4.3 Air Quality

This section analyzes the potential air quality impacts associated with construction and operation of the proposed 2021 LRDP, including from conflicts with applicable air quality plans, exceedance of air quality standards from criteria pollutant emissions, exposure of sensitive receptors to substantial pollutant concentrations, and odor emissions. The analysis in this section is based in part on modeling using the California Emissions Estimator Model (CalEEMod; modeling outputs included in Appendix C) and the *2021 Long Range Development Plan Programmatic Health Risk Assessment* (HRA; Appendix C).

4.3.1 Environmental Setting

Local Climate and Meteorology

The UCR campus is located in the South Coast Air Basin (SCAB), which encompasses an approximately 6,600-square-mile coastal plain, bounded by the San Gabriel, San Bernardino, and the San Jacinto Mountains to the north and east and the Pacific Ocean to the west and includes all of Orange County and the non-desert portions of Los Angeles, Riverside, and San Bernardino Counties, in addition to the San Gorgonio Pass area in Riverside County. The regional climate in the SCAB is semi-arid and characterized by warm summers, mild winters, infrequent seasonal rainfall, moderate daytime onshore breezes, and moderate humidity. Air quality in the SCAB is primarily influenced by meteorology and a wide range of emissions sources, such as dense population centers, substantial vehicular traffic, and industry.

Air pollutant emissions in the SCAB are generated primarily by stationary and mobile sources. Stationary sources can be divided into two major subcategories: point and area sources. Point sources occur at a specific location and are often identified by an exhaust vent or stack. Examples include boilers or combustion equipment that produce electricity or generate heat. Area sources are widely distributed and include such sources as residential and commercial water heaters, painting operations, lawn mowers, agricultural fields, landfills, and some consumer products. Mobile sources refer to emissions from motor vehicles, including tailpipe and evaporative emissions and are classified as either on-road or off-road. On-road sources may be legally operated on roadways and highways. Off-road sources include aircraft, ships, trains, and self-propelled construction equipment. Air pollutants can also be generated by the natural environment, such as when high winds suspend fine dust particles.

Air Quality Standards

The federal and State governments have established ambient air quality standards for the protection of public health. The United States Environmental Protection Agency (US EPA) is the federal agency designated to administer air quality regulation, while the California Air Resources Board (CARB) is the state equivalent in the California Environmental Protection Agency (Cal/EPA). County-level Air Pollution Control Districts (APCDs) provide local management of air quality. The South Coast Air Quality Management District (SCAQMD) is the designated air quality control agency in the SCAB. CARB has established air quality standards and is responsible for the control of mobile emission sources, while the local APCDs are responsible for enforcing standards and regulating stationary sources. CARB has established 14 air basins statewide.

The federal Clean Air Act (CAA) requires the US EPA to designate areas within the country as either attainment or nonattainment for each criteria pollutant based on whether the National Ambient Air Quality Standards (NAAQS) have been achieved. Similarly, the California CAA requires CARB to designate areas in California as either attainment or nonattainment for each criteria pollutant based on whether the California Ambient Air Quality Standards (CAAQS) have been achieved. If a pollutant concentration is lower than the State or federal standard, the area is classified as being in attainment for that pollutant. If a pollutant violates, or is above, the standard, the area is considered a nonattainment area.

The US EPA has set primary NAAQS for ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter 10 micrometers in diameter or less (PM_{10}), fine particulate matter 2.5 micrometers in diameter or less ($PM_{2.5}$), and lead (Pb). Primary standards are those levels of air quality deemed necessary, with an adequate margin of safety, to protect public health. In addition, California has established health-based ambient air quality standards for these and other pollutants, some of which are more stringent than the federal standards. Table 4.3-1 lists the current federal and State standards for regulated pollutants.

Table 4.3-1 Federal and State Ambient Air Quality Standards

Pollutant	Averaging Time	Federal Primary Standards	California Standard
Ozone	1-Hour	–	0.09 ppm
	8-Hour	0.070 ppm	0.070 ppm
Carbon Monoxide	8-Hour	9.0 ppm	9.0 ppm
	1-Hour	35.0 ppm	20.0 ppm
Nitrogen Dioxide	Annual	0.053 ppm	0.030 ppm
	1-Hour	0.100 ppm	0.18 ppm
Sulfur Dioxide	Annual	–	–
	24-Hour	–	0.04 ppm
	1-Hour	0.075 ppm	0.25 ppm
PM_{10}	Annual	–	20 µg/m^3
	24-Hour	150 µg/m^3	50 µg/m^3
$PM_{2.5}$	Annual	12 µg/m^3	12 µg/m^3
	24-Hour	35 µg/m^3	–
Lead	30-Day Average	–	1.5 µg/m^3
	3-Month Average	0.15 µg/m^3	–

ppm = parts per million

µg/m^3 = micrograms per cubic meter

PM_{10} = particulate matter 10 micrometers in diameter or less; $PM_{2.5}$= fine particulate matter 2.5 micrometers in diameter or less

Source: California Air Resource Board (CARB) 2016a

SCAB is designated nonattainment for the federal and State 1-hour and 8-hour O_3 standards, the State PM_{10} standard, the federal 24-hour $PM_{2.5}$ standard, and the State and federal annual $PM_{2.5}$ standard. SCAB is in attainment of all other federal and State standards.

Air Quality Pollutants of Primary Concern

The federal and State clean air acts mandate the control and reduction of certain air pollutants. Under these laws, US EPA and CARB have established ambient air quality standards for certain criteria pollutants. Ambient air pollutant concentrations are affected by the rates and distributions of corresponding air pollutant emissions and by the climate and topographic influences discussed above. Proximity to major sources is the primary determinant of concentrations of non-reactive pollutants, such as CO and suspended PM. Ambient CO levels usually follow the spatial and temporal distributions of vehicular traffic. A discussion of each primary criterion pollutant is provided below.

Ozone

O_3 is produced by a photochemical reaction (i.e., triggered by sunlight) between nitrogen oxides (NO_X) and reactive organic gases (ROG).[1] NO_X is formed during the combustion of fuels, while ROG is formed during combustion and evaporation of organic solvents. Because O_3 requires sunlight to form, it mostly occurs in substantial concentrations between the months of April and October. O_3 is a pungent, colorless, toxic gas with direct health effects on humans including respiratory and eye irritation and possible changes in lung functions, including constriction of the airways resulting in shortness of breath. Groups most sensitive to O_3 include children, the elderly, people with respiratory disorders, and people who exercise strenuously outdoors. O_3 can aggravate existing respiratory diseases such as asthma, bronchitis, and emphysema. Additional details and studies on health effects associated with O_3 are provided below under Impact AQ-2, *Health Consequences of Ozone and PM.*

Carbon Monoxide

CO is an odorless, colorless gas and can cause several health problems including fatigue, headache, confusion, and dizziness. When inhaled at high concentrations, CO combines with hemoglobin in the blood and reduces the oxygen-carrying capacity of the blood. This results in reduced oxygen reaching the brain, heart, and other body tissues. This condition is especially critical for people with cardiovascular diseases, chronic lung disease, or anemia.

The incomplete combustion of petroleum fuels in on-road vehicles and at power plants is a cause of CO. CO is also produced during the winter from wood stoves and fireplaces. CO tends to dissipate rapidly into the atmosphere; consequently, violations of the State CO standards are generally associated with major roadway intersections during peak-hour traffic conditions.

Localized CO “hotspots” can occur at intersections with heavy peak-hour traffic. Specifically, hotspots can be created at intersections where traffic levels are sufficiently high that the local CO concentration exceeds the NAAQS of 35.0 parts per million (ppm) or the CAAQS of 20.0 ppm.

[1] Organic compound precursors of O_3 are routinely described by a number of variations of three terms: hydrocarbons (HC), organic gases (OG), and organic compounds (OC). These terms are often modified by adjectives such as total, reactive, or volatile, and result in an array of acronyms: HC, THC (total hydrocarbons), RHC (reactive hydrocarbons), TOG (total organic gases), ROG (reactive organic gases), TOC (total organic compounds), ROC (reactive organic compounds), and VOC (volatile organic compounds). While most of these differ in some way from a chemical perspective, two groups are important from an air quality perspective: non-photochemically reactive in the lower atmosphere, or photochemically reactive in the lower atmosphere (HC, RHC, ROG, and VOC).

Nitrogen Dioxide

NO_2 is a by-product of fuel combustion, with the primary source being motor vehicles and industrial boilers and furnaces. Nitric oxide (NO) is the principal form of NO_X produced by combustion, but NO reacts rapidly to form NO_2, creating the mixture of NO and NO_2 commonly called NO_X. Aside from its contribution to O_3 formation, NO_2 can increase the risk of acute and chronic respiratory disease, is an irritant and can reduce visibility. A relationship between NO_2 and chronic pulmonary fibrosis may exist, and an increase in bronchitis may occur in young children at concentrations below 0.3 ppm. NO_2 absorbs blue light and causes a reddish-brown cast to the atmosphere and reduced visibility. It can also contribute to the formation of PM_{10} and acid rain.

Suspended Particulate Matter

PM_{10} is PM measuring 10 microns or less in diameter; $PM_{2.5}$ is fine PM measuring 2.5 microns in diameter or less. Suspended particulates are mostly dust particles, nitrates, and sulfates. Both PM_{10} and $PM_{2.5}$ are by-products of fuel combustion and wind erosion of soil and unpaved roads and are directly emitted into the atmosphere through these processes. Suspended particulates are also created in the atmosphere through chemical reactions. The characteristics, sources, and potential health effects associated with the small particulates (those between 2.5 and 10 microns in diameter) and fine particulates (those 2.5 microns and below) can be very different.

The small particulates generally come from windblown dust and dust kicked up by mobile sources. The fine particulates are generally associated with combustion processes and form in the atmosphere as a secondary pollutant through chemical reactions. Fine PM is more likely to penetrate deeply into the lungs and poses a health threat to all groups but particularly to the elderly, children, and those with respiratory problems. More than half of the small and fine PM inhaled into the lungs remains there. These materials can damage health by interfering with the body's mechanisms for clearing the respiratory tract or by acting as carriers of an absorbed toxic substance. Acute and chronic health effects associated with high particulate levels include the aggravation of chronic respiratory diseases, heart and lung disease, as well as coughing, bronchitis and respiratory illnesses in children. Recent mortality studies have shown an association between morbidity and mortality and daily concentrations of PM in the air.

Ultrafine particles are particles that are 0.1 micron or less in diameter. These particles have the potential to be more easily inhaled and can be deposited deeper into the lungs. Because of their size they can rapidly penetrate into lung tissue and other organs in the body. Ultrafine particles are associated with death from heart disease caused by blocked arteries. Additional details and studies on health effects associated with PM are provided below under Impact AQ-2, *Health Consequences of Ozone and PM.*

Toxic Air Contaminants

The California Health and Safety Code defines a toxic air contaminant (TAC) as "an air pollutant which may cause or contribute to an increase in mortality or in serious illness, or which may pose a present or potential hazard to human health." According to The California Almanac of Emissions and Air Quality (CARB 2009), the majority of the estimated health risk from TACs can be attributed to relatively few compounds, the most important being PM from diesel-fueled engines (diesel PM). Diesel PM differs from other TACs in that it is not a single substance but rather a complex mixture of hundreds of substances. Although diesel PM is emitted by diesel-fueled internal combustion engines, the composition of the emissions varies depending on engine type, operating conditions, fuel composition, lubricating oil, and whether an emission control system is present.

CARB has made preliminary concentration estimates based on a PM exposure method. This method uses the CARB emissions inventory's PM_{10} database, ambient PM_{10} monitoring data, and the results from several studies to estimate concentrations of diesel PM. In addition to diesel PM, the TACs for which data are available that pose the greatest existing ambient risk in California are benzene, 1,3-butadiene, acetaldehyde, carbon tetrachloride, hexavalent chromium, para-dichlorobenzene, formaldehyde, methylene chloride, and perchloroethylene.

According to CARB, diesel engine emissions are believed to be responsible for about 70 percent of California's estimated known cancer risk attributable to TACs and they make up about 8 percent of outdoor $PM_{2.5}$ (CARB 2016b).

Lead

Pb is a metal found in the environment and in manufacturing products. The major sources of Pb emissions historically have been mobile and industrial sources. In the early 1970s, the US EPA set national regulations to gradually reduce the Pb content in gasoline. In 1975, unleaded gasoline was introduced for motor vehicles equipped with catalytic converters. The US EPA completed the ban prohibiting the use of leaded gasoline in highway vehicles in December 1995. As a result of the US EPA's regulatory efforts to remove Pb from gasoline, atmospheric Pb concentrations have declined substantially over the past several decades. The most dramatic reductions in Pb emissions occurred prior to 1990 due to the removal of Pb from gasoline sold for most highway vehicles. Pb emissions were further reduced substantially between 1990 and 2008, with reductions occurring in the metals industries at least in part because of national emissions standards for hazardous air pollutants (US EPA 2013). Because of phasing out leaded gasoline, metal processing is now the primary source of Pb emissions. The highest level of Pb in the air is found generally near Pb smelters. Other stationary sources include waste incinerators, utilities, and Pb-acid battery manufacturers.

The SCAQMD has found that the highest stationary source emitter of Pb is from the lead-acid battery recycling industry, and this is the only known stationary source category that has the potential to violate the lead NAAQS (SCAQMD 2012). As the proposed project is a campus long range development plan that does not include a lead-acid battery recycling facility, the proposed project would not be a source of Pb that has the potential to exceed the NAAQS or pose a health issue to the local environment.

While lead-based paint (LBP) may currently exist on the property due to the age of the buildings, there are strict regulations in place the governs the handling of LBP during removal, including but not limited to the California Occupational Safety and Health Administration's (Cal/OSHA's) Construction Lead Standard, Title 8 California Code of Regulations (CCR) Section 1532.1 and Department of Health Services Regulation 17 CCR Sections 35001– 36100, as may be amended. These regulations have been implemented to reduce or eliminate the risk to nearby-sensitive receptors during demolition activities. Therefore, the removal of LBP would not pose a health concern for existing nearby sensitive receptors.

Pb has been well below regulatory thresholds for decades and is still below the regulatory thresholds for the project area. Construction related removal of LBP is regulated by existing laws to reduce or eliminate the risk to nearby receptors. Further, the proposed project is not an air-based source of Pb. Additionally, LBP removal occurs in the basin on a daily basis and has yet to result in an increase in the regional ambient air emissions for Pb to near or above the threshold. Therefore, implementation of the project will not result in an environmental impact with respect to Pb and therefore is not discussed further in this analysis.

Current Air Quality

The SCAQMD operates a network of air quality monitoring stations throughout the SCAB. The purpose of the monitoring stations is to measure ambient concentrations of pollutants and determine whether ambient air quality meets the California and federal standards. The monitoring station located closest to UCR is the Riverside-Rubidoux station, located at 5888 Mission Boulevard Riverside, California 92509, approximately 5.3 miles west of the campus and is considered representative of air quality at UCR. Table 4.3-2 indicates the number of days that each of the air quality standards have been exceeded at the Riverside-Rubidoux station.

Table 4.3-2 Ambient Air Quality at the Riverside-Rubidoux Monitoring Station

Pollutant	2017	2018	2019
8-Hour Ozone (ppm), 8-Hour Maximum	0.118	0.101	0.096
Number of Days of Federal Exceedances (>0.070 ppm)	81	53	59
Ozone (ppm), 1-Hour Maximum	0.145	0.123	0.123
Number of Days of State Exceedances (>0.09 ppm)	47	22	24
Number of Days of Federal Exceedances (>0.112 ppm)	2	0	0
Nitrogen Dioxide (ppb) - 1-Hour Maximum	63.0	55.4	56.0
Number of Days of State Exceedances (>0.18 ppm)	0	0	0
Number of Days of Federal Exceedances (0.10 ppm)	0	0	0
Particulate Matter 10 microns, $\mu g/m^3$, 24-Hour Maximum	92.0	86.5	132.5
Number of Days above Federal Standard (>150 $\mu g/m^3$)	0	0	0
Particulate Matter <2.5 microns, $\mu g/m^3$, 24-Hour Maximum	50.3	66.3	55.7
Number of Days above Federal Standard (>35 $\mu g/m^3$)	7	3	5

ppm = parts per million
ppb = parts per billion
$\mu g/m^3$ = micrograms per cubic meter
Source: CARB 2019a.

Despite the current nonattainment status and local air quality standard exceedances, air quality in the Basin has improved generally since the inception of air pollutant monitoring in 1976. This improvement is due mainly to lower-polluting on-road motor vehicles, more stringent regulation of industrial sources, and the implementation of emission reduction strategies by the SCAQMD. This trend toward cleaner air has occurred despite continued population growth.[2] As discussed in the 2012 Air Quality Management Plan (AQMP) for the SCAB as a whole (SCAQMD 2013):

> Despite this growth, air quality has improved significantly over the years, primarily due to the impacts of the region's air quality control program…PM_{10} levels have declined almost 50 percent since 1990, and $PM_{2.5}$ levels have also declined 50 percent since measurements began in 1999…the only air monitoring station that is currently exceeding or projected to exceed the 24-hour $PM_{2.5}$ standard from 2011 forward is the Mira Loma station in Western Riverside County.

[2] These trends are shown in greater detail on SCAQMD's website at: http://www.aqmd.gov/home/air-quality/historical-air-quality-data.

> Similar improvements are observed with O_3, although the rate of O_3 decline has slowed in recent years.[3]

As also discussed in the 2016 AQMP for the SCAB:

> Since the end of World War II, the Basin has experienced faster population growth than the rest of the nation. The annual average percent growth has slowed but the overall population of the region is expected to continue to increase through 2023 and beyond… Despite this population growth, air quality has improved significantly over the years, primarily due to the impacts of air quality control programs at the local, State and federal levels…$PM_{2.5}$ levels in the Basin have improved significantly in recent years. By 2013 and again in 2014 and 2015, there were no stations measuring $PM_{2.5}$ in the Basin violating the former 1997 annual $PM_{2.5}$ NAAQS (15.0 µg/m3) for the 3-year design value period with the filter-based federal reference method (FRM). On July 25, 2016, the US EPA finalized a determination that the Basin attained the 1997 annual (15.0 µg/m3) and 24-hour $PM_{2.5}$ (65 µg/m3) NAAQS, effective August 24, 2016.

As discussed in the 2016 AQMP, similar trends are anticipated generally to occur under future cumulative projections.

Sensitive Receptors

Ambient air quality standards have been established to represent the levels of air quality considered sufficient, with a margin of safety, to protect public health and welfare. They are designed to protect that segment of the public most susceptible to respiratory distress, such as children under 14, the elderly over 65, persons engaged in strenuous work or exercise, and people with cardiovascular and chronic respiratory diseases. Most sensitive receptor locations are, therefore, schools, hospitals, convalescent homes, and residences.

Residential areas are considered sensitive to poor air quality because people usually stay home for extended periods of time, with associated greater exposure to ambient air quality. Recreational uses also are considered sensitive due to the greater exposure to ambient air quality conditions because vigorous exercise associated with recreation places a high demand on the human respiratory system.

Sensitive uses located in the vicinity primarily include multi- and single-family residential uses. Specifically, the nearest residential developments are: (1) multi-family residential located directly north of the project site along Canyon Crest Drive (approximately 20 feet from campus boundary), (2) multi-family residences directly east across Blaine Street (approximately 120 feet from campus boundary), and (3) the residential community to the east, adjacent to Big Springs Road (approximately 120 feet from campus boundary). The nearest school is Islamic Academy of Riverside, approximately 16 feet west of campus boundary. These receptors are representative of the sensitive receptors within the project area and are focused on because they are the closest and, therefore, the most directly affected by proposed 2021 LRDP activities.

Emissions from Existing Uses

The UCR campus is composed of approximately 604 acres on the East Campus and approximately 504 acres on the West Campus. The total campus space is approximately 7,205,252 gsf, with

[3] 2012 Air Quality Management Plan for the South Coast Air Basin. (Introduction, pages 1-5; Available at: http://www.aqmd.gov/docs/default-source/clean-air-plans/air-quality-management-plans/2012-air-quality-management-plan/final-2012-aqmp-(february-2013)/main-document-final-2012.pdf

1,830,425 gsf of academics and research, 2,188,463 gsf of academic support, 2,813,945 gsf of student life, and 372,419 gsf of other facilities. These uses generate existing air quality emissions and are included in the regional monitoring station data.

4.3.2 Regulatory Setting

Federal

Clean Air Act

The US EPA is charged with implementing national air quality programs. US EPA's air quality mandates are drawn primarily from the federal CAA, passed in 1963 by the U.S. Congress and amended several times. The 1970 federal CAA amendments strengthened previous legislation and laid the foundation for the regulatory scheme of the 1970s and 1980s. In 1977, Congress again added several provisions, including nonattainment requirements for areas not meeting NAAQS and the Prevention of Significant Deterioration program. The 1990 federal CAA amendments represent the latest in a series of federal efforts to regulate air quality in the U.S. The federal CAA allows states to adopt more stringent standards or to include additional pollution species.

National Ambient Air Quality Standards

The federal CAA requires the US EPA to establish primary and secondary NAAQS for several criteria air pollutants. The air pollutants for which standards have been established are considered the most prevalent air pollutants known to be hazardous to human health. NAAQS have been established for O_3, CO, NO_2, SO_2, PM_{10}, $PM_{2.5}$, and Pb.

Construction Equipment Fuel Efficiency Standards

The US EPA sets emission standards for construction equipment. The first federal standards (Tier 1) were adopted in 1994 for all off-road engines over 50 horsepower and were phased in by 2000. A new standard was adopted in 1998 that introduced Tier 1 for all equipment below 50 horsepower and established the Tier 2 and Tier 3 standards. The Tier 2 and Tier 3 standards were phased in by 2008 for all equipment. The current iteration of emissions standards for construction equipment are the Tier 4 efficiency requirements are contained in 40 Code of Federal Regulations Parts 1039, 1065, and 1068 (originally adopted in 69 Federal Register 38958 [June 29, 2004], and most recently updated in 2014 [79 Federal Register 46356]). Emissions requirements for new off-road Tier 4 vehicles were completely phased in by the end of 2015.

CARB is also charged with developing air pollution control regulations based upon the best available control measures and implementing every feasible control measure under the State and federal CAA. (Health & Saf. Code, §§ 39602.5, 39667, 43013, subds. (a) and (h), 43018, 40600, 40601, 40612(a)(2) and (c)(1)(A). Pursuant to these directives, stringent emission standards were adopted in 2004 for off-road construction equipment (i.e., "Tier 4" standards) (40 Code of Federal Regulations Parts 1039, 1065, and 1068; Cal. Code Regs., tit. 13, § 2025; AR 2854). CARB also adopted emission standards for on-road heavy duty diesel vehicles (i.e., haul trucks). (Cal. Code Regs., tit. 13, § 1956.8.) These haul truck regulations mandate fleet turn-over to ensure that by January 1, 2023 nearly all on-road diesel trucks will have 2010 model year engines or equivalent [i.e., Tier 4]. In addition, interim steps are incorporated into the regulations (e.g., vehicles older than 1999 will be replaced with newer engines by 2020).

Corporate Average Fuel Economy Standards

The Corporate Average Fuel Economy (CAFE) standards are federal rules established by the National Highway Traffic Safety Administration (NHTSA) that set fuel economy and GHG emissions standards for all new passenger cars and light trucks sold in the U.S. It is, however, legally infeasible for individual municipalities to adopt more stringent fuel efficiency standards. The CAA (42 United States Code [USC] Section 7543[a]) states that "no state or any political subdivision therefore shall adopt or attempt to enforce any standard relating to the control of emissions from new motor vehicles or new motor vehicle engines subject to this part."

In October 2012, the US EPA and the NHTSA, on behalf of the Department of Transportation, issued final rules to further reduce GHG emissions and improve CAFE standards for light-duty vehicles for model years 2017 and beyond (77 Federal Register [FR] 62624). NHTSA's CAFE standards have been enacted under the Energy Policy and Conservation Act since 1978. This national program requires automobile manufacturers to build a single light-duty national fleet that meets all requirements under both federal programs and the standards of California and other states. This program would increase fuel economy to the equivalent of 54.5 miles per gallon limiting vehicle emissions to 163 grams of CO_2 per mile for the fleet of cars and light-duty trucks by model year 2025.

Safer Affordable Fuel-Efficient Vehicles Rule (Modification to the CAFE Standards)

On August 2, 2018, the NHTSA and US EPA, operating under the direction of the Trump Administration, proposed the Safer Affordable Fuel-Efficient Vehicles Rule (SAFE Rule). This rule addresses emissions and fuel economy standards for motor vehicles and is separated in two parts as described below.

- Part One, "One National Program" (84 FR 51310) revokes a waiver granted by the US EPA to the State of California under Section 209 of the CAA to enforce more stringent emission standards for motor vehicles than those required by US EPA for the explicit purpose of GHG reduction, and indirectly, criteria air pollutants and O_3 precursor emission reduction. This revocation became effective on November 26, 2019, potentially restricting the ability of CARB to enforce more stringent GHG emission standards for new vehicles and set zero emission vehicle mandates in California.
- Part Two addresses CAFE standards for passenger cars and light trucks for model years 2021 to 2026. This rulemaking proposes new CAFE standards for model years 2022 through 2026 and would amend existing CAFE standards for model year 2021. The proposal would retain the model year 2020 standards (specifically, the footprint target curves for passenger cars and light trucks) through model year 2026. The proposal addressing CAFE standards is being jointly developed by NHTSA and US EPA, with US EPA simultaneously proposing tailpipe CO_2 standards for the same vehicles covered by the same model years.

The US EPA and NTHSA published final rules to amend and establish national CO_2 and fuel economy standards on April 30, 2020 (Part Two of the SAFE Vehicles Rule) (85 FR 24174). California and 22 other states are currently challenging this new rule in the court system, and it is reasonably foreseeable that the State will be successful in its legal challenges, for the reasons outlined in the State's lawsuit (State of California 2019) and on the CARB website (CARB 2021). Furthermore, on January 20, 2021, President Biden signed an executive order directing the Government to revise fuel economy standards with the goal of further reducing emissions (White House 2021). In February 2021, the Biden Administration's Department of Justice also asked courts to put the litigation on hold while the administration "reconsidered the policy decisions of a prior administration." Most recently, on April 22, 2021, the Biden Administration proposed to formally roll back portions of the SAFE Rule thereby restoring California's right to enforce more stringent fuel efficiency standards.

It is, however, legally infeasible for individual agencies (in this case, the UC system) to adopt more stringent fuel efficiency standards for commuter vehicles. The CAA (42 United States Code [USC] Section 7543[a]) states that "no state or any political subdivision therefore shall adopt or attempt to enforce any standard relating to the control of emissions from new motor vehicles or new motor vehicle engines subject to this part." Therefore, UCR abides by federal and State transportation fuel efficiency standards related to commuter vehicles.

State

California Clean Air Act

The California CAA, signed into law in 1988, requires all areas of the State to achieve and maintain the CAAQS by the earliest practical date. CARB is the State air pollution control agency and is a part of Cal/EPA. CARB is the agency responsible for coordination and oversight of State and local air pollution control programs in California and for implementing the requirements of the California CAA. CARB overseas local district compliance with federal and California laws, approves local air quality plans, submits the State implementation plans to the US EPA, monitors air quality, determines and updates area designations and maps, and sets emissions standards for new mobile sources, consumer products, small utility engines, off-road vehicles, and fuels.

California Ambient Air Quality Standards

The California CAA requires CARB to establish CAAQS. Similar to the NAAQS, CAAQS have been established for O_3, CO, NO_2, SO_2, PM_{10}, $PM_{2.5}$, Pb, vinyl chloride, hydrogen sulfide, sulfates, and visibility-reducing particulates. In most cases, the CAAQS are more stringent than the NAAQS. The California CAA requires all local air districts to endeavor to achieve and maintain the CAAQS by the earliest practical date. The California CAA specifies that local air districts should focus attention on reducing the emissions from transportation and area-wide emission sources and provides districts with the authority to regulate indirect sources.

Toxic Air Contaminants

A TAC is a substance CARB has determined to have the potential to cause serious health effects. TACs tend to be localized and are found in relatively low concentrations in ambient air; however, exposure to low concentrations over long periods can result in increased risk of cancer and/or adverse health effects.

The State of California has taken regulatory action to identify, evaluate, and control the harmful effects of TACs through the California Air Toxics Program, which establishes the process for the identification and control of TACs and includes provisions to make the public aware of significant toxic exposures and for reducing risk. The California Air Toxics Program is implemented by CARB and shaped by multiple key pieces of legislation originating in the 1980s.

In 1983, the California Legislature enacted a program to identify the health effects of TACs and to reduce exposure to these contaminants to protect the public health (Assembly Bill [AB] 1807: Health and Safety Code Sections 39650–39674). The Legislature established a two-step process to address the potential health effects from TACs. The first step is the risk assessment (or identification) phase. The second step is the risk management (or control) phase of the process.

Additionally, the Air Toxics "Hot Spots" Information and Assessment Act (AB 2588, Connelly Bill) was enacted in 1987 and requires stationary sources to report the types and quantities of certain substances routinely released into the air. The goals of the Air Toxics "Hot Spots" Act are to collect emission data, identify facilities having localized impacts, ascertain health risks, notify nearby residents of significant risks, and reduce those significant risks to acceptable levels. The Children's Environmental Health Protection Act, California Senate Bill 25 (Chapter 731, Escutia, Statutes of 1999), focuses on children's exposure to air pollutants. The act requires CARB to review its air quality standards from a children's health perspective, evaluate the statewide air quality monitoring network, and develop any additional air toxic control measures needed to protect children's health.

Fuel Economy Standards

PAVLEY I AND II

AB 1493 (known as Pavley I) provided the nation's first GHG standards for automobiles. AB 1493 required CARB to adopt vehicle standards that will lower GHG emissions from new light-duty autos to the maximum extent feasible beginning in 2009. Additional strengthening of the Pavley standards (referred to previously as Pavley II and now referred to as the Advanced Clean Cars [ACC] measure) was adopted for vehicle model years 2017–2025 in 2012.

The SAFE Vehicle Rule Part One (discussed above) revokes California's authority to set its own GHG emissions standards and establish zero-emission vehicle (ZEV) mandates in California, which affects some of the underlying assumptions in CARB's EMission FACtors (EMFAC) models. As noted above under "Federal Regulations," this revocation has been challenged by the State of California and is being reconsidered by the Biden Administration. To account for the effects of the Part One Rule, CARB released off-model adjustment factors on November 20, 2019 to adjust criteria air pollutant emissions outputs from the EMFAC model (CARB 2019b). These off-model adjustment factors are to be applied by multiplying the emissions calculated for light- and medium-duty vehicles by the adjustment factor. With the incorporation of these adjustment factors, operational emissions generated by light-duty automobiles, light-duty trucks, and medium-duty trucks associated with project-related vehicle trips at the year 2040 would be approximately 0.5 percent greater for ROG, 1.4 percent greater for PM, 0.5 percent greater for NO_X, and 1.6 percent greater for CO.

LOW CARBON FUEL STANDARD

The Low Carbon Fuel Standard (LCFS) mandates a statewide goal be established to reduce the carbon intensity of California's transportation fuels by at least 10 percent by 2020. In September 2018, the LCFS regulation was amended to increase the statewide goal to a 20 percent reduction in carbon intensity of California's transportation fuels by at least by 2030. Note that while the LCFS regulation was amended and extended to ensure compliance with the 2030 Scoping Plan, CARB ultimately adopted a more stringent target (20 percent reduction in carbon intensity by 2030) than assumed in the 2030 Scoping Plan (18 percent reduction in carbon intensity by 2030). Therefore, future updates to the Scoping Plan are likely to include the more stringent version of the LCFS that was adopted by CARB. Note that the majority of the emissions benefits due to the LCFS come from the production cycle (upstream emissions) of the fuel rather than the combustion cycle (tailpipe).

Executive Order B-48-18: Zero-Emission Vehicles

On January 26, 2018, Governor Brown signed Executive Order B-48-18 requiring all State entities to work with the private sector to have at least 5 million ZEVs on the road by 2030, as well as install

200 hydrogen fueling stations and 250,000 electric vehicle charging stations by 2025. It specifies that 10,000 of the EV charging stations should be direct current fast chargers. This order also requires all State entities to continue to partner with local and regional governments to streamline the installation of ZEV infrastructure. The Governor's Office of Business and Economic Development is required to publish a Plug-in Charging Station Design Guidebook. All State entities are required to participate in updating the 2016 ZEV Action Plan, along with the 2018 ZEV Action Plan Priorities Update, which includes and extends the 2016 ZEV Action Plan (Governor's Interagency Working Group on Zero-Emission Vehicles 2016, 2018), to help expand private investment in ZEV infrastructure with a focus on serving low-income and disadvantaged communities. The Governor's Office of Business and Economic Development updated the *Hydrogen Station Permitting Guidebook* with the second edition in September 2020 (Eckerle and Vacin 2020).

Executive Order N-79-20

Governor Gavin Newsom signed Executive Order N-79-20 in September 2020, which sets a statewide goal that 100 percent of all new passenger car and truck sales in the State will be zero-emissions by 2035. It also sets a goal that 100 percent of statewide new sales of medium- and heavy-duty vehicles will be zero emissions by 2045, where feasible, and for all new sales of drayage trucks to be zero emissions by 2035. Additionally, the Executive Order targets 100 percent of new off-road vehicle sales in the State to be zero-emission by 2035. CARB is responsible for implementing the new vehicle sales regulation.

University of California

UC Policy on Sustainable Practices

At the direction of the Regents of the UC, the UC Office of the President (UCOP) developed a Sustainable Practices Policy which establishes sustainability goals to be achieved by all campuses, medical centers, and the Lawrence Berkeley National Laboratory in the UC system. The policy is regularly updated, with the most recent update occurring in July 2020. The policy goals encompass nine areas of sustainable practices: green building, clean energy, transportation, climate protection, sustainable operations, waste reduction and recycling, environmentally preferable purchasing, sustainable foodservice, and sustainable water systems (UCOP 2020). The policy includes the following provisions relevant to the air quality emissions reductions, primarily via zero-emission transportation policies. Energy efficiency policies are relevant to air quality in so far as they reduce emissions from the combustion of natural gas and other on-site combustible fuels:

- **Green Building Design**
  - All new buildings projects, other than acute care facilities, shall be designed, constructed, and commissioned to outperform the California Building Code (Title 24 portion of the California Code of Regulations) energy efficiency standards by at least 20 percent or achieve energy performance targets, related to 1999 benchmarks, shown in Table 1 of Section V.A.3 of the policy.
  - All new buildings will strive to achieve certification of U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) "Gold" and achieve a minimum of LEED "Silver" certification, whenever possible within the constraints of program needs and standard budget parameters.

- **Sustainable Transportation**
  - By 2025, ZEVs or hybrid vehicles shall account for at least 50 percent of all new light-duty vehicle acquisitions.
  - By 2025, each location shall strive to reduce its percentage of employees and students commuting by single-occupant vehicle (SOV) by 10 percent relative to its 2015 SOV commute rates.
  - By 2050, each location shall strive to have no more 40 percent of its employees and no more than 30 percent of all employees and students commuting to the location by SOV.
  - By 2025, each location shall strive to have at least 4.5 percent of commuter vehicles be ZEV.
  - By 2050, each location shall strive to have at least 30 percent of commuter vehicles be ZEV.
- **Sustainable Building Operations for Campuses**
  - Each campus shall seek to certify as many existing buildings as possible through the "LEED for Operations and Maintenance" rating system, within budgetary constraints and eligibility limitations.
  - All new buildings will achieve a USGBC LEED "Silver" certification at a minimum. All new buildings will strive to achieve certification at a USGBC LEED "Gold" rating or higher, whenever possible within the constraints of program needs and standard budget parameters.
  - The UC will design, construct, and commission new laboratory buildings to achieve a minimum of LEED "Silver" certification as well as meeting at least the prerequisites of the Laboratories for the 21st Century (Labs21) Environmental Performance Criteria (EPC). Laboratory spaces in new buildings also shall meet at least the prerequisites of Labs21 EPC. Design, construction, and commissioning processes shall strive to optimize the energy efficiency of systems not addressed by the California Energy Code energy efficiency standards.
  - No new building or major renovation that is approved after June 30, 2019 shall use on-site fossil fuel combustion (e.g., natural gas) for space and water heating (except those projects connected to an existing campus central thermal infrastructure). Projects unable to meet this requirement shall document the rationale for this decision, as described in Section V.A.4 of the UC Policy on Sustainable Practices.
- **Clean Energy**
  - Energy Efficiency: Each location will implement energy efficiency actions in buildings and infrastructure systems to reduce the location's energy use intensity by an average of least 2 percent annually.
  - On-campus Renewable Electricity: Campuses and health locations will install additional on-site renewable electricity supplies and energy storage systems whenever cost-effective and/or supportive of the location's Climate Action Plan or other goals.
  - Off-campus Clean Electricity: By 2025, each campus and health location will obtain 100 percent clean electricity.
  - On-campus Combustion: By 2025, at least 40 percent of the natural gas combusted on-site at each campus and health location will be biogas.

University of California, Riverside

UCR Campus Standards

The current UCR *Campus Standards* that specifically relate to air quality and sustainability include the following: Section 1, subsection 1.5(C) – Permits and Plan Checking. SCAQMD "permit to construct" is required for air pollution control devices and combustion sources.

Section 1, subsection 1.30(A) - (C) – UC Policy on Green Building Design.

A. UCR by UC policy shall incorporate the principles of energy efficiency and sustainability in all capital projects within budgetary constraints and programmatic requirements. UCR's minimum requirement is to attain USGBC LEED "certified" rating and strives to achieve "Silver" certification whenever possible (based bid LEED certification level required for project is described in specification section 01 8113, Sustainable Design Requirements).
B. Prerequisites requirements from the LEED program must be incorporated into each project, as applicable.
C. Provide areas dedicated to recycling as required by Materials & Resources prerequisite MRp1: Storage & Collection of Recyclables Required.

Section 3, subsection 1.10(A) - (B) – Sustainability.

A. All University projects, including major renovations, shall attempt to meet and exceed the requirements of *Materials and Resources Credit 4 – Recycled Content* and *Credit 5 – Regional Materials* under the current LEED rating system for this material. Generally, the use of cement substitutes and additives in the concrete design that promote the use of recycled materials, such as fly ash and slag shall be considered. Concrete materials and products should be extracted, recovered, and manufactured within 500 miles of University.
B. Sustainable Materials, Products and Equipment.
    1. Specify materials, products and equipment with the following attributes where they meet the performance goals needed for the project:
        a. Materials, products and equipment that have an inherent ability to serve their function with minimal maintenance.
        b. Materials, products or equipment that can be removed and re-used when they are no longer needed for the project.
        c. Materials, products or equipment that create no or minimal health risks to the people who occupy, construct and maintain the project.
        d. Materials, products or equipment that have significant post-industrial and post-consumer recycled content.
        e. Local/regional materials and equipment manufactured or having final assembly at a facility within 500 miles of the Project.
        f. Certified wood from manufacturers declaring conformance with Forest Stewardship Council Guidelines for certified wood building components.

Section 6, subsection 1.11(E) – Adhesives. Type I, complying with SCAQMD Rule 1168.

Section 6, subsection 1.11(F) – Adhesive for Bonding Plastic Laminate. Type I, specific formulation as recommended by manufacturer for application.

1. Adhesives applied on-site shall comply with SCAQMD Rule 1168.

Section 7, subsection 1.9(A) – Detail all special conditions. All materials used shall be top-of-the-line available suited for the conditions being sealed and in compliance with the VOC requirements listed in the *Campus Standards*.

Section 23, subsection 1.1(E) – Campus Heating and Cooling Overview. Chlorofluorocarbon (CFC) and Hydro chlorofluorocarbon (HCFC) refrigerants shall not be used for any new HVAC equipment on campus. Any existing buildings being renovated and which contain CFC refrigerant shall have the refrigeration system changed to a newer non-CFC and HCFC refrigerant. UCR Environmental Health & Safety Ozone Depleting Substances (ODS)/Refrigerant Emissions Program facilitates compliance with the SCAQMD and the US EPA regulations, which apply to stratospheric ODSs, such as CFCs and HCFCs used in stationary and motor vehicle refrigeration and air conditioning systems.

Section 23, subsection 1.2(S)(3) – HVAC Design Criteria. Outside air brought into a building for ventilation and indoor air quality shall conform to the latest edition of ASHRAE Standard (ANSI/ASHRAE Std. 62.1) and/or California Energy Code for Ventilation for Acceptable Indoor Air Quality as stated in the *Campus Standards*.

Section 32, subsection 2.5(A) – Local/Regional Materials. Use materials or products extracted, harvested, or recovered, as well as manufactured, within a 500-mile radius from the project site, if available. Submit documentation indicating distance between manufacturing facility and the project site. Indicate distance of raw material origin from the project site.

UCR Transportation Demand Management

UCR's Transportation Demand Management (TDM) programs include multi-pronged efforts such as marketing, incentives, expanded vanpool offerings, on- and near-campus housing amenities, parking pricing, and more. UCR encourages students to use designated bike paths to commute to and travel within the campus. Registered bicyclists or walkers are eligible to receive a complimentary bicycle parking allotment and are eligible to utilize the day-use locker and shower facilities at the SRC without charge (UCR 20210). UCR has also encouraged ride-sharing services, and the average vehicle ridership has increased from approximately 1.36 to 1.57 occupants per vehicle over the last 15 years.

Regional and Local (Binding)

SCAQMD Air Quality Management Plan

The SCAQMD's AQMP is regularly updated, and each update has a 20-year horizon. The 2016 AQMP was adopted on March 3, 2017 and incorporated new scientific data and notable regulatory actions that have come about since adoption of the 2012 AQMP, including the approval of the new federal 8-hour O_3 standard of 0.070 ppm that was finalized in 2015 (SCAQMD 2017).

The 2016 AQMP addresses several federal and State planning requirements and incorporates new scientific information, primarily in the form of updated emissions inventories, ambient measurements, and updated meteorological air quality models. The 2016 AQMP builds upon the approaches taken in the 2012 AQMP for the attainment of federal PM and O_3 standards and highlights the significant reductions to be achieved. It emphasizes the need for interagency planning to identify strategies to achieve reductions in the timeframes allowed under the federal CAA, especially with mobile sources. The 2016 AQMP also includes a discussion of emerging issues and opportunities, such as fugitive toxic particulate emissions, zero-emission mobile source control strategies, and the interacting dynamics among climate, energy, and air pollution. The AQMP includes attainment demonstrations of the new federal 8-hour O_3 standard and vehicle miles traveled emissions offsets, according to recent US EPA requirements.

SCAQMD Rules and Regulations

All projects are subject to SCAQMD rules and regulations in effect at the time of construction. Specific rules applicable to the proposed project would include the following[4] (additional SCAQMD rules relevant to other resource areas are described in other chapters of this Draft EIR):

RULE 53 – SPECIFIC AIR CONTAMINANTS (RIVERSIDE COUNTY)

For sulfur compounds, a person shall not discharge into the atmosphere from any single source within the following areas of Riverside County, sulfur compounds in any state or combination thereof, in excess of the following concentrations at the point of discharge: (1) In the west-central area, 0.05 percent by volume calculated as sulfur dioxide (SO_2); (2) In all portions of Riverside County not within the west-central area, 0.15 percent by volume calculated as sulfur dioxide (SO_2). For fluorine compounds, emission shall be controlled to the maximum degree technically feasible in respect to the process or operation causing such emission, but no emission shall be permissible which may cause injury to the property of others.

RULE 401 – VISIBLE EMISSIONS

A person shall not discharge into the atmosphere from any single source of emission whatsoever any air contaminant for a period or periods aggregating more than 3 minutes in any 1 hour that is as dark or darker in shade as that designated No. 1 on the Ringelmann Chart, as published by the United States Bureau of Mines; or of such opacity as to obscure an observer's view to a degree equal to or greater than does smoke described in the rule.

RULE 402 – NUISANCE

A person shall not discharge from any source whatsoever such quantities of air contaminants or other material that cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or that endanger the comfort, repose, health, or safety of any such persons or the public, or that cause, or have a natural tendency to cause, injury or damage to business or property. The provisions of this rule do not apply to odors emanating from agricultural operations necessary for the growing of crops or the raising of fowl or animals.

RULE 403 – FUGITIVE DUST

This rule is intended to reduce the amount of PM entrained in the ambient air as a result of anthropogenic (human-made) fugitive dust sources by requiring actions to prevent, reduce, or mitigate fugitive dust emissions. Rule 403 applies to any activity or human-made condition capable of generating fugitive dust and identifies measures to reduce fugitive dust. This includes soil treatment for exposed soil areas. Treatment shall include, but not necessarily be limited to, periodic watering, application of environmentally safe, non-toxic soil stabilization materials, and/or roll

[4] Rule 53 can be found here: http://www.aqmd.gov/docs/default-source/rule-book/rule-iv/reg-iv-addendum.pdf?sfvrsn=6; Rules 401, 402, 403, 475 can be found here: http://www.aqmd.gov/home/regulations/rules/scaqmd-rule-book/regulation-iv; Rule 1113 can be found here: http://www.aqmd.gov/home/regulations/rules/scaqmd-rule-book/regulation-xi.

compaction as appropriate. As indicated in SCAQMD's guidance they are "increasing reliance on non-toxic chemical dust suppressants to stabilize soils" (SCAQMD 2014).

RULE 473 – DISPOSAL OF SOLID AND LIQUID WASTES

A person shall not burn any combustible refuse in any incinerator except in a multiple-chamber incinerator or in equipment found by the Air Pollution Control Officer to be equally effective for the purpose of air pollution control. A person is also prohibited from discharging into the atmosphere from any incinerator or other equipment except as allowed by the rule.

RULE 475 – ELECTRIC POWER GENERATING EQUIPMENT

A person shall not discharge into the atmosphere from any equipment having a maximum rating of more than 10 net megawatts used to produce electric power, for which a permit to build, erect, install or expand is required after May 7, 1976, air contaminants that exceed the provisions in the rule.

RULE 1113 – ARCHITECTURAL COATINGS

No person shall apply or solicit the application of any architectural coating (e.g., paint) within the SCAQMD with volatile organic compounds (VOC) content in excess of the values specified in a table incorporated in the rule.

RULE 1403 – ASBESTOS EMISSIONS FROM DEMOLITION/RENOVATION ACTIVITIES

This rule governs work practice requirements for asbestos in all renovation and demolition activities. The purpose of the rule is to protect the health and safety of the public by limiting dangerous emissions from the removal and associated disturbance of asbestos-containing materials (ACM). Rule 1403 applies to owners and operators of any demolition or renovation activity, and the associated disturbance of asbestos-containing material, any asbestos storage facility, or any active waste disposal site. These regulations require testing of any facility being demolished or renovated for the presence of all friable and Class I and II non-friable ACM. They also establish notification procedures, removal procedures, handling operations, and warning label requirements. Approved procedures for ACM removal to protect surrounding uses include HEPA filtration, the glovebag method, wetting, and some methods of dry removal.

Southern California Association of Governments

The Southern California Association of Governments (SCAG) is a regional planning agency that serves as a forum for regional issues relating to transportation, economics, community development, and environmental issues. SCAG is not an air quality management agency, but it is responsible for development of transportation, land use, and energy conservation measures that impact air quality. SCAG's Regional Comprehensive Plan and Guide provide growth forecasts used by SCAQMD to develop air quality and land use strategies (SCAG 2008). SCAG is charged with developing and implementing Senate Bill 375, a measure that addresses GHG reduction in the State, with participation from Riverside County and the other cities and counties that make up SCAG.

Regional and Local (Non-Binding)

As noted in Section 4, "University of California Autonomy," UCR, a constitutionally created State entity, is not subject to municipal regulations of surrounding local governments for uses on property owned or controlled by UCR that are in furtherance of the university's educational purposes.

However, UCR may consider, for coordination purposes, aspects of local plans and policies of the communities surrounding the campus when it is appropriate and feasible, but not bound by those plans and policies in its planning efforts.

City of Riverside General Plan

The City of Riverside's (City's) General Plan Air Quality element includes objectives and policies that help reduce air quality impacts. These objectives and policies include general measures to reduce transportation-related air quality emissions and to consider sensitive receptors in placement of land uses.

4.3.3 Environmental Impacts and Mitigation Measures

Significance Criteria

UCR utilizes the following 2020 CEQA Guidelines Appendix G significance criteria questions related to Air Quality.

Would the proposed 2021 LRDP:

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

b) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment 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?

Issues Not Evaluated Further

Other Emissions such as Odors (Criterion d)

The Initial Study for the 2021 LRDP (Appendix A) determined that there would be a less than significant impact related to other emissions, such as odors, adversely affecting a substantial number of people. This topic is not evaluated further in this section.

Analysis Methodology

Criteria pollutant and GHG emissions for project construction and operation were calculated using the CalEEMod, Version 2016.3.2. CalEEMod is a statewide land use emissions computer model designed to provide a uniform platform for government agencies, land use planners, and environmental professionals to quantify potential criteria pollutant and GHG emissions associated with both construction and operations from a variety of land use projects. The model was developed by BREEZE Software for the California Air Pollution Control Officers Association (CAPCOA) in collaboration with the California air districts. CalEEMod allows for the use of standardized data (e.g., emission factors, trip lengths, meteorology, source inventory) provided by the various California air districts to account for local requirements and conditions, and/or user-defined inputs. The model calculates criteria pollutant emissions and GHGs emissions, reported as CO_2e (discussed further in Section 4.8, *Greenhouse Gas Emissions*). The calculation methodology and input data used in CalEEMod can be found in the CalEEMod User's Guide Appendices A, D, and E (CAPCOA 2017). The input data and subsequent construction and operation emission estimates for the project are detailed in the following discussion. CalEEMod output files (which include a list of model inputs) for the project are included in Appendix C of the EIR.

For analysis of Impact AQ-1, a project would be inconsistent with the AQMP if it would generate population, housing, or employment growth exceeding forecasts used in the development of the AQMP.

Construction Emissions

Project construction would primarily generate temporary criteria pollutant and GHG emissions from construction equipment operation on-site, construction worker vehicle trips to and from the site, and from export of materials off-site. Construction input data for CalEEMod include but are not limited to: (1) the anticipated start and finish dates of construction activity; (2) inventories of construction equipment to be used; (3) areas to be excavated and graded; and (4) volumes of materials to be exported from and imported to the project site. The analysis assessed maximum daily emissions from individual construction activities, including demolition and site preparation, grading, building construction, paving, and architectural coating. Construction equipment estimates are based on surveys of construction projects within California conducted by members of CAPCOA (CAPCOA 2017). Modeling accounted for SCAQMD Rule 403 with the assumption of watering (or soil stabilizers) twice daily to control fugitive dust emissions. Diesel welders were removed from CalEEMod default construction list for building construction because they would not be anticipated to be used in construction; instead, electric welders are more common in modern construction and these would be covered by a generator set during the building construction phase.

In contract documents with contractors, UCR requires the design builder/contractor to implement Tier 4 engines for 75 percent of the off-road diesel-powered construction equipment that is 50 horsepower or larger. In addition, as construction equipment fleet turnover continues to occur, the base amount of Tier 4 engines in a contractor’s fleet will increase. Construction modeling conservatively assumed only 75 percent of construction equipment would use Tier 4 engines.

CONSTRUCTION TIMELINE

Although the exact timeline of 2021 LRDP buildout is unknown at this stage of planning, for a conservative analysis, it was assumed that the largest amount of construction would occur during the first year of LRDP buildout at 700,000 gsf (approximately 13 percent of total construction of approximately 5.5 million gsf). This number was determined because historically the campus has developed at a much lower number than 700,000 gsf per year, with only the most intensive years approaching this number. The remaining years were analyzed at 367,258 gsf per year (approximately 7 percent of total construction per year). It is conservative to assume construction would be front-loaded into the first year out of 14 years of proposed 2021 LRDP development, since in CalEEMod emissions from equipment are higher in earlier years (i.e., CalEEMod assumes advancements in engine technology and turnover in the equipment fleet that results in lower estimated emission levels in future years).

DEMOLITION

Demolition assumptions were based upon the demolition assumptions used in the project’s GHG emissions analysis (Appendix G), which assumed 885,279 total gsf to be demolished during the LRDP. This was inputted into the model for each scenario by estimating 13 percent of the demolished gsf would occur for the 2022 scenario, and 7 percent of the demolished gsf would occur per year for the 2023-2035 scenario. This factored in the smaller size(s) of existing buildings (i.e., fewer floors, less assignable square footage) than proposed buildings, as well as sites where no demolition would occur.

SOIL MOVEMENT

The amount of import and export of soil for each scenario was estimated by assuming a 20-foot cut depth for 25 percent of the proposed gsf, and then assuming 50 percent of that soil would be exported, and 50 percent imported. This is considered a reasonable assumption because a depth of 20 foot is a reasonable depth for a multi-story building, and as most buildings would be multi-story, the sf for the cut would be a fraction of the total building gsf.

BUILDING CONSTRUCTION

Table 4.3-3 details the assigned land uses for proposed 2021 LRDP facilities based on CalEEMod User Guide.

Table 4.3-3 Proposed 2021 LRDP Facility Types per CalEEMod User Guide

Project Description	CalEEMod Land Use Designation	2022 Scenario Square Footage (gsf)	2023-2035 Scenario Annual Square Footage (gsf)
Academics & Research	Research & Development	82,644	43,361
Academic Support	General Office Building	171,896	90,188
Student Life Facilities	Mid-Rise Apartments	432,963	227,162
Indoor Recreation	Health Club	12,498	6,557
Totals		700,000	367,268

It should be noted that the sequencing and phasing of proposed construction is only a prediction and is ultimately subject to funding, demand, etc. Project-specific information used in model assumptions is based on information at this stage of planning. The analysis is presented as a conservative scenario of potential project impacts given available information. It is possible that later LRDP years include a higher development intensity than earlier years; however, by performing the analysis where higher development intensities occur in earlier years, the emissions estimates are conservative given construction fleet turnover and increasing fuel efficiency.

CalEEMod has the capability to calculate reductions in construction emissions from the effects of dust control, diesel-engine classifications, and other selected emissions reduction measures. Emissions calculations assume application of water during grading (or soil stabilizers) and a 15-mph speed limit on unpaved surfaces in compliance with SCAQMD Rule 403, Fugitive Dust (as detailed above in Section 4.3.2), and use of architectural coatings with a VOC content of 50 grams/liter (g/L) in compliance with SCAQMD Rule 1113 (as detailed above in Section 4.3.2). Based on CalEEMod version 2016.3.2, the PM_{10} and $PM_{2.5}$ reduction for watering two times per day is 55 percent.

Operational Emissions

Operational sources of criteria pollutant emissions include area, energy, and mobile sources. These sources are described below.

ENERGY SOURCES

Emissions from energy use that generate criteria pollutant emissions include natural gas use. The emissions factors for natural gas combustion are based on US EPA's AP-42 (*Compilation of Air*

Pollutant Emissions Factors) and California Climate Action Registry (CCAR) General Reporting Protocol (CCAR 2009). Electricity emissions only apply to GHG emissions (as discussed in Section 4.8, *Greenhouse Gas Emissions*, of this EIR) as the energy is generated off-site and therefore may not be relevant for local and regional air quality conditions.

AREA SOURCES

Emissions associated with area sources, including space and water heating, consumer products, landscape maintenance, and architectural coating were calculated in CalEEMod and utilize standard emission rates from CARB, US EPA, and emission factor values provided by the local air district (CAPCOA 2017).

MOBILE SOURCES

Mobile source emissions are generated by the increase in vehicle trips to and from the project site associated with operation of onsite development. Trip rates were adjusted in CalEEMod to account for the project-generated vehicle miles traveled as determined by the Transportation analysis (Section 4.15) and GHG Supporting Information (Appendix G). Modeling conservatively did not assume emissions reductions from UCR vehicles in accordance with Executive Order B-48-18.

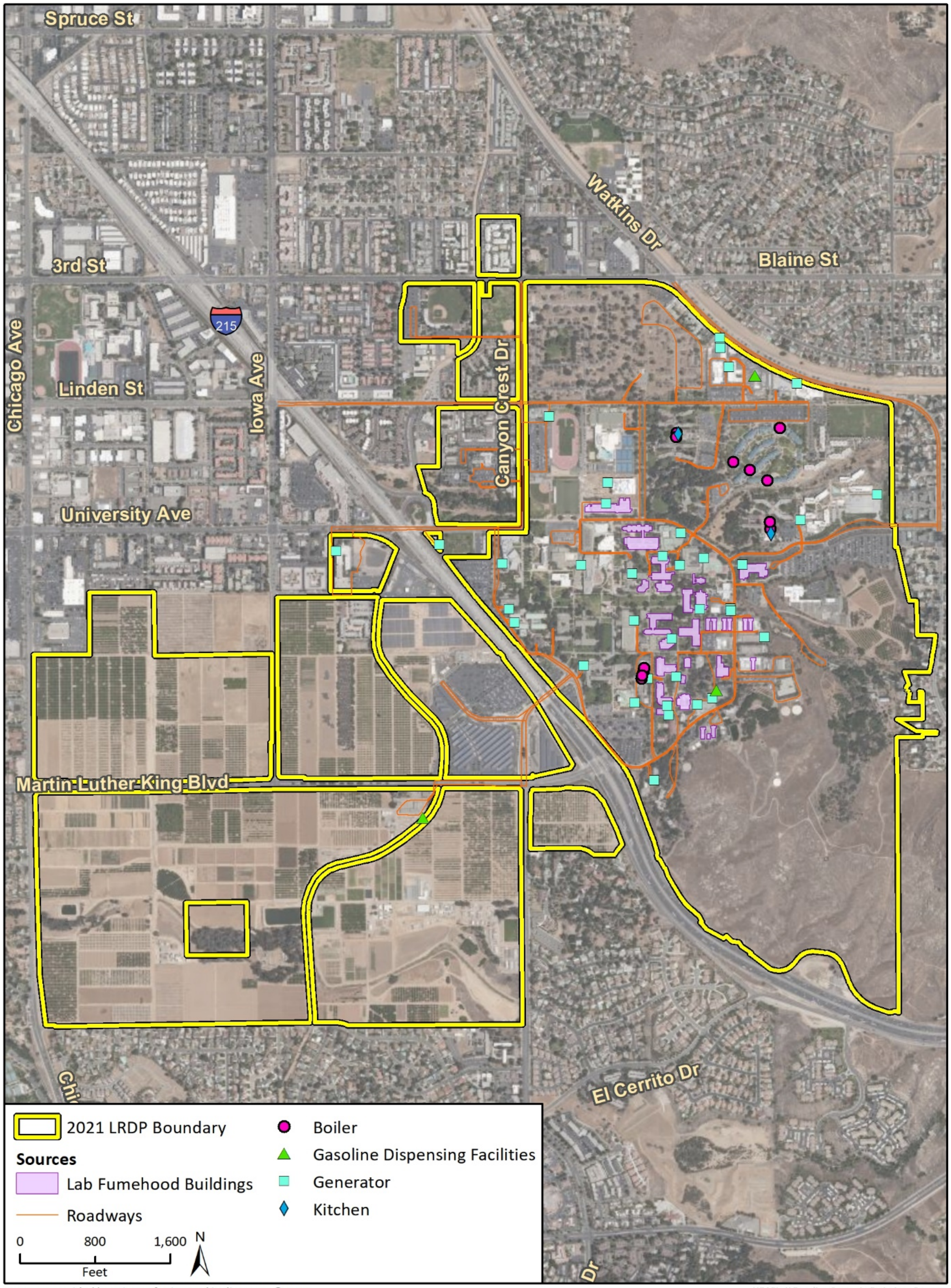
TOXIC AIR CONTAMINANTS

Rincon prepared a Programmatic HRA to evaluate potential impacts associated with emissions of TACs under implementation of the proposed 2021 LRDP. The Programmatic HRA evaluates TAC emissions from six primary sources of TAC emissions on campus:

- **Kitchen Equipment.** This source includes natural gas ovens located at University dining facilities.
- **Emergency Generators.** This source includes diesel- and natural gas-fired emergency back-up generators located at critical facilities throughout campus.
- **Boilers**. This source includes on-site boilers at University housing facilities and emissions from the University’s Central Plant.
- **Gasoline Dispensing Facilities**. This source includes emissions from gasoline storage and refueling areas at three gasoline dispensing facilities on-campus.
- **Laboratory Chemical Usage**. This source includes emissions from laboratory fume hoods at University research labs.
- **Diesel Delivery Trucks**. This source includes emissions of diesel PM from delivery trucks circulating on and adjacent to campus.

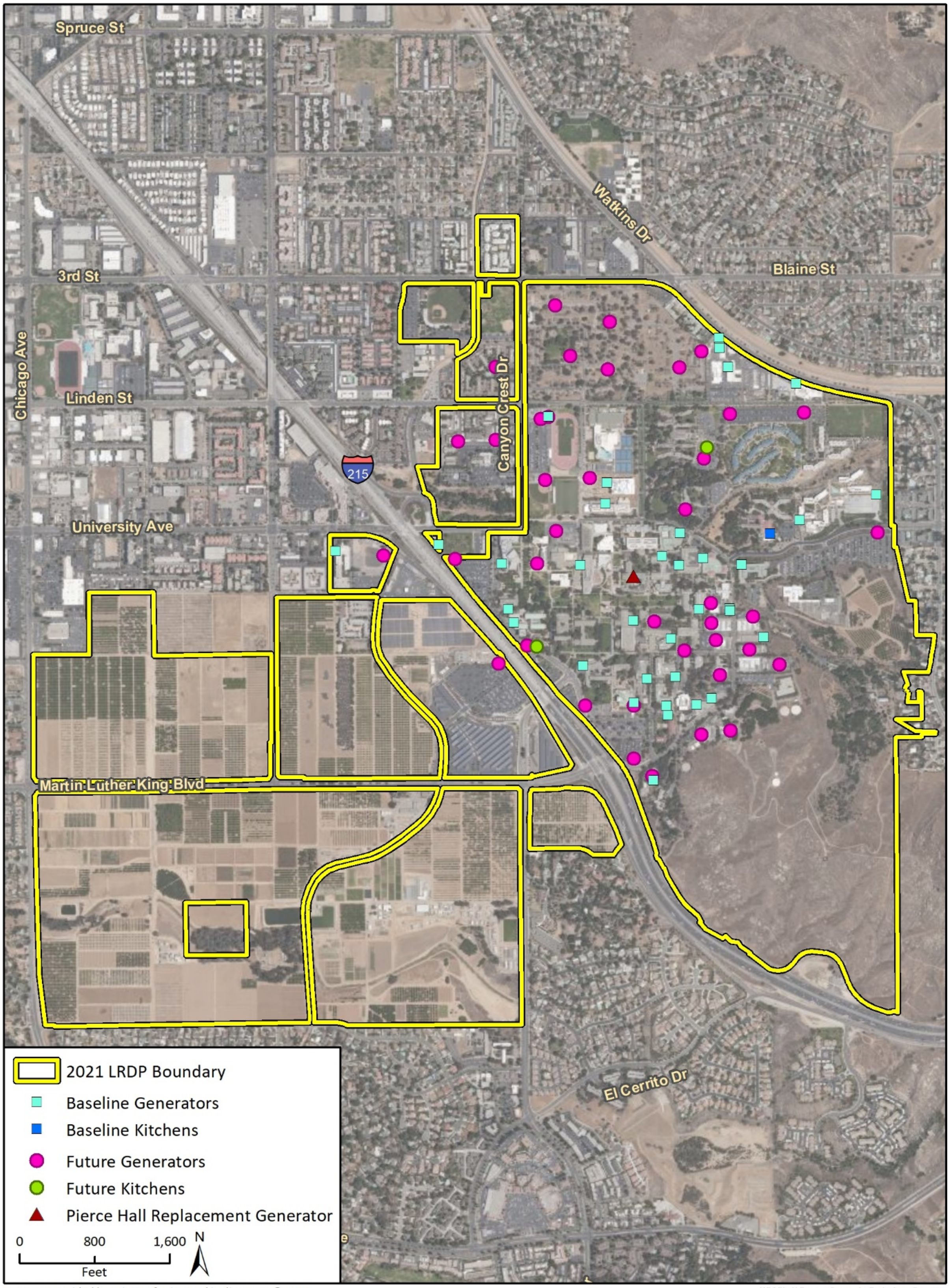
The Programmatic HRA characterizes emissions of TACs under two scenarios: Baseline (2018/2019 academic year) and Future (2035 horizon year). By employing a scenario-based modeling approach, the Programmatic HRA provides a direct comparison of health risk associated with buildout of the proposed 2021 LRDP to clearly assess potential impacts of the proposed project for the purposes of CEQA. Figure 4.3-1 and Figure 4.3-2 show the location of emissions sources modeled on campus under the Baseline and Future scenarios, respectively.

Figure 4.3-1 TAC Emissions Sources – Baseline Scenario



Imagery provided by Microsoft Bing and its licensors © 2021.

Figure 4.3-2 New/Relocated TAC Emissions Sources – Future Scenario



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Air dispersion modeling using the American Meteorological Society/US EPA Regulatory Model (AERMOD) and health risk calculations in CARB's Hotspots Analysis and Reporting Program version 2 (HARP 2) were used to determined carcinogenic and non-carcinogenic health risks at on-campus and off-campus sensitive receptors under the Baseline and Future scenarios. Additional information on AERMOD and HARP 2 is available in the user guides linked in the references section below. In total, the Programmatic HRA calculated health risk at over 6,300 receptors across campus and surrounding neighborhoods to evaluate potential health risk associated with implementation of the proposed 2021 LRDP. Receptors located further away from these locations would have reduced project related impacts, as concentrations would be further reduced with increasing distance.

For more detailed discussion of the methodology used to evaluate health risk associated with campus operations under the Baseline and Future scenarios, refer to the Programmatic HRA (Appendix C).

Thresholds

REGIONAL

Pursuant to CEQA Guidelines Section 15064(h)(3), SCAQMD's approach for assessing cumulative impacts is based on the AQMP forecasts of attainment of ambient air quality standards in accordance with the requirements of the federal and State CAAs. If a project's mass regional emissions do not exceed the applicable SCAQMD, then the project's criteria pollutant emissions would not be cumulatively considerable. The SCAQMD recommends quantitative regional significance thresholds for temporary construction activities and long-term project operation in the SCAB, shown in Table 4.3-4.

Table 4.3-4 SCAQMD Regional Significance Thresholds

Construction Thresholds	Operational Thresholds
75 pounds per day of ROG	55 pounds per day of ROG
100 pounds per day of NO_X	55 pounds per day of NO_X
550 pounds per day of CO	550 pounds per day of CO
150 pounds per day of SO_X	150 pounds per day of SO_X
150 pounds per day of PM_{10}	150 pounds per day of PM_{10}
55 pounds per day of $PM_{2.5}$	55 pounds per day of $PM_{2.5}$

ROG = reactive organic gases
NO_x = nitrogen oxides
CO = carbon monoxide
SO_x = sulfur dioxide
PM_{10} = particulate matter 10 micrometers in diameter or less
$PM_{2.5}$ = fine particulate matter 2.5 micrometers in diameter or less
Source: SCAQMD 2015.

Air districts, such as SCAQMD, base their significance thresholds on the federal and California CAAs. The federal and State CAAs regulate emissions of airborne pollutants and have established AAQS for the protection of public health. An air quality standard is defined as "the maximum amount of a pollutant averaged over a specified period of time that can be present in outdoor air without harming public health" (CARB 2019c). Pursuant to Section 109(b) of the federal CAA, the NAAQS established at the federal level are designed to be protective of public health with an adequate margin of safety. To derive these standards, the US EPA reviews data from integrated science assessments and risk/exposure assessments to determine the ambient pollutant concentrations at which human health impacts occur, then reduces these concentrations to establish a margin of safety (US EPA 2018). In addition, the State of California has established health-based AAQS for these and other pollutants, some of which are more stringent than the federal standards (CARB 2019d and 2019e). SCAQMD's thresholds for evaluating VOC, NO_X, and CO emissions are consistent with the federal CAA *de minimis* thresholds. The *de minimis* thresholds are used in the US EPA's general conformity process and are the emission levels at which an activity would not cause or contribute to a violation of the NAAQS, worsen an existing violation of the NAAQS, or delay attainment of the NAAQS (US EPA 2017).

LOCAL

In addition to regional thresholds, the SCAQMD has developed Localized Significance Thresholds (LSTs) in response to the Governing Board's Environmental Justice Enhancement Initiative (1-4). LSTs were devised in response to concern regarding exposure of individuals to criteria pollutants in local communities and have been developed for NO_X, CO, PM_{10}, and $PM_{2.5}$. LSTs represent the maximum emissions from a project that will not cause or contribute to an air quality exceedance of the most stringent applicable federal or State ambient air quality standard at the nearest sensitive receptor, taking into consideration ambient concentrations in each source receptor area (SRA), distance to the sensitive receptor, and project size. LSTs have been developed for emissions within construction areas up to 5 acres in size. LSTs only apply to emissions in a fixed stationary location and are not applicable to mobile sources, such as cars on a roadway (SCAQMD 2008). Therefore, LSTs are applied only to construction emissions for this analysis. The SCAQMD LST methodology states: "LSTs are applicable at the project-specific level and generally are not applicable to regional projects such as local General Plans unless specific projects are identified in the General Plans." Nevertheless, to be conservative, this LST analysis has been provided below.

The SCAQMD provides LST lookup tables for project sites that measure 1, 2, or 5 acres. Overall project construction would occur over several hundred acres, and each phase modeled (described above under *Analysis Methodology*) would cover an area that exceeds 5 acres. Therefore, the LST analysis conservatively uses 5-acre LSTs. LSTs are provided for receptors at 82 to 1,640 feet from the project disturbance boundary to the sensitive receptors. The border of construction activity would occur immediately adjacent to nearest on-site sensitive receptors and 55 feet to off-site sensitive (single-family residential buildings). According to the SCAQMD's publication, *Final LST Methodology*, projects with boundaries located closer than 82 feet to the nearest receptor should use the LSTs for receptors located at 82 feet. Therefore, the analysis below uses the LST values for 82 feet. In addition, the project is in SRA 23 (Metropolitan Riverside County). LSTs for construction in SRA 23 on a 5-acre site with a receptor 82 feet away are shown in Table 4.3-5.

Table 4.3-5 SCAQMD LSTs for Construction (SRA 23)

Pollutant	Allowable Emissions for a 5-acre Site in SRA 23 for a Receptor 82 feet Away (lbs/day)
Gradual conversion of NO_X to NO_2	270
CO	1,577
PM_{10}	13
$PM_{2.5}$	8

SRA = source receptor area
lbs/day = pounds per day
NO_x/NO_2 = nitrogen oxides
CO = carbon monoxide
PM_{10} = particulate matter 10 micrometers in diameter or less
$PM_{2.5}$ = fine particulate matter 2.5 micrometers in diameter or less
Source: SCAQMD 2009.

HEALTH RISK

SCAQMD has developed significance thresholds for the emissions of TACs based on health risks associated with elevated exposure to such compounds. For carcinogenic compounds, cancer risk is assessed in terms of incremental excess cancer risk. A project would result in a potentially significant impact if it would generate a Maximum Incremental Cancer Risk of 10 in 1 million or a cancer burden of 0.5 excess cancer cases in areas exceeding 1 in 1 million risk. Additionally, non-carcinogenic health risks are assessed in terms of a Hazard Index. A project would result in a potentially significant impact if it would result in a chronic and acute Hazard Index greater than 1.0 (SCAQMD 2015).

2021 LRDP Objectives and Policies

The proposed 2021 LRDP explains that TDM Programs at UCR, such as the highly successful UPASS program, will continue to further encourage the use of public transit, ride-sharing, vanpooling, cycling, and walking to campus. These programs reduce the demand for parking and vehicle trips to campus. TDM programs include multi-pronged efforts such as marketing, incentives, expanded vanpool offerings, on- and near campus housing amenities, parking pricing, and more." The proposed 2021 LRDP contains objectives and policies relevant to air quality, including:

Mobility (M)

- Objective M1: Reduce future vehicular traffic, parking demand, and GHG emissions, by increasing student housing on campus up to 40 percent of the projected enrollment in 2035.
    - Policy: Continue to grow and support on-campus residency by focusing on more affordable student housing options, as well as the capacity for returning students (upperclassmen) and graduate students.
    - Promote public transit as a convenient and preferred mode of commuting to campus and connecting campus residents to the community and regional destinations.
    - Policy: Develop the University Avenue and Canyon Crest Drive Gateway streetscapes to support increased use and functional efficiency of the RTA system, improved clarity of drop-off and pick-up locations for ride-sharing services, reduced conflict, and improved safety for

cyclists, pedestrians, and emerging micro-mobility[5] solutions in these increasingly busy mixed-mode circulation areas.

  - Policy: Improve access to public transit on campus by providing connectivity to access points via pathways or shuttles, as well as comfortable waiting facilities, proximate to commuter related services, where appropriate.
  - Policy: Advocate and support the development of a Metrolink train platform along Watkins Drive adjacent to campus to provide direct access and significantly reduce commute times. Consider dedicated vanpools or shuttles to nearby stations in the interim.

- Objective M2: Invest in infrastructure to increase bicycle use and support other active transportation modes to integrate desired routes with the campus' and City's circulation framework.
  - Policy: Support and facilitate City-led initiatives to extend bikeways to campus from every direction, including routes proposed along Canyon Crest Drive, Martin Luther King Boulevard, and the Gage Canal.
  - Policy: Develop wayfinding systems to interconnect preferred bicycle routes and invest in safe and secure pathways along all bicycle routes.
  - Policy: Provide adequate support amenities to facilitate and encourage the use of bicycles and other alternative transportation modes.
  - Policy: Develop a comprehensive improvement plan for Campus Drive to improve function, safety, and utility for each mode of travel, as incremental growth occurs.

- Objective M3: Emphasize safe and pleasing passage for pedestrians and bicycle riders through the careful, continued development and integration of the campus' multi-modal circulation framework and its extensions into the immediate community.
  - Policy: Identify and address gaps within the existing non-motorized circulation network, both on campus and within the adjacent community.
  - Policy: Implement University policies to improve pedestrian safety and encourage social interaction in zones of high pedestrian activity.

Campus Utility Infrastructure (INF) – Electricity (E)

- Objective INF E1: Prioritize redundancy and overall reliability in the campus' power distribution network.
  - Policy: Ensure infrastructure services and demands are regularly monitored and expanded as needed to meet applicable planned campus development.
- Objective INF E2: Emphasize high-performance new construction and building retrofits in support of the UC Policy on Sustainable Practices and minimize the need to purchase carbon offsets.
  - Policy: For mechanical systems in existing facilities, a 30 percent reduction in electrical energy use is projected, inclusive of a 30 percent reduction in electrical energy usage in existing facilities' mechanical systems.

[5] Micro-mobility is a category of modes of transport that are provided by very light vehicles such as electric scooters, electric skateboards, shared bicycles and electric pedal assisted bicycles. The primary condition for inclusion in the category is a gross vehicle weight of less than 500 kg.

- Policy: Take the fullest possible advantage of RPU's clean energy plans and the City's "greening of the grid" initiatives.
- Policy: Achieve a 5 percent improvement in energy performance for new building mechanical systems through retro-commissioning.

- Objective INF E3: Support alternative measures (e.g., alternative fuels, energy sources, practices, carbon offsets, etc.) and mixed energy source portfolios in support of green sustainability practices.
  - Policy: Continuously explore the potential to use alternative fuels over time as they become feasibly available.
  - Policy: Evaluate procurement options for alternative energy while considering long-term financial viability for the University.
  - Policy: Incorporate solar panels on the roofs of new construction to the maximum feasible extent.
  - Policy: Incorporate solar panels as integral elements of new construction design and applicable green building certifications to the maximum feasible extent.

Campus Utilities Infrastructure (INF) – Natural Gas (NG)

- Objective INF NG1: Reduce reliance on natural gas in conformance with UC policies.
  - Policy: Future projects shall not employ or expand demand for natural gas as an energy source.
  - Policy: Continue to work with RPU and UCOP to reduce current natural gas demand through efficiency improvements to the existing system, conversion of steam boilers to electricity as they are replaced over time, and, rigorous pursuit of obtaining sources for biogas, or renewable energy credit purchases to fully offset GHG emissions in conformance with UC policies.
  - Policy: Take the fullest possible advantage of RPU's clean energy plans, and the City's "greening of the grid" initiatives.

Campus Utilities Infrastructure (INF) – Potable Water, Wastewater and Irrigation (WWI)

- Objective INF WWI1: Commit to a multi-prong approach to conserving potable water use.
  - Policy: Reduce potable water use in an existing building in the Academic Center by 20 percent.
  - Policy: Reduce potable water use in student residential buildings by 30 percent.
  - Policy: Reduce potable water use in new facilities by exceeding applicable codes by a minimum of 20 percent.
  - Policy: Retrofit existing urinals, toilets, showerheads, and faucets for existing buildings with higher water efficiency rated equipment.

- Objective INF WWI2: Explore options to shift away from potable water use where feasible.
  - Policy: Design new building irrigation and efficient toilet flushing systems for use with future non-potable water sources.

- Policy: Achieve a further 20 percent reduction of potable water use for irrigation by extending Gage Canal water to also irrigate the UCR Botanic Gardens and reducing turf on campus and replacing with lower water use landscaping.

Campus Sustainability (CS)

- Objective CS1: Continue to build on this commitment to environmental stewardship to account for the impacts of development and expansion of campus infrastructure. Major planning and policy issues of the University will be subject to include the following:
  - Policy: Carbon Neutrality Initiative: Carbon Neutral by 2025 – Climate neutrality from Scope 1 & Scope 2 sources by 2025.
  - Policy: Climate neutrality from specific Scope 3 sources by 2050 or sooner - At a minimum, meet the UC intermediate goal in pursuit of climate neutrality (see AB 32) and California Global Warming Solutions Act of 2006: emission limit (SB 32).
  - Policy: Energy Efficiency: UC Annual 2 percent Energy Use Intensity (EUI) Reduction Policy (Energy Efficiency) – Each location will implement energy efficiency actions in buildings and infrastructure systems to reduce the location's energy use intensity by an average of at least 2 percent annually.
  - Policy: On-Campus Renewable Electricity – Campuses and health locations will install additional on-site renewable electricity supplies and energy storage systems whenever cost-effective and/or supportive of the location's Climate Action Plan or other goals.
  - Policy: Off-Campus Clean Electricity: 100 percent Renewable Electricity by 2025 – By 2025, each campus and health location will obtain 100 percent clean electricity.
  - Policy: On-Campus Combustion – By 2025, at least 40 percent of the natural gas combusted on-site at each campus and health location will be biogas.

Impact Analysis

Impact AQ-1 CONFLICT WITH OR OBSTRUCT IMPLEMENTATION OF AN APPLICABLE AIR QUALITY PLAN.

IMPLEMENTATION OF THE PROPOSED 2021 LRDP WOULD NOT GENERATE POPULATION, HOUSING, OR EMPLOYMENT GROWTH EXCEEDING FORECASTS IN THE 2016 AQMP. THEREFORE, IMPACTS WOULD BE LESS THAN SIGNIFICANT.

A project may be inconsistent with the AQMP if it would generate population, housing, or employment growth exceeding forecasts used in the development of the AQMP. The 2016 AQMP, the most recent AQMP adopted by the SCAQMD, incorporates local city general plans and SCAG's 2016 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) socioeconomic forecast projections of regional population, housing, and employment growth.

Pursuant to Section 4.12, *Population and Housing,* the proposed 2021 LRDP would incrementally accommodate an additional 7,419 undergraduate students and 3,659 graduate students plus 2,806 faculty and staff, resulting in a net increase to the campus population of approximately 13,884 people by the 2035 horizon year. The net increase of 13,884 people by academic year 2035/2036 is within the total regional population projections for 2035 of 356,839 net increase in regional population. It can be assumed logically that many students, faculty, and staff would be from the region. In fact, according to available zip code information for UCR students, faculty, and staff, approximately 85 percent of the campus population currently resides in a "reasonable" commute radius (approximately 1 hour each way). It is reasonable to assume that these trends will continue and that much of the campus population projected in the proposed 2021 LRDP will have already been accounted for in existing and/or projected population growth in the Inland Southern California region.

As discussed in Section 4.12, *Population and Housing,* the proposed 2021 LRDP assumes approximately 6,395 new students and faculty/staff would require non-UCR-affiliated, off-campus housing between the baseline (2018/2019) and buildout (2035/2036) years (13,884 net increase to the campus population – 7,489 new on-campus beds). Using a conservative estimate of even population growth each year assuming no students currently reside in the region, approximately 376 new residents[6] (6,395 students/17 years) could require non-UCR-affiliated, off-campus housing in the region year over year.

The net increase of 6,395 housing units by academic year 2035/2036 represents approximately 5.6 percent of the net increase of total regional housing projections for 2035 (6,395 net increase in off-campus housing units/113,401 net increase in regional housing units). Furthermore, if the vacancy rate for the region remains in line with 2020 at 4.8 percent, then approximately 37,080 available housing units would be available in the region in 2035. Therefore, the new campus population residing in non-UCR-affiliated housing could be absorbed into the already assumed future housing stock.

The employment growth forecasts in SCAG's 2016 RTP/SCS for Riverside estimate that the total number of jobs would increase from 145,400 to 188,700 in 2040, an increase of 43,300 jobs. The increase in employment anticipated from the proposed 2021 LRDP of 2,806 would be within SCAG's project 2040 employment increase of jobs from 2020, and the project would not exceed regional employment projections.

In support of SCAG's overall goals in the 2016 RTP/SCS, the project would increase student housing opportunities on campus by approximately 7,489 beds, which would house approximately 68 percent of the increase in total student population. The proposed 2021 LRDP therefore also would further the underlying goals of the AQMP by providing significantly more on-campus housing through proposed 2021 LRDP Objective M1, which would provide VMT and air quality emission benefits. The project is consistent with SCAG's growth projections and land use policies, including the policies of focusing growth and development within urban areas, encouraging infill development, and re-using previously developed urban land. UCR implements, and would continue to implement pursuant through the LRDP, numerous programs and policies to improve air quality in the region, including TDM measures that would reduce vehicle trips and minimizing energy use through project design and through proposed 2021 LRDP Objectives M1 through M3.

As implementation of the proposed 2021 LRDP would not generate population, housing, or employment growth exceeding forecasts in the 2016 AQMP, impacts would be **less than significant**.

Mitigation Measures

Mitigation measures are not required.

Significance After Mitigation

Impacts would be less than significant without mitigation.

[6] This number is reduced to approximately 57 new residents when accounting for the 85 percent campus draw from the existing regional population.

Impact AQ-2 CONSTRUCTION AND OPERATION-GENERATED EMISSIONS OF CRITERIA AIR POLLUTANTS AND PRECURSORS.

CONSTRUCTION OF THE PROPOSED 2021 LRDP WOULD GENERATE ROG AND NO_X IN QUANTITIES THAT EXCEED SCAQMD SIGNIFICANCE THRESHOLDS. OPERATION WOULD EXCEED SCAQMD THRESHOLDS FOR ROG, NO_X, AND PM_{10}. FOLLOWING MITIGATION, THIS IMPACT WOULD BE SIGNIFICANT AND UNAVOIDABLE.

Construction

As discussed in Section 2, *Project Description*, buildout under the proposed 2021 LRDP would include construction activities, including demolition, grading, construction worker travel to and from the LRDP Plan Area, delivery and hauling of construction supplies and debris to and from campus, and fuel combustion by on-site construction equipment, which would generate emissions. Table 4.3-6 summarizes the estimated maximum daily emissions of pollutants associated with construction emissions from buildout of the proposed 2021 LRDP. Additional details regarding this modeling are provided above in Section 4.3.3 under "Analysis Methodology" and Appendix C.

Table 4.3-6 Construction Emissions

	Maximum Emissions (lbs/day)					
	ROG	NO_x	CO	SO_2	PM_{10}	$PM_{2.5}$
2022 Scenario						
Construction Year 2022	260	108	52	<1	12	5
2023-2035 Scenario						
Construction Year 2023 – 2035	136	49	41	<1	9	5
Maximum Emissions	**260**	**108**	**52**	**<1**	**12**	**5**
SCAQMD Regional Thresholds	75	100	550	150	150	55
Threshold Exceeded?	**Yes**	**Yes**	**No**	**No**	**No**	**No**
Maximum On-site Emissions	N/A	21	31	N/A	9	5
SCAQMD Localized Significance Thresholds (LSTs)	N/A	270	1,577	N/A	13	8
Threshold Exceeded?	**N/A**	**No**	**No**	**N/A**	**No**	**No**

Notes: See Appendix C for modeling results. Some numbers may not add up precisely due to rounding considerations. Maximum on-site emissions are the highest emissions that would occur on the project site from on-site sources, such as heavy construction equipment and architectural coatings, and excludes off-site emissions from sources such as construction worker vehicle trips and haul truck trips. These numbers do not include any mitigation measures. Compliance with SCAQMD Rule 403 has been accounted for with watering twice (or soil stabilizers) per day for fugitive dust control.

As shown in Table 4.3-6, the year with the maximum daily emissions for ROG, NO_X, CO, SO_2, PM_{10}, and $PM_{2.5}$ is under the 2022 scenario. CO, SO_2, PM_{10}, and $PM_{2.5}$ emissions would not exceed SCAQMD regional thresholds or LSTs under either the 2022 scenario or 2023-2035 scenario. NO_X emissions would not exceed the SCAQMD regional threshold from 2023 to 2035; however, ROG emissions would. In addition, under the 2022 scenario, ROG and NO_X emissions would exceed the SCAQMD regional threshold for ROG and NO_X emissions. This exceedance is due to the conservative assumption that the highest year of LRDP construction would occur within a single year, which results in a large amount of soil import and export assumed for 2022 that leads to a large number of hauling trips, and results in a large amount of painting which increases ROG emissions. Therefore, impacts from ROG and NO_X emissions would be **significant**.

As discussed in Section 4.3.1, ROG and NOx are precursor chemicals which can form O_3 in the atmosphere. Health effects of O_3 include respiratory and eye irritation and possible changes in lung functions, including constriction of the airways resulting in shortness of breath. Groups most sensitive to O_3 include children, the elderly, people with respiratory disorders, and people who exercise strenuously outdoors. O_3 can also aggravate existing respiratory diseases such as asthma, bronchitis, and emphysema. Aside from its contribution to O_3 formation, NO_2 can increase the risk of acute and chronic respiratory disease, is an irritant, and can reduce visibility.

Operational

As discussed in Section 2, *Project Description*, buildout under the proposed 2021 LRDP would result in long-term air pollutant emissions over the course of operations. Emissions include energy sources, area sources, and mobile emissions. Emissions from energy use that generate criteria pollutant emissions include natural gas use. Area sources include space and water heating, consumer products, landscape maintenance, and architectural coating. Mobile source emissions are generated by the increase in vehicle trips to and from the project site associated with operation of onsite development. Table 4.3-7 summarizes the operational emissions by emission source (area, energy, and mobile) attributed to the proposed 2021 LRDP. Additional details regarding this modeling are provided above in Section 4.3.3 under "Analysis Methodology" and Appendix C.

Table 4.3-7 Project Operational Emissions

	Maximum Daily Emissions (lbs/day)					
Emission Source	**ROG**	**NO_X**	**CO**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
Area	126	2	205	<1	1	1
Energy	2	17	11	<1	1	1
Mobile	21	124	275	2	156	42
Project Emissions	**149**	**144**	**491**	**2**	**159**	**45**
SCAQMD Regional Thresholds	55	55	550	150	150	55
Threshold Exceeded?	**Yes**	**Yes**	**No**	**No**	**Yes**	**No**

Notes: See Appendix C for modeling results. Some numbers may not add up precisely due to rounding considerations. These results do not include mitigation measures.

The proposed 2021 LRDP would house approximately 68 percent of the increase in total student population on campus which would also provide regional VMT and air quality emission benefits. Development under the proposed 2021 LRDP would also incorporate an existing TDM Plan discussed in Section 4.3.2 that would include measures to reduce vehicle trips. This TDM Plan includes multi-pronged efforts such as marketing, incentives, expanded vanpool offerings, on- and near-campus housing amenities, parking pricing, and more. This Plan also encourages students to use designated bike paths to commute to and travel within the campus. Registered bicyclists or walkers are eligible to receive a complimentary bicycle parking allotment and are eligible to utilize the day-use locker and shower facilities at the SRC without charge. UCR has also encouraged ride-sharing services, and the average vehicle ridership has increased from approximately 1.36 to 1.57 occupants per vehicle over the last 15 years. This would have the effect of reducing operational NO_X, PM_{10}, and $PM_{2.5}$ emissions. The proposed 2021 LRDP, through Objectives M1 through M3, further encourages the reduction of vehicular traffic and investing in infrastructure on campus to encourage alternative modes of transportation.

However, at this stage of planning, specifics on the TDM Plan that would be quantifiable in the modeling were not available. In addition, the operational air quality analysis assumes a worst-case scenario in estimating vehicular emissions associated with the proposed 2021 LRDP, as it assumes that all project vehicular trips are new trips to the region that would result in new additional mobile emissions. However, it is important to note that it is highly unlikely that those vehicular trips would be entirely additive to the traffic in the region. Many of the students and faculty that are a part of the campus growth live in the SCAQMD and undertake vehicle trips that already contribute to the NO_X, PM_{10}, and $PM_{2.5}$ emissions of the area. As discussed under Impact AQ-1, 85 percent of the campus population currently resides within a “reasonable” commute radius (approximately 1 hour each way). In addition, the construction of new student housing on campus would allow for more students to live on campus instead of commuting, and the proposed 2021 LRDP for some persons would thereby have a positive effect on reducing their VMT and therefore a reduction in their NO_X, PM_{10}, and $PM_{2.5}$ emissions. The quantitative analysis is considered conservative, because the beneficial effects of this displaced growth were not considered.

The campus is well served by public transportation systems, including buses, providing alternative transportation options for students, employees, and visitors going to and from campus. As discussed in Section 4.15, *Transportatio*n, the existing UCR campus produces a lower VMT per Service Population. This is likely due to the reduction in trip and trip lengths associated with students who live on campus and the UCR community’s use of available transit services used to access the campus.

Table 4.3-7 summarizes the operational emissions by emission source (area, energy, and mobile) attributed to the proposed 2021 LRDP. The emissions generated by operation of the campus would not exceed SCAQMD regional thresholds for criteria pollutants for CO, SO_2, and $PM_{2.5}$. However, operational emissions would exceed the SCAQMD regional thresholds for ROG, NO_X, and PM_{10}. Most ROG emissions are associated with area emissions from consumer product use. The majority of NO_X and PM_{10} emissions are from vehicle trips associated with the project.

As such, impacts for ROG, NO_X, and PM_{10} would be **significant**.

As discussed in Section 4.3.1, ROG and NO_x are precursor chemicals which can form O_3 in the atmosphere. Health effects of O_3 include respiratory and eye irritation and possible changes in lung functions, including constriction of the airways resulting in shortness of breath. Groups most sensitive to O_3 include children, the elderly, people with respiratory disorders, and people who exercise strenuously outdoors. O_3 can also aggravate existing respiratory diseases such as asthma, bronchitis, and emphysema. Aside from its contribution to O_3 formation, NO_2 can increase the risk of acute and chronic respiratory disease, is an irritant, and can reduce visibility.

Acute and chronic health effects associated with high particulate levels (PM_{10}) include the aggravation of chronic respiratory diseases, heart and lung disease, and coughing, bronchitis and respiratory illnesses in children. Recent mortality studies have shown an association between morbidity and mortality and daily concentrations of PM in the air. Ultrafine particles are particles that are 0.1 micron or less in diameter. These particles have the potential to be more easily inhaled and can be deposited deeper into the lungs. Because of their size, they can rapidly penetrate into lung tissue and other organs in the body. Ultrafine particles are associated with death from heart disease caused by blocked arteries. The Health Risk Assessment under Impact AQ-3 includes consideration of PM, which is a subset of TACs.

Mitigation Measures

See Mitigation Measure **MM GHG-1** in Section 4.8, *Greenhouse Gas Emissions*.

Significance After Mitigation

NO_X and PM emissions during operation are primarily generated from mobile trips (e.g., students and faculty/staff commuting). Implementation of Mitigation Measure **MM GHG-1** is proposed to reduce the project's GHG emissions impacts, as described in Section 4.8. Parts of this measure would have an effect of reducing criteria pollutant emissions from mobile trips. For example, Measure FL1 would replace fleet vehicles with electric vehicles or low-emission alternative vehicles that would lower operational NO_X and PM mobile. Measure EN1 in Mitigation Measure **MM GHG-1**, which would provide 100 percent electrification of new campus buildings, would have the effect of reducing natural gas emissions on campus (and thus area emissions during operation). In addition, Measures TR2 through TR4 would reduce VMT and therefore NO_X and PM mobile emissions from operation. While the TDM plan, the proposed 2021 LRDP Objectives M1 through M3, and Mitigation Measure **MM GHG-1** would reduce campus VMT and campus vehicle fleet emissions associated with the project, some of these measures are not quantifiable, and due to the amount of development associated with the LRDP, NO_X and PM, emissions would still exceed the SCAQMD NO_X and PM threshold during operation.

Project ROG emissions exceed the SCAQMD threshold of 55 pounds per day due to consumer product use, which is determined by individual consumer behavior (e.g., residents using personal cleaning or hair products) that would not be feasible to mitigate.

Construction ROG emissions exceed the SCAQMD threshold of 75 pounds per day due to the large amount of sf assumed to be painted during the most conservative year analyzed of 2022. Lower VOC paints may not be available or feasible for the type of construction involved; therefore, these emissions would not be feasible to mitigate. In the modeled years of 2023 to 2035, the project would not exceed the SCAQMD threshold of 75 pounds per day.

NO_X emissions from construction activities are primarily generated from off-site hauling trips (e.g., vendor deliveries and soil import and export). Due to the loads these trucks must carry, they are typically generated by diesel or gasoline engines; there is no feasible mitigation measures to reduce NO_X emissions as these vehicles are powered by a fossil fuel source. Therefore, NO_X emissions during construction would still exceed the SCAQMD NO_X construction threshold.

Infeasibility of Additional Health Risk Analysis

Per the *Sierra Club v. County of Fresno* (Friant Ranch, L.P.) (2018) California Supreme Court decision, it is not scientifically feasible at the time of drafting of this report to substantively connect this individual project's criteria pollutant impacts to likely health consequences.

The SCAQMD provided an amicus brief regarding the case that is included in Appendix C. With regard to the analysis of air quality-related health impacts, the SCAQMD, the air quality authority for the SCAB, has stated that "EIRs must generally quantify a project's pollutant emissions, but in some cases, it is not feasible to correlate these emissions to specific, quantifiable health impacts (e.g., premature mortality; hospital admissions).” In such cases, a general description of the adverse health impacts resulting from the pollutants at issue may be sufficient.

The SCAQMD stated that from a scientific standpoint, it takes a large amount of additional precursor emissions to cause a modeled increase in ambient O_3 levels over an entire region. For example, the SCAQMD’s 2012 AQMP showed that reducing NO_X by 432 tons per day and reducing ROG by 187 tons per day would only reduce O_3 levels at the SCAQMD’s monitor site with the highest levels by only 9 parts per billion (SCAQMD 2013). SCAQMD staff does not currently know of a way to accurately quantify O_3-related health impacts caused by NO_X or ROG precursor emissions from relatively small projects.

SCAQMD acknowledged that it may be feasible to analyze air quality related health impacts for projects on a regional scale with very high emissions of NO_X and ROGs, where impacts are regional. The example SCAQMD provided was for proposed Rule 1315, which authorized various newly permitted sources to use offsets from the “internal bank” of emission reductions. The CEQA analysis accounted for essentially all of the increases in emissions due to new or modified sources in the District between 2010 and 2030, or approximately 6,620 pounds per day of NO_X and 89,947 pounds per day of ROG, to expected health outcomes from O_3 and PM (e.g., 20 premature deaths per year and 89,947 school absences in the year 2030 due to O_3).

PM_{10} and $PM_{2.5}$, as calculated in CalEEMod, is primarily from light-duty automobiles from brake and tire wear. These emissions occur on a more regional level as the vehicle miles are calculated in CalEEMod over a distance of up to 16 miles from campus, and a localized model of criteria pollutants such as PM_{10} and $PM_{2.5}$ would not provide meaningful and accurate data.

The SCAQMD stated its staff does not currently know of a way to accurately quantify O_3- and PM-related health impacts from relatively small projects, then a general description of the adverse health impacts resulting from the pollutants at issue, described in this report, is all that can be provided at this time. Please see the above description of general adverse health impacts resulting from O_3 and PM.

The San Joaquin Valley Air Pollution Control District (SJVAPCD) amicus brief is incorporated by reference under Appendix C and also addresses whether it is scientifically feasible to correlate an individual project’s air quality emissions to specific health impacts. Human health impacts associated with criteria pollutants are analyzed and taken into consideration when the US EPA sets the NAAQS for each criteria pollutant (42 U.S.C. Section 7409(b)(1)). The health impact of a particular criteria pollutant is analyzed on a regional, not a facility level, based on how close the area is to complying with (attaining) the NAAQS. As discussed by the SJVAPCD, it is not feasible to conduct a criteria air pollutant analysis detailing health impacts, as currently available computer modeling tools are not equipped for this task.

In proposing a health risk type analysis for criteria air pollutants, it is important to understand how the relevant criteria pollutants (O_3 and PM) are formed, dispersed and regulated. Ground level O_3 (smog) is not directly emitted into the air but is instead formed when precursor pollutants, such as NO_X and ROG are emitted into the atmosphere and undergo complex chemical reactions in the process of sunlight. Once formed, O_3 can be transported long distances by wind. Because of the complexity of O_3 formation, a specific tonnage amount of NO_X or ROGs emitted in a particular area does not equate to a particular concentration of O_3 in that area. Even rural areas that have relatively low tonnages of emissions of NO_X or ROG can have high levels of O_3 concentrations simply due to wind transport. Conversely, areas that have substantially more NO_X and ROG emissions could experience lower concentrations of O_3 simply because sea breezes disperse the emissions (SJVAPCD 2007).

The disconnect between the tonnage of precursor pollutants and the concentration of O_3 formed is important, because it is not necessarily the tonnage of precursor pollutants that causes human health effects; rather, it is the concentration of resulting O_3 that causes these effects. The NAAQS, which are statutorily required to be set by US EPA at levels that are requisite to protect the public health, are established as concentrations of O_3 and not as tonnages of their precursor pollutants. Because the NAAQS are focused on achieving a particular concentration region-wide, the SJVAPCD's tools and plans for attaining the NAAQS are regional in nature.

The computer models used to simulate and predict an attainment date for O_3 are based on regional inventories of precursor pollutants and meteorology in the air basin. At a very basic level, the models simulate future O_3 levels based on predicted changes in precursor emissions basin-wide. The computer models are not designed to determine whether the emissions generated by an individual development project will affect the date that the air basin attains the NAAQS. Instead, the models help inform regional planning strategies based on the extent all of the emission-generating sources in the air basin must be controlled in order to reach attainment.

In the case of the LRDP, operational emissions exceed the SCAQMD operational significance thresholds for NO_X, ROG, and PM. However, this does not mean that one can feasibly determine the concentration of O_3 and PM that would be created at or near a project site on a particular day or month of the year, or the specific human health impacts that may occur. This is especially true for the LRDP, where most of the criteria pollutant emissions derive not from a single "point source," but from mobile sources (cars and trucks) driving to, from, and around campus, or from consumer product and architectural coating use that can occur in many individual areas of campus.

In addition, it would be infeasible to model the impact on NAAQS attainment that these emissions from the LRDP may have. As discussed above, the currently available tools are equipped to model the impact of all emission sources in the air basin on attainment. According to the SCAQMD's 2016 AQMP, basin-wide emissions in 2012 of ROG was 162.4 tons per day, 293.1 tons per day of NO_X, and 14.4 tons of $PM_{2.5}$ emissions (SCAQMD 2017). Running the photochemical grid model used for predicting O_3 attainment with the emissions solely from a project (which equates to less than one percent for ROG, NO_x, and $PM_{2.5}$) would not yield valid information given the relatively small scale involved.

Health Consequences of O_3 and PM

A summary discussion of air pollution and potential health effects was provided in Section 4.3.1. In addition, the national and State criteria pollutants and the applicable ambient air quality standards were also provided in Section 4.3.1. As stated above, air pollution is a major public health concern, and the adverse health effects associated with air pollution are diverse. O_3 is a pungent, colorless, toxic gas with direct health effects on humans, including respiratory and eye irritation and possible changes in lung functions. Groups most sensitive to O_3 include children, the elderly, persons with respiratory disorders, and people who exercise strenuously outdoors. PM_{10} and $PM_{2.5}$ can damage health by interfering with the body's mechanisms for clearing the respiratory tract or by acting as carriers of an absorbed toxic substance.

The adverse effects reported with short-term O_3 exposure are greater with increased activity, because activity increases the breathing rate and the volume of air reaching the lungs, resulting in an increased amount of O_3 reaching the lungs. Children may be a particularly vulnerable population to air pollution effects, because they spend more time outdoors, are generally more active, and have a higher ventilation rate than adults. A number of adverse health effects associated with ambient O_3 levels and PM levels have been identified from laboratory and epidemiological studies. These include increased respiratory symptoms, damage to cells of the respiratory tract, decreases in lung function, increased susceptibility to respiratory infection, and increased risk of hospitalization.

The Children's Health Study, conducted by researchers at the University of Southern California, followed a cohort of children that live in 12 communities in southern California with differing levels of air pollution for several years. A publication from this study found that school absences in fourth graders for respiratory illnesses were associated with ambient O_3 levels and 24-hour PM_{10} values. An increase of 20 parts per billion of O_3 was associated with an 83 percent increase in illness-related absence rates, and change of 10 micrograms per meter in PM was associated with a 5.7 percent increase in illness-related absences (Gilliland et al. 2004). In addition, long-term exposure to elevated levels of PM can affect acute response to O_3. The number of hospital admissions and emergency room visits for all respiratory causes (infections, respiratory failure, chronic bronchitis, etc.), including asthma, show a consistent increase as ambient O_3 levels increase in a community. These excess hospital admissions and emergency room visits are observed when hourly O_3 concentrations are as low as 0.08 to 0.10 ppm.

Numerous recent studies have found positive associations between increases in O_3 levels and excess risk of mortality. These associations persist even when other variables including season and levels of PM are accounted for. This indicates that O_3 mortality effects are independent of other pollutants (Bell et al. 2004). Several population-based studies suggest that asthmatics are more adversely affected by ambient O_3 levels, as evidenced by increased hospitalizations and emergency room visits. Laboratory studies have attempted to compare the degree of lung function change seen in age and gender-matched healthy individuals versus asthmatics and those with chronic obstructive pulmonary disease. While the degree of change evidenced did not differ significantly, that finding may not accurately reflect the true impact of exposure on these respiration-compromised individuals. Since the respiration-compromised group may have lower lung function to begin with, the same degree of change may represent a substantially greater adverse effect overall.

A publication from the Children's Health Study focused on children and outdoor exercise. In communities with high O_3 concentrations, the relative risk of developing asthma in children playing three or more sports was found to be over three times higher than in children playing no sports (McConnell et al. 2002). These findings indicate that new cases of asthma in children are associated with heavy exercise in communities with high levels of O_3. The susceptibility to O_3 observed under ambient conditions could be due to the combination of pollutants that coexist in the atmosphere or O_3 may actually sensitize these subgroups to the effects of other pollutants. A study of birth outcomes in southern California found an increased risk for birth defects in the aortic and pulmonary arteries associated with O_3 and PM exposure in the second month of pregnancy (Ritz et al. 2000). In summary, acute adverse effects associated with O_3 exposures have been well documented, although the specific causal mechanism is still somewhat unclear. Additional research efforts are required to evaluate the long-term effects of air pollution and to determine the role of O_3 in influencing chronic effects.

The evidence linking these effects to air pollutants is derived from population based observational and field studies (epidemiological) as well as controlled laboratory studies involving human subjects and animals. There have been an increasing number of studies focusing on the mechanisms (that is, on learning how specific organs, cell types, and biochemicals are involved in the human body's response to air pollution) and specific pollutants responsible for individual effects. Yet the underlying biological pathways for these effects are not always clearly understood. Although individuals inhale pollutants as a mixture under ambient conditions, the regulatory framework and the control measures developed are mostly pollutant-specific. This is appropriate, in that different pollutants usually differ in their sources, their times and places of occurrence, the kinds of health effects they may cause, and their overall levels of health risk. Different pollutants, from the same or different sources, may sometimes act together to harm health more than they would acting separately. Nevertheless, as a practical matter, health scientists, as well as regulatory officials, usually must deal with one pollutant at a time in determining health effects and in adopting air quality standards. To meet the air quality standards, comprehensive plans are developed such as the SCAQMD's AQMP.

CONCLUSIONS

Consistent with the California Supreme Court's Friant Ranch decision, the above information provides additional details regarding the potential health effects from the project's significant and unavoidable criteria pollutant emissions. It also explains why it is not scientifically feasible at the time of drafting of this report to substantively connect this individual project's criteria pollutant impacts to likely health consequences so that the public may make informed decisions regarding the costs and benefits of the LRDP.

In summary, at this stage of planning, project design features and mitigation are not available that would feasibly reduce impacts from construction NO_X and ROG emissions and operational ROG, NO_X, and PM emissions to a less-than-significant level. Therefore, impacts from construction and operational emissions would be **significant and unavoidable**.

Impact AQ-3 EXPOSE SENSITIVE RECEPTORS TO SUBSTANTIAL POLLUTANT CONCENTRATIONS FROM CO HOTSPOTS OR TACS.

IMPLEMENTATION OF THE PROPOSED 2021 LRDP WOULD NOT EXPOSE SENSITIVE RECEPTORS TO SUBSTANTIAL POLLUTANT CONCENTRATIONS FROM CO HOTSPOTS OR TACS. IMPACTS WOULD BE LESS THAN SIGNIFICANT. NO MITIGATION WOULD BE REQUIRED.

CO Hotspots

A CO hotspot is a localized concentration of CO that is above a CO ambient air quality standard. Localized CO hotspots can occur at intersections with heavy peak hour traffic. Specifically, hotspots can be created at intersections where traffic levels are sufficiently high such that the local CO concentration exceeds the federal 1-hour standard of 35.0 ppm or the federal and State 8-hour standard of 9.0 ppm (CARB 2016a).

The SCAB is in conformance with State and federal CO standards, and most air quality monitoring stations no longer report CO levels. In 2019, the Riverside-Rubidoux station, located at 5888 Mission Boulevard Riverside, California 92509, approximately 5.3 miles west of the campus, detected an 8-hour maximum CO concentration of 1.2 ppm, which is substantially below the State and federal standards (US EPA 2018). Under the proposed 2021 LRDP, the campus would result in CO emissions of approximately 513 pounds per day, below the 550 pounds per day threshold. Additional details regarding this modeling are provided above in Section 4.3.3 under "Analysis Methodology" and Appendix C. Based on the low-background level of CO in the campus area, improving vehicle emissions standards for new cars in accordance with State and federal regulations, and the proposed 2021 LRDP's operational CO emissions, implementation of the proposed 2021 LRDP would not create new hotspots or contribute substantially to existing hotspots, and impacts are considered to be **less than significant**.

Toxic Air Contaminants

Construction

Construction-related activities would result in temporary emissions of diesel PM exhaust from off-road, heavy-duty diesel equipment for site preparation, grading, building construction, and other construction activities.

The dose of a contaminant to which the receptors are exposed is the primary factor used to determine health risk. Dose is a function of the concentration of a substance or substances in the environment and the extent of exposure that person has with the substance. Dose is positively correlated with time, meaning that a longer exposure period generally results in a higher exposure level for the maximally exposed individual. The risks estimated for a maximally exposed individual are higher if a fixed exposure occurs over a longer period.

Current models and methodologies for conducting HRAs are associated with longer-term exposure periods of 9, 30, and 70 years that do not correlate well with the temporary and highly variable nature of construction activities, resulting in difficulties in producing accurate estimates of health risk. Furthermore, individual projects would be located throughout the approximately 1,108-acre campus. Generation of diesel PM from individual construction projects under the proposed 2021 LRDP would occur in a single area for a relatively short period of time, limiting the potential for localized health risk impacts associated with construction.

The maximum diesel PM emissions would generally occur during site preparation and grading activities when heavy equipment is operating most consistently. These activities would typically be expected to last months for individual construction projects. Diesel PM emissions would decrease for other construction activities such as building construction and architectural coating, as these activities would require less diesel-fueled construction equipment. Furthermore, as described under Impact AQ-2, above, maximum on-site construction emissions would not exceed applicable LSTs for any criteria pollutants; LSTs are used to evaluate localized air quality impacts and intended to be protective of human health. Given that the maximum diesel PM emissions associated with construction would occur at a single site for a small fraction of the recommended health risk exposure period and that construction emissions would be dispersed across the greater, approximately 1,108-acre campus area, diesel PM generated by construction of individual project construction under the proposed 2021 LRDP would not create unsafe or potentially hazardous conditions for sensitive receptors. Construction-related impacts are considered to be **less than significant**.

Operation

The Programmatic HRA assesses potential operational health risk to on- and off-campus sensitive receptors associated with implementation of the proposed 2021 LRDP. As described in *Analysis Methodology*, above, the Programmatic HRA employed a scenario-based approach to accurately assess the potential health risk impact of the proposed 2021 LRDP. Health risks from six primary sources of TAC emissions on-campus were quantified under both a baseline and future scenario. Baseline emissions were based primarily on TAC emissions reported in UCR’s 2019 Annual Emissions Report submitted to SCAQMD. Future emissions were estimated using source-specific information provided by UCR, VMT modeling conducted by Fehr & Peers, and/or growth factors to project increased emissions commensurate with an increase in relevant campus land uses (i.e., laboratory fume hood emissions were projected to increase in the Future scenario commensurate with an increase in wet lab square footage). For more information regarding the methodology employed in the Programmatic HRA, refer to Appendix C.

To assess impacts to sensitive receptors, the Programmatic HRA identifies the maximally exposed receptors for each scenario. The maximally exposed receptor is the modeled receptor experiencing the highest health risk under the exposure scenario being modeled. The Programmatic HRA identifies the off-campus and on-campus maximally exposed individual residents (MEIRs), as well as the off-campus and on-campus maximally exposed individual workers (MEIWs). Additionally, modeled receptors at the Early Childhood Services (Child Development Center) were evaluated to identify the maximum health risk faced by children at the daycare facility. The maximally exposed receptors were determined through an iterative process evaluating potential receptors based on model-generated risk contours to ensure the maximum health risks were captured for each scenario. The maximally exposed receptors for carcinogenic (cancer) risk and non-carcinogenic (chronic and acute) risk were identified in the Programmatic HRA.

Cancer Risk

Carcinogenic health risk is the probability for an individual to develop cancer over a lifetime as a result of exposure to a possible carcinogen. Carcinogenic health risk is generally presented as the incremental excess cancer risk, a probability expressed in “chances per 100,000” or “chances per million.” To provide a perspective on cancer risk, the American Cancer Society (2020) reports that in the U.S., men have about a 40 in 100 chance (0.40 probability) and women about a 39 in 100 chance (0.39) of developing cancer during a lifetime. Based on this background cancer risk level in the general population, application of a 10 in 1 million (1.0×10^{-5}) excess risk limit means that the contribution from a toxic hazard should not cause the resultant cancer risk for the exposed population to exceed 0.40001 for men or 0.39001 for women.

Incremental excess cancer risk values at the off-campus and on-campus MEIR, MEIW, and Early Childhood Services (Child Development Center) are described in Table 4.3-8. As shown, incremental excess cancer risks attributable to the proposed 2021 LRDP would not exceed the SCAQMD threshold of 10 in 1 million at the off- or on-campus MEIR, MEIW, or Early Childhood Services (Child Development Center).

Table 4.3-8 Cancer Risk Results

Scenario	Cancer Risk
Off-Campus Resident[1]	
Baseline Scenario	20.9 in 1 million
Future Scenario	25.8 in 1 million
Net Increase	4.9 in 1 million
SCAQMD Significance Threshold	10 in 1 million
Exceeds Threshold?	**No**
On-Campus Resident[2]	
Baseline Scenario	3.2 in 1 million
Future Scenario	3.5 in 1 million
Net Increase	0.3 in 1 million

Scenario	Cancer Risk
SCAQMD Significance Threshold	10 in 1 million
Exceeds Threshold?	**No**
Off-Campus Worker[3]	
Baseline Scenario	1.1 in 1 million
Future Scenario	1.4 in 1 million
Net Increase	0.3 in 1 million
SCAQMD Significance Threshold	10 in 1 million
Exceeds Threshold?	**No**
On-Campus Worker[4]	
Baseline Scenario	14.0 in 1 million
Future Scenario	14.1 in 1 million
Net Increase	0.1 in 1 million
SCAQMD Significance Threshold	10 in 1 million
Exceeds Threshold?	**No**
Early Childhood Services (Child Development Center)[5]	
Baseline Scenario	3.7 in 1 million
Future Scenario	6.8 in 1 million
Net Increase	3.1 in 1 million
SCAQMD Significance Threshold	10 in 1 million
Exceeds Threshold?	**No**

SCAQMD = South Coast Air Quality Management District

[1] Evaluated over a 30-year exposure duration. Off-campus Maximally Exposed Individual Resident (MEIR) for cancer risk is located at residence near the intersection of Valencia Hill Drive and Big Springs Road.

[2] Evaluated over a 6-year exposure duration. On-campus MEIR for cancer risk is located at Glen Mor Building H.

[3] Evaluated over 25-year exposure duration. Off-campus Maximally Exposed Individual Worker (MEIW) for cancer risk is located at commercial structure near the intersection of Watkins Drive and Big Springs Road.

[4] Evaluated over 25-year exposure duration. On-campus MEIW for cancer risk is located at Geology building.

[5] Evaluated over 6-year exposure duration

Source: Programmatic HRA (Appendix C)

Non-Cancer Risk

Non-carcinogenic health risks are health risks that do not result in cancer. These risks include acute and chronic health effects. Unlike carcinogenic health risk, neither chronic nor acute health risk impacts are expressed in “chances per million,” but instead as a unitless “hazard index.” The hazard index is calculated by dividing the concentration of the pollutant (i.e., maximum hourly concentration for acute risk, annual average concentration for chronic risk) by a pollutant-specific reference exposure level. The reference exposure level is the concentration level at or below which no adverse health effects are anticipated for a given contaminant, based on medical and toxicological literature.

Chronic Health Risk Impacts

Chronic health risks are long-term health issues resulting from longer-term exposure (from 1 year to a lifetime) that are not cancer. This may include reproductive health issues, heart disease, or respiratory illness. Chronic hazard indices at the off-campus and on-campus MEIR, MEIW, and Early Childhood Services (Child Development Center) are described in Table 4.3-9. As shown, chronic hazard indices under the proposed 2021 LRDP would not exceed the SCAQMD threshold of 1.0 at the off- or on-campus MEIR, MEIW, or Early Childhood Services (Child Development Center).

Table 4.3-9 Chronic Health Risk Results

Scenario	Chronic Hazard Index
Off-Campus Resident[1]	
Baseline Scenario	0.04
Future Scenario	0.06
Net Increase	0.02
SCAQMD Significance Threshold	1.0
Exceeds Threshold?	**No**
On-Campus Resident[2]	
Baseline Scenario	0.09
Future Scenario	0.11
Net Increase	0.02
SCAQMD Significance Threshold	1.0
Exceeds Threshold?	**No**
Off-Campus Worker[3]	
Baseline Scenario	0.01
Future Scenario	0.02
Net Increase	0.01
SCAQMD Significance Threshold	1.0
Exceeds Threshold?	**No**
On-Campus Worker[4]	
Baseline Scenario	0.13
Future Scenario	0.15
Net Increase	0.02
SCAQMD Significance Threshold	1.0
Exceeds Threshold?	**No**

Scenario	Chronic Hazard Index
Early Childhood Services (Child Development Center)	
Baseline Scenario	0.01
Future Scenario	0.02
Net Increase	0.01
SCAQMD Significance Threshold	1.0
Exceeds Threshold?	**No**

SCAQMD = South Coast Air Quality Management District

[1] Off-campus Maximally Exposed Individual Resident (MEIR) for chronic health risk is located at the rear/side yard of a single-family residence at the western terminus of West Broadbent Drive.

[2] On-campus MEIR for chronic health risk is located at the southern portion of Lothian Hall.

[3] Off-campus Maximally Exposed Individual Worker (MEIW) for chronic health risk is located at commercial structure near the intersection of Watkins Drive and Big Springs Road.

[4] On-campus MEIW for chronic health risk is located at Geology building under baseline scenario and Science Lab 1 under future scenario.

Source: Programmatic HRA (Appendix C)

Acute Health Risk Impacts

Acute health risks are short-term and sometimes immediate reactions to health risks. These health risks are based on 1-hour exposure and generally include symptoms such as throat pain, eye irritation, and other similar symptoms. Acute hazard indices at the off-campus and on-campus MEIR, off-campus MEIW, and Early Childhood Services (Child Development Center) are described in Table 4.3-10. As shown, acute hazard indices under the proposed 2021 LRDP would not exceed the SCAQMD threshold of 1.0 at the off- or on-campus MEIR, off-campus MEIW, or Early Childhood Services (Child Development Center).

Table 4.3-10 Acute Health Risk Results

Scenario	Acute Hazard Index
Off-Campus Resident[1]	
Baseline Scenario	0.10
Future Scenario	0.13
Net Increase	0.03
SCAQMD Significance Threshold	1.0
Exceeds Threshold?	**No**
On-Campus Resident[2]	
Baseline Scenario	0.23
Future Scenario	0.27
Net Increase	0.04
SCAQMD Significance Threshold	1.0
Exceeds Threshold?	**No**

Scenario	Acute Hazard Index
Off-Campus Worker[3]	
Baseline Scenario	0.07
Future Scenario	0.11
Net Increase	0.04
SCAQMD Significance Threshold	1.0
Exceeds Threshold?	**No**
Early Childhood Services (Child Development Center)	
Baseline Scenario	0.10
Future Scenario	0.14
Net Increase	0.04
SCAQMD Significance Threshold	1.0
Exceeds Threshold?	**No**

SCAQMD = South Coast Air Quality Management District

[1] Off-campus Maximally Exposed Individual Resident (MEIR) for acute health risk is located at the rear yard of a single-family residence along West Campus View Drive, north of the campus Physical Plant.

[2] On-campus MEIR for acute health risk is located at the eastern portion of Lothian Hall.

[3] Off-campus Maximally Exposed Individual Worker (MEIW) for acute health risk is located at church near the intersection of University Avenue and West. Campus Drive.

Note: Health risk modeling as described in the Programmatic HRA identified the on-campus MEIW for acute health risk at campus laboratory facilities. However, the HRA methodology results in an inflated acute hazard index for on-campus workers, given that standard laboratory safety procedures cannot be incorporated. Such screening values are not reflective of the true acute health risk posed to on-campus workers under baseline or future scenarios, and therefore, are not described further in the Programmatic HRA. Nevertheless, health risk modeling indicated a net increase in acute hazard index of less than 0.1 for the on-campus MEIW between the baseline and future scenarios, below the SCAQMD significance threshold of 1.0.

Source: Programmatic HRA (Appendix C)

As summarized in Table 4.3-8 through Table 4.3-10, implementation of the proposed 2021 LRDP would not result in a net health risk increase exceeding SCAQMD's carcinogenic or non-carcinogenic health risk significance thresholds. Projects implemented under the proposed 2021 LRDP that include new sources of TACs will be required to undergo the appropriate level of project-specific environmental review to determine their consistency with the conclusions of this EIR, including the Programmatic HRA. Furthermore, new or altered sources of TACs would remain subject to all applicable State and air district regulations, including AB 2588 and SCAQMD New Source Review and Rule 1402 (*Control of Toxic Air Contaminants from Existing Sources*). Sources of TACs exceeding air district health risk standards would be required to implement risk reduction measures to minimize potential health risks to sensitive receptors. The Programmatic HRA also conservatively evaluates health risk at the edge of buildings without separation by windows or walls and assumes no use of California Energy Code-required building filtration systems. Nevertheless, despite these conservative assumptions, the health risk impacts associated with the proposed 2021 LRDP were determined not to exceed applicable SCAQMD thresholds. Consequently, operation of the proposed 2021 LRDP would not expose sensitive receptors to substantial pollutant concentrations, and this impact is considered to be **less than significant**.

Mitigation Measures

Mitigation measures are not required.

Significance After Mitigation

Impacts would be less than significant without mitigation.

4.3.4 Cumulative Impacts

The cumulative context for air quality is regional. The SCAB is designated a nonattainment area for the federal and State 1-hour and 8-hour O_3 standards, the State PM_{10} standards, the federal 24-hour $PM_{2.5}$ standard, and the federal and State annual $PM_{2.5}$ standard. SCAB is in attainment of all other federal and State standards. Despite the current nonattainment status and local air quality standard exceedances, air quality in the SCAB has generally improved since the inception of air pollutant monitoring in 1976. This improvement is mainly due to lower-polluting on-road motor vehicles, more stringent regulation of industrial sources, and the implementation of emission reduction strategies by the SCAQMD. This trend toward cleaner air has occurred despite continued population growth.[7] As discussed in the 2012 AQMP for the SCAB (SCAQMD 2013):

> Despite this growth, air quality has improved significantly over the years, primarily due to the impacts of the region's air quality control program…PM_{10} levels have declined almost 50 percent since 1990, and $PM_{2.5}$ levels have also declined 50 percent since measurements began in 1999…the only air monitoring station that is currently exceeding or projected to exceed the 24-hour $PM_{2.5}$ standard from 2011 forward is the Mira Loma station in Western Riverside County. Similar improvements are observed with O_3, although the rate of O_3 decline has slowed in recent years.

The proposed 2021 LRDP would contribute PM and the O_3 precursors ROG and NO_X to the area during construction and operation. As described under Impact AQ-2 above, regional emissions during construction would exceed SCAQMD ROG and NO_X thresholds and contribute substantially to an existing or projected air quality violation and would be potentially significant. ROG emissions during construction would exceed the SCAQMD ROG threshold because of the conservative construction scenario assumed for 2022, in which feasible mitigation is not available to reduce below significance. As the NO_x emissions exceedance is primarily due to off-site hauling trips, mitigation measures are not available that would feasibly reduce impacts from construction NO_X emissions to a less-than-significant level. Therefore, after mitigation impacts would be significant and unavoidable, and the proposed 2021 LRDP would have a significant and unavoidable **cumulatively considerable contribution of ROG and NO_X from construction emissions**.

Similarly, project operation would result in ROG, NO_X, and PM_{10} emissions that exceed SCAQMD thresholds during operation. Consumer product use is ultimately dependent on future individual consumer behavior, and therefore feasible mitigation measures do not exist to reduce these emissions. In addition, while a TDM Plan would be implemented as part of the proposed 2021 LRDP that would reduce mobile emissions, however additional mitigation measures are not available that would further reduce impacts from operational (i.e., mobile) NO_X and PM_{10} emissions to a less-than-significant level. Therefore, after mitigation impacts would be significant and unavoidable, and the proposed 2021 LRDP would have a significant and unavoidable **cumulatively considerable contribution of ROG, NO_X, and PM_{10} from operational emissions**.

As identified in Section 4.3.3, Impact Analysis and Mitigation Measures, under Impact AQ-3, the proposed 2021 LRDP would not have a significant impact from CO hotspots or construction or operational emissions of TACs. Existing and increased traffic and population growth in Inland

[7] These trends are show in greater detail on SCAQMD's website at: http://www.aqmd.gov/home/air-quality/historical-air-quality-data.

Southern California have cumulatively resulted in air quality impacts. In the area surrounding campus, existing sources of TACs and other pollutant emissions include the heavily-traveled I-215/SR 60 freeway, Metrolink railroad facilities, and gasoline storage and dispensing facilities in commercial corridors. Given southern California's longstanding history of degraded air quality and the presence of substantial pollution sources off-campus, it is reasonable to conclude that sensitive receptors in the project vicinity have been and may continue to be exposed to substantial pollutant concentrations from a wide range of sources, and such cumulative impacts are considered to be significant.

To date, SCAQMD has not adopted cumulative health risk thresholds to analyze cumulative environmental impacts associated with exposure of sensitive receptors to substantial pollutant concentrations. However, the analysis contained herein evaluates potential health risk impacts associated with construction and implementation of the proposed 2021 LRDP and compares such impacts to SCAQMD's project-level health risk thresholds. As discussed under Impact AQ-3, neither construction nor implementation of the proposed 2021 LRDP would result in exceedances of SCAQMD's health risk thresholds, which are intended to be protective of human health. Therefore, while cumulative impacts associated with exposure of sensitive receptors to substantial pollutant concentrations may be potentially significant, the proposed 2021 LRDP's contribution to such impacts **would not be cumulatively considerable**.

4.3.5 References

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