4.3 - Greenhouse Gas Emissions

4.3.1 - Introduction

Purpose

This section assesses the impact of the project's greenhouse gas emissions, assesses whether or not the project would conflict with a plan, policy, or regulation pertaining to greenhouse gases, and assesses the possibility of climate change effects impacting the project.

Sources

Information in this section is based on the following sources:

- Air Quality and Greenhouse Gas Analysis Report, Michael Brandman Associates, August 25, 2010 (Appendix D).
- Salem Lutheran Church and School Specific Plan, Michael Madden Associates, April 30, 2011 (Appendix I).
- Comments received during the public review period. These comments are contained in Appendix A.

4.3.2 - Environmental Setting

Climate change is a change in the average weather of the earth that is measured by alterations in wind patterns, storms, precipitation, and temperature. These changes are assessed using historical records of temperature changes occurring in the past, such as during previous ice ages. Many of the concerns regarding climate change use this data to extrapolate a level of statistical significance specifically focusing on temperature records from the last 150 years (the Industrial Age) that differ from previous climate changes in rate and magnitude.

The United Nations Intergovernmental Panel on Climate Change constructed several emission trajectories of greenhouse gases needed to stabilize global temperatures and climate change impacts. The Intergovernmental Panel on Climate Change predicted that global mean temperature change from 1990 to 2100, given six scenarios, could range from 1.1 degrees Celsius (°C) to 6.4°C. Regardless of analytical methodology, global average temperatures and sea levels are expected to rise under all scenarios.

In California, climate change may result in consequences such as the following.

• A reduction in the quality and supply of water to the State from the Sierra snowpack. If heattrapping emissions continue unabated, more precipitation will fall as rain instead of snow, and the snow that does fall will melt earlier, reducing the Sierra Nevada spring snowpack by as much as 70 to 90 percent. This can lead to challenges in securing adequate water supplies. It can also lead to a potential reduction in hydropower.

- Increased risk of large wildfires. If rain increases as temperatures rise, wildfires in the grasslands and chaparral ecosystems of southern California are estimated to increase by approximately 30 percent toward the end of the 21st century because more winter rain will stimulate the growth of more plant "fuel" available to burn in the fall. In contrast, a hotter, drier climate could promote up to 90 percent more northern California fires by the end of the century by drying out and increasing the flammability of forest vegetation.
- Reductions in the quality and quantity of certain agricultural products. The crops and products likely to be adversely affected include wine grapes, fruit, nuts, and milk.
- Exacerbation of air quality problems. If temperatures rise to the medium warming range, there could be 75 to 85 percent more days with weather conducive to ozone formation in Los Angeles and the San Joaquin Valley, relative to today's conditions. This is more than twice the increase expected if rising temperatures remain in the lower warming range.
- A rise in sea levels resulting in the displacement of coastal businesses and residences. During the past century, sea levels along California's coast have risen about seven inches. If heat-trapping emissions continue unabated and temperatures rise into the higher anticipated warming range, sea level is expected to rise an additional 22 to 35 inches by the end of the century. Elevations of this magnitude would inundate coastal areas with salt water, accelerate coastal erosion, threaten vital levees and inland water systems, and disrupt wetlands and natural habitats.
- Damage to marine ecosystems and the natural environment.
- An increase in infections, disease, asthma, and other health-related problems.
- A decrease in the health and productivity of California's forests.

Greenhouse Gases

Gases that trap heat in the atmosphere are referred to as greenhouse gases. The effect is analogous to the way a greenhouse retains heat. Common greenhouse gases include water vapor, carbon dioxide, methane, nitrous oxides, chlorofluorocarbons, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, ozone, and aerosols. Natural processes and human activities emit greenhouse gases. The presence of greenhouse gases in the atmosphere affects the earth's temperature. It is believed that emissions from human activities, such as electricity production and vehicle use, have elevated the concentration of these gases in the atmosphere beyond the level of naturally occurring concentrations.

Climate change is driven by forcings and feedbacks. Radiative forcing is the difference between the incoming energy and outgoing energy in the climate system. Positive forcing tends to warm the surface while negative forcing tends to cool it. Radiative forcing values are typically expressed in watts per square meter. A feedback is a climate process that can strengthen or weaken a forcing. For example, when ice or snow melts, it reveals darker land underneath which absorbs more radiation and

causes more warming. The global warming potential is the potential of a gas or aerosol to trap heat in the atmosphere. The global warming potential of a gas is essentially a measurement of the radiative forcing of a greenhouse gas compared with the reference gas, carbon dioxide.

Individual greenhouse gas compounds have varying global warming potential and atmospheric lifetimes. Carbon dioxide, the reference gas for global warming potential, has a global warming potential of one. The calculation of the carbon dioxide equivalent is a consistent methodology for comparing greenhouse gas emissions since it normalizes various greenhouse gas emissions to a consistent metric. Methane's warming potential of 21 indicates that methane has a 21 times greater warming affect than carbon dioxide on a molecule per molecule basis. A carbon dioxide equivalent is the mass emissions of an individual greenhouse gas multiplied by its global warming potential.

Greenhouse gases as defined by AB 32 include the following gases: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexaflouride. Greenhouse gases as defined by AB 32 and sources are summarized in Table 4.3-1.

Greenhouse Gas	Description and Physical Properties	Sources
Nitrous oxide	Nitrous oxide is also known as laughing gas and is a colorless greenhouse gas. It has a lifetime of 114 years. Its global warming potential is 310.	Microbial processes in soil and water, fuel combustion, and industrial processes.
Methane	Methane is a flammable gas and is the main component of natural gas. It has a lifetime of 12 years. Its global warming potential is 21.	Methane is extracted from geological deposits (natural gas fields). Other sources are landfills, fermentation of manure, decay of organic matter, and cattle.
Carbon dioxide	Carbon dioxide (CO ₂) is an odorless, colorless, natural greenhouse gas. Carbon dioxide's global warming potential is 1. The concentration in 2005 was 379 parts per million (ppm), which is an increase of about 1.4 ppm per year since 1960.	Natural sources include decomposition of dead organic matter; respiration of bacteria, plants, animals, and fungus; evaporation from oceans; and volcanic outgassing. Anthropogenic sources are from burning coal, oil, natural gas, and wood.
Chloro- fluorocarbons	These are gases formed synthetically by replacing all hydrogen atoms in methane or ethane with chlorine and/or fluorine atoms. They are nontoxic, nonflammable, insoluble, and chemically unreactive in the troposphere (the level of air at the earth's surface). Global warming potentials range from 3,800 to 8,100.	Chlorofluorocarbons were synthesized in 1928 for use as refrigerants, aerosol propellants, and cleaning solvents. They destroy stratospheric ozone. The Montreal Protocol on Substances that Deplete the Ozone Layer prohibited their production in 1987.
Hydro- fluorocarbons	Hydrofluorocarbons are a group of greenhouse gases containing carbon, chlorine, and at least one hydrogen atom. Global warming potentials range from 140 to 11,700.	Hydrofluorocarbons are synthetic manmade chemicals used as a substitute for chlorofluorocarbons in applications such as automobile air conditioners and refrigerants.

Table 4.3-1: Greenhouse Gases

Greenhouse Gas	Description and Physical Properties	Sources
Per- fluorocarbons	Perfluorocarbons have stable molecular structures and only break down by ultraviolet rays about 60 kilometers above Earth's surface. Because of this, they have long lifetimes, between 10,000 and 50,000 years. Global warming potentials range from 6,500 to 9,200.	Two main sources of perfluorocarbons are primary aluminum production and semiconductor manufacturing.
Sulfur hexafluoride	Sulfur hexafluoride is an inorganic, odorless, colorless, and nontoxic, nonflammable gas. It has a lifetime of 3,200 years. It has a high global warming potential, 23,900.	This gas is manmade and used for insulation in electric power transmission equipment, in the magnesium industry, in semiconductor manufacturing, and as a tracer gas.
Sources: Michael Brandman Associates, 2010.		

Table 4.3-1 (cont.): Greenhouse Gases

Greenhouse gases not defined by AB 32 include water vapor, ozone, and aerosols. Water vapor is an important component of our climate system and is not regulated. Ozone and aerosols are short-lived greenhouse gases; global warming potentials for short-lived greenhouse gases are not defined by the IPCC. Aerosols can remain suspended in the atmosphere for about a week and can warm the atmosphere by absorbing heat and cool the atmosphere by reflecting light. Black carbon is a type of aerosol that can also cause warming from deposition on snow.

There are no adverse health effects from the concentration of greenhouse gases in the atmosphere at the current levels, with the exception of ozone and aerosols (particulate matter). The potential health effects of ozone and particulate matter are discussed in criteria pollutant analyses. At very high concentrations, carbon dioxide, methane, sulfur hexafluoride, and some chlorofluorocarbons can cause suffocation as the gases can displace oxygen.

4.3.3 - Regulatory Setting

There are a variety of federal, State, and local regulations regarding climate change and greenhouse gases. For a more detailed account of these regulations, please refer to the Air Quality and Greenhouse Gas Analysis Report (Appendix D). A summary is contained herein.

Federal

International and federal agreements have been enacted to deal with climate change issues. In 1988, the United Nations and the World Meteorological Organization established the Intergovernmental Panel on Climate Change to assess the scientific, technical and socio economic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts, and options for adaptation and mitigation.

On March 21, 1994, the United States joined a number of countries around the world in signing the United Nations Framework Convention on Climate Change. Under the Convention, governments

gather and share information on greenhouse gas emissions, national policies, and best practices; launch national strategies for addressing greenhouse gas emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries; and cooperate in preparing for adaptation to the impacts of climate change.

A particularly notable result of the United Nations Framework Convention on Climate Change efforts is a treaty known as the Kyoto Protocol, which went into effect on February 16, 2005. When countries sign the Kyoto Protocol, they demonstrate their commitment to reduce their emissions of greenhouse gases or engage in emissions trading. More than 170 countries are currently participating in the Kyoto Protocol. Industrialized countries are required to reduce their greenhouse gas emissions by an average of 5 percent below their 1990 levels by 2012. In 1998, United States Vice President Al Gore symbolically signed the Protocol; however, in order for the Kyoto Protocol to be formally ratified, the United States Congress must approve it. Congress did not do this during the Clinton Administration. Former President George W. Bush did not submit the Protocol to Senate to be ratified based on the exemption granted to China. President Barack Obama has not taken action regarding the Kyoto Protocol because it is about to end.

Massachusetts v. EPA (Supreme Court Case 05-1120) was argued before the United States Supreme Court on November 29, 2006, in which it was petitioned that EPA regulate four greenhouse gases, including carbon dioxide, under Section 202(a)(1) of the Clean Air Act. A decision was made on April 2, 2007, in which the Supreme Court held that petitioners have a standing to challenge the EPA and that the EPA has statutory authority to regulate greenhouse gases emissions from new motor vehicles.

On December 7, 2009, the EPA Administrator signed two distinct findings regarding greenhouse gases under Section 202(a) of the Clean Air Act: 1) Current and projected concentrations of the six key well-mixed greenhouse gases--carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride--in the atmosphere threaten the public health and welfare of current and future generations. 2) The combined emissions of these well-mixed greenhouse gases from new motor vehicles and new motor vehicle engines contribute to the greenhouse gas pollution, which threatens public health and welfare.

State

There has been significant legislative and regulatory activity that affects climate change and greenhouse gases in California, as discussed below.

Title 24. Although not originally intended to reduce greenhouse gases, California Code of Regulations Title 24 Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings, was first adopted 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 efficient technologies and methods. The 2008 standards

became effective January 1, 2010. The requirement for when the 2008 standards must be followed is dependent on when the application for the building permit is submitted. Energy efficient buildings require less electricity; therefore, increased energy efficiency reduces fossil fuel consumption and decreases greenhouse gas emissions.

California Green Building Standards. On January 12, 2010, the State Building Standards Commission unanimously adopted updates to the California Green Building Standards Code, which will go into effect on January 1, 2011. The Code is a comprehensive and uniform regulatory code for all residential, commercial and school buildings.

Pavley Regulations. California AB 1493, enacted on July 22, 2002, required the ARB to develop and adopt regulations that reduce greenhouse gases emitted by passenger vehicles and light duty trucks. The regulation was stalled by automaker lawsuits and by the EPA's denial of an implementation waiver. On January 21, 2009, the ARB requested that the EPA reconsider its previous waiver denial. On January 26, 2009, President Obama directed that the EPA assess whether the denial of the waiver was appropriate. On June 30, 2009, the EPA granted the waiver request, which begins with motor vehicles in the 2009 model year.

Executive Order S-3-05. California Governor Arnold Schwarzenegger announced on June 1, 2005, through Executive Order S 3-05, the following reduction targets for greenhouse gas emissions:

- By 2010, reduce greenhouse gas emissions to 2000 levels.
- By 2020, reduce greenhouse gas emissions to 1990 levels.
- By 2050, reduce greenhouse gas emissions to 80 percent below 1990 levels.

The 2050 reduction goal represents what scientists believe is necessary to reach levels that will stabilize the climate. The 2020 goal was established to be an aggressive, but achievable, mid-term target. The Climate Action Team's Report to the Governor in 2006 contains recommendations and strategies to help ensure the 2020 targets in Executive Order S-3-05 are met.

Low Carbon Fuel Standard - Executive Order S-01-07. The Governor signed Executive Order S-01-07 on January 18, 2007. The order mandates that a statewide goal shall be established to reduce the carbon intensity of California's transportation fuels by at least 10 percent by 2020. In particular, the executive order established a Low-Carbon Fuel Standard and directed the Secretary for Environmental Protection to coordinate the actions of the California Energy Commission, the ARB, the University of California, and other agencies to develop and propose protocols for measuring the "life-cycle carbon intensity" of transportation fuels. This analysis supporting development of the protocols was included in the State Implementation Plan for alternative fuels (State Alternative Fuels Plan adopted by California Energy Commission on December 24, 2007) and was submitted to ARB for consideration as an "early action" item under AB 32. The ARB adopted the Low Carbon Fuel Standard on April 23, 2009.

AB 32. The California State Legislature enacted AB 32, the California Global Warming Solutions Act of 2006. AB 32 requires that greenhouse gases emitted in California be reduced to 1990 levels by the year 2020. "Greenhouse gases" as defined under AB 32 include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. ARB is the State agency charged with monitoring and regulating sources of greenhouse gases. AB 32 states the following:

Global warming poses a serious threat to the economic well-being, public health, natural resources, and the environment of California. The potential adverse impacts of global warming include the exacerbation of air quality problems, a reduction in the quality and supply of water to the state from the Sierra snowpack, a rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to marine ecosystems and the natural environment, and an increase in the incidences of infectious diseases, asthma, and other human health-related problems.

The ARB Board approved the 1990 greenhouse gas emissions level of 427 MMTCO₂e on December 6, 2007. Therefore, emissions generated in California in 2020 are required to be equal to or less than 427 MMTCO₂e. Emissions in 2020 in a "business as usual" scenario are estimated to be 596 MMTCO₂e.

The ARB approved the Climate Change Scoping Plan in December 2008. The Scoping Plan contains measures designed to reduce the State's emissions to 1990 levels by the year 2020. The Scoping Plan identifies recommended measures for multiple greenhouse gas emission sectors and the associated emission reductions needed to achieve the year 2020 emissions target—each sector has a different emission reduction target. The measures in the Scoping Plan will be in place by 2012. Most of the measures target the transportation and electricity sectors.

Local

The City of Orange published interim guidance for greenhouse gas emissions analysis in CEQA documents. The guidance is discussed in more detail in the Project Impacts section below.

On February 10, 2009, the Orange City Council adopted the "Orange Goes Green! Program." This program outlines City policies and actions aimed at guiding the City toward more resource efficient, environmentally responsible planning, development, and operations. The green program focuses on:

- Public Information and Outreach;
- City Planning and Development Policy;
- City Facilities and Operations; and
- Private Development Incentives.

In 2009, the City held Orange Code Academy II focusing on the new energy and green building standards, which will be incorporated into the California Building Code in the coming months. The

Code Academy also included workshops on City waste management and water conservation programs, and utility provider rebates and City incentives available to Orange residents and businesses.

To set the example, the City has adopted a policy that new public buildings and retrofits (greater than 10,000 square feet) will be designed to meet the Leadership in Energy and Environmental Design (LEED) green building standards, provided that the decision is fiscally responsible considering the environmental benefit, up-front cost and long-term cost savings. In addition, City staff are evaluating purchasing, maintenance and fleet policies and will be making changes to incorporate greener practices.

To encourage others to build green, the City is offering "Priority Processing" for planning entitlement and building permits for new third-party certified green buildings in Orange, and for eligible "green upgrades" to existing buildings. The City is also offering a Local Recognition Program whereby "green" projects will be recognized and promoted by the City as an example of environmentally responsible development in Orange.

4.3.4 - Significance Thresholds

CEQA Guidelines

According to Appendix G of the State CEQA Guidelines and the City's Local Guidelines, a project would normally have a significant effect on the environment if it would result in the following:

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

City of Orange Thresholds

In its Interim Guidance for Greenhouse Gas Emissions Analysis, the City of Orange accepts the "Tier 3" quantitative interim significance thresholds recommended by the SCAQMD for commercial, industrial, mixed use, and industrial development projects as follows:

- Industrial Projects 10,000 metric tons of carbon dioxide equivalents (MTCO2e) per year
- Residential, Commercial, and Mixed Use Projects (including industrial parks, warehouses, etc.) 3,000 MTCO2e per year.

Because of the nature of the project, the applicable greenhouse gas significance threshold is 3,000 MTCO₂e. If the project would generate greenhouse gas emissions below the threshold, it is acceptable to conclude that the project's greenhouse gas contribution would not be "cumulatively considerable" and would therefore be "less than significant" under CEQA.

If the project would generate greenhouse gas emissions above the quantitative thresholds identified above, the analysis should focus on design features or mitigation measures that would reduce or sequester greenhouse gas emissions, such that project emissions would be reduced to below the SCAQMD threshold. Feasible offsite greenhouse gas emission reduction projects could also be considered as a last option. Potential mitigation measures are listed in Appendix B of the California Air Pollution Control Officers Association report. Project level mitigation measures are also identified in the "Addressing Climate Change at the Project Level" document developed by the State Attorney General's Office. Energy conservation measures are also listed in Appendix F of the State CEQA Guidelines.

If the project would continue to generate greenhouse gas emissions that exceed the threshold after all feasible mitigation measures have been incorporated into the project, the analysis should conclude that the project would contribute greenhouse gas emissions which may be "cumulatively considerable" and the impact would be significant and unavoidable. Findings and a Statement of Overriding Considering (associated with a Draft EIR) would then be required, pursuant to CEQA.

4.3.5 - Project Impacts

The suggested components of a greenhouse gas analysis according to the City of Orange interim greenhouse gas guidance and the corresponding location in this Draft EIR section are as follows:

- Regulatory background: briefly review State law and regulatory framework for greenhouse gases (Section 4.3.3);
- Existing greenhouse gas setting: description of greenhouse gases, ARB and City of Orange inventory of greenhouse gases (Section 4.3.2);
- Quantification of project greenhouse gases (Section 4.3.5);
- Significance determination (Section 4.3.5 Level of Significance; and
- Mitigation measures (Section 4.3.5).

Impacts Not Found To Be Significant

The Initial Study determined that impacts would result from all of the significance threshold questions listed previously in Section 4.3.4.

Potentially Significant Impacts

Significance thresholds deemed to be potentially significant are evaluated individually. The list below restates the significance threshold and gives the corresponding Draft EIR Impact Number:

Table 4.3-2: Greenhouse Gas Emissions Significance Threshold and Corresponding Draft EIR Impact Number

	Significance Threshold - Greenhouse Gas Emissions	EIR Impact Number
a)	Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	Impact 4.3-1
b)	Conflict with an applicable policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	Impact 4.3-2

Greenhouse Gas Emissions Generation

Impact 4.3-1	Although the project would generate greenhouse gas emissions these emissions
	would not have a significant impact on the environment.

Impact Analysis

This analysis is restricted to greenhouse gases identified by AB 32, which include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. The project would generate a variety of greenhouse gases during construction and operation, including several defined by AB 32 such as carbon dioxide, methane, and nitrous oxide.

The project may also emit greenhouse gases that are not defined by AB 32. For example, the project may generate aerosols. Aerosols are short-lived particles, as they remain in the atmosphere for about one week. Black carbon is a component of aerosol. Studies have indicated that black carbon has a high global warming potential; however, the Intergovernmental Panel on Climate Change states that it has a low level of scientific certainty. Water vapor could be emitted from evaporated water used for landscaping, but this is not a significant impact because water vapor concentrations in the upper atmosphere are primarily due to climate feedbacks rather than emissions from project-related activities. The project would emit nitrogen oxides and volatile organic compounds, which are ozone precursors. Ozone is a greenhouse gas; however, unlike the other greenhouse gases, ozone in the troposphere is relatively short-lived and can be reduced in the troposphere on a daily basis. Stratospheric ozone can be reduced through reactions with other pollutants.

Certain greenhouse gases defined by AB 32 would not be emitted by the project. Perfluorocarbons and sulfur hexafluoride are typically used in industrial applications, none of which would be used by the project. Therefore, it is not anticipated that the project would emit those gases.

Greenhouse gas emissions from motor vehicles are assumed to remain the same over time because the emission factors used to estimate emissions from the motor vehicles that would access the project site are currently calculated as remaining constant. The on-road mobile inventory used the current version of the EMission FACtors model (EMFAC2007), and the off-road mobile inventory used the OFFROAD model for base emission factors. Both the EMFAC and OFFROAD Models develop carbon dioxide and methane emission estimates; however, they are not currently used as the basis for

ARB's official greenhouse gas inventory, which is based on fuel usage information. It is important to note that the current versions of EMFAC and OFFROAD are not fuel-based, but apply a single carbon dioxide factor that is unchanged throughout future years. ARB is working to reconcile the emissions estimates from the fuel usage approach and the models. Implementation of adopted regulations (such as AB 1493) and anticipated regulations will reduce future motor vehicular emissions.

The City of Orange guidance indicates, "...given that CO₂ [carbon dioxide] is the most prevalent GHG [greenhouse gas] associated with land development, the URBEMIS model will capture the majority of project GHGs and is therefore a reasonable choice" (City of Orange 2010). The City of Orange guidance also indicates that the methodology for the inventory should follow recommendations in Chapters 3 and 4 of the SCAQMD's Interim Thresholds document. The guidance goes on to say that the emissions should include indirect sources and direct sources (including construction emissions amortized over a 30 year period) and operational emissions (mobile, building energy use, energy use from water consumption, etc.).

An inventory of greenhouse gas emissions generated by the project is presented below. The emissions are converted to metric tons of carbon equivalents (MTCO₂e) using the formula:

 $MTCO_2e = (tons of gas) x (global warming potential) x (0.9072 metric tons of gas)$

Short-term Operations

The project would emit greenhouse gases from direct sources such as construction equipment and worker and delivery mobile sources and from upstream emission sources. An upstream emission source (also known as life cycle emissions) refers to emissions that were generated during the manufacture of products to be used for construction of the project. Upstream emission sources for the project include but are not limited to the following: emissions from the manufacture of cement; emissions from the manufacture of steel; and/or emissions from the transportation of building materials to the seller (i.e., URBEMIS only estimates the transportation of building materials locally). The upstream emissions were not estimated because they are not within the control of the project and to do so would be speculative at this time. Additionally, the California Air Pollution Control Officers Association White Paper on CEQA and Climate Change (2008) supports this conclusion by stating, "The full life-cycle of GHG [greenhouse gas] emissions from construction activities is not accounted for ... and the information needed to characterize [life-cycle emissions] would be speculative at the CEQA analysis level." Therefore, pursuant to CEQA Guidelines Sections 15144 and 15145, upstream /life cycle emissions are speculative and no further discussion is necessary.

The emissions of carbon dioxide from project construction equipment, worker vehicles, and haul trucks are shown in Table 4.3-3. Emissions of nitrous oxide and methane are negligible. The emissions are from all phases of construction.

Phase	Carbon Dioxide Emissions (tons)	Emissions (MTCO ₂ e)
Demolition	31	28
Grading	25	23
Trenching	9	8
Asphalt Paving	7	6
Building Construction and Architectural Coating	209	190
Total	281	255
Amortized (per year)	9	9
Notes: MTCO2e = metric tons of carbon dio: by 0.9072 and the global warming po divided by 30 years.	xide equivalent, converted f tential of 1. Amortized emi	rom tons by multiplying ssions are the total

Table 4.3-3: Construction Greenhouse Gases

Source: Michael Brandman Associates, 2010.

Long-term Operations

Operational or long-term emissions occur over the life of the project. Mobile, area source, and indirect sources generate operational emissions. Mobile sources are exhaust emissions from the motor vehicles that would access the project site. Note that the increases in motor vehicles would only be on Sundays. There would not be increases in vehicle trips during the weekdays. Area source emissions are primarily from natural gas. Electricity refers to the emissions from power plants used to generate the increase in electricity to be used for the project. An increase in building size may require an increase in air conditioning power. Refrigerants refer to leakages in refrigerants from the air conditioning system. Note that there may be negligible emissions from any increases in waste or water use; however, these would be minor and are therefore not reported. Table 4.3-4 summarizes the increase in greenhouse gas emissions from the operation of the project.

Table 4.3-4: Op	perational Green	house Gases
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Activity	Carbon Dioxide Emissions (pounds per day)	Days per Year	Emissions (MTCO₂e per year)
Area Sources	271	365	45
Motor Vehicles: Sunday	5,230	52	124
Electricity	225	365	37
Refrigerants	N/A	365	51
Total			257
Notes: MTCO ₂ e = metric tons of carbo N/A = not applicable because r Source: Michael Brandman As	on dioxide equivalent. efrigerants are hydrofluoro ssociates, 2010.	ocarbons, not carb	oon dioxide emissions.

Total Annualized

Total annualized greenhouse gas emissions from the project are derived by amortizing the construction emissions over 30 years as recommended by the SCAQMD and adding the estimated annual operational emissions. The total annualized greenhouse gas emissions from the project are summarized in Table 4.3-5. Also provided is the greenhouse gas significance threshold accepted by the City of Orange. As noted in the table, the annualized greenhouse gas emissions from the project would not exceed the significance threshold accepted by the City of Orange.

Activity	Emissions (MTCO₂e per year)
Construction (annualized over 30 years)	9
Operations	257
Total	266
City of Orange Greenhouse Gas Significance Threshold	3,000
Exceeds Threshold?	No
Notes: MTCO ₂ e = metric tons of carbon dioxide equivalent. Source: Michael Brandman Associates, 2010.	

Table 4.3-5: Total Annualized Greenhouse Gas Emissions

The City of Orange guidance indicates that the SCAQMD interim thresholds provide substantial evidence that the thresholds are consistent with the policy goals and greenhouse gas reduction targets set by the State. Specifically, the thresholds were set at levels that capture 90 percent of the greenhouse gas emissions from residential, commercial, mixed use, and industrial projects, consistent with the Executive Order S-3-05 target of reducing greenhouse gas emissions to 80 percent below 1990 levels by 2050 (or a 90 percent reduction from existing levels). Further, the threshold is a reasonable threshold because it will require medium and large projects to reduce greenhouse gas emissions, while allowing smaller projects (generally infill development) to proceed. The thresholds function as both project-level and cumulative-level thresholds. Emissions are less than significant.

Level of Significance Before Mitigation

Less than significant.

Mitigation Measures

No mitigation measures are required.

Level of Significance After Mitigation

Impacts were determined to be less than significant before mitigation.

Conflict with Existing Plans or Policies

Impact 4.3-2 The project would not conflict with an applicable policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases.

Impact Analysis

The City of Orange General Plan contains a variety of climate change related policies. The policies that apply to the project are listed in Table 4.3-6. As shown in the table, the project is consistent with the applicable policies.

Table 4.3-6: General Plan Consistency

General Plan Policy Summary	Project Consistency
Land Use Element	
Policy 2.6: Encourage linkage in and around mixed-use areas using a multi-modal circulation network, particularly transit, pedestrian sidewalks, paths and paseos, and bicycle and trail systems.	Consistent. The project provides pedestrian access via sidewalks along Orange Park Boulevard and Santiago Canyon Road that provide perimeter access to the site.
Policy 2.7: Ensure that the architecture, landscape design, and site planning of mixed-use projects are of the highest quality, and that they emphasize a pedestrian orientation and safe, convenient access between uses.	Consistent. The project provides pedestrian access, as described above.
Policy 3.4: Discourage commercial and industrial enterprises that have significant adverse soil, air, water, or noise impacts.	Consistent. The project does not have significant adverse air quality impacts.
Policy 6.8: Maximize landscaping along streetscapes and within development projects to enhance public health and environmental benefits.	Consistent. The project involves landscaping.
Growth Management Element	
Policy 1.7: Promote the expansion and development of alternative methods of transportation.	Consistent. The project provides pedestrian crosswalks at the intersection of the proposed Santiago Canyon Road entry and the intersection of Frank Lane/Orange Park Boulevard from Frank Lane and is adjacent to bicycle lane on Santiago Canyon Road.
Policy 1.8: Encourage the development of housing within close proximity to jobs and services.	Not needed. The project does not propose housing.
Policy 1.9: Ensure that new developments incorporate non- motorized and alternative transit amenities such as bike racks, bus benches and shelters, and pedestrian connections.	Consistent. The project will include bicycle racks and pedestrian connections.
Policy 2.4: Explore infill development or mixed-use opportunities wherever possible as developable space becomes more limited.	Consistent. The project could be considered an infill project.
Policy 2.5: Continue to work with OCTA and other regional transit agencies to provide such amenities as bus shelters, shade, and other special streetscape treatments at transit stations that encourage the use of regional bus and train services.	Not needed. There are no bus routes adjacent to the project site.

Table 4.3-6 (cont.): Greenhouse Gases

General Plan Policy Summary	Project Consistency
Natural Resources Element	
Policy 2.2: Support alternative transportation modes, alternative technologies, and bicycle and pedestrian-friendly neighborhoods to reduce emissions related to vehicular travel.	Consistent. The project provides pedestrian crosswalks at the intersection of the proposed Santiago Canyon Road entry and the intersection of Frank Lane/Orange Park Boulevard and bicycle access from Santiago Canyon Road and Orange Park Blvd. via Frank Lane.
Policy 2.3: Reduce the amount of water used for landscaping through the use of native and drought-tolerant plants, proper soil preparation, and efficient irrigation systems as parks are built or renovated.	Consistent. The project would utilize efficient irrigation systems.
Policy 2.6: Encourage sustainable building and site designs for new construction and renovation projects.	Consistent. The project incorporates sustainable features.
Policy 3.1: Evaluate the potential effects of climate change on the City's human and natural systems and prepare strategies that allow the City to appropriately respond and adapt.	Consistent. Refer to the climate change adaptation section.
Policy 3.2: Develop and adopt a comprehensive strategy to reduce greenhouse gases within Orange by at least 15 percent from current levels by 2020.	Consistent. The City of Orange greenhouse gas guidance indicates that the suggested numerical thresholds were set at levels that capture 90 percent of the greenhouse gas emissions from residential, commercial, mixed use, and industrial projects, consistent with the Executive Order S-3-05 target of reducing greenhouse gas emissions to 80 percent below 1990 levels by 2050 (or a 90 percent reduction from existing levels).
Public Safety Element	
Policy 9.1: Enhance and maintain safe pedestrian and bicycle movement through the integration of traffic control devices, crosswalks, and pedestrian-oriented lighting, into the design of streets, sidewalks, trails, and school routes throughout Orange.	Consistent. The project provides for pedestrian crosswalks at the intersection of the proposed Santiago Canyon Road entry and the intersection of Frank Lane/Orange Park Boulevard and bicycle access from Santiago Canyon Road and Orange Park Blvd. via Frank Lane.
Policy 9.2: Support creation of safe routes that encourage children to walk or bike to schools and recreational facilities.	Consistent. The project provides for pedestrian crosswalks at the intersection of the proposed Santiago Canyon Road entry and the intersection of Frank Lane/Orange Park Boulevard and there are bicycle lanes adjacent to the project.

Table 4.3-6 (cont.): Greenhouse Gases

General Plan Policy Summary	Project Consistency
Policy 9.3: Identify and attempt to remove impediments to pedestrian and bicycle access including those associated with rail, street, freeway, and waterway crossings and poorly marked or maintained pathways and sidewalks.	Consistent. The project includes improvements to pedestrian access.
Infrastructure Element	
Policy 4.4: Encourage integrated and cost-effective design and technology features within new development to minimize demands on dry utility networks.	Consistent. The project includes energy efficiency features.
Urban Design Element	
Policy 6.2: Ensure that new infill development contributes positively to the quality of the surrounding corridor or neighborhood, including the potential to provide additional park space, and minimize the visibility of onsite parking.	Consistent. Parking will be concentrated to the western and central portions of the site, resulting in less visibility from adjacent roadways. The grass multipurpose field at the eastern end of the project site will be used for occasional Sunday and special event parking but will remain a play field the majority of the time.
Source of General Plan Policy: City of Orange 2010. Source of Project Consistency: Michael Brandman Associates.	

There are no other plans that would be applicable to the project, such as a Climate Action Plan prepared by the City of Orange. The Salem project is consistent with all applicable climate change policies in the General Plan. Although the project emissions are under the City of Orange's significance thresholds, the following project features that are incorporated into the project would reduce emissions.

- New building construction and retrofitting the existing onsite vacant structure will incorporate energy Title 24 efficient measures including Part 11 CALGreen.
- Energy Star appliances and lighting will be incorporated into the project.
- Compact fluorescent lighting will be incorporated into the project.
- Low flush toilets will be incorporated into the new building construction and retrofitting the existing onsite vacant structure.
- Recognize the City's Orange Goes Green policy and incorporate elements of sustainable design.
- Window and door placements allow for cross-ventilation and airflow through the building's interior space providing natural ventilation and reducing the dependency on mechanical air conditioning systems.

- Faucets with flow reducers are provided.
- High-efficiency irrigation systems with low-flow drip and weather-based controllers to reduce water consumption are provided.

In addition to the features identified above, the following existing features will not be eliminated by the Salem Specific Plan and continue to be available that when used would reduce emissions.

- An existing off-street equestrian trail along Orange Park Boulevard, along the east side of the project site, runs west along Santiago Canyon Road and terminates where it intersects with the Sully-Miller Equestrian Arena adjacent to the project site. Equestrian crossing signals are proposed to be installed at the northwest and southwest corner of Orange Park Boulevard and Frank Lane, for the safety of the horses crossing on the equestrian trail along Orange Park Boulevard.
- The intersection at Santiago Canyon Road at Orange Park Boulevard is signalized and provides pedestrian push buttons and crosswalks for crossing maneuvers. At the intersection of Orange Park Boulevard and Frank Lane, and the proposed project entry at Santiago Canyon Road, crosswalks will be added for pedestrian use.
- Additionally, Santiago Canyon Road and Orange Park Boulevard are designated as Existing Class II (On-Street) bikeways. The bicyclists traveling along Orange Park Boulevard could use the pedestrian crosswalks located at the Frank Lane/Orange Park Boulevard intersections as well as the Santiago Canyon Road/Orange Park Boulevard intersections.

Level of Significance Before Mitigation

Less than significant.

Mitigation Measures

No mitigation measures are required.

Level of Significance After Mitigation

Impacts were determined to be less than significant before mitigation.

Climate Change Adaptation

Impact 4.3-3 The project would not be significantly impacted by climate change induced impacts from a reduced water supply, increased wildfires, or flooding.

Impact Analysis

Reduction in Water Supply

A vast network of human-made reservoirs and aqueducts captures and transports water throughout the state from northern California rivers and the Colorado River. The current distribution system relies on Sierra Nevada snowpack to supply water during the dry spring and summer months. Rising

temperatures, potentially compounded by decreases in precipitation, could severely reduce spring snowpack, increasing the risk of summer water shortages.

One of the major impacts of climate change is a loss of natural snowpack, particularly the Sierra Nevada snowpack. Snowmelt provides an annual average of 15 million acre-feet of water, released between April and July each year. The California Department of Water Resources projects that the Sierra snowpack will experience a 25 to 40 percent reduction from its historic average by 2050. Climate change is also anticipated to bring warmer storms that result in less snowfall at lower elevations, reducing the total snowpack.

The project would obtain a portion of its water from the Sierra snowpack. Therefore, it is possible that impacts from climate change could deplete the project's water supply. However, project features would reduce the project's consumption of water resources (see Impact 4.3-2 for a list of features). Therefore, this potential impact is less than significant.

Increased Wildfires

Climate change could result in increased wildfires. Warmer temperatures and longer dry seasons are the main reasons for the increasing trend in forest wildfire risk. Reduced winter precipitation and early spring snowmelt deplete the moisture in soils and vegetation, leading to longer growing seasons and drought. These increasingly dry conditions provide more favorable conditions for ignition. In addition, higher temperatures increase evaporative water loss from vegetation, increasing the risk of rapidly spreading and large fires. If temperatures rise into the predicted medium warming range, the risk of large wildfires in California could increase by as much as 55 percent, which is almost twice the increase expected if temperatures stay in the lower warming range.

The project site is surrounded by existing urban development and infrastructure on four sides. Therefore, the project would not be at risk of wildfires.

Flooding

The combination of increasingly severe winter storms, rising mean sea levels, other climactic fluctuations like El Niño, and high tides is expected to cause more frequent and severe flooding, erosion, and damage to coastal structures. Many California coastal areas are at significant risk for flood damage. For example, the city of Santa Cruz is built on the 100-year floodplain and is only 20 feet above sea level.

As precipitation falls in the form of rain rather than snow with greater storm intensity, high frequency flood events are projected to increase. Changes in soil moisture and watershed vegetation will change runoff and recharge patterns. Increased impermeable surfaces also contribute to more floods. Potential increases in wildfires due to climate change would increase floods following fire. For the purposes of federal flood insurance, the Federal Emergency Management Agency has traditionally used the 100-year flood event, which refers to the level of flood flows that has a one-percent chance of being exceeded in any single year. As California's hydrology changes, what is currently

considered a 100-year flood may strike more often, leaving many communities at greater risk. Moreover, as peak flows and precipitation change over time, climate change calls into question assumptions of "stationarity" that is used in flood-related statistical analyses like the 100-year flood. The California Department of Water Resources encourages planners to factor a new level of safety into the design, operation, and regulation of flood protection facilities such as dams, floodways, bypasses and levees, as well as the design of local sewers and storm drains.

The Project is not located within a 100-year flood plain or other flood hazard area. In addition, the project site has not been flooded since it was constructed in 1965. Impacts are less than significant.

Level of Significance Before Mitigation

Less than significant.

Mitigation Measures

No mitigation measures are required.

Level of Significance After Mitigation

Impacts were determined to be less than significant before mitigation.