3.8 GREENHOUSE GAS EMISSIONS AND CLIMATE CHANGE

This section discusses greenhouse gas (GHG) emissions expected to result from campus development and growth under the proposed 2021 LRDP. GHGs are a type of gas, most commonly carbon dioxide but also including other gases, that trap heat in the Earth's atmosphere, leading to global climate change. Emissions of GHGs from projects have the potential to adversely affect the environment because they contribute to global climate change. Although no single project produces enough GHG emissions to alter global climate, each project has the potential to contribute GHGs that ultimately concentrate in the Earth's atmosphere and contribute to this growing global crisis. Unlike criteria air pollutants and toxic air contaminants (TACs) that are short-lived pollutants of localized or regional concern, the location where GHG emissions are generated is less of a concern due to their long-term atmospheric residence time.

The fact that GHGs are emitted from a project does not always mean they are "new" emissions. Because these emissions are tied to people and their activities, such as heating their homes, driving, and in this case, education, they are often emitted in a different location and at a different rate than they were prior to a project's construction, and the project serves to "transfer" the location from where GHGs are emitted. A project located in an area that reduces driving or places people in homes powered by renewable energy may, in the aggregate, reduce global GHGs. By contrast, a project located in a remote area that increases commutes may cause a net increase in GHGs. In terms of this project, the 2021 LRDP does not necessarily create new students and faculty/staff because it is likely some or all of these students and faculty/staff would have attended other colleges and been employed elsewhere. Therefore, the rate per person at which GHGs are emitted is as important, or more important, in determining a project's effect on climate change than the gross quantity of emissions.

Public comments on the NOP (Appendix B) included concerns regarding the GHG impacts associated with growth planned under the 2021 LRDP, GHG impacts from construction activities, and consistency of campus growth and development under the 2021 LRDP with regional growth plans and UC Santa Cruz's GHG reduction efforts. Concerns were also raised related to the potential for the 2021 LRDP to result in increased students and staff vehicles and related emissions due to limited housing availability on-campus and within the city of Santa Cruz.

3.8.1 Regulatory Setting

FEDERAL

Supreme Court Ruling

The U.S. Environmental Protection Agency (EPA) is the federal agency responsible for implementing the federal Clean Air Act (CAA) and its amendments. Per *Massachusetts v. Environmental Protection Agency,* the Supreme Court of the United States ruled on April 2, 2007, that carbon dioxide (CO_2) (which is a GHG) is an air pollutant as defined under the CAA, and that EPA has the authority to regulate emissions of GHGs. The ruling in this case resulted in EPA taking steps to regulate GHG emissions and lend support to state and local agencies' in their efforts to reduce GHG emissions.

Greenhouse Gas Permitting Requirements

EPA's New Source Review permitting program, including its Prevention of Significant Deterioration (PSD) requirements, applies to new major sources of criteria air pollutants and precursors. Title V of the federal CAA requires "major sources" of air pollutants to obtain and operate in compliance with an operating permit (EPA 2019a). Operating permits are legally-enforceable documents designed to improve compliance by clarifying what sources must do to control air pollution.

In 2010, EPA issued the Prevention of Significant Deterioration and Title V Greenhouse Gas Tailor Rule (EPA 2011). This rule set mass emission-based permitting criteria specifically for carbon dioxide-equivalent (CO_2e) emissions that define when permits under the New Source Review PSD and Title V Operating Permit programs are required for new

and existing industrial facilities. This is known as Steps 1 and 2 of the Tailoring Rule for PSD and Title V permitting based on CO_2e emissions.

A new part of the GHG Tailoring Rule, known as Step 3, was issued by EPA in 2012. This step, known as Step 3, revised the regulations to require a source that emits or has the potential to emit levels of CO_2e that exceed established mass emission criteria (i.e., 100,000 tons per year [90,718 metric tons (MT) per year]) of CO_2e, but that has minor source emissions of all other regulated pollutants, to apply for an operating permit. However, in 2014, the US Supreme Court issued its decision in *Utility Air Regulatory Group v. EPA*, 134 S. Ct. 2427. The Court held that EPA may not treat GHGs as an air pollutant for purposes of determining whether a source is a major source required to obtain a PSD or Title V permit. The Court also held that PSD permits that are otherwise required (based on emissions of other, non-GHG pollutants) may continue to require limitations on GHG emissions. In response to the Supreme Court decision and the D.C. Circuit's amended judgment, EPA is undertaking various actions to explain the next steps in GHG permitting (EPA 2019a). This program is currently under review by EPA, but has not been changed at the time of publication of this Draft EIR.

Regulations for Greenhouse Gas Emissions from Passenger Cars and Trucks and Corporate Average Fuel Economy Standards

In October 2012, EPA and the National Highway Traffic Safety Administration (NHSTA), on behalf of the Department of Transportation, issued final rules to further reduce GHG emissions and improve corporate average fuel economy (CAFE) standards for light-duty vehicles for model years 2017 and beyond (77 FR 62624). NHSTA'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 (mpg) limiting vehicle emissions to 163 grams of CO_2 per mile for the fleet of cars and light-duty trucks by model year 2025 (77 FR 62630).

On August 2, 2018, NHTSA and EPA proposed the Safer Affordable Fuel-Efficient Vehicle Rule (SAFE Rule). This rule addresses emissions and fuel economy standards for motor vehicles and is separated in two parts as follows.

- Part One, "One National Program" (84 FR 51310), revokes a waiver granted by 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 EPA for the explicit purpose of GHG emission reduction, and indirectly, criteria air pollutant and ozone precursor emission reduction. This revocation became effective on November 26, 2019, restricting the ability of the California Air Resources Board (CARB) to enforce more stringent GHG emission standards for new vehicles and set zero emission vehicle mandates in California. CARB has estimated the vehicle tailpipe and evaporative emissions impacts to criteria air pollutants and precursors from SAFE Rule Part One and has provided off-model adjustment factors to adjust emission outputs from CARB's Emission Factor (EMFAC2017) model. EMFAC2017 is CARB's most recent version of the EMFAC model series and considers effects of known policy implementation and economic forecasts, such as the implementation of the CAFE standards and Advanced Clean Cars program.
- Part Two, "Vehicles Rule for Model Years 2021–2026 Passenger Cars and Light Trucks" (85 FR 24174) 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 through model year 2026, but comment is sought on a range of alternatives discussed throughout the proposed rule that would affect tailpipe emissions, including CO_2. The final SAFE Rule Part Two was published in the Federal Register on April 30, 2020. The outcome of any pending or potential lawsuits (and how such lawsuits could delay or affect its implementation) are unknown at this time.

Clean Power Plan

The Clean Power Plan was unveiled by President Obama on August 3, 2015. The plan aims to reduce CO_2 emissions from electrical power generation by 32 percent relative to 2005 levels within 25 years. President Trump signed an executive order on March 28, 2017 mandating the EPA to review the plan. On June 19, 2019, EPA repealed the Clean Power Plan citing exceedance of EPA's statutory authority under the CAA (EPA 2019b).

STATE

CARB is the agency responsible for coordination and oversight of state and local air pollution control programs in California and for implementing the California Clean Air Act, which was adopted in 1988. Various initiatives to reduce the state's contribution to GHG emissions are underway.

California Building Efficiency Standards (Title 24, Part 6)

The California Building Standards Code or Title 24 of the California Code of Regulations contains the regulations that govern the construction of buildings in California. Within the Building Standards Code, two parts pertain to the incorporation of both energy efficient and green building elements into land use development. Part 6 is California's Energy Efficiency Standards for Residential and Non-Residential Buildings and Part 11 is the California Green Building Standards, also known as CALGreen. These standards were first adopted in 1978 in response to a legislative mandate to reduce California's energy consumption and are updated on an approximately 3-year cycle to allow consideration and possible incorporation of new energy efficient technologies and methods. All buildings for which an application for a building permit is submitted on or after January 1, 2020 must follow the 2019 standards (CEC 2018). The next set of standards is anticipated in 2022. Energy efficient buildings require less electricity; therefore, increased energy efficiency reduces fossil fuel consumption and decreases GHG emissions.

California Integrated Waste Management Act

To minimize the amount of solid waste that must be disposed of in landfills, the State Legislature passed the California Integrated Waste Management Act of 1989 (AB 939), effective January 1990. According to AB 939, all cities and counties were required to divert 25 percent of all solid waste from landfill facilities by January 1, 1995, and 50 percent by January 1, 2000. Through other statutes and regulations, this 50 percent diversion rate also applies to State agencies. In order of priority, waste reduction efforts must promote source reduction, recycling and composting, and environmentally-safe transformation and land disposal.

In 2011, AB 341 modified the California Integrated Waste Management Act and directed the California Department of Resources Recycling and Recovery (CalRecycle) to develop and adopt regulations for mandatory commercial recycling. The resulting Mandatory Commercial Recycling Regulation (2012) requires that on and after July 1, 2012, certain businesses that generate four cubic yards or more of commercial solid waste per week shall arrange recycling services. To comply with this requirement, businesses may either separate recyclables and self-haul them or subscribe to a recycling service that includes mixed waste processing. AB 341 also established a statewide recycling goal of 75 percent; the 50 percent disposal reduction mandate still applies for cities and counties under AB 939, the Integrated Waste Management Act.

In April 2016, AB 1826 further modified the California Integrated Waste Management Act, requiring businesses that generate a specified amount of organic waste per week to arrange for recycling services for that organic waste in a specified manner. If CalRecycle determines that statewide disposal of organic waste has not been reduced by 50 percent below 2014 levels by 2020, businesses generating more than two cubic yards of organic waste per week would be subject to these waste collection requirements. CalRecycle plans to make this assessment in the fall of 2020 (CalRecycle 2020).

Diverting organic waste from landfills reduces emissions of methane (CH_4), considered a GHG. This is equivalent to reducing anaerobic decomposition of organic waste that would have otherwise occurred in landfills where organic waste is often buried with other inorganic waste.

Executive Order S-3-05

Executive Order (EO) S-3-05, signed by Governor Arnold Schwarzenegger in 2005, proclaimed that California is vulnerable to the impacts of climate change. It declared that increased temperatures could reduce the Sierra Nevada snowpack, further exacerbate California's air quality problems, and potentially cause a rise in sea levels. To combat those concerns, the EO established total GHG emission targets for the state. Specifically, statewide emissions are to be reduced to 2000 levels by 2010, 1990 levels by 2020, and to 80 percent below 1990 levels by 2050.

This executive order was the subject of a California Appellate Court decision, *Cleveland National Forest Foundation v. San Diego Association of Governments* (SANDAG) (November 24, 2014) 231 Cal.App.4th 1056, which was reviewed by the California Supreme Court in January 2017. The case addressed the adequacy of the GHG analysis in the EIR SANDAG prepared for its 2011 Regional Transportation Plan. The Supreme Court ruled on July 13, 2017 that SANDAG did not abuse its discretion by declining "to adopt the 2050 goal as a measure of significance in light of the fact that the Executive Order does not specify any plan or implementation measures to achieve its goal."

In addition to concluding that an EIR need not use this executive order's goal for determining significance, the Court described several principles relevant to CEQA review of GHG impacts, including: (1) EIRs should "reasonably evaluate" the "long-range GHG emission impacts for the year 2050;" (2) the 2050 target is "grounded in sound science" in that it is "based on the scientifically supported level of emissions reduction needed to avoid significant disruption of the climate;" (3) in the case of the SANDAG plan, the increase in long-range GHG emissions by 2050, which would be substantially greater than 2010 levels, was appropriately determined to be significant and unavoidable; (4) the reasoning that a project's role in achieving a long-range emission reduction target is "likely small" is not valid for rejecting a target; and (5) "as more and better data become available," analysis of proposed plan impacts will likely improve, such that "CEQA analysis stays in step with evolving scientific knowledge and state regulatory schemes." The Court also ruled that "an EIR's designation of a particular adverse environmental effect as 'significant' does not excuse the EIR's failure to reasonably describe the nature and magnitude of the adverse effect." The Court also recognized that the 40 percent reduction in 1990 GHG levels by 2030 is "widely acknowledged" as a "necessary interim target to ensure that California meets its longer-range goal of reducing greenhouse gas emission 80 percent below 1990 levels by the year 2050." Senate Bill (SB) 32 has since defined the 2030 goal in statute (discussed below).

Assembly Bill 32, the California Global Warming Solutions Act of 2006

In September 2006, Governor Schwarzenegger signed the California Global Warming Solutions Act of 2006, Assembly Bill (AB) 32. AB 32 establishes regulatory, reporting, and market mechanisms to achieve quantifiable reductions in GHG emissions and a cap on statewide GHG emissions. AB 32 requires that statewide GHG emissions be reduced to 1990 levels by 2020.

Low Carbon Fuel Standard

In January 2007, EO S-01-07 established a Low Carbon Fuel Standard (LCFS). The EO calls for a statewide goal to be established to reduce the carbon intensity of California's transportation fuels by at least 10 percent by 2020, and that a LCFS for transportation fuels be established for California. The LCFS applies to all refiners, blenders, producers, or importers ("Providers") of transportation fuels in California, including fuels used by off-road construction equipment (Wade, pers. comm. 2017).

In June 2007, CARB adopted the LCFS under AB 32 pursuant to Health and Safety Code Section 38560.5, and, in April 2009, CARB approved the new rules and carbon intensity reference values with new regulatory requirements taking effect in January 2011. The standards require providers of transportation fuels to report on the mix of fuels they provide and demonstrate they meet the LCFS intensity standards annually. This is accomplished by ensuring that the number of "credits" earned by providing fuels with a lower carbon intensity than the established baseline (or obtained from another party) is equal to or greater than the "deficits" earned from selling higher intensity fuels.

In response to certain court rulings, CARB re-adopted the LCFS regulation in September 2015, and the LCFS went into effect on January 1, 2016. In 2018, CARB approved amendments to the regulation to readjust carbon intensity benchmarks to meet California's 2030 GHG reductions targets under SB32. These amendments include opportunities to promote zero emission vehicle (ZEV) adoption, carbon capture and sequestration, and advanced technologies for decarbonization of the transportation sector (CARB 2020a).

Senate Bill 375 of 2008

Senate Bill (SB) 375, signed by Governor Schwarzenegger in September 2008, aligns regional transportation planning efforts, regional GHG emission reduction targets, and land use and housing allocation. SB 375 requires metropolitan planning organizations (MPOs) to adopt a regional plan showing prescribed land use allocation in each MPO's

Regional Transportation Plan. CARB, in consultation with the MPOs, is to provide each affected region with reduction targets for GHGs emitted by passenger cars and light trucks in their respective regions for 2020 and 2035.

Climate Change Scoping Plan

In December 2008, CARB adopted its first version of its *Climate Change Scoping Plan*, which contained the main strategies California will implement to achieve the mandate of AB 32 to reduce statewide GHG emissions to 1990 levels by 2020. Subsequent versions of the plan were released and in 2017 CARB adopted the most recent version titled *California's 2017 Climate Change Scoping Plan* (2017 Scoping Plan) (CARB 2017a). The 2017 Scoping Plan indicates that California is on track to achieve the 2020 statewide GHG target mandated by AB 32 (CARB 2017a:9). It also lays out the framework for achieving the mandate of SB 32 (discussed below) to reduce statewide GHG emissions to at least 40 percent below 1990 levels by the end of 2030 (CARB 2017a).

The 2017 Scoping Plan recommends that local plan-level GHG emission reduction goals should be consistent with state goals of reducing emissions to 40 percent below 1990 levels by 2030 and 80 percent below 1990 levels by 2050. For local plans, CARB recommends statewide targets of no more than 6 metric tons of CO_2e per capita by 2030 and 2 $MTCO_2e$ per capita by 2050, which were developed by applying the percent reduction goals to the State's 1990 emissions. Because these per-capita targets include emissions from all sectors in the State, CARB states that it is appropriate for local jurisdictions to develop evidence-based per-capita targets that are consistent with the framework used to develop statewide per-capita targets. The resulting emissions should be consistent with the downward trends of the statewide objectives (CARB 2017a: 99-100).

Additionally, the 2017 Scoping Plan includes some guidance for project-level thresholds for consideration. Where adequate geographically-specific GHG reduction plans, as defined in the 2017 Scoping Plan, are not available, CARB recommends that projects incorporate design features and GHG reduction measures, as feasible, to minimize GHG emissions. CARB considers a project-level threshold of no net additional increase in GHG emissions to be appropriate as an overall objective for new development, although the Scoping Plan specifically states that a net zero approach is not required (CARB 2017a: 101.).

Cap-and-Trade Program

In 2011, CARB adopted the cap-and-trade regulation and created the cap-and-trade program, which covers sources of GHG emissions that emit more than 25,000 MT CO_2e per year in the State such as refineries, power plants, industrial facilities, and transportation fuels. The cap-and-trade program includes an enforceable state-wide GHG emissions cap that declines approximately three percent annually. CARB distributes allowances, which are tradable permits, equal to the emissions allowed under the cap. Sources that reduce emissions more than their limits can auction carbon allowances to other covered entities through the cap-and-trade market. Sources subject to the cap are required to surrender allowances and offsets equal to their emissions at the end of each compliance period. The cap-and-trade program took effect in early 2012 with the enforceable compliance obligation beginning January 1, 2013. The cap-and-trade program was initially slated to sunset in 2020 but the passage of SB 398 in 2017 extended the program through 2030.

The Santa Cruz campus is subject to cap-and-trade and participates in the program. Through an agreement with CARB, all subject UC campuses, including the Santa Cruz campus, receive allowances in exchange for a financial commitment to university actions to combat climate change.

Legislation Associated with Electricity Generation

Senate Bill X1-2 (SB X1-2) of 2011 requires all California utilities to generate 33 percent of their electricity from renewables by 2020. SB X1-2 sets a three-stage compliance period requiring all California utilities, including independently-owned utilities, energy service providers, and community choice aggregators, to generate 20 percent of their electricity from renewables by December 31, 2013; 25 percent by December 31, 2016; and 33 percent by December 31, 2020. SB X1-2 also requires the renewable electricity standard to be met increasingly with renewable energy that is supplied to the California grid from sources within, or directly proximate to, California. SB X1-2 mandates that renewables from these sources make up at least 50 percent of the total renewable energy for the 2011-2013 compliance period, at least 65 percent for the 2014-2016 compliance period, and at least 75 percent for 2016 and beyond. In October 2015, SB 350 was

signed by Governor Brown, which requires retail sellers and publicly-owned utilities to procure 50 percent of their electricity from renewable resources by 2030. In September 2018, SB 100 was signed by Governor Brown, committing California to 100% clean energy by 2045. SB 100 requires all California utilities to generate 52 percent of their electricity from renewables by 2027, 60 percent by 2030, and 100 percent by 2045.

Advanced Clean Cars Program

In January 2012, CARB approved the Advanced Clean Cars program which combines the control of GHG emissions and criteria air pollutants, as well as requirements for greater numbers of zero-emission vehicles, into a single package of regulatory standards for vehicle model years 2017 through 2025. The new regulations strengthen the GHG standard for 2017 models and beyond. This will be achieved through existing technologies, the use of stronger and lighter materials, and more efficient drivetrains and engines. The program's zero-emission vehicle regulation requires battery, fuel cell, and/or plug-in hybrid electric vehicles to account for up to 15 percent of California's new vehicle sales by 2025. The program also includes a clean fuels outlet regulation designed to support the commercialization of zero-emission hydrogen fuel cell vehicles planned by vehicle manufacturers by 2015 by requiring increased numbers of hydrogen fueling stations throughout the state. The number of stations will grow as vehicle manufacturers sell more fuel cell vehicles. By 2025, when the rules will be fully implemented, the statewide fleet of new cars and light trucks will emit 40 percent fewer GHGs and 75 percent fewer smog-forming emissions than 2012 model year vehicles (CARB 2020b). However, the recent federal SAFE Rule Part One revokes CARB's authority to enforce these new rules under the Advanced Clean Cars Program. In June 2020, CARB released estimates of how the federal SAFE Rule would affect vehicle emissions forecasts in CARB's EMFAC2017 model in the form of adjustment factors developed to modify existing CO_2 emission factors for light and medium duty gasoline fueled vehicles (LDA, LDT1, LDT2, MDV). The adjustment factors increase the CO_2 emissions of these vehicles by up to 12 percent (2050 emission factors).

Executive Order B-18-12

In April 2012, Governor Brown signed EO B-18-12 requiring State agencies, departments, and other entities under the Governor's direct executive authority to implement green building practices to improve energy, water and materials efficiency, improve air quality and working conditions for State employees, reduce costs to the State and reduce environmental impacts from State operations. Among other actions, the EO requires State agencies to reduce agency-wide water use by 10 percent by 2015 and 20 percent by 2020, as measured against a 2010 baseline. The EO directs that new State buildings larger than 10,000 square feet use clean, on-site power generation and obtain the US Green Building Council's Leadership in Energy and Environmental Design (LEED) Silver certification. Further, EO B-18-12 states that all new State buildings beginning design after 2025 be constructed as Zero Net Energy (ZNE) facilities, with an interim target of 50 percent of new facilities beginning design after 2020 to be ZNE. The EO also calls for State agencies to identify and pursue opportunities to provide electric vehicle charging stations at employee parking facilities in new buildings. As a state entity not under the direct executive authority of the Governor, the UC is not subject to EO B-18-12; however, the green building practices required by the EO are largely implemented through the UC Sustainable Practices Policy, discussed further below.

Executive Order B-30-15

On April 20, 2015 Governor Brown signed EO B-30-15 to establish a California GHG reduction target of 40 percent below 1990 levels by 2030. The Governor's EO aligns California's GHG reduction targets with those of leading international governments such as the 28-nation European Union, which adopted the same target in October 2014. California is on track to meet or exceed the target of reducing GHG emissions to 1990 levels by 2020, as established in AB 32, discussed above. California's emission reduction target of 40 percent below 1990 levels by 2030 sets the next interim step in the State's continuing efforts to pursue the long-term target expressed under EO S-3-05 to reach the goal of reducing emissions 80 percent below 1990 levels by 2050. This is in line with the scientifically established levels needed in the US to limit global warming below 2 degrees Celsius, the warming threshold at which major climate disruptions are projected, such as super droughts and rising sea levels.

Senate Bill 32 and Assembly Bill 197 of 2016

In August 2016, Governor Brown signed SB 32 and AB 197, which extend California's GHG reduction programs beyond 2020. SB 32 amended the Health and Safety Code to include Section 38566, which contains language to authorize CARB to achieve a statewide GHG emissions reduction of at least 40 percent below 1990 levels by no later than December 31, 2030. SB 32 codified the targets established by EO B-30-15 for 2030, which set the next interim step in the State's continuing efforts to pursue the long-term target expressed in EO S-3-05 and B-30-15 of 80 percent below 1990 emissions levels by 2050. AB 197 requires CARB to prioritize direct emission reductions and consider social costs when adopting regulations to reduce GHG emissions as a means to protect what are perceived as impacted and disadvantaged communities. The legislation requires CARB to prioritize those rules and regulations that would result in direct emissions reductions at large stationary and mobile sources.

Senate Bill 1383 of 2016

In supporting the goals of AB 32, Governor Brown approved SB 1383 in September 2016, which requires CARB to approve and begin implementing a comprehensive strategy to reduce emissions of short-lived climate pollutants (SLCPs), such as CH_4, hydrofluorocarbons, and anthropogenic black carbon (soot) emissions. SLCPs are GHGs that degrade in the atmosphere at a faster rate than CO_2 and are considered to be responsible for 40 percent of current net climate changing emissions. The strategy includes a target to reduce CH_4 emissions by 40 percent below 2013 levels by 2030, including those from livestock management operations. This bill also requires CalRecycle and CARB to adopt regulations that achieve specific targets to reduce organic waste in landfills. The Final SLCP Reduction Strategy was approved by CARB in March 2017 and includes recommendations to reduce CH_4 emissions from a variety of sources as well as refrigerants and fumigants (CARB 2017b).

Executive Order B-48-18

In January 2018, Governor Brown signed EO B-48-18 requiring all State entities to work with the private sector to have at least 5 million zero-emission vehicles (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 electric vehicle 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* and update the *2015 Hydrogen Station Permitting Guidebook* (Eckerle and Jones 2015) to aid in these efforts. All State entities are required to participate in updating the *2016 Zero-Emissions Vehicle Action Plan* (Governor's Interagency Working Group on Zero-Emission Vehicles 2016) to help expand private investment in ZEV infrastructure with a focus on serving low-income and disadvantaged communities. Additionally, all State entities are to support and recommend policies and actions to expand ZEV infrastructure at residential land uses, through the Low Carbon Fuel Standard Program, and recommend how to ensure affordability and accessibility for all drivers.

Executive Order B-55-18

On September 10, 2018, Governor Brown signed EO B-55-18, committing California to total, economy-wide carbon neutrality by 2045. The executive order directs CARB to work with relevant State agencies to develop a framework to implement and accounting that tracks progress toward this goal.

Executive Order N-79-20

In September 2020, Governor Gavin Newsom signed Executive Order N-79-20, 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 establishes a goal that 100 percent of statewide new sales of medium- and heavy-duty vehicles will be zero emissions by 2045, where feasible, and that all new drayage trucks sold in California will 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

University of California Carbon Neutrality Initiative

In November 2013, UC President Janet Napolitano introduced the Carbon Neutrality Initiative, which commits UC campuses (buildings and vehicle fleets) to emitting net zero GHG emissions by 2025. In line with this initiative, UC Santa Cruz and other UC campuses also planned to achieve net zero GHG emissions from commuting and business air travel by 2050. These goals require the UC system, including UC Santa Cruz, to aggressively improve energy efficiency in buildings, reduce emissions from campus fleet and other sources, and increase utilization of renewable energy sources. (University of California Office of the President [UCOP] 2018). The UC defines carbon neutrality as where:

> *… the University will have net zero climate impacts from [GHG] emissions attributed to Scope 1 direct emission sources and Scope 2 indirect emission sources as defined by The Climate Registry, and specific Scope 3 emissions as defined by the American College and University Presidents' Climate Commitment (ACUPCC). This neutrality will be achieved by minimizing GHG emissions from these sources as much as possible and using carbon offsets or other measures to mitigate the remaining GHG emissions.*

Scope 1, 2, or 3 emissions are defined in greater detail below in Section 3.8.2 in the discussion of GHG Emissions Classification. The UC has incorporated the Carbon Neutrality Initiative into the UC Sustainable Practices Policy, which specifies the emissions reduction targets in the Climate Action section.

University of California Sustainable Practices Policy

At the direction of The Regents of the University of California, UCOP developed a Sustainable Practices Policy which establishes sustainability goals to be achieved by all campuses, medical centers, and the Lawrence Berkeley National Laboratory within 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, sustainable water systems (UCOP 2020). The policy includes the following provisions relevant to the reduction of GHG emissions:

- 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 (summarized in Table 3.6-1, in Section 3.6, "Energy").
  - All new buildings will strive to achieve certification of US Green Building Council's LEED "Gold" and achieve a minimum of LEED "Silver" certification, whenever possible within the constraints of program needs and standard budget parameters.
  - No new building or major renovation that is approved after June 30, 2019, shall use onsite 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.
- Clean Energy
  - 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.
  - By 2025, each campus and health location will obtain 100 percent clean [i.e., zero carbon] electricity. By 2018, the University's Wholesale Power Program will provide 100 percent clean electricity to participating locations.

- Climate Protection
  - Each campus and the UC Office of the President will develop strategies for meeting the following UC goals:
    - Carbon neutrality from Scope 1 and 2 sources, such as on-site natural gas combustion and off-site electricity generation, by 2025.
    - Carbon neutrality from specific Scope 3 sources (as defined by the Second Nature's Carbon Commitment) by 2050 or sooner.
- Sustainable Transportation
  - Each location shall implement strategies to reduce GHG emissions from fleet activities, such that by 2025 zero emission vehicles or hybrid vehicles shall account for at least 50% of all new light-duty vehicle acquisitions.
  - Each location shall strive to reduce its percentage of employees and students commuting by single occupancy vehicle (SOV) by 10 percent relative to its 2015 SOV commute rate and have at least 4.5 percent of commuter vehicles be ZEVs by 2025.
  - Each location shall strive to have no more than 40 percent of its employees and no more than 30 percent of all employees and students commuting to the location by SOV and have at least 30 percent of commuter vehicles be ZEVs by 2050.
  - Each location shall develop a business-case analysis for any proposed parking structures serving University affiliates or visitors to campus to document how a capital investment in parking aligns with each campus' Climate Action Plans and/or sustainable transportation policies.
- Sustainable Building Operations for Campuses
  - Each campus shall seek to certify as many buildings as possible through the "LEED for Operations and Maintenance" rating system, within budgetary constraints and eligibility limitations.
- Zero Waste
  - The University will reduce per capita total municipal solid waste generation at all locations other than medical centers as follows:
    - reduce waste generation by 25 percent per capita from FY2015/16 levels by 2025,
    - reduce waste generation by 50 percent per capita from FY2015/16 levels by 2030,
    - divert 90% of municipal solid waste from landfills.
  - By 2020, the University will prohibit the sale, procurement or distribution of Expanded Polystyrene (EPS) other than that utilized for laboratory supply or medical packaging and products.

As a member of the UC, the goal of carbon neutrality under the Climate Protection section shown above applies to UC Santa Cruz. By 2025, UC Santa Cruz and its projects must demonstrate zero net emissions from on-campus natural gas combustion sources such as the central plant, campus fleet, and purchased electricity (Scope 1 and 2 emissions) to comply with the UC's climate change commitments.

American College and University Presidents Climate Commitment

The UC has also signed the American College and University Presidents Climate Commitment (ACUPCC). Each signatory commits to completing an inventory of GHG emissions within one year, and to developing, within two years, an institutional plan to achieve carbon neutrality as soon as possible. The commitment also includes specific interim actions, including requiring that new campus construction will be built to at least the US Green Building Council's LEED Silver standard or equivalent; purchasing Energy Star appliances; offsetting greenhouse gas emissions generated by institutional air travel; encouraging and providing access to public transportation; purchasing or producing at least 15 percent of the institution's electricity consumption from renewable sources; supporting climate

and sustainability shareholder proposals at companies where the institution's endowment is invested; and adopting measures to reduce waste.

UC Santa Cruz Climate and Energy Strategy

UC Santa Cruz's 2017 Climate and Energy Strategy (CES) serves as the campus's climate action plan and addresses how the campus would achieve its two climate and energy goals: achieving carbon neutrality by 2025 from Scope 1 and Scope 2 sources and mitigating the impacts of the Cap-and-Trade Regulation (UC Santa Cruz 2017). The strategies to meet these goals include the following:

- Purchasing voluntary carbon offsets for the remainder of emissions that cannot be mitigated through onsite reductions starting in 2025,
- Double the pace of implementation of energy efficiency projects that qualify for funding through the Higher Education Energy Efficiency Partnership (Strategic Energy Partnership) program.
- Install up to 4.4 megawatts (MW) solar photovoltaic panels (3.3 MW of which would be installed on main residential campus, with an additional 1.1 MW at Westside Research Park and the Long Marine Lab at the Coastal Science Campus) through execution of a Power Purchase Agreement.
- Establish energy use intensity (EUI) targets for new capital projects that achieve the UC Sustainable Practices Policy "stretch targets" at a minimum, and strive to achieve a 60 percent reduction in EUI below 1999 benchmarks (by building type) in conjunction with achieving Net Zero Site Source targets for major capital projects.

The CES did not explore GHG reductions from Scope 1 mobile emissions (e.g., fleet), Scope 3 emissions (e.g., commuter vehicles), renewable energy technologies other than solar, waste and water-mitigation strategies, or specific strategies included in UC Sustainability Practices Policy. The CES refers to the UC Sustainability Practices Policy Transportation section for GHG reductions related to Scope 1 mobile emissions from fleet activity (UC Santa Cruz 2017).

UC Santa Cruz Energy Efficiency Programs

The Energy Management department leads several efforts related to energy efficiency for UC Santa Cruz. These efforts focus on energy efficiency projects, building commissioning, behavioral change towards higher conservation, installation of onsite renewable energy generation, and procurement of renewable energy. UC Santa Cruz is currently in year 3 of a multiyear project to retrofit all campus buildings to high efficiency LED lighting with integrated daylighting/occupancy controls. This retrofit effort is anticipated to substantially reduce campus energy usage, especially during times of peak demand for the campus and the state.

UC Santa Cruz is also focusing on the commissioning and renovation of its district utility systems, specifically to improve the operation of the main residential campus' campus-wide heating and cooling loops, through a combination of hardware and software renovations. These systems are two of the highest energy using systems on the main residential campus, and these projects will result in significant energy/carbon savings.

Additionally, while campus vehicles used about 72,000 gallons of diesel in 2019, student shuttles and other fleet vehicles began using renewable biodiesel that year. Biodiesel emits 50-90% less carbon than traditional diesel, so this transfer reduces UC Santa Cruz's annual fleet emissions by at least 25% annually. "Biodiesel" is a blend of diesel fuel derived from biological sources, including plant and animal matter (e.g. raw vegetable oils, used cooking oils, and animal fats), and conventional diesel derived from petroleum. A typical blend might be B20 (20% biological, 80% petroleum). UC Santa Cruz has identified a high-quality product "RD99" which is derived from 99% biological sources.

To encourage the use of electric (zero-emission) vehicles, UC Santa Cruz's Transportation and Parking Services (TAPS) has installed a number of EV charging stations on campus. 14 EV charging stations are located at the Core West Parking Structure, eight EV charging stations at the Coastal Science Campus, and 40 new EV charging stations were installed in the East Remote parking lot. TAPS will be required to electrify the campus shuttle fleet by 2040.

UC Santa Cruz Campus Sustainability Plan

UC Santa Cruz's Campus Sustainability Plan is divided into four focus areas: learning and culture; materials management and food systems; natural environmental and infrastructure; and climate and energy. The following lists the plan's goals and strategies by focus area that are relevant to the 2021 LRDP. Many of these goals are related to the policies included in UC Sustainability Practices Policy (UC Santa Cruz 2019).

Natural Environment & Infrastructure

GOAL 2: Meet the UC Office of the President Sustainable Practices Policy goal to reduce potable water usage by 36 percent by weighted campus user by 2025 from a 2005-08 baseline.

- **STRATEGY 2.1:** Increase the use of non-potable water on campus.
- **STRATEGY 2.2:** Reduce potable water use through technological innovations and physical improvements.
- **STRATEGY 2.4:** Identify new sources of funding for both potable water reduction and non-potable sourced development projects.

GOAL 3: Reduce commute travel mode impacts relative to a 2017 baseline by: reducing Scope 3 commuter greenhouse gas emissions 10 percent by 2022; reducing commute vehicle miles travelled (VMT) five percent by 2022; and reducing per capita parking demand 10 percent by 2022.

- **STRATEGY 3.1:** Increase transit ridership to/from campus by 10 percent.
- **STRATEGY 3.2:** Develop an outreach strategy to promote sustainable transportation culture and prioritize human-powered on-campus travel at UC Santa Cruz.
- **STRATEGY 3.4:** Increase electric vehicle (EV) charging infrastructure and programs to achieve a 4.5 percent mix of zero-emission vehicles for personal commute by 2025.

Climate & Energy

GOAL 1: Support the UC Office of the President Sustainable Practices Policy goal of achieving carbon neutrality for Scope 1 and Scope 2 emissions by 2025.

GOAL 2: Achieve net zero emissions for all new capital projects.

- **STRATEGY 2.1:** For all major capital projects, achieve at least the UC Office of the President Sustainable Practices Policy "stretch" EUI targets and strive for 50 percent better than baseline design.
- **STRATEGY 2.2:** Develop and implement a net zero energy policy for capital projects that provides different avenues to mitigate emissions and incorporates net zero ready building requirements.
- **STRATEGY 2.3:** Continue to achieve LEED Silver and strive for LEED Gold (V4) for new buildings and, for labs, meet at least the prerequisites of the Laboratories for the 21st Century.

GOAL 3: Improve the energy efficiency of campus buildings by 10 percent below a 2010-2012 baseline (in kBtu/sf).

- **STRATEGY 3.1:** Implement the 90+ energy efficiency and renewable energy projects identified in the UC Santa Cruz Climate & Energy Strategy report recommendations.
- **STRATEGY 3.2:** Reduce energy use from plug loads through procurement policies and behavior change.
- **STRATEGY 3.3:** Reduce excessive energy use through improvements to space management practices, response time to equipment and operational issues, and building operations scheduling.

GOAL 4: Reduce energy use by 10 percent, over a 2010 baseline, through energy conservation programs and practices (in kBtu/sf).

- **STRATEGY 4.1:** Develop Carbon Neutrality and energy use reduction education and training materials.

LOCAL

As noted in Section 1.1 of the Introduction, UC Santa Cruz, a constitutionally created State entity, is not subject to municipal regulations of surrounding local governments for uses on property owned or controlled by UC Santa Cruz that are in furtherance of the university's educational purposes. However, UC Santa Cruz may consider, for coordination purposes, aspects of local plans and policies of the communities surrounding the campus when it is appropriate and feasible, but it is not bound by those plans and policies in its planning efforts.

Monterey Bay Air Resources District

The Monterey Bay Air Resources District's (MBARD) CEQA guidelines consider the cumulative impact of GHG emissions to climate change and set project-level thresholds for stationary source projects (MBARD 2008, 2016).

A proposed stationary source project will not have a significant GHG impact, if operation of the project will:

- Emit less than the significance level of 10,000 metric tons per year (MT/year) CO_2e, or
- In accordance with the State CEQA Guidelines Section 15064.4(b)(3), the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of GHG emissions [such as, sources subject to the Cap-and-Trade requirements pursuant to Title 17, Article 5 (California Cap on Greenhouse Gas Emissions and Market-based Compliance Mechanisms)].

MBARD has not adopted project- or plan-level GHG thresholds to be used for CEQA evaluations of land use plans and land development projects.

Association of Monterey Bay Area Governments

The Association of Monterey Bay Area Governments (AMBAG) serves as the MPO for Monterey, San Benito and Santa Cruz Counties. In accordance with SB 375, AMBAG has prepared a Metropolitan Transportation Plan/Sustainable Communities Strategy (MTP/SCS) that integrates land use and transportation planning at a regional level to achieve GHG emission reduction targets from passenger vehicles. The most recent MTP/SCS is Moving Forward Monterey Bay 2040, which was adopted in June 2018. CARB set a target for the Monterey Bay Area of 5 percent reduction from 2005 per capita GHG emissions for the year 2030. The MTP/SCS demonstrates the region's ability to exceed the GHG emission reduction target set forth by CARB through transportation investments, strategic land use development, and performance measures (AMBAG 2018).

City of Santa Cruz Climate Action Plan

Completed in 2012, the City of Santa Cruz's (City) Climate Action Plan (CAP) sets target of reducing the City's GHG emissions by 37 percent below 1990 levels by 2030 and 80 percent below 1990 levels by 2050 (City of Santa Cruz 2012). The City's CAP was completed in 2012 and anticipated growth from the 2005 LRDP through 2020. With respect to campus growth, the CAP directs the City to partner with residential landowners to improve energy efficiency for off-campus student housing. The CAP also encourages continued collaboration between the Santa Cruz METRO Transit District and UC Santa Cruz to support transit programs paid by student fees. The CAP only includes emissions generated by activities within the city limits, which excludes the UC Santa Cruz campus.

County of Santa Cruz Climate Action Strategy

The County of Santa Cruz Climate Action Strategy (CAS) presents a countywide GHG emissions inventory for 2009 (and a simplified inventory of GHG emissions from agricultural sources for 2011) and sets an interim target for GHG reductions by 2035, derived by linear interpolation, that is consistent with the statewide goals of reducing GHG emissions to 1990 levels by 2020 and achieving an 80 percent reduction in GHGs below 1990 levels by 2050 (County of Santa Cruz 2013). The second part of the document contains a vulnerability assessment and discussion of the conditions that may occur in Santa Cruz county as a result of climate change impacts, identifying the most susceptible areas. The CAS does not specifically discuss the UC Santa Cruz campus, and emissions from the university would not be included in the county inventory.

Climate Action Compact

In 2007, the County of Santa Cruz (County), the City, UC Santa Cruz, and various local businesses and organizations partnered to create the Climate Action Compact (City of Santa Cruz 2007). This compact established a public-private partnership to establish measurable community-wide GHG reduction goals. The Climate Action Compact primarily focuses on developing partnerships between jurisdictions and local entities to lower GHG emissions.

3.8.2 Environmental Setting

THE PHYSICAL SCIENTIFIC BASIS OF GREENHOUSE GAS EMISSIONS AND CLIMATE CHANGE

Certain gases in the earth's atmosphere, classified as GHGs, play a critical role in determining the earth's surface temperature. Solar radiation enters the earth's atmosphere from space. A portion of the radiation is absorbed by the earth's surface and a smaller portion of this radiation is reflected back toward space. The absorbed radiation is then emitted from the earth as low-frequency infrared radiation. The frequencies at which bodies emit radiation are proportional to temperature. The earth has a much lower temperature than the sun; therefore, the earth emits lower frequency radiation. Most of the incoming solar radiation passes through and is not absorbed by the gases present in the earth's atmosphere; however, infrared radiation emitted by the earth is absorbed by GHGs. As a result, radiation that otherwise would have escaped back into space is instead "trapped," resulting in a warming of the atmosphere. This phenomenon, known as the greenhouse effect, is responsible for maintaining a habitable climate on earth.

Prominent GHGs contributing to the greenhouse effect are CO_2, methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Human-caused emissions of these GHGs more than natural ambient concentrations have been found to be responsible for intensifying the greenhouse effect and leading to a trend of unnatural warming of the earth's climate, known as global climate change or global warming. It is "extremely likely" that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic increase in GHG concentrations and other anthropogenic forcing (International Panel on Climate Change [IPCC] 2014).

GHGs have varying potential to trap heat in the atmosphere, known as global warming potential (GWP), and atmospheric lifetimes. GWP reflects how long GHGs remain in the atmosphere, on average, and how intensely they absorb energy. Gases with a higher GWP absorb more energy per pound than gases with a lower GWP, and thus contribute more to warming the earth's atmosphere. The parameter "atmospheric lifetime" describes how long the molecules will remain in the atmosphere. Atmospheric lifetimes of GHGs range from tens to thousands of years. These gases remain in the atmosphere long enough to become well mixed. The amount that is measured in the atmosphere is roughly the same all over the world, regardless of the source of the emissions. The GWP of a gas is determined using CO_2 as the reference gas, which has a GWP of 1 over 100 years (IPCC 2007).[1] For example, a gas with a GWP of 10 is 10 times more potent than CO_2 over 100 years. The use of GWP allows GHG emissions to be reported using CO_2 as a baseline. The sum of each GHG multiplied by its associated GWP is referred to as "carbon dioxide equivalents" (CO_2e). This essentially means that 1 metric ton of a GHG with a GWP of 10 has the same climate change impacts as 10 metric tons of CO_2.

Climate change is a global problem. GHGs are global pollutants, unlike criteria air pollutants and toxic air contaminants, which are pollutants of regional and local concern. Whereas most pollutants with localized air quality effects have relatively short atmospheric lifetimes (about one day), GHGs have long atmospheric lifetimes (one to several thousand years). GHGs persist in the atmosphere for long enough time periods to be dispersed around the globe. Although the lifetime of any GHG molecule is dependent on multiple variables and cannot be determined with any certainty, it is understood that more CO_2 is emitted into the atmosphere than is sequestered or trapped by ocean uptake, vegetation, and other forms of sequestration. Of the total annual human-caused CO_2 emissions,

[1] All Global Warming Potentials are given as 100-year values.

approximately 55 percent are estimated to be sequestered through ocean and land uptake every year, averaged over the last 50 years, whereas the remaining 45 percent of human-caused CO_2 emissions remains stored in the atmosphere (IPCC 2013:467).

The quantity of GHGs in the atmosphere that ultimately result in climate change is not precisely known, but is enormous; no single project alone would measurably contribute to an incremental change in the global average temperature, or to global, local, or microclimates. From the standpoint of CEQA, GHG impacts relative to global climate change are inherently cumulative.

GREENHOUSE GAS EMISSION SOURCES

GHG emissions contributing to global climate change are attributable in large part to human activities associated with the electricity, transportation, industrial, commercial, residential, and agricultural/forestry sectors. Emissions of CO_2 are mainly byproducts of fossil fuel combustion. CH_4, a highly potent GHG, primarily results from off-gassing (the release of chemicals from nonmetallic substances under ambient or greater pressure conditions) and is largely associated with agricultural practices and landfills. N_2O is also largely attributable to agricultural practices and soil management. CO_2 sinks, or reservoirs, include vegetation and the ocean, which absorb CO_2 through sequestration and dissolution (CO_2 dissolving into the water), respectively, two of the most common processes for removing CO_2 from the atmosphere.

STATEWIDE SOURCES

As discussed previously, GHG emissions are attributable in large part to human activities. California government is putting in place programs and legislation to reduce GHG emissions with the hope of delaying, mitigating, or preventing at least some of the anticipated impacts of global climate change on California communities. The total GHG inventory for California in 2017 was 424 million metric tons of carbon dioxide equivalent ($MMTCO_2e$) (CARB 2019). This is less than the 2020 target of 431 $MMTCO_2e$ set forth by the state pursuant to AB 32 (CARB 2019). Combustion of fossil fuel in the statewide transportation sector was the single largest source of California's GHG emissions in 2017, accounting for 41 percent of total GHG emissions in the state (CARB 2019). This sector was followed by the industrial sector (24 percent) and the electric power sector (including both in-state and out-of-state sources) (15 percent) (CARB 2019). See Table 3.8-1 and Figure 3.8-1 below.

Table 3.8-1 California Greenhouse Gas Emissions Inventory

Emissions Sector	MMT CO_2e/year 1990	MMT CO_2e/year 2000	MMT CO_2e/year 2005	MMT CO_2e/year 2010	MMT CO_2e/year 2017
Transportation	150.6	179.5	188.9	168.1	173.9
Electricity Generation[1]	110.5	105.3	108.2	90.6	63.6
Industrial[2]	105.3	104.6	104.6	101.1	101.8
Agriculture & Forestry	18.9	32.0	34.5	34.6	33.9
Residential	29.7	31.2	29.5	31.3	29.7
Commercial	14.4	14.3	15.8	20.1	21.2
Not Specified[3]	1.3	0.4	0.3	0.3	—
Total Emissions[4]	**430.7**	**467.2**	**481.7**	**446.1**	**424.1**

Notes: GWP = global warming potential; MMT CO_2e/year = million metric tons of carbon dioxide equivalent per year

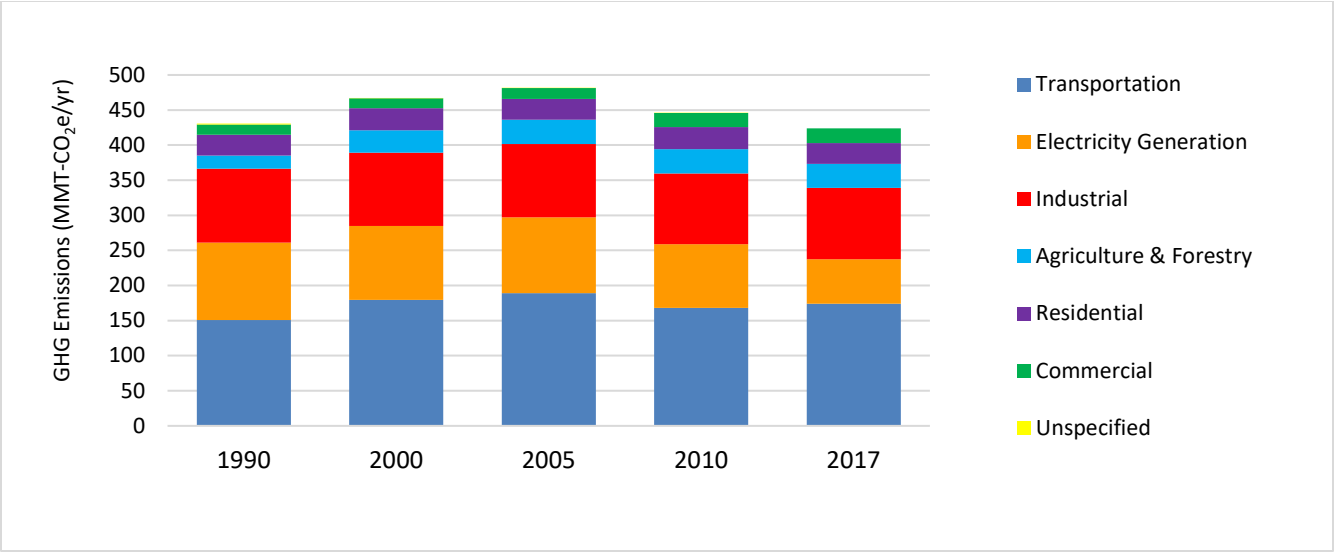
[1] Includes in-state-generated and imported electricity production.

[2] Waste emissions are contained within Industrial Sector emissions.

[3] Includes solvent and chemical emissions

[4] Totals may not sum exactly due to rounding

Source: CARB 2019



Source: CARB 2019

Figure 3.8-1 California's Greenhouse Gas Emissions by Economic Sector (1990–2017)

GHG EMISSIONS CLASSIFICATION

To achieve consistency in reporting across different geographies, UC Santa Cruz uses a GHG emissions classification system that classifies GHG emissions into three "scopes" based on the nature and source of the emissions. The UCOP Sustainability Practices Policy defines Scope 1 and 2 emissions per the Climate Registry (The Climate Registry 2018). Given that the Climate Registry defines Scope 3 emissions as "all other indirect emissions," the UCOP defines Scope 3 emissions per Second Nature's Carbon Commitment (The Climate Registry 2018, Second Nature 2020). These definitions are as follows.

- Scope 1 GHG emissions include direct emissions that are emitted on the project site/facility and are associated with on-site combustion of natural gas, fuel use in University-owned vehicle fleets, and fugitive emissions of gases used for refrigeration and scientific research. Fugitive gases include hydrofluorocarbon gases, perfluorocarbon gases, and sulfur hexafluoride (SF_6).
- Scope 2 GHG emissions include indirect emissions associated with the consumption of purchased energy from off-site sources. Scope 2 electricity emissions reflect emissions from all energy used at the electricity-generating power plant, but exclude transmission and distribution losses, which are reported under Scope 3.
- Scope 3 GHG emissions include indirect emissions not covered in Scope 2, such as GHG emissions from employee and student commuting, business air and ground travel.

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

Note that CEQA requires an evaluation of direct and indirect emissions. With the exception of business air and ground travel, all of the Scope 1, 2, and 3 emission sources listed above and those from off-site wastewater treatment; water supply, treatment, and conveyance; and solid waste disposal must be also addressed in a CEQA document.

UC SANTA CRUZ EMISSIONS

The UC Sustainability Practices Policy requires each campus to report a GHG emissions inventory to an independent reporting organization. UC Santa Cruz currently reports its annual Scope 1 and Scope 2 GHG emissions inventory to the Climate Registry. The most recent inventory reported to the Climate Registry was for calendar year 2018. UC Santa Cruz emissions inventories reported to outside agencies are verified by accredited independent auditors.

A summary of UC Santa Cruz's GHG inventories for the Santa Cruz campus during 1990 and 2018, as reported in the CES (UC Santa Cruz 2017), is presented below in Table 3.8-2. The values for 2018 are based on actual data collected and reported to the Climate Registry, while 1990 values are based on collected data and regression analysis.

Table 3.8-2 UC Santa Cruz GHG Emissions between 1990 and 2018 ($MTCO_2e$)

Annual GHG Emissions ($MTCO_2e$)	1990	2007	2009	2018
Emissions Source Stationary Sources	16,989	22,872	24,046	28,917
Purchased Electricity	4,136	16,912	11,183	1,595
Mobile Fleet	1,701	2,266	2,151	2,032
Scopes 1 and 2 Total	22,826	42,050	37,380	32,544
Mobile Non-Fleet (Commuters)	26,830	24,160	23,468	22,780
Business Air Travel	6,856	11,420	10,681	10,940
Scope 3 Total[1]	33,686	35,580	34,149	33,720
TOTAL	55,512	77,630	71,529	66,264

Notes: $MTCO_2e$ = metric tons of carbon dioxide equivalents

[1] Reports did not include solid waste, water, and wastewater-related emissions.

Sources: UC Santa Cruz 2017; Second Nature 2018; data compiled by Ascent Environmental in 2020.

EFFECTS OF CLIMATE CHANGE ON CALIFORNIA

According to IPCC, which was established in 1988 by the World Meteorological Organization and the United Nations Environment Programme, global average temperature will increase by 1.7 to 4.8 degrees Celsius (°C) (3.1 to 8.6 degrees Fahrenheit [°F]) by the end of the century unless additional efforts to reduce GHG emissions are made (IPCC 2014:10). According to *California's Fourth Climate Change Assessment (dated August 2018)*, with global GHGs reduced at a moderate rate, California will experience average daily high temperatures that are warmer than the historic average by 2.5 °F from 2006 to 2039, by 4.4 °F from 2040 to 2069, and by 5.6 °F from 2070 to 2100; and if GHG emissions continue at current rates then California will experience average daily high temperatures that are warmer than the historic average by 2.7 °F from 2006 to 2039, by 5.8 °F from 2040 to 2069, and by 8.8 °F from 2070 to 2100 (OPR, CEC, and CNRA 2018:5).

Since its previous climate change assessment in 2012, California has experienced several of the most extreme natural events in its recorded history: a severe drought from 2012-2016, an almost non-existent Sierra Nevada winter snowpack in 2014-2015, increasingly large and severe wildfires, and back-to-back years of the warmest average temperatures (OPR, CEC, and CNRA 2018:3). According to CNRA's report, *Safeguarding California Plan: 2018 Update* (CNRA 2018), California experienced the driest four-year statewide precipitation on record from 2012 through 2015; the warmest years on average in 2014, 2015, and 2016; and the smallest and second smallest Sierra snowpack on record in 2015 and 2014 (CNRA 2018). In contrast, the northern Sierra Nevada range experienced its wettest year on record in the 2016-2017 water year (CNRA 2018). The changes in precipitation exacerbate wildfires throughout California with increasing frequency, size, and devastation. As temperatures increase, the increase in precipitation falling as rain rather than snow also could lead to increased potential for floods because water that would normally be held in the snowpack of the Sierra Nevada and Cascade mountains until spring would flow into the Central Valley concurrently with winter rainstorm events. This scenario would place more pressure on California's levee/flood control system (CNRA 2018).

Changes in temperature, precipitation patterns, extreme weather events, and sea-level rise have the potential to affect and decrease the efficiency of thermal power plants and substations, decrease the capacity of transmission lines, disrupt electrical demand, and threaten energy infrastructure with the increased risk of flooding (CNRA 2018). Increased temperatures would also lead to increased electricity demand for cooling needs in buildings and facilities.

Water availability and changing temperatures, which affect prevalence of pests, disease, and species, directly impact crop development and livestock production. Other environmental concerns include decline in water quality, groundwater security, and soil health (CNRA 2018). Vulnerabilities of water resources also include risks to degradation of watersheds, alteration of ecosystems and loss of habitat, impacts to coastal areas, and ocean acidification (CNRA 2018). The ocean absorbs approximately a third of the CO_2 released into the atmosphere every year from industrial and agricultural activities, changing the chemistry of the ocean by decreasing the pH of seawater (CNRA 2018).

In comparison with historical annual means (between 1961 and 1990), Santa Cruz County annual mean rainfall is expected to decrease by 3 to 4 inches and annual maximum temperatures are projected to rise 3 to 5°F by the 2070-2099 period, according to the RCP 4.5 scenario under CEC's Cal-Adapt climate change scenario planning tool (CEC 2020). Cal-Adapt is a climate change scenario planning tool developed by CEC that downscales global climate model data to local and regional resolution under representative concentration pathways (RCPs): the RCP 8.5 represents a scenario where emissions continue to rise strongly through 2050 and plateau around 2100, and the RCP 4.5 represents a scenario where emissions peak around 2040, then decline. RCP 4.5 represents a low-emissions scenario in which global emissions are lower in the long term compared to RCP 8.5. (CEC 2020).

With respect to sea-level rise, although UC Santa Cruz is located in a coastal area, the project boundaries are not likely to be affected by sea-level rise even under the maximum inundation scenario (CEC 2020).

3.8.3 Environmental Impacts and Mitigation Measures

SIGNIFICANCE CRITERIA

Impacts from campus development under the 2021 LRDP would be significant if the project would exceed either of the following significance criteria, in accordance with Appendix G of the *State CEQA Guidelines*:

- generate GHGs, either directly or indirectly, that may have a significant impact on the environment; or
- conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs.

The 2021 LRDP is considered to have a significant impact to global climate change if the 2021 LRDP would:

- generate GHG emissions that would exceed the GHG emission reduction efforts of the State of California. With respect to statewide planning efforts to reduce GHG emissions, the 2021 LRDP would have a less-than-significant impact if, despite LRDP growth and development, UC Santa Cruz's total (including both existing and 2021 LRDP sources) 2030 emissions are at least 40 percent below 1990 emissions and UC Santa Cruz's total 2040 emissions are at least 60 percent below 1990 emissions;
- generate GHG emissions within the LRDP area in excess of campus-wide GHG emissions under existing conditions; or
- conflict with the following plans for the reduction of GHG emissions: (1) the UC Sustainable Practices Policy (UCOP 2020), (2) the GHG reduction goals of the AMBAG RTP/SCS; or (3) the potential attainment of the State GHG reduction goals for 2050 (i.e., 2017 Scoping Plan).

As stated in the 2017 Scoping Plan, "… the State's (2020 and) 2030 targets have not been set in isolation. They represent benchmarks, consistent with prevailing climate science, charting an appropriate trajectory forward that is in line with California's role in stabilizing global warming below dangerous thresholds." (CARB 2017a:ES3). Per the Scoping Plan, achieving the 2020 and 2030 GHG reduction targets will place California on a path toward and provide the momentum to attain a 2050 goal of 80 percent reduction in GHG emissions below 1990 levels.

These thresholds were developed using science-based goals of the world-wide reductions in GHG emissions that would be needed in order to avoid dangerous climate change effects, as discussed in both the regulatory and environmental setting discussions above; these goals represent what can be described as California's—and by parallel consideration, UC Santa Cruz's—proportional reduction in GHG emissions to avoid dangerous climate change. Per the 2017 Scoping Plan, local governments can demonstrate consistency with statewide targets by "applying the

percent reductions necessary to reach 2030 and 2050 climate goals (i.e., 40 percent and 80 percent, respectively) to their community-wide GHG emissions target" (CARB 2017:100). For the purposes of demonstrating consistency with the State's targets, UC Santa Cruz can be considered a "local government," as it has functions as largely as a self-contained small city, with students living, eating, recreating, and studying within campus limits, and UC Santa Cruz has jurisdiction over the land uses within the campus. Although the Scoping Plan also gave local jurisdictions the option of using per-capita or per-service-population targets, UC Santa Cruz has decided to use the relative percent reduction in line with the state's targets as its threshold due to the availability of the campus's 1990 GHG emissions inventory baseline because the campus's range of emission sectors span all sectors accounted for in the state's inventory. As such, these thresholds are consistent with CARB's recommendations for assessing plan-level direct and indirect impacts to global climate change in the 2017 Scoping Plan (CARB 2017a:99).

In addition, the California Supreme Court's decision in Center for Biological Diversity v. Department of Fish and Wildlife (62 Cal.4th 204) confirmed that there are multiple potential pathways for evaluating GHG emissions consistent with CEQA. The decision clarified that use of statewide emission reduction targets is a "permissible criterion of significance" so long as substantial evidence and reasoned explanation is provided to relate those goals to project-specific emissions.

As an alternative threshold, this document also analyzes 2021 LRDP emissions against a "net zero" threshold, under which any increase in GHG emissions above existing conditions (net zero) would be considered a significant impact on the environment. The project will therefore result in a significant GHG impact if implementation of 2021 LRDP increases GHG emissions associated with uses in the LRDP area above existing conditions. In its 2017 Scoping Plan Update, CARB specifically stated that this threshold--"Achieving no net additional increase in GHG emissions"--is an appropriate significance threshold for development projects (CARB 2017a).

ANALYSIS METHODOLOGY

The California Office of Planning and Research recommends that lead agencies under CEQA make a good-faith effort, based on available information, to estimate the quantity of GHG emissions that would be generated by a proposed project, including the emissions associated with construction activities and operational sources (stationary sources, vehicular traffic, and energy consumption), and to determine whether the project's incremental contribution of GHG emissions would be cumulatively considerable and to mitigate the project's incremental contribution where feasible mitigation is available (CEQA Guidelines Section 15064.4).

Of note, biogenic GHG emissions are included in UC Santa Cruz's GHG verified inventory, but are excluded from the analysis of GHG impacts herein. EPA has defined biogenic emissions as CO_2 emissions related to the natural carbon cycle, such as the decomposition, combustion, and digestion of organic matter (EPA 2017). Conversion of un-fossilized organic matter into CO_2 emissions releases CO_2 to the atmosphere that is later converted into organic matter through photosynthesis in plants, whether directly or indirectly through consumption. Biogenic emissions exclude anthropomorphic CO_2 emissions, such as premature removal of vegetation leading to increased CO_2 emissions from the accelerated release of the carbon stored in vegetation. According to the Local Government Operations Protocol, biogenic emissions may be reported, but should be quantified separately from anthropomorphic emissions because biogenic emissions do not contribute to a net increase of GHGs in the atmosphere (CARB 2010:24). Excluding biogenic emissions also allows for the recognition of the lower carbon intensities of biofuels relative to their fossil fuel equivalents.

The following section describes the analysis methodology for estimating construction emissions and operational emissions associated with the proposed 2021 LRDP.

Construction-Related Greenhouse Gas Emissions

Construction-related GHG emissions were calculated using the California Emissions Estimator Model (CalEEMod) Version 2016.3.2 modeling tool (CAPCOA 2016), as recommended by MBARD (MBARD 2008, 2016). Modeling was based on project-specific information (e.g., land use types, traffic modeling, amount of new building space) and default values in CalEEMod that are based on location, land use type, and typical construction activities. CalEEMod

accounts for a variety of state, federal, and local programs and policies that affect construction-related emissions, such as local air district rules on architectural coatings and federal emission standards for off-road equipment, but these regulations primarily affect emissions of criteria pollutants. For a detailed description of model input and output parameters, and assumptions, refer to Appendix D1.

Due to the programmatic nature of this analysis, the timing of construction activities for all projects anticipated during implementation of the 2021 LRDP cannot be predicted. Construction of additional academic space under the 2021 LRDP would begin as early as 2022. It is conservatively assumed that an average of 112,000 square-feet (sf) of academic space would be constructed per year, including facilities for Instruction and Research, Academic and Administrative Support, and Student Support and Public Services, through to full implementation of the 2021 LRDP (i.e., 2040). Other components of the 2021 LRDP, such as parking lots, infrastructure, and housing for students and faculty, could also be constructed starting in 2022.

Construction-related GHG emissions are based on the results of CalEEMod runs for the construction of 112,000 sf of academic space per year and 200,700 sf of other land uses per year. For construction years 2022 through 2040, the exact construction schedule of all land uses of the 2021 LRDP during any given year is unknown. To simplify the analysis of construction emissions in these years, the construction activity of all land uses is averaged over an 18-year lifespan to estimate annual construction activity and associated annual emissions that may occur within a given year of construction. Annual levels of emissions are needed to compare against GHG thresholds that are based on annual emissions targets.

Operational Greenhouse Gas Emissions

Operational emissions of GHGs were estimated from energy use (i.e., electricity and natural gas consumption), area sources (i.e., landscaping equipment), water use, wastewater generation, solid waste generation, and mobile sources using CalEEMod Version 2016.3.2. CalEEMod also accounts for policies that may affect emissions factors, such as state and federal vehicle emission standards and building energy efficiency standards, discussed further below. These policies are accounted for in modeling results, unless otherwise noted.

With respect to building energy use, electricity and natural gas consumption would result in indirect and direct GHG emissions, respectively. While the Green Building Design policy of the Sustainable Practices Policy specifies that new buildings anticipated to be developed under the 2021 LRDP will only use electricity for space and water heating purposes rather than onsite fossil fuel combustion, an exception may be made for buildings connected to existing campus thermal infrastructure that relies on natural gas usage. These buildings would consume both electricity and natural gas for lighting, space and water heating, and appliances, and gasoline for landscaping maintenance equipment. Building energy use was estimated using CalEEMod Version 2016.3.2 (CAPCOA 2016). CalEEMod default values were adjusted based on the assumption that the land uses within the campus would meet 2019 Title 24 building energy efficiency standards. These standard were chosen because the UCOP Sustainable Practices Policy allows campuses to choose between achieving energy usage rate 20 percent better than the current Title 24 building energy efficiency standards or meeting the UC Whole Building Performance Targets, and, as shown in Table 3.6-2 of Section 3.6, "Energy," 2019 Title 24 standards are more stringent than the UC Whole Building Performance Targets (UCOP 2020).

Further, the list below describes how specific policies of the Sustainable Practices Policy are reflected in the modeling of operational emissions. In general, the modeling of operational GHG emissions reflects policy language that specifically requires UC Santa Cruz to achieve a certain target, versus targeting a certain level of sustainability with no set requirement.

- Green Building Design
  - GHG reductions resulting from achieving the energy performance targets related to 1999 benchmarks, as shown in Table 1 of the *UC Building 1999 Energy Benchmarks by Campus* (Sahai, et al. 2014), are accounted for through reduced energy consumption in GHG modeling.

- Climate Protection
  - Achieving carbon neutrality for Scope 1 and 2 sources by 2025, and for Scope 3 sources by 2050, is accounted for in the GHG modeling assumptions.
- Sustainable Transportation
  - Strategies to reduce GHG emissions from fleet activities and other sustainable transportation strategies are included as part of the suite of emissions reduction projects that UC Santa Cruz would enact as part of its commitment to achieve carbon neutrality from Scope 1 and 2 sources by 2025. As part of Transportation Mitigation Measure 3.16-1, traffic demand model (TDM) performance standards will be implemented that result in the reduction of total VMT per capita to 15 percent below current campus average and the total employment VMT per employee to 15 percent below the countywide average. This additional reduction is accounted for in calculation of mitigated GHG emissions.
- Sustainable Building Operations for Campuses
  - Certification of as many buildings as possible through the "LEED for Operations and Maintenance" rating system is not accounted for in GHG modeling.
- Zero Waste
  - Reduction of per capita total municipal solid waste generation at campus facilities is not accounted for in GHG modeling.

With respect to emissions from electricity use, UC Santa Cruz procures its electricity from PG&E. Electricity-related operational emissions of GHGs for the existing main residential campus and Westside Research Park and new development under the 2021 LRDP were calculated in CalEEMod, and for this analysis it was conservatively assumed that no new solar panels would be installed. As recommended by EPA, annual non-baseload output emissions rates were used to calculate the GHG emissions associated with electricity use for the existing and future conditions of the main residential campus and research park (EPA 2014). In addition, increases in the renewable mix of electricity generation sources due to the California Renewable Portfolio Standard (RPS) and SB 350 are assumed to affect the emission factors in future years. For 2040 conditions, electricity emission factors used in calculating GHG emissions were chosen to reflect year 2040 statewide averages (i.e., 77.8 lb-CO_2/MWh, 0.005 lb-CH_4/MWh, and 0.001 lb-N_2O/MWh). These are based on factors from EPA's Emissions & Generation Resource Integrated Database (eGRID) for the CAMX region and interpolated for 2040 based on the State's 2045 100 percent clean energy target under SB 100 (EPA 2020).

Operational area-source GHG emissions from landscaping equipment were estimated using CalEEMod based on model defaults for the applied land uses. The analysis assumed that new uses under the 2021 LRDP would not include fireplaces or wood-burning stoves. Plan implementation is expected to result in some loss of vegetation (i.e., trees) during construction, with an overall net decrease in the number of trees (approximately 3,386 trees over the 2021 LRDP implementation period). The change in carbon sequestration potential was accounted for using CalEEMod's vegetation module. This rate is based on a review of the current tree density on campus of approximately 22 trees per acre. Any new land uses built on currently forested land were assumed to result in the loss of 22 trees per acre developed. This rate was applied to a total acreage, including parking lot acreage and redevelopment areas, of approximately 153.9 acres.

With respect to mobile sources, EMFAC2017 was used to estimate GHG emissions from vehicle miles traveled (VMT) generated by implementation of the 2021 LRDP (refer to Section 3.16, "Transportation"). The modeled emission factors reflect the average vehicle mix and usage rates forecast for Santa Cruz County in 2040, the 2021 LRDP's approximate year for achieving full implementation. Daily VMT were adjusted to annual VMT using a conversion factor of 287 which accounts for UC Santa Cruz's academic schedule, holidays, and enrollment levels during summer and regular academic quarters. See Appendix D1 for calculation details.

Modeling was based on 2021-LRDP-specific information (e.g., land use types, traffic modeling, building space) and default values in CalEEMod that are based on location and land use types. For a detailed description of model input and output parameters, refer to Appendix D1. Full implementation of the 2021 LRDP is assumed to occur in 2040.

ISSUES NOT EVALUATED FURTHER

No issues related to GHG emissions have been eliminated from further discussion.

IMPACTS AND MITIGATION MEASURES

Impact 3.8-1: Generate Greenhouse Gas Emissions that May Have a Significant Impact on the Environment

The 2021 LRDP would increase development and population within the main residential campus and Westside Research Park. This increase in development along with the implementation of design features, programs, and other measures would result in annual emissions of 26,769 $MTCO_2e$ per year in 2040. This amount is below existing conditions, and would therefore result in a less-than-significant impact under the net zero threshold. However, when applying the more conservative "state target" threshold, this reduction is equivalent to 46 percent below the campus's 1990 levels by 2040, which is not consistent with the interpolated target to reduce statewide GHG emissions by 60 percent below 1990 levels by 2040. Therefore, the 2021 LRDP contribution to climate change from GHG emissions would be **significant**.

Table 3.8-3 shows the historical and anticipated annual GHG emissions generated by UC Santa Cruz from 1990 through 2040. Emissions from water, wastewater, and solid waste were not included in the 1990 and 2018 inventories, and as a result, data from those years are not presented in the table below. With the implementation of the UC Sustainable Practices Policy, sustainability actions outlined in the UC Santa Cruz CES, and potential planned emissions reductions projects, the Scope 1 and 2 emissions under the build-out scenario would be reduced to zero by 2025 with the help of on-site GHG reduction projects and the purchase of offset credits. Without these emission reduction projects or the purchase of carbon offsets, the 2021 LRDP would result in a net increase in campus-wide GHG emissions caused by additional construction activity; on-road VMT; building energy consumption; water, waste, and wastewater emissions; and additional stationary source emissions—up to 30 percent over 1990 levels—by 2040. This accounts for any emissions reductions from existing buildings and operations that may occur as a result of legislative requirements as the state's electricity grid becomes more carbon neutral under SB 100 and as average vehicle emission rates decrease over time.

Tables 3.8-3 through 3.8-5 show the GHG emissions generated by both existing UC Santa Cruz operations and operations that would occur under the 2021 LRDP in order to compare the effect of the 2021 LRDP on the campus's progress toward meeting both the UC Carbon Neutrality Initiative Target and the State's GHG reduction targets under SB 32.

Table 3.8-3 UC Santa Cruz GHG Emissions under the 2021 LRDP (Without On-Site Emission Reduction Projects, Carbon Offsets, or Renewable Energy Credits) ($MTCO_2e$/year)

Emissions Source	1990 Reference Emissions	Existing Emissions (2018)	Existing + 2021 LRDP Emissions (2025) [1]	Existing + 2021 LRDP Emissions (2030) [1]	Existing + 2021 LRDP Emissions (2040)
Scopes 1 & 2 [2]					
Stationary Sources (Existing)	16,989	28,917	28,917	28,917	28,917
Purchased Electricity[3] (Existing)	4,136	1,595	2,068	1,654	517
Campus Fleet (Existing)	1,701	2,032	1,785	1,609	1,257
Stationary Sources (2021 LRDP growth)	0	0	1,494	2,561	4,695
Purchased Electricity[3] (2021 LRDP growth)	0	0	364	625	1,145
Campus Fleet (2021 LRDP growth)[4]	0	0	205	351	644
Total Scope 1 and 2 Emissions	22,826	32,544	34,833	35,717	37,175

Emissions Source	1990 Reference Emissions	Existing Emissions (2018)	Existing + 2021 LRDP Emissions (2025) [1]	Existing + 2021 LRDP Emissions (2030) [1]	Existing + 2021 LRDP Emissions (2040)
Scope 3[5]					
Non-Fleet Mobile Sources (Existing)[6]	26,830	22,780	19,616	17,355	12,835
Non-Fleet Mobile Sources (2021 LRDP growth)[6]	0	0	3,446	5,908	10,832
2021 LRDP Construction (2021 LRDP growth)[7]	0	0	942	942	942
Changes to on-campus vegetation (2021 LRDP growth)[8]	0	0	687	1,178	2,160
Total Scope 3 Emissions	26,830	22,780	24,692	25,384	26,769
Totals					
Total Emissions from Existing UC Santa Cruz Operations	49,656	55,324	52,386	49,536	43,526
Total Emissions from New Development under 2021 LRDP	0	0	7,139	11,565	20,418
Total Emissions without Additional Reductions	49,656	55,324	59,525	61,101	63,944
Other Scope 3 Emissions (excluded from total) [1,9]					
Process/Fugitive Emissions (2021 LRDP growth)[10]	N/A	0	39	67	124
Water/Wastewater (2021 LRDP growth)	N/A	0	257	440	807
Solid Waste (2021 LRDP growth)	N/A	0	751	1,287	2,360
Electricity Transmission and Distribution Losses (2021 LRDP growth)	N/A	0	<0.1	<0.1	<0.1

Notes: $MTCO_2e$ = metric tons of carbon dioxide equivalents; LRDP = Long Range Development Plan.

Post-1990 emissions are adjusted to use global warming potential factors from IPCC's Third Assessment Report, which is consistent with the factors used in UC Santa Cruz's 1990 emissions inventory (UC Santa Cruz 2017). See Appendix D1 for additional details.

[1] 2025 and 2030 emissions are based on interpolation between 2018 and 2040. This approach assumes a linear rate of growth through 2040.

[2] Includes emissions from electricity and natural gas combustion in buildings, campus fleet, electricity, and stationary sources. Excludes process and fugitive sources (e.g., refrigerants, scientific research). The UC Santa Cruz CES did not quantify these emissions for 1990 levels, however the "Annual Progress Evaluation for University of California, Santa Cruz, 2018" reported that process and fugitive emissions were less than one percent of total emissions. Thus, process and fugitive emissions are expected to remain small and are excluded from this analysis.

[3] Reductions based on SB 100 state goal of 50 percent of electricity to be powered by renewable resources by 2025, 60 percent by 2030, and 100 percent zero-carbon electricity by 2045 (interpolated to 88 percent by 2040), relative to 1990 levels.

[4] Scaled from 2018 campus emissions, thus has the same scope as the campus's 2018 inventory (i.e., includes emissions from the Westside Research Park)

[5] The UC Santa Cruz CES excludes air travel, electricity transmissions and distribution losses, off-site wastewater treatment, and off-site municipal solid waste disposal. Air travel is excluded from CEQA analysis. These other emissions are included at the end of the table for informational purposes.

[6] Includes all on-road mobile emissions, including commuting, vendor trips, and trucks trips, excluding campus fleet.

[7] Represents average annual construction emissions under the 2021 LRDP over 30 years, the assumed lifespan of new construction. 2021 LRDP construction emissions would not continue after 2040.

[8] Accounts for the net change in carbon losses due to removal of trees during construction. 2025 and 2030 values interpolated from total loss anticipated in 2040.

[9] Included for informational purposes.

[10] Scaled from campus's existing process and fugitive emission reported by Second Nature by growth in research building area.

Source: UC Santa Cruz 2017; Second Nature 2018; data compiled by Ascent Environmental in 2020

Table 3.8-4 Comparison of Emissions to UC Carbon Neutrality Initiative Target ($MTCO_2e$/year)

Emissions Source	Existing + 2021 LRDP Emissions (2025) [1]	Existing + 2021 LRDP Emissions (2030) [1]	Existing + 2021 LRDP Emissions (2040)
Scope 1 and 2 Emissions without Reductions	34,833	35,717	37,175
Scope 1 Emissions Reductions (e.g., carbon offsets and on-site emission reduction projects)	12,773	20,353	35,513
Scope 2 Emissions Reductions (e.g., renewable energy credits)	529	907	1,662
Total Scope 1 and 2 Reductions	13,302	21,260	37,175
Scope 1 and 2 Emissions with Reductions	21,532	14,458	0
UC Carbon Neutrality Initiative Target (Scopes 1 and 2) [1]	0	0	0
Meets 2025 UC Carbon Neutrality Initiative Target?	No	No	Yes

Notes: $MTCO_2e$ = metric tons of carbon dioxide equivalents; LRDP = Long Range Development Plan.

Emissions shown use global warming potential factors from IPCC's Third Assessment Report, which is consistent with the factors used in UC Santa Cruz's 1990 emissions inventory (UC Santa Cruz 2017). See Appendix D1 for additional details.

[1] Scope 3 emissions are not required to be carbon neutral until 2050 (UCOP 2020; UC Santa Cruz 2017).

Source: Data compiled by Ascent Environmental in 2020

Table 3.8-5 Comparison of Emissions to State GHG Reduction Targets ($MTCO_2e$/year)

Emissions Source	1990 Reference Emissions	Existing Emissions (2018)	Existing + 2021 LRDP Emissions (2025) [1]	Existing + 2021 LRDP Emissions (2030) [1]	Existing + 2021 LRDP Emissions (2040)
Scope 1, 2, and 3 Emissions without reductions	49,656	55,324	59,525	61,101	63,944
Percent Change from 1990 without reductions	—	11%	20%	23%	29%
Scope 1, 2, and 3 Emissions with reductions	49,656	55,719	46,223	39,842	26,769
Percent Change from 1990 with reductions		12%	-7%	-20%	-46%
State GHG Reduction Targets (Percent Change from 1990)				-40%	-60%
Targeted Scope 1,2, and 3 Emissions under State Targets ($MTCO_2e$)				29,794	19,862
Do Scope 1, 2, and 3 Emissions with reductions meet State GHG Reduction Targets?				No	No
Additional Reductions Needed to Meet State Targets ($MTCO_2e$)				10,048	6,907

Notes: $MTCO_2e$ = metric tons of carbon dioxide equivalents; LRDP = Long Range Development Plan.

Post-1990 emissions use global warming potential factors from IPCC's Third Assessment Report, which is consistent with the factors used in UC Santa Cruz's 1990 emissions inventory (UC Santa Cruz 2017). See Appendix D1 for additional details.

[1] 2025 and 2030 emissions are based on interpolation between 2018 and 2040. This approach assumes a linear rate of growth through 2040.

[2] Includes Scopes 1, 2, and 3 emissions.

Source: Data compiled by Ascent Environmental in 2020

With anticipated emission increases in the years leading to 2040 with 2021 LRDP implementation, UC Santa Cruz will be concurrently implementing the UC Sustainable Practices Policy and the UC Santa Cruz 2017 CES to meet the requirement of climate neutrality for Scope 1 and 2 emissions by 2025 and climate neutrality for selected Scope 3 emissions (e.g., commuting) by 2050. Implementation of these policies and initiatives would reduce emissions through improved energy efficiency in new and existing buildings, an increased proportion of renewable energy use, and reduced emissions of research gases.

UC Santa Cruz has approved and implemented on-site projects to reduce overall campus emissions, such as the 250-kW photovoltaic solar array that was installed at the McHenry library roof in December 2013, which generates 20,000 kWh/month. In addition, a photovoltaic solar array was installed within the East Remote Parking Lot and will generate

2.1 MWh/month. Combined, these two solar arrays currently displace over 20 percent of purchased electricity or 6.4 percent of the total campus electrical load, and reduce campus-wide GHG emissions by 767 $MTCO_2e$ or 2 percent of UC Santa Cruz's Scope 1 and 2 emissions.

As part of its effort to increase campus sustainability, UC Santa Cruz is continually evaluating additional projects, subject to financial feasibility and/or technical viability, for direct action and in a manner consistent with the UC Sustainable Practices Policy. Additional and concurrent solutions being considered by UC Santa Cruz include high performance building renovations, behavior-based conservation programs, fleet renewal, and space planning solutions. Due to uncertainties associated with forecasting, including not knowing the exact number of affected structures, these potential reductions were not quantified. It is expected that these upcoming emission reductions would further reduce the projected 2030 and 2040 Scope 1 and 2 emissions but are not expected to fully achieve the 2025 climate neutrality targets for Scopes 1 and 2. In the case where the actions to reduce emissions on campus, as described above, would not completely reduce UC Santa Cruz campus emissions to the 2025 target set by the UC Sustainable Practices Policy, UC Santa Cruz would purchase renewable energy credits and carbon offsets to meet the GHG reduction goals. These credits would need to meet relevant criteria to be considered valid, such as additionality and permanence; see Mitigation Measure 3.8-1.

UC Santa Cruz produces an annual GHG inventory to track GHG emission volumes and sources. Through this tracking system, GHG reductions are expected to continue the overall downward trend that has occurred since 2007 (Table 3.8-2). The annual UC Santa Cruz GHG inventory will be used to determine the need for purchasing renewable energy credits and/or carbon offsets in the year 2025 to ensure emission reductions match the 2025 climate neutrality requirement for Scopes 1 and 2 emissions. UC Santa Cruz will prioritize developing on-campus projects to reduce GHG emissions and only purchase renewable energy credits and/or offsets as necessary, seeking out offsets generated within or as close to Santa Cruz as available that would achieve additionality, social justice, and the advancement of UC research. It should be further noted that the UC is currently developing an official carbon offset policy that will provide specific guidelines for individual campuses to follow.

The annual inventory will also be used to track progress towards meeting the limited Scope 3 climate neutrality requirement under the UC Sustainable Practices Policy. To meet the 2040 target of 60 percent below 1990 levels, a remaining reduction of 6,907 $MTCO_2e$ would still need to be achieved by 2040 from Scope 3 sources.

As shown in Table 3.8-5, with implementation of the UC Sustainable Practices Policy, campus emissions reduction projects, and purchases of renewable energy credits and carbon offsets, the 2021 LRDP would result in GHG emissions that are seven percent less than 1990 levels by 2025, 20 percent less than 1990 levels by 2030, and 46 percent less than 1990 levels by 2040. Campus energy efficiency projects and other green energy projects would help decrease the need to purchase carbon offsets. As noted above, UC Santa Cruz plans to follow CARB guidance with respect to prioritization as outlined in the 2017 Scoping Plan (e.g., on-site reductions first followed by local/regional investments in GHG reductions then potential broader applications, including carbon credits).

With respect to the potential for 2021 LRDP implementation to result in increased GHG emissions by UC Santa Cruz, Table 3.8-5 identifies a net reduction in overall campus emissions under 2025, 2030, and 2040 conditions compared to existing conditions. Thus, the 2021 LRDP Update would result in a net reduction of GHG emissions compared to existing conditions, which constitutes a less-than-significant impact when applying the net zero threshold specifically condoned by CARB in its 2017 scoping plan.

However, although UC Santa Cruz's emissions would meet the UC Carbon Neutrality Initiative targets, they would not meet the interpolated GHG reductions goals of reducing GHG emissions to 60 percent below 1990 levels by 2040 in order to meet the State's 2050 goals. Therefore, when evaluated under this threshold, the 2021 LRDP would not be consistent with the statewide GHG reduction goals and would considerably contribute to climate change. This impact would be **significant**.

Mitigation Measures

Mitigation Measure 3.8-1: Reduce Annual Greenhouse Gas Emissions

UC Santa Cruz shall commit to reducing annual GHG emissions by at least 6,907 $MTCO_2e$ by 2040. This reduction shall be achieved through the combination of on-campus GHG reduction projects and, if necessary, purchase of carbon offsets.

On-Campus or Other Regional Lands Reductions

UC Santa Cruz shall prioritize GHG reductions through on-campus GHG-reduction projects and actions or at other university-owned properties in the region. UC Santa Cruz could also pursue joint GHG-reduction efforts with other local/regional agencies (e.g., City and County of Santa Cruz.) Reductions in GHG emissions shall be achieved through the combination of any of the following:

1. Replanting removed trees or planting equivalent new trees displaced by construction at a 1:1 ratio and ensuring the continued health of the replanted trees. A 100 percent replanting rate would offset 2,160 $MTCO_2e$ per year by 2040. Tree planting at a higher rate would provide further GHG reductions.
2. Reducing new non-fleet mobile source emissions from commuting, vendor trips, and delivery trips by 2040. A 10 percent reduction in anticipated emissions from these sources would reduce emissions by 1,083 $MTCO_2e$ per year in 2040. These reductions can be achieved through an enhanced Transportation Demand Management Program (see Mitigation Measure 3.16-2). This program would include parking management, expanded vanpool program, improved transit service, and increased telecommuting.
3. Requiring renewable diesel or other zero carbon emissions alternatives to be used in place of conventional diesel use in equipment for all construction activity, even those occurring after this 2021 LRDP plan period. A 100-percent renewable diesel construction fleet would reduce emissions in 2040 by 942 $MTCO_2e$ per year.
4. Reducing waste and increasing recycling and composting within the LRDP area as part of UC Santa Cruz's Zero Waste goal under UCOP's Sustainable Practices Policy, including additional on-campus education and opportunities for waste recycling.
5. Pursuing innovative on-site wastewater treatment alternatives, such as waste-to-energy projects, that reduce N_2O and CH_4 process emissions compared to those generated at off-site wastewater treatment.
6. Pursuing electrification of existing buildings and requiring that all new buildings be electric only.
7. Any other on-campus or regional projects or measures identified during the course of the 2021 LRDP that would effectively and quantifiably reduce emissions.

Acquire Carbon Offset Credits in Conformance with CARB Guidance that are Demonstrably Real, Permanent, Additional, Quantifiable, Verifiable, and Enforceable

As part of this mitigation measure, UC Santa Cruz would make the following separate, though overlapping, GHG emission reduction commitments: (1) UC Santa Cruz will maintain compliance with carbon offset accreditation requirements under CARB's Cap-and-Trade program, and (2) per existing UC Policy, UC Santa Cruz's GHG emissions shall, commencing in 2025, be entirely carbon neutral.

<u>Compliance with CARB's Cap-and-Trade Program</u>: Any carbon offset credits obtained for the purpose of compliance with CARB's Cap-and-Trade program shall be purchased from an accredited carbon credit market. Based on the current program as of January 2021, such offset credits (or California Carbon Offsets) shall be registered with, and retired by an Offset Project Registry, as defined in 17 California Code of Regulations § 95802(a), that is approved by CARB, such as, but not limited to, Climate Action Reserve (CAR), American Carbon Registry, and Verra (formerly Verified Carbon Standard), that is recognized by The Climate Registry, a non-profit organization governed by U.S. states and Canadian provinces and territories.

<u>Compliance with UC Policy</u>: Compliance with UC's policies for carbon neutrality by 2025 and UC's own policy to reduce Scope 1, 2, and transportation-related Scope 3 emissions below 1990 levels pursuant to AB 32 will be accomplished through reductions in direct emissions, the purchase of renewable electricity, and the purchase of carbon offset credits.

UC Santa Cruz will purchase voluntary carbon offset credits as the final action to reach the GHG emission reduction targets. Internal guidelines will be developed per the UC Carbon Neutrality Initiative to ensure that any use of offsets for this purpose will derive from verified GHG emissions reductions resulting from actions that align, as much as possible, with UC's research, teaching, and public service mission.

To demonstrate that the carbon offset credits provided are real, permanent, additional, quantifiable, verifiable, and enforceable, as those terms are defined in 17 California Code of Regulations § 95802(a), UC Santa Cruz shall prepare an annual report documenting the protocol used to verify those credits and submit that report for approval to a CARB-accredited third-party verification entity. If the verification entity finds that any credits purchased did not meet these criteria, UC shall purchase alternative credits and submit a follow-up report to the verification entity for concurrence. All carbon offsets purchased will be reported publicly and tracked through the Climate Registry as required by UC policy.

For any remaining emissions not achieved through on-campus reduction efforts, as outlined above, UC Santa Cruz shall ensure that the remaining emissions reductions are taking place and on the trajectory toward meeting the target of reducing annual GHG emissions by at least 6,907 $MTCO_2e$ by 2040 and shall conduct an annual review of emissions reductions. To achieve any remaining GHG emissions reductions, voluntary carbon offsets shall be purchased.

Significance after Mitigation

Implementation of Mitigation Measures 3.8-1 would reduce annual GHG emissions generated by the UC Santa Cruz campus under the 2021 LRDP, which were already below the net zero threshold before mitigation, by 6,907 $MTCO_2e$, which is needed to reduce the campus's emissions to 60 percent below 1990 levels. Therefore, with mitigation, this impact would be **less than significant**.

Impact 3.8-2: Conflict with an Applicable Plan, Policy or Regulation Adopted for the Purpose of Reducing the Emissions of Greenhouse Gases

Implementation of the 2021 LRDP would achieve targets established in the UC Sustainable Practices Policy through anticipated planning and policy actions. As achievement of the Sustainable Practices Policy would meet or exceed statewide targets for 2030 and not impede the ability of UC Santa Cruz to achieve statewide 2050 targets, the 2021 LRDP would not conflict with an applicable plan, policy, or regulations intended to reduce GHG emissions. A **less-than-significant** impact would occur.

As described above in Impact 3.8-1, the UC Santa Cruz GHG emission reduction strategies will result in large scale emission reductions compared to both existing (absolute) emissions and per-capita reductions. While implementation of the 2021 LRDP would result in actions and activities that increase Scope 1, 2, and 3 emissions, UC Santa Cruz GHG emission reduction strategies and requirements will account for and plan reduction efforts to reduce these emissions associated with the 2021 LRDP. Further GHG emissions reductions may be achieved by the purchase of voluntary carbon offsets.

Specific 2021 LRDP items, such as large increases in on-campus student housing, have been incorporated into the 2021 LRDP because they are supportive and complementary to the GHG emission reduction strategies for the Scopes 1, 2, and 3 reduction requirements.

Proposed land uses, population increases, building development and redevelopment, and planned infrastructure for the 2021 LRDP are required through UC policies to achieve the university's goal of reducing GHG emissions generated by the campus. Individually, these elements would not reduce GHG emissions and, in contrast, would increase emissions due to the campus expansion under the 2021 LRDP. Campus expansion will result in additional GHG emissions due to construction, an increase in mobile sources, more building space requiring more heating and cooling, and an increased campus population. However, with implementation of the 2021 LRDP:

- Existing campus facilities would be redeveloped to be more energy efficient, resulting in less energy use and generating less emissions than existing conditions;

- New on-campus facilities would be developed to meet or exceed energy efficiency standards with a commitment to achieve at least LEED Silver, thereby resulting in fewer emissions from electricity and natural gas use compared to similar new facilities built elsewhere in the state;
- Land use and planned infrastructure would be developed to discourage personal vehicle use, such as through providing limited parking for personal vehicles and preferential parking for shared vehicles, as well as the construction of bicycle and transit infrastructure, thereby reducing transportation-related emissions; and
- Any remaining GHG emissions that need to be reduced after the physical implementation of the 2021 LRDP to meet UC Santa Cruz's GHG reduction targets would be abated by purchases of renewable energy credits and verified carbon offset credits by UC Santa Cruz.

The combination of these actions would lead to the emissions reductions shown in Table 3.8-3 despite increases in campus population under the 2021 LRDP.

The UC Sustainable Practices Policy sets specific dates of 2025 for Scope 1 and 2 carbon neutrality and 2050 for limited Scope 3 carbon neutrality, consistent with the goals set in the UC Carbon Neutrality Initiative. The UC Sustainable Practices Policy sets ambitious goals for Scopes 1 and 2 and has no requirement for carbon neutrality or offset purchases for interim year emissions between 2020 and 2025 or between 2025 and 2050. The activities planned under the 2021 LRDP would likely contribute interim year emissions described in this document while the campus would be concurrently implementing emission reduction efforts leading up to the 2025 Scope 1 and 2 requirements.

As described in the impact discussion for Impact 3.8-1, UC Santa Cruz produces an annual GHG inventory to track GHG emission volumes and sources. The annual GHG inventory will be used to determine the need for purchasing renewable energy credits and/or carbon offsets in the year 2025 to ensure emission reductions match the 2025 carbon neutrality requirement for Scopes 1 and 2 emissions. In consideration of future reduction targets beyond the forecast period for this EIR, the 2050 annual inventory will be used to track compliance with the Scope 3 carbon neutral requirement, but 2050 is outside of the 2021 LRDP planning period. Nevertheless, by achieving (or exceeding) 2030 GHG reduction goals, UC Santa Cruz would demonstrate it is on a path toward achieving 2050 statewide GHG reduction goals. The 2021 LRDP would not preclude or create obstacles to future attainment of the 2050 reduction goal. Compliance with the 2050 goal is anticipated by the year 2050 but analysis of detailed compliance with the 2050 reduction goal is not feasible at this time.

Based on this discussion, the 2021 LRDP would implement the UC Sustainable Practices Policy, which is consistent with the UC Carbon Neutrality Initiative, which in turn supports the state's GHG reduction plans. Additionally, the 2021 LRDP would not conflict with the implementation of the AMBAG 2040 MTP/SCS. More specifically, the 2021 LRDP would be consistent with the six primary goals of the MTP/SCS (Access and Mobility, Economic Vitality, Environment, Healthy Communities, Social Equity, and System Preservation and Safety). With respect to access and mobility, the 2021 LRDP would expand on-campus transit and active transportation facilities consistent with the MTP/SCS goal to provide convenient, accessible, and reliable travel options. In terms of economic vitality through a high-performing transportation system, development under the 2021 LRDP would provide both infill and clustered development oriented towards enhanced alternative transportation modes. With respect to promoting environmental sustainability and protection of the environment, the various sections of this EIR identify mitigation measures designed to conserve and protect the physical environment through the prevention of significant impacts, where feasible. With respect to healthy communities and as noted in Section 3.3, "Air Quality," the 2021 LRDP would not result in potential health risks to the on-campus population or nearby receptors. In terms of social equity and system preservation, implementation of the 2021 LRDP would provide for the enhancement of existing transportation services in the area, consistent with this goal. Thus, the adoption of the 2021 LRDP would not conflict with the applicable plan, policy, or regulations for GHG emission reductions. Impacts would be **less than significant**.

Mitigation Measures

No mitigation is required.

This page intentionally left blank.