4.7 Climate Change

4.7.1 Regulatory Framework and Methodology

4.7.1.1 Regulatory Framework

The applicable federal, state, and local regulations that are relevant to an analysis of the proposed project's climate change impacts are listed below. For additional information regarding these regulations, please see the Climate Change Technical Report in Appendix BB of this Draft EIS/EIR.

Federal

The following federal regulations are applicable to the proposed project:

- Section 202(a) of the Clean Air Act
- National Clean Car Program

State

The following state regulations are applicable to the proposed project:

- Executive Order (EO) S-3-05
- EO S-01-07 (January 18, 2007)
- EO B-30-15
- Assembly Bill (AB) 32, the Global Warming Solutions Act of 2006
- AB 1493, Pavley, Vehicular Emissions: Greenhouse Gases, 2002
- Senate Bill (SB) 97
- SB 375, Sustainable Communities and Climate Protection Act of 2008
- SB 391 Chapter 585, 2009 California Transportation Plan
- SB 32 Global Warming Solutions Act of 2006 (passed in 2016)

Local

The following local and regional agencies and regulations are applicable to the proposed project:

- Southern California Association of Governments 2016-2040 RTP/SCS
- South Coast Air Quality Management District Air Quality Management Plan
- City of Los Angeles Green LA: An Action Plan to Lead the Nation in Fighting Global Warming
- City of Los Angeles ClimateLA
- City of Los Angeles Sustainable City pLAn
- Metro 2012 Climate Action and Adaptation Plan
- Metro Green Construction Policy

4.7.1.2 Methodology

The proposed project would generate construction-related and operational emissions. The methodology used to evaluate construction and operational effects is described below.

Evaluation of Construction-Period Impacts

Project construction would be a source of greenhouse gases (GHG) emissions. Such emissions would result from earthmoving and the use of heavy equipment as well as land clearing, ground excavation, cut-and-fill operations, and the reconstruction of roadways. Construction-period GHG emissions are quantified by using the California Emissions Estimator Model (CalEEMod) (version 2013.2.2). CalEEMod has been approved by SCAQMD for emissions estimations within the South Coast Air Basin. Consistent with SCAQMD-recommended methodology, total construction-period emissions are amortized over a 30-year period, then added to the opening-year GHG emissions total to arrive at the annual tons per year total, which accounts for construction and operations emissions.

Evaluation of Operational Impacts

Operational GHG emissions would result from transit vehicle and maintenance facility operations as well as changes in local VMT related to local traffic redistribution, changes in roadway network travel speeds, and mode-shift effects that would occur because of the proposed project.

CalEEMod was used to estimate emissions related to maintenance facility operations that would result from trips made by workers; facility energy demands related to lighting, temperature control, and water conveyance; and area sources, such as the use of consumer products, periodic application of architectural coatings, the use of landscaping equipment, etc., that would occur during long-term project operations. In calculating mobile-source emissions, CalEEMod relies on EMFAC2011 emissions factors and default trip generation rates and distances. Area-source emissions were compiled using CalEEMod default assumptions.

Fixed guideway transit vehicle operations emissions were calculated by applying Los Angeles Department of Water and Power carbon intensity factors to the annual estimate of system electricity demand. Propulsion and station electricity demand were established by determining the per-mile energy demand for Metro's existing LRT lines and applying that consumption rate to the proposed 9.2-mile alignment.

Emissions related to changes in local VMT and roadway network travel speeds were calculated using traffic data (VMT apportioned into 5 mph speed bins) that were derived from a micro-simulation model that captures project effects and CT-EMFAC2014 emissions factors.

Each of the build alternatives was compared against existing conditions, which "normally constitute[s] the baseline physical conditions by which a lead agency determines whether an impact is significant," under Section 15125(a) of the CEQA Guidelines. Because Alternative 3 would have the greatest traffic impacts, the Existing (2012) with Alternative 3 scenario presents the worst-case for GHG emissions relative to any of the other "Existing Plus Project" scenarios. Thus, in order to evaluate, analyze, and compare each of the alternatives, the qualitative analysis for the other build alternatives extrapolates from the quantitative analysis for the Existing (2012) with Alternative 3 scenario. In addition, the emissions of each of the build alternatives have been evaluated against the No-Build Alternative for a future baseline (2040) analysis.

4.7.1.3 CEQA Significance Thresholds

CEQA requires state and local government agencies to identify the significant environmental effects of proposed actions. According to the Governor's Office of Planning and Research, significance thresholds for a given environmental effect are at the discretion of the Lead Agency and are the levels at which the Lead Agency finds the effects of the project to be significant.

State CEQA Guidelines

The State CEQA Guidelines define a significant effect on the environment as: "a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance" (State CEQA Guidelines, Section 15382).

The State CEQA Guidelines do not describe specific significance thresholds. However, Appendix G of the State CEQA Guidelines lists a variety of potentially significant effects, which are often used as thresholds or guidance in developing thresholds for determining impact significance. Accordingly, for the purposes of this EIS/EIR, a project would have a significant effect due to GHG emissions under CEQA, if it would:

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

The State CEQA Guidelines also state that the significance criteria established by the applicable air quality management district or air pollution control district may be relied upon to make the determinations above.

Although SCAQMD has a regulatory role in the South Coast Air Basin, it has not adopted or proposed any quantitative thresholds that would be applicable to the proposed project. As such, project GHG emissions are evaluated for consistency with California's AB 32 (Global Warming Solutions Act of 2006) emissions reduction goals to determine significance.

4.7.1.4 *L.A. CEQA Thresholds Guide*

The City's *L.A. CEQA Threshold Guide* does not contain thresholds for climate change impacts related to GHG emissions. As such, project GHG emissions are evaluated for consistency with AB 32 emissions reduction goals to determine significance.

4.7.2 Affected Environment/Existing Conditions

4.7.2.1 Description of Relevant Pollutants

GHGs include CO_2, CH_4, N_2O, and fluorinated gases. Presented below is a description of each GHG and their known sources.

Carbon dioxide (CO_2) enters the atmosphere through the burning of fossil fuels (oil, natural gas, and coal), solid waste, trees and wood products, respiration, and also as a result of other chemical reactions (e.g., manufacture of cement). Carbon dioxide is also removed from the atmosphere (or "sequestered") when it is absorbed by plants as part of the biological carbon cycle.

Methane (CH_4) is emitted during the production and transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices and the decay of organic waste in municipal solid waste landfills.

Nitrous oxide (N_2O) is emitted during agricultural and industrial activities as well as during the combustion of fossil fuels and solid waste.

Fluorinated gases are synthetic, strong GHGs that are emitted from a variety of industrial processes. Fluorinated gases are sometimes used as substitutes for ozone-depleting substances. These gases are typically emitted in smaller quantities, but because they are potent GHGs, they are sometimes referred to as High Global Warming Potential gases.

Chlorofluorocarbons (CFCs) are GHGs and covered under the 1987 Montreal Protocol. CFCs are used in refrigeration, air-conditioning, packaging, insulation, solvents, or aerosol propellants. Because they are not destroyed in the lower atmosphere (troposphere, stratosphere), CFCs drift into the upper atmosphere where, given suitable conditions, they break down ozone. These gases are being replaced by other compounds that are GHGs and covered under the Kyoto Protocol.

Perfluorocarbons (PFCs) are a group of human-made chemicals composed of carbon and fluorine only. These chemicals (predominantly perfluoromethane [CF_4] and perfluoroethane [C_2F_6]) were introduced as alternatives, along with HFCs, to the ozone-depleting substances. In addition, PFCs are emitted as by-products of industrial processes and are also used in manufacturing. PFCs do not harm the stratospheric ozone layer, but they are strong GHGs.

Sulfur Hexafluoride (SF_6) is a colorless gas that is soluble in alcohol and ether and slightly soluble in water. SF_6 is a strong GHG and used primarily in electrical transmission and distribution systems as a dielectric.[1]

Hydrochlorofluorocarbons (HCFCs) contain hydrogen, fluorine, chlorine, and carbon atoms. Although ozone-depleting substances, they are less potent than CFCs. They have been introduced as temporary replacements for CFCs and are also GHGs.

Hydrofluorocarbons (HFCs) contain only hydrogen, fluorine, and carbon atoms. They were introduced as alternatives to ozone-depleting substances in items that serve many industrial, commercial, and personal needs. HFCs are emitted as by-products of industrial processes and are also used in manufacturing. They do not significantly deplete the stratospheric ozone layer, but they are strong GHGs.

4.7.2.2 California GHG Emissions

California is the second-largest emitter of GHGs in the United States (Texas is the largest GHG emitter) and the sixteenth largest GHG emitter in the world.[2] However, because of more stringent air pollutant emission regulations and mild climate, in 2011, California ranked fourth lowest in carbon emissions per capita and fifth lowest among states (including the District of Columbia) in CO_2 emissions per unit economic output.[3] In 2010, California produced 452 million metric tons (MMT) of

[1] An electrical insulator that is highly resistant to the flow of an electric current.

[2] California Energy Commission. 2006. *Our Changing Climate, Assessing the Risks to California, 2006 Biennial Report*. California Climate Change Center, California Energy Commission Staff Paper, Sacramento, CA. Report CEC-500-2006-077.

[3] U.S. Energy Information Administration. 2014. State-Level Energy-Related Carbon Dioxide Emissions, 2000-2011. Available: <http://www.eia.gov/environment/emissions/state/analysis/pdf/stateanalysis.pdf>. Tables 5 and 8.

CO_2-equivalent (CO_2e)[4] emissions, of which, 38% were from transportation sources, 21% from activities related to electric power generation, and 19% from industrial sources.[5] Other major sources of state GHG emissions include mineral production, waste combustion and land use, and forestry changes. Agriculture, forestry, commercial, and residential activities compose the balance of California's GHG emissions.[6]

Climate change could affect the natural environment in California in the following ways, among others:

- Rising sea levels along the California coastline, particularly in San Francisco and the San Joaquin Delta due to ocean expansion.
- Extreme heat conditions, such as heat waves and very high temperatures, which could last longer and become more frequent.
- An increase in heat-related human deaths, infectious diseases, and a higher risk of respiratory problems caused by deteriorating air quality.
- Reduced snow pack and streamflow in the Sierra Nevada, affecting winter recreation and water supplies.
- Potential increase in the severity of winter storms, affecting peak streamflows and flooding.
- Changes in growing season conditions that could affect California agriculture, causing variations in crop quality and yield.
- Changes in the distribution of plant and wildlife species due to changes in temperature, competition from colonizing species, changes in hydrologic cycles, changes in sea levels, and other climate-related effects.

These changes in California's climate and ecosystems are occurring at a time when California's population is expected to increase from 34 million to 59 million (i.e., by 2040) (California Energy Commission [CEC] 2005). As such, the number of people that could be affected by climate change, as well as the amount of anthropogenic GHG emissions expected under a "business as usual" scenario, is expected to increase. Changes similar to those noted above for California would also occur in other parts of the world, with regional variations in resources affected and vulnerability to adverse effects. GHG emissions in California are attributable to human activities associated with the industrial/manufacturing, utility, transportation, residential, and agricultural sectors (CEC 2006) as well as natural processes.

4.7.2.3 Project Vicinity Mobile-Source Emissions

The estimate of daily VMT that occurs within the project vicinity under the existing/baseline condition is approximately 5.3 million. This generates approximately 996,578 metric tons of CO_2e emissions per year.

[4] GHG emissions, other than CO_2, are commonly converted into CO_2 equivalents, which take into account the differing global warming potential (GWP) of different gases. For example, the Intergovernmental Panel on Climate Change (IPCC) finds that N_2O has a GWP of 310, and CH_4 has a GWP of 21. Thus, the emission of 1 ton of N_2O and 1 ton of CH_4 is represented as the emission of 310 tons of CO_2e and 21 tons of CO_2e, respectively. This allows for the summation of different GHG emissions into a single total.

[5] California Air Resources Board. 2013. *California Greenhouse Gas Inventory for 2000–2010 by Category, as Defined in the Scoping Plan.*

[6] *Ibid.*

4.7.3 Environmental Consequences, Impacts, and Mitigation Measures

4.7.3.1 No-Build Alternative

Construction Impacts

No construction activities would be undertaken under the No-Build Alternative, and no construction-related GHG emissions would be generated.

Operational Impacts

The No-Build Alternative would not involve any new project facilities or services and as a consequence, it would not generate new GHG emissions and no project-related impacts under CEQA or NEPA would occur as a result of the No-Build Alternative. However, future conditions in the year 2040 under the No-Build Alternative represent the future baseline against which the proposed project alternatives are compared. As shown in Table 4.7-1, traffic operations in 2012 and 2040 under No-Build conditions would result in the annual emission of approximately 72 MMT of CO_2e under the 2012 scenario and approximately 61 MMT of CO_2e under the 2040 scenario. Emissions were calculated using traffic data from the SCAG region (VMT apportioned into 5 mph speed bins) that were derived from a traffic micro-simulation model and CT-EMFAC2014 emissions factors. The fleet assumed by the model takes into consideration the fuel-efficiency of the most recent vehicle models as well as older models that will continue to be in operation (and are phased out over time). Due to regional population growth, more cars are assumed to be in operation in 2040 relative to existing conditions.

Table 4.7-1. Baseline Conditions – GHG Emissions

Phase	CO_2e (metric tons)
Operation	
2012 Traffic Emissions	71,942,145
2040 Traffic Emissions	60,993,074
Source: Emissions modeling by ICF (2016) (See Appendix A of the Climate Change Technical Report).	

Potential for Conflict with GHG Reduction Plans

The No-Build Alternative would not involve construction and would not affect capacity on roadways in the project vicinity. It would not conflict with the Metro Climate Action and Adaptation Plan, GreenLA, ClimateLA, Sustainable City pLAn, SB 375, or AB 32 Scoping Plan measures, nor would it be inconsistent with the goals of reducing local and statewide GHG emissions. No project-related impacts under CEQA or NEPA would occur as a result of the No-Build Alternative; however, the No-Build Alternative would not include transit system improvements that could help achieve the goals of those plans.

Cumulative Impacts

No impact would occur under the No-Build Alternative; therefore, it would not contribute to any cumulative GHG impacts.

Mitigation Measures

Construction Mitigation Measures

No construction mitigation measures would be required.

Operational Mitigation Measures

No operational mitigation measures would be required.

Impacts Remaining After Mitigation

NEPA Finding

No effects would occur as a result of construction and operation of the No-Build Alternative.

CEQA Determination

No impacts would occur as a result of construction and operation of the No-Build Alternative.

4.7.3.2 TSM Alternative

Construction Impacts

The TSM Alternative may include minor physical improvements to bus stops and roadways; consequently, there would be no or very minor construction-related GHG emissions.

Operational Impacts

Operation of the TSM Alternative would involve GHG emissions stemming from the use of motor vehicles. As demonstrated for the 2012 Alternative 3 scenario in Table 4.7-5, there would be net reductions in operational GHG emissions relative to the 2012 No Build scenario. Because roadway capacity would be reduced by the greatest amount under Alternative 3 relative to the other build alternatives, Alternative 3 represents a worst-case with respect to traffic flow. By extension, operations under the TSM Alternative would have less delay and more efficient operating speeds than Alternative 3, which would result in lower emissions from motor vehicles operating in the project vicinity. On the basis of the less extensive traffic impacts relative to the 2012 Alternative 3 scenario and due to the fact that the TSM Alternative would not have emissions associated with a new MSF or LRT/tram propulsion, operational GHG emissions reductions under the 2012 TSM Alternative scenario would be greater than those identified in Table 4.7-5. Due to the reduction in GHG emissions under the 2012 TSM Alternative scenario, no significant impacts would occur under CEQA and no adverse effects would occur under NEPA.

As shown in Table 4.7-2, traffic operations in 2040 under the TSM Alternative condition would result in the annual emission of approximately 3,000 MT of CO2e over the future (2040) baseline condition vehicle emissions, an increase of 0.005%. Emissions were calculated using traffic data (VMT apportioned into 5 mph speed bins) that were derived from a traffic micro-simulation model and CT-EMFAC2014 emissions factors. The TSM Alternative would result in a negligible increase in GHG emissions compared with the baseline due to increased bus service and lower operational efficiency of roadways in the project vicinity. Lower operational efficiency of roadways would result from additional delays on project vicinity roadways relative to 2040 baseline conditions. Impacts are addressed below.

Table 4.7-2. TSM Alternative – GHG Emissions in Year 2040

Phase	CO_2e (metric tons)
Operation	
Traffic Emissions	60,996,107
2040 Baseline Traffic Emissions	60,993,074
Net Operational Emissions	3,033
TOTAL	**3,033**
Percent Change Compared to 2040 Baseline	**0.005%**
Source: Emissions modeling by ICF (2016) (See Appendix A of the Climate Change Technical Report).	

Potential for Conflict with GHG Reduction Plans

SB 375 supports the state's climate action goals to reduce GHG emissions through coordinated transportation and land use planning with the goal of more sustainable communities. Specifically, SB 375 requires regional transportation plans to include a policy element that describes the transportation issues in the region, identifies and quantifies regional needs, and describes the desired short-range and long-range transportation goals, and pragmatic objective and policy statements. SB 375 also recommended the quantification of indicators of means of travel and transit accessibility.

As directed by SB 375, SCAG's primary goal with the RTP/SCS is to provide a vision for future growth in Southern California that will decrease per capita greenhouse gas emissions from automobiles and light trucks, with goals of a 8% reduction by 2020 and an 18% reduction by 2035. The 2016-2040 RTP/SCS identifies improved accessibility and mobility as one of its goals (p. 64). The TSM Alternative would increase bus frequencies and transit capacity, which would support the RTP/SCS goal of improved accessibility and mobility in its implementation of SB 375. Therefore, the TSM Alternative would not conflict with the goals of SB 375 and the SCAG RTP/SCS.

The Metro Climate Action and Adaptation Plan identifies the goal of reducing Metro's GHG emissions per boarding by 5% from 2010 to 2020. As identified in the Transportation Impacts Report, operation of the TSM Alternative would result in approximately 500 new transit trips per day (KOA 2015). Given that increased ridership would be achieved along the alignment compared with the future 2040 baseline conditions, the TSM Alternative would contribute to a decrease in GHG emissions from Metro buses per boarding, as additional transit boardings would occur with a marginal increase in service. The increase in GHG emissions under the TSM Alternative would occur as a result of minor increases in congestion due to the additional buses on the street network. Despite an overall increase in GHG emissions occurring as a result of increased congestion, the TSM Alternative would reduce Metro's emissions per transit boarding and would not conflict with the 5% GHG emissions reduction per boarding goal.

The Sustainable City pLAn outlines GHG emissions reductions goals of 45% by 2025, 60% by 2035, and 80% by 2050 compared to 1990 baseline emissions as well as reductions in VMT per capita and increases in the percentage of trips made by walking, biking, and transit. Operation of the TSM Alternative would result in new transit trips, thereby contributing to reductions in VMT per capita and increases in the percentage of trips made by transit. Because mode-shift from cars to more efficient public transit vehicles would occur, the TSM Alternative would not conflict with the plan's GHG reduction goals.

Operation of the TSM Alternative is predicted to result in GHG emissions of approximately 3,000 metric tons (MT) over the future (2040) baseline conditions (an increase of 0.005%) based on vehicles operating at less efficient speeds due to increased congestion. However, this estimate could be offset by future transportation-source GHG emissions reductions as the project vicinity becomes more transit-oriented and sustainable over time. Changes in development patterns would lead to higher levels of mode-shift from passenger vehicle to transit, bicycle, and walking trips.

Overall, the TSM Alternative would not conflict with the AB 32, SB 32, SB 375, and Metro and City of Los Angeles goals to reduce GHG emissions by providing the transportation infrastructure necessary to enable more sustainable communities. No significant impacts would occur under CEQA, and no adverse effects would occur under NEPA.

Cumulative Impacts

GHG emissions and climate change are exclusively cumulative impacts; there are no non-cumulative GHG emissions impacts from a climate change perspective. Climate change is the result of cumulative global emissions. No single project, when considered in isolation, can cause climate change because a single project's emissions are not enough to change the radiative balance of the atmosphere. Because climate change is the result of GHG emissions and GHGs are emitted by innumerable sources worldwide, global climate change will have a significant cumulative impact on the natural environment as well as human development and activity. As such, GHGs and climate change are cumulatively considerable, even though the contribution may be individually limited (SCAQMD 2008). SCAQMD methodology and thresholds are thus cumulative in nature.

As discussed above, the project would not exceed the threshold of significance and would be consistent with adopted plans and regulations that aim to reduce GHG emissions. Therefore, the project would not contribute to a cumulatively significant impact related to GHG emissions and climate change.

Mitigation Measures

Construction Mitigation Measures

No construction mitigation measure would be required.

Operational Mitigation Measures

No operational mitigation measures would be required.

Impacts Remaining After Mitigation

NEPA Finding

No adverse effects would occur under NEPA.

CEQA Determination

No significant impacts would occur under CEQA.

4.7.3.3 BRT Alternatives (Build Alternatives 1 and 2)

Alternative 1 – Curb-Running BRT

Construction Impacts

Construction activities under Alternative 1 would involve roadway and sidewalk modifications as well as the installation of canopies at stops. These activities would result in the emission of approximately 1,280 metric tons of CO_2e over the course of the construction period, as shown in Table 4.7-3. Consistent with SCAQMD-recommended methodology, construction-period emissions were amortized over a 30-year period, resulting in an annual equivalent of approximately 43 metric tons of CO_2e.

Table 4.7-3. Alternative 1 – GHG Emissions in Year 2040

Phase	CO_2e (metric tons)
Operation	
Traffic Emissions	60,995,897
2040 Baseline Traffic Emissions	60,993,074
Net Operational Emissions	2,823
Construction	
Roadway, Sidewalks, and Stations	1,281
30-Year Amortization of Construction Emissions	43
TOTAL	**2,857**
Percent Change Compared to 2040 Baseline	**0.005%**
Source: Emissions modeling by ICF (2016) (See Appendix A of the Climate Change Technical Report).	

Operational Impacts

Operation of Alternative 1 would involve GHG emissions stemming from the use of motor vehicles. As demonstrated for the 2012 Alternative 3 scenario in Table 4.7-5, there would be net reductions in operational GHG emissions relative to the 2012 No Build scenario. Because roadway capacity would be reduced by the greatest amount under Alternative 3 relative to the other build alternatives, Alternative 3 represents a worst-case with respect to traffic flow. By extension, operations under Alternative 1 would have less delay and more efficient operating speeds than Alternative 3, which would result in lower emissions from motor vehicles operating in the project vicinity. On the basis of the less extensive traffic impacts relative to the 2012 Alternative 3 scenario and due to the fact that Alternative 1 would not have emissions associated with a new MSF or LRT/tram propulsion, operational GHG emissions reductions under the 2012 Alternative 1 scenario would be greater than those identified in Table 4.7-5. Due to the reduction in GHG emissions under the 2012 Alternative 1 scenario, no significant impacts would occur under CEQA and no adverse effects would occur under NEPA.

As shown in Table 4.7-3, traffic operations in 2040 under Alternative 1 would result in the annual emission of approximately 2,800 MT of CO_2e above future (2040) baseline vehicle emissions, an increase of 0.005%. Emissions were calculated using traffic data (VMT apportioned into 5 mph speed bins) that were derived from a traffic micro-simulation model and CT-EMFAC2014 emissions factors.

Including the amortized construction emissions, total GHG emission resulting from the implementation of Build Alternative 1 would be 0.005% greater than under the future (2040) baseline condition. The projected increases in GHG generation are due to construction emissions as well as increased bus service and the lower operational efficiency of roadways in the project vicinity due to a reduction in roadway capacity for mixed-flow traffic. Impacts related to GHG emissions are discussed below.

Potential for Conflict with GHG Reduction Plans

Alternative 1 would involve the implementation of a curb-running BRT service in dedicated lanes. As directed by SB 375, SCAG's primary goal with the RTP/SCS is to provide a vision for future growth in Southern California that will decrease per capita GHG emissions from automobiles and light trucks, with goals of an 8% reduction by 2020 and an 18% reduction by 2035. The 2016-2040 RTP/SCS identifies improved accessibility and mobility as one of its goals (p. 64). Alternative 1 would introduce BRT service capable of increasing transit capacity, which would support the RTP/SCS goal of improved accessibility and mobility in its implementation of SB 375. Although Alternative 1 would result in greater GHG emissions than under the future (2040) baseline condition, it would not conflict with the goals of SB 375 and the SCAG RTP/SCS in that it would provide a new transit service that would contribute to a larger rapid transit network. Such rapid transit systems are a recognized method of achieving transportation-related GHG emissions reductions.

The Metro Climate Action and Adaptation Plan identified the goal of reducing Metro's GHG emissions per boarding by 5% from 2010 to 2020. As identified in the Transportation Impacts Report, operation of Alternative 1 would result in approximately 3,000 new transit trips per day (KOA 2015). Given that increased ridership would be achieved with an increase of 10 Metro buses operating along the alignment compared with the future (2040) baseline, Alternative 1 would contribute to a decrease in GHG emissions per boarding and would not conflict with the 5% GHG emissions reduction per boarding goal. In addition, construction activities would comply with the Metro Green Construction Policy.

The Sustainable City pLAn outlines goals of GHG emission reductions of 45% by 2025, 60% by 2035, and 80% by 2050 in comparison to 1990 baseline emissions, as well as reductions in VMT per capita and increases in the percentage of trips made by walking, biking, and transit. Operation of Alternative 1 would result in new transit trips, thereby contributing to reductions in VMT per capita and increases in the percentage of trips made by transit. Because mode-shift from cars to more efficient public transit vehicles would occur, Alternative 1 would not conflict with the pLAn GHG reduction goals.

Although the Alternative 1 year 2040 traffic scenario predicts a certain level of mode-shift from passenger vehicle to transit, bicycle, and walking trips based on existing land use patterns, additional mode-shift would very likely occur as a result of future transit-oriented development (TOD)/redevelopment that this project may facilitate. Since these potential changes are not well understood and would be difficult to quantify, the potential future transportation-source GHG emissions reductions were not included in the modeling.

Without considering future mode-shift to transit, bicycling, and walking, the operation of Alternative 1 is predicted to result in GHG emissions reductions under the 2012 scenario and increases of approximately 2,800 MT (a 0.005% increase) over the future (2040) baseline condition based on vehicles operating at less efficient speeds due to increased congestion. However, future transportation-source GHG emissions reductions could offset this minimal increase as the project vicinity becomes more transit-oriented and sustainable over time. Changes in development patterns would lead to higher levels of mode-shift from passenger vehicle to transit, bicycle, and walking trips.

Overall, Alternative 1 does not conflict with the AB 32, SB 32, SB 375, and Metro and City of Los Angeles goals to reduce GHG emissions by providing the transportation infrastructure necessary to enable more sustainable communities. No significant impact would occur under CEQA, and no adverse effects would occur under NEPA.

Cumulative Impacts

See Cumulative Impacts discussion for the TSM Alternative. Alternative 1 would not exceed the threshold of significance and would be consistent with adopted plans and regulations that aim to reduce GHG emissions. Therefore, the project would not result in a cumulatively considerable impact related to GHG emissions and climate change.

Mitigation Measures

Construction Mitigation Measures

No construction mitigation measures are required.

Operational Mitigation Measures

No operational mitigation measures are required.

Impacts Remaining After Mitigation

NEPA Finding

No adverse effects would occur under NEPA.

CEQA Determination

No significant impacts would occur under CEQA.

Alternative 2 – Median-Running BRT

Construction Impacts

Construction activities under Alternative 2 would involve roadway, bus stop, and sidewalk modifications to allow for a median-running BRT service. These activities would result in the emission of approximately 2,170 metric tons of CO_2e, as shown in Table 4.7-4. Consistent with SCAQMD-recommended methodology, construction-period emissions were amortized over a 30-year period, resulting in an annual equivalent of approximately 72 MT of CO_2e.

Table 4.7-4. Alternative 2 – GHG Emissions in Year 2040

Phase	CO_2e (metric tons)
Operation	
Traffic Emissions	60,993,238
2040 Baseline Traffic Emissions	60,993,074
Net Operational Traffic Emissions	165
Construction	
Roadway, Sidewalks, and Stations	2,168
30-Year Amortization of Construction Emissions	72
TOTAL	**237**
Percent Change Compared to 2040 Baseline	**0.0004%**
Source: Emissions modeling by ICF (2015) (See Appendix A of the Climate Change Technical Report).	

Operational Impacts

Operation of Alternative 2 would involve GHG emissions stemming from the use of motor vehicles in the project vicinity. As demonstrated for the 2012 Alternative 3 scenario in Table 4.7-5, there would be net reductions in operational GHG emissions relative to the 2012 No Build scenario. Because roadway capacity would be reduced by the greatest amount under Alternative 3 relative to the other build alternatives, Alternative 3 represents a worst-case with respect to traffic flow. By extension, operations under Alternative 2 would have less delay and more efficient operating speeds than Alternative 3, which would result in lower emissions from motor vehicles operating in the project vicinity. On the basis of the less extensive traffic impacts relative to the 2012 Alternative 3 scenario and due to the fact that Alternative 2 would not have emissions associated with a new MSF or LRT/tram propulsion, operational GHG emissions reductions under the 2012 Alternative 2 scenario would be greater than those identified in Table 4.7-5. Due to the reduction in GHG emissions under the 2012 Alternative 2 scenario, no significant impacts would occur under CEQA and no adverse effects would occur under NEPA.

As shown in Table 4.7-4, without considering future mode shift to transit, bicycle, and walking, traffic operations in 2040 under Alternative 2 would result in the annual emission of approximately 165 MT of CO_2e above future (2040) baseline condition vehicle emissions, an increase of less than one-thousandth of 1%. The projected increases in GHG generation are due to construction emissions as well increased bus service and the lower operational efficiency of roadways in the project vicinity. Emissions were calculated using traffic data (VMT apportioned into 5 mph speed bins) that were derived from a traffic micro-simulation model and CT-EMFAC2014 emissions factors.

Including the amortized construction emissions, total GHG emission resulting from the implementation of Alternative 2 would be 0.0004% greater than the future (2040) baseline condition. Impacts due to GHG emissions are discussed below.

Potential for Conflict with GHG Reduction Plans

Alternative 2 would introduce a BRT service capable of increasing transit capacity, which would support the RTP/SCS goal of improved access and capacity in its implementation of SB 375. Therefore, Alternative 2 would not conflict with the goals of SB 375 and the SCAG RTP/SCS.

Alternative 2 would contribute to a decrease in GHG emissions per boarding and would not conflict with the 5% GHG emissions reduction per boarding goal identified in the Metro Climate Action and Adaptation Plan. Alternative 2's construction activities would also comply with the Metro Green Construction Policy.

Alternative 2 would not conflict with the Sustainable City pLAn GHG reduction goals.

Although the Alternative 2 year 2040 traffic scenario predicts a certain level of mode-shift from passenger vehicle to transit, bicycle, and walking trips based on existing land use patterns, additional mode-shift may occur as a result of future TOD/redevelopment that this project may facilitate. Since these potential changes are not well understood and would be speculative to establish, the potential future transportation-source GHG emissions reductions are not quantified.

The operation of Alternative 2 is predicted to result in GHG emissions reductions compared to 2012 existing conditions. Without considering future mode shift, emissions would increase approximately 165 MT over the future (2040) baseline conditions (a 0.0004% increase) based on vehicles operating at less efficient speeds due to increased congestion. However, this estimate could be offset by future transportation-source GHG emissions reductions as the project vicinity becomes more transit-oriented and sustainable over time. Changes in development patterns would lead to higher levels of mode-shift from passenger vehicle to transit, bicycle, and walking trips.

Overall, Alternative 2 does not conflict with the AB 32, SB 32, SB 375, and Metro and City of Los Angeles goals to reduce GHG emissions by providing the transportation infrastructure necessary to enable more sustainable communities. No significant impacts would occur under CEQA, and no adverse effects would occur under NEPA.

Cumulative Impacts

See Cumulative Impacts discussion for the TSM Alternative. Alternative 2 would not exceed the threshold of significance and would be consistent with adopted plans and regulations that aim to reduce GHG emissions. Therefore, the project would not result in a cumulatively considerable impact related to GHG emissions and climate change.

Mitigation Measures

Construction Mitigation Measures

No construction mitigation measures are required.

Operational Mitigation Measures

No operational mitigation measures are required.

Impacts Remaining After Mitigation

NEPA Finding

No adverse effects would occur under NEPA.

CEQA Determination

No significant impacts would occur under CEQA.

4.7.3.4 Rail Alternatives (Build Alternatives 3 and 4)

Alternative 3 – Low-Floor LRT/Tram

Construction Impacts

Construction activities under Alternative 3 would involve roadway and sidewalk modifications to allow for median-running Low-Floor LRT/Tram service. In addition, Alternative 3 would involve construction of a MSF, a pedestrian bridge to the Sylmar/San Fernando Metrolink station, and the installation of approximately nine TPSS units. In total, these activities would result in the emission of approximately 4,025 metric tons of CO_2e, as shown in Table 4.7-5. Consistent with SCAQMD-recommended methodology, construction-period emissions were amortized over a 30-year period, resulting in an annual equivalent of approximately 134 metric tons of CO_2e.

Table 4.7-5. Alternative 3 – GHG Emissions in Year 2012

Phase	CO_2e (metric tons)
Operation	
Traffic Emissions	71,941,386
2012 Baseline Traffic Emissions	71,942,145
Net Operational Traffic Emissions	(760)
Maintenance Facility	1,416
Vehicle Propulsion and Stations	12,904
Construction	
Roadway/Track, Sidewalks, Stations	3,116
Maintenance Facility	562
TPSS, Bridges, and Other	347
30-Year Amortization of Construction Emissions	134
TOTAL	**13,694**
Percent Change Compared to 2012 Baseline	**0.019%**
Source: Emissions modeling by ICF (2016) (See Appendix A of the Climate Change Technical Report).	

Operational Impacts

Operation of Alternative 3 would involve GHG emissions stemming from the use of motor vehicles, operation of the MSF, and electricity consumption for vehicle propulsion and station operation. As shown in Table 4.7-5, project operation under the 2012 Alternative 3 scenario would result in reductions of 760 metric tons in mobile-source GHG emissions relative to the 2012 No Build scenario. However, because of the amortized construction emissions, as well as the ongoing transit vehicle propulsion and maintenance facility emissions, the 2012 Alternative 3 scenario would result in a 0.019% increase in emissions over the 2012 baseline scenario. Traffic emissions were calculated using traffic data (VMT apportioned into 5 mph speed bins) that were derived from a traffic micro-simulation model and CT-EMFAC2014 emissions factors. Operation of the MSF would be responsible for an additional 1,420 metric tons of CO_2e emitted annually. LRT vehicle propulsion and station operation would result in the emission of 12,900 metric tons of CO_2e per year.

The projected increases in GHG emissions under Alternative 3 are due to construction activities as well as the introduction of the Low-Floor LRT/Tram service, which would result in emissions from the electricity used to power it. Because Alternative 3 would result in an increase in GHG emissions compared with the 2012 No Build scenario, such changes would be significant under CEQA. No adverse effects would occur under NEPA, as the increase would result from the provision of an additional high-capacity transit service in an urban setting and would not represent a substantial increase in the context of global GHG emissions.

In the longer term, as shown in Table 4.7-6, traffic operations under the 2040 Alternative 3 scenario would result in the annual emission of approximately 44,000 MT of CO_2e above future (2040) baseline condition vehicle emissions, an increase of approximately 0.072%. Including the amortized construction emissions, implementation of Alternative 3 would result in a 0.096% increase in GHG emissions compared with the future (2040) baseline emissions.

Table 4.7-6. Alternative 3 – GHG Emissions in Year 2040

Phase	CO_2e (metric tons)
Operation	
Traffic Emissions	61,037,093
2040 Baseline Traffic Emissions	60,993,074
Net Operational Traffic Emissions	44,019
Maintenance Facility	1,416
Vehicle Propulsion and Stations	12,904
Construction	
Roadway/Track, Sidewalks, Stations	3,116
Maintenance Facility	562
TPSS, Bridges, and Other	347
30-Year Amortization of Construction Emissions	134
TOTAL	**58,473**
Percent Change Compared to 2040 Baseline	**0.096%**
Source: Emissions modeling by ICF (2016) (See Appendix A of the Climate Change Technical Report).	

Potential for Conflict with GHG Reduction Plans

Alternative 3 would introduce a Low-Floor LRT/Tram service capable of increasing transit capacity, which would support the RTP/SCS goal of improved access and capacity in its implementation of SB 375. Therefore, Alternative 3 would not conflict with the goals of SB 375 and the SCAG RTP/SCS.

The Metro Climate Action and Adaptation Plan identifies the goal of reducing Metro's GHG emissions per boarding by 5% from 2010 to 2020. As identified in the Transportation Impacts Report, operation of Alternative 3 would result in approximately 8,500 new transit trips (KOA 2015). Given that increased ridership on energy-efficient Low-Floor LRT/Tram vehicles would be achieved without substantially increasing GHG emissions relative to the future (2040) baseline, Alternative 3 would not conflict with the 5% GHG emissions reduction per boarding. In addition, construction activities would comply with the Metro Green Construction Policy.

Alternative 3 would not conflict with the Sustainable City pLAn GHG reduction goals. Although the Alternative 3 year 2040 traffic scenario predicts a certain level of mode-shift from passenger vehicle to transit, bicycle, and walking trips based on existing land use patterns, additional mode-shift may occur as a result of future TOD/redevelopment that this project may facilitate. Since these potential changes are not well understood and would be speculative to establish, the potential future transportation-source GHG emissions reductions are not quantified.

Without considering future mode-shift to transit, bicycle, and walking, the operation of Alternative 3 is predicted to result in GHG emissions of approximately 58,000 MT CO_2e over the future (2040) baseline conditions (an increase of 0.096%) based on vehicles operating at less efficient speeds due to increased congestion. However, this estimate could be offset by future transportation-source GHG emissions reductions as the project vicinity becomes more transit-oriented and sustainable over time. Changes in development patterns would lead to higher levels of mode-shift from passenger vehicle to transit, bicycle, and walking trips.

Overall, Alternative 3 does not conflict with the AB 32, SB 32, SB 375, and Metro and City of Los Angeles goals to reduce GHG emissions by providing the transportation infrastructure necessary to enable more sustainable communities. Alternative 3 would be supportive of these policies in the long run since it would improve transit service and result in mobility improvements by providing increased capacity to move more people more efficiently along the corridor. However, in the interim, Alternative 3 would result in an increase of GHG emissions over future baseline conditions due to the lower vehicle speed and increased congestion in the mixed-flow vehicle lanes. Therefore, Alternative 3 would result in a significant impact for GHG emissions under CEQA.

Cumulative Impacts

See Cumulative Impacts discussion for the TSM Alternative. Alternative 3 would result in significant impacts because it would increase GHG emissions over the baseline conditions related to transit vehicle propulsion, station, and MSF operation. Therefore, the project would result in a cumulatively considerable impact related to GHG emissions and climate change.

Mitigation Measures

Construction Mitigation Measures

No construction mitigation measures would be required.

Operational Mitigation Measures

The GHG emissions increases from the implementation of Alternative 3 would result primarily from transit vehicle propulsion, with additional emissions increases associated with station and MSF operation, which are necessary for project operation. Feasible mitigation measures to reduce GHG emissions have been explored. As specified in Metro's June 2012 Climate Action and Adaptation Plan, Metro has investigated on-board storage of regenerative braking energy for all new rail cars. A study prepared for Bay Area Rapid Transit found that regenerative braking energy storage in combination with different propulsion systems and changes to lighting and ventilation could result in a per-mile reduction of electricity of 43% (Metro 2010).

Impacts Remaining After Mitigation

NEPA Finding

No adverse effects would occur under NEPA.

CEQA Determination

Impacts would be significant and unavoidable under CEQA.

Alternative 4 – LRT

Construction Impacts

Alternative 4 would involve construction activities and changes to roadways and sidewalks to accommodate LRT service. This would include the construction of a tunnel and three subterranean stations. In addition, Alternative 4 would involve construction of a MSF, a pedestrian bridge to the Sylmar/San Fernando Metrolink station, the LRT and heavy rail bridges over the Pacoima Wash, and the installation of approximately 10 TPSS units. MSF Site 2 and the cut-and-cover method of tunnel construction were assumed because these would result in the greatest impacts with respect to GHG emissions. In total, these activities would result in the emission of approximately 19,900 metric tons of CO_2e, as shown in Table 4.7-6. Consistent with SCAQMD-recommended methodology, construction-period emissions were amortized over a 30-year period, resulting in an annual equivalent of approximately 663 metric tons of CO_2e.

Operational Impacts

Operation of Alternative 4 would involve GHG emissions stemming from the use of motor vehicles, operation of the MSF, and electricity consumption for vehicle propulsion and station operation. As demonstrated for the 2012 Alternative 3 scenario in Table 4.7-5, there would be net reductions in operational GHG emissions from motor vehicles operating in the project vicinity relative to the 2012 No Build scenario. Because roadway capacity would be reduced by the greatest amount under Alternative 3 relative to the other build alternatives, Alternative 3 represents a worst-case with respect to traffic flow. By extension, operations under Alternative 4 would have less delay and more efficient operating speeds than Alternative 3, which would result in lower emissions from motor vehicles operating in the project vicinity. On the basis of the less extensive traffic impacts relative to the 2012 Alternative 3 scenario, operational traffic GHG emissions reductions under the 2012 Alternative 4 scenario would be greater than those identified in Table 4.7-5. Although there would be emissions associated with the new MSF and LRT vehicle propulsion under the 2012 Alternative 4 scenario that would not occur under the 2012 No Build scenario, the reductions in emissions from motor vehicles would offset the emissions from the MSF and LRT propulsion such that overall operational emissions would be minor. Due to the minor change in GHG emissions under the 2012 Alternative 4 scenario, no significant impacts would occur under CEQA and no adverse effects would occur under NEPA.

As shown in Table 4.7-7, traffic operations in 2040 under Alternative 4 would result in the annual emissions reduction of approximately 29,000 MT of CO_2e compared with the future (2040) baseline condition vehicle emissions, a decrease of 0.05%. Emissions were calculated using traffic data (VMT apportioned into 5 mph speed bins) that were derived from a traffic micro-simulation model and CT-EMFAC2014 emissions factors. Operation of the MSF would be responsible for an additional 1,420 metric tons of CO_2e emitted annually. LRT vehicle propulsion and station operation would result in the emission of 12,900 metric tons of CO_2e per year.

Table 4.7-7. Alternative 4 – GHG Emissions in Year 2040

Phase	CO_2e (metric tons)
Operation	
Traffic Emissions	60,964,076
2040 Baseline Traffic Emissions	60,993,074
Net Operational Traffic Emissions	(28,998)
Maintenance Facility	1,416
Vehicle Propulsion and Stations	12,904
Construction	
Roadway/Track, Sidewalks, Aboveground Stations	3,618
Tunnels and Belowground Stations (Cut and Cover)	15,366
Maintenance Facility	562
TPSS, Bridges, and Other	347
30-Year Amortization of Construction Emissions	663
TOTAL	**(14,015)**
Percent Change Compared to 2040 Baseline	**(0.023%)**
Source: Emissions modeling by ICF (2016) (See Appendix A of the Climate Change Technical Report).	

Including the amortized construction emissions, implementation of Alternative 4 would result in a 0.023% reduction in GHG emissions compared with future (2040) baseline conditions.

Potential for Conflict with GHG Reduction Plans

Alternative 4 would provide new LRT service capable of increasing transit capacity, which would support the RTP/SCS goal of improved access and capacity in its implementation of SB 375. Therefore, Alternative 4 would not conflict with the goals of SB 375 and the SCAG RTP/SCS.

The Metro Climate Action and Adaptation Plan identified the goal of reducing Metro's GHG emissions per boarding by 5% from 2010 to 2020. As identified in the Transportation Impacts Report, operation of Alternative 4 would result in approximately 8,600 new transit trips (KOA 2015). Given that increased ridership would be achieved while decreasing overall GHG emissions relative to the future (2040) baseline conditions, Alternative 4 would contribute to a decrease in GHG emissions per boarding and would not conflict with the 5% GHG emissions reduction per boarding. In addition, construction activities would comply with the Metro Green Construction Policy.

Alternative 4 would not conflict with the Sustainable City pLAn GHG reduction goals.

Although the Alternative 4 year 2040 traffic scenario predicts a certain level of mode-shift from passenger vehicle to transit, bicycle, and walking trips based on existing land use patterns, additional mode-shift may occur as a result of future TOD/redevelopment that this project may facilitate. Since these potential changes are not well understood and would be speculative to establish, the potential future transportation-source GHG emissions reductions are not quantified.

The operation of Alternative 4 is predicted to result in GHG emissions reductions or minor increases under the 2012 Alternative 4 scenario. In addition, GHG emissions reductions of approximately 15,000 MT below the future (2040) baseline conditions would occur based on predicted future travel behavior and existing land use patterns (i.e., non-TOD). This estimate would likely be reduced further by future transportation-source GHG emissions reductions as the project vicinity becomes more transit-oriented and sustainable over time. Changes in development patterns would lead to higher levels of mode-shift from passenger vehicle to transit, bicycle, and walking trips.

Overall, Alternative 4 would not conflict with the AB 32, SB 32, SB 375, and Metro and City of Los Angeles' goals to reduce GHG emissions by providing the transportation infrastructure necessary to enable more sustainable communities.

Cumulative Impacts

Alternative 4 could result in increases in GHG emissions over existing baseline conditions, as reductions in emissions from motor vehicles in the project vicinity may not completely offset emissions resulting from operation of the new MSF, LRT vehicle propulsion, and stations. The net increase in GHG emissions that could occur under the 2012 Alternative 4 scenario would contribute to significant cumulative climate change impacts from the proposed project in combination with past, present, and reasonably foreseeable anthropogenic and natural sources of GHG emissions. The contribution of Alternative 4, however, would diminish over time. As demonstrated in Table 4.7-7, by 2040, overall emissions from Alternative 4 would be less than both the 2040 No Build scenario and 2012 No Build scenario. However, based on the results of the 2012 Alternative 4 impacts scenario, and for the purposes of this EIS/EIR, the GHG emissions from Alternative 4 are considered to be cumulatively considerable under CEQA.

Mitigation Measures

Construction Mitigation Measures

No construction mitigation measures are required.

Operational Mitigation Measures

The GHG emissions increases from the implementation of Alternative 4 would result primarily from transit vehicle propulsion, with additional emissions increases associated with station and MSF operation, which are necessary for project operation. Feasible mitigation measures to reduce GHG emissions have been explored. As specified in Metro's June 2012 Climate Action and Adaptation Plan, Metro has investigated on-board storage of regenerative braking energy for all new rail cars. A study prepared for Bay Area Rapid Transit found that regenerative braking energy storage in combination with different propulsion systems and changes to lighting and ventilation could result in a per-mile reduction of electricity of 43% (Metro 2010).

Impacts Remaining After Mitigation

NEPA Finding

No adverse effects would occur under NEPA.

CEQA Determination

No significant impacts would occur under CEQA.