BIOLOGICAL & ENVIRONMENTAL PROGRAM INTEGRATION CENTER (BIOEPIC)

Environmental Analysis and Checklist

Prepared By:

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

January 2020

Contact: Jeffrey Philliber, Chief Environmental Planner
jgphilliber@lbl.gov

TABLE OF CONTENTS

Air Quality and Greenhouse Gas Emissions Calculations
Memorandum: Evaluation of BioEPIC Building Operations Relative to Previous Health Risk Assessments

Appendix C. Energy Calculations
Appendix D. Noise Calculations
Appendix E. BioEPIC Transportation Impact Study

LIST OF FIGURES

LIST OF TABLES

1.0 ENVIRONMENTAL ANALYSIS AND CHECKLIST

Project Title: Biological & Environmental Program Integration Center (BioEPIC) Project

Lead Agency: The University of California Lawrence Berkeley National Laboratory (UC LBNL, the University, or Berkeley Lab)

Location: Lawrence Berkeley National Laboratory
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 a portion of the Bayview Planning Area at the Berkeley Lab. The site is vacant, graded, and largely paved; it currently serves as a parking and storage area. The site was previously developed with Building 51B (Bevatron Accelerator Support Building) that was dismantled around 2004.

Surrounding Land Uses: The recently constructed Building 91 (Integrative Genomics Building or "IGB," office and laboratory) is immediately south of the proposed BioEPIC project; the recently completed Building 91X (Modular Utility Plant, or MUP) is immediately east. Immediately to the north are Buildings 55, 60, 63, and 64 (office, laboratory, and storage). At further distances, the project site is surrounded by the Building 50 and 70 (office and laboratory) complexes to the west and south. Undeveloped slopes and McMillan Road are located to the east. Further east are additional LBNL buildings, including Building 46 (office).

Description of Project: See **Project Description** in **Section 2.0** of this document.

Responsible Agencies:

- Bay Area Air Quality Management District (Authority to Construct/Permit to Operate for the emergency generator)
- San Francisco Bay Regional Water Quality Control Board (Coverage under the Statewide NPDES General Permit for Stormwater Discharges Associated with Construction Activity and Land Disturbance Activities)
- East Bay Municipal Utility District (wastewater discharge permit to manage accumulated ground and stormwater)

Identification of previous documents incorporated by reference:

This environmental analysis incorporates by reference the text in the following documents:

- 2006 Long Range Development Plan Final EIR SCH No. 2000102046
- Seismic Life Safety, Modernization and Replacement of General Purpose Buildings, Phase 2 Project (Including Supplementation of the LBNL 2006 LRDP EIR with respect to Traffic Impacts at One Intersection) Final EIR SCH No. 2008122030
- 2012 Memorandum: Construction Truck Trips (Updated), prepared by Fehr & Peers, 2012
- Building 59 Upgrade & Installation and Operation of NERSC-9 (Including Supplementation of the 2006 LRDP EIR with respect to Greenhouse Gas Emissions and Energy Impacts) Final EIR SCH No. 2016062007

These documents are available for review at the following location:

- Lawrence Berkeley National Laboratory
  1 Cyclotron Road Mail Stop 76-225
  Berkeley, California 94720-8281

2.0 PROJECT DESCRIPTION

2.1 Introduction

The section describes the proposed Biological & Environmental Program Integration Center (BioEPIC) project need and objectives, its various components and design features, its associated population, its operational activities, and its construction schedule.

The University of California, as the management and operating contractor of the Lawrence Berkeley National Laboratory (UC LBNL),[1] proposes to construct BioEPIC, an approximately 73,000 gross-square-foot (gsf), four-story multi-disciplinary research and office building that would accommodate complementary U.S. Department of Energy (DOE) research programs from the Biosciences Area and Earth and Environmental Science Area. Additionally, a number of major Science Focus Areas (SFAs) and other significant projects and programs would be co-located in BioEPIC for collaboration and operational efficiencies, including Ecosystems and Networks Integrated with Genes and Molecular Assemblies (ENIGMA), Watershed Function SFA, and Microbial Community Analysis and Functional Evaluation in Soils (m-CAFÉs) program projects. The programs expected to be housed in BioEPIC are currently dispersed across multiple buildings (Buildings 64, 70, 70A, and 84) on the Berkeley Lab, two of which (Buildings 64 and 70A) are rated seismically deficient, as well as in leased space located at 717 Potter Street in Berkeley, California.

Because the project would be undertaken on UC Regents-owned land and would require UC Regents design approval, the University must evaluate the environmental impacts of the proposed project pursuant to the California Environmental Quality Act (CEQA). CEQA Section 15168(c)(2) provides that if, pursuant to CEQA Section 15162, no new impacts could occur and no new mitigation measures are required, then a project may be considered within the scope of a governing program Environmental Impact Report (EIR) and no new environmental documentation would be required. Berkeley Lab's current governing programmatic CEQA document is its 2006 Long Range Development Plan (LRDP) Final EIR, certified in 2007 and as later supplemented (the "2006 LRDP EIR").[2] UC LBNL has evaluated the proposed BioEPIC project in accordance with *State CEQA Guidelines* Section 15168(c)(2) to determine whether the proposed project is within the scope of the LBNL 2006 LBNL EIR. The University's intent to

---

1. In this document, "LBNL" refers to the Lawrence Berkeley National Laboratory, a national federally funded research and development center located in the Oakland-Berkeley hills, and "UC LBNL" refers to the University in its role as the management and operating contractor of the laboratory. LBNL facilities are owned or controlled by the Department of Energy (DOE) and are located at the main LBNL site in the Berkeley-Oakland hills and at a number of leased properties, such as the Potter Street facility in Berkeley. The main LBNL site is on land owned by the Regents of the University of California and includes land the federal government leases from the University and on which it constructs federally-owned buildings, as well as UC-owned land not leased to the federal government.

2 2006 LRDP EIR was supplemented in 2010 (Seismic Life Safety, Modernization and Replacement of General Purpose Buildings, Phase 2 Project (Including Supplementation of the LBNL 2006 LRDP EIR with respect to Traffic Impacts at One Intersection) Final EIR SCH No. 2008122030) and in 2017 (Building 59 Upgrade & Installation and Operation of NERSC-9 (Including Supplementation of the 2006 LRDP EIR with respect to Greenhouse Gas Emissions and Energy Impacts) Final EIR SCH No. 2016062007).

analyze projects under the 2006 LRDP program using the 2006 LRDP EIR pursuant to CEQA Section 15168(c)(2) is identified and explained in the Introduction, Summary, and Project Description sections of the 2006 LRDP Final EIR.

UC LBNL has determined—on the basis of the environmental analysis and checklist in this document —that the environmental impacts from construction and operation of a research and office building on the project site were evaluated in the Program EIR, and that under *State CEQA Guidelines* Section 15162 there would be no new impacts, and no new mitigation measures are required. Therefore, further evaluation and documentation under CEQA are not required for the proposed BioEPIC project. (*State CEQA Guidelines* Section 15168(c)(2).)

2.2 Research Programs

Biosciences Area

The Biosciences Area (BSA) forges multidisciplinary teams to solve national challenges in energy, environment, and health issues, as well as advance the engineering of biological systems for sustainable manufacturing. BSA research is coordinated through three Divisions and one User Facility: Biological Systems and Engineering, Environmental Genomics and Systems Biology, Molecular Biophysics and Integrated Bioimaging, and the National User Facility DOE Joint Genome Institute.

Earth & Environmental Sciences Area

Berkeley Lab's Earth & Environmental Sciences Area (EESA) is a premier Earth sciences research organization where scientists tackle some of the most pressing environmental and energy challenges of the 21st century. EESA scientists have identified key grand challenges that will guide efforts in the coming years, including:

> **Earth's Microbial Engines**: to accurately predict how microbes impact terrestrial ecosystem function. An additional challenge is to integrate fundamental discovery and multi-scale sensing and simulation capabilities into translational ecology to find solutions for enhancing ecosystem function and health.
>
> **Climate and the Carbon Sink**: to transform our fundamental understanding of the terrestrial carbon sink and ecosystem carbon metabolism and develop scalable eco-technologies for mitigating climate change and enhancing the resilience of agricultural and other ecosystems.
>
> **Future Water**: to improve capabilities for quantifying, predicting, and improving water availability and quality at scale in response to a range of gradual and abrupt perturbations and complex constraints.

2.3 Project Need and Objectives

Within DOE, there is a capability gap in the understanding and ability to quantify how microbial communities respond to and shape environmental systems, or biomes. This gap impacts DOE's mission to deliver the scientific discoveries and major technological tools required to transform our understanding of nature and strengthen the connection between advances in fundamental

science and technology innovation. At the core of this challenge is the range of scales and dynamic conditions that influence interactions and feedback between microbial communities and other biome components, including minerals, fluids, dissolved constituents, and plants. Bridging the informational gap from microbe-scale to biome-scale is critical for predicting how ecosystems respond to global change, and for harnessing microbial metabolic potential in natural environments for a range of benefits relevant to the DOE mission, including terrestrial carbon sequestration, sustainable growth of bioenergy and bioproduct feedstocks, and environmental remediation.

DOE lacks sufficient infrastructure to enable seamless measurements and manipulations across scales. This infrastructure is needed to test key hypotheses and to develop predictive models of how DOE mission-critical environmental systems function – from the microbe to the biome scales. BioEPIC would house complementary expertise and programs from the BSA and EESA to address the mission gap described above, with a focus on soil-microbe-plant interactions. A key element of BioEPIC is the Ecosystem Manipulatory, a unique integrated laboratory facility that would bring together new experimental platforms spanning the scale from molecules to ecosystems (mass spectrometry, cryo-electron microscopy, EcoPODs, SMART Soils testbeds and advanced telemetry) with other enabling technologies that collectively would facilitate a new level of understanding of ecosystem function.

In addition to bringing together an internationally-unique suite of biological and environmental expertise and experimental platforms, BioEPIC would benefit from co-location with other major DOE investments at Berkeley Lab. Examples include the adjacent Integrative Genomics Building (IGB), which houses the Joint Genome Institute (JGI) and the DOE Systems Biology Knowledgebase (KBase) programs, and nearby user facilities, including the Advanced Light Source (ALS), the Molecular Foundry, and especially the National Energy Research Scientific Computing Center (NERSC).

Key objectives of the proposed project are to:

- Bring targeted research programs together in one facility to enhance integration and operational efficiencies;
- Provide an adaptable laboratory environment that can "flex" over time as science needs change;
- Provide a new center of multidiscipline research linking with the site's other recent development in the Bayview Planning Area;
- Provide a facility that enhances and promotes scientific interaction and collaboration; and
- Create a long-lasting and durable facility to withstand long-term intense use with safety as a primary planning and systems driver.

2.4 Project Location and Surrounding Uses

LBNL is situated in the eastern hills of the cities of Berkeley and Oakland in Alameda County on approximately 200 acres that are owned by the University of California (see **Figure 1, Regional**

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 BioEPIC project would be located in the Bayview Planning Area, a roughly 6.6-acre plateau in the central portion of the LBNL hill site that was formerly occupied by Building 51 (Bevatron) (see **Figure 2, Project Site Location**) and associated structures, including Building 51B, a Bevatron support building. The Bevatron, a large particle accelerator that operated between 1954 and 1993, was dismantled and removed along with its housing (Building 51) over a period of years ending in 2012.

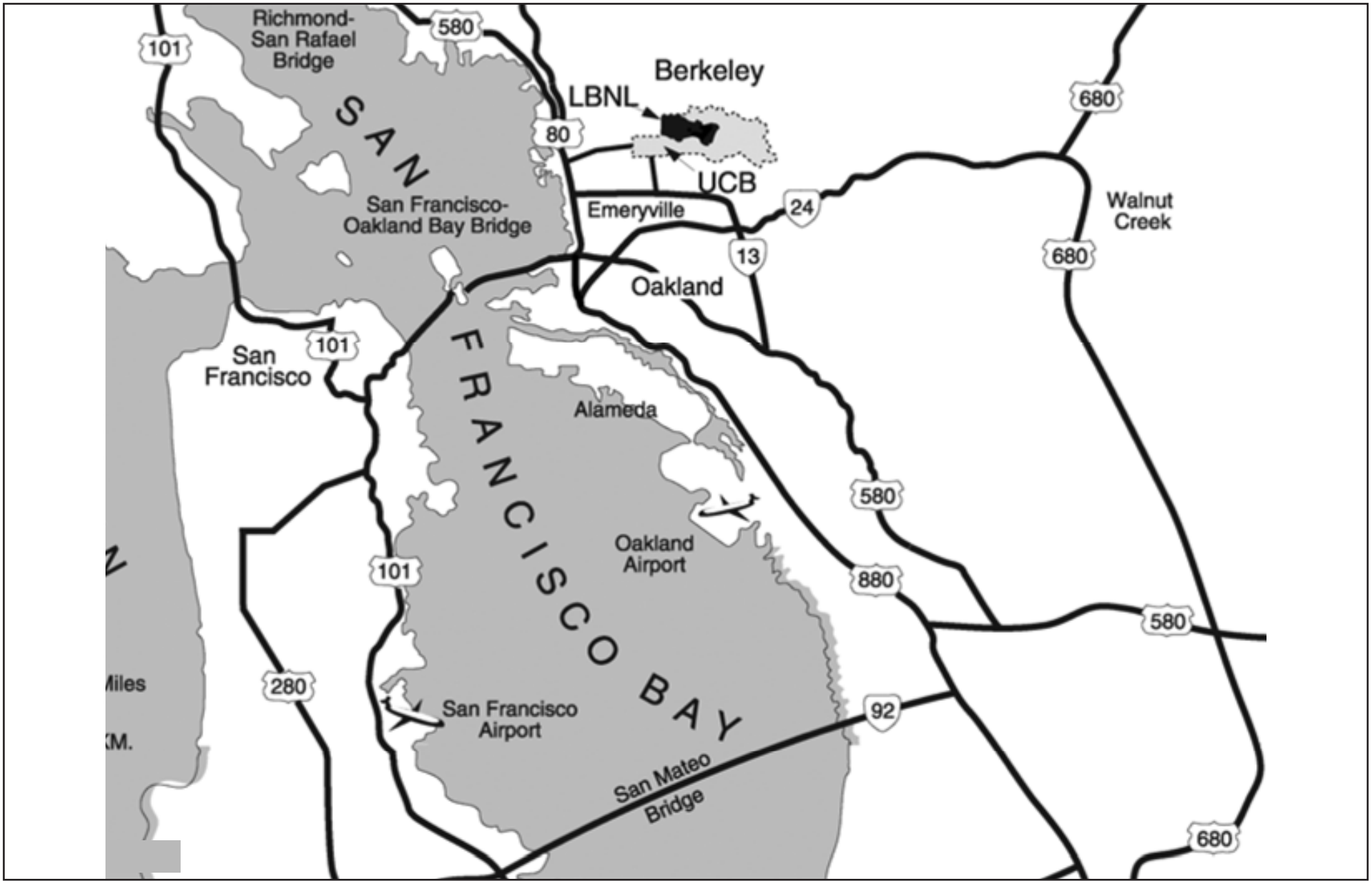
Other structures in the Bayview Planning Area include Building 64 (lab/office; approximately 30,000 gross square feet) and a number of smaller lab/office buildings located in the northeastern portion of the Bayview Planning Area, including Buildings 55, 55A, 56, 60, 64; a Modular Utility Plant (MUP) located in the southeastern portion; and the recently completed IGB (Building 91) in the southern portion of the Bayview Planning Area.

Major facilities surrounding the Bayview Planning Area include the Building 50 and 70 complexes to the southwest, the Building 90 complex to the northwest, the Building 71 complex to the north, and Berkeley Lab's "Old Town" area to the east.

The proposed BioEPIC project would occupy approximately one acre of land within the larger Bayview Planning Area. The immediate project site is currently paved and used for parking and storage; it is generally level at approximately 709 elevation above mean sea level (msl). Some shallow slopes ranging from around 0.5 to 3.0 percent are present within the project footprint; these direct stormwater flows to localized drainage inlets. Topography surrounding the project site and the Bayview Planning Area plateau features more pronounced changes in elevation. The nearby segment of Alvarez Road generally slopes to the southwest. Further west beyond Alvarez Road, the sloping hillside drops sharply to the Blackberry Canyon parking lot, which is at an elevation of around 630 feet msl. Immediately east of the project site, a retaining wall shores up a steep uphill slope that continues to McMillan Road at an elevation above 800 feet msl.

2.5 Project Site Contamination

From approximately 1992 to 2018, LBNL conducted investigations of soil, soil vapor, and groundwater contamination in the Bayview Planning Area. The initial investigations were conducted from approximately 1992 to 2000 as part of the Resource Conservation and Recovery Act (RCRA) Corrective Action Program (CAP) conducted under the regulatory oversight of the California Department of Toxic Substances Control (DTSC). The purpose of these investigations was to evaluate areas identified as having the potential to have released contaminants to the environment. Corrective measures approved by the DTSC to address contaminated soil and



SOURCE: Lawrence Berkeley National Laboratory, 2016

FIGURE **1**

IMPACT SCIENCES

Regional Location

924.014•01/19

groundwater discovered during those initial investigations were initiated in 2000 and largely concluded in 2006, although operation, monitoring, and maintenance of the measures for contaminated groundwater have continued through the present. Additional investigations were conducted in the Bay View Planning Area between 2008 and 2019 to assess previously inaccessible areas as the Bevatron was being demolished and to assess conditions at the sites proposed for new buildings (i.e. the Integrative Genomics Building [IGB] and BioEPIC). The following discussion summarizes the results of the RCRA CAP and subsequent investigations that include the area where soil, soil vapor, or groundwater contaminants could pose a potential risk to future BioEPIC building occupants.

The initial CAP investigations conducted from 1992 to 2002 identified contaminated soil and associated groundwater contamination in two primary areas near the BioEPIC site: 1) beneath and adjacent to the southeast corner of Building 64; and, 2) at the location of former Building 51L (which was located west of the IGB (Building 91).

Soil investigations conducted in the late 1990s and early 2000s indicated that volatile organic compounds (VOCs) were present in soil adjacent to the southeast corner of Building 64 and immediately north of Building 51 to the south. A plume of VOC-contaminated groundwater (The Building 51/64 Groundwater Solvent Plume) derived from this soil contamination flows westward from the areas of soil contamination and extends beneath the location of the proposed BioEPIC building footprint. The primary contaminants present in the groundwater beneath the BioEPIC project area are cis-1,2-dichloroethene (cis-1,2-DCE), 1,1-dichloroethene (1,1-DCE), 1,1-dichloroethane (1,1-DCA), vinyl chloride, and trichloroethene (TCE). Excavation and offsite disposal of VOC-contaminated soil adjacent to the southeast corner of Building 64 (the primary source of the groundwater plume) was conducted in 2000. The corrective measure implemented for the groundwater contamination consists of soil flushing beneath the southern end of Building 64 (extraction of contaminated groundwater, treatment, and reinjection of the treated groundwater to flush contaminants to the surface). Soil flushing has resulted in substantial decreases in VOC concentrations over the period of operation (2003 to the present).

Soil investigations conducted between 2000 and 2005 at former Building 51L, which was located immediately east of the IGB, indicated that VOC contamination was present in soil beneath and around that building. A relatively small plume of impacted groundwater (The Building 51L Groundwater Solvent Plume) derived from this soil contamination was found to extend a short distance to the north, to the area southwest of the BioEPIC project footprint. The primary contaminant present in groundwater is TCE, with lesser concentrations of vinyl chloride. Excavation and offsite disposal of VOC-contaminated soil beneath and adjacent to Building 51L (the primary source of the groundwater plume) was conducted in 2006. The groundwater corrective measure for this plume is groundwater extraction and treatment, which was initiated in 2006 to control the potential migration of contaminated groundwater and continues to the present. These corrective measures have resulted in substantial decreases in VOC levels in the former Building 51L area.

A number of soil-vapor investigations have been conducted in and near the BioEPIC project to assess whether soil vapor contamination is present at levels that could pose a potential risk to future building occupants at potential and planned building sites via intrusion of contaminated soil vapor into indoor air. Investigations were conducted in 2008, 2010, and 2014 in several areas to the southwest of the BioEPIC project to assess potential soil vapor contamination in the

SOURCE: Lawrence Berkeley National Laboratory, 2019

FIGURE **2**

IMPACT SCIENCES

Project Site Location

924.014•01/19

vicinity of former Buildings 51L and 51, and to address potential vapor intrusion risks for the IGB (Building 91). These investigations indicated the presence of elevated soil vapor concentrations in the area southwest of the BioEPIC project. An investigation was conducted in 2015 in the area between Building 64 and Building 51, northeast of the proposed BioEPIC building footprint, to assess potential soil vapor contamination derived from known soil and groundwater contamination in that area. The investigation found elevated levels of VOCs in the soil vapor throughout much of that area.

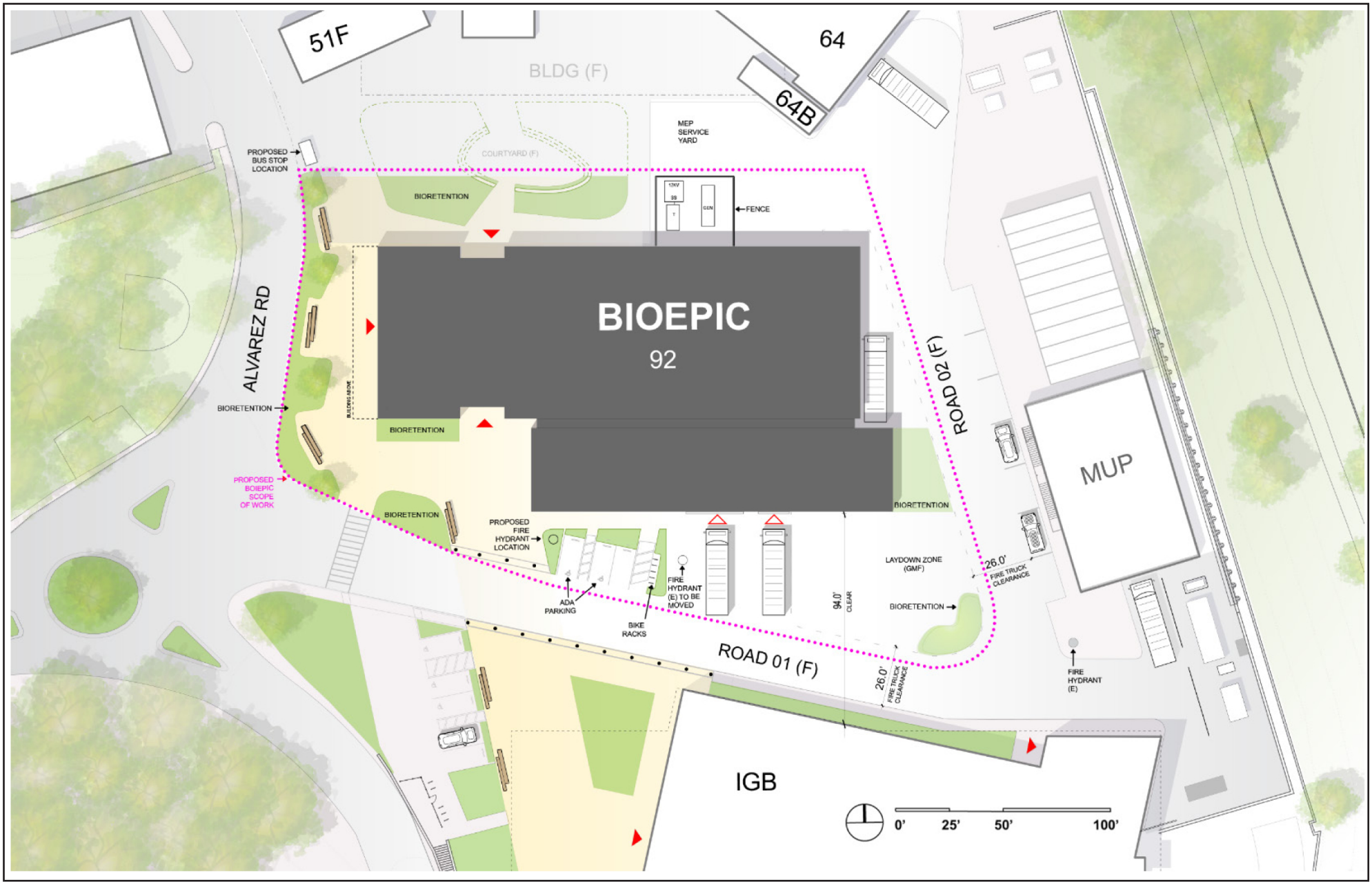
Given the elevated soil vapor levels discovered in areas adjacent to the proposed BioEPIC project area, a soil vapor investigation was conducted in 2018 specifically to assess potential risks from soil vapor contamination to occupants of the proposed BioEPIC building. This investigation was conducted beneath the proposed BioEPIC building footprint and within a 100-foot buffer zone surrounding the footprint. A 100-foot buffer is the DTSC recommended distance for assessing potential vapor intrusion risk.

The 2018 investigation indicated that VOC-contaminated soil vapor (primarily TCE and PCE) is present beneath the building footprint and within the 100-foot buffer zone at levels exceeding DTSC vapor-intrusion screening levels (i.e. levels at which a potential risk to building occupants may be present). PCE and/or TCE were detected in the 2018 soil vapor samples at concentrations exceeding their respective screening levels in two areas within the 100-foot buffer (under the northwest corner of the building footprint and at the northeast corner of the 100-foot buffer). In addition, previous soil vapor sampling results conducted in the former Building 51L area indicated soil vapor levels exceeding DTSC vapor intrusion screening levels under the southwestern edge of the 100-foot buffer as indicated by the soil vapor concentrations in that area.

Due to the potential for vapor intrusion impacts indicated by soil vapor concentrations exceeding DTSC screening levels within the 100-foot buffer zone around the proposed BioEPIC building footprint, the proposed project includes an engineered subfloor vapor barrier and ventilation system and subsurface utility vapor barrier plugs along subgrade utilities that enter the building. These project features would be designed and monitored to be protective of building occupants in accordance with DTSC guidance. See the next section, **Project Characteristics**, for further details.

2.6 Project Characteristics

The proposed project is a new multidisciplinary research facility and site development, including roadwork, plaza, and service areas, along with utility connections to the broader site and the existing MUP. The project is shown on **Figure 3, Site Plan**.



SOURCE: Lawrence Berkeley National Laboratory, 2019

FIGURE **3**

IMPACT SCIENCES

Site Plan

924.014•09/19

Proposed Building

The proposed 73,000 gross square foot (gsf) building would contain laboratory, office, and interaction space. Of the building's estimated 44,300 assignable square feet (asf),[3] approximately 40 percent would be used for office type functions and about 60 percent for laboratory space. About half the laboratory space would be wet lab (involving chemical use) and half would be dry lab space.

BioEPIC would be a four-story building constructed in the southern portion of the one-acre project site. The first floor (Level 1) would contain specialized laboratories, including high bay space, to take advantage of first-floor access to exterior services and laydown space and to provide slab-on grade vibration stability. The upper three floors (Levels 2-4) would contain more conventional laboratory space and office environments. A portion of the roof might be used for greenhouse space; that option is considered as part of the project throughout this analysis.

EESA departments and intended BioEPIC occupants GMF (Geosciences Measurement Facility) and EcoSENSE would require operational space exterior to the building; this would include exterior truck entry that does not conflict with fire and emergency vehicle access. GMF also needs about 2,000 square feet of equipment laydown space as well as space for storing 10 shipping containers. EcoSENSE needs indoor test bed space for one or two trailers and outdoor space for staging.

To meet these needs, the building would include two large roll-up doors on the south side connected to a working outdoor staging space, with interior room for up to two flatbed trailers (see **Figure 3, Site Plan**).

Based on historical and preliminary geotechnical data, the BioEPIC building would rely on a slab-on-grade foundation. Due to the proximity of soil vapor concentrations above screening levels, the proposed project includes a ventilation system between the first-floor slab and the foundation. The ventilation system would consist of an engineered vapor barrier and perforated piping, laid in gravel above the building foundation, that would vent to the outdoors, and would have the means to mechanically extract air from the piping and vent it outside. This system would be developed in schematic design and coordinated with the foundation system and under-slab utility routing to ensure compliance and constructability.

Building Design Features

BioEPIC building design features passive sustainability strategies that define the building mass, orientation, footprint, façade, and building systems. The design includes green building strategies of achieving a minimum Leadership in Energy and Environmental Design (LEED) Gold rating from the U.S. Green Building Council. Some of the proposed design features include separating laboratories from non-laboratory functions for HVAC efficiency, orienting the building for solar exposure, and providing natural daylight in lab spaces. The building

3 "Assignable square feet" (asf) comprises the portion of building area assigned to or available for an occupant or specific use, also referred to as occupiable space. Common areas such as restrooms, hallways, or mechanical space are excluded from asf.

orientation along the east-west axis would minimize western exposure so as to mitigate heat gain and glare. Arranged along the north side of the building, lab spaces would receive northern light, which tends to be a soft, diffuse light that is optimal for laboratories.

The exterior building cladding is anticipated to include a mix of metal panel and glass and would be visually compatible with surrounding buildings. Exterior lighting features would include landscape lighting and building exterior lighting limited to exit doors and near outdoor equipment. Exterior and rooftop lighting would have cut-off shielding to prevent light spill and light pollution per LEED requirements.

Roadway and Pedestrian Access, On-Site Circulation, and Parking

Automobile access to Berkeley Lab is via Cyclotron Road (Blackberry entrance), McMillan Road (Grizzly Peak entrance), and Lawrence Road (Strawberry Canyon entrance). Direct access to the BioEPIC project would be via the existing driveway on Alvarez Road; this driveway currently serves the project site parking area and the adjacent IGB.

Three Americans with Disabilities Act (ADA) parking stalls along with parking for deliveries are necessary for building critical operations and maintenance; these are included in the proposed project design. By occupying a site currently used for parking, the BioEPIC project would result in a net reduction of 76 parking spaces on the LBNL hill site.

The proposed project would provide bicycle parking spaces, showers, and locker rooms in order to encourage bicycle travel to the site. Bicycle parking would be provided sufficient to meet LEED v4 requirements.

Pedestrian access to the project site is available from the sidewalks along Smoot, Alvarez, and McMillan Roads. Pedestrian access to the LBNL hill site is available from the Blackberry Canyon, Grizzly Peak, and Strawberry Canyon gates.

Public transportation is accessible through the LBNL shuttle system. The LBNL shuttle system provides regular service throughout the business day and includes several stops at UC Berkeley, the City of Berkeley, and the Downtown and North Berkeley BART stations, as well as throughout the Berkeley Lab site. Shuttle service would be conveniently accessible to the project site via existing stops on Chu Road and Smoot Road. With a shift of population associated with the proposed project and the recently opened IGB, a shuttle stop directly serving the Bayview Planning Area may be added.

Landscaping

The project site is entirely paved, thus no trees or natural habitat would be removed to construct the project. A number of green spaces and outdoor use areas are proposed along the western side of the building. Landscaping design would be consistent with LBNL Construction Standards and Design Requirements and would conform to and complement the existing character of planting in the surrounding areas. Lined flow-through planters and similar biofiltration strategies would be used in landscaping to minimize stormwater infiltration (see Stormwater, below). Drought-tolerant, low water use, and low fire-fuel-volume plant materials (mostly native plants) would be installed in unpaved areas disturbed during project construction. No lawn areas are proposed.

Consistent with LBNL policy,[4] irrigation would be used on site for approximately the first 18 months in order to allow the plantings to establish.

2.7 Utilities and Hazardous Materials/Wastes

In compliance with the Berkeley Lab's operational sustainability policies[5], and in order to support the Lab's ongoing strategic goals[6] of reducing greenhouse gas emissions and showing continuous improvement in the development of high performance, low-cost building design, this project shall attain a minimum of a Gold rating within the LEED v4 program.[7] In addition to LEED Gold certification, the project's sustainability goals include the following:

- Meet or exceed whole building energy use targets
- Provide electric space heating and hot water
- Divert a minimum of 90 percent by weight of construction waste from landfill
- Achieve a minimum of 30-40 percent water savings below LEED baseline
- Provide water-efficient landscaping designed so that irrigation is no longer needed after initial establishment period of 18 months
- Achieve the Bicycle Facilities credit within LEED v4
- Include a minimum of one parking space supported by a 208-240V electric vehicle supply equipment (EVSE) or conduit and conductor to support electric vehicle charging

Furthermore, BioEPIC would comply with the LBNL Policy on Sustainability Standards for New Construction.[8] The project's utility demand that is presented below is based on the inclusion of design features that comply with the sustainability standards and are designed to achieve the goals listed above.

Table 1, BioEPIC Project Utility Demand, presents the project's annual and daily demand for utilities. The details of the utility systems are presented below.

---

4 Lawrence Berkeley National Lab. *Sustainability Standards for New Construction*. Available online: https://commons.lbl.gov/display/rpm2/Sustainability+Standards+for+New+Construction

5 Current LBNL operational sustainability standards contained in Sustainability Standards for New Construction (citation above); proposed new and more comprehensive standards contained within draft LBNL Sustainability Standards for Operations: (expected finalization in late 2019): https://docs.google.com/document/d/1OjUu78iBjne_N_FksE60oad4c2YAcv99jObSn-b2eSg/edit#

6 Lawrence Berkeley National Lab. *Sustainable Berkeley Lab Climate Goals*: https://sbl.lbl.gov/climate/

7 LEED v4 is the newest version of the LEED green building rating system and this version is more specialized and designed for a better user experience. LEED v4 is designed to provide a more flexible, performance-based approach that calls for measurable results throughout a building's life cycle. It also allows for a more streamlined user experience and more goal-oriented credits.

8 Sustainability Standards for New Construction (citation above)

Table 1
BioEPIC Project Utility Demand

Utility[1]	Daily Demand		Annual Demand	
	Project Target	LEED v4 Standard[1]	Project Target	LEED v4 Standard[1]
Potable Water[2]	**5,400 GPD**	**6,700 GPD**	**1.4 MGY**	**1.75 MGY**
Wastewater	**1,730 GPD**	**2,960 GPD**	**0.45 MGY**	**0.77 MGY**
	Daily Demand		**Annual Consumption**	
Electricity Average demand	**10.97 MWh**		**3,296 MWh**	
Electricity Peak demand	**9.96 MWh**		**N/A**	

Source: UC LBNL, Smithgroup

[1] *No natural gas will be used in the BioEPIC building for space heating or research.*

[2] *Based on LEED v4 standards for annual water consumption.*

[3] *Includes cooling tower make-up water*

Wastewater

Wastewater flows from the western portion of the LBNL hill site are received in the City of Berkeley's sewer lines below Hearst Avenue (sanitary sewer sub-basin 17-013); this sanitary sewage then flows westward to the East Bay Municipal Utility District wastewater treatment plant. Existing wastewater lines on and adjacent to the project site are scheduled to be replaced and re-aligned prior to the commencement of the BioEPIC project. The proposed BioEPIC project would be preceded by the Bayview Site Utility Relocation Project (SURP), which will relocate on-site 6-inch pipeline prior to the BioEPIC project. Sewer service laterals would connect from the BioEPIC project to the 6-inch relocated line.

Solid Waste

In accordance with UC policy,[9] the BioEPIC project would be designed and operated to meet waste diversion goals: by 2020, send 90 percent of municipal solid waste to recycling and compost facilities, and by 2030, reduce the per capita generation of municipal solid waste by 50 percent from 2016 levels. BioEPIC would also include sufficient space for diversion of organic waste (see Cal Green Building Code Section 4.410.2 & Section 5.410.1). Adequate facilities would be included in the building for the collection and disposal of recyclables and landfill-bound solid waste.

9 University of California Office of the President. *Zero Waste*. Available online: https://ucop.edu/sustainability/policy-areas/waste-reduction-and-recycling/index.html

Potable and Fire Suppression Water

The annual water consumption demand for the project, assuming recycling of water in the proposed cooling tower (see Chilled and Hot Water Systems, below), is estimated to be about 1.4 million gallons per year (MGY). This includes demand for domestic water, fire water, laboratory water including de-ionized water, and cooling tower water. The proposed project includes high-efficiency fixtures and low-flow urinals, which would further reduce water demand.

Potable water service (including water for fire suppression) for the BioEPIC project would be supplied from an existing 10-inch high pressure domestic water line adjacent to the project site. Per LBNL standards, two sources of water are required for the building to provide redundancy. To meet the requirement, a new line would be installed from the existing 10-inch water main on Smoot Road.

Stormwater

As BioEPIC is a federal project, UC LBNL is required to implement, as technically feasible, stormwater quality and quantity management practices that maintain or restore the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of flow, in accordance with EPA 841-B-09-001: Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects, Section 438 of the Energy Independence and Security Act (EISA). As each project site presents its own unique constraints, EISA 438 is performance based, allowing a range of best practices to be utilized to achieve results. These practices are intended to be used in combination, as appropriate, to the maximum extent technically feasible (METF). The METF language provides agencies with compliance flexibility in recognition that not all projects and project sites are capable of fully meeting EISA 438's predevelopment hydrology targets.

LBNL also holds a National Pollutant Discharge Elimination System (NPDES) Industrial General Permit issued by the State Water Resources Control Board (SWRCB). The NPDES permit program aims to limit runoff flows and reduce pollution from a development project's stormwater runoff. To achieve these goals, the guidelines require the implementation of post-construction stormwater Best Management Practices (BMP) to treat and manage the proposed peak flow of stormwater runoff prior to discharge into the local stormwater system.

LBNL is a federal facility operated by the University of California and conducting work within the University's mission on land that is owned or controlled by The Regents of the University of California. As such, LBNL is generally exempted by the federal and state constitutions from compliance with local land use regulations, including general plans and zoning. However, LBNL seeks to cooperate with local jurisdictions to reduce any physical consequences of potential land use conflicts to the extent feasible.

The existing Baview Planning Area is a paved parking lot and storage area that drains to the North Fork Strawberry Creek via two primary storm drain pipes: a 48-inch, westerly flowing, reinforced concrete pipe (RCP) just north of the proposed BioEPIC project, and a 24-inch, northwesterly flowing, RCP storm drain south of Building 91 (IGB). While the 24-inch pipe has had previous capacity issues, the existing 48-inch pipe system has no recorded capacity issues. In addition, project stormwater flows would not result in any flows to the 24-inch pipe.

Construction stormwater BMPs on the project site would include, as necessary, erosion controls, sediment controls, wind erosion controls, track-out controls, and waste and materials management controls and no off-site run-on from adjacent areas. As several forms of soil contamination exist within and around the site, BMPs that infiltrate stormwater into the ground cannot be used on the project site.

On October 29, 2018, the DOE issued a partial waiver of EISA 438 requirements for the BioEPIC project in recognition of the infeasibility of stormwater infiltration in the Bayview Planning Area site. This infeasibility is due to existing subsurface contamination on the site and slope stability issues on neighboring properties down gradient of the project. In order to partially meet EISA 438 requirements per DOE stipulations, the project shall use lined biofiltration systems (e.g., lined, flow-through planters) to address stormwater flow rates, temperature, and quality.

When operational, the proposed project site would direct stormwater into localized BMPs, including lined bioretention areas and flow-through planters to capture and detain stormwater runoff generated from impervious surfaces. The BMPs would provide improved water quality and decrease the peak discharge rate compared to existing conditions before ultimately discharging into the City of Berkeley storm drain system. The BMPs would be sized using the County "4-percent method," which is a simplified method for sizing stormwater treatment facilities and recommends that the surface area of the treatment area should be 4 percent of the impervious area that drains to it for treatment. To limit the size of the BMPs, the site would be designed to minimize impervious surfaces. Stormwater from the BMPs would flow into the local storm drain collection network and ultimately discharge into the existing 48-inch RCP pipe. The proposed project is replacing a previously impervious area, yielding a decrease in the total impervious area. With this decrease in impervious surfaces and the addition of stormwater BMPs, the peak flow to the existing 48-inch SD would decrease. Thus, capacity is not anticipated to be an issue.

Chilled and Hot Water Systems

Chilled water would be used for cooling building space and for laboratory use. A 480-ton cooling tower would be installed in the existing MUP along with a chilled water system that would include two 200-ton high-efficiency heat recovery chillers. Consistent with the UC Sustainable Practices Policy,[10] natural gas would not be used in the BioEPIC project for space and water heating. Two air source heat pumps, each with a capacity of 639 Kbtu/hour, would also be added to the MUP to provide heating to the proposed building.

Energy Systems

Electricity

Both the peak demand and annual consumption of electricity for the proposed facility are reported in **Table 1**. As indicated in that table, annual electricity consumption is estimated at 3,296 Megawatt hours (MWh). Electrical power at the LBNL hill site is purchased from the

10 University of California Office of the President. *Climate Change and Clean Energy*. Available Online: https://ucop.edu/sustainability/policy-areas/climate-change-and-clean-energy/index.html

Western Area Power Administration and delivered by the Pacific Gas and Electric (PG&E) transmission system to the Lab's Grizzly Substation located adjacent to Building 77. The Grizzly Substation consists of two DOE-owned transformers with a sustained service capacity of 50 MW. This substation is exclusively for LBNL use. In addition, power can be supplied to LBNL from UC Berkeley's Hill Area Substation, located adjacent to the Grizzly Substation. There is currently sufficient electrical capacity at LBNL to serve the proposed project.

Several underground low- and high- voltage power lines run throughout the project site. The Bayview SURP will relocate a 12kV high voltage duct bank that will run within a joint trench on the north side of the proposed BioEPIC project. The project would connect to the relocated 12kV line.

Berkeley Lab *Sustainability Standards for New Construction* require new buildings to be designed to generate at least 7.5 percent of the estimated project energy consumption from a renewable energy source. The project would set aside area on the roof for installation of photovoltaic panels that could be installed at a later date.

Standby electrical power would be provided through a back-up generator located in the MUP. The 750-kilowatt (kW) diesel generator with an approximately 2,300-gallon sub-base fuel storage tank would provide electricity to the building for a minimum of 24 hours continuous run-time at full load. The generator would be located in a sound-attenuated enclosure to control noise. A Diesel Particulate Filter (DPF) would be installed to reduce the diesel particulate matter (DPM) emissions from the generator.

Natural Gas

Natural gas would be required for use in the building's wet laboratories. The natural gas supply to the LBNL hill site is provided by the Defense Fuel Supply Center in Oregon and delivered by the PG&E system. The point of delivery is a meter vault in the hillside area above Cyclotron Road and below Building 88. A gas line distributes high pressure natural gas from PG&E's metering vault to the buildings throughout the LBNL hill site. An existing 3-inch, low-pressure natural gas line is located beneath Alvarez and Smoot Roads south and southeast of the site; a 2-inch, low-pressure natural gas line runs along the east side of the site. The proposed BioEPIC project would be supplied by a 3-inch natural gas line connecting near the southwest corner of the building.

Exhaust

All air exhaust ducts would be located on the building roof. Exhaust stack height and velocity would be designed to address the potential health hazard of fumes migrating to occupied spaces or outside air intakes of other nearby buildings. Exhaust stack heights would be consistent with the heights of exhaust stacks on other LBNL buildings. There would be an approximately 6-foot parapet wall around the roof, along with full-height penthouse walls, enclosing the exhaust system and other rooftop mechanical equipment.

Approximately 16 fume hoods would be installed in the BioEPIC laboratories. Typical chemical fume hoods would be variable air volume hoods. Each fume hood would be equipped with an airflow sensor. Flammables and corrosives would be stored in specialized cabinets adjacent to fume hoods with cabinets venting directly into the hood exhaust systems. Fume hood exhaust discharge would meet all applicable vertical velocity and stack height requirements. The BioEPIC

laboratories, like other laboratory spaces at LBNL, would follow the Bay Area Air Quality Monitoring District (BAAQMD) responsible laboratory management practices.

Building air intakes would be located along the roof. Potential air re-entrainment from the proximity of air exhaust outlets and air intakes would be avoided through specific engineering and design, including wind-tunnel modeling, conducted during the project's detailed design phase.

Chemicals and Research Materials On-Site

Research conducted in the proposed facility would involve a variety of research materials, including non-hazardous organic and inorganic materials, and hazardous chemicals. BioEPIC project safety standards would exceed the minimum requirements for the handling and storage of hazardous materials, including biohazardous materials. In all portions of the building, primary and secondary barriers would be used to reduce or eliminate exposure of the laboratory environment and the outside environment to potentially hazardous agents. Primary barriers (one BSL-2 laboratory, biosafety cabinets, and fume hoods) are designed to protect personnel and the laboratory environment from exposure to hazardous agents. Facility design criteria provide secondary barriers as a protection for personnel inside and outside the laboratory. Air changes would be implemented for worker safety. All wet lab facilities would maintain negative pressure, which would control the release of any airborne materials to non-wet lab areas via doors and other openings. The laboratory staff and researchers would be trained in the use of certified biosafety cabinets, autoclaving and other specialized disinfection techniques, and biological materials handing protocols. The storage, handling, use, and disposal of all hazardous materials, hazardous wastes, and other scientific materials within the BioEPIC project would be subject to UC LBNL EHS program requirements.

Hazardous Waste

Hazardous waste generated in the BioEPIC project would be transported to the LBNL Hazardous Waste Handling Facility in Building 85/85A, which operates under a permit from the DTSC. Waste management activities would be conducted in full compliance with all applicable local, state, and federal requirements to assure proper accumulation, storage, treatment, and disposal. In addition, a variety of best management practices helps ensure these activities are conducted with minimal environmental impact.

2.8 Project Population and Daily Vehicle Trips

It is anticipated that there would be a maximum of 210 occupants located at the BioEPIC project site. Of this total, approximately 85 persons would relocate to the BioEPIC project site from Buildings 64, 70A, and 84 on the Berkeley Lab and approximately 125 persons would relocate from LBNL leased space at 717 Potter Street in Berkeley. The BioEPIC project is therefore expected to increase the daily population of the LBNL hill site by about 125 persons and result in an estimated 330 daily vehicle trips associated with the commuting researchers and visitors, with approximately 66 of these trips occurring during the peak AM and PM commute hours. Consistent with the 2006 LRDP planning principles, the proposed project has been designed to reduce vehicle trips. The BioEPIC project would be in close proximity to a shuttle stop and employees would be encouraged to participate in the LBNL employee ride share program. The

project would also supply bicycle racks and shower facilities. Other than two ADA spaces and spaces for deliveries, no vehicle parking is included in the project. Furthermore, by developing the proposed building on a portion of a paved parking lot and storage area, the project would reduce available parking spaces on the LBNL hill site by approximately 76 spaces.

2.9 Project Construction

Construction Schedule

BioEPIC project construction would occur over approximately 24 months. The early completion date for construction is projected to be in mid-2023, followed by a commissioning period, with early occupancy to commence in late 2023. Construction would take place Monday through Friday and would involve typical construction hours that extend from early morning through mid-afternoon. Consistent with **LRDP Mitigation Measure NOISE-1a** (construction noise), which is a standard project feature incorporated into the project description, project construction hours are expected to be consistent with those identified in the City of Berkeley Noise Ordinance.

Construction Access and Staging

Typical construction access to the project site would be via Chu Road and the Blackberry Canyon Gate entrance on Cyclotron Road. A staging area would be established within the Bayview Planning Area. The staging area would be fenced and enclosed.

Site Grading Activities and Construction Traffic

The proposed BioEPIC project construction would be scheduled to follow two separate, already-approved projects that would take place in the Bayview Planning Area: the Bayview SURP and the Bayview Parcel-1 Cleanup. The SURP would replace and relocate existing, antiquated utility lines that traverse the Bayview site. The Bayview Parcel-1 Cleanup project would excavate and remove several existing deep foundations and utility "tunnels" that remain from Building 51B, which was demolished and removed in 2004. Where excavations from these two projects would coincide with the proposed BioEPIC project foundation footprint, backfilling may not be conducted so that later BioEPIC excavation activities may be minimized.

Approximately 2,500 haul truck trips are anticipated to transfer material to and from the project site during the 24-month construction period. There would be an average of 11 construction truck trips per day between early 2021 and early 2023. In general, heavy and slow-moving trucks would not be allowed between 7:00 AM and 8:30 AM. Haul trucks would travel on Chu Road exit via the Blackberry Canyon gate to Cyclotron Road, and then to the City of Berkeley designated truck routes to dispose of the material off site. Project construction activities would also generate daily construction worker commute trips.

In the 2006 LRDP EIR, UC LBNL committed to minimizing construction traffic impacts on Berkeley city streets (LBNL 2006). Pursuant to LRDP Best Practice TRANS-6c, and as further modified by subsequent traffic studies and management tools, UC LBNL has instituted a program to manage project construction schedules in aggregate so as to keep construction truck trips below impact threshold levels. In particular, the total number of construction truck trips on the Hearst-Oxford-University Avenue truck route are managed below the impact threshold of 96

round trips per day (Fehr and Peers 2012). LBNL's Site Construction Coordinator, with assistance from its Environmental Planner, manages these trips and administers other best management practices for ensuring that construction vehicle traffic does not contribute to a substantial increase in volumes or degradation in the level of service on surrounding roadways. The proposed BioEPIC construction-related truck trips would be managed under this program.

Construction Phase Stormwater and Groundwater Controls

The project site is served by a stormwater collection system that drains into the North Fork of Strawberry Creek. The proposed project would apply for coverage under the State Water Resources Control Board Construction (SWRCB) General Permit for Storm Water Discharges (Order 2009-0009-DWQ) (Construction General Permit). In compliance with the permit process, UC LBNL would file a Notice of Intent with the SWRCB, and a construction-phase Stormwater Pollution Prevention Plan (SWPPP) would be developed and implemented during project construction in order to avoid the discharge of pollutants into surface waters. Discharge monitoring would be conducted as required by the permit.

Any groundwater encountered during project construction or water accumulated during rain events would be tested and, if found to be contaminated, would be treated and appropriately disposed. Treated contaminated groundwater and/or stormwater may be discharged to the sanitary sewer system if a Special Wastewater Discharge is obtained from the East Bay Municipal Utility District.

2.10 2006 LRDP EIR Mitigation Measures

LBNL's 2006 LRDP projected future growth and development at the Berkeley Lab that was analyzed in the corresponding LRDP EIR. Mitigation measures adopted by the UC Regents in conjunction with the 2006 LRDP Final EIR are carried forward as "standard project features" (SPFs) in all subsequent LBNL projects, as applicable. As an element of that projected 2006 LRDP growth and development, the proposed BioEPIC project is subject to all applicable SPFs.

In 2010, the Supplementation of the LBNL 2006 LRDP EIR with respect to Traffic Impacts at One Intersection (henceforth referred to as the 2010 Supplement) was prepared as part of the Seismic Life Safety, Modernization and Replacement of General Purpose Buildings, Phase 2 Project EIR (SCH#2008112030). The 2010 Supplement updated the LRDP EIR traffic analysis based on new information and, in doing so, identified a significant impact at one additional intersection. A new mitigation measure was adopted to address that impact.

A second Supplement to the LBNL 2006 LRDP EIR (henceforth referred to as the 2017 Supplement) was prepared in 2017 as part of the Building 59 Upgrade & Installation and Operation of NERSC – 9 Focused EIR (NERSC-9 Project EIR). The 2017 Supplement updated the analysis of the potential impacts from GHG emissions and found that emissions from LBNL growth under the 2006 LRDP would exceed applicable thresholds. Mitigation measures were adopted to address impacts regarding GHG emissions.

In **Section 4.0**, the analysis considers potential environmental impacts that would result from the proposed project with inclusion of all applicable SPFs. These SPFs are an intrinsic part of the proposed project and therefore will not be readopted as mitigation measures. However, the SPFs

applicable to and included in the proposed project would be monitored as specified in the Mitigation Monitoring and Reporting Plan adopted as part of the LBNL 2006 LRDP Final EIR and two Supplements. All applicable SPFs are presented in **Appendix A**.

2.11 Parcel Modification

The proposed BioEPIC project site is within an area of UC-owned land that is currently leased to DOE as part of Wilson Tract Parcel 1B. Under the project, Parcel 1B would be divided into Parcels 1B and 1C. Parcel 1C, which would be approximately 70,000 square feet, would be occupied by the BioEPIC building and its ground lease term would be extended to 50 years from DOE's BioEPIC project approval date. The newly defined Parcel 1B would continue to be occupied by Buildings 56, 60, 63, 64, and Trailers 51F, 56A, 64B. Besides the extension of the lease term for Parcel 1C, there would be no changes in land uses, conditions, or operations occurring on either Parcel 1B or 1C as a result of this proposed parcel modification.

2.12 Project Approvals

The BioEPIC project would be a DOE facility located within the LBNL main site on land owned by the University of California. The Board of Regents is the University's decision-making body and is responsible for making decisions pursuant to CEQA and approving projects to be built on University-owned land. The Regents will review and consider this environmental analysis document in conjunction with the Regents' decision-making on the BioEPIC project.

Other potential permits or approvals that may be required include the following:

- An Authority to Construct and a Permit to Operate from the BAAQMD for the emergency generator included in the proposed project.
- Coverage under the Statewide Construction General Permit to be obtained by filing a Notice of Intent with the State Water Resources Control Board.
- A wastewater discharge permit from the East Bay Municipal Utility District to manage accumulated ground and rainwater during construction.
- Coordination with the Environmental Services Group's, Environmental Management Systems (EMS) Manager, to certify that the project meets LBNL EMS requirements at phase CD-4 (DOE Order 413.3B).

3.0 ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED

The environmental resources, if checked below, would be potentially affected by this project and would involve at least one impact that is a significant or potentially significant impact that has not been previously addressed in the 2006 LRDP EIR and cannot be reduced to a less than significant level as indicated by the checklist on the following pages.

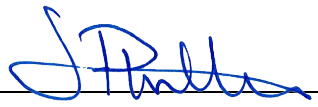
	Aesthetics		Agricultural and Forestry Resources
	Air Quality		Biological Resources
	Cultural Resources		Energy
	Geology/ Soils		Greenhouse Gas Emissions
	Hazards & Hazardous Materials		Hydrology/Water Quality
	Land Use/Planning		Mineral Resources
	Noise		Population/Housing
	Public Services		Recreation
	Transportation		Tribal Cultural Resources
	Utilities/Service Systems		Wildfire
	Mandatory Findings of Significance		

4.0 DETERMINATION

On the basis of this initial evaluation:

____ I find that the proposed project could have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, and that these effects have not been adequately analyzed by an earlier EIR. A TIERED ENVIRONMENTAL IMPACT REPORT will be prepared.

X I find that although the proposed project could have a significant effect on the environment, all potentially significant effects (1) have been addressed adequately in an earlier environmental document pursuant to applicable standards, (2) no substantial changes to the project are proposed, and (3) no substantial changes in circumstances or new information of substantial importance has been identified. Applicable mitigation measures from the 2006 LRDP EIR are incorporated into the project as standard project features. The project is within the scope of the LRDP and no further environmental documentation is required. FINDINGS will be prepared.

Signature:  Date: 12-31-19

Printed Name: Jeff Philliber, UC LBNL Chief Environmental Planner

5.0 EVALUATION OF ENVIRONMENTAL IMPACTS

The University stated in the LBNL 2006 LRDP Final EIR (page III-48) that in addition to disclosing the environmental impacts from the adoption of the 2006 LRDP, the Program EIR could also be used by the University in connection with the consideration of certain specific projects pursuant to the 2006 LRDP, as well as for later modifications of such projects. The 2006 LRDP EIR further provided that pursuant to *State CEQA Guidelines* Section 15168, some of those projects might be approved as within the scope of the Program EIR and other projects would be approved after preparation of a second-tier CEQA document.

The 2006 LRDP Final EIR also noted that any use of the EIR in connection with subsequent approvals would be subject to two additional restrictions that resulted from consultations with the City of Berkeley. First, the 2006 LRDP Final EIR would not be used as the first-tier EIR for any project exceeding the net development totals projected in the 2006 LRDP: 980,000 gsf of new occupiable space construction and 320,000 gsf of demolition. Second, an updated traffic study would be prepared at the earliest occurrence of either of two milestone events following 2006 LRDP Final EIR certification: the passing of 10 years, or when 375 net new parking spaces were added to the LBNL main site. The first restriction does not apply in the BioEPIC case because the proposed project will add only 44,300 square feet of new occupiable/assignable space. The second restriction is applicable and was satisfied when an updated LRDP EIR traffic study was prepared in 2010 as part of the Seismic Life Safety, Modernization, and Replacement of General Purpose Buildings, Phase 2 Project EIR. This update to the 2006 LRDP EIR traffic study was prepared to address new information related to the assessment of operational impact standards as reported in the 2006 LRDP EIR analysis. The total number of parking spaces at the LBNL main site has not changed substantially since 2007.

As noted earlier, this document has been prepared pursuant to Section 15168(c)(2) to demonstrate that the proposed project is within the scope of the 2006 LRDP EIR. A checklist utilizing the *State CEQA Guidelines* Appendix G list of questions has been used (consistent with *State CEQA Guidelines* Section 15168(c)(4)) to document the evaluation of the site- and project-specific information to determine whether the environmental impacts of the proposed project were covered in the Program EIR. The column headings in the checklist in this document are as follows:

- "Additional Project-level Impact Analysis Required" applies where the project may result in a new significant environmental impact that was not evaluated in the earlier program document, a substantial increase in the severity of a significant impact previously evaluated in the program document, or a requirement for new mitigation measures, due to substantial project changes, substantial changes in circumstances, or new information of substantial importance, since certification of the program document.

- "No Further Environmental Document Required" applies where the project would result in no new significant environmental effects not considered in the program document and no substantial increases in the severity of a significant environmental effect previously evaluated in the program document, and no new mitigation measures would be required.

Scope of 2006 LRDP EIR

The 2006 LRDP Final EIR analyzed the overall effects of implementation and full 2006 LRDP development. The 2006 LRDP sets forth plans and policies that are intended to guide Berkeley Lab's physical development at the LBNL hill site, including the construction of new buildings, roads, parking lots, and infrastructure systems, while protecting significant natural resources at the site. The proposed LBNL hill site analyzed in the 2006 LRDP Final EIR included the development 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, for a total of approximately 660,000 gross square feet of net new occupiable space for the site through 2025. The 2006 LRDP Final EIR analyzed an increase in Adjusted Daily Population of the LBNL hill site from 3,650 to 4,650 persons, a net increase of 1,000 persons.

The 2006 LRDP Final EIR included a thorough analysis of a project description option called the "Project Variant," wherein the contemporaneous Lab population occupying off-site leased space (about 350 people) would be consolidated on the Lab hill site by 2025. Under the Project Variant, the full realization of the 2006 LRDP would result in a hill site population of 5,000 persons, an increase of 1,350 persons. This Environmental Analysis and Checklist conservatively analyzes the proposed project against both the 2006 LRDP Project and Project Variant scenarios.

2006 LRDP EIR Mitigation Measures

As noted in **Section 2.11**, because the proposed project is an element of the growth projected under the LBNL 2006 LRDP, relevant mitigation measures in the 2006 LRDP Final EIR and the two Supplements are standard project features that have been included in and are a part of the proposed project. The analysis presented in this document evaluates environmental impacts that would result from project implementation following the application of the standard project features.

Cumulative Projects

The proposed project is an element of 2006 LRDP-projected growth and development, so this BioEPIC analysis incorporates the evaluation of cumulative operational impacts from the 2006 LRDP EIR, as updated by the two Supplements prepared in 2010 and 2017. Given the time lapse since the cumulative operational impacts were evaluated in the 2006 LRDP EIR and the two Supplements, UC LBNL has also conducted an updated cumulative impact analysis of the operational traffic impacts through 2040, taking into account the additional growth that is now projected in the study area, including the Upper Hearst project proposed by UC Berkeley which would redevelop the Upper Hearst parking structure site and add academic and study space while maintaining some parking.

In addition, this analysis also considers nearby near-term projects currently planned at Berkeley Lab and its surroundings that could potentially result in construction-phase cumulative impacts with the proposed project. These projects are listed in **Table 2, Near-Term Cumulative Projects (Construction Phase)** and comprise the proposed project's "cumulative context" for construction impacts. Near-term projects are defined to include approved-but-not-built projects and planned-but-not-approved projects expected to be completed in the same timeframe as the proposed project.

Table 2
Near-Term Cumulative Projects (Construction Phase)

Project Name	Description	Construction Information	Building Space/Population
Old Town Demolition	Remove approx. 7 one- and two-story buildings and foundations from prior buildings in the "Old Town" area. Remediate area.	In progress. Completion expected in 2021.	Approximately 56,000 gsf of buildings to be demolished and removed.
Integrative Genomics Building (IGB)	Construct and operate approximately 81,000 gsf, four-story research and office building in the Bayview Planning Area.	Construction completed in fall of 2019.	Approximately 81,000 gsf Approximately 333 occupants
Bayview Site Utility Replacement Project (SURP)	Replace outdated utility lines that serve Bayview and other west-campus facilities.	Construction expected mid-2019 through late 2019, to be resumed late-2020 through mid-2021.	N/A
Bayview Parcel 1 Cleanup project	Remove (Bevatron era) Building 51B foundation slabs and tunnels in the Bayview Planning Area.	Project scheduled to commence in late 2019 and be completed in early 2022.	N/A
NERSC-9 Project	Install next generation high-performance computing system, called "NERSC-9," in existing Bldg. 59.	Construction from late 2018 to late 2020.	N/A
Upper Hearst Project	Construct 37,000 gsf academic building and a separate residential building on top of the Upper Hearst Parking Structure	Construction from September 2019 through July 2021	Approximately 19,440 sf + 225 bedrooms Approximately 1,176 occupants

5.1 Aesthetics

5.1.1 Background

Section IV.A of the 2006 LRDP Final EIR addresses the aesthetic effects of Lab growth under the 2006 LRDP and is incorporated by reference in this document for this proposed project pursuant to *State CEQA Guidelines*, Section 15150. The following discussion summarizes the information presented in the 'Setting' subsection of Section IV.A of the 2006 LRDP EIR and describes the project site and relevant aspects of the proposed project.

LBNL

The LBNL hill site is located on the steeply sloping hillsides of the Berkeley-Oakland hills, rising from elevation 500 feet near the Blackberry Canyon Gate to about 1,000 feet 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 and introduced eucalyptus and conifers. The entire LBNL hill site cannot be viewed from any single on- or 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, Grizzly Peak Road, and Hearst Avenue. As described in the 2006 LRDP Final 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 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 BioEPIC project site is located in the western portion of the LBNL hill site at the intersection of Chu Road with Smoot Road/McMillan Road and Alvarez Road. Due to the extensive tree growth to the far west and rows of trees to the east and south, as well as proximity to nearby hillsides and other buildings, the project site is not visible from most off-site areas near the LBNL hill site. Intermittent views of the project site are available from a small number of locations in nearby residential neighborhoods at higher elevations, primarily to the north and northwest.

5.1.2 2006 LRDP EIR Analysis

The 2006 LRDP EIR evaluated visual impacts of Lab growth and development under the 2006 LRDP utilizing an Illustrative Development Scenario, which was a conceptual portrayal of

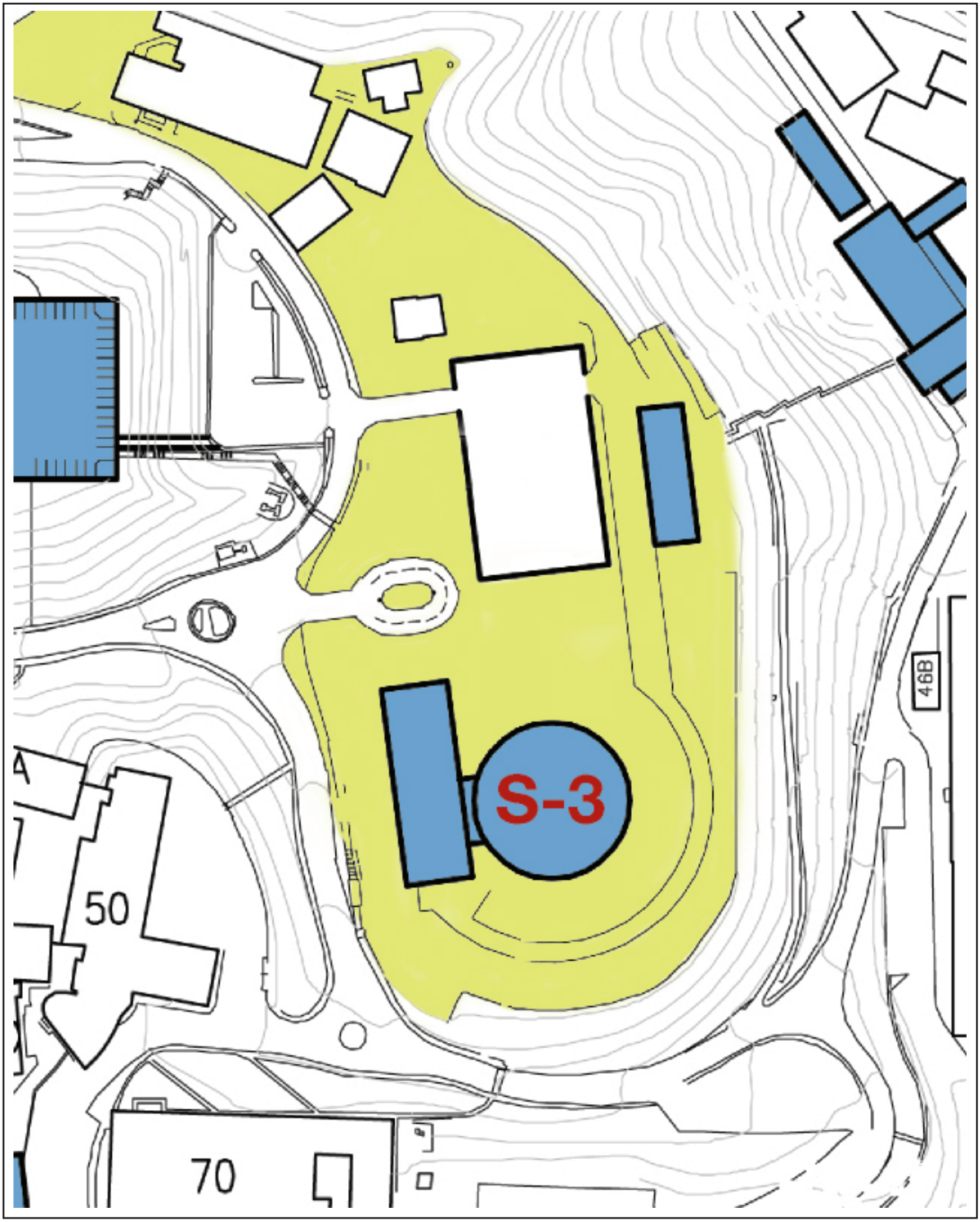
potential development under the 2006 LRDP. The scenario depicts conceptual siting and dimensions of new buildings, parking garages, roadway changes, and demolition of existing buildings consistent with the 2006 LRDP goals and objectives, the 2006 LRDP Land Use Map, the LBNL Design Guidelines, and the LRDP's proposed development uses and square footages; the LRDP EIR noted that the actual Illustrative Development Scenario features would vary over time as specific projects were proposed and considered for approval. The Illustrative Development Scenario is intended to provide a conservative basis for the analysis of environmental impacts.

The Illustrative Development Scenario included Building S-3, an eight-story, substantially larger building to be located in the general area that is now the site proposed for the BioEPIC project (**Figure 4**). The 2006 LRDP Final EIR analysis determined that development on the LBNL hill site pursuant to the 2006 LRDP could result in significant and unavoidable impacts on scenic vistas and scenic resources (LRDP Impact VIS-2) and site character (LRDP Impact VIS-3), but would not result in a significant impact related to light and glare (LRDP Impact VIS-4) or due to construction activities (LRDP Impact VIS-1).

The proposed project is within the scope of analysis of the 2006 LRDP Final EIR. Relevant mitigation measures in the 2006 LRDP Final EIR, as supplemented (now standard project features for projects under the 2006 LRDP) have been incorporated as part of the planning and design of the proposed project and would be implemented during project construction and operations consistent with LRDP mitigation monitoring requirements. A list of 2006 LRDP EIR mitigation measures, including the mitigation measures added under the 2010 and 2017 Supplements, is provided in **Appendix A**.

5.1.3 Environmental Checklist and Discussion

AESTHETICS Would the project…	Additional Project-Level Impact Analysis Required	No Further Environmental Document Required
a) Have a substantial adverse effect on a scenic vista?	☐	☑
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☑
c) In non-urbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?	☐	☑
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☑



SOURCE: Lawrence Berkeley National Laboratory, 2019

FIGURE **4**

IMPACT SCIENCES

Illustrative Development Scenario

0924.014•12/19

DISCUSSION:

BioEPIC Project Analysis

a. Have a substantial adverse effect on a scenic vista? No Further Environmental Document Required.

The 2006 LRDP Final EIR evaluated temporary impacts on scenic views of the LBNL hill site from construction activities under the 2006 LRDP, under LRDP Impact VIS-1 (page IV.A-11). The analysis concluded that because construction activities would occur over a limited period of time, limited geographical area, and generally would not involve the extensive removal of vegetation, the temporary impact of construction activities on scenic views, scenic resources, and the existing visual character or quality of the LBNL hill site would be less than significant. The proposed project is within the scope of construction activities described and evaluated in the 2006 LRDP EIR. The construction of an eight-story building in the general area of the current project site was included in the 2006 LRDP analysis. The proposed project would construct a four-story building, which would be substantially smaller than previously analyzed. Furthermore, due to its location in the central portion of the LBNL hill site, construction activities associated with the proposed project would not be visible from most locations outside of the LBNL hill site, particularly due to distance and intervening terrain, foliage, and structures. The project's temporary construction-phase impacts on scenic views, scenic resources, and the existing visual character of the LBNL hill site are adequately addressed under LRDP Impact VIS-1 and would be less than significant.

The 2006 LRDP Final EIR addressed long-term impacts to views of the LBNL hill site from nearby areas and scenic resources under LRDP Impact VIS-2 (page IV.A-13). Visual simulations were provided in the analysis to illustrate how LRDP implementation could affect views. Development of an eight-story building (Building S-3) in the general area of the project site was evaluated under the Illustrative Development Scenario in the 2006 LRDP Final EIR, and the visual simulations demonstrated that the building would not be prominently visible from most of the key off-site viewpoints in downtown Berkeley, including viewpoints on Shattuck Avenue, Hearst Avenue, and San Pablo Avenue, as shown in Figures IV.A-4, IV.A-5, and IV.A-6, although it would be visible from areas to the northeast and east of the Lab, including the Lawrence Hall of Science (LHS) (Figure IV.A-2). The 2006 LRDP Final EIR concluded that the impact on scenic vistas and scenic resources from individual projects in the Illustrative Development Scenario, such as the eight-story building on the BioEPIC project site, would not be significant. However, the 2006 LRDP Final EIR did conservatively conclude that the overall aesthetic impact of aggregate LRDP development would be significant and unavoidable. As the building analyzed in the 2006 LRDP Final EIR at the location of the proposed project was substantially taller and larger than the proposed project, the impacts of the BioEPIC project on views and scenic resources would be less than the impact of the building evaluated in the 2006 LRDP Final EIR. Furthermore, due to its location, the proposed project would not be visible from most viewpoints off of the LBNL hill site; of the few viewpoints available, the proposed project would appear only well below the panoramic view plane and in an area of similar development. Therefore, the proposed project would not affect scenic views. In addition, as the surrounding site has been substantially disturbed, altered, and developed with pavement, roads, buildings, mechanical infrastructure, and parking and laydown uses, no scenic resources are present that could be affected by the BioEPIC project. The proposed project's impact on scenic vistas and scenic resources is adequately addressed under LRDP Impact VIS-2 and would be less than significant.

b. Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway? No Further Environmental Document Required.

See item "**a**" above for analysis.

c. In non-urbanized areas, substantially degrade the existing visual character or quality of the site and its surroundings? In urbanized areas, conflict with applicable zoning and other regulations governing scenic quality? No Further Environmental Document Required.

The 2006 LRDP EIR addressed long-term impacts associated with degradation of visual character or quality under LRDP Impact VIS-3 (page IV.A-21). The EIR concluded that some of the development under the 2006 LRDP would alter the visual character of the LBNL hill site as viewed from certain viewpoints in the Strawberry Canyon, the Panoramic Hill neighborhood, University land upslope of LBNL, and the Northside residential neighborhood, resulting in a significant and unavoidable impact. Visual simulations from these key viewpoints were included in the 2006 LRDP EIR. Of viewpoints analyzed, the Northside residential neighborhood viewpoint and a viewpoint from the UC-owned Lawrence Hall of Science (LHS) parking lot are pertinent to the proposed BioEPIC project. (the project would not be visible from Strawberry Canyon or the Panoramic Hill neighborhood). In all of the LRDP simulations, the 2006 LRDP Final EIR presented a simulated, eight-story building (Building S-3) in the general area of the current BioEPIC project site. The 2006 LRDP Final EIR analysis demonstrated that if Building S-3 were constructed in that location, only its upper four stories would be visible from the LHS parking lot viewpoint and only a small portion of its upper two stories would be intermittently visible (i.e., "…peeks out from the trees…") from the Northside Neighborhood viewpoint.

The proposed BioEPIC project would develop a much smaller building of substantially lower height than the analyzed Building S-3. Consequently, the BioEPIC building would not be visible looking uphill from any of the public viewpoints as shown in the 2006 LRDP EIR visual simulations, including the Northside residential neighborhood viewpoint. A portion of the proposed project would likely be visible looking downhill from the UC-owned LHS parking lot, but this would be well below the panoramic view plane vista, and it would be indistinguishable from the predominating visual character of the surrounding LBNL site. The proposed project's impact on visual character and quality is adequately addressed by the 2006 LRDP Final EIR and would be less than significant.

The 2006 LRDP Building Height Map in the 2006 LRDP Final EIR (page III-24) displays the maximum number of stories/heights of existing and future buildings on the LBNL hill site. Among the constraints considered regarding building heights are aesthetic considerations involving how different building heights and scales might affect the visual character of LBNL. Accordingly, and to support the aesthetic principles put forth in the LBNL Design Guidelines, the Height Zoning Map is used to guide placement and height of buildings under the 2006 LRDP. The project site is split about evenly between two adjacent height zones: an area that is designated for a four-story maximum height and one designated for eight stories. As such, the project is within the scope of the 2006 LRDP. Additionally, project design and implementation would be consistent with the 2006 LRDP Design Guidelines as the proposed project would use materials, colors, textures, and hardscaping schemes complementary to the adjacent IGB and

Modular Utility Plant buildings. The proposed project's impact on visual character would be less than significant.

d. Create a new source of substantial light or glare, which would adversely affect day or nighttime views in the area? No Further Environmental Document Required.

The 2006 LRDP Final EIR addressed long-term impacts associated with light and glare under LRDP Impact VIS-4 (page IV.A-28). Development of an eight-story building at the project site was evaluated under the Illustrative Development Scenario in the 2006 LRDP EIR. The proposed project would develop a smaller building but would still create new sources of light and glare, including expansive windows and metal materials, in a developed portion of the LBNL hill site. During the day, sunlight could reflect off the glass and metallic portions of the building exterior, which could result in glare. Portions of the project site would be lit for nighttime operations and security considerations; this could result in nighttime illumination in the project vicinity. However, **LRDP Mitigation Measures VIS-4a** and **VIS-4b** (light and glare measures) are standard project features of the proposed project. These measures require shielding to minimize light spillage, light fixtures to be compatible with existing fixtures, and reflective surfaces to be limited to reduce glare. The proposed project also includes as a standard project feature **LRDP Mitigation Measure VIS-4c** (light and glare measure), which requires all new buildings on the LBNL hill site constructed pursuant to the 2006 LRDP to incorporate design standards that preclude or limit the use of reflective exterior wall materials or reflective glass. In addition, **LRDP Mitigation Measure VIS-4c** also limits the use of white surfaces for roofs, roads, and parking lots, except in specific instances when required for energy conservation. As stated in the 2006 LRDP Final EIR concerning projects under the 2006 LRDP, the potential impact from light and glare would be less than significant with implementation of **LRDP Mitigation Measures VIS-4a** through **VIS-4c** as part of the proposed project. The impact related to light and glare from the proposed project is adequately addressed under LRDP Impact VIS-4 and would be less than significant with standard project features.

5.1.4 Analysis of Cumulative Impacts in 2006 LRDP EIR

Cumulative visual impacts of the 2006 LRDP are addressed under LRDP Impact VIS-5 (page IV.A-30) of the Final EIR. The 2006 LRDP Final 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 LBNL. 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 visual impacts that would occur in combination with impacts from 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 Final EIR. Therefore, the proposed project's cumulative aesthetic effects are adequately addressed under LRDP Impact VIS-5 and would be less than significant. Taking into consideration the present-day setting and the current cumulative context, this analysis finds that no conditions have changed and no new information has become available since certification of the 2006 LRDP EIR that would alter this previous analysis.

5.1.5 Changes in Circumstances or New Information that could affect the Earlier Environmental Analysis

There are no changes in circumstances and no new information related to visual resources has become available since the certification of the 2006 LRDP Final EIR, including the two Supplements, that would alter the previous analyses and change its conclusions.

5.2 Agriculture and Forestry Resources

5.2.1 Background

The LBNL hill site does not contain any designated or actively farmed land or forest land. The LBNL hill site, including the project site, is mapped as "Urban and Built-Up" by the Farmland Mapping and Monitoring Program (FMMP) (California Department of Conservation 2012).

Project Site

The BioEPIC project site is located in an area that has previously been graded and disturbed in conjunction with prior development and is a paved parking lot and storage area at this time.

5.2.2 2006 LRDP EIR Analysis

Agricultural and forest resources were scoped out of the 2006 LRDP EIR based on an analysis in an Initial Study prepared to accompany the NOP.

5.2.3 Environmental Checklist and Discussion

AGRICULTURE AND FORESTRY RESOURCES Would the project…	Additional Project-Level Impact Analysis Required	No Further Environmental Document Required
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?	☐	☑
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☑
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 by Public Resources Code Section 4526)?	☐	☑
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☑
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 non-forest use?	☐	☑

DISCUSSION:

BioEPIC Project Analysis

a.- e. 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 by 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? No Further Environmental Document Required.

The project site is located in a developed area. According to the FMMP, there are no Williamson Act contracts for any land within the boundaries of LBNL or its vicinity. The proposed 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 Lab. There is also no forest land on the project site. Therefore, implementation of the proposed project would not impact agricultural and forest resources.

5.2.4 Analysis of Cumulative Impacts in 2006 LRDP EIR

Because there would be no project impact on agricultural and forest resources, the proposed project would not contribute to any cumulative impacts on these resources.

5.2.5 Changes to Circumstances or New Information that could affect the Earlier Environmental Analysis

There are no changes in circumstances and no new information related to agricultural or forestry resources has become available since the certification of the 2006 LRDP Final EIR, including the two Supplements, that would alter the previous analyses and change its conclusions.

5.3 Air Quality

5.3.1 Background

Section IV.B of the 2006 LRDP Final EIR addresses the air quality effects of LBNL growth under the 2006 LRDP and is incorporated by reference in this document for this proposed project pursuant to *State CEQA Guidelines* Section 15150. The following discussion summarizes the information presented in the 'Setting' subsection of Section IV.B of the 2006 LRDP Final EIR.

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 US Environmental Protection Agency (EPA), the California Air Resources Board (CARB), and Bay Area Air Quality Management District (BAAQMD).

Air pollution is a major public health concern. Studies conducted in various parts of the world, including the United States, have documented a wide range of adverse effects of ambient air pollution on human health. Adverse health effects from short-term and long-term exposure to air pollution include, but are not limited to, increased respiratory illnesses (asthma incidence, asthma severity, hospital care for asthma, infections, and other symptoms); exacerbation of symptoms in sensitive patients with respiratory or cardiovascular disease; decreased lung function and lung inflammation; increased mortality, including increased risk of premature death from heart or lung diseases in the elderly and people with potentially predisposing conditions (such as chronic obstructive pulmonary disease, diabetes, congestive heart failure, and myocardial infarction); declines in pulmonary function growth in children; and potential immunological changes. Although numerous air pollutants are emitted by both natural and anthropogenic sources and contribute to adverse human health effects, ozone and particulate matter have been identified as the pollutants of greatest concern.

LBNL

The LBNL hill site is located in Alameda County, which, along with eight other counties, is within the San Francisco Bay Area Air Basin (SFBAAB or Air 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 (O_3) is formed in the atmosphere in the presence of sunlight by a series of chemical reactions involving oxides of nitrogen (NO_x) and reactive organic gases (ROG). Because these reactions are broad scale in effects, the effects of ozone typically are analyzed at the regional level (i.e., in the Air Basin) rather than the local level. On the other hand, other air pollutants such as sulfur dioxide (SO_2), respirable particulate matter (PM10), fine particulate matter (PM2.5), 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. TACs are also known as hazardous air pollutants. Therefore, the study area for emissions of SO_2, PM10, PM2.5, CO, Pb, and TACs is the local area nearest the source, such as in the vicinity of congested intersections or near

construction sites, whereas the study area for regional pollutants such as NO_x and ROG is the entire Air Basin.

Air pollutants typically are categorized as either criteria pollutants or TACs. The criteria pollutants are those regulated at the federal level by US EPA and at the state and regional level by CARB and BAAQMD, respectively. These include O_3, PM10, PM2.5, CO, nitrogen dioxide (NO_2), SO_2, and Pb. O_3 is a secondary pollutant formed during photochemical reactions with precursor pollutants. As such, O_3 is analyzed by assessing emissions of its precursors, ROG and NO_x. The primary sources of criteria pollutants at the LBNL hill site include automobiles and heating equipment.

TACs are known to have adverse human health effects and therefore are regulated. 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 heavy-duty construction equipment, particularly diesel-fueled vehicles; and area sources, such as farms, landfills, construction sites, and residential areas. Sources of TACs at and around the LBNL hill site include diesel trucks, laboratory vent emissions, emergency generators, and painting operations.

Air quality in the Air Basin is monitored by the BAAQMD and CARB. Based on pollutant concentrations measured at monitoring stations within the Air Basin, the SFBAAB is classified as being either in attainment or non-attainment of federal and state air quality standards. Air quality of a region is considered to be in attainment of the state standards if the measured ambient air pollutant levels for O_3, CO, SO_2 (1- and 24-hour), NO_2, PM10, PM2.5, and visibility reducing particles are not exceeded, and all other standards are not equaled or exceeded at any time in any consecutive three-year period. The SFBAAB is currently designated as a nonattainment area with respect to the state standards for O_3, PM10, and PM2.5 and is designated as attainment or unclassified for all other pollutants.

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. Locations where these groups of people are found, such as 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

The project site is currently a surface parking lot and storage area. 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 the MUP, emergency generators associated with various existing Lab buildings, and fume hoods located in laboratories, which are vented to the roofs of laboratory buildings. There are no receptors on the Berkeley Lab site that meet the criteria of sensitive

receptors as defined by CARB. As shown in **Figure 5**, the nearest off-site sensitive receptors are single-family residences approximately 0.20 mile (1,080 feet) to the north of the project site.[11]

5.3.2 2006 LRDP EIR Analysis

The 2006 LRDP Final EIR evaluated air quality impacts of Lab growth and development under the 2006 LRDP utilizing an Illustrative Development Scenario, which was a conceptual portrayal of development under the 2006 LRDP. That illustrative scenario assumed that a new eight-story building (Building S-3) would be constructed in the area that is now being considered for the location of the BioEPIC project. The 2006 LRDP Final EIR analysis determined that development on the LBNL hill site pursuant to the 2006 LRDP could result in significant impacts associated with criteria air pollutant emissions from construction activities and TACs, but that mitigation measures would reduce these impacts to a less than significant level. The 2006 LRDP Final EIR analysis also concluded that there would not be a significant impact related to operational criteria air pollutant emissions or odors, increases in carbon monoxide concentrations, or cumulative increase in criteria air pollutants. However, there would be a significant and unavoidable impact from cumulative emissions of TACs.

The proposed project is within the scope of analysis of the 2006 LRDP Final EIR. Relevant mitigation measures in the 2006 LRDP Final EIR (now standard project features for projects under the LRDP) have been incorporated as part of the planning and design of the proposed project and would be implemented during project construction and operations consistent with LRDP mitigation monitoring requirements.

5.3.3 Environmental Checklist and Discussion

AIR QUALITY Would the project…	Additional Project-Level Impact Analysis Required	No Further Environmental Document Required
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☑
b) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable federal or state ambient air quality standard?	☐	☑
c) Expose sensitive receptors to substantial pollutant concentrations?	☐	☑
d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?	☐	☑

11 These distances were estimated using Google Earth Pro and reflect the distance between the nearest residence and the point on the project site boundary closest to that residence.

SOURCE: Google, 2018

FIGURE 5

Nearby Sensitive Receptors

IMPACT SCIENCES

0924.014•12/19

DISCUSSION:

BioEPIC Project Analysis

a. Conflict with or obstruct implementation of the applicable air quality plan? No Further Environmental Document Required.

The 2006 LRDP Final EIR analyzed potential impacts related to emissions of criteria pollutants from construction activities on the LBNL hill site under LRDP Impact AQ-1 (page IV.B-31), and evaluated the impact based on the BAAQMD's recommended approach at that time that emphasizes the implementation of effective and comprehensive control measures. The 2006 LRDP Final EIR concluded that an individual activity under the LRDP such as the construction and demolition activities analyzed in the Illustrative Development Scenario would affect local air quality in the vicinity of the project as a result of short-term emissions of fugitive dust and criteria air pollutants, but that with the implementation of **LRDP Mitigation Measures AQ-1a** and **AQ-1b** (construction-related emissions measures) (included in **Appendix A**) that were adopted as part of the 2006 LRDP, the impact would be less than significant.

The 2006 LRDP Final EIR also evaluated potential impacts related to operational emissions of criteria pollutants from Lab growth and development under LRDP Impact AQ-2 (page IV.B-35). The 2006 LRDP EIR evaluated the operational impacts both using a plan-level analysis which evaluated the 2006 LRDP against regional air quality plans and a project-level analysis which estimated the total emissions and compared them to BAAQMD thresholds. Both analyses concluded that the impact associated with LRDP operations would be less than significant.

Since the certification of the 2006 LRDP Final EIR, the *CEQA Air Quality Guidelines* were updated and adopted by the BAAQMD in 2010 and were updated as recently as 2017. These provide additional guidance on the evaluation of a proposed project's construction-phase and operational air quality impacts, including new methodologies and thresholds for lead agencies to use in the impact assessment.

Construction

The *2017 CEQA Air Quality Guidelines* call for the quantification of construction emissions. CalEEMod was used to estimate the emissions of criteria pollutants that would be generated during BioEPIC project construction. CalEEMod is a program that calculates air pollutant emissions from construction and operation of land development projects. It incorporates the California Air Resources Board EMFAC2014 model for on-road vehicle emissions and the OFFROAD2011 model for off-road vehicle emissions. The model also incorporates factors specific to the project region, such as vehicle fleet mix. The model can estimate emissions that would occur during different phases of construction, such as grading and building construction, concurrently or separately. The proposed project was assumed to be constructed in a single phase beginning in January 2021 and ending in February 2023.

Based on information for the proposed project, the estimated construction emissions are provided below in **Table 3, Estimated Construction Emissions**. No dust or other emissions control measures were assumed to be part of the proposed project, although the site would be watered two times per day as is standard practice for construction sites in the Bay Area per BAAQMD

recommendations. Also, estimates of PM10 and PM2.5 presented in **Table 3** include fugitive dust in addition to vehicle exhaust emissions, while the BAAQMD thresholds for PM10 and PM2.5 apply only to vehicle exhaust emissions. Additionally, **LRDP Mitigation Measures AQ-1a** and **AQ-1b** would be implemented as standard project features of the proposed project. As the results in the table show, construction of the proposed project would not result in emissions that would exceed the applicable BAAQMD thresholds of significance for construction emissions. Therefore, the impact from the project's construction emissions would be less than significant. No further environmental evaluation is required.

Table 3
Estimated Construction Emissions

Year	Average Daily Emissions (lbs/day)					
	ROG	**NOx**	**CO**	**Sox**	**PM10**	**PM2.5**
2021	2	19	14	<1	1	1
2022	2	13	13	<1	1	1
2023	34	1	2	<1	<1	<1
BAAQMD Threshold	**54**	**54**	**--**	**--**	**82**	**54**
Exceeds Threshold?	No	No	N/A	N/A	No	No

*Source: Impact Sciences, Inc. Emissions calculations are provided in **Appendix B**.*

Operation

Criteria Pollutants

Operational emissions would result from vehicular traffic associated with 210 occupants traveling to and from the proposed building. The proposed project also includes an emergency generator stationary source, which is assumed to be up to 800 horsepower. The backup generator would operate only in the event of a power outage or during regular maintenance testing. The backup generator would require a permit to operate from the BAAQMD and would be limited to approximately 50 hours of operation per year for testing and maintenance according to standard permit conditions for emergency generators.

Estimated operational emissions associated with the proposed project are shown in **Table 4, Estimated Operational Emissions**. As the table shows, the emissions of all criteria pollutants would be well below applicable thresholds and the impact related to the proposed project's operational emissions would be less than significant. Additionally, the operational emissions associated with the use of the leased space in Berkeley would be eliminated after the programs located in the leased space are relocated to the BioEPIC project site. Therefore, the net emissions associated with the BioEPIC project would be even less than the numbers reported below. No further environmental evaluation is required.

Table 4
Estimated Operational Emissions

Source	Average Daily Emissions (lbs/day)					
	ROG	NOx	CO	SOx	PM10	PM2.5
Area	1.71	0.00	0.00	<0.01	0.00	0.00
Energy	0.05	0.47	0.39	<0.01	0.04	0.04
Mobile	0.35	2.13	3.96	0.02	1.31	0.36
Generator	0.18	0.80	0.46	<0.01	0.03	0.03
Total	2.28	3.40	4.81	**0.02**	**1.37**	**0.42**
BAAQMD Threshold	**54**	**54**	**--**	**--**	**82**	**54**
Exceeds Threshold?	No	No	N/A	N/A	No	No

*Source: Impact Sciences, Inc. Emissions calculations are provided in **Appendix B***

b. Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable federal or state ambient air quality standard? No Further Environmental Document Required.

See item "**a**" above for analysis. Because the proposed project would result in emissions of ROG and NOx (which are O_3 precursors), PM10 and PM2.5 well below the thresholds put forth by the BAAQMD, it would not result in a cumulatively considerable net increase of O_3, PM10, and PM2.5, which are the criteria pollutants for which the project region is in non-attainment under the federal or state ambient air quality standards.

c. Expose sensitive receptors to substantial pollutant concentrations? No Further Environmental Document Required.

Effect on Sensitive Receptors from Project TAC Sources

Project construction would involve diesel-fueled equipment that would emit diesel particulate matter (DPM), which is a known TAC. The BAAQMD has provided a screening approach to conduct an initial evaluation of potential health risks from exposure to TACs, including DPM and PM2.5, from construction activities (BAAQMD May 2017). The construction health risk screening table provided by the BAAQMD as part of this screening approach contains offset distances between the project construction site and the nearest sensitive receptor at which it can be conservatively assumed that the health risks (cancer and non-cancer) from the construction project would be less than significant and a construction-phase health risk analysis is not necessary. The *BAAQMD CEQA Guidelines* state that the zone of influence for risk and hazards for new sources or receptors is 1,000 feet from the source to the receptor. As noted above, the nearest sensitive receptor is approximately 1,080 feet from the proposed project site. Since the nearest sensitive receptors to the project site are further than 1,000 feet from the site, no construction-phase health risk assessment is required. Furthermore, since PM2.5 emissions from the construction of the proposed project are well below BAAQMD thresholds and since standard project feature **LRDP Mitigation Measure AQ-1b** would include measures to reduce criteria air pollutant emissions, the impact from construction-phase TAC and PM2.5 emissions would be less than significant.

The 2006 LRDP Final EIR included a human health risk assessment (HHRA) that evaluated the impact related to incremental carcinogenic and non-carcinogenic human health risk to receptors on the Lab site as well as off-site from exposure to TACs associated with Lab growth (LRDP Impact AQ-4 (page IV.B-41)). The 2006 LRDP Final EIR concluded that lab-wide development under the LRDP such as the development analyzed in the Illustrative Development Scenario would result in TAC emissions that would not significantly affect off-site receptors but could affect on-site receptors (i.e., within the Lab site), but that with the implementation of **LRDP Mitigation Measure AQ-4a** (TAC minimization measure), which was adopted as part of the 2006 LRDP, prior to construction of a parking structure at location PS-1 or similarly configured building at that location, the impact would be less than significant. The EIR also concluded that the human health risks from TACs generated by all of the development under the Illustrative Development Scenario would be similar to that under the 2006 LRDP, but that any individual project, such as those included in the Illustrative Development Scenario, would generate risk from exposure to TACs that would be lower than those associated with LRDP implementation. Further, the EIR concluded that the impact from individual projects and full development under the Illustrative Development Scenario would be a less than significant impact with the implementation of **LRDP Mitigation Measure AQ-4a**.

Development of the proposed project would add research laboratories and stationary sources such as an emergency generator to the LBNL hill site that would be potential sources of TACs. The emergency generator would not be within 1,000 feet of any off-site sensitive receptors, and is only anticipated to be operated for short-term testing purposes or in the case of emergency. Furthermore, the backup generator would require a permit from the BAAQMD to operate and would be limited to approximately 50 hours of operation per year for testing and maintenance according to standard permit conditions for emergency generators. As a result, operation of the emergency generator is not anticipated to increase concentrations of TACs at nearby sensitive receptors.

To evaluate whether the proposed project is within the scope of the 2006 LRDP EIR HHRA analysis, Alta Environmental conducted an evaluation of TAC emissions from laboratory operations associated with the BioEPIC project and compared the emissions to the laboratory emissions analyzed in the 2006 LRDP Final EIR HHRA for potential health risk impacts. The Alta Environmental technical memorandum is included in **Appendix B.** The 2006 LRDP HHRA included predicted emissions of TACs from laboratory operations expected to be performed in future buildings that would be developed under the 2006 LRDP. As discussed above, the HHRA was based on an Illustrative Development Scenario that was a conceptual portrayal of potential development under the 2006 LRDP. The scenario included a future lab building (Building S-3) in the general area of the proposed BioEPIC project and the previously approved Integrative Genomics Building (IGB) project. The risk assessment also accounted for emissions from other planned sources, including stationary equipment (HVAC, boilers, generators, paint spray booths, etc.) and mobile sources (pool vehicles and employee shuttle buses) associated with the new operations.

A 2014 evaluation considered the impact of laboratory operations from the then-proposed IGB, which is completing construction adjacent to the BioEPIC site on a portion of the Building S-3 site. Operational TAC emissions were predicted for this building based on planned chemical inventory quantities.

UC LBNL provided a laboratory chemical inventory to Alta Environmental for the BioEPIC project. This inventory was evaluated using a database program to extract total values of each chemical listed. A listing of all chemicals from the Office of Environmental Health Hazard Assessment's (OEHHA's) Hot Spots Unit Risk and Cancer Potency Values table was also loaded to the database and used to create a table of each OEHHA Listed compound in the inventory with their total quantities. The inventory from the IGB building was also loaded to the database and the totals quantified. As was assumed in the 2014 IGB evaluation, only chemicals with non-negligible vapor pressures (all which were volatile organic liquids) were evaluated for their potential air emissions. Considering this approach, the database was used to generate a cross-reference query resulting in a list of 12 volatile organic chemicals that appear on both OHHEA's Hot Spots table and the BioEPIC chemical lists. These chemicals are identified in a table in **Appendix B**. Of these chemicals, five were evaluated as laboratory chemicals in the risk calculations in the 2006 HHRA's LRDP scenario. As the table in **Appendix B** shows, for each of the five previously evaluated chemicals, the total estimated BioEPIC laboratory emissions are significantly lower than the laboratory emissions analyzed from the projected Lab-wide growth under the 2006 LRDP. The most significant of these is Chloroform, which would be expected to generate most of the project-related risk from its use as a laboratory chemical. However, the estimated Chloroform emissions from BioEPIC and IGB projects combined (179.3 lb/hr) are only approximately 31 percent of the total Lab-wide Chloroform emissions from the projected LRDP growth analyzed in the 2006 LRDP HHRA.

In order to evaluate the relative impact of the seven of the 12 chemicals that were not included in the 2006 HHRA, the project's emissions of all 12 chemicals were also compared to a set of air toxic threshold levels put forth by the Bay Area Air Quality Management District (BAAQMD) in its New Source Review of Toxic Air Contaminants Rule (BAAQMD Regulation 2, Rule 5). These are threshold screening levels for new emissions sources being evaluated for air permits, that, if not exceeded, remove the need for further health risk assessment. As indicated in the table in **Appendix B**, with the exception of Chloroform, the estimated BioEPIC emissions of each of the 12 laboratory chemicals would be well below the threshold levels and would, by definition, assumed to represent very little risk. Regarding the use of Chloroform as a BioEPIC laboratory chemical, as noted above, the 2006 LRDP HHRA projected and analyzed a significantly higher growth in Lab-wide emissions than that estimated from laboratory operations for both the BioEPIC and IGB projects combined. These lower Chloroform emissions would more than offset the risk associated with emissions of the 7 chemicals not accounted for in the 2006 HHRA. Therefore, the laboratory emissions associated with the BioEPIC Project would not increase the previously reported human health risk from LBNL operations in the 2006 HHRA and would be within the scope of the 2006 LRDP and 2006 LRDP Final EIR.

Effect on Project Site Receptors from Existing TAC Sources

As discussed in **Section 2.5** there is VOC contamination along the western and eastern edges of the project site as shown in **Figure 2**. The contamination was determined to not pose an unacceptable risk to construction workers due to incomplete exposure pathways.

However, there was concern that the contamination could pose a potential risk to future employees working indoors on the project site due to vapor intrusion into a confined space. As noted in **Section 2.5**, the BioEPIC project includes construction of an under-slab vapor barrier and ventilation system in accordance with the DTSC guidance. This system would be developed

during Schematic Design and coordinated with the foundation system and under-slab utility routing to ensure compliance and constructability. See **Section 2.6** for additional information.

e. Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people? No Further Environmental Document Required.

There is no history of odor complaints from LBNL and the Lab site is fairly distant from off-site receptors. The 2006 LRDP Final EIR therefore concluded that growth and development under the 2006 LRDP would not involve activities expected to create nuisance or objectionable odors affecting substantial numbers of people, particularly off site. The proposed project would not be located next to any sensitive receptors and is not anticipated to generate offensive odors. There would be no impact. No further environmental evaluation is required.

5.3.4 Analysis of Cumulative Impacts in 2006 LRDP EIR

Construction Phase Cumulative Impacts

Construction of the proposed project would take place from 2021 through 2023. No other projects on the LBNL site are currently under construction or planned to be under construction within 1,000 feet of the project site when the construction of the proposed project would take place, as shown in **Table 2** in **Section 5.0**. (The Bayview Parcel-1 Cleanup project would be in close-out phase until early 2022, but this would not entail major construction activity.) Therefore, the construction activities of the proposed project would not overlap with those of other construction projects on the LBNL hill site and there would not be a potential for significant cumulative construction-phase air quality impacts on nearby sensitive receptors, including impacts related to emissions of TACs and PM2.5.

Operational Cumulative Impacts

The 2006 LRDP Final EIR evaluated the cumulative effects on air quality from 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 (see **Section 5.11** below). Therefore, the proposed project's cumulative criteria air pollutant effects are adequately addressed under LRDP Impact AQ-5 and are determined to be less than significant. Taking into consideration the present-day setting and the current cumulative context, this analysis finds that 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.

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 BAAQMD significance threshold has changed, as further described below. The 2006 LRDP Final 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 proposed 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 Final EIR. The 2006 LRDP Final EIR noted that even with the implementation of **LRDP Mitigation Measure TRANS-1c** (TDM program measure) 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 earlier in this section, the BioEPIC 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 BioEPIC project would generate on-site TAC emissions and traffic TAC emissions which would contribute to this significant cumulative impact. Although **LRDP Mitigation Measure AQ-1b** (intersection signalization measure) and **LRDP Mitigation Measure TRANS-1c** are incorporated as standard project features of the proposed project and would reduce TAC emissions, there would still be vehicular TAC emissions as a result of the proposed project. The proposed project would result in a cumulative impact related to TACs that would be significant and unavoidable when compared against the standard of significance utilized in the 2006 LRDP Final EIR; this impact is adequately analyzed in the 2006 LRDP Final EIR and was fully addressed in the Findings and Statement of Overriding Considerations adopted by The Regents in connection with its approval of the 2006 LRDP.

As noted above, in 2010 and in 2017, 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 BioEPIC project.

5.3.5 Changes to Circumstances or New Information that could affect the earlier Environmental Analysis

As noted above under item **a**, in 2010, the BAAQMD updated the CEQA *Air Quality Guidelines,* including new thresholds and approaches for the evaluation of air quality impacts. The *CEQA Air Quality Guidelines* were updated most recently in 2017. As the evaluation above shows, the analysis of project-level and cumulative impacts from construction and operational activities in the 2006 LRDP EIR is still valid and the conclusions remain unchanged. The one exception is the cumulative cancer risk impact from TAC emissions, which is less than significant under the current BAAQMD cumulative impact significance threshold of 100 in 1 million. The changes in the thresholds and analytical methods do not alter the significance of the previously analyzed impacts other than with regard to the cumulative cancer risk impact from TAC emissions, which is less than significant under the new BAAQMD guidance, and it therefore does not constitute significant new information.

Because of increased concern regarding human health effects from exposure to diesel particulate matter emissions from LBNL-related construction truck traffic generally, in 2009 LBNL

conducted an evaluation of the potential cancer and non-cancer risk to sensitive receptors located along the truck routes between the Lab site and the nearest freeway (I-80). This risk assessment included all construction truck trips associated with reasonably foreseeable construction projects on the Lab site, including an eight-story building (S-3) on the project site, and reasonably foreseeable construction projects on the UC Berkeley campus. The study concluded that the maximum lifetime excess cancer risk to receptors along the truck routes from exposure to construction truck diesel particulate matter from all truck trips combined would be 2 in one million, which is well below the BAAQMD's project-level cancer risk threshold of 10 in one million and substantially below the BAAQMD's cumulative cancer risk threshold of 100 in one million. Similarly, the study estimated the non-cancer chronic hazard index (HI) to be 0.003, which is also substantially below the BAAQMD threshold of an HI of 1.0 (Golder Associates 2009). Therefore, the cumulative impact from construction truck trips, including the truck trips associated with the eight-story building (S-3) on the project site, on human health would be less than significant. This analysis was conducted after 2006 LRDP Final EIR certification, but it does not identify any new or substantially more severe, significant impacts. The 2006 LRDP Final EIR concluded that, with implementation of **LRDP Mitigation Measure AQ-4**, the risks from potential TACs emissions due to LRDP-related development would be less than significant; it does not constitute significant new information.

5.4 Biological Resources

5.4.1 Background

Section IV.C of the 2006 LRDP Final EIR addresses the effects on biological resources from LBNL growth and development under the 2006 LRDP and is incorporated by reference herein pursuant to *State CEQA Guidelines* Section 15150. The following discussion summarizes the information presented in the 'Setting' subsection of Section IV.C of the 2006 LRDP Final EIR as it relates to the proposed project.

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 oak and mixed hardwood forests, native and non-native grasslands, chaparral, coast and riparian scrub, marsh and wetland communities, 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 oak and California bay. Coast live oak woodland occurs on over 9 acres at LBNL. California bay woodland occurs on 5.5 acres of the hill site and is concentrated mainly in drainages. Coastal scrub occurs on approximately 8.5 acres of the LBNL hill site 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 Final 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 BioEPIC project site is located in the Bayview Planning Area, a 6.6-acre plateau that has been graded, paved, and otherwise disturbed in conjunction with previous development. The BioEPIC project site was formerly associated with the Bevatron accelerator facility complex and now serves as a paved parking lot and storage area. There is no natural habitat present on the project site. However, there are trees bordering the project site along the south, west, and northeast sides.

5.4.2 2006 LRDP EIR Analysis

Impacts on biological resources from LBNL hill site growth under the 2006 LRDP are evaluated in Section IV.C of the 2006 LRDP Final EIR, which is incorporated herein by reference. The 2006

LRDP Final EIR analysis concluded that all impacts to biological resources would either be less than significant or would be reduced to a less than significant level with mitigation.

The proposed project is within the scope of analysis of the 2006 LRDP Final EIR. Relevant mitigation measures in the 2006 LRDP Final EIR (now standard project features for projects under the LRDP) have been incorporated as part of the planning and design of the proposed project and will be implemented during project construction and operations consistent with LRDP mitigation monitoring requirements.

5.4.3 Environmental Checklist and Discussion

BIOLOGICAL RESOURCES Would the project…	Additional Project-Level Impact Analysis Required	No Further Environmental Document Required
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☐	☑
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Wildlife or US Fish and Wildlife Service?	☐	☑
c) Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☑
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☑
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☑
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?	☐	☑

DISCUSSION:

BioEPIC Project Analysis

a. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service? No Further Environmental Document Required.

Potential impacts to nesting raptors and special-status bats from construction activities are addressed under LRDP Impacts BIO-3 and BIO-4 (pages IV.C-44 through IV.C-49). The project site does not contain any natural habitat, including trees, suitable for nesting birds and does not contain any existing structures that could provide habitat for special-status bat species. However, the noise and vibration generated by construction activities could adversely affect nesting raptors that may be present in the trees adjacent to the project site. **LRDP Mitigation Measure BIO-3** (nesting bird measure) was adopted as part of the 2006 LRDP and would be implemented as a standard project feature of the proposed project. Therefore, the proposed project's impact on nesting birds would be less than significant. Similarly, special-status bats potentially roosting in trees and buildings adjacent to the project site could be disturbed by noisy construction activity such as concrete breaking. **LRDP Mitigation Measure BIO-4** (roosting bat measure) was adopted as part of the 2006 LRDP and would be implemented as a standard project feature of the proposed project, and the proposed project's impact on special status bats would be less than significant. Therefore, the proposed project's impacts on nesting birds and bats are adequately addressed under LRDP Impacts BIO-3 and BIO-4 and would be less than significant with standard project features.

Potential impacts on the Alameda whipsnake and special-status plant species are addressed under LRDP Impact BIO-5 (page IV.C-49) and Impact BIO-6 (page IV.C-54) respectively. The project site does not contain any natural habitat that could support Alameda whipsnake or special-status plant species. No impacts would occur to these species.

b. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service? No Further Environmental Document Required.

LRDP Impact BIO-2 (page IV.C-41) discusses the potential for the 2006 LRDP development to affect drainages or riparian habitat. There are no existing drainages or other sensitive communities on the project site that could be affected by the proposed project. There would be no impact.

c. Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means? No Further Environmental Document Required.

LRDP Impact BIO-2 (page IV.C-41) discusses the potential for the 2006 LRDP development to affect wetlands. There are no state or federally protected wetlands on the project site. There would be no impact.

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? No Further Environmental Document Required.

The project site is in a developed portion of the Berkeley Lab and is not part of a migratory corridor or nursery site to any native resident or migratory species. There would be no impact.

e. Conflict with any applicable policies protecting biological resources? No Further Environmental Document Required.

Policies protecting biological resources applicable to the proposed project are contained in the LBNL 2006 LRDP within the Open Space Framework. There is no designated or natural open space on or adjacent to the project site. As described above, there are no trees that would be removed during construction of the project. The project would have no impact related to conflict with policies protecting biological resources.

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? No Further Environmental Document Required.

No Habitat Conservation Plans or Natural Community Conservations Plans have been adopted that encompass the project area. Therefore, no impact would occur.

5.4.4 Analysis of Cumulative Impacts in 2006 LRDP EIR

As concluded in the 2006 LRDP Final 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. Taking into consideration the present-day setting and the current cumulative context, this analysis finds that no conditions have changed, and no new information has become available since certification of the 2006 LRDP Final 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.

5.4.5 Changes to Circumstances or New Information that could affect the Earlier Environmental Analysis

There are no changes in circumstances and no new information related to biological resources has become available since the certification of the 2006 LRDP Final EIR that would alter the previous analyses and change its conclusions.

5.5 Cultural Resources

5.5.1 Background

Section IV.D of the 2006 LRDP Final EIR addresses the effects on cultural resources from LBNL growth and development under the 2006 LRDP and is incorporated by reference herein pursuant to *State CEQA Guidelines* Section 15150. The following discussion summarizes the information presented in the 'Setting' subsection of Section IV.D of the 2006 LRDP Final EIR.

LBNL hill site history presented in the 2006 LRDP Final EIR was 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 Final 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 archaeological resources survey, no indications of prehistoric archaeological resources were encountered in any location on the LBNL hill site. Preliminary findings of the historic resources survey suggest that Building 71, located north of the project site, and Building 88, located southwest of the project site, may be eligible for listing in the National Register.

Recent Studies of Archaeological Resources

Field surveys and archival research at the California Historical Resources Information System's Northwest Information Center have been undertaken a number of times since 2006 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

The BioEPIC project site is located in an area that has previously been graded, filled, and disturbed. The site is currently used as a parking and storage area. Project excavation would be

minimal and would mostly disturb previous fill deposited during the late 1940s and early 1950s to support Bevatron construction.

5.5.2 2006 LRDP EIR Analysis

Impacts on cultural resources from LBNL growth and development under the 2006 LRDP are evaluated in Section IV.D of the 2006 LRDP Final EIR and incorporated herein by reference.

The proposed project is within the scope of analysis of the 2006 LRDP Final EIR. Relevant mitigation measures in the 2006 LRDP Final EIR (now standard project features for projects under the LRDP) have been incorporated as part of the planning and design of the proposed project and will be implemented during project construction and operations consistent with LRDP mitigation monitoring requirements.

5.5.3 Environmental Checklist and Discussion

CULTURAL RESOURCES Would the project…	Additional Project-Level Impact Analysis Required	No Further Environmental Document Required
a) Cause a substantial adverse change in the significance of a historical resource pursuant to Section 15064.5?	☐	☑
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5?	☐	☑
c) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☑

DISCUSSION:

BioEPIC Project Analysis

a. Cause a substantial adverse change in the significance of a historical resource pursuant to §15064.5? No Further Environmental Document Required.

As described under LRDP Impact CUL-2 (page IV.D-15), implementation of the 2006 LRDP would allow demolition of buildings and structures that have been found to be ineligible for listing on the National Register individually or as a historic district. The 2006 LRDP Final EIR also evaluated the potential for adverse changes to the significance of historical resources (including making conservative assumptions about potential historical resources that had not yet been discovered or evaluated for their historical significance) under LRDP Impact CUL-1 (page IV.D-13) and found the impact to be significant and unavoidable. These impacts do not apply to the proposed project as there are no buildings or other historic structures on the project site. The proposed project does not involve demolition or alteration of existing buildings. There would be no impact related to historical resources.

b. Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5? No Further Environmental Document Required.

LRDP Impact CUL-3 analyzes the potential that undiscovered archaeological resources could be disturbed or destroyed during an activity under the 2006 LRDP (LRDP Impact CUL-3, page IV.D-16). To minimize impacts to undiscovered archaeological resources, **LRDP Mitigation Measure CUL-3**, which requires work stoppage and archaeological assessment in the event of a discovery, was adopted as part of the 2006 LRDP. The proposed project is within the scope of the 2006 LRDP and **LRDP Mitigation Measure CUL-3** (archaeological artifacts measure) would be implemented as a standard project feature of the proposed project. Furthermore, there is a very low potential that undiscovered archaeological resources could be discovered during construction of the proposed building because the project site was previously disturbed, was filled during the late 1940s and early 1950s, and, further, would be excavated prior to BioEPIC project construction by the approved Bayview Parcel-1 Cleanup project. The BioEPIC project's impact is adequately addressed under LRDP Impact CUL-3 and would be less than significant with employment of standard project features.

c. Disturb any human remains, including those interred outside of formal cemeteries? No Further Environmental Document Required.

LRDP Impact CUL-4 analyzes the potential that previously unknown human remains could be disturbed or destroyed during an activity under the 2006 LRDP (LRDP Impact CUL-4, page IV.D-18). The potential for such encounters at LBNL is considered low as per the 2006 LRDP Final EIR cultural resources analysis; it is even less likely at the BioEPIC project site for reasons explained above under **Section 5.5.1**. As stated under LRDP Impact CUL-4, in the unlikely event that human remains are discovered during project construction, **LRDP Mitigation Measure CUL-4** (human remains measure), which provides for work stoppage and appropriate treatment and Native American involvement, would be implemented. The proposed project is within the scope of the 2006 LRDP, and **LRDP Mitigation Measure CUL-4** would be implemented as a standard project feature of the proposed project. Therefore, the proposed project's impact is adequately addressed under LRDP Impact CUL-4 and would be less than significant with standard project features.

5.5.4 Analysis of Cumulative Impacts in 2006 LRDP EIR

As concluded in the 2006 LRDP Final EIR (page IV.D-20), implementation of the 2006 LRDP would not combine with other cumulative projects to change to the significance of historical resources at the LBNL hill site. Furthermore, 2006 LRDP implementation would not adversely affect historic resources that exist either independently or in combination with other historic resources at or around the LBNL hill site (LRDP Impact CUL-5). Taking into consideration the present-day setting and the current cumulative context, this analysis finds that no conditions have changed, and no new information has become available since certification of the 2006 LRDP Final EIR that would alter this previous analysis. As noted above, the proposed project would not affect any historical resources. Therefore, it would not contribute to any cumulative impact on historic resources.

5.5.5 Changes to Circumstances or New Information that could affect the Earlier Environmental Analysis

There are no changes in circumstances and no new information related to cultural resources has become available since the certification of the 2006 LRDP EIR that would alter the previous analyses and change its conclusions.

5.6 Energy

5.6.1 Background

Although the 2006 LRDP Final EIR did not explicitly analyze impacts from wasteful consumption of energy resources, Section IV.M of the 2006 LRDP Final EIR addresses the effects of LBNL growth under the 2006 LRDP on utility systems, including energy use, that serve the LBNL hill site and is incorporated by reference herein pursuant to *State CEQA Guidelines* Section 15150.

As part of the NERSC-9 Project EIR, the 2017 Supplement reevaluated energy impacts that would result from growth under the 2006 LRDP. The following discussion summarizes the information presented in the 2006 LRDP Final EIR and the 2017 Supplement.

Electricity: UC LBNL purchases electricity from the Western Area Power Administration. Electricity is delivered to the LBNL's Grizzly Peak Substation via the PG&E transmission system. The total electrical power consumption in 2006 at LBNL was 74,500 megawatt hours. LBNL also has a number of stationary and portable emergency power generators that are powered by diesel, gasoline, or natural gas.

Natural Gas: Natural gas is used on the LBNL hill site for heating all 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 on the site. Two buildings (Buildings 73 and 73A) in the eastern portion of LBNL are served by another PG&E line located along Centennial Drive.

5.6.2 2006 LRDP EIR Analysis, including the 2017 Supplement

Impacts on energy resources from LBNL growth and development under the 2006 LRDP are evaluated in Section IV.M of the 2006 LRDP EIR and incorporated herein by reference. In 2017, LBNL prepared a Supplement to the 2006 LRDP EIR that recalculated the amount of energy resources (electricity and natural gas) that would be used by new buildings on the LBNL hill site, as well as a projected increase in petroleum-based fuel use under the 2006 LRDP through 2025, and reevaluated energy impacts of the 2006 LRDP. The analysis concluded that implementation of the 2006 LRDP would increase the use of energy resources at the Berkeley Lab, but would not result in wasteful, inefficient, or unnecessary consumption of energy resources. No mitigation measures were identified in the 2017 Supplement.

The proposed project is within the scope of analysis of the 2006 LRDP EIR and the 2017 Supplement. Relevant mitigation measures in the 2006 LRDP EIR (now standard project features for projects under the LRDP) have been incorporated as part of the planning and design of the proposed project and will be implemented during project construction and operations consistent with LRDP mitigation monitoring requirements.

5.6.3 Environmental Checklist and Discussion

Energy Would the project…	Additional Project-Level Impact Analysis Required	No Further Environmental Document Required
a) Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?	☐	☑
b) Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?	☐	☑

Discussion:

BioEPIC Project Analysis

a. Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?

Construction Impacts

Project construction would require demolition, site preparation, grading, building construction, paving, and architectural coating. All construction would be typical for the region and building type. During construction, energy would be consumed in the form of petroleum-based fuels (i.e., gasoline and diesel) used to power off-road construction vehicles and equipment on the project site, for construction worker travel to and from the project site, as well as for delivery truck trips; and to operate generators to provide temporary power for lighting and electronic equipment. The manufacturing of construction materials used by the proposed project would also involve energy use. Due to the large number of materials and manufacturers involved in the production of construction materials (including manufacturers in other states and countries), upstream energy use cannot be reasonably estimated. However, it is reasonable to assume that manufacturers of building materials such as concrete, steel, etc., would employ all reasonable energy conservation practices in the interest of minimizing the cost of doing business. Furthermore, UC LBNL does not have control over or the ability to influence energy resource use by the manufacturers of construction materials. Therefore, this analysis does not evaluate upstream energy use.

The average annual and total consumption of gasoline and diesel fuel during project construction was estimated using the same assumptions and factors from CalEEMod that were used in estimating construction air emissions in **Section 5.2, Air Quality**. As shown in **Table 5, Construction Period Petroleum Fuel Consumption**, a total of approximately 54,897 gallons of diesel fuel and 6,082 gallons of gasoline would be consumed over the project's construction horizon, or approximately 27,449 gallons of diesel fuel, and 3,041 gallons of gasoline annually (see **Appendix B** for detailed breakdown).

Table 5
Construction Period Petroleum Fuel Consumption

Diesel Fuel (in gallons)[a]	Gasoline (in gallons)[b]
54,897	6,082

Source: CalEEMod Model Data; Impact Sciences 2019
Note:
a. Includes consumption from off-road construction equipment, vendor trips, and hauling trips.
b. Includes consumptions from worker trips.

The estimated amounts of energy resources reported in **Table 5** would be consumed over a period of 24 months and would represent a small percentage of the total energy used in the state. More importantly, for reasons presented below, this consumption would not represent a wasteful and inefficient use of energy resources.

There is growing recognition among developers and retailers that sustainable construction is not more expensive than "business as usual" construction methods, and further, that there are long-term significant cost-savings potential in utilizing green building practices and materials. In addition, the proposed project would feature a sustainable design to comply with CALGreen and CHPS, which would result in the use of sustainable materials and recycled content that would reduce energy consumption during project construction. Construction materials would include recycled materials and products originating from nearby sources to the extent feasible in order to comply with CALGreen and to reduce costs of transportation.

Worker trips, included in the estimates in **Table 5** above, are expected to vary by phase; however, trips would be temporary and would occur over the 24-month timeframe of construction activity. As these trips would be temporary, they would not be wasteful or inefficient use of energy. CARB has adopted Title 13 Section 2485, an Airborne Toxic Control Measure (ATCM), to limit diesel motor vehicle idling in order to reduce public exposure to diesel particulate matter and other toxic air contaminants. All diesel-fueled commercial heavy- and medium-duty vehicles are required to comply with these measures. The ATCM requires that construction idling times shall be minimized either by shutting equipment off when not in use or limiting the maximum idling time to five minutes. It also requires that all construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications and that all equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation. Idling restrictions and the use of newer engines and properly maintained equipment would result in less fuel combustion and energy consumption. Furthermore, contractors and owners have a strong financial incentive to avoid wasteful, inefficient, and unnecessary consumption of energy during construction.

Construction activities would not consume measurable amounts of electricity or natural gas. Although construction would consume fuel energy resources, construction activities would be

temporary and would cease at the end of construction. Therefore, there would be no long-term energy impacts associated with construction activities and the proposed project would not involve the inefficient, wasteful, and unnecessary use of energy during construction.

Operational Impacts

The proposed project would use electricity for the operation of the BioEPIC building and for on-road vehicle trips (gasoline and diesel fuel) generated by the proposed project. The proposed project would be responsible for conserving energy, to the extent feasible, and relies heavily on reducing per capita energy consumption to achieve this goal, including through Statewide and local measures.

Electricity and Natural Gas

Electricity would be used for light and space heating in the BioEPIC building. No natural gas would be used. Total annual electricity (kWh) usage associated with the operation of the proposed project is estimated to be approximately 3,295,995 kWh/year. This annual usage is well within the increase in electricity use for the Lab that was estimated and analyzed in the 2017 Supplement. As set forth in the updated energy analysis in the 2017 Supplement, the electricity use associated with Lab development under the 2006 LRDP would not involve inefficient, wasteful, or unnecessary use of energy resources. As the proposed project is within the scope of the previous analysis, the proposed project's impact on energy resources would also be less than significant. Furthermore, the proposed project incorporates the measures such as meeting or exceeding Title 24 energy requirements, installing high efficiency lighting, and a percentage of electricity utilized would be renewable energy to reduce the proposed project's operational electricity.

In compliance with the Berkeley Lab's sustainability policy, the BioEPIC building would attain a minimum of a Gold rating within the LEED v4 program. Energy efficiency would be accomplished within the building design through responsive lighting controls, daylighting elements, and sensitivity towards equipment selection.

In order to confirm as-operated building performance and to achieve a high-performing building, meters would be installed for each building utility use such as electricity, water, chilled water, hot water, and natural gas. Major energy using systems would have metering and monitoring for all energy flows and associated sensor points to verify these flows. End-use metering for electrical systems would also be used for all major energy end-uses such as HVAC, lighting, lab versus office plug-loads, and utility corridors. Renewable energy systems such as PV would also have associated metering and monitoring capabilities.

The BioEPIC building design strategy also includes daylighting to save energy by reducing or eliminating the need for electric lighting systems during daylight hours. Other energy efficiency components include use of ceiling fans and operable windows to ensure sufficient local air movement, to help expand the thermal comfort range and facilitate the creation of a thermally comfortable environment with only passive and low-energy technology.

Petroleum-Based Fuel

The proposed project would result in the consumption of petroleum-fuel related to vehicular travel (quantified as vehicle miles travelled (VMT) to and from the project site. **Table 6, Estimated Petroleum-based Fuel Usage at Buildout**, below, presents the projected consumption of approximately 16,192 gallons of diesel and 28,429 gallons of gasoline per year, or a total of 44,621 gallons of petroleum-based fuels per year based on an annual estimate of 634,029 VMT[12] obtained from the CalEEMod results for the proposed project. This 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 6**. It is anticipated that state laws and regulations will continue to require further improvements in fuel efficiency in motor vehicles produced and/or sold in California and so the total annual consumption of petroleum-based fuel is expected to decrease over time. The project-related increase in petroleum-based fuel usage is within the increase in petroleum-based fuel usage calculated and analyzed in the 2017 Supplement. As set forth in the updated energy analysis in the 2017 Supplement, the petroleum-based fuel use associated with Lab development under the 2006 LRDP would not involve inefficient, wasteful, or unnecessary use of energy resources. As the proposed project is within the scope of the previous analysis, the proposed project's impact on petroleum-based fuel resources would also be less than significant.

California consumed a total of 15.1 billion gallons of gasoline (non-diesel) and 1.6 billion gallons of diesel fuel in the year 2015 (CEC 2018b). As shown in **Table 6** below, residents of the proposed project would use approximately 28,429 gallons of gasoline and 16,192 gallons of diesel. This would represent approximately 0.002 percent of the statewide annual gasoline consumption and approximately 0.001 percent of the statewide annual diesel consumption. This supports a conclusion that the project's use of energy would not be wasteful or inefficient.

Table 6
Estimated Petroleum-based Fuel Usage at Project Buildout

Source	Fleet Mix[a]	Generation Factor[b, c]	Annual Consumption (in gallons)
Mobile			
Diesel (gallons)	16.6%	634,029/6.5 mpg	16,192
Gasoline (gallons)	83.4%	634,029/18.6 mpg	28,429
		Total	**44,621**

Source: CalEEMod Model Data; Impact Sciences 2019
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

12 CalEEmod default trip lengths were used which is an average trip length of approximately 9.5 miles.

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

b. Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?

The proposed project would comply with Title 24. 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. The proposed project is required to comply with Title 24, and therefore would be consistent with the state's plan for energy efficiency. Furthermore, the proposed project would include features to minimize energy consumption overall, many of which are mandated by the CALGreen and CHPS. These features would further reduce the amount of electricity and natural gas consumed as a result of the proposed project. Consistent with the characteristics of other buildings on the LBNL site, the BioEPIC project would also include a number of additional energy efficient features as detailed above. Because the proposed project would be consistent with Title 24, this impact would be less than significant.

5.6.4 Analysis of Cumulative Impacts in the 2006 LRDP EIR

The 2006 LRDP Final EIR analyzed the cumulative impact on energy resources under LRDP Impact UTILS-6. According to that analysis, other foreseeable development in the City of Berkeley and in the area surrounding the Lab hill site would contribute to cumulative increases in 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 energy resources associated with the 2006 LRDP would not be expected to represent a substantial increase in demand, and existing energy systems would be expected to handle growth anticipated under the 2006 LRDP. Taking into consideration the present-day setting and the current cumulative context, this analysis finds that 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 the 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.

5.6.5 Changes to Circumstances or New Information that could affect the Earlier Environmental Analysis

Changes to the *State CEQA Guidelines* have occurred since the 2006 LRDP Final EIR. The new guidelines released in 2018, in recognition of the state's need to specifically address energy resources, have separated energy into its own focused section to be analyzed separately. However, the 2006 LRDP Final EIR, under section IV.M, and the 2017 Supplement fully address the impacts of the 2006 LRDP related to energy resources. None of the guideline changes have altered the previous analyses or changed the conclusions.

5.7 Geology/Soils

5.7.1 Background

Section IV.E of the 2006 LRDP Final EIR addresses the effects related to geology and soils from LBNL growth and development under the 2006 LRDP and is incorporated by reference herein, pursuant to *State CEQA Guidelines* Section 15150. The following discussion summarizes the information presented in the 'Setting' subsection of Section IV.E of the 2006 LRDP Final EIR.

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 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 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 LBNL hill 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 Magnitude 6.7 on the Hayward-Rodgers Creek Fault system by 2032 and a 21 percent chance of an earthquake of Magnitude 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 BioEPIC project site is located in the west-central part of the LBNL hill site on a 6.6-acre plateau known as the Bayview Planning Area. The site is vacant, graded, and largely paved and currently serves as a parking and storage area. The eastern side of the site is bound by a moderately up-sloped area. The soil underlying the site is characterized as Maymen loam, which are well-drained soils that generally allow for rapid runoff of precipitation and are highly susceptible to erosion (LBNL 2007). However, these soils are no longer present (or have been heavily disturbed and redistributed) as the site was graded, filled, and paved or covered with hardscape in conjunction with the construction of the buildings that were previously on the project site.

5.7.2 2006 LRDP EIR Analysis

Impacts related to geology and soils from LBNL growth and development under the 2006 LRDP are evaluated in Section IV.E of the 2006 LRDP Final EIR and incorporated herein by reference. Section IV.D of the 2006 LRDP EIR discusses impacts with regards to paleontological resources and is incorporated herein by reference. The 2006 LRDP Final EIR analysis concluded that all impacts related to geology and soils would either be less than significant or would be reduced to a less than significant level with mitigation.

The proposed project is within the scope of analysis of the 2006 LRDP EIR. Relevant mitigation measures in the 2006 LRDP Final EIR (now standard project features for projects under the LRDP) have been incorporated as part of the planning and design of the proposed project and will be implemented during project construction and operations consistent with LRDP mitigation monitoring requirements.

5.7.3 Environmental Checklist and Discussion

GEOLOGY and SOILS Would the project…	Additional Project-Level Impact Analysis Required	No Further Environmental Document Required
a) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:		
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☑
ii) Strong seismic ground shaking?	☐	☑
iii) Seismic-related ground failure, including liquefaction?	☐	☑
iv) Landslides?	☐	☑
b) Result in substantial soil erosion or the loss of topsoil?	☐	☑
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☑
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?	☐	☑

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?	☐	☑
f)	Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☑

DISCUSSION:

BioEPIC Project Analysis

a. i-iv. Directly or indirectly cause 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? Strong seismic ground shaking? Seismic-related ground failure, including liquefaction? Landslides? No Further Environmental Document Required.

The 2006 LRDP Final EIR evaluated the potential for seismic-related impacts to life and property from the growth and development under the 2006 LRDP (LRDP Impacts GEO-1 and GEO-2, pages IV.E-21 and IV.E-23). The 2006 LRDP Final EIR concluded that individual projects under the 2006 LRDP, such as those included in the Illustrative Development Scenario, would expose people and structures to seismic hazards. The project site is not within a designated Earthquake Fault Zone, which indicates that there is a low potential for fault rupture on the project site. Furthermore, the project site is flat and underlain by compacted cohesive soils and bedrock and therefore there is a very low potential for seismic related ground failure including liquefaction.

LRDP Mitigation Measure GEO-2 (seismic hazards measure), which requires a site-specific, design-level geotechnical investigation to occur during the design of any proposed buildings and for geotechnical recommendations to subsequently be incorporated into building design, was adopted as part of the 2006 LRDP and is a standard project feature of the proposed project. Pursuant to **LRDP Mitigation Measure GEO-2**, a geotechnical investigation was completed in July 2019.

In general, the BioEPIC site is considered relatively free of geologic hazards except for earthquake ground shaking, a hazard shared throughout the region (A3GEO 2019). The Berkeley Lab is located within the seismically active San Francisco Bay Area and it is virtually certain that the site will experience strong earthquake shaking during BioEPIC's useful life. The direct effects of earthquake ground motions on structures are addressed through the structural design provisions of the California Building Code (CBC).

The closest known active fault is the Hayward fault, the nearest trace of which is mapped (CDMG, 1982) about 1,000 feet west of the site. The various other faults that have been mapped closer to the site (including the contact between Great Valley Sequence and Orinda Formation rocks) are not considered active. The BioEPIC site is well outside of the official Alquist-Priolo Fault Hazard Zone that surrounds the Hayward fault. According to the geotechnical

investigation, the overall potential for significant fault related offsets to occur at the BioEPIC site is very low to negligible (A3GEO 2019).

The fill that underlies the BioEPIC site is predominantly cohesive and was compacted under intermittent engineering control. Borings drilled in the vicinity of the site generally indicate that the fill is underlain by colluvium comprising soils that are predominantly cohesive and Orinda Formation rock. Accordingly, the potential for significant liquefaction or densification to occur beneath the BioEPIC site is essentially nil (A3GEO 2019).

Geotechnical recommendations were made as part of the geotechnical investigation. These include seismic design so structures resist strong earthquake shaking in accordance with applicable building code. These recommendations would reduce impacts from seismic hazards. The proposed project's impact is adequately addressed under LRDP Impact GEO-2 and the impact would be less than significant with standard project features.

b. Result in substantial soil erosion or the loss of topsoil? No Further Environmental Document Required.

LRDP Impact GEO-3 (page IV.E-25) analyzed erosion associated with excavation, grading, and construction under the 2006 LRDP. The 2006 LRDP Final EIR concluded that individual construction projects under the 2006 LRDP, such as those included in the Illustrative Development Scenario, would involve excavation and grading that could result in soil erosion, which would be a significant impact. Although the project site has been previously disturbed, project construction activities (i.e., excavation, grading) could result in increased rates of erosion. The proposed project would disturb approximately 1 acre and, therefore, would be required by state law to obtain coverage under the State Construction General Permit prior to construction. As required, a Storm Water Pollution Prevention Plan (SWPPP) would be developed and implemented during construction to minimize sedimentation and contamination of storm water runoff generated by the project. The SWPPP would specify Best Management Practices to prevent erosion and sedimentation of runoff water and to keep construction pollutants from coming into contact with storm water. **LRDP Mitigation Measures GEO-3a** (construction erosion measures) and **GEO-3b** (revegetation measures), which were adopted as part of the LRDP and would be implemented as standard project features of the proposed project, include construction management practices to minimize erosion impacts to a less than significant level. The proposed project's impact is adequately addressed under LRDP Impact GEO-3 and the impact would be less than significant with standard project features.

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? No Further Environmental Document Required.

LRDP Impact GEO-3 (page IV.E-25) also includes a discussion of potential impacts related to unstable soils resulting from implementation of the 2006 LRDP. As discussed, implementation of the 2006 LRDP could lead to development on areas of unstable or unsuitable soils. The 2006 LRDP Final EIR concluded that compliance with California Building Code standards and **LRDP Mitigation Measures GEO-2**, **GEO-3a**, and **GEO-3b** would reduce potential impacts on new development from expansive and unstable soils to a less than significant level. The previously developed project site is flat and underlain by existing fill materials placed during the initial

grading of the Bevatron flat in 1949 and in association with the Bevatron Demolition Project between 2009 and 2012. No landslide deposits are present within the site. The LRDP Final EIR shows in figure IV.E-2 that the CGS has not designated any portion of the LBNL as a Seismic Hazard Zone for liquefaction. Although soils in some portions of the BioEPIC site could be moderately to highly expansive, those would be over-excavated and removed per the recommendations of the project-specific geotechnical investigation. Furthermore, **LRDP Mitigation Measures GEO-3a** and **GEO-3b**, which require hydroseeding to establish grasses for erosion control, primarily during construction, and revegetation of disturbed areas to stabilize disturbed areas, would be implemented as standard project features of the proposed project. Therefore, the proposed project's impact is adequately addressed under LRDP Impact GEO-3 and would be less than significant with standard project features.

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? No Further Environmental Document Required.

See item "**c**" above for analysis.

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? No Further Environmental Document Required.

The Initial Study prepared as part of the 2006 LRDP Final EIR scoping process concluded that development on the LBNL hill site would have no impact related to septic systems. The project site is served by a sanitary sewer system and would not require the use of septic tanks or alternative wastewater disposal systems. There would be no impact related to septic disposal systems.

f. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

The LRDP Initial Study found that growth and development under the 2006 LRDP would not have a significant impact on a unique paleontological resource or site or a unique geologic feature at LBNL. During the course of development at the LBNL hill site, extensive excavation for buildings and infrastructure has not revealed the presence of unique paleontological or geologic resources, and thus implementation of the 2006 LRDP, including the proposed project, would not affect such resources. There would be no impact.

5.7.4 Analysis of Cumulative Impacts in 2006 LRDP EIR

The 2006 LRDP Final EIR concluded that growth and development under the 2006 LRDP, when combined with cumulative growth, would increase the population exposed to geologic and seismic hazards (LRDP Impact GEO-4, page IV.E-27). Construction in conformance with the California Building Code, local building codes, where applicable, and other pertinent regulations and guidelines would reduce the risks of injury and structural damage from ground shaking, earthquake-induced landsliding, and other seismic and geologic hazards to a less than significant level. The 2006 LRDP Final EIR concluded that individual projects under the LRDP, such as those included in the Illustrative Development Scenario, would expose people and structures to seismic hazards, but that their cumulative impact would be less than significant for the same reasons.

Taking into consideration the present-day setting and the current cumulative context, this analysis finds that no conditions have changed and no new information has become available since certification of the 2006 LRDP Final EIR that would alter this previous analysis. The proposed project, which involves the construction of a four-story building, would potentially expose additional people and structures at the project site to geologic or seismic hazards; however, this impact was previously analyzed in the 2006 LRDP Final EIR. Furthermore, the majority of this population is already exposed to similar hazards at their existing on- and off-site LBNL locations and would not be subject to substantially increased hazards at this site. The proposed building and population associated with the BioEPIC project are within the scope of the 2006 LRDP. Furthermore, with implementation of standard project features **LRDP Mitigation Measures GEO-2**, **GEO-3a**, and **GEO-3b**, and with the Lab's compliance with regulations related to emergency response and construction worker safety, the proposed project's contribution to the cumulative impact would not be considerable and the proposed project's cumulative impact would be less than significant.

5.7.5 Changes to Circumstances or New Information that could affect the Earlier Environmental Analysis

There are no changes in circumstances and no new information related to geology and soils has become available since the certification of the 2006 LRDP Final EIR that would alter the previous analyses and change its conclusions.

5.8 Greenhouse Gas Emissions

5.8.1 Background

Section IV of the 2006 LRDP Final EIR addresses the greenhouse gas (GHG) emissions associated with LBNL growth under the 2006 LRDP and is incorporated by reference herein, pursuant to *State CEQA Guidelines* Section 15150. The 2006 LRDP Final EIR evaluated the increase in global warming–associated gases associated with the 2006 LRDP in response to a comment raised on the Draft EIR.

As part of the NERSC-9 Project EIR, the 2017 Supplement reevaluated the impact from GHG emissions that would result from growth under the 2006 LRDP. The following discussion summarizes the information presented in the 2006 LRDP Final EIR and the 2017 Supplement.

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 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 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.

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 SSP for fiscal year 2018 (FY 2018), covering the period from October 2017 through September 2018. 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.

Project Site

Motor vehicles and commercial boilers are the primary sources of GHG emissions in the vicinity of the project site. Other sources of GHG emissions in the vicinity of the project site include emergency generators associated with various existing buildings.

5.8.2 2006 LRDP EIR Analysis

The 2006 LRDP Final EIR evaluated the increase in GHGs associated with the 2006 LRDP in response to a comment raised on the Draft EIR. The Final EIR explained that while the 2006 LRDP would result in "incremental increases" in GHGs, they would be neither substantial nor significant due to the LRDP's numerous features that would reduce overall emissions:

> *Qualitatively… 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…New construction at the Lab would also be required to meet California Energy Efficiency Standards in the state Building Code…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.*

The Final EIR explained that these LRDP features support the EIR's conclusion that the 2006 LRDP's contribution to climate change "would not be cumulatively considerable, and the cumulative impact of the project would therefore be less than significant."

Since the 2006 LRDP, Berkeley Lab has adopted a policy setting sustainability standards for new construction, which further reduces GHG emissions associated with projects at the Lab.

In 2017, LBNL reevaluated the impacts from GHG emissions from growth and development under the 2006 LRDP. The 2017 Supplemental analysis replaced the previous 2006 LRDP Final EIR analysis, and concluded that that impacts would be less than significant after mitigation measures were incorporated.

The proposed project is within the scope of analysis of the 2017 Supplement. Relevant mitigation measures in the 2017 Supplement that are standard features of the 2006 LRDP have been incorporated as part of the planning and design of the proposed project and will be implemented

during project construction and operations consistent with LRDP mitigation monitoring requirements.

5.8.3 Environmental Checklist and Discussion

GREENHOUSE GAS EMISSIONS Would the project…	Additional Project-Level Impact Analysis Required	No Further Environmental Document Required
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☑
b) Conflict with an applicable plan, policy, or regulation adopted for the purpose or reducing the emissions of greenhouse gases?	☐	☑

DISCUSSION:

BioEPIC Project Analysis

a. Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment? No Further Environmental Document Required.

Construction 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 Berkeley Lab and a lack of data precludes their quantification without speculation.

The CalEEMod forecast model was used to estimate the potential emissions from the construction of the project. Construction GHG emissions would occur only during construction activities for a period of about three years. The *Bay Area Air Quality Management District (BAAQMD) CEQA Air Quality Guidelines* state that that construction GHG emissions should be estimated and their significance evaluated, without providing a quantitative threshold for evaluating their significance. Total GHG emissions associated with construction of the project are estimated to be 678 MT CO_2e, or an average of 226 MT CO_2e per year during construction. While the *BAAQMD CEQA Air Quality Guidelines* do not provide a quantitative threshold for the evaluation of construction impacts, the guidelines contain a bright line operational emissions threshold of 1,100 MT CO_2e per year which is used here to evaluate the project's construction emissions impact. As the annual emissions during project construction would be well below the bright line operational threshold of 1,100 MT CO_2e per year, the impact from the project's construction related GHG emissions would be less than significant.

Operational Emissions

As noted above, in 2017, in a supplement to the 2006 LRDP EIR, UC LBNL prepared a detailed analysis of the projected GHG emissions from the operation of the Berkeley Lab through full development under the 2006 LRDP. That analysis used the projected increase in building space and future population of the Berkeley Lab under the 2006 LRDP to estimate future GHG emissions and evaluated the significance of the impact associated with those emissions. The analysis in LRDP Impact GHG-1 in the 2017 Supplement concluded that implementation of the 2006 LRDP would contribute to long-term cumulative increases in GHG emissions as a result of increases in traffic (mobile sources), building heating (area sources), electricity consumption especially in Berkeley Lab high performance computing facilities, water use, wastewater generation, and solid waste generation. The analysis found that the incremental GHG emissions from new sources added to the Berkeley Lab under the 2006 LRDP would exceed applicable thresholds, and a significant impact would result. The 2017 Supplement included **LRDP Mitigation Measure GHG-1** (GHG monitoring and offset measure), which requires the Berkeley Lab to monitor its total annual GHG emissions and implement measures to control them, including procurement of offsets if necessary. With **LRDP Mitigation Measure GHG-1**, which was adopted by the Regents, the impact was found to be less than significant.

As discussed in **Section 5.11**, the proposed BioEPIC project is within the scope of the LRDP development program. The amount of building space and the number of employees it would add to the Berkeley Lab site are both within the amount of building space and employees analyzed in the 2017 Supplement for the 2006 LRDP. Therefore, the project's operational emissions, which are directly related to the amount of building space and the number of employees, are accounted for in the analysis contained in the 2017 Supplement, and the project's GHG impact is also accounted for in that previous analysis. With implementation of **LRDP Mitigation Measure GHG-1,** which is a standard project feature of the LRDP that addresses the Lab's GHG emissions on a Lab-wide, and not a project-specific, basis, the project's GHG impact would be less than significant.

Given the above, quantification of the project's operational emissions is not required. However, the project's operational emissions were estimated and are reported for informational purposes only. The operational emissions were calculated using CalEEMod and the same project information and assumptions that were used for the air quality calculations and are reported in **Table 7, Annualized New GHG Emissions – Non-Stationary Sources**. Detailed emission projections are provided in **Appendix B**. As shown in **Table 7**, emissions from project operations would be small and below the BAAQMD bright-line significance threshold.

It is noteworthy that the total GHG emissions reported in **Table 7** (997 metric tons CO2e/year) is a conservative estimate. As the BioEPIC project would accommodate existing programs currently located in Berkeley, the vast majority of these operational emissions associated with non-stationary sources are existing emissions that currently are emitted as a result of energy use and by employees commuting to the current leased space. If the existing emissions were deducted, the net increase due to the proposed project would be smaller than the annual increase reported in **Table 7**.

Table 7
Annualized New GHG Emissions – Non-Stationary Sources

Source	GHG Emissions (Metric Tons CO_2e/year)
Area	<1
Energy Use	719
Mobile	273
Waste	<1
Water	4
Total Annual GHG Emissions	**997**
BAAQMD Threshold	**1,100**
Exceeds Threshold?	**No**

*Source: CalEEMod Model Results. Emission details are provided in **Appendix B**.*

The proposed project would also include a standby back-up diesel generator assumed to be approximately 800 horsepower. Emissions from this stationary source were calculated using CalEEMod. The estimated emissions are presented in **Table 8, Annualized GHG Emissions – Stationary Sources,** below. As shown in the table, the stationary source emissions would be well below the BAAQMD threshold for stationary sources.

Table 8
Annualized GHG Emissions – Stationary Sources

Source	GHG Emissions (Metric Tons CO_2e/year)
Backup Generator	15
Total Annual GHG Emissions	**788**
BAAQMD Threshold	**10,000**
Exceeds Threshold?	**No**

*Source: CalEEMod Model Results. Emission details are provided in **Appendix B**.*

b. Conflict with an applicable plan, policy, or regulation adopted for the purpose or reducing the emissions of greenhouse gases? No Further Environmental Document Required.

The proposed project would comply with the *Sustainable Practices Policy*[13] approved by The UC Regents in 2004 and updated most recently in 2019. New buildings (except acute care facilities) are required to achieve a minimum of LEED Silver, preferably LEED Gold. Additionally, new buildings shall be designed, constructed, and commissioned to outperform the California

13 University of California Office of the President. *Green Building.* Available online: https://ucop.edu/sustainability/policy-areas/green-building/index.html

Building Code (CBC) energy-efficiency standards by at least 20 percent. The BioEPIC project would be designed to achieve LEED Gold certification in compliance specifically with the *Sustainable Practices Policy* and would outperform the CBC energy efficiency standards by at least 20 percent.

In compliance with Executive Order 13514, Energy Independence and Security Act of 2007 and other federal mandates, Berkeley Lab has adopted its own policy, the Sustainability Standards for New Construction, which requires that new building designs must demonstrate energy performance 30 percent lower than the maximum allowed by ASHRAE 90.1-2010. Heating and cooling of buildings should be achieved by using alternative methods such as building orientation, design of windows and building envelope, or use of shading and thermal mass, prior to using refrigeration cycle-based cooling. Energy efficient lighting systems must be used. The project would comply with the Berkeley Lab Sustainability Standards for New Construction and include the principles of sustainability and energy efficiency to the fullest extent possible, consistent with budgetary constraints and regulatory and programmatic requirements.

Berkeley Lab prepares yearly Site Sustainability Plans, most recently for the fiscal year (FY) 2018 (LBNL 2018). The Site Sustainability Plan requires a 30 percent overall reduction in GHG emissions by FY 2025 from a baseline of FY 2015. A variety of sustainable building goals are required under the Site Sustainability Plan. Examples of such goals are:

- Energy intensity reductions
- Potable water intensity reduction
- Water consumption reduction for industrial, landscaping, and agricultural water (from a FY 2010 baseline)
- Divert non-hazardous solid waste
- Reduction in fleet-wide per-mile GHG emissions
- Reduction in annual petroleum consumption
- Increase in annual alternative fuel consumption
- Increase light duty vehicle acquisitions consisting of alternative fuel vehicles
- Increase passenger vehicle acquisitions consist of zero emission or plug-in hybrid electric vehicles
- Procure or produce at least 7.5 percent of electricity from renewable sources
- New buildings meet minimum LEED Gold status

The proposed project would comply with an applicable plan for reducing the emissions of greenhouse gases (the Site Sustainability Plan). Therefore, this impact is considered less than significant.

5.8.4 Analysis of Cumulative Impacts in 2006 LRDP EIR

As the impact from a project's GHG emissions is essentially a cumulative impact, the analysis presented in the section provides an adequate analysis of the proposed project's cumulative impact related to GHG emissions. As the analysis above shows, with implementation of standard project feature **LRDP Mitigation Measure GHG-1**, the GHG impact of the proposed project is less than significant.

5.8.5 Changes to Circumstances or New Information that could affect the Earlier Environmental Analysis

At the time that the 2017 Supplement to the LRDP EIR was prepared, it utilized the bright line threshold set forth by the BAAQMD in its *CEQA Air Quality Guidelines*. The thresholds in the guidelines were designed to control GHG emissions in the Bay Area in compliance with AB 32. Since then, SB 32 and other state laws were enacted which require the state to reduce its GHG emissions to even lower levels than previously targeted under AB 32. To comply with SB 32, the BAAQMD is preparing updated guidance, including new thresholds, that lead agencies in the Bay Area may use to evaluate and control GHG emissions associated with new development projects. The updated guidance has not been published at this time. However, it is considered likely that the BAAQMD will continue to recommend the use of the bright line threshold as it is a conservative threshold. Further, even if this threshold were revised, the impact conclusion in the 2017 Supplement, both before and after mitigation, would remain unchanged. Therefore, there are no changed circumstances that could affect the earlier analysis.

5.9 Hazards and Hazardous Materials

5.9.1 Background

Section IV.F of the 2006 LRDP Final EIR addresses impacts related to hazards and hazardous materials from the growth of LBNL under the 2006 LRDP and is incorporated by reference herein pursuant to *State CEQA Guidelines* Section 15150. The following discussion summarizes the information presented in the 'Setting' subsection of Section IV.F of the 2006 LRDP Final EIR.

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 to believe would be injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment.

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/Safety (EHS) Division has the primary responsibility for developing strategies for compliance with applicable local, state, and federal laws and regulations. EHS 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. EHS 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 fuels, certain chemicals, and other hazardous materials in aboveground tanks, storage drums, and in laboratories in small quantities. Hazardous wastes and 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. The wastes are hauled off from this facility for treatment and disposal.

Other Hazards

Other potential hazards at the LBNL hill site include the presence of asbestos, lead-based paints, polychlorinated biphenyls, and radioactive materials in structures; and soil and groundwater contaminations in some areas of the hill site due to historical releases of hazardous and radioactive materials. Soil and groundwater contamination associated with the proposed BioEPIC project site are addressed in **Section 2.5**.

The LBNL hill site's developed areas are interspersed with grassland areas and groves of native and non-native 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

See **Section 2.5** for a discussion of soil and groundwater contamination associated with the proposed BioEPIC project site.

The project site is not listed on the California Environmental Protection Agency Hazardous Waste and Substances Sites List compiled pursuant to Government Code Section 65962.5, also known as the Cortese list. The project site is within 0.25 mile of pre-schools and childcare centers.

5.9.2 2006 LRDP EIR Analysis

Impacts related to hazards and hazardous materials from LBNL growth under the 2006 LRDP are evaluated in Section IV.F of the 2006 LRDP Final EIR and are incorporated herein by reference. The 2006 LRDP EIR analysis concluded that all hazards and hazardous materials related impacts would either be less than significant or would be rendered less than significant with mitigation.

The proposed project is within the scope of analysis of the 2006 LRDP Final EIR. Relevant mitigation measures (now standard project features for projects under the LRDP) have been incorporated as part of the planning and design of the proposed project and will be implemented during project construction and operations consistent with LRDP mitigation monitoring requirements.

5.9.3 Environmental Checklist and Discussion

HAZARDS & HAZARDOUS MATERIALS Would the project…	Additional Project-Level Impact Analysis Required	No Further Environmental Document Required
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☑
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☑

c)	Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☑
d)	Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☑
e)	For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?	☐	☑
f)	Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☑
g)	Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires?	☐	☑

DISCUSSION:

BioEPIC Project Analysis

a. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials? No Further Environmental Document Required.

LRDP Impact HAZ-3 addresses impacts associated with hazardous material use, generation, storage, transport, and disposal in conjunction with operation of the LBNL facilities (page IV.F-28). Operation of the BioEPIC project would involve increased use, transport, or disposal of hazardous materials associated with laboratory uses. Future generation, handling, storage, and transport of these types of materials would continue to be subject to applicable federal, state, and local requirements. Additionally, the proposed project's impact related to an accidental release of hazardous wastes is adequately addressed under LRDP Impact HAZ-3 and would be less than significant with incorporation of **LRDP Mitigation Measures HAZ-3a** through **-3f** (hazardous waste reporting and handling measures) as standard project features of the proposed project.

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? No Further Environmental Document Required.

See item "**a**" above for analysis.

c. Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school? No Further Environmental Document Required.

LRDP Impact HAZ-4 (page IV.F-31) discusses handling of hazardous materials and wastes within 0.25 mile of an existing school and concluded that while there are no public or private

elementary, middle, or high schools with 0.25 mile of the LBNL, there are several day-care centers and preschools. However, the impact on these receptors would be less than significant with the implementation of **LRDP Mitigation Measures HAZ-3a** through **HAZ-3f**, which would require appropriate hazardous material handling, storage, shipping, and disposal and adequate emergency preparedness, as standard project features of the project. The project's impact is adequately addressed under LRDP Impact HAZ-3 and would be less than significant with standard project features.

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? No Further Environmental Document Required.

LRDP Impacts HAZ-1 (page IV.F-23) and HAZ-2 (page IV.F-26) address impacts associated with demolition and remediation activities at the LBNL hill site. According to the 2006 LRDP Final EIR, demolition of older structures that may contain lead-based paint, asbestos, and other contamination, and future construction including earth-moving activities such as excavation and grading, could potentially expose workers, the public, and the environment to soil and groundwater that has been affected by hazardous materials. There are no structures present on the project site and consequently no potential hazard due to exposure to hazardous materials during demolition. The project site is not on a list of hazardous materials site compiled pursuant to Government Code Section 65962.5.

However, there are soil vapor plumes beneath and adjacent to the project site, as discussed in **Section 2.5**. The contamination does not pose an unacceptable risk to construction workers. However, as the soil vapor could potentially intrude into the building and affect future employees on the BioEPIC project site, the project includes design and installation of a vapor barrier and ventilation system that would be reviewed and approved by DTSC to ensure that any potential for vapor intrusion would fall below health-related regulatory screening levels. In addition, as discussed in the 2006 LRDP Final EIR, construction and remediation activities under the 2006 LRDP, including the proposed project, would comply with federal and state laws regulating the use, transport, and disposal of hazardous materials and hazardous wastes, and project specifications would be developed to ensure that contractors meet applicable environmental, health, and safety regulations. Potential exposure of workers, the public, and the environment to hazardous materials would be minimized through development of Construction Site Health and Safety Plans and proper handling, storage, and disposal of contaminated soil and groundwater. The proposed project's impacts are adequately addressed under LRDP Impacts HAZ-1 and HAZ-2 and would be less than significant.

e. For a project located within an airport land use plan or, where such plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area? No Further Environmental Document Required.

The Initial Study prepared as part of the 2006 LRDP Final EIR scoping process concluded that growth and development on the LBNL hill site would have no impact related to safety hazards for people within 2 miles of a public airport or a public use airport. The LBNL hill site, including the project site, is neither within an airport land use plan nor in the vicinity of an airport. There would be no impact.

f. Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan? No Further Environmental Document Required.

LRDP Impact HAZ-5 (page IV.F-32) addresses impacts associated with exposure of people or structures to 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. The proposed project would increase the number of people and the amount of property that could be exposed to regional, compounded, or terrorist-related catastrophic events (although, by an equivalent amount, the project would decrease the number of people exposed to such threats in off-site leased space that would be vacated by the project). Construction and laboratory operation activities at LBNL, including the proposed project, would comply with federal and state laws to ensure that there would be no conflict with emergency response plans. The increase in population, associated vehicle traffic, and building square footage associated with the proposed project is within the scope of the 2006 LRDP. Therefore, the proposed project's impact is adequately addressed under LRDP Impact HAZ-5 and would be less than significant.

g. Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires? No Further Environmental Document Required.

LRDP Impact HAZ-6 (page IV.F-39) addresses impacts associated with exposure of people or structures to wildland fire hazards. The 2006 LRDP Final EIR concluded that continued implementation of the LBNL vegetation management program would limit damage to assets from wildland fires and would reduce potential wildland fire hazards. Development of the proposed project would increase both laboratory and other facility space at the LBNL hill site. This development would meet required safety standards and fire codes at the time of facility construction. Furthermore, the BioEPIC project site would be located in the center of the LBNL hill site in an area that is developed with buildings and is not adjacent to wildland areas. Therefore, the proposed project would not expose structures or persons to a significant risk from wildland fires. The project's impact is adequately addressed under LRDP Impact HAZ-6 and would be less than significant.

5.9.4 Analysis of Cumulative Impacts in 2006 LRDP EIR

The 2006 LRDP Final EIR found that implementation of the 2006 LRDP would contribute to cumulative increases in exposure to hazards and hazardous materials (LRDP Impact HAZ-7, page IV.F-41). The 2006 LRDP could result in development that disturbs contaminated soil or groundwater, or increases exposure to wildland fire hazards. Compliance by UC LBNL with federal, state, and local regulations and LBNL policies would reduce potential impacts, and compliance with regulations governing hazardous materials and hazardous wastes by UC Berkeley and other institutions would reduce potential cumulative impacts in the vicinity of LBNL to less-than-significant levels. Therefore, the 2006 LRDP Final EIR concluded that implementation of the 2006 LRDP would not result in a considerable contribution to any cumulative increases in the use of or exposure to hazards or hazardous materials. Taking into consideration the present-day setting and the current cumulative context, this analysis finds that no conditions have changed, and no new information has become available since certification of the 2006 LRDP Final EIR that would alter this previous analysis. The proposed project is within the scope of the growth and development analyzed in the 2006 LRDP Final EIR and as shown

above would comply with federal and state laws regulating the use, transport, and disposal of hazardous material during construction and operation. The proposed project's cumulative hazards impacts are adequately addressed under LRDP Impact HAZ-7 and would be less than significant.

5.9.5 Changes to Circumstances or New Information that could affect the Earlier Environmental Analysis

Potential impacts from exposure to existing groundwater and VOC contamination on the project site were analyzed in the 2006 LRDP EIR and were determined to be less than significant. The additional sampling and health risk assessments prepared for the BioEPIC project have also revealed that the proposed project would not result in a significant impact related to exposure to existing contamination in the project vicinity with the incorporation of a vapor barrier and ventilation system as part of the project. The project-specific analysis does not alter the significance of the previously analyzed impact in the 2006 LRDP Final EIR and therefore does not constitute significant new information.

5.10 Hydrology and Water Quality

5.10.1 Background

Section IV.G of the 2006 LRDP Final EIR addresses the hydrology and water quality effects of LBNL growth and development under the 2006 LRDP and is incorporated by reference herein pursuant to *State CEQA Guidelines* Section 15150. The following discussion summarizes the information presented in the 'Setting' subsection of Section IV.G of the 2006 LRDP Final EIR.

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 the 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 main fork of Strawberry Creek in Strawberry Canyon (herein identified as simply Strawberry Creek). The total watershed area of the Strawberry Creek North and main 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 main fork, including Ravine Creek, Ten-Inch Creek, Chicken Creek, No Name Creek, and Botanical Garden Creek. Runoff from the easternmost portion of the LBNL hill site (including Chicken, No-Name, and Botanical Garden Creeks) is routed into the Strawberry Creek main fork via a mid-canyon detention basin, from where water may be released downstream at flow rates consistent with the design parameters of the storm drainage systems of UC Berkeley and the City of Berkeley. LBNL site runoff 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 near the surface to approximately 100 feet below ground surface. Groundwater flow patterns generally reflect the site topography with groundwater tending to flow southward. Groundwater at LBNL is not used for potable or irrigation uses. Because heavy saturation by groundwater can destabilize slopes, LBNL strives to avoid creating obstacles to smooth and to efficient groundwater flow.

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

LBNL has had a stormwater management program in place since 1992. This program is designed to control pollutants from site activities from entering downstream surface waters in accordance with California General Industrial Permit requirements. Groundwater in some portions of the LBNL hill site has been affected by past, accidental releases of hazardous and radioactive materials (See **Section 5.9.1**, above). For a similar period of time, UC LBNL has implemented a remediation and monitoring program to address the groundwater contamination.

Project Site

The project site is currently impervious as it is covered with paved parking and storage areas. The proposed BioEPIC project site and the greater Bayview Planning Area are located within Blackberry Canyon, which is within Strawberry Creek watershed. Groundwater flows to the west following the westerly trending downward topography. Surface water from the project site and the larger Strawberry Creek watershed is ultimately discharged into San Francisco Bay. This occurs south of the Berkeley Marina at the terminus of the municipal storm drain system that conveys Strawberry Creek through the City of Berkeley (LBNL 2007b).

5.10.2 2006 LRDP EIR Analysis

Impacts on hydrology and water quality from LBNL growth and development under the 2006 LRDP are evaluated in Section IV.G of the 2006 LRDP Final EIR and are incorporated herein by reference. The LRDP EIR analysis concluded that all hydrology and water quality impacts of LBNL growth under the 2006 LRDP would be less than significant. No mitigation measures related to hydrology and water quality impacts are identified in the 2006 LRDP Final EIR. The proposed project is within the scope of analysis of the 2006 LRDP Final EIR.

5.10.3 Environmental Checklist and Discussion

HYDROLOGY & WATER QUALITY Would the project…	Additional Project-Level Impact Analysis Required	No Further Environmental Document Required
a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?	☐	☑
b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable management of the basin?	☐	☑
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:		
i) Result in substantial erosion or siltation on- or off-site?	☐	☑
ii) Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite?	☐	☑
iii) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☑
iv) Impede or redirect flood flows?	☐	☑

d)	In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?	☐	☑
e)	Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?	☐	☑

DISCUSSION:

BioEPIC Project Analysis

a. Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality? No Further Environmental Document Required.

Construction

LRDP Impact HYDRO-1 addresses impacts to water quality, including potential to violate water quality standards and waste discharge requirements, from construction activities under the 2006 LRDP (page IV.G-22 of the revised Hydrology and Water Quality section in Appendix A of the LRDP Final EIR). The analysis concluded that individual projects under the 2006 LRDP, such as those identified in the Illustrative Development Scenario, would not result in significant impacts with regard to stormwater sedimentation, or construction-related pollution of stormwater. Disturbed areas would be either be paved or landscaped and re-seeded at the earliest practical time during construction so that ground cover would be well-established by the next rainy season, consistent with standard project features **LRDP Mitigation Measures GEO-3a** and **GEO-3b**. Areas that are not paved or covered with gravel would be landscaped with a network of lined biofiltration planter systems. Implementation of these measures is anticipated to effectively control the discharge of sediment and pollutants into stormwater from small construction sites that encompass less than 1 acre and are therefore not subject to NPDES requirements.

The project site is approximately 1 acre. Under the state Construction General Permit (1 acre or more in size), which is administered by the SWRCB, a Stormwater Pollution Prevention Plan (SWPPP) must be developed and implemented during construction to minimize sedimentation and contamination of stormwater runoff. The SWPPP would require a project-specific erosion plan and the use of Best Management Practices to minimize stormwater pollution from sediments and construction-related contaminants. Compliance with NPDES regulations would render the proposed project's impact less than significant.

Operations/Occupancy

There are no natural drainages on or near the project site that could be directly affected by the project. With regard to indirect effects on drainages through discharge of site runoff, the proposed site would be graded to direct site stormwater runoff into localized BMPs, including lined bioretention areas and flow-through planters. The BMPs would provide improved water quality and decrease the peak discharge rate compared to existing conditions before ultimately discharging into the City of Berkeley storm drain system. As under existing conditions, the project site will continue to be covered by the LBNL NPDES General Industrial Permit and associated SWPPP and Storm Water Monitoring Plan that apply to the entire Lab site. UC LBNL

will continue to implement control measures to address surface water quality, including through the use of a network of lined biofiltration landscaping systems. The project would not degrade surface water quality and would therefore result in a less than significant impact, similar to the conclusion under LRDP Impact HYDRO-2.

Soil and groundwater contamination associated with the proposed project site are discussed in **Section 2.5**. Groundwater under the LBNL site is not used as a drinking water source by the Lab or by local utilities, and groundwater contamination is therefore not a threat to the local drinking water supply. The project would not degrade groundwater quality and would therefore result in a less than significant impact.

With respect to site runoff following the completion of project construction, see item "**c**" below.

b. Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable management of the basin? No Further Environmental Document Required.

Water used at the LBNL hill site is supplied from the East Bay Municipal Utility District's Shasta Reservoir and Berkeley View Reservoir systems. Groundwater at the site is not used by LBNL, nor would the project require any groundwater withdrawal. The 2006 LRDP Final EIR concluded that LBNL's steep slopes, shallow bedrock, and thin soils presently inhibit significant groundwater recharge of the East Bay Plain. The proposed project would maintain or slightly reduce the amount of impervious surfaces on the project site because following the removal of the parking lot, the site would be developed with a four-story facility, roadwork, plaza and service areas, and utility connections, along with a network of lined biofiltration landscaping. Landscaping and outdoor use areas are proposed along the northern and western sides of the proposed building. Compliance with NPDES regulations would ensure runoff, and resultant infiltration, on the site would remain approximately the same as pre-project conditions. Therefore, the proposed project would not adversely affect groundwater levels or recharge such that the project may impede sustainable management of the basin. The impact would be less than significant.

c. i. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would result in substantial erosion or siltation on- or off-site? No Further Environmental Document Required.

LRDP Impact HYDRO-3 (page IV.G-26 in Appendix A of the LRDP Final EIR) discusses the potential impacts from increases in stormwater volume resulting in erosion of creek channels or downstream flooding under the 2006 LRDP. The 2006 LRDP Final EIR noted that in compliance with NPDES requirements, the LBNL will design appropriate stormwater control measures into projects to ensure that pre- and post-construction runoff remains approximately the same. In addition to NPDES regulations, Section 438 of the Energy Independence and Security Act (EISA) requires that federal projects above 5,000 square feet maintain or restore the predevelopment hydrology of the property to the maximum extent technically feasible.

The existing Bayview Planning Area is a paved parking lot and storage area that drains to the North Fork Strawberry Creek via two primary storm drain pipes: (1) a northern 48-inch

reinforced concrete pipe (RCP) storm drain that flows west just north of the proposed BioEPIC building, and (2) a southern 24-inch RCP storm drain that flows northwest to the south of the Building 91 (IGB). The existing 48-inch pipe system, to which project stormwater would flow, has no recorded capacity issues. There are currently no existing stormwater treatment BMPs in the project vicinity, since subsurface areas of soil contamination exist within and around the site. For this reason, stormwater infiltration into site soils is restricted to ensure that stormwater does not become contaminated and to keep localized areas of contamination immobilized. There is no off-site run-on from adjacent areas.

The proposed site would be graded to direct site stormwater runoff into localized BMPs, including lined bioretention areas and flow-through planters. The BMPs would provide improved water quality and decrease the peak discharge rate compared to existing conditions before ultimately discharging into the City of Berkeley storm drain system. Further, there would be a slight decrease in the amount of impervious surfaces on the project site. The project would, therefore, not cause the capacity of the storm drain system to be exceeded, would not result in hydromodification impacts in the receiving waters, and flooding would also not occur. The impact from the change in the volume of surface water runoff is adequately addressed under LRDP Impact HYDRO-3 and would be less than significant.

c. ii. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces in a manner which would increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite? No Further Environmental Document Required.

See item "**c. i**" above for analysis.

c. iii. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would 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? No Further Environmental Document Required.

See item "**c. i**" above for analysis.

c. iv. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would impede or redirect flood flows? No Further Environmental Document Required.

See item "**c. i**" above for analysis.

d. **In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?**

Active faults within the San Francisco Bay Area have largely horizontal movement and are not expected to generate significant waves in the San Francisco Bay. 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. No lakes or open bodies of water are located in the watershed where the project site is located. Moreover, given the location of the project site on a ridge, there would be minimal

impacts from mudflows. Therefore, implementation of the project would result in no impact related to the risk of inundation from seiche, tsunami, or mudflow.

e. Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?

As BioEPIC is a federally funded project, UC LBNL is required to implement stormwater quality and quantity management practices that maintain or restore the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of flow, in accordance with EPA 841-B-09-001: Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects, Section 438 of the Energy Independence and Security Act (EISA).

LBNL is not required to meet all state and local regulations. Post-construction stormwater Best Management Practices (BMP) would be implemented to treat and manage the proposed peak flow of stormwater runoff prior to discharge into the local stormwater system. As such, implementation of the project would not conflict with or obstruct with implementation of a water quality control plan or sustainable groundwater management plan and no impact would occur.

5.10.4 Analysis of Cumulative Impacts in 2006 LRDP EIR

As discussed under LRDP Impact HYDRO-4, implementation of the 2006 LRDP, when combined with implementation of the UC Berkeley 2020 LRDP and other cumulative development, would not result in significant cumulative hydrologic or water quality impacts (pages IV.G-29 through G-30 in Appendix A of the LRDP Final EIR). LRDP Impact HYDRO-4 concluded that potential hydrologic and water quality impacts associated with the proposed 2006 LRDP would be less than significant. Furthermore, other development in the area and the region that could contribute to water quality impacts (on the San Francisco Bay, for example) would also be subject to NPDES permit regulations, SWPPPs, and other programmatic requirements that would further reduce the potential for cumulative adverse impacts. The 2006 LRDP Final EIR concluded that individual projects, such as those included in the Illustrative Development Scenario, would result in cumulative hydrology and water quality impacts that would be less than significant. Taking into consideration the present-day setting and the current cumulative context, this analysis finds that no conditions have changed, and no new information has become available since certification of the 2006 LRDP Final EIR that would alter this previous analysis. The proposed project's cumulative hydrology and water quality impacts are adequately addressed under LRDP Impact HYDRO-4 and would be less than significant.

5.10.5 Changes to Circumstances or New Information that could affect the Earlier Environmental Analysis

There are no changes in circumstances and no new information related to hydrology and water quality has become available since the certification of the 2006 LRDP Final EIR that would alter the previous analysis and change its conclusions.

5.11 Land Use/Planning

5.11.1 Background

Section IV.H of the 2006 LRDP Final EIR addresses the effects of LBNL growth and development under the 2006 LRDP on land use and planning and is incorporated by reference herein pursuant to *State CEQA Guidelines* Section 15150. The following summarizes the information presented in the 'Setting' subsection of Section IV.H of the 2006 LRDP Final EIR.

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. The nearest private residential neighborhoods are along the west and northwest edges of the LBNL hill site in the City of Berkeley; the University of California Berkeley (UCB) main campus is adjacent to the south, while UCB-managed "hill campus" space is to the north and east.

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 (or main campus site) is land owned by the Regents of the University of California. On the LBNL hill site are 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 US Department of Energy. The University and its campuses are exempted by the state constitution from compliance with local land use regulations, including municipal general plans and zoning. However, UC seeks to cooperate with local jurisdictions to reduce any physical consequences of potential land use conflicts to the extent feasible. UC campuses, including UC LBNL, are subject to individual, Regent-approved long-range development plans (LRDPs) for land use and development guidance. The western half of the LBNL hill site is within the Berkeley city limits, and the eastern half is within the Oakland city limits.

Project Site

The BioEPIC project site is currently paved and used for parking and storage. The 2006 LRDP designates the project site as within an area designated Research and Academic land use. The project site is located within the Berkeley city limits.

Laboratory, office, engineering, and computing functions occupy the LBNL buildings immediately adjacent to the project site. Open space or landscaped areas border the site immediately to the east. Land uses surrounding the project site include laboratory buildings and offices. From the early 1950s to the early 2000s, the project site was occupied by the Bevatron accelerator complex, a massive accelerator and laboratory facility that was demolished and removed during the 21st century's first decade. The project site is approximately 1,080 feet from

the nearest residences to the north, with more residences to the west of the project approximately 1,197 feet. The Lawrence Hall of Science is about 1,300 feet east of the project.[14]

The proposed BioEPIC project site is within an area of UC-owned land that is currently leased to DOE as part of Wilson Tract Parcel 1B. Under the project, Parcel 1B would be divided into Parcels 1B and 1C. Parcel 1C, which would be approximately 70,000 square feet, would be occupied by the BioEPIC building and its ground lease term would be extended to 50 years from DOE's BioEPIC project approval date. The newly defined Parcel 1B would continue to be occupied by Buildings 56, 60, 63, 64, and Trailers 51F, 56A, 64B. Besides the extension of the lease term for Parcel 1C, there would be no changes in land uses, conditions, or operations occurring on either Parcel 1B or 1C as a result of this proposed parcel modification.

5.11.2 2006 LRDP EIR Analysis

Impacts of LBNL growth and development under the 2006 LRDP on land use and planning are evaluated in Section IV.H of the 2006 LRDP Final EIR and incorporated herein by reference. The LRDP EIR analysis concluded that all land use and planning impacts of LBNL growth and development under the 2006 LRDP would be less than significant. The proposed project is within the scope of analysis of the 2006 LRDP Final EIR.

5.11.3 Environmental Checklist and Discussion

LAND USE & PLANNING Would the project…	Additional Project-Level Impact Analysis Required	No Further Environmental Document Required
a) Physically divide an established community?	☐	☑
b) Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☑

DISCUSSION:

BioEPIC Project Analysis

a. Physically divide an established community? No Further Environmental Document Required.

LRDP Impact LU-1 (page IV.H-10) concluded that the implementation of the 2006 LRDP would not physically divide an established community as all new construction would be within developed areas of the LBNL hill site and would not introduce substantially new land uses, as the proposed project would be similar to existing land use surrounding the project site. The project site is located in the west-central portion of the LBNL main campus in an area currently developed with institutional research and support uses. The proposed BioEPIC project would be

14 These distances were estimated using Google Earth and reflect the distance between the nearest residence and center of the project site.

similar in use to surrounding uses; furthermore, it would be less intensively developed than historic site uses. Implementation of the proposed project would not divide an existing community. Therefore, there would be no impact.

b. Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect? No Further Environmental Document Required.

The applicable land use plan for the project site is the LBNL 2006 LRDP. The following discussion describes the proposed project's relationship to and consistency with the development projections, population projections, land use designations, and objectives contained in the 2006 LRDP and LRDP Final EIR.

Consistency with 2006 LRDP Scope of Development

The 2006 LRDP provides for the construction of approximately 980,000 gross square feet (gsf) of additional research and support space and demolition of up to 320,000 gsf of building space, for a net increase of 660,000 gsf of new research and support space on the LBNL hill site through 2025. As a result, the total building space on the LBNL hill site under the 2006 LRDP could increase to 2,420,000 gsf.

Berkeley Lab projects approved for implementation since 2006 have added (and in some cases subtracted) research and support space at the LBNL hill site. The proposed BioEPIC project would add approximately 73,000 gsf of such space. As shown in **Table 9, 2006 LRDP Building Space and Approved and Pending Projects**, the LBNL projects approved and/or constructed under the 2006 LRDP, with the addition of the proposed BioEPIC project, would not exceed the 2006 LRDP's net new research and support space projections.

Table 9
2006 LRDP Building Space and Approved and Pending Projects

Project	Research and Support Space Increment (gsf)	Cumulative Total (gsf)
Existing Building Space as of 2006	-	1,760,000
Building Space demolished since 2006 [1]	-196,439	1,563,561
Building Space constructed since 2006 [2]	314,000	1,877,561
Old Town demolition	-55,000	1,822,561
Integrative Genomics Building (under construction)	77,000	1,899,561
Biological & Environmental Program Integration Center	*73,000*	*1,972,561*
Net New Development	**212,561**	
2006 LRDP Building Space Projection for 2025	660,000	2,420,000

[1] *Square footage of space demolished includes Building 51 (126,500 gsf) and other buildings (69,939 gsf).*

[2] *Square footage numbers include the following projects: Guest House (25,000 gsf), User Support Building (30,000 gsf), Solar Energy Research Center Facility (SERC) (90,000 gsf), Seismic Phase 2 (GPL) (43,000 gsf), and Computational Research and Theory Facility (CRT) (126,000 gsf).*

The 2006 LRDP also projects a net gain of up to 500 parking spaces. Much of the project site currently serves as a parking area and storage area. After Building 51 was removed, the site of the former building was developed as a temporary parking lot with approximately 250 parking spaces, approximately 111 of which are in the general vicinity of the proposed BioEPIC project. The project would remove approximately 76 net parking spaces to provide space for the proposed building. The proposed project would have 35 net parking spaces to remain, which would include two new ADA parking spaces and one electric vehicle changing station. Therefore, as the proposed project would have a net reduction in parking spaces, the proposed project would not contribute toward the 500 net additional parking spaces allowed under the 2006 LRDP.

Consistency with 2006 LRDP Land Use Designations and Height Restrictions

The project site is designated for Research and Academic use in the 2006 LRDP Land Use plan. This land use designation provides for scientific research and associated support functions and constitutes the majority of the developed land at the LBNL hill site. The proposed project fits within that land use category and is consistent with the 2006 LRDP land use designation for this site. Therefore, the proposed project would be consistent with the 2006 LRDP Land Use plan.

The 2006 LRDP Design Guidelines include a Height Zoning Map for the LBNL hill site; this map establishes height restrictions for new buildings in certain areas of the hill site based on aesthetics and other planning considerations. Per the Height Zoning Map, the northern portion of the BioEPIC project is located in a four-story zone; the southern portion of the project site is in an eight-story zone. As the proposed project would be four stories, it would comply with the 2006 LRDP's height restrictions.

Consistency with 2006 LRDP Population Projections

The 2006 LRDP projects that, through 2025, the LBNL hill site's adjusted daily population (ADP) could increase to 4,650 persons, an increase of 1,000 persons over the 2003 baseline. Under the LRDP EIR Project Variant, the hill site ADP could increase to 5,000 persons. The proposed project would relocate 85 current employees from hill site facilities, including Buildings 64, 70, 70A, and 84 and another 125 employees from 717 Potter Street in Berkeley. Therefore, the project would add approximately 125 employees to the LBNL hill site. This would not, by itself or in combination with other projects constructed, approved, or planned since 2006, increase LBNL's adjusted daily population in excess of 2006 LRDP daily population projections (see **Table 10, 2006 LRDP Hill Site Adjusted Daily Population and Approved and Pending Projects**). Therefore, the proposed project is within the 2006 LRDP's daily population projections.

Table 10
2006 LRDP Hill Site Adjusted Daily Population and Approved and Pending Projects

Project	Population Increment (FTE)	Cumulative Total
Hill Site ADP in 2006 LRDP	-	3,650
Increase in ADP since 2006	254[1]	3,904
Integrative Genomics Building (under construction)	333	4,237
Biological & Environmental Program Integration Center	125	4,362

Project	Population Increment (FTE)	Cumulative Total
Net Population Increase	**712**	**-**
2006 LRDP Daily Population Projection for 2025	1,000	4,650
2006 LRDP EIR Project Variant Daily Population Projection for 2025	1,350	5,000

Note: This table reports the net new persons associated with each project and does not include persons who would be relocated from another LBNL building on the hill site to the project site. (updated 2019)

[1] *The total includes the new population added to the hill site by the following projects: Guest House (8 persons), User Support Building (0 persons), Solar Energy Research Center Facility (85 persons), Seismic Phase 2 (30 persons), and Computational Research and Theory Facility (131 persons).*

Consistency with 2006 LRDP Objectives

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 seven principle objectives of which the following are pertinent to the proposed project as discussed below:

- Strengthen and expand existing research programs to sustain and grow LBNL's role as a national research laboratory;
- Expand partnerships and collaborations to enhance LBNL's scientific and technical base;
- Provide flexibility to return staff from its off-site facilities leased in Berkeley and Oakland to the main site in order to enhance collaboration, productivity, and efficiency;[15]
- Expand the capacity of existing high demand advanced facilities and provide broader functionality;
- 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. In addition to bringing together a world-unique suite of biological and environmental expertise and experimental platforms, the science to be housed in BioEPIC would benefit from co-location with other major DOE investments at LBNL. The project would benefit from proximity to the Integrative Genomics Building housing the Joint Genome Institute (JGI) and the DOE Systems Biology Knowledgebase (KBase), the Advanced Light Source (ALS), the Molecular Foundry and especially the National Energy Research Scientific Computing Center (NERSC). This research is expected to sustain and grow LBNL's role as a national research laboratory. The proposed project would also provide a new interdisciplinary facility on a site that is currently occupied by a paved parking lot and storage area. The location of the project site has been selected to foster interaction between existing LBNL research programs and facilities in the center of the hill site and the

15 This objective is relevant to the proposed project because it relates to the relocation of off-site programs to the LBNL hill site.

proposed BioEPIC facility. The proposed project is consistent with the objectives of the 2006 LRDP.

Consistency with LBNL 2006 Design Guidelines

In addition to the 2006 LRDP, the proposed project would also be consistent with LBNL Design Guidelines. As mentioned above, the LBNL Design Guidelines were developed as a supporting document to the 2006 LRDP and are the basis for several impact assumptions and conclusions in the 2006 LRDP Final EIR.

The guidelines applicable to land use are separated into three main categories: Land, Topography, and Views; Research Clusters; and Linkages. Due to the topography of the hill site, the proposed project would not be visible from residences to the west. A few residences to the north are on the rim of the hillside overlooking the Bayview Planning Area and could potentially view the BioEPIC site. The proposed BioEPIC building would be far less visually prominent than either its historic predecessor (Building 51B)[16] or the future structure postulated for that site in the 2006 LRDP EIR (Building S-3)[17]. Additionally, the simulation of Building S-3 showed that there are some large trees between the project site and the residences to the north which would screen views to some extent. With respect to the Research Clusters portion of the LBNL Design Guidelines, the proposed project would consolidate complimentary research programs into one building. Projects that promote research clusters and minimize the visibility of new developments would be considered consistent with the LBNL Design Guidelines. Therefore, the proposed project would be consistent with the LBNL Design Guidelines and no impact would occur. (See further discussion under **Section 5.1**, above.)

5.11.4 Analysis of Cumulative Impacts in 2006 LRDP EIR

LRDP Impact LU-3 found that LBNL growth and development under the 2006 LRDP, when combined with cumulative growth in the project vicinity, would increase the intensity of existing land uses in the area but would not physically divide an established community, conflict with applicable land use regulations, or cause conflicts with existing uses (page IV.H-13). Therefore, implementation of the 2006 LRDP, together with the cumulative impacts of regional growth, would not conflict with local land use regulations such that an incompatibility would occur among local land uses, and the 2006 LRDP would not result in a significant cumulative effect. Taking into consideration the present-day setting and the current cumulative context, this analysis finds that no conditions have changed, and no new information has become available since certification of the 2006 LRDP EIR that would alter this previous analysis.

The population and building square footage proposed as part of the BioEPIC project is within the analyzed 2006 LRDP increase in LBNL population growth and building square footage.

---

16 Building 51B was a 75-foot-tall, approximately 45,000 gsf footprint structure: about the same height but with more than twice the footprint of the proposed BioEPIC project. In combination with Building 51, the Bevatron accelerator complex comprised over 170,000 gsf in area.

17 Building S-3, which was postulated in the 2006 LRDP Final EIR "Illustrative Development Scenario," was depicted as being 8 stories in height, with a 45,000 gsf footprint and total building space of 215,000 gsf.

Therefore, the proposed project's cumulative impact is adequately analyzed in LRDP Impact LU-3 and would be less than significant.

5.11.5 Changes to Circumstances or New Information that could affect the Earlier Environmental Analysis

There are no changes in circumstances and no new information related to land use and planning has become available since the certification of the 2006 LRDP Final EIR that would alter the previous analysis and change its conclusions.

5.12 Mineral Resources

5.12.1 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 at the LBNL hill site would not impede extraction or result in the loss of availability of mineral resources.

5.12.2 2006 LRDP EIR Analysis

Mineral resources were addressed in the Initial Study prepared for the NOP and were scoped out of the analysis in the 2006 LRDP Final EIR.

5.12.3 Environmental Checklist and Discussion

MINERAL RESOURCES Would the project…	Additional Project-Level Impact Analysis Required	No Further Environmental Document Required
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☑
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?	☐	☑

DISCUSSION:

BioEPIC Project Analysis

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? No Further Environmental Document Required.

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. Therefore, implementation of the proposed project would not impact mineral resources, and there would be no impact.

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? No Further Environmental Document Required.

See item "**a**" above for analysis.

5.12.4 Analysis of Cumulative Impacts in 2006 LRDP EIR

Because the proposed project would not result in any impact on mineral resources, it would not contribute to a cumulative impact on mineral resources.

5.12.5 Changes to Circumstances or New Information that could affect the Earlier Environmental Analysis

There are no changes in circumstances and no new information related to minerals has become available since the certification of the 2006 LRDP Final EIR that would alter the previous analysis and change its conclusions.

5.13 Noise

5.13.1 Background

Section IV.I of the 2006 LRDP Final EIR addresses the noise effects of LBNL growth and development under the 2006 LRDP and is incorporated by reference herein pursuant to *State CEQA Guidelines* Section 15150. The following discussion summarizes the information presented in the 'Setting' subsection of Section IV.I of the 2006 LRDP Final EIR that is relevant to the proposed project.

As a federal facility managed and operated by the University of California, LBNL is generally exempt from local land use regulations, including the noise ordinances of the Cities of Berkeley and Oakland. Nevertheless, Berkeley Lab seeks to cooperate with local jurisdictions to the extent feasible to meet municipal goals and standards -- such as those established in noise ordinances-- intended to reduce potential land use conflicts.

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 (dB(A)) 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 1 hour.
- DNL, the energy average of the A-weighted sound levels occurring during a 24-hour period, with a 10 dB(A) "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. Ongoing 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 activities 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 in specific locations along its western and northwestern boundaries.

Project Site

The primary existing noise sources in the vicinity of the BioEPIC project site are vehicular traffic on Alvarez Road and Smoot Road/McMillan Road and stationary sources associated with surrounding buildings. Secondary, intermittent sources of noise include distant aircraft noise and sounds from parking lots. There are no noise-sensitive receptors in the immediate vicinity of the project site. The nearest residential receptors are homes in the North Berkeley Hills neighborhood, which are located approximately 1,080 feet to the north of the project site and the residences to the west of the project site, located approximately 1,197 feet from the project site.[18]

5.13.2 2006 LRDP EIR Analysis

Impacts of LBNL growth and development under the 2006 LRDP related to noise are evaluated in Section IV.I of the 2006 LRDP Final EIR, and that analysis is incorporated herein by reference. The 2006 LRDP Final EIR concluded that all noise impacts except two would be either less than significant or less than significant following implementation of mitigation measures. The 2006 LRDP Final EIR concluded that LRDP Impact NOISE-1 related to construction noise would be significant and unavoidable even after mitigation and LRDP Impact NOISE-5 related to cumulative construction noise would also be significant and unavoidable after mitigation.

For reasons set forth in **Section 5.11**, the proposed project is within population and building space projections of the 2006 LRDP and therefore, is within the scope of analysis of the 2006 LRDP Final EIR. Relevant mitigation measures in the 2006 LRDP Final EIR (now standard project features for projects under the LRDP) have been incorporated as part of the planning and design of the proposed project and will be implemented during project construction and operations consistent with LRDP mitigation monitoring requirements.

18 These distances were estimated using Google Earth and reflect the distance between the nearest residence and the center of the project site.

5.13.3 Environmental Checklist and Discussion

NOISE Would the project result in…	Additional Project-Level Impact Analysis Required	No Further Environmental Document Required
a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☑
b) Generation of excessive groundborne vibration or groundborne noise levels?	☐	☑
c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☑

DISCUSSION:

BioEPIC Project Analysis

a. Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies? No Further Environmental Document Required.

Construction Noise

Temporary noise increases related to construction activities under the 2006 LRDP, including the proposed project, are discussed under LRDP Impact NOISE-1 (page IV.I-13). The EIR analysis conservatively concluded that construction activities in some portions of the Lab site could exceed the City of Berkeley's maximum allowable receiving noise standard at the nearest off-site receptors, resulting in a significant and unavoidable impact, although for the most part, the sites where construction would occur would not be close to off-site sensitive receptors. The 2006 LRDP Final EIR stated that depending on the locations of development projects, construction/demolition noise levels could exceed the City of Berkeley's maximum allowable receiving noise standard of 60 to 65 dBA (depending on the residential zone where noise is heard) for stationary equipment (i.e., construction/demolition equipment that is operated over a period of 10 days or more). However, implementation of **LRDP Mitigation Measures NOISE-1a** and **NOISE-1b** (construction noise measures), which are standard project features, would normally reduce such noise to a less-than-significant level. With implementation of **LRDP Mitigation Measures NOISE-1a** and **NOISE-1b**, maximum expected construction noise levels would be approximately 47.6 dBA at the sensitive receptors to the north of the project site along Campus Drive. This noise level would not exceed the City of Berkeley's maximum allowable

noise standard (See **Appendix D** for noise calculations). The proposed project's impact is adequately addressed under LRDP Impact NOISE-1 and would be less than significant.

Operational Traffic Noise

The 2006 LRDP Final EIR evaluated increases in permanent noise levels from vehicle traffic (LRDP Impact NOISE-3 (page IV.I-19)) as a result of increased development and population on the LBNL hill site. As described in the 2006 LRDP Final EIR, the increase in traffic volumes anticipated with growth on the LBNL hill site would not be sufficient to generate perceivable increases in traffic noise.[19] The resulting impact would be less than significant, as stated in the LRDP Final EIR. The population associated with the proposed project is within the population increase analyzed in the 2006 LRDP Final EIR and the volume of increased vehicular traffic related to the proposed project is included in the maximum traffic volumes analyzed for noise impacts under the 2006 LRDP. As the noise impacts from full development under the 2006 LRDP would be less than significant, the proposed project's traffic noise impact is adequately addressed under LRDP Impact NOISE-3 and would also be less than significant.

Operational Stationary Noise

The 2006 LRDP Final EIR evaluated increases in permanent ambient noise levels from stationary sources such as Heating, Ventilation, and Air Conditioning (HVAC) equipment (LRDP Impact NOISE-4 (page IV.I-20)) as a result of increased development and population on the Lab site. As described in the 2006 LRDP Final EIR, HVAC equipment and specialized research equipment could generate noise that may affect off-site receptors. Observance of local noise ordinance standards and **LRDP Mitigation Measure NOISE-4** (operational noise measure), which would require mechanical equipment and building designs to incorporate noise controls to attenuate noise, would reduce any potential impact. The resulting impact would be less than significant, as stated in the 2006 LRDP Final EIR. The proposed project would result in increases or changes in noise levels from operation of the proposed building. **LRDP Mitigation Measure NOISE-4** would be implemented as a standard project feature of the proposed project which would require the design of the BioEPIC project to shield stationary sources to reduce the ambient noise from the project site at off-site receptors, such as the nearby residences, and on-site receptors. The proposed project's impact is adequately addressed under LRDP Impact NOISE-4 and would be less than significant with standard project features.

b. Generation of excessive ground borne vibration or ground borne noise levels? No Further Environmental Document Required.

LRDP Impact NOISE-2 (page IV.I-18) concluded that construction-related vibration impacts which could stem from pile driving and the use of vibratory compaction equipment would be less than significant. The proposed project would remove the existing parking lot and storage area and construct a four-story building on the project site. However, project construction

19 According to the Caltrans Technical Noise Supplement (2013), a doubling of vehicle traffic is required to produce an audible 3 dBA increase in ambient noise. According to the traffic study prepared for the proposed project (Fehr & Peers 2019), the traffic volumes for the proposed project are not anticipated to audibly increase ambient noise levels.

activities would not involve pile driving. Additionally, the off-site receptors are greater than 500 feet away, which is beyond the distance where vibrations -- even from impact pile driving -- are perceptible. Once construction is completed, the project would not involve any equipment that would generate perceptible vibrations. Therefore, the potential vibration impacts from the BioEPIC project implementation are adequately addressed under LRDP Impact NOISE-2 and would be less than significant.

c. For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels? No Further Environmental Document Required.

The project site is not located within the boundaries of any private airstrip or airport land use plan and is more than 2 miles from the nearest public airport. Therefore, the proposed project would not expose people working on the project site to excessive aircraft noise levels associated with a public airport.

5.13.4 Analysis of Cumulative Impacts in 2006 LRDP EIR

As discussed under LRDP Impact NOISE-5, the 2006 LRDP Final 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 Final EIR noted that it was possible during the lifetime of the 2006 LRDP that instances of LBNL construction noise could contribute to cumulative construction noise impacts. On the basis that there might be exceedances of local noise ordinance standards, the 2006 LRDP Final EIR found the cumulative impact of construction noise to be significant and unavoidable. LRDP Impact NOISE-5 noted that in most instances, it can reasonably be anticipated that construction noise impacts on off-site receptors would be reduced to a less than significant level through implementation of **LRDP Mitigation Measures NOISE-1a** and **NOISE-1b**. In addition, both distance to sensitive receptors and intervening terrain, foliage, and structures could further attenuate potential noise impacts. The 2006 LRDP Final EIR concluded that individual projects, such as those in the Illustrative Development Scenario including one on the proposed project site (i.e., hypothetical building "S-3"), would result in less-than-significant cumulative construction noise impacts because of distance to the nearest receptors and implementation of mitigation measures. Due to the proposed project's distance from the nearest off-site receptors and other attenuation factors, the implementation of standard project features **LRDP Mitigation Measures NOISE-1a** and **NOISE-1b**, and the general absence of any other concurrent construction project in the same area as the proposed project, the proposed project's contribution to the cumulative noise impact would not be cumulatively considerable, and the proposed project's cumulative impact would be less than significant.

LRDP Impact NOISE-6 concluded that cumulative impacts related to noise levels from increased traffic and human activities would be less than significant. Taking into consideration the present-day setting and the current cumulative context, this analysis finds that no conditions have changed, and no new information has become available since certification of the 2006 LRDP Final EIR that would alter this previous analysis. The building space, population, associated vehicle traffic, and stationary sources proposed as part of the BioEPIC project are all within the scope of

the 2006 LRDP and therefore were adequately analyzed in the 2006 LRDP Final EIR and would have a less than significant cumulative operational noise impact.

5.13.5 Changes to Circumstances or New Information that could affect the Earlier Environmental Analysis

There are no changes in circumstances and no new information related to noise has become available since the certification of the 2006 LRDP Final EIR that would alter the previous analysis and change its conclusions.

5.14 Population/Housing

5.14.1 Background

LBNL Population, Housing, and Residence Patterns

Section IV.J of the 2006 LRDP Final EIR addresses the population and housing effects of LBNL growth and development under the 2006 LRDP and is incorporated by reference herein pursuant to *State CEQA Guidelines* Section 15150. The following discussion summarizes the information presented in the 'Setting' subsection of Section IV.J of the 2006 LRDP Final EIR.

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 (7 percent of the total), and postdoctoral researchers (6 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, a conservatively estimated 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 (ADP) of 4,375 people for 2003, counting both employees and guests; of which 3,650 average daily population is on the main site.[20]

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 1 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.

Implementation of the 2006 LRDP could increase the LBNL hill site's total ADP from 3,650 in 2003 to 4,650 by 2025, an increase of about 1,000 people or 27 percent. Under the Project Variant, 2006 LRDP implementation could increase the LBNL hill site by 1,350 people, or 37 percent, for a total ADP of 5,000 by 2025. Compared to the ADP of approximately 4,550 people in 2014, the capacity for increase by 2025 would be approximately 825 people, or 1,169 people under the Project Variant.

20 The LBNL estimate of adjusted daily population (ADP) is defined to include FTE employment plus 40 percent of total annual guests.

Regional Population and Housing

As of 2010, the total population of the Bay Area was just over 7,150,000, with roughly 2.6 million households. By 2019 the population had increased by some 633,000 to approximately 7,783,000, an annual growth rate of 1.0 percent (California Department of Finance [DOF] 2019). By 2040, the population of the Bay Area is projected to reach approximately 9.65 million residents, growing 35 percent over 2010 levels, and 26 percent over 2015 levels (ABAG 2018).

Population projections for Alameda County show a 2040 population of just above 2,092,000, a growth of approximately 423,000 over 2019 levels (DOF 2019). The cities of Berkeley and Albany, located within Alameda County, are expected to continue their population growth. Berkeley, with a 2019 population of around 123,000 is projected to grow to just below 141,000. Albany is expected to grow from a 2019 population of around 19,000 to slightly below 20,500 (DOF 2019; ABAG 2018).

Projections show the number of households growing at a slightly lower rate of 31 percent, reaching 3.42 million by 2040. The difference in population and household growth rates translates into a marginal increase in the average household size from 2.67 to 2.76 persons per household (ABAG 2018). Within Alameda County, the number of households is projected to increase by 35 percent to 734,000 in 2040. Following trends in population growth, the cities of Berkeley and Albany are expected to increase the number of households. Berkeley is expected to increase from 2019 levels of 47,604 households to 55,370 households in 2040. Albany has a 2019 estimate of 6,552 households and is projected to grow to 7,855 households in 2040 (DOF 2019; ABAG 2018).

Proposed Project

The proposed project would provide laboratory and office space for approximately 210 occupants. The majority (125) of the employees would relocate from existing off-site leased facilities located in Berkeley.

5.14.2 2006 LRDP EIR Analysis

Impacts related to population and housing from LBNL growth and development under the 2006 LRDP are evaluated in Section IV.J of the 2006 LRDP Final EIR. The 2006 LRDP Final EIR concluded that all population and housing impacts of LBNL growth under the 2006 LRDP would be less than significant. As the population associated with the proposed project is within the population projections in the 2006 LRDP, the proposed project is within the scope of analysis of the 2006 LRDP Final EIR.

5.14.3 Environmental Checklist and Discussion

POPULATION & HOUSING Would the project…	Additional Project-Level Impact Analysis Required	No Further Environmental Document Required
a) Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☑

b)	Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?	☐	☑

DISCUSSION:

BioEPIC Project Analysis

a. Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)? No Further Environmental Document Required.

LRDP Impact POP-1 (page IV.J-13) provides examination of the impact associated with the increase in permanent employees and Lab guest population under the 2006 LRDP and a conclusion that the impact would be less than significant. Operation of the BioEPIC project would transfer approximately 125 employees located at 717 Potter Street in Berkeley to the BioEPIC project site and relocate 85 employees from buildings already on the LBNL hill site. Therefore, the total increase in the hill site population would be about 125 personnel, while there would be no increase in LBNL's overall population. It is unlikely that the employees working at 717 Potter Street in Berkeley would relocate their residences to be closer to the LBNL hill site. Furthermore, due to the large number of communities within commuting distance of the LBNL hill site and the availability of transit, the number of employees that might move into any one community such as Berkeley or Oakland would not be large. All of the employees associated with the proposed project are within the anticipated 2006 LRDP hill site growth of 1,000 employees under the 2006 LRDP project, or under the 1,350 employees under the 2006 LRDP Final EIR Project Variant (see **Table 10**). Therefore, the proposed project's impact is adequately addressed under LRDP Impact POP-1 and would be less than significant.

The proposed project would generate incidental, short-term construction employment. However, due to the short-term nature of construction jobs and the fact that the Bay Area contains a large pool of construction workers, these jobs would not result in an influx of new population into the Bay Area. The proposed project would also not require extension of roads or other infrastructure that could indirectly induce substantial population growth. The project's impact would be less than significant.

b. Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere? No Further Environmental Document 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 proposed project and no replacement housing would be required. Therefore, there would be no impact.

5.14.4 Analysis of Cumulative Impacts in 2006 LRDP EIR

LRDP Impact POP-2 evaluated the cumulative impact of 2006 LRDP growth in conjunction with other regional growth on population and housing. The 2006 LRDP Final EIR analysis indicated that the 2006 LRDP employment growth and associated demand for housing would not comprise

a substantial portion of the planned growth in Berkeley and the region, and LBNL growth under the 2006 LRDP would not contribute to cumulative adverse effects with regard to population or housing. Taking into consideration the present-day setting and the current cumulative context, this analysis finds that no conditions have changed, and no new information has become available since certification of the 2006 LRDP Final EIR that would alter this previous analysis.

Because the proposed project is within the 2006 LRDP scope of development, the proposed project would also not contribute to cumulative adverse effects related to population and housing.

5.14.5 Changes to Circumstances or New Information that could affect the Earlier Environmental Analysis

There are no changes in circumstances and no new information related to population and housing has become available since the certification of the 2006 LRDP Final EIR that would alter the previous analysis and change its conclusions.

5.15 Public Services

5.15.1 Background

Section IV.K of the 2006 LRDP Final EIR addresses the effects on public services from LBNL growth under the 2006 LRDP and is incorporated by reference herein pursuant to *State CEQA Guidelines* Section 15150. The following discussion summarizes the information presented in the 'Setting' subsection of Section IV.K of the 2006 LRDP Final EIR.

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. The 2006 LRDP EIR also discusses hazardous materials emergency response and the emergency program. 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. In addition, the 2006 LRDP EIR describes LBNL's Vegetation Management Plan as a prevention program for wildland fires.

Law Enforcement

Police services at LBNL 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. 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. UC LBNL does not have such an agreement with Oakland Police Department.

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 employees who live in these two communities.

Parks and Recreation

The East Bay Regional Park District (EBRPD) manages over 114,000 acres within Alameda and Contra Costa Counties, including 65 regional parks, recreational areas, wilderness, shorelines, preserves, and land bank areas as well as 1,200 miles of trails. EBRPD properties within the vicinity of the LBNL hill site include Tilden Park and the Claremont Canyon Preserve (EBRPD 2014).

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. Additional resources include the Ecological Study Areas. The University also owns the 2.3-acre People's Park located south of the UC Berkeley campus.

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. There are 52 parks providing traditional activities such as athletic fields, swimming pools, and tennis and basketball courts, as well as numerous tot and school-age play areas, community gardens, rock climbing, and a variety of water sports at the Berkeley Marina. The City of Berkeley maintains the parks-to-population ratio of 2.0 acres of parkland per 1,000 residents that was established in the 1977 City of Berkeley Master Plan (City of Berkeley 2001).

The City of Oakland's Office of Parks, Recreation, and Cultural Affairs manages the City's parks and recreation centers. There are 127 parks totaling 6,063 acres of parkland in the City of Oakland (City of Oakland 2014, The Trust for Public Land 2014). These parks provide amenities, including play structures, sports fields, picnic areas, and dog play areas.

Project Site

The proposed project would accommodate a population of approximately 210 occupants and involve construction of about 73,000 gsf of new building space. These occupants and the new building space developed under this project would be served by public service agencies in the Cities of Berkeley and Oakland, Alameda County, UC Berkeley, and LBNL in the manner discussed above.

5.15.2 2006 LRDP EIR Analysis

Impacts of LBNL growth and development under the 2006 LRDP on public services are evaluated in Section IV.K of the 2006 LRDP Fina EIR. Because implementation of the 2006 LRDP would not

result in any significant impacts to public services and recreation, the 2006 LRDP Final EIR did not identify any mitigation measures for impacts to public services and recreation. As discussed in **Section 5.11**, both the population and building space associated with the proposed project are within the 2006 LRDP population and building space projections, the proposed project is within the scope of analysis of the 2006 LRDP Final EIR.

5.15.3 Environmental Checklist and Discussion

PUBLIC SERVICES Would the project…	Additional Project-Level Impact Analysis Required	No Further Environmental Document Required
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?	☐	☑
ii) Police protection?	☐	☑
iii) Schools?	☐	☑
iv) Parks?	☐	☑
v) Other public facilities?	☐	☑

DISCUSSION:

BioEPIC Project Analysis

a.i. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered fire protection facilities, need for new or physically altered fire protection facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives? No Further Environmental Document Required.

The 2006 LRDP Final EIR concluded that based on current and expected demand for fire protection services and discussion with Alameda County Fire Department, implementation of the 2006 LRDP and individual projects under it would not result in the need for new facilities, staff, or equipment to provide adequate fire protection (LRDP Impact PUB-1 (page IV-K-17)), and the impact would be less than significant. Construction of the proposed BioEPIC project and additional employees associated with the proposed project would increase the potential need for emergency fire services. Implementation of the proposed project would add about 125 personnel to the LBNL hill site to the current on-site employee population. As shown in **Table 10**, the increase in employees associated with the BioEPIC project is within the 2006 LRDP daily population and building space growth projections. Therefore, the impact of the proposed project in relation to fire protection services is adequately addressed under LRDP Impact PUB-1 and the

proposed project would not require new fire service facilities, and its impact would be less than significant.

a.ii. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered police protection facilities, need for new or physically altered police protection facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives? No Further Environmental Document Required.

LRDP Impact PUB-2 (page IV.K-18) discusses the impacts associated with the increase in calls for police services associated with the increase in employees under the 2006 LRDP and concluded that the impact would be less than significant. As discussed in the 2006 LRDP Final EIR, a 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 5 minutes. Under the existing contract, UCPD responds to incidents on the LBNL hill site as needed, and response times for UCPD are also less than 5 minutes. While facility construction and addition of staff population at the LBNL hill site would potentially increase the need for police services, project-related increases in new space and employees is within the 2006 LRDP population growth projections. Therefore, the impact of the proposed project in relation to police services is adequately addressed under LRDP Impact PUB-2 and would be less than significant.

a.iii. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered schools, need for new or physically altered schools, the construction of which could cause significant environmental impacts, in order to maintain performance objectives? No Further Environmental Document Required.

As discussed under LRDP Impact PUB-3 (page IV.K-20), implementation of the 2006 LRDP would not result in the need for new or physically altered public school facilities. The proposed project would not develop residential uses and therefore would not directly generate new student enrollment in the BUSD or OUSD (or other school districts). While it is possible that some project-related households might relocate to the cities of Berkeley and Oakland, such relocations would be minimal. Furthermore, as noted above, the increase in employees associated with the BioEPIC project is within the 2006 LRDP population growth projections. Therefore, the impact of the proposed project on schools is adequately addressed under LRDP Impact PUB-3 and would be less than significant.

a.iv. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered parks, need for new or physically altered parks, the construction of which could cause significant environmental impacts, in order to maintain performance objectives? No Further Environmental Document Required.

As discussed under LRDP Impact PUB-4 (page IV.K-21), implementation of the 2006 LRDP would not adversely affect the provision of parks and recreational facilities. As noted above, the 210 occupants associated with the BioEPIC project are within the 2006 LRDP population growth projections. Therefore, the impact of the proposed project in relation to parks and recreation is adequately addressed under LRDP Impact PUB-4 and would be less than significant.

a.v. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered public facilities, need for new or physically altered public facilities, the construction of which could cause significant environmental impacts, in order to maintain performance objectives? No Further Environmental Document Required.

No other governmental services are expected to be affected by the proposed project.

5.15.4 Analysis of Cumulative Impacts in 2006 LRDP EIR

Police and Fire Services

Cumulative impacts on fire and police protection services are discussed under LRDP Impact PUB-5. Implementation of the 2006 LRDP would contribute to an increase in demand for fire protection services and police services. While foreseeable development on the LBNL hill site may cause call volume for fire services to increase slightly, such incremental increases in demand for fire protection services would be accommodated without additional staffing or facilities. Therefore, the 2006 LRDP Final EIR concluded that the increased demand would not result in the need for new or physically altered facilities, the construction of which could cause significant environmental impacts. Reasonably foreseeable development in the East Bay could result in the increased need for new or altered fire protection or police facilities in the region. The City of Berkeley General Plan indicates the need for additional fire protection facilities and the City of Oakland General Plan indicates the need for expanded facilities or the seismic retrofit of existing facilities. However, the 2006 LRDP Final EIR concluded that implementation of the 2006 LRDP would not result in the need for new facilities, staff, or equipment to provide adequate fire protection or police services. Accordingly, it concluded that the 2006 LRDP's contribution to cumulative demand would not be cumulatively considerable. Furthermore, planned residential development in local jurisdictions where UC LBNL employees might live, such as the cities of Berkeley or Oakland, would be subject to the local agency's zoning ordinance and general plan policies, which would require that environmental impacts associated with new residential development be mitigated to the maximum extent feasible.

The increase in LBNL population due to the proposed BioEPIC project is well within the levels of growth analyzed in the 2006 LRDP EIR and the demand for police and fire services attributable to the proposed project is within the scope of the 2006 LRDP analysis. Therefore, the proposed project's cumulative impacts on police and fire services are adequately addressed by the analysis in the 2006 LRDP Final EIR and are found to be less than significant. Taking into consideration the present-day setting and the current cumulative context, this analysis finds that no conditions have changed, and no new information has become available since certification of the 2006 LRDP Final EIR that would alter this previous analysis.

Schools

According to the 2006 LRDP Final EIR, implementation of the 2006 LRDP under cumulative conditions would not result in the need for new or physically altered public school facilities (LRDP Impact PUB-6). As discussed under LRDP Impact PUB-3, the 2006 LRDP would include no housing, and therefore the effect of implementing the 2006 LRDP would be indirect; that is, any increased demand for school facilities would derive from residential development to accommodate increased daily population at the LBNL hill site. Because the 2006 LRDP would

result in no direct impact on school facilities, and because the indirect effect would be minimal, implementation of the 2006 LRDP would not result in a considerable contribution to any cumulative increase in the demand for school facilities in any one school district. The increase in LBNL population due to the proposed BioEPIC project is well within the levels of growth analyzed in the 2006 LRDP Final EIR and the demand for public school services attributable to the proposed project is within the scope of the 2006 LRDP analysis. Taking into consideration the present-day setting and the current cumulative context, this analysis finds that no conditions have changed, and no new information has become available since certification of the 2006 LRDP Final EIR that would alter this previous analysis.

Parks and Recreation Facilities

Implementation of the 2006 LRDP would not substantially affect the provision of parks and recreation facilities under cumulative conditions (LRDP Impact PUB-7). Implementation of the 2006 LRDP along with cumulative development could result in an increased demand for parks and recreation facilities in Berkeley and Oakland. The 2006 LRDP does not include any housing component, and therefore the effect of implementing the 2006 LRDP would be indirect; that is, any increased demand for park and recreation facilities would derive from new residential development to accommodate increased daily population at the LBNL hill site. Because the 2006 LRDP would result in no direct impact on park and recreation facilities, and because any indirect effect would be minimal, implementation of the 2006 LRDP would not result in a considerable contribution to any cumulative increase in the demand for park and recreation facilities. The increase in LBNL population due to the proposed BioEPIC project is well within the levels of growth analyzed in the 2006 LRDP Final EIR and the demand for parks and recreation services attributable to the proposed project is within the scope of the 2006 LRDP analysis. Taking into consideration the present-day setting and the current cumulative context, this analysis finds that no conditions have changed, and no new information has become available since certification of the 2006 LRDP Final EIR that would alter this previous analysis.

5.15.5 Changes to Circumstances or New Information that could affect the Earlier Environmental Analysis

There are no changes in circumstances and no new information related to public services has become available since the certification of the 2006 LRDP Final EIR that would alter the previous analysis and change its conclusions.

5.16 Recreation

5.16.1 Background

Section IV.K (Public Services and Recreation) of the 2006 LRDP Final EIR addresses the demand for recreational facilities and the potential for substantial deterioration of recreational facilities as a result of development under the 2006 LRDP and is incorporated by reference herein pursuant to *State CEQA Guidelines* Section 15150. Background conditions for recreation are discussed under Section 5.15.1 above.

5.16.2 2006 LRDP EIR Analysis

Impacts of LBNL growth and development under the 2006 LRDP on recreation are evaluated in Section IV.K of the 2006 LRDP Final EIR. Because implementation of the 2006 LRDP would not result in any significant impacts to recreation, the 2006 LRDP EIR did not identify any mitigation measures for impacts to recreation. For reasons set forth in **Section 5.11**, the proposed project is within the scope of analysis of the 2006 LRDP Final EIR.

5.16.3 Environmental Checklist and Discussion

RECREATION Would the project…	Additional Project-Level Impact Analysis Required	No Further Environmental Document Required
a) 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?	☐	☑
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☑

DISCUSSION:

BioEPIC Project Analysis

a. 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? No Further Environmental Document Required.

As discussed under LRDP Impact PUB-4 (page IV.K-21), implementation of the 2006 LRDP would not adversely affect parks and recreational facilities. 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 item **5.15 a. iv**, above. Because the population increase associated with the proposed BioEPIC project is within the 2006 LRDP daily population growth projections, physical deterioration of recreational facilities is not expected to occur as a

result of the proposed project. The project's impact is adequately addressed under LRDP Impact PUB-4 and would be less than significant.

b. Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment? No Further Environmental Document Required.

The proposed project would not include recreational facilities. Since the proposed project's impacts on existing recreational facilities would be less than significant (see response to item **5.15 a. iv**, above), and new or expanded recreational facilities would not be required, the proposed project's impact is adequately addressed under LRDP Impact PUB-4 and would be less than significant.

5.16.4 Analysis of Cumulative Impacts in 2006 LRDP EIR

Implementation of the 2006 LRDP would not substantially affect the provision of parks and recreation facilities under cumulative conditions (LRDP Impact PUB-7). Implementation of the 2006 LRDP along with cumulative development could result in an increased demand for parks and recreation facilities in Berkeley and Oakland. The 2006 LRDP does not include any housing component, and therefore the effect of implementing the 2006 LRDP would be indirect; that is, any increased demand for park and recreation facilities would derive from new residential development to accommodate increased daily population at the LBNL hill site. Because the 2006 LRDP would result in no direct impacts on park and recreation facilities, and because any indirect effect would be minimal, implementation of the 2006 LRDP would not result in a considerable contribution to any cumulative increase in the demand for park and recreation facilities. The increase in LBNL population due to the BioEPIC project is well within the levels of growth analyzed in the 2006 LRDP Final EIR and the demand for parks and recreation services attributable to the proposed project is within the scope of the 2006 LRDP analysis. Taking into consideration the present-day setting and the current cumulative context, this analysis finds that no conditions have changed, and no new information has become available since certification of the 2006 LRDP Final EIR that would alter this previous analysis.

5.16.5 Changes to Circumstances or New Information that could affect the Earlier Environmental Analysis

There are no changes in circumstances and no new information related to recreation has become available since the certification of the 2006 LRDP Final EIR that would alter the previous analysis and change its conclusions.

5.17 Transportation

5.17.1 Background

Section IV.L of the 2006 LRDP Final EIR addresses the transportation, circulation, and parking effects of LBNL growth under the 2006 LRDP and is incorporated by reference herein pursuant to *State CEQA Guidelines* Section 15150. The following discussion summarizes the information presented in the 'Setting' subsection of Section IV.L of the 2006 LRDP Final EIR, which provides a basis for the analysis of the environmental effects of the proposed project.

Regional and LBNL Roadway Network

The LBNL hill site is located close to three regional highways: Interstate 80/580 about 3 miles to the west and State Routes (SR) 24 and 13 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 SR-13 is via Tunnel Road.

The LBNL hill site is served by three roadway entrances: (1) the Blackberry Canyon Gate in the southwestern portion of the LBNL hill site; it is the main entrance to the LBNL hill site and is on Cyclotron Road, north of the intersection of Hearst Avenue and Gayley Road; (2) Strawberry Canyon Gate in the southeastern area of the LBNL hill site, which is accessed via Centennial Drive; and (3) Grizzly Peak Gate in the northeastern area of the LBNL hill site, which is 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 7:00 AM to 9:00 AM) and afternoon (generally 4:00 PM to 6:00 PM) peak commute times. The LOS standard for City intersections is LOS D.

Of the 20 city intersections evaluated in the 2006 LRDP Final EIR, only one intersection (Bancroft Way at Gayley Road/Piedmont Avenue) operated at an unacceptable LOS in 2006. The 2006 LRDP Final 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 LOS.

A Transportation Impact Study, provided in **Appendix E,** was prepared for the proposed project (Fehr & Peers 2019). Four intersections adjacent to the project site were chosen for study: Hearst Avenue/Gayley Road/La Loma Avenue, Stadium Rim Way/Gayley Road, Bancroft Way/Piedmont Avenue, and Durant Avenue/Piedmont Avenue.

The existing intersection delay and LOS at the study intersections adjacent to the project site are provided below in **Table 11, Existing Intersection Delay/Level of Service**. Detailed information regarding the study intersections is provided in **Appendix E**. As the table shows, all four study intersections currently operate at LOS D or better in the AM peak hour. One intersection operates at LOS D or better during the PM peak hour. Based on the analysis and verified by observations, the northbound and southbound vehicle flows at the Bancroft Way/Piedmont Avenue intersection and all approaches at the Stadium Rim Way/Gayley Road intersections are impeded by the high pedestrian volumes crossing Piedmont Avenue and Gayley Road, respectively, during the PM peak hour. The Stadium Rim Way/Gayley Road intersection is the only stop-controlled study intersection that currently satisfies the California MUTCD peak hour traffic volume signal warrant.

Table 11
Existing Intersection Delay/Level of Service

Intersection	Traffic Control	AM		PM	
		Delay (sec/vehicle)[1]	LOS[1]	Delay (sec/vehicle)[1]	LOS[1]
1. Hearst Avenue/Gayley Road/La Loma Avenue	Signal	16	B	13.8	B
2. Stadium Rim Way/Gayley Road[2]	All-Way Stop	17	C	**13.8**	**E**
3. Bancroft Way/Piedmont Avenue[2]	All-Way Stop	21	C	**44.6**	**F**
4. Durant Avenue/Piedmont Avenue[2]	All-Way Stop	12	B	**28.7**	**F**

Source: Fehr and Peers 2019 ***Appendix E****.*
Notes: ***Bold*** *indicates an intersection operating at unacceptable LOS E or LOS F.*
For signalized, all-way stop-controlled, and roundabout intersections, average intersection delay and LOS based on the 2000 HCM method is shown.
[1] *Average intersection delay and LOS based on the HCM, 6th Edition method.*
[2] *Intersection analyzed using SimTraffic software because of unique conditions including heavy pedestrian volumes. Field observations validate the results shown in the table.*

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 accessible to the general public. UC LBNL implements a permit parking program. Under its Transportation Demand Management (TDM) program, UC LBNL discourages the use of single occupant vehicle commuting.

Bicycle and Pedestrian Network

About 10 percent of LBNL main hill site employees commute by bicycle. Roads are narrow and steep with no dedicated bike lanes. Pedestrian walkways within the LBNL hill site are discontinuous. Walkways are generally used to move between nearby building clusters; for longer trips, the employees use shuttles, government vehicles, or personal vehicles.

Transit

The LBNL hill site is served by LBNL shuttles that run between the LBNL hill site and the Center Street/Shattuck BART station. Service schedules vary between 10 and 15 minutes on weekdays. An express shuttle operates on an hourly schedule during commute hours between the LBNL hill site and the Rockridge BART station. The LBNL shuttle stops have been coordinated with AC Transit bus lines serving downtown Berkeley. The shuttles are equipped with bicycle racks.

Project Site

The BioEPIC project site is located adjacent to the intersection where Chu Road divides into Smoot Road/McMillan Road and Alvarez Road. The project site is a 1-acre portion of a 6.6-acre Bayview Planning Area, which includes a 250-space parking and storage area.

5.17.2 2006 LRDP EIR Analysis

Impacts on traffic, circulation, and parking from LBNL growth and development under the 2006 LRDP are evaluated in Section IV.L of the 2006 LRDP Final EIR. The 2006 LRDP Final EIR analysis concluded under LRDP Impact TRANS-1 that the addition of LRDP-related traffic would affect the level of service at three study intersections. However, after the certification of the 2006 LRDP Final EIR, the City of Berkeley adopted new thresholds of significance for the evaluation of a project's traffic impacts. To address the change in the thresholds, in 2010 UC LBNL conducted a supplemental analysis of the traffic impacts from LRDP development under 2025 conditions. in conjunction with the Seismic Phase 2 environmental review. The 2010 Supplement updated pages IV.L-28 through IV.L-44 of the 2006 LRDP Final EIR. The supplemental analysis concluded that traffic associated with growth and development under the 2006 LRDP could affect the level of service at a fourth intersection: Bancroft Way and Piedmont Avenue. Both the 2006 LRDP Final EIR and the supplemental analysis concluded that fair share funding of traffic improvements pursuant to **LRDP Mitigation Measures TRANS-1a** through **TRANS-1e** would reduce the significant LRDP Impact TRANS-1 at the four affected intersections to a less than significant level. The mitigation also required UC LBNL to prepare and implement a new Transportation Demand Management (TDM) Program which included several implementation phases tied to the addition of parking on the LBNL hill site. However, because no plan was in place for the installation of the traffic improvements at the affected intersections (due in part to the fact that implementation was outside the authority of UC LBNL to conduct on its own), this impact was determined to be significant and unavoidable. The Regents found the remaining significant and unavoidable impact to be acceptable when the LRDP's benefits were weighed against its environmental consequences.

The 2006 LRDP Final EIR and the 2010 Supplement also concluded that a significant and unavoidable cumulative traffic impact (LRDP Impact TRANS-8) would occur at certain study intersections. **LRDP Mitigation Measure TRANS-8** (cumulative traffic impacts measure) would be implemented for this impact, but for the same reasons identified above under LRDP Impact TRANS-1, there would be a significant unavoidable impact. All other traffic impacts were determined to be less than significant.

The proposed project is within the scope of analysis of the 2006 LRDP Final EIR, as supplemented in 2010. Relevant mitigation measures in the 2006 LRDP Final EIR (now standard project features

for projects under the LRDP) have been incorporated as part of the planning and design of the proposed project and will be implemented during project construction and operations consistent with LRDP mitigation monitoring requirements.

5.17.3 Environmental Checklist and Discussion

TRANSPORTATION Would the project…	Additional Project-Level Impact Analysis Required	No Further Environmental Document Required
a) Conflict with a program plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?	☐	☑
b) Conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?	☐	☑
c) Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☑
d) Result in inadequate emergency access?	☐	☑

DISCUSSION:

BioEPIC Project Analysis

a Conflict with a program plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities? No Further Environmental Document Required.

Impacts on Transit

LRDP Impact TRANS-2 (page IV.L-34) and Impact TRANS-3 (page IV.L-35) discuss the effects of the 2006 LRDP growth on transit ridership and shuttle buses and find that the impact on transit service would be less than significant, and the impact on shuttle buses would be less than significant with implementation of **LRDP Mitigation Measure TRANS-3** (transportation mode balance measure). The proposed project is within the scope of the LRDP analysis as it would increase the LBNL hill site population by a number that is within the population increase (and thereby ridership increase) analyzed in the 2006 LRDP Final EIR. Furthermore, **LRDP Mitigation Measures TRANS-1a** and **TRANS-1b,** which involve the implementation of a TDM plan, would be implemented as standard project features. The proposed project's impacts on transit are adequately addressed under LRDP Impacts TRANS-2 and TRANS-3 and would be less than significant with standard project features.

Parking on the Bevatron parking lot would be reduced with construction of the proposed project, discouraging driving to work. The consolidation of two related research programs would also encourage the use of alternative transit and carpooling to the LBNL hill site. Consequently, the proposed project would not conflict with the 2006 LRDP Vehicle Access, Circulation, and Parking

Strategies or the UC Policy on Sustainable Transportation Practices[21]. The impact would be less than significant.

Construction Traffic Impacts

Impacts from increases in construction truck traffic from construction projects under the 2006 LRDP, including the proposed project, are addressed under LRDP Impact TRANS-6 (page IV.L-38). The analysis concluded that construction-related traffic would have temporary and intermittent effects on area traffic because of the slower movements and larger turning radii of construction trucks compared to passenger vehicles. However, with implementation of LRDP Best Practice TRANS-6, the short-term construction-related transportation impacts would be less than significant. The proposed project would also implement LRDP Best Practice TRANS-6 and the project's impact would be less than significant. In addition, as part of its TDM Plan and pursuant to LRDP EIR TRANS-6c, LBNL implements a Construction Truck Management System that assures that truck trips stay well below CEQA impact thresholds. Under the System, all LBNL construction truck trips for the lLBNL hill site are managed by a construction truck coordinator. The coordinator assures that aggregate construction truck trips do not exceed an impact threshold that is periodically updated by an outside traffic engineering consultant. When truck trips begin to approach such levels, the coordinator works with project managers to reduce or reschedule trucks to avoid impacts.

Impacts to roadway pavement surfaces from wear associated with construction-related truck trips are evaluated under LRDP Impact TRANS-7 (page IV.L-41). The 2006 LRDP construction would not generate enough truck traffic to result in substantial wear of roadways. The 2006 LRDP Final EIR concluded that the impact of individual construction projects under the LRDP on roadway wear would be less than significant. The proposed project's impact is adequately addressed under LRDP Impact TRANS-7 and would be less than significant.

Operational Traffic Impacts

A traffic impact assessment was prepared by Fehr & Peers for the proposed BioEPIC project to evaluate the effect of the project's operational traffic on intersections that serve the site. Results of that assessment are summarized below. The full report is presented in **Appendix E.** This traffic analysis conservatively examines a scenario where all 210 BioEPIC occupants are new to the Lab hill site, as opposed to the 125 occupants who are expected to be new.

Because the proposed project would increase the population on the LBNL hill site, more people would drive to the LBNL hill site, take public transit, or use the LBNL shuttle. **Table 12, Vehicle Trip Generation Summary**, presents estimated peak hour trips. There would be a total of approximately 34 AM peak hour and 32 PM peak hour vehicle trips.

21 University of California Office of the President. *Sustainable Transportation*. Available Online: https://ucop.edu/sustainability/policy-areas/sustainable-transportation/index.html

Table 12
Vehicle Trip Generation Summary

	Average Daily Population	Daily Vehicle Trips	AM Peak Hour Trips			PM Peak Hour Trips		
			In	Out	Total	In	Out	Total
Existing LBNL[1]	4,200	6,640	581	93	674	85	551	636
BioEPIC Project[2]	210	330	29	5	34	4	28	32

Source: Fehr and Peers 2019 ***Appendix E****.*
Notes:
[1] Based on counts at LBNL gates conducted in April 2011.
[2] Based on the following current trip generation rate at the LBNL hill site:
Daily = 1.58 trips per Average Daily Population (ADP)
AM Peak Hour = 0.16 trips per ADP (86% in, 14 % out)
PM Peak Hour = 0.15 trips per ADP (13% in, 87% out)

Existing Plus Project Traffic Impacts

As part of the traffic analysis, the project's peak hour trips were added to the projected traffic volumes at the four study intersections to examine the proposed project's effect on existing traffic conditions. The results of the analysis are provided below in **Table 13, Existing Plus Project Conditions – Study Intersection LOS Summary**.

Table 13
Existing Plus Project Conditions – Study Intersection LOS Summary

Intersection	Traffic Control	Peak Hour	Existing No Project		Existing Plus Project	
			Delay[1] (sec/vehicle)	LOS[1]	Delay[1] (sec/vehicle)	LOS[1]
1. Hearst Avenue/Gayley Road/La Loma Avenue	Signal	AM	16	B	16	B
		PM	17	B	18	B
2. Stadium Rim Way/Gayley Road	All-Way Stop	AM	17	C	17	C
		PM	**42**	**E**	**44**	**E**
3. Bancroft Way/Piedmont Avenue[1]	All-Way Stop	AM	21	C	23	C
		PM	**>75**	**F**	**>75**	**F**
4. Durant Avenue/Piedmont Avenue[1]	All-Way Stop	AM	12	B	12	B
		PM	**62**	**F**	**65**	**F**

Source: Fehr and Peers 2019 ***Appendix E****.*
Notes: ***Bold*** *indicates an intersection operating at LOS E or LOS F.*
[1] Average intersection delay and LOS based on the HCM, 6th Edition method.
[2] Intersection analyzed using SimTraffic software because of unique conditions including heavy pedestrian volumes. Field observations validate the results shown in the table.

The traffic analysis includes an evaluation of the proposed project's traffic effects based on City of Berkeley thresholds of significance. According to the City, an impact is significant if the project would cause:

- At a signalized intersection, operations degrade from LOS D to LOS E or worse and more than a two-second increase in delay; or
- At a signalized intersection, more than a three-second increase in delay at intersections operating at LOS E without and with the project; or
- At a signalized intersection, operations degrade from LOS E to LOS F and more than a three-second increase in delay; or
- At a signalized intersection operating at LOS F without the project, a change in the volume-to-capacity (v/c) ratio of more than 0.01.
- At an unsignalized intersection, the addition of project-related traffic causes:
    - the critical approach to operate at LOS F; and
    - The intersection meets the peak hour traffic volume signal warrants (California Manual on Uniform Traffic Control Devices [MUTCD] Warrant 3); and
    - A minimum of 10 vehicles are added to the critical movement.

As **Table 13** above shows, all study intersections during the AM peak hour and the Hearst Avenue/Gayley Road/La Loma Avenue intersection during the PM peak hour would continue to operate at LOS D or better under the Existing Plus Project conditions. The three all-way stop-controlled study intersections would operate at LOS E or LOS F during the PM peak hour. However, the project would not cause an impact at these intersections because the Bancroft Way/ Piedmont Avenue and the Durant Avenue/Piedmont Avenue intersections would not satisfy the California MUTCD peak hour traffic volume signal warrant. Although the Stadium Rim Way/Gayley Road intersection would satisfy the California MUTCD peak hour traffic volume signal warrant, the project would not cause a significant impact at this intersection because it would add fewer than 10 peak hour trips to any of the intersection movements.

b. Conflict or be inconsistent with *CEQA Guidelines* Section 15064.3, subdivision (b)? No Further Environmental Document Required.

CEQA Guidelines Section 15064.3, subdivision (b) sets forth the new CEQA requirements that transportation impacts of a proposed project be evaluated in terms of the project's potential to increase vehicle miles traveled (VMT) on the network serving the project. These changes to the guidelines identify VMT as the most appropriate metric to evaluate a project's transportation impacts. With the California Natural Resources Agency's certification and adoption of the changes to the *CEQA Guidelines*, automobile delay, as measured by "level of service" and other similar metrics, generally no longer constitutes a significant environmental effect under CEQA. (Pub. Resources Code, § 21099, subd. (b)(3).) Although agencies may begin the use of new metrics whenever they so choose, July 1, 2020 is the statewide implementation date.

As the revised guidelines were certified in late December 2018, as of the preparation of this environmental assessment, neither the University nor the local jurisdiction (City of Berkeley) has developed standards or thresholds to use to evaluate traffic impacts based on new metric.

Therefore, this environmental assessment uses the LOS metric to evaluate transportation impacts. See item "**a**" above for LOS analysis.

c. Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)? No Further Environmental Document Required.

LRDP Impact TRANS-5 (page IV.L-37) discusses potential conflicts between LRDP-related growth in traffic and pedestrians and bicyclists. The impact conclusion indicates that individual projects under the LRDP program, including the proposed project, could marginally increase potential traffic conflicts with pedestrians and bicyclists by intermittently increasing traffic volumes. This impact would be less than significant. The proposed project would be constructed in accordance with the 2006 LRDP design guidelines, which would ensure that hazards due to geometric design features or incompatible uses would not substantially increase. The BioEPIC project, consistent with the 2006 LRDP, would not substantially increase transportation hazards as the proposed project involves no changes to any roads outside of project site driveways. The proposed project would be constructed in accordance with the 2006 LRDP, which would minimize vehicle access and circulation conflicts. The impact is adequately addressed under LRDP Impact TRANS-5 and would be less than significant.

d. Result in inadequate emergency access? No Further Environmental Document Required.

LRDP Impact TRANS-1 (IV.L-28) examined the effect of LRDP-related traffic increases on emergency vehicle access to the LBNL hill site. No potential impacts were identified. The proposed project would not result in significant impacts to the study intersections as discussed above. Therefore, the proposed project's impact is adequately addressed under LRDP Impact TRANS-1 and the project would not have a significant impact on emergency access to the LBNL hill site.

5.17.4 Analysis of Cumulative Impacts in 2006 LRDP EIR

Construction Traffic Impacts

The 2006 LRDP EIR, under Impact TRANS-6 (focused on construction traffic), concluded that estimated construction truck traffic from the Lab, including 65 one-way daily truck trips (33 trucks per day) in a peak year, would not result in a significant impact on City intersections. A subsequent study conducted by Fehr & Peers in 2012 demonstrated that if the average truck traffic from all construction projects at the Lab does not exceed 96 daily peak truck trips and the hourly maximum is maintained at no more than 8 truck trips per hour, the impact from the Lab's construction truck traffic would be less than significant (Fehr & Peers 2012). Pursuant to LRDP Best Practice TRANS-6, UC LBNL has an established program to manage daily construction truck trips from ongoing construction projects so as not to exceed the numbers established by the Fehr & Peers study. This program, which is implemented and actively monitored by UC LBNL, is a part of every construction project at the Lab, and it is a part of the proposed project. By limiting the total number of daily truck trips from the proposed project and other concurrent LBNL construction projects, UC LBNL will continue to avoid an exceedance of the truck trips number established to avoid a significant traffic impact on area streets, including the Hearst Avenue/Gayley Road/La Loma Avenue intersection and Gayley Road/Stadium Rim Way

intersection. Therefore, the project's cumulative construction traffic impact would be less than significant.

Operational Traffic Impacts (Year 2025 Analysis)

An analysis of the cumulative effect of LBNL growth under the 2006 LRDP was included in the 2006 LRDP Final EIR (LRDP Impact TRANS-8). As noted earlier in this section, a supplemental traffic analysis was conducted in July 2010 to update the cumulative traffic impacts of the 2006 LRDP in light of the revised LOS thresholds adopted by the City of Berkeley. That additional analysis, which was presented in the Seismic Phase 2 EIR, found significant and unavoidable long-term cumulative impacts at four intersections as a result of LRDP development, in combination with traffic generated by other reasonably foreseeable development in the area. The four affected intersections are:

- Durant Avenue/Piedmont Avenue,
- Hearst Avenue/Gayley Road–La Loma Avenue,
- Gayley Road/Stadium Rim Way, and
- Bancroft Way/Piedmont Avenue.[22]

Baseline and cumulative conditions have not experienced a meaningful change since preparation of the July 2010 supplemental traffic analysis, and the cumulative projects that were included in the July 2010 supplemental traffic analysis include all of the cumulative projects which this BioEPIC project environmental assessment analyzes. Therefore, the conclusions of the 2006 LRDP Final EIR analysis as updated by the July 2010 study remain unchanged.

Through the 2006 LRDP Final EIR and the 2010 Supplement approvals process, UC LBNL is committed to working with the City of Berkeley and UC Berkeley to implement measures at the four intersections identified in **LRDP EIR Mitigation Measures TRANS-1a** through **TRANS-1e**. This includes conducting a detailed study at the Hearst Avenue/Gayley Road–La Loma Avenue intersection and contributing on a fair-share basis to the cost of implementing any specific mitigation measures identified through the study. The study was completed in November 2009 and identified a number of improvements that, taken together, would be sufficient to improve year 2025 LOS from F to E. UC LBNL has committed to its share of the necessary funding, but as of the preparation of this document, no improvement plan has been advanced or adopted by the City of Berkeley. Cumulative impacts on LOS at the Hearst Avenue/Gayley Road–La Loma Avenue intersection were therefore identified as significant and unavoidable in both the 2006 LRDP Final EIR and in the 2010 Supplement. A similar situation exists with the other three intersections identified in the 2006 LRDP Final EIR and 2010 Supplement as significantly affected: improvements have been identified and UC LBNL has committed to fair-share funding, but since improvement plans have yet to be adopted by the City, cumulative impacts at the Durant

22 The key difference between the findings of the LBNL 2006 LRDP EIR and those of the 2010 Supplement was the finding of a significant and unavoidable cumulative impact at a fourth intersection (Bancroft Way/Piedmont Avenue); the other three intersections were identified as subject to a significant and unavoidable long-term cumulative impact in the 2006 LRDP EIR.

Avenue/Piedmont Avenue, Gayley Road/Stadium Rim Way, and Bancroft Way/Piedmont Avenue intersections are considered significant and unavoidable.

In summary, the BioEPIC project's long-term operational traffic contribution to the four affected intersections would be comparatively small; nevertheless, evaluated conservatively, the impact contribution is viewed as cumulatively considerable. The impact could be effectively mitigated through implementation of **LRDP Mitigation Measures TRANS-1a** through **TRANS-1e**, which are included in the proposed project as standard project features. However, although it has committed to appropriate, fair-share mitigation for the four affected intersections, UC LBNL alone cannot implement the improvements prescribed in these mitigation measures. These mitigation measures require full participation and fair-share funding from UC Berkeley and the City of Berkeley as well. Because a joint commitment by all participants has not yet been made to mutually undertake the mitigation-prescribed improvements described in the **LRDP Mitigation Measures TRANS-1a** through **TRANS-1e**, this CEQA analysis assumes that the BioEPIC project's contribution to this impact would be cumulatively considerable. This impact is adequately analyzed in the 2006 LRDP Final EIR and 2010 Supplement and was fully addressed in the Findings and Statement of Overriding Considerations adopted by The Regents in connection with its approval of the 2010 Supplement with respect to Traffic Impacts at One Intersection.

Operational Traffic Impacts (Year 2040 Analysis)

As the BioEPIC project would become operational in 2023, UC LBNL determined that the updated cumulative impact analysis presented in the 2010 Supplement that goes out only through 2025 would not provide an adequate cumulative analysis for the project (typically cumulative impacts are analyzed for a future year that is at least 10 to 15 years beyond the year that a project would become fully operational). Therefore, an additional analysis of cumulative transportation impacts of the BioEPIC project under 2040 conditions was conducted as part of the BioEPIC traffic study. The results of that cumulative analysis are summarized below.

Traffic forecasts to the year 2040 were developed based on the results of the Alameda County Transportation Commission (CTC) Countywide Travel Demand Model. The most recent version of the Alameda CTC Model, released in June 2018, which reflects assumptions in residential and non-residential land use growth, as well as changes to the transportation network, consistent with Metropolitan Transportation Commission (MTC) Plan Bay Area 2040 (i.e., Sustainable Community Strategies), served as the basis for developing AM and PM peak hour intersection turning movement forecasts for the year 2040. The traffic volume forecasts were adjusted to account for the expected traffic generated by major projects currently under construction or planned at LBNL and UC Berkeley in the vicinity of the study intersections. The results of the analysis are provided below in **Table 14, Cumulative (2040) Project Conditions – Study Intersection LOS Summary**.

Table 14
Cumulative (2040) Project Conditions – Study Intersection LOS Summary

Intersection	Traffic Control	Peak Hour	Cumulative (2040) No Project		Cumulative (2040) Plus Project	
			Delay (sec/vehicle)	LOS	Delay (sec/vehicle)	LOS
1. Hearst Avenue/Gayley Road/La Loma Avenue	Signal	AM	20	C	20	C
		PM	34	C	34	C
2. Stadium Rim Way/Gayley Road	All-Way Stop	AM	**>75**	**F**	**>75**	**F**
		PM	**>75**	**F**	**>75**	**F**
3. Bancroft Way/Piedmont Avenue[1]	All-Way Stop	AM	**50**	**F**	**52**	**F**
		PM	**>75**	**F**	**>75**	**F**
4. Durant Avenue/Piedmont Avenue[1]	All-Way Stop	AM	**50**	**F**	**52**	**F**
		PM	**>75**	**F**	**>75**	**F**

Source: Fehr and Peers 2019 ***Appendix E****.*
Notes: ***Bold*** *indicates an intersection operating at LOS E or LOS F.*
[1] *Average intersection delay and LOS based on the HCM 6th Edition method.*
[2] *Intersection analyzed using SimTraffic software because of unique conditions including heavy pedestrian volumes. Field observations validate the results shown in the table.*

The signalized Hearst Avenue/Gayley Road/La Loma Avenue intersection would continue to operate at LOS D or better during both AM and PM peak hours under the Cumulative (2040) Plus Project conditions. The three all-way stop-controlled study intersections would operate at LOS F during both the AM and PM peak hours. However, the project would not cause an impact at these intersections because the Bancroft Way/ Piedmont Avenue and the Durant Avenue/Piedmont Avenue intersections would not satisfy the California MUTCD peak hour traffic volume signal warrant under Cumulative (2040) conditions. Although the Stadium Rim Way/Gayley Road intersection would satisfy the California MUTCD peak hour traffic volume signal warrant under Cumulative (2040) conditions regardless of the proposed project, the project would not cause a significant impact at this intersection because it would add fewer than 10 peak hour trips to any of the intersection movements.

5.17.5 Changes to Circumstances or New Information that could affect the Earlier Environmental Analysis

Since the certification of the 2006 LRDP Final EIR, in anticipation of concurrent construction of a number of large projects on the Lab site, UC LBNL conducted a reevaluation of the traffic impacts associated with construction truck trips. This study, conducted by Fehr & Peers in 2012, examined the existing traffic conditions along the designated truck route from the Lab site through the City of Berkeley to I-80, focusing on major intersections that are known to be operating at or near failing conditions. The study determined that so long as the average truck traffic from all construction projects at the Lab does not exceed 96 daily peak truck trips and the hourly maximum is maintained at no more than 8 truck trips per hour, the impact from the Lab's construction truck traffic would be less than significant (Fehr & Peers 2012). As noted above, pursuant to LRDP Best Practice TRANS-6c, the LBNL has instituted a Construction Truck

Management System to manage construction schedules to minimize the overlap of heavy truck activity periods. As a part of this program, the LBNL makes necessary adjustments to truck movements to keep the total number of truck trips below 96 trips-per-day impact threshold (daily truck trips are typically held to a small fraction of the impact threshold). Truck trips associated with the proposed project would also be subject to this Lab site program, which is a part of the project and would ensure that the impact on city intersections would remain less than significant.

In addition, since the certification of the 2006 LRDP Final EIR, the City of Berkeley adopted new thresholds of significance for the evaluation of a project's traffic impacts. To address the change in the thresholds, as discussed above, UC LBNL conducted in 2010 a supplemental analysis of the traffic impacts from LRDP development under 2025 conditions. The results of that analysis are reported in **Section 5.17.4,** above. Also, the project-level traffic analysis for the BioEPIC project presented in this document utilizes the updated thresholds of significance that are used throughout the City of Berkeley, and the analysis does not utilize the previous thresholds in use at the time of 2006 LRDP Final EIR preparation.

The Transportation Impact Analysis prepared for this project shows that the significance of the previously analyzed impacts under the LRDP EIR would not be altered and would not constitute significant new information.

5.18 Tribal Cultural Resources

5.18.1 Background

2006 LRDP Final EIR Section IV.D addresses the effects on cultural resources, including tribal cultural resources, from LRDP-related growth and development and is incorporated herein by reference pursuant to *State CEQA Guidelines* Section 15150. The following discussion summarizes the information presented in the 'Setting' subsection of 2006 LRDP Final EIR Section IV.D.

LBNL hill site history presented in the 2006 LRDP Final EIR was 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.

Field surveys and archival research at the California Historical Resources Information System's Northwest Information Center have been undertaken a number of times since 2006 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.

5.18.2 2006 LRDP EIR Analysis

The 2006 LRDP Final EIR was prepared prior to the passage of Assembly Bill 52 (AB 52); at that time, CEQA did not require a dedicated analysis of impacts on tribal cultural resources due to project implementation.

5.18.3 Environmental Checklist and Discussion

Tribal Cultural Resources Would the project…	Additional Project-Level Impact Analysis Required	No Further Environmental Document Required
a) Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:		

i)	Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k)?	☐	☑
ii)	A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1? In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe?	☐	☑

DISCUSSION:

BioEPIC Project Analysis

a. i. Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k)?

UC LBNL sent out notification letters in March 2019 to five local Native American tribes: The Costanoan Rumsen Carmel Tribe, the Muwekma Ohlone Indian Tribe of the SF Bay Area, the Ohlone Indian Tribe, the Amah Mutsun Tribal Band of Mission San Juan Bautista, and the Indian Canyon Mutsun Band of Costanoan. These five tribes have indicated an interest in receiving such notification for projects proposed in the Berkeley Lab area. According to AB 52, tribal notification recipients should respond within 30 days if they want to request consultation. No tribal request for consultation has been received by UC LBNL within the 30-day period or after (as of the completion of this document).

The geographic area of the project site is not known or expected to contain any tribal cultural resources (TCRs). Furthermore, the site -- including the entire BioEPIC footprint -- has been heavily disturbed since the late 1940s, including by major grading and filling to accommodate Bevatron construction, later Bevatron demolition, and the Bayview Parcel-1 Cleanup project, the latter of which is scheduled to occur prior to BioEPIC project construction. LRDP Impact CUL-3 (page IV.D-16) discusses impacts related to cultural resources regarding Native American sites. The 2006 LRDP Final EIR notes that the potential for Native American sites to exist on the project site is considered low to moderate, based on field surveys and archival research at the Northwest Information Center. In the unlikely event that archaeological artifacts are discovered during construction (including grading, excavation, and other earthmoving activities), **LRDP Mitigation Measure CUL-3**, would be implemented.

LRDP Impact CUL-4 (page IV.D-18) analyzes the possibility of disturbing human remains, including Native American human remains. The impact found that there is no known evidence of prehistoric habitation at LBNL, nor any indication that the site has been used for burial purposes

in the recent or distant past. Thus, and for reasons mentioned above, encountering human remains at the LBNL site would be unlikely. However, if human remains should be encountered during excavation and construction, work would be halted and **LRDP Mitigation Measure CUL-4** would be implemented. After mitigation, impacts would be less than significant.

LRDP Mitigation Measures CUL-3 and **CUL-4** are standard project features that would be implemented to ensure that, should such resources be encountered during construction, they would be protected, documented, and preserved, as appropriate. Therefore, while no TCRs are expected to be affected by the proposed project, the standard project features **LRDP Mitigation Measures CUL-3** and **CUL-4** 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.

a. ii. Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is 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 Public Resources Code Section 5024.1?

The project site is not known to be a cultural resource or location of particular cultural value to any existing Native American tribe; no evidence to the contrary was produced during communications with interested area tribes pursuant to AB 52. See section "**a. i**" above for analysis.

5.18.4 Analysis of Cumulative Impacts in 2006 LRDP EIR

At the time the 2006 LRDP Final EIR was prepared, CEQA did not require a dedicated analysis of impacts to tribal cultural resources due to project implementation. AB 52, which was approved in September 2014 and became effective on July 1, 2015, requires that CEQA lead agencies consult with California Native American tribes that are traditionally and culturally affiliated with the geographic area of a revised project, if so requested by the tribes. AB 52 applies only to projects where the Notice of Preparation (NOP) was filed after July 1, 2015. Since the NOP for the 2017 Supplement to the 2006 LRDP Final EIR was issued after 2015, the BioEPIC project as an element of growth under the 2006 LRDP is subject to AB 52. Compliance with applicable laws, regulations, and statutes would aim to protect any possible tribal cultural resources that are discovered in the project site. These regulations would apply to all development of the project site. By ensuring that cultural resources discovered within the project site are properly recorded and handled, with implementation of standard project feature **LRDP Mitigation Measure CUL-3,** the contribution of the proposed project to cumulative impacts on archaeological resources would not be cumulatively considerable. In addition, by ensuring that human remains and any associated or unassociated funerary objects are treated in compliance with applicable State laws by implementation of standard project feature **LRDP Mitigation Measure CUL-4**, the contribution of the proposed project to cumulative impacts on human remains would not be

cumulatively considerable. The impact would be less than significant. Therefore, it would not contribute to any cumulative impact on tribal cultural resources.

5.18.5 Changes to Circumstances or New Information that could affect the Earlier Environmental Analysis

See **Section 5.18.4** above for details.

5.19 Utilities/Service Systems

5.19.1 Background

LRDP Final EIR Section IV.M addresses the effects of LRDP-related growth and development on utility systems that serve the LBNL hill site and is incorporated by reference herein pursuant to *State CEQA Guidelines* Section 15150. The LBNL hill site is served by the following utility and service systems:

Potable and Fire Protection Water: East Bay Municipal Utility District (EBMUD) provides 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 in the Berkeley View Pressure Zone. On the LBNL hill 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, fire suppression, and for other uses. UC LBNL also maintains three 200,000-gallon water storage tanks on-site for emergency water supply. In 2006, the total annual water consumption at the LBNL hill site was approximately 41.6 million gallons. Even though the total building space at LBNL has increased, water usage has declined substantially since 1990 because of water conservation measures that UC LBNL has been implementing. There is adequate water supply to meet the Lab's demand (LBNL 2007b).

Wastewater: LBNL hill site wastewater is collected in a gravity-flow system that discharges into the City of Berkeley's sanitary sewer system through a monitoring station located at Hearst Avenue and a second monitoring station located at Centennial Drive. The volume and quality of effluent at both monitoring stations are monitored and evaluated for compliance with EBMUD discharge requirements. From these monitoring stations, the effluent continues through the City's sewer system to EBMUD's north interceptor sewer and then to the wastewater treatment facility in Oakland.

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. Electricity is delivered to the LBNL's Grizzly Peak Substation via the PG&E transmission system. The total electrical power consumption in 2006 at LBNL was 74,500 megawatt hours. LBNL also has a number of stationary and portable emergency power generators that are powered by diesel, gasoline, or natural gas.

Natural Gas: Natural gas is used on the LBNL hill site for heating existing buildings, to operate certain equipment, and also in some experimental uses. However, new buildings constructed after June 30, 2019, including the proposed BioEPIC building, shall be heated by electricity consistent with the UC Sustainable Practices Policy. 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 on the site. 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

The BioEPIC project would require water for human consumption, to produce deionized water for lab use, and for use in the cooling towers. Per LBNL standards, two sources of water are required for the building to provide redundancy. To meet the requirement, a new line would be installed from the existing 10-inch water line on Smoot Road.

The project would also produce wastewater from sanitary sources, laboratories, and cooling towers. There are existing wastewater lines on and adjacent to the project site. The proposed BioEPIC project construction would be preceded by the Bayview Site Utility Relocation Project (SURP), which will relocate on-site 6-inch pipeline as part of a utility modernization effort for the Bayview Planning Area and surrounding building clusters. Sewer service laterals would connect from the BioEPIC project to the 6-inch relocated line.

In accordance with UC policy, the BioEPIC project would be designed and operated to meet a waste diversion goal to send 90 percent of municipal solid waste to recycling and compost facilities by 2020 and to reduce the per capita generation of municipal solid waste by 50 percent by 2030 from 2016 levels. The BioEPIC project would also be designed with adequate space for diversion of organic waste (see Cal Green Building Code Section 4.410.2; & Section 5.410.1). Adequate facilities would be included in the building for the collection and disposal of recyclables and landfill-bound solid waste.

Electrical power at the LBNL hill site is purchased from the Western Area Power Administration and delivered by the Pacific Gas and Electric (PG&E) transmission system to the Lab's Grizzly Substation located adjacent to Building 77.

5.19.2 2006 LRDP EIR Analysis

Impacts of LBNL growth and development under the 2006 LRDP on utilities and service systems are evaluated in Section IV.M of the 2006 LRDP Final EIR. The EIR analysis concluded that implementation of the 2006 LRDP would result in impacts on utilities that would either be less than significant or reduced to a less than significant level with mitigation measures.

Based on the population and building space associated with the project, the proposed project is within the scope of analysis of the 2006 LRDP Final EIR. Relevant mitigation measures in the 2006 LRDP Final EIR (now standard project features for projects under the LRDP) have been incorporated as part of the planning and design of the proposed project and would be

implemented during project construction and operations consistent with LRDP mitigation monitoring requirements.

5.19.3 Environmental Checklist and Discussion

UTILITIES & SERVICE SYSTEMS Would the project…	Additional Project-Level Impact Analysis Required	No Further Environmental Document Required
a) Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?	☐	☑
b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?	☐	☑
c) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the providers existing commitments?	☐	☑
d) Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?	☐	☑
e) Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?	☐	☑

DISCUSSION:

BioEPIC Project Analysis

a. Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects? No Further Environmental Document Required.

With respect to water, LRDP Impact UTILS-1 (page IV.M-16) concluded that the implementation of the 2006 LRDP would generate demand for additional water but would not require the construction of new water facilities or expansion of existing facilities. The proposed project would connect to and use the existing water infrastructure adjacent to the project site and would not require off-site improvements to pipelines. The proposed project's impacts on water infrastructure are adequately addressed under LRDP Impact UTILS-1 and would be less than significant.

LRDP Impact UTILS-2 (page IV.M-19) concluded that the implementation of the 2006 LRDP would generate additional wastewater which would require system upgrades to accommodate flows. The proposed BioEPIC project would be preceded by the Bayview Site Utility Relocation Project (SURP), which will relocate the on-site 6-inch pipeline prior to the construction of the BioEPIC project. Sewer service laterals would connect from the BioEPIC project to the 6-inch relocated line. The proposed project would not require further off-site improvements to pipelines or upgrades to treatment facilities. Wastewater flows from the western portion of the LBNL hill site exit through sewer lines within Hearst Avenue that flow to the City of Berkeley's sanitary sewer sub-basin 17-013. The increase in population growth and associated increase in wastewater flows as part of the BioEPIC project is within the growth analyzed under the 2006 LRDP. Therefore, the EBMUD treatment facility has adequate capacity to treat wastewater from the project site. The proposed project's impacts on wastewater infrastructure and wastewater capacity are adequately addressed under LRDP Impact UTILS-2 and would be less than significant.

As discussed under **Section 5.9, Hydrology and Water Quality**, the impervious surfaces on the project site would not increase and could decrease with removal of the existing parking lot and storage area and construction of the proposed facility. Therefore, post-project flows from the site would not exceed current flows. The BioEPIC project would therefore neither require construction of new nor expansion of existing storm drain facilities. The impact from the change in the volume of surface water runoff is adequately addressed under LRDP Impact HYDRO-3 and would be less than significant.

LRDP Impact UTILS-5 (page IV.M-25) concluded that the 2006 LRDP would create additional demand for electricity and natural gas but would not require expansion or construction of infrastructure. A 215,000 gsf laboratory and office facility was analyzed in the area of the BioEPIC project site in the 2006 LRDP EIR under the Illustrative Development Scenario. The proposed project would construct a smaller, approximately 73,000 gsf, laboratory and office building. Additionally, the BioEPIC project, in compliance with the UC LBNL's sustainability policy, shall attain a minimum of a Gold rating within the LEED v4 program. Furthermore, the project's sustainability goals include producing at least 7.5 percent of estimated annual energy from on-site renewable sources and meeting or exceeding whole building energy use targets. Therefore, any increase in demand for energy due to the proposed project would be within the previously analyzed 2006 LRDP projections, and the delivery of additional electricity to the LBNL hill site would be accommodated by existing infrastructure. The existing site utility connections would be used for the proposed BioEPIC project. Therefore, the proposed project would not require the construction or expansion of electrical facilities. The proposed project's impact on transmission and generation facilities is adequately addressed under LRDP Impact UTILS-5 and would be less than significant.

b. Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry, and multiple dry years? No Further Environmental Document Required.

LRDP Impact UTILS-1 (page IV.M-16) concluded that the implementation of the 2006 LRDP would increase demand for water, but not would not require off-site infrastructure upgrades. The 2006 LRDP also includes various system upgrades intended to improve reliability and reduce

water loss due to outdated, deteriorating pipelines. Improvements include the replacement of selected existing water distribution lines.

The BioEPIC project has an estimated annual demand of 1.4 mgy of water (assuming recycled water is used for the proposed cooling towers). This includes demand for domestic water, fire water, laboratory water including de-ionized water, and cooling tower water. The proposed project includes high-efficiency fixtures and low-flow urinals that would reduce water demand. Additionally, landscaping introduced to the project site would include drought-tolerant plant materials that would not be irrigated beyond a short establishment period and no lawns areas are proposed; in keeping with Lab policy, landscaping would not be watered after a short establishment period. On February 8, 2019, UC LBNL communicated with the Water Distribution Planning Division of EBMUD to inform them of the proposed BioEPIC project's water supply needs. Although a response from EBMUD was not received as of the preparation of this document, based on experience with other similar projects and the small water demand associated with the proposed project, UC LBNL anticipates that EBMUD will be able to serve the project with existing water supplies under all conditions. Therefore, the proposed project would not result in the need for new or expanded water entitlements under normal, dry, and multiple dry years. The proposed project's impact is adequately addressed under LRDP Impact UTILS-2 and would be less than significant.

c. Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the providers existing commitments? No Further Environmental Document Required.

See item "**a**" above for analysis.

d. Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals? No Further Environmental Document Required.

LRDP Impact UTILS-4 (page IV.M-24) concluded that without recycling, construction debris generated at the LBNL hill site would affect Altamont Landfill capacity. The existing parking lot on the project site would be removed, which would generate construction waste. The proposed project would implement **LRDP Mitigation Measure UTILS-4** (solid waste diversion measure) as a standard project feature to maximize diversion of construction wastes from the regional landfill. The contractor would be required to develop and/or follow a Waste Management Plan to meet goals for construction waste materials recycling goals per LBNL standards.

The proposed project would result in an increased waste stream due to an increase in operations (additional personnel and building space). However, adequate facilities would be included in the building for the collection and disposal of recyclables and landfill-bound solid waste. The proposed project would minimize waste in accordance with LBNL Sustainability Standards and would comply with federal, state, and local statutes regarding solid waste generation. Furthermore, the increase of approximately 125 new persons associated with the BioEPIC project is within the 2006 LRDP daily population growth projections. Therefore, the solid waste impacts of the proposed project are adequately analyzed under LRDP Impact UTILS-4 and would be less than significant with standard project features.

e. Comply with federal, state, and local management and reduction statutes and regulations related to solid waste? No Further Environmental Document Required.

See item "**d**" above for analysis.

5.19.4 Analysis of Cumulative Impacts in 2006 LRDP EIR

The 2006 LRDP Final 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 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, and existing utility delivery systems would be expected to handle growth anticipated under the 2006 LRDP. Taking into consideration the present-day setting and the current cumulative context, this analysis finds that 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 the 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.

5.19.5 Changes to Circumstances or New Information that could affect the Earlier Environmental Analysis

There are no changes in circumstances and no new information related to utilities and service systems has become available related to utilities since the certification of the 2006 LRDP Final EIR that would alter the previous analysis and change its conclusions.

5.20 Wildfire

5.20.1 Background

Section IV.F of the 2006 LRDP EIR addresses impacts related to hazards, including wildland fire, from the growth of LBNL under the 2006 LRDP and is incorporated by reference herein pursuant to *State CEQA Guidelines* Section 15150. The following discussion summarizes the information presented in the 'Setting' subsection of Section IV.F of the 2006 LRDP Final EIR.

Fire Hazards: The eastern boundary of the LBNL hill site is in an interface between wildlands and developed lands in the East Bay hills. The hill site is similar in character to other developed hillside areas in the region as it features developed lands amidst groves of trees and non-irrigated grassland areas. Dry summers desiccate plant materials and make them more prone to burning, and a "fire season" is declared by the state each summer and fall. The fire risk during brief periods of the fall months is even more pronounced when strong offshore winds, often called "Diablo winds," occur in the East Bay hills. These offshore winds further desiccate fuel material and can drive fire fronts and fire brands at extreme speeds.

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

LBNL provides firefighting services through a service contract with the Alameda County Fire Department, which staffs a fire station on the LBNL grounds (Alameda County Station 19). At least four firefighters are on duty at all times. Equipment at Station 19 includes one fire engine, one reserve fire engine, a hazardous materials vehicle, and a light-duty four-wheel drive "brush rig" that can be used for low-intensity wildland fires. LBNL has an automatic aid agreement with the City of Berkeley, which means that the fire engine at Station 19 responds to locations in Berkeley, including the UC Berkeley campus, when the first-due Berkeley Fire Department engine is on another call, and Berkeley Fire Department personnel and apparatus respond to the Lab when Engine 19 – stationed at the firehouse at LBNL – is on another call. The Alameda County Fire Department has mutual aid agreements with other agencies, including Oakland and the East Bay Regional Park District, which can be activated in the event of a major emergency. (Please see **Section 5.15**, above)

5.20.2 2006 LRDP EIR Analysis

LRDP growth-related impacts on wildfire risks are evaluated in Section IV.F of the 2006 LRDP Final EIR and incorporated herein by reference. The EIR analysis concluded that implementation of the 2006 LRDP would result in less-than-significant impacts related to wildfire hazards and no mitigation would be required.

For reasons set forth in **Section 5.11**, the proposed project is within the scope of analysis of the 2006 LRDP EIR. Relevant mitigation measures in the 2006 LRDP Final EIR (now standard project features for projects under the LRDP) have been incorporated as part of the planning and design of the proposed project and would be implemented during project construction and operations consistent with LRDP mitigation monitoring requirements.

5.20.3 Environmental Checklist and Discussion

Wildfire			
If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project…		Additional Project-Level Impact Analysis Required	No Further Environmental Document Required
a)	Substantially impair an adopted emergency response plan or emergency evacuation plan?	☐	☑
b)	Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?	☐	☑
c)	Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?	☐	☑
d)	Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?	☐	☑

DISCUSSION:

BioEPIC Project Analysis

a. Substantially impair an adopted emergency response plan or emergency evacuation plan?

LRDP HAZ-5 (page IV.F-32) concluded that LRDP implementation would have a less than significant effect regarding exposure of people to catastrophic events. The analysis included the secondary impacts (e.g. from evacuation) from such catastrophic events. Current safety measures and procedures would continue under the 2006 LRDP program. UC LBNL has taken many precautions to limit the impacts of such events should they occur. These include:

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

Construction and laboratory operation activities at the LBNL hill site, including the proposed project, would comply with federal and state laws to ensure that there would be no conflict with emergency response plans. Proposed project-related increases in population, vehicle traffic, and building space are within the scope of the 2006 LRDP. Therefore, the proposed project's impact is adequately addressed under LRDP Impact HAZ-5 and would be less than significant.

b. Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?

LRDP Impact HAZ-6 (page IV.F-39) addresses impacts associated with exposure of people or structures to wildland fire hazards. The 2006 LRDP Final EIR concluded that continued implementation of the LBNL vegetation management program would limit damage to assets from wildland fires and would reduce potential wildland fire hazards. Development of the proposed project would increase both laboratory and other facility space at the LBNL hill site. This development would meet required safety standards and fire codes at the time of facility construction. Furthermore, the BioEPIC project site would be located in the center of the LBNL hill site in an area that is developed, devoid of vegetation, and not adjacent to wildland areas. Therefore, the proposed project would not expose structures or persons to a significant risk from wildland fires. The project's impact is adequately addressed under LRDP Impact HAZ-6 and would be less than significant.

c. Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?

LRDP Impact HAZ-6 (page IV.F-39) indicates that the great majority of new construction and renovation on the LBNL hill site would occur within designated developable areas. The Perimeter Open Space land use zone would continue to be managed to reduce wildland fire risk and primarily be reserved for minor maintenance and support structures.

The BioEPIC project would be located centrally on the LBNL hill site, within the developable "Research and Academic" zone designated on the LRDP Land Use Map. The project site is not adjacent to wildland areas. The project would not require the installation or maintenance of associated infrastructure that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment. The impact would be less than significant.

d. Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?

See **Sections 5.7** and **5.9**, above. The BioEPIC project would be located centrally on the LBNL hill site, on a plateau that has been leveled and graded and is currently used for parking and storage. The risk of wildland fire at the site is low and the project would not expose the building occupants or the BioEPIC project to significant risks from landslides or other post-fire slope instability. The impact would be less than significant.

5.20.4 Analysis of Cumulative Impacts in 2006 LRDP EIR

LRDP Impact HAZ-7 (page IV.F-41) analyzes cumulative impacts related to catastrophic events, such as a wildfire. It concludes that LBNL's contribution to any region-wide impacts would be less than cumulatively considerable. 2006 LRDP implementation would not substantially increase the Lab's contribution to any such risk; in some cases, it would decrease the Lab's contribution compared to existing conditions. For these reasons, the cumulative impact would be less than significant.

5.20.5 Changes to Circumstances or New Information that could affect the Earlier Environmental Analysis

Changes to the *State CEQA Guidelines* have occurred since the certification of the 2006 LRDP Final EIR. The new guidelines released in 2018, in recognition of the state's need to specifically address wildfire dangers, have separated wildfire risks into its own focused section to be analyzed separately. However, the 2006 LRDP Final EIR, under section IV.F, addressed the impacts related to catastrophic events, including wildfires. Furthermore, none of the Guidelines changes have altered the previous analysis or changed its conclusions.

5.21 Mandatory Findings of Significance

MANDATORY FINDINGS OF SIGNIFICANCE Would the project…	Additional Project-Level Impact Analysis Required	No Further Environmental Document Required
a) Does the project have the potential to substantially 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, substantially 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 prehistory?	☐	☑
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)?	☐	☑
c) Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☑

DISCUSSION:

a. Does the project have the potential to substantially 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, substantially 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 prehistory? No Further Environmental Document Required.

As noted in the checklist responses, the BioEPIC project would not substantially degrade the quality of the environment, or adversely affect wildlife or fish habitat or cultural resources. Therefore, no further environmental documentation is required.

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)? No Further Environmental Document Required.

All cumulative impacts are adequately addressed in the 2006 LRDP Final EIR, as supplemented by the 2010 and 2017 Supplements, which provided updated traffic, energy, tribal cultural resources, and GHG analyses, and further evaluation of those cumulative impacts is not required. Consideration of the current cumulative context both at and surrounding the LBNL site

conducted for this BioEPIC Environmental Analysis and Checklist further confirms that there is no new information, pursuant to *CEQA Guidelines* §15162, that would alter this conclusion.

c. Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly? No Further Environmental Document Required.

For reasons presented in the checklist responses, the proposed project would not, directly or indirectly, have a substantial adverse effect on human beings.

6.0 REFERENCES

Association of Bay Area Governments (ABAG). 2018. Plan Bay Area Projections 2040: A Companion to Plan Bay Area 2040. November. http://mtcmedia.s3.amazonaws.com/files/Projections_2040-ABAG-MTC-web.pdf

A3GEO, Inc. 2019. Geotechnical Investigation Report Biological & Environmental Program Integration Center (BioEPIC) Project: Schematic Design Phase.

Bay Area Air Quality Management District. 2017. *CEQA Air Quality Guidelines*. May. http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES.aspx.

California Department of Conservation. 2012. Farmland Mapping and Monitoring Program. Accessed August 6, 2014. http://www.consrv.ca.gov/dlrp/fmmp/Pages/Index.aspx

California Department of Finance (DOF). 2019. E-5 Population and Housing Estimates for Cities, Counties, and the State, 2011-2019 with 2010 Census Benchmark.

California Division of Mines and Geology (CDMG). 1982. Special Studies Zone Map, Richmond Quadrangle.

City of Berkeley. 2001. City of Berkeley General Plan: A Guide for Public Decision-Making: Open Space and Recreation. http://www.cityofberkeley.info/Planning_and_Development/Home/BERKELEY_DRAFT_GENERAL_PLAN_EIR_-_4H.aspx.

City of Oakland. 2014. Parks. http://www2.oaklandnet.com/Government/o/opr/s/Parks/index.htm.

East Bay Regional Park District (EBRPD). 2014. http://www.ebparks.org/.

Federal Emergency Management Agency (FEMA). 2009. FIRM Alameda County, California and Unincorporated Areas, Map Number 0061C0019G.

Fehr & Peers. 2012. Memorandum: Construction Truck Trips (Updated). August.

Fehr & Peers. 2019. BioEPIC Project Transportation Impact Analysis. June.

Lawrence Berkeley National Laboratory (LBNL). 2005. Demolition of Building 51 and the Bevatron Draft Environmental Impact Report. October.

LBNL 2007a. Long Range Development Plan Draft Environmental Impact Report. January.

LBNL. 2007b.Long Range Development Plan Final Environmental Impact Report, SCH No. 200102046. July.

LBNL. 2010. Seismic Safety, Modernization, and Replacement of General Purpose Buildings, Phase 2 Project (Including Supplementation of the LBNL 2006 LRDP EIR with respect to Traffic Impacts at One Intersection) Final EIR, SCH No. 2008122030.

LBNL. 2014. Soil Vapor Sampling Report for the BioEPIC Site. December.

LBNL. 2017. Building 59 Upgrade & Installation and Operation for NERSC-9 (Including Supplementation of the 2006 LRDP EIR with respect to Greenhouse Gas Emissions and Energy Impacts) Final EIR, SCH No. 2016062007.

The Trust for Public Land. 2014. City Profiles: Oakland. http://parkscore.tpl.org/city.php?city=Oakland

University of California. 2019. University of California – Policy on Sustainable Practices. July.

7.0 REPORT PREPARERS

Lawrence Berkeley National Laboratory

Jeff Philliber, Chief Environmental Planner

Impact Sciences, Inc.

Jessica Kirchner Flores, Owner and Principal
Angela Pan, Project Manager
Raul Castillo, Project Planner
Jerod Jerome, Air Quality, GHG, and Noise Specialist
Kara Yates Hines, Publications Manager

Barati Consulting

Shabnam Barati, Ph.D., Principal

Alta Environmental

Kevin Cosgrove, Senior Engineer
Chris Waller, Director, Environmental Health and Safety & Air
Yasaman Azar Houshang, Specialist III, Environmental Health and Safety & Air

Fehr & Peers

Sam Tabibnia, Senior Associate

APPENDIX A

Standard Project Features

Introduction to Standard Project Features

Standard Project Features (SPFs) were originally identified in the UC LBNL 2006 LRDP EIR as environmentally proactive measures that would be incorporated into all LBNL projects. These measures have been adopted as part of the LBNL 2006 LRDP EIR by the Regents of the University of California. Because the proposed BioEPIC Project is an element of the LBNL site growth projected by the University, the following SPFs are included in and a part of the proposed project (described in **Section 2.0, Project Description**).

For clarity this Appendix lists SPFs as they were characterized in the 2006 LDRP EIR in Chapter 5, entitled Mitigation Monitoring and Reporting Program, including some revisions made to the traffic SPFs following a supplemental traffic analysis that was conducted in 2010 and new mitigation measures implemented following a 2017 Supplement (Building 59 Upgrade & Installation and Operation of NERSC – 9 Focused EIR). These SPFs are pertinent to such environmental resource areas as aesthetics; air quality; biological resources; cultural resources; geology and soils; greenhouse gas emissions; hazards and hazardous materials; hydrology and water quality; noise; traffic and transportation; and utilities and service systems. The analysis presented in the Environmental Analysis and Checklist evaluates environmental impacts that would result from project implementation following the application of these SPFs.

SPF VIS-4a: All new buildings on the LBNL hill site constructed pursuant to the 2006 LRDP shall incorporate design standards that ensure lighting would be designed to confine illumination to its specific site, in order to minimize light spillage to adjacent LBNL buildings and open space areas. Consistent with safety considerations, LBNL project buildings shall shield and orient light sources so that they are not directly visible from outside their immediate surroundings.

SPF VIS-4b: New exterior lighting fixtures shall be compatible with existing lighting fixtures and installations in the vicinity of the new building, and will have an individual photocell. In general, and consistent with safety considerations, exterior lighting at building entrances, along walkways and streets, and at parking lots shall maintain an illumination level of not more than 20 Lux (approximately 2 foot-candles).

SPF VIS-4c: All new buildings on the LBNL hill site constructed pursuant to the 2006 LRDP shall incorporate design standards that preclude or limit the use of reflective exterior wall materials or reflective glass, or the use of white surfaces for roofs, roads, and parking lots, except in specific instances when required for energy conservation.

SPF 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.

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.

SPF 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-NOx emitting, low-particulate emitting, or alternatively fueled construction equipment into the construction equipment fleet where feasible, especially when operating near sensitive receptors.

- For all construction projects of more than 10 days' duration, LBNL shall designate and have on-site during construction a qualified air quality manager to oversee the implementation of construction air quality mitigation measures. Alternatively, LBNL may direct the construction contractor(s) to employ and have on site a construction air quality manager acceptable to LBNL.

- Idling time of diesel powered construction equipment shall be limited to three minutes.

- All diesel engines used by LBNL construction contractor(s) at the site, or for on-road hauling of construction material, shall be post-1996 models.

- On-site power shall be used to minimize reliance on portable generators.

- Offer incentives to encourage construction workers to carpool or employ other means of transportation. The incentives shall include, but are not necessarily limited to, preferential onsite parking and substantial assistance with transportation costs

(gas cards, FasTrak toll passes, public transit passes, etc.); charging for parking as a disincentive shall also be explored.

- All construction diesel engines, which have a rating of 100 hp or more, shall meet, at a minimum, the Tier 2 California Emission Standards for Off-Road Compression-Ignition Engines as specified in California Code of Regulations, Title 13, section 2423(b)(1) unless certified by the on-site construction air quality manager that such engine is not available for a particular item of equipment. In the event a Tier 2 engine is not available for any off-road equipment larger than 100 hp, that equipment shall be outfitted with a Tier 1 engine. In the event a Tier 1 engine is not available for any off-road equipment larger than 100 hp, that equipment shall be outfitted with a catalyzed diesel particulate filter (soot filter), unless certified by engine manufacturers or the on-site construction air quality manager that the use of such devices is not practical for specific engine types. For purposes of this condition, the use of such devices is "not practical" if, among other reasons:

  (1) There is no available soot filter that has been certified by either the California Air Resources Board or U.S. Environmental Protection Agency for the engine in question; or

  (2) The construction equipment is intended to be on-site for ten (10) days or less.

  The use of a soot filter may be terminated immediately if one of the following conditions exists, provided that LBNL is informed within one (1) working day of the termination:

  (1) The use of the soot filter is excessively reducing normal availability of the construction equipment due to increased downtime for maintenance, and/or reduced power output due to an excessive increase in backpressure.

  (2) The soot filter is causing or is reasonably expected to cause significant engine damage.

  (3) The soot filter is causing or is reasonably expected to cause a significant risk to workers or the public.

  (4) Any other seriously detrimental cause which has the approval of LBNL prior to the termination being implemented.

  Relief may be granted from this requirement if the construction air quality manager can demonstrate to LBNL that a good faith effort has been made to comply with this requirement and that compliance is not possible.

- Include the specifications in this measure in the construction bid documents and contracts.

SPF BIO-3: 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 EIR Table IV.C-1) 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 nesting 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:

    a. 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;

    b. Distance and amount of vegetation or other screening between the project site and the nest; and

    c. 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.

SPF BIO-4: Project implementation under the 2006 LRDP 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 breeding season (March 1 through August 31), 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:

    a. 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;

    b. Distance and amount of vegetation or other screening between the project site and the roost; and

    c. 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 season (September 1 through February 28).

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, of this EIR shall be implemented.

SPF 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.

SPF 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.

SPF GEO-2: A site-specific, design-level geotechnical investigation shall occur during the design phase of each LBNL building project, and prior to approval of new building construction within the LBNL hill site. This investigation shall be conducted by a licensed geotechnical engineer and include a seismic evaluation of potential maximum ground motion at the site. Geotechnical investigations for sites within either a Seismic Hazard Zone for landslides or an area of historic landslide activity at LBNL, as depicted on Figures IV.E-2 and IV.E-3, or newly recognized areas of slope instability at the inception of project planning, shall incorporate a landslide analysis in accordance with CGS Publication 117. Geotechnical recommendations shall subsequently be incorporated into building design.

Earthquakes and groundshaking in the Bay Area are unavoidable and may occur at some time during the period covered by the LRDP. Although some structural damage is typically not avoidable, building codes and local construction requirements have been

established to protect against building collapse and to minimize injury during a seismic event. Considering that the future individual buildings would be constructed in conformance with the California Building Code, LBNL requirements, federal regulations and guidelines, and Mitigation Measure GEO-2, the risks of injury and structural damage from groundshaking and earthquake-induced landsliding would be reduced and the impacts, therefore, would be considered less than significant.

Furthermore, as described in the Project Description, some of the buildings constructed pursuant to the LRDP would be occupied by staff relocated from other, older LBNL facilities, some of which were constructed in accordance with less stringent building code requirements than those that would apply to future construction. As of 2003, 14 percent of LBNL buildings were over 60 years old. Many of these buildings were constructed as temporary structures that were never replaced. The LRDP specifically proposes the demolition of some 30 outdated buildings that together include approximately 250,000 square feet. In this regard, implementation of the LRDP would result in a beneficial seismic safety impact.

SPF GEO-3a: Construction under the LRDP shall be required to use construction best management practices and standards to control and reduce erosion. These measures could include, but are not limited to, restricting grading to the dry season, protecting all finished graded slopes from erosion using such techniques as erosion control matting and hydroseeding or other suitable measures.

SPF GEO-3b: Revegetation of areas disturbed by construction activities, including slope stabilization sites, using native shrubs, trees, and grasses, shall be included as part of all new projects.

Compliance with California Building Code standards and compliance with Mitigation Measures GEO-2, GEO-3a, and GEO-3b would reduce potential impacts associated with expansive soils and soil erosion to a less-than-significant level.

SPF 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 MTCO2e/year by the end of FY 2021 to reduce GHG emissions from Building 59.

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

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

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

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

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

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

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

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

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

- Continue to post phone numbers of LBNL EH&S subject matter experts on the EH&S website.[1]
- Continue to post Emergency Response and Evacuation Plans in all LBNL buildings.
- Continue to post sinks, in areas where hazardous materials are handled, with signs reminding users that hazardous materials and wastes cannot be poured down the drain.
- Continue to post dumpsters and central trash collection areas where hazardous materials are handled with signs reminding users that hazardous wastes cannot be disposed of as trash.

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

SPF NOISE-1a: To reduce daytime noise impacts due to construction/demolition, LBNL shall require construction/demolition contractors to implement noise reduction measures appropriate for the project being undertaken. Measures that might be implemented could include, but not be limited to, the following:

---

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

- Construction/demolition activities would be limited to a schedule that minimizes disruption to uses surrounding the project site as much as possible. Such activities would be limited to the hours designated in the Berkeley and/or Oakland noise ordinance(s), as applicable to the location of the project. This would eliminate or substantially reduce noise impacts during the more noise-sensitive nighttime hours and on days when construction noise might be more disturbing.

- To the maximum extent feasible, equipment and trucks used for project construction shall utilize the best available noise control techniques (e.g., improved mufflers, equipment redesign, use of intake silencers, ducts, engine enclosures and acoustically-attenuating shields or shrouds, wherever feasible).

- Stationary noise sources shall be located as far from adjacent receptors as possible.

- At locations where noise may affect neighboring residential uses, LBNL will develop a comprehensive construction noise control specification to implement construction/demolition noise controls, such as noise attenuation barriers, siting of construction laydown and vehicle staging areas, and community outreach, as appropriate to specific projects. The specification will include such information as general provisions, definitions, submittal requirements, construction limitations, requirements for noise and vibration monitoring and control plans, noise control materials and methods. This document will be modified as appropriate for a particular construction project and included within the construction specification.

SPF NOISE-1b: For each subsequent project pursuant to the LRDP that would involve construction and/or demolition activities, LBNL shall engage a qualified noise consultant to determine whether, based on the location of the site and the activities proposed, construction/demolition noise levels could approach the property-line receiving noise standards of the cities of Berkeley or Oakland (as applicable). If the consultant determines that the standards would not be exceeded, no further mitigation is required. If the standards would be reached or exceeded absent further mitigation, one or more of the following additional measures would be required, as determined necessary by the noise consultant.

- Stationary noise sources shall be muffled and enclosed within temporary sheds, incorporate insulation barriers, or other measures to the extent feasible.

- Impact tools (e.g., jack hammers, pavement breakers, and rock drills) used for project construction shall be hydraulically or electrically powered wherever possible to avoid noise associated with compressed air exhaust from pneumatically powered tools. However, where use of pneumatic tools is unavoidable, an exhaust muffler on the compressed air exhaust shall be used; this muffler can lower noise levels from the exhaust by up to about 10 dBA. External jackets on the tools themselves shall be used where feasible, and this could achieve a reduction of 5 dBA. Quieter procedures shall be used, such as drills rather than impact equipment, whenever feasible.

- Noise from idling trucks shall be kept to a minimum. No trucks shall be permitted to idle for more than 10 minutes if waiting within 100 feet of a residential area.

- If determined necessary by the noise consultant, a set of site-specific noise attenuation measures shall be developed before construction begins; possible measures might include erection of temporary noise barriers around the construction

site, use of noise control blankets on structures being erected to reduce noise emission from the site, evaluation of the feasibility of noise control at the receivers by temporarily improving the noise reduction capability of adjacent buildings, and monitoring the effectiveness of noise attenuation measures by taking noise measurements.

- If determined necessary by the noise consultant, at least two weeks prior to the start of excavation, LBNL or its contractor shall provide written notification to all neighbors within 500 feet of the construction site. The notification shall indicate the estimated duration and completion date of the construction, construction hours, and necessary contact information for potential complaints about construction noise (i.e., name, telephone number, and address of party responsible for construction). The notice shall indicate that noise complaints resulting from construction can be directed to the contact person identified in the notice. The name and phone number of the contact person also shall be posted outside the LBNL boundaries.

SPF 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 emergency generators, acoustical screen walls, and equipment enclosures.

SPF TRANS-1a: LBNL shall work with UC Berkeley and the City of Berkeley to design and install a signal at the Gayley Road/Stadium Rim Way intersection, when a signal warrant analysis shows that the signal is needed. LBNL shall contribute funding on a fairshare basis, to be determined in consultation with UC Berkeley and the City of Berkeley, for a periodic (annual or biennial) signal warrant check to allow the City to determine when a signal is warranted, and for installation of the signal. Should the City determine that alternative mitigation strategies may reduce or avoid the significant impact, the Lab shall work with the City and UC Berkeley to identify and implement such alternative feasible measure(s). See also Mitigation Measure TRANS-1d, development and implementation of a new Transportation Demand Management Program.

SPF TRANS-1b: LBNL shall work with the City of Berkeley to design and install a signal at the Durant Avenue/Piedmont Avenue intersection, when a signal warrant analysis shows that the signal is needed. LBNL shall contribute funding, on a fairshare basis, to be determined in consultation with UC Berkeley and the City of Berkeley, for a periodic (annual or biennial) signal warrant check to allow the City to determine when a signal is warranted, and for installation of the signal. Should the City determine that alternative mitigation strategies may reduce or avoid the significant impact, the Lab shall work with the City and UC Berkeley to identify and implement such alternative feasible measure(s). See also Mitigation Measure TRANS-1d, development and implementation of a new Transportation Demand Management Program.

SPF TRANS-1c: LBNL shall fund and conduct a study to evaluate whether there may be feasible mitigation (with design standards acceptable to the City) at the intersection of Hearst

Avenue at Gayley Road/La Loma Avenue. This intersection is currently signalized, and physical geometric limitations constrain improvements within its current right-of-way. All four corners of this intersection are occupied by existing UC Berkeley facilities, including Foothill Student Housing, Cory Hall, and outdoor tennis courts, as well as the Founders' Rock. The LOS analyses herein used conservative assumptions so as to not underestimate potential project impacts. For example, even though the approach widths at this intersection allow drivers to maneuver past other vehicles as they near the intersection, the absence of pavement striping to delineate separate lanes dictated that the analysis conservatively assume all vehicle movements on each approach are made on a single lane. Similarly, without the certainty that standard lane widths (and adequate storage lengths) could be provided, possible improvement measures were not relied on to judge that significant impacts would be mitigated to less than significant levels. Judging the success of possible mitigation measures with a conservative standard is reasonable, but in consultation with City of Berkeley staff, the Lab will conduct a further study to re evaluate whether there may be feasible mitigation (with design standards acceptable to the City) at this intersection. That additional study will be conducted by the Lab as part of the TDM program set forth below as Mitigation Measure TRANS-1d. If such mitigation is determined by Berkeley Lab to be feasible, then Berkeley Lab shall contribute funding on a fair-share basis, to be determined in consultation with UC Berkeley and the City of Berkeley, for the installation of the improvements.

SPF TRANS-1d: LBNL shall develop and implement a new TDM Program to replace its existing TDM program. This enhanced TDM Program has been drafted in consultation with the City of Berkeley, and is proposed to be adopted by the Lab following The Regents' consideration of the 2006 LRDP. The proposed TDM Program includes several implementation phases tied to the addition of parking to LBNL. The final provisions of the TDM Program may be revised as it is finally adopted but will include a TDM coordinator and transportation committee, an annual inventory of parking spaces and a gate count, a study of more aggressive TDM measures, investigation of a possible parking fee, investigation of sharing services with UC Berkeley and an alternative fuels program. The TDM program shall also include funding of a study to reevaluate the feasibility of mitigation at the Hearst and Gayley/LaLoma intersection. The new draft proposed TDM Program also includes a requirement that LBNL conduct an additional traffic study to reevaluate traffic impacts on the earliest to occur of 10 years following the certification of this EIR or the time at which the Lab formally proposes a project that will bring total development of parking spaces pursuant to the 2006 LRDP to or above 375 additional parking spaces.

SPF TRANS-1e: LBNL will work with the City of Berkeley to design and install a signal at the Bancroft Way/Piedmont Avenue intersection and provide an exclusive left-turn lane and an exclusive through lane on the northbound approach when a signal warrant analysis shows that the signal is needed. LBNL shall contribute funding, on a fair-share basis, to be determined in consultation with UC Berkeley and the City of Berkeley, for a periodic (annual or biennial) signal warrant check to allow the City to determine when a signal is warranted, and for installation of the signal. Should the City determine that alternative mitigation strategies may reduce or avoid the significant impact, the Lab shall work with the City and UC Berkeley to identify and implement such alternative feasible measure(s). See also Mitigation Measure TRANS-1d, development and implementation of a new Transportation Demand Management Program.

SPF TRANS-3: LBNL shall develop and maintain a transportation plan designed to ensure that the current balance of transportation modes is maintained. This plan shall include 1) maintaining the same (or lesser) ratio of parking permits and parking spaces to average daily population (ADP), and 2) ensuring that levels of shuttle bus service and provision of bike racks on shuttle buses are sufficient to accommodate projected demand.

SPF TRANS-8: LBNL shall implement LRDP MM TRANS-1a (work with UC Berkeley and the City of Berkeley to design and install a signal at the Gayley Road/Stadium Rim Way intersection; LBNL would contribute funding on a fair share basis, to be determined in consultation with UC Berkeley and the City of Berkeley, to install the signal); LRDP MM TRANS-1b (work with the City of Berkeley to design and install a signal at the Durant Avenue/Piedmont Avenue intersection, when a signal warrant analysis shows that the signal is needed); and LRDP MM TRANS-1e (work with the City of Berkeley to design and install a signal at the Bancroft Way/Piedmont Avenue intersection when a signal warrant analysis shows that the signal is needed). LBNL would contribute funding on a fair-share basis, to be determined in consultation with UC Berkeley and the City of Berkeley, to install the signal and for monitoring to determine when a signal is warranted.

SPF UTILS-4: LBNL shall develop a plan for maximizing diversion of construction and demolition materials associated with the construction of the proposed project from landfill disposal.

APPENDIX B

CalEEMod Model Results
Air Quality and Greenhouse Gas Emissions Calculations
Memorandum: Evaluation of BioEPIC Building Operations Relative to Previous Health Risk Assessments

BioEPIC - Alameda County, Annual

BioEPIC

Alameda County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Research & Development	70.30	1000sqft	1.00	70,300.00	210

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	63
Climate Zone	5			**Operational Year**	2023
Utility Company	Pacific Gas & Electric Company				
CO2 Intensity (lb/MWhr)	427	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics - CO2 Intensity Factor based on PGE 2013 rates.

Land Use - According to PD, 1-acre site and approx 70,300sf facility. Total population 210 persons.

Construction Phase - Default schedule adjusted to fit 24-month timeline.

Trips and VMT - Material export based on 2,500 total truck trips at 10 CY per truck.

Demolition - Debris based on asphalt removal of 1-acre. Assumes asphalt is 3.5 inches thick and weighs 3915 pounds per cubic yard.

Grading - 1-acre site. Material export based on 2,500 total truck trips at 10 CY per truck.

Vehicle Trips - Based on 330 daily trips. Saturday/Sunday adjusted based on caleemod default ratios.

Energy Use - Client provided energy estimate - 3.3m kwh

Water And Wastewater - PD Table 1 states 1.85MG water use

Construction Off-road Equipment Mitigation -

Energy Mitigation - Sustainability features from 2019 LBL Site Sustainability Plan. LED savings based on Office of Energy estimate.

Water Mitigation - Sustainability features from 2019 LBL Site Sustainability Plan. Assumed to be included in water use estimate (no mitigation applied).

Waste Mitigation - Sustainability features from 2019 LBL Site Sustainability Plan

Stationary Sources - Emergency Generators and Fire Pumps -

Table Name	Column Name	Default Value	New Value
tblConstructionPhase	NumDays	5.00	22.00
tblConstructionPhase	NumDays	100.00	441.00
tblConstructionPhase	NumDays	10.00	44.00
tblConstructionPhase	NumDays	2.00	9.00
tblConstructionPhase	NumDays	5.00	22.00
tblConstructionPhase	NumDays	1.00	4.00
tblEnergyUse	T24E	1.21	67.00
tblGrading	AcresOfGrading	3.38	1.00
tblGrading	AcresOfGrading	2.00	0.00
tblGrading	MaterialExported	0.00	25,000.00
tblLandUse	LotAcreage	1.61	1.00
tblLandUse	Population	0.00	210.00
tblProjectCharacteristics	CO2IntensityFactor	641.35	427
tblTripsAndVMT	HaulingTripNumber	3,125.00	2,500.00
tblVehicleTrips	ST_TR	1.90	1.10
tblVehicleTrips	SU_TR	1.11	0.64
tblVehicleTrips	WD_TR	8.11	4.69
tblWater	IndoorWaterUseRate	34,566,084.49	1,850,000.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2021	0.2604	2.4099	1.8347	4.43E-03	0.0939	0.0986	0.1925	0.0327	0.0942	0.127	0	388.3524	388.3524	0.0548	0	389.721
2022	0.2323	1.7071	1.6987	3.36E-03	0.032	0.0741	0.1061	8.74E-03	0.0714	0.0801	0	283.8999	283.8999	0.044	0	284.9989
2023	0.3521	0.0138	0.0201	3.00E-05	4.20E-04	7.50E-04	1.16E-03	1.10E-04	7.50E-04	8.60E-04	0	3.011	3.011	1.70E-04	0	3.0152
Maximum	**0.3521**	**2.4099**	**1.8347**	**4.43E-03**	**0.0939**	**0.0986**	**0.1925**	**0.0327**	**0.0942**	**0.127**	**0**	**388.3524**	**388.3524**	**0.0548**	**0**	**389.721**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2021	0.2604	2.4099	1.8347	4.4300e-003	0.0939	0.0986	0.1925	0.0327	0.0942	0.1270	0.0000	388.3521	388.3521	0.0548	0.0000	389.7207
2022	0.2323	1.7071	1.6987	3.3600e-003	0.0320	0.0741	0.1061	8.7400e-003	0.0714	0.0801	0.0000	283.8996	283.8996	0.0440	0.0000	284.9987
2023	0.3521	0.0138	0.0201	3.0000e-005	4.2000e-004	7.5000e-004	1.1600e-003	1.1000e-004	7.5000e-004	8.6000e-004	0.0000	3.0110	3.0110	1.7000e-004	0.0000	3.0152
Maximum	**0.3521**	**2.4099**	**1.8347**	**4.4300e-003**	**0.0939**	**0.0986**	**0.1925**	**0.0327**	**0.0942**	**0.1270**	**0.0000**	**388.3521**	**388.3521**	**0.0548**	**0.0000**	**389.7207**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	1-1-2021	3-31-2021	1.0219	1.0219
2	4-1-2021	6-30-2021	0.5486	0.5486
3	7-1-2021	9-30-2021	0.5546	0.5546
4	10-1-2021	12-31-2021	0.5555	0.5555
5	1-1-2022	3-31-2022	0.4992	0.4992
6	4-1-2022	6-30-2022	0.5040	0.5040
7	7-1-2022	9-30-2022	0.5095	0.5095
8	10-1-2022	12-31-2022	0.4385	0.4385
9	1-1-2023	3-31-2023	0.3733	0.3733
		Highest	1.0219	1.0219

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.3113	1.00E-05	6.50E-04	0		0	0		0	0	0	1.26E-03	1.26E-03	0	0	1.34E-03
Energy	9.38E-03	0.0853	0.0716	5.10E-04		6.48E-03	6.48E-03		6.48E-03	6.48E-03	0	1,091.58	1,091.58	0.0696	0.0157	1,098.01
Mobile	0.0633	0.3884	0.7225	2.95E-03	0.2371	2.41E-03	0.2396	0.0637	2.26E-03	0.066	0	272.2628	272.2628	0.0103	0	272.5202
Stationary	0.0328	0.1468	0.0837	1.60E-04		4.83E-03	4.83E-03		4.83E-03	4.83E-03	0	15.2319	15.2319	2.14E-03	0	15.2853
Waste						0	0		0	0	1.084	0	1.084	0.0641	0	2.6855
Water						0	0		0	0	0.5869	1.9388	2.5258	0.0604	1.45E-03	4.4684
Total	**0.4167**	**0.6204**	**0.8785**	**3.62E-03**	**0.2371**	**0.0137**	**0.2509**	**0.0637**	**0.0136**	**0.0773**	**1.6709**	**1,381.02**	**1,382.69**	**0.2065**	**0.0172**	**1,392.97**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	0.3113	1.00E-05	6.50E-04	0		0	0		0	0	0	1.26E-03	1.26E-03	0	0	1.34E-03
Energy	7.35E-03	0.0668	0.0561	4.00E-04		5.08E-03	5.08E-03		5.08E-03	5.08E-03	0	715.1882	715.1882	0.045	0.0104	719.4015
Mobile	0.0633	0.3884	0.7225	2.95E-03	0.2371	2.41E-03	0.2396	0.0637	2.26E-03	0.066	0	272.2628	272.2628	0.0103	0	272.5202
Stationary	0.0328	0.1468	0.0837	1.60E-04		4.83E-03	4.83E-03		4.83E-03	4.83E-03	0	15.2319	15.2319	2.14E-03	0	15.2853
Waste						0	0		0	0	0.1084	0	0.1084	6.41E-03	0	0.2686
Water						0	0		0	0	0.5869	1.9388	2.5258	0.0604	1.45E-03	4.4684
Total	**0.4147**	**0.602**	**0.863**	**3.51E-03**	**0.2371**	**0.0123**	**0.2495**	**0.0637**	**0.0122**	**0.0759**	**0.6953**	**1,004.62**	**1,005.32**	**0.1243**	**0.0118**	**1,011.95**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**0.49**	**2.97**	**1.76**	**3.04**	**0.00**	**10.20**	**0.56**	**0.00**	**10.32**	**1.81**	**58.39**	**27.25**	**27.29**	**39.82**	**31.30**	**27.35**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Demolition	Demolition	1/1/2021	3/3/2021	5	44	
2	Site Preparation	Site Preparation	3/4/2021	3/9/2021	5	4	
3	Grading	Grading	3/10/2021	3/22/2021	5	9	
4	Building Construction	Building Construction	3/23/2021	11/29/2022	5	441	

5	Paving	Paving	11/30/2022	12/29/2022	5	22	
6	Architectural Coating	Architectural Coating	12/30/2022	1/30/2023	5	22	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 1

Acres of Paving: 0

Residential Indoor: 0; Residential Outdoor: 0; Non-Residential Indoor: 105,450; Non-Residential Outdoor: 35,150; Striped Parking Area:

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Demolition	Concrete/Industrial Saws	1	8.00	81	0.73
Demolition	Rubber Tired Dozers	1	8.00	247	0.40
Demolition	Tractors/Loaders/Backhoes	3	8.00	97	0.37
Site Preparation	Graders	1	8.00	187	0.41
Site Preparation	Rubber Tired Dozers	1	7.00	247	0.40
Site Preparation	Tractors/Loaders/Backhoes	1	8.00	97	0.37
Grading	Graders	1	6.00	187	0.41
Grading	Rubber Tired Dozers	1	6.00	247	0.40
Grading	Tractors/Loaders/Backhoes	1	7.00	97	0.37
Building Construction	Cranes	1	6.00	231	0.29
Building Construction	Forklifts	1	6.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Tractors/Loaders/Backhoes	1	6.00	97	0.37
Building Construction	Welders	3	8.00	46	0.45
Paving	Cement and Mortar Mixers	1	6.00	9	0.56
Paving	Pavers	1	6.00	130	0.42
Paving	Paving Equipment	1	8.00	132	0.36
Paving	Rollers	1	7.00	80	0.38
Paving	Tractors/Loaders/Backhoes	1	8.00	97	0.37

Architectural Coating	Air Compressors	1	6.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Demolition	5	13.00	0.00	91.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Site Preparation	3	8.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Grading	3	8.00	0.00	2,500.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	7	23.00	12.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Paving	5	13.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	5.00	0.00	0.00	10.80	7.30	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

3.2 Demolition - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					9.9000e-003	0.0000	9.9000e-003	1.5000e-003	0.0000	1.5000e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0439	0.4333	0.3188	5.3000e-004		0.0229	0.0229		0.0214	0.0214	0.0000	46.3569	46.3569	0.0119	0.0000	46.6533
Total	**0.0439**	**0.4333**	**0.3188**	**5.3000e-004**	**9.9000e-003**	**0.0229**	**0.0328**	**1.5000e-003**	**0.0214**	**0.0229**	**0.0000**	**46.3569**	**46.3569**	**0.0119**	**0.0000**	**46.6533**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	3.6000e-004	0.0123	2.2800e-003	4.0000e-005	7.7000e-004	4.0000e-005	8.1000e-004	2.1000e-004	4.0000e-005	2.5000e-004	0.0000	3.4400	3.4400	1.7000e-004	0.0000	3.4443
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	9.1000e-004	6.5000e-004	6.8200e-003	2.0000e-005	2.2600e-003	2.0000e-005	2.2800e-003	6.0000e-004	1.0000e-005	6.2000e-004	0.0000	1.9404	1.9404	5.0000e-005	0.0000	1.9416
Total	**1.2700e-003**	**0.0129**	**9.1000e-003**	**6.0000e-005**	**3.0300e-003**	**6.0000e-005**	**3.0900e-003**	**8.1000e-004**	**5.0000e-005**	**8.7000e-004**	**0.0000**	**5.3804**	**5.3804**	**2.2000e-004**	**0.0000**	**5.3858**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					9.9000e-003	0.0000	9.9000e-003	1.5000e-003	0.0000	1.5000e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0439	0.4333	0.3188	5.3000e-004		0.0229	0.0229		0.0214	0.0214	0.0000	46.3569	46.3569	0.0119	0.0000	46.6532
Total	**0.0439**	**0.4333**	**0.3188**	**5.3000e-004**	**9.9000e-003**	**0.0229**	**0.0328**	**1.5000e-003**	**0.0214**	**0.0229**	**0.0000**	**46.3569**	**46.3569**	**0.0119**	**0.0000**	**46.6532**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	tons/yr										MT/yr					
Hauling	3.6000e-004	0.0123	2.2800e-003	4.0000e-005	7.7000e-004	4.0000e-005	8.1000e-004	2.1000e-004	4.0000e-005	2.5000e-004	0.0000	3.4400	3.4400	1.7000e-004	0.0000	3.4443
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	9.1000e-004	6.5000e-004	6.8200e-003	2.0000e-005	2.2600e-003	2.0000e-005	2.2800e-003	6.0000e-004	1.0000e-005	6.2000e-004	0.0000	1.9404	1.9404	5.0000e-005	0.0000	1.9416
Total	**1.2700e-003**	**0.0129**	**9.1000e-003**	**6.0000e-005**	**3.0300e-003**	**6.0000e-005**	**3.0900e-003**	**8.1000e-004**	**5.0000e-005**	**8.7000e-004**	**0.0000**	**5.3804**	**5.3804**	**2.2000e-004**	**0.0000**	**5.3858**

3.3 Site Preparation - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0105	0.0000	0.0105	5.7900e-003	0.0000	5.7900e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	3.1100e-003	0.0348	0.0151	3.0000e-005		1.5300e-003	1.5300e-003		1.4100e-003	1.4100e-003	0.0000	3.0237	3.0237	9.8000e-004	0.0000	3.0481
Total	**3.1100e-003**	**0.0348**	**0.0151**	**3.0000e-005**	**0.0105**	**1.5300e-003**	**0.0121**	**5.7900e-003**	**1.4100e-003**	**7.2000e-003**	**0.0000**	**3.0237**	**3.0237**	**9.8000e-004**	**0.0000**	**3.0481**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.0000e-005	4.0000e-005	3.8000e-004	0.0000	1.3000e-004	0.0000	1.3000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.1086	0.1086	0.0000	0.0000	0.1086
Total	**5.0000e-005**	**4.0000e-005**	**3.8000e-004**	**0.0000**	**1.3000e-004**	**0.0000**	**1.3000e-004**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**0.1086**	**0.1086**	**0.0000**	**0.0000**	**0.1086**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0105	0.0000	0.0105	5.7900e-003	0.0000	5.7900e-003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	3.1100e-003	0.0348	0.0151	3.0000e-005		1.5300e-003	1.5300e-003		1.4100e-003	1.4100e-003	0.0000	3.0237	3.0237	9.8000e-004	0.0000	3.0481
Total	**3.1100e-003**	**0.0348**	**0.0151**	**3.0000e-005**	**0.0105**	**1.5300e-003**	**0.0121**	**5.7900e-003**	**1.4100e-003**	**7.2000e-003**	**0.0000**	**3.0237**	**3.0237**	**9.8000e-004**	**0.0000**	**3.0481**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	5.0000e-005	4.0000e-005	3.8000e-004	0.0000	1.3000e-004	0.0000	1.3000e-004	3.0000e-005	0.0000	3.0000e-005	0.0000	0.1086	0.1086	0.0000	0.0000	0.1086

Total	**5.0000e-005**	**4.0000e-005**	**3.8000e-004**	**0.0000**	**1.3000e-004**	**0.0000**	**1.3000e-004**	**3.0000e-005**	**0.0000**	**3.0000e-005**	**0.0000**	**0.1086**	**0.1086**	**0.0000**	**0.0000**	**0.1086**

3.4 Grading - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0223	0.0000	0.0223	0.0114	0.0000	0.0114	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	5.8000e-003	0.0645	0.0285	6.0000e-005		2.8700e-003	2.8700e-003		2.6400e-003	2.6400e-003	0.0000	5.5727	5.5727	1.8000e-003	0.0000	5.6177
Total	**5.8000e-003**	**0.0645**	**0.0285**	**6.0000e-005**	**0.0223**	**2.8700e-003**	**0.0251**	**0.0114**	**2.6400e-003**	**0.0141**	**0.0000**	**5.5727**	**5.5727**	**1.8000e-003**	**0.0000**	**5.6177**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0100	0.3371	0.0626	9.8000e-004	0.0212	1.0300e-003	0.0222	5.8300e-003	9.9000e-004	6.8100e-003	0.0000	94.5052	94.5052	4.6900e-003	0.0000	94.6223
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.1000e-004	8.0000e-005	8.6000e-004	0.0000	2.8000e-004	0.0000	2.9000e-004	8.0000e-005	0.0000	8.0000e-005	0.0000	0.2443	0.2443	1.0000e-005	0.0000	0.2444
Total	**0.0101**	**0.3372**	**0.0634**	**9.8000e-004**	**0.0215**	**1.0300e-003**	**0.0225**	**5.9100e-003**	**9.9000e-004**	**6.8900e-003**	**0.0000**	**94.7494**	**94.7494**	**4.7000e-003**	**0.0000**	**94.8667**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.0223	0.0000	0.0223	0.0114	0.0000	0.0114	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	5.8000e-003	0.0645	0.0285	6.0000e-005		2.8700e-003	2.8700e-003		2.6400e-003	2.6400e-003	0.0000	5.5726	5.5726	1.8000e-003	0.0000	5.6177
Total	**5.8000e-003**	**0.0645**	**0.0285**	**6.0000e-005**	**0.0223**	**2.8700e-003**	**0.0251**	**0.0114**	**2.6400e-003**	**0.0141**	**0.0000**	**5.5726**	**5.5726**	**1.8000e-003**	**0.0000**	**5.6177**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0100	0.3371	0.0626	9.8000e-004	0.0212	1.0300e-003	0.0222	5.8300e-003	9.9000e-004	6.8100e-003	0.0000	94.5052	94.5052	4.6900e-003	0.0000	94.6223
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.1000e-004	8.0000e-005	8.6000e-004	0.0000	2.8000e-004	0.0000	2.9000e-004	8.0000e-005	0.0000	8.0000e-005	0.0000	0.2443	0.2443	1.0000e-005	0.0000	0.2444
Total	**0.0101**	**0.3372**	**0.0634**	**9.8000e-004**	**0.0215**	**1.0300e-003**	**0.0225**	**5.9100e-003**	**9.9000e-004**	**6.8900e-003**	**0.0000**	**94.7494**	**94.7494**	**4.7000e-003**	**0.0000**	**94.8667**

3.5 Building Construction - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	tons/yr										MT/yr					
Off-Road	0.1849	1.3909	1.3157	2.2500e-003		0.0698	0.0698		0.0674	0.0674	0.0000	185.1786	185.1786	0.0331	0.0000	186.0051
Total	**0.1849**	**1.3909**	**1.3157**	**2.2500e-003**		**0.0698**	**0.0698**		**0.0674**	**0.0674**	**0.0000**	**185.1786**	**185.1786**	**0.0331**	**0.0000**	**186.0051**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	3.7900e-003	0.1309	0.0277	3.3000e-004	8.0400e-003	2.7000e-004	8.3100e-003	2.3300e-003	2.6000e-004	2.5900e-003	0.0000	32.0652	32.0652	1.7600e-003	0.0000	32.1092
Worker	7.4900e-003	5.3400e-003	0.0559	1.8000e-004	0.0186	1.2000e-004	0.0187	4.9300e-003	1.1000e-004	5.0500e-003	0.0000	15.9170	15.9170	3.8000e-004	0.0000	15.9265
Total	**0.0113**	**0.1363**	**0.0837**	**5.1000e-004**	**0.0266**	**3.9000e-004**	**0.0270**	**7.2600e-003**	**3.7000e-004**	**7.6400e-003**	**0.0000**	**47.9822**	**47.9822**	**2.1400e-003**	**0.0000**	**48.0357**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1849	1.3909	1.3157	2.2500e-003		0.0698	0.0698		0.0674	0.0674	0.0000	185.1784	185.1784	0.0331	0.0000	186.0048

Total	**0.1849**	**1.3909**	**1.3157**	**2.2500e-003**		**0.0698**	**0.0698**		**0.0674**	**0.0674**	**0.0000**	**185.1784**	**185.1784**	**0.0331**	**0.0000**	**186.0048**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	3.7900e-003	0.1309	0.0277	3.3000e-004	8.0400e-003	2.7000e-004	8.3100e-003	2.3300e-003	2.6000e-004	2.5900e-003	0.0000	32.0652	32.0652	1.7600e-003	0.0000	32.1092
Worker	7.4900e-003	5.3400e-003	0.0559	1.8000e-004	0.0186	1.2000e-004	0.0187	4.9300e-003	1.1000e-004	5.0500e-003	0.0000	15.9170	15.9170	3.8000e-004	0.0000	15.9265
Total	**0.0113**	**0.1363**	**0.0837**	**5.1000e-004**	**0.0266**	**3.9000e-004**	**0.0270**	**7.2600e-003**	**3.7000e-004**	**7.6400e-003**	**0.0000**	**47.9822**	**47.9822**	**2.1400e-003**	**0.0000**	**48.0357**

3.5 Building Construction - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1954	1.4816	1.5081	2.6100e-003		0.0698	0.0698		0.0674	0.0674	0.0000	215.1686	215.1686	0.0375	0.0000	216.1055
Total	**0.1954**	**1.4816**	**1.5081**	**2.6100e-003**		**0.0698**	**0.0698**		**0.0674**	**0.0674**	**0.0000**	**215.1686**	**215.1686**	**0.0375**	**0.0000**	**216.1055**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	4.1100e-003	0.1445	0.0302	3.9000e-004	9.3400e-003	2.7000e-004	9.6100e-003	2.7000e-003	2.6000e-004	2.9600e-003	0.0000	36.8880	36.8880	1.9600e-003	0.0000	36.9368
Worker	8.0800e-003	5.5500e-003	0.0595	2.0000e-004	0.0216	1.4000e-004	0.0217	5.7300e-003	1.3000e-004	5.8600e-003	0.0000	17.8179	17.8179	4.0000e-004	0.0000	17.8278
Total	**0.0122**	**0.1500**	**0.0897**	**5.9000e-004**	**0.0309**	**4.1000e-004**	**0.0313**	**8.4300e-003**	**3.9000e-004**	**8.8200e-003**	**0.0000**	**54.7058**	**54.7058**	**2.3600e-003**	**0.0000**	**54.7646**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1954	1.4816	1.5081	2.6100e-003		0.0698	0.0698		0.0674	0.0674	0.0000	215.1684	215.1684	0.0375	0.0000	216.1053
Total	**0.1954**	**1.4816**	**1.5081**	**2.6100e-003**		**0.0698**	**0.0698**		**0.0674**	**0.0674**	**0.0000**	**215.1684**	**215.1684**	**0.0375**	**0.0000**	**216.1053**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	4.1100e-003	0.1445	0.0302	3.9000e-004	9.3400e-003	2.7000e-004	9.6100e-003	2.7000e-003	2.6000e-004	2.9600e-003	0.0000	36.8880	36.8880	1.9600e-003	0.0000	36.9368
Worker	8.0800e-003	5.5500e-003	0.0595	2.0000e-004	0.0216	1.4000e-004	0.0217	5.7300e-003	1.3000e-004	5.8600e-003	0.0000	17.8179	17.8179	4.0000e-004	0.0000	17.8278
Total	**0.0122**	**0.1500**	**0.0897**	**5.9000e-004**	**0.0309**	**4.1000e-004**	**0.0313**	**8.4300e-003**	**3.9000e-004**	**8.8200e-003**	**0.0000**	**54.7058**	**54.7058**	**2.3600e-003**	**0.0000**	**54.7646**

3.6 Paving - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	7.5600e-003	0.0745	0.0969	1.5000e-004		3.8200e-003	3.8200e-003		3.5300e-003	3.5300e-003	0.0000	12.9466	12.9466	4.1000e-003	0.0000	13.0492
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**7.5600e-003**	**0.0745**	**0.0969**	**1.5000e-004**		**3.8200e-003**	**3.8200e-003**		**3.5300e-003**	**3.5300e-003**	**0.0000**	**12.9466**	**12.9466**	**4.1000e-003**	**0.0000**	**13.0492**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.2000e-004	2.9000e-004	3.1200e-003	1.0000e-005	1.1300e-003	1.0000e-005	1.1400e-003	3.0000e-004	1.0000e-005	3.1000e-004	0.0000	0.9349	0.9349	2.0000e-005	0.0000	0.9354
Total	**4.2000e-004**	**2.9000e-004**	**3.1200e-003**	**1.0000e-005**	**1.1300e-003**	**1.0000e-005**	**1.1400e-003**	**3.0000e-004**	**1.0000e-005**	**3.1000e-004**	**0.0000**	**0.9349**	**0.9349**	**2.0000e-005**	**0.0000**	**0.9354**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	7.5600e-003	0.0745	0.0969	1.5000e-004		3.8200e-003	3.8200e-003		3.5300e-003	3.5300e-003	0.0000	12.9466	12.9466	4.1000e-003	0.0000	13.0492
Paving	0.0000					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**7.5600e-003**	**0.0745**	**0.0969**	**1.5000e-004**		**3.8200e-003**	**3.8200e-003**		**3.5300e-003**	**3.5300e-003**	**0.0000**	**12.9466**	**12.9466**	**4.1000e-003**	**0.0000**	**13.0492**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.2000e-004	2.9000e-004	3.1200e-003	1.0000e-005	1.1300e-003	1.0000e-005	1.1400e-003	3.0000e-004	1.0000e-005	3.1000e-004	0.0000	0.9349	0.9349	2.0000e-005	0.0000	0.9354

Total	**4.2000e-004**	**2.9000e-004**	**3.1200e-003**	**1.0000e-005**	**1.1300e-003**	**1.0000e-005**	**1.1400e-003**	**3.0000e-004**	**1.0000e-005**	**3.1000e-004**	**0.0000**	**0.9349**	**0.9349**	**2.0000e-005**	**0.0000**	**0.9354**

3.7 Architectural Coating - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0167					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.0000e-004	7.0000e-004	9.1000e-004	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005	0.0000	0.1277	0.1277	1.0000e-005	0.0000	0.1279
Total	**0.0168**	**7.0000e-004**	**9.1000e-004**	**0.0000**		**4.0000e-005**	**4.0000e-005**		**4.0000e-005**	**4.0000e-005**	**0.0000**	**0.1277**	**0.1277**	**1.0000e-005**	**0.0000**	**0.1279**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	5.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0163	0.0163	0.0000	0.0000	0.0164
Total	**1.0000e-005**	**1.0000e-005**	**5.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0163**	**0.0163**	**0.0000**	**0.0000**	**0.0164**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.0167					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.0000e-004	7.0000e-004	9.1000e-004	0.0000		4.0000e-005	4.0000e-005		4.0000e-005	4.0000e-005	0.0000	0.1277	0.1277	1.0000e-005	0.0000	0.1279
Total	**0.0168**	**7.0000e-004**	**9.1000e-004**	**0.0000**		**4.0000e-005**	**4.0000e-005**		**4.0000e-005**	**4.0000e-005**	**0.0000**	**0.1277**	**0.1277**	**1.0000e-005**	**0.0000**	**0.1279**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.0000e-005	1.0000e-005	5.0000e-005	0.0000	2.0000e-005	0.0000	2.0000e-005	1.0000e-005	0.0000	1.0000e-005	0.0000	0.0163	0.0163	0.0000	0.0000	0.0164
Total	**1.0000e-005**	**1.0000e-005**	**5.0000e-005**	**0.0000**	**2.0000e-005**	**0.0000**	**2.0000e-005**	**1.0000e-005**	**0.0000**	**1.0000e-005**	**0.0000**	**0.0163**	**0.0163**	**0.0000**	**0.0000**	**0.0164**

3.7 Architectural Coating - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	tons/yr										MT/yr					
Archit. Coating	0.3499					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.0100e-003	0.0137	0.0190	3.0000e-005		7.4000e-004	7.4000e-004		7.4000e-004	7.4000e-004	0.0000	2.6809	2.6809	1.6000e-004	0.0000	2.6849
Total	**0.3519**	**0.0137**	**0.0190**	**3.0000e-005**		**7.4000e-004**	**7.4000e-004**		**7.4000e-004**	**7.4000e-004**	**0.0000**	**2.6809**	**2.6809**	**1.6000e-004**	**0.0000**	**2.6849**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.4000e-004	1.0000e-004	1.0500e-003	0.0000	4.2000e-004	0.0000	4.2000e-004	1.1000e-004	0.0000	1.1000e-004	0.0000	0.3301	0.3301	1.0000e-005	0.0000	0.3303
Total	**1.4000e-004**	**1.0000e-004**	**1.0500e-003**	**0.0000**	**4.2000e-004**	**0.0000**	**4.2000e-004**	**1.1000e-004**	**0.0000**	**1.1000e-004**	**0.0000**	**0.3301**	**0.3301**	**1.0000e-005**	**0.0000**	**0.3303**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.3499					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Off-Road	2.0100e-003	0.0137	0.0190	3.0000e-005		7.4000e-004	7.4000e-004		7.4000e-004	7.4000e-004	0.0000	2.6809	2.6809	1.6000e-004	0.0000	2.6849
Total	**0.3519**	**0.0137**	**0.0190**	**3.0000e-005**		**7.4000e-004**	**7.4000e-004**		**7.4000e-004**	**7.4000e-004**	**0.0000**	**2.6809**	**2.6809**	**1.6000e-004**	**0.0000**	**2.6849**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	1.4000e-004	1.0000e-004	1.0500e-003	0.0000	4.2000e-004	0.0000	4.2000e-004	1.1000e-004	0.0000	1.1000e-004	0.0000	0.3301	0.3301	1.0000e-005	0.0000	0.3303
Total	**1.4000e-004**	**1.0000e-004**	**1.0500e-003**	**0.0000**	**4.2000e-004**	**0.0000**	**4.2000e-004**	**1.1000e-004**	**0.0000**	**1.1000e-004**	**0.0000**	**0.3301**	**0.3301**	**1.0000e-005**	**0.0000**	**0.3303**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.0633	0.3884	0.7225	2.9500e-003	0.2371	2.4100e-003	0.2396	0.0637	2.2600e-003	0.0660	0.0000	272.2628	272.2628	0.0103	0.0000	272.5202

Unmitigated	0.0633	0.3884	0.7225	2.9500e-003	0.2371	2.4100e-003	0.2396	0.0637	2.2600e-003	0.0660	0.0000	272.2628	272.2628	0.0103	0.0000	272.5202

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
Research & Development	329.71	77.33	44.99	634,029	634,029
Total	329.71	77.33	44.99	634,029	634,029

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
Research & Development	9.50	7.30	7.30	33.00	48.00	19.00	82	15	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
Research & Development	0.561348	0.038614	0.190285	0.107199	0.015389	0.005180	0.024554	0.046236	0.002209	0.002456	0.005491	0.000334	0.000704

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Exceed Title 24

Install High Efficiency Lighting

Percent of Electricity Use Generated with Renewable Energy

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	642.4284	642.4284	0.0436	9.0300e-003	646.2092
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	998.7322	998.7322	0.0678	0.0140	1,004.6100
NaturalGas Mitigated	7.3500e-003	0.0668	0.0561	4.0000e-004		5.0800e-003	5.0800e-003		5.0800e-003	5.0800e-003	0.0000	72.7599	72.7599	1.3900e-003	1.3300e-003	73.1923
NaturalGas Unmitigated	9.3800e-003	0.0853	0.0716	5.1000e-004		6.4800e-003	6.4800e-003		6.4800e-003	6.4800e-003	0.0000	92.8490	92.8490	1.7800e-003	1.7000e-003	93.4008

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Research & Development	1.73993e+006	9.3800e-003	0.0853	0.0716	5.1000e-004		6.4800e-003	6.4800e-003		6.4800e-003	6.4800e-003	0.0000	92.8490	92.8490	1.7800e-003	1.7000e-003	93.4008
Total		**9.3800e-003**	**0.0853**	**0.0716**	**5.1000e-004**		**6.4800e-003**	**6.4800e-003**		**6.4800e-003**	**6.4800e-003**	**0.0000**	**92.8490**	**92.8490**	**1.7800e-003**	**1.7000e-003**	**93.4008**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
Research & Development	1.36347e+006	7.3500e-003	0.0668	0.0561	4.0000e-004		5.0800e-003	5.0800e-003		5.0800e-003	5.0800e-003	0.0000	72.7599	72.7599	1.3900e-003	1.3300e-003	73.1923

Total		**7.3500e-003**	**0.0668**	**0.0561**	**4.0000e-004**		**5.0800e-003**	**5.0800e-003**		**5.0800e-003**	**5.0800e-003**	**0.0000**	**72.7599**	**72.7599**	**1.3900e-003**	**1.3300e-003**	**73.1923**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Research & Development	5.15651e+006	998.7322	0.0678	0.0140	1,004.6100
Total		**998.7322**	**0.0678**	**0.0140**	**1,004.6100**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
Research & Development	3.31689e+006	642.4284	0.0436	9.0300e-003	646.2092
Total		**642.4284**	**0.0436**	**9.0300e-003**	**646.2092**

6.0 Area Detail

6.1 Mitigation Measures Area

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.3113	1.0000e-005	6.5000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.2600e-003	1.2600e-003	0.0000	0.0000	1.3400e-003
Unmitigated	0.3113	1.0000e-005	6.5000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.2600e-003	1.2600e-003	0.0000	0.0000	1.3400e-003

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0367					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.2746					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	6.0000e-005	1.0000e-005	6.5000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.2600e-003	1.2600e-003	0.0000	0.0000	1.3400e-003
Total	**0.3113**	**1.0000e-005**	**6.5000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**1.2600e-003**	**1.2600e-003**	**0.0000**	**0.0000**	**1.3400e-003**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.0367					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	0.2746					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Landscaping	6.0000e-005	1.0000e-005	6.5000e-004	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	1.2600e-003	1.2600e-003	0.0000	0.0000	1.3400e-003
Total	**0.3113**	**1.0000e-005**	**6.5000e-004**	**0.0000**		**0.0000**	**0.0000**		**0.0000**	**0.0000**	**0.0000**	**1.2600e-003**	**1.2600e-003**	**0.0000**	**0.0000**	**1.3400e-003**

7.0 Water Detail

7.1 Mitigation Measures Water

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	2.5258	0.0604	1.4500e-003	4.4684
Unmitigated	2.5258	0.0604	1.4500e-003	4.4684

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Research & Development	1.85 / 0	2.5258	0.0604	1.4500e-003	4.4684
Total		**2.5258**	**0.0604**	**1.4500e-003**	**4.4684**

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
Research & Development	1.85 / 0	2.5258	0.0604	1.4500e-003	4.4684
Total		**2.5258**	**0.0604**	**1.4500e-003**	**4.4684**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Institute Recycling and Composting Services

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	0.1084	6.4100e-003	0.0000	0.2686
Unmitigated	1.0840	0.0641	0.0000	2.6855

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
Research & Development	5.34	1.0840	0.0641	0.0000	2.6855
Total		**1.0840**	**0.0641**	**0.0000**	**2.6855**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			

Research & Development	0.534	0.1084	6.4100e-003	0.0000	0.2686
Total		**0.1084**	**6.4100e-003**	**0.0000**	**0.2686**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type
Emergency Generator	1	1	50	800	0.73	Diesel

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

10.1 Stationary Sources

Unmitigated/Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Equipment Type	tons/yr										MT/yr					
Emergency Generator - Diesel (750 - 9999 HP)	0.0328	0.1468	0.0837	1.6000e-004		4.8300e-003	4.8300e-003		4.8300e-003	4.8300e-003	0.0000	15.2319	15.2319	2.1400e-003	0.0000	15.2853

Total	0.0328	0.1468	0.0837	1.6000e-004		4.8300e-003	4.8300e-003		4.8300e-003	4.8300e-003	0.0000	15.2319	15.2319	2.1400e-003	0.0000	15.2853

11.0 Vegetation

BioEPIC Construction Unmitigated Yearly

Year	ROG	Nox	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5	CO2e
2021	0.26	2.41	1.83	0.00	0.09	0.10	0.19	0.03	0.09	0.13	390
2022	0.23	1.71	1.70	0.00	0.03	0.07	0.11	0.01	0.07	0.08	285
2023	0.35	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3
										Total CO2e	678
										Yearly	226

BioEPIC Construction Unmitigated Daily Average

Year	ROG	Nox	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
2021 Pounds Per Year	2	19	14	0	1	1	1	0	1	1
2022 Pounds Per Year	2	13	13	0	0	1	1	0	1	1
2023 Pounds Per Year	34	1	2	0	0	0	0	0	0	0
Total Average Daily Emissions (542 Construction Days)	12	11	10	0	0	0	1	0	0	1

BioEPIC Operational Unmitigated Yearly (Mitigated CO2e to account for project design features)

Source	ROG	Nox	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5	CO2e
Area	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Energy	0.01	0.09	0.07	0.00	0.00	0.01	0.01	0.00	0.01	0.01	719.40
Mobile	0.06	0.39	0.72	0.00	0.24	0.00	0.24	0.06	0.00	0.07	272.52
Stationary	0.03	0.15	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.29
Waste											0.27
Water											4.47
Total	0.42	0.62	0.88	0.00	0.24	0.01	0.25	0.06	0.01	0.08	1012

997

BioEPIC Operational Unmitigated Daily Average

Source	ROG	Nox	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Area	1.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Energy	0.05	0.47	0.39	0.00	0.00	0.04	0.04	0.00	0.04	0.04
Mobile	0.35	2.13	3.96	0.02	1.30	0.01	1.31	0.35	0.01	0.36
Stationary	0.18	0.80	0.46	0.00	0.00	0.03	0.03	0.00	0.03	0.03
Waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	2.28	3.40	4.81	0.02	1.30	0.08	1.37	0.35	0.07	0.42

BioEPIC Construction Unmitigated Yearly

Year	ROG	Nox	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5	CO2e
2021	0.26	2.41	1.83	0.00	0.09	0.10	0.19	0.03	0.09	0.13	390
2022	0.23	1.71	1.70	0.00	0.03	0.07	0.11	0.01	0.07	0.08	285
2023	0.35	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3
										Total CO2e	678
										Yearly	226

BioEPIC Construction Unmitigated Daily Average

Year	ROG	Nox	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
2021 Pounds Per Year	2	19	14	0	1	1	1	0	1	1
2022 Pounds Per Year	2	13	13	0	0	1	1	0	1	1
2023 Pounds Per Year	34	1	2	0	0	0	0	0	0	0
Total Average Daily Emissions (542 Construction Days)	12	11	10	0	0	0	1	0	0	1

BioEPIC Operational Unmitigated Yearly (Mitigated CO2e to account for project design features)

Source	ROG	Nox	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5	CO2e
Area	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Energy	0.01	0.09	0.07	0.00	0.00	0.01	0.01	0.00	0.01	0.01	719.40
Mobile	0.06	0.39	0.72	0.00	0.24	0.00	0.24	0.06	0.00	0.07	272.52
Stationary	0.03	0.15	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.29
Waste											0.27
Water											4.47
Total	0.42	0.62	0.88	0.00	0.24	0.01	0.25	0.06	0.01	0.08	1012

997

BioEPIC Operational Unmitigated Daily Average

Source	ROG	Nox	CO	SO2	Fugitive PM10	Exhaust PM10	Total PM10	Fugitive PM2.5	Exhaust PM2.5	Total PM2.5
Area	1.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Energy	0.05	0.47	0.39	0.00	0.00	0.04	0.04	0.00	0.04	0.04
Mobile	0.35	2.13	3.96	0.02	1.30	0.01	1.31	0.35	0.01	0.36
Stationary	0.18	0.80	0.46	0.00	0.00	0.03	0.03	0.00	0.03	0.03
Waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	2.28	3.40	4.81	0.02	1.30	0.08	1.37	0.35	0.07	0.42

December 30, 2019

Ms. Angela Pan
Project Manager
Impact Sciences
505 14th Street, Suite 900
Oakland, CA 94612

Subject: Evaluation of BioEPIC Building Operations Relative to Previous Health Risk Assessments
Alta Project ISCI-19-8923

Dear Ms. Pan:

You have contracted Alta Environmental (Alta) to review the potential impact of chemicals to be used at the proposed Biological & Environmental Program Integration Center (BioEPIC) building. This review was to consider the incremental change laboratory operations in this proposed building will have to the overall health risk while considering the previous assessments developed for the Lawrence Berkeley National Laboratory (LBNL). This review relies on the assumptions and conclusions from a site wide human health risk assessment (HHRA) developed as part of the 2006 Environmental Impact Report (EIR) for LBNL's Long Range Development Plan (LRDP).

The 2006 HHRA included predicted emissions of Toxic Air Contaminants (TAC) from laboratory operations expected to be performed at future buildings that would be developed under the LRDP. The risk assessment was based on an Illustrative Development Scenario that was a conceptual portrayal of potential development under the 2006 LRDP. The scenario depicted the likely locations of future buildings on the LBNL hill site, including a future lab building (Building S-3) in the general area of the proposed BioEPIC project. The risk assessment also accounted for emissions from other planned sources including stationary equipment (HVAC, boilers, generators, paint spray booths, etc.) and mobile sources (pool vehicles and employee shuttle buses) associated with the new operations.

In 2014, an evaluation was conducted to consider the impact of laboratory operations in the new Integrative Genomics Building (IGB) which is under construction adjacent to the BioEPIC site on a portion of the Building S-3 site. TAC emissions were predicted for this building based on planned chemical inventory quantities. For this evaluation, all inventory quantities were assumed to be used and completely emitted into the air over a period of 311 days, which is likely very conservative since much of their volumes are likely to be collected and disposed of as

wastes. Therefore, the assumed annual emission rate for each TAC in the IGB evaluation is 365/311 or 1.17 times the inventory amount.

A laboratory chemical inventory was provided to Alta Environmental by UC LBNL for the BioEPIC project. This inventory was evaluated using a database program to extract total values of each chemical listed. A listing of all chemicals from the Office of Environmental Health Hazard Assessment's (OEHHA's) Hot Spots Unit Risk and Cancer Potency Values table was also loaded to the database and used to create a table of each OEHHA Listed compound in the inventory with their total quantities. The inventory from the IGB building was also loaded to the database and the totals quantified. As was assumed in the 2014 IGB evaluation, only chemicals with non-negligible vapor pressures (all which were volatile organic liquids) were evaluated for their potential air emissions. Considering this approach, the database was used to generate a cross-reference query resulting in a list of 12 volatile organic chemicals which appear on the both OEHHA's Hot Spots table and the BioEPIC chemical listings. These chemicals are identified in Table 1 (attached). Of these chemicals, five had been evaluated in the risk calculations in the 2006 HHRA's LRDP scenario as laboratory chemicals.

Chemicals evaluated in 2006 HHRA as Future Laboratory Emissions

As Table 1 shows, the total estimated laboratory emissions for each of the five previously evaluated chemicals are significantly less than the laboratory emissions assumed in the 2006 HHRA. The most significant of these is Chloroform, which should generate most of the risk from its use as a laboratory chemical. However, its estimated emissions (179.3 lb/hr) are only approximately 31 percent of those assumed in the 2006 LRDP HHRA.

Evaluation of all Chemicals Against BAAQMD Trigger Levels

In order to evaluate the relative impact of the seven new chemicals, the project's emissions of all 12 chemicals were also compared to a set of air toxic threshold levels put forth by the Bay Area Air Quality Management District (BAAQMD) in its New Source Review of Toxic Air Contaminants Rule (BAAQMD Regulation 2, Rule 5). These are threshold screening levels for new emissions sources being evaluated for air permits, that if not exceeded remove the need for further health risk assessment. As indicated in the Table 1, with the exception of Chloroform, the estimated emissions of each of the 12 laboratory chemicals are well below the threshold levels and can be assumed to represent very little risk.

Regarding Chloroform, as noted above, the 2006 LRDP HHRA used a significantly higher emission rate than that estimated from laboratory operations from both the BioEPIC and IGB projects combined. These lower Chloroform emissions should more than offset the risks associated with emissions from the other 11 chemicals. Therefore, the total human health risk from laboratory emissions should be less than those used in the 2006 HHRA.

Conclusions

Based on this evaluation, the predicted TAC emissions from laboratories in the proposed BioEPIC facility, even when combined with those from the IGB facility, would present health risks well within those predicted for laboratory operations in the 2006 HHRA. Therefore, no additional risk assessment should be necessary for the BioEPIC facility.

Sincerely,

Kevin Cosgrove, CPP
Senior Engineer, EHS & Air

Karl Jerome Bacho, CPP
Associate III, EHS & Air

Attachments: Table 1 - Comparison of BioEPIC & IGB to Original LRDP Emission Values from 2006 HHRA

ALTA ENVIRONMENTAL
AN NV5 COMPANY

Comparison of BioEPIC & IGB to Original LRDP Emission Values from 2006 HHRA of OEHHA Listed Toxic Air Contaminants

CAS No.	Chemical	Source of OEHHA AB 2588 Listing[1]	Assumed Lab Emissions in Lbs			2006 HHRA Lab Emissions in lbs	BAAQMD Trigger[2]	Exceeds BAAQMD
			BioEPIC	IGB	Total			
75-07-0	ACETALDEHYDE	TAC	0.01	0.00	0.01		38	No
71-43-2	BENZENE	TAC	3.7		3.7	96.4	3.8	No
50-32-8	BENZO(A)PYRENE	TAC	0.001		0.001		0.0069	No
56-23-5	CARBON TETRACHLORIDE	TAC	0.4		0.4	73.2	2.5	No
67-66-3	CHLOROFORM	TAC	151.1	28.2	179.3	572.2	20	Yes
123-91-1	1,4-DIOXANE	Prop 65	0.3		0.3		14	No
107-06-2	1,2-DICHLOROETHANE	TAC	1.8		1.8	65.7	5.3	No
50-00-0	FORMALDEHYDE	TAC	6.3	0.3	6.7	67.3	18	No
1634-04-4	METHYL TERT-BUTYL ETHER	Hot Spots	3.1		3.1		210	No
75-09-2	METHYLENE CHLORIDE	TAC	58.4		58.4		110	No
127-18-4	TETRACHLOROETHYLENE	TAC	4.2		4.2		18	No
75-56-9	PROPYLENE OXIDE	IRIS	1.0		1.0		29	No

(1) This column identifies the source of each compound listed on the OHHEA's AB 2588 Hot Spots Unit Risk and Cancer Potency Table. Three of these compounds were not specifically identified as Toxic Air Containments, but were included because they are considered as a potential risk as air contaminants.

(2) These Trigger Levels are taken from BAAQMD Regulation 2, Rule 5 "New Source Review of Toxic Air Contaminants" which are the threshold level for each TAC "below which the resulting health risks are not expected to cause, or contribute significantly to, adverse health effects."

APPENDIX C

Energy Calculations

Table 2
Off-Road Construction Equipment Diesel Fuel Consumption

Phase	Equipment Type	Units	Hours	Horse Power	Load Factor	Number of Days	Fuel Usage Factor[a]	Diesel Usage[b]
Demolition	Concrete/Industrial Saws	1	8	81	0.73	44	0.05	1040.69
	Rubber Tired Dozers	1	8	247	0.40	44	0.05	1738.88
	Tractors/Loaders/Backhoes	3	8	97	0.37	44	0.05	1894.99
Site Preparation	Graders	1	8	187	0.41	4	0.05	122.67
	Rubber Tired Dozers	1	7	247	0.40	4	0.05	138.32
	Tractors/Loaders/Backhoes	1	8	97	0.37	4	0.05	57.42
Grading	Graders	1	6	187	0.41	9	0.05	207.01
	Rubber Tired Dozers	1	6	247	0.40	9	0.05	266.76
	Tractors/Loaders/Backhoes	1	7	97	0.37	9	0.05	113.05
Building Construction	Cranes	1	6	231	0.29	441	0.05	8862.78
	Forklifts	1	6	89	0.20	441	0.05	2354.94
	Generator Sets	1	8	84	0.74	441	0.05	10965.02
	Tractors/Loaders/ Backhoes	1	6	97	0.37	441	0.05	4748.25
	Welders	3	8	46	0.45	441	0.05	10954.44
Paving	Cement and Mortar Mixers	1	6	9	0.56	22	0.05	33.26
	Pavers	1	6	130	0.42	22	0.05	360.36
	Paving Equipment	1	8	132	0.36	22	0.05	418.18
	Rollers	1	7	80	0.38	22	0.05	234.08
	Tractors/Loaders/ Backhoes	1	8	97	0.37	22	0.05	315.83
Architectural Coatings	Air Compressors	1	6	78	0.48	22	0.05	247.10
							Project Total	**45,074**

Table 3
Construction Worker Petroleum Fuel Consumption

Phase	Number of Daily Trips	Number of Days	Average Round-Trip Commute Distance (in miles)	Fuel Usage (ave mpg)[a]	Fuel Usage (in gallons)
Worker Trips (Gasoline)					
Demolition	13	44	10.8	18.6	680
Site Preparation	8	4	10.8	18.6	100
Grading	8	9	10.8	18.6	226
Building Construction	23	441	10.8	18.6	3,852
Paving	13	22	10.8	18.6	340
Architectural Coating	5	22	10.8	18.6	884
			Total Gasoline Usage		**6,082**
Vendor Trips (Diesel)					
Building Construction	12	441	6.9	7.3	1,851
Hauling Trips (Diesel)					
Demolition	91[b]	--	20	6.5	280
Grading	2,500[b]	--	20	6.5	7,692
			Total Diesel Usage		**9,823**

Source: CalEEMod Model Data; Impact Sciences 2019

Notes:

ave – average mpg – miles per gallon
a This is a conservatively estimated total, as it assumes no electric, hybrid or other alternate fuel use vehicles in the fleet mix
b Number of haul trips total for entire phase

APPENDIX D

Noise Calculations

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 7/25/2019
Case Description: BioEPIC Demolition Noise

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Nearest Off-Site Receptor	Residential	46	46	46

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (exhaust muffling & sound barriers included as LRDP Mitigation) (dBA)
Concrete Saw	No	20		89.6	1080	13
Dozer	No	40		81.7	1080	13
Tractor	No	40	84		1080	13
Tractor	No	40	84		1080	13
Tractor	No	40	84		1080	13

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Concrete Saw	49.9	42.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	42	38	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	44.3	40.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	44.3	40.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	44.3	40.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	49.9	47.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Tibetan Nyingma Institute	Residential	48	48	48

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Saw	No	20		89.6	1280	13
Dozer	No	40		81.7	1280	13
Tractor	No	40	84		1280	13
Tractor	No	40	84		1280	13
Tractor	No	40	84		1280	13

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Concrete Saw	48.4	41.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	40.5	36.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	42.8	38.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	42.8	38.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	42.8	38.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	48.4	46.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 7/25/2019
Case Description: BioEPIC Site Prep Noise

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Nearest Off-Site Receptor	Residential	46	46	46

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (exhaust muffling & sound barriers included as LRDP Mitigation) (dBA)
Grader	No	40	85		1080	13
Dozer	No	40		81.7	1080	13
Tractor	No	40	84		1080	13

	Calculated (dBA)		Results Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Grader	45.3	41.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	42	38	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	44.3	40.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	45.3	44.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Tibetan Nyingma Institute	Residential	48	48	48

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85		1280	13
Dozer	No	40		81.7	1280	13
Tractor	No	40	84		1280	13

	Calculated (dBA)		Results Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Grader	43.8	39.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dozer	40.5	36.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	42.8	38.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	43.8	43.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 7/25/2019
Case Description: BioEPIC Building Construction Noise

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Nearest Off-Site Receptor	Residential	46	46	46

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (exhaust muffling & sound barriers included as LRDP Mitigation) (dBA)
Crane	No	16		80.6	1080	13
Man Lift	No	20		74.7	1080	13
Generator	No	50		80.6	1080	13
Welder / Torch	No	40		74	1080	13
Welder / Torch	No	40		74	1080	13
Welder / Torch	No	40		74	1080	13
Tractor	No	40	84		1080	13

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Crane	40.9	32.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift	35	28	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Generator	40.9	37.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Welder / Torch	34.3	30.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Welder / Torch	34.3	30.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Welder / Torch	34.3	30.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	44.3	40.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	44.3	43.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Tibetan Nyingma Institute	Residential	48	48	48

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Crane	No	16		80.6	1280	13
Man Lift	No	20		74.7	1280	13
Generator	No	50		80.6	1280	13
Welder / Torch	No	40		74	1280	13
Welder / Torch	No	40		74	1280	13
Welder / Torch	No	40		74	1280	13
Tractor	No	40	84		1280	13

Results

	Calculated (dBA)		Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
			Day		Evening		Night		Day		Evening		Night	
Equipment	*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Crane	39.4	31.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Man Lift	33.5	26.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Generator	39.5	36.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Welder / Torch	32.8	28.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Welder / Torch	32.8	28.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Welder / Torch	32.8	28.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor	42.8	38.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	42.8	42.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 7/25/2019
Case Description: BioEPIC Building Construction Noise

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Nearest Off-Site Receptor	Residential	46	46	46

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (exhaust muffling & sound barriers included as LRDP Mitigation) (dBA)
Concrete Mixer Truck	No	40		78.8	1080	13
Paver	No	50		77.2	1080	13
Roller	No	20		80	1080	13
Tractor	No	40	84		1080	13

		Results Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Concrete Mixer Truck		39.1	35.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paver		37.5	34.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller		40.3	33.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor		44.3	40.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	44.3	42.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Tibetan Nyingma Institute	Residential	48	48	48

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Concrete Mixer Truck	No	40		78.8	1280	13
Paver	No	50		77.2	1280	13
Roller	No	20		80	1280	13
Tractor	No	40	84		1280	13

		Results Calculated (dBA)		Noise Limits (dBA) Day		Evening		Night		Noise Limit Exceedance (dBA) Day		Evening		Night	
Equipment		*Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq	Lmax	Leq
Concrete Mixer Truck		37.6	33.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Paver		36.1	33	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Roller		38.8	31.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tractor		42.8	38.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Total	42.8	41.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

APPENDIX E

BioEPIC Project Transportation Impact Study

BioEPIC Project

Transportation Impact Analysis

Prepared for:
LBNL

June 2019

OK19-0306

FEHR PEERS

Table of Contents

Appendices:

List of Figures

List of Tables

1.0 INTRODUCTION

This report presents an analysis of the impacts of the proposed Biological and Environmental Program Integration Center (BioEPIC) Project at the Lawrence Berkeley National Laboratory (LBNL) main campus in Berkeley on the transportation network. This analysis assesses impacts of implementing the project (addition of about 210 employees) at the Lawrence Berkeley National Laboratory (LBNL) on traffic operations at intersections in the vicinity of the project site. **Figure 1** shows the location of the BioEPIC project site.

1.1 REPORT ORGANIZATION

This report is divided into the following four chapters:

- ***Chapter 1 – Introduction*** describes the analysis methods used for the transportation impact assessment used for the proposed BioEPIC project. This chapter also includes the significance criteria for determining project impacts.
- ***Chapter 2 – Existing Conditions*** describes the existing conditions in the vicinity of the BioEPIC site, including the existing roadway network, traffic operations, transit, and bicycle and pedestrian circulation.
- ***Chapter 3 – Project Transportation Characteristics*** describes the estimated number of trips generated by the project and the projected trip distribution and assignment of BioEPIC project trips. This chapter also includes results for Existing Plus Project conditions.
- ***Chapter 4 – Cumulative (2040) Analysis*** describes the 2040 Cumulative traffic operations for both No Project and Plus Project scenarios.

1.2 INTERSECTION OPERATION ANALYSIS METHOD

Intersection operations are described using the term "Level of Service" (LOS). LOS is a qualitative description of traffic operations from the vehicle driver perspective and consists of the delay experienced by the driver at the intersection. It ranges from LOS A, with no congestion and little delay, to LOS F, with excessive congestion and delays. Different methods are used to assess signalized and unsignalized (stop-controlled) intersections.

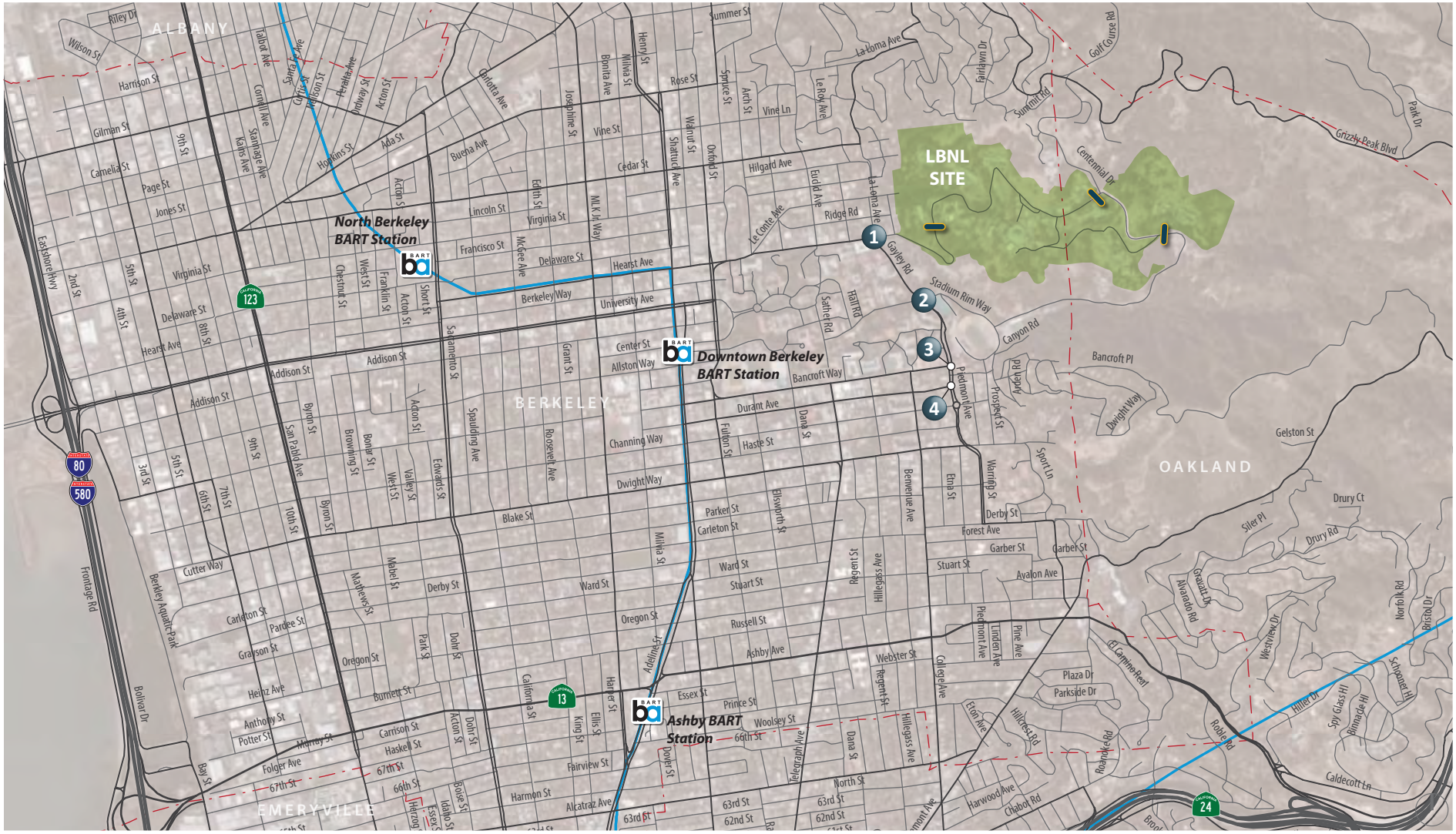


Figure 1

LBNL BioEPIC Study Locations

OK19_0306_1_StudyArea

1.2.1 SIGNALIZED INTERSECTIONS

Signalized intersection operations are evaluated using methods provided in the Highway Capacity Manual (HCM), 6th Edition. This method uses intersection characteristics to estimate average control delay and then assign a LOS. Control delay is defined as the delay associated with deceleration, stopping, moving up in the queue, and acceleration experienced by drivers at an intersection. **Table 1** provides descriptions of various LOS and the corresponding ranges of delays for signalized intersections.

1.2.2 UNSIGNALIZED INTERSECTIONS

Unsignalized intersection (four-way stop-controlled, side-street stop-controlled, and roundabouts) LOS are also analyzed using HCM, 6th Edition. Delay is calculated for movements that are controlled by a stop sign or that must yield the right-of-way. This method defines operations by average control delay per vehicle (measured in seconds) for each stop-controlled movement. This incorporates delay associated with deceleration, acceleration, stopping, and moving up in the queue. For side-street stop-controlled intersections, the movement or approach with the highest delay is reported. **Table 1** summarizes the LOS ranges for unsignalized intersections. They are lower than the delay ranges for signalized intersections because drivers will generally tolerate more delay at signals.

1.2.3 ANALYSIS TOOLS

The Synchro Software was used to estimate delay and LOS for all signalized and some unsignalized study intersections. Synchro uses the equations provided in HCM, 6th Edition to calculate control delay. These equations use intersection characteristics, such as vehicle and pedestrian volumes, lane geometry, and signal phasings, as inputs in estimating control delay.

Delay at the all-way stop-controlled intersections (Gayley Road/Stadium Rim Way, Bancroft Way/Piedmont Avenue, and Durant Avenue/Piedmont Avenue intersections) was calculated using SimTraffic because of the unique conditions at these intersections. The heavy pedestrian crossing volumes and/or the close distance of the intersections to each other cannot be accurately measured by Synchro. SimTraffic is used for modeling and simulating traffic operations based on the behavior of individual drivers in a network. The software accounts for the physical features of the transportation system, traffic flow conditions, and driver behavior characteristics to estimate travel delays and other performance measures that describe traffic operations.

TABLE 1
INTERSECTION LEVEL OF SERVICE DEFINITIONS

Unsignalized Intersections		Level of Service Grade	Signalized Intersections	
Description	**Average Total Vehicle Delay (Seconds)**		**Average Control Vehicle Delay (Seconds)**	**Description**
No delay for stop-controlled approaches.	≤10.0	A	≤10.0	Free Flow or Insignificant Delays: Operations with very low delay, when signal progression is extremely favorable and most vehicles arrive during the green light phase. Most vehicles do not stop at all.
Operations with minor delay.	>10.0 and ≤15.0	B	>10.0 and ≤20.0	Stable Operation or Minimal Delays: Generally occurs with good signal progression and/or short cycle lengths. More vehicles stop than with LOS A, causing higher levels of average delay. An occasional approach phase is fully utilized.
Operations with moderate delays.	>15.0 and ≤25.0	C	>20.0 and ≤35.0	Stable Operation or Acceptable Delays: Higher delays resulting from fair signal progression and/or longer cycle lengths. Drivers begin having to wait through more than one red light. Most drivers feel somewhat restricted.
Operations with increasingly unacceptable delays.	>25.0 and ≤35.0	D	>35.0 and ≤55.0	Approaching Unstable or Tolerable Delays: Influence of congestion becomes more noticeable. Longer delays result from unfavorable signal progression, long cycle lengths, or high volume to capacity ratios. Many vehicles stop. Drivers may have to wait through more than one red light. Queues may develop, but dissipate rapidly, without excessive delays.
Operations with high delays, and long queues.	>35.0 and ≤50.0	E	>55.0 and ≤80.0	Unstable Operation or Significant Delays: Considered to be the limit of acceptable delay. High delays indicate poor signal progression, long cycle lengths and high volume to capacity ratios. Individual cycle failures are frequent occurrences. Vehicles may wait through several signal cycles. Long queues form upstream from intersection.
Operations with extreme congestion, and with very high delays and long queues unacceptable to most drivers.	>50.0	F	>80.0	Forced Flow or Excessive Delays: Occurs with oversaturation when flows exceed the intersection capacity. Represents jammed conditions. Many cycle failures. Queues may block upstream intersections.

Source: Highway Capacity Manual, Transportation Research Board, 2016.

Microsimulation programs, such as SimTraffic, incorporate the element of randomness inherent in traffic flow. Therefore, in order to average out the random fluctuations and obtain a statistically more significant result, a microsimulation model should be run several times and the average of the runs should be reported. For this study, the SimTraffic files were each run ten times.

1.3 SIGNIFICANCE CRITERIA

For the purposes of this analysis, the following intersection LOS thresholds of significance are used based on the City of Berkeley standards and practices.

An impact is significant if the project would cause:

- At a signalized intersection, operations degrade from LOS D to LOS E or worse and more than a two-second increase in delay; or
- At a signalized intersection, more than a three-second increase in delay at intersections operating at LOS E without and with the project; or
- At a signalized intersection, operations degrade from LOS E to LOS F and more than a three-second increase in delay; or
- At a signalized intersection operating at LOS F without the project, a change in the volume-to-capacity (v/c) ratio of more than 0.01.
- At an unsignalized intersection, the addition of project-related traffic causes:
    - the critical approach to operate at LOS F; and
    - the intersection meets the peak hour traffic volume signal warrants (California Manual on Uniform Traffic Control Devices [MUTCD] Warrant 3); and
    - a minimum of 10 vehicles are added to the critical movement.

A project's contribution to cumulative impacts is considered "considerable" (i.e., significant) when the project exceeds at least one of the thresholds listed above under a future year scenario.

2.0 EXISTING CONDITIONS

This chapter describes existing transportation conditions for the existing LBNL site.

2.1 EXISTING ROADWAY NETWORK

Figure 1 shows the existing LBNL site, the surrounding roadway system, and intersections analyzed as part of this analysis. The regional and local roadways serving the project site, as well as the internal circulation within the site are described below.

2.1.1 REGIONAL ROADWAYS

Interstate 80 (I-80) connects the San Francisco Bay Area with the Sacramento region and continues east. Within Berkeley, I-80 is oriented in a north-south direction along the western edge of the city and provides five lanes of travel in each direction. Access from I-80 to the city of Berkeley is provided through interchanges at Ashby Avenue, University Avenue, and Gilman Street. I-80 and the nearby I-80/I-580 interchange operate at capacity during the peak commute hours. I-80 between Emeryville and Albany is also I-580. I-80 has an average annual daily traffic (AADT) of 278,300 vehicles between the University Avenue and Gilman Street interchanges in 2017.[1]

State Route 24 (SR 24) links I-680 in Contra Costa County to I-80/I-580 and I-980. SR 24 provides four travel lanes in each direction near Berkeley. This is the primary route used by Berkeley-bound travelers from Contra Costa County. The primary access routes from SR 24 to the LBNL area are SR 13 (Ashby Avenue) to the Belrose-Derby-Warring-Piedmont corridor and Telegraph Avenue. SR 24 has an AADT of 172,200 vehicles east of SR 13 in 2017.[2]

State Route 13/Ashby Avenue (SR 13) connects I-580 in east Oakland to I-80, with a partial access interchange at SR 24. In Berkeley, SR 13 is Tunnel Road/Ashby Avenue, a generally east-west two to four-lane arterial through the city. Ashby Avenue intersects the major north-south roadways in Berkeley, providing several routes toward LBNL and UC Berkeley campus. It is about 1.25 miles south of the LBNL.

[1] http://www.dot.ca.gov/trafficops/census/volumes2017/

[2] http://www.dot.ca.gov/trafficops/census/volumes2017/

During the peak commute hours, on-street parking restrictions on the north side of Ashby Avenue in the morning and the south side in the evening provide an additional travel lane for commuters. Ashby Avenue provides sidewalks on both sides of the roadway. SR 13 has an AADT of 22,500 vehicles north of SR 24 in 2017.[3]

University Avenue provides one of Berkeley's three connections to I-80 to the west (along with Gilman Street and Ashby Avenue). It is an east-west major arterial that extends from the Berkeley Marina and I-80 in the west to the UC Berkeley campus in the east. The divided roadway provides a center median and left-turn pockets at major intersections. Left turns from University Avenue onto cross-streets generally are not served by a separate left-turn signal phase. University Avenue is a four-lane arterial, with parallel parking and sidewalks on both sides of the roadway.

Belrose-Derby-Warring-Piedmont Corridor. This is a heavily used route connecting SR 24 with Berkeley's Southside area (i.e., the area just south of the UC Berkeley campus), UC Berkeley, and LBNL. With a single travel lane in each direction, the route is at or near capacity for several hours during the morning and evening commute periods. The roadways in this corridor provide sidewalks on both sides of the street. Using roadway signs and notices in official mailings, the City of Berkeley and UC Berkeley have been encouraging travelers to use other routes, like Telegraph Avenue.

Hearst Avenue is a two -lane, east-west street that extends between west Berkeley and LBNL's main entrance at Cyclotron Road, which diverges from Hearst Avenue just east of Gayley Road along the northern boundary of the UC Berkeley campus. Hearst Avenue provides sidewalks on both sides of the street with parallel parking on both sides along most segments of the street. Hearst Avenue is designated as a bicycle lane (Class 2) west of Le Conte Avenue in the westbound direction and west of Euclid Avenue in the eastbound direction, and a bicycle route (Class 3) east of Le Conte Avenue in the westbound direction and east of Euclid Avenue in the eastbound direction.

2.1.2 LOCAL ROADWAYS

Bancroft Way is an east-west roadway extending from downtown Berkeley through the Southside area, along the southern boundary of the UC Berkeley campus. The roadway is one-way westbound, with two travel lanes from Piedmont Avenue to Telegraph Avenue and two travel lanes and one bus lane from Telegraph Avenue to the Bancroft Way/Oxford Street intersection. Bancroft Way provides sidewalks on both sides of the street and a two-way cycletrack between Dana and Fulton Streets.

[3] http://www.dot.ca.gov/trafficops/census/volumes2017/

Durant Avenue is a major east-west roadway extending from downtown Berkeley through the Southside area. East of Shattuck Avenue, the roadway is one-way eastbound with three travel lanes. Durant Avenue serves as a "one-way couplet" with Bancroft Way for east-west travel on the south side of the UC Berkeley campus. Durant Avenue provides sidewalks on both sides of the roadway.

La Loma Avenue/Gayley Road is a two-lane, north-south street that extends from Hearst Avenue through north Berkeley. South of Hearst Avenue, La Loma Avenue becomes Gayley Road and borders the east side of the UC Berkeley campus. Parking is allowed on both sides of the street north of Hearst Avenue, but is not allowed south of Hearst Avenue until the vicinity of Memorial Stadium, where Gayley Road becomes Piedmont Avenue. Both streets provide sidewalks on both sides of the roadway. Gayley Road, just north of Bancroft Way, provides Class 2 bicycle lanes.

Stadium Rim Way wraps around the east and north sides of Memorial Stadium and connects the west end of Panoramic Way to Gayley Road near the Greek Theater. It provides access from Gayley Road and Prospect Street to the east side of Memorial Stadium and surrounding parking facilities. Stadium Rim Way generally provides pedestrian facilities on the south side of the roadway consisting of sidewalks or an at-grade path separated from the roadway with bollards.

Centennial Drive borders the east and south perimeters of LBNL. It connects Grizzly Peak Boulevard and Stadium Rim Way and provides access to LBNL through the Strawberry Canyon and Grizzly Peak gates. Centennial Drive also provides access to the Lawrence Hall of Science (LHS), the Botanical Garden, Strawberry Canyon Recreational Area, and Tilden Regional Park. Centennial Drive provides intermittent sidewalks or parallel unpaved path along specific segments.

2.1.3 INTERNAL CIRCULATION

The LBNL campus is served by an east-west traffic circulation system that generally conforms to the contours of the site's topography. Employees and visitors access the site through three gates. The Blackberry Canyon Gate, on the west of the site, is accessed via Cyclotron Road and connects to Hearst Avenue. The Strawberry Canyon and Grizzly Peak Gates, on the east of the site, are accessed via Centennial Road. The three gates are attended by security personnel during business hours; the Blackberry Canyon Gate is the only one accessible by a card access system at other times.

2.2 TRAFFIC OPERATIONS ANALYSIS

This study analyzes existing traffic operations during typical weekday AM and PM peak hours at the following four intersections in the City of Berkeley:

1. Hearst Avenue/Gayley Road/La Loma
2. Gayley Road/Stadium Rim Way
3. Bancroft Way/Gayley Road/Piedmont Avenue
4. Durant Avenue/Piedmont Avenue

These intersections were selected for analysis because they are most likely to be affected by the proposed project. **Figure 1** shows the location of the study intersections and their configuration and control.

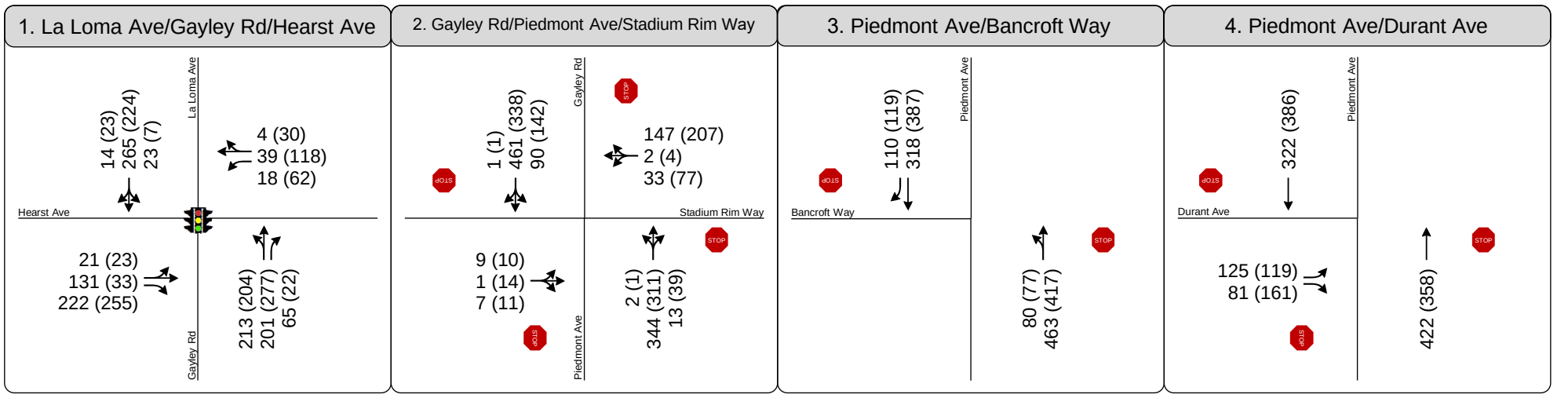
2.2.1 EXISTING INTERSECTION VOLUMES

The intersection operations analysis presented in this study is based on AM and PM peak period (7:00 to 9:00 AM and 4:00 to 6:00 PM) intersection turning movement, pedestrian, and bicycle volumes collected on Tuesday, April 24, 2018 (intersection #1), Tuesday, December 4, 2018 (intersections #3 and 4), and Thursday, February 28, 2019 (intersection #2), while UC Berkeley was in regular session. These time periods were selected because trips generated by the proposed project, in combination with background traffic, are expected to represent typical worst traffic conditions. Within the peak periods, the peak hours (i.e., the hour with the highest traffic volumes observed in the study area) are from 8:00 AM to 9:00 AM (AM peak hour) and 5:00 PM to 6:00 PM (PM peak hour).

Figure 2 presents the existing AM and PM peak hour intersection vehicle turn movement volumes at the study intersections. **Figure 3** presents the existing AM and PM peak hour pedestrian and bicycle volumes at the study intersections. **Appendix A** presents the detailed count sheets at the study intersections.

2.2.1 EXISTING INTERSECTION OPERATIONS

Table 2 summarizes existing weekday peak hour intersection LOS analysis results. **Appendix B** provides the detailed calculation work sheets. As shown in the table, the signalized Hearst Avenue/Gayley Road/La Loma Avenue intersection currently operates at LOS B during both AM and PM peak hours. The three all-way stop-controlled intersections operate at LOS C or better during the AM peak hour and at LOS E or LOS F during the PM peak hour.



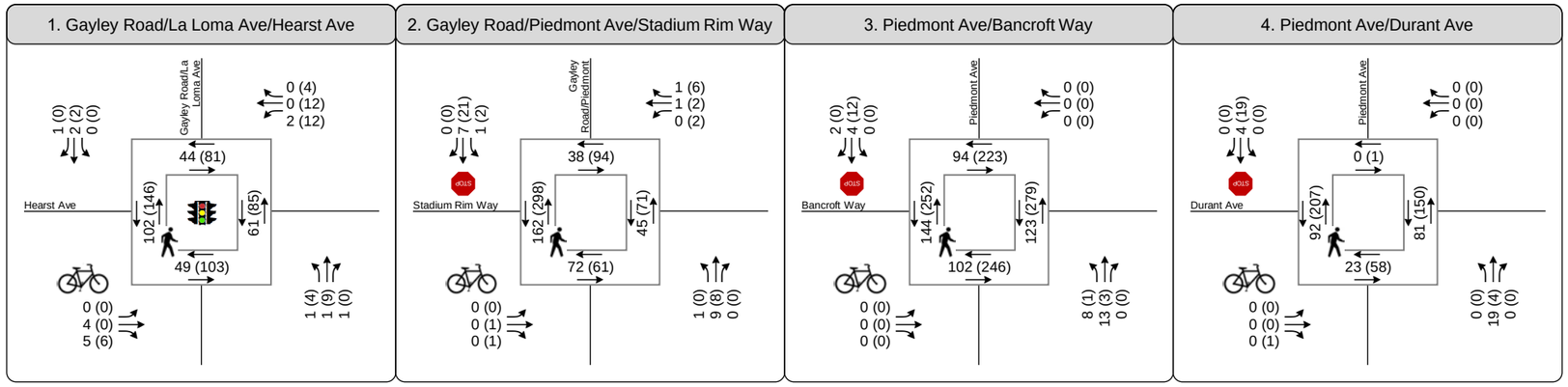
LEGEND

XX (YY) AM (PM) Peak Hour Traffic Volumes

1 Study Intersection

Figure 2

Existing Peak Hour
Traffic Volumes, Lane Configurations and Traffic Control



LEGEND

XX (YY) AM (PM) Peak Hour Volumes

1 Study Intersection

Figure 3

Existing
Pedestrian and Bicycle Peak Hour Volumes

TABLE 2
EXISTING CONDITIONS – STUDY INTERSECTION LOS SUMMARY

Intersection	Control	AM Peak Hour		PM Peak Hour	
		Delay (Seconds)[1]	LOS [1]	Delay (Seconds) [1]	LOS [1]
1. Hearst Avenue/Gayley Road/La Loma Avenue	Signal	16	B	17	B
2 Stadium Rim Way/ Gayley Road [2]	All-Way Stop	17	C	**42**	**E**
3 Bancroft Way/ Piedmont Avenue [2]	All-Way Stop	21	C	**>75**	**F**
4 Durant Avenue/ Piedmont Avenue [2]	All-Way Stop	12	B	**62**	**F**

Notes: **Bold** indicates an intersection operating at LOS E or LOS F.
1. Average intersection delay and LOS based on the HCM, 6th Edition method.
2. Intersection analyzed using SimTraffic software because of unique conditions including heavy pedestrian volumes. Field observations validate the results shown in the table.

Source: Fehr & Peers, 2019.

Based on the analysis and verified by observations, the northbound and southbound vehicle flows at the Bancroft Way/Piedmont Avenue intersection and all approaches at the Stadium Rim Way/Gayley Road intersections are impeded by the high pedestrian volumes crossing Piedmont Avenue and Gayley Road, respectively, during the PM peak hour. The Stadium Rim Way/Gayley Road intersection is the only stop-controlled study intersection that currently satisfies the California MUTCD peak hour traffic volume signal warrant.

2.3 EXISTING TRANSIT AND SHUTTLE SERVICES

The LBNL site is served indirectly by BART, AC Transit, and UC Berkeley Shuttle Service (BEAR Transit) and directly by the LBNL shuttle service. **Figure 4** shows the transit routes in the vicinity of the project site. Each transit service is described below.

2.3.1 BART

BART provides regional commuter rail transit in Alameda, Contra Costa, San Francisco, and San Mateo counties. Currently, BART trains operate on weekdays from 4:00 AM to 1:00AM, on Saturdays from 6:00 AM to 1:00 AM, and on Sundays from 8:00 AM to 1:00 AM. The nearest BART station to the LBNL site is the Downtown Berkeley station located one block west of the UC Berkeley campus at the Center Street/

Shattuck Avenue intersection (approximately 1.25 miles east of the project site). The LBNL shuttle service provides access between the LBNL site and the Downtown Berkeley BART Station.

The Downtown Berkeley BART Station is served by the Richmond-Warm Springs/South Fremont and Richmond-Daly City/ Millbrae lines. Other destinations in the BART system can be reached by transferring at stations in Oakland. Typically, Downtown Berkeley BART Station is served by a train every seven (peak weekday commute periods) to 20 minutes (Sundays). The Downtown Berkeley BART station is one of the most highly used stations within the BART system with average weekday exits and entries of approximately 23,000 passengers in February 2019.

2.3.2 AC TRANSIT

Local bus service in Berkeley is provided by AC Transit. Within the City of Berkeley, at least one AC Transit route provides service within walking distance (0.25 mile) of nearly every resident in the city. **Figure 4** illustrates the existing AC Transit routes in the vicinity of LBNL. Although these routes do not directly serve LBNL, the LBNL shuttle service provides access to them. **Table 3** describes the major bus routes serving the project area. Additional AC Transit routes can be accessed in downtown Berkeley and Southside area through the LBNL shuttles.

2.3.3 LBNL SHUTTLES

LBNL provides a free on-site and off-site shuttle service connecting LBNL to UC Berkeley, BART, AC Transit, and local neighborhoods. These shuttles are described below.

- The Orange Route operates in a clockwise loop between the LBNL Strawberry Gate, the UC Berkeley campus and the Downtown Berkeley BART Station through Hearst Avenue, Gayley Road Centennial Drive, and Bancroft Way on weekdays with 15-minute headways from 6:30 AM to 7:00 PM.
- The Blue Route operates in a clockwise loop between the Downtown Berkeley BART Station, north side of the UC Berkeley campus, and LBNL through Hearst Avenue, and Cyclotron Road on weekdays with 5 to 10-minute headways from 6:15 AM to 7:30 PM. The Blue Route also operates with limited service from 7:30 PM to 9:30 PM.
- The Rockridge Shuttle operates between LBNL and the Rockridge BART Station on 30-minute headways from 6:40 AM to 9:10 AM and from 3:45 PM to 6:30 PM.
- The Potter Street/JBEI Route operates between LBNL, UC Berkeley Campus, Downtown Berkeley BART Station, and LBNL's remote sites in Emeryville and West Berkeley on 30-minute headways from 8:00 AM to 8:00 PM.

TABLE 3
AC TRANSIT SERVICE SUMMARY

Line	Route	Nearest Stop [1]	Weekday		Weekend	
			Hours	Frequency	Hours	Frequency
Local Routes						
6	Between Berkeley and Downtown Oakland BART Stations via Telegraph Av. and Broadway	Telegraph Avenue/Bancroft Way (About 1.0 miles)	5:00 AM to 12:30 AM	10 minutes	5:00 AM to 12:30 AM	15 minutes
36	Between UC Berkeley and West Oakland BART via Adeline St., 40th St., Shellmound St., Dwight Way and Durant Ave.	Piedmont Avenue/Bancroft Way (About 0.9 miles)	6:00 AM to 12:45 AM	30 minutes	5:40 AM to 12:30 AM	30 minutes
51B	Between Rockridge BART and Berkeley Amtrak Station via College Av., Bancroft Way/Durant Av., and University Av.	College Avenue/ Bancroft Way (About 0.9 miles)	5:00 AM to 12:30 AM	10 to 15 minutes	5:00 AM to 12:30 AM	15 to 20 minutes
52	Between UC Berkeley and Albany University Village via Bancroft Way, University Av., San Pablo Av., and Hearst Av.	Leroy Avenue/ Hearst Avenue (About 0.4 miles)	6:00 AM to 12:00 AM	15 to 20 minutes	8:00 AM to 8:30 PM	20 minutes
65	Between Berkeley BART and Lawrence Hall of Science via Euclid Av. and Grizzly Peak Blvd.	Euclid Avenue/ Hearst Avenue (About 0.5 miles)	5:30 AM to 9:00 PM	30 minutes	7:30 AM to 7:30 PM	60 minutes
79	Between Rockridge BART and El Cerrito BART via Claremont Ave, Piedmont Av., Bancroft Way/Durant Av., Shattuck Ave, MLK Way, and Colusa Av.	College Avenue/ Bancroft Way (About 0.9 miles	6:00 AM to 11:15 PM	30 minutes	6:00 AM to 8:40 PM	30 minutes
Night Routes						
851	Between Fruitvale and Berkeley BART Stations via, Fruitvale Av., Santa Clara Av., Webster St., Broadway, College Av., and Bancroft Way/Durant Av.	College Avenue/ Bancroft Way (About 0.9 miles)	12:00 AM to 5:00 AM	60 minutes	12:00 AM to 5:00 AM	60 minutes
Transbay Routes						
F	Between UC Berkeley and San Francisco Transbay Terminal	Leroy Avenue/ Hearst Avenue (About 0.4 miles)	6:00 AM to 1:30 AM	30 minutes	6:00 AM to 1:00 AM	30 minutes

1. Distance shown is current walking distance between bus stop and Blackberry Gate.
Source: AC Transit, 2019.

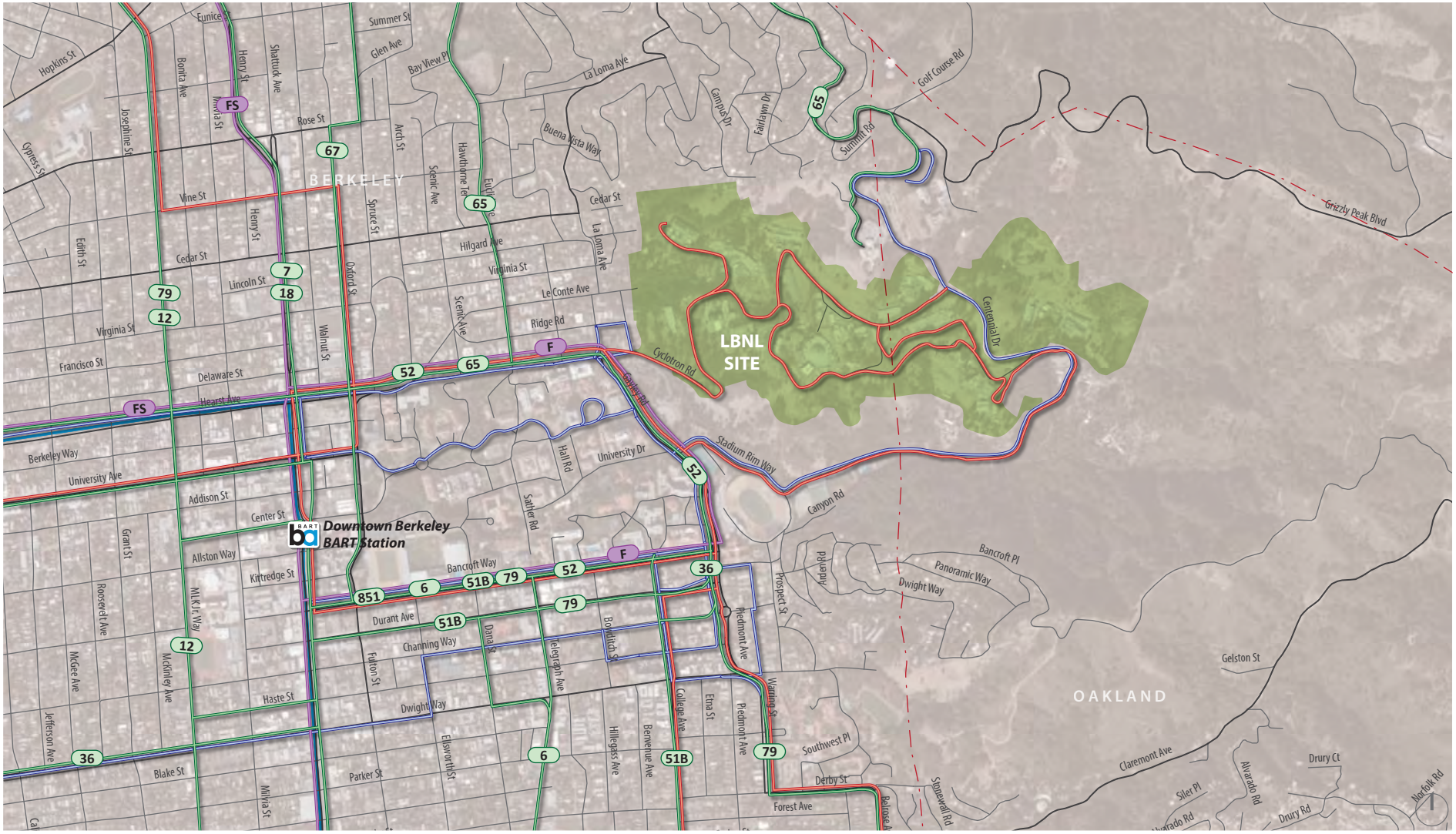


Figure 4

Existing Transit Service

- The North Berkeley BART Shuttle operates between LBNL and the North Berkeley BART Station on 60-minute headways from 7:00 AM to 10:00 AM and from 4:30 PM to 7:30 PM.

Although the LBNL shuttles are free, they are restricted to LBNL employees and visitors and shuttle riders are required to provide a valid identification to the driver. Shuttle stops are coordinated with AC Transit bus lines serving downtown Berkeley. The LBNL shuttles are equipped with bicycle racks for the ride up the hill. The nearest shuttle stop to the project site is on Alvarez Road near Building 55.

2.3.4 BEAR TRANSIT

BEAR Transit, operated by UC Berkeley, primarily serves the UC Berkeley community, providing service between the UC Berkeley campus, surrounding neighborhoods, and select destinations, including the Richmond Field Station (RFS). In general, the daytime shuttles operate on a fixed route and schedule between 6:45 AM and 7:30 PM. The night shuttles operate on a fixed schedule between 7:30 PM and 3:00 AM, and door-to-door service throughout the service area is provided between 3:00 AM and 6:00 AM.

All BEAR Transit shuttle buses, except the RFS shuttle line, are free to UC Berkeley students, faculty, staff, post-docs, and visiting scholars, who have valid university identification. Others must pay a fair of $1.00. The Bear Transit Line H serves destinations along Centennial Drive including the UC Berkeley Botanical Garden and LHS.

2.4 EXISTING PEDESTRIAN AND BICYCLE CIRCULATION

Most LBNL employees and visitors either drive or use transit to access the site. The hilly terrain and steep grades make walking or biking to the site rather difficult. Most walking and biking trips to the LBNL site are through the Blackberry Canyon Gate which connects to the City's sidewalks and bicycle facilities through Cyclotron Road and Hearst Avenue. The Strawberry Canyon and Grizzly Peak Gates can also be accessed by bicyclists using Centennial Drive and pedestrians using the intermittent paved sidewalks and unpaved paths along Centennial Drive. Many bicyclists also use the LBNL shuttles that are equipped with bike racks for their uphill inbound trip to the site and use their bicycles for the outbound downhill trip.

Within the site, pedestrian and bicycle paths meander and have many discontinuities. Pedestrian pathways primarily connect parking facilities and buildings. Although these paths are used for shorter trips within the site, the on-site shuttle service is typically used for longer trips.

Within the City of Berkeley, all non-residential and most residential streets provide sidewalks and crosswalks for pedestrians.

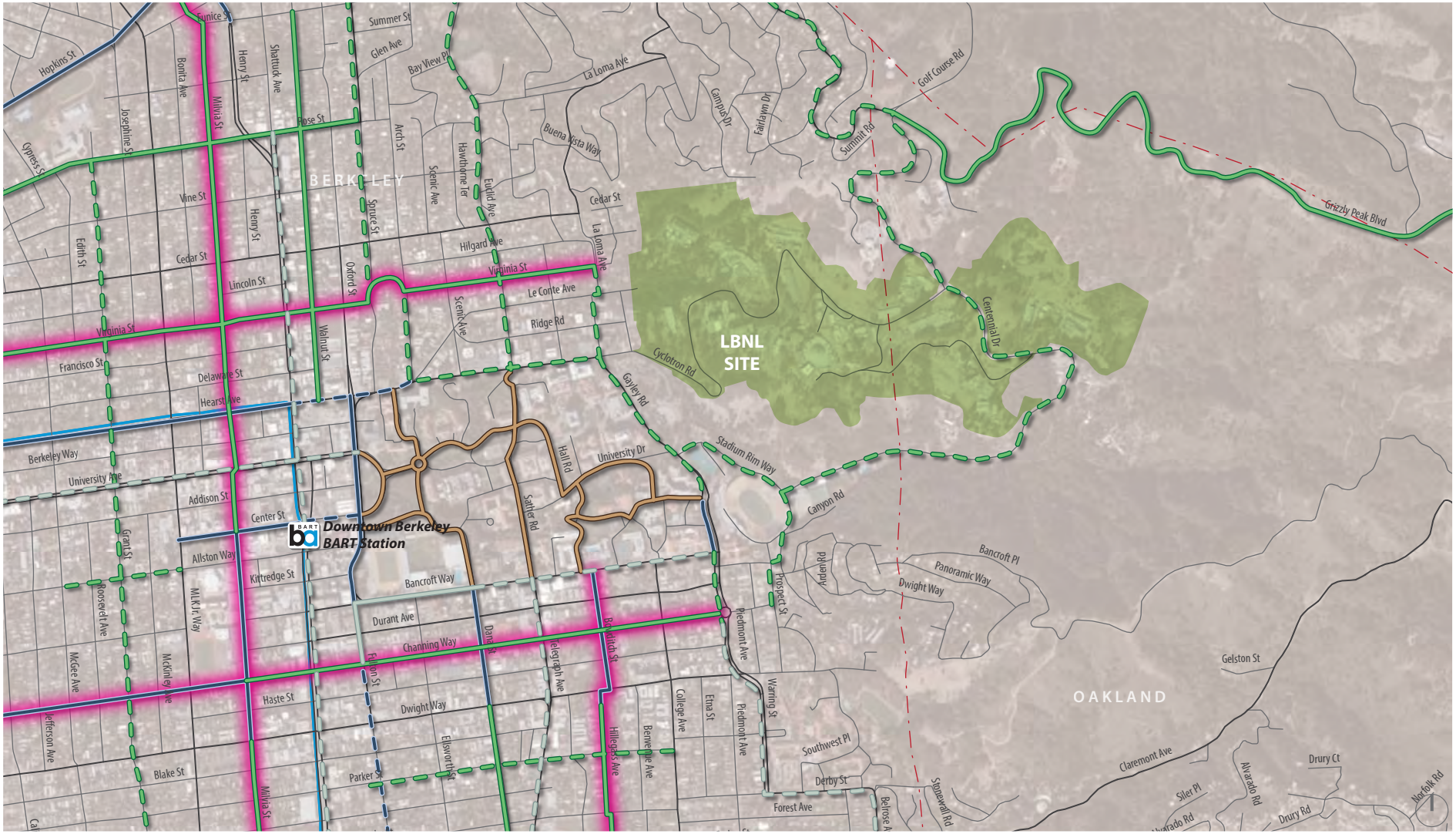
Based on the *City of Berkeley Bicycle Plan* (May 2017), bicycle facilities can be classified into several types, including:

- ***Multi-Use Paths (Class 1)*** – These facilities are located off-street and can serve both bicyclists and pedestrians.
- ***Bicycle Lanes (Class 2)*** – These facilities provide a dedicated area for bicyclists within the paved street width using striping and appropriate signage.
- ***Bicycle Routes (Class 3)*** – These facilities are found along streets that do not provide adequate width for dedicated bicycle lanes. The street is then designated as a bicycle route using signage informing drivers to expect bicyclists.
- ***Cycletrack (Class 4)*** – These facilities provide a dedicated and protected area for bicyclists within the paved street width using physical barriers such as bollards or on-street parking.
- ***Bicycle Boulevards (Class 3E)*** – These facilities are installed along residential streets with low traffic volumes and prioritize bicycle travel. Assignment of right-of-way to the route, traffic calming measures and bicycle traffic signal actuation are used to prioritize through-trips for bicycles.

Figure 5 identifies existing and proposed bicycle facilities in the study area. Currently, bicyclists are allowed on all roadways within the study area. Existing bicycle facilities near the project site include Class 2 bicycle lanes on Gayley Road adjacent to the California Memorial Stadium and Class 3 bicycle routes on Grizzly Peak Boulevard and along Hearst Avenue/Cyclotron Road leading up to the Blackberry Gate.

The *2017 Berkeley Bicycle Plan* identifies Gayley Road as a future Class 3 facility (shared roadway where full bicycle lanes cannot be implemented but other improvements and amenities can be provided), and Bancroft Way and Piedmont Avenue as future Class 4 facilities (cycletracks). In addition, the *2006 UC Berkeley Campus Bicycle Plan* recommends Gayley Road and Stadium Rim Way as future bikeways.

As previously shown on Figure 3, intersections in the vicinity of LBNL generally experience moderate to high pedestrian and bicycle activity.



Source: City of Berkeley Bicycle Plan (2017).

Bikeway Type	Existing	Proposed
Class 1 Bike Path		
Class 2 Bike Lane		
Class 3 Bike Route		
Class 4 Cycletrack		
UCB Campus Bikeway		

Existing Bicycle Boulevard

BART

Figure 5

Existing and Future Bicycle Network

3.0 PROJECT TRANSPORTATION CHARACTERISTICS

The proposed BioEPIC project would be located at the site of an existing parking lot formerly occupied by the Bevatron Building in the main LBNL Campus in Berkeley. The proposed building would provide about 70,000 square feet of office and laboratory space to accommodate about 210 employees; consisting of about 85 employees who are housed in other buildings in the main LBNL Campus and about 125 employees who are housed in off-site facilities in southwest Berkeley and Emeryville. The proposed project would result in elimination of existing parking spaces.

3.1 TRIP GENERATION

Table 4 shows the estimated vehicle trip generation for the proposed BioEPIC project. The project trip generation is conservatively based on the latest observed trip generation at LBNL using data collected at LBNL gates in 2011. This analysis conservatively assumes that the BioEPIC employees would have the same trip making characteristics as the employees at the current LBNL site. Considering that parking at LBNL is generally at or near capacity on most weekdays, the proposed BioEPIC and other under-construction and planned projects would increase the average daily population (ADP) and demand for parking, and that the BioEPIC project would reduce the available parking supply, it is likely that BioEPIC and other future projects would have lower trip generation rates than the current site.

TABLE 4
BIOEPIC PROJECT
VEHICLE TRIP GENERATION SUMMARY

	Average Daily Population	Daily	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Existing LBNL [1]	4,200	6,640	581	93	674	85	551	636
BioEPIC Project [2]	210	330	29	5	34	4	28	32

1. Based on counts at existing LBNL gates conducted in April 2011.
2. Based on the following trip generation rate per data collected at the LBNL gates in 2011:
   Daily = 1.58 trips per Average Daily Population (ADP)
   AM Peak Hour = 0.16 trips per ADP (86% in, 14% out)
   PM Peak Hour = 0.15 trips per ADP (13% in, 87% out)

Source: Fehr & Peers, 2019.

Although only about 125 BioEPIC employees would be new to the main LBNL Campus, this analysis conservatively assumes that all 210 BioEPIC employees would be new to the main LBNL Campus to account for potential backfilling of current main LBNL Campus employees who would relocate to the BioEPIC

building. It is estimated that the proposed BioEPIC project, which would increase the average daily population (ADP) at LBNL by about 210 employees, would generate about 330 daily automobile trips, 34 AM peak hour trips, and 32 PM peak hour trips.

3.1 TRIP DISTRIBUTION AND ASSIGNMENT

Trip distribution is defined as the directions of approach and departure that vehicles would use to arrive at and depart from the project site. As previously stated, this analysis assumes that the BioEPIC employees at the LBNL site would have the same trip making characteristics as the employees at the current LBNL site. Thus, the trip distribution for the proposed project is based on the trip distribution of current LBNL employees. **Figure 6** shows the resulting trip distribution. **Figure 7** shows the project trip assignment at the study intersections, based on the distribution.

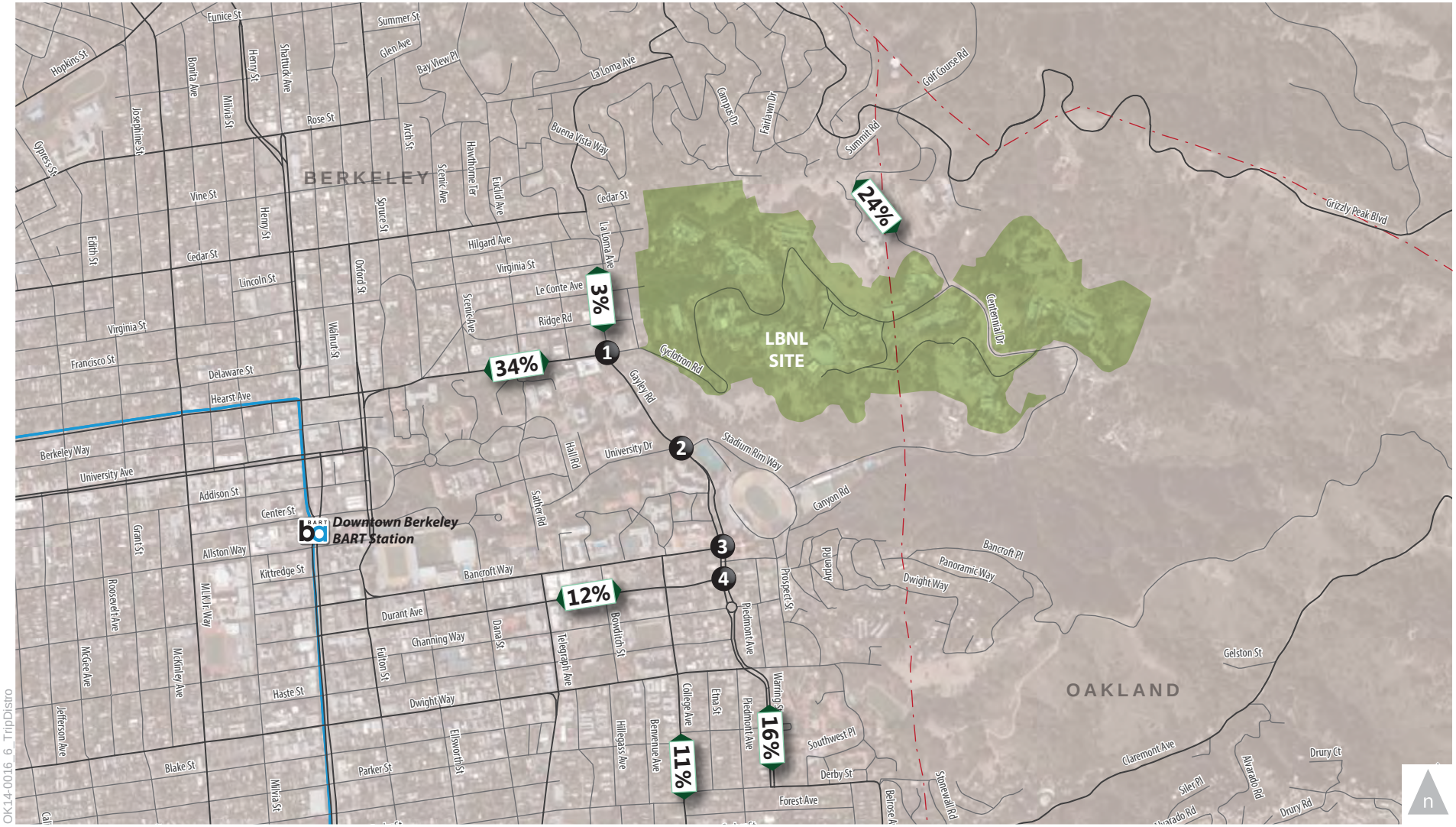
3.2 EXISTING PLUS PROJECT CONDITIONS

Figures 8 shows the Existing Plus Project traffic volumes, which consist of traffic volumes under Existing No Project conditions (Figure 2) plus project traffic assignment (Figure 7). This analysis assumes no roadway modifications at the study intersections under this scenario.

Table 5 summarizes intersection operations at the study intersections under the Existing Plus Project conditions. **Appendix B** provides the detailed calculation work sheets.

All study intersections during the AM peak hour and the signalized Hearst Avenue/Gayley Road/La Loma Avenue intersection during the PM peak hour would continue to operate at LOS D or better under the Existing Plus Project conditions.

The three all-way stop-controlled study intersections would operate at LOS E or LOS F during the PM peak hour. However, the project would not cause an impact at these intersections because the Bancroft Way/ Piedmont Avenue and the Durant Avenue/Piedmont Avenue intersections would not satisfy the California MUTCD peak hour traffic volume signal warrant. Although the Stadium Rim Way/Gayley Road intersection would satisfy the California MUTCD peak hour traffic volume signal warrant, the project would not cause an impact at this intersection because it would add fewer than 10 peak hour trips to any of the intersection movements.



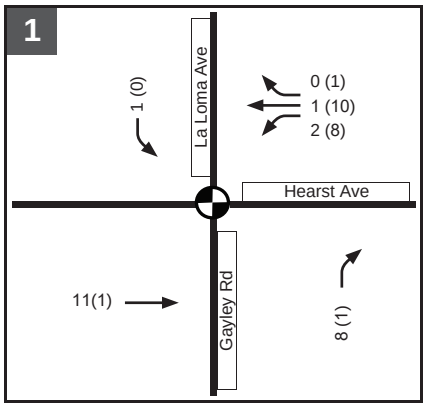
OK14-0016_6_TripDistro

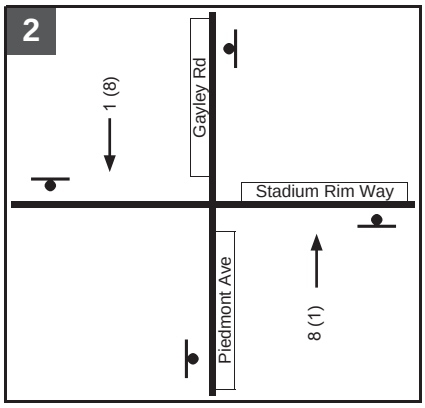
LEGEND

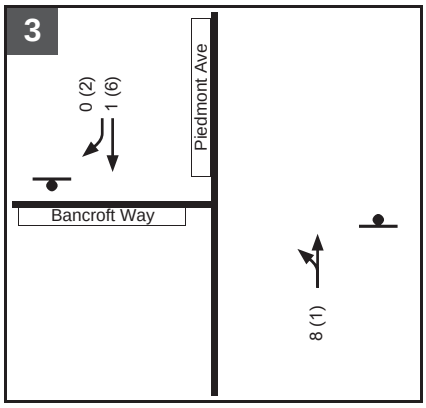
1 Study Intersection — LBNL Gates — BART — XX% Trip Distribution

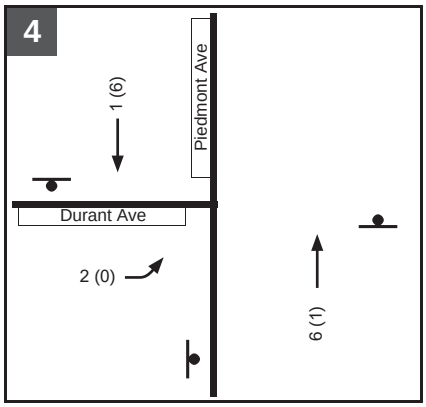
Figure 6

Project Trip Distribution









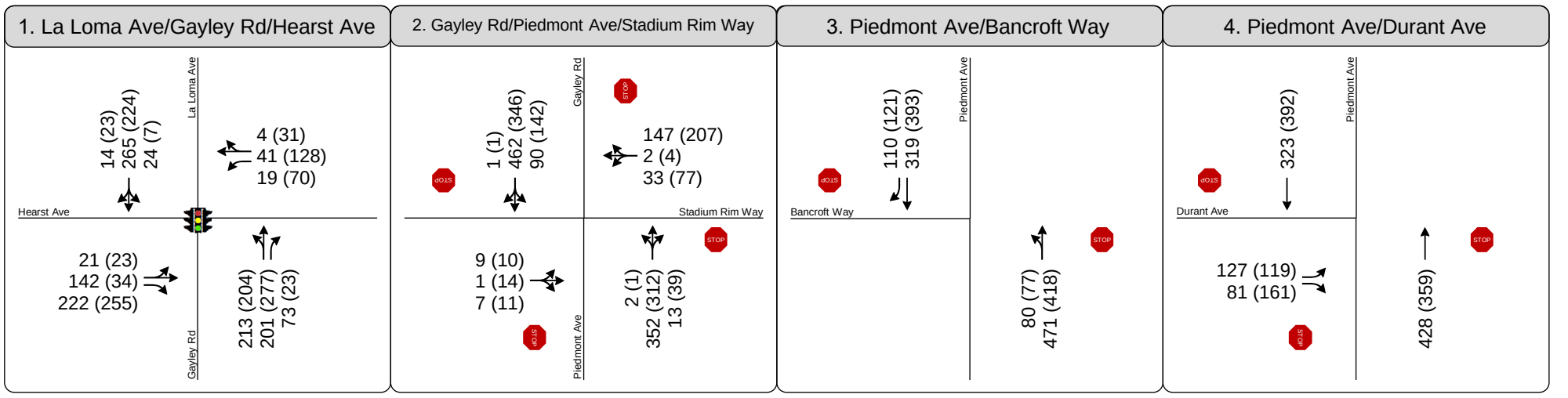
LEGEND

XX (YY)	AM (PM) Peak Hour Traffic Volumes
	Signalized Intersection
	Stop Sign
1	Study Intersection
	BART

OK14-0016_7_PTA

Figure 7

Project Trip Assignment



LEGEND

XX (YY) AM (PM) Peak Hour Traffic Volumes

1 Study Intersection

Figure 8

Existing Plus Project

Peak Hour Traffic Volumes, Lane Configurations and Traffic Control

TABLE 5
EXISTING PLUS PROJECT CONDITIONS – STUDY INTERSECTION LOS SUMMARY

Intersection	Traffic Control	Peak Hour	Existing No Project		Existing Plus Project		Significant Impact?
			Delay[1] (seconds)	LOS[1]	Delay[1] (seconds)	LOS[1]	
1. Hearst Avenue/Gayley Road/La Loma Avenue	Signal	AM	16	B	16	B	No
		PM	17	B	18	B	No
2. Stadium Rim Way/ Gayley Road [2]	All-Way Stop	AM	17	C	17	C	No
		PM	**42**	**E**	**44**	**E**	No
3. Bancroft Way/ Piedmont Avenue [2]	All-Way Stop	AM	21	C	23	C	No
		PM	**>75**	**F**	**>75**	**F**	No
4. Durant Avenue/ Piedmont Avenue [2]	All-Way Stop	AM	12	B	12	B	No
		PM	**62**	**F**	**65**	**F**	No

Notes: **Bold** indicates an intersection operating at LOS E or LOS F.
1. Average intersection delay and LOS based on the HCM, 6th Edition method.
2. Intersection analyzed using SimTraffic software because of unique conditions including heavy pedestrian volumes.

Source: Fehr & Peers, 2019.

4.0 CUMULATIVE (2040) ANALYSIS

This section summarizes traffic operations under Cumulative (2040) No Project and Cumulative (2040) Plus Project conditions.

4.1 CUMULATIVE (2040) NO PROJECT CONDITIONS

Traffic forecasts to the year 2040 were developed based on the results of the Alameda County Transportation Commission (CTC) Countywide Travel Demand Model. The most recent version of the Alameda CTC Model, released in June 2018, which reflects assumptions in residential and non-residential land use growth, as well as changes to the transportation network, consistent with Metropolitan Transportation Commission (MTC) *Plan Bay Area 2040* (i.e., Sustainable Community Strategies), served as the basis for developing AM and PM peak hour intersection turning movement forecasts for the year 2040. The Model land use database and roadway network were checked for accuracy in the vicinity of the LBNL. The forecasting process involved running the 2010 and 2040 models and using the model produced volumes and existing turning movement count data to estimate year 2040 intersection turn movements using growth rates for each corridor. Since the ACTC Model did not include any growth at the LBNL site or UC Berkeley, the traffic volume forecasts were adjusted to account for the expected traffic generated by major projects currently under construction or planned at LBNL and UC Berkeley in the vicinity of the study intersections, which include:

- ***Integrated Genomics Building (IGB)*** would increase LBNL ADP by 333 persons.
- ***Upper Hearst Development*** at UC Berkeley would eliminate about 235 parking spaces at the Upper Hearst Parking structure at the northwest corner of the Hearst Avenue/Gayley Road/La Loma Avenue intersection to expand the Goldman School of Public Policy and provide up to 150 new graduate student and/or faculty/staff housing units.

Other planned projects, such as Old Town Demolition at LBNL and Hearst Greek Theater Renovations at UC Berkeley would not result in an increase in daily population at LBNL or increase the parking supply at UC Berkeley. Thus, they are not expected to add additional traffic to the surrounding roadway network.

Figure 9 shows the Cumulative (2040) No Project traffic volumes.

The Cumulative (2040) No Project analysis assumes no major roadway modifications in the study area.

Table 6 summarizes the Cumulative (2040) No Project intersection LOS analysis results. **Appendix B** provides the detailed calculation work sheets.

Only one intersection, the Hearst Avenue/Galey Road/La Loma Avenue intersection, would continue to operate at LOS D or better during both AM and PM peak hours under Cumulative (2040) No Project conditions. The three all-way stop-controlled study intersections would operate at LOS F during both AM and PM peak hours. The Stadium Rim Way/Gayley Road intersection is the only stop-controlled study intersection that would satisfy the California MUTCD peak hour traffic volume signal warrant under Cumulative (2040) No Project conditions.

4.2 CUMULATIVE (2040) PLUS PROJECT CONDITIONS

Figure 10 shows the Cumulative (2040) Plus Project traffic volumes, which consist of traffic volumes under Cumulative (2040) No Project conditions (Figure 9) plus Project traffic assignment (Figure 7). This analysis assumes no roadway modifications under this scenario.

Table 6 summarizes intersection operations at the study intersections under the Cumulative (2040) Plus Project conditions. **Appendix B** provides the detailed calculation work sheets.

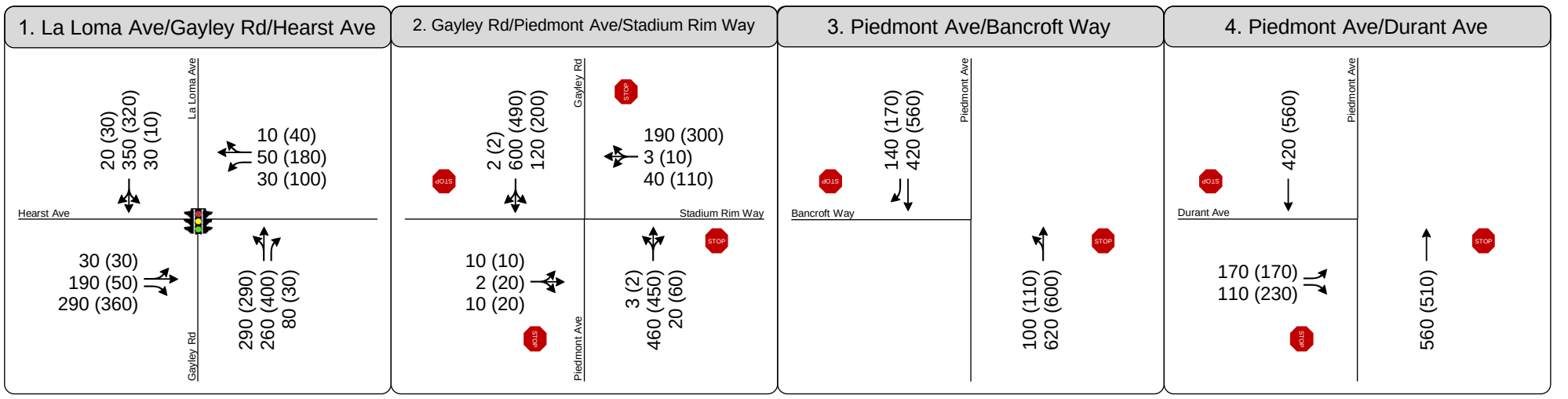
TABLE 6
CUMULATIVE (2040) CONDITIONS – STUDY INTERSECTION LOS SUMMARY

Intersection	Traffic Control	Peak Hour	Cumulative (2040) No Project		Cumulative (2040) Plus Project		Significant Impact?
			Delay[1] (seconds)	LOS[1]	Delay[1] (seconds)	LOS[1]	
1. Hearst Avenue/Gayley Road/La Loma Avenue	Signal	AM	20	C	20	C	No
		PM	34	C	34	C	No
2. Stadium Rim Way/ Gayley Road [2]	All-Way Stop	AM	**>75**	**F**	**>75**	**F**	No
		PM	**>75**	**F**	**>75**	**F**	No
3. Bancroft Way/ Piedmont Avenue [2]	All-Way Stop	AM	**50**	**F**	**52**	**F**	No
		PM	**>75**	**F**	**>75**	**F**	No
4. Durant Avenue/ Piedmont Avenue [2]	All-Way Stop	AM	**50**	**F**	**52**	**F**	No
		PM	**>75**	**F**	**>75**	**F**	No

Notes: **Bold** indicates an intersection operating at LOS E or LOS F.
1. Average intersection delay and LOS based on the HCM 6th Edition method.
2. Intersection analyzed using SimTraffic software because of unique conditions including heavy pedestrian volumes.

Source: Fehr & Peers, 2019.

The signalized Hearst Avenue/Gayley Road/La Loma Avenue intersection would continue to operate at LOS D or better during both AM and PM peak hours under the Cumulative (2040) Plus Project conditions. The three all-way stop-controlled study intersections would operate at LOS F during both the AM and PM peak hours. However, the project would not cause an impact at these intersections because the Bancroft Way/ Piedmont Avenue and the Durant Avenue/Piedmont Avenue intersections would not satisfy the California MUTCD peak hour traffic volume signal warrant under Cumulative (2040) conditions. Although the Stadium Rim Way/Gayley Road intersection would satisfy the California MUTCD peak hour traffic volume signal warrant under Cumulative (2040) conditions regardless of the proposed project, the project would not cause an impact at this intersection because it would add fewer than 10 peak hour trips to any of the intersection movements.



LEGEND

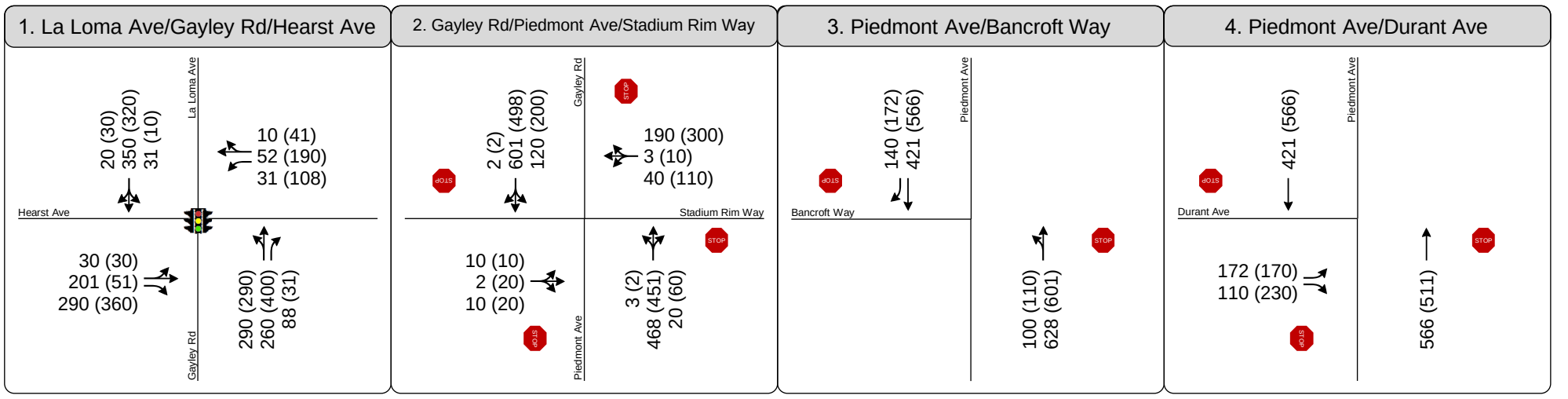
XX (YY) AM (PM) Peak Hour Traffic Volumes

1 Study Intersection

Figure 9

Cumulative (2040) No Project

Peak Hour Traffic Volumes, Lane Configurations and Traffic Control



LEGEND

XX (YY) AM (PM) Peak Hour Traffic Volumes

1 Study Intersection

Figure 10

Cumulative (2040) Plus Project

Peak Hour Traffic Volumes, Lane Configurations and Traffic Control

APPENDIX A

Intersection Count Data Sheets

Prepared by National Data & Surveying Services

Gayley Rd & Hearst Ave

Peak Hour Turning Movement Count

ID: 18-08207-001
City: Berkeley

Day: Tuesday
Date: 04/24/2018

PEAK HOURS

AM: 08:00 AM - 09:00 AM
NOON: NONE
PM: 04:45 PM - 05:45 PM

COUNT PERIODS

AM: 07:00 AM - 09:00 AM
NOON: NONE
PM: 04:00 PM - 06:00 PM

SOUTHBOUND (Gayley Rd)

AM	14	265	23	0	226	AM
NOON	0	0	0	0	0	NOON
PM	23	224	7	0	330	PM

EASTBOUND (Hearst Ave)

AM	NOON	PM	
266	0	345	
0	0	0	0
21	0	23	0
131	0	33	0.5
222	0	255	0.5

WESTBOUND (Hearst Ave)

PM	NOON	AM	
30	0	4	0
118	0	39	2
62	0	18	0
0	0	0	0
62	0	219	

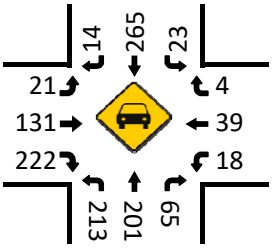
NORTHBOUND (Gayley Rd)

PM	541	0	204	277	22	PM
NOON	0	0	0	0	0	NOON
AM	505	0	213	201	65	AM

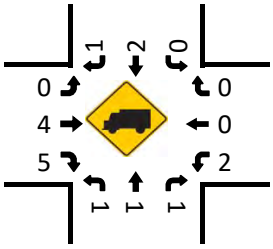
0.5 0.5 0 0 (SB approach)
0 0 0.5 0.5 (NB approach)

CONTROL			
Signalized			
TEV	1216	0	1278
	AM	NOON	PM
PHF	0.97		0.93

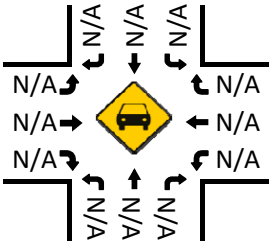
Total Vehicles (AM)



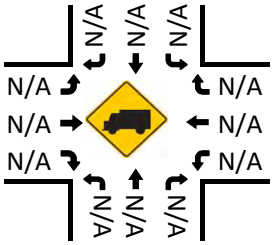
Bikes (AM)



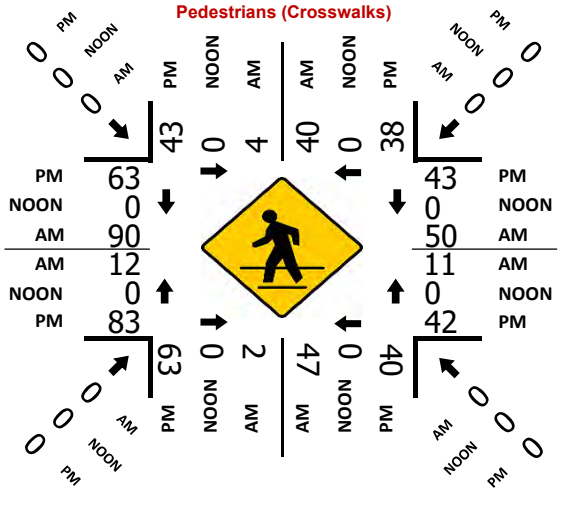
Total Vehicles (Noon)



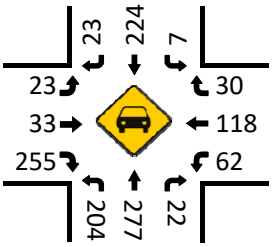
Bikes (NOON)



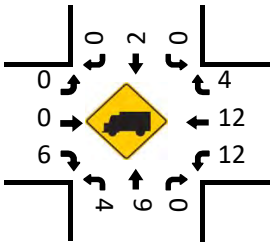
Pedestrians (Crosswalks)



Total Vehicles (PM)



Bikes (PM)



Prepared by National Data & Surveying Services

Gayley Rd & Stadium Rim Way

Peak Hour Turning Movement Count

ID: 19-08072-001
City: Berkeley

Day: Thursday
Date: 02/28/2019

PEAK HOURS

AM: 08:00 AM - 09:00 AM
NOON: NONE
PM: 05:00 PM - 06:00 PM

COUNT PERIODS

AM: 07:00 AM - 09:00 AM
NOON: NONE
PM: 04:00 PM - 06:00 PM

Gayley Rd — SOUTHBOUND

AM	1	461	90	2	502	AM
NOON	0	0	0	0	0	NOON
PM	1	338	142	0	528	PM

Stadium Rim Way — EASTBOUND

AM	NOON	PM	
5	0	6	
0	0	0	0
9	0	10	0
1	0	14	1
7	0	11	0
AM	NOON	PM	

WESTBOUND — Stadium Rim Way

PM	NOON	AM	
207	0	147	0
4	0	2	1
77	0	33	0
0	0	0	0
195	0	104	
PM	NOON	AM	

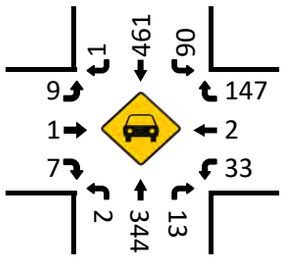
Gayley Rd — NORTHBOUND

PM	428	2	1	311	39	PM
NOON	0	0	0	0	0	NOON
AM	502	1	2	344	13	AM

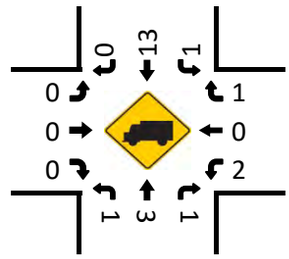
CONTROL: 4-Way Stop

TEV	1113 AM	0 NOON	1157 PM
PHF	0.95		0.95

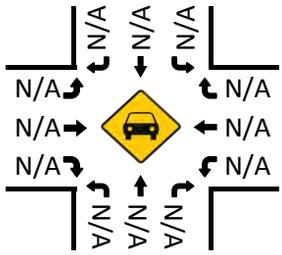
Total Vehicles (AM)



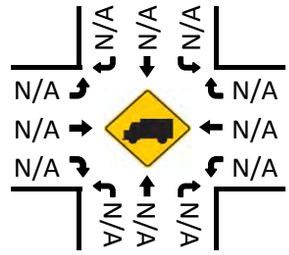
HT (AM)



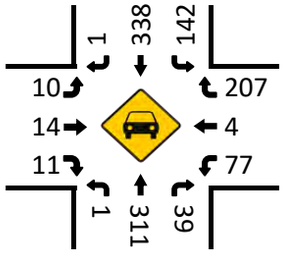
Total Vehicles (Noon)



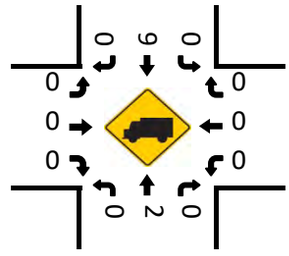
HT (NOON)



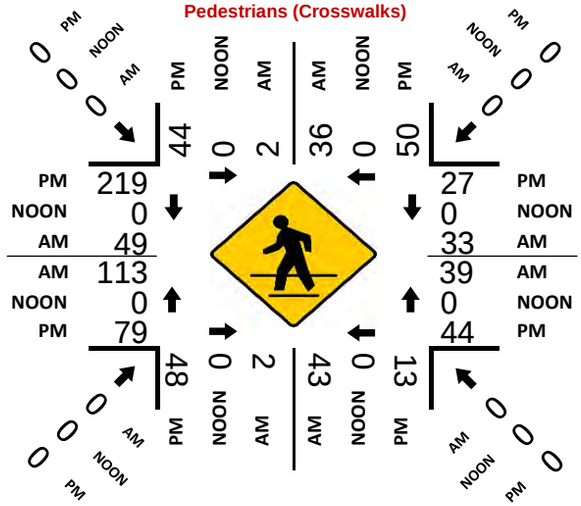
Total Vehicles (PM)



HT (PM)

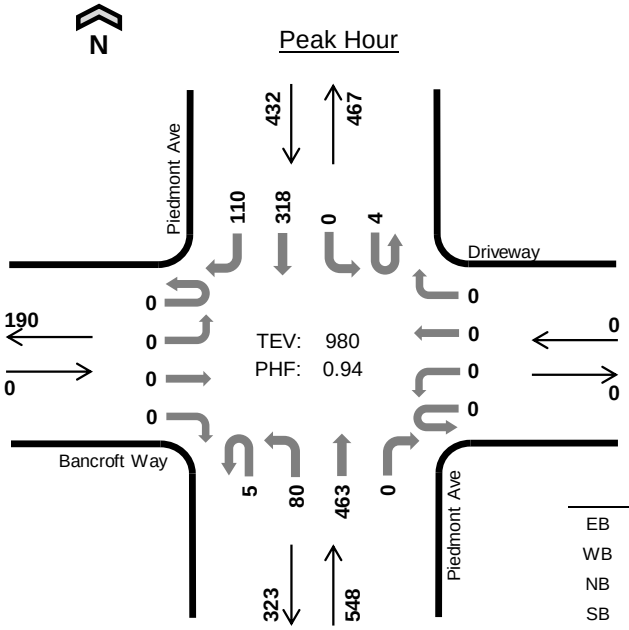


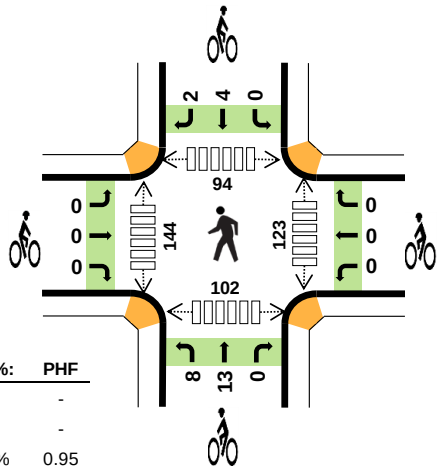
Pedestrians (Crosswalks)



Piedmont Ave
Bancroft Way

Date: 12-04-2018
Count Period: 7:00 AM to 9:00 AM
Peak Hour: 8:00 AM to 9:00 AM





	HV %:	PHF
EB	-	-
WB	-	-
NB	3.5%	0.95
SB	5.8%	0.90
TOTAL	4.5%	0.94

Two-Hour Count Summaries

Interval Start	Bancroft Way Eastbound				Driveway Westbound				Piedmont Ave Northbound				Piedmont Ave Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	0	0	0	0	0	0	1	11	64	0	3	0	34	13	126	0
7:15 AM	0	0	0	0	0	0	0	0	1	13	93	0	0	0	40	11	158	0
7:30 AM	0	0	0	0	0	0	0	0	1	18	96	0	0	0	82	10	207	0
7:45 AM	0	0	0	0	0	0	0	0	1	19	113	0	2	0	82	20	237	728
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**21**	**111**	**0**	**1**	**0**	**88**	**31**	**252**	854
8:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**17**	**114**	**0**	**2**	**0**	**72**	**22**	**228**	924
8:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**22**	**115**	**0**	**1**	**0**	**74**	**23**	**238**	955
8:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**20**	**123**	**0**	**0**	**0**	**84**	**34**	**262**	**980**
Count Total	0	0	0	0	0	0	0	0	9	141	829	0	9	0	556	164	1,708	0
Peak Hour All	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**80**	**463**	**0**	**4**	**0**	**318**	**110**	**980**	**0**
Peak Hour HV	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**6**	**12**	**0**	**0**	**0**	**9**	**16**	**44**	**0**
Peak Hour HV%	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**20%**	**8%**	**3%**	**-**	**0%**	**-**	**3%**	**15%**	**4%**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	0	0	2	6	*8*	0	0	1	0	*1*	8	4	5	7	*24*
7:15 AM	0	0	5	3	*8*	0	0	2	1	*3*	6	3	6	6	*21*
7:30 AM	0	0	5	4	*9*	0	0	1	0	*1*	13	16	9	8	*46*
7:45 AM	0	0	3	6	*9*	0	0	7	2	*9*	36	36	24	20	*116*
8:00 AM	**0**	**0**	**4**	**6**	***10***	**0**	**0**	**5**	**3**	***8***	**26**	**45**	**18**	**24**	*113*
8:15 AM	**0**	**0**	**4**	**6**	***10***	**0**	**0**	**4**	**1**	***5***	**24**	**26**	**23**	**25**	*98*
8:30 AM	**0**	**0**	**3**	**7**	***10***	**0**	**0**	**4**	**2**	***6***	**32**	**26**	**22**	**21**	*101*
8:45 AM	**0**	**0**	**8**	**6**	***14***	**0**	**0**	**8**	**0**	***8***	**41**	**47**	**31**	**32**	***151***
Count Total	0	0	34	44	*78*	0	0	32	9	*41*	186	203	138	143	*670*
Peak Hour	**0**	**0**	**19**	**25**	***44***	**0**	**0**	**21**	**6**	***27***	**123**	**144**	**94**	**102**	***463***

Two-Hour Count Summaries - Heavy Vehicles

Interval Start	Bancroft Way				Driveway				Piedmont Ave				Piedmont Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	0	0	0	0	0	0	0	1	1	0	0	0	3	3	8	0
7:15 AM	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0	3	8	0
7:30 AM	0	0	0	0	0	0	0	0	0	4	1	0	0	0	1	3	9	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3	3	9	34
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**3**	**0**	**0**	**0**	**2**	**4**	**10**	36
8:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**2**	**0**	**0**	**0**	**2**	**4**	**10**	38
8:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**0**	**0**	**0**	**4**	**3**	**10**	39
8:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**5**	**0**	**0**	**0**	**1**	**5**	**14**	**44**
Count Total	0	0	0	0	0	0	0	0	1	12	21	0	0	0	16	28	78	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**6**	**12**	**0**	**0**	**0**	**9**	**16**	**44**	**0**

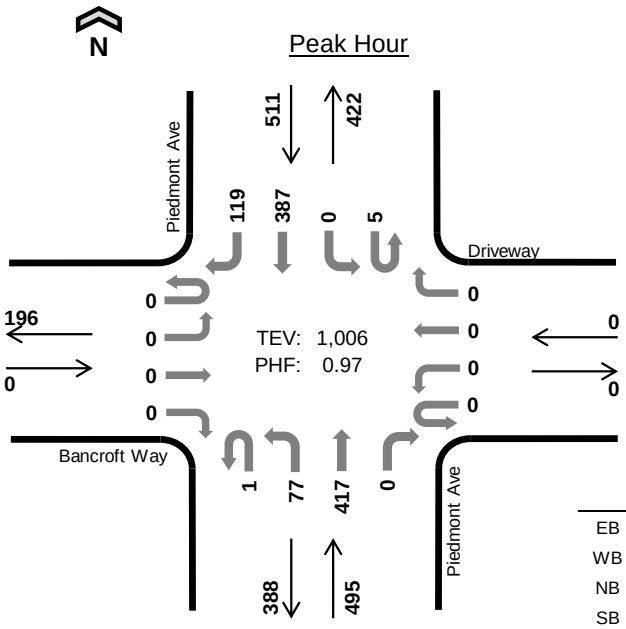
Two-Hour Count Summaries - Bikes

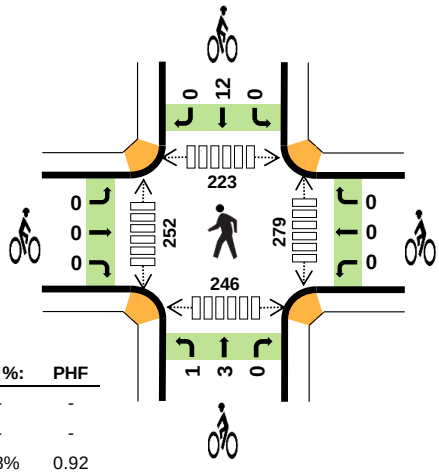
Interval Start	Bancroft Way			Driveway			Piedmont Ave			Piedmont Ave			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
7:00 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	0
7:15 AM	0	0	0	0	0	0	1	1	0	0	1	0	3	0
7:30 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	0
7:45 AM	0	0	0	0	0	0	3	4	0	0	2	0	9	14
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**4**	**0**	**0**	**3**	**0**	**8**	21
8:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**2**	**0**	**0**	**1**	**0**	**5**	23
8:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**2**	**6**	28
8:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**3**	**0**	**0**	**0**	**0**	**8**	**27**
Count Total	0	0	0	0	0	0	12	20	0	0	7	2	41	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**8**	**13**	**0**	**0**	**4**	**2**	**27**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Piedmont Ave
Bancroft Way

Date: 12-04-2018
Count Period: 4:00 PM to 6:00 PM
Peak Hour: 4:30 PM to 5:30 PM





	HV %:	PHF
EB	-	-
WB	-	-
NB	0.8%	0.92
SB	2.3%	0.90
TOTAL	1.6%	0.97

Two-Hour Count Summaries

Interval Start	Bancroft Way Eastbound				Driveway Westbound				Piedmont Ave Northbound				Piedmont Ave Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	0	0	0	0	0	0	0	1	13	105	0	0	0	88	28	235	0
4:15 PM	0	0	0	0	0	0	0	0	2	15	110	0	1	0	89	28	245	0
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**18**	**115**	**0**	**0**	**0**	**93**	**27**	**254**	0
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**22**	**109**	**0**	**1**	**0**	**96**	**29**	**257**	991
5:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**18**	**96**	**0**	**0**	**0**	**92**	**31**	**237**	993
5:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**19**	**97**	**0**	**4**	**0**	**106**	**32**	**258**	**1,006**
5:30 PM	0	0	0	0	0	0	0	0	0	19	89	0	1	0	90	45	244	996
5:45 PM	0	0	0	0	0	0	0	0	1	24	98	0	0	0	97	36	256	995
Count Total	0	0	0	0	0	0	0	0	5	148	819	0	7	0	751	256	1,986	0
Peak Hour All	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**77**	**417**	**0**	**5**	**0**	**387**	**119**	**1,006**	**0**
Peak Hour HV	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**3**	**9**	**16**	**0**
Peak Hour HV%	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0%**	**5%**	**0%**	**-**	**0%**	**-**	**1%**	**8%**	**2%**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	0	0	0	5	*5*	0	0	1	4	*5*	92	54	65	37	*248*
4:15 PM	0	0	2	3	*5*	0	0	2	5	*7*	37	34	27	27	*125*
4:30 PM	**0**	**0**	**0**	**3**	***3***	**0**	**0**	**1**	**4**	***5***	**51**	**41**	**36**	**43**	*171*
4:45 PM	**0**	**0**	**2**	**4**	***6***	**0**	**0**	**3**	**2**	***5***	**54**	**52**	**49**	**44**	*199*
5:00 PM	**0**	**0**	**0**	**1**	***1***	**0**	**0**	**0**	**1**	***1***	**84**	**95**	**78**	**83**	*340*
5:15 PM	**0**	**0**	**2**	**4**	***6***	**0**	**0**	**0**	**5**	***5***	**90**	**64**	**60**	**76**	***290***
5:30 PM	0	0	2	3	*5*	0	0	5	5	*10*	73	57	50	93	*273*
5:45 PM	0	0	3	6	*9*	0	0	1	4	*5*	86	26	114	57	*283*
Count Total	0	0	11	29	*40*	0	0	13	30	*43*	567	423	479	460	*1,929*
Peak Hour	**0**	**0**	**4**	**12**	***16***	**0**	**0**	**4**	**12**	***16***	**279**	**252**	**223**	**246**	***1,000***

Two-Hour Count Summaries - Heavy Vehicles

Interval Start	Bancroft Way				Driveway				Piedmont Ave				Piedmont Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3	5	0
4:15 PM	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	2	5	0
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**2**	**3**	0
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**1**	**3**	**6**	19
5:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**1**	15
5:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**1**	**3**	**6**	**16**
5:30 PM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	2	5	18
5:45 PM	0	0	0	0	0	0	0	0	0	2	1	0	0	0	2	4	9	21
Count Total	0	0	0	0	0	0	0	0	0	7	4	0	0	0	9	20	40	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**3**	**9**	**16**	**0**

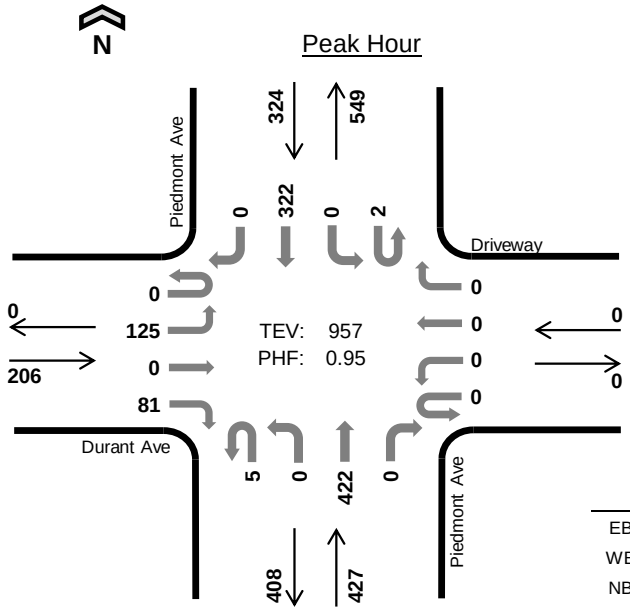
Two-Hour Count Summaries - Bikes

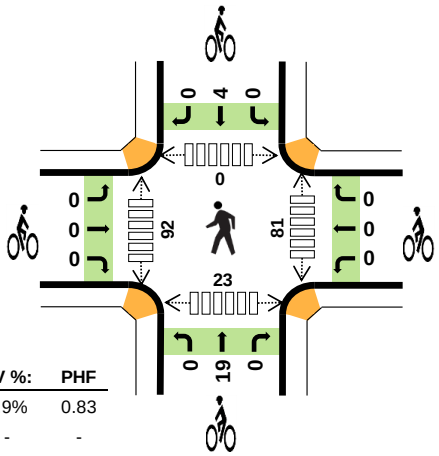
Interval Start	Bancroft Way			Driveway			Piedmont Ave			Piedmont Ave			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
4:00 PM	0	0	0	0	0	0	0	1	0	0	4	0	5	0
4:15 PM	0	0	0	0	0	0	2	0	0	0	5	0	7	0
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**4**	**0**	**5**	0
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**2**	**0**	**5**	22
5:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**	18
5:15 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**5**	**16**
5:30 PM	0	0	0	0	0	0	1	4	0	0	5	0	10	21
5:45 PM	0	0	0	0	0	0	0	1	0	0	3	1	5	21
Count Total	0	0	0	0	0	0	4	9	0	0	29	1	43	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**3**	**0**	**0**	**12**	**0**	**16**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Piedmont Ave
Durant Ave

Date: 12-04-2018
Count Period: 7:00 AM to 9:00 AM
Peak Hour: 8:00 AM to 9:00 AM





	HV %:	PHF
EB	3.9%	0.83
WB	-	-
NB	3.0%	0.93
SB	2.8%	0.92
TOTAL	3.1%	0.95

Two-Hour Count Summaries

Interval Start	Durant Ave Eastbound				Driveway Westbound				Piedmont Ave Northbound				Piedmont Ave Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	9	0	7	0	0	0	0	1	0	64	0	0	0	33	0	114	0
7:15 AM	0	13	0	13	0	0	0	0	0	0	90	0	0	0	38	0	154	0
7:30 AM	0	15	0	12	0	0	0	0	0	0	98	0	1	0	78	0	204	0
7:45 AM	0	27	0	9	0	0	0	0	0	0	111	0	2	0	80	0	229	701
8:00 AM	**0**	**27**	**0**	**18**	**0**	**0**	**0**	**0**	**1**	**0**	**99**	**0**	**1**	**0**	**82**	**0**	**228**	815
8:15 AM	**0**	**26**	**0**	**16**	**0**	**0**	**0**	**0**	**1**	**0**	**114**	**0**	**0**	**0**	**73**	**0**	**230**	891
8:30 AM	**0**	**33**	**0**	**29**	**0**	**0**	**0**	**0**	**1**	**0**	**104**	**0**	**0**	**0**	**80**	**0**	**247**	934
8:45 AM	**0**	**39**	**0**	**18**	**0**	**0**	**0**	**0**	**2**	**0**	**105**	**0**	**1**	**0**	**87**	**0**	**252**	**957**
Count Total	0	189	0	122	0	0	0	0	6	0	785	0	5	0	551	0	1,658	0
Peak Hour All	**0**	**125**	**0**	**81**	**0**	**0**	**0**	**0**	**5**	**0**	**422**	**0**	**2**	**0**	**322**	**0**	**957**	**0**
Peak Hour HV	**0**	**6**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**13**	**0**	**0**	**0**	**9**	**0**	**30**	**0**
Peak Hour HV%	**-**	**5%**	**-**	**2%**	**-**	**-**	**-**	**-**	**0%**	**-**	**3%**	**-**	**0%**	**-**	**3%**	**-**	**3%**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	1	0	1	3	*5*	0	0	1	0	*1*	4	8	0	1	*13*
7:15 AM	4	0	3	0	*7*	0	0	2	1	*3*	7	2	0	3	*12*
7:30 AM	2	0	4	1	*7*	0	0	1	0	*1*	7	9	0	3	*19*
7:45 AM	3	0	0	3	*6*	1	0	7	2	*10*	24	24	0	6	*54*
8:00 AM	**2**	**0**	**3**	**2**	***7***	**0**	**0**	**5**	**3**	***8***	**23**	**31**	**0**	**9**	*63*
8:15 AM	**2**	**0**	**2**	**2**	***6***	**0**	**0**	**5**	**1**	***6***	**26**	**14**	**0**	**7**	*47*
8:30 AM	**2**	**0**	**3**	**3**	***8***	**0**	**0**	**5**	**0**	***5***	**17**	**20**	**0**	**4**	*41*
8:45 AM	**2**	**0**	**5**	**2**	***9***	**0**	**0**	**4**	**0**	***4***	**15**	**27**	**0**	**3**	***45***
Count Total	18	0	21	16	*55*	1	0	30	7	*38*	123	135	0	36	*294*
Peak Hour	**8**	**0**	**13**	**9**	***30***	**0**	**0**	**19**	**4**	***23***	**81**	**92**	**0**	**23**	***196***

Two-Hour Count Summaries - Heavy Vehicles

Interval Start	Durant Ave				Driveway				Piedmont Ave				Piedmont Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	1	0	0	0	0	0	0	0	0	1	0	0	0	3	0	5	0
7:15 AM	0	2	0	2	0	0	0	0	0	0	3	0	0	0	0	0	7	0
7:30 AM	0	2	0	0	0	0	0	0	0	0	4	0	0	0	1	0	7	0
7:45 AM	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3	0	6	25
8:00 AM	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**2**	**0**	**7**	27
8:15 AM	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**2**	**0**	**6**	26
8:30 AM	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**3**	**0**	**8**	27
8:45 AM	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**0**	**0**	**2**	**0**	**9**	**30**
Count Total	0	14	0	4	0	0	0	0	0	0	21	0	0	0	16	0	55	0
Peak Hour	**0**	**6**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**13**	**0**	**0**	**0**	**9**	**0**	**30**	**0**

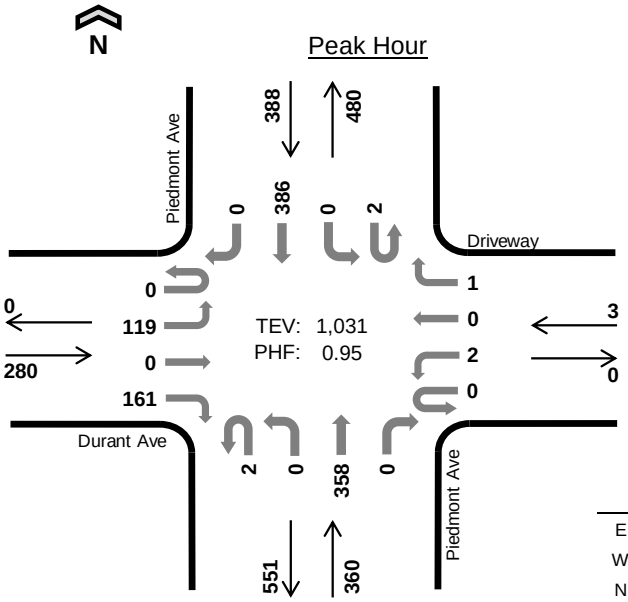
Two-Hour Count Summaries - Bikes

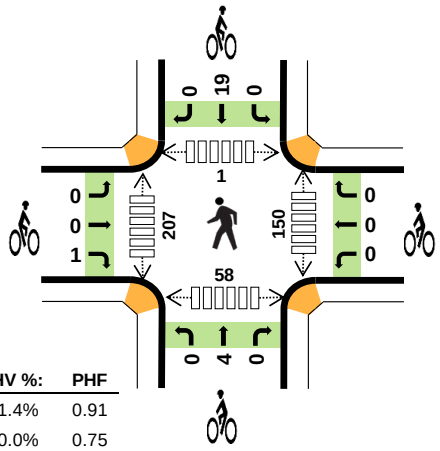
Interval Start	Durant Ave			Driveway			Piedmont Ave			Piedmont Ave			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
7:00 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	0
7:15 AM	0	0	0	0	0	0	0	2	0	0	1	0	3	0
7:30 AM	0	0	0	0	0	0	0	1	0	0	0	0	1	0
7:45 AM	1	0	0	0	0	0	0	7	0	0	2	0	10	15
8:00 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**0**	**3**	**0**	**8**	22
8:15 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**0**	**1**	**0**	**6**	25
8:30 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**5**	29
8:45 AM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**0**	**0**	**4**	**23**
Count Total	1	0	0	0	0	0	0	30	0	0	7	0	38	0
Peak Hour	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**19**	**0**	**0**	**4**	**0**	**23**	**0**

Note: U-Turn volumes for bikes are included in Left-Turn, if any.

Piedmont Ave
Durant Ave

Date: 12-04-2018
Count Period: 4:00 PM to 6:00 PM
Peak Hour: 4:30 PM to 5:30 PM





	HV %:	PHF
EB	1.4%	0.91
WB	0.0%	0.75
NB	0.6%	0.86
SB	1.0%	0.87
TOTAL	1.0%	0.95

Two-Hour Count Summaries

Interval Start		Durant Ave Eastbound				Driveway Westbound				Piedmont Ave Northbound				Piedmont Ave Southbound				15-min Total	Rolling One Hour
		UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM		0	27	0	38	0	0	0	0	2	0	93	0	0	0	92	0	252	0
4:15 PM		0	26	0	34	0	0	0	0	3	0	96	0	1	0	89	0	249	0
4:30 PM		**0**	**24**	**0**	**33**	**0**	**1**	**0**	**0**	**1**	**0**	**104**	**0**	**2**	**0**	**93**	**0**	**258**	0
4:45 PM		**0**	**29**	**0**	**40**	**0**	**1**	**0**	**0**	**1**	**0**	**100**	**0**	**0**	**0**	**97**	**0**	**268**	1,027
5:00 PM		**0**	**34**	**0**	**43**	**0**	**0**	**0**	**1**	**0**	**0**	**70**	**0**	**0**	**0**	**85**	**0**	**233**	1,008
5:15 PM		**0**	**32**	**0**	**45**	**0**	**0**	**0**	**0**	**0**	**0**	**84**	**0**	**0**	**0**	**111**	**0**	**272**	**1,031**
5:30 PM		0	37	1	35	0	0	0	0	1	0	65	0	1	2	85	0	227	1,000
5:45 PM		0	33	1	43	0	0	0	0	0	0	92	1	0	0	96	0	266	998
Count Total		0	242	2	311	0	2	0	1	8	0	704	1	4	2	748	0	2,025	0
Peak Hour	**All**	**0**	**119**	**0**	**161**	**0**	**2**	**0**	**1**	**2**	**0**	**358**	**0**	**2**	**0**	**386**	**0**	**1,031**	**0**
	HV	**0**	**2**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**4**	**0**	**10**	**0**
	HV%	**-**	**2%**	**-**	**1%**	**-**	**0%**	**-**	**0%**	**0%**	**-**	**1%**	**-**	**0%**	**-**	**1%**	**-**	**1%**	**0**

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	0	0	0	1	*1*	0	0	1	4	*5*	32	44	0	16	*92*
4:15 PM	2	0	1	1	*4*	0	0	2	4	*6*	24	27	0	6	*57*
4:30 PM	**0**	**0**	**0**	**2**	***2***	**0**	**0**	**1**	**7**	***8***	**27**	**42**	**1**	**11**	*81*
4:45 PM	**2**	**0**	**1**	**0**	***3***	**0**	**0**	**2**	**3**	***5***	**42**	**34**	**0**	**12**	*88*
5:00 PM	**1**	**0**	**0**	**1**	***2***	**0**	**0**	**1**	**3**	***4***	**38**	**72**	**0**	**22**	*132*
5:15 PM	**1**	**0**	**1**	**1**	***3***	**1**	**0**	**0**	**6**	***7***	**43**	**59**	**0**	**13**	***115***
5:30 PM	0	0	2	1	*3*	1	0	3	7	*11*	50	47	0	22	*119*
5:45 PM	2	0	2	1	*5*	0	0	1	4	*5*	55	27	0	24	*106*
Count Total	8	0	7	8	*23*	2	0	11	38	*51*	311	352	1	126	*790*
Peak Hour	**4**	**0**	**2**	**4**	***10***	**1**	**0**	**4**	**19**	***24***	**150**	**207**	**1**	**58**	***416***

Two-Hour Count Summaries - Heavy Vehicles

Interval Start	Durant Ave				Driveway				Piedmont Ave				Piedmont Ave				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
4:15 PM	0	1	0	1	0	0	0	0	0	0	1	0	0	0	1	0	4	0
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**2**	0
4:45 PM	**0**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**3**	10
5:00 PM	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**2**	11
5:15 PM	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**3**	**10**
5:30 PM	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	3	11
5:45 PM	0	1	0	1	0	0	0	0	0	0	2	0	0	0	1	0	5	13
Count Total	0	4	0	4	0	0	0	0	0	0	7	0	0	0	8	0	23	0
Peak Hour	**0**	**2**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**4**	**0**	**10**	**0**

Two-Hour Count Summaries - Bikes

Interval Start	Durant Ave			Driveway			Piedmont Ave			Piedmont Ave			15-min Total	Rolling One Hour
	Eastbound			Westbound			Northbound			Southbound				
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT		
4:00 PM	0	0	0	0	0	0	0	1	0	0	4	0	5	0
4:15 PM	0	0	0	0	0	0	0	2	0	0	4	0	6	0
4:30 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**7**	**0**	**8**	0
4:45 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**0**	**3**	**0**	**5**	24
5:00 PM	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**3**	**0**	**4**	23
5:15 PM	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**0**	**7**	**24**
5:30 PM	0	0	1	0	0	0	0	3	0	0	6	1	11	27
5:45 PM	0	0	0	0	0	0	0	1	0	0	4	0	5	27
Count Total	0	0	2	0	0	0	0	11	0	0	37	1	51	0
Peak Hour	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**4**	**0**	**0**	**19**	**0**	**24**	**0**

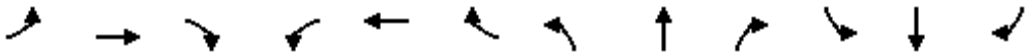
Note: U-Turn volumes for bikes are included in Left-Turn, if any.

APPENDIX B

Intersection LOS Calculations

HCM 6th Signalized Intersection Summary
6: Gayley Rd/La Loma Ave & Hearst Ave

05/20/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	21	131	222	18	39	4	213	201	65	23	265	14
Future Volume (veh/h)	21	131	222	18	39	4	213	201	65	23	265	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.93		0.90	0.96		0.92	0.96		1.00	0.98		0.89
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1945	1945	1870	1870	1870
Adj Flow Rate, veh/h	22	135	229	19	40	4	220	207	0	24	273	14
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	98	528	455	341	529	53	468	398		92	932	46
Arrive On Green	0.32	0.32	0.32	0.32	0.32	0.32	0.57	0.57	0.00	0.57	0.57	0.57
Sat Flow, veh/h	146	1655	1427	978	1658	166	703	700	1648	76	1639	81
Grp Volume(v), veh/h	157	0	229	19	0	44	427	0	0	311	0	0
Grp Sat Flow(s),veh/h/ln	1801	0	1427	978	0	1824	1402	0	1648	1796	0	0
Q Serve(g_s), s	0.0	0.0	10.4	1.2	0.0	1.3	7.5	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	5.0	0.0	10.4	6.2	0.0	1.3	14.4	0.0	0.0	7.0	0.0	0.0
Prop In Lane	0.14		1.00	1.00		0.09	0.52		1.00	0.08		0.05
Lane Grp Cap(c), veh/h	637	0	455	341	0	581	875	0		1081	0	0
V/C Ratio(X)	0.25	0.00	0.50	0.06	0.00	0.08	0.49	0.00		0.29	0.00	0.00
Avail Cap(c_a), veh/h	637	0	455	341	0	581	875	0		1081	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	20.2	0.0	22.1	22.5	0.0	19.0	10.4	0.0	0.0	8.9	0.0	0.0
Incr Delay (d2), s/veh	0.9	0.0	3.9	0.3	0.0	0.3	1.9	0.0	0.0	0.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.3	0.0	3.9	0.3	0.0	0.6	4.5	0.0	0.0	2.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.2	0.0	26.1	22.9	0.0	19.3	12.3	0.0	0.0	9.6	0.0	0.0
LnGrp LOS	C	A	C	C	A	B	B	A		A	A	A
Approach Vol, veh/h		386			63			427	A		311	
Approach Delay, s/veh		24.1			20.4			12.3			9.6	
Approach LOS		C			C			B			A	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		30.0		50.0		30.0		50.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		25.5		45.5		25.5		45.5				
Max Q Clear Time (g_c+I1), s		8.2		16.4		12.4		9.0				
Green Ext Time (p_c), s		0.2		3.6		1.5		2.2				

Intersection Summary		
HCM 6th Ctrl Delay		15.8
HCM 6th LOS		B

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Intersection 7 **Piedmont Ave/Stadium Rim Way** **All-way Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	2	1	70.0%	9.7	13.3	A
	Through	344	340	98.9%	13.8	3.5	B
	Right Turn	13	13	100.0%	14.7	8.3	B
	Subtotal	359	355	98.8%	13.9	3.5	B
SB	Left Turn	90	88	98.0%	24.7	17.3	C
	Through	461	462	100.1%	23.2	14.4	C
	Right Turn	1	1	110.0%	5.6	16.5	A
	Subtotal	552	551	99.8%	23.5	15.0	C
EB	Left Turn	9	8	92.2%	7.7	3.5	A
	Through	1	1	70.0%	1.1	3.5	A
	Right Turn	7	8	117.1%	6.7	3.4	A
	Subtotal	17	17	101.2%	7.4	1.9	A
WB	Left Turn	33	32	97.0%	9.2	2.2	A
	Through	2	3	130.0%	3.7	5.4	A
	Right Turn	147	153	104.2%	6.8	1.2	A
	Subtotal	182	188	103.2%	7.2	1.2	A
Total		1,110	1,111	100.0%	17.3	7.8	C

Intersection 8 **Piedmont Ave/Bancroft Way** **All-way Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	80	77	96.8%	27.4	12.9	D
	Through	463	477	103.0%	28.2	12.9	D
	Right Turn						
	Subtotal	543	554	102.1%	28.1	12.8	D
SB	Left Turn						
	Through	318	329	103.3%	14.0	3.9	B
	Right Turn	110	117	106.5%	9.0	2.0	A
	Subtotal	428	446	104.1%	12.8	3.5	B
EB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		971	1,000	103.0%	21.5	8.3	C

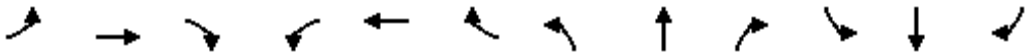
SimTraffic Post-Processor **BioEPIC Project Traffic Study**
Average Results from 10 Runs **Existing**
Volume and Delay by Movement **AM Peak Hour**

Intersection 9 **Piedmont Ave/Durant Ave** **All-way Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	422	411	97.3%	16.7	12.7	C
	Right Turn						
	Subtotal	422	411	97.3%	16.7	12.7	C
SB	Left Turn						
	Through	322	338	104.9%	9.5	0.9	A
	Right Turn						
	Subtotal	322	338	104.9%	9.5	0.9	A
EB	Left Turn	125	130	104.2%	8.7	3.2	A
	Through						
	Right Turn	81	84	103.2%	5.2	1.1	A
	Subtotal	206	214	103.8%	7.4	1.9	A
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		950	962	101.3%	12.0	5.3	B

HCM 6th Signalized Intersection Summary
6: Gayley Rd/La Loma Ave & Hearst Ave

05/20/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	33	255	62	118	30	204	277	22	7	224	23
Future Volume (veh/h)	23	33	255	62	118	30	204	277	22	7	224	23
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.90		0.84	0.91		0.81	0.94		1.00	0.98		0.85
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1930	1930	1856	1856	1856
Adj Flow Rate, veh/h	25	35	274	67	127	32	219	298	0	8	241	25
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	219	280	426	338	438	110	406	486		57	897	91
Arrive On Green	0.33	0.32	0.32	0.32	0.32	0.32	0.57	0.56	0.00	0.57	0.56	0.56
Sat Flow, veh/h	471	867	1321	970	1358	342	605	869	1635	15	1603	163
Grp Volume(v), veh/h	60	0	274	67	0	159	517	0	0	274	0	0
Grp Sat Flow(s),veh/h/ln	1339	0	1321	970	0	1700	1475	0	1635	1781	0	0
Q Serve(g_s), s	0.1	0.0	13.5	4.2	0.0	5.3	11.1	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	5.4	0.0	13.5	9.6	0.0	5.3	17.1	0.0	0.0	6.0	0.0	0.0
Prop In Lane	0.42		1.00	1.00		0.20	0.42		1.00	0.03		0.09
Lane Grp Cap(c), veh/h	507	0	426	338	0	548	902	0		1056	0	0
V/C Ratio(X)	0.12	0.00	0.64	0.20	0.00	0.29	0.57	0.00		0.26	0.00	0.00
Avail Cap(c_a), veh/h	507	0	426	338	0	548	902	0		1056	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	18.0	0.0	22.0	22.9	0.0	19.2	10.9	0.0	0.0	8.7	0.0	0.0
Incr Delay (d2), s/veh	0.5	0.0	7.3	1.3	0.0	1.3	2.6	0.0	0.0	0.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.0	4.9	1.1	0.0	2.2	5.7	0.0	0.0	2.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.5	0.0	29.3	24.2	0.0	20.6	13.5	0.0	0.0	9.3	0.0	0.0
LnGrp LOS	B	A	C	C	A	C	B	A		A	A	A
Approach Vol, veh/h		334			226			517	A		274	
Approach Delay, s/veh		27.4			21.7			13.5			9.3	
Approach LOS		C			C			B			A	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		29.0		47.0		29.0		47.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		24.5		42.5		24.5		42.5				
Max Q Clear Time (g_c+I1), s		11.6		19.1		15.5		8.0				
Green Ext Time (p_c), s		1.0		4.2		1.0		1.9				

Intersection Summary		
HCM 6th Ctrl Delay		17.4
HCM 6th LOS		B

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Intersection 7 **Piedmont Ave/Stadium Rim Way** **All-way Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	1	0	10.0%	0.0	0.0	A
	Through	311	316	101.4%	29.4	8.0	D
	Right Turn	39	40	103.3%	25.5	13.0	D
	Subtotal	351	356	101.4%	28.9	8.4	D
SB	Left Turn	142	144	101.5%	73.3	40.1	F
	Through	338	390	115.3%	64.0	38.8	F
	Right Turn	1	1	50.0%	14.4	30.9	B
	Subtotal	481	534	111.1%	66.4	39.1	F
EB	Left Turn	10	10	99.0%	10.9	5.3	B
	Through	14	13	93.6%	11.5	5.1	B
	Right Turn	11	12	111.8%	6.5	3.4	A
	Subtotal	35	35	100.9%	9.9	1.5	A
WB	Left Turn	77	75	96.8%	15.1	3.1	C
	Through	4	4	105.0%	10.3	11.7	B
	Right Turn	207	203	98.1%	13.1	4.3	B
	Subtotal	288	282	97.8%	13.8	3.7	B
Total		1,155	1,207	104.5%	42.1	19.7	E

Intersection 8 **Piedmont Ave/Bancroft Way** **All-way Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	77	58	75.1%	93.3	12.3	F
	Through	417	308	73.8%	95.5	10.1	F
	Right Turn						
	Subtotal	494	366	74.0%	95.2	9.8	F
SB	Left Turn						
	Through	387	360	93.1%	110.2	17.1	F
	Right Turn	119	109	91.3%	96.8	17.1	F
	Subtotal	506	469	92.6%	107.1	16.6	F
EB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		1,000	834	83.4%	101.9	13.0	F

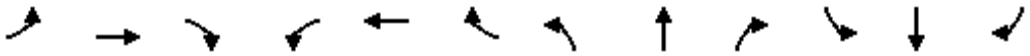
SimTraffic Post-Processor **BioEPIC Project Traffic Study**
Average Results from 10 Runs **Existing**
Volume and Delay by Movement **PM Peak Hour**

Intersection 9 **Piedmont Ave/Durant Ave** **All-way Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn Through Right Turn	358	247	68.9%	182.4	30.4	F
	Subtotal	358	247	68.9%	182.4	30.4	F
SB	Left Turn Through Right Turn	386	364	94.2%	16.3	5.6	C
	Subtotal	386	364	94.2%	16.3	5.6	C
EB	Left Turn	119	120	100.4%	30.9	7.0	D
	Through						
	Right Turn	161	157	97.3%	9.7	1.9	A
	Subtotal	280	276	98.6%	18.8	3.1	C
WB	Left Turn Through Right Turn						
	Subtotal						
Total		1,024	886	86.6%	62.2	2.8	F

HCM 6th Signalized Intersection Summary
6: Gayley Rd/La Loma Ave & Hearst Ave

05/20/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	21	142	222	19	41	4	213	201	73	24	265	14
Future Volume (veh/h)	21	142	222	19	41	4	213	201	73	24	265	14
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.93		0.90	0.96		0.92	0.96		1.00	0.98		0.89
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1945	1945	1870	1870	1870
Adj Flow Rate, veh/h	22	146	229	20	42	4	220	207	0	25	273	14
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	93	534	455	334	531	51	468	398		95	928	46
Arrive On Green	0.32	0.32	0.32	0.32	0.32	0.32	0.57	0.57	0.00	0.57	0.57	0.57
Sat Flow, veh/h	132	1676	1427	970	1667	159	703	699	1648	81	1633	80
Grp Volume(v), veh/h	168	0	229	20	0	46	427	0	0	312	0	0
Grp Sat Flow(s),veh/h/ln	1808	0	1427	970	0	1826	1402	0	1648	1794	0	0
Q Serve(g_s), s	0.0	0.0	10.4	1.3	0.0	1.4	7.4	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	5.4	0.0	10.4	6.6	0.0	1.4	14.5	0.0	0.0	7.0	0.0	0.0
Prop In Lane	0.13		1.00	1.00		0.09	0.52		1.00	0.08		0.04
Lane Grp Cap(c), veh/h	638	0	455	334	0	582	874	0		1080	0	0
V/C Ratio(X)	0.26	0.00	0.50	0.06	0.00	0.08	0.49	0.00		0.29	0.00	0.00
Avail Cap(c_a), veh/h	638	0	455	334	0	582	874	0		1080	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	20.4	0.0	22.1	22.9	0.0	19.0	10.4	0.0	0.0	8.9	0.0	0.0
Incr Delay (d2), s/veh	1.0	0.0	3.9	0.3	0.0	0.3	1.9	0.0	0.0	0.7	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.4	0.0	3.9	0.3	0.0	0.6	4.5	0.0	0.0	2.7	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.4	0.0	26.1	23.2	0.0	19.3	12.3	0.0	0.0	9.6	0.0	0.0
LnGrp LOS	C	A	C	C	A	B	B	A		A	A	A
Approach Vol, veh/h		397			66			427	A		312	
Approach Delay, s/veh		24.1			20.5			12.3			9.6	
Approach LOS		C			C			B			A	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		30.0		50.0		30.0		50.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		25.5		45.5		25.5		45.5				
Max Q Clear Time (g_c+I1), s		8.6		16.5		12.4		9.0				
Green Ext Time (p_c), s		0.2		3.6		1.6		2.2				

Intersection Summary												
HCM 6th Ctrl Delay			15.9									
HCM 6th LOS			B									

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Intersection 7 **Piedmont Ave/Stadium Rim Way** **All-way Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	2	1	60.0%	1.1	3.4	A
	Through	352	345	97.9%	12.6	2.3	B
	Right Turn	13	14	104.6%	10.5	7.9	B
	Subtotal	367	359	97.9%	12.6	2.3	B
SB	Left Turn	90	95	105.7%	22.6	8.0	C
	Through	462	466	100.8%	23.2	9.0	C
	Right Turn	1	2	150.0%	0.7	1.6	A
	Subtotal	553	562	101.6%	23.1	8.8	C
EB	Left Turn	9	9	100.0%	7.1	3.4	A
	Through	1	1	90.0%	1.3	3.0	A
	Right Turn	7	7	95.7%	4.0	1.9	A
	Subtotal	17	17	97.6%	6.5	1.7	A
WB	Left Turn	33	36	109.4%	8.1	1.1	A
	Through	2	2	100.0%	1.2	2.5	A
	Right Turn	147	142	96.7%	6.3	1.1	A
	Subtotal	182	180	99.0%	6.6	1.0	A
Total		1,119	1,118	99.9%	17.0	4.6	C

Intersection 8 **Piedmont Ave/Bancroft Way** **All-way Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	80	80	99.5%	31.1	9.2	D
	Through	471	482	102.3%	31.3	9.3	D
	Right Turn						
	Subtotal	551	562	101.9%	31.2	9.1	D
SB	Left Turn						
	Through	319	309	96.8%	13.5	3.3	B
	Right Turn	110	112	101.4%	9.2	2.1	A
	Subtotal	429	420	98.0%	12.4	2.8	B
EB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		980	982	100.2%	23.2	5.5	C

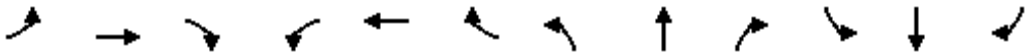
SimTraffic Post-Processor **BioEPIC Project Traffic Study**
Average Results from 10 Runs **Existing Plus Project**
Volume and Delay by Movement **AM Peak Hour**

Intersection 9 **Piedmont Ave/Durant Ave** **All-way Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	428	429	100.2%	16.9	7.6	C
	Right Turn						
	Subtotal	428	429	100.2%	16.9	7.6	C
SB	Left Turn						
	Through	323	318	98.6%	9.5	1.2	A
	Right Turn						
	Subtotal	323	318	98.6%	9.5	1.2	A
EB	Left Turn	127	125	98.7%	9.2	2.4	A
	Through						
	Right Turn	81	83	102.8%	5.2	1.1	A
	Subtotal	208	209	100.3%	7.6	1.6	A
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		959	956	99.7%	12.4	3.9	B

HCM 6th Signalized Intersection Summary
6: Gayley Rd/La Loma Ave & Hearst Ave

05/20/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	34	255	70	128	31	204	277	23	7	224	23
Future Volume (veh/h)	23	34	255	70	128	31	204	277	23	7	224	23
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.90		0.84	0.92		0.81	0.94		1.00	0.98		0.85
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1930	1930	1856	1856	1856
Adj Flow Rate, veh/h	25	37	274	75	138	33	219	298	0	8	241	25
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	211	284	426	333	444	106	406	486		57	897	91
Arrive On Green	0.33	0.32	0.32	0.32	0.32	0.32	0.57	0.56	0.00	0.57	0.56	0.56
Sat Flow, veh/h	448	882	1321	970	1377	329	605	869	1635	15	1603	163
Grp Volume(v), veh/h	62	0	274	75	0	171	517	0	0	274	0	0
Grp Sat Flow(s),veh/h/ln	1330	0	1321	970	0	1706	1475	0	1635	1781	0	0
Q Serve(g_s), s	0.1	0.0	13.5	4.8	0.0	5.7	11.1	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	5.9	0.0	13.5	10.7	0.0	5.7	17.1	0.0	0.0	6.0	0.0	0.0
Prop In Lane	0.40		1.00	1.00		0.19	0.42		1.00	0.03		0.09
Lane Grp Cap(c), veh/h	504	0	426	333	0	550	902	0		1056	0	0
V/C Ratio(X)	0.12	0.00	0.64	0.23	0.00	0.31	0.57	0.00		0.26	0.00	0.00
Avail Cap(c_a), veh/h	504	0	426	333	0	550	902	0		1056	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	18.0	0.0	22.0	23.5	0.0	19.4	10.9	0.0	0.0	8.7	0.0	0.0
Incr Delay (d2), s/veh	0.5	0.0	7.3	1.6	0.0	1.5	2.6	0.0	0.0	0.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.0	4.9	1.2	0.0	2.4	5.7	0.0	0.0	2.3	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	18.5	0.0	29.3	25.0	0.0	20.9	13.5	0.0	0.0	9.3	0.0	0.0
LnGrp LOS	B	A	C	C	A	C	B	A		A	A	A
Approach Vol, veh/h		336			246			517	A		274	
Approach Delay, s/veh		27.3			22.1			13.5			9.3	
Approach LOS		C			C			B			A	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		29.0		47.0		29.0		47.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		24.5		42.5		24.5		42.5				
Max Q Clear Time (g_c+I1), s		12.7		19.1		15.5		8.0				
Green Ext Time (p_c), s		1.0		4.2		1.1		1.9				

Intersection Summary												
HCM 6th Ctrl Delay			17.6									
HCM 6th LOS			B									

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Intersection 7 **Piedmont Ave/Stadium Rim Way** **All-way Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	1	0	30.0%	2.9	9.3	A
	Through	312	310	99.4%	29.5	15.4	D
	Right Turn	39	38	98.5%	28.4	21.8	D
	Subtotal	352	349	99.1%	29.4	16.0	D
SB	Left Turn	142	131	92.5%	73.2	47.2	F
	Through	346	412	119.0%	67.6	45.4	F
	Right Turn	1	2	150.0%	44.3	66.5	E
	Subtotal	489	544	111.3%	69.1	46.0	F
EB	Left Turn	10	10	102.0%	9.6	7.2	A
	Through	14	14	98.6%	10.7	3.0	B
	Right Turn	11	12	104.5%	7.7	3.0	A
	Subtotal	35	36	101.4%	10.1	1.7	B
WB	Left Turn	77	76	98.2%	16.4	4.1	C
	Through	4	4	105.0%	13.3	8.8	B
	Right Turn	207	209	100.9%	14.4	4.4	B
	Subtotal	288	289	100.2%	15.0	4.1	B
Total		1,164	1,217	104.6%	44.1	24.6	E

Intersection 8 **Piedmont Ave/Bancroft Way** **All-way Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	77	59	76.8%	95.5	12.4	F
	Through	418	305	72.9%	93.9	6.4	F
	Right Turn						
	Subtotal	495	364	73.5%	94.2	7.0	F
SB	Left Turn						
	Through	393	357	90.8%	113.8	16.2	F
	Right Turn	121	111	91.5%	100.8	11.2	F
	Subtotal	514	467	90.9%	111.0	15.0	F
EB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		1,009	831	82.4%	103.4	10.2	F

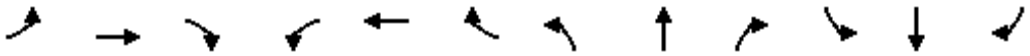
SimTraffic Post-Processor **BioEPIC Project Traffic Study**
Average Results from 10 Runs **Existing Plus Project**
Volume and Delay by Movement **PM Peak Hour**

Intersection 9 **Piedmont Ave/Durant Ave** **All-way Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	359	246	68.4%	177.8	17.3	F
	Right Turn						
	Subtotal	359	246	68.4%	177.8	17.3	F
SB	Left Turn						
	Through	392	359	91.5%	16.5	4.5	C
	Right Turn						
	Subtotal	392	359	91.5%	16.5	4.5	C
EB	Left Turn	119	118	99.5%	45.5	33.1	E
	Through						
	Right Turn	161	158	98.4%	10.8	3.2	B
	Subtotal	280	277	98.9%	25.7	16.7	D
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		1,031	881	85.5%	65.1	7.6	F

HCM 6th Signalized Intersection Summary
6: Gayley Rd/La Loma Ave & Hearst Ave

05/23/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	190	290	30	50	10	290	260	80	30	350	20
Future Volume (veh/h)	30	190	290	30	50	10	290	260	80	30	350	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.91		0.87	0.96		0.89	0.96		1.00	1.00		0.86
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1945	1945	1870	1870	1870
Adj Flow Rate, veh/h	31	196	299	31	52	10	299	268	0	31	361	21
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	96	528	439	285	475	91	441	334		90	927	52
Arrive On Green	0.32	0.32	0.32	0.32	0.32	0.32	0.57	0.57	0.00	0.57	0.57	0.57
Sat Flow, veh/h	139	1656	1379	866	1491	287	654	587	1648	73	1630	91
Grp Volume(v), veh/h	227	0	299	31	0	62	567	0	0	413	0	0
Grp Sat Flow(s),veh/h/ln	1796	0	1379	866	0	1778	1241	0	1648	1794	0	0
Q Serve(g_s), s	0.0	0.0	15.1	2.3	0.0	2.0	20.1	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	7.5	0.0	15.1	9.8	0.0	2.0	30.1	0.0	0.0	10.0	0.0	0.0
Prop In Lane	0.14		1.00	1.00		0.16	0.53		1.00	0.08		0.05
Lane Grp Cap(c), veh/h	635	0	439	285	0	567	782	0		1080	0	0
V/C Ratio(X)	0.36	0.00	0.68	0.11	0.00	0.11	0.72	0.00		0.38	0.00	0.00
Avail Cap(c_a), veh/h	635	0	439	285	0	567	782	0		1080	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	21.1	0.0	23.7	24.9	0.0	19.2	14.4	0.0	0.0	9.6	0.0	0.0
Incr Delay (d2), s/veh	1.6	0.0	8.2	0.8	0.0	0.4	5.8	0.0	0.0	1.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.5	0.0	5.8	0.5	0.0	0.9	8.6	0.0	0.0	3.9	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.7	0.0	32.0	25.7	0.0	19.6	20.2	0.0	0.0	10.6	0.0	0.0
LnGrp LOS	C	A	C	C	A	B	C	A		B	A	A
Approach Vol, veh/h		526			93			567	A		413	
Approach Delay, s/veh		27.9			21.6			20.2			10.6	
Approach LOS		C			C			C			B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		30.0		50.0		30.0		50.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		25.5		45.5		25.5		45.5				
Max Q Clear Time (g_c+I1), s		11.8		32.1		17.1		12.0				
Green Ext Time (p_c), s		0.3		4.0		1.8		3.1				

Intersection Summary		
HCM 6th Ctrl Delay		20.4
HCM 6th LOS		C

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Intersection 7 **Piedmont Ave/Stadium Rim Way** **All-way Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	3	1	40.0%	19.6	33.4	C
	Through	460	446	97.0%	54.6	16.8	F
	Right Turn	20	16	78.0%	58.6	31.5	F
	Subtotal	483	463	95.9%	54.6	17.1	F
SB	Left Turn	120	94	78.0%	133.4	18.9	F
	Through	600	487	81.1%	132.0	14.3	F
	Right Turn	2	1	40.0%	30.4	52.5	D
	Subtotal	722	581	80.5%	132.4	14.4	F
EB	Left Turn	10	9	92.0%	8.1	3.9	A
	Through	2	1	60.0%	3.2	6.2	A
	Right Turn	10	12	116.0%	6.7	2.3	A
	Subtotal	22	22	100.0%	7.8	2.1	A
WB	Left Turn	40	46	116.0%	14.8	4.4	B
	Through	3	2	80.0%	8.1	12.4	A
	Right Turn	190	214	112.8%	12.8	4.4	B
	Subtotal	233	263	113.0%	13.3	4.2	B
Total		1,460	1,330	91.1%	79.7	8.6	F

Intersection 8 **Piedmont Ave/Bancroft Way** **All-way Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	100	72	71.6%	62.1	6.5	F
	Through	620	438	70.6%	60.8	7.5	F
	Right Turn						
	Subtotal	720	509	70.7%	61.0	7.2	F
SB	Left Turn						
	Through	420	415	98.8%	42.3	22.5	E
	Right Turn	140	156	111.4%	35.5	20.5	E
	Subtotal	560	571	101.9%	40.5	22.0	E
EB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		1,280	1,080	84.4%	50.5	13.8	F

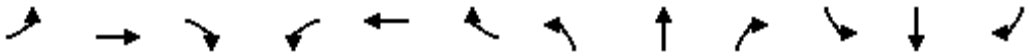
SimTraffic Post-Processor **BioEPIC Project Traffic Study**
Average Results from 10 Runs **2040 No Project**
Volume and Delay by Movement **AM Peak Hour**

Intersection 9 **Piedmont Ave/Durant Ave** **All-way Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	560	338	60.4%	122.9	17.2	F
	Right Turn						
	Subtotal	560	338	60.4%	122.9	17.2	F
SB	Left Turn						
	Through	420	416	99.0%	14.7	4.1	B
	Right Turn						
	Subtotal	420	416	99.0%	14.7	4.1	B
EB	Left Turn	170	172	101.2%	23.3	5.9	C
	Through						
	Right Turn	110	122	110.9%	6.7	0.9	A
	Subtotal	280	294	105.0%	16.6	4.6	C
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		1,260	1,048	83.2%	49.9	3.4	E

HCM 6th Signalized Intersection Summary
6: Gayley Rd/La Loma Ave & Hearst Ave

05/23/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	50	360	100	180	40	290	400	30	10	320	30
Future Volume (veh/h)	30	50	360	100	180	40	290	400	30	10	320	30
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.89		0.78	0.91		0.75	0.94		1.00	1.00		0.80
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1930	1930	1856	1856	1856
Adj Flow Rate, veh/h	32	54	387	108	194	43	312	430	0	11	344	32
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	177	270	394	272	444	98	377	427		59	908	83
Arrive On Green	0.33	0.32	0.32	0.32	0.32	0.32	0.57	0.56	0.00	0.57	0.56	0.56
Sat Flow, veh/h	348	836	1221	859	1376	305	554	764	1635	18	1624	148
Grp Volume(v), veh/h	86	0	387	108	0	237	742	0	0	387	0	0
Grp Sat Flow(s),veh/h/ln	1184	0	1221	859	0	1681	1318	0	1635	1789	0	0
Q Serve(g_s), s	0.3	0.0	23.9	8.7	0.0	8.5	33.3	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	8.8	0.0	23.9	17.4	0.0	8.5	42.5	0.0	0.0	9.2	0.0	0.0
Prop In Lane	0.37		1.00	1.00		0.18	0.42		1.00	0.03		0.08
Lane Grp Cap(c), veh/h	454	0	394	272	0	542	813	0		1061	0	0
V/C Ratio(X)	0.19	0.00	0.98	0.40	0.00	0.44	0.91	0.00		0.36	0.00	0.00
Avail Cap(c_a), veh/h	454	0	394	272	0	542	813	0		1061	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	18.4	0.0	25.5	27.3	0.0	20.3	17.3	0.0	0.0	9.4	0.0	0.0
Incr Delay (d2), s/veh	0.9	0.0	41.3	4.3	0.0	2.6	16.3	0.0	0.0	1.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.0	11.1	2.1	0.0	3.6	14.8	0.0	0.0	3.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.3	0.0	66.8	31.6	0.0	22.9	33.6	0.0	0.0	10.4	0.0	0.0
LnGrp LOS	B	A	E	C	A	C	C	A		B	A	A
Approach Vol, veh/h		473			345			742	A		387	
Approach Delay, s/veh		58.2			25.6			33.6			10.4	
Approach LOS		E			C			C			B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		29.0		47.0		29.0		47.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		24.5		42.5		24.5		42.5				
Max Q Clear Time (g_c+I1), s		19.4		44.5		25.9		11.2				
Green Ext Time (p_c), s		0.9		0.0		0.0		2.8				

Intersection Summary												
HCM 6th Ctrl Delay			33.6									
HCM 6th LOS			C									

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Intersection 7 **Piedmont Ave/Stadium Rim Way** **All-way Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	2	0	15.0%	0.6	1.9	A
	Through	450	297	66.0%	150.4	6.2	F
	Right Turn	60	36	60.2%	139.4	14.4	F
	Subtotal	512	333	65.1%	149.2	5.4	F
SB	Left Turn	200	112	56.0%	282.4	20.3	F
	Through	490	319	65.2%	269.0	19.4	F
	Right Turn	2	2	80.0%	16.3	51.6	C
	Subtotal	692	433	62.6%	272.5	12.5	F
EB	Left Turn	10	12	119.0%	19.0	10.0	C
	Through	20	22	110.5%	18.1	4.9	C
	Right Turn	20	18	91.5%	15.3	7.0	C
	Subtotal	50	52	104.6%	18.6	4.7	C
WB	Left Turn	110	88	79.5%	42.7	3.7	E
	Through	10	9	85.0%	51.5	6.2	F
	Right Turn	300	239	79.6%	41.8	2.3	E
	Subtotal	420	335	79.7%	42.3	1.8	E
Total		1,674	1,153	68.9%	158.7	3.5	F

Intersection 8 **Piedmont Ave/Bancroft Way** **All-way Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	110	54	49.4%	94.0	14.1	F
	Through	600	314	52.3%	93.0	10.8	F
	Right Turn						
	Subtotal	710	368	51.8%	93.1	11.3	F
SB	Left Turn						
	Through	560	352	62.9%	121.7	8.5	F
	Right Turn	170	109	64.3%	111.5	11.8	F
	Subtotal	730	461	63.2%	119.4	8.9	F
EB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		1,440	829	57.6%	107.3	8.0	F

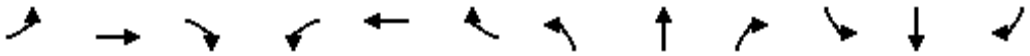
SimTraffic Post-Processor **BioEPIC Project Traffic Study**
Average Results from 10 Runs **2040 No Project**
Volume and Delay by Movement **PM Peak Hour**

Intersection 9 **Piedmont Ave/Durant Ave** **All-way Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	510	203	39.8%	220.1	21.7	F
	Right Turn						
	Subtotal	510	203	39.8%	220.1	21.7	F
SB	Left Turn						
	Through	560	356	63.6%	48.2	20.1	E
	Right Turn						
	Subtotal	560	356	63.6%	48.2	20.1	E
EB	Left Turn	170	166	97.5%	80.1	52.8	F
	Through						
	Right Turn	230	223	96.8%	21.2	10.6	C
	Subtotal	400	388	97.1%	46.3	25.1	E
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		1,470	948	64.5%	81.5	13.1	F

HCM 6th Signalized Intersection Summary
6: Gayley Rd/La Loma Ave & Hearst Ave

05/23/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	201	290	31	52	10	290	260	88	31	350	20
Future Volume (veh/h)	30	201	290	31	52	10	290	260	88	31	350	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.91		0.87	0.96		0.89	0.96		1.00	1.00		0.86
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1945	1945	1870	1870	1870
Adj Flow Rate, veh/h	31	207	299	32	54	10	299	268	0	32	361	21
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	93	532	439	279	479	89	441	334		92	924	52
Arrive On Green	0.32	0.32	0.32	0.32	0.32	0.32	0.57	0.57	0.00	0.57	0.57	0.57
Sat Flow, veh/h	132	1668	1379	858	1502	278	654	587	1648	76	1625	91
Grp Volume(v), veh/h	238	0	299	32	0	64	567	0	0	414	0	0
Grp Sat Flow(s),veh/h/ln	1800	0	1379	858	0	1780	1241	0	1648	1792	0	0
Q Serve(g_s), s	0.0	0.0	15.1	2.4	0.0	2.0	20.1	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	7.9	0.0	15.1	10.3	0.0	2.0	30.1	0.0	0.0	10.0	0.0	0.0
Prop In Lane	0.13		1.00	1.00		0.16	0.53		1.00	0.08		0.05
Lane Grp Cap(c), veh/h	636	0	439	279	0	568	782	0		1079	0	0
V/C Ratio(X)	0.37	0.00	0.68	0.11	0.00	0.11	0.72	0.00		0.38	0.00	0.00
Avail Cap(c_a), veh/h	636	0	439	279	0	568	782	0		1079	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	21.2	0.0	23.7	25.3	0.0	19.3	14.4	0.0	0.0	9.6	0.0	0.0
Incr Delay (d2), s/veh	1.7	0.0	8.2	0.8	0.0	0.4	5.8	0.0	0.0	1.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.7	0.0	5.8	0.6	0.0	0.9	8.6	0.0	0.0	3.9	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	22.9	0.0	32.0	26.1	0.0	19.7	20.2	0.0	0.0	10.6	0.0	0.0
LnGrp LOS	C	A	C	C	A	B	C	A		B	A	A
Approach Vol, veh/h		537			96			567	A		414	
Approach Delay, s/veh		27.9			21.8			20.2			10.6	
Approach LOS		C			C			C			B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		30.0		50.0		30.0		50.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		25.5		45.5		25.5		45.5				
Max Q Clear Time (g_c+I1), s		12.3		32.1		17.1		12.0				
Green Ext Time (p_c), s		0.3		4.0		1.8		3.1				

Intersection Summary		
HCM 6th Ctrl Delay		20.4
HCM 6th LOS		C

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Intersection 7 **Piedmont Ave/Stadium Rim Way** **All-way Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	3	2	53.3%	12.6	22.7	B
	Through	468	466	99.5%	55.2	25.5	F
	Right Turn	20	23	114.0%	48.9	22.6	E
	Subtotal	491	490	99.8%	54.9	25.4	F
SB	Left Turn	120	102	84.7%	117.1	26.5	F
	Through	601	502	83.5%	124.4	31.8	F
	Right Turn	2	2	80.0%	45.3	76.6	E
	Subtotal	723	605	83.7%	123.2	29.8	F
EB	Left Turn	10	10	100.0%	9.1	3.4	A
	Through	2	1	40.0%	1.6	3.3	A
	Right Turn	10	10	104.0%	8.6	6.5	A
	Subtotal	22	21	96.4%	8.3	2.4	A
WB	Left Turn	40	40	99.0%	14.1	4.7	B
	Through	3	2	66.7%	5.6	9.6	A
	Right Turn	190	185	97.3%	11.5	2.5	B
	Subtotal	233	226	97.2%	12.0	2.5	B
Total		1,469	1,343	91.4%	77.7	16.9	F

Intersection 8 **Piedmont Ave/Bancroft Way** **All-way Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	100	63	62.8%	61.8	10.9	F
	Through	628	457	72.8%	59.3	5.1	F
	Right Turn						
	Subtotal	728	520	71.4%	59.7	5.2	F
SB	Left Turn						
	Through	421	437	103.8%	46.2	13.4	E
	Right Turn	140	136	97.4%	36.5	14.4	E
	Subtotal	561	573	102.2%	43.9	13.6	E
EB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		1,289	1,093	84.8%	51.5	8.8	F

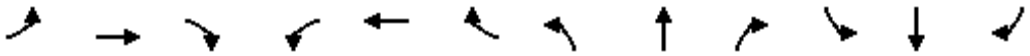
SimTraffic Post-Processor **BioEPIC Project Traffic Study**
Average Results from 10 Runs **2040 Plus Project**
Volume and Delay by Movement **AM Peak Hour**

Intersection 9 **Piedmont Ave/Durant Ave** **All-way Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	566	359	63.4%	119.3	12.2	F
	Right Turn						
	Subtotal	566	359	63.4%	119.3	12.2	F
SB	Left Turn						
	Through	421	445	105.7%	15.5	3.7	C
	Right Turn						
	Subtotal	421	445	105.7%	15.5	3.7	C
EB	Left Turn	172	166	96.7%	36.1	33.1	E
	Through						
	Right Turn	110	105	95.3%	6.3	1.4	A
	Subtotal	282	271	96.2%	23.1	15.9	C
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		1,269	1,075	84.7%	51.7	5.4	F

HCM 6th Signalized Intersection Summary
6: Gayley Rd/La Loma Ave & Hearst Ave

05/23/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	51	360	108	190	41	290	400	31	10	320	30
Future Volume (veh/h)	30	51	360	108	190	41	290	400	31	10	320	30
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.89		0.78	0.92		0.75	0.94		1.00	1.00		0.80
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1856	1856	1856	1856	1856	1856	1856	1930	1930	1856	1856	1856
Adj Flow Rate, veh/h	32	55	387	116	204	44	312	430	0	11	344	32
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	3	3	3
Cap, veh/h	173	267	394	267	447	96	377	427		59	908	83
Arrive On Green	0.33	0.32	0.32	0.32	0.32	0.32	0.57	0.56	0.00	0.57	0.56	0.56
Sat Flow, veh/h	334	829	1221	860	1386	299	554	764	1635	18	1624	148
Grp Volume(v), veh/h	87	0	387	116	0	248	742	0	0	387	0	0
Grp Sat Flow(s),veh/h/ln	1164	0	1221	860	0	1684	1318	0	1635	1789	0	0
Q Serve(g_s), s	0.4	0.0	23.9	9.5	0.0	8.9	33.3	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	9.2	0.0	23.9	18.7	0.0	8.9	42.5	0.0	0.0	9.2	0.0	0.0
Prop In Lane	0.37		1.00	1.00		0.18	0.42		1.00	0.03		0.08
Lane Grp Cap(c), veh/h	448	0	394	267	0	543	813	0		1061	0	0
V/C Ratio(X)	0.19	0.00	0.98	0.43	0.00	0.46	0.91	0.00		0.36	0.00	0.00
Avail Cap(c_a), veh/h	448	0	394	267	0	543	813	0		1061	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	18.4	0.0	25.5	28.1	0.0	20.5	17.3	0.0	0.0	9.4	0.0	0.0
Incr Delay (d2), s/veh	1.0	0.0	41.3	5.1	0.0	2.8	16.3	0.0	0.0	1.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	0.0	11.1	2.3	0.0	3.8	14.8	0.0	0.0	3.5	0.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	19.4	0.0	66.8	33.1	0.0	23.2	33.6	0.0	0.0	10.4	0.0	0.0
LnGrp LOS	B	A	E	C	A	C	C	A		B	A	A
Approach Vol, veh/h		474			364			742	A		387	
Approach Delay, s/veh		58.1			26.4			33.6			10.4	
Approach LOS		E			C			C			B	

Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		29.0		47.0		29.0		47.0				
Change Period (Y+Rc), s		4.5		4.5		4.5		4.5				
Max Green Setting (Gmax), s		24.5		42.5		24.5		42.5				
Max Q Clear Time (g_c+I1), s		20.7		44.5		25.9		11.2				
Green Ext Time (p_c), s		0.8		0.0		0.0		2.8				

Intersection Summary		
HCM 6th Ctrl Delay		33.6
HCM 6th LOS		C

Notes

Unsignalized Delay for [NBR] is excluded from calculations of the approach delay and intersection delay.

Intersection 7 **Piedmont Ave/Stadium Rim Way** **All-way Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	2	1	65.0%	32.8	56.5	D
	Through	451	297	65.8%	144.8	7.7	F
	Right Turn	60	43	70.8%	144.0	20.2	F
	Subtotal	513	340	66.4%	144.7	7.5	F
SB	Left Turn	200	107	53.5%	286.3	22.8	F
	Through	498	319	64.0%	272.4	22.6	F
	Right Turn	2	1	70.0%	149.9	189.3	F
	Subtotal	700	427	61.0%	276.7	17.7	F
EB	Left Turn	10	12	119.0%	22.3	9.1	C
	Through	20	19	95.5%	21.1	8.8	C
	Right Turn	20	22	109.0%	19.0	14.5	C
	Subtotal	50	53	105.6%	19.5	6.4	C
WB	Left Turn	110	88	80.0%	42.0	3.0	E
	Through	10	8	78.0%	49.6	11.4	E
	Right Turn	300	242	80.8%	40.7	3.5	E
	Subtotal	420	338	80.5%	41.4	3.1	E
Total		1,683	1,158	68.8%	156.2	6.1	F

Intersection 8 **Piedmont Ave/Bancroft Way** **All-way Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn	110	55	50.3%	97.0	13.2	F
	Through	601	311	51.7%	93.5	7.1	F
	Right Turn						
	Subtotal	711	366	51.5%	94.1	7.8	F
SB	Left Turn						
	Through	566	349	61.6%	125.5	11.3	F
	Right Turn	172	103	59.6%	103.4	6.4	F
	Subtotal	738	451	61.1%	121.2	10.1	F
EB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		1,449	818	56.4%	108.8	8.1	F

SimTraffic Post-Processor **BioEPIC Project Traffic Study**
Average Results from 10 Runs **2040 Plus Project**
Volume and Delay by Movement **PM Peak Hour**

Intersection 9 **Piedmont Ave/Durant Ave** **All-way Stop**

Direction	Movement	Demand Volume (vph)	Served Volume (vph) Average	Served Volume (vph) Percent	Total Delay (sec/veh) Average	Total Delay (sec/veh) Std. Dev.	LOS
NB	Left Turn						
	Through	511	204	39.9%	210.2	19.1	F
	Right Turn						
	Subtotal	511	204	39.9%	210.2	19.1	F
SB	Left Turn						
	Through	566	355	62.8%	51.4	18.1	F
	Right Turn						
	Subtotal	566	355	62.8%	51.4	18.1	F
EB	Left Turn	170	163	95.9%	97.7	55.8	F
	Through						
	Right Turn	230	225	97.6%	23.0	13.1	C
	Subtotal	400	388	96.9%	54.0	20.7	F
WB	Left Turn						
	Through						
	Right Turn						
	Subtotal						
Total		1,477	947	64.1%	85.1	12.5	F