4.6 GREENHOUSE GAS EMISSIONS

This section discusses global climate change, its causes and the contribution of human activities, as well as a summary of existing greenhouse gas emissions. The section describes the criteria for determining the significance of climate change impacts, and analyzes the proposed Amendments' impacts related to global climate change and greenhouse gas emissions.

4.6.1 Setting

a. Climate Change and Greenhouse Gases. Global climate change is the observed increase in the average temperature of the Earth's atmosphere and oceans along with other significant changes in climate (such as wind patterns, precipitation, and storms) over an extended period of time. The term "global climate change" is often used interchangeably with the term "global warming," but "global climate change" is preferred to "global warming" because it helps convey that there are other changes in addition to rising temperatures. The baseline, against which these changes are measured, originates in historical records identifying temperature changes that have occurred in the past, such as during previous ice ages. The global climate is continuously changing, as evidenced by repeated episodes of substantial warming and cooling documented in the geologic record. The rate of change has typically been incremental, with warming or cooling trends occurring over the course of thousands of years. The past 10,000 years have been marked by a period of incremental warming, as glaciers have steadily retreated across the globe. However, scientists have observed acceleration in the rate of warming during the past 150 years. Per the United Nations Intergovernmental Panel on Climate Change (IPCC), the understanding of anthropogenic warming and cooling influences on climate has led to a high confidence (95 percent or greater chance) that the global average net effect of human activities has been the dominant cause of warming since the mid-20th century (IPCC 2014).

Gases that absorb and re-emit infrared radiation in the atmosphere are called greenhouse gases (GHGs). GHGs are present in the atmosphere naturally, are released by natural sources, or are formed from secondary reactions taking place in the atmosphere. The gases that are widely seen as the principal contributors to human-induced global climate change carbon dioxide (CO_2), methane (CH_4), nitrous oxides (N_2O), flourinated gases such as hydroflourocarbons (HFCs) and perflourocarbons (PFCs), and sulfur hexaflouride (SF_6). Water vapor is excluded from the list of GHGs because it is short-lived in the atmosphere and its atmospheric concentrations are largely determined by natural processes, such as oceanic evaporation.

GHGs are emitted by both natural processes and human activities. Of these gases, CO_2 and CH_4 are emitted in the greatest quantities from human activities. Emissions of CO_2 are largely by-products of fossil fuel combustion, whereas CH_4 results from off-gassing associated with agricultural practices and landfills. Man-made GHGs, many of which have greater heat-absorption potential than CO_2, include fluorinated gases and sulfur hexafluoride (SF_6) (California Environmental Protection Agency [CalEPA], 2006). Different types of GHGs have varying global warming potential (GWP). The GWP of a GHG is the potential of a gas or aerosol to trap heat in the atmosphere over a specified timescale (generally, 100 years). Because GHGs absorb different amounts of heat, a common reference gas (CO_2) is used to relate the amount of heat absorbed to the amount of the gas emissions, referred to as "carbon dioxide equivalent" (CO_2e), and is the amount of a GHG emitted multiplied by its GWP. Carbon dioxide has a 100-year GWP of one. By

contrast, methane (CH_4) has a GWP of 25, meaning its global warming effect is 25 times greater than CO_2 on a molecule per molecule basis (IPCC 2007).

The accumulation of GHGs in the atmosphere regulates the earth's temperature. Without the natural heat trapping effect of GHGs, Earth's surface would be about 34° C cooler (CalEPA, 2006). However, it is believed that emissions from human activities, particularly the consumption of fossil fuels for electricity production and transportation, have elevated the concentration of these gases in the atmosphere beyond the level of naturally occurring concentrations. The following discusses the primary GHGs of concern.

Carbon Dioxide. The global carbon cycle is made up of large carbon flows and reservoirs. Billions of tons of carbon in the form of CO_2 are absorbed by oceans and living biomass (i.e., sinks) and are emitted to the atmosphere annually through natural processes (i.e., sources). When in equilibrium, carbon fluxes among these various reservoirs are roughly balanced (U.S. Environmental Protection Agency [USEPA] 2014). CO_2 was the first GHG demonstrated to be increasing in atmospheric concentration, with the first conclusive measurements being made in the last half of the 20th Century. The global atmospheric concentration of CO_2 has increased from a pre-industrial value of about 280 ppm to 391 ppm in 2011 (IPCC 2007; NOAA 2010). Currently, CO_2 represents an estimated 74 percent of total GHG emissions (IPCC 2007). The largest source of CO_2, and of overall GHG emissions, is fossil fuel combustion.

Methane. CH_4 is an effective absorber of radiation, though its atmospheric concentration is less than that of CO_2 and its lifetime in the atmosphere is limited to 10 to 12 years. It has a GWP approximately 25 times that of CO_2 (refer to *Greenhouse Gas Inventory* below for a discussion of GWP). Over the last 250 years, the concentration of CH_4 in the atmosphere has increased by 148 percent (IPCC, 2007), although emissions have declined from 1990 levels. Anthropogenic sources of CH_4 include enteric fermentation associated with domestic livestock, landfills, natural gas and petroleum systems, agricultural activities, coal mining, wastewater treatment, stationary and mobile combustion, and certain industrial processes (USEPA 2014).

Nitrous Oxide. Concentrations of N_2O began to rise at the beginning of the industrial revolution. N_2O is produced by microbial processes in soil and water, including those reactions that occur in fertilizers that contain nitrogen, fossil fuel combustion, and other chemical processes. Use of these fertilizers has increased over the last century. Agricultural soil management and mobile source fossil fuel combustion are the major sources of N_2O emissions. N_2O's GWP is approximately 298 times that of CO_2 (IPCC 2007).

Fluorinated Gases (HFCS, PFCS and SF_6). Fluorinated gases, such as hydrofluorocarbons (HFCs), perflurocarbons (PFCs), and sulfurhexafluoride (SF_6), are powerful GHGs that are emitted from a variety of industrial processes. Fluorinated gases are used as substitutes for ozone-depleting substances such as chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), and halons, which have been regulated since the mid-1980s because of their ozone-destroying potential and are phased out under the Montreal Protocol (1987) and Clean Air Act Amendments of 1990. Electrical transmission and distribution systems account for most SF_6 emissions, while PFC emissions result from semiconductor manufacturing and as a by-product of primary aluminum production. Fluorinated gases are typically emitted in smaller quantities than CO_2, CH_4, and N_2O, but these compounds have much higher GWPs. SF_6 is the most potent GHG that the IPCC has evaluated.

b. Greenhouse Gas Inventory. Worldwide anthropogenic emissions of GHG were approximately 40,000 million metric tons (MMT) CDE in 2004, including ongoing emissions from industrial and agricultural sources, but excluding emissions from land use changes (i.e., deforestation, biomass decay) (IPCC 2014). CO_2 emissions from fossil fuel combustion and industrial processes contributed about 65 percent of total emissions in 2010. Of anthropogenic GHGs, CO_2 was the most abundant accounting for 76 percent of total 2010 emissions. CH_4 emissions accounted for 16 percent of the 2010 total, while nitrous oxide and fluorinated gases account for six and two percent, respectively (IPCC 2014).

Total U.S. GHG emissions were 6,511.3 million metric tons (MMT or gigatonne) CO_2e in 2016 (U.S. EPA 2018). Total U.S. emissions have increased by 2.4 percent since 1990; emissions decreased by 1.9 percent from 2015 to 2016 (U.S. EPA 2018). The decrease from 2015 to 2016 was a result of multiple factors, including: (1) substitution from coal to natural gas consumption in the electric power sector and (2) warmer winter conditions in 2016 resulting in a decreased demand for heating fuel in the residential and commercial sectors (U.S. EPA 2018). Since 1990, U.S. emissions have increased at an average annual rate of 0.1 percent. In 2016, the industrial and transportation end-use sectors accounted for 22 percent and 28 percent of CO_2 emissions, respectively. Meanwhile, the residential and commercial, agriculture, and electricity end-use sectors accounted for 11 percent, 9 percent, and 28 percent of CO_2 emissions, respectively (U.S. EPA 2018).
Based on the California Air Resource Board's (CARB) California Greenhouse Gas Inventory for 2000-2016, California produced 429.4 MMT of CO_2e in 2016 (CARB 2018a). The major source of GHGs in California is associated with transportation, contributing 41 percent of the state's total GHG emissions. The industrial sector is the second largest source, contributing 23 percent of the state's GHG emissions. Electric power accounted for approximately 16 percent of the total emissions (CARB 2018a). California emissions are due in part to its large size and large population compared to other states. However, a factor that reduces California's per capita fuel use and GHG emissions, as compared to other states, is its relatively mild climate. CARB has projected that statewide unregulated GHG emissions for the year 2020 will be 509 MMT of CO_2e (CARB 2018b). These projections represent the emissions that would be expected to occur in the absence of any GHG reduction actions.

c. Potential Effects of Climate Change. Globally, climate change has the potential to affect numerous environmental resources through potential impacts related to future air temperatures and precipitation patterns. Scientific modeling predicts that continued GHG emissions at or above current rates would induce more extreme climate changes during the 21st century than were observed during the 20th century. Long-term trends have found that each of the past three decades has been warmer than all the previous decades in the instrumental record, and the decade from 2000 through 2010 has been the warmest. The global combined land and ocean temperature data show an increase of about 0.89°C (0.69°C–1.08°C) over the period 1901–2012 and about 0.72°C (0.49°C–0.89°C) over the period 1951–2012 when described by a linear trend. Several independently analyzed data records of global and regional Land-Surface Air Temperature (LSAT) obtained from station observations are in agreement that LSAT, and surface temperatures, have increased. In addition to these findings, there are identifiable signs that global warming is currently taking place, including substantial ice loss in the Arctic over the past two decades (IPCC 2014).

According to the CalEPA's 2010 Climate Action Team Biennial Report, potential impacts of climate change in California may include decreased snow pack, sea level rise, an increase in extreme heat days per year, high ground-level O3 days, large forest fires, and drought (CalEPA 2010). Below is a summary of some of the potential impacts that could be experienced in California as a result of climate change.

Air Quality. Higher temperatures, which are conducive to air pollution formation, could worsen air quality in California. Climate change may increase the concentration of ground-level ozone, but the magnitude of the effect, and therefore its indirect effects, are uncertain. If higher temperatures are accompanied by drier conditions, the potential for large wildfires could increase, which, in turn, would further worsen air quality. However, if higher temperatures are accompanied by wetter, rather than drier conditions, the rains would tend to temporarily clear the air of particulate pollution and reduce the incidence of large wildfires, thereby ameliorating the pollution associated with wildfires. Additionally, severe heat accompanied by drier conditions and poor air quality could increase the number of heat-related deaths, illnesses, and asthma attacks throughout the state (CEC 2009).

Water Supply. Analysis of paleoclimatic data (such as tree-ring reconstructions of stream flow and precipitation) indicates a history of naturally and widely varying hydrologic conditions in California and the west, including a pattern of recurring and extended droughts. However, the average early spring snowpack in the Sierra Nevada decreased by about 10 percent during the last century, a loss of 1.5 million acre-feet of snowpack storage. During the same period, sea level rose eight inches along California's coast. California's temperature has risen 1°F, mostly at night and during the winter, with higher elevations experiencing the highest increase. Many Southern California cities have experienced their lowest recorded annual precipitation twice within the past decade. In a span of only two years, Los Angeles experienced both its driest and wettest years on record (DWRCalifornia Department of Water Resources (DWR) 2008; California Climate Change Center (CCCC) 2009).

This uncertainty complicates the analysis of future water demand, especially where the relationship between climate change and its potential effect on water demand is not well understood. The Sierra snowpack provides the majority of California's water supply by accumulating snow during the state's wet winters and releasing it slowly during the state's dry springs and summers. Based upon historical data and modeling DWR projects that the Sierra snowpack will experience a 25 to 40 percent reduction from its historic average by 2050. Climate change is also anticipated to bring warmer storms that result in less snowfall at lower elevations, reducing the total snowpack (DWR 2008).

Hydrology. As discussed above, climate changes could potentially affect: the amount of snowfall, rainfall, and snow pack; the intensity and frequency of storms; flood hydrographs (flash floods, rain or snow events, coincidental high tide and high runoff events); sea level rise and coastal flooding; coastal erosion; and the potential for salt water intrusion. Sea level rise may be a product of climate change through two main processes: expansion of sea water as the oceans warm and melting of ice over land. A rise in sea levels could result in coastal flooding and erosion and could jeopardize California's water supply. Increased storm intensity and frequency could affect the ability of flood-control facilities, including levees, to handle storm events.

Agriculture. California has a $30 billion agricultural industry that produces half of the country's fruits and vegetables. Higher CO_2 levels can stimulate plant production and increase plant water-use efficiency. However, if temperatures rise and drier conditions prevail, water demand could increase; crop-yield could be threatened by a less reliable water supply; and greater ozone pollution could render plants more susceptible to pest and disease outbreaks. In addition, temperature increases could change the time of year certain crops, such as wine grapes, bloom or ripen, and thereby affect their quality (CCCC 2006).

Ecosystems and Wildlife. Climate change and the potential resulting changes in weather patterns could have ecological effects on a global and local scale. Increasing concentrations of GHGs are likely to accelerate the rate of climate change. Scientists expect that the average global surface temperature could rise as discussed previously: 1.0-4.6°F (0.6-2.5°C) in the next 50 years, and 2.2-10°F (1.4-5.8°C) in the next century, with substantial regional variation. Soil moisture is likely to decline in many regions, and intense rainstorms are likely to become more frequent. Sea level could rise as much as two feet along most of the U.S. coast. Rising temperatures could have four major impacts on plants and animals: (1) timing of ecological events; (2) geographic range; (3) species' composition within communities; and (4) ecosystem processes, such as carbon cycling and storage (IPCC 2007; Parmesan 2004; Parmesan, C. and H. Galbraith 2004).

While the above-mentioned potential impacts identify the possible effects of climate change at a global and potentially statewide level, in general scientific modeling tools are currently unable to predict what impacts would occur locally.

d. Regulatory Setting. The following regulations address both climate change and GHG emissions.

Federal Regulations. The U.S. Supreme Court in *Massachusetts et al. v. Environmental Protection Agency et al.* (2007 549 U.S. 05-1120, held that the U.S. EPA has the authority to regulate motor-vehicle GHG emissions under the federal Clean Air Act. The U.S. EPA issued a Final Rule for mandatory reporting of GHG emissions in October 2009. This Final Rule applies to fossil fuel suppliers, industrial gas suppliers, direct GHG emitters, and manufacturers of heavy-duty and off-road vehicles and vehicle engines, and requires annual reporting of emissions. In 2012 the U.S. EPA issued a Final Rule that establishes the GHG permitting thresholds that determine when Clean Air Act permits under the New Source Review Prevention of Significant Deterioration (PSD) and Title V Operating Permit programs are required for new and existing industrial facilities.

In 2014, the U.S. Supreme Court in *Utility Air Regulatory Group v. EPA* (2014) 134 S. Ct. 2427, held that U.S. 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 pollutants) may continue to require limitations on GHG emissions based on the application of Best Available Control Technology (BACT).

California Regulations. California Air Resources Board (CARB) is responsible for the coordination and oversight of State and local air pollution control programs in California. California has numerous regulations aimed at reducing the state's GHG emissions. These

initiatives are summarized below. Assembly Bill (AB) 1493 (2002), California's Advanced Clean Cars program (referred to as "Pavley"), requires CARB to develop and adopt regulations to achieve "the maximum feasible and cost-effective reduction of GHG emissions from motor vehicles." On June 30, 2009, U.S. EPA granted the waiver of Clean Air Act preemption to California for its greenhouse gas emission standards for motor vehicles beginning with the 2009 model year. Pavley I regulates model years from 2009 to 2016 and Pavley II, which is now referred to as "LEV (Low Emission Vehicle) III GHG" regulates model years from 2017 to 2025. The Advanced Clean Cars program coordinates the goals of the Low Emissions Vehicles (LEV), Zero Emissions Vehicles (ZEV), and Clean Fuels Outlet programs, and would provide major reductions in GHG emissions. By 2025, when the rules will be fully implemented, new automobiles will emit 34 percent fewer GHGs and 75 percent fewer smog-forming emissions from their model year 2016 levels (CARB 2011).

California's major initiative for reducing GHG emissions is outlined in Assembly Bill 32 (AB 32), the "California Global Warming Solutions Act of 2006," signed into law in 2006. AB 32 codifies the statewide goal of reducing GHG emissions to 1990 levels by 2020, and requires CARB to prepare a Scoping Plan that outlines the main State strategies for reducing GHGs to meet the 2020 deadline. In addition, AB 32 requires CARB to adopt regulations to require reporting and verification of statewide GHG emissions. Based on this guidance, CARB approved a 1990 statewide GHG level and 2020 limit of 427 MMT CO_2e. The Scoping Plan was approved by CARB on December 11, 2008, and included measures to address GHG emission reduction strategies related to energy efficiency, water use, and recycling and solid waste, among other measures. Many of the GHG reduction measures included in the Scoping Plan (e.g., Low Carbon Fuel Standard, Advanced Clean Car standards, and Cap-and-Trade) have been adopted since approval of the Scoping Plan.

In May 2014, CARB approved the first update to the AB 32 Scoping Plan. The 2013 Scoping Plan update defines CARB's climate change priorities for the next five years and sets the groundwork to reach post-2020 statewide goals. The update highlights California's progress toward meeting the "near-term" 2020 GHG emission reduction goals defined in the original Scoping Plan. It also evaluates how to align the State's longer-term GHG reduction strategies with other State policy priorities, such as for water, waste, natural resources, clean energy and transportation, and land use (CARB 2014).

Senate Bill (SB) 97, signed in August 2007, acknowledges that climate change is an environmental issue that requires analysis in California Environmental Quality Act (CEQA) documents. In March 2010, the California Resources Agency (Resources Agency) adopted amendments to the State CEQA Guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions. The adopted guidelines give lead agencies the discretion to set quantitative or qualitative thresholds for the assessment and mitigation of GHG and climate change impacts.

SB 375, signed in August 2008, enhances the state's ability to reach AB 32 goals by directing CARB to develop regional GHG emission reduction targets to be achieved from passenger vehicles by 2020 and 2035. In addition, SB 375 directs each of the state's 18 major Metropolitan Planning Organizations (MPOs) to prepare a "sustainable communities strategy" (SCS) that contains a growth strategy to meet these emission targets for inclusion in the Regional

Transportation Plan (RTP). On March 22, 2018, CARB adopted updated regional targets for reducing GHG emissions from 2005 levels by 2020 and 2035. The Southern California Association of Governments (SCAG) was assigned targets of an 8 percent reduction in GHGs from transportation sources by 2020 and a 19 percent reduction in GHG's from transportation sources by 2035. In the SCAG region, SB 375 also provides the option for the coordinated development of subregional plans by the subregional councils of governments and the county transportation commissions to meet SB 375 requirements.

On September 8, 2016, the governor signed Senate Bill 32 (SB 32) into law, extending AB 32 by requiring the State to further reduce GHGs to 40 percent below 1990 levels by 2030 (the other provisions of AB 32 remain unchanged). On December 14, 2017, CARB adopted the 2017 Scoping Plan, which provides a framework for achieving the 2030 target. The 2017 Scoping Plan relies on the continuation and expansion of existing policies and regulations, such as the Cap-and-Trade Program, as well as implementation of recently adopted policies and policies, such as SB 350 and SB 1383 (see below). The 2017 Scoping Plan also puts an increased emphasis on innovation, adoption of existing technology, and strategic investment to support its strategies. As with the 2013 Scoping Plan Update, the 2017 Scoping Plan does not provide project-level thresholds for land use development. Instead, it recommends that local governments adopt policies and locally-appropriate quantitative thresholds consistent with a statewide per capita goal of six metric tons (MT) CO_2e by 2030 and two MT CO_2e by 2050 (CARB 2017). As stated in the 2017 Scoping Plan, these goals may be appropriate for plan-level analyses (city, county, subregional, or regional level), but not for specific individual projects because they include all emissions sectors in the State (CARB 2017).

Adopted in September 2016, SB 1383 requires CARB to approve and begin implementing a comprehensive strategy to reduce emissions of short-lived climate pollutants. The bill requires the strategy to achieve the following reduction targets by 2030:

- *Methane – 40 percent below 2013 levels*
- *Hydrofluorocarbons – 40 percent below 2013 levels*
- *Anthropogenic black carbon – 50 percent below 2013 levels*

The bill also requires the California Department of Resources Recycling and Recovery (CalRecycle), in consultation with the CARB, to adopt regulations that achieve specified targets for reducing organic waste in landfills.

For more information on the Senate and Assembly Bills, Executive Orders, and reports discussed above, and to view reports and research referenced above, please refer to the following websites: www.climatechange.ca.gov and www.arb.ca.gov/cc/cc.htm. Adopted on September 10, 2018, SB 100 supports the reduction of GHG emissions from the electricity sector by accelerating the state's Renewables Portfolio Standard Program, which was last updated by SB X 1-2 in 2011. SB 100 requires electricity providers to increase procurement from eligible renewable energy resources to 33 percent of total retail sales by 2020, 60 percent by 2030, and 100 percent by 2045.

On September 10, 2018, the governor issued Executive Oder B-55-18, which established a new statewide goal of achieving carbon neutrality by 2045 and maintaining net negative emissions thereafter. This goal is in addition to the existing statewide GHG reduction targets established by SB 375, SB 32, SB 1383, and SB 100.

Pursuant to the requirements of SB 97, the Resources Agency has adopted amendments to the State CEQA Guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions. The adopted CEQA Guidelines provide general regulatory guidance on the analysis and mitigation of GHG emissions in CEQA documents, while giving lead agencies the discretion to set quantitative or qualitative thresholds for the assessment and mitigation of GHGs and climate change impacts. To date, a variety of air districts have adopted quantitative significance thresholds for GHGs.

Local Regulations. The City of Rancho Palos Verdes adopted an Emissions Reduction Action Plan (ERAP) in December 2017. The ERAP was adopted prior to the adoption of SB 32, however, the ERAP establishes a goal for 2035 which aligns with the trajectory of EO S-3-05. Rancho Palos Verdes' ERAP includes emission reduction goals and measures that are primarily associated with increasing energy efficiency and decreasing energy demand.

4.6.2 Impact Analysis

a. Methodology and Significance Thresholds. Based on Appendix G of the State *CEQA Guidelines*, impacts related to GHG emissions from the proposed project would be significant if the project would:

a) *Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment; and/or*
b) *Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases.*

The vast majority of individual projects do not generate sufficient GHG emissions to directly influence climate change. However, physical changes caused by a project can contribute incrementally to cumulative effects that are significant, even if individual changes resulting from a project are limited. The issue of climate change typically involves an analysis of whether a project's contribution towards an impact would be cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, other current projects, and probable future projects (CEQA Guidelines, Section 15064[h][1]).

For future projects, the significance of GHG emissions may be evaluated based on locally adopted quantitative thresholds, or consistency with a regional GHG reduction plan (such as a Climate Action Plan).
The proposed Landslide Moratorium Ordinance revisions would not involve any specific development proposals or change any land use designations, it would indirectly result in the potential development of 31 new single-family residences. Nonetheless, in order to determine whether or not GHG emissions associated with buildout and operation of 31 single-family residences are "cumulatively considerable," this analysis determines the project's consistency with applicable greenhouse gas emissions reductions strategies. Although the City has an

adopted ERAP, the proposed project is also quantitatively evaluated for informational purposes based on the SCAQMD's recommended/preferred option threshold for all land use types including residential of 3,000 metric tons CO_2e per year (SCAQMD, "Proposed Tier 3 Quantitative Thresholds – Option 1", September 2010).

As discussed in Section 4.2, *Air Quality*, emissions associated with the construction (short-term) and operation (long-term) of the project were quantitatively estimated using the [CalEEMod] version 2016.3.2 computer model, based on the projected maximum amount of equipment that would be used on-site at one time. Complete CalEEMod results and assumptions can be viewed in Appendix B. Construction emissions include emissions generated by construction equipment, such as backhoes and bulldozers operating on the project area, as well as emissions generated by off-site vehicle trips associated with construction, such as hauling trips and worker travel to and from the project area. Operational emissions include mobile source emissions (i.e., vehicle emissions), energy emissions (primarily natural gas combustion), and area source emissions (emissions generated by landscape maintenance equipment, consumer products, and architectural coatings).

b. Project Impacts and Mitigation Measures.

Impact GHG-1 **Development that could be facilitated by the proposed ordinance revisions would generate additional GHG emissions beyond existing conditions. However, GHG emissions generated by full development potential within Zone 2 would not exceed relevant significance thresholds. Further, the proposed project would be generally consistent with the City's ERAP, the SCAG Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS), and the CARB 2017 Scoping Plan. Impacts would be Class III, *less than significant.***

As stated above, GHG emissions for potential buildout of the project area under the proposed ordinance revisions were quantitatively calculated using the SCAQMD's CalEEMod computer model based on the development potential that would be accommodated as a result of the proposed revisions to the Landslide Moratorium Ordinance. The following summarizes the project's overall GHG emissions (see Appendix B for full CalEEMod worksheets).

Construction Emissions. For the purpose of this analysis, construction activity is conservatively assumed to occur over a period of approximately four years (extending the assumed construction period over a longer period would result in lower overall emissions since emission rates for construction equipment will decline over time as lower emitting technologies are required). Based on the CalEEMod model results, construction activity for the project would generate an estimated 624 metric tons CO_2e (as shown in Table 4.6-1) during the first year of construction, which is the year with the highest amount of GHG emissions since this year incudes site preparation and grading phases. Although construction emissions are temporary in nature, in order to account for their contribution over the lifetime of the project the SCAQMD recommends amortization of construction emissions over a 30-year period and then addition of the construction emissions to the operational emissions (SCAQMD, 2008). Following the

SCAQMD's recommended methodology to amortize emissions over a 30-year period (the assumed life of the project), construction of the proposed project would generate approximately 50 metric tons CO_2e per year.

Table 4.6-1
Estimated Construction Emissions of Greenhouse Gases

Emission Source (Construction Year)	Annual Emissions (metric tons CO_2e)
2019	623.8
2020	329.8
2021	328.0
2022	207.6
Total	**1,489.2**
Amortized over 30 years[1]	**49.6 metric tons CO_2e per year**

[1] See Appendix B for calculations and for GHG emission factor assumptions. Totals have been rounded up to nearest decimal.

Operational Indirect and Stationary Direct Emissions.

Area Source Emissions. The CalEEMod model was used to calculate direct sources of air emissions located in the project area. This includes hearths, consumer product use, and landscape maintenance equipment. Because the project would involve residential units which do not typically have large rates of emissions associated with consumer products, emissions from the proposed project associated with consumer products would be negligible (0 metric tons per year). As shown in Table 4.6-2, the area sources would generate approximately 10 metric tons CO_2e per year.

Table 4.6-2
Estimated Area Source Greenhouse Gas Emissions

Emission Source	Annual Emissions (metric tons CO_2e)
Hearth	9.9
Landscaping	0.5
Total	**10.5**

Source: See Appendix B for calculations and for GHG emission factor assumptions. Totals have been rounded up to nearest decimal.

Energy Use. Operation of the potential new residences would consume both electricity and natural gas (see Appendix B for calculations). The generation of electricity through combustion of fossil fuels typically yields CO_2, and to a smaller extent, N_2O and CH_4. As discussed above, annual electricity and natural gas emissions can be calculated using default values from the CEC sponsored CEUS and RASS studies which are built into the CalEEMod model.

As shown in Table 4.6-3, electricity consumption associated with the project would generate approximately 79 metric tons CO_2e per year. Natural gas use would generate approximately 43 metric tons CO_2e per year. Thus, overall energy use at the development sites would generate approximately 122 metric tons CO_2e per year.

Table 4.6-3
Estimated Annual Energy-Related Greenhouse Gas Emissions

Emission Source	Annual Emissions (metric tons CO_2e)
Electricity	79.5
Natural Gas	42.9
Total	**122.4**

Source: See Appendix B for calculations and for GHG emission factor assumptions. Totals have been rounded up to nearest decimal.

Solid Waste Emissions. The potential new residences would generate approximately 36 tons of solid waste per year according to the CalEEMod output. As shown in Table 4.6-4, based on this estimate, this aspect of the project would generate approximately 18 metric tons of CO_2e per year.

Table 4.6-4
Estimated Annual Solid Waste Greenhouse Gas Emissions

Emission Source	Annual Emissions (metric tons CO_2e)
Solid Waste	**18.4**

Source: See Appendix B for calculations and for GHG emission factor assumptions. Totals have been rounded up to nearest decimal.

Water Use Emissions. The project would use approximately 3,300,000 gallons of water per year. Based on the amount of electricity generated in order to supply this amount of water, as shown in Table 4.6-5, this aspect of the project would generate approximately 16 metric tons CO_2e per year.

Table 4.6-5
Estimated Greenhouse Gas Emissions from Water Use

Emission Source	Annual Emissions (metric tons CO_2e)
Water Use	**15.7**

Source: See Appendix B for calculations and for GHG emission factor assumptions. Totals have been rounded up to nearest decimal.

Transportation Emissions. Mobile source GHG emissions were estimated using the ITE rate for average daily trips single family residences consistent with the project's transportation study prepared by LLG Engineers (2019) and by the total vehicle miles traveled (VMT) estimated in CalEEMod. Based on the CalEEMod model estimate, potential development would generate approximately 1,000,752 annual VMT.

Table 4.6-6 shows the estimated mobile emissions of GHGs for the project based on the estimated annual VMT. As noted above, the CalEEMod model does not calculate N_2O emissions related to mobile sources. As such, N_2O emissions were calculated based on the project's VMT using calculation methods provided by the California Climate Action Registry General Reporting Protocol (January 2009). As shown in Table 4.6-6 below, the project would result in approximately 432 metric tons CO_2eunits associated with mobile emissions.

Table 4.6-6
Estimated Annual Mobile Emissions of Greenhouse Gases

Emission Source	Annual Emissions (metric tons CO_2e)
Mobile Emissions (CO_2 & CH_4)	411.1
Mobile Emissions (N_2O)	20.9
Total	**432.0**

Source: See Appendix B for calculations and for GHG emission factor assumptions. Totals have been rounded up to nearest decimal.

Combined Construction, Stationary and Mobile Source Emissions. Table 4.6-7 combines the construction, operational and mobile GHG emissions associated with on-site development for the proposed project. Construction emissions associated with construction activity (approximately 624 metric tons CO_2e) are amortized over 30 years (the anticipated life of the project). Therefore, construction of the proposed project would generate approximately 50 metric tons CO_2e per year. Operation emissions, including mobile emissions, would generate

approximately 599 metric tons CO_2e per year. Therefore, the combined annual emissions would total approximately 649 metric tons CO_2e per year. This total represents roughly 0.00015% of California's total emissions of 429.4 MMT of CO_2e in 2016. These emission projections also indicate that the majority of the project's GHG emissions are associated with vehicular travel (approximately 67 percent). However, mobile emissions are in part a redirection of existing travel to other locations, and so are already a part of the total California GHG emissions.

Table 4.6-7
Combined Annual Emissions of Greenhouse Gases

Emission Source	Annual Emissions (metric tons CO_2e)
Construction	49.6
Operational	
Area	10.5
Energy	122.4
Solid Waste	18.4
Water	15.7
Mobile	432.0
Total	**648.6 metric tons CO_2e**

Sources: See Appendix B for calculations and for GHG emission factor assumptions.

Based on the development potential in Zone 2 that would result from revisions to the Landslide Moratorium Ordinance, total GHG emissions would be approximately 649 metric tons CO_2e per year. Although development facilitated by the proposed project would generate additional GHG emissions beyond existing conditions, the total amount of GHG emissions would be less than 3,000 metric tons per year.

Development allowed under the proposed project would also be generally consistent with applicable regulations or plans addressing greenhouse gas reductions. As indicated above, the City's ERAP was adopted prior to the adoption of SB 32; however, the ERAP establishes a goal for 2035 which aligns with the trajectory of EO S-3-05. Rancho Palos Verdes' ERAP includes emission reduction goals and measures that are primarily associated with increasing energy efficiency and decreasing energy demand. According to the SCAG RTP/SCS, goals include the focus of new growth around transit and to reflect the changing population and demands. Tables 4.6-8 and 4.6-9 illustrate that the proposed project would be consistent with the applicable GHG reduction strategies set forth by the City's ERAP and SCAG RTP/SCS.

Further, the project would be consistent with the 2017 Scoping Plan measures established to reduce GHG emissions. Specifically, the 2017 Scoping Plan intends to reduce total light-duty vehicle miles traveled (VMT) by 15 percent from expected levels in 2050. The 2017 Scoping Plan also encourages the use of streets for multiple modes of transportation. All residents would have access to the City's existing trails for alternative modes of transportation. In addition, public bus transit service is currently provided by the Los Angeles County Metropolitan Transportation Authority and the Palos Verdes Peninsula Transit Authority (see Table 4.10-4 in

Section 4.10), which would further encourage future residents to utilize alternative modes of transportation. Therefore, development facilitated under the proposed project would not contribute to a significant increase in VMT.

Table 4.6-8
Project Consistency with Applicable ERAP Community GHG Reduction Strategies

Strategy	***Project Consistency***
Goal 2: Increase Energy Efficiency in new Residential Development	
Measure 2.1 Encourage or Require EE Standards Exceeding Title 24.	**Consistent** Although the proposed revisions to the Landslide Moratorium Ordinance do not include specific development projects, all future development would comply with current California's Building Energy Efficiency Standards; thus, energy would not be used in a wasteful manner. Since the project would allow the development of 31 single-family homes, the implementation of additional energy efficiency opportunities would be completed at the discretion of each homeowner.
Goal 5: Increase Energy Efficiency through Water Efficiency	
Measure 5.1 Promote or Require Water Efficiency through SBX7-7. ***Measure 5.2*** Promote Water Efficiency Standards Exceeding SB X7-7	**Consistent** SB X7-7, or The Water Conservation Act of 2009, requires all water suppliers to increase water use efficiency. As proposals for development of the 31 residential lots are submitted to the City of approval, each developer would be required to comply with City requirements (Municipal Code Chapter 15.34, Water Efficient Landscaping) to provide adequate water efficiency measures for the on-site development, which could include low-irrigation landscaping.
Goal 6: Decrease Energy Demand through Reducing Urban Heat Island Effect	
Measure 6.1 Promote Tree Planting for Shading and Energy Efficiency	**Consistent** As proposals for development of the 31 residential lots are submitted to the City, each developer would be required to submit a landscape plan for City review, which would include details for the number of trees proposed for a lot on a case-by-case basis.

Table 4.6-9
Project Consistency with Applicable SCAG RTP/SCS Emission Reduction Strategies

Strategy	*Project Consistency*
Land Use Strategies	
Focus new growth around transit The 2016 RTP/SCS land use pattern reinforces the trend of focusing growth in the region's High Quality Transit Areas (HQTAs). While many residents and employees within half a mile of a transit stop or corridor can walk or bike to transit, not all of these areas are targeted for new growth and/or land use changes. The 2016 RTP/SCS assumes that 46 percent of new housing and 55 percent of new employment locations developed between 2012 and 2040 will be located within HQTAs, which comprise only three percent of the total land area in the SCAG region.	**Consistent** While Zone 2 is not located within a HQTA, all residential development facilitated under the proposed project would have access to public bus transit services currently provided by the Los Angeles County Metropolitan Transportation Authority and the Palos Verdes Peninsula Transit Authority (see Table 4.10-4 in Section 4.10). In addition, all residents would have access to existing City trails as alternative odes of transportation.
Transportation Strategies	
Preserve our existing transit system Ensuring that the existing transportation system is operating efficiently is critical for the success of HQTAs, Livable Corridors, and other land use strategies outlined in the 2016 RTP/SCS.	**Consistent** While Zone 2 is not located within a HQTA, all residential development facilitated under the proposed project not conflict with existing public transit services. Individual construction on the 31 residential properties is not expected to result in temporary roadblocks.

Although the proposed revisions to the Landslide Moratorium Ordinance do not include specific development projects, development facilitated by the revisions within Zone 2 would result in an incremental increase in GHG emissions. However, as indicated above in Table 4.6-7, the increase of GHG emissions would be approximately 649 metric tons CO_2e per year which is below the SCAQMD-recommended threshold of 3,000 metric tons CO_2e per year. In addition, as indicated in Tables 4.6-8 and 4.6-9, the proposed project would be consistent with GHG reduction measures in the City's ERAP, the SCAG RTP/SCS. The proposed project would also be consistent with the CARB 2017 Scoping Plan. Therefore, the proposed project's contribution to cumulative GHG emissions and climate change would not be significant.

Mitigation Measures. As specified above, the proposed project would result in less than 3,000 metric tons CO_2eper year and would be consistent with the GHG reduction measures in the City's ERAP, the SCAG RTP/SCS, and the CARB 2017 Scoping Plan; therefore, no mitigation is necessary. Future project area development would, however, be subject to various ERAP policies and programs, including those related to increased energy efficiency, use of green building techniques, use of low irrigation landscaping, and encouraging tree planting.

Significance after Mitigation. Impacts would be less than significant without mitigation.

c. Cumulative Impacts. Planned and pending development in and around the City is listed in Table 3-1 in Section 3.0, *Environmental Setting*. As indicated above in Impact GHG-1, GHG emissions associated with the proposed project would be less than significant. Analyses of greenhouse gases are cumulative in nature as they affect the accumulation of greenhouse gases in the atmosphere. Since there would be no significant project impact and given the relatively small contribution to cumulative GHG emissions associated with the proposed project, the project would not make a substantial contribution to cumulative impacts related to climate change.