RECIRCULATED DRAFT

ENVIRONMENTAL IMPACT REPORT

FOR THE

2040 LAKE FOREST GENERAL PLAN

(SCH: 2019090102)

FEBRUARY 2020

Prepared for:

City of Lake Forest
100 Civic Center Drive
Lake Forest, CA 92630

Prepared by:

De Novo Planning Group
180 E. Main Street Suite
Tustin, CA 92780
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D e N o v o P l a n n i n g G r o u p

A Land Use Planning, Design, and Environmental Firm

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RECIRCULATED DRAFT EIR

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Appendices

This section summarizes the purpose of the Recirculated Draft Environmental Impact Report for the 2040 Lake Forest General Plan (General Plan, General Plan Update, or proposed project). The following discussion addresses the environmental procedures that are to be followed according to State law; the intended uses of the Recirculated Draft EIR; the contents of the Recirculated Draft EIR; the procedures for submittal of public and agency comments on the Recirculated Draft EIR; and the requirements for responding to comments on the original Draft EIR and the Recirculated Draft EIR.

1.1 INTRODUCTION

The California Environmental Quality Act (CEQA) requires that all state and local government agencies consider the environmental consequences of programs and projects over which they have discretionary authority before taking action on those projects or programs. Where there is substantial evidence that a project may have a significant effect on the environment, the agency shall prepare an environmental impact report (EIR) (CEQA Guidelines, Section 15164[a]). An EIR is an informational document that will inform public agency decision makers and the general public of the significant environmental effects of a project, identify possible ways to minimize the significant effects, and describe reasonable alternatives to the project.

CEQA requires that a draft EIR be prepared and circulated for public review. Following the close of the public review period, the lead agency prepares a final EIR, which includes the comments received during the review period (either verbatim or in summary), and responses to the significant environmental issues raised in those comments. Prior to taking action on a proposed project, the lead agency must certify the EIR and make certain findings.

A lead agency is required to recirculate a draft EIR, prior to certification, when "significant new information" is added to the EIR after the public review period begins (CEQA Guidelines Section 15088.5). New information is deemed significant if it reveals the following:

- A new significant environmental impact resulting from either the project itself or a new proposed mitigation measure;
- A substantial increase in the severity of an environmental impact would result unless mitigation measures are adopted that reduce the impact to a level of insignificance;
- A feasible project alternative or mitigation measure considerably different from others previously analyzed would clearly lessen the significant environmental impacts of the project, but the project proponent declines to adopt it; or
- The Draft EIR was so fundamentally inadequate and conclusory that it precluded meaningful public review and comment.

In addition, a lead agency may choose to recirculate an EIR if additional studies or analysis is conducted for a project before a specific action is taken by local decision makers to approve a project. Recirculation may be limited to those chapters or portions of the EIR that have been modified (CEQA Guidelines Section 15088.5(c).)

1.2 PROJECT BACKGROUND AND REASONS FOR EIR RECIRCULATION

Notice of Preparation

The City circulated a Notice of Preparation (NOP) of an EIR for the proposed project and an Initial Study on September 5, 2019 to trustee and responsible agencies, the State Clearinghouse, and the public. A public scoping meeting was held on September 24, 2019. Concerns raised in response to the NOP were considered during preparation of the Draft EIR.

Draft EIR

The City circulated a Draft EIR to the State Clearinghouse, trustee and responsible agencies, and the public on November 8, 2019. A Notice of Completion (NOC) was filed, and a 45-day public review period was provided between November 8, 2019 and December 23, 2019 to receive public and agency comments on the adequacy of the environmental analysis contained in the Draft EIR. The Draft EIR contains a description of the project, description of the environmental setting, identification and analysis of project impacts, as well as an analysis of project alternatives, identification of significant irreversible environmental changes, growth-inducing impacts, and cumulative impacts. The Draft EIR identifies issues determined to have no impact or a less than significant impact, and provides detailed analysis of potentially significant and significant impacts.

REASONS FOR EIR RECIRCULATION

In light of comments received during the 45-day public comment period on the Draft EIR, the City has elected to conduct additional technical analysis of potential GHG impacts, provide further clarity and supporting information regarding the methodology used in the analysis, and provide the public and interested agencies with an opportunity to comment on this revised and expanded GHG analysis documentation.

In accordance with State CEQA Guidelines, section 15088.5, the City is recirculating this revised Draft EIR Greenhouse Gases, Climate Change, and Energy chapter, with associated appendix, to provide the public and agencies with ample opportunity to review and comment on the updated analysis and new project information. Procedures for commenting on this revised analysis are detailed below.

1.3 SUMMARY OF CHANGES

One section of the original Draft EIR has been revised and is included in this Recirculated Draft EIR.

Chapter 3.7: Greenhouse Gases, Climate Change, and Energy

The original Draft EIR included an analysis of greenhouse gases, climate change and energy in Chapter 3.7. The greenhouse gases, climate change and energy analysis has been revised to include more refined inputs and assumptions, and to further articulate how the conclusions in that chapter were reached. This revised analysis is supplemented with expanded technical appendices and documentation to further substantiate the conclusions contained in the analysis. The technical methodology and documentation associated with the revised analysis is included as Appendix A to

this Recirculated Draft EIR. The technical methodology and documentation are described in detail in Chapter 3.7 of this Recirculated Draft EIR.

The original Draft EIR concluded that impacts related to greenhouse gases, climate change and energy would be less than significant. This Recirculated Draft EIR has also concluded that impacts related greenhouse gases, climate change and energy would be less than significant.

1.4 COMMENTS ON THE RECIRCULATED DRAFT EIR

In accordance with Section 15088.5(f)(2) of the CEQA Guidelines, *"When the EIR is revised only in part and the lead agency is recirculating only the revised chapters or portions of the EIR, the lead agency may request that reviewers limit their comments to the revised chapters or portions of the recirculated EIR. The lead agency need only respond to (i) comments received during the initial circulation period that relate to chapters or portions of the document that were* ***not*** *revised and recirculated, and (ii) comments received during the recirculation period that relate to the chapters or portions of the earlier EIR that were revised and recirculated." (emphasis added)*

The 2040 Lake Forest General Plan Draft EIR was originally circulated for a 45-day public review and comment period between November 8, 2019 and December 23, 2019. The City of Lake Forest, acting as the lead agency for the project, formally requests that reviewers of the Recirculated Draft EIR **limit their comments to the revised portions of the Recirculated Draft EIR included herein**. The Final EIR, which will be prepared after the public review period for the Recirculated Draft EIR, will include responses to comments received on all sections of the original Draft EIR and responses to comments received on the Recirculated Draft EIR that relate to the portions that were recirculated.

1.5 PUBLIC NOTICE/PUBLIC REVIEW

CEQA requires a public review period of at least 45 days for a recirculated draft EIR (Guidelines Sections 15088.5 and 15105). Additionally, Public Resources Code Section 21092.1 requires the City to send a notice of recirculation to every agency, person, or organization that commented on the original Draft EIR.

Consistent with CEQA, the review period for this Recirculated Draft EIR is forty-five (45) days. City Planning staff will be available to answer questions from the public regarding the Recirculated Draft EIR. Public comment on the Recirculated Draft EIR will be accepted in written form. All comments or questions regarding the Recirculated Draft EIR should be addressed to:

Gayle Ackerman, AICP, Director of Community Development
City of Lake Forest
25550 Commercentre Drive, Suite 100
Lake Forest, CA 92630

RESPONSE TO COMMENTS/FINAL EIR

Following the public review period, a Final EIR will be prepared. The Final EIR will include responses to comments received on all sections of the original Draft EIR and responses to comments received on the Recirculated Draft EIR that relate to the portions that were recirculated.

CERTIFICATION OF THE EIR/PROJECT CONSIDERATION

The City will review and consider the Final EIR. If the City finds that the Final EIR is adequate and completed in compliance with CEQA, the City Council may certify the Final EIR in accordance with CEQA. As set forth by CEQA Guidelines Section 15151, the standards of adequacy require an EIR to provide a sufficient degree of analysis to allow decisions to be made regarding the proposed project that intelligently take account of environmental consequences.

Following review and consideration of the Final EIR, the City may take action to approve, modify, or reject the project. A decision to approve the proposed project, for which the original Draft EIR identifies significant environmental effects, must be accompanied by written findings in accordance with State CEQA Guidelines Sections 15091 and 15093. If any mitigiaton meausres are incorporated into and imposed upon the project to reduce or avoid significant effects on the environment, a Mitigation Monitoring Program would also be adopted in accordance with Public Resources Code Section 21081.6(a) and CEQA Guidelines Section 15097. Any such Mitigation Monitoring Program would be designed to ensure that these measures are carried out during project implementation, in a manner that is consistent with the EIR.

1.6 ORGANIZATION OF THE DOCUMENT

This Recirculated Draft EIR includes two chapters as follows:

CHAPTER 1.0 – INTRODUCTION

This chapter summarizes the purpose of the Recirculated Draft EIR, describes the environmental procedures that are to be followed according to State law, the intended uses of the Recirculated Draft EIR, the contents of the Recirculated Draft EIR, including a summary of changes made to the original Draft EIR, the procedures for submittal of public and agency comments on the Recirculated Draft EIR, and the requirements for responding to comments on the original Draft EIR and the Recirculated Draft EIR.

REVISED CHAPTER 3.7 – GREENHOUSE GASES, CLIMATE CHANGE, AND ENERGY

Chapter 3.7 provides background information on the existing environmental and regulatory settings as they relate to greenhouse gases, climate change, and energy, identifies the methodologies used to complete the greenhouse gas analysis, identifies the thresholds of significance used in the analysis, and includes both a quantitative and qualitative analysis of the proposed project's impacts related to greenhouse gases and climate change. The greenhouse

gases, climate change and energy analysis has been revised; and, the technical methodology and documentation associated with the revised analysis is included as an appendix to this Recirculated Draft EIR. As noted previously, the original Draft EIR concluded that impacts related to greenhouse gases, climate change, and energy would be less than significant. This Recirculated Draft EIR has concluded that impacts related to greenhouse gases, climate change, and energy would also be less than significant.

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This section discusses regional greenhouse gas (GHG) emissions, climate change, and energy conservation impacts that could result from implementation of the General Plan. This section provides a background discussion of greenhouse gases and climate change linkages and effects of global climate change. This section also provides background discussion on energy use in Lake Forest. This section is organized with an existing setting, regulatory setting, approach/methodology, and impact analysis.

The analysis and discussion of the GHG, climate change, and energy conservation impacts in this section focuses on the General Plan's consistency with local, regional, statewide, and federal climate change and energy conservation planning efforts and discusses the context of these planning efforts as they relate to the proposed project. Disclosures of the estimated energy usage and greenhouse gas emissions due to implementation of the General Plan are provided.

Emissions of GHGs have the potential to adversely affect the environment in a cumulative context. The emissions from a single project will not cause global climate change; however, GHG emissions from multiple projects throughout the world could result in a cumulative impact with respect to global climate change. Therefore, the analysis of GHGs and climate change presented in this section is presented in terms of the proposed project's contribution to cumulative impacts and potential to result in cumulatively considerable impacts related to GHGs and climate change.

No comments were received during the NOP comment period regarding this environmental topic. The City received one comment on this topic during the public comment period for the Draft EIR. The City has revised the GHG analysis as a result of this comment letter, and this revised analysis is included in this Recirculated Draft EIR.

3.7.1 ENVIRONMENTAL SETTING

GREENHOUSE GASES AND CLIMATE CHANGE LINKAGES

Various gases in the Earth's atmosphere, classified as atmospheric GHGs, play a critical role in determining the Earth's surface temperature. Solar radiation enters Earth's atmosphere from space, and a portion of the radiation is absorbed by the Earth's surface. The Earth emits this radiation back toward space, but the properties of the radiation change from high-frequency solar radiation to lower-frequency infrared radiation.

Naturally occurring greenhouse gases include water vapor (H_2O), carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and ozone (O_3). Several classes of halogenated substances that contain fluorine, chlorine, or bromine are also greenhouse gases, but they are, for the most part, solely a product of industrial activities. Although the direct greenhouse gases CO_2, CH_4, and N_2O occur naturally in the atmosphere, human activities have changed their atmospheric concentrations. From the pre-industrial era (i.e., ending about 1750) to 2011, concentrations of these three greenhouse gases have increased globally by 40, 150, and 20 percent, respectively (IPCC, 2013).

Greenhouse gases, which are transparent to solar radiation, are effective in absorbing infrared radiation. As a result, this radiation that otherwise would have escaped back into space is now retained, resulting in a warming of the atmosphere. This phenomenon is known as the greenhouse effect. Among the prominent GHGs contributing to the greenhouse effect are CO_2, CH_4, O_3, water vapor, N_2O, and chlorofluorocarbons (CFCs).

Emissions of GHGs contributing to global climate change are attributable in large part to human activities associated with the industrial/manufacturing, utility, transportation, residential, and agricultural sectors. In California, the transportation sector is the largest emitter of GHGs, followed by the industrial sector (California Energy Commission, 2019b).

As the name implies, global 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, respectively. California produced approximately 424 million gross metric tons of carbon dioxide equivalents ($MMTCO_2e$) in 2017 (California Energy Commission, 2019b). To meet the annual statewide targets set by the California Air Resources Board, California emissions need to be below 431 $MMTCO_2e$ by 2020, and to below 260 $MMTCO_2e$ by 2030 (California Air Resources Board, 2017).

Carbon dioxide equivalents are a measurement used to account for the fact that different GHGs have different potential to retain infrared radiation in the atmosphere and contribute to the greenhouse effect. This potential, known as the global warming potential of a GHG, is also dependent on the lifetime, or persistence, of the gas molecule in the atmosphere. Expressing GHG emissions in carbon dioxide equivalents takes the contribution of all GHG emissions to the greenhouse effect and converts them to a single unit equivalent to the effect that would occur if only CO_2 were being emitted.

Consumption of fossil fuels in the transportation sector was the single largest source of California's GHG emissions in 2017, accounting for 41% of total GHG emissions in the state. This category was followed by the industrial sector (24%), the electricity generation sector (including both in-state and out of-state sources) (15%), the agriculture and forestry sector (8%), the residential energy consumption sector (7%), and the commercial energy consumption sector (5%) (California Energy Commission, 2019b).

EFFECTS OF GLOBAL CLIMATE CHANGE

The effects of increasing global temperature are far-reaching and extremely difficult to quantify. The scientific community continues to study the effects of global climate change. In general, increases in the ambient global temperature as a result of increased GHGs are anticipated to result in rising sea levels, which could threaten coastal areas through accelerated coastal erosion, threats to levees and inland water systems and disruption to coastal wetlands and habitat.

If the temperature of the ocean warms, it is anticipated that the winter snow season would be shortened. Snowpack in the Sierra Nevada provides both water supply (runoff) and storage (within the snowpack before melting), which is a major source of water supply for the state. The snowpack portion of the supply could potentially decline by 50% to 75% by the end of the 21st century (National Resources Defense Council, 2014). This phenomenon could lead to significant challenges

securing an adequate water supply for a growing state population. Further, the increased ocean temperature could result in increased moisture flux into the state; however, since this would likely increasingly come in the form of rain rather than snow in the high elevations, increased precipitation could lead to increased potential and severity of flood events, placing more pressure on California's levee/flood control system.

Sea level has risen approximately seven inches during the last century and it is predicted to rise an additional 22 to 35 inches by 2100, depending on the future GHG emissions levels (California Environmental Protection Agency, 2010). If this occurs, resultant effects could include increased coastal flooding, saltwater intrusion and disruption of wetlands. As the existing climate throughout California changes over time, mass migration of species, or failure of species to migrate in time to adapt to the perturbations in climate, could also result. According to the most recent California Climate Change Assessment (*California's Fourth Climate Change Assessment*) (2019), the impacts of global warming in California are anticipated to include, but are not limited to, the following.

Wildfires

In recent years, the area burned by wildfires has increased in parallel with increasing air temperatures. Wildfires have also been occurring at higher elevations in the Sierra Nevada mountains, a trend which is expected to continue under future climate change. Climate change will likely modify the vegetation in California, affecting the characteristics of fires on the land. Land use and development patterns also play an important role in future fire activity. Because of these complexities, projecting future wildfires is complicated, and results depend on the time period for the projection and what interacting factors are included in the analysis. Because wildfires are affected by multiple and sometimes complex drivers, projections of wildfire in future decades in California range from modest changes from historical conditions to relatively large increases in wildfire regimes.

Public Health

Nineteen heat-related events occurred from 1999 to 2009 that had significant impacts on human health, resulting in about 11,000 excess hospitalizations. However, the National Weather Service issued Heat Advisories for only six of the events. Heat-Health Events (HHEs), which better predict risk to populations vulnerable to heat, will worsen drastically throughout the state: for example, by midcentury, the Central Valley is projected to experience average Heat-Health Events that are two weeks longer, and HHEs could occur four to ten times more often in the Northern Sierra region.

Higher temperatures are expected to increase the frequency, duration, and intensity of conditions conducive to air pollution formation. Climate change poses direct and indirect risks to public health, as people will experience earlier death and worsening illnesses. Air quality could be further compromised by increases in wildfires, which emit fine particulate matter that can travel long distances depending on wind conditions.

Energy Resources

Higher temperatures will increase annual electricity demand for homes, driven mainly by the increased use of air conditioning units. High demand is projected in inland and Southern California, and more moderate increases are projected in cooler coastal areas. However, the increased annual residential energy demand for electricity is expected to be offset by reduced use of natural gas for space heating. Increases in peak hourly demand during the hot months of the year could be more pronounced than changes in annual demand. This is a critical finding for California's electric system, because generating capacity must match peak electricity demand.

Water Supply

A vast network of man-made reservoirs and aqueducts capture and transport water throughout the state from northern California rivers and the Colorado River. The current distribution system relies on Sierra Nevada snow pack to supply water during the dry spring and summer months. Rising temperatures, potentially compounded by decreases in precipitation, could severely reduce spring snow pack, increasing the risk of summer water shortages.

The state's water supplies are also at risk from rising sea levels. An influx of saltwater would degrade California's estuaries, wetlands, and groundwater aquifers. Saltwater intrusion caused by rising sea levels is a major threat to the quality and reliability of water within the southern edge of the Sacramento/San Joaquin River Delta, a major state fresh water supply.

Current management practices for water supply and flood management in California may need to be revised for a changing climate. This is in part because such practices were designed for historical climatic conditions, which are changing and will continue to change during the rest of this century and beyond. As one example, the reduction in the Sierra Nevada snowpack, which provides natural water storage, will have implications throughout California's water management system. Even under the wetter climate projections, the loss of snow pack would pose challenges to water managers, hamper hydropower generation, and nearly eliminate all skiing and other snow-related recreational activities.

Agriculture

Increased GHG emissions are expected to cause widespread changes to the agriculture industry reducing the quantity and quality of agricultural products statewide. Although higher carbon dioxide levels can stimulate plant production and increase plant water-use efficiency, California's farmers will face greater water demand for crops and a less reliable water supply as temperatures rise.

Plant growth tends to be slow at low temperatures, increasing with rising temperatures up to a threshold. However, faster growth can result in less-than-optimal development for many crops, so rising temperatures are likely to worsen the quantity and quality of yield for a number of California's agricultural products. Products likely to be most affected include wine grapes, fruits and nuts, and milk.

Crop growth and development will be affected, as will the intensity and frequency of pest and disease outbreaks. Rising temperatures will likely aggravate ozone pollution, which makes plants more susceptible to disease and pests and interferes with plant growth.

In addition, continued global warming will likely shift the ranges of existing invasive plants and weeds and alter competition patterns with native plants. Range expansion is expected in many species while range contractions are less likely in rapidly evolving species with significant populations already established. Should range contractions occur, it is likely that new or different weed species will fill the emerging gaps. Continued global warming is also likely to alter the abundance and types of many pests, lengthen pests' breeding season, and increase pathogen growth rates.

Forests and Landscapes

Climate change will make forests more susceptible to extreme wildfires. *California's Fourth Climate Change Assessment* found that by 2100, if greenhouse gas emissions continue to rise, the frequency of extreme wildfires burning over approximately 25,000 acres would increase by nearly 50 percent, and that average area burned statewide would increase by 77 percent by the end of the century. In the areas that have the highest fire risk, wildfire insurance is estimated to see costs rise by 18 percent by 2055 and the fraction of property insured would decrease.

Moreover, continued global warming will alter natural ecosystems and biological diversity within the state. For example, alpine and sub-alpine ecosystems are expected to decline by as much as 60% to 80% by the end of the century as a result of increasing temperatures. The productivity of the state's forests is also expected to decrease as a result of global warming.

Rising Sea Levels

A new model estimates that, under mid to high sea-level rise scenarios, 31 to 67 percent of Southern California beaches may completely erode by 2100 without large-scale human interventions. Statewide damages could reach nearly $17.9 billion from inundation of residential and commercial buildings under 50 centimeters (~20 inches) of sea-level rise, which is close to the 95th percentile of potential sea-level rise by the middle of this century. A 100-year coastal flood, on top of this level of sea-level rise, would almost double the costs.

Rising sea levels, more intense coastal storms, and warmer water temperatures will increasingly threaten the state's coastal regions. Rising sea levels would inundate coastal areas with saltwater, accelerate coastal erosion, threaten vital levees and inland water systems, and disrupt wetlands and natural habitats.

ENERGY CONSUMPTION

Energy in California is consumed from a wide variety of sources. Fossil fuels (including gasoline and diesel fuel, natural gas, and energy used to generate electricity) are the most widely used form of energy in the State. However, renewable sources of energy (such as solar and wind) are growing in

proportion to California's overall energy mix. A large driver of renewable sources of energy in California is the State's current Renewable Portfolio Standard (RPS), which requires the State to derive at least 33% of electricity generated from renewable resources by 2020, and 50 percent by 2030.

Overall, in 2017, California's per capita energy usage was ranked 48th in the nation (U.S. EIA, 2018). Additionally, California's per capita rate of energy usage has remained relatively constant since the 1970's. Many State regulations since the 1970's, including new building energy efficiency standards, vehicle fleet efficiency measures, as well as growing public awareness, have helped to keep per capita energy usage in the State in check.

The consumption of nonrenewable energy (primarily gasoline and diesel fuel) associated with the operation of passenger, public transit, and commercial vehicles results in GHG emissions that ultimately result in global climate change. Other fuels such as natural gas, ethanol, and electricity (unless derived from solar, wind, nuclear, or other energy sources that do not produce carbon emissions) also result in GHG emissions and contribute to global climate change.

Electricity Consumption

California relies on a regional power system composed of a diverse mix of natural gas, renewable, hydroelectric, and nuclear generation resources. Approximately 71 percent of the electrical power needed to meet California's demand is produced in the state. Approximately 29 percent of its electricity is imported from the Pacific Northwest and the Southwest (California Energy Commission, 2019b). In 2010, California's in-state generated electricity was derived from natural gas (53.4 percent), large hydroelectric resources (14.6 percent), coal (1.7 percent), nuclear sources (15.7 percent), and renewable resources that include geothermal, biomass, small hydroelectric resources, wind, and solar (14.6 percent) (California Energy Commission, 2019b). The percentage of renewable resources as a proportion of California's overall energy portfolio is increasing over time, as directed the State's Renewable Portfolio Standard (RPS).

According to the California Energy Commission (CEC), total statewide electricity consumption increased from 166,979 gigawatt-hours (GWh) in 1980 to 228,038 GWh in 1990, which is an estimated annual growth rate of 3.76 percent. The statewide electricity consumption in 1997 was 246,225 GWh, reflecting an annual growth rate of 1.14 percent between 1990 and 1997 (California Energy Commission, 2019b). Statewide consumption was 274,985 GWh in 2010, an annual growth rate of 0.9 percent between 1997 and 2010. The community of Lake Forest consumed approximately 184,540 MWh in 2017 (according to Southern California Edison), roughly 0.1% of the state total.

Oil

The primary energy source for the United States is oil, which is refined to produce fuels like gasoline, diesel, and jet fuel. Oil is a finite, nonrenewable energy source. World consumption of petroleum products has grown steadily in the last several decades. As of 2018, world consumption of oil had reached 100 million barrels per day (U.S. EIA, 2019a). The United States, with approximately five percent of the world's population, accounts for approximately 21 percent of world oil consumption, or approximately 20.5 million barrels per day (U.S. EIA, 2019b). The transportation sector relies

heavily on oil. In California, petroleum-based fuels currently provide approximately 96 percent of the state's transportation energy needs (California Energy Commission, 2018).

Natural Gas

Natural gas supplies are derived from underground sources and brought to the surface at gas wells. Once it is extracted, gas is purified and the odorant that allows gas leaks to be detected is added to the normally odorless gas. Natural gas suppliers, such as Southern California Gas Company, then send the gas into transmission pipelines, which are usually buried underground. Compressors propel the gas through the pipeline system, which delivers it to homes and businesses.

The state produces approximately 12 percent of its natural gas, while obtaining 22 percent from Canada and 65 percent from the Rockies and the Southwest (California Energy Commission, 2018). In 2006, California produced 325.6 billion cubic feet of natural gas (California Energy Commission, 2019a). Southern California Edison (SCE) provides natural gas for residential, industrial, and agency consumers within Orange County, including the City of Lake Forest

3.7.2 REGULATORY SETTING

FEDERAL

Clean Air Act

The Federal Clean Air Act (FCAA) was first signed into law in 1970. In 1977, and again in 1990, the law was substantially amended. The FCAA is the foundation for a national air pollution control effort, and it is composed of the following basic elements: National ambient air quality standards (NAAQS) for criteria air pollutants, hazardous air pollutant standards, state attainment plans, motor vehicle emissions standards, stationary source emissions standards and permits, acid rain control measures, stratospheric ozone protection, and enforcement provisions.

The U.S. Environmental Protection Agency (USEPA) is responsible for administering the FCAA. The FCAA requires the USEPA to set NAAQS for several problem air pollutants based on human health and welfare criteria. Two types of NAAQS were established: primary standards, which protect public health, and secondary standards, which protect the public welfare from non-health-related adverse effects such as visibility reduction.

Energy Policy and Conservation Act

The Energy Policy and Conservation Act of 1975 sought to ensure that all vehicles sold in the U.S. would meet certain fuel economy goals. Through this Act, Congress established the first fuel economy standards for on-road motor vehicles in the United States. Pursuant to the Act, the National Highway Traffic and Safety Administration, which is part of the U.S. Department of Transportation (USDOT), is responsible for establishing additional vehicle standards and for revising existing standards.

Since 1990, the fuel economy standard for new passenger cars has been 27.5 mpg. Since 1996, the fuel economy standard for new light trucks (gross vehicle weight of 8,500 pounds or less) has been 20.7 mpg. Heavy-duty vehicles (i.e., vehicles and trucks over 8,500 pounds gross vehicle weight) are not currently subject to fuel economy standards. Compliance with federal fuel economy standards is determined on the basis of each manufacturer's average fuel economy for the portion of its vehicles produced for sale in the U.S. The Corporate Average Fuel Economy (CAFE) program, which is administered by the USEPA, was created to determine vehicle manufacturers' compliance with the fuel economy standards. The USEPA calculates a CAFE value for each manufacturer based on city and highway fuel economy test results and vehicle sales. Based on the information generated under the CAFE program, the USDOT is authorized to assess penalties for noncompliance.

Energy Policy Act of 1992 (EPAct)

The Energy Policy Act of 1992 (EPAct) was passed to reduce the country's dependence on foreign petroleum and improve air quality. EPAct includes several parts intended to build an inventory of alternative fuel vehicles (AFVs) in large, centrally fueled fleets in metropolitan areas. EPAct requires certain federal, state, and local government and private fleets to purchase a percentage of light duty AFVs capable of running on alternative fuels each year. In addition, financial incentives are included in EPAct. Federal tax deductions will be allowed for businesses and individuals to cover the incremental cost of AFVs. States are also required by the act to consider a variety of incentive programs to help promote AFVs.

Energy Policy Act of 2005

The Energy Policy Act of 2005 was signed into law on August 8, 2005. Generally, the act provides for renewed and expanded tax credits for electricity generated by qualified energy sources, such as landfill gas; provides bond financing, tax incentives, grants, and loan guarantees for a clean renewable energy and rural community electrification; and establishes a federal purchase requirement for renewable energy.

Intermodal Surface Transportation Efficiency Act (ISTEA)

ISTEA (49 U.S.C. § 101 et seq.) promoted the development of intermodal transportation systems to maximize mobility as well as address national and local interests in air quality and energy. ISTEA contained factors that metropolitan planning organizations (MPOs), were to address in developing transportation plans and programs, including some energy-related factors. To meet the ISTEA requirements, MPOs adopted explicit policies defining the social, economic, energy, and environmental values that were to guide transportation decisions in that metropolitan area. The planning process was then to address these policies. Another requirement was to consider the consistency of transportation planning with federal, state, and local energy goals. Through this requirement, energy consumption was expected to become a criterion, along with cost and other values that determine the best transportation solution.

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)

SAFETEA-LU (23 U.S.C. § 507), renewed the Transportation Equity Act for the 21st Century (TEA-21) of 1998 (23 U.S.C.; 49 U.S.C.) through FY 2009. SAFETEA-LU authorized the federal surface transportation programs for highways, highway safety, and transit. SAFETEA-LU addressed the many challenges facing our transportation system today—such as improving safety, reducing traffic congestion, improving efficiency in freight movement, increasing intermodal connectivity, and protecting the environment—as well as laying the groundwork for addressing future challenges. SAFETEA-LU promoted more efficient and effective federal surface transportation programs by focusing on transportation issues of national significance, while giving state and local transportation decision makers more flexibility to solve transportation problems in their communities. SAFETEA-LU was extended in March of 2010 for nine months, and expired in December of the same year. In June 2012, SAFETEA-LU was replaced by the Moving Ahead for Progress in the 21st Century Act (MAP-21), which took effect October 1, 2012.

U.S. Federal Climate Change Policy

According to the USEPA, "the United States government has established a comprehensive policy to address climate change" that includes slowing the growth of emissions; strengthening science, technology, and institutions; and enhancing international cooperation. To implement this policy, "the Federal government is using voluntary and incentive-based programs to reduce emissions and has established programs to promote climate technology and science." The federal government's goal is to reduce the greenhouse gas (GHG) intensity (a measurement of GHG emissions per unit of economic activity) of the American economy by 18 percent over the 10-year period from 2002 to 2012. In addition, the EPA administers multiple programs that encourage voluntary GHG reductions, including "ENERGY STAR", "Climate Leaders", and Methane Voluntary Programs. However, as of this writing, there are no adopted federal plans, policies, regulations, or laws directly regulating GHG emissions.

Mandatory Greenhouse Gas Reporting Rule

On September 22, 2009, EPA issued a final rule for mandatory reporting of GHGs from large GHG emissions sources in the United States. In general, this national reporting requirement will provide USEPA with accurate and timely GHG emissions data from facilities that emit 25,000 metric tons or more of CO_2 per year. This publicly available data will allow the reporters to track their own emissions, compare them to similar facilities, and aid in identifying cost effective opportunities to reduce emissions in the future. Reporting is at the facility level, except that certain suppliers of fossil fuels and industrial greenhouse gases along with vehicle and engine manufacturers will report at the corporate level. An estimated 85% of the total U.S. GHG emissions, from approximately 10,000 facilities, are covered by this final rule.

STATE

Warren-Alquist Act

The 1975 Warren-Alquist Act established the California Energy Resources Conservation and Development Commission, now known as CEC. The Act established state policy to reduce wasteful, uneconomical, and unnecessary uses of energy by employing a range of measures. The California Public Utilities Commission (CPUC) regulates privately-owned utilities in the energy, rail, telecommunications, and water fields.

Energy Action Plan

The first Energy Action Plan (EAP) emerged in 2003 from a crisis atmosphere in California's energy markets. The State's three major energy policy agencies (CEC, CPUC, and the Consumer Power and Conservation Financing Authority [established under deregulation and now defunct]) came together to develop one high-level, coherent approach to meeting California's electricity and natural gas needs. It was the first time that energy policy agencies formally collaborated to define a common vision and set of strategies to address California's future energy needs and emphasize the importance of the impacts of energy policy on the California environment.

In the October 2005 Energy Action Plan II, CEC and CPUC updated their energy policy vision by adding some important dimensions to the policy areas included in the original EAP, such as the emerging importance of climate change, transportation-related energy issues, and research and development activities. The CEC adopted an update to the EAP II in February 2008 that supplements the earlier EAPs and examines the State's ongoing actions in the context of global climate change.

State of California Energy Action Plan

The CEC is responsible for preparing the State Energy Plan, which identifies emerging trends related to energy supply, demand, conservation, public health and safety, and the maintenance of a healthy economy. The current plan is the 1997 California Energy Plan. The plan calls for the State to assist in the transformation of the transportation system to improve air quality, reduce congestion, and increase the efficient use of fuel supplies with the least environmental and energy costs. To further this policy, the plan identifies a number of strategies, including assistance to public agencies and fleet operators in implementing incentive programs for zero-emission vehicles and addressing their infrastructure needs; and encouragement of urban design that reduces VMT and accommodates pedestrian and bicycle access.

Assembly Bill 1493

In response to AB 1493, the CARB approved amendments to the California Code of Regulations (CCR) adding GHG emission standards to California's existing motor vehicle emission standards. Amendments to CCR Title 13 Sections 1900 (CCR 13 1900) and 1961 (CCR 13 1961), and adoption of Section 1961.1 (CCR 13 1961.1) require automobile manufacturers to meet fleet average GHG emission limits for all passenger cars, light-duty trucks within various weight criteria, and medium-duty passenger vehicle weight classes beginning with the 2009 model year. Emission limits are further reduced each model year through 2016. For passenger cars and light-duty trucks 3,750

pounds or less loaded vehicle weight (LVW), the 2016 GHG emission limits are approximately 37 percent lower than during the first year of the regulations in 2009. For medium-duty passenger vehicles and light-duty trucks 3,751 LVW to 8,500 pounds gross vehicle weight (GVW), GHG emissions are reduced approximately 24 percent between 2009 and 2016.

The CARB requested a waiver of federal preemption of California's Greenhouse Gas Emissions Standards. The intent of the waiver is to allow California to enact emissions standards to reduce carbon dioxide and other greenhouse gas emissions from automobiles in accordance with the regulation amendments to the CCRs that fulfill the requirements of AB 1493. The U.S. EPA granted a waiver to California to implement its greenhouse gas emissions standards for cars.

Assembly Bill 1007

Assembly Bill 1007, (Pavley, Chapter 371, Statutes of 2005) directed the CEC to prepare a plan to increase the use of alternative fuels in California. As a result, the CEC prepared the State Alternative Fuels Plan in consultation with the state, federal, and local agencies. The plan presents strategies and actions California must take to increase the use of alternative non-petroleum fuels in a manner that minimizes costs to California and maximizes the economic benefits of in-state production. The Plan assessed various alternative fuels and developed fuel portfolios to meet California's goals to reduce petroleum consumption, increase alternative fuels use, reduce greenhouse gas emissions, and increase in-state production of biofuels without causing a significant degradation of public health and environmental quality.

Bioenergy Action Plan – Executive Order #S-06-06

Executive Order #S-06-06 establishes targets for the use and production of biofuels and biopower and directs state agencies to work together to advance biomass programs in California while providing environmental protection and mitigation. The executive order establishes the following target to increase the production and use of bioenergy, including ethanol and biodiesel fuels made from renewable resources: produce a minimum of 20 percent of its biofuels within California by 2010, 40 percent by 2020, and 75 percent by 2050. The executive order also calls for the state to meet a target for use of biomass electricity.

California Executive Orders S-3-05 and S-20-06, and Assembly Bill 32

On June 1, 2005, Governor Arnold Schwarzenegger signed Executive Order S-3-05. The goal of this Executive Order is to reduce California's GHG emissions to: 1) 2000 levels by 2010, 2) 1990 levels by the 2020 and 3) 80% below the 1990 levels by the year 2050. EO-S-20-06 establishes responsibilities and roles of the Secretary of Cal/EPA and state agencies in climate change

In 2006, this goal was further reinforced with the passage of Assembly Bill 32 (AB 32), the Global Warming Solutions Act of 2006. AB 32 sets the same overall GHG emissions reduction goals while further mandating that the CARB create a plan, which includes market mechanisms, and implement rules to achieve "real, quantifiable, cost-effective reductions of greenhouse gases." Executive Order

S-20-06 further directs state agencies to begin implementing AB 32, including the recommendations made by the state's Climate Action Team.

EO S-13-08

EO S-13-08 was issued on November 14, 2008. The EO is intended to hasten California's response to the impacts of global climate change, particularly sea level rise, and directs state agencies to take specified actions to assess and plan for such impacts, including requesting the National Academy of Sciences to prepare a Sea Level Rise Assessment Report, directing the Business, Transportation, and Housing Agency to assess the vulnerability of the State's transportation systems to sea level rise, and requiring the Office of Planning and Research and the Natural Resources Agency to provide land use planning guidance related to sea level rise and other climate change impacts.

The order also required State agencies to develop adaptation strategies to respond to the impacts of global climate change that are predicted to occur over the next 50 to 100 years. The adaption strategies report summarizes key climate change impacts to the State for the following areas: public health; ocean and coastal resources; water supply and flood protection; agriculture; forestry; biodiversity and habitat; and transportation and energy infrastructure. The report recommends strategies and specific responsibilities related to water supply, planning and land use, public health, fire protection, and energy conservation.

Assembly Bill 32 - Climate Change Scoping Plan

On December 11, 2008, the CARB adopted its *Climate Change Scoping Plan* (Scoping Plan), which functions as a roadmap of the CARB's plans to achieve GHG reductions in California required by Assembly Bill (AB) 32 through subsequently enacted regulations. The Scoping Plan contains the main strategies California will implement to reduce carbon dioxide-equivalent (CO_2e) emissions by 169 million metric tons (MMT), or approximately 30 percent, from the state's projected 2020 emissions level of 596 MMT of CO_2e under a business-as-usual scenario. (This is a reduction of 42 MMT CO_2e, or almost 10 percent, from 2002–2004 average emissions, but requires the reductions in the face of population and economic growth through 2020.) The Scoping Plan also breaks down the amount of GHG emissions reductions the CARB recommends for each emissions sector of the state's GHG inventory. The Scoping Plan calls for the largest reductions in GHG emissions to be achieved by implementing the following measures and standards:

- improved emissions standards for light-duty vehicles (estimated reductions of 31.7 MMT CO_2e);
- the Low-Carbon Fuel Standard (15.0 MMT CO_2e);
- energy efficiency measures in buildings and appliances and the widespread development of combined heat and power systems (26.3 MMT CO_2e); and
- a renewable portfolio standard for electricity production (21.3 MMT CO_2e).

The CARB updated the Scoping Plan in 2013 (*First Update to the Scoping Plan*) and again in 2017 (the *Final Scoping Plan*). The 2013 Update built upon the initial Scoping Plan with new strategies and recommendations, and also set the groundwork to reach the long-term goals set forth by the state. Successful implementation of existing programs (as identified in previous iterations of the Scoping

Plan) has put California on track to meet the 2020 target. The 2017 Update expands the scope of the plan further by focusing on the strategy for achieving the state's 2030 GHG target of 40 percent emissions reductions below 1990 levels (to achieve the target codified into law by SB 32), and substantially advances toward the state's 2050 climate goal to reduce GHG emissions by 80 percent below 1990 levels.

The 2017 Update relies on the preexisting programs paired with an extended, more stringent Cap-and-Trade Program, to delivery climate, air quality, and other benefits. The 2017 Update identifies new technologically feasible and cost-effective strategies to ensure that California meets its GHG reduction targets in a way that promotes and rewards innovation, continues to foster economic growth, and delivers improvements to the environment and public health.

Senate Bill 32

Senate Bill 32, which passed into law in 2016, sets the target of reducing greenhouse gas emissions to 40 percent below the 1990 level by the year 2030. SB 32 extends the original set of greenhouse gas targets provided by the passage of AB 32 (the Global Warmings Solutions Act of 2006). This new target sets an aggressive goalpost, helping the State along its pathway to achieve its longer-term goal of an 80 percent reduction in greenhouse gas emissions by the year 2050.

Senate Bill 743

SB 743, passed into law in 2013, changes the way that public agencies evaluate the transportation impacts of projects under CEQA. The proposed revisions to the State CEQA Guidelines would establish new criteria for determining the significance of a project's transportation impacts that will more appropriately balance the needs of congestion management with statewide goals related to infill development, promotion of public health through active transportation, and reduction of GHGs. The 2017 Update to the Scoping Plan identified that slower VMT growth from more efficient land use development patterns would promote achievement of the state's climate goals.

As detailed in SB 743, the Governor's Office of Planning and Research (OPR) was tasked with developing potential metrics to measure transportation impacts and replace the use of delay and level of service (LOS). More detail about SB 743 is provided in the setting section of Chapter 3.14, "Traffic and Circulation" of the Draft EIR.

In December 2018, OPR released its final changes to the CEQA Guidelines, including the addition of Section 15064.3 of the CEQA Guidelines that would implement SB 743. In support of these changes, OPR also published its Technical Advisory on Evaluating Transportation Impacts in CEQA, which recommends that the transportation impact of a project be based on whether it would generate a level of vehicle miles traveled (VMT) per capita (or VMT per employee) that is 15 percent lower than existing development in the region. OPR's technical advisory explains that this criterion is consistent with Section 21099 of the California Public Resources Code, which states that the criteria for determining significance must "promote the reduction in greenhouse gas emissions". It is also consistent with the statewide per capita VMT reduction target developed by Caltrans in its Strategic

Management Plan, which calls for a 15 percent reduction in per capita VMT, compared to 2010 levels, by 2020. Additionally, the California Air Pollution Control Officers Association (CAPCOA) determined that a 15 percent reduction in VMT is typically achievable for projects. CARB's First Update to the Climate Change Scoping Plan also called for local governments to set communitywide GHG reduction targets of 15 percent below then-current levels by 2020. Although not required, a lead agency may elect to be governed by the provisions of Section 15064.3 immediately. However, the provisions of Section 15064.3 do not apply statewide until July 1, 2020. Lake Forest will comply with these provisions starting July 1, 2020.

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

In January 2018, EO B-48-18 was signed into law and requires 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 Executive 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 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 uses through the Low Carbon Fuel Standard Program, and recommend how to ensure affordability and accessibility for all drivers.

Assembly Bill 2076: California Strategy to Reduce Petroleum Dependence

In response to the requirements of Assembly Bill (AB) 2076 (Chapter 936, Statutes of 2000), the CEC and the CARB developed a strategy to reduce petroleum dependence in California. The strategy, *Reducing California's Petroleum Dependence*, was adopted by the CEC and the CARB in 2003. The strategy recommends that California reduce on-road gasoline and diesel fuel demand to 15 percent below 2003 demand levels by 2020 and maintain that level for the foreseeable future; the Governor and Legislature work to establish national fuel economy standards that double the fuel efficiency of new cars, light trucks, and sport utility vehicles (SUVs); and increase the use of non- petroleum fuels to 20 percent of on-road fuel consumption by 2020 and 30 percent by 2030.

Assembly Bill 2188: Solar Permitting Efficiency Act

Assembly Bill (AB) 2188, enacted in California in 2015, required local governments to adopt a solar ordinance by September 30, 2015 that creates a streamlined permitting process that conforms to the bests practices for expeditious and efficient permitting of small residential rooftop solar systems. The act is designed to lower the cost of solar installations in California and further expand the accessibility of solar to more California homeowners. The bulk of the time and cost savings associated with a streamlined permitting process comes from the use of a standardized eligibility

checklist and a simplified plan. This bill also shortens the number of days for those seeking Homeowner's Association (HOA) approval for a written denial of a proposed solar installation.

Governor's Low Carbon Fuel Standard (Executive Order #S-01-07)

Executive Order #S-01-07 establishes a statewide goal to reduce the carbon intensity of California's transportation fuels by at least 10 percent by 2020 through establishment of a Low Carbon Fuel Standard. The Low Carbon Fuel Standard is incorporated into the State Alternative Fuels Plan and is one of the proposed discrete early action GHG reduction measures identified by the CARB pursuant to AB 32.

Senate Bill 97

Senate Bill (SB) 97 (Chapter 185, 2007) required OPR to develop recommended amendments to the State CEQA Guidelines for addressing greenhouse gas emissions. OPR prepared its recommended amendments to the State CEQA Guidelines to provide guidance to public agencies regarding the analysis and mitigation of greenhouse gas emissions and the effects of greenhouse gas emissions in draft CEQA documents. The Amendments became effective on March 18, 2010.

Senate Bill 375

Senate Bill (SB) 375 (Stats. 2008, ch. 728) (SB 375) was built on AB 32 (California's 2006 climate change law). SB 375's core provision is a requirement for regional transportation agencies to develop a Sustainable Communities Strategy (SCS) in order to reduce GHG emissions from passenger vehicles. The SCS is one component of the existing Regional Transportation Plan (RTP).

The SCS outlines the region's plan for combining transportation resources, such as roads and mass transit, with a realistic land use pattern, in order to meet a state target for reducing GHG emissions. The strategy must take into account the region's housing needs, transportation demands, and protection of resource and farmlands.

Additionally, SB 375 modified the state's Housing Element Law to achieve consistency between the land use pattern outlined in the SCS and the Regional Housing Needs Assessment allocation. The legislation also substantially improved cities' and counties' accountability for carrying out their housing element plans.

Finally, SB 375 amended the California Environmental Quality Act (Pub. Resources Code, § 21000 et seq.) to ease the environmental review of developments that help reduce the growth of GHG emissions.

Executive Order B-30-15

On April 29, 2015, Governor Jerry Brown issued Executive Order (EO) B-30-15, which establishes a State GHG reduction target of 40 percent below 1990 levels by 2030. The new emission reduction target provides for a mid-term goal that would help the State to continue on course from reducing GHG emissions to 1990 levels by 2020 (per AB 32) to the ultimate goal of reducing emissions 80

percent under 1990 levels by 2050 (per EO S-03-05). This is in line with the scientifically established levels needed in the U.S. to limit global warming below 2 degrees Celsius – the warming threshold at which scientists say there will likely be major climate disruptions. EO B-30-15 also addresses the need for climate adaptation and directs State government to:

- Incorporate climate change impacts into the State's Five-Year Infrastructure Plan;
- Update the Safeguarding California Plan, the State climate adaptation strategy, to identify how climate change will affect California infrastructure and industry and what actions the State can take to reduce the risks posed by climate change;
- Factor climate change into State agencies' planning and investment decisions; and
- Implement measures under existing agency and departmental authority to reduce GHG emissions.

Advanced Clean Cars Program

In January 2012, the 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 standards for vehicle model years 2017 through 2025. The new rules 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 program will have significant energy demand implications as battery, fuel cell, and/or plug-in hybrid electric vehicle sales increase overtime, creating new demand for electricity services both in residential and commercial buildings (e.g. charging stations) as well as demand for new EV and hydrogen fuel cell charging stations. The number of stations will grow as vehicle manufacturers sell more fuel cell vehicles. According to the CARB, by 2025, when the rules will be fully implemented, the statewide fleet of new cars and light trucks will emit 34 percent fewer global warming gases and 75 percent fewer smog-forming emissions than the statewide fleet in 2016.

California Building Energy Efficiency Standards

Title 24, Part 6 of the California Code of Regulations, known as the Building Energy Efficiency Standards (Standards), was established in 1978 in response to a legislative mandate to reduce California's energy consumption. The standards are updated periodically to allow consideration and possible incorporation of new energy efficiency technologies and methods. On January 1, 2010, the California Building Standards Commission adopted CALGreen and became the first state in the United States to adopt a statewide green building standards code.

The 2016 update to the California Building Energy Efficiency Standards (the current version of the Standards) went into effect on January 1, 2017. The Standards are divided into three basic sets. First, there is a basic set of mandatory requirements that apply to all buildings. Second, there is a set of

performance standards – the energy budgets – that vary by climate zone (of which there are 16 in California) and building type; thus, the Standards are tailored to local conditions. Finally, the third set constitutes an alternative to the performance standards, which is a set of prescriptive packages that are basically a recipe or a checklist compliance approach.

Compared with the previous version of the Standards, the 2016 Standards are expected to reduce statewide annual electricity consumption by approximately 281 gigawatt-hours per year, and natural gas consumption by 16 million therms per year, which is equivalent to a reduction in GHG emissions of approximately 160,000 MT CO_2e/year. The forthcoming update to the Standards (the 2019 Standards) will become effective on January 1, 2020, and will further increase energy efficiency requirements for new development beyond the 2016 update.

LOCAL

South Coast Air Quality Management District

The South Coast Air Quality Management District (SCAQMD) adopted a Policy on Global Warming and Stratospheric Ozone Depletion in April 1990. The policy commits the SCAQMD to consider global impacts in rulemaking and in drafting revisions to the Air Quality Management Plan. In March 1992, the SCAQMD Governing Board reaffirmed this policy and adopted amendments to the policy to include the following directives:

- Phase out the use and corresponding emissions of CFCs, methyl chloroform (1,1,1-trichloroethane or TCA), carbon tetrachloride, and halons by December 1995;
- Phase out the large quantity use and corresponding emissions of HCFCs by the year 2000;
- Develop recycling regulations for HCFCs (e.g., SCAQMD Rules 1411 and 1415);
- Develop an emissions inventory and control strategy for methyl bromide; and
- Support the adoption of a California GHG emission reduction goal.

The legislative and regulatory activity detailed above is expected to require significant development and implementation of energy efficient technologies and shifting of energy production to renewable sources.

City of Lake Forest

The City of Lake Forest does not have any plans, policies, regulations, significance thresholds, or laws addressing climate change at this time. The City of Lake Forest has established ECOnomic, which is a voluntary green home education program. The City, through ECOnomic, encourages homeowners and building professionals to incorporate green building design into construction projects. The City also promotes utility company incentive programs to retrofit existing development with energy efficient lighting, air conditioning and heating systems to reduce energy consumption.

3.7.3 IMPACTS AND MITIGATION MEASURES

GREENHOUSE GASES THRESHOLDS OF SIGNIFICANCE

Per Appendix G of the CEQA Guidelines, climate change-related impacts are considered significant if implementation of the proposed project would do any of the following:

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

Analysis Approach

Cumulative impacts are the collective impacts of one or more past, present, and future projects that, when combined, result in adverse changes to the environment. In determining the significance of a project's contribution to anticipated adverse future conditions, a lead agency should generally undertake a two-step analysis. The first question is whether the *combined* effects from *both* the proposed project *and* other projects would be cumulatively significant. If the agency answers this inquiry in the affirmative, the second question is whether "the project's *incremental* effects are cumulatively considerable" and thus significant in and of themselves. The cumulative project list for this issue (climate change) comprises anthropogenic (i.e., human-made) GHG emissions sources across the globe and no project alone would reasonably be expected to contribute to a noticeable incremental change to the global climate. However, legislation and executive orders on the subject of climate change in California have established a statewide context and process for developing an enforceable statewide cap on GHG emissions. Given the nature of environmental consequences from GHGs and global climate change, CEQA requires that lead agencies consider evaluating the cumulative impacts of GHGs. Small contributions to this cumulative impact (from which significant effects are occurring and are expected to worsen over time) may be potentially considerable and, therefore, significant.

The California Office of Planning and Research (OPR) recommends that lead agencies under CEQA create a plan to reduce GHG emissions that meets the goals of both CEQA and general plans. The OPR states that the GHG emissions reduction plan can be either a stand-alone CAP or directly part of the general plan. The City of Lake Forest has elected to include the GHG emissions reduction plan within the General Plan, which is summarized in the analysis below.

An analysis of the proposed project's consistency with the California statewide 2030 GHG emissions target of 40% below 1990 levels by 2030 (as encapsulated by SB 32) is provided herein. Further, a qualitative analysis of the project's consistency with the California statewide 2050 target of 80% below 1990 levels by 2050 (as encapsulated in AB 32 and Executive Order S-03-05) is also provided herein.

Methodology

According to the OPR, it is preferable to create the plan to reduce GHG emissions concurrently with or closely following a general plan update. In addition, the OPR recommends the use of the SEEC ClearPath California tool. The SEEC ClearPath California tool, supported by the state and available without charge, provides a "five milestone" process for GHG inventory, planning, implementation, and monitoring.[1] To this end, the City of Lake Forest has completed the "five milestone" process for GHG inventory, planning, implementation, and monitoring, utilizing the SEEC ClearPath California tool. The results of this analysis are provided in the following discussion and analysis. The development of each of the elements in the "five milestone" process is provided below.

The five milestones include:

1. Inventory GHG Emissions
2. Establish a Reduction Target
3. Develop a Plan to Reduce GHG Emissions
4. Implement Policies and Measures to Reduce GHG Emissions
5. Monitor and Verify Results

COMMUNITY GHG EMISSIONS INVENTORY

This section identifies the major sources and the overall magnitude of GHG emissions in Lake Forest. The GHG inventory was prepared to provide a recent measure of emissions in order for the City to understand its baseline starting point in terms of meeting its reduction targets. The GHG inventory is prepared for the year 2015, which is a commonly used baseline year and for which applicable data was available. Full data for all emissions sources was not available for years after 2015. As such, 2015 was selected as the baseline year, as it allows for a full and complete analysis of existing emissions sources, using the most complete data set available.

The 2015 baseline inventory is focused specifically on community-wide emissions sectors, which refers to emissions generated from sources and activities attributable to residents and businesses in Lake Forest. Consistent with guidance from the Governor's Office of Planning and Research (OPR), the 2015 baseline community-wide inventory was developed with the SEEC ClearPath California tool, which is designed to be consistent with the U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions, commonly known as the U.S. Community Protocol (developed by ICLEI). The 2015 community inventory is focused specifically on community-wide GHG emissions and provides an assessment of activities throughout the community which contribute to city's total annual GHG emissions.

[1] See OPR's General Plan Guidelines (2017 Update), Chapter 8: Climate Change.

"Scopes" are used in the context of reporting on GHG emissions associated with individual organizational entities (e.g., the operations of a business or local government). In that context, the scopes framework can be used to categorize direct (scope 1) emissions (e.g., tailpipes that release emissions within an organizational boundary), indirect energy-related (scope 2) emissions (e.g., the use of purchased or acquired electricity and heating regardless of where the energy is generated), and other indirect (scope 3) emissions not covered in scope 2 (e.g., upstream and downstream emissions from the extraction and production of purchased materials and fuels).[2]

The emissions inventory covers direct GHG[3] emissions from sources within the boundaries of Lake Forest, such as natural gas usage within the residential, commercial, and industrial sectors (i.e. Scope 1 emissions). Additionally, indirect emissions associated with the consumption of energy (such as electricity, with no end point emissions) that are generated outside the borders of the City are also included (i.e. Scope 2 emissions). Furthermore, the emissions inventory also includes other upstream and downstream indirect emissions not covered under Scope 2, such as GHG emissions associated with the community's solid waste sent to landfill and wastewater sent to the applicable wastewater treatment facilities (i.e. Scope 3 emissions).[4]

The emissions inventory is calculated for the year 2015, which serves as the baseline year for the purposes of the Lake Forest Community-wide GHG inventory. As noted above, 2015 is the year for which the most complete data set of existing emissions levels were available. As such, 2015 was selected as the baseline year in order to provide the most accurate and complete baseline emissions inventory. The emissions inventory tallies emissions from seven sectors, which are described below in Table 3.7-1.[5] Specifically, the emissions inventory includes those sectors that ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions identifies as the set of five "Basic Emissions Generating Activities", which include 1) use of electricity by the community, 2) use of fuel in residential and stationary combustion equipment (e.g., natural gas used in boilers and furnaces), 3) on-road passenger and freight motor vehicle travel, 4) use of energy in potable water and wastewater treatment and distribution, and 5) generation of solid waste by the community. In addition, as provided in Table 3.7-1, additional emissions generating activities and sources are included in the emissions inventory, such as off-road vehicle emissions and off-gassing from wastewater treatment processes.

Activity data was collected from utilities serving the City of Lake Forest, as well as other sources of publicly available information. The inventory is organized into sectors and sub-sectors based on various community activities. Table 3.7-1 (below) provides a summary of the sectors and sources

[2] As provided in the ICLEI's U.S. Community Protocol for Accounting and Reporting of Greenhouse Gas Emissions (v.1.2).
[3] GHGs considered in the analysis are carbon dioxide (CO_2), as well as methane (CH_4) and nitrous oxide (N_2O) (where information was available). The emissions of CH_4 and N_2O have been converted to carbon dioxide equivalent (CO_2e), by multiplying the emissions of CH_4 and nitrous oxide N_2O by their respective. Global Warming Potential (GWP) values. GWP values of 21 for N_2O and 310 for CH_4 were provided by the latest version of ICLEI's U.S. Community Protocol (October 2012), consistent with the GWP values provided within the SEEC ClearPath tool.
[4] See Appendix A for further detail.
[5] Note: As shown in Table 3.7-1, most sectors include multiple activities & sectors.

included as part of the community-wide GHG emissions inventory. All source data identified in the table below is included in Appendix A of this Recirculated Draft EIR.

TABLE 3.7-1: LAKE FOREST COMMUNITY GHG INVENTORY EMISSIONS SECTORS

GHG SECTOR	*ACTIVITIES AND SOURCES INCLUDED IN THE SECTOR*	*RAW DATA SOURCES*
Commercial Energy	• Commercial electricity consumption • Commercial natural gas consumption	• Southern California Edison • Southern California Gas
Residential Energy	• Residential electricity consumption • Residential natural gas consumption	• Southern California Edison • Southern California Gas
Industrial Energy	• Industrial electricity consumption • Industrial natural gas consumption	• Southern California Gas
Transportation & Mobile Sources	• On-road transportation (emissions from gasoline, diesel, natural gas and electricity); • Off-road transportation from construction vehicles and lawn equipment (emissions from gasoline and diesel)	• VMT data was included in the EIR Traffic Impact Analysis (Kittelson, 2019) • Off-road gasoline & diesel fuel usage was derived from the OFFROAD2017 (v1.0.1) Emissions Inventory Model
Solid Waste	• Solid waste sent to landfills (off-gassing at landfill)	• CalRecycle's Jurisdiction Diversion/Disposal Rate Detail data for Lake Forest
Water & Wastewater	• Wastewater treatment processes (electricity and natural gas); • Wastewater treatment processes (off-gasing)	• Irvine Ranch Water District's Energy and GHG Master Plan • Population served and Michelson Water Recycling Plant characteristics
Upstream Impacts of Activities	• Transmission and Distribution (T&D) losses from electric power transmission	• Southern California Edison

COMMUNITY GHG EMISSIONS INVENTORY

RESIDENTIAL, COMMERCIAL, AND INDUSTRIAL ELECTRICITY AND NATURAL GAS USAGE

Emissions from electricity consumption were calculated using electricity usage for the residential and commercial sectors as provided by Southern California Edison (SCE) for year 2015, along with the SCE 2015 emission factor of approximately 0.2399 metric tons of CO_2e per net MWh[6], which is equivalent to approximately 528.9 pounds of CO_2 per megawatt-hour (lbs/MWh). This emission factor is inclusive of N_2O and CH_4. Emissions from industrial electricity consumption was not available from SCE; therefore, a conservative estimate of industrial electricity consumption was

[6] As provided in the 2017 "EEI ESG/Sustainability Template – Section 2: Quantitative Information", for Total Owned + Purchased Generation CO2e Emissions Intensity.

made based on the ratio of industrial natural gas consumption as a proportion of overall natural gas emissions as provided by Southern California Gas (SoCalGas), as a proxy.[7]

Emissions from natural gas consumption were calculated for the residential, commercial, and industrial sectors as provided by SoCalGas for year 2015, along with emission factors for CO_2, CH_4, and N_2O, as provided by the United States Environmental Protection Agency's (USEPA) *Emissions Factors for Greenhouse Gas Inventories* (2018).

Table 3.7-2 shows the total citywide consumption of electricity and natural gas, for 2015. The commercial sector has the largest electricity consumption, while the residential sector has the largest natural gas consumption, followed by industrial.

TABLE 3.7-2: RESIDENTIAL, COMMERCIAL, AND INDUSTRIAL ELECTRICITY AND NATURAL GAS INPUTS; 2015

		INPUTS
Residential	Electric (kWh per year)	186,731,868
	Natural gas (therms per year)	6,581,667
Commercial	Electric (kWh per year)	228,691,710
	Natural gas (therms per year)	2,438,399
Industrial	Electric (kWh per year)	21,037,211
	Natural gas (therms per year)	481,145
TOTAL BY SOURCE		
Electricity (kWh per year)		415,423,578
Natural Gas (therms per year)		9,501,211

SOURCE: SOUTHERN CALIFORNIA EDISON, 2019; SOUTHERN CALIFORNIA GAS COMPANY, 2019.

ON-ROAD TRANSPORTATION

Transportation emissions are based on vehicle miles traveled (VMT) for on-road vehicles. Kittelson & Associates provided an estimate for daily weekday VMT generated by the project in 2019[8] and for the General Plan buildout year of 2040. This data is included in Appendix A. Data was provided following the origin-destination method, as recommended by the California Air Resources Board's (CARB) SB 375 Regional Targets Advisory Committee (RTAC), which accounts for VMT as follows:

- 100% of VMT for all trips that have both an origin and destination within the jurisdiction;
- 50% of VMT for those trips that have either an origin or destination within the jurisdiction;

[7] Industrial-related electricity consumption was not available from SCE, as industrial electricity consumption in Lake Forest did not meet the 15/20 Aggregation Rule for data requests (the data set must contain at least 15 customers, and no single customer can make up more than 20 percent of the total energy consumption). This is due to the extremely limited number of industrial facilities in Lake Forest. In general, electricity from land uses that could host industrial facilities (such as Light Industrial and Urban Industrial land uses) are typically included in the commercial electricity category by SCE. To estimate industrial electricity consumption for the purposes of the GHG emissions inventory, the ratio of natural gas consumption for the industrial land use category in 2015 in proportion to overall natural gas emissions was applied to the total electricity consumption provided by SCE in 2015.

[8] This data was used a proxy for VMT for baseline year 2015 due to the fact that 2015 VMT data was not available.

- 0% of trips that do not have an origin or destination within the jurisdiction (such as pass-through trips).

The total annual VMT in 2019 was 1,503,178 weekday VMT, which annualized is 391,899,979 annual weekday VMT. Weekend VMT was added to the weekday data by assuming an average of 84.537% of weekday trips are taken on the weekend.[9] Additionally, it was assumed that there are 365 days in a year for the purposes of the annual VMT calculation. The EMFAC2017 web database (i.e. EMFAC2017) was utilized to determine the breakdown in gasoline, diesel, natural gas, and electric vehicles for year 2019. GHG emissions were calculated with the SEEC ClearPath tool, with GHG emission factors provided by EMFAC2017 for gasoline and diesel emissions, and the ClearPath tool was used for natural gas and electric vehicle emissions.[10]

OFF-ROAD TRANSPORTATION

The off-road transportation emissions in Lake Forest include construction and mining equipment.[11] The CARB's OFFROAD2017 (version 1.0.1) model generated annual gasoline and diesel fuel usage from construction equipment in Orange County for year 2015 (in gallons per year). Fuel usage was prorated to Lake Forest based on the ratio of Lake Forest population as a proportion of Orange County's population in 2015. The fuel usage was found for calendar year 2015; Monday through Sunday; annual emissions (no season was chosen); and all equipment, fuels, and horsepowers. The fuel usage were then pro-rated by Lake Forest's share of the county population within Orange County, multiplied by 365 days, and converted input into the SEEC ClearPath tool. The SEEC ClearPath tool calculated emissions for CO_2, CH_4, and N_2O using the default factors.[12] The CO_2, CH_4, and N_2O emissions were calculated in metric tons per day.

SOLID WASTE

CalRecycle provided total adjusted reporting-year disposal amounts in tons for 2015 for Lake Forest (64,856 tons).[13] This value was input into the SEEC ClearPath tool, with the following additional calculation inputs[14]:

[9] Weekend VMT was estimated based on *A comparison of Weekend and Weekday Travel Behavior Characteristics in Urban Areas,* 2004, which demonstrated that for households living in a metropolitan area of between 500,000 and 1,000,000 people (which includes the Mission Viejo-Lake Forest-San Clemente MSA), the ratio of weekend to weekday trips is approximately 84.537% (5.03/5.95). Available at: See: https://scholarcommons.usf.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=1935&context=etd),

[10] These figures are based on available data. EMFAC2017 was used for emission factors where data was available, since it is able to provide more up-to-date and localized factors.

[11] Since data for Lake Forest was unavailable, Orange County data was prorated for Lake Forest (by population).

[12] The SEEC ClearPath tool utilizes emissions factors as contained in Table G.14 of the California Air Resources Board Local Government Operations Protocol (LGOP). The LGOP is the latest reporting protocol developed by the California Air Resources Board for GHG Assessment.

[13] Based on data provided by Orange County and CalRecycle's "Facility Reports", solid waste from Lake Forest in 2015 was assumed to be sent to the Frank R. Bowerman, Prima Deshecha, and Olinda Alpha landfills. For more detail, see: www.oclandfills.com/landfill and www2.calrecycle.ca.gov/LGCentral/DisposalReporting/Origin/FacilitySummary.

[14] Calculation inputs are based on landfill characteristics, i.e. landfill location (for "landfill methane collection scenario", "landfill moisture content", and "disposal location") and waste types for "waste type to calculate emissions for".

- Landfill Methane Collection Scenario: California Regulatory
- Landfill Moisture Content: Dry
- Waste Type to Calculate Emissions For: Mixed MSW
- Disposal Location: Outside the Jurisdiction

CO_2e was calculated by the SEEC ClearPath tool by summing CO_2, CH_4, and N_2O and applying the global warming potential values to CH_4 to express records in terms of CO_2 equivalent.

WATER AND WASTEWATER ELECTRICITY USAGE

Emissions from electricity used during water supply and wastewater treatment in 2015 were calculated using 2015 projected data from the IRWD's Energy and GHG Master Plan Summary Report.[15] Emissions were prorated to Lake Forest based on the ratio of Lake Forest population as a proportion of the service population of the IRWD in 2015. For the purposes of the GHG inventory, it was assumed that the entire population of Lake Forest was served by IRWD in 2015. Emissions from electricity consumption for water and wastewater use was calculated using the default emission factors as provided in the SEEC ClearPath tool.

WASTEWATER TREATMENT PROCESSES

Emissions from wastewater treatment processes were calculated based on the entire population of Lake Forest in 2015 (80,070).[16] For the purposes of the GHG Inventory, it was assumed that wastewater treatment for the entire population of Lake Forest occurred at the Michelson Water Recycling Plant. The SEEC ClearPath tool was used to generate an estimate of wastewater treatment process emissions associated with nitrification/denitrification and emissions associated with the wastewater treatment lagoons, based on population data, as well as applicable parameters as recommended by the SEEC Clearpath tool and consistent with ICLEI's U.S. Community Protocol.[17]

UPSTREAM IMPACT OF ACTIVITIES

Electric power transmission and distribution (T&D) losses are considered upstream impacts. T&D losses include electricity that is lost due to the transmission of electricity over the electricity grid. According to a California Energy Commission Staff Report from 2011, CPUC General Rate Case Transmission and Distribution Losses for SCE are approximately 8.1%. Therefore, this percentage was prorated based on the total electricity emissions for Lake Forest provided by SCE. The SEEC ClearPath tool was used to generate total CO_2e emissions associated with this activity.

TOTAL EMISSIONS

The results of the Lake Forest Community GHG Emissions Inventory for baseline year 2015 is provided in Table 3.7-3, below.

[15] See Table 4 on page 4 of the IRWDs Energy and GHG Master Plan Summary Report for further detail.
[16] Population data provided by the California Department of Finance Demographic Research Unit, Report E-4, Population Estimates for Cities, Counties, and the State, 2011-2019, with 2010 Benchmark (May 1, 2019).
[17] SEEC Clearpath Tool defaults were used where more specific information was unavailable.

TABLE 3.7-3: LAKE FOREST COMMUNITY GHG EMISSIONS INVENTORY – BASELINE YEAR 2015

GHG SECTOR	*GHG SUBSECTOR*	*MT CO_2E/YEAR*
Commercial Energy	Electricity	54,867
	Natural Gas	12,951
	Total Commercial	**67,818**
Residential Energy	Electricity	44,800
	Natural Gas	34,956
	Total Residential	**79,756**
Industrial Energy	Electricity	5,047
	Natural Gas	2,556
	Total Industrial	**7,603**
Transportation & Mobile Sources	On-road Gasoline	170,287
	On-road Diesel	22,233
	On-road Natural Gas	9
	On-Road Electric	<1
	Off-road Gasoline	343
	Off-road Diesel	96
	Total Transportation & Mobile	**192,968**
Solid Waste	**Total Solid Waste**	**29,389**
Water & Wastewater	Wastewater Treatment Energy	8,844
	Wastewater Treatment Processes	22,603
	Total Water and Wastewater	**31,447**
Upstream Impacts of Activities	**Total Upstream Impacts**	**8,073**
Total		**417,054**

SOURCE: SEEC CLEARPATH TOOL; DE NOVO PLANNING GROUP.

NOTE: TOTALS MAY NOT ADD UP DUE TO ROUNDING

ESTABLISH A GHG REDUCTION TARGET

The CARB's 2017 Scoping Plan (Scoping Plan), adopted in November 2017, provides guidance on how the State's established GHG reduction targets will be achieved through various State and local actions. As discussed in Chapter 5 of the Scoping Plan "Achieving Success", local jurisdictions working to set GHG reduction targets aligned with the State targets may use per capita emission estimates to recognize the GHG reductions needed to remain in line with State targets. For the City of Lake Forest's proposed General Plan, proportional per capita targets were developed that express the level of GHG emissions reductions that would be needed locally between 2015 and the established future target years to reduce emissions below the level that would be cumulatively considerable, as recommended in CEQA Guidelines section 15183.5(b)(1)(B). These are in alignment with the State's

recommended per capita targets of reducing statewide annual emissions to 6 $MTCO_2e$ by 2030, and a longer-term goal of reducing annual emissions to 2 $MTCO_2e$ per capita by 2050.

Importantly, the per capita targets reported in the Scoping Plan are framed as statewide 2030 targets that must be met on a statewide basis; however, this does not mean that the statewide per capita targets must be applied uniformly to every local jurisdiction. Considering that the per capita emissions reduction targets recommended in the Scoping Plan account for emissions from all sectors (including those sectors that are outside of the influence of a local jurisdiction, including Lake Forest), emissions inventories and reduction strategies adopted by local jurisdictions would necessarily exclude emissions sources that cannot be feasibly controlled at the local level. For example, GHG emissions categories such as refrigerants and hydroflorocarbons (CFCs), which are regulated at the state and federal level, are a highly-regulated source of GHG emissions; thus, they are excluded from the City's inventory and forecasts. Thus, an adjustment to the state reductions achieved under the Scoping Plan to reflect applicable sectors for local GHG reduction planning and target-setting is necessary and appropriate. To that end, De Novo Planning Group developed recommended GHG reduction targets to adjust for the GHG emissions sectors that are feasibly controllable at the local level.[18] The following table (Table 3.7-4) provides the *California Greenhouse Gas Inventory for 1990 – by Sector and Activity* for those GHG sectors that are controllable at the local level only for year 1990, which was used as the basis for this downward revision (i.e. increased strictness) of the CARB's 2017 Scoping Plan per capita targets (for the purposes of establishing appropriate per capita GHG targets for the Lake Forest General Plan).[19]

The adjustments provided in the table below result in a local per capita GHG threshold that is more stringent than the per capita thresholds established under CARB's 2017 Scoping Plan. CARB's 2017 Scoping Plan identifies that (on page 99-100 of the document): "CARB recommends that local governments evaluate and adopt robust and quantitative locally-appropriate goals that align with the statewide per capita targets and the State's sustainable development objectives and develop plans to achieve the local goals." Additionally, on page 100 of the document, it continues: "Since the statewide per capita targets are based on the statewide GHG emissions inventory that includes all emissions sectors in the State, it is appropriate for local jurisdictions to derive evidence-based local per capita goals based on local emissions sectors and population projections that are consistent with the framework used to develop the statewide per capita targets."

[18] Specifically, the per capita targets were adjusted for Lake Forest by calculating the proportion of GHG emissions sectors that are considered controllable at the local level out of the net California emissions provided within the *California Greenhouse Gas Inventory in 1990*. The proportion of GHG emissions that are considered controllable at the local level include approximately 286.70 $MMCO_2e$ out of a total of 430.72 $MMTCO_2e$, or approximately 66.56% of the total California State GHG inventory. This factor (66.56%) was applied to the State's recommended per capita targets contained with the CARB's 2017 Scoping Plan, to derive targets that are locally appropriate. Separately, since the CARB didn't provide year a 2040 per capita target within the 2017 Scoping Plan, the year 2040 per capita target was derived by averaging the 2030 and 2050 targets.

[19] The full California Greenhouse Gas Inventory for 1990 can be found at: https://ww3.arb.ca.gov/cc/inventory/archive/tables/ghg_inventory_ipcc_all_90-04_ar4.pdf.

TABLE 3.7-4: CALIFORNIA GREENHOUSE GAS INVENTORY FOR 1990 – BY SECTOR AND ACTIVITY FOR LAND-USE DRIVEN SECTORS ONLY -- YEAR 1990

EMISSIONS SECTOR	*STATEWIDE MMTCO2E*
Transportation	
On Road	
Passenger Cars	63.77
Light Duty Trucks	44.75
Motorcycles	0.43
Heavy Duty Trucks	29.03
Freight	0.02
Electricity Generation In-State	
CHP: Commercial	***0.70***
Merchant Owned	***2.33***
Transmission and Distribution	***1.56***
Utility Owned	***29.92***
Electricity Generation In-State	
Specified Imports	***29.61***
Transmission and Distribution	***1.02***
Unspecified Imports	***30.96***
Commercial	
CHP: Commercial	***0.40***
Communication	***0.07***
Domestic Utilities	***0.34***
Education	***1.42***
Food Services	***1.89***
Healthcare	***1.32***
Hotels	***0.67***
Not Specified Commercial	***5.58***
Offices	***1.46***
Retail & Wholesale	***0.68***
Transportation Services	***0.03***
Residential	
Household Use	***29.66***
Industrial	
Landfills	***6.26***
Wastewater Treatment	
Domestic Wastewater	2.83
Total Emissions	**286.70**

SOURCE: CALIFORNIA AIR RESOURCES BOARD, 2007

Based on this approach, the following GHG reduction targets have been established by the City of Lake Forest to reduce the City's annual GHG emissions consistent with the framework used to develop the State's per capita targets. Additionally, a GHG reduction goal has been included that would ensure the City is consistent with the State's long-term 2050 goal of reducing statewide

emissions to 80 percent below 1990 levels as stated in Executive Order S-03-05 and consistent with AB 32.

The City targets are:

- 3.99 $MTCO_2e$ per capita by 2030
- 2.66 $MTCO_2e$ per capita by 2040; and
- 1.33 $MTCO_2e$ per capita by 2050.

These per capita GHG emissions targets are formally established by the City of Lake Forest via General Plan Policy RR-4.8. These GHG reduction targets represent the level below which the contribution to GHG emissions associated with buildout and implementation of the proposed General Plan would not be cumulatively considerable. As noted above, these per capita GHG emissions targets are more stringent than) the CARB's 2017 Scoping Plan per capita GHG emissions targets of 6 $MTCO_2e$ by 2030, and 2 $MTCO_2e$ per capita by 2050. While a target has been established for 2050, it is acknowledged that this future horizon year is 30 years away. As such, the quantification of 2050 future GHG emissions is speculative, and is provided in this EIR for informational purposes only. Given that the General Plan has a 20-year buildout horizon, the thresholds of significance for complying with CARB's 2017 Scoping Plan per capita GHG emissions targets are applied to the horizon years of 2030 and 2040 only.

2030, 2040, AND 2050 COMMUNITY-WIDE GREENHOUSE GAS EMISSIONS FORECASTS

To understand what annual GHG emissions will look like in the future, the future emissions growth scenarios were modeled based on projected trends in growth of population, jobs, housing, and non-residential square footage for the target years 2030 and 2040, as well as a longer-term 2050 goal, based on the State's established GHG reduction goals. Emissions forecasts allow the City to assess the effectiveness of various GHG reduction strategies over time.

BUSINESS-AS-USUAL FORECASTS

The basis for all emission growth scenarios is the Business-as-Usual (BAU) forecast. A BAU forecast predicts how GHG emissions will increase assuming population, jobs, housing, and non-residential square footage continue to increase based on the City's General Plan growth rate projections, as shown in Table 2.0-2 of the Draft EIR. The City adjusted the BAU forecast to incorporate the land use assumptions incorporated into the General Plan (proposed project). As described in greater detail in the Project Description chapter of the DEIR, the City has proposed changes to its Land Use Map that would allow for higher residential densities than are currently allowed in Lake Forest, and promotes expanded opportunities for mixed use development and employment opportunities. The proposed Land Use Map (Draft EIR Figure 2.0-3) would increase the City's future buildout potential for population, jobs, housing units and non-residential building area above the buildout projections associated with the existing Lake Forest General Plan, as shown in Table 2.0-2 of the Project Description.

Growth Rates

Growth rates were calculated to estimate future GHG emissions (for forecast years 2030, 2040, and 2050). Growth rates for four demographic factors were calculated based on the estimates provided by the proposed project General Plan Land Use Map for year 2040, as compared with existing values. Specifically, values are provided for housing, population, non-residential square footage, and jobs. These growth rates were calculated as shown in Table 3.7-5. Growth rates for a particular demographic type were correlated to each GHG emissions sector (using best fit), to develop an estimate for BAU growth in GHG emissions. For example, the VMT growth rate was applied to the Transportation and Mobile Sources sector, based on the correlation between the number of vehicle miles traveled in the City and the corresponding increase in mobile source emissions, as compared with the other demographic factors. The demographic factor assumed to be best suited for each GHG emissions sector was selected, as shown in Table 3.7-6.

TABLE 3.7-5: LAKE FOREST DEMOGRAPHIC FACTOR GROWTH RATES

	DEMOGRAPHIC CATEGORY				
	HOUSING	*POPULATION*	*NON-RESIDENTIAL SQUARE FOOTAGE*	*JOBS*	*VMT*[20]
Existing[21]	28,928	81,888	15,315,700	38,039	1,503,178
Future Year 2040	**51,334**	**152,462**	**27,726,585**	**52,241**	**2,751,045**
Annualized Growth Rate	2.77%	3.00%	2.87%	1.52%	2.92%

SOURCE: CITY OF LAKE FOREST, 2019.

The following table (Table 3.7-6) identifies the demographic factor used, based on the growth rates as provided in table 3.7-5, to establish the BAU emissions forecasts for each emissions sector.

[20] The scenario for VMT is the 2040 Proposed GP With 20-Year Circulation Improvements scenario.

[21] Data as of August 1st, 2019 (latest data available).

TABLE 3.7-6: LAKE FOREST DEMOGRAPHIC GROWTH RATES APPLIED TO EACH GHG SECTOR

GHG SECTOR	*DEMOGRAPHIC FACTOR*
On-Road Transportation & Mobile Sources	VMT
Off-Road Transportation	Housing
Solid Waste	Housing
Water & Wastewater	Population
Commercial Energy	Non-residential Square Footage
Industrial Energy	Non-residential Square Footage
Residential Energy	Housing
Upstream Impacts of Activities	Population

SOURCE: DE NOVO PLANNING GROUP, 2019.

Business-as-Usual (BAU) GHG Emissions Scenarios

The BAU scenarios account for the projected growth in GHG emissions associated with years 2030, 2040, and 2050, excluding the expected impacts of state and federal legislation (as provided in further detail below). The results of the BAU GHG emissions scenarios show that BAU GHG emissions are expected to increase progressively over time, from a baseline of approximately 417,054 MT CO_2e in 2015 to 639,937 MT CO_2e in 2030, 851,389 MT CO_2e in 2040, and 1,132,769 MT CO_2e in 2050. The following tables (Tables 3.7-7 through 3.7-9) provide the results of the BAU GHG emissions scenarios.

TABLE 3.7-7: LAKE FOREST COMMUNITY GHG EMISSIONS INVENTORY – BAU PROJECT FUTURE YEAR 2030

GHG SECTOR	*BAU PLUS PROPOSED PROJECT SCENARIO (MT CO_2E/YEAR)*
On-Road Transportation & Mobile Sources	296,474
Off-Road Transportation	661
Solid Waste	45,814
Water & Wastewater	49,022
Commercial Energy	103,623
Industrial Energy	11,616
Residential Energy	120,139
Upstream Impacts of Activities	12,584
Total	**639,937**

SOURCE: SEEC CLEARPATH TOOL; DE NOVO PLANNING GROUP.

TABLE 3.7-8: LAKE FOREST COMMUNITY GHG EMISSIONS INVENTORY – BAU PROJECT FUTURE YEAR 2040

GHG SECTOR	*BAU PLUS PROPOSED PROJECT SCENARIO (MT CO_2E/YEAR)*
Transportation & Mobile Sources	395,350
Off-Road Transportation	868
Solid Waste	61,594
Water & Wastewater	65,908
Commercial Energy	137,468
Industrial Energy	15,411
Residential Energy	157,870
Upstream Impacts of Activities	16,920
Total	**851,389**

SOURCE: SEEC CLEARPATH TOOL; DE NOVO PLANNING GROUP.

TABLE 3.7-9: LAKE FOREST COMMUNITY GHG EMISSIONS INVENTORY – BAU PROJECT FUTURE YEAR 2050

GHG SECTOR	*BAU PLUS PROPOSED PROJECT SCENARIO (MT CO_2E/YEAR)*
Transportation & Mobile Sources	527,200
Off-Road Transportation	1,141
Solid Waste	82,811
Water & Wastewater	88,610
Commercial Energy	182,366
Industrial Energy	20,444
Residential Energy	207,449
Upstream Impacts of Activities	22,747
Total	**1,132,769**

SOURCE: SEEC CLEARPATH TOOL; DE NOVO PLANNING GROUP.

FEDERAL AND STATE ACTIONS

Following completion of the BAU forecasts, the City adjusted the future year GHG projections to demonstrate how Federal and State actions will impact local emissions for various sectors (independent of local GHG reduction activities). The Federal and State actions included in this adjustment have been approved, programmed, and/or adopted by the respective federal or state agency responsible for the actions. Incorporating them into the forecast and reduction assessment provides a more accurate picture of future emissions growth and the responsibility and ability of local governments versus the State to reduce GHG emissions. These Federal and State actions, as well as the corresponding assumptions used in the BAU forecasts, are described in greater detail below.

As noted previously, both the State and Federal governments have adopted and enacted several pieces of legislation and regulatory requirements which will function to reduce BAU GHG emissions at the federal, state, and local level. A brief description of each of these Federal and State actions, many of which are incorporated into the legislative-adjusted BAU scenarios (as shown in Tables 3.7-10 through 3.7-12), are provided below.

- **Assembly Bill 1493 (Pavley Clean Car Standards)**. Signed into law in 2002, AB 1493 requires carmakers to reduce GHG emissions from new passenger cars and light trucks beginning in 2009. It is expected that new vehicles sold in California will result in an average of 16 percent less GHG emissions than models previous to 2009. The EMFAC2017 web database was utilized to account for the reduction in greenhouse gas emissions associated this reduction in greenhouse gas emission rates in future years based on implementation of statewide car standards (including the Pavley Clean Car Standards) and other national trends, in comparison to the 2015 baseline year. This is because the EMFAC2017 web database accounts for the implementation of statewide car standards since such standards are built into the database's forecasts for future years. The overall weighted CO_2 emissions factor associated with vehicles between 2015 and 2030 in the EMFAC2017 web database is reduced by approximately 31.9%; from 2015 to 2040 by approximately 39.2%; and from 2015 to 2050 by approximately 40.1%.[22] These factors were used as an approximation for the reduction in on-road transportation GHG emissions rates anticipated in future years (associated with the Pavley Clean Car Standards and other associated on-road transportation-related legislation, such as the Advanced Clean Car Standards).[23]

- **Advanced Clean Car Standards**. In 2012, the CARB adopted the Advanced Clean Cars program, which established coordination between the CARB, the U.S. Environmental Protection Agency (EPA) and National Highway Traffic Safety Administration (NHTSA) to set limits on the emission of smog-causing pollutants and GHGs for vehicle model years 2015 through 2025. It should be noted that sufficient data was not available to quantify this measure in isolation. However, the approach utilized to account for future reductions in on-road transportation greenhouse gas emission rates from implementation of statewide car standards (including the Advanced Clean Car Standards) and national trends is accounted for in the forecasted emissions rates provided from the EMFAC2017 web database (as described previously).

- **Fuel Efficiency Standards for Medium- and Heavy-Duty Vehicles**. In 2016, the U.S. EPA and NHTSA adopted fuel efficiency standards for medium- and heavy-duty vehicles which focus on vehicle and engine performance standards for model years 2018-2027 for certain tractor-trailers and model years 2021-2027 for semi-trucks, large pickup trucks, vans, and all types and sizes of buses and work trucks. It should be noted the impact of this measure is assumed

[22] EMFAC2017 data for Orange County was used as a proxy for Lake Forest, since EMFAC2017 does not provide data for individual cities (such as for Lake Forest).
[23] Note that this measure does not affect off-road transportation emissions.

to be accounted for in the forecasted emissions rates provided from the EMFAC2017 web database (as described previously).

- **USEPA Off-Road Compression-Ignition Engine Standards. (40 CFR Part 89).** This regulation establishes federal standards for the phasing in of EPA diesel engine tiers for off-road compression-ignition equipment. The regulation serves to reduce emissions by integrating engine and fuel control systems to achieve emissions reductions and requiring equipment manufacturers to produce engines with advance emissions control technologies. It should be noted the impact of this measure is assumed to be accounted for in the forecasted emissions rates provided from the EMFAC2017 web database (as described previously).

- **Renewable Portfolio Standard**. First established under SB 1078 and updated through various legislation, the Renewable Portfolio Standard (RPS) requires that all electricity retailers in the State sell a certain percentage of electricity from renewable resources. SB X1-2, signed in 2011, requires 33 percent of electricity sales to come from renewable resources by 2020. In 2018, SB 100 increased California's Renewable Energy Portfolio targets to 52 percent renewables by 2027 and 60 percent renewables by 2030. SB 100 also established a new requirement to achieve 100 percent zero-carbon electricity by 2045. This state measure was accounted for by calculating the proportional increase in renewable energy usage from 2015 to future years. Specifically, the 2015 SCE eligible renewable rate (i.e. renewables that quality under the RPS) was 25% (as provided by the SCE's power content label for year 2015). This renewable percentage is required to increase to 60% by 2030 (see SB 100 signed into law in September 2008), 90% by 2040 (estimated based on the requirement to have all of the state's electricity come from carbon-free resources by 2045), and 100% by 2050. Based on these values, and in line with the state's RPS, since the baseline (year 2015) eligible renewable percentage for SCE was already 25%, electricity-based GHG emissions in 2015 were only generated from the remaining 75% of electricity. Therefore, the proportional reduction in SCE-related electricity-based GHG emissions from the 2015 baseline would be a reduction of SCE-related electricity-based GHG emissions by approximately 46.7% from 2015 to 2030, by approximately 86.7% from 2015 to 2040, and by 100% by 2050.[24]

- **Title 24 – Building Energy Efficiency Standards**. The California Energy Code, first established in 1978 by the California Energy Commission (CEC), sets energy efficiency standards for new construction of residential and non-residential buildings in the State. These standards are routinely updated to incorporate new energy efficiency standards and methods which reduce energy use. The 2016 Energy Efficiency Standards are the most recent version of the regulation, which took effect on January 1st, 2017. The 2019 Title 24 Part 6 Building Energy Efficiency Standards were adopted by CEC on May 9, 2018 and took effect on January 1,

[24] These reductions are calculated as follows: (New non-renewable proportion – old non-renewable proportion)/(Old non-renewable proportion) . Therefore, for Year 2030: (0.4 - 0.75)/0.75 = 0.467; for Year 2040: (0.1 – 0.75)/0.75 = 0.867; and for year 2050: 0.0 – 0.75)/0.75) = 1

2020. CEC estimates that the combination of mandatory on-site renewable energy and prescriptively-required energy efficiency features in the 2019 Standards will result in new residential construction that uses 53 percent less energy than the 2016 standards. Nonresidential buildings using the 2019 Standards are anticipated to reduce energy consumption by 30 percent compared to the 2016 standards, primarily through prescriptive requirements for high-efficiency lighting (CEC 2018). Consistent with the energy reduction estimates from the CEC, the impact of this state measure was calculated by applying the reduction of 53% to new residential buildings and 30% for new non-residential buildings for future inventory years.

- **AB 341**. Established in 2011, this policy sets the goal that no less than 75 percent of solid waste generated in the State be reduced, recycled, or composted by 2020. Cal-Recycle, the State agency tasked with guiding implementation of this policy, is providing strategies for local jurisdiction to meet these targets. The five priority strategies proposed by Cal-Recycle are: 1) Moving Organics Out of the Landfill, 2) Expanding Recycling/Manufacturing Infrastructure, 3) Exploring New Approaches for State and Local Funding of Sustainable Waste Management Programs, 4) Promoting State Procurement of Post-Consumer Recycled Content Products, and 5) Promoting Extended Producer Responsibility. This impact of this state measure was calculated based on the reduction in solid waste required to meet this target by 2020, which is equivalent to a disposal rate of 2.7 pounds of waste per resident per day, according to CalRecycle. Since the disposal rate for Lake Forest in 2015 was: 4.4 pounds of waste per resident per day[25], the City of Lake Forest would need to achieve a 38.6% reduction in solid waste due to AB 341.[26] The impact of this measure was calculated based on this required percentage reduction in per capita solid waste emissions from 2015.

- **SB X7-7 (The Water Conservation Act of 2009)**. This legislation requires that water suppliers in the State increase water use efficiency with the goal of reducing urban water consumption 20 percent by the year 2020. The legislation includes 18 actions to reduce water consumption, which the Department of Water Resources (DWR) is required to implement through various policy mechanisms. The actions under SB X7-7 include a variety of activities which will be undertaken by DWR including strategies to convene specific tasks forces to address specific water conservation issues, work with the California Urban Water Conservation Council to provide a public information platform for reporting on water use metrics in California, develop a method for calculating urban water use to track the 20 percent reduction required in the law, adopt regulations for implementation of SB X7-7, report to the Legislature on the progress toward achieving the 20 percent reduction in urban water use, and update the Urban Water Management Plan (UWMP) Guidebook for local jurisdictions. The projects also include strategies specific to the agriculture and urban sectors such as quantifying the efficiency of agricultural water use and updating criteria for funding sources to implement agricultural and urban water conservation projects. It should be noted that sufficient data was not available to quantify this measure, and therefore the

[25] See: https://www2.calrecycle.ca.gov/LGCentral/%20DiversionProgram/JurisdictionDiversionDetail/245/Year/2015
[26] This reduction is calculated as follows: (2.7 – 4.4)/(4.4) = 38.6%

GHG reduction associated with this action was not accounted for (resulting in a more conservative estimate for the future legislative-adjusted BAU scenarios).

Summary of Legislative-Adjusted BAU Plus Proposed Project GHG Emissions Scenarios

The legislative-adjusted BAU plus project scenario forecasts (i.e. inclusive of the legislative adjustments, as described above) are provided in the following tables (Table 3.7-10 through 3.7-12, below).

TABLE 3.7-10: LAKE FOREST COMMUNITY GHG EMISSIONS INVENTORY – PROJECT FUTURE YEAR 2030

GHG SECTOR	*LEGISLATIVE-ADJUSTED BAU PLUS PROPOSED PROJECT SCENARIO (MT CO_2E/YEAR)*
On-Road Transportation & Mobile Sources	201,933
Off-Road Transportation	661
Solid Waste	28,113
Water & Wastewater	43,521
Commercial Energy	60,170
Industrial Energy	8,018
Residential Energy	78,394
Upstream Impacts of Activities	6,712
Total	**427,521**

SOURCE: SEEC CLEARPATH TOOL; DE NOVO PLANNING GROUP.

NOTE: TOTALS MAY NOT ADD UP DUE TO ROUNDING

TABLE 3.7-11: LAKE FOREST COMMUNITY GHG EMISSIONS INVENTORY – PROJECT FUTURE YEAR 2040

GHG SECTOR	*LEGISLATIVE-ADJUSTED BAU PLUS PROPOSED PROJECT SCENARIO (MT CO_2E/YEAR)*
On-Road Transportation & Mobile Sources	240,353
Off-Road Transportation	868
Solid Waste	37,797
Water & Wastewater	52,172
Commercial Energy	35,564
Industrial Energy	6,544
Residential Energy	62,275
Upstream Impacts of Activities	2,256
Total	**437,829**

SOURCE: SEEC CLEARPATH TOOL; DE NOVO PLANNING GROUP.

NOTE: TOTALS MAY NOT ADD UP DUE TO ROUNDING

TABLE 3.7-12: LAKE FOREST COMMUNITY GHG EMISSIONS INVENTORY – PROJECT FUTURE YEAR 2050

GHG SECTOR	*LEGISLATIVE-ADJUSTED BAU PLUS PROPOSED PROJECT SCENARIO (MT CO_2E/YEAR)*
On-Road Transportation & Mobile Sources	315,677
Off-Road Transportation	1,141
Solid Waste	50,816
Water & Wastewater	67,302
Commercial Energy	30,149
Industrial Energy	6,872
Residential Energy	69,890
Upstream Impacts of Activities	0
Total	**541,845**

SOURCE: SEEC CLEARPATH TOOL; DE NOVO PLANNING GROUP.

NOTE: TOTALS MAY NOT ADD UP DUE TO ROUNDING

The results of the legislative-adjusted BAU plus project scenario forecasts identify that the community-wide per capita GHG emissions would be as follows:

- Year 2030: 3.77 MT CO_2e/year per capita (based on 427,521 MT CO_2e divided by a population projection of 113,401). This is below the City's established GHG reduction target level of 3.99 MT CO_2e/per capita for this target year.
- Year 2040: 2.87 MT CO_2e/year per capita (based on 437,829 MT CO_2e divided by a population projection of 152,462). This is above the City's established GHG reduction target level of 2.66 MT CO_2e/per capita for this target year.
- Year 2050:[27] 2.64 MT CO_2e/year per capita (based on 541,845 MT CO_2e divided by a population projection of 204,977). This is above the City's established GHG reduction target level of 1.33 MT CO_2e/per capita for this target year.

PROPOSED GENERAL PLAN POLICIES AND ACTIONS TO REDUCE GHG EMISSIONS

In order to further reduce GHG emissions associated with buildout of the General Plan, the City has included numerous policies and actions aimed at reducing GHG emissions and promoting sustainability in Lake Forest. The following goals, policies, and implementation programs (action items) from the proposed General Plan are specifically relevant to climate change and GHG emissions and energy consumption within the Planning Area. Numerous policies and programs in the General Plan address sustainable development, which influence operational mobile, energy, and

[27] Year 2050 forecasts and GHG emissions projections are based on a future horizon year using the annualized growth rates through 2040. The year 2050 exceeds the buildout horizon of the proposed Lake Forest General Plan, and as such, total future growth assumptions exceed the growth projections associated with the General Plan.

area-source emissions in the Planning Area. Policies and implementation programs throughout the Land Use and Mobility Elements promote reductions in VMT through the mix and density of land uses, walkable neighborhood design, bicycle facilities and infrastructure, and public transportation facilities and infrastructure. Policies and programs in the Recreation and Resources Element and the promote conservation of open space, enhancements of urban forests, and the expansion of trails networks. Policies and programs in the Public Facilities Element promote energy conservation and management. These relevant policies and actions are listed below.

Land Use Related Goals, Policies and Actions

GOAL LU-1: Land Use Mix. A community with a balanced land use pattern that meets the City's long-term housing, employment, and civic needs.

Policy LU-1.1 Land Use Pattern. Promote an appropriate land use plan that fosters and enhances community livability and public health; supports economic development; promotes efficient development and multiple transportation options; reduces pollution, greenhouse gas emissions, and the expenditure of energy and other resources; and ensures compatibility between uses.

Policy LU-1.2 Exceptional Projects. Consider development intensity up to the maximum identified in the Land Use Element for development projects that provide exceptional design quality, important public amenities or benefits, or other factors that promote the goals and policies of the General Plan.

Policy LU-1.3 Future Development. Accommodate future economic growth and development in strategic locations throughout the community near major roadways and transportation facilities.

Policy LU-1.4 Density and Intensity. Allow sufficient density and intensity to enable new development to support all required infrastructure, community facilities, and open space.

Policy LU-1.5 Housing Choices. Expand the range of housing types and density ranges to meet the diverse demographic, economic, and social needs of the community.

Policy LU-1.6 Public Gathering Spaces. Encourage the provision of both formal and informal public gathering spaces through pedestrian-oriented street design; sidewalk furniture and pedestrian-oriented development; well-designed, multi-use public spaces of different sizes including pocket parks, plazas, and monuments; and community events.

GOAL LU-3: Placemaking. A distinct community image and identity that promotes Lake Forest as a desirable place to live and do business.

Policy LU-3.1 Public Landscaping. Ensure that all public landscaping in public rights-of-way is attractive, adequately maintained, and utilizes California native, drought-tolerant, and/or other sustainable plant material if appropriate.

GOAL LU-4: Streetscapes. A community with streetscapes that enhance the economic vitality and overall visual quality of the City, support the circulation network, and encourage pedestrian-scale streets and patterns of activity.

Policy LU-4.1 Major Corridors. Enhance the streetscape along the City's major corridors through coordinated public and private improvements to convey a positive image of the City, contribute to its economic vitality, and improve visual and physical transitions into adjacent neighborhoods and developments.

Policy LU-4.2 Walkability. Enhance walkability on a citywide scale by improving or adding sidewalks, landscaping, benches, wayfinding signage, and pedestrian-scaled lighting, where appropriate and feasible.

Policy LU-4.5 Connectivity. Provide convenient pedestrian and transit access throughout commercial and mixed-use corridors, including an interconnected network of high-amenity streetscapes and multiple walkways that connect activities and uses.

Policy LU-4.6 Street Trees. Recognize the importance of planting and maintaining trees consistent with the image of Lake Forest. Provide for the consistent use of street trees to identify city streets, residential neighborhoods, commercial and employment districts, and gateways.

GOAL LU-5: Focus Areas for Economic Growth. A community featuring mixed-use activity centers located along the City's major roadways and transportation facilities which allow for the co-location and harmonious development of housing, shopping, jobs, and public uses.

Policy LU-5.3 Focus Area Revitalization. Encourage revitalization of the focus areas by evaluating and pursuing, when possible, programs, policies, and financing mechanisms to spur local investment and foot traffic.

Policy LU-5.4 Development Scale. Establish development standards to ensure that a sufficient scale and footprint of any single use is achieved in mixed-use areas to establish a cohesive environment that minimizes impacts attributable to the adjacency of differing uses.

Policy LU-5.5 Housing Element Consistency. In the City's focus areas, allow for residential development at or above densities established by the State of California to meet the objectives of the Housing Element.

Policy LU-5.6 Variety of Uses. Allow for a variety of uses and activities in the City's Focus Areas to encourage an economically strong, lively, and social environment.

Policy LU-5.7 Design Integration. Require that residential and nonresidential portions of mixed-use buildings and sites be integrated through site and building design to ensure compatibility among uses.

Policy LU-5.8 On-Site Amenities. Require that residential/commercial mixed-use projects provide on-site gathering spaces (plazas, courtyards, etc.) and other pedestrian-scale amenities, such as benches, fountains, and landscaping, that contribute to the living environment of residents.

Policy ED-5.2 Mixed-Use. Encourage the development of mixed-use projects that blend residential with complementary retail, hotel, and office uses, in order to support diverse housing options and reduce driving times and distances.

Policy ED-6.1 Public Spaces. Promote the inclusion of public spaces within commercial and mixed-use developments where residents and workers can gather and interact.

Policy ED-6.2 Live/Work/Play. Encourage the development of active and accessible live/work/play environments in Lake Forest, through mixed-use projects that bring housing, employment opportunities, hospitality, and retail/dining amenities in close proximity to each other along major transportation corridors.

Action ED-6a Review and revise Zoning Ordinance, as necessary, to allow for flexibility and diversity in commercial and mixed-use development, in order to attract new and desired development typologies.

Policy PF-2.4 Mixed-use Developments. Encourage mixed-use developments along major corridors and around activity and employment centers, as defined in the Land Use Element, to reduce public service costs and environmental impacts through compatible land use relationships, and efficient circulation and open space systems.

GOAL HW-1 ACTIVE LIVING. A community environment that fosters opportunities for people living and working in Lake Forest to enjoy healthy lifestyles and active living.

Policy HW-1.1 Development Pattern. Encourage mixed-use, pedestrian-, and transit-oriented development in select locations such as along major roadways and around key activity centers to enhance nonmotorized access and reduce traffic.

Policy HW-1.2 Trails and Walkability. Enhance the built environment and maintain a trail system that supports walkability and an interconnected active infrastructure system.

Policy HW-1.3 Open Space. Maintain the City's existing public spaces which provide valuable opportunities for exercise, gathering, community enrichment, and youth development.

Policy HW-1.4 Multimodal Access. Consider access to multimodal transportation options, including walking, biking, and transit, when making decisions regarding where future growth should occur.

Policy HW-1.5 Public Transit. Work with public transit service providers to encourage direct paratransit and public transit service to community facilities, public spaces, and regional medical facilities.

Policy HW-1.6 Pedestrian Safety. Consider strategies to calm traffic and increase pedestrian safety on City streets.

Policy HW-1.7 Events and Program. Develop and support events and City Programs that facilitate active living for people living and working in Lake Forest.

Mobility Related Goals, Policies and Actions

GOAL M-3 COMPLETE STREETS. Provide a citywide a transportation network that is safe and accessible for all transportation modes and users.

Policy M-3.1 Transportation Improvements for All Users. Strive to apply Complete Streets principles to new roadways and to new transportation improvements on City facilities to serve all types of travel (including pedestrians, bicyclists, motorists, public transportation, and goods movement) and all abilities.

Policy M-3.2 Eliminating Gaps. Continue to identify and address gaps in networks serving automobiles, bicyclists, pedestrians, transit users, equestrians, and other users. Remove man-made barriers to accessibility and connectivity.

Policy M-3.4 Safe Routes to School. Work with the Saddleback Valley Unified School District and other schools in the City to establish a Safe Routes to School Program, encouraging parents and children to walk or bike to schools within the city.

Policy M-3.5 Context Sensitivity. Consider the land use and design context of the surrounding areas when designing Complete Streets.

Policy M-3.6 Local and Regional Collaboration. Cooperate and collaborate with regional and local partners, stakeholders, and agencies to ensure the implementation of Complete Streets within and connecting to the City.

Policy M-3.7 Effects of New Technologies on Complete Streets. Monitor and evaluate the development of new mobility technologies (e.g., scootershare and bikeshare) and the potential impacts on designing a transportation network that accommodates all modes and users.

Action M-3a Design, construct, operate, and maintain the street network depicted in the Mobility Element network map that provides safe and efficient access to all areas of the City.

Action M-3b Develop and implement the Capital Improvement Plan to maintain and repair roadways; construct and improve roadways to build out the roadway network to ensure adequate levels of service.

Action M-3c When planning roadway facilities, incorporate the concept of complete streets. Complete streets include design elements for all modes that use streets, including autos, transit, pedestrians, and bicycles. Complete streets shall be developed in a context-sensitive manner. For example, it may be more appropriate to provide a Class I bike path instead of bike lanes along a major arterial.

Action M-3d Consider the standards set forth in the latest editions of the California MUTCD and American Association of State Highway and Transportation Officials (AASHTO) Green Book for improvement and re-striping of appropriate major collector and arterial streets to accommodate Class II bike lanes or Class IV protected bikeways in both directions, as applicable to the City of Lake Forest.

GOAL M-4 PUBLIC TRANSIT. Support increased public transportation use in the City.

Policy M-4.1 Public Transit Use. Support programs encouraging public transit use by people living in, working in, or visiting Lake Forest.

Policy M-4.2 New Transit Facilities. Promote the provision of public transit and supportive transit facilities within areas of major development.

Policy M-4.3 Improve Local Public Transit Service and Stops. Work with OCTA to improve local transit service in the City and bus stop amenities along roads that have local transit service.

Policy M-4.4 Paratransit Service. Continue to support OCTA ACCESS paratransit and other special transit services in Lake Forest.

Policy M-4.5 Regional Transit Connectivity. Encourage OCTA to provide access and public transit service between Lake Forest and the Irvine Transportation Center and other regional-serving transportation centers.

Policy M-4.6 Metrolink Service. Monitor and participate in discussions pertaining to Metrolink service to encourage a level of service that meets Lake Forest's needs.

Policy M-4.7 Park and Ride Facilities. Continue to encourage the provision of additional regional public transportation services and support facilities, such as park and ride lots near the San Diego Freeway (I-5) and the Foothill Transportation Corridor (SR-241).

Policy M-4.8 Effects of New Technologies on Transit Use. Monitor and evaluate the development of new mobility technologies (such as rideshare and microtransit) and the potential effects on transit demand and the way users access public transit.

Action M-4a Continue to participate in regional transit planning with OCTA through regular communication and coordination.

Action M-4b Monitor Federal, State, and OCTA transit funding programs to identify potential sources of funds for transit programs in Lake Forest. Pursue any potential funding through the identified programs.

GOAL M-5 BICYCLE, PEDESTRIAN, AND EQUESTRIAN USE. Support and promote the use of pedestrian, bicycle, and equestrian facilities.

Policy M-5.1 Promote Non-Vehicular Modes. Promote the provision of non-vehicular circulation modes within Lake Forest.

Policy M-5.2 Pedestrian Access Between Uses. Improve pedestrian access between complementary uses such as residential and commercial areas.

Policy M-5.3 Recreational Trails. Work with the County of Orange to ensure local trails are open and maintained and facilitate access to and from the trails within Lake Forest.

Policy M-5.4 Effective Roadway Projects. Consider the implementation of active transportation improvements (such as high visibility crosswalks) when roadways are undergoing rehabilitation, resurfacing, or other modifications.

Policy M-5.5 Coordination with Adjacent Jurisdictions. Coordinate with adjacent jurisdictions to ensure connected and consistent non-vehicular facilities

Action M-5a Review and update the City's Municipal Code, as necessary, to reflect Transportation Demand Management best practices.

GOAL M-6 SAFETY. Provide a safe transportation system for all users.

Policy M-6.1 Speeds on Residential Streets. Explore innovative ways to reduce vehicular speeds through residential neighborhoods to posted speed limits, such as implementing traffic calming strategies.

Policy M-6.2 Speeds on Arterial Roadways. Encourage programming and design strategies to maintain safe vehicular speeds on its arterial roadways.

Policy M-6.3 Site Designs and Safety. Ensure that development projects follow best design practices to reduce conflicts between multiple travel modes.

Policy M-6.4 Bicyclist and Pedestrian Safety. Develop safe and convenient bicycle and pedestrian facilities and crossings at key intersections and other locations.

Policy M-6.5 Freeway Ramp Safety. Encourage Caltrans and the Transportation Corridor Agencies (TCA) to provide safe pedestrian crossings and other facilities at freeway ramps in Lake Forest.

GOAL M-8 VEHICLE MILES TRAVELED. Reduce citywide vehicle miles traveled per capita and contribute to regional and statewide greenhouse gas emission targets.

Policy M-8.1 VMT Thresholds. Establish vehicle miles traveled (VMT) thresholds and Transportation Demand Management (TDM) mitigation requirements for the purposes of environmental review under the California Environmental Quality Act (CEQA). The City shall continue to maintain LOS standards for the purposes of planning and designing street improvements.

Policy M-8.2 Existing Transportation Demand Management Efforts. Continue to support the implementation of existing regional efforts such as the employer TDM provisions of the Air Quality Management Plan (AQMP) and the Congestion Management Program (CMP).

Action M-8a Review and update the City's Municipal Code, as necessary, to reflect Transportation Demand Management best practices.

Action M-8b Consider allowing for a reduction in parking standards if comprehensive TDM programs and/or other parking strategies are provided.

Action M-8c Require developments that are approved based on TDM plans to incorporate monitoring and enforcement of TDM targets as part of those plans.

GOAL M-10 FUNDING. Ensure the utilization of various financing methods to improve and provide a fiscally sound transportation system.

Policy M-10.1 Funding Sources. Leverage existing available funding methods and sources to fund the transportation system in Lake Forest while also researching innovative funding sources at the federal, state, regional, and county levels.

Policy M-10.2 New Developments. Ensure that new development projects contribute their appropriate fair share to transportation network improvements and that existing funding commitments are met.

Policy M-10.3 Monitor Funding. Monitor and ensure adequate funding of LFTM and other programmed transportation improvements.

Policy M-10.4 Regional Funding. Maintain standards to qualify for regional transportation revenues while encouraging regional agencies to continue to provide adequate transportation funding to local jurisdictions.

Recreation and Open Space Related Goals, Policies and Actions

GOAL RR-1 PARKS AND RECREATION. A community with high-quality parks and recreational amenities.

Policy RR-1.1 Recreation Types. Provide residents a wide variety of public and private recreational lands, facilities, trails, and recreational amenities to foster a comprehensive system for residents that is usable for a diverse community.

Policy RR-1.2 Proximity. Maintain a public park and trail system that is accessible to all parts of the City.

Policy RR-1.5 Innovative Design. Maintain and update design standards for City parks and trails based on proven best practices and innovations in public safety, active transportation, and recreation planning.

Policy RR-1.7 Trail System. Promote park and open space connectivity by expanding the integrated system of trails within Lake Forest to connect local bikeways, equestrian trails, and hiking trails to regional trails, open space areas, residential neighborhoods, employment centers, and mixed-use activity centers.

Policy RR-1.8 Funding. Continue to pursue funding from established sources and explore non-traditional funding options and innovative partnerships to bolster and support the development, improvement, and maintenance of City parks and recreational amenities.

Policy RR-1.9 Landscaping. Protect local and regional resources by fortifying new parks and recreational development with sustainable drought-tolerant landscaping.

Policy RR-1.11 Public Input. Promote a high level of public outreach regarding park and recreation opportunities and facility design in Lake Forest.

GOAL RR-2 REGIONAL AND LOCAL OPEN SPACE. A community that protects and manages natural open space areas to allow for scenic beauty and community enjoyment.

Policy RR-2.1 Open Space Boundaries. Maintain the amount of existing open space within the City of Lake Forest by carefully considering the impact of new development in established open space areas.

Policy RR-2.2 Regional Partners. Coordinate with regional partners to maintain and preserve open space areas under overlapping jurisdiction or within nearby communities to protect all local and regional opportunities for recreation available to Lake Forest residents.

Policy RR-2.3 Scenic Resources. Protect Lake Forest's scenic resources, including scenic corridors along roads and views of the hillsides, prominent ridgelines, canyons, and other significant natural features, to the extent practical.

Policy RR-2.4 Education. Work with state, federal, and community partners to develop educational and other materials that promote the preservation and conservation of Lake Forest's natural resources.

Air Quality and GHG Related Goals, Policies and Actions

GOAL RR-4 AIR QUALITY AND GREENHOUSE GAS EMISSIONS. A community with optimal air quality for its residents.

Policy RR-4.1 Regional Standards. Coordinate planning efforts with the South Coast Air Quality Management District (SCAQMD), Southern California Association of Governments (SCAG), and the California Air Resource Board (CARB) to meet local and regional air quality standards and ensure attainment of established goals.

Policy RR-4.2 Land Use Planning. Utilize land-use planning techniques to reduce traffic congestion and promote alternative modes of transportation for the community.

Policy RR-4.3 Development. Encourage and incentivize the development of mixed-use residential opportunities and live-work environments within the City to lessen the impacts of traffic congestion on local air quality.

Policy RR-4.4 Active Transportation. Improve active transportation options within the City by connecting local bikeways and trails to City bus stops and public transportation centers.

Policy RR-4.5 Public Transit. Coordinate with the OCTA and actively pursue the improvement and expansion of public transit for Lake Forest residents.

Policy RR-4.6 Sensitive Receptors. Insulate sensitive receptors from areas of heightened air quality pollution, including highways, by utilizing land use planning to buffer and protect residential areas.

Policy RR-4.7 Mitigation. Require the implementation of relevant mitigation measures for all future development upon identification of potential air quality impacts.

Policy RR-4.8 Local Reduction Targets. The City of Lake Forest establishes the following per capita GHG reduction targets, in order to meet the requirements established by the state under AB 32 and SB 32, consistent with the CARB's 2017 Scoping Plan:

- 3.99 MT CO2e per capita by 2030
- 2.66 MT CO2e per capita by 2040; and
- 1.33 MT CO2e per capita by 2050.

Policy RR-4.10 Carbon Reduction. Expand the number of parks and trees in Lake Forest to provide a larger carbon sink or area containing natural sources that retain more carbon than what those sources emit.

Policy RR-4.11 Public Engagement. Promote regional air quality programs in order to inform the public on regional air quality concerns and encourage the engagement of all Lake Forest residents in future planning decisions related to air quality.

Policy RR-5.10 Urban Forest. Build upon existing streetscapes and develop an urban forest along the City's major corridors to provide avian habitat, sequester carbon monoxide emissions, foster pedestrian activity, and provide shade. The City's "urban forest" refers to all public- and privately-owned trees, vegetation, and landscaping throughout Lake Forest which provide a range of benefits to the community, including reduced energy use, cooling along streets and sidewalks, improved air and water quality, diversification of wildlife habitat, and increased health and well-being.

Action RR-4a Review all new industrial and commercial development projects for potential air quality impacts to residences and other sensitive receptors. Ensure that mitigation measures and best management practices are implemented to reduce significant emissions of criteria pollutants.

Action RR-4b Review development, infrastructure, and planning projects for consistency with SCAQMD requirements during the CEQA review process. Require project applicants to prepare air quality analyses to address SCAQMD and General Plan requirements, which include analysis and identification of:

1. Air pollutant emissions associated with the project during construction, project operation, and cumulative conditions.
2. Potential exposure of sensitive receptors to toxic air contaminants.
3. Significant air quality impacts associated with the project for construction, project operation, and cumulative conditions.
4. Mitigation measures to reduce significant impacts to less than significant or the maximum extent feasible where impacts cannot be mitigated to less than significant.

Action RR-4c Work with Orange County and the South Coast Air Quality Management District to implement programs aimed at improving regional air quality.

Action RR-4d Continue to review development projects to ensure that all new public and private development complies with the California Code of Regulations (CCR), Title 24 standards as well as the energy efficiency standards established by the Lake Forest Municipal Code.

Action RR-4e Monitor GHG emissions generated by the community over time for consistency with the established GHG reduction targets, and update the City's community GHG Inventory every five years. In the event that the City determines that ongoing efforts to reduce GHG emissions are not on track to meet the City's adopted GHG reduction targets, the City shall establish and adopt new and/or revised GHG reductions measures that will effectively meet the established GHG reduction targets.

Action RR-4f Provide the necessary facilities and infrastructure to facilitate the use of City-owned low or zero-emission vehicles such as electric vehicle charging facilities and conveniently located alternative fueling stations at key City facilities as operations necessitate and/or as funding becomes available.

Action RR-4g Evaluate and consider multi-modal transportation benefits to all City employees, such as free or low-cost monthly transit passes. Encourage employer participation in similar programs. Encourage new transit/shuttle services and use.

Action RR-4h Evaluate and consider the feasibility of allowing private bicycle rental companies to operate in Lake Forest.

Action RR-4i Encourage community car-sharing and carpooling.

Action RR-4j Support the establishment and expansion of a regional network of electric vehicle charging stations and encourage the expanded use of electric vehicles.

Action RR-4k Establish and adopt standards and requirements for electric vehicle parking, including minimum requirements for the installation of electric vehicle charging stations in new multi-family residential and commercial, office, and light industrial development.

Action RR-4l Periodically review and update the City's Green Building Program to reflect best practices, such as encouraging the use of cement substitutes and recycled building materials for new construction.

Action RR-4m Update the City's Green Building Program to promote the reduction of urban heat islands through vegetation management and cool surfaces. Encourage multi-family residential and non-residential development to increase the use of higher-albedo materials for surfaces including roofs, parking areas, driveways, roads, and sidewalks. Encourage developments with parking lot areas to shade these areas with vegetation or solar panels when appropriate. Support various programs to plant and maintain trees, which can also contribute to a reduction of urban heat islands.

Action RR-4n Future development projects implemented under the General Plan will be required to demonstrate consistency with SCAQMD construction emission thresholds. Where emissions from individual projects exceed SCAQMD thresholds, the following actions shall be incorporated as necessary to minimize impacts. These measures do not exclude the use of other, equally effective mitigation measures.

- Require all off-road diesel equipment greater than 50 horsepower (hp) used for this Project to meet USEPA Tier 4 final off-road emission standards or equivalent. Such equipment shall be outfitted with Best Available Control Technology (BACT) devices including a California Air Resources Board Certified Level 3 Diesel Particulate Filter (DPF) or equivalent. This DPF will reduce diesel particulate matter and NOx emissions during construction activities.
- Require a minimum of 50 percent of construction debris be diverted for recycling.
- Require building materials to contain a minimum 10 percent recycled content.
- Require materials such as paints, primers, sealants, coatings, and glues to have a low volatile organic compound concentration compared to conventional products. If low VOC materials are not available, architectural coating phasing should be extended sufficiently to reduce the daily emissions of VOCs.

Action RR-4o Future development projects implemented under the General Plan will be required to demonstrate consistency with SCAQMD's operational emission thresholds. For projects where operational emissions exceed regulatory thresholds, the following measures may be used to reduce impacts. Note the following measures are not all inclusive and developers have the option to add or substitute measures that are equally or more appropriate for the scope of their project.

- Develop a project specific TDM program for residents and/or employees that provides opportunities for carpool/vanpools.
- Provide onsite solar/renewable energy in excess of regulatory requirements.

- Require that owners/tenants of non-residential or multi-family residential developments use architectural coatings that are 10 grams per liter or less when repainting/repairing properties.
- Require dripless irrigation and irrigation sensor units that prevent watering during rain storms.
- Ensure all parking areas are wired for capability of future EV charging and include EV charging stations that exceed regulatory requirements.

GOAL PS-7 CLIMATE CHANGE AND RESILIENCY PLANNING. A well-prepared community where risks to life, property, the economy, and the environment resulting from climate change, including extreme weather events, are minimized.

Policy PS-7.5 Energy Supply. Promote plans and programs that increase sustainable energy sources.

Action PS-7a Provide information and resources to the public and businesses regarding steps the City is taking to address the issue of climate change.

Action PS-7b Study the transition to energy-efficient street lights, such as LEDs, for City-owned light facilities.

Action PS-7c Prioritize purchasing only electric or alternative-energy vehicles for the City vehicle fleet, as appropriate, based on the intended use of the vehicle.

Action PS-7d Evaluate the feasibility for government-constructed and/or -operated new development to exceed the CalGreen Tier 1, or successor program, standards.

Action PS-7e Promote the use of sustainable and carbon-neutral energy sources in new development as directed in the City's Green Building Program.

Action PS-7f Explore using renewable energy and clean generation technologies such as solar, wind, biogas, or fuel cells to power City facilities where appropriate.

GOAL PF-6 ENERGY MANAGEMENT. A community with adequate power, provided through economically and environmentally sustainable means.

Policy PF-6.1 Compliance with State Legislation. Comply with all state requirements regarding the generation of power and encourage energy providers to investigate the use or expansion of renewable sources of energy.

Policy PF-6.3 City-Sponsored Projects and Activities. Evaluate renewable energy capacity on municipal property and renewable energy use in City-sponsored projects and activities.

Policy PF-6.4 Business Community. Support the decisions of the Lake Forest business community as they select and implement the most appropriate, financially feasible, and responsible energy source for their individual operations.

Policy PF-6.5 Conservation. Promote conservation strategies during design, construction, and maintenance of facilities.

Policy PF-6.6 Public-Private Partnerships. Investigate the opportunity to engage in public-private partnerships on energy efficiency, energy storage, and microgrid development to achieve cost savings, reduce energy use, and improve energy reliability

Policy PF-6.7 Public Education. Promote public education programs that advocate for reducing energy consumption, and promote renewable sources of energy.

Policy PF-6.8 Innovation. Encourage innovative energy management solutions in new developments.

Policy PF-6.9 Promote Energy Conservation in Existing Building Stock. Promote energy conservation by residents and businesses in existing structures, through the City's newsletter, flyers, and website, in close coordination with other agencies and local energy providers, including the SCAQMD and Southern California Edison.

Action PF-6b Continue to review development projects to ensure that all new public and private development complies with the California Code of Regulations, Title 24 standards as well as the energy efficiency standards established by the General Plan and the Municipal Code.

Action PF-6c Develop a public education program to increase public participation in energy conservation, including information on programs that provide free or low-cost energy efficiency audits and retrofits to existing buildings.

Action PF-6d Cooperate with other agencies, jurisdictions, and organizations to expand energy conservation programs.

Action PF-6e Support SCE and other private partners to promote widespread marketing through the City's newsletter, flyers, and website to encourage conservation and greater energy efficiency in homes and businesses.

Action PF-6f Promote the CEC Building Energy Benchmarking Program (AB 802) on the City's website to help benchmark and monitor energy use for participating businesses seeking to increase energy efficiency and realize cost savings.

Action PF-6g Educate City residents via the City's newsletter, flyers, website, and at community events about appliance and equipment incentives and rebates offered by utility providers, the CEC, and the South Coast Air Quality Management District.

Action PF-6h Support SCE by promoting the energy and cost saving benefits of solar hot water heating systems for businesses and residents in the City through the City website, newsletter, and handouts.

Action PF-6i Support SCE by promoting residential retrofit programs through the City's newsletter, flyers, and website to help homeowners convert to all electrical appliances and HVAC systems, consistent with the goals established in SCE's Pathway 2045 efforts.

Action PF-6j Promote, via the City's website and materials for residents and businesses, participation in SCE's Green Rate program, which allows residential and business electricity customers to pay low monthly fees to meet electricity needs from either 50 percent or 100 percent renewable sources.

Action PF-6k Provide a related flyer at the public counter and strongly encourage new development projects to install electrified space (HVAC) and water heating systems in lieu of natural gas systems, above and beyond the requirements of Title 24 (2019 version), consistent with the strategies identified in SCE's Pathway 2045, before and during the building plan check process.

Solid Waste Reduction Goals, Policies and Actions

GOAL RR-6 SOLID WASTE MANAGEMENT & RECYCLING. A community that minimizes the generation and disposal of waste to landfills through recycling and participation in waste diversion programs.

Policy RR-6.1 Compliance with and Exceedance of State Legislation. Continue to comply with all State regulations regarding waste diversion, source reduction, recycling, and composting, and strive to achieve an 85% diversion rate from landfills by 2040.

Policy RR-6.2 Compliance with Regional Plans. Reduce the per capita generation of solid waste in Lake Forest in concert with the County of Orange source reduction and recycling plans for reducing solid waste.

Policy RR-6.3 Waste Service Performance Collection Facilities. Support efforts of the solid waste service provider to maintain adequate residential, commercial, and industrial solid waste and mixed recycling collection service levels and solid waste facilities in accordance with state law, and periodically review waste collection performance to verify adequacy of service.

Policy RR-6.5 Municipal Waste. Increase the City's role in the source reduction and recycling components of waste management through recycling programs at City facilities to reduce the quantity of City-generated waste.

Policy RR-6.8 Organic Waste. Explore opportunities to collect and compost organic matter, including grass clippings, landscaping, Christmas trees, composting and mulch, and other sources of organic waste; when feasible distribute for use in parks, medians, and other municipal areas

Policy RR-6.9 Public Education. Promote citywide educational programs to inform citizens of the benefits of recycling and appropriate recycling options and locations.

Action RR-6a Regularly monitor the level of service provided by waste and recycling collection contractors to ensure that service levels meet the terms of the contract.

Action RR-6b Include standard language in requests for services and in City agreements requiring contractors to use best management practices to maximize diversion of waste from the landfill in order to meet the City's specified diversion rates.

Action RR-6c Encourage recycling, reuse, and appropriate disposal of hazardous materials, including the following:

- Increased participation in single family and multifamily residential curbside recycling programs;
- Increased participation in commercial and industrial recycling programs for paper, cardboard, and plastics;
- Reduce yard and landscaping waste through methods such as composting, grass recycling, and using resource efficient landscaping techniques; and

Action RR-6d Encourage local businesses to provide electronic waste (e-waste) drop-off services and encourage residents and businesses to properly dispose of, or recycle, e-waste.

Water Conservation Related Goals, Policies and Actions

GOAL PF-3 WATER SYSTEM. A community served by an efficient, well-maintained water system that provides all its residents with access to clean, safe, and potable water.

Policy PF-3.6 Water Conservation. Support water conservation measures that comply with state and federal legislation and that are consistent with measures adopted in all applicable Urban Water Management Plans.

Action PF-3a Continue educational outreach designed to increase public participation in water conservation and water quality awareness through printed material and the City's website and social media accounts.

Policy PF-4.2 Sewer Deposit Best Practices. Encourage wastewater service providers to identify and implement best practices and feasible technologies for wastewater collection and treatment, including those that reduce the amount of wastewater requiring treatment, prevent contamination, maintain the highest possible energy efficiency, and reduce costs and greenhouse gas (GHG) emissions.

Policy PF-4.3 Reduced System Demand. Reduce wastewater system demand by encouraging water-conserving designs and equipment, encouraging water-conserving devices, and designing wastewater systems to minimize inflow and infiltration.

MODIFIED GHG FORECAST WITH LOCAL GHG REDUCTION POLICIES AND ACTIONS

Methodology

This section describes General Plan policies and actions that reduce GHG emissions, quantifies emissions reductions, and explains how these policies and actions will be implemented. These reductions are from policies and actions in addition to Federal and State regulations which were incorporated into the Legislative Adjusted BAU forecast conditions that are already reflected in the modeling discussed previously. The relevant General Plan policies and actions are organized according to the following categories:

- Pedestrian Improvements and Increased Connectivity
- Traffic Calming
- Transit System Improvements
- Transportation Demand Management (TDM)
- Electric Vehicle Infrastructure
- Solid Waste Reductions
- Energy Efficiency Improvements
- Renewable Energy Usage

The California Air Pollution Control Officers Association's (CAPCOA's) *Quantifying Greenhouse Gas Mitigation Measures* report was developed as a resource for local governments to assess emissions reductions from GHG mitigation measures. This section primarily uses the methodology outlined in the CAPCOA report for each category to quantify emissions reductions from the General Plan policies and actions.[28] In instances where other assumptions were used to quantify GHG emissions reductions, those sources and/or assumptions are identified. The reductions are applied to the emissions forecast in the following section to obtain the "modified forecast."

[28] While many of the policies and actions quantified in the report are project-level in nature, much of the supporting literature is from studies on a citywide, countywide, or regional context. The methodology in this section is based on these regional studies, which is therefore applicable to the General Plan policies and actions listed in this section.

Pedestrian Improvements and Increased Connectivity

Measure:	General Plan Goals and Policies:	2040 Reduction:
Pedestrian Improvements and Increased Connectivity	LU-1.6, LU-4.1, LU-4.2, LU-4.5, LU-4.6, LU-5.8, ED-5.2, ED-6.1, ED-6.2, PF-2.4, HW-1.1, HW-1.2, HW-1.4, HW-1.6, M-3.1, M-3.2, M-3.4, M-3.5, M-3.6, M-3.7, M-3a, M-3c, M-3d, M-5.1, M-5.2, M-5.3, M-5.4, M-5.5, M-5a, M-6.3, M-6.4, M-6.5, RR-4.4, RR-5.10	2,404 $MTCO_2e$ per year

POLICY/ACTION DESCRIPTION

Pedestrian Improvements

Lake Forest's pedestrian network consists of sidewalks and street crossings as well as off-road paths and trails. While most streets in Lake Forest have sidewalks, the suburban layout with winding roads and high-speed arterials with narrow sidewalks and spread out crossings can present a difficult pedestrian environment. The General Plan includes policies that create more walkable, livable neighborhoods by expanding the multi-modal transportation system and creating a safe, pedestrian-oriented environment.

Increased Connectivity

The General Plan provides strategies for maximizing multi-modal accessibility to and connectivity within mixed use areas, including the Metrolink Station and OCTA transit services. These are intended as a foundation for realizing the goal of a connected, accessible, and active community by creating pedestrian- and transit-oriented mixed use areas that reflect each area's existing assets and establish unique identities. Components of the strategy serve to improve connectivity between the proposed mixed use areas and the City's existing neighborhoods; provide new jobs, housing, and entertainment opportunities in compact, walkable environments; support multiple modes of transit, car travel, walking and bicycling; and increase accessibility to and from surrounding cities. The General Plan also includes a number of other improvements to enhance connectivity for bicycles, pedestrians, and transit in Lake Forest.

Quantification

Providing an improved pedestrian network and increasing connectivity encourages people to walk more, and results in people driving less, causing a reduction in VMT. An estimate of 1 percent reduction in VMT from pedestrian improvements and connectivity was assumed[29], which corresponds to a reduction of 2,404 $MTCO_2e$ per year in 2040.

[29] Center for Clean Air Policy. Transportation Emission Guidebook.

Implementation

Pedestrian improvements and increased connectivity will occur through implementation of the General Plan.

Traffic Calming

Measure:	General Plan Goals and Policies:	2040 Reduction:
Traffic Calming	M-1.3, M-1.6, M-1c, M-2c, M-3.3, M-3.4, M-3a, M-6.1, M-6.2 M-6.3, M-6.4, M-6.5	601 $MTCO_2e$ per year

POLICY/ACTION DESCRIPTION

The General Plan includes policies for "calming" traffic to make streets safer and more comfortable for pedestrian travel. Traffic calming devices include roundabouts, corner bulb-outs, speed cushions, surface textures, raised pavement, road narrowing, and other devices that encourage people to drive more slowly or to walk or bike instead of using a vehicle, especially for short trips in and around residential neighborhoods.

Quantification

CAPCOA's *Quantifying Greenhouse Mitigation Measures* was used to quantify the effect of traffic calming devices. A 0.25 percent reduction in on-road VMT was assumed to occur from these improvements, which corresponds to a reduction of 601 $MTCO_2e$ per year in 2040.

Implementation

Traffic calming improvements will occur through the implementation of the General Plan.

Transit System Improvements

Measure:	General Plan Goals and Policies:	2040 Reduction:
Transit System Improvements	M-4.1, M-4.2, M-4.3, M-4.4, M-4.5, M-4.6, M-4.7, M-4.8, M-4a, M-4b, HW-1.5, RR-4.5, RR-4g	2,897 $MTCO_2e$ per year

POLICY/ACTION DESCRIPTION

Transit service can provide an alternative to automobile travel and is a critical mode of transportation for those who cannot drive (such as the elderly, youth, or disabled) or do not have access to a vehicle. OCTA provides bus service and shared-ride paratransit service within Lake Forest and throughout Orange County. In addition, transit riders can access Metrolink and Amtrak commuter rail services in nearby Irvine and Mission Viejo. There are also a number of park and ride lots in and adjacent to Lake Forest, most of which provide access to OCTA bus routes.

Given that the majority of Lake Forest is of a suburban, lower-density character, the General Plan prioritizes providing high-quality service between employment centers and mixed-use destinations along major arterials within the City, supplemented with features such as park-n-rides and pedestrian and bicycle infrastructure to create multi-modal transportation nodes.

Quantification

Transportation system improvements can result in VMT reductions. According to CAPCOA's Quantifying Greenhouse Gas Mitigation Measures, transit system improvements can result in the following reductions: 0.1 to 8.2 percent VMT reduction from expanding the transit network, 0.5 to 24.6 percent VMT reduction from increasing transit accessibility, and 0.02 to 2.5 percent VMT reduction from increasing transit service frequency and speed. Conservatively assuming the combined effect of these strategies, summing the lower ends of the VMT reduction ranges gives a 1.2 percent reduction in VMT emissions, or an estimated 2,897 $MTCO_2e$ reduction per year in 2040.

Implementation

Transit improvements will occur through the implementation of the General Plan, and by coordinating with OCTA, Metrolink, and neighboring jurisdictions.

Transportation Demand Management (TDM)

Measure:	**General Plan Goals and Policies:**	**2040 Reduction:**
Transportation Demand Management	M-8.1, M-8.2, M-8a, M-8b, M-8c	1,393 $MTCO_2e$ per year

POLICY/ACTION DESCRIPTION

Transportation demand management (TDM), or simply demand management, is defined a set of strategies aimed at maximizing traveler choices. Traditionally, TDM has been narrowly defined as commuter ridesharing and its planning application restricted to air quality mitigation (conformity analysis), development mitigation (reducing trip generation rates and parking needs), or efforts to increase multi-modalism in transportation plans. A more contemporary definition of TDM consists of maximizing travel choices, as stated in the definition provided in an FHWA report on TDM:

Managing demand is about providing travelers, regardless of whether they drive alone, with travel choices, such as work location, route, time of travel and mode. In the broadest sense, demand management is defined as providing travelers with effective choices to improve travel reliability

Policy M-8.1 requires the City to establish VMT thresholds for new development projects, and to establish new TDM mitigation requirements for the subsequent CEQA review of projects, in compliance with the requirements of SB 743.

Quantification

TDM system improvements can result in VMT reductions. The Mobility Element includes numerous policies and actions that support alternative modes of transportation, complete streets, pedestrian and bicycle network improvements, and increased connectivity between residential and commercial areas of the City, as well as requirements for implementation of new TDM measures. Literature supports a 10-30 percent reduction in overall VMT through the implementation of a local

transportation demand management (TDM) program.[30] The effectiveness of a TDM program will be incremental, with the full VMT reduction potential being reached by 2050 or beyond. For the sake of a conservative calculation approach, this analysis assumes a 5 percent reduction in local VMT[31] from implementation of TDM measures by 2040, which corresponds to a reduction 1,393 $MTCO_2e$ per year in 2040.

Implementation

Implementation of TDM measures will occur through the implementation of the General Plan, and through adoption and implementation of VMT thresholds and TDM mitigation measures during the review of subsequent development projects.

Electric Vehicles

Measure:	**General Plan Goals and Policies:**	**2040 Reduction:**
Electric Vehicles	RR-4f, RR-4j, RR-4k	8,009 $MTCO_2e$ per year

POLICY/ACTION DESCRIPTION

Installation of electric vehicle (EV) infrastructure will encourage Lake Forest residents, businesses, and the City vehicle fleet to switch to clean fuel and electric vehicles in order to reduce transportation related GHG emissions. The increase in EV ownership and use in the City will serve to reduce GHG emissions associated with on-road vehicles as the City continues to grow. The installation of new EV charging stations will serve to encourage EV adoption rates among City residents and increase convenience for EV owners. The General Plan requires the City to establish minimum standards for EV charging stations in new development, and encourages the expansion of the EV charging network in already developed areas.

Quantification

CAPCOA's Quantifying Greenhouse Mitigation Measures was used to quantify the effect of electric vehicle infrastructure and the corresponding increase in local electric vehicle ownership rates over time. Most analysts anticipate that electric vehicles will start to become commonplace in California, the United States, and globally throughout the 2020s and 2030s. CAPCOA identifies a range of 0.4% to 20.3% reduction in fuel use as a result of increased use of electric or hybrid vehicles. It is worth noting that the CAPCOA quantification recommendations were established in 2010. Over the past 10 years, electric vehicles have become more affordable, and a far greater range of products are available to consumers. Recent electric vehicles forecasts provide a much higher estimate of future (2040) electric vehicle ownership rates. For example, by 2040, the 2019 Bloomberg Electric Vehicle Outlook estimates that electric vehicles would make up approximately 32.14% of the global vehicle

[30] Victoria Transport Policy Institute. 2010. Transportation Management Programs. http://www.vtpi.org/tdm/tdm42.htm.

[31] Local VMT is assumed to only include those trips that are both start and end in Lake Forest, which is only 11.5950% of total VMT in 2040 (See Appendix A for further detail).

fleet (i.e. by 2040, out of a global vehicle fleet of 1,680,000,000, approximately 540,000,000 are estimated to be electric vehicles).[32]

In order to be conservative, it was assumed that there would only be a 3.5 percent increase in the overall on-road fleet mix in Lake Forest that would be electric in 2040, as compared to what is anticipated by EMFAC2017 from implementation of the CARB's "Mid-Range Scenario of the Advanced Clean Cars Midterm Review", which only estimates increases in electric vehicle implementation through to 2025.[33,34] This estimate is highly conservative, considering the anticipated increase in electric vehicles as a proportion of the global, national, and California vehicle fleet between 2025 and 2040, as electric vehicle technology continues to mature. As shown in Appendix A, this corresponds to a reduction of 8,009 $MTCO_2e$ per year in 2040.

Implementation

EV infrastructure improvements will occur through the implementation of the General Plan, including the installation of electric vehicle charging stations throughout the Planning Area.

Solid Waste Reductions

Measure:	**General Plan Goals and Policies:**	**2040 Reduction:**
Solid Waste Reductions	RR-6.1, RR-6.2, RR-6.3, RR-6.5, RR-6.8, RR-6.9, RR-6a, RR-6b, RR-6c, RR-6d	15,119 $MTCO_2e$ per year

POLICY/ACTION DESCRIPTION

The transport and decomposition of landfill waste and the flaring of landfill gas all produce GHG emissions. Decomposition of waste produces methane, a GHG which has a global warming potential over 20 times that of CO_2. The transport of waste from the site of generation to the landfill produces GHG emissions from the combustion of the fuel used to power the vehicle. Choosing waste management practices which reduce the amount of waste sent to landfills will reduce GHG emissions. Strategies to reduce landfill waste include increasing recycling, reuse, and composting, and encouraging lifestyle choices and office practices which reduce waste generation.

These policies and actions call on the City to reduce the per capita generation of solid waste generated in Lake Forest through a combination of waste reduction practices, increased recycling, increased composting, and public education. Additionally, the City has established a waste diversion target of 85 percent by 2040, which exceeds the requirements established by AB 341.

[32] For further detail, see the Bloomberg Electric Vehicle Outlook 2019. Available at: https://about.bnef.com/electric-vehicle-outlook/#toc-viewreport

[33] For further detail, see California's Advanced Clean Cars Midterm Review, Appendix A: Analysis of Zero Emission Vehicle Regulation Compliance Scenarios: Estimated minimum 1.2 million ZEVs and PHEVs by 2025.

[34] The EMFAC2017 web database only anticipates approximately 4.67% of total VMT in Orange County in 2040 would be generated by electric vehicles. However, as provided on pages 193 and 194 of the EMFAC2017 Volume III Technical Documentation (version 1.02 July 20, 2018), the current version of EMFAC2017 does not account for potential increases in the electric vehicle market share post-2025.

Quantification

A diversion rate of 75 percent was assumed for 2030 (based on the requirements of AB 341, which requires diversion rate of 75 percent in 2020), and a diversion rate of 85 percent was assumed for 2040 (based on the City's waste diversion target of 85 percent in 2040). This corresponds to a reduction of 15,119 $MTCO_2e$ per year in 2040.[35]

Implementation

Solid waste reductions and increased diversions and recycling will occur through the implementation of the General Plan and coordination with the City's contracted waste hauling provider.

Energy Efficiency Improvements to Building Stock

Measure:	**General Plan Goals and Policies:**	**2040 Reduction:**
Energy Efficiency Improvements to Existing Building Stock	PS-7b, PF-6.4, PF-6.5, PF-6.6, PF-6.7, PF-6.9, PF-6c, PF-6d, PF-6e, PF-6f, PF-6g, PF-6h, PF-6i, PF-6l	7,670 $MTCO_2e$ per year

POLICY/ACTION DESCRIPTION

Energy conservation can be achieved through small changes to daily behaviors with little to no upfront investment. Through these measures, the City will encourage strategies utilizing marketing and education in coordination with local energy utilities to increase energy conservation. These strategies will be designed to yield energy reductions and cost savings for residents and businesses. In addition, these measures will leverage statewide programs and regulations that facilitate ongoing energy benchmarking and tracking as tools that can help residents and businesses understand, monitor, and improve their energy efficiency. These measures also promote appliance upgrades in existing residences and buildings, and encourage developers to install electrified HVAC systems and water heaters, thereby reducing natural gas consumption and the corresponding GHG emissions.

Quantification

As appropriate, CAPCOA's Quantifying Greenhouse Mitigation Measures was used to quantify the effect of energy efficiency improvements to the building stock. CAPCOA Measure BE-4 was used to estimate the electricity savings associated with the use of energy efficient appliances on existing building stock. A 2% reduction in electricity-based residential building energy emissions (on the existing building stock) was used to estimate the GHG reduction associated with measure. Additionally, natural gas energy efficiency savings were estimated to reduce overall natural-gas related residential GHG emissions by 10% in 2040, based on expected improvements in the efficiency of natural gas appliances by 2040 (inclusive of the General Plan relevant policies and actions). Combined, this corresponds to a reduction of 7,671 $MTCO_2e$ per year in 2040.

[35] These reductions are calculated as follows: (New landfill proportion of waste stream – old landfill proportion of waste stream)/(Old landfill proportion of waste stream) . Therefore, for Year 2040: (0.15 – 0.25)/0.25 = -0.4 (i.e. representing a 40% reduction in solid waste-related emissions).

Implementation

Energy efficiency improvements to the existing building stock will be achieved through a combination of public outreach and education, and coordination with local energy providers, building owners, and residents.

Renewable Energy Usage

Measure:	**General Plan Goals and Policies:**	**2040 Reduction:**
Renewable Energy Usage	PF-6j, PF-6k	2,193 $MTCO_2e$ per year

POLICY/ACTION DESCRIPTION

This measure works to promote increased participation in SCE's clean energy program through marketing and outreach strategies which target City customers and businesses not currently participating in the program. SCE's renewable energy program (Green Rate), allows all electricity customers to pay low monthly fees to meet electricity needs from renewable sources. The City would update its website and help develop materials for residents and businesses to promote SCE's green electricity source options.

Quantification

The analysis of this measure assumed an aggregate 10 percent participation rate[36] from residential and commercial electricity customers in Lake Forest by 2040, which corresponds to a reduction of 2,193 $MTCO_2e$ per year in 2040.

Implementation

The expanded use of renewable energy sources from SCE will occur through ongoing coordination with SCE and the community to inform, promote, and market the Green Rate program.

[36] This participation rate reflects the weighted proportion of customers who are anticipated to be full participants.

Modified GHG Reductions Results

Table 3.7-13 shows the emissions reductions that would occur with implementation of the proposed General Plan policies and actions discussed above. The largest reduction comes from increased solid waste diversions, followed by energy efficiency improvements in the building stock, electric vehicle infrastructure, transit system improvements, pedestrian improvements and increased connectivity, renewable energy usage, TDM programs, and traffic calming.

TABLE 3.7-13: GHG REDUCTIONS FROM ADDITIONAL GENERAL PLAN POLICIES AND ACTIONS

GHG REDUCTION CATEGORY	*YEAR 2040 GHG REDUCTIONS ($MTCO_2E$)*
Pedestrian Improvements and Increased Connectivity	2,404
Traffic Calming	601
Transit System Improvements	2,897
Transportation Demand Management (TDM)	1,393
Electric Vehicle Infrastructure	8,009
Solid Waste Reductions	15,119
Energy Efficiency Improvements	7,670
Renewable Energy Usage	2,193
Total GHG Reductions from General Plan Policies and Actions	**40,286**

SOURCE: SEEC CLEARPATH TOOL; DE NOVO PLANNING GROUP.

CONCLUSIONS

Table 3.7-14 shows the total future year GHG emissions with the reductions described above and summarized in Table 3.7-13, which include Federal and State actions, as well as the General Plan policies and actions described in the previous section.

TABLE 3.7-14: LAKE FOREST COMMUNITY GHG EMISSIONS INVENTORY – PROJECT FUTURE YEAR 2040 MODIFIED FORECAST

YEAR	*TOTAL MODIFIED FORECAST ($MTCO_2E$)*	*TOTAL MODIFIED FORECAST ($MTCO_2E$ PER CAPITA PER YEAR)*	*GHG EMISSIONS TARGETS ($MTCO_2E$ PER CAPITA PER YEAR)*
2040	397,541	2.61	2.66

SOURCE: SEEC CLEARPATH TOOL; DE NOVO PLANNING GROUP.

IMPACTS AND MITIGATION MEASURES

Impact 3.7-1: General Plan implementation has the potential to generate GHG emissions that could have a significant impact on the environment (Less than Significant)

Emissions of GHGs contributing to global climate change are attributable in large part to human activities associated with the industrial/manufacturing, utility, transportation, residential, and agricultural sectors. Therefore, the cumulative global emissions of GHGs contributing to global climate change can be attributed to every nation, region, and city, and virtually every individual on Earth. A project's GHG emissions are at a micro-scale relative to global emissions, but could result in a cumulatively considerable incremental contribution to a significant cumulative macro-scale impact. Implementation of the proposed project would contribute to increases of GHG emissions that are associated with global climate change. Estimated GHG emissions attributable to future development would be primarily associated with increases of CO_2 and other GHG pollutants, such as methane (CH_4) and nitrous oxide (N_2O), from mobile sources and utility usage.

While the City of Lake Forest does not currently have any adopted plans or policies related to GHG reductions, the City has developed the Proposed General Plan to achieve local per capita GHG emissions levels that would be consistent with the statewide reduction targets established by AB 32, SB 32 and the CARB's 2017 Scoping Plan. The proposed General Plan's approach to GHG reductions is consistent with the framework established by ICLEI- Local Governments for Sustainability, through the "Five Milestones Framework." The proven Five Milestones framework offers a systematic approach for analyzing baseline greenhouse gas emissions, developing an emissions reduction target, developing and implementing a climate action plan, and monitoring emissions reduction progress. These milestones include:

1. Inventory GHG Emissions
2. Establish a Reduction Target
3. Develop a Plan to Reduce GHG Emissions
4. Implement Policies and Actions to Reduce GHG Emissions
5. Monitor and Verify Results

These guidelines set forth a basic framework for developing a plan to reduce GHG emissions and acknowledges the role CEQA plays in ensuring the impacts of climate change are addressed.

The following analysis includes a summary of the proposed Lake Forest General Plan's approach to reducing GHG emissions through buildout of the General Plan.

COMMUNITY GHG EMISSIONS INVENTORY, FORECASTS, AND TARGETS

The following pages summarize the City's quantification of baseline GHG emissions generated by Lake Forest, the establishment of GHG emissions targets that demonstrate a level which the contribution of GHG emissions from activities covered by the plan would not be cumulatively considerable, and forecasts for future year GHG emissions. The analysis and results of these first three Plan Elements are provided above in this EIR chapter, and are briefly summarized below.

Community GHG Emissions Inventory

As shown above in Table 3.7-3, the 2015 Community GHG Emissions Inventory for all emissions sectors is 417,054 $MTCO_2e$. Based on existing population levels for baseline year 2015 and forecasted population as provided in Table 2.0-3 of the Project Description (See *Chapter 2.0: Project Description* of the DEIR), per capita emissions in baseline year 2015 are estimated at 5.21 MT CO_2e per capita (derived by dividing 417,054 MT CO_2e by a 2015 year population of 80,070).

GHG Reduction Targets

The target years 2030 and 2040 were selected, based on the target year for SB 32 (2030) and the Lake Forest General Plan horizon year (2040).

To this end, the City of Lake Forest has developed community GHG emissions inventories for baseline year 2015 and projections for future years 2030, 2040, and 2050, and targets for each future year based on the latest guidance from the CARB. Based on this approach recommended by the CARB 2017 Scoping Plan, the following recommended per capita GHG reduction targets for 2030, 2040, and 2050 have been developed to reduce the City's annual GHG emissions consistent with the framework used to develop the State's per capita targets. The year 2050 target is provided for informational purposes only, since it is outside of the General Plan's (i.e. proposed project) horizon year.

As established by Policy RR-4.8, the City targets are:

- 3.99 MT CO_2e per capita by 2030
- 2.66 MT CO_2e per capita by 2040; and
- 1.33 MT CO_2e per capita by 2050.[37]

GHG Emissions Forecasts

Tables 3.7-7 through 3.7-9 provide forecasts for future year community GHG emissions by sector (without legislative adjustments), for years 2030, 2040, and 2050, respectively. Two separate forecast scenarios are provided for each forecast year. The first forecast scenario, the "BAU Plus Proposed Project" scenario, reflects the BAU scenario after proposed project (General Plan) land use assumptions are incorporated (to reflect the land use scenario provided in the General Plan). This

[37] Note: Buildout year for the General Plan (i.e. proposed project) is year 2040; therefore, analysis of the proposed project's emissions in 2050 are included here for informational purposes only).

forecast reflects the long-term forecast for buildout of the General Plan Land Use Map, but does not include trends reflecting existing and planned local programs and policies, including those identified in the proposed General Plan. The BAU forecast for 2030 is 639,937 $MTCO_2e$. The BAU forecast for 2040 is 851,389 $MTCO_2e$. The BAU forecast for 2050 is 1,132,796 $MTCO_2e$.

The "Legislative-adjusted BAU Plus Proposed Project" scenario builds on the "BAU Plus Proposed Project" scenario by further incorporating the GHG reduction benefits of these Federal and State actions that are designed to reduce GHG emissions, such as the Pavley Clean Car Standards (AB 1493) and the Renewable Portfolio Standard (established under SB 1078).[38]

The legislative-adjusted BAU plus project scenario forecasts (i.e. inclusive of the legislative adjustments, as described above) are provided in Tables 3.7-10 through 3.7-12, above.

The results of the legislative-adjusted BAU plus project scenario forecasts identify that the community-wide per capita GHG emissions would be as follows:

- Year 2030: 3.77 MT CO_2e/year per capita (based on 427,521 MT CO_2e divided by a population projection of 113,401). This is below the threshold of 3.99 MT CO_2e/per capita for this target year.
- Year 2040: 2.87 MT CO_2e/year per capita (based on 437,829 MT CO_2e divided by a population projection of 152,462). This is above the threshold of 2.66 MT CO_2e/per capita for this target year.
- Year 2050:[39] 2.64 MT CO_2e/year per capita (based on 541,845 MT CO_2e divided by a population projection of 204,977). This is above the threshold of 1.33 MT CO_2e/per capita for this target year.

As shown in Tables 3.7-7 through 3.7-12, GHG emissions in Lake Forest are estimated to increase over time under the BAU Plus Proposed Project scenario as well as the Legislative-adjusted BAU Plus Proposed Project scenario. The slowdown in the increase of GHG emissions from 2015 to 2050 is primarily due to aggressive actions by the State to increase energy efficiency both at the building and utility levels (e.g. via increasing Title 24 building energy efficiency standards and the Renewable Portfolio Standard) during these timeframes. Efforts to reduce on-road transportation GHG emissions (such as by the Pavley Clean Car Standards), also play a major role in reducing GHG emissions through the forecast years. Overall, Federal and State actions reduce overall BAU Plus Proposed Project GHG emissions by approximately 33% in year 2030, 48.6% in year 2040, and 52.2% in year 2050.

[38] See the discussion under Methodology for a full list of federals/state actions that are incorporated into the legislative-adjusted BAU scenario.

[39] Year 2050 forecasts and GHG emissions projections are based on a future horizon year using the annualized growth rates through 2040. The year 2050 exceeds the buildout horizon of the proposed Lake Forest General Plan, and as such, total future growth assumptions exceed the growth projections associated with the General Plan.

Based on forecasted population levels for each forecast year and the results provided in the preceding tables, after taking into account federal and state actions (i.e. as provided under the Legislative-adjusted BAU Plus Proposed Project scenarios), per capita emissions are estimated to decline from 5.21 MT CO_2e in 2015 to 3.77 MT CO_2e in year 2030, 2.87 MT CO_2e in year 2040, and 2.64 MT CO_2e in year 2050. Table 3.7-15 provides a summary of these per capita results.

TABLE 3.7-15: LAKE FOREST COMMUNITY GHG EMISSIONS PER CAPITA EMISSIONS AND TARGETS (MT CO_2E)

YEAR	*PER CAPITA EMISSIONS (LEGISLATIVE-ADJUSTED BAU PLUS PROPOSED PROJECT SCENARIO)*	*POPULATION PROJECTIONS*	*PER CAPITA EMISSIONS*	*PER CAPITA TARGET*	*ACHIEVES PER CAPITA TARGET?*
2015	417,054	80,070	5.21	N/A	N/A
2030	427,521	113,401	3.77	3.99	Y
2040	437,829	152,462	2.87	2.66	N
2050	541,845	204,977	2.64	1.33	N

SOURCE: SEEC CLEARPATH TOOL; DE NOVO PLANNING GROUP.

As shown in Table 3.7-15 the proposed project (which includes buildout of the Land Use Map, but does not account for GHG reduction policies included in the Draft General Plan) would achieve the per capita GHG target for year 2030, but would not achieve the per capita target for buildout year 2040, or 2050. Therefore, the City of Lake Forest has included numerous policies and actions in the proposed General Plan to further reduce GHG emissions and to bridge the gap for buildout year 2040. Separately, although Table 3.7-15 identifies that the proposed project would not meet the per capita GHG target for year 2050, year 2050 is outside of the scope of the proposed project, since the proposed project buildout year would occur by 2040. Therefore, year 2050 information is provided herein for informational purposes only.

GHG REDUCTION MEASURES

The third milestone in ICLEI's five milestone process calls for the development of a plan to reduce GHG emissions to achieve the established reduction targets.

A range of policies and actions have been included in the General Plan that would reduce potential GHG emissions within Lake Forest at the local level, which are listed previously within this section. The effectiveness of these General Plan policies and actions in reducing GHG emissions at the local level is described in detail above.

As shown in Table 3.7-13 above, the combined GHG emissions reductions associated with implementation of the policies and actions contained in the General Plan would result in a total emissions reduction of approximately 40,286 $MTCO_2e$. This equates to a 2040 per capita GHG emissions level of 2.61 $MTCO_2e$ per capita per year, which is below the established threshold of 2.66 $MTCO_2e$. These policies and actions will be implemented over time, throughout the life of the General Plan.

MONITORING

The City of Lake Forest has committed to updating its GHG inventory every five years to ensure that the City's ongoing efforts to reduce GHG emissions are being properly and effectively implemented, and that the City remains on track to reach the established reduction targets for future years.

Action RR-4e of the proposed General requires such monitoring. The SEEC ClearPath California tool will be used to allow for efficient monitoring of Lake Forest's community GHG levels in future years. If GHG emissions are found to be higher in future years than what is projected within the General Plan, additional community GHG reduction measures would be adopted to the City of Lake Forest to ensure continued consistency with established reduction targets, as required by Action RR-4e, which states: *"Monitor GHG emissions generated by the community over time for consistency with the established GHG reduction targets, and update the City's community GHG Inventory every five years. In the event that the City determines that ongoing efforts to reduce GHG emissions are not on track to meet the City's adopted GHG reduction targets, the City shall establish and adopt new and/or revised GHG reductions measures that will effectively meet the established GHG reduction targets."*

CONCLUSION

As demonstrated in the analysis provided above, the proposed project is consistent with the ICLEI five milestone framework for developing a plan to reduce GHG emissions. Upon adoption of the Proposed General Plan, and implementation of the policies and actions identified above, the City of Lake Forest would not exceed the per capita GHG emission targets established to ensure compliance with SB 32, AB 32, CARB's 2017 Scoping Plan and other California legislation for future year 2030 and General Plan buildout year 2040. Therefore, the proposed project would not generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment. There is a **less than significant** impact.

Impact 3.7-2: General Plan implementation has the potential to conflict with adopted plans, policies, or regulations adopted for the purpose of reducing greenhouse gas emissions (Less than Significant)

As described under Impact 3.7-1, the proposed project (Lake Forest General Plan) would satisfy the GHG reduction requirements established by SB 32 and AB 32. As further provided under Impact 3.7-1, the per capita GHG reduction targets developed for the proposed General Plan are consistent with the per capita GHG reduction targets provided in the CARB's 2017 Scoping Plan, which were developed by the CARB to ensure compliance with AB 32, SB 32, and consistent with Executive Order S-03-05. These laws established a statewide reduction in GHG emissions to 15% below 1990 levels by 2020 (under AB 32), a 40% below 1990 levels by 2030 (under SB 32), and 80% below 1990 levels by 2050 (under AB 32 and consistent with Executive Order S-03-05).

As demonstrated under Impact 3.7-1, the proposed project would be consistent with the CARB's 2017 Scoping Plan, and thus all current statewide GHG reduction laws (i.e. AB 32 and SB 32) relevant to the proposed project that have been adopted to reduce GHG emissions.

More specifically, the CARB's 2017 Scoping Plan, adopted in November 2017, provides guidance on how the State's established GHG reduction targets will be achieved through various State and local actions. As discussed in Chapter 5 of the Scoping Plan "Achieving Success", local jurisdictions working to set GHG reduction targets aligned with the State targets may use per capita emission estimates to recognize the GHG reductions needed to remain in line with State targets.

As provided under Impact 3.7-1, the proposed project would reduce emissions to below the per capita thresholds through buildout of the General Plan (i.e. for years 2030 and 2040), which ensures that the proposed project is consistent with all GHG reduction targets established for the state. Therefore, the proposed project would not conflict with the State of California's GHG reduction goals and targets.

On the local level, the City of Lake Forest has established ECOnomic, which is a voluntary green home education program. The City, through ECOnomic, encourages homeowners and building professionals to incorporate green building design into construction projects. The proposed project would not conflict with this program. Separately, the SCAQMD adopted a Policy on Global Warming and Stratospheric Ozone Depletion in April 1990. However, this policy did not set a GHG reduction target or goal, and the proposed project would not conflict with this policy. There are currently no other local policies relevant to the proposed project adopted for the purpose of reducing GHG emissions.

The proposed project would not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases. There is a **less than significant** impact relative to this topic.

Impact 3.7-3: General Plan implementation has the potential to result in a significant impact due to wasteful, inefficient, or unnecessary consumption of energy resources, or conflict with or obstruct a state or local plan for renewable energy or energy efficiency (Less than Significant)

ENERGY CONSERVATION THRESHOLDS OF SIGNIFICANCE

The proposed project would result in a significant impact on energy use if it would:

- Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation; or
- Conflict with or obstruct a state or local plan for renewable energy or energy efficiency.

In order to determine whether or not the proposed project would result in a significant impact on energy use, this EIR includes an analysis of proposed project energy use, as provided below. A description of the methodology used to estimate energy emissions is provided within the following

analysis.

The State CEQA Guidelines require consideration of the potentially significant energy implications of a project. CEQA requires mitigation measures to reduce "wasteful, inefficient and unnecessary" energy usage (Public Resources Code Section 21100, subdivision [b][3]). According to Appendix G of the CEQA Guidelines, the means to achieve the goal of conserving energy include decreasing overall energy consumption, decreasing reliance on natural gas and oil, and increasing reliance on renewable energy sources. In particular, a project would be considered "wasteful, inefficient, and unnecessary" if it were to violate state and federal energy standards and/or result in significant adverse impacts related to project energy requirements, energy inefficiencies, energy intensiveness of materials, cause significant impacts on local and regional energy supplies or generate requirements for additional capacity, fail to comply with existing energy standards, otherwise result in significant adverse impacts on energy resources, or conflict or create an inconsistency with applicable plan, policy, or regulation.

The proposed project is the updated Lake Forest General Plan, with a horizon year of 2040. Buildout of the General Plan includes residential, commercial, office, industrial, mixed-use, open space, and other land uses (see Chapter 2.0: Project Description for further detail). The amount of energy used in the Planning Area at buildout would directly correlate to the type and size of development, the energy consumption associated with unit appliances, outdoor lighting, and energy use associated with other buildings and activities. Other major sources of Plan Area energy consumption include fuel used by vehicle trips generated during construction and operational activities, and fuel used by off-road and on-road construction vehicles during construction. The following discussion provides calculated levels of energy use expected for the Project, based on commonly used modelling software (i.e. CalEEMod v.2016.3.2 and the California Air Resource Board's EMFAC2017). The following analysis provides an estimate of the energy consumption in the Planning Area in buildout year 2040.

ELECTRICITY AND NATURAL GAS

At buildout, the City of Lake Forest's electricity and natural gas consumption would be used primarily to power buildings (all types of buildings, including residential, commercial, office, industrial, public, etc.). Total annual electricity (kWh) and natural gas (kBTU) usage associated with operational activities at proposed project buildout are shown in Table 3.7-16, below (as provided by CalEEMod).

TABLE 3.7-16: PROJECT OPERATIONAL NATURAL GAS AND ELECTRICITY USAGE (UNMITIGATED SCENARIO)

ELECTRICITY (KWH/YEAR)	*NATURAL GAS (KBTU/YEAR)*	*CO_2E EMISSIONS (MT/YEAR)*
483,740,060	1,171,371,280	217,561

SOURCE: CALEEMOD (V.2016.3.2)

According to CalEEMod's *Appendix A: Calculation Details for CalEEMod*, CalEEMod uses the California Commercial End Use Survey (CEUS) database to develop energy intensity value for non-residential buildings. The energy use from residential land uses is calculated based on the Residential Appliance Saturation Survey (RASS). Similar to CEUS, this is a comprehensive energy use assessment

that includes the end use for various climate zones in California.

FUEL CONSUMPTION - ON-ROAD VEHICLES (OPERATION)

Buildout of the General Plan would generate vehicle trips during its operational phase. Based on the traffic study prepared for the proposed project (Kittelson & Associates, 2019), the proposed project would generate approximately 3,958,507 daily vehicles trips. In order to calculate operational on-road vehicle energy usage and emissions, default trip lengths generated by CalEEMod were used, which are based on the project location and urbanization level parameters De Novo (the EIR consultant) selected within CalEEMod (i.e. "Orange County" and "Urban", respectively). These values are provided by the individual districts or use a default average for the state, depending on the location of the Project (CAPCOA, 2017). Based on Year 2040 gasoline and diesel MPG (miles per gallon) factors for individual vehicle classes as provided by EMFAC2017, De Novo derived weighted MPG factors for operational on-road vehicles of approximately 39.1 MPG for gasoline and 16.2 MPG for diesel vehicles. With this information, De Novo calculated as a conservative estimate that on-road vehicle energy usage in the Planning Area at buildout year 2040 would be approximately 94,332 gallons of gasoline and 16,486-gallons of diesel fuel per day, on average, or 34,431,177 annual gallons of gasoline and 6,017,510 annual gallons of diesel fuel.

FUEL CONSUMPTION - ON-ROAD VEHICLES (CONSTRUCTION)

The proposed project would also generate on-road vehicle trips during construction activities (from construction workers, vendors, and haulers). Estimates of vehicle fuel consumed were derived based on the assumed construction schedule, vehicle trip lengths and number of workers per construction phase as provided by CalEEMod (v 2016.3.2), and Year 2040 gasoline and diesel MPG factors provided by EMFAC2017. Table 3.7-17, below, describes gasoline and diesel fuel used by on-road mobile sources during each phase of the construction schedule. As shown, the vast majority of on-road mobile vehicle fuel used during the construction activities during buildout of the General Plan would occur during the building construction phase. See Appendix A for a detailed calculation.

TABLE 3.7-17: ON-ROAD MOBILE FUEL GENERATED BY PROJECT CONSTRUCTION ACTIVITIES – BY PHASE

CONSTRUCTION PHASE	*TOTAL DAILY WORKER TRIPS[A]*	*TOTAL DAILY VENDOR TRIPS[A]*	*TOTAL DAILY HAULING TRIPS[A]*	*GALLONS OF GASOLINE FUEL[B]*	*GALLONS OF DIESEL FUEL[B]*
Site Preparation	18	0	0	1,803	0
Grading	20	0	0	1,995	0
Paving	15	0	0	1,496	0
Building Construction	199	68	0	297,628	171,429
Architectural Coating	199	0	0	51,265	0
Total	**N/A**	**N/A**	**N/A**	**354,187**	**171,429**

NOTE: [A] PROVIDED BY CALEEMOD. [B] SEE APPENDIX A FOR FURTHER DETAIL.
SOURCE: CALEEMOD (V.2016.3.2); EMFAC2017.

OFF-ROAD VEHICLES (CONSTRUCTION)

Off-road construction vehicles would use diesel fuel during construction activities. A non-exhaustive list of off-road constructive vehicles expected to be used during construction activities includes: cranes, forklifts, generator sets, tractors, excavators, and dozers. Based on the total amount of CO_2 emissions expected to be generated by the proposed project (as provided by the CalEEMod output), and a CO_2 to diesel fuel conversion factor (provided by the U.S. Energy Information Administration), the proposed project would use a total of approximately 113,220 gallons of diesel fuel for off-road construction vehicles (during the site preparation and grading phases). Detailed calculations are provided in Appendix A.

CONCLUSION

Buildout of the General Plan would use energy resources for the operation of buildings (electricity and natural gas), for on-road vehicle trips (e.g. gasoline and diesel fuel), and from off-road construction activities (e.g. diesel fuel) associated with buildout of the General Plan. Each of these activities would require the use of energy resources. Developers of individual projects within the Planning Area would be responsible for conserving energy, to the extent feasible, and would rely heavily on reducing per capita energy consumption to achieve this goal, including through Statewide and local measures.

Buildout of the General Plan would be in compliance with all applicable federal, state, and local regulations regulating energy usage. For example, SCE is responsible for the mix of energy resources used to provide electricity for its customers, and it is in the process of implementing the Statewide Renewable Portfolio Standard (RPS) to increase the proportion of renewable energy (e.g. solar and wind) within its energy portfolio.

SCE is expected to achieve at least 60% renewables by 2030, and 100 percent zero-carbon electricity by 2045 (in compliance with SB 100). Additionally, energy-saving regulations, including the latest State Title 24 building energy efficiency standards (“part 6”), would be applicable to the proposed project. Other Statewide measures, including those intended to improve the energy efficiency of the statewide passenger and heavy-duty truck vehicle fleet (e.g. the Pavley Bill and the Low Carbon Fuel Standard), would improve vehicle fuel economies, thereby conserving gasoline and diesel fuel. These energy savings would continue to accrue over time. Furthermore, additional project-specific the sustainability features individual development projects could further energy consumption of individual projects. The proposed project would also be in compliance with the planning documents described previously within this section.

As a result, the proposed project would not result in any significant adverse impacts related to project energy requirements, energy use inefficiencies, and/or the energy intensiveness of materials by amount and fuel type for during General Plan buildout, including during construction, operations, maintenance, and/or removal. SCE, the electricity provider to the site, and SoCalGas, the natural gas provider, maintains sufficient capacity to serve the Planning Area. The City of Lake Forest would comply with all existing energy standards, and would not result in significant adverse impacts on

energy resources. Furthermore, connections exist between the Planning Area and nearby pedestrian and bicycle pathways, and public transit access exists nearby, reducing the need for local motor vehicle travel. Although improvements to the City's pedestrian, bicycle, and public transit systems would provide further opportunities for alternative transit, the Planning Area would be linked closely with existing networks that, in large part, are sufficient for most residents of the Planning Area and neighboring communities. For the reasons stated above, buildout of the General Plan would not be expected cause an inefficient, wasteful, or unnecessary use of energy resources nor conflict with or obstruct a state or local plan for renewable energy or energy efficiency. This is a **less than significant** impact.

APPENDIX A – GREENHOUSE GAS INVENTORIES, FORECASTS, TARGETS, AND LOCAL REDUCTION MEASURES

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APPENDIX A.1 – SEEC CLEARPATH TOOL INVENTORY OUTPUTS

Files

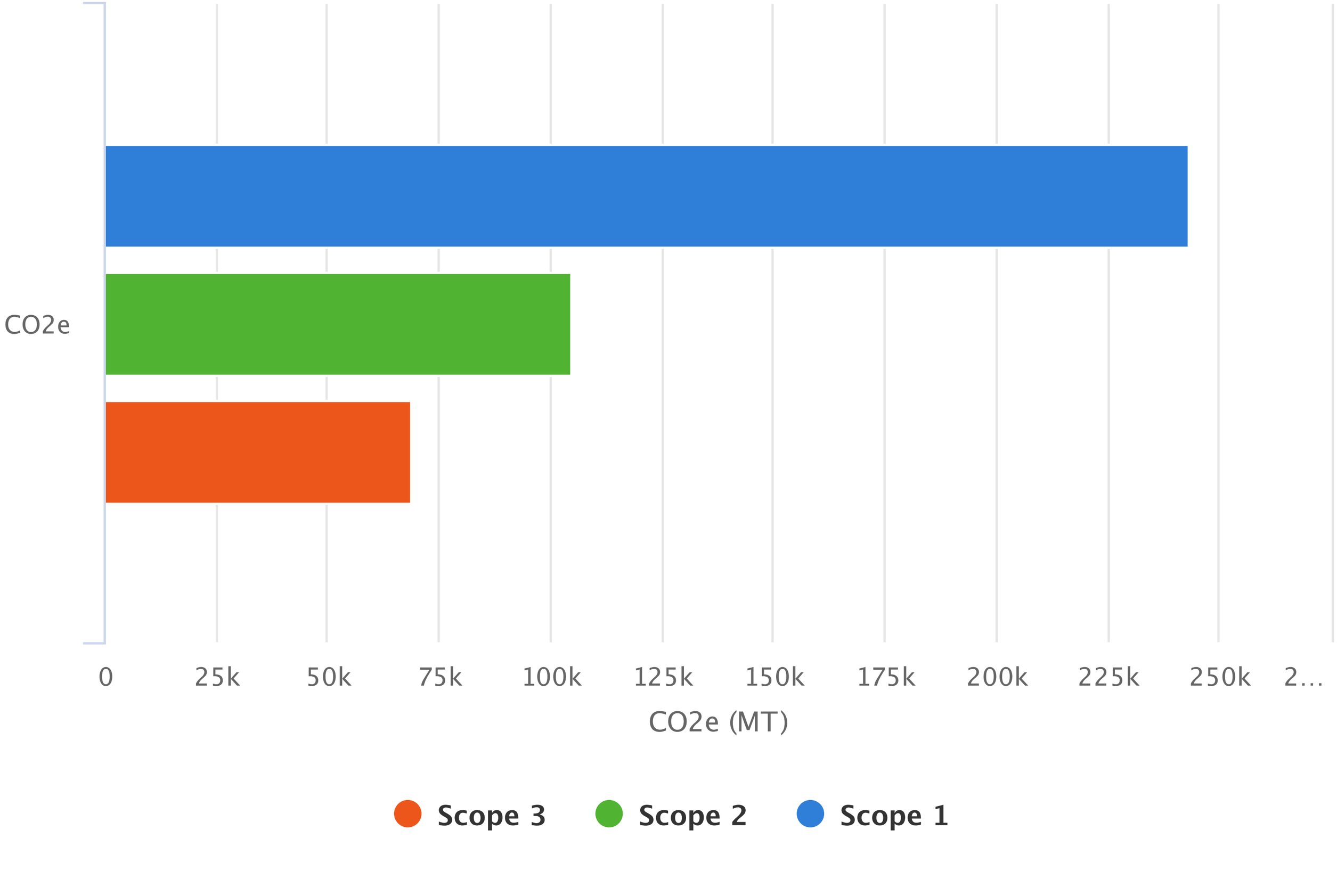
Baseline Inventory By Scope

Baseline Inventory by Scope & Sector

Baseline Inventory Detail

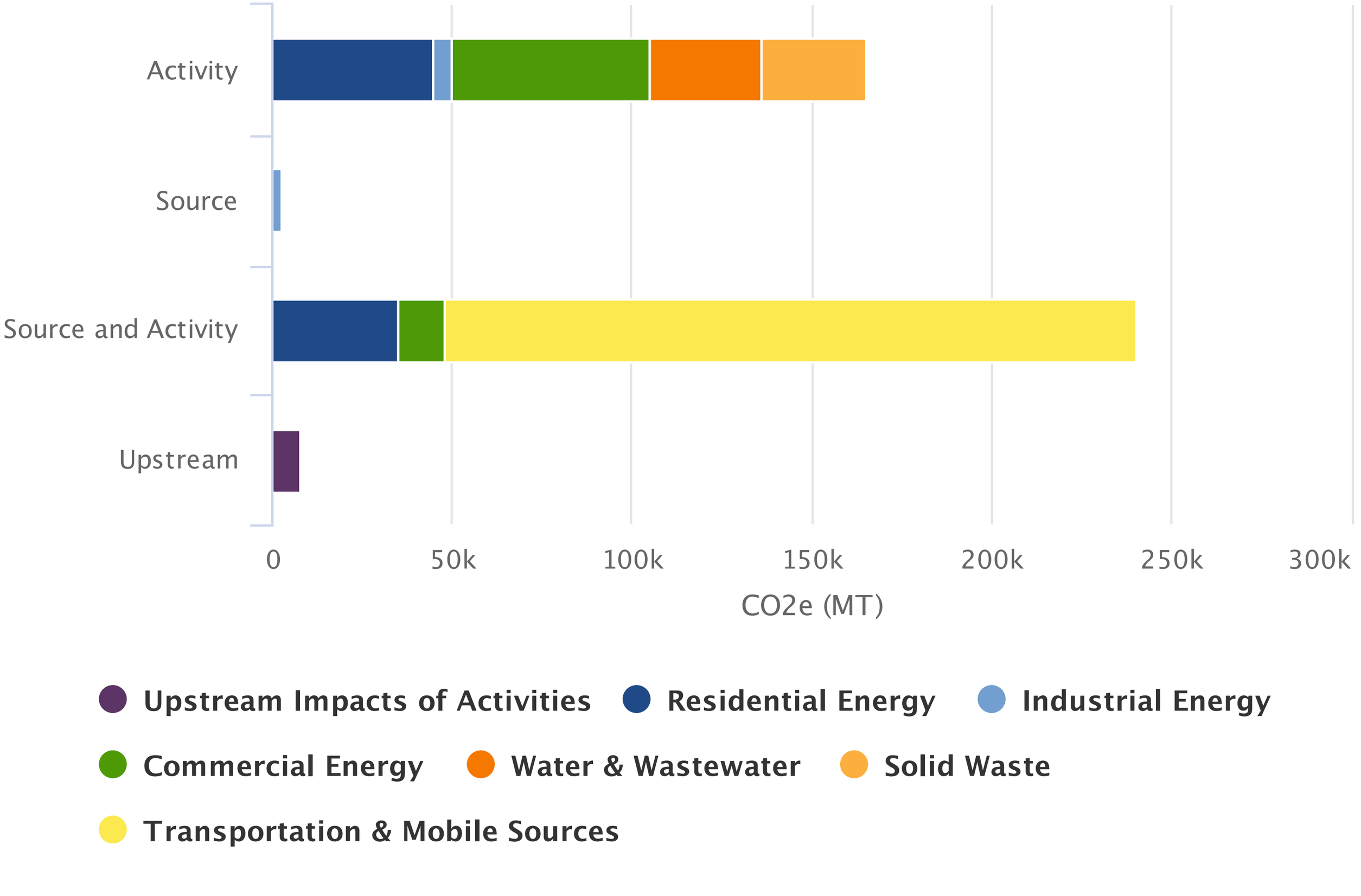
Clearpath Baseline Inventory Output (by Activity/Source)

Activity/Source	CO2e
Scope 1	243,430
Scope 2	104,714
Scope 3	68,909


CO2e
0
25k
50k
75k
100k
125k
150k
175k
200k
225k
250k
2...
CO2e (MT)
Scope 3
Scope 2
Scope 1

Clearpath Baseline Inventory Output (by Source and Sector)

Activity/Source	Sector	CO2e
Scope 1	Transportation & Mobile Sources	192,967
Scope 1	Commercial Energy	12,950
Scope 1	Industrial Energy	2,555
Scope 1	Residential Energy	34,956
Scope 2	Transportation & Mobile Sources	-
Scope 2	Commercial Energy	54,867
Scope 2	Industrial Energy	5,047
Scope 2	Residential Energy	44,800
Scope 3	Solid Waste	29,389
Scope 3	Water & Wastewater	31,447
Scope 3	Upstream Impacts of Activities	8,073


Activity
Source
Source and Activity
Upstream
0
50k
100k
150k
200k
250k
300k
CO2e (MT)
Upstream Impacts of Activities
Residential Energy
Industrial Energy
Commercial Energy
Water & Wastewater
Solid Waste
Transportation & Mobile Sources

Transportation & Mobile Sources

Id	Output Record Ids With Co2e	Inventory Record	Calculator	Gpc Scope	GPC Ref Number
117174	1467451	Off-Road Construction and Lawn Equipment Vehicles - Gasoline	Emissions from Off Road Vehicles	Scope 1	I.3.1
117175	1467470	Off-Road Construction and Lawn Equipment Vehicles - Diesel	Emissions from Off Road Vehicles	Scope 1	I.3.1
124420	1590657	On-road Transportation (Natural Gas)	On Road Transportation	Scope 1	II.1.1
117026	1464100	On-road Transportation (Gasoline)	On Road Transportation	Scope 1	II.1.1
117347	1470735	On-road Transportation (Diesel)	On Road Transportation	Scope 1	II.1.1
117349	1470768	On-road Transportation (Electric)	On Road Transportation	Scope 2	II.1.2

Factor Profiles	Global Warming Potential Category		Activity Source
	IPCC 2nd Assessment	Transportation & Mobile Sources	Source
	IPCC 2nd Assessment	Transportation & Mobile Sources	Source
Grid Electricity and Lake Forest On-Road Transportation (EMFAC2017)	IPCC 2nd Assessment	Transportation & Mobile Sources	Source and Activity
Grid Electricity and Lake Forest On-Road Transportation (EMFAC2017)	IPCC 2nd Assessment	Transportation & Mobile Sources	Source and Activity
Grid Electricity and Lake Forest On-Road Transportation (EMFAC2017)	IPCC 2nd Assessment	Transportation & Mobile Sources	Source and Activity
Grid Electricity and Lake Forest On-Road Transportation (EMFAC2017)	IPCC 2nd Assessment	Transportation & Mobile Sources	Activity

Notes
As provided by the California Air Resource Board's Offroad 2017 model for construction and lawn and garden equipment (gasoline). Prorated Orange County data for Lake Forest (using year 2015 population)
As provided by the California Air Resource Board's Offroad 2017 model for construction and lawn and garden equipment (diesel). Prorated Orange County data for Lake Forest (using year 2015 population)

VMT data provided directly by Kittelson (traffic consultant), and as found in the General Plan. 2015 VMT data estimated by backtracking 2040 VMT growth rates from 2019. Fleet breakdown and CO2, CH4, and N2O emissions fac
VMT data provided directly by Kittelson (traffic consultant), and as found in the General Plan. 2015 VMT data estimated by backtracking 2040 VMT growth rates from 2019. Fleet breakdown and CO2, CH4, and N2O emissions fac
VMT data provided directly by Kittelson (traffic consultant), and as found in the General Plan. 2015 VMT data estimated by backtracking 2040 VMT growth rates from 2019. Fleet breakdown based on EMFAC2017 modeling for yea

Created By	Created At	CO2 (MT)	CH4 (MT)	N2O (MT)	CO2e (MT)	Tags	On Road VMT	Fossil Fuel Energy Equivalent (MMBtu)	Biofuel Energy (MMBtu)	CO2 Emissions Factor
jsmith@denovoplanning.com	2019 Oct 15 10:14pm	339.9636534	0.019360117	0.008518451	343.0109358					0.070268107
jsmith@denovoplanning.com	2019 Oct 15 10:16pm	94.82427042	0.005386687	0.002414722	95.68595463					0.073964068
jsmith@denovoplanning.com	2020 Feb 4 05:36am	0	0.190942119	0.016996374	9.278660346		97122.13559	0	0	0.052529183
jsmith@denovoplanning.com	2019 Oct 15 06:07pm	168593.9521	4.658009512	5.146512236	170287.1891		445920088	0	0	0.000378081
jsmith@denovoplanning.com	2019 Oct 22 05:21pm	21194.84169	0.247596026	3.331533958	22232.81673		21312465.67	0	0	0.000994481
jsmith@denovoplanning.com	2019 Oct 22 05:25pm	0.126816096	NaN	NaN	0.126816096		62901.32929	1.804036174	0	0.070295761

CO2 Emissions Factor Units	Biogenic CO2 Emissions Factor	Biogenic CO2 Emissions Factor Units	CH4 Emissions Factor	CH4 Emissions Factor Units	N2O Emissions Factor	N2O Emissions Factor Units
MT/MMBtu	0	MT/MMBtu	4.0016E-06	MT/MMBtu	1.7607E-06	MT/MMBtu
MT/MMBtu	0	MT/MMBtu	4.20168E-06	MT/MMBtu	1.88351E-06	MT/MMBtu
MT/MMBtu	0	MT/MMBtu	0.000001966	MT/mile	0.000000175	MT/mile
MT/mile	0	MT/mile	1.04458E-08	MT/mile	1.15413E-08	MT/mile
MT/mile	0	MT/mile	1.16174E-08	MT/mile	1.56319E-07	MT/mile
MT/MMBtu	0	MT/MMBtu	NaN	MT/MMBtu	NaN	MT/MMBtu

TR.1.A
TR.1.A
TR.1.A
TR.1.A

Waster & Wastewater

Id	Output Record Ids With Co2e	Inventory Record	Calculator	Gpc Scope	GPC Ref Number
124445	1591194	Water Supply and Wastewater Treatment - Natural Gas	Emissions from Wastewater Treatment Energy Use	Scope 3	VI.1
124442	1591130	Water Supply and Wastewater Treatment - Electricity	Emissions from Wastewater Treatment Energy Use	Scope 3	VI.1
124467	1591668	Wastewater - Emissions from Nitrification/Denitrification	Nitrification/Denitrification Process N2O Emissions from Wastewater Treatment	Scope 3	III.4.2
124468	1591678	Wastewater - Emissions from Wastewater Treatment Lagoons	Process Emissions from Wastewater Treatment Lagoons	Scope 3	III.4.2

Factor Profiles	Global Warming Potential	Category	Activity Source
Grid Electricity	IPCC 2nd Assessment	Water & Wastewater	Activity
Grid Electricity	IPCC 2nd Assessment	Water & Wastewater	Activity
Grid Electricity	IPCC 2nd Assessment	Water & Wastewater	Activity
Grid Electricity	IPCC 2nd Assessment	Water & Wastewater	Activity

Notes
Natural gas consumption estimate provided by the 2012 IRWD GHG Master Plan. Values for 2015 were used were forecast (latest information available). Natural gas usage was estimted to be 1,143,800 therms/year in 2015. See
Electricity consumption estimate provided by the 2012 IRWD GHG Master Plan. 2015 forecast values (latest information available). Electricity usage for the all IRWD facilities is projected for 2015 at 149,394,800 kWh/year. See T
Based on Lake Forest population in 2015 (80,070).
Based on population (80,070 in 2015).

Created By	Created At	CO2 (MT)	CH4 (MT)	N2O (MT)	CO2e (MT)	Tags	Process N2O Population Served	N2O Emissions Factor (g/person)	N2O Emissions Factor Units
jsmith@denovoplanning.com	2020 Feb 4 06:28pm	1280.453886	0.0241322	0.0024132	1281.708754				MT/MMBtu
jsmith@denovoplanning.com	2020 Feb 4 06:07pm	7562.120642			7562.120642				MT/MMBtu
jsmith@denovoplanning.com	2020 Feb 4 07:05pm			0.7006125	217.189875		80070	7	g/person
jsmith@denovoplanning.com	2020 Feb 4 07:08pm		1066.000935		22386.01964				

US Community Protocol Reference	Daily Lagoon BOD5 Load (kg/day)	CH4 Emissions Factor	CH4 Emissions Factor Units	Electricity Energy (MMBtu)	Natural Gas Energy(MMBtu)	Electric CO2 Emissions Factor
			MT/MMBtu	0	24132.2	0
			MT/MMBtu	107575.7705	0	0
WW.7						
WW.6(alt)	6080.315625	0.17532	0			

Natural Gas CO2 Emissions Factor	CO2 Emissions Factor Units	Electric CH4 Emissions Factor	Natural Gas CH4 Emissions Factor	Electric N2O Emissions Factor	Natural Gas N2O Emissions Factor
0	MT/MMBtu	0	0	0	0
0	MT/MMBtu	0	0	0	0

Residential Energy

Id	Output Record Ids With Co2e	Inventory Record	Calculator	Gpc Scope	GPC Ref Number	Factor Profiles	Global Warming Potential	Category	Activity Source
117021	1463996	Electricity - Residential	Emissions from Grid Electricity	Scope 2	I.1.2	Grid Electricity	IPCC 2nd Assessment	Residential Energy	Activity
117022	1464016	Natural Gas - Residential	Emissions from Stationary Fuel Combustion	Scope 1	I.1.1		IPCC 2nd Assessment	Residential Energy	Source and Activity

Notes
SCE Emission factor for 2015 for CO2e utilized (as provided by SCE's EEI ESG/Sustainability Template), As provided in the 2017 “EEI ESG/Sustainability Template – Section 2: Quantitative Information”, for Total Owned + Purch

Created By	Created At	CO2 (MT)	CH4 (MT)	N2O (MT)	CO2e (MT)	Tags	Energy Equivalent (MMBtu)	CO2 Emissions Factor	CO2 Emissions Factor Units	Biogenic CO2 Emissions Factor
jsmith@denovoplanning.com	2019 Oct 15 05:45pm	44800.20049			44800.20049			0	MT/MMBtu	
jsmith@denovoplanning.com	2019 Oct 15 05:51pm	34922.3251	0.6581667	0.06581667	34956.54977		658167	53.02	kg/MMBtu	0

Biogenic CO2 Emissions Factor Units	CH4 Emissions Factor	CH4 Emissions Factor Units	N2O Emissions Factor	N2O Emissions Factor Units	US Community Protocol Reference Electricity Energy Equivalent (MMBtu)
	0	MT/MMBtu	0	MT/MMBtu	637310.1297
kg/MMBtu	0.005	kg/MMBtu	0.0001	kg/MMBtu	

Commercial Energy

Id	Output Record Ids With Co2e	Inventory Record	Calculator	Gpc Scope	GPC Ref Number	Factor Profiles	Global Warming Potential	Category	Activity Source
117023	1464038	Electricity - Commercial	Emissions from Grid Electricity	Scope 2	I.2.2	Grid Electricity	IPCC 2nd Assessment	Commercial Energy	Activity
117024	1464059	Natural Gas - Commercial	Emissions from Stationary Fuel Combustion	Scope 1	I.2.1		IPCC 2nd Assessment	Commercial Energy	Source and Activity

Notes	Created By	Created At	CO2 (MT)	CH4 (MT)	N2O (MT)	CO2e (MT)	Tags	Electricity Energy Equivalent (MMBtu)
SCE Emission factor for 2015 utilized (as provided by SCE).	jsmith@denovoplanning.com	2019 Oct 15 05:53pm	54867.09134			54867.09134		780517.7816
	jsmith@denovoplanning.com	2019 Oct 15 05:55pm	12938.14509	0.2438399	0.024384	12950.82477		

CO2 Emissions Factor	CO2 Emissions Factor Units	CH4 Emissions Factor	CH4 Emissions Factor Units	N2O Emissions Factor	N2O Emissions Factor Units	US Community Protocol Reference Energy Equivalent (MMBtu)
0	MT/MMBtu kg/MMBtu	0	MT/MMBtu kg/MMBtu	0	MT/MMBtu kg/MMBtu	243839.9

CO2 Emissions Factor (kg/MMBtu)	CH4 Emissions Factor (kg/MMBtu)	N2O Emissions Factor (kg/MMBtu)
53.02	0.005	0.0001

Industrial Energy

Id	Output Record Ids With Co2e	Inventory Record	Calculator	Gpc Scope	GPC Ref Number	Factor Profiles	Global Warming Potential	Category	Activity Source
123857	1580662	Electricity - Industrial (estimated)	Emissions from Grid Electricity	Scope 2	I.3.2	Grid Electricity	IPCC 2nd Assessment	Industrial Energy	Activity
117025	1464080	Natural Gas - Industrial	Emissions from Stationary Fuel Combustion	Scope 1	I.3.1		IPCC 2nd Assessment	Industrial Energy	Source

Notes
Note: Industrial-related electricity consumption was not available from SCE, as industrial electricity consumption in Lake Forest did not meet the 15/20 Aggregation Rule for data requests (the data set must contain at least 15 custo

Created By	Created At	CO2 (MT)	CH4 (MT)	N2O (MT)	CO2e (MT)	Tags	Energy Equivalent (MMBtu)	CO2 Emissions Factor	CO2 Emissions Factor Units	CH4 Emissions Factor
jsmith@denovoplanning.com	2020 Jan 24 05:27pm	5047.190209			5047.190209			0	MT/MMBtu	0
jsmith@denovoplanning.com	2019 Oct 15 05:56pm	2552.95537	0.0481145	0.0048115	2555.45734		48115	0	MT/MMBtu	0

CH4 Emissions Factor Units	N2O Emissions Factor	N2O Emissions Factor Units	US Community Protocol Reference
MT/MMBtu	0	MT/MMBtu	
MT/MMBtu	0	MT/MMBtu	

Solid Waste

Id	Output Record Ids With Co2e	Inventory Record	Calculator	Gpc Scope	GPC Ref Number	Factor Profiles	Global Warming Potential	Category	Activity Source
117157	1467105	Solid Waste	Waste Generation (2019)	Scope 3	III.1.2	Waste Characterization Spreadsheet	IPCC 2nd Assessment	Solid Waste	Activity

Notes
64856.16 tons. Source for City 2015 disposal tonnage: https://www2.calrecycle.ca.gov/LGCentral/%20DiversionProgram/JurisdictionDiversionDetail/245/Year/2015 Assumes waste sent to Prima Deshecha landfill. Landfill moisture

Created By	Created At	CO2 (MT)	CH4 (MT)	N2O (MT)	CO2e (MT)	Tags	Waste Generated (wet tons)	Mixed MSW Emissions Factor (MT CH4/wet short ton)
jsmith@denovoplanning.com	2019 Oct 15 08:14pm		1399.492163		29389.33542		64856.16	0.0648

Newspaper Emissions Factor (MT CH4/wet short ton)	Office Paper Emissions Factor (MT CH4/wet short ton)	Corrugated Cardboard Emissions Factor (MT CH4/wet short ton)
0.042	0.1556	0.1048

Magazines/Third Class Mail Emissions Factor (MT CH4/wet short ton)	Food Scraps Emissions Factor (MT CH4/wet short ton)	Grass Emissions Factor (MT CH4/wet short ton)	Leaves Emissions Factor (MT CH4/wet short ton)
0.0476	0.0648	0.0228	0.026

Branches Emissions Factor (MT CH4/wet short ton)	Dimensional Lumber Emissions Factor (MT CH4/wet short ton)	Mixed MSW LFG Capture Rate (%)	Newspaper LFG Capture Rate (%)	Office Paper LFG Capture Rate (%)
0.058	0.0068	63	67	67

Corrugated Containers LFG Capture Rate (%)	Magazines/Third Class Mail LFG Capture Rate (%)	Food Scraps LFG Capture Rate (%)	Grass LFG Capture Rate (%)	Leaves LFG Capture Rate (%)
66	67	65	57	64

Branches LFG Capture Rate (%)	Dimensional Lumber LFG Capture Rate (%)	Oxidation Rate
65	68	0.1

APPENDIX A.2 – GREENHOUSE GAS INVENTORIES, FORECASTS, AND TARGETS

Files

a. Baseline Inventory Emissions Calculations: Electricity – SCE
b. Baseline Inventory Emissions Calculation: Electricity – Industrial Estimate
c. Baseline Inventory Emissions Calculations: Natural Gas – SoCalGas
d. Baseline Inventory Emissions Calculations: On-Road Transportation Emissions
e. Baseline Inventory Emissions Calculations: On-Road Transportation Emissions Rates and VMT Breakdown
f. Baseline Inventory Emissions Calculations: Solid Waste Emissions
g. Baseline Inventory Emissions Calculations: Wastewater Energy Emissions
h. Baseline Inventory Emissions Calculations: SCE Transmission & Distribution Losses
i. Baseline Inventory Emissions Calculations: Off-Road Emissions
j. Forecast Years (2030, 2040, 2050) Demographic Growth Rates
k. State Measure Reduction Calculations/Summary
l. Per Capita GHG Target Calculations for Forecast Years (2030, 2040, 2050)
m. Summary of Emissions for Baseline and Forecast Years
n. State Legislative Reduction Calculation – Commercial Energy (2030)
o. State Legislative Reduction Calculation – Residential Energy (2030)
p. State Legislative Reduction Calculation – Industrial Energy (2030)
q. State Legislative Reduction Calculation – Water & Wastewater (2030)
r. State Legislative Reduction Calculation – Commercial Energy (2040)
s. State Legislative Reduction Calculation – Residential Energy (2040)
t. State Legislative Reduction Calculation – Industrial Energy (2040)
u. State Legislative Reduction Calculation – Water & Wastewater (2040)
v. State Legislative Reduction Calculation – Commercial Energy (2050)
w. State Legislative Reduction Calculation – Residential Energy (2050)
x. State Legislative Reduction Calculation – Industrial Energy (2050)
y. State Legislative Reduction Calculation – Water & Wastewater (2050)

Electricity - SCE

		Total Usage (KWH)	
		Year	
City	Rate Category	2015	Source: SCE
LAKE FOREST, CITY OF	Agricultural	*	
LAKE FOREST, CITY OF	Commercial	228,691,710	
LAKE FOREST, CITY OF	Industrial	*	
LAKE FOREST, CITY OF	Residential	186,731,868	
Totals:		**415,423,578**	

Year: 2015

Emission Factor (MT CO2e/net MWh)

0.240 Note: CO2e emission factors provided by SCE.

Source: SCE ESG/Sustainability Template, 2017

Therefore:

	CO2e Emissions (MT CO2e)
	2015
Commercial	54,867.0913426311
Residential	44,800.2004888421

Electricity - Industrial Sector Estimate

Note: Industrial-related electricity consumption was not available from SCE, as industrial electricity consumption in Lake Forest did not meet the 15/20 Aggregation Rule for data requests (the data set must contain at least 15 customers, and no single customer can make up more than 20 percent of the total energy consumption). This is due to the extremely limited number of industrial facilities in Lake Forest. In general, electricity from land uses that could host industrial facilities (such as Light Industrial and Urban Industrial land uses) are typically included in the commercial electricity category by SCE. To estimate industrial electricity consumption for the purposes of the GHG emissions inventory, the ratio of natural gas consumption for the industrial land use category in 2015 in proportion to overall natural gas emissions was applied to the total electricity consumption provided by SCE in 2015.

CITY OF LAKE FOREST 2015		
Category	**# of Customers**	**Annual Therms**
Commercial	610	2,438,399
Industrial	36	481,145
Single-Family Residential	13,473	4,083,645
Multi-Family Residential	8,680	2,498,022
Total Therms		**9,501,211**

Ratio of Industrial Natural Gas Consumption of Total: 5.06%

Total Lake Forest Electricity Consumption in 2015: 415,423,578.0 KWh

Therefore: Estimate for Industrial Electricity Consumption in 2015: 21,037,210.6710197 KWh

Emission Factors (MT CO2e/net MWh) (note: total owned and purchased generation MT CO2e emissions intensity factor)

0.240

CO2e Emissions (MT CO2e)
2015
5,047.19020851702

Natural Gas - SoCalGas

CITY OF LAKE FOREST 2015		
Category	**# of Customers**	**Annual Therms**
Commercial	610	2,438,399
Industrial	36	481,145
Single-Family Residential	13,473	4,083,645
Multi-Family Residential	8,680	2,498,022
Total Therms		**9,501,211**

Conversions

mmBtu	kg CO2	MT CO2	g CH4	MT CH4	g N20	MT N20	MT CO2e
243,839.9	12,938,145.094	12,938.145094	243,839.9	0.2438399	24,383.99	0.0243840	12,950.8247688
48,115	2,552,955.370	2,552.955370	48,114.5	0.0481145	4,811.45	0.0048115	2,555.4573240
408,365	21,667,820.370	21,667.820370	408,364.5	0.4083645	40,836.45	0.0408365	21,689.0553240
249,802	13,254,504.732	13,254.504732	249,802.2	0.2498022	24,980.22	0.0249802	13,267.4944464

Source: USEPA, Emission Factors for Greenhouse Gas Inventories. 2018.

Available at: https://www.epa.gov/sites/production/files/2018-03/documents/emission-factors_mar_2018_0.pdf

mmBtu	kg CO2	MT CO2	g CH4	MT CH4	g N20	MT N20	MT CO2e
Sum of Residential (Single- and Multi-Family)							
658,167	34,922,325.102	34,922.325102	658,166.7	0.6581667	65,816.67	0.065816670	34,956.549770400

Emission Factors

CO2	53.06	kg CO2 per mmBtu
CH4	1	g CH4 per mmBtu
N2O	0.1	g N2O per mmBtu

Therms/mmBtu conversion 10 Therms/mmBtu

Global Warming Potential (GWP) Factors (Source: ICLEI's U.S. Community Protocol)

CO2	1
CH4	21
N2O	310

Metric ton conversions

kg/MT	1000
g/MT	1,000,000

On-Road Transportation

Source for VMT data: Kittelson

Ratio of weekend to weekday trips for Lake Forest: 84.54%

Days Per Year: 365

See EMFAC2017 Output

	Daily Weekday VMT	Annual Weekday VMT	Annual Weekend VMT	Total Annual VMT	Gasoline Only	Diesel Only	Electric Only	Natural Gas	Check
					95.406%	4.560%	0.013%	0.021%	
Existing (Year 2019)	1,503,178	391,899,979	132,520,194	524,420,173	500,327,777.823650	23,912,846.4224339	70,576.0586364698	108,972.2206797930	524,420,173
Backdated (Year 2015)	1,339,716	349,283,172	118,109,406	**467,392,578**	**445,920,088.396022**	**21,312,465.6737542**	**62,901.3292899962**	**97,122.1355920231**	467,392,578
Note: 2015 VMT estimated by applying the 2040 VMT growth factor backwards from 2019.				Check					
				467,392,578					

Notes:

The University of South Florida conducted a study that contains rigorous and generalizable data . A comparison of the data in Tables 4.6 and 4.7 suggest that the ratio between vehicle trips on the weekends vs. weekdays for households living a metropolitan area of between 500,000 and 1,000,000 people (which includes the Mission Viejo-Lake Forest-San Clemente MSA) is approximately 84.537% (5.03/5.95).

Source: A Comparison of Weekend and Weekday Travel Behavior Characteristics in Urban Areas, Ashish Agarwal. 5-27-2004. See: https://scholarcommons.usf.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=1935&context=etd

CAGR Formula: A = P*(1+ r)^t
CAGR Formula: P = A/[(1+r)^t]
Where A is the ending amount, P is the beginning amount,
r is the compound growth rate, and t is total number of years.

2019-2040 VMT Rate 2.92%

EMFAC2017 (v1.0.2) Emissions Inventory
Region Type: County 1 ton equals 907185 grams
Region: ORANGE
Calendar Year: 2015
Season: Annual
Vehicle Classification: EMFAC2011 Categories
Units: miles/day for VMT, trips/day for Trips, tons/day for Emissions, 1000 gallons/day for Fuel Consumption

Region	Calendar Year	Vehicle Category	Fuel	Population	VMT	Trips	CO2_TOTEX	CH4_TOTEX	N2O_TOTEX	Fuel Consumption	MPG
ORANGE	2015	All Other Buses	DSL	421.89	20363.38882	3543.876	25.37498303	0.000589223	0.003988594	2.261495385	9.004391056
ORANGE	2015	LDA	GAS	1146196	45212991.38	5398304	15921.31166	0.875484296	0.627684232	1680.545435	**26.9037602**
ORANGE	2015	LDA	DSL	8500.232	343994.2034	39914.57	90.56764022	0.000578697	0.014235972	8.071662556	**42.61751541**
ORANGE	2015	LDA	ELEC	7899.331	283384.5289	40345.82	0	0	0	0	#DIV/0!
ORANGE	2015	LDT1	GAS	111302.3	4012067.768	503083.4	1651.761292	0.149500181	0.098823269	174.3486943	23.01174542
ORANGE	2015	LDT1	DSL	101.113	2001.468519	348.8419	0.968051893	3.15986E-05	0.000152164	0.086275718	23.1985147
ORANGE	2015	LDT1	ELEC	243.6341	7859.296106	1196.603	0	0	0	0	#DIV/0!
ORANGE	2015	LDT2	GAS	427603.9	16745036.06	2010881	7661.498047	0.390269297	0.32791142	808.6956555	20.70622729
ORANGE	2015	LDT2	DSL	1342.395	66210.27892	6733.059	24.09918198	8.21067E-05	0.003788056	2.147792129	30.82713546
ORANGE	2015	LDT2	ELEC	90.5202	3159.064766	458.4901	0	0	0	0	#DIV/0!
ORANGE	2015	LHD1	GAS	34488.19	1256541.084	513822.7	1173.492242	0.045253025	0.056073196	123.8658644	10.14436939
ORANGE	2015	LHD1	DSL	15356.65	617411.5716	193167.4	351.7412243	0.003910484	0.055288822	31.34824384	19.6952523
ORANGE	2015	LHD2	GAS	6341.229	243090.2598	94474.86	259.084344	0.006460298	0.009930836	27.34718226	8.889042297
ORANGE	2015	LHD2	DSL	5885.739	243452.7157	74035.19	153.1040637	0.001318383	0.024065827	13.64509813	17.84177098
ORANGE	2015	MCY	GAS	48501.49	357086.0441	97002.98	90.9831457	0.171025778	0.027564253	9.603562412	37.18266501
ORANGE	2015	MDV	GAS	299850.1	11357092.3	1399823	6255.28773	0.336473796	0.264843088	660.2656531	17.2007922
ORANGE	2015	MDV	DSL	3348.284	149549.5215	16671.76	72.08738257	0.000145431	0.011331133	6.424645991	23.27747268
ORANGE	2015	MDV	ELEC	9.629808	213.4874081	41.81367	0	0	0	0	#DIV/0!
ORANGE	2015	MH	GAS	8141.04	75326.21461	814.4296	145.3246642	0.003060164	0.003292287	15.33948372	4.910609508
ORANGE	2015	MH	DSL	2648.197	28987.44402	264.8197	32.16862285	0.000122218	0.00505646	2.866965153	10.1108463
ORANGE	2015	Motor Coach	DSL	126.26	14359.93886	1843.396	27.94224922	0.000435711	0.004392132	2.490297928	5.766353777
ORANGE	2015	OBUS	GAS	1017.871	50584.21855	20365.56	98.71269232	0.00228992	0.002577023	10.41944081	4.854792063
ORANGE	2015	PTO	DSL	0	22841.60458	0	55.73037871	0.001224183	0.008760039	4.966860238	4.598801553
ORANGE	2015	SBUS	GAS	463.5997	20386.45076	1854.399	22.20314032	0.002389605	0.001172374	2.343612568	8.698729063
ORANGE	2015	SBUS	DSL	1283.75	39679.55763	14814.3	62.55433037	0.000680879	0.00983267	5.575031489	7.117369238
ORANGE	2015	T6 Ag	DSL	4.11	30.94536926	18.084	0.04286687	2.37489E-06	6.73807E-06	0.003820425	8.099980116
ORANGE	2015	T6 CAIRP heavy	DSL	82.91997	14298.34569	1210.632	16.05324449	0.000118316	0.002523346	1.430713798	9.993856618
ORANGE	2015	T6 CAIRP small	DSL	37.08289	1985.361318	541.4103	2.386573089	2.6095E-05	0.000375136	0.212698626	9.334152056
ORANGE	2015	T6 instate construction hea	DSL	373.2896	22081.59532	1687.628	26.81185392	0.000501473	0.00421445	2.389553673	9.240886938
ORANGE	2015	T6 instate construction sma	DSL	2476.25	117069.587	11195.03	142.6305792	0.002402776	0.022419541	12.71166945	9.209615417
ORANGE	2015	T6 instate heavy	DSL	3578.68	442280.5691	41297.47	507.740802	0.006802209	0.079809783	45.25139895	9.773854054
ORANGE	2015	T6 instate small	DSL	16638.22	780184.6692	192002.8	938.6070159	0.013405719	0.147535952	83.65150165	9.32660686
ORANGE	2015	T6 OOS heavy	DSL	47.5737	8196.347369	694.576	9.202511256	6.95269E-05	0.001446507	0.820155691	9.993648109
ORANGE	2015	T6 OOS small	DSL	21.30468	1139.422035	311.0483	1.369824491	1.50424E-05	0.000215317	0.12208291	9.333182153
ORANGE	2015	T6 Public	DSL	966.07	14183.72412	2930.412	21.75010239	8.81656E-05	0.003418813	1.938435037	7.317100573
ORANGE	2015	T6 utility	DSL	306.08	5243.428344	3519.92	6.88053119	1.10446E-05	0.001081524	0.613213791	8.550734546
ORANGE	2015	T6TS	GAS	6244.93	365585.0078	124948.6	704.1769529	0.018305157	0.018407354	74.32813257	4.918528088
ORANGE	2015	T7 Ag	DSL	1	30.80416531	4.4	0.061049491	1.01477E-06	9.59613E-06	0.005440916	5.661577494
ORANGE	2015	T7 CAIRP	DSL	729.02	139732.0445	10643.69	259.44544	0.002543623	0.04078121	23.12256385	6.043103412
ORANGE	2015	T7 CAIRP construction	DSL	77.98756	15861.40174	352.5787	28.43249836	0.000244146	0.004469193	2.533990417	6.259456087
ORANGE	2015	T7 NNOOS	DSL	853.6414	170533.7677	12463.16	307.097521	0.002785778	0.048271454	27.36946171	6.230804593
ORANGE	2015	T7 NOOS	DSL	286.2948	54896.65204	4179.904	103.7389715	0.001050265	0.016306322	9.245531513	5.937641548
ORANGE	2015	T7 POLA	DSL	990.3	117852.4427	7526.28	228.9577549	0.001185188	0.035988971	20.40540896	5.775549165
ORANGE	2015	T7 Public	DSL	1004.01	20342.20805	3045.497	44.09211058	0.000189262	0.006930666	3.929622514	5.176631592
ORANGE	2015	T7 Single	DSL	1957.12	115034.8863	22584.89	212.5309772	0.003057835	0.03340691	18.94140475	6.073197202
ORANGE	2015	T7 single construction	DSL	648.4355	39349.22032	2931.552	73.41052291	0.001241218	0.011539112	6.542568268	6.014338515
ORANGE	2015	T7 SWCV	DSL	504.7633	20454.26961	1968.577	112.6899173	3.0841E-05	0.017713286	10.04326693	2.036615152
ORANGE	2015	T7 SWCV	NG	436.1367	17342.41715	1700.933	72.82496967	0.124314923	0.014845846	8.417455769	2.060292043
ORANGE	2015	T7 tractor	DSL	1645.52	219522.5076	20898.1	392.3153326	0.006017804	0.061666507	34.96433133	6.278470063
ORANGE	2015	T7 tractor construction	DSL	471.172	32459.64243	2130.15	60.23865965	0.000958818	0.009468678	5.368651898	6.046143994
ORANGE	2015	T7 utility	DSL	63.72	1246.158539	732.78	2.375022653	5.44044E-06	0.00037332	0.211669216	5.887292266
ORANGE	2015	T7IS	GAS	34.66731	1216.506926	693.6235	3.328570517	0.000669358	0.000454836	0.351341278	3.462465136
ORANGE	2015	UBUS	GAS	203.8081	19254.51246	815.2324	49.87718411	0.00025928	0.000613117	5.264696519	3.6572882
ORANGE	2015	UBUS	DSL	71.60128	4274.324673	286.4051	10.57857373	0.000853037	0.001662804	0.942794548	4.533675636
ORANGE	2015	UBUS	NG	627.6821	78791.20498	2510.729	169.9920242	0.869557423	0.034653986	19.64848528	4.010039647
					Sum:						
					84,014,144						

VMT % Breakdown for GHG Inventory (VMT)

	Motorcycles	Passenger Vehicles	Light Trucks	Heavy Trucks	Total	% of Total VMT
Gasoline	0	45,212,991	20,757,104	13654720.91	79,624,816	95.406%
		56.8%	26.1%	17.1%	100.0%	
Diesel		343,994	68,212	3,393,411	3,805,617	4.560%
		9.0%	1.8%	89.2%	100.0%	
Electric		0	11,018	213	11,232	0.013%
		0.0%	98.1%	1.9%	100.0%	
Natural Gas		0	0	17,342	17,342	0.021%
		0.0%	0.0%	100.0%	100.0%	**Check:**
						100.000%

Solid Waste

Source: CalRecycle Jurisdiction Diversion/Disposal Rate Detail for Lake Forest

Year	Total Adjusted Reporting-Year Disposal Amount (tons)
2015	64,856.16

See Clearpath Appendix files for further detail.
Note: Year 2015 data was the latest 'approved' data available.

Wastewater Electricity

1 IRWD Wastewater Treatment Facilities

a.	Electricity Consumption:	149,394,800	kWh/yr	Note:	Year 2015 data estimated
	Natural Gas Consumption:	1,143,800	therms/yr	Source:	Table 4 of the 2012 IRWD GHG Master Plan
b.	2015 Lake Forest Population:	80,070		Source: City of Lake Forest	
c.	2015 Population Served by IRWD:	379,510		Source: IRWD	
	Therefore, Lake Forest proportion:	21.098%			
d.	Therefore, Lake Forest proportion:	**31,519,700.761508300**	kWh/yr		
	and	**241,321.878211378**	therms/yr		

Electricity Emissions Calculations

Emission Factors (MT CO2e/net MWh) (note: total owned and purchased generation MT CO2e emissions intensity factor)

Year: 2015

0.240 Note: CO2e emission factors provided by SCE.
(SCE ESG/Sustainability Template, 2017)

CO2e Emissions (MT CO2e)

2015	
7,562.12064168865	**MT CO2e**

Natural Gas Emissions Caluclations

241,322 therms
24,132 mmBtu

CO2:	1,280,453.8858	kg CO2
	1,280.4538858	MT CO2e
CH4	24,132.1878	g CO2
	0.0241322	MT CO2e
N2O:	2,413.2188	g CO2
	0.0024132	MT CO2e

Emission Factors

CO2	53.06	kg CO2 per mmBtu
CH4	1	g CH4 per mmBtu
N2O	0.1	g N2O per mmBtu

Therms/mmBtu conversion 10 Therms/mmBtu

Global Warming Potential (GWP) Factors (Source: ICLEI's U.S. Community Protocol)

CO2	1
CH4	21
N2O	310

Metric ton conversions

kg/MT	1000
g/MT	1,000,000

SCE Transmission and Distribution Losses

Note: According to a California Energy Commission Staff Report from 2011, CPUC General Rate Case Transmission and Distribution Losses for SCE are approximately 8.1% (see Table ES-1).
Source: https://ww2.energy.ca.gov/2011publications/CEC-200-2011-009/CEC-200-2011-009.pdf

		Total Usage (KWH)
		Year
City	Rate Category	2015
LAKE FOREST, CITY OF	Agricultural	*
LAKE FOREST, CITY OF	Commercial	228,691,710
LAKE FOREST, CITY OF	Industrial	*
LAKE FOREST, CITY OF	Residential	186,731,868
Totals:	**Sum:**	415,423,578
	T&D Loss:	0.0810
		Total T&D Loss (kWH)
		33,649,309.818

Source: SCE ESG/Sustainability Template, 2017.

Emission Factors (MT CO2e/net MWh)

Note: total owned and purchased generation MT CO2e emissions intensity factor

0.240 Note: CO2e emission factors provided by SCE.
(SCE ESG/Sustainability Template, 2017)

or 0.000239917 MT CO2e/net kWh

Therefore:

CO2e Emissions (MT CO2e)

8,073.0506383493

OFFROAD2017 (v1.0.1) Emissions Inventory

Region Type: County
Region: Orange
Calendar Year: 2015
Scenario: All Adopted Rules - Exhaust
Vehicle Classification: OFFROAD2017 Equipment Sectors
Units: Emissions: tons/day, Fuel Consumption: gallons/year, Activity: hours/year, HP-Hours: HP-hours/year

Population:	Lake Forest	Orange County	Lake Forest as proportion of Orange County
	80,070	3,155,578	**2.54%**

Region	CalYr	VehClass	MdlYr	HP_Bin	Fuel	CO2_tpd	Fuel_gpy
Orange	2015	OFFROAD - Construction and Mining	Aggregated	Aggregated	Gasoline	24.95218846	1525973.75
Orange	2015	OFFROAD - Construction and Mining	Aggregated	Aggregated	Diesel	10.99050364	366018.35

Sum 35.94269211

Tons per year 13,119

Tons per year for Lake Forest Only **332.89**

Gasoline Sum 1525973.75

Gasoline GPY for Lake Forest Only **38,720.23387236820**

Diesel Sum 366018.35

Diesel GPY for Lake Forest Only **9,287.39181363921**

Growth Rates Per Period

Based on growth provided by the General Plan (project)
Note: VMT data for 2040 is for "2040 Proposed GP &20-Year Circulation"

As of	Housing	Population	Non-residential Square Footage	Jobs	VMT	
8/1/2019	28,928	81,888	15,315,700	38,039	1,503,178	As provided by the City of Lake Forest (GP)
Add'l margin by buildout	22,406	70,574	12,410,885	14,202	1,247,867	Note: New Growth over existing conditions by buildout (year 2040)
Therefore, In buildout year (year 2040)	**51,334**	**152,462**	**27,726,585**	**52,241**	**2,751,045**	Total numbers are provided by the General Plan land use map by buildout (year 2040)

Therefore,	Housing	Population	Non-residential Square Footage	Jobs	VMT
Annual growth rates (from 2019-2040):	2.7687966576%	3.0040616036%	2.8665710665%	1.5222107053%	2.9199092148%

	Year	Population Projections by year (interpolated)	
1	2019	81,888	
2	2020	84,348	
3	2021	86,882	
4	2022	89,492	
5	2023	92,180	
6	2024	94,949	
7	2025	97,802	
8	2026	100,740	
9	2027	103,766	
10	2028	106,883	
11	2029	110,094	
12	2030	113,401	
13	2031	116,808	
14	2032	120,317	
15	2033	123,931	
16	2034	127,654	
17	2035	131,489	
18	2036	135,439	
19	2037	139,508	
20	2038	143,699	
21	2039	148,016	
22	2040	152,462	checks out
23	2041	157,042	
24	2042	161,760	
25	2043	166,619	
26	2044	171,624	
27	2045	176,780	
28	2046	182,091	
29	2047	187,561	
30	2048	193,195	
31	2049	198,999	
32	2050	204,977	

State Measure Reduction Calculations

State Measure:	**On-road Transportation: Assembly Bill 1493 (Pavley Clean Car Standards) & Advanced Clean Car Standards**	**Renewable Portfolio Standard**	**Title 24 – Building Energy Efficiency Standards**	**AB 341**
Calculation Methodology:	EMFAC2017 to calculate for all on-road transportation emissions	Note: Adjusted forecast to reflect RPS targets (electricity only). Natural gas emission factor stays constant (i.e. is unaffected by RPS).	Note: Adjusted forecast to reflect post-2020 Title 24 updates as they reflect electricity and natural gas (separate for residential vs. commercial/industrial). Accounted for both for electricity and natural gas.	With respect to solid waste generation, the California Department of Resources Recycling and Recovery (CalRecycle) established a target pursuant to AB 341 (Chapter 476, Statutes of 2011) to achieve a statewide waste diversion of 75 percent by 2020, which is equivalent to a disposal rate of 2.7 pounds of waste per resident per day (CalRecycle). Sources: https://calpirgedfund.org/reports/cap/state-waste-california;
Factors:	Summary of on-road weighted CO2 emissions factor (g/mile).	2015 RPS level for SCE (% Renewable) and adjusted to what it would be by 2030, 2040, and 2050.	The California Energy Commission (CEC) states: "Once rooftop solar electricity generation is factored in, homes built under the 2019 standards will use about 53 percent less energy than those under the 2016 standards... [and] Nonresidential buildings will use about 30 percent less energy due mainly to lighting upgrades." (CEC, 2018) ("2019 Buidling Energy Efficiency Standards"). The 2019 standards took effect on January 1, 2020.	The disposal rate for Lake Forest in 2015 was: 4.4 lbs/person/day (CalRecycle - Jurisdiction Diversion/Disposal Rate Detail). Source: https://www2.calrecycle.ca.gov/LGCentral/%20DiversionProgram/JurisdictionDiversionDetail/245/Year/2015
Calculations:	For 2015: **407.587318348487**	2015 SCE eligible renewable %: **25.000%**	New Residential buildings (built starting in 2020) as a percentage reduction (compared with baseline 2015): **53.000%**	Therefore, the percentage reduction in solid waste that would occur to achieve AB 341 by 2020 would be: **-38.636%**
	For 2030: **277.612863922899**	Expected 2030 renewable %: **60.000%**	New Non-residential buildings (built starting in 2020) as a percentage reduction (compared with baseline year 2015): **30.000%**	Reducion in solid waste by 2020, and through the remaining forecast years (2030, 2040, and 2050). This is applied to forecast values (after adjusting for population).
	Overall % Reduction from 2015 by 2030: **-31.8887385780879%**	Expected 2040 renewable %: **90.000%**		
	For 2040: **247.792582221834**	Expected 2050 renewable %: **100.000%**		
	Overall % Reduction from 2015 by 2040: **-39.2050313964942%**	Therefore, electricity emissions from RPS for the following years would be reduced per years as follows (% change formula):		
	For 2050: **244.054659839648**	Year 2030 (compared with 2015): **-46.667%**		
	Overall % Reduction from 2015 by 2050: **-40.1221164513805%**	Year 2040 (compared with 2015): **-86.667%**		
		Year 2050 (compared with 2015): **-100.000%**		

Per Capita Target Calculation for future years (2030, 2040, and 2050)

Year	Total Net Emissions		Applicable to Lake Forest	% Difference	Proportion
1990		430.72	286.7	-33.437%	0.6656296
	CARB's targets		Therefore, targets:		
2030		6	**3.99**		
2040	-		**2.66**		
2050		2	**1.33**		

Summary of Emissions (Baseline) and Future Forecasts

BASELINE YEAR													
Emissions Sectors	**Emissions (MT CO2e)**	**Growth Rate Type to Apply**									Estimate for 2040:	0.4364749	Proportion of post-2020 res. buildings in 2040
												0.4476168	Proportion of post-2020 non-res. buildings in 2040
On-Road Transportation	192,529.41	VMT									2030 Assumption:	0.2182374	Proportion of post-2020 res. buildings in 2030
Off-Road Transportation	438.70	Housing										0.2238084	Proportion of post-2020 non-res. buildings in 2030
Solid Waste	29,389.00	Population				**Electricity and Natural Gas Breakdown**							
Water & Wastewater	31,446.99	Population	% Electricity			Emissions		Emissions					
Commercial Energy	67,817.92	Non-res		80.904%		54,867	electricity	12,951	nat. gas	Note: Comm.			
Industrial Energy	7,602.65	Non-res		66.387%		5,047	electricity	2,555	nat. gas	Note: Ind.			
Residential Energy	79,756.75	Housing		56.171%		44,800	electricity	34,957	nat. gas	Note: Res.			
Upstream Impacts of Activities	8,073.05	Population											
	Sum		**Population**			**Per capita emissions**							
	417,054			80,070		5.21	MT CO2e						

YEAR 2030									
Emissions Sectors	**BAU plus Proposed Project**	**Plus Legislative Actions**	**Legislative Action Applied**	**% Change**					
On-Road Transportation	296,474.94	201,932.82	Pavley	-31.89%					
Off-Road Transportation	660.82	660.82		0.00%					
Solid Waste	45,814.19	28,113.26	AB 341	-38.64%					
Water & Wastewater	49,022.37	43,521.07	RPS (electricity only)	-11.22%					
Commercial Energy	103,623.53	60,169.76	RPS (electricity only) & Title 24	-41.93%					
Industrial Energy	11,616.59	8,017.69	RPS	-30.98%					
Residential Energy	120,139.69	78,393.83	RPS (electricity only) & Title 24	-34.75%					
Upstream Impacts of Activities	12,584.99	6,712.00	RPS	-46.67%					
			Pop. Projection	**Per capita emissions BAU Plus Project**		**Target (MT CO2e)**	**Per capita Emissions w/ Legis. Actions**		**Below Target?**
	639,937	**427,521.24**	113,401	5.64	MT CO2e	3.99	3.769985	MT CO2e	Y
	% Difference:	-33.19%							

YEAR 2040									
Emissions Sectors	**BAU plus Proposed Project**	**Plus Legislative Actions**	**Legislative Action Applied**	**% Change**					
On-Road Transportation	395,350.17	240,353.01	Pavley	-39.21%					
Off-Road Transportation	868.35	868.35		0.00%		**Local Reductions Needed:**		**Local Reductions Needed:**	
Solid Waste	61,594.73	37,796.77	AB 341	-38.64%		**-7.285025%** of total inventory	or	**(31,895.94) MT CO2e**	
Water & Wastewater	65,907.95	52,172.15	RPS (electricity only)	-20.84%					
Commercial Energy	137,467.81	35,563.86	RPS (electricity only) & Title 24	-74.13%					
Industrial Energy	15,410.67	6,544.04	RPS	-57.54%					
Residential Energy	157,869.86	62,274.69	RPS (electricity only) & Title 24	-60.55%					
Upstream Impacts of Activities	16,919.85	2,255.98	RPS	-86.67%					
			Pop. Projection	**Per capita emissions BAU Plus Project**		**Target (MT CO2e)**	**Per capita Emissions w/ Legis. Actions**		**Below Target?**
	851,389	**437,828.85**	152,462	5.58	MT CO2e	2.66	2.871724	MT CO2e	N
	% Difference:	-48.57%							

YEAR 2050									
Emissions Sectors	**BAU plus Proposed Project**	**Plus Legislative Actions**	**Legislative Action Applied**	**% Change**					
On-Road Transportation	527,200.58	315,676.55	Pavley	-40.12%					
Off-Road Transportation	1,141.06	1,141.06		0.00%					
Solid Waste	82,810.81	50,815.73	AB 341	-38.64%					
Water & Wastewater	88,609.71	67,301.57	RPS (electricity only)	-24.05%					
Commercial Energy	182,365.91	30,148.91	RPS (electricity only) & Title 24	-83.47%					
Industrial Energy	20,443.92	6,871.76	RPS	-66.39%					
Residential Energy	207,449.29	69,889.52	RPS (electricity only) & Title 24	-66.31%					
Upstream Impacts of Activities	22,747.83	0.00	RPS	-100.00%					
			Pop. Projection	**Per capita emissions BAU Plus Project**		**Target (MT CO2e)**	**Per capita Emissions w/ Legis. Actions**		**Below Target?**
	1,132,769	**541,845.09**	204,977	5.53	MT CO2e	1.33	2.643443	MT CO2e	N
	% Difference:	-52.17%							

State Reduction Calculation - Commercial Energy 2030

Year: 2030

Commercial Energy

Logic: Take BAU Emissions and Apply two separate adjustments - first, account for the reduction in energy consumption due to the Title 24 Improvements. Second, for what remains, apply the reduction associated with the RPS.

Step 1 Separate electricity and natural gas consumption emissions, based on the proportion associated with each source.

Therefore: **Total BAU Comm. Energy Emissions (year 2030):**

103,623.532

Proportion Elect. And Nat. Gas for this sector (from baseline inventory):

Elect:	Nat. Gas	Total		
54,867	12,951	67,818	Check:	67,818
%				
80.904%	19.096%			

Therefore: **Total BAU Comm. Energy Emissions (year 2030)**

Elect:	Nat. Gas	Total		
83,835.1	19,788.4	103,623.532	Check	103,623.532

Step 2 Calculate the emissions associated with Title 24 reductions on the commercial sector (only for those buildings post-2020).

Step 2a Proportion of non-res buildings in 2030 that would be built after 2020 (based on GP data) - used as a proxy for commercial buildings.

0.223808395

Step 2b % Reduction in total commercial energy emissions associated with the 2020 Title 24

30.0%

Step 2c Apply the applicable (30%) Title 24 reduction to this proportion of the **commercial energy emission**s (reflecting the proportion of non-res. Buildings built after 2020 out of the total non-res. buildings by 2030)
(note: this is appropriate because only the buildings built 2020 and later would actually be eligible to receive this creidit)

Total:	6,957.54	MT CO2e		
Elect. Only:	5,628.90	MT CO2e		
Nat. Gas only:	1,328.65	MT CO2e	Check:	6,957.54

Note: This number reflects the emissions reduction associated with the application of the 2020 Title 24 impact on overall commercial energy usage, only for those buildings built in 2020 and later.

Therefore, total commercial emissions would be reduced to the following values based on this single measure (for commercial emissions in 2030):

Total:	**96,665.99**	**MT CO2e**		
Elect. Only:	**78,206.20**	**MT CO2e**		
Nat. Gas only:	**18,459.79**	**MT CO2e**	Check:	96,665.99

Note: This number reflects the emissions reduction associated with the application of the 2020 Title 24 impact on overall commercial energy usage, only for those buildings built in 2020 and later.

Step 3 For the remaining value (i.e. the emissions remaining after application of the Title 24 credit for post-2020 bulidings), apply the reduction credit associated with the Renewable Portfolio Standard (to the **electricity portion** of the emissions only)

Step 3a % reduction from RPS by this year (applied to electricity emissions only)

46.6667% Note: Year 2030 reduction

Step 3b Total:	36,496.23	MT CO2e		
Elect. Only:	36,496.23	MT CO2e		
Nat. Gas only:	-	MT CO2e	Check:	36,496.23

Therefore, total commercial emissions would be reduced to the following values based on the combination of the two measures (Title 24 and RPS) (for commercial emissions in 2030):

Total:	**60,169.76**	**MT CO2e**		
Elect. Only:	**41,709.97**	**MT CO2e**		
Nat. Gas only:	**18,459.79**	**MT CO2e**	Check:	**60,169.76**

Note: This number reflects the emissions reduction associated with the application of the 2020 Title 24 impact on overall commercial energy usage, only for those buildings built in 2020 and later.

State Reduction Calculation - Residential Energy 2030

Year: 2030

Residential Energy

Logic: Take BAU Emissions and Apply two separate adjustments - first, account for the reduction in energy consumption due to the Title 24 Improvements. Second, for what remains, apply the reduction associated with the RPS.

Step 1 Separate electricity and natural gas consumption emissions, based on the proportion associated with each source.

Therefore: **Total BAU Res. Energy Emissons (year 2030):**
120,139.694
Proportion Elect. And Nat. Gas for this sector (from baseline inventory):

Elect:	Nat. Gas	Total		
44,800	34,957	79,757	Check:	79,757
%				
56.171%	43.829%			

Therefore: **Total BAU Res. Energy Emissions (year 2030)**

Elect:	Nat. Gas	Total		
67,483.7	52,656.0	120,139.694	Check	120,139.694

Step 2 Calculate the emissions associated with Title 24 reductions on the residential sector (only for those buildings post-2020).

Step 2a Proportion of residential buildings in 2030 that would be built after 2020 (based on GP data).
0.218237425

Step 2b % Reduction in total residential energy emissions associated with the 2020 Title 24
53.0%

Step 2c Apply the applicable (53%) Title 24 reduction to this proportion of the **residential energy emission**s (reflecting the proportion of residential buildings built after 2020 out of the total non-res. buildings by 2030)
(note: this is appropriate because only the buildings built 2020 and later would actually be eligible to receive this creidit)

Total:	13,896.06	MT CO2e		
Elect. Only:	7,805.56	MT CO2e		
Nat. Gas only:	6,090.50	MT CO2e	Check:	13,896.06

Note: This number reflects the emissions reduction associated with the application of the 2020 Title 24 impact on overall residential energy usage, only for those buildings built in 2020 and later.

Therefore, total residentiall emissions would be reduced to the following values based on this single measure (for commercial emissions in 2040):

Total:	**106,243.64**	**MT CO2e**		
Elect. Only:	**59,678.16**	**MT CO2e**		
Nat. Gas only:	**46,565.47**	**MT CO2e**	Check:	106,243.64

Note: This number reflects the emissions reduction associated with the application of the 2020 Title 24 impact on overall commercial energy usage, only for those buildings built in 2020 and later.

Step 3 For the remaining value (i.e. the emissions remaining after application of the Title 24 credit for post-2020 bulidings), apply the reduction credit associated with the Renewable Portfolio Standard (to the **electricity portion** of the emissions only)

Step 3a % reduction from RPS by this year (applied to electricity emissions only)
46.6667% Note: Year 2030 reduction

Step 3b

Total:	27,849.81	MT CO2e		
Elect. Only:	27,849.81	MT CO2e		
Nat. Gas only:	-	MT CO2e	Check:	27,849.81

Therefore, total commercial emissions would be reduced to the following values based on the combination of the two measures (Title 24 and RPS) (for commercial emissions in 2040):

Total:	**78,393.83**	**MT CO2e**		
Elect. Only:	**31,828.35**	**MT CO2e**		
Nat. Gas only:	**46,565.47**	**MT CO2e**	Check:	**78,393.83**

Note: This number reflects the emissions reduction associated with the application of the 2020 Title 24 impact on overall commercial energy usage, only for those buildings built in 2020 and later.

State Reduction Calculation - Industrial Energy 2030

Year: 2030

Industrial Energy

Logic: Take BAU Emissions and Apply RPS adjustment (just to the electricity portion of emissions).

Step 1 Separate electricity and natural gas consumption emissions, based on the proportion associated with each source.

Therefore: **Total BAU Ind. Energy Emisisons (year 2030):**

11,616.594

Proportion Elect. And Nat. Gas for this sector (from baseline inventory):

Elect:	Nat. Gas	Total		
5,047	2,555	7,603	Check:	7,603
%				
66.387%	33.613%			

Therefore: **Total BAU Ind. Energy Emissions (year 2030):**

Elect:	Nat. Gas	Total		
7,711.9	3,904.7	11,616.594	Check	11,616.594

Step 3 Apply the reduction credit associated with the Renewable Portfolio Standard (to the **electricity portion** of the emissions only)

Step 3a % reduction from RPS by this year (applied to electricity emissions only)

46.6667% Note: Year 2030 reduction

Step 3b

Total:	3,598.91	MT CO2e		
Elect. Only:	3,598.91	MT CO2e		
Nat. Gas only:	-	MT CO2e	Check:	3,598.91

Therefore, total industrial emissions would be reduced to the following values (for industrial emissions in 2030):

Total:	**8,017.69**	**MT CO2e**		
Elect. Only:	**4,113.03**	**MT CO2e**		
Nat. Gas only:	**3,904.65**	**MT CO2e**	Check:	**8,017.69**

State Reduction Calculation - Water & Wastewater 2030

Year: 2030

Water and Wastewater-related Electricity

Logic: Take BAU Emissions and Apply RPS adjustment (just to the electricity portion of emissions).

Step 1 Separate the sources of water & wastewater emissions emissions, based on the proportion associated with each source.

Therefore: **Total BAU Water & Wastewater Energy Emisisons (year 2030):**

49,022.373

Proportion Elect. And Nat. Gas for this sector (from baseline inventory):

Elect:	Nat. Gas	Nit./Denit.	Lagoons	Total		
7,562.121	1,281.700	217.190	22,386.000	31,447.0	Check:	31,447.0
%						
24.047%	4.076%	0.691%	71.186%	100.000%		

Therefore: **Total BAU Water & Wastewater Emissions (year 2030):**

Elect:	Nat. Gas	Nit./Denit.	Lagoons	Total		
11,788.5	1,998.0	338.6	34,897.3	49,022.373	Check	49,022.373

Step 3 Apply the reduction credit associated with the Renewable Portfolio Standard (to the **electricity portion** of the emissions only)

Step 3a % reduction from RPS by this year (applied to electricity emissions only)

46.6667% Note: Year 2030 reduction

Step 3b

Total:	5,501.30	MT CO2e		
Elect. Only:	5,501.30	MT CO2e		
Nat. Gas only:	-	MT CO2e	Check:	5,501.30

Therefore, total water & wastewater emissions would be reduced to the following values (for water and wastewater emissions in 2030):

Total:	**43,521.07**	**MT CO2e**		
Elect. Only:	**6,287.20**	**MT CO2e**		
Nat. Gas only:	**1,998.03**	**MT CO2e**	Check:	**43,521.073**
Nit./Denit. Only:	**338.57**	**MT CO2e**		
Lagoons only:	**34,897.27**	**MT CO2e**		

State Reduction Calculation - Commercial Energy 2040

Year: 2040

Commercial Energy

Logic: Take BAU Emissions and Apply two separate adjustments - first, account for the reduction in energy consumption due to the Title 24 Improvements. Second, for what remains, apply the reduction associated with the RPS.

Step 1 Separate electricity and natural gas consumption emissions, based on the proportion associated with each source.

Therefore: **Total BAU Comm. Energy Emisisons (year 2040):**

137,467.814

Proportion Elect. And Nat. Gas for this sector (from baseline inventory):

Elect:	Nat. Gas	Total		
54,867	12,951	67,818	Check:	67,818
%				
80.904%	19.096%			

Therefore: **Total BAU Comm. Energy Emissions (year 2040)**

Elect:	Nat. Gas	Total		
111,216.3	26,251.5	137,467.814	Check	137,467.814

Step 2 Calculate the emissions associated with Title 24 reductions on the commercial sector (only for those buildings post-2020).

Step 2a Proportion of non-res buildings in 2040 that would be built after 2020 (based on GP data) - used as a proxy for commercial buildings.

0.447616791

Step 2b % Reduction in total commercial energy emissions associated with the 2020 Title 24

30.0%

Step 2c Apply the applicable (30%) Title 24 reduction to this proportion of the **commercial energy emission**s (reflecting the proportion of non-res. Buildings built after 2020 out of the total non-res. buildings by 2040)
(note: this is appropriate because only the buildings built 2020 and later would actually be eligible to receive this creidit)

Total:	18,459.87	MT CO2e		
Elect. Only:	14,934.69	MT CO2e		
Nat. Gas only:	3,525.18	MT CO2e	Check:	18,459.87

Note: This number reflects the emissions reduction associated with the application of the 2020 Title 24 impact on overall commercial energy usage, only for those buildings built in 2020 and later.

Therefore, total commercial emissions would be reduced to the following values based on this single measure (for commercial emissions in 2040):

Total:	**119,007.94**	**MT CO2e**		
Elect. Only:	**96,281.63**	**MT CO2e**		
Nat. Gas only:	**22,726.31**	**MT CO2e**	Check:	119,007.94

Note: This number reflects the emissions reduction associated with the application of the 2020 Title 24 impact on overall commercial energy usage, only for those buildings built in 2020 and later.

Step 3 For the remaining value (i.e. the emissions remaining after application of the Title 24 credit for post-2020 bulidings), apply the reduction credit associated with the Renewable Portfolio Standard (to the **electricity portion** of the emissions only)

Step 3a % reduction from RPS by this year (applied to electricity emissions only)

86.6667% Note: Year 2040 reduction

Step 3b

Total:	83,444.08	MT CO2e		
Elect. Only:	83,444.08	MT CO2e		
Nat. Gas only:	-	MT CO2e	Check:	83,444.08

Therefore, total commercial emissions would be reduced to the following values based on the combination of the two measures (Title 24 and RPS) (for commercial emissions in 2040):

Total:	**35,563.86**	**MT CO2e**		
Elect. Only:	**12,837.55**	**MT CO2e**		
Nat. Gas only:	**22,726.31**	**MT CO2e**	Check:	**35,563.86**

Note: This number reflects the emissions reduction associated with the application of the 2020 Title 24 impact on overall commercial energy usage, only for those buildings built in 2020 and later.

State Reduction Calculation - Residential Energy 2040

Year: 2040

Residential Energy

Logic: Take BAU Emissions and Apply two separate adjustments - first, account for the reduction in energy consumption due to the Title 24 Improvements. Second, for what remains, apply the reduction associated with the RPS.

Step 1 Separate electricity and natural gas consumption emissions, based on the proportion associated with the source.

Therefore: **Total BAU Res. Energy Emisisons (year 2040):**

157,869.863

Proportion Elect. And Nat. Gas for this sector (from baseline inventory):

Elect:	Nat. Gas	Total		
44,800	34,957	79,757	Check:	79,757
%				
56.171%	43.829%			

Therefore: **Total BAU Res. Energy Emissions (year 2040)**

Elect:	Nat. Gas	Total		
88,677.2	69,192.7	157,869.863	Check	157,869.863

Step 2 Calculate the emissions associated with Title 24 reductions on the residential sector (only for those buildings post-2020).

Step 2a Proportion of residential buildings in 2040 that would be built after 2020 (based on GP data).

0.436474851

Step 2b % Reduction in total residential energy emissions associated with the 2020 Title 24

53.0%

Step 2c Apply the applicable (53%) Title 24 reduction to this proportion of the **residential energy emission**s (reflecting the proportion of residential buildings built after 2020 out of the total non-res. buildings by 2040)
(note: this is appropriate because only the buildings built 2020 and later would actually be eligible to receive this creidit)

Total:	36,520.30	MT CO2e		
Elect. Only:	20,513.83	MT CO2e		
Nat. Gas only:	16,006.47	MT CO2e	Check:	36,520.30

Note: This number reflects the emissions reduction associated with the application of the 2020 Title 24 impact on overall residential energy usage, only for those buildings built in 2020 and later.

Therefore, total residentiall emissions would be reduced to the following values based on this single measure (for commercial emissions in 2040):

Total:	**121,349.56**	**MT CO2e**		
Elect. Only:	**68,163.32**	**MT CO2e**		
Nat. Gas only:	**53,186.25**	**MT CO2e**	Check:	121,349.56

Note: This number reflects the emissions reduction associated with the application of the 2020 Title 24 impact on overall commercial energy usage, only for those buildings built in 2020 and later.

Step 3 For the remaining value (i.e. the emissions remaining after application of the Title 24 credit for post-2020 bulidings), apply the reduction credit associated with the Renewable Portfolio Standard (to the **electricity portion** of the emissions only)

Step 3a % reduction from RPS by this year (applied to electricity emissions only)

86.6667% Note: Year 2040 reduction

Step 3b Total:	59,074.88	MT CO2e		
Elect. Only:	59,074.88	MT CO2e		
Nat. Gas only:	-	MT CO2e	Check:	59,074.88

Therefore, total commercial emissions would be reduced to the following values based on the combination of the two measures (Title 24 and RPS) (for commercial emissions in 2040):

Total:	**62,274.69**	**MT CO2e**		
Elect. Only:	**9,088.44**	**MT CO2e**		
Nat. Gas only:	**53,186.25**	**MT CO2e**	Check:	**62,274.69**

Note: This number reflects the emissions reduction associated with the application of the 2020 Title 24 impact on overall commercial energy usage, only for those buildings built in 2020 and later.

State Reduction Calculation - Industrial Energy 2040

Year: 2040

Industrial Energy

Logic: Take BAU Emissions and Apply RPS adjustment (just to the electricity portion of emissions).

Step 1 Separate electricity and natural gas consumption emissions, based on the proportion associated with each source.

Therefore: **Total BAU Ind. Energy Emisisons (year 2040):**

15,410.667

Proportion Elect. And Nat. Gas for this sector (from baseline inventory):

Elect:	Nat. Gas	Total		
5,047	2,555	7,603	Check:	7,603
%				
66.387%	33.613%			

Therefore: **Total BAU Ind. Energy Emissions (year 2040):**

Elect:	Nat. Gas	Total		
10,230.7	5,179.9	15,410.667	Check	15,410.667

Step 3 Apply the reduction credit associated with the Renewable Portfolio Standard (to the **electricity portion** of the emissions only)

Step 3a % reduction from RPS by this year (applied to electricity emissions only)

86.6667% Note: Year 2040 reduction

Step 3b

Total:	8,866.63	MT CO2e		
Elect. Only:	8,866.63	MT CO2e		
Nat. Gas only:	-	MT CO2e	Check:	8,866.63

Therefore, total industrial emissions would be reduced to the following values (for industrial emissions in 2040):

Total:	**6,544.04**	**MT CO2e**		
Elect. Only:	**1,364.10**	**MT CO2e**		
Nat. Gas only:	**5,179.95**	**MT CO2e**	Check:	**6,544.04**

State Reduction Calculation - Water & Wastewater 2040

Year: 2040

Water and Wastewater-related Electricity

Logic: Take BAU Emissions and Apply RPS adjustment (just to the electricity portion of emissions).

Step 1 Separate the sources of water & wastewater emissions emissions, based on the proportion associated with each source.

Therefore: **Total BAU Water & Wastewater Energy Emisisons (year 2040):**

65,907.954

Proportion Elect. And Nat. Gas for this sector (from baseline inventory):

Elect:	Nat. Gas	Nit./Denit.	Lagoons	Total		
7,562.121	1,281.700	217.190	22,386.000	31,447.0	Check:	31,447.0
%						
24.047%	4.076%	0.691%	71.186%	100.000%		

Therefore: **Total BAU Water & Wastewater Emissions (year 2040):**

Elect:	Nat. Gas	Nit./Denit.	Lagoons	Total				
15,849.0	2,686.2	455.2	46,917.5	65,907.954	Check	65,907.954	Check	15,849.0

Step 3 Apply the reduction credit associated with the Renewable Portfolio Standard (to the **electricity portion** of the emissions only)

Step 3a % reduction from RPS by this year (applied to electricity emissions only)

86.6667% Note: Year 2040 reduction

Step 3b	Total:	13,735.81	MT CO2e	Check:	13,735.81
	Elect. Only:	13,735.81	MT CO2e		
	Nat. Gas only:	-	MT CO2e	Check:	13,735.81

Therefore, total water & wastewater emissions would be reduced to the following values (for water and wastewater emissions in 2040):

Total:	**52,172.15**	**MT CO2e**		
Elect. Only:	**2,113.20**	**MT CO2e**		
Nat. Gas only:	**2,686.24**	**MT CO2e**	Check:	**52,172.148**
Nit./Denit. Only:	**455.20**	**MT CO2e**		
Lagoons only:	**46,917.51**	**MT CO2e**		

State Reduction Calculation - Commercial Energy 2050

Year: 2050

Commercial Energy

Logic: Take BAU Emissions and Apply two separate adjustments - first, account for the reduction in energy consumption due to the Title 24 Improvements. Second, for what remains, apply the reduction associated with the RPS.

Step 1 Separate electricity and natural gas consumption emissions, based on the proportion associated with each source.

Therefore: **Total BAU Comm. Energy Emisisons (year 2050):**

182,365.911

Proportion Elect. And Nat. Gas for this sector (from baseline inventory):

Elect:	Nat. Gas	Total		
54,867	12,951	67,818	Check:	67,818
%				
80.904%	19.096%			

Therefore: **Total BAU Comm. Energy Emissions (year 2050)**

Elect:	Nat. Gas	Total		
147,540.5	34,825.4	182,365.911	Check	182,365.911

Step 2 Calculate the emissions associated with Title 24 reductions on the commercial sector (only for those buildings post-2020).

Step 2a Proportion of non-res buildings in 2050 that would be built after 2020 (based on GP data) - used as a proxy for commercial buildings (conservative estimate).

0.447616791

Step 2b % Reduction in total commercial energy emissions associated with the 2020 Title 24

30.0%

Step 2c Apply the applicable (30%) Title 24 reduction to this proportion of the **commercial energy emission**s (reflecting the proportion of non-res. Buildings built after 2020 out of the total non-res. buildings by 2050)
(note: this is appropriate because only the buildings built 2020 and later would actually be eligible to receive this creidit)

Total:	24,489.01	MT CO2e		
Elect. Only:	19,812.48	MT CO2e		
Nat. Gas only:	4,676.54	MT CO2e	Check:	24,489.01

Note: This number reflects the emissions reduction associated with the application of the 2020 Title 24 impact on overall commercial energy usage, only for those buildings built in 2020 and later.

Therefore, total commercial emissions would be reduced to the following values based on this single measure (for commercial emissions in 2050):

Total:	**157,876.90**	**MT CO2e**		
Elect. Only:	**127,727.99**	**MT CO2e**		
Nat. Gas only:	**30,148.91**	**MT CO2e**	Check:	157,876.90

Note: This number reflects the emissions reduction associated with the application of the 2020 Title 24 impact on overall commercial energy usage, only for those buildings built in 2020 and later.

Step 3 For the remaining value (i.e. the emissions remaining after application of the Title 24 credit for post-2020 bulidings), apply the reduction credit associated with the Renewable Portfolio Standard (to the **electricity portion** of the emissions only)

Step 3a % reduction from RPS by this year (applied to electricity emissions only)

100.0000% Note: Year 2050 reduction

Step 3b

Total:	127,727.99	MT CO2e		
Elect. Only:	127,727.99	MT CO2e		
Nat. Gas only:	-	MT CO2e	Check:	127,727.99

Therefore, total commercial emissions would be reduced to the following values based on the combination of the two measures (Title 24 and RPS) (for commercial emissions in 2050):

Total:	**30,148.91**	**MT CO2e**		
Elect. Only:	**-**	**MT CO2e**		
Nat. Gas only:	**30,148.91**	**MT CO2e**	Check:	**30,148.91**

Note: This number reflects the emissions reduction associated with the application of the 2020 Title 24 impact on overall commercial energy usage, only for those buildings built in 2020 and later.

State Reduction Calculation - Residential Energy 2050

Year: 2050

Residential Energy

Logic: Take BAU Emissions and Apply two separate adjustments - first, account for the reduction in energy consumption due to the Title 24 Improvements. Second, for what remains, apply the reduction associated with the RPS.

Step 1 Separate electricity and natural gas consumption emissions, based on the proportion associated with each source.

Therefore: **Total BAU Res. Energy Emisisons (year 2050):**
207,449.287
Proportion Elect. And Nat. Gas for this sector (from baseline inventory):

Elect:	Nat. Gas	Total		
44,800	34,957	79,757	Check:	79,757
%				
56.171%	43.829%			

Therefore: **Total BAU Res. Energy Emissions (year 2050)**

Elect:	Nat. Gas	Total		
116,526.4	90,922.9	207,449.287	Check	207,449.287

Step 2 Calculate the emissions associated with Title 24 reductions on the residential sector (only for those buildings post-2020).

Step 2a Proportion of residential buildings in 2050 that would be built after 2020 (based on GP data) (conservative estimate).
0.436474851

Step 2b % Reduction in total residential energy emissions associated with the 2020 Title 24
53.0%

Step 2c Apply the applicable (53%) Title 24 reduction to this proportion of the **residential energy emission**s (reflecting the proportion of residential buildings built after 2020 out of the total non-res. buildings by 2050)
(note: this is appropriate because only the buildings built 2020 and later would actually be eligible to receive this creidit)

Total:	47,989.59	MT CO2e		
Elect. Only:	26,956.25	MT CO2e		
Nat. Gas only:	21,033.34	MT CO2e	Check:	47,989.59

Note: This number reflects the emissions reduction associated with the application of the 2020 Title 24 impact on overall residential energy usage, only for those buildings built in 2020 and later.

Therefore, total residentiall emissions would be reduced to the following values based on this single measure (for commercial emissions in 2050):

Total:	**159,459.70**	**MT CO2e**		
Elect. Only:	**89,570.18**	**MT CO2e**		
Nat. Gas only:	**69,889.52**	**MT CO2e**	Check:	159,459.70

Note: This number reflects the emissions reduction associated with the application of the 2020 Title 24 impact on overall commercial energy usage, only for those buildings built in 2020 and later.

Step 3 For the remaining value (i.e. the emissions remaining after application of the Title 24 credit for post-2020 bulidings), apply the reduction credit associated with the Renewable Portfolio Standard (to the **electricity portion** of the emissions only)

Step 3a % reduction from RPS by this year (applied to electricity emissions only)
100.0000% Note: Year 2050 reduction

Step 3b

Total:	89,570.18	MT CO2e		
Elect. Only:	89,570.18	MT CO2e		
Nat. Gas only:	-	MT CO2e	Check:	89,570.18

Therefore, total commercial emissions would be reduced to the following values based on the combination of the two measures (Title 24 and RPS) (for commercial emissions in 2050):

Total:	**69,889.52**	**MT CO2e**		
Elect. Only:	**-**	**MT CO2e**		
Nat. Gas only:	**69,889.52**	**MT CO2e**	Check:	**69,889.52**

Note: This number reflects the emissions reduction associated with the application of the 2020 Title 24 impact on overall commercial energy usage, only for those buildings built in 2020 and later.

State Reduction Calculation - Industrial Energy 2050

Year: 2050

Industrial Energy

Logic: Take BAU Emissions and Apply RPS adjustment (just to the electricity portion of emissions).

Step 1 Separate electricity and natural gas consumption emissions, based on the proportion associated with each source.

Therefore: **Total BAU Ind. Energy Emisisons (year 2050):**

20,443.915

Proportion Elect. And Nat. Gas for this sector (from baseline inventory):

Elect:	Nat. Gas	Total		
5,047	2,555	7,603	Check:	7,603
%				
66.387%	33.613%			

Therefore: **Total BAU Ind. Energy Emissions (year 2050):**

Elect:	Nat. Gas	Total		
13,572.2	6,871.8	20,443.915	Check	20,443.915

Step 3 Apply the reduction credit associated with the Renewable Portfolio Standard (to the **electricity portion** of the emissions only)

Step 3a % reduction from RPS by this year (applied to electricity emissions only)

100.0000% Note: Year 2050 reduction

Step 3b

Total:	13,572.16	MT CO2e		
Elect. Only:	13,572.16	MT CO2e		
Nat. Gas only:	-	MT CO2e	Check:	13,572.16

Therefore, total industrial emissions would be reduced to the following values (for industrial emissions in 2050):

Total:	**6,871.76**	**MT CO2e**		
Elect. Only:	**-**	**MT CO2e**		
Nat. Gas only:	**6,871.76**	**MT CO2e**	Check:	**6,871.76**

State Reduction Calculation - Water & Wastewater 2050

Year: 2050

Water and Wastewater-related Electricity

Logic: Take BAU Emissions and Apply RPS adjustment (just to the electricity portion of emissions).

Step 1 Separate the sources of water & wastewater emissions emissions, based on the proportion associated with each source.

Therefore: **Total BAU Water & Wastewater Energy Emisisons (year 2050):**

88,609.713

Proportion Elect. And Nat. Gas for this sector (from baseline inventory):

Elect:	Nat. Gas	Nit./Denit.	Lagoons	Total		
7,562.121	1,281.700	217.190	22,386.000	31,447.0	Check:	31,447.0
%						
24.047%	4.076%	0.691%	71.186%	100.000%		

Therefore: **Total BAU Water & Wastewater Emissions (year 2050):**

Elect:	Nat. Gas	Nit./Denit.	Lagoons	Total				
21,308.1	3,611.5	612.0	63,078.1	88,609.713	Check	88,609.713	Check	21,308.1

Step 3 Apply the reduction credit associated with the Renewable Portfolio Standard (to the **electricity portion** of the emissions only)

Step 3a % reduction from RPS by this year (applied to electricity emissions only)

100.0000% Note: Year 2050 reduction

Step 3b	Total:	21,308.14	MT CO2e	Check:	21,308.14
	Elect. Only:	21,308.14	MT CO2e		
	Nat. Gas only:	-	MT CO2e	Check:	21,308.14

Therefore, total water & wastewater emissions would be reduced to the following values (for water and wastewater emissions in 2050):

Total:	**67,301.57**	**MT CO2e**					
Elect. Only:	**-**	**MT CO2e**					
Nat. Gas only:	**3,611.51**	**MT CO2e**	Check:	**67,301.572**	Check	21,308.14	
Nit./Denit. Only:	**611.99**	**MT CO2e**					
Lagoons only:	**63,078.08**	**MT CO2e**					

APPENDIX A.3 – EMFAC2017 EMISSION RATE OUTPUT FILES

Files

a. EMFAC2017 Orange County Emission Rates – Year 2015

b. EMFAC2017 Orange County Emission Rates – Year 2030

c. EMFAC2017 Orange County Emission Rates – Year 2040

d. EMFAC2017 Orange County Emission Rates – Year 2050

EMFAC2017 (v1.0.2) Emission Rates
Region Type: County
Region: ORANGE
Calendar Year: 2015
Season: Annual
Vehicle Classification: EMFAC2011 Categories
Units: miles/day for VMT, trips/day for Trips, g/mile for RUNEX, PMBW and PMTW, g/trip for STREX, HTSK and RUNLS, g/vehicle/day for IDLEX, RESTL and DIURN

Weighted CO2 Emission Factor (g/mile)
Gasoline: **378.081088227205**
Diesel: **994.480977158771**
Combined: **407.5873183**

Weighted CH4 Emission Factor (g/mile)
Gasoline: **0.010445839147**
Diesel: **0.011617427571**
Combined: **0.021175663**

Weighted N2O Emission Factor (g/mile)
Gasoline: **0.011541333021**
Diesel: **0.156318560646**
Combined: **0.018750358**

									408.7669211					
Region	Calendar Y	Vehicle Cat	Model Yea	Speed	Fuel	Population	VMT	Trips	CO2_RUNEX	CH4_RUNEX	N2O_RUNEX	g of CO2 (derived)	g of CH4 (derived)	g of N2O (derived)
ORANGE	2015	All Other B	Aggregate	Aggregate	DSL	421.89	20363.39	3543.876	1116.45106	0.025861004	0.17549056	22734727.1	526.6176715	3573.582495
ORANGE	2015	LDA	Aggregate	Aggregate	DSL	8500.232	343994.2	39914.57	238.845899	0.001526145	0.03754325	82161604.7	524.9851102	12914.66009
ORANGE	2015	LDT1	Aggregate	Aggregate	DSL	101.113	2001.469	348.8419	438.7789	0.014322393	0.06896993	878202.156	28.66581889	138.0411493
ORANGE	2015	LDT2	Aggregate	Aggregate	DSL	1342.395	66210.28	6733.059	330.196712	0.001124991	0.05190232	21862416.4	74.48595109	3436.467407
ORANGE	2015	LHD1	Aggregate	Aggregate	DSL	15356.65	617411.6	193167.4	513.275354	0.00561901	0.08067974	316902143	3469.242014	49812.60374
ORANGE	2015	LHD2	Aggregate	Aggregate	DSL	5885.739	243452.7	74035.19	565.011049	0.004789475	0.08881187	137553474	1166.010756	21621.4906
ORANGE	2015	MDV	Aggregate	Aggregate	DSL	3348.284	149549.5	16671.76	437.290548	0.0008822	0.06873598	65396592.2	131.9325909	10279.43359
ORANGE	2015	MH	Aggregate	Aggregate	DSL	2648.197	28987.44	264.8197	1006.74251	0.003824897	0.1582459	29182892.1	110.8739976	4587.144245
ORANGE	2015	Motor Coa	Aggregate	Aggregate	DSL	126.26	14359.94	1843.396	1662.56234	0.023616422	0.26133165	23874293.6	339.1303824	3752.706484
ORANGE	2015	PTO	Aggregate	Aggregate	DSL	0	22841.6	0	2213.40683	0.048620082	0.34791673	50557763.6	1110.560692	7946.976381
ORANGE	2015	SBUS	Aggregate	Aggregate	DSL	1283.75	39679.56	14814.3	1311.72793	0.014552503	0.20618536	52048784	577.4368887	8181.344028
ORANGE	2015	T6 Ag	Aggregate	Aggregate	DSL	4.11	30.94537	18.084	1176.5001	0.061199925	0.18492943	36407.23	1.893854272	5.722709558
ORANGE	2015	T6 CAIRP h	Aggregate	Aggregate	DSL	82.91997	14298.35	1210.632	1014.57065	0.007462539	0.15947638	14506681.8	106.7019618	2280.248367
ORANGE	2015	T6 CAIRP s	Aggregate	Aggregate	DSL	37.08289	1985.361	541.4103	1077.43469	0.01178386	0.16935773	2139097.15	23.39521898	336.2362832
ORANGE	2015	T6 instate	Aggregate	Aggregate	DSL	373.2896	22081.6	1687.628	1090.16241	0.020284112	0.17135835	24072525.2	447.9055545	3783.865725
ORANGE	2015	T6 instate	Aggregate	Aggregate	DSL	2476.25	117069.6	11195.03	1090.50724	0.018383721	0.17141255	127665232	2152.174663	20067.19662
ORANGE	2015	T6 instate l	Aggregate	Aggregate	DSL	3578.68	442280.6	41297.47	1035.9671	0.013855447	0.1628396	458188117	6127.994878	72020.79134
ORANGE	2015	T6 instate	Aggregate	Aggregate	DSL	16638.22	780184.7	192002.8	1076.6351	0.015378503	0.16923205	839974203	11998.07219	132032.2473
ORANGE	2015	T6 OOS he	Aggregate	Aggregate	DSL	47.5737	8196.347	694.576	1014.58978	0.007649953	0.15947938	8315930.29	62.70166972	1307.148436
ORANGE	2015	T6 OOS sm	Aggregate	Aggregate	DSL	21.30468	1139.422	311.0483	1077.53765	0.0118348	0.16937391	1227770.14	13.48483216	192.9883687
ORANGE	2015	T6 Public	Aggregate	Aggregate	DSL	966.07	14183.72	2930.412	1157.13331	0.003719593	0.18188524	16412459.7	52.7576761	2579.810106
ORANGE	2015	T6 utility	Aggregate	Aggregate	DSL	306.08	5243.428	3519.92	1077.57367	0.001513219	0.16937957	5650180.32	7.934457902	888.1296631
ORANGE	2015	T7 Ag	Aggregate	Aggregate	DSL	1	30.80417	4.4	1739.38661	0.027537665	0.27340735	53580.3525	0.8482748	8.422085266
ORANGE	2015	T7 CAIRP	Aggregate	Aggregate	DSL	729.02	139732	10643.69	1560.10535	0.013604905	0.24522683	217996710	1901.041192	34266.04696
ORANGE	2015	T7 CAIRP c	Aggregate	Aggregate	DSL	77.98756	15861.4	352.5787	1608.10743	0.013581319	0.25277209	25506838.1	215.4187584	4009.319738
ORANGE	2015	T7 NNOOS	Aggregate	Aggregate	DSL	853.6414	170533.8	12463.16	1492.22775	0.011310127	0.23455742	254475220	1928.758496	39999.96076
ORANGE	2015	T7 NOOS	Aggregate	Aggregate	DSL	286.2948	54896.65	4179.904	1560.163	0.013717361	0.2452359	85647725.5	753.0371934	13462.62974
ORANGE	2015	T7 POLA	Aggregate	Aggregate	DSL	990.3	117852.4	7526.28	1679.86924	0.007838673	0.26405205	197976693	923.8068074	31119.17917
ORANGE	2015	T7 Public	Aggregate	Aggregate	DSL	1004.01	20342.21	3045.497	1794.26517	0.005571157	0.2820335	36499315.3	113.3296408	5737.184084
ORANGE	2015	T7 Single	Aggregate	Aggregate	DSL	1957.12	115034.9	22584.89	1619.55365	0.022148031	0.25457128	186305170	2547.796263	29284.57823
ORANGE	2015	T7 single c	Aggregate	Aggregate	DSL	648.4355	39349.22	2931.552	1650.05072	0.026672995	0.259365	64928209.4	1049.561576	10205.81034
ORANGE	2015	T7 SWCV	Aggregate	Aggregate	DSL	504.7633	20454.27	1968.577	4886.81295	0.00024898	0.76813894	99956189.7	5.092706573	15711.72105
ORANGE	2015	T7 tractor	Aggregate	Aggregate	DSL	1645.52	219522.5	20898.1	1594.70653	0.024124821	0.25066566	350073977	5295.941166	55026.75414
ORANGE	2015	T7 tractor	Aggregate	Aggregate	DSL	471.172	32459.64	2130.15	1638.25712	0.025390186	0.25751121	53177240.3	824.1563611	8358.721641
ORANGE	2015	T7 utility	Aggregate	Aggregate	DSL	63.72	1246.159	732.78	1634.91094	0.002615874	0.25698523	2037358.22	3.259794259	320.244341
ORANGE	2015	UBUS	Aggregate	Aggregate	DSL	71.60128	4274.325	286.4051	2245.20226	0.181049103	0.35291453	9596723.41	773.8626464	1508.471277
ORANGE	2015	LDA	Aggregate	Aggregate	ELEC	7899.331	283384.5	40345.82	0	0	0	0	0	0
ORANGE	2015	LDT1	Aggregate	Aggregate	ELEC	243.6341	7859.296	1196.603	0	0	0	0	0	0
ORANGE	2015	LDT2	Aggregate	Aggregate	ELEC	90.5202	3159.065	458.4901	0	0	0	0	0	0
ORANGE	2015	MDV	Aggregate	Aggregate	ELEC	9.629808	213.4874	41.81367	0	0	0	0	0	0
ORANGE	2015	LDA	Aggregate	Aggregate	GAS	1146196	45212991	5398304	311.711071	0.00715264	0.00869682	1.4093E+10	323392.2591	393209.4128
ORANGE	2015	LDT1	Aggregate	Aggregate	GAS	111302.3	4012068	503083.4	363.829882	0.017511865	0.01748521	1459710143	70258.78936	70151.84511
ORANGE	2015	LDT2	Aggregate	Aggregate	GAS	427603.9	16745036	2010881	404.849879	0.008720219	0.01242376	6779225822	146020.382	208036.3588
ORANGE	2015	LHD1	Aggregate	Aggregate	GAS	34488.19	1256541	513822.7	835.518534	0.014279252	0.02222324	1049863364	17942.4672	27924.41919
ORANGE	2015	LHD2	Aggregate	Aggregate	GAS	6341.229	243090.3	94474.86	954.437196	0.008330277	0.01953798	232014386	2025.009295	4749.49306
ORANGE	2015	MCY	Aggregate	Aggregate	GAS	48501.49	357086	97002.98	214.063319	0.367127151	0.06598882	76439023.9	13109 5.9822	23563.68557
ORANGE	2015	MDV	Aggregate	Aggregate	GAS	299850.1	11357092	1399823	487.049338	0.011250095	0.01522141	5531464288	127768.364	172870.9647
ORANGE	2015	MH	Aggregate	Aggregate	GAS	8141.04	75326.21	814.4296	1749.8741	0.036376309	0.03934247	131811392	2740.089636	2963.519656
ORANGE	2015	OBUS	Aggregate	Aggregate	GAS	1017.871	50584.22	20365.56	1750.48596	0.021653417	0.0356699	88546964.6	1095.321175	1804.334012
ORANGE	2015	SBUS	Aggregate	Aggregate	GAS	463.5997	20386.45	1854.399	921.454209	0.047315179	0.04634949	18785180.9	964.5885568	944.9016694
ORANGE	2015	T6TS	Aggregate	Aggregate	GAS	6244.93	365585	124948.6	1722.84774	0.023691661	0.03534056	629847305	8661.315941	12919.9807
ORANGE	2015	T7IS	Aggregate	Aggregate	GAS	34.66731	1216.507	693.6235	2423.30638	0.499159643	0.32830864	2947969	607.2311629	399.3897357
ORANGE	2015	UBUS	Aggregate	Aggregate	GAS	203.8081	19254.51	815.2324	2345.6168	0.006824731	0.02563417	45163708	131.4068714	493.5734113
ORANGE	2015	T7 SWCV	Aggregate	Aggregate	NG	436.1367	17342.42	1700.933	3696.3373	6.464594054	0.75352254	64103423.4	112111.6868	13067.9022
ORANGE	2015	UBUS	Aggregate	Aggregate	NG	627.6821	78791.2	2510.729	1957.25163	10.01189728	0.39899855	154214214	788849.4512	31437.57645
											Sum			
												3.4243E+10	Sum 1779055.214	Sum 1575295.236

EMFAC2017 (v1.0.2) Emission Rates
Region Type: County
Region: ORANGE
Calendar Year: 2030
Season: Annual
Vehicle Classification: EMFAC2011 Categories
Units: miles/day for VMT, trips/day for Trips, g/mile for RUNEX, PMBW and PMTW, g/trip for STREX, HTSK and RUNLS, g/vehicle/day for IDLEX, RESTL and DIURN

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	Population	VMT	Trips	CO2_RUNEX	**g of CO2 (derived)**	**Weighted Emission Factor (g/mile)**
ORANGE	2030	All Other Buses	Aggregated	Aggregated	DSL	642.765	35309.68	5399.226	832.4490219	29,393,510	**277.612863922899**
ORANGE	2030	LDA	Aggregated	Aggregated	GAS	1446144	51235695	6839333	216.1938743	11,076,843,391	
ORANGE	2030	LDA	Aggregated	Aggregated	DSL	16626.8	609778.6	79608.08	170.3050929	103,848,393	
ORANGE	2030	LDA	Aggregated	Aggregated	ELEC	69007.34	2748528	337685.7	0	-	
ORANGE	2030	LDT1	Aggregated	Aggregated	GAS	170086.9	5755462	787120.5	255.9332578	1,473,014,116	
ORANGE	2030	LDT1	Aggregated	Aggregated	DSL	20.44992	708.054	94.11997	322.3017639	228,207	
ORANGE	2030	LDT1	Aggregated	Aggregated	ELEC	4036.461	163945.7	19879.22	0	-	
ORANGE	2030	LDT2	Aggregated	Aggregated	GAS	488156.3	16784690	2278640	260.4735557	4,371,967,846	
ORANGE	2030	LDT2	Aggregated	Aggregated	DSL	4439.369	161307.1	21237.88	232.0072317	37,424,407	
ORANGE	2030	LDT2	Aggregated	Aggregated	ELEC	14375.28	402022	70674.64	0	-	
ORANGE	2030	LHD1	Aggregated	Aggregated	GAS	34594.73	1189793	515409.9	714.6293217	850,260,704	
ORANGE	2030	LHD1	Aggregated	Aggregated	DSL	32340.7	1177962	406805.4	414.3384746	488,074,786	
ORANGE	2030	LHD2	Aggregated	Aggregated	GAS	6400.169	209510.2	95352.98	826.2946765	173,117,138	
ORANGE	2030	LHD2	Aggregated	Aggregated	DSL	13022.56	458716.3	163807.4	458.1676221	210,168,976	
ORANGE	2030	MCY	Aggregated	Aggregated	GAS	70824.86	453260	141649.7	214.5439371	97,244,185	
ORANGE	2030	MDV	Aggregated	Aggregated	GAS	318161.6	10565920	1471676	322.4326362	3,406,797,561	
ORANGE	2030	MDV	Aggregated	Aggregated	DSL	9930.976	350157.5	47281.93	304.3169657	106,558,868	
ORANGE	2030	MDV	Aggregated	Aggregated	ELEC	9741.011	277985.7	48223.64	0	-	
ORANGE	2030	MH	Aggregated	Aggregated	GAS	6410.728	62056.92	641.3293	1456.719366	90,399,512	
ORANGE	2030	MH	Aggregated	Aggregated	DSL	3360.158	28787.88	336.0158	881.4055676	25,373,794	
ORANGE	2030	Motor Coach	Aggregated	Aggregated	DSL	174.3342	20392.6	2545.279	1246.517494	25,419,734	
ORANGE	2030	OBUS	Aggregated	Aggregated	GAS	1068.244	42968.51	21373.43	1445.578166	62,114,347	
ORANGE	2030	PTO	Aggregated	Aggregated	DSL	0	40093.16	0	1776.997034	71,245,423	
ORANGE	2030	SBUS	Aggregated	Aggregated	GAS	756.489	29318.97	3025.956	805.5177948	23,616,950	
ORANGE	2030	SBUS	Aggregated	Aggregated	DSL	1153.57	36594.02	13312.04	1096.99156	40,143,333	
ORANGE	2030	T6 Ag	Aggregated	Aggregated	DSL	1.010227	2.203738	4.444999	1053.137019	2,321	
ORANGE	2030	T6 CAIRP heavy	Aggregated	Aggregated	DSL	118.383	21046.32	1728.392	696.5478704	14,659,770	
ORANGE	2030	T6 CAIRP small	Aggregated	Aggregated	DSL	60.40888	2770.85	881.9696	768.8374042	2,130,333	
ORANGE	2030	T6 instate construct	Aggregated	Aggregated	DSL	456.3058	27748.34	2062.941	867.9058686	24,082,945	
ORANGE	2030	T6 instate construct	Aggregated	Aggregated	DSL	2959.962	147112.9	13381.87	811.6187468	119,399,549	
ORANGE	2030	T6 instate heavy	Aggregated	Aggregated	DSL	6832.928	786202.4	78851.04	759.4539885	597,084,568	
ORANGE	2030	T6 instate small	Aggregated	Aggregated	DSL	23934.72	1106377	276203.3	807.7745181	893,703,090	
ORANGE	2030	T6 OOS heavy	Aggregated	Aggregated	DSL	66.9385	11930.09	977.302	696.2101225	8,305,852	
ORANGE	2030	T6 OOS small	Aggregated	Aggregated	DSL	36.64417	1673.594	535.0049	769.1768979	1,287,290	
ORANGE	2030	T6 Public	Aggregated	Aggregated	DSL	794.7672	12322.88	2410.794	886.143839	10,919,845	
ORANGE	2030	T6 utility	Aggregated	Aggregated	DSL	365.9906	6084.923	4208.892	781.9720676	4,758,240	
ORANGE	2030	T6TS	Aggregated	Aggregated	GAS	6954.805	296804.8	139151.7	1504.405915	446,514,937	
ORANGE	2030	T7 Ag	Aggregated	Aggregated	DSL	1.928627	8.737526	8.485961	1623.307501	14,184	
ORANGE	2030	T7 CAIRP	Aggregated	Aggregated	DSL	990.2343	198072.4	14457.42	1024.942818	203,012,923	
ORANGE	2030	T7 CAIRP constructi	Aggregated	Aggregated	DSL	108.1854	19931.87	489.1019	1097.652209	21,878,264	
ORANGE	2030	T7 NNOOS	Aggregated	Aggregated	DSL	1347.409	241478.7	19672.17	967.1350537	233,542,504	
ORANGE	2030	T7 NOOS	Aggregated	Aggregated	DSL	394.9513	77824.11	5766.289	1027.795466	79,987,270	
ORANGE	2030	T7 POLA	Aggregated	Aggregated	DSL	1496.831	255327.4	11375.92	1254.353767	320,270,926	
ORANGE	2030	T7 Public	Aggregated	Aggregated	DSL	1079.722	21870.65	3275.156	1353.628164	29,604,733	
ORANGE	2030	T7 Single	Aggregated	Aggregated	DSL	2729.123	201917.2	31493.7	1219.520968	246,242,207	
ORANGE	2030	T7 single constructi	Aggregated	Aggregated	DSL	695.7436	49447.31	3145.43	1225.038621	60,574,863	
ORANGE	2030	T7 SWCV	Aggregated	Aggregated	DSL	145.7228	5953.999	568.319	4862.493858	28,951,282	
ORANGE	2030	T7 SWCV	Aggregated	Aggregated	NG	1344.396	54788.96	5243.145	2983.300765	163,451,958	
ORANGE	2030	T7 tractor	Aggregated	Aggregated	DSL	2553.708	294896.7	32432.09	1123.005102	331,170,547	
ORANGE	2030	T7 tractor construct	Aggregated	Aggregated	DSL	584.2723	40789.68	2641.472	1228.405288	50,106,254	
ORANGE	2030	T7 utility	Aggregated	Aggregated	DSL	71.4775	1448.085	821.9912	1313.818403	1,902,520	
ORANGE	2030	T7IS	Aggregated	Aggregated	GAS	14.02233	1824.357	280.5587	1681.814711	3,068,230	
ORANGE	2030	UBUS	Aggregated	Aggregated	GAS	222.289	21000.48	889.1561	1885.768823	39,602,041	
ORANGE	2030	UBUS	Aggregated	Aggregated	DSL	0	0	0	0	-	
ORANGE	2030	UBUS	Aggregated	Aggregated	NG	782.2239	90597.75	3128.895	2031.509072	184,050,161	
									Sum		
										26,883,534,785	

EMFAC2017 (v1.0.2) Emission Rates
Region Type: County
Region: ORANGE
Calendar Year: 2040
Season: Annual
Vehicle Classification: EMFAC2011 Categories
Units: miles/day for VMT, trips/day for Trips, g/mile for RUNEX, PMBW and PMTW, g/trip for STREX, HTSK and RUNLS, g/vehicle/day for IDLEX, RESTL and DIURN

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	Population	VMT	Trips	CO2_RUNEX	**g of CO2 (derived)**	**Weighted Emission Factor (g/mile)**
ORANGE	2040	All Other Buses	Aggregated	Aggregated	DSL	755.0402	40267.56	6342.338	775.0392916	31,208,938	**247.792582221834**
ORANGE	2040	LDA	Aggregated	Aggregated	GAS	1582685	52652247	7463206	196.7426604	10,358,943,062	
ORANGE	2040	LDA	Aggregated	Aggregated	DSL	19404.32	653803	91977.51	157.0171309	102,658,277	
ORANGE	2040	LDA	Aggregated	Aggregated	ELEC	99687.04	3504424	476430.9	0	-	
ORANGE	2040	LDT1	Aggregated	Aggregated	GAS	194475.2	6110029	894231.6	230.4253019	1,407,905,392	
ORANGE	2040	LDT1	Aggregated	Aggregated	DSL	25.5654	827.2651	119.2532	299.113734	247,446	
ORANGE	2040	LDT1	Aggregated	Aggregated	ELEC	6911.691	237054.4	32761.91	0	-	
ORANGE	2040	LDT2	Aggregated	Aggregated	GAS	526969.3	17096889	2453408	227.6163357	3,891,531,155	
ORANGE	2040	LDT2	Aggregated	Aggregated	DSL	5296.556	175287.3	24934.14	209.3937447	36,704,055	
ORANGE	2040	LDT2	Aggregated	Aggregated	ELEC	22773.47	547642.4	108422.9	0	-	
ORANGE	2040	LHD1	Aggregated	Aggregated	GAS	35398.89	1167778	527390.7	653.9108404	763,622,592	
ORANGE	2040	LHD1	Aggregated	Aggregated	DSL	40246.32	1322787	506248.1	382.0646649	505,390,166	
ORANGE	2040	LHD2	Aggregated	Aggregated	GAS	6555.765	206607.2	97671.14	753.8259196	155,745,876	
ORANGE	2040	LHD2	Aggregated	Aggregated	DSL	16331.07	517672.3	205424.4	422.8363755	218,890,692	
ORANGE	2040	MCY	Aggregated	Aggregated	GAS	83552.73	478890.3	167105.5	214.1123029	102,536,299	
ORANGE	2040	MDV	Aggregated	Aggregated	GAS	338991.4	10660563	1565483	278.3209485	2,967,058,130	
ORANGE	2040	MDV	Aggregated	Aggregated	DSL	11876.49	382113	55571.43	272.6076124	104,166,900	
ORANGE	2040	MDV	Aggregated	Aggregated	ELEC	16408.88	395657.9	78199.19	0	-	
ORANGE	2040	MH	Aggregated	Aggregated	GAS	6757.148	63292.33	675.9851	1334.451923	84,460,569	
ORANGE	2040	MH	Aggregated	Aggregated	DSL	3605.599	29119.5	360.5599	811.0428879	23,617,164	
ORANGE	2040	Motor Coach	Aggregated	Aggregated	DSL	184.0291	22762.52	2686.825	1130.67259	25,736,956	
ORANGE	2040	OBUS	Aggregated	Aggregated	GAS	1186.803	44315.21	23745.56	1325.800157	58,753,113	
ORANGE	2040	PTO	Aggregated	Aggregated	DSL	0	46381.77	0	1586.692232	73,593,598	
ORANGE	2040	SBUS	Aggregated	Aggregated	GAS	939.7427	34439.47	3758.971	736.6930887	25,371,320	
ORANGE	2040	SBUS	Aggregated	Aggregated	DSL	1222.841	39043.12	14111.41	922.0456959	35,999,539	
ORANGE	2040	T6 CAIRP heavy	Aggregated	Aggregated	DSL	141.2692	23517.26	2062.531	647.9625354	15,238,305	
ORANGE	2040	T6 CAIRP small	Aggregated	Aggregated	DSL	72.09447	3089.708	1052.579	718.2509493	2,219,186	
ORANGE	2040	T6 instate construc	Aggregated	Aggregated	DSL	383.1318	25115	1732.124	800.4454601	20,103,191	
ORANGE	2040	T6 instate construc	Aggregated	Aggregated	DSL	2676.151	133151.8	12098.77	735.1799144	97,890,494	
ORANGE	2040	T6 instate heavy	Aggregated	Aggregated	DSL	8895.473	917923.7	102652.5	695.6851117	638,585,863	
ORANGE	2040	T6 instate small	Aggregated	Aggregated	DSL	27118.88	1226308	312948.1	733.9497898	900,048,529	
ORANGE	2040	T6 OOS heavy	Aggregated	Aggregated	DSL	79.52448	13324.28	1161.057	647.5408845	8,628,018	
ORANGE	2040	T6 OOS small	Aggregated	Aggregated	DSL	44.13557	1870.435	644.3793	719.4563657	1,345,696	
ORANGE	2040	T6 Public	Aggregated	Aggregated	DSL	798.4915	12360.52	2422.091	769.4634913	9,510,967	
ORANGE	2040	T6 utility	Aggregated	Aggregated	DSL	390.9695	6520.302	4496.149	718.7407091	4,686,406	
ORANGE	2040	T6TS	Aggregated	Aggregated	GAS	6070.05	246613	121449.6	1333.740317	328,917,756	
ORANGE	2040	T7 Ag	Aggregated	Aggregated	DSL	1.54448	5.305284	6.79571	1617.408413	8,581	
ORANGE	2040	T7 CAIRP	Aggregated	Aggregated	DSL	1044.641	221007.2	15251.75	897.1889522	198,285,257	
ORANGE	2040	T7 CAIRP construct	Aggregated	Aggregated	DSL	101.0176	18040.33	456.6968	993.2145652	17,917,914	
ORANGE	2040	T7 NNOOS	Aggregated	Aggregated	DSL	1618.412	269440.2	23628.82	895.9859471	241,414,622	
ORANGE	2040	T7 NOOS	Aggregated	Aggregated	DSL	415.1159	86836.12	6060.692	897.8975906	77,969,944	
ORANGE	2040	T7 POLA	Aggregated	Aggregated	DSL	1675.724	348244.3	12735.5	1004.663664	349,868,427	
ORANGE	2040	T7 Public	Aggregated	Aggregated	DSL	1145.091	23199.93	3473.443	1123.388023	26,062,520	
ORANGE	2040	T7 Single	Aggregated	Aggregated	DSL	2899.543	233587.9	33460.33	1084.961098	253,433,758	
ORANGE	2040	T7 single construct	Aggregated	Aggregated	DSL	587.8573	44754.73	2657.68	1084.495255	48,536,291	
ORANGE	2040	T7 SWCV	Aggregated	Aggregated	DSL	52.96896	2164.226	206.579	4848.401416	10,493,037	
ORANGE	2040	T7 SWCV	Aggregated	Aggregated	NG	1647.391	67158.55	6424.826	2672.650458	179,491,328	
ORANGE	2040	T7 tractor	Aggregated	Aggregated	DSL	2596.314	322326.7	32973.19	944.547958	304,453,071	
ORANGE	2040	T7 tractor construc	Aggregated	Aggregated	DSL	492.6426	36918.71	2227.218	1061.144046	39,176,070	
ORANGE	2040	T7 utility	Aggregated	Aggregated	DSL	76.67414	1554.186	881.7526	1097.268115	1,705,359	
ORANGE	2040	T7IS	Aggregated	Aggregated	GAS	20.11042	2174.646	402.3693	1538.116951	3,344,860	
ORANGE	2040	UBUS	Aggregated	Aggregated	GAS	234.8135	22183.71	939.2539	1722.977441	38,222,026	
ORANGE	2040	UBUS	Aggregated	Aggregated	DSL	0	0	0	0	-	
ORANGE	2040	UBUS	Aggregated	Aggregated	NG	826.2968	95702.31	3305.187	2031.957353	194,463,016	
										-	
										Sum	
										24,986,161,731	

EMFAC2017 (v1.0.2) Emission Rates
Region Type: County
Region: ORANGE
Calendar Year: 2050
Season: Annual
Vehicle Classification: EMFAC2011 Categories
Units: miles/day for VMT, trips/day for Trips, g/mile for RUNEX, PMBW and PMTW, g/trip for STREX, HTSK and RUNLS, g/vehicle/day for IDLEX, RESTL and DIURN

Region	Calendar Year	Vehicle Category	Model Year	Speed	Fuel	Population	VMT	Trips	CO2_RUNEX	g of CO2 (derived)	Weighted Emission Factor (g/mile)
ORANGE	2050	All Other Buses	Aggregated	Aggregated	DSL	871.7433	44957.23	7322.643	758.721267	34,110,003	**244.054659839648**
ORANGE	2050	LDA	Aggregated	Aggregated	GAS	1682232	53380475	7923601	194.138347	10,363,197,117	
ORANGE	2050	LDA	Aggregated	Aggregated	DSL	20927.39	666188.8	98710.83	155.285181	103,449,241	
ORANGE	2050	LDA	Aggregated	Aggregated	ELEC	111867.8	3659665	529116.8	0	-	
ORANGE	2050	LDT1	Aggregated	Aggregated	GAS	210722.2	6266598	963800.4	223.653311	1,401,545,489	
ORANGE	2050	LDT1	Aggregated	Aggregated	DSL	29.04758	872.8346	133.658	293.749522	256,395	
ORANGE	2050	LDT1	Aggregated	Aggregated	ELEC	8413.588	258864.6	38944.83	0	-	
ORANGE	2050	LDT2	Aggregated	Aggregated	GAS	558704.5	17330637	2601005	221.339595	3,835,956,277	
ORANGE	2050	LDT2	Aggregated	Aggregated	DSL	5778.1	180136.6	26983.38	205.947028	37,098,604	
ORANGE	2050	LDT2	Aggregated	Aggregated	ELEC	26112.58	578455.3	122575.2	0	-	
ORANGE	2050	LHD1	Aggregated	Aggregated	GAS	36745.66	1170655	547455.5	635.833691	744,342,036	
ORANGE	2050	LHD1	Aggregated	Aggregated	DSL	44950.83	1379634	565424.9	371.425055	512,430,536	
ORANGE	2050	LHD2	Aggregated	Aggregated	GAS	6896.139	208634.9	102742.2	729.17403	152,131,180	
ORANGE	2050	LHD2	Aggregated	Aggregated	DSL	18455.72	543407.4	232149.7	411.395232	223,555,224	
ORANGE	2050	MCY	Aggregated	Aggregated	GAS	91837.82	489685.9	183675.6	214.109638	104,846,481	
ORANGE	2050	MDV	Aggregated	Aggregated	GAS	357010.7	10775334	1651467	268.175228	2,889,677,682	
ORANGE	2050	MDV	Aggregated	Aggregated	DSL	12951.31	392937.8	60113.37	266.013001	104,526,574	
ORANGE	2050	MDV	Aggregated	Aggregated	ELEC	19389.29	424813	90656.5	0	-	
ORANGE	2050	MH	Aggregated	Aggregated	GAS	7288.42	64791.99	729.1336	1297.81299	84,087,888	
ORANGE	2050	MH	Aggregated	Aggregated	DSL	3729.717	29172.32	372.9717	774.16015	22,584,045	
ORANGE	2050	Motor Coach	Aggregated	Aggregated	DSL	202.6905	25126.31	2959.282	1104.6422	27,755,583	
ORANGE	2050	OBUS	Aggregated	Aggregated	GAS	1243.267	45020.23	24875.28	1298.2922	58,449,420	
ORANGE	2050	PTO	Aggregated	Aggregated	DSL	0	51628.28	0	1476.23543	76,215,490	
ORANGE	2050	SBUS	Aggregated	Aggregated	GAS	1053.693	36952.51	4214.772	687.828061	25,416,972	
ORANGE	2050	SBUS	Aggregated	Aggregated	DSL	1361.557	43045.88	15712.18	860.080132	37,022,902	
ORANGE	2050	T6 CAIRP heavy	Aggregated	Aggregated	DSL	160.7379	25960.68	2346.773	647.193721	16,801,588	
ORANGE	2050	T6 CAIRP small	Aggregated	Aggregated	DSL	81.96163	3410.191	1196.64	717.202118	2,445,796	
ORANGE	2050	T6 instate constru	Aggregated	Aggregated	DSL	403.9403	27370.03	1826.198	745.879442	20,414,744	
ORANGE	2050	T6 instate constru	Aggregated	Aggregated	DSL	2962.321	145107.2	13392.54	718.512554	104,261,342	
ORANGE	2050	T6 instate heavy	Aggregated	Aggregated	DSL	10359.13	1025544	119542.9	663.439678	680,386,420	
ORANGE	2050	T6 instate small	Aggregated	Aggregated	DSL	30539.98	1350294	352427.2	718.103667	969,651,095	
ORANGE	2050	T6 OOS heavy	Aggregated	Aggregated	DSL	90.41599	14708.03	1320.073	647.159754	9,518,447	
ORANGE	2050	T6 OOS small	Aggregated	Aggregated	DSL	50.49445	2065.073	737.219	718.090976	1,482,910	
ORANGE	2050	T6 Public	Aggregated	Aggregated	DSL	825.5738	12806.07	2504.241	727.413041	9,315,305	
ORANGE	2050	T6 utility	Aggregated	Aggregated	DSL	412.5153	6871.791	4743.926	715.406696	4,916,125	
ORANGE	2050	T6TS	Aggregated	Aggregated	GAS	5942.177	241839.5	118891.1	1294.0809	312,959,885	
ORANGE	2050	T7 Ag	Aggregated	Aggregated	DSL	0.810349	1.098137	3.565534	1617.40841	1,776	
ORANGE	2050	T7 CAIRP	Aggregated	Aggregated	DSL	1183.695	243942.5	17281.95	891.161071	217,392,062	
ORANGE	2050	T7 CAIRP construc	Aggregated	Aggregated	DSL	113.7967	19660.13	514.4704	988.230056	19,428,733	
ORANGE	2050	T7 NNOOS	Aggregated	Aggregated	DSL	1849.075	297401.7	26996.5	897.968094	267,057,233	
ORANGE	2050	T7 NOOS	Aggregated	Aggregated	DSL	470.585	95847.7	6870.541	891.441538	85,442,624	
ORANGE	2050	T7 POLA	Aggregated	Aggregated	DSL	2130.17	442755.5	16189.29	956.228515	423,375,441	
ORANGE	2050	T7 Public	Aggregated	Aggregated	DSL	1211.893	24553.02	3676.075	1028.92123	25,263,126	
ORANGE	2050	T7 Single	Aggregated	Aggregated	DSL	3216.421	260010.3	37117.05	1009.43206	262,462,751	
ORANGE	2050	T7 single construc	Aggregated	Aggregated	DSL	639.7621	48773.17	2892.34	1009.48245	49,235,660	
ORANGE	2050	T7 SWCV	Aggregated	Aggregated	DSL	9.304656	380.1732	36.28816	4810.45251	1,828,805	
ORANGE	2050	T7 SWCV	Aggregated	Aggregated	NG	1827.356	74508.04	7126.687	2565.59825	191,157,699	
ORANGE	2050	T7 tractor	Aggregated	Aggregated	DSL	2865.06	354340.4	36386.27	896.889669	317,804,243	
ORANGE	2050	T7 tractor constru	Aggregated	Aggregated	DSL	546.2568	40233.57	2469.606	997.185592	40,120,339	
ORANGE	2050	T7 utility	Aggregated	Aggregated	DSL	80.8486	1638.841	929.7589	1037.63357	1,700,517	
ORANGE	2050	T7IS	Aggregated	Aggregated	GAS	22.3892	2235.867	447.9631	1511.25227	3,378,959	
ORANGE	2050	UBUS	Aggregated	Aggregated	GAS	247.3379	23366.94	989.3517	1722.87294	40,258,266	
ORANGE	2050	UBUS	Aggregated	Aggregated	DSL	0	0	0	0	-	
ORANGE	2050	UBUS	Aggregated	Aggregated	NG	870.3697	100806.9	3481.479	2031.95735	204,835,258	
										-	
									Sum	25,121,552,288	

APPENDIX A.4 – LOCAL GHG REDUCTION POLICIES/ACTIONS

Files

a. Local GHG Reduction Measure 1: Pedestrian Improvements and Increased Connectivity
b. Local GHG Reduction Measure 2: Provide Traffic Calming Measures
c. Local GHG Reduction Measure 3a: Transit System Improvements (Expand Transit Network)
d. Local GHG Reduction Measure 3b: Transit System Improvements (Increase Transit Frequency/Speed)
e. Local GHG Reduction Measure 4: Promote Local Transportation Demand Management
f. Local GHG Reduction Measure 5: Utilize Electric or Hybrid Vehicles
g. Local GHG Reduction Measure 6: Institute or Extend Recycling and Composting Services
h. Local GHG Reduction Measure 7a: Energy Efficiency Improvements to Building Stock (Natural Gas)
i. Local GHG Reduction Measure 7b: Energy Efficiency Improvements to Building Stock (Electricity)
j. Local GHG Reduction Measure 8: Clean Energy
k. Summary of Local GHG Reduction Policies/Actions
l. Commute VMT Estimates
m. EMFAC2017 Year 2040 Emission Rates and Associated Calculations

Local GHG Reduction Measure 1: Pedestrian Improvements and Increased Connectivity

General Plan Goals and Policies: LU-1.6, LU-4.1, LU-4.2, LU-4.5, LU-4.6, LU-5.8, ED-5.2, ED-6.1, ED-6.2, PF-2.4, HW-1.1, HW-1.2, HW-1.4, HW-1.6, M-3.1, M-3.2, M-3.4, M-3.5, M-3.6, M-3.7, M-3a, M-3c, M-3d, M-5.1, M-5.2, M-5.3, M-5.4, M-5.5, M-5a, M-6.3, M-6.4, M-6.5, RR-4.4, RR-5.10

Measure Description:	Providing a pedestrian access network to link areas of the Planning Area encourages people to walk instead of drive. This mode shift results in people driving less and thus a reduction in VMT. The project will provide a pedestrian access network that internally links all uses and connects to all existing or planned external streets and pedestrian facilities contiguous with the project site. The project will minimize barriers to pedestrian access and interconnectivity. Physical barriers such as walls, landscaping, and slopes that impede pedestrian circulation will be eliminated. Context: Urban/suburban Extent of pedestrian accomodations: Within City of Lake Forest
Assumptions	1% VMT reduction based on extension of pedestrian networks throughout the City by 2040 (within the City). This correlates with a 1% reduction in VMT. Data Based upon the following reference: Center for Clean Air Policy (CCAP) Transportation Emission Guidebook; 1000 Friends of Oregon (1997) "Making the Connections: A Summary of the LUTRAQ Project" (p. 16). See CAPCOA Measure SDT-1 for further detail.
Assumptions	
% VMT Reduction	1.00% Calculation Note: This value reflect the overall VMT reduction expected from this measure.
Total On-road Emissions in 2040 (BAU + Legislative Adjust.):	240,353 MT CO2e
Calculation	
Reduction in GHG Emissions due to this measure (2040):	**2,404 MT CO2e**

Local GHG Reduction Measure 2: Provide Traffic Calming Measures

General Plan Goals and Policies: M-1.3, M-1.6, M-1c, M-2c, M-3.3, M-3.4, M-3a, M-6.1, M-6.2 M-6.3, M-6.4, M-6.5

Measure Description:	Providing traffic calming measures encourages people to walk or bike instead of using a vehicle, where applicable. This mode shift will result in a decrease in VMT. Planning Area design will include pedestrian/bicycle safety and traffic calming measures. Roadways will be designed to reduce motor vehicle speeds and encourage pedestrian and bicycle trips with traffic calming features. Traffic calming features may include: marked crosswalks, count-down signal timers, curb extensions, speed tables, raised crosswalks, raised intersections, median islands, tight corner radii, roundabouts or mini-circles, on-street parking, planter strips with street trees, chicanes/chokers, and others. Assumes lowest level of traffic calming improvements developed provided in CAPCOA (i.e. 25% of streets and intersections with traffic calming improvements). Extent of pedestrian accomodations: Within City of Lake Forest		
Assumptions	0.25% VMT reduction due to this measure. Data Based upon the following references: Cambridge Systematics. Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions.(p. B-25) http://www.movingcooler.info/Library/Documents/Moving%20Cooler_Appendices _Complete_102209.pdf; Sacramento Metropolitan Air Quality Management District (SMAQMD) Recommended Guidance for Land Use Emission Reductions. (p.13) See CAPCOA Measure SDT-2 for further detail.		
Assumptions			
% VMT Reduction	Note: This value reflect the overall VMT reduction expected from this measure.	0.25%	Calculation
Total On-road Emissions in 2040 (BAU + Legislative Adjust.)		240,353	MT CO2e
Calculation			
Reduction in GHG Emissions due to this measure (2040):		**601**	**MT CO2e**

Local GHG Reduction Measure 3a: Transit System Improvements (Expand Transit Network)

General Plan Goals and Policies: M-4.1, M-4.2, M-4.3, M-4.4, M-4.5, M-4.6, M-4.7, M-4.8, M-4a, M-4b, HW-1.5, RR-4.5, RR-4g

Measure Description:	The project will expand the local transit network by adding or modifying existing transit service to enhance the service near the project site. This will encourage the use of transit and therefore reduce VMT. **% VMT Reduction associated with this measure = (% increase in transit network coverage) * (elasticity of transit) * (Existing transit mode share) * (Adjustments of transit ridership increase to VMT)**		
Calculation Methodology:	Where: % increase in network coverage = 50% Elasticity of transit (urban setting) = 0.72 (see CAPCOA GHG Quantification Manual for further detail). Existing transit mode share = 4% (urban) (see CAPCOA GHG Quantification Manual for further detail). Adjustments of transit ridership increase to VMT = 0.67 (see CAPCOA GHG Quantification Manual for further detail). See CAPCOA Measure TST-3 for further detail.		
Assumptions			
% VMT Reduction	Note: This value reflect the overall VMT reduction expected from this measure.	0.96%	Calculation
Total On-road Emissions in 2040 (BAU + Legislative Adjust.)		240,353	MT CO2e
Calculation			
Reduction in GHG Emissions due to this measure (2040):		**2,319**	**MT CO2e**

Local GHG Reduction Measure 3b: Transit System Improvements (Increase Transit Frequency/Speed)

General Plan Goals and Policies: M-4.1, M-4.2, M-4.3, M-4.4, M-4.5, M-4.6, M-4.7, M-4.8, M-4a, M-4b, HW-1.5, RR-4.5, RR-4g

Measure Description:	This project will reduce transit-passenger travel time through more reduced headways and increased speed and reliability. This makes transit service more attractive and may result in a mode shift from auto to transit which reduces VMT.
Calculation Methodology:	**% VMT Reduction associated with this measure = (% Reduction in Headway) * (elasticity of transit) * (Adjustment for level of Implementation) * (Existing transit mode share) * (Adjustments of transit ridership increase to VMT)** Where: Headway = 33% Elasticity of transit (urban setting) = 0.32 (see CAPCOA GHG Quantification Manual for further detail). Level of Implementation (i.e. number of lines improved/total number of lines serving project): 85% (see CAPCOA GHG Quantification Manual for further detail). Existing transit mode share = 4% (urban) (see CAPCOA GHG Quantification Manual for further detail). Adjustments of transit ridership increase to VMT = 0.67 (see CAPCOA GHG Quantification Manual for further detail). See CAPCOA Measure TST-4 for further detail.

Assumptions

% VMT Reduction	0.24%	Calculation
	Note: This value reflect the overall VMT reduction expected from this measure.	
Total On-road Emissions in 2040 (BAU + Legislative Adjust.)	240,353	MT CO2e

Calculation

Reduction in GHG Emissions due to this measure (2040):	**578 MT CO2e**

Local GHG Reduction Measure 4: Promote Local Transportation Demand Management

General Plan Goals and Policies: M-8.1, M-8.2, M-8a, M-8b, M-8c

Measure Description:	The City will continue to implement strategies and policies that reduce the demand for personal motor vehicle travel for intracity (local) trips. For example, Policy M-8.1 requires the City to establish VMT thresholds for new development projects, and to establish new TDM mitigation requirements for the subsequent CEQA review of projects, in compliance with the requirements of SB 743. **% Reduction in On-road GHG emissions = (VMT Reduction associated with this measure) * (Local VMT as a proportion of overall VMT)**	
Calculation Methodology:	Where: Expected VMT Reduction associated with this measure (by 2040): 5% Local VMT as a proportion of overall VMT = the proportion of trips 100% internal to the City (following origin-destination VMT method) (as provided by the Kittelson & Associates) = (318,983/2,751,045) = 11.5950%	
Assumptions		
% VMT Reduction	Note: This value reflect the overall VMT reduction expected from this measure.	0.58% Calculation
Total On-road Emissions in 2040 (BAU + Legislative Adjust.)		240,353 MT CO2e
Calculation		
Reduction in GHG Emissions due to this measure (2040):		**1,393 MT CO2e**

Local GHG Reduction Measure 5: Utilize Electric or Hybrid Vehicles

General Plan Goals and Policies: RR-4f, RR-4j, RR-4k

Measure Description:	When vehicles are powered by grid electricity rather than fossil fuel, direct GHG emissions from fuel combustion are replaced with indirect GHG emissions associated with the electricity used to power the vehicles. Installation of electric vehicle (EV) infrastructure will encourage Lake Forest residents, businesses, and the City vehicle fleet to switch to clean fuel and electric vehicles in order to reduce transportation related GHG emissions.	
Assumption		
The proportion of the total VMT by 2040 that would be generated by electric vehicles beyond what was assumed by EMFAC2017 (note: EMFAC2017 data assumes electric vehicle VMT consistent with what would be required to meet the State's Advanced Clean Cars standard, which has a sunset implementation date of 2025).	3.50%	Improvement in electric vehicle fleet mix beyond what is in EMFAC2017. Note: This serves as a highly conservative estimate, based on the most recent forecasts for electric vehicles as a proportion of the global, national, and/or California vehicle fleet. For example, see "Bloomberg's Electric Vehicle Outlook 2019", which estimates that electric vehicles would encompass approximately 30% proportion of the global vehicle fleet by 2040, wheeras EMFAC2017 only assumes the following electric vehicle fleet mix for 2025 and later years: passenger cars: 6.3%; Light trucks: 4.0-4.6%; Medium Heavy Duty trucks: 5.3% (see pg. 194 of the EMFAC2017 Volume III Technical Documentation v.1.0.2). Overall, electric vehicle VMT as a proportion of the vehicle fleet in Orange County (used as a proxy for Lake Forest) in 2040 is only estimated at 4.674% (EMFAC2017).
Assumptions		
Average MPGe of electric vehicles by 2040:	112	Note: Nissan Leaf MPGe in 2019 used a proxy for overall MPGe by 2040 electric vehicles fleetwide (112 MPGe).
Total Weighted Gasoline/Diesel MPG in 2040	40.25	Note: See the EMFAC2017 Output worksheet for detail.
Calculation		
Therefore, the nominal improvement to MPGe from non-electric to electric vehicles is equivalent to (in GHG terms):	278.28%	
Input		
Electricity emissions reduced in 2040 by RPS (Compared with 2015)	-86.67%	Note: see detail in baseline GHG Inventory workbook.
Calculation		
The inverse of -86.67% is:	13.33%	
Therefore, GHG emissions from the electric grid would be in 2040, on average, the following percentage better than in 2015 (baseline year):	750%	Note: This reflects the expected improvement solely based on GHG reductions to the electric grid by the expansion of RPS by 2040.
Calculations		
When the nominal improvement to MPGe from switching to electric vehicles is combined with the expected improvement in renewable energy in 2040 compared with 2015, the effective improvement in GHG emissions from electric vehicles (in comparison to non-electric vehicles) is:	2087.114%	Note: This number reflectes the percentage 'improvement' in terms of GHG emissions by utilizing an electric vehicle in 2040 as compared with a gasoline/diesel vehicle (inclusive of the improvement in MPGe + improvement based on the effect of the RPS).
The inverse of the above: the percentage of GHG emissions associated with a unit of travel with an electric vehicle in 2040 as compared with gasoline/diesel vehicle in 2040 is (the inverse of the above figure):	4.79%	Note: This is the inverse of the above value.
Therefore, the average percentage reduction to the City's on-road GHG emissions in 2040 (under the BAU with legislative adjusted scenario) is:	3.33%	Note: This value is used to estimate the overall improvement in GHG emissions reductions associated with the vehicle fleet by 2040 due to uptake in electric vehicles into the overall fleet mix.
Input		
On-road Traffic MT CO2e Emissions Associated with Gasoline & Diesel Vehicles in 2040 (w/ On-road Vehicle emissions under the BAU with legislative adjusted scenario)	240,353.0	MT CO2e
Calculations		
Reduction in GHG Emissions due to this measure (2040):	**8,009.29**	**MT CO2e**

Local GHG Reduction Measure 6: Institute or Extend Recycling and Composting Services

General Plan Goals and Policies: RR-6.1, RR-6.2, RR-6.3, RR-6.5, RR-6.8, RR-6.9, RR-6a, RR-6b, RR-6c, RR-6d

Measure Description:	This measure requires the community to divert 85% of solid waste from landfill (through recycling, composting, or other applicable means). This is an improvement above the requried 75% diversion required by California State law by 2020 (and which is presumed to remain in effect in 2040). This would be a 40% reduction in solid waste emissions above and beyond the solid waste emissions associated with the BAU + Legislative-adjusted scenario.
Calculation Methodology:	**Reduction in Solid Waste GHG emissions = (BAU & Legislative-adjusted Scenario solid waste emissions) * (% reduction in solid waste emissions associated with an 85% diversion rate)** Where: BAU & Legislative-adjusted Scenario solid waste emissions = those emission under the forecast years inclusive of the adjustment due to AB 341; % reduction in solid waste emissions associated with an 85% diversion rate = % reduction in solid waste compared to the 75% solid waste diversion scenario = (1-0.85)-(1-0.75))/(1-0.75) = 0.4
Assumptions	
% Solid Waste Reduction	40.00% Note: This value reflects the overall reduction in solid waste emissions due to this measure.
Total Solid Waste Emissions in 2040 (BAU + Legislative Adjust.):	37,797 MT CO2e
Calculation	
Reduction in GHG Emissions due to this measure (2040):	**15,119 MT CO2e**

Local GHG Reduction Measure 7a: Energy Efficiency Improvements to Building Stock (Natural Gas)

General Plan Goals and Policies: PS-7b, PF-6.4, PF-6.5, PF-6.6, PF-6.7, PF-6.9, PF-6c, PF-6d, PF-6e, PF-6f, PF-6g, PF-6h, PF-6i, PF-6l

Measure Description:	Residential and Non-residential buildings to exceed 2019 Title 24 Building Envelope Energy Efficiency Standards for Natural Gas (by 10%) (for total City building stock on average), through City policie and actions PS-7b, PF-6.4, PF-6.5, PF-6.6, PF-6.7, PF-6.9, PF-6c, PF-6d, PF-6e, PF-6f, PF-6g, PF-6h, PF-6i, PF-6l
	Reduction in residential and commercial natural gas GHG emissions = (BAU & Legislative-adjusted Scenario residential and commercial natural gas emissions) x (% reduction in residential and commercial natural gas emissions)
Calculation Methodology:	Where:
	BAU & Legislative-adjusted Scenario residential and commercial natural gas emissions in 2040 = 75,913 MT CO2e % Reduction in natural gas emissions = 10%

Assumptions		
BAU & Legislative-adjusted Scenario residential and commercial natural gas emissions	75,913	MT CO2e
% reduction in natural gas emissions	10%	
Calculation		
Reduction in GHG Emissions due to this measure (2040):	**7,591**	**MT CO2e**

Local GHG Reduction Measure 7b: Energy Efficiency Improvements to Building Stock (Electricity)

General Plan Goals and Policies: PS-7b, PF-6.4, PF-6.5, PF-6.6, PF-6.7, PF-6.9, PF-6c, PF-6d, PF-6e, PF-6f, PF-6g, PF-6h, PF-6i, PF-6l

Measure Description:	Using energy-efficient appliances reduces a building's energy consumption as well as the associated GHG emissions from electricity production. Requires the use of energy efficient appliances for all new development. Assumes lowest level of reductions in electricity savings, for new development as provided by Measure BE-4 (2%).
Calculation Methodology:	**Reduction in new development residential natural gas and electricity GHG emissions = (BAU & Legislative-adjusted Scenario residential electricity emissions) x (proportion of new residentail development in 2040 as a proportion of existing development) x (Assumed Reduction % for electricity for new development compared with non-energy efficient appliances)** Where: BAU & Legislative-adjusted Scenario residential electricity emissions in 2040 = 9,088 MT CO2e Proportion of new residentail development in 2040 as a proportion of existing development = 43.64749% (note: as provided by the Lake Forest General Plan) Assumed Reduction % for electricity for new development compared with non-energy efficient appliances = 2%

Assumptions		
Residential electricity emissions in 2040 (BAU + Legislative Adjust.):	9,088 MT CO2e	
Proportion of new residentail development in 2040 as a proportion of existing development	43.65%	As provided by the Lake Forest General Plan
Reduction % for electricity for new development compared with non-energy efficient appliances	2%	Assumption (see CAPCOA Measuer BE-4 for more detail)
Calculation		
Reduction in GHG Emissions due to this measure (2040):	**79 MT CO2e**	

Local GHG Reduction Measure 8: Clean Energy

General Plan Goals and Policies: PF-6.1, PF-6.3, Policy PF-6.7, PS-7f, PF-6j

Measure Description:	This measure works to promote increased participation in SCE's clean energy program through marketing and outreach strategies which target City customers and businesses not currently participating in the program. -Promote participation in SCE's renewable energy program, which allows all electricity customers to pay low monthly fees to meet electricity needs from either 50 percent or 100 percent renewable sources. -Promote participation in SCE's available solar rebate programs, including those as administered through California Solar Initiative (CSI), such as the CSI General Market Program, the CSI-thermal program, the Single Family Affordable Homes (SASH) Program, the Multifamily Affordable Solar Housing (MASH) program, and the CSI Research, Development, Demonstration, and Deplyment Program. -Update the City's website and materials for residents and businesses to promote SCE's green electricity source options. -Work closely with SCE to conduct local outreach, events, and promotions for SCE's clean energy programs.
Calculation Methodology:	**Reduction in residential and commercial electricity GHG emissions = (BAU & Legislative-adjusted Scenario residential and commercial electricity emissions) * (Participation Rate)** Where: BAU & Legislative-adjusted Scenario residential and commercial electricity emissions in 2040 = 21,926 MT CO2e Participation Rate = 10%

Assumptions	
BAU & Legislative-adjusted Scenario residential and commercial electricity emissions in 2040:	21,926 MT CO2e
% reduction in residential and commercial electricity emissions:	10%
Calculation	
Reduction in GHG Emissions due to this measure (2040):	**2,193 MT CO2e**

Summary Local Policy Reductions

Measure	MT CO2e Savings	Units
Pedestrian Improvements & Increased Connectivity	2,404	MT CO2e
Traffic Calming	601	MT CO2e
Electric Vehicles	8,009	MT CO2e
Solid Waste	15,119	MT CO2e
Title 24 Improvement (for natural gas)	7,591	MT CO2e
Energy Efficient Appliances	79	MT CO2e
Expand Transit Network	2,319	MT CO2e
Increase Transit Frequency/Speed	578	MT CO2e
SCE Offsite Renewable Energy	2,193	MT CO2e
TDM	1,393	MT CO2e
Total Savings	40,286	MT CO2e Savings
Total Needed	31,806	MT CO2e
Remainder Needed	**-8,480**	MT CO2e

Commute VMT Estimate

Source: VMT Data from Kittelson & Associates for '2040 Proposed GP & 20-Year Circulation' scenario

Note: According to the Transportation Impact Analysis (Kittelson & Associates, 2019), Work-based VMT represents Commuter VMT.

Scenario: 2040 Proposed GP & 20-Year Circulation

Category	VMT	Proportion
Home-based VMT	2,531,888	63.9768%
Work-based VMT	1,425,619	36.0232%

EMFAC2017 (v1.0.2) Emissions Inventory
Region Type: County
Region: ORANGE
Calendar Year: 2040
Season: Annual
Vehicle Classification: EMFAC2011 Categories
Units: miles/day for VMT, trips/day for Trips, tons/day for Emissions, 1000 gallons/day for Fuel Consumption

1 ton	equals	907185	grams

VMT % Breakdown

	Motorcycles	Passenger Veh.	Light Trucks	Heavy Trucks	Total	% of Total VMT
Gasoline	0	52,652,247	23,206,918	12577136.41	88,436,301	88.229%
		59.5%	26.2%	14.2%	100.0%	
Diesel		653,803	176,115	6,216,567	7,046,484	7.030%
		9.3%	2.5%	88.2%	100.0%	
Electric		3,504,424	784,697	395,658	4,684,779	4.674%
		74.8%	16.7%	8.4%	100.0%	
Natural Gas		0	0	67,159	67,159	0.067%
		0.0%	0.0%	100.0%	100.0%	**Check:**
						100.000%

													g/mile	
Region	Calendar Y	Vehicle Category	Fuel	Population	VMT	Trips	CO2_TOTEX	CH4_TOTEX	N2O_TOTEX	Fuel Consumption	MPG	MPG	CO2 Emission Factor	CH4 Emission Factor	N2O Emission Factor
ORANGE	2040	All Other Buses	DSL	755.0402	40267.55579	6342.338	34.84213672	1.7611E-05	0.005476699	3.105236812	12.96762799				
ORANGE	2040	LDA	GAS	1582685	52652246.55	7463206	11742.97016	0.198558898	0.315097665	1239.508109	**42.47833975**			**0.00342112**	**0.005429054**
ORANGE	2040	LDA	DSL	19404.32	653803.034	91977.51	113.161347	0.000174855	0.017787388	10.08528217	**64.8274409**			**0.00024262**	**0.024680906**
ORANGE	2040	LDA	ELEC	99687.04	3504423.927	476430.9	0	0	0	0	#DIV/0!	Light Truck Gasoline:			
ORANGE	2040	LDT1	GAS	194475.2	6110029.498	894231.6	1597.820808	0.027213996	0.040498222	168.6551034	36.22795501	**36.55474666**		**0.004625051**	**0.005847373**
ORANGE	2040	LDT1	DSL	25.5654	827.2650889	119.2532	0.272762832	7.40507E-07	4.28745E-05	0.02430945	34.03059645	Light Truck Diesel:			
ORANGE	2040	LDT1	ELEC	6911.691	237054.4232	32761.91	0	0	0	0	#DIV/0!	**48.51421333**		**0.000790372**	**0.032980026**
ORANGE	2040	LDT2	GAS	526969.3	17096888.69	2453408	4416.717261	0.091100545	0.109084827	466.1986518	36.67296897				
ORANGE	2040	LDT2	DSL	5296.556	175287.258	24934.14	40.45928379	0.000152697	0.006359636	3.605853981	48.61185699				
ORANGE	2040	LDT2	ELEC	22773.47	547642.4141	108422.9	0	0	0	0	#DIV/0!	Heavy Truck Gasoline:			
ORANGE	2040	LHD1	GAS	35398.89	1167777.844	527390.7	854.9329889	0.011098427	0.021605844	90.24091498	12.94066937	**26.31925791**		**0.021421351**	**0.010069156**
ORANGE	2040	LHD1	DSL	40246.32	1322786.985	506248.1	561.8993019	0.002884781	0.088322745	50.07816859	26.4144441	Heavy Truck Diesel:			
ORANGE	2040	LHD2	GAS	6555.765	206607.2181	97671.14	174.4889276	0.002009055	0.004044253	18.41786512	11.21776149	**14.23016799**		**0.001380275**	**0.112437183**
ORANGE	2040	LHD2	DSL	16331.07	517672.3313	205424.4	244.4467913	0.001159107	0.038423631	21.78583882	23.76187282	Heavy Truck Nat. Gas:			
ORANGE	2040	MCY	GAS	83552.73	478890.2715	167105.5	123.4856286	0.2204123	0.03667687	13.03430357	36.74076401	**2.854662322**		**4.105551412**	**0.560486607**
ORANGE	2040	MDV	GAS	338991.4	10660563.45	1565483	3370.017762	0.06245073	0.072936302	355.7161676	29.96929692				
ORANGE	2040	MDV	DSL	11876.49	382112.9527	55571.43	114.8243189	0.000119789	0.018048784	10.23349127	37.33945168				
ORANGE	2040	MDV	ELEC	16408.88	395657.9114	78199.19	0	0	0	0	#DIV/0!				
ORANGE	2040	MH	GAS	6757.148	63292.32801	675.9851	93.11710066	0.000252165	0.000863925	9.828808191	6.439471274				
ORANGE	2040	MH	DSL	3605.599	29119.50109	360.5599	26.03345983	7.04366E-05	0.004092097	2.320180833	12.55053083				
ORANGE	2040	Motor Coach	DSL	184.0291	22762.51895	2686.825	30.12243773	5.50786E-05	0.004734828	2.684602934	8.478914575				
ORANGE	2040	OBUS	GAS	1186.803	44315.21061	23745.56	65.73755904	0.001065087	0.001135213	6.938809888	6.38657224				
ORANGE	2040	PTO	DSL	0	46381.77222	0	81.12303188	6.10597E-05	0.012751411	7.229930439	6.415244602				
ORANGE	2040	SBUS	GAS	939.7427	34439.47102	3758.971	30.4406097	0.002800559	0.000776235	3.213103843	10.7184432				
ORANGE	2040	SBUS	DSL	1222.841	39043.11832	14111.41	43.51845294	4.9995E-05	0.006840495	3.878496407	10.0665604				
ORANGE	2040	T6 CAIRP heavy	DSL	141.2692	23517.26202	2062.531	16.87292789	8.09634E-06	0.002652189	1.503766466	15.63890575				
ORANGE	2040	T6 CAIRP small	DSL	72.09447	3089.707995	1052.579	2.484750102	1.21695E-06	0.000390568	0.221448459	13.95226686				
ORANGE	2040	T6 instate construction hea	DSL	383.1318	25115.00363	1732.124	22.3866935	1.12851E-05	0.003518876	1.995169966	12.58790181				
ORANGE	2040	T6 instate construction sma	DSL	2676.151	133151.7519	12098.77	109.3877583	5.39456E-05	0.017194232	9.748968514	13.65803487				
ORANGE	2040	T6 instate heavy	DSL	8895.473	917923.7165	102652.5	709.0292714	0.000358961	0.111449528	63.19083734	14.52621543				
ORANGE	2040	T6 instate small	DSL	27118.88	1226308.042	312948.1	1007.116512	0.000501628	0.158304691	89.75727559	13.6624918				
ORANGE	2040	T6 OOS heavy	DSL	79.52448	13324.28227	1161.057	9.55325621	4.58095E-06	0.001501639	0.851415144	15.64957161				
ORANGE	2040	T6 OOS small	DSL	44.13557	1870.435147	644.3793	1.507023836	7.39724E-07	0.000236883	0.134310531	13.92619871				
ORANGE	2040	T6 Public	DSL	798.4915	12360.51735	2422.091	12.8707813	1.63475E-05	0.002023108	1.147083033	10.77560821				
ORANGE	2040	T6 utility	DSL	390.9695	6520.301645	4496.149	5.738485371	4.56601E-06	0.00090201	0.511431206	12.74912747				
ORANGE	2040	T6TS	GAS	6070.05	246613.0411	121449.6	369.767285	0.006584276	0.006207923	39.03012115	6.318531273				
ORANGE	2040	T7 Ag	DSL	1.54448	5.305283955	6.79571	0.012965477	6.38885E-08	2.03799E-06	0.001155523	4.591241946				
ORANGE	2040	T7 CAIRP	DSL	1044.641	221007.243	15251.75	241.2647186	0.000744397	0.037923454	21.50224286	10.27833443				
ORANGE	2040	T7 CAIRP construction	DSL	101.0176	18040.32528	456.6968	20.08491689	2.35533E-05	0.003157069	1.790028659	10.07823265				
ORANGE	2040	T7 NNOOS	DSL	1618.412	269440.188	23628.82	309.7309961	0.001286212	0.048685399	27.60416499	9.760852684				
ORANGE	2040	T7 NOOS	DSL	415.1159	86836.12121	6060.692	97.15146506	0.000348539	0.015270857	8.658432978	10.02908049				
ORANGE	2040	T7 POLA	DSL	1675.724	348244.3324	12735.5	397.3715979	0.000592793	0.062461281	35.41496102	9.833254713				
ORANGE	2040	T7 Public	DSL	1145.091	23199.9272	3473.443	31.91100383	9.45859E-05	0.005015965	2.844005366	8.157483623				
ORANGE	2040	T7 Single	DSL	2899.543	233587.8759	33460.33	293.4919014	0.000497899	0.04613284	26.15688766	8.93026261				
ORANGE	2040	T7 single construction	DSL	587.8573	44754.72885	2657.68	55.59235189	8.17027E-05	0.008738344	4.95455887	9.033040081				
ORANGE	2040	T7 SWCV	DSL	52.96896	2164.226054	206.579	11.83430673	3.14141E-06	0.001860188	1.054709279	2.051964553				
ORANGE	2040	T7 SWCV	NG	1647.391	67158.54954	6424.826	203.5382491	0.30393236	0.041492604	23.52591724	2.854662322				
ORANGE	2040	T7 tractor	DSL	2596.314	322326.7477	32973.19	346.2833858	0.000523546	0.054430926	30.86182473	10.44418956				
ORANGE	2040	T7 tractor construction	DSL	492.6426	36918.71106	2227.218	44.89223787	7.2812E-05	0.007056435	4.000932283	9.227527099				
ORANGE	2040	T7 utility	DSL	76.67414	1554.186184	881.7526	1.989231815	3.44873E-06	0.00031268	0.177286368	8.766529571				
ORANGE	2040	T7IS	GAS	20.11042	2174.646107	402.3693	3.702835776	0.000171463	0.000319237	0.390846175	5.563943685				
ORANGE	2040	UBUS	GAS	234.8135	22183.70676	939.2539	42.21472258	0.000277001	0.000568195	4.455899165	4.978502865				
ORANGE	2040	UBUS	DSL	0	0	0	0	0	0	0	#DIV/0!				
ORANGE	2040	UBUS	NG	826.2968	95702.31164	3305.187	214.3587205	0.684928562	0.043698427	24.77659869	3.862608941	Total Weighted MPG			
												40.25			