

## SECTION III.S GREENHOUSE GAS EMISSIONS

### III.S.1 Introduction

It is widely recognized that emissions of greenhouse gases<sup>1106</sup> (GHG) associated with human activities are contributing to changes in the global climate, and that such changes are having and would have adverse effects on the environment, the economy, and public health. These changes are the cumulative effects of past, present, and future actions worldwide. While worldwide contributions of greenhouse gases are expected to have widespread consequences, in general, currently it is not possible to correlate specific greenhouse gas emissions from a particular source or location with a climate change or associated environmental impacts of climate change at another location in California or the world. It is possible to quantify the greenhouse gases that would be emitted either directly from Project sources or indirectly from other sources, such as production of electricity used at the Project. However, those emissions cannot be tied to a particular adverse climate change effect on the environment.

During build-out and operation of the Project, greenhouse gases would be emitted as the result of construction activities; changes in vegetation sequestration capacity; new direct operational sources, such as natural gas usage; and indirect operational sources, such as production of electricity used at the Project, transport of water, and decomposition of Project-related wastes. Greenhouse gases would also be emitted by residents, visitors, and employees travelling to and from the Project site. This environmental impact report (EIR) estimates the Project's greenhouse gas emissions and discusses the Project's contribution to worldwide emissions of greenhouse gases.

The State of California, through the *California Global Warming Solutions Act of 2006*, Assembly Bill (AB) 32, and Executive Order S-3-05, has set statewide targets for the reduction of greenhouse gas emissions (refer to the Section III.S.3 [Regulatory Framework]). "The goal of AB 32 and S-3-05 is the significant reduction of future greenhouse gas emissions in a state that is expected to rapidly grow in both population and economic output."<sup>1107</sup> Accordingly, to achieve the state's goals, there would have to be a significant reduction in per capita greenhouse gas emissions.

For this EIR, emissions from nine categories of direct and indirect GHG emissions are estimated: emissions due to changes in vegetation sequestration, emissions from construction activities, residential building emissions, non-residential building emissions, mobile source emissions, municipal emissions, area sources, solid waste, and transit services. All emissions inventories are presented in metric tons unless otherwise indicated. An analysis of the life-cycle emissions associated with building materials was also prepared but not considered in the main emissions inventory.

The emissions inventory presented in this report was developed using guidance from two government-sponsored organizations to assist in the estimation of GHG emissions. These are the methodologies established by the California Climate Action Registry (CCAR) or the Intergovernmental Panel on Climate

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<sup>1106</sup> For the purposes of this analysis, the term "greenhouse gases" refers to carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride, those gases regulated under the California Global Warming Solutions Act of 2006 (Assembly Bill 32).

<sup>1107</sup> CAPCOA, 2008. *CEQA and Climate Change*, p. 32.

Change (IPCC), where possible. A variety of methods are employed to develop a complete emissions inventory including using studies commissioned by the California Energy Commission (CEC) providing data on energy use patterns associated with municipal activities, natural resource distribution, and other activities that would take place at the Project. In addition to CEC studies, studies performed by individual municipalities or scientific organizations are also used. Several publically available models and software programs developed by California agencies were used to assist in calculation of emissions. These include OFFROAD 2007, EMFAC2007, and Urban Emissions Model (URBEMIS). Sources used for this section include *Climate Change Technical Report for the Candlestick Point–Hunters Point Shipyard Phase II Project* (Environ 2009), included as Appendix S (Climate Change Technical Report), and information from the City and County of San Francisco Climate Action Plan (SFCAP), California Air Resources Board (ARB), and the California Climate Action Team (CAT).

## III.S.2 Setting

### ■ Overview of Climate Change

Global climate change is a broad term used to describe any worldwide, long-term change in the earth's climate. This change could be, for example, an increase or decrease in temperatures, the start or end of an ice age, or a shift in precipitation patterns. The term global warming is a more specific type of global climate change and refers to a general increase in temperatures across the earth. These rising temperatures can cause other climatic changes, such as a shift in the frequency and intensity of rainfall or hurricanes. Global warming does not necessarily imply that all locations would be warmer. Some specific, unique locations may be cooler even though the world, on average, is warmer.

Some gases in the atmosphere affect the Earth's heat balance through the greenhouse effect by absorbing infrared radiation. This layer of gases in the atmosphere prevents the heat from escaping. These gases are known as greenhouse gases. Naturally occurring GHGs have been present at relatively stable levels in the atmosphere for millennia. Examples of these natural GHGs include carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), and water vapor. In addition to these natural GHGs, there are several other man-made GHGs, including but not limited to: sulfur hexafluoride, hydrofluorocarbons, and perfluorocarbons.

As human industrial activity increased, the concentrations of GHGs in the atmosphere have increased. There is a general scientific consensus that most current global warming is the result of human activity on the planet. It is widely accepted that continued increases in GHG emissions would contribute to global climate change although there is uncertainty concerning the magnitude and timing of future emissions and the resultant warming trend. Human activities associated with industrial/manufacturing, utilities, transportation, residential, and agricultural sectors contribute to these GHG emissions. The ARB reported that transportation was the largest sector contributing to GHG emissions at 38 percent of the state's 2004 GHG emissions, followed by electricity generation.<sup>1108</sup>

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<sup>1108</sup> California Air Resources Board. 2007. *Staff Report – California 1990 Greenhouse Gas Emissions Level and 2020 Emission Limit*, November 16. <http://www.arb.ca.gov/cc/ccei.htm>.

The effect that each of these gases can have on global warming is a combination of the mass of their emissions and their global warming potential (GWP). As shown in Table III.S-1 (Global Warming Potentials of Select Greenhouse Gases), 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<sub>2</sub>. CH<sub>4</sub> and N<sub>2</sub>O are substantially more potent GHGs than CO<sub>2</sub>, with GWPs of 21 and 310, respectively.<sup>1109</sup> The GWP of a specific GHG depends on the absorption of infrared radiation by a GHG, the spectral location of its absorbing wavelengths, and the atmospheric lifetime of the GHG. In emissions inventories, GHG emissions are typically reported in terms of pounds (lbs) or tonnes<sup>1110</sup> of CO<sub>2</sub> equivalents (CO<sub>2</sub>e). CO<sub>2</sub>e are calculated as the sum of the product of the mass emitted of all six GHG and the GHG's specific GWP. While CH<sub>4</sub> and N<sub>2</sub>O have much higher GWPs than CO<sub>2</sub>, CO<sub>2</sub> is emitted in such vastly higher quantities that it accounts for the majority of GHG emissions in CO<sub>2</sub>e, both from residential developments and human activity in general (ENVIRON, p. 1).

<b>Table III.S-1 Global Warming Potentials of Select Greenhouse Gases</b>	
<b>Gas</b>	<b>Global Warming Potential (100 year time horizon)</b>
Carbon Dioxide	1
Methane	21
Nitrous Oxide	310
HFC-23	11,700
HFC-134a	1,300
HFC-152a	140
PFC: Tetrafluoromethane (CF <sub>4</sub> )	6,500
PFC: Hexafluoroethane (C <sub>2</sub> F <sub>6</sub> )	9,200
Sulfur Hexafluoride (SF <sub>6</sub> )	23,900

SOURCE: California Climate Action Registry. 2009. General Reporting Protocol Version 3.1. January

Water vapor is an important GHG, but is not recognized by international conventions because there is not an obvious correlation between water concentrations and specific human activities. Water vapor concentrations appear to act in a positive feedback manner; higher temperatures lead to higher water vapor concentrations.<sup>1111</sup>

<sup>1109</sup> GWP values from IPCC's Second Assessment Report (SAR, 1996) are still used by international convention and are used in this protocol, even though more recent (and slightly different) GWP values were developed in the IPCC's Third Assessment Report (TAR, 2001).

<sup>1110</sup> In this report, "tonnes" would be used to refer to metric tonnes (1,000 kilograms). "Tons" would be used to refer to short tons (2,000 pounds).

<sup>1111</sup> IPCC. Third Assessment Report.

Each of the six GHGs that are regulated by the Kyoto accords and the State of California<sup>1112</sup> are discussed below:

**Carbon dioxide** (CO<sub>2</sub>) is an odorless, colorless gas, which has both natural and anthropogenic (arising from human activities) sources. Natural sources include decomposition of dead organic matter; respiration of bacteria, plants, animals, and fungus; evaporation from oceans; and volcanic outgassing. Anthropogenic sources of carbon dioxide are from burning coal, oil, natural gas, and wood. Concentrations of carbon dioxide were 379 parts per million (ppm) in 2005, which equates to an increase of 1.4 ppm per year since 1960.<sup>1113</sup> CO<sub>2</sub> is the most common greenhouse gas generated by California activities, constituting approximately 84 percent of all greenhouse gas emissions.<sup>1114</sup> CO<sub>2</sub> emissions attributed to California activities are mainly associated with in-state fossil fuel combustion and fossil fuel combustion in out-of-state power plants supplying electricity to California. Other activities that produce CO<sub>2</sub> emissions include mineral production, waste combustion, and land use changes that reduce vegetation.

**Methane** (CH<sub>4</sub>) is a flammable gas and is the main component of natural gas. When one molecule of methane is burned in the presence of oxygen, one molecule of carbon dioxide and two molecules of water are released. A natural source of methane is from the anaerobic decay of organic matter. Geological deposits, known as natural gas fields, also contain methane, which is extracted for fuel. Other sources are landfills, fermentation of manure, and cattle.

**Nitrous oxide** (N<sub>2</sub>O), also known as laughing gas, is produced naturally by microbial processes in soil and water. Anthropogenic sources of nitrous oxide include agricultural sources, industrial processing, fossil fuel-fired power plants, and vehicle emissions. Nitrous oxide also is used as an aerosol spray propellant and in medical applications.

Other gases that contribute to the greenhouse effect include ozone,<sup>1115</sup> chlorofluorocarbons (CFCs), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF<sub>6</sub>), and aerosols. However, these latter greenhouse gases are generally emitted during industrial processes that are not expected at the Candlestick Point–Hunters Point Shipyard Phase II Redevelopment. This analysis, therefore, considers those GHGs most likely to be emitted by the Project: carbon dioxide, nitrous oxide, and methane.

Candlestick Point–Hunters Point Shipyard Phase II Redevelopment Plan residents, employees, and patrons of commercial and municipal buildings use electricity, heat their homes and water, and are transported in motor vehicles, all of which directly or indirectly emit GHGs. The principal GHGs emissions resulting from such developments are CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O. CO<sub>2</sub> is considered the most

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<sup>1112</sup> Governor Schwarzenegger recently added nitrogen trifluoride to the list regulated by the state of California.

Nitrogen trifluoride is used primarily in the microelectronics industry.

<sup>1113</sup> IPCC, 2007. R.B. Alley et al. *Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Summary for Policymakers.

<sup>1114</sup> CEC, 2007. *Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004*.

<sup>1115</sup> Ozone is a greenhouse gas; however, unlike other greenhouse gases, ozone in the troposphere is relatively short-lived. It is difficult to make an accurate determination of the contribution of ozone precursors (nitrogen oxides and volatile organic compounds) to global climate change. California Environmental Protection Agency, 2004. Technical Support Document for Staff Proposal Regarding Reduction of Greenhouse Gas Emissions from Motor Vehicles Climate Change Overview.

important GHG, due primarily to the large emissions produced by fossil fuel combustion, especially for the generation of electricity and powering of motor vehicles. CH<sub>4</sub> and N<sub>2</sub>O are also emitted by fossil fuel combustion, though their emissions are much less significant than CO<sub>2</sub>. CH<sub>4</sub> is also emitted from the transmission, storage, and incomplete combustion of natural gas (ENVIRON, p. 1) and landfills.

## ■ Scientific Assessment of Climate Change Scenarios

As GHG emissions increase, temperatures in California are projected to rise over the twenty-first century. The modeled magnitudes of the warming vary because of uncertainties in future emissions and the climate's sensitivity. According to a CEC report,<sup>1116</sup> projected warming scenarios predict temperatures to increase between 3.6 to 9°F by 2100. To comprehend the magnitude of these projected temperature changes over the next century, the lower range is slightly larger than the difference in annual temperature between Monterey and Salinas, which is 2.5°F, and the upper range of the warming is greater than the temperature difference between San Francisco and San Jose, which is 7.4°F. Rising temperatures could have a variety of impacts, including stress on sensitive populations (e.g., sick and elderly), additional burden on building systems (e.g., demand for air conditioning), and, indirectly, increasing emissions of greenhouse gases and criteria pollutants associated with energy generation. It is not possible to reliably quantify these risks at this time.

The California Resources Agency (CRA)<sup>1117</sup> recently prepared a document that discusses the impacts of climate change upon California. CRA reports that extreme natural events are likely to occur, including higher nighttime temperatures and longer, more frequent heat waves overall; 12 to 35 percent decrease in precipitation levels by mid- to late-twenty-first century; increased evaporation and faster incidences of snowmelt that would increase drought conditions, and more precipitation in the form of rain as compared to snow that would decrease water storage in California during the dry season and increase flood events during the wet season.<sup>1118</sup>

CRA also states that climate change would intensify California's "Mediterranean climate pattern," with the majority of annual precipitation occurring between November and March and drier conditions during the summer.<sup>1119</sup> This would increase droughts and floods and would affect river systems. Climate change is expected to alter seasonal and inter-annual patterns of precipitation. These changes continue to be one of the most uncertain aspects of future scenarios. For this Project, the most relevant direct impacts are likely to be changes in the timing and volume of stormwater runoff and changes in demand for irrigation. It is not possible to reliably quantify the implications of these changes at this time.

Another impact of global climate change is increased fire hazard. Changes in temperature and precipitation may combine to alter risks of wildfire. Fire is an important natural disturbance within many California ecosystems that promotes vegetation and wildlife diversity, releases nutrients, and eliminates

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<sup>1116</sup>Cayan, D. et al. 2009. *Climate Change Scenarios and Sea Level Rise Estimates for the California 2008 Climate Change Scenarios Assessment*. PIER Research Report, CEC-500-2009-014, California Energy Commission.

<sup>1117</sup> California Natural Resources Agency. *2009 California Climate Adaptation Strategy*. Discussion Draft.

<sup>1118</sup> Cayan, Dan, Mary Tyree, Mike Dettinger, Hugo Hidalgo, Tapash Das, Ed Maurer, Peter Bromirski, Nicholas Graham, and Reinhard Flick (2009). *Climate Change Scenarios and Sea Level Rise Estimates for the California 2008 Climate Change Scenarios Assessment*. PIER Research Report, CEC-500-2009-014, Sacramento, CA: California Energy Commission.

<sup>1119</sup> Cayan et al. 2009.

heavy fuel accumulations that can lead to catastrophic burns. The changing climate could alter fire regimes in ways that could have social, economic, and ecological consequences. As the existing climate throughout California changes over time, mass migration of species, or worse, failure of species to migrate in time to adapt to the changes in climate, could also result. Due to its weather, topography, and native vegetation, nearly all Northern California is at some risk from wildland fires also called wildfires. The extended droughts characteristic of California's Mediterranean climate result in large areas of dry vegetation that provide fuel for wildland fires that can spread into urban areas. Wildland-urban fires occur when a fire burning in wildland vegetation gets close enough to ignite urban structures. Areas of dense, dry vegetation, particularly in canyon areas and hillsides pose the greatest wildland fire potential. Changes in wildfire hazard have the potential to impact the Project; however, it is not possible to reliably quantify the implications of these changes at this time.

Changes in temperature and precipitation may also influence seasonal and inter-annual availability of water supplies. Consequently, it is reasonable to consider that climate change may affect water supply reliability. It is not possible to reliably quantify these risks for the Project at this time.

CRA states that sea level rise can cause damage to coastal communities and loss of land. A detailed discussion of sea level rise predictions is provided in Section III.M (Hydrology and Water Quality) of this EIR. The San Francisco Bay Conservation and Development Commission (BCDC) has prepared maps for areas inundated by 16 inches of sea level rise by 2050 and 55 inches of sea level rise by 2100.<sup>1120</sup> Therefore, extrapolating BCDC projections to the 2075 mid-point, sea level rise would be about 36 inches (3 feet), although some studies have concluded this rise would not occur until after the year 2100.<sup>1121</sup>

The CRA also notes that an emerging effect from climate change may be acidification (i.e., a decrease in the pH of the ocean water, making it more acidic.) of the ocean. In turn, acidification would affect the ability of hard-shelled invertebrates to create their skeletal structures.<sup>1122</sup> The implications of this change being major losses to shellfish industries, and shifts in food resources for ocean fisheries. The primary contributing factors were cited as increasing levels of CO<sub>2</sub> and weather pattern shifts. Increases in CO<sub>2</sub> result in increased uptake (i.e., absorption of the CO<sub>2</sub> into the ocean water) by the oceans, which result in decreased pH (acidification). Weather pattern shifts change the amount of calcium carbonate being delivered by rivers from sources stored in rocks, which further exacerbates the ability of invertebrates to form calcified shells.<sup>1123</sup>

One of the main contributing factors to CO<sub>2</sub>, outside of human influences, is melting permafrost. When permafrost thaws, it releases carbon into soil or beneath lakes and releases CO<sub>2</sub> and methane into the atmosphere. Scientists are now estimating that there is more than twice the total amount of carbon

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<sup>1120</sup> San Francisco Bay Conservation and Development Commission (BCDC), April 7, 2009, *Living with a Rising Bay: Vulnerability and Adaptation in San Francisco Bay and on its Shoreline*, Draft Staff Report.

<sup>1121</sup> Moffatt & Nichol, *Candlestick Point/Hunters Point Development Project Initial Shoreline Assessment*, prepared for Lennar Urban, February, 2009, op. cit.

<sup>1122</sup> Risien, J. (ed.). 2009. *West Coast Regional Marine Research and Information Needs*. Corvallis, Oregon: Oregon Sea Grant. ORESU-Q-09-001.

<sup>1123</sup> Griffith, E.M., A. Paytan, K. Caldeira, T. D. Bullen and E. Thomas. 2008. A dynamic marine calcium cycle during the past 28 million years. *Science*. December 12, 2008.

stored in permafrost as there is in atmospheric carbon dioxide, and “could amount to roughly half those resulting from global land-use change during this century.”<sup>1124</sup>

The importance of addressing climate impacts for California was recognized with Executive Order S-13-08 which called on state agencies to develop California’s first strategy to identify and prepare for these expected climate impacts. In response to S-13-08, CRA has developed a draft adaptation strategy. CRA recognizes that mitigation of GHG emissions is not the only means of dealing with climate change. The CRA report states “To effectively address the challenges that a changing climate would bring, climate adaptation and mitigation (i.e., reducing state GHG emissions) policies must complement each other, and efforts within and across sectors must be coordinated.” Adaptation refers to efforts to respond to the impacts of climate change not avoidance of the change. Adaptation is adjustments in natural or human systems to actual or expected climate changes to minimize harm or take advantage of beneficial opportunities. In the 2009 California Climate Adaptation Strategy Discussion Draft, the CRA made several recommendations. Key recommendations include:

- Appointment of a Climate Adaptation Advisory Panel
- Improved water management in anticipation of reduced water supplies, including a 20 percent reduction in per capita water use by 2020
- Consideration of project alternatives that avoid significant new development in areas that cannot be adequately protected from flooding due to climate change
- Preparation of agency-specific adaptation plans, guidance or criteria by September 2010
- Consideration of climate change impacts for all significant state projects
- Assessment of climate change impacts on emergency preparedness
- Identification of key habitats and development of plans to minimize adverse effects from climate change
- Development of guidance by the California Department of Public Health by September 2010 for use by local health departments to assess adaptation strategies
- Amendment of Plans to assess climate change impacts and develop local risk reduction strategies by communities with General Plans and Local Coastal Plans
- Inclusion of climate change impact information into fire program planning by state fire fighting agencies

## **Additional Climate Change Impacts**

### **Ecosystems and Biodiversity<sup>1125</sup>**

Climate change is expected to have effects on diverse types of ecosystems, from alpine to deep-sea habitat. 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

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<sup>1124</sup> Schuur, E.A.G. et al. 2008. Vulnerability of Permafrost Carbon to Climate Change: Implications for the Global Carbon Cycle. *BioScience*. 58(8): 701–714.

<sup>1125</sup> EPA, 2008. *Climate Change – Ecosystems and Biodiversity*. <http://www.epa.gov/climatechange/effects/eco.html> (accessed January 3, 2009).

impacts within this century if global mean temperatures exceed 2 to 3°C (3.6 to 5.4°F) relative to pre-industrial levels.<sup>1126</sup> Shifts in existing biomes could also make ecosystems vulnerable to invasive species encroachment. 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<sup>1127</sup>

Climate change may increase the risk of vector-borne infectious diseases, particularly those found in tropical areas and spread by insects: malaria, dengue fever, yellow fever, and encephalitis. 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 Inventories

Worldwide emissions of GHGs in 2004 were 26.8 billion tonnes of CO<sub>2</sub>e.<sup>1128</sup> In 2004, the US emitted about 7 billion tonnes of CO<sub>2</sub>e or about 24 tonnes of CO<sub>2</sub>e per year per person.<sup>1129</sup> Over 80 percent of the GHG emissions in the US are comprised of CO<sub>2</sub> emissions from energy related fossil fuel combustion. In 2004, California emitted 0.492 billion tonnes of CO<sub>2</sub>e, or about 7 percent of the US emissions.<sup>1130</sup> If California were a country, it would be the 16<sup>th</sup> largest emitter of GHGs in the world.<sup>1131</sup> This large number is due primarily to the sheer size of California. Compared to other states, California has one of the lowest per capita GHG emission rates in the country. This is due to California's higher energy efficiency standards, its temperate climate, and the fact that it relies on substantial out-of-state energy generation.

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<sup>1126</sup> IPCC, 2007: *Climate Change 2007: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change* [Parry, Martin L., Canziani, Osvaldo F., Palutikof, Jean P., van der Linden, Paul J., and Hanson, Clair E. (eds.)]. Cambridge University Press, Cambridge, United Kingdom, 1,000 pp.

<sup>1127</sup> EPA, 2008. *Climate Change – Health and Environmental Effects*.

<http://www.epa.gov/climatechange/effects/health.html#climate> (accessed January 3, 2009).

<sup>1128</sup> Sum of Annex I and Annex II countries without counting Land-Use, Land-Use Change and Forestry (LULUCF) [http://unfccc.int/ghg\\_emissions\\_data/predefined\\_queries/items/3814.php](http://unfccc.int/ghg_emissions_data/predefined_queries/items/3814.php) For countries for which 2004 data was unavailable, the most recent year was used.

<sup>1129</sup> 2006 Inventory of US Greenhouse Gas Emissions and Sinks.

[http://yosemite.epa.gov/oar/globalwarming.nsf/UniqueKeyLookup/RAMR6MBLP4/\\$File/06ES.pdf](http://yosemite.epa.gov/oar/globalwarming.nsf/UniqueKeyLookup/RAMR6MBLP4/$File/06ES.pdf).

<sup>1130</sup> California Air Resources Board. Note that 2004 is typically the most recent inventory year presented by the ARB; as such, USA- and world-wide emissions from 2004 are presented here to keep the comparison years the same.

<sup>1131</sup> Anywhere between the 12<sup>th</sup> and 16<sup>th</sup> depending upon methodology. *Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004*. California Energy Commission.

In 2004, 81 percent of greenhouse gas emissions (in CO<sub>2</sub>e) from California were comprised of CO<sub>2</sub> emissions from fossil fuel combustion, with 4 percent comprised of CO<sub>2</sub> from process emissions. CH<sub>4</sub> and N<sub>2</sub>O accounted for 5.7 percent and 6.8 percent of total CO<sub>2</sub>e respectively, and high GWP gases<sup>1132</sup> accounted for 2.9 percent of the CO<sub>2</sub>e emissions. Transportation is the largest end-use category of GHG emissions. Transportation includes that used for industry (i.e., shipping) as well as residential use.

In 2007, 102.6 million metric tonnes of CO<sub>2</sub>-equivalent (MMTCO<sub>2</sub>E) greenhouse gases were emitted by the San Francisco Bay Area (95.5 MMTCO<sub>2</sub>E were emitted within the Bay Area Air District and 7.1 MMTCO<sub>2</sub>E were indirect emissions from imported electricity). Transportation sources (e.g. fossil fuel combustion) were associated with 41 percent of the total emissions, industrial/commercial 34 percent, domestic 7 percent, power plants 15 percent, and off-road equipment 3 percent. In 1990, San Francisco's total GHG emissions were approximately 8.3 million metric tonnes CO<sub>2</sub>e.

### III.S.3 Regulatory Framework

Climate change has only recently been widely recognized as a threat to the global climate, economy, and population. As a result, the climate change regulatory setting—federal, state, and local—is complex and evolving. This section identifies key legislation, executive orders, and seminal court cases related to climate change germane to Project GHG emissions.

#### ■ Federal

Currently, there is no federal legislation requiring reductions in GHG emissions. Rather, the United States Environmental Protection Agency (USEPA) administers a variety of voluntary programs and partnerships with GHG emitters in which the USEPA partners with industries producing and utilizing synthetic GHGs to reduce emissions of these particularly potent GHGs. There are federal actions requiring increasing automobile efficiency, an endangerment finding for CO<sub>2</sub>, and a recently finalized regulation requiring large sources of GHG emissions to report their emission to the USEPA. In addition, there are several bills pending in Congress that are attempting to regulate GHG emissions in the United States; most of these bills require a cap and trade program where GHG emissions would be reduced overall through a market-driven approach.

#### **April 2007 Supreme Court Ruling**

In *Massachusetts et al. vs. Environmental Protection Agency et al.* (April 2, 2007) the US Supreme Court ruled that the *Clean Air Act* (CAA) authorizes the USEPA to regulate CO<sub>2</sub> emissions from new motor vehicles. The Court did not mandate that the USEPA enact regulations to reduce GHG emissions, but found that the only instances where the USEPA could avoid taking action if it were found that GHGs do not contribute to climate change or if it offered a “reasonable explanation” for not determining that GHGs contribute to climate change. On April 24, 2009 the US EPA issued a proposed endangerment finding, stating that high atmospheric levels of greenhouse gases “are the unambiguous result of human emissions, and are very likely the cause of the observed increase in average temperatures and other climatic changes.” The USEPA further found that “atmospheric concentrations of greenhouse gases

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<sup>1132</sup> Such as HFCs and PFCs.

endanger public health and welfare within the meaning of Section 202 of the CAA.” The finding itself does not impose any requirements on industry or other entities. The public comment period for this proposed endangerment finding ended June 23, 2009, and the finding is now under final review.<sup>1133</sup>

### **Corporate Average Fuel Efficiency Standards**

In response to the *Massachusetts et al. vs. Environmental Protection Agency et al.* ruling, the Bush Administration issued an executive order on May 14, 2007, directing the USEPA and Departments of Transportation (DOT) and Energy (DOE) to establish regulations that reduce GHG emissions from motor vehicles, non-road vehicles, and non-road engines by 2008. On December 19, 2007, the *Energy Independence and Security Act of 2007* (EISA) (discussed below) was signed into law, which requires an increased Corporate Average Fuel Economy (CAFE) standard of 35 miles per gallon for the combined fleet of cars and light trucks by model year 2020. EISA requires establishment of interim standards (from 2011 to 2020) that would be the “maximum feasible average fuel economy” for each fleet. On October 10, 2008, the National Highway Traffic Safety Administration (NHTSA) released a final environmental impact statement analyzing proposed interim standards for model years 2011 to 2015 passenger cars and light trucks. NHTSA issued a final rule for model year 2011 on March 23, 2009.<sup>1134</sup>

On May 19, 2009, President Obama announced a national policy for fuel efficiency and emissions standards in the US auto industry. The proposed rulemaking is a collaboration between the DOT and USEPA with the support of the United Auto Workers. The proposed federal standards apply to passenger cars, light-duty trucks, and medium duty passenger vehicles built in model years 2012 through 2016. If finalized, the proposed rule would surpass the 2007 CAFE standards and require an average fuel economy standard of 35.5 mpg in 2016. On May 22, 2009, the DOT and USEPA issued a notice of upcoming joint rulemaking on this issue.<sup>1135,1136</sup> A Draft Environmental Impact Statement has been issued and the comment period for this ends on November 9, 2009. On June 30, 2009 the USEPA granted the waiver to California for its greenhouse gas emission standards for motor vehicles; this is described in more detail below.

### **Energy Independence and Security Act of 2007**

In addition to setting increased CAFE standards for motor vehicles, the EISA includes other provisions:

- Renewable Fuel Standard (RFS) (Section 202)
- Appliance and Lighting Efficiency Standards (Section 301–325)
- Building Energy Efficiency (Sections 411–441)

Additional provisions of the EISA address energy savings in government and public institutions, promoting research for alternative energy, additional research in carbon capture, international energy programs, and the creation of “green jobs.”

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<sup>1133</sup> Available at <http://www.epa.gov/climatechange/endangerment.html>.

<sup>1134</sup> <http://www.nhtsa.dot.gov/portal/site/nhtsa/menuitem.43ac99aefa80569eea57529cdba046a0/>.

<sup>1135</sup> <http://yosemite.epa.gov/opa/admpress.nsf/6fa790d452bcd7f58525750100565efa/>.

451902cb77d4add5852575bb006d3f9b!OpenDocument.

<sup>1136</sup> <http://www.nhtsa.dot.gov/portal/site/nhtsa/menuitem.43ac99aefa80569eea57529cdba046a0/>.

## **Consolidated Appropriations Act of 2008 (HR 2764)**

Congress passed the *Consolidated Appropriations Act of 2008* (HR 2764) in December 2007, which includes provisions requiring the establishment of mandatory GHG reporting requirements. The measure directed USEPA to publish draft rules by September 2008, and final rules by June 2009 mandating reporting “for all sectors of the economy.” The USEPA finalized GHG reporting rules on September 22, 2009. The GHG reporting rule requires reporting of GHG emissions from facilities that emit 25,000 metric tonnes or more per year of GHG emissions and these are required to submit annual reports to EPA.

## **Congressional Bills**

There are several pieces of proposed legislation in both the United States Senate and House of Representatives. While these pieces are not yet final enacted regulations, they are key pieces that could have an impact on GHG emission reductions. The *American Clean Energy and Security Act of 2009*, known as the Waxman-Markey Bill is an energy bill that would establish a cap-and-trade plan for GHG emission reductions of 17 percent by 2020 to address climate change and 80 percent reduction by 2050. It also includes a 20 percent renewable energy source and efficiency requirement for utilities by 2020. This bill was passed by the House of Representatives on June 26, 2009. The bill needs to be voted on in the Senate.

The Senate is working on a companion bill, which was referred to the Senate Environment and Public Works committee for consideration. This bill is the *Clean Energy Jobs and American Power Act* known as the Kerry-Boxer bill. This bill calls for a 20 percent reduction in GHG emissions by 2020 and greater than 80 percent reductions by 2050. This is higher than the Waxman-Markey bill passed in the House of Representatives.

## **■ State**

California has enacted a variety of legislation that relates to climate change, much of which sets aggressive goals for GHG reductions within the state. However, none of this legislation provides definitive direction regarding the treatment of climate change in environmental review documents prepared under CEQA. As discussed below, the Office of Planning and Research (OPR) has been directed to develop CEQA Guidelines for the mitigation of GHG emissions and their effects; ARB must adopt regulations by January 1, 2010. OPR recently released a guidance document, discussed below, for analyzing GHG emissions under CEQA, but this document is purely advisory and serves as guidance only. On January 8, 2009, OPR released Preliminary Draft CEQA Guideline Amendments for Greenhouse Gas Emissions. These amendments propose specific guidelines to public agencies for addressing GHG emissions as part of the general CEQA requirements to determine a project’s effects on the environment. In addition, on October 24, 2008, ARB released a draft staff proposal entitled “Recommended Approaches for Setting Interim Significance Thresholds for Greenhouse Gases under the *California Environmental Quality Act*” (Draft ARB Thresholds). More detail was provided in another document released on December 9, 2008. However, the process of developing statewide guidance has been halted by the ARB. Because this process was halted, with no intention of continuing, it would not be further discussed in this section. On April 13, 2009, OPR submitted proposed amendments to the

CEQA Guidelines for greenhouse gas emissions to the Secretary for Natural Resources.<sup>1137,1138,1139</sup> On July 3, 2009, the CRA commenced the *Administrative Procedure Act* rulemaking process for certifying and adopting these amendments. Public comments were accepted through August 20, 2009.

No relevant local, state, or regional agency has promulgated binding regulations for analyzing GHG emissions, determining their significance, or mitigating any significant effects in CEQA documents for residential and commercial developments. The discussion below provides a brief overview of the ARB and OPR documents and of the primary legislation that relates to climate change, which may affect the emissions associated with the Project.

### **Assembly Bill 32 (Statewide GHG Reductions)**

The *California Global Warming Solutions Act of 2006*, widely known as AB 32, requires ARB to develop and enforce regulations for the reporting and verification of statewide greenhouse gas emissions. ARB is directed to set a greenhouse gas emission limit, based on 1990 levels, to be achieved by 2020. The bill sets a timeline for adopting a scoping plan for achieving greenhouse gas reductions in a technologically and economically feasible manner.

The heart of the bill is the requirement that statewide GHG emissions must be reduced to 1990 levels by 2020. California needs to reduce GHG emissions by approximately 29 percent below business-as-usual predictions of year 2020 GHG emissions to achieve this goal. The bill requires ARB to adopt rules and regulations in an open public process to achieve the maximum technologically feasible and cost-effective GHG reductions. Key AB 32 milestones include:

- June 30, 2007—Identification of discrete early action greenhouse gas emissions reduction measures. On June 21, 2007, ARB satisfied this requirement by approving three early action measures. These were later supplemented by adding six other discrete early action measures.
- January 1, 2008—Identification of the 1990 baseline GHG emissions level and approval of a statewide limit equivalent to that level. Adoption of reporting and verification requirements concerning GHG emissions. On December 6, 2007, ARB approved a statewide limit on GHG emissions levels for the year 2020 consistent with the determined 1990 baseline.
- January 1, 2009—Adoption of a scoping plan for achieving GHG emission reductions. On October 15, 2008, ARB issued a “discussion draft” Scoping Plan entitled “Climate Change Draft Scoping Plan: A Framework for Change” (Draft Scoping Plan). ARB adopted the Draft Scoping Plan at its December 11, 2008 meeting.
- January 1, 2010—Adoption and enforcement of regulations to implement the “discrete” actions.
- January 1, 2011—Adoption of GHG emissions limits and reduction measures by regulation.
- January 1, 2012—GHG emissions limits and reduction measures adopted in 2011 become enforceable.

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<sup>1137</sup> <http://opr.ca.gov/index.php?a=ceqa/index.html>.

<sup>1138</sup> <http://ceres.ca.gov/ceqa/guidelines/>.

<sup>1139</sup> <http://www.arb.ca.gov/cc/localgov/ceqa/ceqa.htm>.

### **Executive Order S-3-05 (Statewide GHG Targets)**

California Executive Order S-03-05 (June 1, 2005) mandates a reduction of GHG emissions to 2000 levels by 2010, to 1990 levels by 2020, and to 80 percent below 1990 levels by 2050. Although the 2020 target is the core of AB 32, and has effectively been incorporated into AB 32, the 2050 target remains the goal of the Executive Order.

### **Low Carbon Fuel Standard (LCFS)**

Executive Order S-01-07 (January 18, 2007) requires a 10 percent or greater reduction in the average fuel carbon intensity for transportation fuels in California regulated by ARB. ARB identified the LCFS as a Discrete Early Action item under AB 32, and the final resolution (09-31) was issued on April 23, 2009.<sup>1140</sup>

### **Senate Bill 1368 (GHG Emissions Standard for Baseload Generation)**

Senate Bill (SB) 1368 prohibits any retail seller of electricity in California from entering into a long-term financial commitment for baseload generation if the GHG emissions are higher than those from a combined-cycle natural gas power plant. This performance standard applies to electricity generated out of state as well as in state, and to publicly owned as well as investor-owned electric utilities.

### **Assembly Bill 1493 (Mobile Source Reductions)**

AB 1493 requires ARB to adopt regulations by January 1, 2005, to reduce GHG emissions from noncommercial passenger vehicles and light-duty trucks of model year 2009 and thereafter. The bill requires the CCAR to develop and adopt protocols for the reporting and certification of greenhouse gas emissions reductions from mobile sources for use by ARB in granting emission reduction credits. The bill authorizes ARB to grant emission reduction credits for reductions of greenhouse gas emissions prior to the date of enforcement of regulations, using model year 2000 as the baseline for reduction.

In 2004, ARB applied to the USEPA for a waiver under the federal CAA to authorize implementation of these regulations. The waiver request was formally denied by the USEPA in December 2007 after California filed suit to prompt federal action. In January 2008 the State Attorney General filed a new lawsuit against the USEPA for denying California's request for a waiver to regulate and limit GHG emissions from these automobiles. In January 2009, President Barack Obama issued a directive to the USEPA to reconsider California's request for a waiver. On June 30, 2009 the USEPA granted the waiver for California for its greenhouse gas emission standards for motor vehicles. As part of this waiver, USEPA specified the following provision: ARB may not hold a manufacturer liable or responsible for any noncompliance caused by emission debits generated by a manufacturer for the 2009 model year. California has agreed to cooperate with the federal CAFE and GHG emission reductions in order for there to be one national standard.

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<sup>1140</sup> <http://www.arb.ca.gov/fuels/lcfs/lcfs.htm>.

### **Senate Bills 1078 and 107 (Renewables Portfolio Standard)**

Established in 2002 under SB 1078 and accelerated in 2006 under SB 107, California's RPS requires retail suppliers of electric services to increase procurement from eligible renewable energy resources by at least 1 percent of their retail sales annually, until they reach 20 percent by 2010.

### **Executive Order S-14-08 and S-21-09 (Renewables Portfolio Standard)**

California Executive Order S-14-08 (November 11, 2008) mandates retail suppliers of electric services to increase procurement from eligible renewable energy resources to 33 percent by 2020. This has been reiterated by California Executive Order S-21-09 which charges ARB by July 31, 2010 to establish a regulation consistent with this 33 percent target by 2020. This is a further increase in RPS over SB 1078 and SB 107.

### **Senate Bill 375 (Land Use Planning)**

SB 375 provides for a new planning process to coordinate land use planning and regional transportation plans and funding priorities in order to help California meet the GHG reduction goals established in AB 32. SB 375 requires regional transportation plans, developed by Metropolitan Planning Organizations (MPOs) relevant to the Project site (including the Metropolitan Transportation Commission (MTC)), to incorporate a "sustainable communities strategy" in their regional transportation plans (RTPs) that would achieve GHG emission reduction targets set by ARB. 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.

SB 375 is similar to the Regional Blueprint Planning Program, established by the California Department of Transit, which provides discretionary grants to fund regional transportation and land use plans voluntarily developed by MPOs working in cooperation with Councils of Government. MTC's 2013 RTP would be its first plan subject to SB 375. The Scoping Plan adopted by ARB in December of 2008 relies on the requirements of SB 375 to implement the carbon emission reductions anticipated from land use decisions. The Regional Targets Advisory Committee (RTAC) established by SB 375 recently provided its recommendations to ARB.

### **Energy Conservation Standards**

Energy Conservation Standards for new residential and non-residential buildings were first adopted by California Energy Resources Conservation and Development Commission in June 1977 and most recently revised in 2008 (Title 24, Part 6 of the *California Code of Regulations* [CCR]).<sup>1141</sup> In general, Title 24 requires the design of building shells and building components to conserve energy. The standards are updated periodically to allow for consideration and possible incorporation of new energy efficiency technologies and methods.

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<sup>1141</sup> Although new building energy efficiency standards were adopted in April 2008, these standards do not go into effect until January 1, 2010. Thus, the 2005 standards that went into effect on October 1, 2005 remain the current Title 24 standards.

The 2006 Appliance Efficiency Regulations (Title 20, CCR Sections 1601 through 1608), dated December 2006, were adopted by the California Energy Commission on October 11, 2006, and approved by the California Office of Administrative Law on December 14, 2006. The regulations include standards for both federally regulated appliances and non-federally regulated appliances. While these regulations are now often seen as “business as usual,” they do exceed the standards imposed by any other state and reduce GHG emissions by reducing energy demand.

On July 17, 2008, the California Building Standards Commission adopted the nation’s first green building standards. The *California Green Building Standards Code* (proposed Part 11, Title 24) was adopted as part of the *California Building Standards Code* (Title 24, CCR). Part 11 establishes voluntary standards, which would become mandatory in the 2010 edition of the Code, on planning and design for sustainable site development, energy efficiency (in excess of the *California Energy Code* requirements), water conservation, material conservation, and internal air contaminants.

### **Office of Planning and Research Advisory on CEQA and Climate Change**

In June 2008, the OPR published a technical advisory entitled *CEQA and Climate Change: Addressing Climate Change Through CEQA* (OPR Advisory). This guidance, which is purely advisory, proposes a three-step analysis of GHG emissions:

1. **Mandatory Quantification of GHG Project Emissions.** The environmental impact analysis must include quantitative estimates of a project’s GHG emissions from different types of air emission sources. These estimates should include both construction-phase emissions, as well as completed operational emissions, using one of a variety of available modeling tools.
2. **Assessment of “Significance” of Project-Specific GHG Emissions.** Each EIR document should assess the significance of the project’s impacts on climate change. The OPR Advisory recognizes uncertainty regarding what GHG impacts should be determined to be significant and encourages agencies to rely on the evolving guidance being developed in this area. According to the OPR Advisory, the environmental analysis should describe a “baseline” of existing (pre-project) environmental conditions, and then add project GHG emissions on to this baseline to evaluate whether impacts are significant.
3. **Mitigation Measures.** According to the OPR Advisory, “all feasible” mitigation measures or project alternatives should be adopted if an impact is significant, defining feasibility in relation to scientific, technical, and economic factors. If mitigation measures cannot sufficiently reduce project impacts, the agency should adopt whatever measures are feasible and include a fact-based statement of overriding considerations explaining why additional mitigation is not feasible. OPR also identifies a menu of GHG emissions mitigation measures, ranging from balanced “mixed-use” master-planned project designs to construction equipment and material selection criteria and practices.

In addition to this three-step process, the OPR Advisory contains more general policy-level guidance. It encourages agencies to develop standard GHG emissions reduction and mitigation measures. The OPR Advisory directs ARB to recommend a method for setting the GHG emissions threshold of significance, including both qualitative and quantitative options.

## **Senate Bill 97 (CEQA Guidelines)**

SB 97 requires that OPR prepare guidelines to submit to the California Resources Agency regarding feasible mitigation of greenhouse gas emissions or the effects of greenhouse gas emissions as required by CEQA. The Resources Agency is required to certify and adopt these revisions to the CEQA Guidelines by January 1, 2010. The Guidelines would apply retroactively to any incomplete environmental impact report, negative declaration, mitigated negative declaration, or other related document.<sup>1142</sup>

The CRA received recommended Amendments to the CEQA Guidelines for greenhouse gas emissions from the Governor's Office of Planning and Research on April 13, 2009. On July 3, 2009, the CRA commenced the *Administrative Procedure Act* rulemaking process for certifying and adopting these amendments pursuant to *Public Resources Code* Section 21083.05. During the process, CRA would hold public hearings, receive oral comments, consider both written and oral comments, and publish the final rule, which would take into consideration comments made.

The January 8, 2009, Preliminary Draft CEQA Guideline Amendments for Greenhouse Gas Emissions state that the lead agency should consider the following when assessing the significance of impacts from GHG emissions on the environment:

- Extent the project helps or hinders the goals of AB 32
- Extent project may increase consumption of fuel and energy resources
- Extent project impacts or emissions exceed any threshold of significance

No specific methodologies for performing an assessment are indicated, but rather it is left to the lead agency to determine the appropriate methodologies in context of a particular project.

The proposed amendments indicate that lead agencies should consider all feasible means of mitigating greenhouse gas emissions that substantially reduce energy consumption or GHG emissions. These potential mitigation measures may include carbon sequestration (i.e., long-term storage of carbon dioxide or other forms of carbon). If off-site or carbon-offset mitigation measures are proposed they must be part of reasonable plan of mitigation that the agency itself is committed to implementing. No threshold of significance or any specific mitigation measures are indicated.

## **■ Regional**

### **Bay Area Air Quality Management District**

The Bay Area Air Quality Management District (BAAQMD) is the primary agency responsible for comprehensive air pollution control in the entire San Francisco Bay Area Air Basin. Currently, BAAQMD does not have an adopted or recommended threshold of significance for GHG emissions. However, BAAQMD is in the process of updating its CEQA Guidelines, which includes the development of recommended significance thresholds, assessment methodologies, and mitigation strategies for GHG emissions. The draft approach that BAAQMD is considering in their September

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<sup>1142</sup> Senate Bill No. 97. CHAPTER 185. An act to add Section 21083.05 to, and to add and repeal Section 21097 of, the Public Resources Code, relating to the California Environmental Quality Act.  
[http://www.opr.ca.gov/ceqa/pdfs/SB\\_97\\_bill\\_20070824\\_chaptered.pdf](http://www.opr.ca.gov/ceqa/pdfs/SB_97_bill_20070824_chaptered.pdf).

2009 document entitled *California Environmental Quality Act Draft Air Quality Guidelines* includes GHG thresholds for land-use development projects. BAAQMD presents three different criteria that could be used for determining significance of mixed-use development's operational GHG emissions. One option would include a numeric "bright line" threshold of 1,100 metric tonnes CO<sub>2</sub>e per year for operational emission sources including residential and non-residential building energy use, mobile source emissions, area source emissions, and indirect emissions associated with water usage. The second option is a metric based on the service population (the residential population plus the number of jobs associated with the land-uses). This metric is 4.6 tonnes per service population per year for operational emissions. The third option is compliance with a qualified Climate Action Plan that includes enforceable measures to reduce GHG emissions consistent with AB 32 goals or Executive Order S-03-05 targets. The BAAQMD expects to adopt new thresholds of significance later this year. In October 2009, BAAQMD posted updates to the staff-recommended CEQA thresholds of significance, which eliminate any climate change thresholds of significance criteria for construction emissions.<sup>1143</sup> Therefore, these are not discussed.

## ■ Local

In February 2002, the San Francisco Board of Supervisors passed the Greenhouse Gas Emissions Reduction Resolution (Resolution 158-02) committing the City to a GHG emissions reduction goal of 20 percent below 1990 levels by the year 2012. The resolution also directs the San Francisco Department of the Environment, the San Francisco Public Utilities Commission (SFPUC), and other appropriate City agencies are required to complete a GHG emission reduction action plan. In September 2004, the San Francisco Department of the Environment and the SFPUC published the Climate Action Plan for San Francisco: Local Actions to Reduce Greenhouse Emissions (Plan). Although the San Francisco Board of Supervisors has not formally committed the City to perform the actions addressed in the Plan, and many of the actions require development and commitment of resources, it is a blueprint for GHG emission reductions, and several of the actions are now in progress.

The Plan presents estimates of San Francisco's baseline GHG inventory and reduction targets. It states that burning fossil fuels in vehicles and for energy use in buildings and facilities is the major contributor to San Francisco's GHG emissions; in 1990, burning fossil fuels for these purposes produced approximately 8.3 million metric tonnes of CO<sub>2</sub>. The Plan also describes recommended emissions reduction actions in the key target sectors: transportation, energy efficiency, renewable energy, and solid waste management to meet stated goals by 2012.

The Plan presents proposals to reduce annual CO<sub>2</sub> emissions by 2.5 million tons by 2012, a 20 percent reduction below 1990 emissions, including greening vehicle fleets; increasing energy efficiency in public and private buildings; developing renewable energy technologies like solar, wind, fuel cells, and tidal power; and expanding residential and commercial recycling programs. The roadmap to achieving these goals requires the cooperation of a number of City, regional, and state agencies as well as private sector partners. The City is already implementing a wide range of actions (e.g., transportation, solar, and energy efficiency) to reduce GHG emissions.

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<sup>1143</sup> Available at <http://www.baaqmd.gov/~media/Files/Planning%20and%20Research/CEQA/Staff-Recommended%20and%20Existing%20CEQA%20Thresholds%20Table%2010-07-09.ashx>.

## Greenhouse Gas Reduction Ordinance

In May 2008, the City adopted an ordinance amending the *Environment Code* to establish GHG emission targets and action plans, to authorize the Department of the Environment to coordinate efforts to meet these targets, and to make environmental findings. The ordinance establishes the following GHG emission reduction limits and target dates for San Francisco:

- Determine 1990 City GHG emissions by 2008 (baseline level with reference to which target reduction are set)
- Reduce GHG emissions by 25 percent below 1990 levels by 2017
- Reduce GHG emission by 40 percent below 1990 levels by 2025
- Reduce GHG emissions by 80 percent below 1990 levels by 2050

The ordinance also requires City departments to prepare Climate Action Plans that assess and report GHG emissions and to prepare recommendations to reduce emissions. The San Francisco Planning Department is also required to (1) update and amend the City's applicable General Plan elements to include the emissions reduction limits set forth in the GHG reduction ordinance and policies to achieve those targets; (2) consider a project's impact on the City's GHG reduction limits as part of its review under CEQA; and (3) work with other City department to enhance the "transit first" policy to encourage a shift to sustainable modes of transportation, thereby reducing emissions and helping to achieve the targets set forth by the ordinance.

## Green Building Code

On August 5, 2008, the City adopted the *San Francisco Building Code* (SFBC), Chapter 13C, "green building codes" for new construction and for renovations of existing structures, consistent with the GHG reduction measures in the SFCAP. The new green building standards in SFBC Chapter 13C are to be phased in by 2012. At 2012, the ordinance specifically requires newly constructed commercial buildings over 5,000 square feet (sf) to be subject to Leadership in Energy and Environmental Design (LEED<sup>®</sup>) Gold, residential buildings over 75 feet in height to be LEED<sup>®</sup> certified or an equivalent standard, and other residential buildings to be subject to GreenPoint Rated to 75 points, which makes San Francisco the city with the most stringent green building requirements in the nation. The ordinance identifies cumulative benefits through the year 2012 which include reducing CO<sub>2</sub> emissions by 60,000 tons, saving 220,000 megawatt hours of power, saving 100 million gallons of drinking water, reducing waste and storm water by 90 million gallons of water, reducing construction and demolition waste by 700 million pounds, increasing the valuations of recycled materials by \$200 million, reducing automobile trips by 540,000, and increasing green power generation by 37,000 megawatt hours.

New projects would be evaluated on a point system with credit given for materials used in the building, the location of the building site and water and energy efficiencies. The new codes focus on water and energy conservation, recycling and reduction of carbon emissions. They apply to most buildings in the City, including residential projects of all sizes, new commercial buildings, and renovations of large commercial spaces. Large residential and commercial buildings would be evaluated under the LEED<sup>®</sup> rating system. Medium and small residential construction would use the GreenPoint rating system, which is less stringent.

## ***Transit First Policy***

In 1973, San Francisco instituted the Transit First Policy, which added Section 16.102 to the City Charter with the goal of reducing the City's reliance on freeways and meeting transportation needs by emphasizing mass transportation. The Transit First Policy gives priority to public transit investments; adopts street capacity and parking policies to discourage increased automobile traffic; and encourages the use of transit, bicycling and walking rather than use of single-occupant vehicles. Subsequent updates to the Planning Code have enhanced this commitment with provisions that have requirements to encourage the use of transit, walking and bicycling while discouraging driving. Some of these include required bicycle parking, required spaces for shared car services, shower facilities and lockers in commercial and industrial buildings, separation of parking costs from housing costs in new residential buildings, and transportation management programs.

In 2007, voters in San Francisco passed Proposition A, which requires a reduction of GHG emissions on the order of 20 percent, specific to the transportation sector. As part of this the San Francisco Municipal Transportation Authority (SFMTA) is developing a Climate Action Plan to meet the goals of this Proposition.

San Francisco has also recently adopted a Bicycle Plan that aims to encourage and increase the number of bicycle trips made in the city by further enhancing the bicycle network and adopting bicycle friendly policies.

San Francisco adopted a commuter benefits ordinance that requires all employers in San Francisco that have 20 or more employees to offer a commuter benefits program.

## ***San Francisco Sustainability Plan***

In 1993, the San Francisco Board of Supervisors established the Commission on San Francisco's Environment, charged with, among other things, drafting and implementing a plan for San Francisco's long-term environmental sustainability. The notion of sustainability is based on the United Nations definition that "a sustainable society meets the needs of the present without sacrificing the ability of future generations and non-human forms of life to meet their own needs." The Sustainability Plan for the City of San Francisco was a result of community collaboration with the intent of establishing sustainable development as a fundamental goal of municipal public policy.

The Sustainability Plan is divided into 15 topic areas, 10 that address specific environmental issues (air quality; biodiversity; energy, climate change and ozone depletion; food and agriculture; hazardous materials; human health; parks, open spaces, and streetscapes; solid waste; transportation; and water and wastewater), and five that are broader in scope and cover many issues (economy and economic development, environmental justice, municipal expenditures, public information and education, and risk management). Additionally, the Sustainability Plan contains indicators designed to create a base of objective information on local conditions and to illustrate trends toward or away from sustainability. Although the Sustainability Plan became official City policy in July 1997, the Board of Supervisors has not committed the City to perform all of the actions addressed in the plan. The Sustainability Plan serves as a blueprint, with many of its individual proposals requiring further development and public comment.

### **The Electricity Resource Plan (Revised December 2002)**

San Francisco adopted the Electricity Resource Plan to help address growing environmental health concerns in San Francisco's southeast community, home of two power plants. The plan presents a framework for assuring a reliable, affordable, and renewable source of energy for the future of San Francisco.

### **San Francisco Municipal Transportation Agency's Zero Emissions 2020 Plan**

The SFMTA's Zero Emissions 2020 plan focuses on the purchase of cleaner transit buses including hybrid diesel-electric buses. Under this plan hybrid buses would replace the oldest diesel buses, some dating back to 1988. The hybrid buses emit 95 percent less particle matter (PM, or soot) than the buses they replace, they produce 40 percent less oxides of nitrogen (NO<sub>x</sub>), and they reduce greenhouse gases by 30 percent.

### **LEED® Silver for Municipal Buildings**

In 2004, the City amended Chapter 7 of the *San Francisco Environment Code*, requiring all new municipal construction and major renovation projects to achieve LEED® Silver Certification from the US Green Building Council.

### **Zero Waste**

In 2004, the City committed to a goal of diverting 75 percent of its waste from landfills by 2010, with the ultimate goal of zero waste by 2020. San Francisco currently recovers 72 percent of discarded material.<sup>1144</sup> In 2009, the City added Chapter 19 to its *Environment Code*, which outlines the City's mandatory recycling and composting program. All people are required to separate their waste into recyclables, compostables, and trash; and all property managers, food vendors, and refuse collectors are required to supply appropriately designed containers so that refuse can be easily be separated.

### **Construction and Demolition Debris Recovery Ordinance**

In 2006, the City adopted Ordinance No. 27-06, requiring all construction and demolition debris to be transported to a registered facility that can divert a minimum of 65 percent of the material from landfills. This ordinance applies to all construction, demolition, and remodeling projects within the City.

In August 2008, Mayor Gavin Newsom signed into law San Francisco's Green Building Ordinance (codified as Chapter 13C of the SFBC) for newly constructed residential and commercial buildings and renovations to existing buildings. The City's Green Building Ordinance includes a requirement to redirect at least 75 percent of construction and demolition waste from landfills.

### **GoSolarSF**

In 2008, the San Francisco Public Utilities Commission (SFPUC) launched the "GoSolarSF" program to San Francisco's businesses and residents, offering incentives in the form of a rebate program that could

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<sup>1144</sup> San Francisco Department of the Environment Zero Waste program overview:  
[http://www.sfenvironment.org/our\\_programs/overview.html?ssi=3](http://www.sfenvironment.org/our_programs/overview.html?ssi=3).

pay for approximately half the cost of installation of a solar power system, and more to those qualifying as low-income residents.

The Planning Department and Department of Building Inspection have also developed a streamlining process for Solar Photovoltaic Permits and priority permitting mechanisms for projects pursuing LEED® Gold Certification.

### **Other Local Ordinances**

San Francisco has implemented several planning and zoning ordinances that address land use related GHG emissions. Some of these ordinances enhance neighborhood-serving retail, preserve and enhance the City's supply of affordable housing, and ensure that commuter traffic does not impede Muni transit service or overburden streets and parking. The City has a ban on non-approved wood burning fireplaces. The City has a transit impact development fee that applies to many new land-use development projects to offset the impact on the transportation system. For water efficiency measures the City has several ordinances including limitations on water use for landscaping in new developments.

## **III.S.4 GHG Emissions Inventory**

### **■ Inventory Method**

Project-generated GHG emissions were developed based on methodologies and emission factors recommended by CCAR, IPCC, and other government agencies to determine whether project implementation would conflict with the state goal of reducing GHG emissions in California to 1990 levels by 2020 (i.e., whether project GHG emissions would result in a substantial contribution to global climate change), as set forth by the timetable established in AB 32 or with San Francisco's Climate Action Plan<sup>1145</sup> such that the project would impede implementation of the local GHG reduction goals established by the 2008 Greenhouse Gas Reduction Ordinance.<sup>1146</sup> Project-specific information was used to determine the total GHG emissions. In addition, energy usage studies specific to the anticipated building uses were used. The methods used in this EIR apply local emission factors for the carbon intensity of electricity which are those recommended by the CCAR to be used in GHG emission inventories.<sup>1147</sup>

The Project consists of the construction and occupancy of the Project site. Project GHG emissions were calculated using guidance from the CCAR and IPCC. The GHG emissions inventory relied on scientific studies and studies conducted by government agencies that provide data on energy use patterns associated with building energy use, municipal activities, natural resources distribution, and other activities that would take place as part of the Project. The GHG emission inventory was developed using

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<sup>1145</sup> San Francisco Department of Environment. 2004. *Climate Action Plan for San Francisco*.  
<http://www.sfenvironment.org/downloads/library/climateactionplan.pdf>.

<sup>1146</sup> *San Francisco Municipal Code*, California Chapter 9 Greenhouse Gas Emissions Targets and Departmental Action Plans. <http://www.municode.com/library/HTML/14134/ch009.html>.

<sup>1147</sup> The CCAR General Reporting Protocol version 3.1 states on p. 34, "If your electricity provider reports an electricity delivery metric under the California Registry's Power/Utility Protocol, you may use this factor to determine your emissions, as it is more accurate than the default regional factor."  
[http://www.climateregistry.org/resources/docs/protocols/grp/GRP\\_3.1\\_January2009.pdf](http://www.climateregistry.org/resources/docs/protocols/grp/GRP_3.1_January2009.pdf).

several models to estimate GHG emissions from the Project. These include the OFFROAD 2007 model, EMFAC model, and the URBEMIS model.

A GHG inventory was prepared for the Project by ENVIRON International Corporation (ENVIRON) to identify both the one-time emissions and annual emissions that are expected to occur each year after build-out of the Project. The following analysis is a summary of this report<sup>1148</sup>.

This inventory was prepared as a “worst-case” analysis. For example, it assumes that all emissions from the Project would be “new,” in the sense that, absent the development of the Project, these emissions would not occur. Given the global nature of GHG emissions, “new” global GHG emissions are those caused by economic growth and population growth (births); local development projects accommodate such growth.

As an example of why these are worst-case emissions, these emissions are estimated assuming that there would be no reductions in GHG-generating activities over time. This would be unlikely, and presents a conservative analysis, given the expected reductions in GHG emissions from most activities that would take place over the years due to future regulations, greater public awareness, and the likely increasing costs of energy.

At the entitlement stage of a development, while the number of homes, the approximate size of commercial areas, and the locations of both are known, the exact designs of the homes, businesses, and facilities are not. The types of buildings and the types of facilities at the future project site can be used for developing an estimate of the project’s anticipated GHG emissions. Energy used in a building depends in part on the built environment; however, actual future emissions from the site would depend heavily upon the future homeowners’ and business owners’ habits. Because the actual future occupants and their habits are not yet known, average current behavior is assumed. That assumption is likely to be a “worst-case” assumption. Given the current regulatory environment and the media focus on global climate change, it is likely that the actual future occupants would be more sensitive to the GHG emissions caused by their activities and, therefore, their activities would result in lower GHG emissions than average current behavior shows.

The GHG emissions inventory includes some aspects that are fully within the control of the project, such as grading and the placement of utilities; some aspects that are in control of the individuals building the houses and commercial buildings, such as construction emissions; and some aspects for which control over emissions is shared by the developers and the residents, such as energy use in the built environment and emissions from traffic by the development’s future residents and employees in the commercial areas.

The timeframe over which GHGs are emitted varies from category to category, which is taken into consideration in the emissions inventory. For most of the categories, GHGs would be emitted every year that the development is inhabited. For these categories (residential buildings, nonresidential buildings, mobile sources, municipal services, and area sources), the inventory includes estimates of annual GHG emissions from ongoing operations associated with the Project. GHG emissions from two of the

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<sup>1148</sup> ENVIRON International Corporation. 2009. *Climate Change Technical Report Candlestick Point–Hunters Point Shipyard Phase II Development Plan*. October (Appendix S to this EIR).

categories, construction and changes in vegetation sequestration, are one-time events that would not be part of the Project's ongoing activity. These one-time emissions can be divided by the estimated lifetime of the Project to allow direct comparison of these two emissions classes. The inventory presents estimates of these one-time emissions, converts them to annualized estimates, and integrates them into an annual inventory.

## ■ Conceptual Design Features

The GHG emission inventory assumed the incorporation of several conceptual design features in its analysis. These conceptual design features are part of the Project. However, since there could be modifications during the entitlement and development process, these have been incorporated as mitigation measures to ensure that the Project would not be redesigned to omit these critical features. There has been no analysis of the GHG emissions without these conceptual design features. The conceptual design features are listed below and further discussed in the GHG emission inventory for individual source categories.

### ***Project Design Features Whose Emissions Reductions Were Incorporated into the Analysis***

- Provide neighborhood-serving retail.
- Provide automobile, public transportation, and pedestrian connections between the Shipyard, Candlestick Point, and the larger Bayview neighborhood.
- The urban design of the Project would reduce its footprint and allow for transportation and open space corridors.
- Integrate land use patterns with multimodal street networks that would facilitate walking and cycling for internal trips and transit for trips of greater distance.
- Extend existing Muni routes to better serve the Project site and area; increase frequencies on existing routes to provide more capacity; and complement those existing routes with new transit facilities and routes that would serve the Project's proposed land use program and transit demand.
- The Project is a redevelopment project and would not result in the conversion of any new land to settlement.
- Plant up to 10,000 trees net new trees at the Project site and in the community.
- Exceed the 2008 Standards for Title 24 Part 6 energy efficiency standards for homes and businesses by at least 15 percent.
- Install ENERGY STAR<sup>1149</sup> appliances, where appliances are offered by homebuilders.
- Use energy efficient street lighting.

### ***Project Design Features Whose Emissions Reductions Were Not Incorporated into the Analysis but Could Yield Further GHG Emissions Savings***

- Transportation Demand Management Plan to reduce the auto use and encourage residents, employees and visitors to use alternative modes of travel, such as transit, walking, and bicycling.

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<sup>1149</sup> The term ENERGY STAR is capitalized as is the convention used by the United States Environmental Protection Agency and Department of Energy.

- The energy savings resulting from the replacement of 256 older homes with new more energy efficient homes.
- The Project would provide a network of reclaimed-water mains for dual plumbing in commercial buildings and for irrigation of landscaped areas. Reclaimed water mains would distribute reclaimed water when and if the City develops a reclaimed source of water.

## ■ Standard Conditions

The Project would follow all applicable regulations and ordinances in existence at the time of Project construction. The follow rules and regulations are currently in existence and would be followed:

- Non-approved types of wood-burning stoves and fireplaces are prohibited.
- Residential and non-residential buildings must follow the *Green Building Code*.

## ■ GHG Emission Inventory

### **Short-Term (One-Time) Impacts**

Short-term or one-time emissions from the development of this Project are associated with vegetation removal and re-vegetation on the Project site and construction-related activities. Construction activities also include a life-cycle analysis estimating the GHG associated with the manufacture and transport of building materials and infrastructure. As previously mentioned, this estimate for life-cycle emissions is used for comparison purposes only and is not included in the final inventory as these emissions would be accounted for under AB 32 in other industry sectors.

### **Vegetation Sequestration Change**

The Project site is located on land classified as settlement as classified by the IPCC publication Guidelines for National Greenhouse Gas Inventories (IPCC Guidelines). There would be no changes in the land use classification. The overall CO<sub>2</sub> emissions due to vegetation change would result from the amount that can be expected to be sequestered by new plantings. The Project would plant approximately 10,000 net new trees at the Project site and in the community. These trees would sequester approximately 7,000 metric tonnes CO<sub>2</sub>. This is based on an average tree sequestration rate of 0.035 tonne CO<sub>2</sub> per year per tree for 20 years of growth. Thus, the net CO<sub>2</sub> emission would be -7,000 tonnes CO<sub>2</sub>e. These trees would continue to sequester carbon after 20 years, although at a slower rate and is typically offset by losses from clipping, pruning, and occasional death.

### **Construction-Related Activities**

CO<sub>2</sub> emissions associated with different aspects of urban development can be estimated using a combination of software programs. The OFFROAD2007<sup>1150</sup> and the EMFAC2007<sup>1151</sup> models are used to generate emission factor data for construction equipment and motor vehicles, respectively. These values

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<sup>1150</sup> California Air Resources Board Mobile Source Emissions Inventory Program. December 2006.

<http://www.arb.ca.gov/msei/offroad/offroad.htm>.

<sup>1151</sup> Emission Factors (EMFAC2007) model (Version 2.3). November 2006. California Air Resources Board.

[http://www.arb.ca.gov/msei/onroad/latest\\_version.htm](http://www.arb.ca.gov/msei/onroad/latest_version.htm).

serve as inputs for the URBEMIS<sup>1152</sup> model, which estimates emissions from several different aspects of urban development including from construction sources based on emission factors and information specific to the Project.

Assumptions regarding construction timing and the number, type, and operating hours of equipment are based on the number and type of equipment that would be used in the construction of the Project, as well as the duration of the different construction phases<sup>1153</sup>. These assumptions are used with CO<sub>2</sub> specific emission factors compiled in OFFROAD 2007 and EMFAC2007. The URBEMIS model estimate does not analyze emissions from construction related electricity or natural gas consumption. Construction-related electricity and natural gas emissions vary based on the amount of electric power used during construction and other unknown factors that make them too speculative to quantify. In addition, this is typically a relatively small contribution to GHG emissions during construction.

Table III.S-2 (Project Construction GHG Emissions) summarizes the output results from Table 3-5 of the GHG inventory and presents the emissions estimates in metric tonnes of CO<sub>2</sub>. The table indicates that an estimated 105,587 tonnes CO<sub>2</sub>e emissions from Project construction equipment would be emitted over the course of the minimum construction period of 16 years.

<b>Table III.S-2 Project Construction GHG Emissions</b>				
<i>Location</i>	<i>Construction Equipment</i>	<i>Worker Commuting</i>	<i>Hauling</i>	<i>Total GHG Emissions</i>
Candlestick Point	56,403	1,807	1316	<b>59,526</b>
Hunters Point Shipyard Phase II	42,895	2,265	901	<b>46,061</b>
<b>Total</b>	<b>99,298</b>	<b>4,072</b>	<b>2,217</b>	<b>105,587</b>

SOURCE: ENVIRON, 2009.

If these one-time emissions are annualized assuming a 40-year development life (which is likely low), the one-time emissions contribute approximately 2,640 tonnes CO<sub>2</sub>e emissions annually. These annualized emissions are added to the total Project-related GHG emissions in Table III.S-3 (Annual Project Related Operational CO<sub>2</sub>e Emissions).

An estimate of “life-cycle” GHG emissions (i.e., GHG emissions from the processes used to manufacture and transport materials used in the buildings and infrastructure) was also performed. As previously stated, this estimate is used for comparison purposes only and is not included in the final GHG inventory because these emissions would be attributable to other industry sectors under AB 32. For instance, the concrete industry is required by law to report emissions and undergo certain early action emission reduction measures. Furthermore, somewhat arbitrary boundaries must be drawn to define the processes considered in the life-cycle analysis of building materials.<sup>1154</sup> Recognizing the

<sup>1152</sup> Urban Emissions Model (URBEMIS) (Version 9.2.4) 2008. Jones & Stokes Associates. Prepared for: South Coast Air Quality Management District. <http://www.urbemis.com>.

<sup>1153</sup> ENVIRON International Corporation. 2009. *Climate Change Technical Report Candlestick Point–Hunters Point Shipyard Phase II Development Plan*. October (Appendix S to this EIR).

<sup>1154</sup> For instance, in the case of building materials, the boundary could include the energy to make the materials, the energy used to make the machine that made the materials, and the energy used to make the machine that made the machine that made the materials.

uncertainties associated with a life-cycle analysis, the California Air Pollution Control Officers Association (CAPCOA) released a white paper that states: “The full life-cycle of GHG emissions from construction activities is not accounted for in the modeling tools available, and the information needed to characterize GHG emissions from manufacture, transport, and end-of-life of construction materials would be speculative at the CEQA analysis level.”<sup>1155</sup>

Life Cycle Assessment (LCA) emissions vary based on input assumptions and assessment boundaries (e.g., how far back to trace the origin of a material). Assumptions made in the LCA are generally conservative. However, due to the open-ended nature of LCAs, the analysis is also highly uncertain.

The LCA evaluates the life-cycle GHG emissions associated with the building materials for this Project. The life-cycle GHG emissions include the embodied energy from the materials manufacture and the energy used to transport those materials to the site. The report then compares the life-cycle GHG emissions to the overall annual Project-related emissions. The materials analyzed in the report include materials for (1) residential and non-residential buildings and (2) site infrastructure.

The LCA estimated the life-cycle GHG emissions for buildings by conducting an analysis of available literature on LCAs for buildings. According to these studies, approximately 75 to 97 percent of GHG emissions from buildings is associated with energy usage during the operational phase; the other 3 to 25 percent of the GHG emissions is due to material manufacture and transport. Using the GHG emissions from the operation of buildings, 3 to 25 percent of building emissions corresponds to approximately 0.9 to 9 percent of the Project emissions.

The LCA calculated the life-cycle GHG emissions for certain components of infrastructure (roads, storm drains, utilities, gas, electricity, and cable). The analysis considered the manufacture and transport of concrete and asphalt only, because it assumed that other construction materials such as steel would be present in much smaller quantities. Because the manufacture of concrete has a higher CO<sub>2</sub> emission factor and most construction estimates higher quantities of concrete than asphalt, the majority of the emissions for infrastructure result from the manufacture of concrete. Because the asphalt and concrete are locally sourced, the transportation emissions are relatively small. If a 40-year lifespan of the infrastructure is assumed, the total annualized emissions from embodied energy in infrastructure materials are approximately 1.8 percent of the Project emissions.

The overall life-cycle emissions, annualized by 40 years, would be 3,068 to 16,285 tonnes CO<sub>2</sub>/year, or 2 to 10 percent of the annualized GHG emissions from the Project. The bulk of these emissions (1.4 to 15 percent) would be from general life cycle analysis studies and do not reflect project-specific information.

As previously indicated, the calculations and results presented in the LCA are estimates and are used only for a general comparison to the overall GHG emissions estimated for the Project. LCA emissions vary based on input assumptions and assessment boundaries (e.g., how far back to trace the origin of a material). Assumptions made in the GHG report are generally conservative.

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<sup>1155</sup> CAPCOA. 2008. *CEQA & Climate Change: Evaluating and Addressing Greenhouse Gas Emissions from Projects Subject to the California Environmental Quality Act*.  
<http://www.capcoa.org/ceqa/?docID=ceqa&PHPSESSID=df1348d67eff0fc2a8263d19d10dd>.

However, due to the open-ended nature of LCAs, and to the fact that literature evaluation, not site-specific studies, was used to analyze the embodied energy, the analysis should be considered to yield highly uncertain results. Additionally, the analysis likely double-counts emissions from other industry sectors.

### **Long-Term (Operational) Impacts**

Long-term operational or annual emissions from the development of this Project include indirect GHG emissions from electricity use in residential and non-residential buildings and emissions from natural gas combustion used in residential and non-residential buildings, mobile sources, municipal sources, area sources, transit services, and waste disposal. Table III.S-3 (Project Annual GHG Emissions) lists the emissions for each of these categories.

### **Residential Building Emissions**

Residential buildings include various types of condos, townhomes, and other multi-family homes of various sizes. The amount of energy and, therefore, the amount of associated GHG emissions emitted per dwelling unit would vary with the type of residential building. Accordingly, information on the type of residential buildings that are planned for the Project is required to estimate GHG emissions.

GHGs are emitted as a result of activities in residential buildings when electricity and natural gas are used as energy sources. Combustion of any type of fuel emits CO<sub>2</sub> and other GHGs directly into the atmosphere; when this occurs in a residential building, it is a direct emission source<sup>1156</sup> associated with that building. GHGs are also emitted during the generation of electricity from fossil fuels. When electricity is used in a residential building, the electricity generation typically takes place off site at the power plant; electricity use in a residential building generally causes indirect emissions of GHGs.

While fuel combustion generates CH<sub>4</sub> and N<sub>2</sub>O, the emissions of these GHGs typically comprise less than 1 percent of CO<sub>2</sub>e emissions from electricity generation and natural gas consumption<sup>1157</sup>. Fuel oil, kerosene, liquefied petroleum gas, and wood can also be used as fuels, but would likely contribute only in small amounts as combustion sources within residential buildings. Wood burning hearths are addressed in the area sources section below. For direct emission of GHGs used in fuel combustion in residential buildings, CH<sub>4</sub> and N<sub>2</sub>O are assumed to contribute a negligible amount of GWP when compared to the CO<sub>2</sub> emissions.

Energy use in residential buildings is divided into (1) energy consumed by the built environment, and (2) energy consumed by uses that are independent of the construction of the building, such as plug-in appliances. In California, Title 24 governs energy consumed by the built environment, including the HVAC system, water heating, and some fixed lighting. Non-building or 'plug-in' energy use can be further subdivided by specific end-uses (refrigeration, cooking, lighting, etc.).

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<sup>1156</sup> California Climate Action Registry (CCAR) General Reporting Protocol (GRP), Version 3.1 (January). Available at: [http://www.climateregistry.org/resources/docs/protocols/grp/GRP\\_3.1\\_January\\_2009.pdf](http://www.climateregistry.org/resources/docs/protocols/grp/GRP_3.1_January_2009.pdf), Chapter 8.

<sup>1157</sup> Ibid. Tables C2 and C3. The methane and nitrous oxide emission factors are negligible compared to the total CO<sub>2</sub> emission factor for electricity generation in California.

Energy use for each residential dwelling unit was calculated separately based on data in the CEC-commissioned California Statewide Residential Appliance Saturation Survey for climate zone 5. The energy use for Title 24 regulated systems has been adjusted to account for updates in Title 24 standards based on CEC impact analysis reports. The energy use associated with refrigerators, dishwashers, and clothes washers has been adjusted to account for reduction in energy use associated with ENERGY STAR appliances that would be required if installed by the builder. The resulting energy use quantities were then converted to GHG emissions by multiplying by the appropriate emission factors, incorporating information on local electricity production. All indirect electricity emission factors used for the Project are based on the most recent, 2007, PG&E Power/Utility Reporting Protocol report and have been adjusted to incorporate the 20 percent Renewable Portfolio Standard required by 2010. The Project would replace 256 dwelling units of existing housing at Alice Griffith with new housing; this replacement housing would not be net new and is, therefore, not considered in the GHG emissions inventory. The net Project-related residential GHG emissions would have 19,035 tonnes for Candlestick Point and 6,642 tonnes for Hunters Point Shipyard.

### **Non-Residential Building Emissions**

GHG emissions from non-residential buildings include all structures except residences that may exist in this development such as municipal, commercial, retail, and office space. The amount of energy used, and the associated GHG emissions emitted per square foot of available space vary with the type of non-residential building. For example, food stores are far more energy intensive than warehouses, which have little climate-conditioned space. For developments such as this, the exact types of buildings are typically unknown. As such, not all building categories that may be built as part of the Project are represented below. However, the analysis accounts for all of the non-residential building area. The general types of non-residential buildings analyzed include office space, retail buildings, research and development space, artist studios, community services, hotel, stadium, and performance venue.

Similar to the case for residential buildings, GHGs are emitted as a result of activities in nonresidential buildings for which electricity and natural gas are used as energy sources. While fuel combustion generates CH<sub>4</sub> and N<sub>2</sub>O, the emissions of these GHGs typically comprise less than 1 percent of CO<sub>2</sub>e emissions from natural gas consumption. Fuel oil, kerosene, liquefied petroleum gas, and wood can also be used as fuels, but generally contribute only in small amounts as combustion sources within non-residential buildings. As such, these minor emissions are not accounted for here.

Similar to energy use in residential buildings, energy use in non-residential buildings is divided into energy consumed by the built environment and energy consumed by uses that are independent of the construction of the building such as plug-in appliances. First, the energy use from systems covered by Title 24 (HVAC system, water heating system, and the lighting system) were estimated. Then, energy use from office equipment, plug-in lighting, and other sources not covered by Title 24 were estimated.

Energy use was estimated using the California Commercial End-Use Survey (CEUS) for all building types except for the Stadium. The Stadium energy use was estimated assuming that the new Stadium would be 20 percent more efficient than the energy use reported in the SFCAP for 1990. This is based on the estimate of energy use savings for other NFL stadiums that have recently been replaced.

The resulting emissions were then estimated as the product of the estimated energy use and the appropriate emission factors obtained by incorporating information on local electricity production. All indirect electricity emission factors used for the Project are based on the most recent, 2007, PG&E Power/Utility Reporting Protocol report and have been adjusted to incorporate the 20 percent Renewable Portfolio Standard required by 2010.

The non-residential related GHG emissions for the Project would be 4,263 tonnes CO<sub>2</sub>e per year for Candlestick Point and 13,766 tonnes CO<sub>2</sub>e per year for Hunters Point Shipyard.

### **Area Source Emissions**

Area source emissions stem from hearths (including gas fireplaces, wood-burning fireplaces, and wood-burning stoves) and small mobile fuel combustion sources such as lawnmowers. Fuel combustion associated with these sources produce direct GHG emissions. Since all of the housing units are multi-family, URBEMIS does not estimate a significant amount of emissions from lawn maintenance equipment and these have not been quantified. Since emissions from natural gas-fired stoves and natural gas heating are already included in the residential sources, calculations based on the URBEMIS method for the remaining types of area sources, natural gas fireplaces was performed.

The Project would have natural gas fireplaces in up to 10 percent of net new residential units. Wood-burning stoves or fireplaces would be prohibited. Direct GHG emissions from these sources were estimated by multiplying the energy use per year by the CO<sub>2</sub> emission factor for natural gas combustion. Annual energy use was determined by the number of fireplaces, the average energy use of each fireplace, and the URBEMIS default fireplace usage rate value of 200 hours/year. An estimated 217 tonnes CO<sub>2</sub> would be generated annually by fuel combustion in natural-gas fireplaces.

### **Municipal Source Emissions**

Municipal sources of GHG emissions that were analyzed as part of the GHG inventory include drinking water and wastewater supply and treatment, lighting in public areas, and municipal vehicles. In general, the majority of municipal sector GHG emissions are related to the energy used to convey, treat, and distribute water and wastewater. Thus, these emissions are generally indirect emissions from the production of electricity to power these systems. Additional emissions from wastewater treatment include CH<sub>4</sub> and N<sub>2</sub>O, which are emitted directly from the wastewater.

The amount of electricity required to treat and supply water depends on the volume of water involved. According to the Water Supply Assessment, the Project would generate a total water demand of 1.67 million gallons per day (mgd).<sup>1158</sup>

Three processes are necessary to supply potable water to residential and commercial users: (1) supply and conveyance of the water from the source; (2) treatment of the water to potable standards; and (3) distribution of the water to individual users. Indirect emissions resulting from electricity use were determined by multiplying electricity use by the CO<sub>2</sub> emission factor provided by the local electricity supplier, PG&E. All indirect electricity emission factors used for the Project are based on the most recent PG&E Power/Utility Protocol report and have been adjusted to incorporate the 20 percent

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<sup>1158</sup> Arup. 2009. Candlestick Point–Hunters Point Shipyard Phase II Water Demand Memorandum. September.

Renewable Portfolio Standard required by 2010. Energy use for different aspects of water treatment (e.g., source water pumping and conveyance, water treatment, distribution to users) was determined using the stated volume of water and energy intensities values (i.e., energy use per unit volume of water) provided by reports from various sources related to San Francisco's water supply system.

Emissions associated with wastewater treatment include indirect emissions necessary to power the treatment process and direct emissions from degradation of organic material in the wastewater. Wastewater treatment direct emissions in the Project are estimated to account for zero tonnes of CO<sub>2</sub>e emissions per year since all methane emissions from the wastewater at the Southeast Wastewater Treatment Plant is burned at the flare station or cogeneration plant and non-methane emissions are directly emitted from the wastewater as directed by the plant's air permit.

Indirect GHG emissions from the electricity necessary to power the wastewater treatment process were calculated for the Project. Wastewater in San Francisco would be treated at the Southeast Pollution Control Plant. The electricity required to operate wastewater treatment plant is estimated to be 1,688 kWh per acre foot (AF). Based on the expected amount of wastewater requiring treatment,<sup>1159</sup> this energy intensity factor and the PG&E carbon-intensity factor adjusted to account for the Renewable Portfolio Standard (RPS) were used to calculate the indirect GHG emissions associated with wastewater treatment.

Lighting sources contribute to GHG emissions indirectly, via the production of the electricity that powers these lights. Lighting sources considered in this source category include streetlights, traffic signals, area lighting for parks and lots, and lighting in public buildings. Data from a report by the City of Duluth shows that the amount of electricity demanded for all types of public lighting is 149 kWh per capita per year.<sup>1160</sup> The Project would use energy efficient street lighting. This would reduce street lighting electricity demand by 16 percent.<sup>1161</sup> Using this study, the PG&E-specific carbon-intensity emission factor adjusted for 20 percent RPS and the expected Project population of 23,869, emissions from public lighting were calculated.<sup>1162</sup> This number is likely a conservative estimate since the Project is a master-planned compact community may require a lower number of lights than the City of Duluth.

GHG emissions from municipal vehicles are due to direct emissions from the burning of fossil fuels. Municipal vehicles considered in this source category include vehicles such as police cars, fire trucks, and garbage trucks. Data from reports by Medford, MA; Duluth, MN; Northampton, MA; and Santa Rosa, California<sup>1163</sup> show that the CO<sub>2</sub> emissions from municipal vehicles would be approximately<sup>1164</sup>

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<sup>1159</sup> Assumed 91 percent of the water treated is to be reclaimed.

<sup>1160</sup> Skoog, C. 2001. This factor was calculated by summing the total electricity needs for municipal uses and dividing by the Duluth population. The Duluth population was calculated by dividing the city's reported GHG emissions by its reported per capita emissions.

<sup>1161</sup> The resultant energy savings is calculated from the annual energy costs found on page 4 of NYSERDA's 2002 How-to Guide to Effective Energy-Efficient Street Lighting.

<sup>1162</sup> Population estimate provided by Lennar Urban.

<sup>1163</sup> City of Medford. 2001. *Climate Action Plan*. October. <http://www.massclimateaction.org/pdf/MedfordPlan2001.pdf>.

City of Northampton. 2006. Greenhouse Gas Emissions Inventory. Cities for Climate Protection Campaign. June.

<http://www.northamptonma.gov/uploads/listWidget/3208/NorthamptonInventoryClimateProtection.pdf>.

City of Santa Rosa. Cities for Climate Protection: Santa Rosa. [http://ci.santa-rosa.ca.us/City\\_Hall/City\\_Manager/CCPFinalReport.pdf](http://ci.santa-rosa.ca.us/City_Hall/City_Manager/CCPFinalReport.pdf).

0.05 tonnes per capita per year. Using these studies and the expected Project population of 23,869, emissions from municipal vehicles in the Project were calculated.

In total, all municipal sources including water, wastewater, public lighting, and municipal vehicles for the Project is expected to produce 2,559 tonnes of CO<sub>2</sub>e annually.

### **Solid Waste Disposal Emissions**

The residential and non-residential uses at the development would generate waste. A large percentage of this waste would be diverted from landfills either by waste generation reduction, recycling, and composting. San Francisco currently diverts a large portion of its waste generated and has goals to even further reduce the amount of waste sent to a landfill. The remainder of the waste not diverted would be disposed of at a landfill. Landfills emit GHG emissions associated with the anaerobic breakdown of material. The waste disposal rates for the various land uses at the development were estimated based on values reported by the Center for Integrated Waste Management Board (CIWMB).<sup>1165</sup> If no waste disposal rates could be found, waste generation rates for that land use were used. These are likely over-estimates since they do not account for the waste that would be diverted from a landfill. The waste disposal rates were multiplied by the non-biogenic emissions associated with the Altamont Landfill in 2005 which is 0.00674 tonnes of CO<sub>2</sub>e emissions per metric ton of waste per year.<sup>1166</sup> The total GHG emissions are anticipated to be 907 tonnes CO<sub>2</sub>e per year for the Project. These estimates are likely conservative given the fact that future residents would be more conscious of waste and the aggressive goals for waste reduction in San Francisco. In addition, this estimate does not account for the carbon sequestration that would occur as a result of disposal of carbon in the landfill that would not degrade.

### **Mobile Source (Vehicle) Emissions**

The Project mobile source emissions considered for this Project would result from the typical daily operation of motor vehicles by residents and non-residents. ENVIRON estimated GHG emissions based upon all miles traveled associated with net new residential and non-residential trips regardless of internal or external destinations or purpose of trip. Traffic patterns, trip rates, and trip lengths are based upon information from the Candlestick Point–Hunters Point Phase II Development Plan Transportation Study (Transportation Study).<sup>1167</sup> For mobile sources, CH<sub>4</sub> and N<sub>2</sub>O are explicitly calculated, multiplied by their respective GWP, and added to the CO<sub>2</sub> emissions, to result in total CO<sub>2</sub>e emissions from mobile sources.

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Skoog, C. 2001. Greenhouse Gas Inventory and Forecast Report. City of Duluth Facilities Management and the International Council for Local Environmental Initiatives.

October.<http://www.ci.duluth.mn.us/city/information/ccp/GHGEmissions.pdf>.

<sup>1164</sup> In an effort to be conservative, the largest per capita number from these four reports was used.

<sup>1165</sup> CIWMB. 1999. Statewide Waste Characterization Study: Results and Final Report. 340-00-009.

<http://www.ciwmb.ca.gov/wastechar/Redispl.htm>.

CIWMB. 2007. Estimated Solid Waste Generation Rates for Industrial Establishments.

<http://www.ciwmb.ca.gov/WasteChar/wasteGenRates/Industrial.htm>.

CIWMB. 2006. Targeted Statewide Waste Characterization Study: Waste Disposal and Diversion Findings for Selected Industry Groups. 341-06-006. <http://www.ciwmb.ca.gov/WasteChar/WasteStudies.htm#2006Industry>.

<sup>1166</sup> Based on information provided by BAAQMD.

<sup>1167</sup> CHS Consulting Group, Fehr and Peers, and LCW Consulting. 2009. *Bayview Waterfront Project Transportation Study*.

The Transportation Study included an estimate of the trip rates incorporating the Project design features. Consistent with one of the options in the OPR Guidance, this section discusses a comparison of Project emissions with the goals of AB 32. Since the 49ers Stadium would replace Candlestick Park, this is not considered to cause new trips from far away. If the Stadium is not built at HPS, it is assumed that a new Stadium would be built elsewhere in the Bay Area and it is unknown if the trips would be shorter or longer for attendees.

The trips and VMT calculated includes all trips and VMT generated by net new Project residential and non-residential land uses. Once the number of trips is determined, the trip type is important. For example, a home based work (HBW) trip is a trip directly from home to work with no stops in-between, or directly from work to home. A home based shopping trip (HBS) is a trip directly from home to shopping or from shopping to home. A home based other trip (HBO) is a trip directly from home to another destination such as school. Non-home based (NHB) trips are trips between work and other types of destinations such as going to the bank during one's lunch hour. For all trip types, directionality is unimportant. The distribution of residential trip types follows the MTC 2030 model defaults.

Since the trip rates are based on weekday conditions, ENVIRON calculated weekend traffic by applying differences between the weekend and the weekday traffic based upon a report by Sonoma Technologies.<sup>1168</sup> Weekend traffic on major highways was assumed to be 80 percent of the weekly capacity, and weekend traffic on small streets was assumed to be 80 percent of weekly capacity.<sup>1169</sup> No adjustment to driving patterns was done for the music venue since this is on a per event basis. The Transportation Study made an estimate of the total number of vehicle trips taking into account use of several alternative modes including public transit, bicycles, and carpooling.

Each type of trip is associated with an average trip length as estimated by Fehr and Peers based on the Caltrans Household Travel Survey for San Francisco County. Total vehicle miles traveled (VMT) were calculated by multiplying the number of trips by the average trip length for each type of trip. The total VMT for Project residents and non-residents is 309,166,932.

The CO<sub>2</sub> emissions from mobile sources were calculated with the trip rates, trip lengths, and emission factors for running and starting emissions from EMFAC2007. EMFAC emission factors from the year 2020 were used based on San Francisco County fleet mix and adjusted to account for Pavley Vehicle Standards. Nitrous oxide, CH<sub>4</sub>, and HFCs<sup>1170</sup> are also emitted from mobile sources. The USEPA recommends assuming that CH<sub>4</sub>, N<sub>2</sub>O, and HFCs account for 5 percent of mobile source GHG emissions, taking into account their GWPs.<sup>1171</sup> Therefore, CO<sub>2</sub> emissions were divided by 0.95 to account for non-CO<sub>2</sub> GHGs.

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<sup>1168</sup> Sonoma Technologies, Inc. 2004. *Correction and Analysis of Weekend/Weekday Emissions Activity Data in the South Coast Air Basin*. May.

<sup>1169</sup> A conservative adjustment for weekend travel was assumed for all the trips since information was not available to distinguish between trips on major highways and trips on small streets. The Sonoma Technologies report gives a range of values, but does not present a weighted value, thus a conservative percent reduction in the number of trips was selected.

<sup>1170</sup> HFCs can be emitted from air conditioning systems.

<sup>1171</sup> USEPA. 2005. *Emission Facts: Greenhouse Gas Emissions from a Typical Passenger Vehicle*. Office of Transportation and Air Quality. February. (<http://www.epa.gov/otaq/climate/420f05004.pdf>)

Vehicles associated with the Project would emit approximately 105,520 tonnes CO<sub>2</sub>e per year. In an effort to evaluate the assumptions described in the section, the changes in estimated fleet distribution and emission factors would likely improve based on anticipated regulations, over and above those currently enacted in law.

### Transit Service GHG Emissions

Emissions from the transit area are associated with increased public transport needed to serve the Project. GHGs are emitted from public buses when the vehicles are in transit and when the vehicles are idling at the curbside. The emissions are based on the net new miles and trips made by transit servicing the Project. The details of the net new transit service were provided by Fehr and Peers. Since San Francisco uses carbon free electricity to power its electric buses and trolleys, the mileage and idling time from these vehicles is not quantified. Total running emissions from transit buses were calculated by multiplying the net new miles and idling time by the GHG emission factors for urban buses. The diesel buses would be diesel-hybrid buses that reduce fuel usage by 25 percent<sup>1172</sup> and San Francisco transit buses use B20 (20 percent biodiesel, 80 percent petroleum diesel).<sup>1173</sup> The USEPA recommends assuming that CH<sub>4</sub>, N<sub>2</sub>O, and HFCs account for 5 percent of GHG emissions from on-road vehicles, taking into account their GWPs.<sup>1174</sup> To incorporate these additional GHGs into the calculations, the total GHG footprint was calculated by dividing the CO<sub>2</sub> emissions by 0.95.

The total amount of GHG emissions from the transit service is estimated to be 1,730 tonnes of CO<sub>2</sub> per year.

### Total Annual Project CO<sub>2</sub> Emissions

As shown in Table III.S-3 (Project Annual GHG Emissions), using all the emission source categories quantified above, the total annual GHG emissions generated from the Project with the design features related to vehicular use is approximately 154,639 tonnes CO<sub>2</sub>e per year. The table reveals that the majority of annual Project emissions is the result of vehicle use (68 percent), followed by residential energy consumption (17 percent).

Several emissions sources were not quantified in this inventory, due to their estimated relatively small<sup>1175</sup> contribution to GHG emissions (typically less than 1 percent based upon previous studies). These sources include emissions from recreational sources and refrigeration leaks, which are described in more detail below.<sup>1176</sup> The Project includes neighborhood community areas and parks, which may also include recreation centers. The precise uses in the neighborhood community areas are not known at this time. . As a result of this uncertainty, the GHG inventory prepared for the Project did not quantify these emissions at this time. Emissions associated with leaks of high global warming potential gases such as from refrigeration leaks were not quantified. At the entitlement stage of development, the degree of

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<sup>1172</sup> SFMTA *Climate Action Plan*. Draft for Public Review, December 19, 2008.

<sup>1173</sup> Based on CCAR recommendations, emissions from burning biodiesel are not included in emissions estimation. EMFAC emission factors are further reduced by 20 percent to account for the use of B20.

<sup>1174</sup> USEPA. 2005. *Emission Facts: Greenhouse Gas Emissions from a Typical Passenger Vehicle*. Office of Transportation and Air Quality. February.

<sup>1175</sup> Typically less than 1 percent of the overall inventory based upon previous studies.

<sup>1176</sup> Black carbon was also not considered. Major sources of black carbon emissions are not present at the Project.

uncertainty in the potential facilities with sources that may have refrigeration leaks make a meaningful quantification of GHG emissions difficult. In addition, since refrigeration systems would be new, they are likely efficient and should be designed to reduce the amount of leaks of high global warming potential gases.

<b>Table III.S-3 Project Annual GHG Emissions</b>			
<b>Source</b>	<b>Candlestick Point (tonnes CO<sub>2</sub>e/year)</b>	<b>Hunters Point Shipyard Phase II (tonnes CO<sub>2</sub>e/year)</b>	<b>Total (tonnes CO<sub>2</sub>e/year)</b>
Residential	19,035	6,642	25,677
Non-Residential	4,263	13,766	18,029
Mobile	75,149	30,371	105,520
Municipal	1,793	766	2,559
Area	161	56	217
Waste	532	375	907
Transit Area	865	865	1,730
<b>Total (annual emissions)</b>	<b>101,798</b>	<b>52,841</b>	<b>154,639</b>

SOURCE: ENVIRON, 2009.

### III.S.5 Impacts

#### ■ Significance Criteria

The City and County of San Francisco has not formally adopted significance standards for climate change impacts but generally considers that implementation of a project would have a significant GHG impact if it were to:

- S.a Conflict with the state goal of reducing GHG emissions in California to 1990 levels by 2020, as set forth by the timetable established in AB 32 (*California Global Warming Solutions Act of 2006*), such that the project’s GHG emissions would result in a substantial contribution to global climate change
- S.b Conflict with San Francisco’s *Climate Action Plan* such that it would impede implementation of the local GHG reduction goals established by the 2008 Greenhouse Gas Reduction Ordinance

#### ■ Analytic Method

The release of GHGs in general and CO<sub>2</sub> specifically into the atmosphere is not of itself an adverse environmental effect. It is the effect that increased concentrations of GHG concentrations of GHG including CO<sub>2</sub> in the atmosphere has upon the earth’s climate (i.e., climate change) and the associated consequences of climate change that results in adverse environmental effects (e.g., sea level rise, loss of snowpack, severe weather events). Although emissions modeling can estimate a project’s incremental contribution of CO<sub>2</sub> into the atmosphere, it is not feasible to determine whether or how an individual project’s relatively small incremental contribution (on a global scale) might translate into physical effects on the environment. Because Earth’s climate is determined by the complex interaction of different

components of Earth and its atmosphere, it is not possible to discern whether the presence or absence of GHG emitted by the Project would result in any measurable impact that would intensify climate change or its adverse environmental impacts.

No state, local, or the applicable regional air quality agency has adopted a methodology or quantitative threshold that can be applied to a specific development or construction project to evaluate the significance of an individual project's contribution. Therefore, this analysis considers GHG emissions from the Project against the anticipated GHG emissions assuming regulations consistent with ARB's Scoping Plan 2020 estimate of a No Action Taken scenario. This compares the Project GHG emission inventory to the GHG emissions that would occur from a community that would be built today without Project design features and energy reduction commitments made by Project Applicant. This baseline comparison is referred to as No Action Taken (NAT), which follows the regulations considered by ARB in developing its 2020 No Action Taken estimate as part of the Scoping Plan. This represents the GHG emission inventory if things were continued to be built according to current standards in place at the time of the Scoping Plan. In addition, this analysis considers GHG emissions from Project implementation in relation to total GHG emissions in the Bay Area and California. It also considers steps that California intends to take to reduce GHG emissions and actions the City and County of San Francisco is taking to reduce GHG emissions, including the City's Climate Action Plan and 2008 Greenhouse Gas Reduction Ordinance.

The state Office of Planning and Research (OPR) published informal guidance regarding the steps lead agencies should take to address climate change in their CEQA documents.<sup>1177</sup> According to the OPR, lead agencies should determine whether GHGs may be generated by a project, and if so, quantify or estimate the GHG emissions by type and source. The lead agency must assess whether those emissions are individually and/or cumulatively significant. When assessing whether a project's effects on climate change are "cumulatively considerable" even though its GHG contribution may be individually limited, the lead agency must consider the impact of the project when viewed in connection with the effects of past, current, and probable future projects. Finally, if the lead agency determines that the GHG emissions from the project as proposed are potentially significant, it must investigate and implement ways to avoid, reduce, or otherwise mitigate the impacts of those emissions.

As stated above in Section III.S.3, the BAAQMD has not adopted quantitative thresholds of significance for construction-related emissions. However, the BAAQMD is developing quantitative CEQA significance thresholds for construction- and operations-related emissions of criteria pollutants, precursors, TACS, and GHGs.<sup>1178</sup> The BAAQMD expects to adopt these new thresholds of significance later this year. Therefore, in anticipation of the BAAQMD's future adoption of new quantitative significance thresholds for operations-related emissions, the Draft EIR also includes a quantitative analysis of the Project's construction- and operations-related emissions based on the draft BAAQMD significance thresholds regarding the Project's operational emissions.

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<sup>1177</sup> State of California, Governor's Office of Planning and Research, *CEQA and Climate Change: Addressing Climate Change through California Environmental Climate Act (CEQA) Review*, June 19, 2008 (hereinafter "OPR Advisory").

<sup>1178</sup> BAAQMD. 2009. *Revised Draft Options and Justification Report California Environmental Quality Act Thresholds of Significance*. October.

## ■ Project Impacts

### **Impact GC-1: Conflict with GHG Emissions Goals**

**Impact GC-1**      **The Project would not result in a substantial contribution to global climate change by increasing GHG emissions in a manner that conflicts with the state goal of reducing GHG emissions in California to 1990 levels by 2020 (e.g., a substantial contribution to global climate change) or conflicts with San Francisco’s Climate Action Plan by impeding implementation of the local GHG reduction goals established by the San Francisco 2008 Greenhouse Gas Reduction Ordinance. (Less than Significant with Mitigation) [Criteria S.a and S.b]**

As explained previously, the analysis of Project emissions in the GHG emission inventory assumed certain Project features. The land use mixes and basic land plan design proposed in the Project Description are fundamental aspects of the Project and include certain features assumed in the GHG emissions inventory, including providing neighborhood-serving retail; providing automobile, public transportation and pedestrian connections between the Shipyard, Candlestick Point, and the larger Bayview neighborhood; providing for transportation and open space corridors; and integrating land use patterns with a multimodal street network that facilitates walking and cycling for internal trips and transit for trips of greater distance. Other Project features assumed in the GHG emission inventory are more conceptual, such as landscape plans and plans related to energy efficiencies in building design. Further, transportation features proposed as part of the Project that would be implemented in part by SFMTA are identified in Section III.D (Transportation and Circulation) as mitigation measures. Because some of the Project features are conceptual, and other Project features are identified elsewhere in the document as mitigation measures, this section identifies mitigation measures MM GC-1 through MM GC-4 as measures that also would be needed to ensure that the reductions considered in developing the GHG emission inventory take place as residential and employment-generating uses are developed.

Because the development plan is conceptual, and there could be modifications during the entitlement and development process, mitigation measures MM GC-1 through MM GC-4 would be implemented to ensure that the reductions considered in developing the GHG emission inventory take place as residential and employment-generating uses are developed.

*MM GC-1      Plant up to 10,000 trees net new trees at the Project site and in the community.*

*MM GC-2      Exceed the 2008 Standards for Title 24 Part 6 energy efficiency standards for homes and businesses would by at least 15 percent.*

*MM GC-3      Install ENERGY STAR appliances, where appliances are offered by homebuilders*

*MM GC-4      Use light emitting diode (LED) based energy efficient street lighting.*

Implementation of mitigation measures MM GC-1 through MM GC-4 would ensure that adequate GHG emission reductions are provided as residential and employment-generating uses are constructed and occupied. Impacts related to climate change and GHG emissions for the operational phase of the development would be less than significant.

### *Construction impacts*

The Project's GHG emissions from construction-related activities and changes in vegetation sequestration would be short-term and would only occur once unlike operational emissions that would continue for the duration of the Project. Since the Project is predicted to result in a net sequestration of carbon due to vegetation as compared to the existing condition, GHG emissions associated with vegetation changes is not an adverse impact. Table III.S-2 summarizes the modeled Project-generated, construction-related GHG emissions. These emissions would contribute to regional increases in GHG emissions and associated climate change effects.

Implementation of the Project would result in a total of 105,587 tonnes of CO<sub>2</sub>e of construction-related activities over the 16 years of construction activities. Over the construction time period, the construction-related GHG emissions average 6,600 tonnes per year. The statewide annual GHG inventory (2004) is estimated at 479,740,000 tonnes. For context purposes, the average annual construction emissions would represent 0.0014 percent of the statewide total emissions for a year. The Bay Area Greenhouse Gas Emission Inventory Projections indicate that the 2007 inventory of 102,552,991 tonnes of CO<sub>2</sub>e has approximately 1.7 percent of these emissions are attributable to construction equipment emissions, 1.8 million metric tonnes and would continue to account for about the same proportion into the future. The estimated annual average construction-related emissions for the Project represent less than one percent of the construction equipment emissions for the Bay Area.

Existing ARB regulations (Title 13 of the CCR, Section 2480 and 2485), which limit idling of diesel-fueled commercial motor vehicles, would help to limit GHG emissions associated with construction-related vehicles. In addition, the ARB's proposed Early Action Measures (EAMs) (pursuant to the *California Global Warming Solutions Act of 2006*) include other emission reduction measures for diesel trucks and diesel off-road equipment. The ARB is expected to review and adopt the EAMs by January 1, 2010, so equipment used for construction of the Project after 2010 could be subject to these requirements. Subsequent to the release of the proposed EAMs, the ARB developed the AB 32 Scoping Plan outlining the state's strategy to achieve AB 32's 2020 GHG emissions limit. Once measures from the EAM and Scoping Plan go into effect, construction contractors on the projects would be subject to these requirements, and the Project would implement these measures as required; emission from Project construction activities would be reduced accordingly.

Given the requirements of ARB's scoping plan and EAMs that would apply to construction contractors, these emissions are less than significant for the cumulative impact to climate change because the Project would not conflict with state goals or the SFCAP.

### *Operational Emissions*

Operation of the Project would result in GHG emissions from building energy use, mobile sources, area sources, energy associated with water usage, and solid waste disposal. Table III.S-3 summarizes the modeled Project-related GHG emissions. These emissions would contribute to regional increases in GHG emissions and associated climate change effects.

Implementation of the Project would result in a total of 154,639 tonnes CO<sub>2</sub>e per year. For context purposes, the Bay Area Greenhouse Gas Emission Inventory Projections indicate that annual emissions

in the San Francisco Bay Area Air Basin are 102,552,991 tonnes per year. The Project would represent 0.15 percent of the Bay Area GHG emissions. Based on the current statewide inventory (2004) of 479,740,000, the Project annual operational emissions would represent 0.0322 percent of the statewide total emissions.

The Scoping Plan outlines various actions the State could take to reduce GHG emissions across various emission source categories. One area of this is building energy efficiency through improvements in building codes and implementation of green building ordinances. With mitigation, when residential buildings are considered, compared to the 2005 Title 24 building code basis used in the Scoping Plan, the Project’s residential GHG emissions would be 20 percent better than the ARB Scoping Plan No Action Taken scenario. Table III.S-4 (Annual GHG Emissions Comparison of Project and ARB Scoping Plan No Action Taken Scenario) shows the ARB Scoping Plan No Action Taken Scenario estimates as well as the Project GHG emissions for comparison purposes. Similarly, its commercial buildings would result in 18 percent reduction in GHG emissions due to energy efficiency measures. Another area is transportation related emissions.

<b>Table III.S-4 Annual GHG Emissions Comparison of Project and ARB Scoping Plan No Action Taken Scenario</b>				
<i>Source</i>	<i>No Action Taken</i>	<i>Project</i>	<i>Difference</i>	<i>Percent Difference</i>
Residential	32,286	25,677	6,609	20%
Non-Residential	21,863	18,028	3,835	18%
Mobile	258,330	105,520	152,810	59%
Municipal Area	2,756	2,559	197	7%
Waste	217	217	0	0%
Transit Service	907	907	0	0%
	2,884	1,730	1154	40%
<b>Total</b>	<b>319,243</b>	<b>154,638</b>	<b>164,605</b>	<b>52%</b>

SOURCE: ENVIRON, 2009.

Several measures in the Scoping Plan are aimed at reducing transportation related emissions including SB 375 which encourages regional transportation planning, vehicle fuel efficiency measures, transit oriented development, mixed-use of land, and urban infill development projects. Consistent with several of these strategies, the Project transportation-related emissions represent a 59 percent reduction in GHG emissions from the ARB Scoping Plan No Action Taken scenario, as shown in Table III.S-4. Transit vehicle emissions would be 40 percent lower due to the use of diesel hybrid buses as shown in Table III.S-4.

Reduction in the carbon-intensity of the electricity supply through implementation of renewable portfolio standards would impact the GHG emissions associated with not only buildings, but also the GHG emissions attributable to the embedded energy in water. Through water efficiency, efficient street lighting, and improved energy carbon intensity, the municipal sources would result in the 7 percent reduction in emissions compared to the regulations assumed in the ARB Scoping Plan No Action Taken

scenario as shown in Table III.S-4. These reductions for all of the major operational categories are large and result in a total of 52 percent reduction in GHG emissions as compared to the ARB Scoping Plan No Action Taken scenario and show the progress this Project is making in reducing GHG emissions.

Furthermore, the City and County of San Francisco has additional regulations and ordinances that would help to limit GHG emissions associated with Project-related operational emissions. These include the green building ordinance, greenhouse gas reduction ordinance, “transit first” policy, and bicycle plan. All of these measures would serve to reduce Project-related GHG emissions. In addition the Project Applicant is committed to several mitigation measures included in the GHG emission inventory analysis that reduce GHG emissions.

Given the Project design as a dense, infill mixed-use project, with a transit-oriented design, the mitigation measures identified previously, the Project’s large reductions in GHG emissions as compared to the ARB Scoping Plan No Action Taken scenario, and the continuing implementation of GHG reduction actions by the City and County of San Francisco, the Project would not conflict with the state’s goals of reducing GHG emissions to 1990 levels by 2020, or the City’s GHG reduction goals established in the Greenhouse Gas Reduction Ordinance, and would not result in a significant cumulative impact.

## ■ BAAQMD Draft GHG Thresholds

As discussed above, BAAQMD is considering the future adoption of quantitative CEQA thresholds of significance for operational-related GHG emission impacts. At present, two options relevant to the Project are under consideration for operational GHG emission thresholds; the lead agency can choose either option. Option 1 is based on a project’s total operational GHG emissions of 1,100 metric tonnes CO<sub>2</sub>e per year. The Project’s total operational emissions would exceed this level, which means that if this was used, the Project would be significant. Option 2, which would apply to mixed-use projects, such as this, is based on the amount of a project’s operational GHG emissions per service population, set at 4.6 metric tonnes CO<sub>2</sub>e per year.

In anticipation of proposed new BAAQMD CEQA thresholds of significance for GHG emissions, this EIR provides an analysis of the Project’s operational GHG emissions under the proposed thresholds of significance identified above. The BAAQMD thresholds stated above are still in draft form and may undergo additional changes before being finalized.

The BAAQMD also suggested some guidance on how to prepare a GHG emission inventory. For operational emissions, the BAAQMD suggests quantifying residential, non-residential, mobile, water, and area sources. The guidance recommends generalized values for energy use for various land use types and generalized emission factors which don’t account for local electricity emission factors or newer vehicle efficiency regulations. The operational emissions estimated for the Project would include additional source categories not included in the BAAQMD proposed methodology for quantifying GHG operational emissions. These additional source categories include solid waste disposal and transit services. The exclusion of these sources from the inventory would likely lower the operational emissions per service population. The operational emissions estimated for the Project utilized different emission factors and methodologies. These include the carbon intensity used for electricity, estimates of building energy use, and vehicle emission factors, which the alteration of these would likely increase the operational

emissions per service population based on only changing the carbon intensity emission factor. The methodologies presented in this EIR for quantification of GHG operational emissions is based on using more refined data sources than indicated in the BAAQMD guidance and are the most appropriate to use for the Project.

With mitigation, the Project-related operational emissions of 154,639 result in 4.5 tonnes CO<sub>2</sub>e per service population per year based on a service population of 34,242 (this accounts for 23,869 net new residents and all jobs except for the stadium jobs, which already exist, 10,373). Therefore, the Project-related operational emissions would be less than 4.6 tonnes CO<sub>2</sub>e per service population per year and would result in a less-than-significant impact on climate change.