4.4 CLIMATE CHANGE/GREENHOUSE GAS EMISSIONS

4.4.1 Existing Conditions

Climate change is the variation of Earth's climate over time, whether due to natural variability or as a result of human activities. The climate system is interactive, consisting of five major components: the atmosphere, the hydrosphere (ocean, rivers, and lakes), the cryosphere (i.e., sea ice, ice sheets, and glaciers), the land surface, and the biosphere (flora and fauna). The atmosphere is the most unstable and rapidly changing part of the system. It is made up of 78.1 percent nitrogen (N_2), 20.9 percent oxygen (O_2), and 0.93 percent argon (Ar). These gases have only limited interaction with the incoming solar radiation and do not interact with infrared (long-wave) radiation emitted by the Earth. However, there are a number of trace gases, such as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and ozone (O_3), that absorb and emit infrared radiation and therefore have an affect on the Earth's climate. These are greenhouse gases (GHG), and while they comprise less than 0.1 percent of the total volume mixing ratio in dry air[1], they are thought by many in the scientific community to play an essential role in influencing the earth's climate.

Because it's economy ranks seventh in the world and due to its relative physical size and population, California is the second largest total emitter of GHGs in the United States, surpassed only by Texas, and the tenth largest GHG emitter in the world. However, because of more stringent air pollutant emission regulations, in 2001 California ranked fourth lowest in carbon emissions per capita and fifth lowest among states in CO_2 emissions from fossil fuel consumption per unit of gross state product (total economic output of goods and services). In 2004, California produced 492 million metric tons (MMTons) of CO_2-equivalent (CO_2e) GHG emissions,[2] of which 81 percent were CO_2 from the combustion of fossil fuels, 2.8 percent were from other sources of CO_2, 5.7 percent were from methane, and 6.8 percent were from N_2O. The remaining 2.9 percent of GHG emissions were from high global warming potential gases.

CO_2 emissions from human activities make up 84 percent of the total GHG emissions. California's transportation sector is the single largest generator of GHG emissions, producing 40.7 percent of the state's total emissions. Electricity consumption is the second largest source, comprising 22.2 percent. While out-of-state electricity generation comprises 22 to 32 percent of California's total electricity supply, it contributes 39 to 57 percent of the GHG emissions associated with electricity consumption in the state. Industrial activities are California's third largest source of GHG emissions, comprising 20.5 percent of state's total emissions. Other major sources of GHG emissions include mineral production, waste combustion and land use, and forestry changes. Agriculture, forestry, commercial, and residential activities comprise the balance of California's greenhouse gas emissions.

Human Influence on Climate Change

For approximately 1,000 years before the Industrial Revolution, the amount of GHG in the atmosphere remained relatively constant. During the 20th century, however, scientists observed a rapid change in the climate and levels of climate change pollutants that are attributable to human activities. The amount of CO_2 has increased by more than 35 percent since pre-industrial times, and has increased at an average rate of 1.4 parts per million (ppm) per year since 1960, mainly due to the combustion of fossil fuels and deforestation. These recent changes in the levels of climate change pollutants far exceed the extremes of the ice ages, and the global mean temperature is warming at a rate that cannot be explained by natural causes alone. Human activities are directly altering the chemical composition of the atmosphere through the buildup of climate change pollutants.

[1] In the atmosphere, the volume of a gas is described in terms of dry weight because water vapor is the most significant contributor to the change in molecular weight of air.
[2] CO_2-equivalence is used to show the relative potential that different GHG have to retain infrared radiation in the atmosphere and contribute to the greenhouse effect. This potential, the global warming potential of a GHG, is also dependent on the lifetime, or persistence, of the gas molecule in the atmosphere.

Climate-change scenarios are affected by varying degrees of uncertainty. The Intergovernmental Panel on Climate Change's (IPCC) *2007 IPCC Fourth Assessment Report*, projects that the global mean temperature increase from 1990 to 2100, under different climate-change scenarios, will range from 1.4 to 5.8°C (2.5 to 10.4°F). In the past, gradual changes in the earth's temperature changed the distribution of species, availability of water, etc. However, human activities are accelerating this process so that environmental impacts associated with climate change no longer occur in a geologic time frame but within a human lifetime.

Potential Climate Change Impacts for California

Climate change is not a local environmental impact but a global impact. Unlike criteria pollutants, CO_2 emissions cannot be attributed to a direct health effect. However, human-caused increases in GHG have been shown to be highly correlated with increases in the surface and ocean temperatures on earth. What is not clear is the extent of the impact on environmental systems, and therefore on human beings.

Like the variability in the projections of the expected increase in global surface temperatures, the environmental consequences of gradual changes in the earth's temperature are also hard to predict, and there are varying degrees of uncertainty in environmental impact scenarios. Because of this uncertainty, the IPCC uses five different confidence levels to quantify climate change impacts on the environment: Very High Confidence (95 percent or greater of occurrence), High Confidence (67 to 95 percent), Medium Confidence (33 to 67 percent), Low Confidence (5 to 33 percent), and Very Low Confidence (5 percent or less).

In California and western North America, observations of the climate indicate that 1) there is a trend toward warmer winter and spring temperatures, 2) a smaller fraction of precipitation is falling as snow instead of rain, 3) there is a decrease in the amount of spring snow accumulation in the lower and middle elevation mountain zones, 4) there is an advance snowmelt of 5 to 30 days earlier in the spring, and 5) there is a similar shift (5 to 30 days earlier) in the timing of spring flower blooms (CAT 2006). According to the California Climate Action Team (CAT), even if actions could be taken to immediately curtail climate change emissions, the potency of emissions that have already built up, their long atmospheric lifetimes (see Table 1), and the inertia of the Earth's climate system could produce as much as 0.6°C (1.1°F) of additional warming. Consequently, some impacts from climate change are now unavoidable.

CAT and the California Environmental Protection Agency (Cal/EPA) use the results from the recent analysis of global climate change impacts for California under three IPCC scenarios: lower emissions (B1), medium-high emissions (A2), and high emissions (A1F1); each is associated with an increasing rise in average global surface temperatures. According to the California Energy Commission (CEC) in their 2006 report, *Our Changing Climate, Assessing the Risks to California*, global climate change risks to California include public health impacts (poor air quality made worse and more severe heat), water resources impacts (decreasing Sierra Nevada snow pack, challenges in securing adequate water supply, potential reduction in hydropower, and loss of winter recreation), agricultural impacts (increasing temperatures, increasing threats from pests and pathogens, expanded ranges of agricultural weeds, and declining productivity), coast sea level impacts (rising sea levels, increasing coastal floods, and shrinking beaches), forest and biological resource impacts (increasing wildfires, increasing threats from pest and pathogens, declining forest productivity, and shifting vegetation and species distribution), and electricity impacts (increased energy demand).

California Regulations

For purposes of planning and regulation, Section 15364.5 of Title 14 of the California Code of Regulations defines GHGs to include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride. Fossil fuel consumption in the transportation sector (on-road motor vehicles, off-highway mobile sources, and aircraft) is the single largest source of GHG emissions, accounting for approximately half of GHG emissions globally. Industrial and commercial sources are the second largest contributors of GHG emissions with about one-fourth of total emissions.

California has passed several bills and the Governor has signed at least three executive orders regarding greenhouse gases. GHG statues and executive orders (EO) include AB 32, SB 1368, EO S-03-05, EO S-20-06 and EO S-01-07.

AB 32 is one of the most significant pieces of environmental legislation that California has adopted. Among other things, it is designed to maintain California's reputation as a "national and international leader on energy conservation and environmental stewardship." It will have wide-ranging effects on California businesses and lifestyles as well as far reaching effects on other states and countries. A unique aspect of AB 32, beyond its broad and wide-ranging mandatory provisions and dramatic GHG reductions, are the short time frames within which it must be implemented. Major components of the AB 32 include:

- Requires the monitoring and reporting of GHG emissions beginning with sources or categories of sources that contribute the most to statewide emissions.
- Requires immediate "early action" control programs on the most readily controlled GHG sources.
- Mandates that by 2020, California's GHG emissions be reduced to 1990 levels.
- Forces an overall reduction of GHG gases in California by 25-40%, from business as usual, over the next 13 years (by 2020).
- Must complement efforts to achieve and maintain federal and state ambient air quality standards and to reduce toxic air contaminants.

Statewide, the framework for developing the implementing regulations for AB 32 is under way. Additionally, through the California Climate Action Registry (CCAR now called the Climate Action Reserve), general and industry-specific protocols for assessing and reporting GHG emissions have been developed. GHG sources are categorized into direct sources (i.e. company owned) and indirect sources (i.e. not company owned). Direct sources include combustion emissions from on-and off-road mobile sources, and fugitive emissions. Indirect sources include off-site electricity generation and non-company owned mobile sources.

4.4.2 Significance Criteria

In response to the requirements of SB97, the state Resources Agency developed guidelines for the treatment of GHG emissions under CEQA. These new guidelines became state laws as part of Title 14 of the California Code of Regulations in March 2010.

Title 14, CCR Section 15064.4 specifies how significance of GHG emissions is to be evaluated. The process is broken down into quantification of project-related GHG emissions, making a determination of significance, and specification of any appropriate mitigation if impacts are found to be potentially significant. At each of these steps, the new GHG guidelines afford the lead agency with substantial flexibility.

Emissions identification may be quantitative, qualitative or based on performance standards. CEQA guidelines allow the lead agency to "select the model or methodology it considers most appropriate". The most common practice for transportation/combustion GHG emissions quantification is to use a computer model such as URBEMIS2007, which was issued by the California Air Resources Board. This is the model that was used in the ensuing analysis.

The significance of those emissions then must be evaluated; the selection of a threshold of significance must take into consideration what level of GHG emissions would be cumulatively considerable. The guidelines are clear that they do not require a zero net emissions threshold. If the lead agency does not have sufficient expertise in evaluating GHG impacts, it may rely on thresholds adopted by an agency with greater expertise.

On December 5, 2008 the SCAQMD Governing Board adopted an Interim quantitative GHG Significance Threshold for industrial projects where the SCAQMD is the lead agency (e.g., stationary source permit projects, rules, plans, etc.) of 10,000 Metric Tons CO_2 equivalent/year. As part of the Interim GHG Significance Threshold development process for industrial projects, the SCAQMD established a working group of stakeholders that also considered thresholds for commercial or residential projects. As discussed in the Interim GHG Significance Threshold guidance document, the focus for commercial projects is on performance standards and a screening level threshold. For discussion purposes, the SCAQMD's working group considered performance standards primarily focused on energy efficiency measures beyond Title 24 and a screening level of 3,000 metric tons (MT) CO_2 equivalent/year based on the relative GHG emissions contribution between non-industrial sectors versus stationary source (industrial) sectors. The working group and staff ultimately decided that additional analysis was needed to further define the performance standards and to coordinate with CARB staff's interim GHG proposal. Staff, therefore, did not recommend action for adopting an interim threshold for non-industrial projects but rather recommended bringing this item back to the Board for discussion and possible action. As of this date, no final action on a quantitative significance threshold has been taken, but 3,000 MT per year has become a *de facto* screening threshold.

GHG emissions would be potentially significant if the project would:

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

4.4.3 Standard Conditions

No standard conditions are required.

4.4.4 Potential Impacts

4.4.4.1 Short-Term Construction Impacts

Construction Impacts

Because the proposed project encompasses only roadway improvements, project implementation will result in only short-term (i.e., construction) impacts. The proposed project is consistent with the local transportation master plan and, therefore, long-term operation of the project will not induce patterns of growth not already anticipated in the AQMP. No project-related long-term impacts would occur because the proposed project would not result in new development that would create a demand for energy resources and/or generate additional vehicular trips that would emit CO_2 and related air pollutants included in the greenhouse gas category in the long-term.

Based on the construction scheduling, equipment mix, and phasing proposed for the roadway improvements, the anticipated GHG emissions have been quantified. Based on the URBEMIS2007 computer model, the anticipated construction activities associated with the proposed project will generate the annual CO_2 emissions summarized in Table 4.4-1.

Table 4.4-1

GHG Construction Emissions

Activity	No. Days of Activity	Lbs/Day CO_2	Short Tons/Year	Metric Tons/ Year
Hardscape Resurface	41	2,902.4	59.87	54.43
Underground Utilities (Dry)	44	1,463.6	32.20	29.27
Underground Utilities (wet)	44	1,696.9	37.33	33.94
Landscape Improvements	43	1,092.6	23.49	21.35
Signals Signage and Striping	42	7,495.3	157.40	143.09
Total		**14,688.8**	**310.29**	**282.08**

SOURCE: Giroux & Associates (September 2010)

Equipment exhaust also contains small amounts of methane and nitric oxides, which are also GHGs. Non-CO_2 GHG emissions represent approximately a one percent increase in CO_2-equivalent emissions from diesel equipment exhaust. For screening purposes, the temporary construction activity GHG emissions were compared to the chronic operational emissions in the SCAQMD's interim thresholds. The screening level operational threshold is 3,000 metric tons (MT) of CO_2-equivalent (CO_2e) per year. As indicated in Table 4.4-1, worst year construction activities generating a total of 310 "short tons" (282 MT) are well below this threshold. As a result, no significant impacts will occur and no mitigation measures are required.

4.4.4.2 Long-Term Operational Impacts

As previously indicated, long-term operational GHG emissions are dependent upon the vehicle miles traveled (VMT) on the affected roadway system with and without the project. On a citywide scale, VMT generation is associated with development associated with buildout of the Dana Point Town Center as well as other areas of the City and within Orange County. Because the proposed project does not include development, it would not, therefore, result in additional VMT or other features that would create a demand for energy resources. As a result, no project-related GHG project-related GHG emissions will occur. There are no substantial long-term GHG implications associated with project implementation.

4.4.5 Mitigation Measures

The greenhouse gas emissions analysis conducted for the proposed project concluded that the short-term construction-related GHG emissions anticipated to occur as a result of project implementation will not exceed the screening threshold recommended by the SCAQMD. Therefore, no significant impacts are anticipated and no mitigation measures are required.

4.4.6 Level of Significance After Mitigation

No significant unavoidable GHG impacts will occur as a result of project implementation.