB is a marginal nonattainment area for the federal 8-hour standard for ozone; a nonattainment area for federal PM2.5 standard; a nonattainment area for the California 1-hour and 8-hour ozone standard; a nonattainment area for the California 24-hour and annual PM10 standards, as well as the California annual PM2.5 standard.

Some groups of people are considered more sensitive to adverse effects from air pollution than the general population. These groups are termed “sensitive receptors.” Sensitive receptors include children, the elderly, and people with existing health problems, who are more often susceptible to respiratory infections and other air quality-related health problems. Schools, childcare centers, hospitals, and nursing homes are all considered sensitive receptors. Air pollution impacts are assessed, in part, based on potential effects on sensitive receptors.

**Project Site**

Sensitive land uses in the vicinity of the proposed project include residential neighborhoods and university student housing. The nearest residences are approximately 600 feet away. The UC Berkeley campus lies west of the project site. Sensitive land uses on the campus, which are in proximity of the project site, include a dormitory and Foothill Student Housing facility. Vehicles are the primary sources of air pollution in the vicinity of the project site. Other sources of emissions in the vicinity of the project site include standby generators associated with various existing buildings, and fume hoods located in laboratories, which are vented to the roofs of laboratory buildings.

**6.3.2 Environmental Checklist and Discussion**

	Impact to be Analyzed in the EIR	No Additional Analysis Required
<b>AIR QUALITY</b> - Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:		
a. Conflict with or obstruct implementation of the applicable air quality plan?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b. Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

	Impact to be Analyzed in the EIR	No Additional Analysis Required
c. 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 (including releasing emissions, which exceed quantitative thresholds for ozone precursors)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d. Expose sensitive receptors to substantial pollutant concentrations?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e. Create objectionable odors affecting a substantial number of people?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f. Expose people to substantial levels of toxic air contaminants (TACs), such that the exposure could cause an incremental human cancer risk greater than 10 in one million or exceed a hazard index of one for the maximally exposed individual?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

**DISCUSSION:**

**a.-b. No Additional Analysis Required.** The project site is located in the SFBAAB, which is currently designated a non-attainment area for PM<sub>10</sub>, PM<sub>2.5</sub>, and ozone. Project construction activities would be limited to installing equipment inside Building 59 or on existing pads and paved areas adjacent to the building. No grading of undeveloped land or major exterior construction would be involved. Therefore the construction emissions would be minimal and would not violate any air quality standard. Furthermore, the project would implement **LRDP Mitigation Measures AQ-1a and AQ-1b.**

**LRDP Mitigation Measure AQ-1a**

The BAAQMD’s approach to dust abatement calls for “basic” control measures that should be implemented at all construction sites, “enhanced” control measures that should be implemented at construction sites greater than four acres in area, and “optional” control measures that should be implemented on a case-by-case basis at construction sites that are large in area or are located near sensitive receptors, or that, for any other reason, may warrant additional emissions reductions (BAAQMD, 1999).

During construction of individual projects proposed under the LRDP, LBNL shall require construction contractors to implement the appropriate level of mitigation (as detailed below), based on the size of the construction area, to maintain project construction-related impacts at acceptable levels; this would reduce the potential impact to a less-than-significant level.

Elements of the “basic” dust control program for project components that disturb less than one acre shall include the following at a minimum:

- Water all active construction areas at least twice daily. Watering should be sufficient to prevent airborne dust from leaving the site. Increased watering frequency may be necessary whenever wind speeds exceed 15 miles per hour. Reclaimed water should be used whenever possible.
- Cover all trucks hauling soil, sand, and other loose materials or require all trucks to maintain at least two feet of freeboard (i.e., the minimum required space between the top of the load and the top of the trailer).
- Pave, apply water three times daily (or as sufficient to prevent dust from leaving the site), or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas, and staging areas at construction sites.
- Sweep daily or as appropriate (with water sweepers using reclaimed water if possible) all paved access roads, parking areas and staging areas at construction sites.
- Sweep streets daily or as appropriate (with water sweepers using reclaimed water if possible) if visible soil material is carried onto adjacent public streets.

Elements of the “enhanced” dust abatement program for project components that disturb four or more acres shall include all of the “basic” measures in addition to the following measures:

- Hydroseed or apply (non-toxic) soil stabilizers to inactive construction areas (previously graded areas inactive for ten days or more).
- Enclose, cover, water twice daily (or as sufficient to prevent dust from leaving the site), or apply (non-toxic) soil stabilizers to exposed stockpiles (dirt, sand, etc.).
- Limit traffic speeds on unpaved roads to 15 miles per hour.
- Install sandbags or other erosion control measures to prevent silt runoff to public roadways.
- Replant vegetation in disturbed areas as quickly as possible.

Elements of the “optional” control measures are strongly “encouraged” at construction sites that are large in area or located near sensitive receptors, or that for any other reason may warrant additional emissions reductions:

- Install wheel washers for all exiting trucks, or wash off tires or tracks of all trucks and equipment leaving the site.
- Install wind breaks, or plant trees/vegetative wind breaks at windward side(s) of construction areas.
- Suspend excavation and grading activity when winds (instantaneous gusts) exceed 25 miles per hour.
- Limit the area subject to excavation, grading, and other construction activity at any one time.
- Pave all roadways, driveways, sidewalks, etc. as soon as possible. In addition, building pads should be laid as soon as possible after grading unless seeding or soil binders are used.
- Designate a person or persons to monitor the dust control program and to order increased watering, as necessary, to prevent transport of dust off-site. Their duties shall include holidays and

weekend periods when work may not be in progress. The names and telephone numbers of such persons shall be provided to the BAAQMD prior to the start of construction.

#### **Mitigation Measure AQ-1b**

To mitigate equipment exhaust emissions, LBNL shall require its construction contractors to comply with the following measures:

- Construction equipment shall be properly tuned and maintained in accordance with manufacturers' specifications.
- Best management construction practices shall be used to avoid unnecessary emissions (e.g., trucks and vehicles in loading and unloading queues would turn their engines off when not in use).
- Any stationary motor sources such as generators and compressors located within 100 feet of a sensitive receptor shall be equipped with a supplementary exhaust pollution control system as required by the BAAQMD and the California Air Resources Board.
- Incorporate use of low-NO<sub>x</sub> emitting, low-particulate emitting, or alternatively fueled construction equipment into the construction equipment fleet where feasible, especially when operating near sensitive receptors.
- Reduce construction-worker trips with ride-sharing or alternative modes of transportation.

With respect to project operations, the proposed NERSC-9 would add stationary sources of emissions to the existing building but would not add any new employees and therefore would not result in any increase in mobile source emissions. The stationary sources added by the proposed project would include (up to) three new cooling towers and a 1.25 MW standby generator. Cooling towers operate on electricity and do not produce any combustion emissions. However the evaporation process from cooling towers produces a small amount of PM<sub>10</sub> and PM<sub>2.5</sub> emissions. With respect to the standby generator, it would be routinely tested for up to 50 hours per year. Criteria pollutant emissions from the routine testing of the generator were estimated using AP-42 emission factors provided by the U.S. EPA.

**Table 3, Estimated Operational Emissions**, shows the project's predicted operational emissions in terms of annual emissions in tons and average daily operational emissions in pounds per day. As shown in **Table 3**, average daily and annual emissions of ROG and NO<sub>x</sub> (which are ozone precursors), PM<sub>10</sub>, or PM<sub>2.5</sub> emissions associated with project operation would not exceed the significance thresholds. As a result, the project's impact associated with operational emissions of criteria pollutants would be less than significant. No further analysis is required.

**Table 3**  
**Estimated Operational Emissions**

Scenario	ROG	NOx	PM10	PM2.5
<b>Annual Emissions (tons per year)</b>				
Standby Generator	0.00	0.54	0.00	0.00
Cooling Towers	0.00	0.00	0.03	0.03
<i>Total</i>	<i>0.00</i>	<i>0.54</i>	<i>0.03</i>	<i>0.03</i>
<b>BAAQMD Thresholds (tons per year)</b>	<b>10</b>	<b>10</b>	<b>15</b>	<b>10</b>
<b>Exceeds Threshold?</b>	No	No	No	No
<b>Daily Emissions (pounds per day)</b>				
Standby Generator	0.18	21.78	0.06	0.06
Cooling Towers	0.00	0.00	1.41	1.41
<i>Total</i>	<i>0.18</i>	<i>21.78</i>	<i>1.47</i>	<i>1.47</i>
<b>BAAQMD Thresholds (pounds per day)</b>	<b>54</b>	<b>54</b>	<b>82</b>	<b>54</b>
<b>Exceeds Threshold?</b>	No	No	No	No

*Source: Illingworth & Rodkin, 2016*

- c. **No Additional Analysis Required.** As shown in **Table 3** above, installation of NERSC-9 and accompanying equipment would not significantly add to short- and long-term emissions of criteria air pollutants from mobile and stationary sources, including PM<sub>10</sub>, PM<sub>2.5</sub>, and ROG and NO<sub>x</sub> that are ozone precursors for which the air basin is in nonattainment. The impact would be less than significant. No further analysis is required.
- d. **No Additional Analysis Required.** The proposed project would not expose sensitive receptors to substantial CO concentrations as the proposed project would not add any new vehicle trips. There would be no impact. No further analysis is required.
- e. **No Additional Analysis Required.** There is no history of odor complaints from the LBNL hill site and the proposed project site is fairly distant from off-site receptors, with the nearest off-site receptors within the Foothill Student Housing Complex located below and about 685 feet to the southwest of Building 59. Ongoing activities from the proposed project are not expected to create nuisance or objectionable odors affecting substantial numbers of people, particularly off-site. Therefore no impact related to objectionable odors would occur and no further analysis is required.
- f. **No Additional Analysis Required.** The project does not include any processes that would generate toxic air contaminants that could affect sensitive receptors that are located approximately 685 to 700 feet to the southwest and west of the project site. The routine testing of the standby generator would result in a small amount of diesel exhaust emissions (emitted as PM<sub>2.5</sub>) that would be vented from the electrical room roof top exhausts periodically. However, as shown in **Table 3** above, the maximum allowable PM<sub>2.5</sub> emissions from the generator would be low. Furthermore, the electrical room exhausts are located to the

east of the building and not on the building aspect that is towards the sensitive receptors. Additionally, the standby generator would require a permit from the BAAQMD. The air district stipulates the maximum number of hours in a year that the generator may be operated for testing and maintenance (i.e., no more than 50 hours), and requires that the generator meet the stipulated PM<sub>2.5</sub> emission rate, and that the operation of the generator not result in human health effects on nearby receptors. For all of these reasons, the routine testing of the generator would not expose nearby sensitive receptors to substantial levels of toxic air contaminant emissions that could result in human health impacts. The impact would be less than significant. No further analysis is required.

### 6.3.3 Cumulative Impacts

#### *Criteria Pollutants*

The SFBAAB is currently designated as a nonattainment area for state and national ozone standards and particulate matter standards. Past, present and future development projects contribute to the region's adverse air quality impacts on a cumulative basis. No single project is sufficient in size to, by itself, result in nonattainment of ambient air quality standards. Instead, the BAAQMD CEQA Air Quality Guidelines states that a project's individual emissions contribute to existing cumulatively significant adverse air quality impacts. According to the BAAQMD, if a project exceeds the identified significance thresholds, its emissions would be cumulatively considerable, resulting in significant adverse air quality impacts to the region's existing air quality conditions. Because as shown in the analysis above, the proposed project would not exceed any of BAAQMD's thresholds of significance, the proposed project would not result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under the federal and state ambient air quality standards. The impact would be less than significant.

Furthermore, the 2006 LRDP EIR evaluated the cumulative effects on air quality from criteria pollutant emissions associated with LBNL growth and development under the 2006 LRDP, together with anticipated future cumulative development in Berkeley and the Bay Area in LRDP Impact AQ-5 (page IV.B-47). The EIR concluded that the LRDP's contribution to the cumulative criteria air pollutant emissions from regional growth would not be "cumulatively considerable." Therefore, growth and development pursuant to the 2006 LRDP would not contribute considerably to cumulative increases in criteria pollutants, and the cumulative effect would be less than significant. The proposed project is within the scope of the growth and development evaluated in the 2006 LRDP EIR. Therefore, the proposed project's cumulative air quality effects are adequately addressed under LRDP Impact AQ-5 and are determined to be less than significant.

The 2006 LRDP EIR also evaluated the potential for traffic associated with full development under the 2006 LRDP to expose sensitive receptors to high carbon monoxide (CO) concentrations in the area of congested intersections (LRDP Impact AQ-3) and other pollutants. The analysis concluded that the CO concentrations would not exceed air quality standards.

No conditions have changed and no new information has become available since certification of the 2006 LRDP EIR that would alter this previous analysis. No further environmental evaluation is required.

#### *Toxic Air Contaminants*

LRDP Impact AQ-6 evaluated cumulative human health impacts from the implementation of the 2006 LRDP in combination with other contributing projects to determine whether the TAC emissions would

result in an exceedance of the BAAQMD significance threshold (cancer risk in excess of 10-in-a-million) used at the time for the evaluation of both project-level and cumulative impacts. Since the LBNL 2006 LRDP EIR was prepared, the threshold has changed, as further described below. The 2006 LRDP EIR analysis concluded that, although the cumulative emissions of TACs would decrease as a result of new regulations and improved technologies, the cumulative emissions of TACs associated with the 2006 LRDP (including the CRT project), combined with toxic air contaminant emissions from sources on the UC Berkeley campus under the UC Berkeley 2020 LRDP, would result in a maximum off-site cancer risk of 22-in-a-million, exceeding the significance threshold in use at that time. Using the standard, the cumulative impact was deemed to be significant in the LBNL 2006 LRDP EIR. The 2006 LRDP EIR noted that even with the implementation of LRDP Mitigation Measure TRANS-1c to reduce vehicular TAC emissions, the impact would not be reduced to a less than significant level. Therefore, the EIR concluded that the impact would be significant and unavoidable. As noted above, the proposed project is within the scope of development envisioned under the 2006 LRDP and analyzed in the 2006 LRDP EIR for environmental impacts, including human health effects. The proposed project would generate minimal TAC emissions associated with the periodic testing of the standby generator which would contribute to this significant cumulative impact.

As noted above, in 2010, the BAAQMD issued updated CEQA Air Quality Guidelines that included new thresholds of significance to evaluate environmental impacts, including a threshold of 100 in 1 million to evaluate cumulative cancer risk impacts. Under the subsequent threshold of 100 in 1 million, the 2006 LRDP's cumulative TAC impact of 22-in-a-million is less than significant, as is the cumulative impact of the proposed project. The cumulative impacts of the proposed project would therefore be less than significant.

## 6.4 Biological Resources

### 6.4.1 Background

#### LBNL

Similar to other developed areas in the Berkeley-Oakland hills, the LBNL hill site is characterized by clusters of development interspersed with open space that contains a mosaic of vegetation types and wildlife habitats, including oaks and mixed hard wood forests, native and non-native grasslands, chaparral, coast scrub, marsh and wetland communities, and riparian scrubs and forests. Grasslands are the predominant plant community and make up approximately 67 acres of the LBNL hill site. Grasslands consist mostly of annual grasses either as open grassland or as an understory in relatively open eucalyptus and pine stands. Eucalyptus stands are the second most dominant plant community with approximately 22 acres under such stands. Oak-Bay woodland is found on about 12 acres of the LBNL hill site and consists of a mix of coast live oaks and California bay. Coast live oak woodland occurs over 9 acres of the LBNL hill site and California bay woodland occurs on 5.5 acres of the hill site, and is concentrated mainly in the drainages. Coastal scrub occurs on approximately 8.5 acres and includes both California sagebrush scrub and coyote brush scrub. Developed areas at the LBNL hill site have been landscaped with non-native ornamentals in the past and native and drought resistant plants in recent years.

The 2006 LRDP EIR evaluated the potential for the LBNL hill site to support special status plant and wildlife species. Based on the evaluated species, the EIR noted that five special status plant species and 21 special status wildlife species had at least a moderate potential to occur on the LBNL hill site. The EIR also determined that four habitats at the LBNL hill site qualified as sensitive habitats, including known habitat of Lee’s micro-blind harvestman, potential Alameda whipsnake habitat, critical Alameda whipsnake habitat, and riparian and wetland habitat.

#### Project Site

The project site is located on a hillside and is developed with buildings and paved areas. A small intermittent drainage is located approximately 50 feet to the south of the project site. There are screening trees that surround the southern portion of Building 59 and the cooling tower cluster.

### 6.4.2 Environmental Checklist and Discussion

	Impact to be Analyzed in the EIR	No Additional Analysis Required
<b>BIOLOGICAL RESOURCES</b> - Would the project:		
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 Game or U.S. Fish and Wildlife Service?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

	Impact to be Analyzed in the EIR	No Additional Analysis Required
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 Game or U.S. Fish and Wildlife Service?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c. Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

**DISCUSSION:**

- a. **No Additional Analysis Required.** According to Figure IV. C-2 in the LBNL 2006 LRDP EIR, the project site is within a high potential area for the Alameda whipsnake. There may be suitable habitat for the Alameda whipsnake in the vicinity of the project site. However, all exterior work would take place on currently developed Building 59 hardscape and in areas previously disturbed in conjunction with the construction of Building 59. Areas devoid of vegetation and contiguous to development and human activity are not considered to be viable habitat for the species (the Alameda whipsnake avoids areas where ground cover cannot visually obscure it from birds of prey; it also avoids human activity). Nevertheless, the project would implement **LBNL Mitigation Measures BIO-5c through 5f** and project construction crews who might work in unpaved areas as required for crane placement would undergo required Alameda whipsnake awareness training. Therefore no habitat for the species would be disturbed and impacts to the species would be avoided.

**LRDP Mitigation Measure BIO-5c:**

A full-time designated monitor shall be employed at project sites that are within or directly adjacent to areas designated as having high potential for whipsnake occurrence, or (2) Daily site surveys for

Alameda whipsnake shall be carried out by a designated monitor at construction sites within or adjacent to areas designated as having moderate potential for whipsnake occurrence.

Each morning, prior to initiating excavation, construction, or vehicle operation at sites identified as having moderate or high potential for whipsnake occurrence, the project area of applicable construction sites shall be surveyed by a designated monitor trained in Alameda whipsnake identification to ensure that no Alameda whipsnakes are present. This survey is not intended to be a protocol-level survey. 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. At sites in high potential areas the monitor shall remain on-site during construction hours. At sites in moderate potential areas the monitor shall remain on-call during construction hours in the event that a snake is found on-site. The designated monitor shall have the authority to halt construction activities in the event that a whipsnake is found within the construction footprint 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 Alameda whipsnakes. The USFWS shall be notified within 24 hours of any such event.

**LRDP Mitigation Measure BIO-5d:**

Alameda whipsnake awareness and relevant environmental sensitivity training for each worker shall be conducted by the designated monitor prior to commencement of on-site activities. All on-site workers at applicable construction sites shall attend an Alameda whipsnake information session conducted by the designated monitor prior to beginning work. This session shall cover identification of the species and procedures to be followed if an individual is found on-site, as well as basic site rules meant to protect biological resources, such as speed limits and daily trash pickup.

**LRDP Mitigation Measure BIO-5e:**

Hours of operation and speed limits shall be instituted and posted. All construction activities that take place on the ground (as opposed to within buildings) at applicable construction sites shall be performed during daylight hours, or with suitable lighting so that snakes can be seen. Vehicle speed on the construction site shall not exceed 5 miles per hour.

**LRDP Mitigation Measure BIO-5f:**

Site vegetation management shall take place prior to tree removal, grading, excavation, or other construction activities. Construction materials, soil, construction debris, or other material shall be deposited only on areas where vegetation has been mowed.

Areas where development is proposed under the 2006 LRDP are subject to annual vegetation management involving the close-cropping of all grasses and ground covers; this management activity would be performed prior to initiating project-specific construction. Areas would be re-mowed if grass or other vegetation on the project site becomes high enough to conceal whipsnakes during the construction period. In areas not subject to annual vegetation management, dense vegetation would be removed prior to the onset of grading or the use of any heavy machinery, using goats, manual brush cutters, or a combination thereof.

With mitigation, the impact would be less than significant. Further analysis is not required.

In order to deliver certain large pieces of equipment, such as the backup generator and cooling towers, to the appropriate locations around Building 59, a large crane or cranes may need to be temporarily installed and operated adjacent to the building. Although no trees are planned for removal or disturbance, trees that surround the southern portion of Building 59 and the cooling tower pad may provide habitat for special-status birds or bat species. Noise associated with the delivery of equipment and installation of the cooling towers could possibly affect special-status bird and/or bat species that may inhabit these nearby trees. However, the proposed project would be required to implement **LRDP Mitigation Measures BIO-1a** and **BIO-1b** that are listed below and are a part of the project. With the implementation of these mitigation measures, the project would have a less than significant impact on nesting birds and bats. No further analysis is required.

#### **LRDP Mitigation Measure BIO-1a**

Direct disturbance, including tree and shrub removal or nest destruction by any other means, or indirect disturbance (e.g., noise, increased human activity in area) of active nests of raptors and other special-status bird species (as listed in Table IV.C-1 in the LBNL 2006 LRDP EIR) within or in the vicinity of the proposed footprint of a future development project shall be avoided in accordance with the following procedures for Pre-Construction Special-Status Avian Surveys and Subsequent Actions. No more than two weeks in advance of any tree or shrub removal or demolition or construction activity involving particularly noisy or intrusive activities (such as concrete breaking) that will commence during the breeding season (February 1 through July 31), a qualified wildlife biologist shall conduct pre-construction surveys of all potential special-status bird nesting habitat in the vicinity of the planned activity and, depending on the survey findings, the following actions shall be taken to avoid potential adverse effects on special-status nesting birds:

1. Pre-construction surveys are not required for demolition or construction activities scheduled to occur during the non-breeding season (August 1 through January 31).
2. If pre-construction surveys indicate that no nests of special-status birds are present or that nests are inactive or potential habitat is unoccupied, no further mitigation is required.
3. If active nests of special-status birds are found during the surveys, a no-disturbance buffer zone will be created around active nests during the breeding season or until a qualified biologist determines that all young have fledged. The size of the buffer zones and types of construction activities restricted within them will be determined through consultation with the CDFW, taking into account factors such as the following:
  - Noise and human disturbance levels at the project site and the nesting site at the time of the survey and the noise and disturbance expected during the construction activity;
  - Distance and amount of vegetation or other screening between the project site and the nest; and
  - Sensitivity of individual nesting species and behaviors of the nesting birds.
4. Noisy demolition or construction activities as described above (or activities producing similar substantial increases in noise and activity levels in the vicinity) commencing during the non-breeding season and continuing into the breeding season do not require surveys (as it is assumed

that any breeding birds taking up nests would be acclimated to project-related activities already under way). However, if trees and shrubs are to be removed during the breeding season, the trees and shrubs will be surveyed for nests prior to their removal, according to the survey and protective action guidelines 3a through 3c, above.

5. Nests initiated during demolition or construction activities would be presumed to be unaffected by the activity, and a buffer zone around such nests would not be necessary.
6. Destruction of active nests of special-status birds and overt interference with nesting activities of special-status birds shall be prohibited.
7. The noise control procedures for maximum noise, equipment, and operations identified in Section IV.I, Noise, of this EIR shall be implemented.

#### **LRDP Mitigation Measure BIO-1b**

Project implementation shall avoid disturbance to the maternity roosts of special-status bats during the breeding season in accordance with the following procedures for Pre- Construction Special-Status Bat Surveys and Subsequent Actions. No more than two weeks in advance of any demolition or construction activity involving concrete breaking or similarly noisy or intrusive activities, that would commence during the pup-rearing season (April 15 through August 31), or winter hibernacula season (October 15 through March 1, depending on weather conditions) a qualified bat biologist, acceptable to the CDFW, shall conduct pre-demolition surveys of all potential special-status bat breeding habitat in the vicinity of the planned activity. Depending on the survey findings, the following actions shall be taken to avoid potential adverse effects on breeding special-status bats:

1. If active roosts are identified during pre-construction surveys, a no disturbance buffer will be created by the qualified bat biologist, in consultation with the CDFW, around active roosts during the breeding season. The size of the buffer will take into account factors such as the following:
  - Noise and human disturbance levels at the project site and the roost site at the time of the survey and the noise and disturbance expected during the construction activity;
  - Distance and amount of vegetation or other screening between the project site and the roost; and
  - Sensitivity of individual nesting species and the behaviors of the bats.
2. If pre-construction surveys indicate that no roosts of special-status bats are present, or that roosts are inactive or potential habitat is unoccupied, no further mitigation is required.
3. Pre-construction surveys are not required for demolition or construction activities scheduled to occur during the non-breeding and winter hibernacula season (September 1 through October 15, and March 1 through April 15).
4. Noisy demolition or construction activities as described above (or activities producing similar substantial increases in noise and activity levels in the vicinity) commencing during the non-

breeding season and continuing into the breeding season do not require surveys (as it is assumed that any bats taking up roosts would be acclimated to project-related activities already under way). However, if trees are to be removed during the breeding season, the trees would be surveyed for roosts prior to their removal, according to the survey and protective action guidelines 1a through 1c, above.

5. Bat roosts initiated during demolition or construction activities are presumed to be unaffected by the activity, and a buffer is not necessary.
6. Destruction of roosts of special-status bats and overt interference with roosting activities of special-status bats shall be prohibited.
7. The noise control procedures for maximum noise, equipment, and operations identified in Section IV.I, Noise, shall be implemented.

- b. No Additional Analysis Required.** There are no existing drainages or other sensitive communities on the project site that could be affected by project implementation. The project would involve installation of NERSC-9 and associated equipment within the existing Building 59 or on outside paved or previously disturbed areas adjacent to the building. Therefore, the proposed project would have no effect on riparian habitat or a sensitive natural community, as defined in local or regional plans, policies, regulations or by the CDFW or USFWS. No further analysis is required.
- c. No Additional Analysis Required.** The project site is developed with Building 59 and paved areas. There are no jurisdictional wetlands or water courses on the project site. Therefore, there would be no impact on wetlands as defined by Section 404 of the Clean Water Act and no further analysis is required.
- d. No Additional Analysis Required.** The project site is developed and surrounded by institutional uses. Although there could be some wildlife movement in the project vicinity, the project site is not part of an established wildlife movement corridor or a native wildlife nursery site. Therefore, there would be no impact to wildlife movement and no further analysis is required.
- e. No Additional Analysis Required.** The proposed project would not involve any site clearance or tree removal. The project would not conflict with policies protecting biological resources. Thus, there would be no impact and no further analysis is required.
- f. No Additional Analysis Required.** No Habitat Conservation Plans or Natural Community Conservations Plans have been adopted that encompass the project area. Therefore, no impact would occur and no further analysis is required.

### 6.4.3 Cumulative Impacts

The proposed project would result in no impacts on certain biological resources such as wetlands and sensitive habitats and to the extent the project construction activities could affect Alameda whipsnake or nesting birds, LRDP mitigation measures would reduce those impacts to less than significant. Therefore with mitigation, the project would not make a cumulatively considerable contribution to any cumulative impacts on these resources.

Furthermore, as concluded in the 2006 LRDP EIR, LBNL growth and development pursuant to the 2006 LRDP, when combined with development under the UC Berkeley LRDP as well as surrounding (primarily residential) development in the Oakland-Berkeley hills, would contribute to a reduction of open space and, consequently, habitat for native plants and wildlife, including special-status species

(LRDP Impact BIO-7, page IV.C-57), but the impact would be less than significant. No conditions have changed and no new information has become available since certification of the 2006 LRDP EIR that would alter this previous analysis. Given that the proposed project is located in an area that is developed and does not contain any natural habitat, the proposed project would not contribute to the cumulative impact associated with the reduction of native habitat and open space. Further analysis is not required.

## 6.5 Cultural Resources

### 6.5.1 Background

LBNL hill site history is presented in the 2006 LRDP EIR and is based on information from technical studies prepared for the project area, including archival research at the California Historical Resources Information System's Northwest Information Center; a cultural resources evaluation and survey; an archaeological survey report; and the first of a series of reports being prepared as part of an inventory and evaluation of potential historically significant buildings and structures at the LBNL hill site.

#### Previous Site-Wide Studies

As part of the environmental analysis for the 1987 LRDP EIR, as amended, all undeveloped land and then-proposed building locations were examined for potential historical and archaeological resources. All reasonably accessible parts of the LBNL hill site area were examined. Special attention was given to areas of relatively flat land or rock outcrops. The steep hillsides were not examined intensively, although transects were made through accessible areas. Based on the findings of the historic and archaeological resources survey, no indications of historic or prehistoric archaeological resources were encountered in any location on the LBNL hill site. Based on this survey, the LBNL hill site was determined not to be eligible for listing on the National Register of Historic Places.

#### Current Studies of Archaeological Resources

Field surveys and archival research at the California Historical Resources Information System's Northwest Information Center have been undertaken to determine whether any archaeological resources have been discovered at the LBNL hill site. The Northwest Information Center has indicated there is a "low potential for Native American sites in the project area" and thus "a low possibility of identifying Native American or historic-period archaeological deposits in the project area." Additionally, field studies conducted at various times at the LBNL hill site have not encountered any archaeological resources. Native American archaeological sites in this portion of Alameda County tend to be situated on terraces along ridgetops, mid-slope terraces, alluvial flats, near ecotones, and near sources of water, including springs. LBNL is situated on a steep slope adjacent to Strawberry Creek. Therefore, there is a low-to-moderate potential for Native American sites to be present on the LBNL hill site.

#### Project Site

In March 2010, archaeologists from Condor Country Consulting inspected and surveyed the Building 59 project site to assess the potential for any intact archaeological sites to be present within the project area. No archaeological or historic resources were encountered other than one isolated fragment of obsidian found in a highly disturbed context on the side of a steep slope. The archaeologist concluded that it was likely an imported item and/or deposited from the construction of Building 70A that is located upslope (Condor Country Consulting 2010).

No cultural resources were encountered at the project site during the construction of Building 59.

## 6.5.2 Environmental Checklist and Discussion

	Impact to be Analyzed in the EIR	No Additional Analysis Required
<b>CULTURAL RESOURCES</b> - Would the project:		
a. Cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b. Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d. Disturb any human remains, including those interred outside of formal cemeteries?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e. Would the project cause a substantial adverse change in the significance of a tribal cultural resource as defined in Public Resources Code 21074?	<input checked="" type="checkbox"/>	<input type="checkbox"/>

### DISCUSSION:

- a. **No Additional Analysis Required.** The proposed project does not involve demolition or alteration to any building or structure that would be considered a historic resource. Therefore, there would be no impact related to historical resources and no further analysis is required.
- b. - d. **No Additional Analysis Required.** The proposed project would not involve any building construction or ground disturbing activities. Equipment installation would mainly be interior to Building 59 and the (up to) three cooling towers that would be installed outside would be placed in a previously paved area. Other than the limited use of some previously disturbed land adjacent to the cooling tower pad for the placement of a crane, no land disturbance is proposed as part of the project. Thus, due to the nature of the project, no impacts to archaeological or paleontological resources would occur. Similarly, no human remains would be disturbed. Further analysis is not required.
- e. **Impact to be Analyzed in the EIR.** Assembly Bill (AB) 52, which came into effect on July 1, 2015, requires that lead agencies consider the effects of projects on tribal cultural resources and conduct consultation with federally and non-federally recognized Native American tribes early in the environmental review process. According to AB 52, it is the responsibility of the tribes to formally request of a lead agency that they be notified of projects in the lead agency's jurisdiction so that they may request consultation. Although at this time, no tribes have contacted UC LBNL requesting notification regarding proposed projects at the LBNL hill site, UC LBNL is proactively sending out letters to tribes in Alameda County notifying them of the proposed project at the same time that the NOP is being issued. As noted above, the proposed project does not involve the construction of new buildings or any major ground disturbing activities and the potential for any tribal cultural resources to exist on the LBNL hill site is low. Therefore,

no impacts to tribal cultural resources are anticipated. Nonetheless, more information regarding the AB 52 process and the completion of consultation will be provided in the Draft EIR.

### **6.5.3 Cumulative Impacts**

Because there would be no project impact on cultural resources, the project would not contribute to any cumulative impacts on these resources. Further analysis is not required.

## 6.6 Geology and Soils

### 6.6.1 Background

#### LBNL

The LBNL hill site is located on the western slopes of the Berkeley-Oakland hills within the central region of the Coast Range Geomorphic province. The Miocene Orinda Formation, composed of poorly indurated non-marine mudstone and sandstone, underlies most of the site. The western and southern portions are underlain by older marine mudstone and sandstone deposits. Some of the higher elevation portions of the site and a portion of the eastern part of the site are underlain by Moraga Formation rocks, and a small portion of the eastern extent of the site is underlain by shallow marine sandstones of the Claremont Formation. The entire site is mapped by the California Department of Conservation, Geologic Survey (CGS) as MRZ-1, an area where no significant mineral or aggregate deposits are present. The majority of the hill site soils are Xerorthents-Millsholm complex, 30 to 40 percent slope. These soils are well-drained and susceptible to erosion. Other soil types on the hill site include Altamont Clay, Mayhem loam, and Mayhem-Los Gatos complex, all soil types highly susceptible to erosion.

The Hayward Fault and associated Earthquake Fault Zone traverses the western edge of the Berkeley Lab site near the Blackberry Canyon Gate. The San Andreas Fault Zone is approximately 19 miles southwest of the LBNL hill site. According to the USGS Working Group on California Earthquake Probabilities estimates, there is a 27 percent chance of an earthquake of M 6.7 on the Hayward-Rodgers Creek Fault system by 2032 and a 21 percent chance of an earthquake of M 6.7 on the San Andreas Fault by 2032. The LBNL hill site is expected to experience strong ground shaking from a seismic event on any of the Bay Area major faults. CGS has designated much of the LBNL hill site as a Seismic Hazard Zone for earthquake-induced landslides. The CGS has not designated any portion of the LBNL hill site as a Seismic Hazard Zone for liquefaction.

#### Project Site

The project site is developed with Building 59 and associated roads and paved surfaces. The project site is located within the Hayward Fault zone, as defined by the Alquist-Priolo Earthquake Fault Zoning map. However, a fault investigation that was conducted before the construction of Building 59 did not identify any active fault traces at the project site.

### 6.6.2 Environmental Checklist and Discussion

	Impact to be Analyzed in the EIR	No Additional Analysis Required
<b>GEOLOGY AND SOILS</b> - Would the project:		
a. Expose people or structures to 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	<input type="checkbox"/>	<input checked="" type="checkbox"/>

	Impact to be Analyzed in the EIR	No Additional Analysis Required
known fault? Refer to Division of Mines and Geology Special Publication 42.		
ii. Strong seismic ground shaking?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
iii. Seismic-related ground failure, including liquefaction?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
iv. Landslides?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b. Result in substantial soil erosion or the loss of topsoil?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e. Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

**DISCUSSION:**

- a. i-iv. **No Additional Analysis Required.** Although Building 59 falls within the Hayward Fault zone, as defined by the Alquist-Priolo Earthquake Fault Zoning Map, the site of the building does not contain any active faults and fault rupture is not a concern. As mentioned above, the entire LBNL hill site is likely to experience strong ground shaking during most large magnitude earthquakes located in the Bay Area. The existing building was designed and constructed in accordance with recommendations from the site specific geotechnical investigation. Therefore, impacts related to seismic-related ground failure and damage were addressed prior to and during the construction of the building. The proposed project would install the NERSC-9 high-performance computing system and associated equipment in Building 59 and adjacent exterior cooling tower enclosure. No new buildings are planned. Thus, there would be no impacts related to seismic-related ground failure and no further analysis is required.
- b. **No Additional Analysis Required.** Although the project site is located on a hillside, there would be no construction activities that would increase rates of erosion. All installation of NERSC-9 and related equipment would be on paved areas and no soils would be disturbed. If needed, a crane may be used to install the cooling towers and would be placed in an unpaved area to the east of Building 59 and north of the cooling tower pad in an area that was previously graded during the construction of Building 59. However, the duration of this activity would be short and appropriate erosion control measures would be implemented to avoid soil erosion and discharge of sediment from the project site. Therefore, no impact would occur and no further analysis is required.

- c.-d. **No Additional Analysis Required.** As noted above, the project would be located on a hillside but within a previously developed building or adjacent exterior paved areas. Building 59, which the proposed project is located in, was designed in accordance with the site-specific geotechnical investigation and is in compliance with building standards and codes. Therefore, no impacts related to ground instability or location on expansive soils would occur and no further analysis is required.
- e. **No Additional Analysis Required.** The project site is currently developed and sewers are available for the disposal of wastewater. Therefore, implementation of the project would not require the construction of septic tanks for wastewater disposal. No further analysis is required.

### 6.6.3 Cumulative Impacts

Because, as noted in the analysis above, there would be no project impacts related to geology and soils, the project would not contribute to any cumulative impacts to these topics. Further analysis is not required.

## 6.7 Greenhouse Gas Emissions

### 6.7.1 Background

#### Definition of Greenhouse Gases

“Greenhouse gases” (so called because of their role in trapping heat near the surface of the earth), including those emitted by human activity, are implicated in global climate change, commonly associated with “global warming.” These greenhouse gases (GHGs) trap heat in the earth’s atmosphere by reflecting solar energy (i.e., long wave radiation) back toward the earth’s surface. The greenhouse effect is responsible for maintaining a habitable climate on earth, but human activity has caused increased concentrations of these gases in the atmosphere. Increasing concentrations of GHGs are therefore considered to contribute towards increasing global temperatures as well as increasing variability in regional and global weather patterns.

The principal GHGs are carbon dioxide, methane, nitrous oxide, ozone, and water vapor. Of GHGs generated by human activities, carbon dioxide and methane are generated in the largest quantities. Emissions of carbon dioxide are largely by-products of fossil fuel combustion, whereas methane results from off-gassing associated with agricultural practices and landfills. There is general international scientific agreement that human-caused increases in GHGs have contributed to and will continue to contribute to global warming, although there is less agreement concerning the magnitude and rate of the warming.

#### LBNL

LBNL activities that generate GHG emissions include the use of motor vehicles (mobile sources) and building heating (area sources), as well as indirect sources such as electricity generation. These sources represent the great majority of GHGs produced in association with the activities at LBNL, because LBNL does not emit industrial or agricultural gases, and thus generates little in the way of GHGs other than carbon dioxide. While certain research activities may incorporate other GHGs, their use typically results in minimal emissions. Moreover, while some refrigeration units at LBNL use a hydrofluorocarbon chemical, such as HFC-134a, this class of chemical is a U.S. EPA-acceptable alternative to the more harmful ozone-depleting substances (chlorofluorocarbons) that were banned in the 1990s. LBNL refrigeration units are closed-loop systems that do not emit during normal operation. When work is performed on these systems, EPA-certified refrigerant recovery equipment is used, which effectively eliminates emissions.

On-road transportation sources (i.e., automobiles, trucks, and buses) represent the largest source of GHG emissions, consistent with existing Bay Area and statewide patterns of GHG emissions. Electricity generation (both from in-state and out-of-state power plants) represents the second largest source of GHG emissions for LBNL (although most of these emissions occur outside the Bay Area).

#### Project Site

The direct sources of GHG emissions in the vicinity of the project site include standby generators associated with various existing buildings. Indirect sources include vehicles and the use of electricity and natural gas in Lab buildings.

**6.7.2 Environmental Checklist and Discussion**

	Impact to be Analyzed in the EIR	No Additional Analysis Required
<b>GREENHOUSE GAS EMISSIONS - Would the project:</b>		
a. Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b. Conflict with any applicable plan, policy or regulation of an agency adopted for the purpose of reducing the emissions of greenhouse gases?	<input checked="" type="checkbox"/>	<input type="checkbox"/>

**DISCUSSION:**

**a., b. Impact to be Analyzed in the EIR.** The proposed project would not add new building space to the LBNL hill site. Furthermore, as noted in the Project Description, it would not increase the total number of employees and visitors who would travel to and from Building 59. Therefore, there would be no increase in GHG emissions from operational vehicle trips to the project site. The proposed project would, however, require additional electricity to operate the high-performance computing system, additional water to operate the facility’s cooling system, and the installation of a back-up generator. All of these project elements would result in direct and indirect GHG emissions. The NERSC-9 project EIR will estimate the direct and indirect GHG emissions from the implementation of the proposed project and evaluate whether the emissions would exceed the BAAQMD’s thresholds for GHGs emitted by development projects. The EIR will also evaluate whether the project would conflict with any applicable plan, policy or regulation adopted by LBNL for the purpose of reducing GHG emissions.

**6.7.3 Cumulative Impacts**

Cumulative impacts related to GHG emissions will be evaluated in the NERSC-9 project EIR.

## 6.8 Hazards and Hazardous Materials

### 6.8.1 Background

#### Definition of Hazardous Materials

The term hazardous material is defined in different ways for different regulatory programs. The 2006 LRDP EIR uses the definition given in California Health and Safety Code Section 25501(o), which defines hazardous material as:

...any material that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment.

Hazardous materials include, but are not limited to, hazardous substances, hazardous wastes, and any material which a handler or the administering agency has a reasonable basis for believing that it would be injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment.

In addition to hazardous chemicals, biohazardous and radioactive materials are also used in laboratories at LBNL.

#### LBNL Hazardous Materials Plans and Policies

UC LBNL has developed an Integrated Safety Management (ISM) System that establishes environment, safety, and health policies and procedures to ensure all work is performed safely and in a manner that strives for the highest protection for the employees, guests, visitors, the public, and the environment. In addition, UC LBNL has developed an Environmental Management System to implement sound environmental stewardship practices that protect the air, water, land, and other resources that could potentially be affected by facility operations. The UC LBNL Environment, Health, and Safety (EH&S) Division has the primary responsibility of developing strategies for compliance with applicable local, state, and federal laws and regulations. EH&S has the authority to require abatement of any condition or operation that could endanger people or facilities at the LBNL hill site or result in violations of pertinent federal or state laws or LBNL policies concerning health and safety. EH&S develops specific policies and programs in the following areas: industrial hygiene, chemical safety, physical safety, radiation safety, biohazard safety, hazardous waste management, and environmental protection.

#### Hazardous Materials Storage, Handling and Disposal

UC LBNL stores chemicals and other hazardous materials in aboveground tanks and storage drums. Hazardous, radioactive and mixed wastes are stored in designated areas in research and support areas throughout the LBNL hill site. From these locations, they are taken to the permitted Hazardous Waste Handling Facility (Building 85) for temporary storage and permitted treatment. From this site, the wastes are hauled off for treatment and disposal.

## **Other Hazards**

Other potential hazards at the LBNL hill site include the presence of asbestos, lead-based paints, PCBs, and radioactive materials in structures; and soil and groundwater contamination in some areas of the hill site due to historical releases of hazardous and radioactive materials.

In 1988, UC LBNL began a rigorous evaluation of potential historical releases of contaminants to the environment as part of an investigation under RCRA, which was required for renewal of its Part B hazardous waste facility permit. This process revealed contamination in soil and groundwater due to past site activities. A number of interim corrective measures were undertaken during the 1990s to clean up soil and groundwater that posed an imminent threat to human health or the environment. The remaining contamination that exceeded the DTSC required site cleanup levels was addressed in a Corrective Measures Implementation (CMI) Work Plan, which was approved by DTSC in March 2006. In July 2007, DTSC determined that UC LBNL had implemented the approved remedies for the remaining soil contamination and that the approved remedies for groundwater had been constructed and were operating successfully. UC LBNL continues to perform monitoring using about 150 groundwater monitoring wells located throughout the hill site and one additional well located off-site. In addition, in connection with demolition of older structures, UC LBNL conducts surveys to identify locations where hazardous substances are present and to establish procedures to safely remove the substances.

Similar to other developed hillside areas, LBNL hill site's developed areas are interspersed with grassland areas and groves of trees. UC LBNL implements a vegetation management program to minimize the risk of wildland fires. In addition, Alameda County Fire Station 19 is located on the LBNL hill site.

## **Project Site**

The proposed project would not involve the use of any hazardous materials other than small amounts of chemicals that would be used in the cooling towers to control scaling, and diesel fuel stored in a new fuel tank used to service a new backup generator. Research that is conducted in Building 59 is limited to computing and computing-related operations and does not involve radioactive materials, hazardous chemicals, hazardous organic or inorganic materials, nano-scale materials, or genetically modified/transgenic plant materials and microorganisms. Additionally, no "wet" laboratories are located in the building.

The NERSC-9 project site is located in a stand of eucalyptus and pine trees with a few immature redwood and oak trees, and a grassland understory. Areas adjacent to the site are also similar in terms of vegetation community and have a moderate to high risk of wildland fires.

6.8.2 Environmental Checklist and Discussion

	Impact to be Analyzed in the EIR	No Additional Analysis Required
<b>HAZARDS AND HAZARDOUS MATERIALS-</b> Would the project:		
a. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
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?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c. Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d. Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e. For a project located within an airport land use plan or, where such plan has not been adopted, within 2 miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f. For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
g. Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
h. Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wild lands?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

**DISCUSSION:**

- a. **No Additional Analysis Required.** Research-related chemicals are not used in Building 59. Any wastes generated in Building 59 following the installation of NERSC-9 would be similar to current wastes that include only small amounts of office-related chemicals and chemicals used in building machinery and cooling systems. Any such wastes determined to be hazardous per regulations would be removed to the Hazardous Waste Handling Facility, aggregated appropriately, and shipped for treatment and disposal in compliance with applicable California hazardous waste regulations and Department of Transportation

regulations. Because only small amounts of chemical wastes would be generated by the facility following project implementation, any hazardous waste generation would be minor and would not impact the ability of LBNL to accumulate, transport, handle, and aggregate its cumulative waste stream. Therefore, there would be a less than significant impact and no further analysis is required.

- b. No Additional Analysis Required.** The proposed project would augment the existing Building 59 backup generator with a second backup generator of the same capacity. A new, approximately 2,300 gallon fuel tank would be installed to provide fuel to the new back-up generator. This above-ground storage tank would be secured with spill-prevention and secondary containment systems to prevent any accidental, uncontrolled releases; this protection system would be regularly inspected by the jurisdictional fire marshal. Therefore, the fuel tank would not 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. The impact would be less than significant impact and no further analysis is required.
- c. No Additional Analysis Required.** There are no public or private elementary, middle, or high schools within one-quarter mile of the LBNL hill site. Therefore there would not be any impact on schools from project-related air toxic emissions. No further analysis is required.
- d. No Additional Analysis Required.** As noted in the CRT Facility EIR, the facility is not located on a Cortese list, and thus would not result in a significant hazard to the public or environment. Therefore, there would be no impact and no further analysis is required.
- e. No Additional Analysis Required.** The project site is more than 11 miles northeast of the Oakland Metropolitan Airport, and lies outside the boundaries of the Alameda County Airport Land Use Commission Plan for the Oakland Metropolitan Airport. Therefore, implementation of the project would not expose people on the project site to hazards from aircraft overflights. There would be no impact. No further analysis is required.
- f. No Additional Analysis Required.** The project site is not located in the vicinity of a private airstrip. Therefore, implementation of the project would not result in an impact related to safety hazards associated with private airstrips. No further analysis is required.
- g. No Additional Analysis Required.** The proposed project would not increase the number of people or the amount of property that could be exposed to regional, compounded, or terrorist-related catastrophic events. Regionally catastrophic events could include earthquakes or fires of sufficient magnitude to impair regional emergency support and service systems such that LBNL could not expect to receive aid from external sources. Due to the nature of the project, the proposed upgrades would not increase the daily population at the LBNL hill site nor the amount of property that could be exposed to catastrophic events. There would be no impact. No further analysis is required.
- h. No Additional Analysis Required.** Development of the proposed project would not increase the amount of facility space at the LBNL hill site. Building 59 would continue to meet required safety standards and fire codes and implement LBNL's vegetation management program, which would limit damage to assets from these fires and would reduce potential wildland fire hazards to a less than significant level. Therefore, the project would not expose any new structures or persons to a significant risk from wildland fires. There would be no impact. No further analysis is required.

### 6.8.3 Cumulative Impacts

For most of the hazards and hazardous materials issues analyzed above, there would be no project impact, and the project would not contribute to any cumulative impacts related to these issues. With respect to the impact associated with the routine use and transportation of hazardous materials, the project would involve a new fuel storage tank that would be located inside the building and maintained in compliance with applicable laws and regulations. As a result of compliance with the law, the potential for accidental spills would be minimal and the project would not contribute considerably to a cumulative impact associated with the routine use of hazardous materials. Further analysis is not required.

## 6.9 Hydrology and Water Quality

### 6.9.1 Background

#### LBNL

##### *Surface Water Hydrology*

The LBNL hill site is located within the Blackberry and Strawberry Canyons in the East Bay Hills, with the majority of the hill site in Strawberry Canyon. The northwestern portion of the LBNL hill site drains to the North Fork of Strawberry Creek in Blackberry Canyon whereas the majority of the site drains to the South Fork of Strawberry Creek in Strawberry Canyon. The total watershed area of the Strawberry Creek North and South Forks pertinent to LBNL is 878 acres, of which about 202 acres are within the LBNL hill site. A number of smaller drainages discharge into the South Fork, including Ravine Creek, Ten-Inch Creek, Chicken Creek, No Name Creek, and Botanical Garden Creek. Runoff from the LBNL hill site that drains into the South Fork of Strawberry Creek is routed into a mid-canyon retention basin from where it is released downstream at flow rates consistent with the design parameters of the storm drainage systems of UC Berkeley and the City of Berkeley. Runoff from the LBNL hill site that drains into the North Fork exits the site at the bottom of Blackberry Canyon from where it flows through a series of check dams and settlement basins before entering the City's storm water system.

##### *Groundwater Resources*

Groundwater at the LBNL hill site occurs at depths ranging from zero feet to approximately 100 feet below ground surface. Groundwater flow patterns generally reflect the site topography with groundwater flowing to the south for the vast majority of the site. Groundwater is not used for potable or irrigation uses on the LBNL hill site.

##### *Flooding*

The LBNL hill site is not located within a 100-year flood plain as determined by the Federal Emergency Management Agency flood hazard mapping.

##### *Surface Water and Groundwater Quality*

UC LBNL has had a storm water management program in place for the hill site since 1992. This program is designed to control pollution of surface waters. Groundwater in some portions of the LBNL hill site has been affected by accidental releases of hazardous and radioactive materials. UC LBNL is implementing a remediation and monitoring program to address the groundwater contamination.

#### **Project Site**

The proposed project site is located in the North Fork watershed of Strawberry Creek. Cafeteria Creek, an intermittent tributary of the North Fork, is located to the southeast of the project site. The project site is mostly impervious and developed with Building 59 and paved areas.

6.9.2 Environmental Checklist and Discussion

	Impact to be Analyzed in the EIR	No Additional Analysis Required
<b>HYDROLOGY AND WATER QUALITY-</b> Would the project:		
a. Violate any water quality standards or waste discharge requirements?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b. Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner, that would result in substantial erosion or siltation on or off site?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner, that would result in flooding on or off site?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e. 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?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f. Otherwise substantially degrade water quality?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
g. Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
h. Place within a 100-year flood hazard area structures, which would impede or redirect flood flows?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
i. Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
j. Inundation by seiche, tsunami, or mudflow?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

## DISCUSSION:

**a., e., f. No Additional Analysis Required.** Water quality is regulated by both state and federal agencies under the authority of the Clean Water Act. Projects that have the potential to degrade water quality are subject to the regulations of those agencies. The project site is currently developed with the existing Building 59 and is mostly impervious. The facility improvements and installation of equipment would occur inside Building 59 or on an existing concrete pad surrounded by a concrete wall located adjacent to the building. Therefore, the proposed project would not change the amount of impervious surfaces associated with the project site and would not result in an increase in runoff (or a reduction in infiltration) compared to existing conditions. Therefore off-site flooding or hydromodification-related erosion impacts would not occur.

Although the project site is located on a hillside, there would be no building construction or ground disturbing activities that would increase rates of erosion. All installation of NERSC-9 and related equipment would be on paved areas and no soils would be disturbed. To the extent it is needed, a crane may be used to install the cooling towers and may be placed in an unpaved area to the east of Building 59 and north of the cooling tower pad. However, the duration of this activity would be short and appropriate erosion control measures would be implemented to avoid soil erosion and discharge of sediment from the project site. The impact would be less than significant.

Water quality and drainage impacts associated with the NERSC-9 project would be less than significant and no further analysis is required.

**b. No Additional Analysis Required.** Water used at LBNL is supplied from the East Bay Municipal Utility District's Shasta Reservoir and Berkeley View Reservoir systems and groundwater at the site is not utilized. The proposed project would not require any groundwater withdrawal. Recharge of the groundwater table would not be affected by implementation of the proposed project because the project would not add any new impervious surfaces to the site. Furthermore, groundwater in the project area is not used for public water supply. Therefore, there would be no impact related to groundwater recharge or depletion of groundwater as a result of the project and no further analysis is required.

**c.-d. No Additional Analysis Required.** The proposed project would not alter the existing building's footprint. No additional structures would be constructed and no grading or excavation would occur. Therefore, there would be no impacts to the existing drainage patterns on the site. No further analysis is required.

**g.-i. No Additional Analysis Required.** The project site is not located within the Federal Emergency Management Agency's (FEMA) Flood Zone A (100-year flood zone). The project would not involve the construction of residential structures. Therefore, there would be no impact and no further analysis is required.

**j. No Additional Analysis Required.** Given the elevation and distance of the project site from the bay's edge, there would be no potential for flooding from a seiche or tsunami. Moreover, given the developed nature of the project vicinity, there is minimal potential for mudflows. Therefore, implementation of the project would result in no impact related to the risk of inundation from seiche, tsunami, or mudflow and no further analysis is required.

### 6.9.3 Cumulative Impacts

For most of the hydrology and water quality issues analyzed above, there would be no project impact, and the project would not contribute to any cumulative impacts related to these issues. With respect to the water quality impact associated with the limited construction activities outside Building 59, the affected area is small and the project would implement appropriate erosion control measures avoid soil erosion and discharge of sediment from the project site. Therefore the project would not contribute considerably to a cumulative water quality impact. No further analysis is required.

## 6.10 Land Use and Planning

### 6.10.1 Background

#### LBNL

The LBNL hill site covers approximately 200 acres in the eastern hills of Berkeley and Oakland. The site is largely buffered by undeveloped land owned by the University of California, although the northwest corner of the LBNL hill site generally abuts residential neighborhoods in the City of Berkeley.

Access to LBNL’s hill site is limited to three controlled-access vehicular gates on Cyclotron Road (the main Blackberry Canyon Gate) and Centennial Drive (the Strawberry Canyon and Grizzly Peak gates), all of which are staffed by an on-site security firm contracted by UC LBNL. Visitors primarily use the Blackberry Canyon Gate. The Grizzly Peak Gate is an exit-only gate after the morning commute hours.

The LBNL hill site is comprised of approximately 200 acres of land owned by the Regents of the University of California, adjacent to the University of California, Berkeley campus. The LBNL hill site includes research and support buildings and structures that are primarily part of a multi-program national research facility called the Lawrence Berkeley National Laboratory, which is managed and operated by the University of California under contract with the U. S. Department of Energy. The University is generally exempted by the state constitution from compliance with local land use regulations, including general plans and zoning. However, the University seeks to cooperate with local jurisdictions to reduce any physical consequences of potential land use conflicts to the extent feasible. The western part of the LBNL hill site is within the Berkeley city limits, and the eastern part is within the Oakland city limits.

#### Project Site

The NERSC-9 project site is currently developed with Building 59, cooling tower cluster, roads and a paved area to the east of the building. The 2006 LRDP designates the project site Research and Academic. The project site is located in the western portion of the Lab site.

### 6.10.2 Environmental Checklist and Discussion

	Impact to be Analyzed in the EIR	No Additional Analysis Required
<b>LAND USE AND PLANNING - Would the project:</b>		
a. Physically divide an established community?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b. Conflict with applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c. Conflict with any applicable habitat conservation plan or natural community conservation plan?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

## DISCUSSION:

- a. **No Additional Analysis Required.** The project site is located on the LBNL hill site in an area currently developed with research and academic uses. Implementation of the project would not disrupt an existing community. Therefore, no impact would occur and no further analysis is required.
- b. **No Additional Analysis Required.** The 2006 LRDP is the applicable land use plan for the LBNL hill site. The LRDP establishes a framework of land-use principles and policies to guide future growth and change at the Berkeley Lab through 2025. The plan identifies projections in population, building space, and land uses.

The project site is designated Research and Academic under the 2006 LRDP. This land use designation provides for scientific research and associated support functions and constitutes the majority of the developed land on the LBNL hill site. The proposed project would involve upgrading the Wang Hall Facility, which already conforms to that land use category. Therefore the project is thus consistent with the 2006 LRDP land use designations.

The primary objectives of the 2006 LRDP are to revitalize existing facilities and infrastructure at the LBNL hill site and to guide the future development at the site. The 2006 LRDP identifies the following principal objectives:

- Strengthen and expand existing research programs to sustain and grow Berkeley Lab's role as a national research laboratory;
- Expand partnerships and collaborations to enhance Berkeley Lab's scientific and technical base;
- Provide flexibility to return staff from its off-site facilities leased in Berkeley and Oakland to the main hill site in order to enhance collaboration, productivity, and efficiency;
- Expand the capacity of existing high demand advanced facilities and provide broader functionality;
- Rehabilitate facilities that have outlived their intended purpose and can be cost-effectively adapted for use in regions of scientific discovery;
- Replace single-purpose facilities with new facilities programmed to accommodate multiple disciplines with advanced infrastructure suitable for future scientific endeavors; and
- Construct new scientific facilities to support future research initiatives and continued growth in existing programs.

The proposed project would support several of these key objectives of the 2006 LRDP. The NERSC program is the main computing facility for the Department of Energy Office of Science, which supports basic and applied research across multiple scientific disciplines. Such research enhances the United States competitiveness and maintains U.S. leadership in science and technology. The proposed NERSC-9 project would support the continually increasing needs of scientists for computational resources for simulation of physical phenomena as well as data analysis of sensor and experimental data. The proposed project is consistent with the objectives of the 2006 LRDP. No impact would occur. No further analysis is required.

- c. **No Additional Analysis Required.** No Habitat Conservation Plans or Natural Community Conservations Plans have been adopted that encompass the project area. Therefore, no impact would occur and no further analysis is required.

### **6.10.3 Cumulative Impacts**

Because the proposed project would not result in any land use impact, it would not contribute to a cumulative land use impact. No further analysis is required.

## 6.11 Mineral Resources

### 6.11.1 Background

According to the State of California Department of Mines and Geology, Mineral Resource Zones and Resource Sectors map, the LBNL hill site is located in an area designated as MRZ-1. This designation refers to an area “where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.” Therefore, development on the LBNL hill site would not impede extraction or result in the loss of availability of mineral resources.

### 6.11.2 Environmental Checklist and Discussion

	Impact to be Analyzed in the EIR	No Additional Analysis Required
<b>MINERAL RESOURCES</b> - Would the project:		
a. Result in the loss of availability of a known mineral resource that would be of future value to the region and the residents of the State?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b. 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?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

#### DISCUSSION:

**a.-b. No Additional Analysis Required.** As noted above, the project site is located in an area designated as MRZ-1. This designation refers to an area “where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence.” Therefore, implementation of the project would not impact mineral resources and no further analysis is required.

### 6.11.3 Cumulative Impacts

Because the proposed project would not result in any impact on mineral resources, it would not contribute to a cumulative impact on mineral resources. No further analysis is required.

## 6.12 Noise

### 6.12.1 Background

#### Characterization of Noise

Sound is mechanical energy transmitted by pressure waves through a medium such as air. Noise is defined as unwanted sound. Technically, sound is described in terms of amplitude (loudness) and frequency (pitch). The standard unit of sound amplitude measurement is the decibel (dB), and the decibel scale adjusted for A-weighting (dBA) is a special frequency-dependent rating scale that relates to the frequency sensitivity of the human ear.

Community noise usually consists of a base of steady “ambient” noise that is the sum of many distant and indistinguishable noise sources, as well as more distinct sounds from individual local sources. A number of noise descriptors are used to analyze the effects of community noise on people, including the following:

- Leq, the equivalent sound level, which is used to describe noise over a specified period of time, typically one hour.
- DNL, the energy average of the A-weighted sound levels occurring during a 24 hour period, with a 10 dBA “penalty” added to noise occurring during the hours of 10:00 PM to 7:00 AM to account for greater nocturnal noise sensitivity.
- CNEL, the Community Noise Equivalent Level, which is a 24-hour-average Leq with a “penalty” of 5 dB added to evening noise occurring between 7:00 PM and 10:00 PM, and a “penalty” of 10 dB added to nighttime noise occurring between 10:00 PM and 7:00 AM.

#### LBNL

##### *Noise Sources*

Within the boundaries of the LBNL hill site, ambient noise levels are generated by vehicular traffic on the road network, heating, ventilation and air conditioning equipment associated with buildings and other stationary equipment such as pumps, cooling towers, generators, and machine shop equipment. On-going construction projects also raise noise levels in the vicinity of the construction sites.

##### *Sensitive Receptors*

Sensitive receptors are noise-sensitive locations, where noise from a project's construction or operations could be experienced and could detract from or interfere with normal activities. Some land uses are considered more sensitive to ambient noise levels than others due to the amount of exposure and the types of activities involved. Typically sensitive receptors include residences, schools, medical facilities, parks, and outdoor recreation areas. The LBNL hill site does not immediately border residential areas, except along its western and northern boundary near Cyclotron Road.

#### Project Site

The primary existing noise sources in the vicinity of the NERSC-9 project site are vehicular traffic on Cyclotron Road and stationary sources associated with the nearby buildings. Secondary, intermittent

sources of noise include distant aircraft noise and sounds from parking lots. There are no noise-sensitive receptors in the vicinity of the project site. The noise sensitive receptors located off the LBNL hill site that are closest to the project site are students who live in the Foothill Student Housing Complex located below and about 685 feet to the southwest of Building 59. The Greek Theater, an entertainment venue on the campus, is located adjacent to Foothill Student Housing Complex. There are also multi-family residences and the Tibetan Nyingma Institute located approximately 790 feet west of Building 59 along Highland Place.

**6.12.2 Environmental Checklist and Discussion**

	Impact to be Analyzed in the EIR	No Additional Analysis Required
<b>NOISE</b> - Would the project result in:		
a. Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b. Exposure of persons to or generation of excessive ground borne vibration or ground borne noise levels?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c. A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e. For a project located within an airport land use plan or, where such a plan has not been adopted, within 2 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?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f. For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

**DISCUSSION:**

**a.- d. No Additional Analysis Required.** The proposed project would not result in significant increases or changes in noise levels from sources such as construction activities, operation of buildings and infrastructure, and increased vehicular traffic.

## Construction

The proposed project would have minimal construction activities since there would be no building construction or ground disturbing activities. The proposed project would involve the installation of the NERSC-9 high-performance computing system and accompanying equipment in the existing building. Most of the installation work would be indoors and construction period noise would be limited to noise associated with the deliveries of equipment and the installation of the (up to) three cooling towers. Furthermore, the deliveries and installation would occur to the east of Building 59 and sensitive receptors that are located to the southwest and west of Building 59 would not be exposed to the noise from these activities. Project construction would not involve any activities that would produce high levels of vibrations that could affect nearby receptors. The construction-phase noise and vibration impacts would be less than significant.

## Operation

As noted in the Project Description, the proposed project would not increase the number of employees and visitors who would travel to and from Building 59. As a result, there would be no increase in traffic-related noise due to the proposed project.

With respect to noise from the operation of the additional equipment that would be added by the NERSC-9 project, the primary noise sources of concern would be the (up to) three new cooling towers that would be added to the existing cooling tower cluster and the air handlers added to the mechanical room. Table 13.40-1 in the Berkeley Municipal Code (BMC) presents the maximum exterior noise levels allowable for residential and commercial land uses. The City uses the noise levels to control the maximum noise from the operation of stationary equipment on one property from adversely affecting adjacent properties. According to the BMC, the maximum allowable exterior noise levels from the operation of stationary equipment as received on an adjacent residential property zoned R-3 and above (which is the zoning of the nearest off-site residential areas), are 60 dB(A) between the hours of 7 AM to 10 PM and 55 dB(A) from 10 PM to 7 AM.

In 2010, in support of the NEPA analysis for the CRT project, a detailed operational noise analysis was conducted by Illingworth and Rodkin. The study analyzed increases in noise levels at the nearest off-site receptors from the operation of five cooling towers. The study found that taking into consideration the attenuation due to distance and the shielding provided by the topography in the case of Foothill Student housing and attenuation due to distance and the shielding provided by Building 59 in the case of the Nyingma Institute, the calculated exterior noise levels from the cooling towers would be 43 to 44 dB(A) at Foothill Student Housing, the Nyingma Institute and in the surrounding areas, well below the BMC allowable level of 60 dB(A) for daytime hours for R-3 and R-5 zoning (LBNL 2011). The addition of up to three more cooling towers at the eastern end of the existing cooling tower cluster would not increase the noise levels substantially such that the noise levels at the nearest sensitive receptors would exceed the levels allowed in the BMC. Furthermore, **LRDP Mitigation Measure Noise-4**, which is a part of the proposed project and would be implemented, requires that noise from stationary sources such as cooling towers meet the Berkeley noise ordinance limits.

Similarly, with respect to new air handlers associated with the NERSC-9 project, the proposed project would implement **LRDP Mitigation Measure Noise-4**, and noise levels from the project air handlers would comply with the Berkeley noise ordinance limits at off-site sensitive receptors.

In summary, the construction and operation of the NERSC-9 project would result in less than significant construction and operational noise impacts. No further analysis is required.

#### **LRDP Mitigation Measure Noise-4**

Mechanical equipment shall be selected and building designs prepared for all future development projects pursuant to the 2006 LRDP so that noise levels from future building and other facility operations would not exceed the Noise Ordinance limits of the cities of Berkeley or Oakland for commercial areas or residential zones as measured on any commercial or residential property in the area surrounding the future LRDP project. 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 standby generators, acoustical screen walls, and equipment enclosures.

- e. **No Additional Analysis Required.** The project site is not located within the boundaries of any airport land use plan and is more than 2 miles from the nearest public airport. Therefore, implementation of the proposed project would not be affected by operation of a public airport and there would be no impact. No further analysis is required.
- f. **No Additional Analysis Required.** The project site is not located within the vicinity of a private airstrip. Therefore, implementation of the project would neither impact nor be affected by a private airstrip. There would be no impact. No further analysis is required.

#### **6.12.3 Cumulative Impacts**

For most of the noise and vibration issues analyzed above, there would be no project impact, and the project would not contribute to any cumulative impacts related to these issues.

As discussed under LRDP Impact NOISE-5, the 2006 LRDP EIR found that growth and development under the 2006 LRDP would result in temporary contributions to cumulative noise impacts related to construction activities, resulting in a significant and unavoidable impact (page IV.I-22). The 2006 LRDP EIR also concluded that individual projects could result in cumulative noise impacts that would be less than significant because of the distance of individual projects to the nearest receptors and implementation of mitigation measures. Due to the nature of the proposed project and the shielding provided by the existing Wang Hall, the proposed project's contribution to the cumulative construction noise impact would not be cumulatively considerable, and the proposed project's cumulative impact would be less than significant.

LRDP Impact NOISE-6 of the 2006 LRDP EIR concluded that cumulative impacts related to noise levels from increased traffic and human activities would be less than significant. With respect to the project's operational noise, mitigation measures are included in the project which would reduce the impact to less than significant, rendering the project's contribution to cumulative operational noise cumulatively not considerable. No further analysis is required.

## 6.13 Population and Housing

### 6.13.1 Background

#### LBNL Population, Housing and Residence Patterns

In 2003, there were 3,800 people employed at LBNL. Most of these employees (56 percent) were full-time employees in scientific and technical positions. Administrative support positions accounted for 16 percent of LBNL employment. Faculty (seven percent of the total), and postdoctoral researchers (six percent of the total), as well as undergraduate and graduate students (combined representing 15 percent of the total) were also counted among the LBNL employees.

In 2003, over the course of the year, a total of about 2,500 people used LBNL facilities as guests. Guests include industry and government researchers working at LBNL for short-term assignments, scientists visiting from other academic institutions, or people from other institutions such as UC Davis who use LBNL facilities regularly over a period of weeks or months. On an average day, 40 percent of total annual guests use LBNL facilities. In 2003, this represented about 1,000 people on any given day. LBNL estimated an adjusted total daily population of 4,515 people for 2006, counting both employees and guests.<sup>3</sup>

LBNL employees and their dependents represented 2.0 percent of the Berkeley and Albany population in 2003. In all other residential locations, LBNL employees and their dependents accounted for less than one percent of the total population. LBNL employees and their dependents represented 0.3 percent of the total population of Emeryville, Oakland and Piedmont; 0.6 percent of the total population of El Cerrito, Richmond, and San Pablo; and 0.7 percent of the total population of Lafayette, Moraga, and Orinda. For the Bay Area region as a whole, LBNL employees and the other members of their households represented 0.1 percent of total regional population in 2003.

#### Project Site

The proposed project would not add any persons or housing to the LBNL hill site.

### 6.13.2 Environmental Checklist and Discussion

	Impact to be Analyzed in the EIR	No Additional Analysis Required
<b>POPULATION &amp; HOUSING - Would the project:</b>		
a. Induce substantial 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)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b. Displace substantial numbers of existing housing, necessitating	<input type="checkbox"/>	<input checked="" type="checkbox"/>

<sup>3</sup> The LBNL estimate of adjusted daily population (ADP) is defined to include FTE employment plus 40 percent of total annual guests.

	Impact to be Analyzed in the EIR	No Additional Analysis Required
the construction of replacement housing elsewhere?		
c. Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

**DISCUSSION:**

- a. **No Additional Analysis Required.** The proposed project does not include residential uses, and would not require extension of roads or other infrastructure that could indirectly induce substantial population growth. It would generate between 20 and 40 short-term construction jobs. These jobs are expected to be filled by construction workers in the greater Bay Area where there is an ample construction workforce and not result in an influx of workers from outside the greater Bay Area. The installation of NERSC-9 would not increase the number of employees and visitors using Building 59. Therefore, the project would not cause population growth. There would be no impact and further analysis is not required.
- b., c. **No Additional Analysis Required.** The LBNL hill site does not include housing or long-term residential uses, and no housing would be displaced with implementation of the proposed project. No individuals would be displaced as a result of the project and no replacement housing would be required. Therefore, there would be no impact and no further analysis is required.

**6.13.3 Cumulative Impacts**

Because the proposed project would not result in any population and housing impacts, it would not contribute to a cumulative impact on these topics. No further analysis is required.

## **6.14 Public Services**

### **6.14.1 Background**

#### **Fire Protection**

The Alameda County Fire Department is under contract with UC LBNL to provide firefighting services and to staff and operate the on-site LBNL fire station. The Alameda County Fire Department provides the LBNL hill site an “around-the-clock” engine company staffed by four Hazardous Materials Emergency Response (HAZMAT) certified firefighters. UC LBNL and the City of Berkeley have developed an Automatic Aid Agreement, under which the LBNL on-site fire station is the first responder for a portion of north Berkeley, including portions of the UC Berkeley campus. The Berkeley Fire Department provides paramedic transport for LBNL; therefore, if a patient in a medical emergency requires transport to a hospital, a City of Berkeley ambulance responds at the Lab. The City of Oakland Fire Department served the far eastern and southeastern portion of the LBNL hill site. HAZMAT automatic aid is available through the Berkeley Fire Department or the Alameda County Fire Department. LBNL’s Master Emergency Program Plan establishes policies, procedures, and an organizational structure for responding to and recovering from a major disaster at the LBNL hill site.

#### **Law Enforcement**

Police services at the LBNL hill site are provided through a contract with the UC Berkeley Police Department (UCPD), as well as with a private security provider responsible for outside security needs including LBNL access, property protection, and traffic control. The UCPD handles all patrol, investigation, and related law enforcement duties for UC Berkeley, LBNL, and other University-owned properties. UCPD operates 24 hours a day, seven days a week, coordinating closely with the City of Berkeley Police Department. UCPD and the Oakland Police Department are members of the California Law Enforcement Master Mutual Aid Plan; all law enforcement agencies in the state belong to this plan to provide each other information and resources when needed. Additionally, UC LBNL has an annual renewable contract with UCPD that provides, when requested, law enforcement emergency response, limited patrols, criminal investigations, and VIP protection. UCPD and the Berkeley Police Department have an agreement regarding jurisdiction over off-site locations occupied by UC staff and LBNL staff; this agreement is reviewed and updated annually.

The LBNL hill site is secured by a perimeter fence that provides access through vehicle entrance points, hardware lock-and-key sets at critical doors, and by an electronic system pre-coded to permit entry only to authorized card holders. Vehicular access onto the LBNL hill site is controlled by security personnel at the three vehicle entrance gates who visually inspect entering vehicles.

#### **Schools**

The Berkeley Unified School District (BUSD) and Oakland Unified School District (OUSD) provide public elementary and secondary school services to dependents of LBNL personnel who live in these two communities.

**Parks and Recreation**

The East Bay Regional Park District (EBRPD) manages over 95,000 acres within Alameda and Contra Costa counties, including 65 regional parks, recreational areas, wilderness, shorelines, preserves, and land bank areas. EBRPD properties within the vicinity of the LBNL hill site include Tilden Park and the Claremont Canyon Preserve.

UC Berkeley manages parks and athletic and recreational facilities that serve the University and the wider community. Athletic and recreational facilities are located within the central campus and also within the Strawberry Canyon Recreation Area.

The City of Berkeley’s Parks, Recreation and Waterfront Department manages the city’s parks and open space. The City has 243 acres of City-owned and/or maintained parks and open space throughout Berkeley, excluding the 99-acre Aquatic Park.

The City of Oakland’s Office of Parks, Recreation and Cultural Affairs manages the city’s parks and recreation centers. According to the Open Space, Conservation and Recreation (OSCAR) Element of the Oakland General Plan, an estimated 3,073 acres of total parklands are available within Oakland’s city limits.

**Project Site**

Building 59 is currently served by public services agencies discussed above.

**6.14.2 Environmental Checklist and Discussion**

	Impact to be Analyzed in the EIR	No Additional Analysis Required
<b>PUBLIC SERVICES</b>		
a. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, 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:		
i. Fire protection?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
ii. Police protection?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
iii. Schools?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
iv. Parks?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
v. Other public facilities?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

## DISCUSSION:

- a.i. No Additional Analysis Required.** There would be no construction of buildings or additional employees associated with the proposed project. Thus, there would be no increase in the need for fire services. The new fuel tank used to provide fuel to the new standby generator would be secured with spill-prevention and secondary containment systems to prevent any accidental, uncontrolled releases. This protection system would be regularly inspected by the jurisdictional fire marshal. The impact of the proposed project in relation to fire services would be less than significant and no further analysis is required.
- a.ii. No Additional Analysis Required.** Implementation of the proposed project would not increase the need for police services. Police services are provided through the UCPD and a private on-site security firm on a contract basis. The private security firm is responsible for on-site security needs including access to the LBNL hill site, property protection, and traffic control, and can respond to any road accessible area of the LBNL hill site in less than five minutes. Under the existing contract, UCPD responds to LBNL as needed, and response times for UCPD are also less than five minutes. Implementation of the proposed project would not add any new employees to the LBNL hill site and there would be no increased demand for on-site security. Therefore, there would be no impact on police services and no further analysis is required.
- a.iii. No Additional Analysis Required.** The proposed project would not develop residential uses and therefore would not generate new student enrollment in the Berkeley Unified School District (BUSD) or Oakland Unified School District (OUSD) (or other school districts). There would be no new employees added for the proposed project, therefore no households would relocate to the cities of Berkeley and Oakland as a result of new employment generated. Thus, there would be no new students and construction of new school sites would not be required. There would be no impact on schools and no further analysis is required.
- a.iv. No Additional Analysis Required.** Since no new households would relocate to the LBNL commute area, there would be no new demand for parks and recreational facilities. Therefore, there would be no impact on parks and recreation and no further analysis is required.
- a.v. No Additional Analysis Required.** No other governmental services would be affected by the proposed project and no further analysis is required.

### 6.14.3 Cumulative Impacts

For most of the public service issues analyzed above, there would be no project impact, and the project would not contribute to any cumulative impacts related to these topics. With respect to the impact to fire services associated with a new fuel storage tank that would be installed as part of the project, the fuel tank would be located inside the building and maintained in compliance with applicable laws and regulations. As a result of compliance with the law, the potential for accidental spills would be minimal and the project would not contribute considerably to a cumulative impact on fire services. Further analysis is not required.

**6.15 Recreation**

**6.15.1 Background**

Background conditions for recreation are discussed under Section 6.14.1 above.

**6.15.2 Environmental Checklist and Discussion**

	Impact to be Analyzed in the EIR	No Additional Analysis Required
<b>RECREATION</b> - Would the project:		
a. 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?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b. Include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

**DISCUSSION:**

- a. **No Additional Analysis Required.** Impacts associated with the increase in demand for parks and recreational facilities in the region as a result of project-related growth in employees are discussed in the response to 14a.iv, "Parks" above. As mentioned above, there would be no increase in population. Thus, no increase in demand for recreational facilities that could cause physical deterioration of recreational facilities would occur as a result of the proposed project. There would be no impact to existing recreational facilities and no further analysis is required.
- b. **No Additional Analysis Required.** The project would not include recreational facilities nor require the construction of new or expanded facilities. Therefore, there would be no impact and no further analysis is required.

**6.15.3 Cumulative Impacts**

Because there would be no project impact on recreational facilities, the project would not contribute to any cumulative impacts regarding recreation. Further analysis is not required.

## **6.16 Transportation/Traffic**

### **6.16.1 Background**

#### **Regional and LBNL Roadway Network**

The LBNL hill site is located near three regional highways: Interstate 80/580 is about 3 miles to the west and State Routes (SR) 24 and 13 are about 2 miles to the south. Access to I-80/580 is via arterial roads in the City of Berkeley and Oakland, including University Avenue, Ashby Avenue, Hearst Avenue, Gayley Road, and College Avenue. Access to SR 24 and 13 is via Tunnel Road.

The LBNL hill site is served by three roadway entrances: (1) the Blackberry Canyon Gate which is the main entrance and is on Cyclotron Road, north of the intersection of Hearst Avenue and Gayley Road in the southwestern portion of the LBNL hill site; (2) Strawberry Canyon Gate which is located at the eastern end of the LBNL hill site and is accessed via Centennial Drive; and (3) Grizzly Peak Gate located along the northern boundary of the LBNL hill site and also accessed via Centennial Drive. Internal circulation on the LBNL hill site is provided by an east-west roadway system that generally follows the site contours.

#### **Roadway Levels of Service**

Level of service (LOS) is a general measure of traffic operating conditions, whereby a letter grade from A (the best) to F (the worst) is assigned to roadway intersections. These grades represent the comfort and convenience associated with driving from the driver's perspective. To assess the worst-case traffic conditions, LOS is measured during morning (generally 7 AM to 9 AM) and afternoon (generally 4 PM to 6 PM) peak commute times. The LOS standard for City intersections is LOS D. Of the 20 city intersections evaluated in the 2006 LRDP EIR, only one intersection (Bancroft Way at Gayley Road/Piedmont Avenue) currently operates at an unacceptable level of service. The 2006 LRDP EIR and subsequent traffic analyses found that by 2025, even without traffic added by LBNL growth, three additional intersections (Hearst Avenue/Gayley Road/La Loma Avenue, Stadium Rim Way/Gayley Road, and Durant Avenue/Piedmont Avenue) would operate at unacceptable levels of service.

#### **Parking**

There are approximately 2,175 off-street and on-street parking spaces at the LBNL hill site. Because access to the LBNL hill site is controlled, parking facilities are not open to the general public. UC LBNL implements a permit parking program. UC LBNL discourages the use of single occupant vehicles for access to the site as part of its Transportation Demand Management (TDM) program.

#### **Bicycle and Pedestrian Network**

Due to the site's hilly terrain, about 10 percent of the employees use bicycles for their commutes. Pedestrian and bicycle facilities within the LBNL hill site are discontinuous. These facilities are used to move between nearby building clusters; for longer trips, the employees use shuttles or personal vehicles.

#### **Transit**

The LBNL hill site is served by LBNL shuttles that run between LBNL and the Center Street/Shattuck BART station on 10 minute headways on weekdays and an express shuttle that operates on an hourly

schedule during commute hours between the Lab and the Rockridge BART station. The LBNL shuttle stops have been coordinated with AC Transit bus lines serving downtown Berkeley.

**Project Site**

The project site is located near the Blackberry Canyon entrance and is served by Chu and Perlmutter Roads. The shuttle route that currently runs off-site to UC Berkeley and the City of Berkeley provides access to the project site through the shuttle stop at the Blackberry Canyon entrance gate and the stop located in Parking Lot A.

**6.16.2 Environmental Checklist and Discussion**

	Impact to be Analyzed in the EIR	No Additional Analysis Required
<b>TRANSPORTATION/TRAFFIC - Would the project:</b>		
a. Conflict with an applicable plan, ordinance, or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b. Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c. Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d. Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e. Result in inadequate emergency access?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f. Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

**DISCUSSION:**

**a., b. No Additional Analysis Required.** The proposed project would not increase vehicle trips to the project area since no additional buildings or persons would be added.

Construction could result in a temporary increase in traffic associated with equipment deliveries, and construction worker commute trips. The 2006 LRDP EIR identified existing construction management “best practices” routinely undertaken at LBNL to limit otherwise potentially adverse construction-related impacts and set these forth as LBNL Best Practices 6a through 6c. The LRDP EIR identified these best practices as continuing best practices required to be incorporated into contract specifications and management oversight for all development projects under the 2006 LRDP. They require construction contractors to meet with UC LBNL and prepare a Construction Traffic Management Plan (CTMP) to lessen the impacts of construction on traffic and parking. The CTMP must propose truck routes, limit truck traffic during peak commute period (7:00 to 9:00 AM and 4:00 to 6:00 PM), and prepare a parking management plan for construction workers. A CTMP would be prepared and implemented during project construction. Furthermore, pursuant to LRDP Best Practice TRANS-6c, UC LBNL has instituted a program to manage aggregate construction truck trips to avoid exceeding impact thresholds during heavy truck activity periods. As a part of this program, the designated UC LBNL Construction Coordinator oversees each construction project on the LBNL site to keep the total number of one-way truck trips on the Hearst–Oxford–University Avenue truck route below 98 trips per day. Truck trips associated with the proposed project would also be subject to this LBNL site program; this would ensure that the project’s construction truck trips when added to truck trips from other ongoing construction projects would not exceed the established limit. Construction worker vehicle trips would be avoided by providing parking at an off-site location and bringing the workers to the site by bus.

Thus, the proposed NERSC-9 project would not result in a significant traffic impact and no further analysis is required.

- c. **No Additional Analysis Required.** The proposed project would not affect the air traffic patterns at any of the regional airports. The project does not include activities or structures that could hinder aviation activity. Therefore, implementation of the project would result in no impact related to air traffic patterns. No further analysis is required.
- d. **No Additional Analysis Required.** The proposed project would not change on-site circulation or surrounding roadways and intersections. Therefore, there would be no impact and no further analysis is required.
- e. **No Additional Analysis Required.** The proposed project would not change on-site circulation or emergency access. Thus, no impact would occur and no further analysis is required.
- f. **No Additional Analysis Required.** The project would not add any persons to the LBNL hill site. No impacts to public transit, bicycle, or pedestrian facilities would occur and no further analysis is required.

### 6.16.3 Cumulative Impacts

Because the project would not add any operational traffic, the project would not contribute to any cumulative traffic impacts. With respect to construction phase traffic, for reasons presented in items a, b above, a cumulatively considerable contribution to a traffic impact would be avoided by keeping the total LBNL-related one-way construction truck trips (including those associated with the proposed project) through Berkeley below 98 trips per day. Further analysis is not required.

## 6.17 Utilities and Service Systems

### 6.17.1 Background

**Potable and Fire Protection Water:** East Bay Municipal Utility District (EBMUD) provides high pressure water to the LBNL hill site via two points of connection – a 12-inch meter on Campus Drive in the Shasta Pressure Zone of the district and a 6-inch meter on Summit Road from the Berkeley View Pressure Zone. On the site, water is distributed by an extensive water distribution system which provides water not only to the buildings but also for use in cooling towers, for irrigation, and for other uses. UC LBNL also maintains three 200,000-gallon water storage tanks on-site for emergency water supply. In April 2015, EBMUD provided LBNL with a water supply assessment that assures a water supply of 92.5 million gallons per year (mgy) to the Berkeley Lab.

**Wastewater:** Wastewater generated at the LBNL hill site is collected in a gravity-flow system that eventually discharges into the City of Berkeley’s sanitary sewer system through a monitoring station located at Hearst Avenue and a second monitoring station located in Centennial Drive. The volume and quality of effluent at both monitoring stations is monitored and evaluated for compliance with EBMUD discharge requirements. From these monitoring stations, the discharge continues down into the City’s sewer system to be transported to EBMUD’s north interceptor sewer and then to the wastewater treatment facility in Oakland. Sanitary sewer sub-basin 17-503 which receives flows from the sewer main in Centennial Drive (and other areas of Berkeley and Oakland) is constrained around Dwight Avenue during peak wet weather conditions.

**Storm Drainage:** The LBNL hill site storm drain system is a gravity-fed system of open and culverted drainages that generally run east–west. The combined flows are then conveyed through the developed portions of the site to eventually discharge via outfalls into the open channels of the Strawberry Creek watershed.

**Solid Waste:** Non-hazardous solid waste is collected and transported off-site by a commercial waste contractor. UC LBNL implements an extensive program focused on waste minimization and recycling.

**Electricity:** UC LBNL purchases electricity from the Western Area Power Administration (WAPA). Electricity generated by WAPA is delivered to the LBNL’s Grizzly Peak Substation via the Pacific Gas & Electric (PG&E) transmission system. In 2015, the LBNL main hill site’s total electrical power consumption was 86,400 megawatt hours. The LBNL hill site maintains several stationary and portable standby electrical generators that are powered by diesel, gasoline, or natural gas.

**Natural Gas:** Natural gas is used on the LBNL hill site for heating buildings, to operate certain equipment and also in some experimental uses. Natural gas is delivered to the site by the PG&E system via a 6-inch line. The point of delivery is located above Cyclotron Road and below Building 88. Natural gas is distributed from this point of delivery to all buildings at LBNL. Two buildings (Buildings 73 and 73A) in the eastern portion of LBNL are served by another PG&E line located along Centennial Drive.

**Other On-Site Utilities:** UC LBNL also owns and operates other specialized utility systems that are needed for the research and specific equipment used on site. These include a LBNL site-wide compressed air system, a LBNL site-wide low conductivity water system, a closed loop cooling water system, building-specific purified water systems, and building-specific de-ionized water systems.

**Project Site**

All of the utilities that would be needed for the proposed project are currently available on the project site.

**6.17.2 Environmental Checklist and Discussion**

	Impact to be Analyzed in the EIR	No Additional Analysis Required
<b>UTILITIES AND SERVICE SYSTEMS - Would the project:</b>		
a. Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
b. Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
c. Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
d. Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new and expanded entitlements needed?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
e. Result in the need for increased chilled water or steam generation capacity or major distribution improvements?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
f. 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?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
g. Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
h. Comply with federal, state, and local statutes and regulations related to solid waste?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
i. Require or result in the construction or expansion of electrical or natural gas facilities which would cause significant environmental	<input type="checkbox"/>	<input checked="" type="checkbox"/>

	Impact to be Analyzed in the EIR	No Additional Analysis Required
impacts?		
j. Require or result in the construction or expansion of telecommunication facilities, which would cause significant environmental impacts?	<input type="checkbox"/>	<input checked="" type="checkbox"/>

**DISCUSSION:**

- a.,b.,f. **No Additional Analysis Required.** The project would not require infrastructure improvements for wastewater service at LBNL since there would be no increase in building space or population. Increased water use would not result in increased sanitary effluent as the cooling towers consume water through evaporation. Therefore, the NERSC-9 project would not contribute to the need for additional wastewater treatment facilities and no further analysis is required.
- c. **No Additional Analysis Required.** The proposed project would not increase the amount of impervious area on the project site. The building footprint would remain unchanged and no additional buildings or structures would be constructed. The new cooling towers would be installed on an existing concrete foundation. Installation of construction cranes would be temporary and on already impervious (asphalt-covered and/or hard-packed) surfaces. Thus, there would be no increase in runoff and no impact on storm water drainage facilities. No further analysis is required.
- d. **No Additional Analysis Required.** High-performance computing relies on intensive energy and cooling. The Building 59 upgrades would include installation of up to three new cooling towers, which – along with the facility’s four existing cooling towers – would rely on water for evaporative heat transfer (cooling). Water used for cooling would thereby increase by an expected 20 mgd over baseline use. Accordingly, total Building 59 water use is projected to increase to approximately 55 mgd, and overall LBNL water use to approximately 92 mgd by 2020. This is consistent with long-range planning coordination between UC LBNL and EBMUD and is within LBNL’s water supply assessment.

Building 59 is designed to produce high-performance computing with the maximum practicable degree of water and energy efficiency. For example, Building 59 is designed with massive, western-facing air-inlets to allow ocean-cooled air to augment the facility’s heat exchange capabilities. Running the same level of computations in less modern or more dispersed facilities elsewhere would most likely require much larger amounts of water and energy than would the proposed project. Given the proposed project’s access to existing, planned water resources and taking into consideration its water-conserving design, no further analysis is needed.

- e. **No Additional Analysis Required.** Implementation of the proposed project would result in increased demand for chilled water for space cooling purposes. This demand would be met by the proposed installation of additional cooling towers and cooling systems. Therefore, the proposed project would not result in the need for major distribution system improvements and no further analysis is required.
- g.-h. **No Additional Analysis Required.** The proposed project would not result in an increased waste stream since no new personnel or building space would be added to the project site. Therefore, the proposed project would not cause any landfill to exceed its permitted capacity and no impacts would occur on solid waste facilities. No further analysis is required.

- i. **No Additional Analysis Required.** Operation of the proposed project would draw upon relatively large amounts of electrical energy to power the existing and proposed high-performance computers and their support systems. By 2020, the project proposes to use up to 27.5 MW for total power capacity, which is approximately 18.6 MW greater than the power used in Building 59 at the present time and approximately 15 MW greater than the total power capacity reviewed in the CRT EIR. UC LBNL works closely with its energy providers (WAPA for energy supply and PG&E for distribution) to forecast future aggregate needs. It is anticipated that, by its fully operational date of 2020, the proposed project would not require the construction or expansion of electrical or natural gas facilities that would cause significant impacts. No further analysis is required.
- j. **No Additional Analysis Required.** The proposed project would not affect telecommunication facilities and no impact would occur. No further analysis is required.

### 6.17.3 Cumulative Impacts

The proposed project would not substantially burden the infrastructure and resources of utility providers to continue to supply the Laboratory with water, electricity, and natural gas, along with storm water, wastewater, solid waste disposal, and telecommunications services. As part of UC LBNL's planned growth, the proposed project is considered in the long-range regional planning of key utility providers and would not be considered to contribute to a cumulatively significant impact to utilities. Further analysis is not required.

The 2006 LRDP EIR analyzed the cumulative impact on utilities under LRDP Impact UTILS-6. According to that analysis, other foreseeable development in the City of Berkeley and in the LBNL area surrounding the Lab hill site would contribute to cumulative increases in utility and energy demand; however, new development would occur within a largely built-out urban area where utilities and service systems generally are provided. Additionally, these increases in demand attributed to other development would be addressed on a site-by-site basis by the service providers prior to approval of new development, and through CEQA review of each development project. The incremental increase in demand for utilities for storm water delivery systems, water supply, and solid waste associated with the 2006 LRDP would not be expected to represent a substantial increase in demand for utility and service systems that would require expanded facilities or entitlements, and existing utility delivery systems would be expected to handle growth anticipated under the 2006 LRDP. Therefore, the cumulative effect of 2006 LRDP development in combination with other foreseeable development would not be significant, nor would the LRDP development's contribution to any cumulative effects be cumulatively considerable. Because the proposed project is within scope of growth and development under the 2006 LRDP, the proposed project's cumulative effects are adequately addressed under LRDP Impact UTILS-6 and its contribution to any cumulative impacts would also not be considerable.

**6.18 Mandatory Findings of Significance**

	Impact to be Analyzed in the EIR	No Additional Analysis Required
<b>MANDATORY FINDINGS OF SIGNIFICANCE</b>		
a. Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or pre-history?	<input checked="" type="checkbox"/>	<input type="checkbox"/>
b. Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects).	<input checked="" type="checkbox"/>	<input type="checkbox"/>
c. Does the project have environmental effects, which will cause substantial adverse effects on human beings, either directly or indirectly?	<input checked="" type="checkbox"/>	<input type="checkbox"/>

**DISCUSSION:**

- a. **Impact to be Analyzed in the EIR.** As noted in the checklist responses, the Building 59 Upgrade & Installation and Operation of NERSC-9 project would not adversely affect wildlife or fish habitat or cultural resources. However, it would result in substantial greenhouse gas emissions that could affect the quality of the environment. This is considered a potentially significant impact and will be analyzed in the Building 59 Upgrade & Installation and Operation of NERSC-9 project EIR.
- b. **Impact to be Analyzed in the EIR.** As noted in the checklist responses, the proposed project has the potential to contribute to cumulative impacts associated with greenhouse gas emissions. This cumulative impact will be analyzed in the Building 59 Upgrade & Installation and Operation of NERSC-9 project EIR. All other cumulative impacts would not require further evaluation.
- c. **Impact to be Analyzed in the EIR.** As discussed in this Initial Study, the project has the potential to directly or indirectly impact human beings via its greenhouse gas emissions. This is considered a potentially significant impact and will be analyzed in the Building 59 Upgrade & Installation and Operation of NERSC-9 project EIR.

## 7. REFERENCES

- Association of Bay Area Governments (ABAG). 2009. Projections and Priorities 2009: Building Momentum. August.
- California Department of Resources Recycling and Recovery (CalRecycle). Solid Waste Information System. Accessed May 10, 2016. <http://www.calrecycle.ca.gov/SWFacilities/Directory/01-AA-0009/Detail/>.
- Condor Country Consulting, Inc. 2010. Archaeological Survey and Section 106 Consultation Report for the Computational Research and Theory Facility (CRT), Lawrence Berkeley National Laboratory, City of Berkeley, Alameda County, California.
- Illingworth & Rodkin. 2016. NERSC-9 Generator Emissions. May 14.
- Lawrence Berkeley National Laboratory. 2007. Long Range Development Plan Final Environmental Impact Report, SCH No. 200102046. July.
- Lawrence Berkeley National Laboratory. 2008. Computational Research and Theory Facility Final Environmental Impact Report, SCH # 2007072106. April.
- Lawrence Berkeley National Laboratory. 2011. Computational Research and Theory Facility Final Environmental Assessment. February.

## 8. REPORT PREPARERS

### **Lawrence Berkeley National Laboratory**

Jeff Philliber, LBNL Chief Environmental Planner  
Sheree Swanson, Project Director, Facilities Division  
James Haslam, Project Manager, Facilities Division  
Nancy Ware, LBNL Senior Counsel

### **Impact Sciences, Inc.**

Shabnam Barati, Managing Principal  
Angela Pan, Project Planner

### **Illingworth & Rodkin, Inc.**

James Reyff, Principal

**JUN 27 REC'D****Facilities Capital Projects**

June 22, 2016

Jeff Philliber, Chief Environmental Planner  
Lawrence Berkeley National Laboratory, Mail Stop 76-225  
One Cyclotron Road  
Berkeley, CA 94720

Re: Notice of Preparation of a Draft Environmental Impact Report – Building 59  
Upgrade and Installation and Operation of NERSC-9, Lawrence Berkeley National  
Laboratory

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 Building 59 Upgrade and Installation and Operation of NERSC-9 Project located in the City of Berkeley. EBMUD has the following comments.

### **WATER SERVICE**

EBMUD's Shasta and Berkeley View Pressure Zones, with service elevations between 900 and 1050 feet and between 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.

### **WATER RECYCLING**

District Policy 9.05 (attached) 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.

While there are currently no specific plans for a satellite recycled water project at this location, EBMUD recommends that the Lawrence Berkeley National Laboratory and its developers maintain continued coordination and consultation with EBMUD as they plan and implement this project to determine the feasibility of an on-site satellite system to provide recycled water for irrigation and other possible uses at the project's area.

## **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](http://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

Jeff Philliber, Chief Environmental Planner  
June 22, 2016  
Page 3

the Regional Private Sewer Lateral Ordinance and applicable municipal codes or Satellite Agency ordinances.

### **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  
Manager of Water Distribution Planning

DJR:SHT:dks  
sb16\_104.docx

Attachment: Policy 9.05 Non-Potable Water



# Policy 9.05

EFFECTIVE 22 SEP 15

SUPERSEDES 26 MAR 13

## NON-POTABLE WATER

---

### IT IS THE POLICY OF EAST BAY MUNICIPAL UTILITY DISTRICT TO:

Require that customers of the East Bay Municipal Utility District ("EBMUD") 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 life, fish and wildlife. When non-potable water satisfying these conditions is made available to the customer, the use of potable water for non-domestic purposes may constitute a waste and unreasonable use of water within the meaning of Section 2 of Article X of the California Constitution and is prohibited.

---

**Findings Related To Use Of Non-potable Water** The Board of Directors of EBMUD has determined that existing water supplies will not adequately accommodate existing and future demand within the EBMUD's Ultimate Service Boundary. Non-potable water resources, including treated wastewater discharged to the San Francisco Bay from EBMUD and other Bay Area treatment plants, and other alternative water sources that could provide a safe and effective alternative water supply for certain non-potable purposes, increase the availability of the limited water supplies of EBMUD, assure non-potable water customers of a more reliable water supply during periods of drought, reduce wastewater discharges to the Bay, and provide EBMUD with greater flexibility to meet instream needs in the Mokelumne River. The State Legislature has determined that the use of potable domestic water for certain non-potable uses may constitute a waste or unreasonable use of water if recycled water is available which meets specified conditions. (Water Code Section 13550 et seq.)

---

**Definitions**

Non-potable Water - All reclaimed, recycled, reused, untreated, or alternative water supplies that meet the conditions set forth in the California Water Code, Section 13550, and are determined by EBMUD to be suitable for non-domestic purposes and feasible for the particular intended use.

Non-domestic Uses - For purposes of this policy, "non-domestic uses" shall mean all applications except drinking, culinary purposes and the processing of products intended for direct human consumption.

---

**Mandated Uses Of Non-potable Water** Customers may be required to use non-potable water consistent with non-potable water service regulations and non-potable/recycled water rate schedule for their non-domestic uses which may include, but are not limited to, the following:

- Irrigation of cemeteries, golf courses, playing fields, parks, and residential and nonresidential landscaped areas;
- Commercial and industrial process uses; and
- Toilet and urinal flushing in nonresidential buildings.

---

**Determination Of Feasibility Of Non-potable Water** In determining whether non-potable water is feasible for a particular non-domestic use, EBMUD shall consider the following factors:

- Whether the non-potable water may be furnished for the intended use at a reasonable cost to the customer and EBMUD.
- Whether the non-potable water is adequate quality for the intended use and does not require significant additional on-site treatment by the customer beyond that required for potable water.
- Whether the use of non-potable water is consistent with all applicable federal, state, and local laws and regulations.
- Whether the use of non-potable water will not be detrimental to the public health and will not adversely affect plant life, fish and wildlife.

---

**Regulations Governing Non-potable Service** The regulations and rates governing non-potable water service, including recycled water, shall be determined by the Board of Directors and published in the Regulations Governing Water Service and Schedule of Rates and Charges for Customers of East Bay Municipal Utility District.

---

**Water Reuse Zones** EBMUD designates Water Reuse Zones within EBMUD's service area where non-potable water service has been determined to be reasonably available.

---

**Non-potable Water Service Agreements** Where implementation of this Policy requires agreements, such agreements shall, wherever possible, have a term of 20 or more years and shall include applicable provisions governing responsibilities for planning, design and construction, and facilities operation and maintenance. Upon termination or expiration of an agreement, customers receiving non-potable water service, including recycled water, pursuant to that agreement shall be governed by the non-potable water service regulations and non-potable/recycled water rate schedule, unless a new agreement is entered into.

---

**Authority** Resolution No. 32981-96, April 9, 1996  
As amended by Resolution No. 33443-04, September 28, 2004  
As amended by Resolution No. 33564-06, November 14, 2006  
As amended by Resolution No. 33919-13, March 26, 2013  
As amended by Resolution No. 34052-15, September 22, 2015

---

**References** Regulations Governing Water Service and Schedule of Rates and Charges for Customers of East Bay Municipal Utility District  
Policy 7.05 – Sustainability

---

**APPENDIX 4.1**

---

**GHG Technical Memoranda**

To: Jeff Philliber  
From: Deirdre Carter  
Date: September 16, 2016  
Re: NERSC Scope 2 Greenhouse Gas Emissions - version 4

---

## **Purpose**

This memo presents reasonable average power consumption values and estimated annual electricity consumption for the proposed NERSC expansions. The electricity consumption is then used to calculate scope 2 greenhouse gas emissions associated with the NERSC expansions.

The emissions calculated for FY2021 should be used for the NERSC-9 EIR evaluation. The FY2021 calculations assume that NERSC-9 is online for the entire fiscal year.

For FY2025, the Shyh Wang Hall Building 59 Plan of Record and the Shyh Wang Hall Building 59 Desired Plan (Low) scenarios are both presented. One of these scenarios, or a value bounded by these scenarios, should be used for the LRDP update.

All annual data presented is based on federal fiscal years (FY), which start on October 1 and end on September 30.

## **Electricity Consumption**

The electricity consumption calculations are based on NERSC power projections from Jeff Broughton's 08/05/2016 "B59 Power Projections" spreadsheet. The power projections spreadsheet includes three scenarios.

### **Assumptions**

- NERSC-9 peak computing power in FY2021 will be 14.0 MW per the Building 59 Plan of Record scenario, excluding cooling loads.
- The peak power for the rest of NERSC computing, office, and common areas will be 6.1 MW in FY2021 per the Building 59 Plan of Record scenario, excluding cooling loads.
- NERSC-9 will be 14.0 MW in FY2025 per the Building 59 Plan of Record scenario, excluding cooling loads.
- The peak power for the rest of NERSC computing, office, and common areas will be 1.5 MW in FY2025 per the Building 59 Plan of Record scenario, excluding cooling loads.
- NERSC-9 will be offline in FY2025 per the Building 59 Desired Plan - Low (Unfunded) scenario.
- The peak power for NERSC computing, office, and common areas will be 21.5 MW in FY2025 per the Building 59 Desired Plan - Low (Unfunded) scenario, excluding cooling loads.
- PUE will be 1.1 in FY2021 and in FY2025 in both scenarios.
- The average power will be 85% of peak power in FY2021 and in FY2025 in both scenarios.

Additional assumptions:

- PUE applies to the full peak load. While the peak load includes office load, which is not typically multiplied by PUE, the office load is negligible compared to the computing load.
- Assumed NERSC-9 is online for the entire year for FY2021.
- Peak power provided by Jeff Broughton are at the building level so transformer losses were included. Assumed 97% efficiency for 115kV to 12.47kV at Grizzly and 97% efficiency for 12.47kV to 480V/277V at building.

	<b>UNITS</b>	<b>FY2021 Plan of Record</b>	<b>FY2025 Plan of Record</b>	<b>FY2025 Desired Plan - Low</b>
NERSC-9	kWh/yr	121,870,975	121,870,975	0
NERSC other	kWh/yr	53,100,925	13,057,604	187,158,997
NERSC total	kWh/yr	174,971,899	134,928,579	187,158,997

### Scope 2 Greenhouse Gas Emissions

For both FY2021 and FY2025, an eGrid 2012 CAMX region emission factor is used, which is 0.29610 MTCO<sub>2</sub>e/MWh. No projected changes to emissions factor are assumed. While California's renewable portfolio standards will bring a significant amount of new renewable energy onto the grid, the loss of the Diablo Canyon nuclear reactor will likely bring new natural gas power plants online. These two trends will offset one another in the 2021 to 2025 timeframe. The 2012 CAMX emissions factors were released 10/8/2015 and are the latest available.

The values presented below are Scope 2 electricity emissions only.

	<b>UNITS</b>	<b>FY2021 Plan of Record</b>	<b>FY2025 Plan of Record</b>	<b>FY2025 Desired Plan - Low</b>
NERSC-9	MTCO <sub>2</sub> e/yr	36,085	36,085	0
NERSC other	MTCO <sub>2</sub> e/yr	15,723	3,866	55,417
NERSC total	MTCO <sub>2</sub> e/yr	51,808	39,952	55,417

## MEMO

**Date:** October 12, 2016

**To:** **Shabnam Barati**  
Impact Sciences

**From:** James Reyff

**SUBJECT: Berkeley Lab GHG Forecasts – GHG Emissions Methodology**  
Job#16-007

Greenhouse gas (GHG) emissions for existing and future scenarios were computed by the Berkeley Lab and provided to us as a workbook that included these emissions and the factors used for making those calculations. We modified these emissions to provide: (1) 1990 emissions for each reported category, (2) add past and future vehicle use emissions, (3) add past, existing and future Stationary Source emissions, (4) add past and future water conveyance emissions, (5) add past and future off-site water treatment emissions, and (6) add past and future off-site solid waste disposal emissions. In many cases, the 2015 emissions provided by the lab were adjusted based on worker growth, compared to the baseline conditions. The following is a description of the methodologies used to compute GHG emissions from the project in two spreadsheets:

1. I&R 2016-08-25 Berkeley Lab GHG Forecast Calculator.xlsx
2. NERSC-9 Usage 082316.xlsx

### Stationary Sources

The Berkeley Lab provided an inventory of generators used to produce electricity. It was assumed that only diesel generators would be routinely tested and that each of those generators would be operated (for testing) 50 hours per year, which is the maximum allowable amount by State law. Gasoline engines, which are mostly small compared to the diesel engines, were assumed to have negligible emissions because they do not require testing and they would be much smaller. GHG emissions from the testing of the new generators projected to

be added to the Berkeley Lab by 2025 were also calculated by assuming that the generator would be tested for up to 50 hours per year. CARB emissions factors were used to estimate generator testing GHG emissions<sup>1</sup>.

### Area Sources

Area source emissions are mostly the result of natural gas combustion on site and were assumed as the only area source emissions. Note that there could be relatively small emissions from other area sources that were not included in this assessment. The Lab reports GHG emissions for natural gas. Natural gas emissions were computed by applying the amount of natural gas used to an emission factor provided by U.S. EPA<sup>2</sup>. These emissions were calculated for the year 2025 based on the projected increase in the use of natural gas on the Berkeley Lab and in 1990 based on past natural gas usage records.

### Employee Vehicles

The lab computed GHG emissions associated with worker travel for year 2015. For years 1990 and future years, the emissions were computed assuming the same travel distance as was used by the lab, but applied emission factors using the EMFAC2014 motor vehicle emission factor model made available by the California Air Resources Board. Essentially, the ratio of the number of employees to the EMFAC2014 emission factor for a certain year were multiplied by the 2015 emission computed by the Lab. Emission factors used in EMFAC2014 were based on Alameda County travel mixes, assuming all commute vehicles are either light-duty autos or light-duty trucks.

### Electricity

GHG emissions that would result from the use of electricity were calculated by multiplying the average annual electricity consumption with an emissions factor of 0.29610 MTCO<sub>2</sub>e/MWh, which is the eGRID 2012 CAMX region emission factor. The use of this 2012 emission factor provides a conservative estimate of the Lab's future GHG emissions because the factor is expected to be lower in future years as more renewable energy sources are developed in the region. Since CAMX region emission factors are not available for 1990, a CAMX region eGRID emission factor for 1996 was used to calculate 1990 emissions<sup>3</sup>.

### Water

---

1 CARB OFFROAD2007 model (<http://www.arb.ca.gov/msei/offroad/offroad.htm>), December, 2006. and Stationary/Off-road engines ARB, "California's Emissions Inventory for Off-Road Large Compression-Ignited (CI) Engines (> 25 HP)" MAC#99-32

<sup>2</sup> U.S. EPA 2014. *Emission Factors for Greenhouse Gas Inventories*. Last updated in November 2015. See [https://www.epa.gov/sites/production/files/2015-11/documents/emission-factors\\_nov\\_2015.pdf](https://www.epa.gov/sites/production/files/2015-11/documents/emission-factors_nov_2015.pdf), accessed on August 30, 2016.

<sup>3</sup> Based on eGRID 1996 emission rates from <https://www.epa.gov/energy/egrid>, accessed October 12, 2016.

GHG emissions that would result from increased water use at the Berkeley Lab were calculated by multiplying the projected average annual water usage by an electricity use factor from CalEEMod that represents the amount of electricity necessary to supply, treat, and distribute water. Because this energy is consumed by outside of the lab, an electricity emission rate PG&E was used. PG&E publishes emission factors for past and future years (out to 2020) that were used<sup>4</sup>.

#### Wastewater and Solid Waste

GHG emissions from increased wastewater and solid waste generated by the Lab were computed by the Lab for existing conditions (i.e., 2015). Emissions for the past (i.e., 1990) and the future were computed by applying the ratio of the number of workers for past or future years to the current number of workers.

---

<sup>4</sup> *ibid.*

# I&R 2016-08-25 Berkeley Lab GHG Forecast Calculator

## Summary of GHG forecast (MTCO<sub>2e</sub>) for 2006 LRDP

Gray cells indicate categories where Berkeley Lab does not maintain a forecast

### Factors

0.29610 MTCO <sub>2e</sub> /MWh	eGrid 2012 CAMX
0.000296095 MTCO <sub>2e</sub> /kWh	Electricity GHG emissions per kWh
0.053115 MTCO <sub>2e</sub> /MMBtu	Used in Federal reporting
0.0053115 MTCO <sub>2e</sub> /therms	Natural gas GHG emissions per therm
6.58710% Scope 3 % of Scope 2 electricity	Used in Federal reporting

### Projected emissions without mitigation (MTCO<sub>2e</sub>)

Location	Scope	Source	Actual data		Forecasted Greenhouse Gases	
			1990	FY2015	FY2020	FY2025
Hill	1	Natural Gas	6,933	6,551	7,129	7,129
Hill	1	Fleet vehicles	76	115		
Hill	1	Fugitive gases	37	55		
Hill	2	Electricity Hill Less NERSC	40,061	24,074	24,965	23,818
Hill	2	Electricity NERSC other		520	15,723	3,866
Hill	2	Electricity NERSC-9		0	36,085	36,085
Hill	3	Electricity T&D Losses		1,620	5,057	4,201
Hill	3	Business Air Travel		5,485		
Hill	3	Business Ground Travel		379		
Hill	3	Employee Commuting	8,311	10,002		7,899
Hill	3	Off-Site Waste Water Treatment	7	10		11
Hill	3	Off-Site Solid Waste Disposal	268	404		446

# NERSC-9 Usage 082316

## NERSC-9 Project Emissions Estimates

Standby	Emergency Generator							
Rating:	1250 kW							
	1,676 HP							
Number of Units:	1							
Operating Hours per Unit:	1 hours/day							
	50 hours/year							
	1.25 MW							
	Standby Emergency Generator Emissions							
Units	Criteria Pollutants							GHG
	ROG	NOX	CO	SOX	PM10	PM2.5	CO2	
g/HP-hr	0.05234	2.242968	0.92364	0.00571536	0.01721	0.015847		511
lbs/hr	0.19	8.28	3.41	0.02	0.06	0.06		1,888
lbs/day	0.19	8.28	3.41	0.02	0.06	0.06		1,888
lbs/yr	9.66	414.08	170.51	1.06	3.18	2.93		94,423
tons/yr	0.00	0.21	0.09	0.00	0.00	0.00		47
metric tons/yr	—	—	—	—	—	—		43

CARB OFFROAD2007 model (<http://www.arb.ca.gov/msei/offroad/offroad.htm>), December, 2006.

Stationary/Off-road engines ARB, "California's Emissions Inventory for Off-Road Large Compression-Ignited (CI) Engines (> 25 HP)" MAC#99-32

Standby	Emergency Generator							
Rating:	1250 kW							
	1,676 HP							
Number of Units:	1							
Operating Hours per Unit:	1 hours/day							
	50 hours/year							
	1.25 MW							
	Standby Emergency Generator Emissions							
Units	Criteria Pollutants							GHG
	ROG	NOX	CO	SOX	PM10	PM2.5	CO2	
g/HP-hr	0.05234	2.242968	0.92364	0.00571536	0.01721	0.015847		511
lbs/hr	0.19	8.28	3.41	0.02	0.06	0.06		1,888
lbs/day	0.19	8.28	3.41	0.02	0.06	0.06		1,888
lbs/yr	9.66	414.08	170.51	1.06	3.18	2.93		94,423
tons/yr	0.00	0.21	0.09	0.00	0.00	0.00		47
metric tons/yr	—	—	—	—	—	—		43

### Water Supply

Average Water Use (MGY)	1.5	55	55
Electricity Use (mW)*	5.34	195.8	195.8
Electricity Emission Rate (lbs/mW/hr)**	427	290	290
Water Use Emissions	1	26	26

\* Based on CalEEMod for supply, treat and distribute. Does not include wastewater  
 \*\* Based on PG&E published rates for 2013 and 2020

**APPENDIX S-1**

---

**LBNL GHG Emissions-Partial Forecast Memorandum**

To: Jeff Philliber  
 From: Deirdre Carter  
 Date: September 16, 2016  
 Re: LBNL Greenhouse Gas Emissions - Partial Forecast - version 2

**Purpose**

Sustainable Berkeley Lab (SBL) maintains a 10-year forecast of gas and electricity consumption for Berkeley Lab. This memo presents those projections for FY2021 and FY2025 and converts them into greenhouse gas emissions.

All annual data presented is based on federal fiscal years (FY), which start on October 1 and end on September 30.

**Summary of energy forecast without mitigation (therms or kWh)**

Gray cells indicate categories where Berkeley Lab does not maintain a forecast. Emissions are identified as originating on the main site (Hill) or off the main site (Offsite). Scope 3 electricity transmission and distribution losses are calculated using a federal factor of 6.58710% of scope 2 electricity consumption. Values are in therms or kWh.

NERSC electricity forecast assumptions are described in the “NERSC Scope 2 Greenhouse Gas Emissions” memo.

Location	Scope	Source	Units	Forecasted Energy	
				FY2021	FY2025
Hill	1	Natural Gas	therms	1,342,134	1,342,134
Hill	1	Fleet vehicles			
Hill	1	Fugitive gases			
Hill	2	Electricity Hill Less NERSC	kWh	84,315,730	80,438,844
Hill	2	Electricity NERSC other	kWh	53,100,925	13,057,604
Hill	2	Electricity NERSC-9	kWh	121,870,975	121,870,975
Hill	3	Electricity T&D Losses	kWh	17,079,535	14,186,468
Hill	3	Business Air Travel			
Hill	3	Business Ground Travel			
Hill	3	Employee Commuting			
Hill	3	Off-Site Waste Water Treatment			
Hill	3	Off-Site Solid Waste Disposal			
Offsite	1	Natural Gas	therms	161,535	161,535
Offsite	1	Fleet vehicles			
Offsite	1	Fugitive gases			
Offsite	2	Electricity	kWh	4,688,540	4,688,540
Offsite	3	Electricity T&D Losses	kWh	308,839	308,839

Offsite	3	Business Air Travel			
Offsite	3	Business Ground Travel			
Offsite	3	Employee Commuting			
Offsite	3	Off-Site Waste Water Treatment			
Offsite	3	Off-Site Solid Waste Disposal			
Hill + Offsite	1 & 2	Renewable Energy Purchase			
Hill + Offsite	1 & 2	REC Purchases			
Hill + Offsite	1 & 2	DOE Bonus for RE on Federal Property			
Hill + Offsite	1 & 2	Total Emissions			
Hill + Offsite	1 & 2	Total RECs			
Hill + Offsite	1 & 2	Total Emissions Less RECs			
Hill + Offsite	3	Total Emissions			
Hill + Offsite	1, 2, & 3	Total Emissions			
Hill + Offsite	1, 2, & 3	Total Emissions Less RECs			

### Projected emissions without mitigation (MTCO<sub>2e</sub>)

Gray cells indicate categories where Berkeley Lab does not maintain a forecast. FY2015 values are reported values from Lawrence Berkeley National Laboratory Site Sustainability Plan for FY2016. Scope 1 natural gas emissions use a federal emissions factor of 0.053115 MTCO<sub>2e</sub>/MMBtu.

For both FY2021 and FY2025, an eGrid 2012 CAMX region emission factor is used, which is 0.29610 MTCO<sub>2e</sub>/MWh. No projected changes to emissions factor are assumed. While California's renewable portfolio standards will bring a significant amount of new renewable energy onto the grid, the loss of the Diablo Canyon nuclear reactor will likely bring new natural gas power plants online. These two trends are likely to offset one another in the 2021 to 2025 timeframe. The 2012 CAMX emissions factors were released 10/8/2015 and are the latest available.

All values are in MTCO<sub>2e</sub>.

Location	Scope	Source	Actual data	Forecasted Greenhouse Gases	
			FY2015	FY2021	FY2025
Hill	1	Natural Gas	6,551	7,129	7,129
Hill	1	Fleet vehicles	115		
Hill	1	Fugitive gases	55		
Hill	2	Electricity Hill Less NERSC	22,498	24,965	23,818
Hill	2	Electricity NERSC other	486	15,723	3,866
Hill	2	Electricity NERSC-9	0	36,085	36,085

Hill	3	Electricity T&D Losses	1,573	5,057	4,201
Hill	3	Business Air Travel	5,485		
Hill	3	Business Ground Travel	379		
Hill	3	Employee Commuting	10,002		
Hill	3	Off-Site Waste Water Treatment	10		
Hill	3	Off-Site Solid Waste Disposal	404		
Offsite	1	Natural Gas	1,751	858	858
Offsite	1	Fleet vehicles	20		
Offsite	1	Fugitive gases	10		
Offsite	2	Electricity	17,990	1,388	1,388
Offsite	3	Electricity T&D Losses	1,232	91	91
Offsite	3	Business Air Travel	964		
Offsite	3	Business Ground Travel	66		
Offsite	3	Employee Commuting	1,757		
Offsite	3	Off-Site Waste Water Treatment	2		
Offsite	3	Off-Site Solid Waste Disposal	71		
Hill + Offsite	1 & 2	Total Emissions	49,476		
Hill + Offsite	1 & 2	RE, REC Purchases	9,249		
Hill + Offsite	1 & 2	Total Emissions Less RE, RECs	40,227		
Hill + Offsite	3	Total Emissions	21,945		
Hill + Offsite	1, 2, & 3	Total Emissions	71,421		
Hill + Offsite	1, 2, & 3	Total Emissions Less RECs	62,172		

### Federal Minimum Mitigation (MTCO<sub>2e</sub>)

Federal minimum mitigation required per Executive Order 13693 based on forecasted emissions only. All values are in MTCO<sub>2e</sub>.

Location	Scope	Source	FY2021	FY2025
Hill	1 & 2	Renewable Energy (RE), RECs for NERSC-9	36,085	36,085
Hill + Offsite	1 & 2	Renewable Energy (RE), RECs	8,415	8,121
Hill + Offsite	1 & 2	Energy Efficiency (EE)	2,866	5,732
Hill + Offsite	1 & 2	RE, RECs, or EE	8,151	0
Hill + Offsite	1 & 2	Total Federal Minimum Mitigation	55,517	49,939

### Hill NERSC FY2016 emissions

The NERSC facility on the hill, Shyh Wang Hall (building 59), is projected to consume 26,651 MWh of electricity for FY2016 based on actual metered data for October 1, 2015 through September 15, 2016 and 15 days of estimated electricity consumption for September 16, 2016 through September 30, 2016. The building does not consume natural gas. Using the eGRID

CAMX emissions factor for electricity, this results in emissions of 7,891 MTCO<sub>2</sub>e for Shyh Wang Hall (building 59) for FY2016.

**Offsite NERSC FY2016 emissions**

The offsite NERSC facility, Oakland Scientific Facility (OSF), is projected to consume 14,794,709 kWh of electricity for FY2016 based on 11 months of utility bill data from PG&E and one month of estimated electricity consumption. OSF is projected to consume 12,563 therms of natural gas for FY2016 based on 8 months of utility bill data from PG&E and 4 months of estimated consumption. Using the federal emissions factor for natural gas and the eGRID CAMX emissions factor for electricity, this results in emissions of 4,447 MTCO<sub>2</sub>e for OSF for FY2016.