

3.3 CLIMATE CHANGE

Climate change is one of the most serious environmental challenges facing the world today. As the concentration of greenhouse gases (GHG) continues to increase in the atmosphere, the Earth's temperature continues to climb above historic levels. Most of the warming in recent decades is likely the result of increased emissions of GHGs caused by human activities. Other aspects of the climate are also changing, including rainfall patterns, snow and ice cover, and sea level.

3.3.1 Regulatory Setting

3.3.1.1 State and Federal Greenhouse Gas Regulations

Federal Greenhouse Gas Regulations

Climate change and GHG emission reductions are a concern at the federal level. In *Massachusetts v. U.S. Environmental Protection Agency (USEPA), et al.*, 549 U.S. 497 (2007), the U.S. Supreme Court ruled that GHGs fit within the federal Clean Air Act (CAA) definition of a pollutant, and that the USEPA has the authority to regulate GHGs. The Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases under the CAA was signed on April 17, 2009. The endangerment finding proposes that the projected concentrations of six GHGs in the atmosphere threaten the public health and welfare of current and future generations. The “cause or contribute” finding proposes that the combined emissions of carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O) and hydrofluorocarbons (HFCs) from new motor vehicles and motor vehicle engines contribute to the atmospheric concentration of key GHGs and the threat of climate change (www.epa.gov/climatechange/endangerment.html). In September 2009, the USEPA adopted regulations requiring certain GHG emission sources to monitor and report their GHG emissions. This will affect electrical generation sources that contribute to the California grid, and may affect the State Implementation Plan (SIP).¹

California Greenhouse Gas Regulations

Assembly Bill 1493

In 2002, with the passage of Assembly Bill 1493 (AB 1493), California launched an innovative and proactive approach to dealing with GHG emissions and climate change at the State level. AB 1493 requires the California Air Resources Board (CARB) to develop and implement regulations to reduce automobile and light truck GHG emissions. These emissions standards, which are stricter than those for other states, were designed to apply to automobiles and light trucks beginning with the 2009 model year and ultimately the USEPA granted California's related request for a waiver to enact the stricter standards (<http://www.epa.gov/otaq/climate/ca-waiver.htm>).

Executive Order S-3-05

On June 1, 2005, Governor Arnold Schwarzenegger signed Executive Order S-3-05, which aims to reduce California's GHG emissions to (1) 2000 levels by 2010; (2) 1990 levels by 2020; and (3) 80 percent below the 1990 levels by 2050. Executive Order S-3-05 also calls for the California Environmental Protection Agency (Cal/EPA) to prepare biennial science reports on the potential impact of continued global warming on certain sectors of the California economy. The latest of these reports, *The Future Is*

¹ www.epa.gov/climatechange/emissions/ghgrulemaking.html

Now: An Update on Climate Change Science, Impacts, and Response Options for California, was published in May 2009.

Assembly Bill 32

In 2006, the goal of Executive Order S-3-05 was further reinforced with the passage of Assembly Bill 32 (AB 32), the Global Warming Solutions Act of 2006. AB 32 sets overall GHG emissions reduction goals and mandates that CARB create a plan, which includes market mechanisms, and implement rules to achieve “real, quantifiable, cost-effective reductions of greenhouse gases.” Executive Order S-20-06, signed October 18, 2006, further directs state agencies to begin implementing AB 32, including the recommendations made by the state’s Climate Action Team. These recommendations include requiring each state agency to develop and implement a GHG reduction policy that reduces GHG emissions by 30 percent by 2020, establishing a GHG emission goal for state government projects, implementing Green Building Executive orders, reducing electricity purchased for buildings by 20 percent by 2015, improving the efficiency and efficient use of vehicles in the state fleet, reducing business related employee travel, and reducing emissions associated with employee commuting.

Executive Order S-01-07

With Executive Order S-01-07, signed January 18, 2007, Governor Schwarzenegger set forth the low carbon fuel standard for California. Under this executive order, the carbon intensity of California’s transportation fuels is to be reduced by at least 10 percent by 2020.

Senate Bill 97

Senate Bill 97 (SB 97) (Chapter 185, 2007) required the Governor’s Office of Planning and Research (OPR) to develop draft CEQA guidelines “for the mitigation of GHG emissions or the effects of GHG emissions.” The OPR was required to “prepare, develop, and transmit” the guidelines to the Natural Resources Agency on or before July 1, 2009.

On April 13, 2009, the OPR submitted to the Secretary for Natural Resources its proposed amendments to the CEQA Guidelines for GHG emissions. On July 3, 2009, the Natural Resources Agency issued notice of proposed rulemaking to adopt CEQA Guidelines amendments pursuant to SB 97. The agency held hearings on the proposed amendments in August 2009. The agency transmitted the adopted amendments and the entire rulemaking file to the Office of Administrative Law (OAL) on December 31, 2009. On February 16, 2010, the amendments were approved and filed with the Secretary of State for inclusion in the California Code of Regulations. The amendments became effective on March 18, 2010.

Senate Bill 375

Senate Bill 375 (SB 375), signed into law by Governor Schwarzenegger on September 30, 2008, became effective January 1, 2009. This law requires CARB to develop regional reduction targets for GHG emissions, and prompts the creation of regional plans to reduce emissions from passenger vehicle use throughout the State. The targets apply to the regions in the State covered by California’s 18 metropolitan planning organizations (MPO). The 18 MPOs have been tasked with creating Sustainable Community Strategies (SCS). The MPOs are required to develop the SCS through integrated land use and transportation planning and demonstrate an ability to attain the proposed reduction targets by 2020 and 2035. This would be accomplished through either the financially constrained SCS as part of their regional transportation plan (RTP) or an unconstrained alternative planning strategy, thereby ensuring that transportation funding is consistent with SCS. If regions develop integrated land use, housing and transportation plans that meet the SB 375 targets, new projects in these regions can be relieved of certain

review requirements of CEQA, thereby ensuring CEQA streamlining for projects that are consistent with SCS.

Per SB 375, CARB appointed a Regional Targets Advisory Committee (RTAC) on January 23, 2009, to provide recommendations on factors to be considered and methodologies to be used in CARB's target-setting process. CARB received the RTAC's recommendations on September 29, 2009, and released their report on proposed regional GHG reduction targets for autos and light trucks on August 9, 2010. CARB has since approved the regional GHG emission reduction targets for autos and light trucks, and the Notice of Decision was filed on February 17, 2011. CARB must update the regional targets every 8 years (or 4 years if it so chooses), consistent with each MPO update of its RTP. The Southern California Associations of Governments (SCAG) is actively working with regional leaders to foster consensus-building regarding implementation strategies for SB 375.

3.3.1.2 Regional Greenhouse Gas Regulations

South Coast Air Quality Management District

The South Coast Air Quality Management District (South Coast AQMD) adopted Interim CEQA GHG Significance Thresholds for Stations Sources, Rules and Plans on December 5, 2008. These interim GHG significance thresholds apply to stationary source/industrial projects where the South Coast AQMD is the lead agency under CEQA. The types of projects this rule affects include South Coast AQMD rules, rule amendments, and plans (e.g., Air Quality Management Plans).

3.3.2 Existing Conditions

Gases that trap heat in the atmosphere are often referred to as GHGs, and are necessary to life since they keep the planet's surface warmer than it otherwise would be. This is referred to as the Greenhouse Effect (Figure 3.3-1). As concentrations of GHGs increase, however, the Earth's temperature also increases. According to data from the National Oceanic and Atmospheric Administration (NOAA) and National Aeronautics and Space Administration (NASA), the Earth's average surface temperature has increased by 1.2 to 1.4°F in the last 100 years.

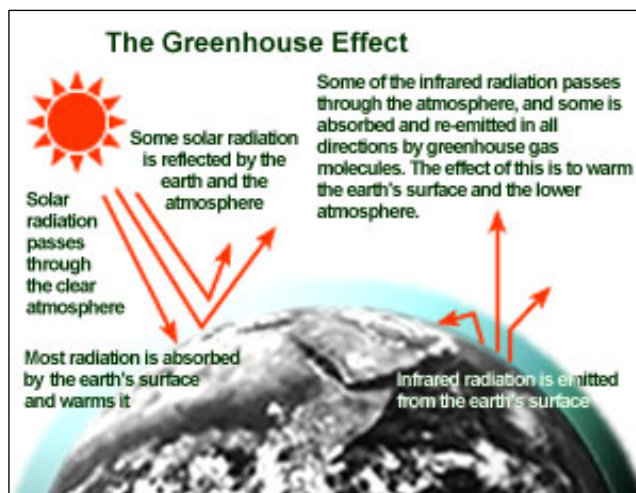


Figure 3.3-1. The Greenhouse Effect

Some GHGs occur naturally and are emitted into the atmosphere through natural processes and human activities. The principal GHGs emitted as a result of human activities are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and fluorinated gases.

GHGs differ in their ability to trap heat. For example, one ton of CO₂ emissions has a different effect than one ton of methane emissions. To compare emissions of GHGs, compilers use a weighting factor called a Global Warming Potential (GWP), where the heat-trapping ability of 1 metric ton (1,000 kilograms) of

CO₂ is taken as the standard, and emissions are expressed in terms of CO₂ equivalent (CO₂e), but can also be expressed in terms of carbon equivalent.

Figure 3.3-2 shows an inventory of GHG emission sources compiled by CARB for the years 2000 to 2008. Transportation accounts for approximately 39 percent of California’s annual GHG inventory, while the U.S. average is approximately 28 percent. As such, reducing transportation GHG emissions is a key element in reducing the overall GHG emissions in California.

3.3.2.1 Impact Criteria

GHG impacts are considered significant if the project would:

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

3.3.3 Environmental Impacts

3.3.3.1 Short-term Construction Impacts

No Build Alternative

No construction activities are associated with the No Build Alternative and thus no GHG impacts would occur.


Transportation Systems Management Alternative

No construction activities are associated with the Transportation Systems Management (TSM) Alternative and thus no GHG impacts would occur.

Build Alternative

The construction of the Build Alternative project is estimated to result in 33,131 metric tons of CO₂, based on the total energy use estimates for construction of both at grade and elevated LTR track.² Implementation of the identified mitigation measures would reduce the CO₂ emissions.

² The Build Alternative was estimated to require 423,439 mBtu of construction energy, based on the length of track miles to be constructed multiplied by 16,341 mBtus/track mile for at-grade track and 30,633 mBtus/track mile for elevated track (from *Caltrans’ Energy and Transportation Systems and New York State Draft Energy Analysis Guidelines for Project Level Analysis*). The construction energy was converted from mBtus to gallons of diesel fuel based on conversion factors in the US Dept of Energy’s *Transportation Energy Data Book*. The gallons of diesel fuel were then converted to kg of CO₂ based on emission factors from the US Energy Information Administration (<http://www.eia.gov/oiaf/1605/coefficients.html>). Kg of CO₂ were then converted to metric tons of CO₂.


California Environmental Protection Agency  Air Resources Board		California Greenhouse Gas Inventory for 2000-2008 — by Category as Defined in the Scoping Plan								
million tonnes of CO ₂ equivalent - (based upon IPCC Second Assessment Report's Global Warming Potentials)		2000	2001	2002	2003	2004	2005	2006	2007	2008
Transportation		171.13	173.71	180.36	178.03	181.71	184.32	184.11	183.84	174.99
On Road		159.40	161.69	168.40	166.17	169.22	170.82	170.49	170.79	163.30
Passenger Vehicles		126.91	129.25	135.43	132.83	134.24	134.51	133.80	133.34	128.51
Heavy Duty Trucks		32.49	32.45	32.97	33.34	34.98	36.31	36.68	37.45	34.79
Ships & Commercial Boats		3.77	3.56	3.87	4.04	4.06	4.36	4.45	4.38	4.32
Aviation (Intrastate)		2.68	2.50	2.66	2.59	2.64	2.70	2.68	2.96	2.42
Rail		1.86	1.87	2.48	2.41	2.89	3.32	3.50	3.15	2.52
Unspecified		3.41	4.08	2.94	2.81	2.90	3.11	3.00	2.56	2.44
Electric Power		103.92	120.62	106.49	109.89	119.96	110.98	107.66	111.10	116.35
In-State Generation		59.93	63.86	50.87	49.08	57.40	51.75	56.28	55.16	55.12
Natural Gas		51.06	55.55	42.42	41.01	48.66	43.21	47.62	47.20	48.07
Other Fuels		8.87	8.31	8.45	8.07	8.74	8.54	8.67	7.96	7.05
Imported Electricity		43.99	56.76	55.62	60.81	62.56	59.22	51.38	55.94	61.24
Unspecified Imports		13.83	24.69	25.42	30.21	31.32	28.44	26.40	30.57	35.19
Specified Imports		30.16	32.07	30.19	30.60	31.24	30.78	24.98	25.37	26.05
Commercial and Residential		42.93	41.02	43.79	41.38	42.54	40.79	41.47	41.83	43.13
Residential Fuel Use		30.13	28.62	29.35	28.31	29.34	28.08	28.46	28.61	28.45
Natural Gas		28.52	27.34	28.03	26.59	27.30	25.89	26.52	26.65	26.10
Other Fuels		1.61	1.27	1.32	1.72	2.04	2.19	1.93	1.96	2.35
Commercial Fuel Use		11.69	11.32	13.37	12.81	12.71	12.56	12.84	12.73	14.31
Natural Gas		10.24	10.07	12.11	11.34	11.13	10.90	11.58	11.35	12.51
Other Fuels		1.45	1.25	1.26	1.46	1.59	1.66	1.26	1.38	1.80
Commercial Cogeneration Heat Output		1.11	1.07	1.08	0.26	0.49	0.15	0.17	0.49	0.37
Industrial		97.27	94.70	96.73	96.14	90.87	90.72	90.47	93.82	92.66
Refineries		33.25	33.07	33.87	34.80	34.06	35.31	36.09	36.07	35.65
General Fuel Use		18.76	17.87	19.53	16.39	16.28	14.80	15.17	14.78	14.82
Natural Gas		13.82	11.92	12.80	10.26	10.53	9.86	9.90	9.76	9.14
Other Fuels		4.94	5.94	6.73	6.13	5.76	4.93	5.27	5.02	5.69
Oil & Gas Extraction [1]		18.41	18.45	17.37	19.51	19.31	18.01	16.48	16.52	17.04
Fuel Use		17.72	17.62	16.64	18.78	18.94	17.66	15.72	15.75	16.27
Fugitive Emissions		0.69	0.83	0.73	0.74	0.37	0.35	0.77	0.77	0.78
Cement Plants		9.41	9.51	9.61	9.72	9.82	9.92	9.75	9.17	8.61
Clinker Production		5.43	5.52	5.60	5.68	5.77	5.85	5.80	5.55	5.31
Fuel Use		3.97	4.00	4.01	4.03	4.05	4.07	3.95	3.62	3.30
Cogeneration Heat Output		11.96	10.69	10.84	10.79	6.19	6.91	6.90	11.22	10.47
Other Process Emissions		5.49	5.11	5.50	4.94	5.22	5.78	6.08	6.07	6.06
Recycling and Waste		6.20	6.28	6.21	6.29	6.23	6.52	6.59	6.53	6.71
Landfills [2]		6.20	6.28	6.21	6.29	6.23	6.52	6.59	6.53	6.71

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Source: California Air Resources Board, 2010

Figure 3.3-2. California Greenhouse Gas Inventory for 2000-2008

California Environmental Protection Agency  Air Resources Board		California Greenhouse Gas Inventory for 2000-2008 — by Category as Defined in the Scoping Plan								
million tonnes of CO ₂ equivalent - (based upon IPCC Second Assessment Report's Global Warming Potentials)		2000	2001	2002	2003	2004	2005	2006	2007	2008
High GWP		10.95	11.34	11.97	12.75	13.57	14.23	14.92	15.27	15.65
<i>Ozone Depleting Substance (ODS) Substitutes</i>		<i>8.55</i>	<i>9.30</i>	<i>10.12</i>	<i>10.92</i>	<i>11.74</i>	<i>12.41</i>	<i>13.05</i>	<i>13.47</i>	<i>13.89</i>
<i>Electricity Grid SF₆ Losses [3]</i>		<i>1.14</i>	<i>1.15</i>	<i>1.07</i>	<i>1.05</i>	<i>1.05</i>	<i>1.04</i>	<i>1.00</i>	<i>0.97</i>	<i>0.96</i>
<i>Semiconductor Manufacturing [2]</i>		<i>1.26</i>	<i>0.89</i>	<i>0.78</i>	<i>0.78</i>	<i>0.78</i>	<i>0.78</i>	<i>0.87</i>	<i>0.84</i>	<i>0.80</i>
Agriculture [4]		25.44	25.37	28.42	28.49	28.82	28.99	29.90	28.26	28.06
<i>Livestock</i>		<i>13.61</i>	<i>14.10</i>	<i>14.56</i>	<i>14.88</i>	<i>14.81</i>	<i>15.36</i>	<i>15.63</i>	<i>15.96</i>	<i>16.28</i>
<i>Enteric Fermentation (Digestive Process)</i>		<i>7.49</i>	<i>7.64</i>	<i>7.86</i>	<i>7.97</i>	<i>7.97</i>	<i>8.26</i>	<i>8.33</i>	<i>8.52</i>	<i>8.70</i>
<i>Manure Management</i>		<i>6.12</i>	<i>6.47</i>	<i>6.70</i>	<i>6.91</i>	<i>6.84</i>	<i>7.10</i>	<i>7.30</i>	<i>7.44</i>	<i>7.58</i>
<i>Crop Growing & Harvesting</i>		<i>8.01</i>	<i>7.46</i>	<i>9.48</i>	<i>9.41</i>	<i>9.51</i>	<i>9.03</i>	<i>9.08</i>	<i>8.53</i>	<i>7.95</i>
<i>Fertilizers</i>		<i>6.55</i>	<i>6.21</i>	<i>8.06</i>	<i>8.02</i>	<i>8.03</i>	<i>7.58</i>	<i>7.44</i>	<i>7.08</i>	<i>6.72</i>
<i>Soil Preparation and Disturbances</i>		<i>1.37</i>	<i>1.18</i>	<i>1.34</i>	<i>1.31</i>	<i>1.41</i>	<i>1.37</i>	<i>1.56</i>	<i>1.36</i>	<i>1.15</i>
<i>Crop Residue Burning</i>		<i>0.09</i>	<i>0.07</i>	<i>0.07</i>	<i>0.08</i>	<i>0.07</i>	<i>0.08</i>	<i>0.08</i>	<i>0.09</i>	<i>0.09</i>
<i>General Fuel Use</i>		<i>3.82</i>	<i>3.81</i>	<i>4.39</i>	<i>4.20</i>	<i>4.50</i>	<i>4.60</i>	<i>5.19</i>	<i>3.78</i>	<i>3.82</i>
<i>Diesel</i>		<i>2.51</i>	<i>2.68</i>	<i>3.02</i>	<i>2.94</i>	<i>3.15</i>	<i>3.38</i>	<i>3.85</i>	<i>2.66</i>	<i>2.93</i>
<i>Natural Gas</i>		<i>1.00</i>	<i>0.75</i>	<i>0.95</i>	<i>0.85</i>	<i>0.82</i>	<i>0.69</i>	<i>0.77</i>	<i>0.79</i>	<i>0.72</i>
<i>Gasoline</i>		<i>0.31</i>	<i>0.38</i>	<i>0.40</i>	<i>0.41</i>	<i>0.52</i>	<i>0.52</i>	<i>0.57</i>	<i>0.32</i>	<i>0.17</i>
<i>Other Fuels</i>		<i>0.01</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.01</i>	<i>0.00</i>	<i>0.00</i>
Forestry		0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
<i>Wildfire (CH₄ & N₂O Emissions)</i>		<i>0.19</i>	<i>0.19</i>	<i>0.19</i>	<i>0.19</i>	<i>0.19</i>	<i>0.19</i>	<i>0.19</i>	<i>0.19</i>	<i>0.19</i>
Total Gross Emissions		458.03	473.23	474.15	473.15	483.88	476.73	475.31	480.85	477.74
Forestry Net Emissions		-4.72	-4.53	-4.40	-4.33	-4.32	-4.17	-4.04	-4.07	-3.98
Total Net Emissions		453.31	468.69	469.75	468.82	479.56	472.56	471.27	476.77	473.76

[1] Reflects emissions from combustion of natural gas, diesel, and lease fuel plus fugitive emissions
 [2] These categories are listed in the Industrial sector of ARB's GHG Emission Inventory sectors
 [3] This category is listed in the Electric Power sector of ARB's GHG Emission Inventory sectors
 [4] Reflects use of updated USEPA models for determining emissions from livestock and fertilizers

Source: California Air Resources Board 2010

Figure 3.3-2. California Greenhouse Gas Inventory for 2000-2008 (continued)

3.3.3.2 Long-term Impacts

No Build Alternative

GHG emissions were estimated for the No Build Alternative’s operational activities. Table 3.3-1 presents the GHG emissions (in CO_{2e}) of the roadways in the four-county region (Los Angeles, San Bernardino, Riverside and Orange Counties) for the year 2035. As shown, the No Build Alternative would not affect GHG emissions, as it would not affect VMT or involve the operation of new facilities.

Table 3.3-1. 2035 Daily Regional GHG Emissions (Metric Tons CO_{2e})

Alternative	Roadways	Rail (Including Stations)	Total	% Change from No Build
No Build	414,885	—	414,885	—
TSM	414,570	—	414,570	-0.1%
Build	414,279	62	414,341	-0.1%

Source: Parsons Brinckerhoff, 2011

Transportation Systems Management Alternative

As shown in Table 3.3-1, the TSM Alternative would slightly decrease GHG emissions compared to the No Build Alternative. Therefore, no significant impact would occur.

Build Alternative

The estimated daily operational GHG emissions of the proposed project are shown in Table 3.3-1. As shown, the Build Alternative would slightly reduce GHG emissions compared to the No Build Alternative. This reduction of 544 metric tons of CO_{2e} per day, as compared to the No Build Alternative, is the equivalent of approximately 60,000 gallons of gasoline consumed each day.³ Therefore, no significant adverse impact would occur.

3.3.4 Cumulative Impacts

The project was analyzed using traffic projections that take into account the foreseeable future. The project is included in SCAG’s 2012-2035 Regional Transportation Plan/Sustainable Communities Strategies (RTP/SCS). As such, the project is part of a program that accounts for future criteria pollutant emissions from all mobile sources and ensures that attainment will not be delayed by future projects.

Furthermore, when considering the combined effect of reduced roadway VMT and increased power usage for the rail system, the project shows a slight reduction in GHG emissions. As such, the project is not expected to have a cumulative impact on the environment.

3.3.5 Mitigation Measures

3.3.5.1 Short-Term Construction Mitigation Measures

Construction would result in the emission of GHGs. Metro has prepared a Climate Action and Adaptation Plan to address the emission of GHGs during construction. Construction mitigation measures include the

³ According to the EPA’s carbon calculator (<http://www.epa.gov/cleanenergy/energy-resources/calculator.html>)

use of newer, more energy-efficient equipment and the minimization of idle times of construction equipment to reduce emissions, identified in Section 3.1. These measures, many of which are in Metro’s Green Construction Policy, include:

- **CON-9**—Contractors shall maintain equipment and vehicle engines in good condition and in proper tune per manufacturers’ specifications.
- **CON-10**—Heavy-duty trucks shall be prohibited from idling in excess of five minutes, both on- and off-site.
- **CON-11**—Construction parking shall be configured to minimize traffic interference.
- **CON-12**—Construction activity that affects traffic flow on the arterial system shall be limited to off-peak hours.
- **CON-13**—Construction staging and vehicle parking, including workers’ vehicles, shall be prohibited on streets adjacent to sensitive receptors such as schools, daycare centers, senior facilities, and hospitals.
- **CON-14**—Portable generators shall be low-emitting and use ultra low sulfur diesel (<15 parts per million) or gasoline.
- **CON-15**—Construction equipment shall use a combination of low sulfur diesel (<15 parts per million) and exhaust emission controls.
- **CON-16**—The construction process shall use equipment having the minimum practical engine size (i.e., lowest appropriate horsepower rating for the intended job).
- **CON-17**—Contractors shall be prohibited from tampering with construction equipment to increase horsepower or defeat emission control devices.
- **CON-18**—The Construction Authority shall designate a person to ensure the implementation of air quality mitigation measures through direct inspections, records reviews, and complaint investigations.
- **CON-19**—LED lighting shall be used for construction activities taking place at night, to the extent feasible.

3.3.5.2 Long-Term Mitigation Measures

No GHG impacts are expected with the operational phase of the project; therefore, no mitigation measures are recommended.

3.3.6 Level of Impact after Mitigation

With implementation of mitigation measures the impacts from construction of the project is anticipated to be less than significant, and the no adverse significant GHG impacts are expected with the operational phase of the project.