3.6 Greenhouse Gas Emissions

This section presents an overview of region-specific information related to greenhouse gas (GHG) emissions, including a description of current emissions in the region. The impact analysis discusses the estimated GHG emissions associated with the updated Master Plan and includes sustainability elements of the Proposed Project. Mitigation measures are identified for significant impacts; the residual impact significance after mitigation measures are implemented is also identified. The impact analysis includes an evaluation of the consistency of the Proposed Project with statewide and local planning efforts to reduce GHG emissions.

3.6.1 Environmental Setting

"Global warming" and "global climate change" are the terms used to describe the increase in the average temperature of the earth's near-surface air and oceans since the mid-20th century and its projected continuation. Warming of the climate system is now considered to be unequivocal (IPCC, 2007), with global surface temperature increasing approximately 1.33 degrees Fahrenheit (°F) over the last 100 years. Continued warming is projected to increase global average temperature between 2 and 11°F over the next 100 years.

Natural processes and human actions have been identified as the causes of this warming. The International Panel on Climate Change (IPCC) concludes that variations in natural phenomena such as solar radiation and volcanoes produced most of the warming from pre-industrial times to 1950 and had a small cooling effect afterward. After 1950, however, increasing GHG concentrations resulting from human activity such as fossil fuel burning and deforestation have been responsible for most of the observed temperature increase. These basic conclusions have been endorsed by more than 45 scientific societies and academies of science, including all of the national academies of science of the major industrialized countries. Since 2007, no scientific body of national or international standing has maintained a dissenting opinion.

Increases in GHG concentrations in the earth's atmosphere are thought to be the main cause of human-induced climate change. GHGs naturally trap heat by impeding the exit of solar radiation that has hit the earth and is reflected back into space. Some GHGs occur naturally and are necessary for keeping the earth's surface inhabitable. However, increases in the concentrations of these gases in the atmosphere during the last 100 years have decreased the amount of solar radiation that is reflected back into space, intensifying the natural greenhouse effect and resulting in the increase of the global average temperature.

Greenhouse Gases (GHGs)

Carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) are the principal GHGs. When concentrations of these gases exceed natural concentrations in the atmosphere, the greenhouse effect may be enhanced. CO_2, CH_4, and N_2O occur naturally, but are also generated through human activity. Emissions of CO_2 are largely by-products of fossil fuel combustion, whereas CH_4

results from off-gassing[1] associated with agricultural practices and landfills. Other human-generated GHGs, which have much higher heat-absorption potential than CO_2, include fluorinated gases such as hydrofluorocarbons (HFCs), perfluorocarbons (PFC), and sulfur hexafluoride (SF_6), which are byproducts of certain industrial processes.

CO_2 is the reference gas for climate change because it is the predominant GHG emitted. The effect that each of the aforementioned gases can have on global warming is a combination of the mass of their emissions and their global warming potential (GWP). GWP indicates, on a pound-for-pound basis, how much a gas is predicted to contribute to global warming relative to how much warming would be predicted to be caused by the same mass of CO_2. CH_4 and N_2O are substantially more potent GHGs than CO_2, with GWPs of 21 and 310 times that of CO_2, respectively.

In emissions inventories, GHG emissions are typically reported in terms of pounds or metric tons of CO_2 equivalents (CO_2e). CO_2e are calculated as the product of the mass emitted of a given GHG and its specific GWP. While CH_4 and N_2O have much higher GWPs than CO_2, CO_2 is emitted in such vastly higher quantities that it accounts for the majority of GHG emissions in CO_2e, both from residential developments and human activity in general.

Potential Effects of Human Activity on GHG Emissions

Fossil fuel combustion, especially for the generation of electricity and powering of motor vehicles, has led to substantial increases in CO_2 emissions (and thus substantial increases in atmospheric concentrations). In 1994, atmospheric CO_2 concentrations were found to have increased by nearly 30 percent above pre-industrial (c. 1860) concentrations. There is international scientific consensus that human-caused increases in GHGs have contributed and will continue to contribute to global warming.

Potential global warming impacts in California may include, but are not limited to, loss in snow pack, sea level rise, more extreme heat days per year, more high ozone days, more large forest fires, and more drought years. Secondary effects are likely to include the displacement of thousands of coastal businesses and residences, impacts to agriculture, changes in disease vectors, and changes in habitat and biodiversity. As the California Air Resources Board (CARB) Scoping Plan noted, the Legislature in enacting Assembly Bill 32 (California Health and Safety Code Division 25.5, Sections 38500, et seq., or AB 32) found that global warming would cause detrimental effects to some of the state's largest industries, including agriculture, winemaking, tourism, skiing, commercial and recreational fishing, forestry, and the adequacy of electrical power. As evidence of these impacts, the Scoping Plan reports that "the Sierra snowpack, an important source of water supply for the state, has shrunk 10 percent in the last 100 years. It is expected to continue to decrease by as much as 25 percent by 2050. World-wide changes are causing sea levels to rise – about 8 inches of increase has been recorded at the Golden Gate Bridge over the past 100 years – threatening low coastal areas with inundation and serious damage from storms."

[1] Off-gassing is defined as the release of chemicals under normal conditions of temperature and pressure.

Impacts of Climate Change

Ecosystem and Biodiversity Impacts

Climate change is expected to have effects on diverse types of ecosystems, from alpine to deep-sea habitat (USEPA, 2008a). As temperatures and precipitation change, seasonal shifts in vegetation would occur; this could affect the distribution of associated flora and fauna species. As the range of species shifts, habitat fragmentation could occur, with acute impacts on the distribution of certain sensitive species. The IPCC states that "20 percent to 30 percent of species assessed may be at risk of extinction from climate change impacts within this century if global mean temperatures exceed 2 to 3°C (3.6 to 5.4°F) relative to pre-industrial levels"(IPCC, 2007). Shifts in existing biomes could also make ecosystems vulnerable to encroachment by invasive species. Wildfires, which are an important control mechanism in many ecosystems, may become more severe and more frequent, making it difficult for native plant species to repeatedly re-germinate. In general terms, climate change is expected to put a number of stressors on ecosystems, with potentially catastrophic effects on biodiversity.

Human Health Impacts

Climate change may increase the risk of vector-borne infectious diseases, particularly those found in tropical areas and spread by insects such as malaria, dengue fever, yellow fever, and encephalitis (USEPA, 2008b). Cholera, which is associated with algal blooms, could also increase. While these health impacts would largely affect tropical areas in other parts of the world, effects would also be felt in California. Warming of the atmosphere would be expected to increase smog and particulate pollution, which could adversely affect individuals with heart and respiratory problems, such as asthma. Extreme heat events would also be expected to occur with more frequency and could adversely affect the elderly, children, and the homeless. Finally, the water supply impacts and seasonal temperature variations expected as a result of climate change could affect the viability of existing agricultural operations, making the food supply more vulnerable.

Greenhouse Gas Emissions Estimates

Global Emissions

Worldwide emissions of GHGs in 2004 were 30 billion tons of CO_2e per year including both ongoing emissions from industrial and agricultural sources, but excluding emissions from land use changes (UNFCCC, 2007).

U.S. Emissions

In 2009, the United States emitted about 6.7 billion tons of CO_2e or about 21 tons/year/person. Of the four major sectors nationwide — residential, commercial, industrial, and transportation — transportation accounts for the highest fraction of GHG emissions (approximately 33 percent); these emissions are entirely generated from direct fossil fuel combustion (USEPA, 2011).

State of California Emissions

In 2004, California emitted approximately 550 million tons of CO_2e, or about six percent of the U.S. emissions. This large number is due primarily to the sheer size and population of California compared to other states. By contrast, California has one of the lowest per capita GHG emission rates in the country, due to the success of its energy efficiency and renewable energy programs and commitments that have lowered the state's GHG emissions rate of growth by more than half of what it would have been otherwise (CEC, 2007). Another factor that has reduced California's fuel use and GHG emissions is its mild climate compared to that of many other states.

The California Environmental Protection Agency's Climate Action Team stated in its March 2006 report that the composition of gross climate change pollutant emissions in California in 2002 (expressed in terms of CO_2 equivalence) were as follows (CalEPA, 2006):

- CO_2 accounted for 83.3 percent;
- CH_4 accounted for 6.4 percent;
- N_2O accounted for 6.8 percent; and
- Fluorinated gases (HFCs, PFC, and SF_6) accounted for 3.5 percent.

The California Energy Commission (CEC) found that transportation is the source of approximately 41 percent of the state's GHG emissions, followed by electricity generation (both in-state and out-of-state) at 23 percent and industrial sources at 20 percent. Agriculture and forestry are the source of approximately 8.3 percent, as is the source categorized as "other," which includes residential and commercial activities (CEC, 2007).

Solano County Emissions

Solano County adopted a Climate Action Plan in June of 2011. Countywide GHG emissions were estimated at 960,700 metric tons per year in 2005 within the unincorporated areas of the County (Solano County, 2011). Of the sources in this total, the largest contributors include transportation sources (51percent), natural gas and electricity consumption (22 percent) and agricultural activities (21 percent).

Existing Emissions at the Airport

Based on fuel usage and electrical usage at the Airport, the estimated GHG emissions associated with the Nut Tree Airport is 1,761 metric tons per year of CO_2e.

3.6.2 Regulatory Setting

Federal Regulations

U.S. Environmental Protection Agency "Endangerment" and "Cause or Contribute" Findings

The U.S. Supreme Court held that the USEPA must consider regulation of motor vehicle GHG emissions. In *Massachusetts v. Environmental Protection Agency* et al., 12 states and cities, including California, together with several environmental organizations, sued to require the USEPA to regulate GHGs as pollutants under the Clean Air Act (127 S. Ct. 1438 (2007)). The Supreme Court ruled that GHGs fit within the Clean Air Act's definition of a pollutant and the USEPA had the authority to regulate GHGs.

On December 7, 2009, the USEPA Administrator signed two distinct findings regarding GHGs under Section 202(a) of the federal Clean Air Act:

- ***Endangerment Finding:*** The current and projected concentrations of the six key well-mixed GHGs—CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6—in the atmosphere threaten the public health and welfare of current and future generations.
- ***Cause or Contribute Finding:*** The combined emissions of these well-mixed GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution that threatens public health and welfare.

Mandatory Greenhouse Gas Reporting Rule

On September 22, 2009, the USEPA released its final Greenhouse Gas Reporting Rule (Reporting Rule). The Reporting Rule is a response to the fiscal year (FY) 2008 Consolidated Appropriations Act (H.R. 2764; Public Law 110-161), that required the USEPA to develop "…mandatory reporting of GHGs above appropriate thresholds in all sectors of the economy…." The Reporting Rule will apply to most entities that emit 25,000 metric tons of CO_2e or more per year. Starting in 2010, facility owners are required to submit an annual GHG emissions report with detailed calculations of facility GHG emissions. The Reporting Rule also mandates recordkeeping and administrative requirements in order for the USEPA to verify annual GHG emissions reports.

State Regulations

The legal framework for GHG emission reduction has come about through Executive Orders, legislation, and regulation. The major components of California's climate change initiative are reviewed within this section.

California Environmental Quality Act and Senate Bill 97

The California Environmental Quality Act (CEQA) requires lead agencies to consider the reasonably foreseeable adverse environmental effects of projects they are considering for approval. GHG emissions have the potential to adversely affect the environment because they

contribute to global climate change. In turn, global climate change has the potential to raise sea levels, affect rainfall and snowfall, and affect habitat.

Senate Bill 97

Senate Bill (SB) 97, signed in August 2007, acknowledges that climate change is a prominent environmental issue requiring analysis under CEQA. This bill directed the Governor's Office of Planning and Research (OPR) to prepare, develop, and transmit to the California Natural Resources Agency guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions, as required by CEQA, no later than July 1, 2009. The California Natural Resources Agency was required to certify or adopt those guidelines by January 1, 2010.

On December 30, 2009, the Natural Resources Agency adopted the state CEQA Guidelines amendments, as required by SB 97. These state CEQA Guidelines amendments provide guidance to public agencies regarding the analysis and mitigation of the effects of GHG emissions in draft CEQA documents. The amendments became effective March 18, 2010.

CEQA Guidelines

The CEQA Guidelines (Section 15064.4) specifically address the significance of GHG emissions. Section 15064.4 calls for a "good-faith effort" to "describe, calculate or estimate" GHG emissions in CEQA environmental documents. Section 15064.4 further states that the analysis of GHG impacts should include consideration of (1) the extent to which the project may increase or reduce GHG emissions, (2) whether the project emissions would exceed a locally applicable threshold of significance, and (3) the extent to which the project would comply with "regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of GHG emissions." The revisions also state that a project's incremental contribution to a cumulative effect is not cumulatively considerable if the project will comply with the requirements in a previously approved plan or mitigation program (including plans or regulations for the reduction of GHG emissions) that provides specific requirements that will avoid or substantially lessen the cumulative problem within the geographic area in which the project is located (Section 15064(h)(3). The CEQA Guidelines revisions do not, however, set a numerical threshold of significance for GHG emissions.

The revisions also include the following guidance (Section 15126.4(c)) on measures to mitigate GHG emissions, when such emissions are found to be significant:

> Consistent with Section 15126.4(a), lead agencies shall consider feasible means, supported by substantial evidence and subject to monitoring or reporting, of mitigating the significant effects of greenhouse gas emissions. Measures to mitigate the significant effects of greenhouse gas emissions may include, among others:
>
> (1) Measures in an existing plan or mitigation program for the reduction of emissions that are required as part of the lead agency's decision;
>
> (2) Reductions in emissions resulting from a project through implementation of project features, project design, or other measures;

(3) Off-site measures, including offsets that are not otherwise required, to mitigate a project's emissions;

(4) Measures that sequester greenhouse gases; and

(5) In the case of the adoption of a plan, such as a general plan, long range development plan, or plans for the reduction of greenhouse gas emissions, mitigation may include the identification of specific measures that may be implemented on a project-by-project basis. Mitigation may also include the incorporation of specific measures or policies found in an adopted ordinance or regulation that reduces the cumulative effect of emissions.

Assembly Bill 1493

In 2002, then-Governor Gray Davis signed Assembly Bill (AB) 1493, which required the CARB to develop and adopt, by January 1, 2005, regulations that achieve "the maximum feasible reduction of GHGs emitted by passenger vehicles and light-duty trucks and other vehicles determined by CARB to be vehicles whose primary use is noncommercial personal transportation in the state."

To meet the requirements of AB 1493, the CARB approved amendments to the California Code of Regulations (CCR) in 2004, adding GHG emissions standards to California's existing standards for motor vehicle emissions. Amendments to CCR Title 13, Sections 1900 and 1961 (13 CCR 1900, 1961), and adoption of Section 1961.1 (13 CCR 1961.1), require automobile manufacturers to meet fleet-average GHG emissions limits for all passenger cars, light-duty trucks within various weight criteria, and medium-duty passenger vehicle weight classes (i.e., any medium-duty vehicle with a gross vehicle weight [GVW] rating of less than 10,000 pounds and that is designed primarily for the transportation of persons), beginning with model year 2009. For passenger cars and light-duty trucks with a loaded vehicle weight (LVW) of 3,750 pounds or less, the GHG emission limits for model year 2016 are approximately 37 percent lower than the limits for the first year of the regulations, model year 2009. For light-duty trucks with an LVW of 3,751 pounds to a GVW of 8,500 pounds, as well as for medium-duty passenger vehicles, GHG emissions will be reduced approximately 24 percent between 2009 and 2016.

Because the Pavley standards (named for the bill's author, state Senator Fran Pavley) would impose stricter standards than those under the federal Clean Air Act, California applied to the USEPA for a waiver under the federal Clean Air Act; this waiver was denied in 2008. In 2009, however, the USEPA granted the waiver.

Executive Order S-3-05

In 2005, in recognition of California's vulnerability to the effects of climate change, then-Governor Arnold Schwarzenegger established Executive Order S-3-05, which sets forth the following target dates by which statewide GHG emissions would be progressively reduced: by 2010, reduce GHG emissions to 2000 levels; by 2020, reduce GHG emissions to 1990 levels; and by 2050, reduce GHG emissions to 80 percent below 1990 levels.

Assembly Bill 32 and the California Climate Change Scoping Plan

In 2006, the California legislature passed AB32, also known as the Global Warming Solutions Act. AB 32 requires the CARB to design and implement feasible and cost-effective emission limits, regulations, and other measures, such that statewide GHG emissions are reduced to 1990 levels by 2020 (representing a 25 percent reduction in emissions). AB 32 anticipates that the GHG reduction goals will be met, in part, through local government actions. The CARB has identified a GHG reduction target of 15 percent from current levels for local governments themselves and notes that successful implementation of the plan relies on local governments' land use planning and urban growth decisions because local governments have primary authority to plan, zone, approve, and permit land development to accommodate population growth and the changing needs of their jurisdictions.

Pursuant to AB 32, the CARB adopted a Scoping Plan in December 2008 (re-approved by the CARB on August 24, 2011 [CARB, 2008]) outlining measures to meet the 2020 GHG reduction goals. In order to meet these goals, California must reduce its GHG emissions by 30 percent below projected 2020 business-as-usual emissions levels or about 15 percent from today's levels. The Scoping Plan recommends measures that are worth studying further, and that the State may implement, such as new fuel regulations. It estimates that a reduction of 174 million metric tons of CO_2e (about 191 million U.S. tons) from the transportation, energy, agriculture, forestry, and other sources could be achieved should the State implement all of the measures in the Scoping Plan. The Scoping Plan relies on the requirements of Senate Bill (SB) 375 (discussed below) to implement the carbon emission reductions anticipated from land use decisions.

Cap-and-Trade Program

The Scoping Plan identifies cap-and-trade as a key strategy for helping California reduce its GHG emissions (CARB, 2008). A cap-and-trade program sets the total amount of GHG emissions allowable for facilities under the cap and allows covered sources, including producers and consumers of energy, to determine the least expensive strategies to comply. AB 32 required the CARB to adopt the cap-and-trade regulation by January 1, 2011, and the program itself was to begin in 2012.

However, a San Francisco Superior Court judge issued a final order implementing a decision that found flaws in the CARB's adoption of the Scoping Plan. The CARB has appealed the judge's order, which blocked the CARB from implementing its recently adopted cap-and-trade program, and has obtained a temporary suspension from the appellate court. Temporary suspension of the order has allowed CARB staff to move forward with a revised analysis of AB 32 Scoping Plan alternatives. However, additional issues remain to be addressed with regard to mechanisms for implementation and the analysis of alternative before the cap and trade program begin.

While considerable uncertainty remains in the details of cap-and-trade, nearly all proposals for GHG reduction allow for the creation and trade of "carbon offset credits." Carbon offset credits are created through the development of projects, such as renewable energy generation or carbon sequestration projects, that achieve the reduction of emissions from activities not otherwise regulated, covered under an emissions cap, or resulting from government incentives. Offsets are

verified reductions of emissions whose ownership can be transferred to others. As required by AB 32, any reduction of GHG emissions used for compliance purposes must be real, permanent, quantifiable, verifiable, enforceable, and additional. Offsets used to meet regulatory requirements must be quantified according to CARB-adopted methodologies, and the CARB must adopt a regulation to verify and enforce the reductions. The criteria developed will ensure that the reductions are quantified accurately and are not double-counted within the system (CARB, 2008).

Executive Order S-1-07

Executive Order S-1-07, signed by then-Governor Arnold Schwarzenegger in 2007, proclaimed that the transportation sector is the main source of GHG emissions in California, at over 40 percent of statewide emissions. The order established a goal of reducing the carbon intensity of transportation fuels sold in California by a minimum of 10 percent by 2020. It also directed the CARB to determine whether this Low Carbon Fuel Standard could be adopted as a discrete, early-action measure after meeting the mandates in AB 32. The CARB adopted the Low Carbon Fuel Standard on April 23, 2009.

Senate Bills 1078 and 107 and Executive Orders S-14-08 and S-21-09

SB 1078 (Chapter 516, Statutes of 2002) requires retail sellers of electricity, including investor-owned utilities and community choice aggregators, to provide at least 20 percent of their supply from renewable sources by 2017. SB 107 (Chapter 464, Statutes of 2006) changed the target date to 2010.

In November 2008, then-Governor Schwarzenegger signed Executive Order S-14-08, which expands the state's Renewable Portfolio Standard to 33 percent renewable power by 2020. In September 2009, then-Governor Schwarzenegger continued California's commitment to the Renewable Portfolio Standard by signing Executive Order S-21-09, which directs the CARB under its AB 32 authority to enact regulations to help the state meet its Renewable Portfolio Standard goal of 33 percent renewable energy by 2020.

The 33-percent-by-2020 goal was codified in April 2011 with Senate Bill X1-2, which was signed by Governor Edmund G. Brown, Jr. This new Renewable Portfolio Standard preempts the CARB 33 percent Renewable Electricity Standard and applies to all electricity retailers in the state, including publicly owned utilities (POUs), investor-owned utilities, electricity service providers, and community choice aggregators. All of these entities must adopt the new Renewable Portfolio Standard goals of 20 percent of retail sales from renewables by the end of 2013 and 25 percent by the end of 2016, with the 33 percent requirement being met by the end of 2020.

Senate Bill 1368

SB 1368 is the companion bill of AB 32 and was signed by then-Governor Schwarzenegger in September 2006. SB 1368 requires the California Public Utilities Commission (PUC) to establish a GHG emission performance standard for baseload generation from investor-owned utilities by February 1, 2007. The CEC was also required to establish a similar standard for local publicly owned utilities by June 30, 2007. These standards cannot exceed the GHG emission rate from a

baseload combined-cycle natural gas-fired plant. The legislation further requires that all electricity provided to California, including imported electricity, must be generated from plants that meet the standards set by the PUC and CEC.

Senate Bill 375

In addition to policy directly guided by AB 32, the legislature in 2008 passed SB 375, which provides for regional coordination in land use and transportation planning and funding to help meet the AB 32 GHG reduction goals. SB 375 aligns regional transportation planning efforts, regional GHG emissions reduction targets, and land use and housing allocations. SB 375 requires RTPs developed by the state's 18 metropolitan planning organizations (MPOs) to incorporate a "sustainable communities strategy" (SCS) that will achieve GHG emission reduction targets set by the CARB. SB 375 also includes provisions for streamlined CEQA review for some infill projects, such as transit-oriented development. SB 375 would be implemented over the next several years.

The Metropolitan Transportation Commission (MTC) is responsible for developing RTPs for the San Francisco Bay Area, including all of Solano County. MTC's 2013 RTP will be its first plan subject to SB 375.

3.6.3 Analysis, Impacts, and Mitigation

Significance Criteria

Criteria outlined in the CEQA Guidelines were used to determine the level of significance of identified impacts on GHGs. Appendix G of the CEQA Guidelines (as revised) indicates that a project would have a significant effect on the environment if it were to:

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

CAPCOA considers GHG impacts to be exclusively cumulative impacts (CAPCOA, 2008); as such, assessment of significance is based on a determination of whether the GHG emissions from a project represent a cumulatively considerable contribution to the global atmosphere.

Methodology and Assumptions

Approach

The Proposed Project's GHG emissions will be compared to the size of major facilities that are required to report GHG emissions (25,000 metric tons/year of CO_2e)[2] to the state; and the Project

[2] The State of California has not provided guidance as to quantitative significance thresholds for assessing the impact of greenhouse gas emissions on climate change and global warming concerns. Nothing in the CEQA Guidelines directly addresses this issue.

size will be compared to the estimated greenhouse reduction state goal of 169 million metric tons per year of projected CO_2e emissions in 2020. As noted above the 25,000 metric ton annual limit identifies the large stationary point sources in California that make up approximately 94 percent of the stationary emissions. If the Project's total emissions are below this limit, its total emissions are equivalent in size to the smaller projects in California that as a group only make up 6 percent of all stationary emissions. It is assumed that the activities of these smaller projects generally would not conflict with the state's ability to reach AB 32 overall goals. In reaching its goals the CARB will focus upon the largest emitters of GHG emissions.

Methodology

GHG emissions resulting from the Project were estimated using the a combination of the CalEEMod emission model for area (electrical usage, water and wastewater transport, the energy used to pump water and wastewater to and from the Proposed Project, and solid waste generation), stationary sources (natural gas combustion for water and space heating) and motor vehicle emissions as well as the Emission and Dispersion Modeling System (EDMS version 5.1.3) model for aircraft emissions.

GHG emissions from electrical usage are generated when energy consumed on the site is generated by fuel combustion. GHG emissions from water and wastewater transport are also indirect emissions resulting from the energy required to transport water from its source and the energy required to treat wastewater and transport it to its treated discharge point. Solid waste emissions are generated when the increased waste generated by a project are taken to a landfill to decompose. GHG emissions from electrical usage, water and wastewater conveyance, and solid waste were estimated using CalEEMod.

Vehicle trips assumed default trip lengths for urban land uses, which are embedded in CalEEMod which makes adjustments for implementation of Pavley vehicle standards and Low Carbon Fuel Standards (see Section 3.6.2). Model data and additional assumptions are included in **Appendix B** of this EIR. Construction emissions were also estimated using CalEEMod for equipment and truck exhaust and construction worker and vendor vehicle trips.

Impacts and Mitigation Measures

Development allowed under the Master Plan would generate GHG emissions directly, during construction and operation, as well as indirectly. GHGs would be emitted from construction through the use of construction equipment and vehicles.

Impact 3.6-1: Could the Proposed Project generate GHG emissions, either directly or indirectly, that may have a cumulatively significant impact on the environment? (*Less Than Significant*)

Phase I Projects

The Proposed Project would generate GHG emissions from a variety of sources. First, GHG emissions would be generated during construction of the Proposed Project. Once fully operational, Proposed Project operations associated with aviation and non-aviation commercial

projects would generate GHG emissions from an increase in both stationary and mobile sources as well as aircraft-related sources.

Construction Emissions

Construction emissions from the Proposed Project were estimated using the CalEEMod emissions model. Construction GHG emissions for all project phases are summed and then amortized over a 30-year period conservatively representing the lifetime of the Proposed Project.[3] Annual construction-related GHG emissions for Phase 1 of the Proposed Project are presented in **Table 3.6-1**. Construction-related GHG emissions are below the 25,000 metric ton of CO_2e threshold.

TABLE 3.6-1
ESTIMATED CONSTRUCTION-RELATED GHG EMISSIONS – PHASE I

	Total Emissions (MT CO_2e)			
Emission Source	**CO_2**	**CH_4**	**N_2O**	**Total CO_2e**
Phase I				
2013 Project	116	0.01	<0.01	116
2014 Projects	852	0.08	<0.01	853
2015 Projects	304	0.04	<0.01	305
2016 Project	226	0.02	<0.01	226
2017 Project	452	0.03	<0.01	452
Total	**1,949**	**0.18**	**<0.01**	**1,953**
Annual construction-related emissions amortized over 30 years	65.0	0.01	<0.01	65.1

Project CO_2 emissions estimates were made using CalEEMod v.2011.1.1.
SOURCE: KB Environmental Sciences, Inc, 2013.

Operational Emissions

As shown in **Table 3.6-2**, a sum of both direct and indirect GHG emissions resulting from operation of Phase 1 of the Proposed Project would result in a total of 15,867 metric tons per year of CO_2e[4] for Phase I. For Phase I, 217 metric tons per year are related to aircraft (within the landing-take-off (LTO) and cruise mode), ground service equipment (GSE), and auxiliary power units (APU) sources and 15,650 metric tons per year are related to area, stationary and motor vehicles sources.

[3] South Coast Air Quality Management District, *Draft Guidance Document – Interim CEQA Greenhouse Gas (GHG) Significance Threshold*, October 2008.

[4] CO_2e in all calculations of project impact include CO_2, CH_4 and N_2O.

TABLE 3.6-2
PROPOSED PROJECT INCREMENT OPERATIONAL GHG EMISSIONS – PHASE I

Emission Source	Total Emissions (MT CO_2e)			
	CO_2	CH_4	N_2O	Total CO_2e
Phase I				
Area. Electrical, Mobile Sources, Waste, and Water	10,201	228	1.94	15,650
Aircraft/APU/GSE	216	<0.01	0.03	217
Total	**10,417**	**228**	**1.97**	**15,867**

a. CH_4 in a large portion of municipal solid waste is counted as an anthropogenic GHG, because even if it is derived from sustainably harvested biogenic sources, degradation would not result in CH4 emissions if not for deposition in landfills. The CO_2 is not counted as a GHG in this context because if it were not emitted from landfills, it would be produced through natural decomposition. These data account for recycling and a nationwide average of landfill gas recovery and flaring (USEPA, 2006).
Columns may not total precisely due to rounding.

SOURCE: KB Environmental Sciences, Inc, 2012.

Area, Electrical, and Indirect Sources

Area and indirect sources associated with the proposed project would primarily result from electrical usage, water and wastewater transport (the energy used to pump water and wastewater to and from the project site) and solid waste generation. GHG emissions from electrical usage are generated when energy consumed on the site is generated by fuel combustion. GHG emissions from water and wastewater transport are also indirect emissions resulting from the energy required to transport water from its source, and the energy required to treat wastewater and transport it to its treated discharge point. Solid waste emissions are generated when the increased waste generated by the project are taken to a landfill to decompose.

GHG emissions from electrical usage, water and wastewater conveyance, and solid waste were estimated using the CalEEMod model. Emissions during Phase 1 projects are presented in **Table 3.6-2**. Electrical usage represents approximately 9 percent of the total operational GHG emissions. Solid waste represents approximately 39 percent of the total operational GHG emissions and water usage represents 40 percent of the total operational GHG emissions.

Mobile Emission Sources

Motor vehicle trips would be generated by an increase in employees and visitors accessing the project site. GHG emissions from these motor vehicle sources were calculated using the CALEEMod. **Table 3.6-2** presents the incremental mobile source GHG emissions associated with the Proposed Project. Transportation represents approximately 13 percent of the total operational GHG emissions.

Aircraft Emission Sources

Aircraft-related GHG emissions from aircraft (within the LTO cycle and within cruise mode to its destination), GSE, and APU were calculated following recommendations issued by the Transportation Research Board (TRB) Airport Cooperative Research Program (ACRP); specifically, the *Guidebook on Preparing Airport Greenhouse Gas Emission Inventories (ACRP Report 11, April 2009)*. To estimate these emissions, the emissions module of FAA's EDMS

program[5] and its internal databases were used. The estimated fuel usage for the aircraft, GSE, and APU was used along with fuel-based GHG emission factors presented in **Table 3.6-3** to determine the GHG emissions. Aircraft, GSE, and APU represent 1 percent of the total operational GHG emissions.

TABLE 3.6-3
AIRCRAFT AND GSE GHG EMISSION FACTORS

Fuel	CO_2	N_2O	CH_4	Units
Jet A	21.095	0.000463	0.000595	lb/gallon
AvGas	18.355	0.000243	0.0155	lb/gallon
Diesel	22.384	0.0001928	0.000534	lb/gallon
Gasoline	19.564	0.0002	0.00055	lb/gallon
Propane	12.669	0.00000023	0.000003	lb/gallon

SOURCE: Guidebook for Preparing Airport-Related Greenhouse Gas Emissions Inventories, prepared for the Airport Cooperative Research Program, Transportation Research Board, April 2009.

For GSE, GHG emissions were calculated based on the equipment fleet mix, its size and fuel rate within the EDMS. For the GHG emissions for APU calculation, the fuel usage was estimated based on manufacture fuel flow rates for respective APU (typically from 50 to 860 pounds per hour) and APU assignments within EDMS.

GHG Significance Threshold

There are no quantitative thresholds for GHG emissions proposed or adopted by YSAQMD. Because GHG emissions from the Proposed Project would result in a total of 15,867 metric tons per year of CO_2e[6] for Phase I, these Phase I GHG emissions would be less than the reporting threshold 25,000 MT/year of CO2e, and thus, *less than significant.*

Project Build-out

Construction Emissions

Construction emissions from the Proposed Project were estimated using the CalEEMod emissions model. Construction GHG emissions for Phases 1, II, and III are summed and then amortized over a 30-year period conservatively representing the lifetime of the Proposed Project.[7] Annual construction-related GHG emissions for the Proposed Project are presented in **Table 3.6-4**. Construction-related GHG emissions are well below the 25,000 metric ton of CO_2e threshold.

5 *Emissions and Dispersion Modeling System (EDMS).* U.S. Department of Transportation, Federal Aviation Administration, Office of Environment and Energy. Washington, DC. Version 5.1.3. November 2010.

6 CO_2e in all calculations of project impact include CO_2, CH_4 and N_2O.

7 South Coast Air Quality Management District, *Draft Guidance Document – Interim CEQA Greenhouse Gas (GHG) Significance Threshold*, October 2008.

TABLE 3.6-4
ESTIMATED CONSTRUCTION-RELATED GHG EMISSIONS

Emission Source	Total Emissions (MT CO_2e)			
	CO_2	CH_4	N_2O	Total CO_2e
	2,937	**0.23**	**<0.01**	**2,941**
Annual construction-related emissions amortized over 30 years	97.9	0.01	<0.01	98.1

Project CO_2 emissions estimates were made using CalEEMod v.2011.1.1.

SOURCE: KB Environmental Sciences, Inc, 2013.

Operational Emissions

As shown in **Table 3.6-5**, a sum of both direct and indirect GHG emissions resulting from operation of the Proposed Project would result in a total of 22,346 metric tons per year of CO_2e for Phase III. For Phase III, 413 metric tons per year are related to aircraft (within the LTO and cruise mode), GSE, and APU sources and 21,933 metric tons per year are related to area, stationary, and motor vehicles sources.

TABLE 3.6-5
PROPOSED PROJECT INCREMENT OPERATIONAL GHG EMISSIONS

Emission Source	Total Emissions (MT CO_2e)			
	CO_2	CH_4	N_2O	Total CO_2e
Project Build-out				
Area. Electrical, Mobile Sources, Waste, and Water	14,218	317	3.18	21,933
Aircraft/APU/GSE	408	0.01	0.09	413
Total	**14,626**	**317**	**3.27**	**22,346**

a. CH_4 in a large portion of municipal solid waste is counted as an anthropogenic GHG, because even if it is derived from sustainably harvested biogenic sources, degradation would not result in CH4 emissions if not for deposition in landfills. The CO_2 is not counted as a GHG in this context because if it were not emitted from landfills, it would be produced through natural decomposition. These data account for recycling and a nationwide average of landfill gas recovery and flaring (USEPA, 2006).
Columns may not total precisely due to rounding.

SOURCE: KB Environmental Sciences, Inc, 2012.

GHG Significance Threshold

There are no quantitative thresholds for GHG emissions proposed or adopted by YSAQMD. Because GHG emissions from the Proposed Project would result in a total of 22,346 metric tons per year of CO_2e for Phase III, GHG emissions associated with full build-out of the Proposed Project would be less than the state reporting threshold of 25,000 MT/year of CO_2e; thus, potential cumulative impacts associated with GHG emissions are considered *less than significant*.

Mitigation Measures: None required.

Impact 3.6-2: Could the Proposed Project conflict with the GHG reduction measures identified in CARB's AB 32 Scoping Plan or other applicable Plan or policy for reducing GHG emissions? (*Less Than Significant)*

In accordance with AB 32, CARB developed the Scoping Plan to outline the State's strategy to achieve 1990 level emissions by year 2020. To estimate the reductions necessary, CARB projected statewide 2020 business as usual (BAU) GHG emissions (i.e. GHG emissions in the absence of statewide emission reduction measures). CARB identified that the State as a whole would be required to reduce GHG emissions by 28.5 percent from year 2020 BAU to achieve the targets of AB 32.[8]

Statewide strategies to reduce GHG emissions include the Low Carbon Fuel Standard, California Appliance Energy Efficiency regulations, California Building Standards (e.g. California Green Building Code [CALGreen] and the 2008 Building and Energy Efficiency Standards), California Renewable Energy Portfolio standard (33 percent RPS), changes in the corporate average fuel economy standards (e.g., Pavley I and Pavley II), and other measures that would ensure the state is on target to achieve the GHG emissions reduction goals of AB 32. Statewide GHG emissions reduction measures that are being implemented over the next 10 years would reduce the project's GHG emissions. These measures have been implemented and operations of the Proposed Project would be subject to their implementation. No facet of the Proposed Project would disrupt or hinder implementation of these statewide efforts. Consequently, the Proposed Project would be consistent with statewide GHG reduction measures.

MTC's Sustainable Communities Strategy, which will regulate GHG emissions at the regional level, is not yet adopted. In addition, the City of Vacaville is in the process of preparing a Climate Action Plan, but it is not yet adopted. Therefore, there is no additional applicable plan, policy, or regulation against which the Master Plan could be compared and therefore would be a *less-than-significant impact.*

Mitigation Measures: None required.

Cumulative Impacts

Impact 3.6-3: Would the Proposed Project cause or contribute to a cumulative impact related to greenhouse gases? (*Less Than Significant*)

As described in section above, GHG emissions are considered cumulative in nature. Impact 3.6-1, addresses the potential for the Proposed Project to generate GHG emissions, either directly or indirectly, that may have a cumulatively significant impact on the environment. Results presented in Tables 3.6-1 through 5 indicate that the Proposed Project would not have a cumulatively

[8] California Air Resources Board (CARB), 2008. *Climate Change Proposed Scoping Plan, a Framework for Change.*

significant contribution on GHG emissions at Phase I or at full build-out; therefore, cumulative impacts related to GHG emissions are considered to be *less than significant*.

Mitigation Measures: None required.

3.6.4 References

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