3.8 Greenhouse Gas Emissions

3.8.1 Introduction

This section describes the regulatory and environmental setting for greenhouse gas (GHG) emissions in the vicinity of the Proposed Project and the Atwater Station Alternative. It also describes the impacts from GHG emissions (and, thus, contributions to climate change) that would result from implementation of the Proposed Project and the Atwater Station Alternative. Appendix J, *Air Quality, Greenhouse Gas, and Health Risk Assessment Supporting Documentation*, contains additional technical information for this section.

Air quality impacts are discussed separately and are presented in Section 3.3, *Air Quality*. GHG emissions cumulatively contribute to the significant adverse environmental impacts of global climate change. Accordingly, the analysis presented in this section is representative of both project-level and cumulative GHG impacts.

3.8.2 Regulatory Setting

Relevant regulatory agencies for GHG emissions include the U.S. Environmental Protection Agency (USEPA), California Air Resources Board (CARB), Bay Area Air Quality Management District (BAAQMD),[1] and San Joaquin Valley Air Pollution Control District (SJVAPCD).

This section summarizes federal, state, regional, and local regulations related to GHGs and climate change and applicable to the Proposed Project and the Atwater Station Alternative.

3.8.2.1 Federal

There is currently no federal overarching law specifically related to climate change or the reduction of GHG emissions. Under the Obama Administration, the USEPA had been developing regulations under the Clean Air Act (CAA) pursuant to USEPA's authority under the CAA.[2] There have also been settlement agreements between USEPA, several states, and nongovernmental organizations to address GHG emissions from electric generating units and refineries, as well as the USEPA's issuance of an "Endangerment Finding" and a "Cause or Contribute Finding." USEPA has also adopted the *Mandatory Reporting Rule and Clean Power Plan* (Clean Power Plan). Under the Clean Power Plan, USEPA issued regulations to control carbon dioxide (CO_2) emissions from new and existing coal-fired power plants. However, on February 9, 2016, the Supreme Court issued a stay of these regulations pending litigation. The Trump administrator proposed to replace the Clean Power Plan with the Affordable Clean Energy rule, but the federal appeals court ruled the Affordable Clean

[1] The existing Altamont Corridor Express (ACE) route passes through Santa Clara and Alameda Counties, which are located within San Francisco Bay Area Air Basin (SFBAAB) and under the local air quality jurisdiction of the Bay BAAQMD. Although no physical improvements are proposed in the SFBAAB as part of the Proposed Project and the Atwater Station Alternative, ACE would continue to operate in the SFBAAB, and the added ridership resulting from the extension to Merced would have system-wide effects throughout the SFBAAB. As such, BAAQMD regulations are included in this section.

[2] In *Coalition for Responsible Regulation, Inc., et al. v. USEPA*, the United States Court of Appeals upheld USEPA's authority to regulate GHG emissions under the CAA.

Energy rule violated the Clean Air Act. Thus, at present neither the Clean Power Plan nor the Affordable Clean Energy rule are in effect.

The National Highway Traffic Safety Administration (NHTSA) sets the Corporate Average Fuel Economy (CAFÉ) standards to improve the average fuel economy and reduce GHG emissions generated by cars and light-duty trucks. NHTSA and USEPA have proposed amendments to the current fuel efficiency standards for passenger cars and light-duty trucks and new standards covering model years 2021 through 2026. Under the Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule, current standards would be maintained through 2026. California, 22 other states, the District of Columbia, and two cities filed suit against the proposed action on September 20, 2019.[3] The lawsuit requests a "permanent injunction prohibiting Defendants from implementing or relying on the Preemption Regulation," but does not stay its implementation during legal deliberations. Part 1 of the SAFE Vehicles Rule went into effect on November 26, 2019. Part 2 of the Rule was finalized on March 30, 2020. The SAFE Vehicles Rule will decrease the stringency of CAFÉ standards to 1.5 percent each year through model year 2026, as compared with the standards issued in 2012, which would have required about 5 percent annual increases. Because the rule would increase on-road vehicle emissions, it has been taken into account in the construction analysis as a worst-case analysis if the rule prevails in court. The rule has not been taken into account in the operational analysis because taking it into account would result in a higher GHG reduction benefit given that on road vehicles would have higher emissions with the new rules compared to the former rule; this is a worst-case analysis if the rule does not prevail in court. In January 2021, The Biden Administration announced plans to propose replacement or revision of the SAFE rule later in 2021.

3.8.2.2 State

California has adopted statewide legislation addressing various aspects of climate change and GHG emissions reduction. The legislation establishes a broad framework for the state's long-term GHG reduction and climate change adaptation program. The governors of California have also issued several executive orders related to the state's evolving climate change policy. Of particular importance are Assembly Bill (AB) 32 and Senate Bill (SB) 32, which outline the state's GHG reduction goals of achieving 1990 emissions levels by 2020 and a level 40 percent below 1990 emissions levels by 2030. While the 2020 state GHG inventory has not been developed yet (it usually takes 12 to 18 months following a year to do an accurate state inventory for that year), based on the latest available state GHG inventory from 2018, which indicated that the state already had emissions (425 MMTCO2e) below 1990 levels (431 MMTCO2e), the state has been on track to meet the AB 32 2020 target. In the absence of federal regulations, control of GHGs is generally regulated at the state level. It is typically approached by setting emission reduction targets for existing sources of GHGs, setting policies to promote renewable energy and increase energy efficiency, and developing statewide action plans. Summaries of key policies, legal cases, regulations, and legislation at the state level that are relevant to the Proposed Project and the Atwater Station Alternative are identified below.

[3] *California et al. v. United States Department of Transportation et al.*, 1:19-cv-02826, U.S. District Court for the District of Columbia,

Assembly Bill 1493, Pavley Rules (2002, Amendments 2009)/Advanced Clean Cars (2011)

Known as Pavley I, Assembly Bill (AB) 1493 outlines the nation's first GHG standards for automobiles. Additional strengthening of the Pavley standards (referred to previously as Pavley II, and now referred to as the Advanced Clean Cars measure) was proposed for vehicle model years 2017–2020. Together, the two standards are expected to increase average fuel economy to roughly 43 miles per gallon by 2020 and reduce GHG emissions from the transportation sector in California by approximately 14 percent. At this time, the 2020 fuel economy results are not yet available. USEPA and CARB have also adopted joint rulemaking to establish GHG emissions standards for 2017–2025 model year passenger vehicles.

Executive Order S-3-05 (2005)

California Executive Order (EO) S-3-05 sets forth a series of target dates by which statewide emissions of GHGs need to be progressively reduced, as follows: by 2010, reduce GHG emissions to 2000 levels (approximately 457 million metric tons of carbon dioxide equivalent [CO_2e]); by 2020, reduce emissions to 1990 levels (approximately 427 million metric tons CO_2e); and by 2050, reduce emissions to 80 percent below 1990 levels (approximately 85 million metric tons CO_2e). California EOs are binding only on state agencies. Accordingly, California EO S-03-05 will guide state agencies' efforts to control and regulate GHG emissions but will have no direct binding effect on local government or private actions. The secretary of the California Environmental Protection Agency is required to report to the governor and state legislature biannually on the impacts of global warming on California, mitigation and adaptation plans, and progress made toward reducing GHG emissions to meet the targets established in this EO.

Executive Order S-01-07, Low Carbon Fuel Standard (2007)

With EO S-01-07, Governor Schwarzenegger set forth the low carbon fuel standard (LCFS) for California in 2007. Under this EO, the carbon intensity of California's transportation fuels was set to be reduced by at least 10 percent by 2020. In 2011, CARB approved amendments to the regulation and, in 2015, readopted the LCFS to address procedural issues. In 2018, CARB approved further amendments to the regulation pertaining to the carbon intensity benchmarks through 2030 (California Air Resources Board 2020a). As of May 31, 2020, the last available update, the reduction in carbon intensity for 2019 was 5.97 percent (California Air Resources Board 2020b).

Executive Order B-55-18

EO B-55-18 acknowledges the environmental, community, and public health risks posed by future climate change. It further recognizes the climate stabilization goal adopted by most of the countries in the world and the European Union under the Paris Agreement (including the United States based on early 2021 action by the Biden Administration). California is committed to meeting the Paris Agreement goals and going beyond them wherever possible. Based on the worldwide scientific agreement that carbon neutrality must be achieved by midcentury, EO B-55-18 establishes a new state goal to achieve carbon neutrality as soon as possible, and no later than 2045, and to achieve and maintain net negative emissions thereafter. The EO charges CARB with developing a framework for implementing and tracking progress towards these goals. This EO extends EO S-3-05 but is binding only on state agencies.

Assembly Bill 32 (2006) and California Climate Change Scoping Plan (2008/2014/2017)

In 2006, the California legislature passed AB 32 (Health and Safety Code Division 25.5, § 38500 et seq.), also known as the California Global Warming Solutions Act. AB 32 requires CARB to implement emission limits, regulations, and other feasible and cost-effective measures such that statewide GHG emissions are reduced to 1990 levels by 2020.

Since AB 32 was adopted, CARB, the California Energy Commission (CEC), the California Public Utilities commission (CPUC), and the Building Standards Commission have been developing regulations that will help meet the goals of AB 32. Under AB 32, CARB is required to prepare a scoping plan and update it every 5 years. The original *Scoping Plan* was approved in 2008, the *First Scoping Plan Update* was approved in 2014, and an additional update was approved in 2017 (see discussion of SB 32 below). CARB's *2017 Climate Change Scoping Plan* identifies specific measures to reduce GHG emissions to 1990 levels by 2020, and requires CARB and other state agencies to develop and enforce regulations and other initiatives for reducing GHGs (California Air Resources Board 2017a). Specifically, the *2017 Climate Change Scoping Plan* articulates a key role for local governments, recommending they establish GHG reduction goals for both their municipal operations and the community consistent with those of the state. In 2018, CARB announced that inventory year 2016 emissions had dropped below 1990 levels, which would be an achievement of the AB 32 goal if emissions continue on their current trajectory (California Air Resources Board 2018a).

Senate Bill 375 (Steinberg) (2008)

SB 375, also known as the Sustainable Communities and Climate Protection Act of 2008, is intended to reduce carbon emissions from land use. SB 375 requires regional transportation plans (RTPs) developed by each of the state's 18 metropolitan planning organizations (MPOs) to incorporate a sustainable communities strategy (SCS) in each RTP to achieve the GHG emissions reduction targets set by CARB. The regions where the Proposed Project and the Atwater Station Alternative would be located have per-capita GHG emissions reduction targets for 2020 and 2035, and these targets are shown in Table 3.8-1.

Table 3.8-1. Metropolitan Planning Organization Regional Greenhouse Gas Emissions Reduction Targets for Senate Bill 375

Metropolitan Planning Organization	2020 Target [a,b]	2035 Target [a,b]
Metropolitan Transportation Commission	10%	19%
Stanislaus Council of Governments	12%	16%
Merced County Association of Governments	10%	14%

Notes:
[a] All targets are reductions relative to per capita passenger vehicle greenhouse gas emissions relative to 2005.
[b] These targets became effective October 1, 2018.
Source: California Air Resources Board 2018b.

Senate Bills 1078, 107, and 2

SBs 1078 (2002), 107 (2006) and 2 (2011), known collectively as California's Renewables Portfolio Standard (RPS), obligates investor-owned utilities, energy service providers, and Community Choice

Aggregators to procure additional retail sales per year from eligible renewable sources with the long-range target of procuring 33 percent of retail sales from renewable resources by 2020. CPUC and CEC are jointly responsible for implementing the program.

Senate Bill 350 and 100—De Leon (Clean Energy and Pollution Reduction Act of 2015, 100 Percent Clean Energy Act of 2017)

SB 350, also known as the Clean Energy and Pollution Reduction Act of 2015, was approved by the California Legislature in September 2015 and signed by Governor Brown in October 2015. Its key provisions are to require the following by 2030: (1) a renewables portfolio standard of 50 percent, and (2) a doubling of energy efficiency (electrical and natural gas) by 2030, including improvements to the efficiency of existing buildings. These mandates will be implemented by future actions of the CPUC and CEC. SB 100 was approved by the California Legislature in August 2018 and signed by Governor Brown in September 2018. Its key provisions include updating the SB 350 RPS requirement from 50 percent to 60 percent by 2030 and creating the policy of planning to meet all the state's retail electricity supply with a mix of RPS-eligible and zero-carbon resources by December 31, 2045, for a total of 100 percent clean energy.

Senate Bill 32 and Assembly Bill 197 (2016)

SB 32 (2016) requires CARB to ensure that statewide GHG emissions are reduced to at least 40 percent below the 1990 level by 2030, consistent with the target set forth in EO B-30-15. The companion bill to SB 32, AB 197, requires the formation of a Joint Legislative Committee on Climate Change Policies, requires CARB to prioritize direct emission reductions and consider social costs when adopting regulations to reduce GHG emissions beyond the 2020 statewide limit, requires CARB to prepare reports on sources of GHGs and other pollutants, establishes 6-year terms for voting members of CARB, and adds two legislators as non-voting members of CARB. CARB adopted the *2017 Climate Change Scoping Plan* in November 2017 to meet the GHG reduction requirement set forth in SB 32. This updated scoping plan includes various elements, including doubling energy efficiency savings, increasing the LCFS from 10 to 18 percent, adding 4.2 million zero-emission vehicles on the road, implementing the Sustainable Freight Strategy, implementing a post-2020 Cap-and-Trade Program, creating walkable communities with expanded mass transit and other alternatives to traveling by car, and developing an Integrated Natural and Working Lands Action Plan to protect land-based carbon sinks.

Senate Bill 605 and Senate Bill 1383

SB 605 directed CARB, in coordination with other state agencies and local air districts, to develop a comprehensive Short-Lived Climate Pollutant (SLCP) Reduction Strategy. SB 1383 directed CARB to approve and implement the SLCP Reduction Strategy to achieve the following reductions in SLCPs.

- 40 percent reduction in methane (CH_4) below 2013 levels by 2030.
- 40 percent reduction in hydrofluorocarbon (HFC) gases below 2013 levels by 2030.
- 50 percent reduction in anthropogenic black carbon below 2013 levels by 2030.

The bill also establishes the following targets for reducing organic waste in landfills and CH_4 emissions from dairy and livestock operations as follows.

- 50 percent reduction in organic waste disposal from the 2014 level by 2020.

- 75 percent reduction in organic waste disposal from the 2014 level by 2025.
- 40 percent reduction in CH_4 emissions from livestock manure management operations and dairy manure management operations below the dairy sector's and livestock sector's 2013 levels by 2030.

CARB and CalRecycle are currently developing regulations to achieve the organic waste reduction goals under SB 1383. In January and June 2019, CalRecycle proposed new and amended regulations in Titles 14 and 27 of the California Code of Regulations. Among other things, the regulations set forth minimum standards for organic waste collection, hauling, and composting. The final regulations will take effect on or after January 1, 2022.

Short-Lived Climate Pollutant Reduction Strategy

CARB adopted the SLCP Reduction Strategy in March 2017 as a framework for achieving the CH_4, HFC, and anthropogenic black carbon reduction targets set by SB 1383. The SLCP Reduction Strategy includes 10 measures to SLCPs, which fit within a wide range of ongoing planning efforts throughout the state, including CARB's and CalRecycle's proposed rulemaking on organic waste diversion (discussed above).

Senate Bill X7-7

SB X7-7, the Water Conservation Act of 2009, sets an overall goal of reducing per-capita urban water use by 20 percent by December 31, 2020. The state is required to make incremental progress toward this goal by reducing per-capita water use by at least 10 percent by December 31, 2015. This is an implementing measure of the Water Sector in the *2017 Climate Change Scoping Plan* that will continue to be implemented beyond 2020. Reduction in water consumption reduces the energy necessary and the associated emissions to convey, treat, and distribute the water; it also reduces emissions from wastewater treatment.

Green Building Code and Title 24 Updates

The California Green Building Standards Code (CALGreen) (proposed Part 11, Title 24) was adopted as part of the California Building Standards Code (24 California Code of Regulations). Part 11 established voluntary standards that became mandatory under the 2010 edition of the code. These involved sustainable site development, energy efficiency (in excess of California Energy Code requirements), water conservation, material conservation, and internal air contaminants. The current energy efficiency standards were adopted in 2019 and took effect on January 1, 2020.

3.8.2.3 Regional and Local

Bay Area Air Quality Management District

BAAQMD has local jurisdiction over air quality in the San Francisco Bay Area Air Basin (SFBAAB), including those in Santa Clara and Alameda Counties, but has no land use jurisdiction and has no authority over mobile sources, such as trains. BAAQMD has adopted advisory emission thresholds to assist CEQA lead agencies in determining the level of significance of a project's GHG emissions, which are outlined in its *California Environmental Quality Act Air Quality Guidelines*. BAAQMD's CEQA Guidelines also outline methods for quantifying GHG emissions, as well as potential mitigation measures (Bay Area Air Quality Management District 2017a).

San Joaquin Valley Air Pollution Control District

SJVAPCD has local air quality jurisdiction in the San Joaquin Valley Air Basin (SJVAB), including those in Merced, Stanislaus, and San Joaquin Counties, but does not have land use jurisdiction or jurisdiction over mobile sources. Similar to the BAAQMD, SJVAPCD has adopted advisory thresholds for the analysis of GHG emissions in their staff report titled *Addressing GHG Emissions Impacts under CEQA*.

County and City General Plans

The San Joaquin Regional Rail Commission (SJRRC), a state joint powers agency, proposes improvements inside and outside of the Union Pacific Railroad (UPRR) right-of-way (ROW). The Interstate Commerce Commission Termination Act (ICCTA) affords railroads engaged in interstate commerce considerable flexibility in making necessary improvements and modifications to rail infrastructure, subject to the requirements of the Surface Transportation Board.[4] ICCTA broadly preempts state and local regulation of railroads and this preemption extends to the construction and operation of rail lines. As such, activities within the UPRR ROW are clearly exempt from local building and zoning codes and other land use ordinances. However, facilities located outside of the UPRR ROW, including proposed stations, the proposed Merced Layover & Maintenance Facility, and the Atwater Station Alternative would be subject to regional and local plans and regulations. Though ICCTA does broadly preempt state and local regulation of railroads, SJRRC intends to obtain local agency permits for construction of facilities that fall outside of the UPRR ROW even though SJRRC has not determined that such permits are legally necessary or not be required.

Appendix G of this environmental impact report (EIR), *Regional Plans and Local General Plans*, provides a list of applicable goals, policies, and objectives from regional and local plans of the jurisdictions in which improvements associated with the Proposed Project and the Atwater Station Alternative would be located. Section 15125(d) of the CEQA Guidelines requires an EIR to discuss "any inconsistencies between the proposed project and applicable general plans, specific plans, and regional plans." These plans were considered during the preparation of this analysis and were reviewed to assess whether the Proposed Project and the Atwater Station Alternative would be consistent with the plans of relevant jurisdictions.[5]

The Proposed Project and the Atwater Station Alternative traverse and would be located in the jurisdictions of two counties and five incorporated cities. Table 3.3-2 in Section 3.3, *Air Quality*, provides a summary of the county and city general plans that have been identified, reviewed, and considered for the preparation of this analysis. Cities along the alignment have also adopted or are in the process of developing climate action plans, GHG reduction plans, or equivalent documents aimed at reducing local GHG emissions. Cities and counties with adopted or in-development climate action plans, GHG reduction plans, or GHG inventories for either municipal operations, community activities, or both include Stanislaus and Merced Counties and the cities of Turlock and Merced (California Air Resources Board no date). These plans call for reductions in GHG emissions below current levels and actions to reduce vehicle miles travelled and associated transportation emissions. All include increased transit service as a key strategy in reducing local GHG emissions. Neither UPRR

[4] ACE operates within a ROW and on tracks owned by the UPRR, which operates interstate freight rail service in the same ROW and on the same tracks.

[5] An inconsistency with regional or local plans is not necessarily considered a significant impact under CEQA unless it is related to a physical impact on the environment that is significant in its own right.

nor SJRRC are subject to local land use regulations and as such, none of the local climate action plans legally apply to the Proposed Project and the Atwater Station Alternative.

Although the Proposed Project and the Atwater Station Alternative would increase emissions from diesel locomotives in the jurisdictions the alignment traverses, it is expected to result in a transportation mode shift (i.e., attract passengers who otherwise would have driven cars). This shift would reduce travel by highway vehicles, reducing mobile source emissions and congestion. Accordingly, even though the local climate action plans do not legally apply to the emissions associated with operation of the Proposed Project and the Atwater Station Alternative, these emissions would not be inconsistent with regional and local GHG policies or climate action plans. Appendix G of this EIR contains a list of applicable GHG and climate change goals, policies, and objectives from the plans listed in Table 3.3-2.

3.8.3 Environmental Setting

This section discusses the environmental setting related to GHG emissions and climate change. The study area includes the state of California and the planet as a whole. The study area for GHGs and climate change is much broader than for the air quality analysis due to the global cumulative nature of climate change.

3.8.3.1 Climate Change

The phenomenon known as the *greenhouse effect* keeps the atmosphere near the Earth's surface warm enough for the successful habitation of humans and other life. Present in the Earth's lower atmosphere, GHGs play a critical role in maintaining the Earth's temperature. Sunlight including infrared, visible, and ultraviolet radiation passes through the atmosphere. Some of the sunlight striking the earth is absorbed and converted to heat, which warms the surface. The surface emits infrared radiation to the atmosphere, where some of it is absorbed by GHGs and re-emitted toward the surface; some of the heat is not trapped by GHGs and escapes into space. Human activities that emit additional GHGs to the atmosphere increase the amount of infrared radiation that gets absorbed before escaping into space, thus enhancing the greenhouse effect and amplifying the warming of the earth.

Increases in fossil fuel combustion and deforestation have increased concentrations of GHGs in the atmosphere since the Industrial Revolution. Rising atmospheric concentrations of GHGs in excess of natural levels enhance the greenhouse effect, which contributes to global warming of the Earth's lower atmosphere. This warming induces large-scale changes in earth surface temperatures, ocean circulation patterns, precipitation patterns, global ice cover, biological distributions, and other changes to the earth system that are collectively referred to as *climate change*.

3.8.3.2 Principal Greenhouse Gases

As defined in AB 32, GHGs include the following gases: CO_2, CH_4, nitrous oxide (N_2O), perfluorinated carbons, sulfur hexafluoride, and HFCs. The State CEQA Guidelines Section 15364.5 also identify these six gases as GHGs.[6] The primary GHGs of concern associated with the Proposed Project and the

[6] Water vapor, the most abundant GHG, is not included in this list because its natural concentrations and fluctuations far outweigh its anthropogenic (human-made) sources.

Atwater Station Alternative are CO_2, CH_4, and N_2O. The principal characteristics of these pollutants are discussed in this section.

- **CO_2** enters the atmosphere through the burning of fossil fuels (oil, natural gas, and coal), solid waste, trees and wood products, and respiration, as well other chemical reactions (e.g., manufacture of cement). CO_2 is also removed from the atmosphere (or *sequestered*) when it is absorbed by plants as part of the biological carbon cycle.
- **CH_4** is emitted during the production and transport of coal, natural gas, and oil. CH_4 emissions also result from livestock and other agricultural practices and the decay of organic waste in municipal solid waste landfills.
- **N_2O** is emitted during agricultural and industrial activities as well as during the combustion of fossil fuels and solid waste.

Methods have been set forth to describe emissions of GHGs in terms of a single gas to simplify reporting and analysis. The most commonly accepted method to compare GHG emissions is the global warming potential (GWP) methodology defined in the Intergovernmental Panel on Climate Change (IPCC) reference documents. The IPCC defines the GWP of various GHG emissions on a normalized scale that recasts all GHG emissions in terms of CO_2e, which compares the gas in question to that of the same mass of CO_2 (CO_2 has a GWP of 1 by definition).

Table 3.8-2 lists the GWP of CO_2, CH_4, and N_2O, their atmospheric lifetimes, and most recent abundances in the atmosphere.

Table 3.8-2. Lifetimes and Global Warming Potentials of Key Greenhouse Gases

Greenhouse Gases	Global Warming Potential (100 years)	Lifetime (years)	Atmospheric Abundance
CO_2	1	100–300	400 ppm
CH_4	25	12.4	1,834 ppb
N_2O	298	121	328 ppb

Sources: California Air Resources Board 2019a; Blasing 2016.

CO_2 = carbon dioxide.
CH_4 = methane.
N_2O = nitrous oxide.
ppm = parts per million.
ppb = parts per billion.

CARB recognizes the importance of short-lived climate pollutants (described in Section 3.8.2, *Regulatory Setting*) and reducing these emissions to achieve the state's overall climate change goals. Short-lived climate pollutants have atmospheric lifetimes on the order of a few days to a few decades, and their relative climate forcing impacts, when measured in terms of how they heat the atmosphere, can be tens, hundreds, or even thousands of times greater than that of CO_2. Recognizing their short-term lifespan and warming impact, short-lived climate pollutants are measured in terms of CO_2e using a 20-year time period. The use of GWPs with a time horizon of 20 years better captures the importance of the short-lived climate pollutants and gives a better perspective on the speed at which emission controls will impact the atmosphere relative to CO_2 emission controls. The SLCP Reduction Strategy, which is discussed in Section 3.8.2, addresses CO_4, HFC gases, and anthropogenic black carbon. Methane has a lifetime of 12 years and a 20-year GWP of 72. HFC gases have lifetimes of 1.4 to 52 years and a 20-year GWP of 437 to 6,350. Anthropogenic black carbon has a lifetime of a few days to weeks and a 20-year GWP of 3,200 (California Air Resources Board 2017b).

3.8.3.3 Greenhouse Gas Emissions Inventories

A GHG inventory is a quantification of all GHG emissions and sinks within a selected physical or economic boundary.[7] GHG inventories can be performed on a large scale (e.g., for global and national entities) or on a small scale (e.g., for a particular building or person). Although many processes are difficult to evaluate, several agencies have developed tools to quantify emissions from certain sources. Table 3.8-3 outlines the most recent global, national, state, and local GHG inventories to help contextualize the magnitude of potential project-related emissions. Not every jurisdiction in the project area has prepared a GHG inventory, but those that have are listed in Table 3.8-3.

Table 3.8-3. Global, National, State, and Local Greenhouse Gas Emissions Inventories

Emissions Inventory	CO_2e (metric tons per year)
2010 IPCC Global GHG Emissions Inventory	52,000,000,000
2018 USEPA National GHG Emissions Inventory	6,677,000,000
2018 CARB State GHG Emissions Inventory	425,300,000
2015 SFBAAB GHG Emissions Inventory	85,000,000
2005 Stanislaus Countywide GHG Emissions Inventory	6,044,113
2011 City of Merced GHG Emissions Inventory	505,579

Sources: Intergovernmental Panel on Climate Change 2014; U.S. Environmental Protection Agency 2020; California Air Resources Board 2020c; Bay Area Air Quality Management District 2017b; ICF International 2013; City of Merced 2014.

CO_2e = carbon dioxide equivalent.
GHG = greenhouse gas.
IPCC = Intergovernmental Panel on Climate Change.
CARB = California Air Resources Board.
SFBAAB = San Francisco Bay Area Air Basin.
USEPA= U.S. Environmental Protection Agency.

3.8.3.4 Potential Effects of Climate Change in California and in the Study Area

Climate change is a complex phenomenon that has the potential to alter local climatic patterns and meteorology. Although modeling indicates that climate change will result in sea level rise (both globally and regionally) as well as changes in climate and rainfall, among other effects, there remains uncertainty with regard to characterizing precise local climate characteristics and predicting precisely how various ecological and social systems will react to any changes in the existing climate at the local level. Regardless of this uncertainty, it is widely understood that substantial climate change is expected to occur in the future, although the precise extent will take further research to define. Specifically, significant impacts from global climate change worldwide and in California include the following.

- Declining sea ice and mountain snowpack levels, thereby increasing sea levels and sea surface evaporation rates with a corresponding increase in atmospheric water vapor, due to the atmosphere's ability to hold more water vapor at higher temperatures (California Natural Resources Agency 2018).

[7] A GHG *sink* is a process, activity, or mechanism that removes a GHG from the atmosphere.

- Rising average global sea levels primarily due to thermal expansion and the melting of glaciers, ice caps, and the Greenland and Antarctic ice sheets (Intergovernmental Panel on Climate Change 2018).
- Changing weather patterns, including changes to precipitation and wind patterns, and more energetic aspects of extreme weather including droughts, heavy precipitation, heat waves, extreme cold, and the intensity of tropical cyclones (Intergovernmental Panel on Climate Change 2018).
- Declining Sierra Mountains snowpack levels, which account for approximately half of the surface water storage in California, by 70 percent to as much as 90 percent over the next 100 years temperatures (California Natural Resources Agency 2018).
- Increasing the number of days conducive to ozone formation (e.g., clear days with intense sun light) by 25 to 85 percent (depending on the future temperature scenario) by the end of the 21st century in high ozone areas (California Natural Resources Agency 2018).
- Increasing the potential for erosion of California's coastlines and seawater intrusion into the Sacramento-San Joaquin Delta and associated levee systems due to the rise in sea level (California Natural Resources Agency 2018).
- Exacerbating the severity of drought conditions in California such that durations and intensities are amplified, ultimately increasing the risk of wildfires and consequential damage incurred (California Natural Resources Agency 2018).
- Under changing climate conditions, agriculture is projected to experience lower crop yields due to extreme heat waves, heat stress and increased water needs of crops and livestock (particularly during dry and warm years), and new and changing pest and disease threats (California Natural Resources Agency 2018).
- The impacts of climate change, such as increased heat-related events, droughts, and wildfires, pose direct and indirect risks to public health, as people will experience earlier death and worsening illnesses. Indirect impacts on public health include increased vector-borne diseases, stress and mental trauma due to extreme events and disasters, economic disruptions, and residential displacement (California Natural Resources Agency 2018).

3.8.4 Impact Analysis

This section describes the environmental impacts of the Proposed Project and the Atwater Station Alternative on GHG emissions. It describes the methods used to evaluate the impacts and the thresholds used to determine whether an impact would be significant.

3.8.4.1 Methods for Analysis

GHG impacts associated with construction and operation of the Proposed Project and the Atwater Station Alternative were assessed and quantified using standard and accepted software tools, techniques, and emission factors. A summary of the methodology is provided in this section and a full list of assumptions is provided in Appendix J, *Air Quality, Greenhouse Gas, and Health Risk Assessment Supporting Documentation*.

As discussed further in this section, the scope of the air quality analysis is limited to the extension of the Altamont Corridor Express (ACE) between Ceres and Merced, where appropriate. However, because the Proposed Project would contribute system-wide ridership changes along the existing

route between Stockton and San Jose, some operational impact determinations are based on the GHG emissions in other areas of the ACE system. This approach ensures total emissions and GHG impacts associated with the entire Proposed Project are accurately assessed in accordance with air district guidance and thresholds.

Construction

Construction of the Proposed Project and the Atwater Station Alternative fall under SJVAPCD's jurisdiction. Construction activities would generate GHG (CO_2, CH_4, and N_2O) emissions from off-road equipment exhaust, employee and haul truck vehicle exhaust (on-road vehicles), and locomotive exhaust. These emissions would be temporary (i.e., limited to the construction period) and would cease when construction activities are complete. Emission estimates for construction activities were estimated using emission factors from CalEEMod (version 2016.3.2), CARB's EMFAC2017 model, and the methods summarized in Section 3.3.4.1 (*Air Quality*), *Methods for Analysis*. Emissions are presented in terms of metric tons CO_2e per year.

Operations

Operation of the Proposed Project would increase passenger train activities (including locomotive movement, locomotive idling, and connecting shuttle service), as well as attract additional motor vehicles to existing and new ACE stations. Proposed Project operations would expand existing ACE service, which would also reduce single-occupancy vehicles from the transportation network and reduce mobile source emissions. Emissions calculations consider both direct and indirect emissions generated by these sources. Emissions were modeled for existing (2019)[8], full operations (2030)[9], and horizon year (2040) conditions to capture changes in the Proposed Project activity and regional emission factors.

Chapter 2, *Project Description*, provides additional information on the ridership estimate for the Proposed Project.

ACE Train Operation and Locomotive Idling

Expanded passenger rail service would result in increased diesel fuel combustion and associated GHG emissions from increased locomotive activity. Unlike criteria pollutants, there are no federal or state GHG standards for locomotives. Accordingly, CO_2, CH_4 and N_2O were calculated using emission factors from the Port of Long Beach 2019 Air Emissions Inventory, which are based on fuel-specific combustion rates for each pollutant (Starcrest Consulting Group 2020). The locomotive operating assumptions assumed in the analysis are summarized in Table 3.3-6 in Section 3.3, *Air Quality*. As noted in Table 3.3-6 in Section 3.3, *Air Quality*, all locomotives would operate with Tier 4 engines. The locomotives for the Project would use renewable diesel fuel. The primary benefit from use of

[8] 2019 was used as the baseline condition because full year data was not available for 2020 during EIR preparation and because 2020 is an anomalous year for transportation emissions due to the substantial disruptions due to the COVID-19 health emergency.

[9] As discussed in Chapter 2, *Project Description*, operations could start by 2025 with one round trip per day between Ceres and Merced, increasing to four round trips per day in 2030. The year 2030 was selected for the GHG analysis over 2025 since the Project would first reach its full level of operation in 2030 including its full level of train operations. In addition, given the progressive improvement in passenger vehicle efficiency, the benefits of diverting passenger vehicle use through increase train use would be lower in 2030 than in 2025 on a per vehicle-mile travelled (VMT) diverted basis and thus the analysis for 2030 would be conservative compared to 2025.

renewable diesel is not directly from the locomotive exhaust stack pipes but from the upstream (or lifecycle) emissions reductions that occur during the production of the fuel compared to the production of conventional diesel. The lifecycle GHG reductions in using renewable diesel compared to conventional diesel depend on the feedstock used to produce renewable diesel. The reductions have been estimated as ranging from 30 percent to 60 percent by CARB and by another study by GNA as ranging from 47 percent (for soybean derived fuel) to 83 percent (for used cooking oil-derived fuel), with most of the renewable diesel in use in California being derived from tallow feedstock which results in having an average reduction of 64 percent to 71 percent compared to conventional diesel (GNA 2017).

ACE locomotives idle while loading passengers at stations, when at the end of the line, and while warming up after receiving routine maintenance. The additional locomotives added as part of the Proposed Project would undergo maintenance at the proposed Merced Layover & Maintenance Facility. Idling emissions at the stations (during passenger loading and end-of-line time) and at the Merced Layover & Maintenance Facility were quantified using USEPA's locomotive emission standards (U.S. Environmental Protection Agency 2009) and daily idling hours provided by the engineering team (AECOM 2020a). When locomotives are at the Merced Layover & Maintenance Facility, they would idle for a one hour time period but would be connected to electric power otherwise with engines off. Additionally, ACE locomotives may be even lower-emitting than Tier 4 in the future because hybrid-electric equipment may be used. The analysis presented here is conservative, however, because it assumes that locomotives, while Tier 4, will be fully diesel-powered and not hybrid-electric.

Station Platform/Facility Operation

Operation of new station platforms would increase electricity consumption from lighting and the amount of solid waste generated. The station platforms would not include bathrooms or other structures that would use water, nor would they consume natural gas. The Merced Layover & Maintenance Facility would also consume electricity for lighting and wayside power, natural gas, and diesel fuel for use in an emergency generator. The Proposed Project ridership scenario assumes operations of the Ceres Station (no improvements to the station platform, this station was previously approved in the *ACE Extension Lathrop to Ceres/Merced EIR* [Prior EIR]) and new stations, including the Turlock Station, Livingston Station, and Merced Station. Operation of the Atwater Station Alternative would also include operation of the Turlock Station and Merced Station.

GHG emissions from electricity use were quantified based on the estimated monthly electricity consumption (AECOM 2020c) for each station platform/facility and emission factors from Merced Irrigation District and Turlock Irrigation District, which are the electric utility service providers for the stations (California Energy Commission 2019). Future year emission factors were estimated based on the projection of increasingly stringent renewable portfolio standards in accordance with state legislation (see Senate Bill 100 in Section 3.8.3, *Regulatory Setting*). Natural gas consumption at the Merced Layover & Maintenance Facility was estimated in CalEEMod based on the default consumption rates for light industrial uses and the facility's square footage. GHG emissions from waste were quantified based on the estimated monthly tonnage of generated waste at each platform (AECOM 2020c) and emission factors from CalEEMod. GHG emissions from the emergency generator were quantified based on the operating characteristics of the emergency generator at the ACE Rail Maintenance Facility in Stockton (generator model, operating time) and emission factors from CalEEMod (AECOM 2020d).

Expanded Shuttle Service

ACE provides shuttle connections at the Great America and Pleasanton Stations, which are used by nearly half of ACE riders (Altamont Corridor Express 2015). Changes in ACE ridership, therefore, would have corresponding effects on shuttle demand and vehicle miles traveled (VMT). GHG emissions associated with changes in Great America Station and Pleasanton Station shuttle service were estimated using VMT data provided by AECOM (AECOM 2020b and 2020c). Emission factors were obtained from EMFAC2017 for the relevant years of analysis (i.e., operational emissions from the shuttles in 2030 were estimated using a 2030 emission factor, etc.). Because all trips would occur in the San Francisco Bay Area, all emissions were assigned to BAAQMD. The shuttle emissions are a conservative estimate because the shuttles may be fully electric in 2030 and/or 2040. Electric shuttles would not generate any exhaust-related emissions.

Displaced Vehicle Miles

The Proposed Project and Atwater Station Alternative operations would expand passenger rail service between Ceres and Merced that would result in reductions in passenger vehicle usage. GHGs reductions achieved by displaced VMT were estimated using emission factors from EMFAC2017, VMT data provided by AECOM (AECOM 2020c), and the methods described in Section 3.3.4.1, *Methods for Analysis*.

The No Project Conditions would involve the use of a bus bridge[10] between Ceres and Merced instead of train service. This bus bridge would result in VMT reductions because passengers would use the bus bridge and then ACE train service instead of driving. The passenger ridership quantities and VMT reductions associated with the bus bridge are considered to be part of the system-wide No Projection Conditions. The Proposed Project's displaced quantity of VMT is relative to No Project Conditions and, thus, represents the Proposed Project's incremental reduction in VMT relative to system-wide ACE operation, including operation of the bus bridge.

Net Operational Emissions

The impact analysis evaluates total operational emissions inclusive of the four emission components (*ACE Train Operation* and *Locomotive Idling*, *Station Platform/Facility Operation, Expanded Shuttle Service*, and *Displaced Vehicles Miles*) discussed previously. Expansion of ACE and connecting shuttle services, as well as operation of additional station platforms are emission sources that would result in an increase in GHGs relative to the No Project Conditions. Displaced VMT due to the Proposed Project would result in a decrease in emissions relative to the No Project Conditions. The difference between emissions generated by operation of the ACE locomotives (inclusive of idling), shuttles, station platforms, and reductions achieved by displaced VMT represents the total net operational impact.

3.8.4.2 Thresholds of Significance

The CEQA Guidelines Appendix G (14 Cal. Code of Regs. 15000 et seq.) has identified significance criteria to be considered for determining whether a project could have significant impacts from GHG emissions.

[10] This would be an electric bus bridge.

An impact would be considered significant is construction or operation of the Proposed Project and the Atwater Station Alternative would have any of the following consequences.

- Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment. For this analysis, a *significant* level of GHG emissions is defined as emission levels that would conflict with statewide GHG reduction goals, as discussed further under *Supplemental Thresholds.*
- Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs. For the purposes of this analysis, applicable plans and regulations include AB 32, SB 32, relevant transportation plans (e.g., San Joaquin Council of Government's Regional Transportation Plan [RTP]) and adopted local climate action plans.

The CEQA Guidelines Section 15125 indicate that existing conditions at the time a notice of preparation is released or when environmental review begins "normally" constitute the baseline for environmental analysis. In 2010, the California Supreme Court issued an opinion holding that while lead agencies have some flexibility in determining what constitutes the baseline, relying on "hypothetical allowable conditions" when those conditions are not a realistic description of the conditions without the Proposed Project, would be an illusory basis for a finding of no significant impact from the Proposed Project and, therefore, a violation of CEQA (*Communities for a Better Environment v. South Coast Air Quality Management District* [2010] 48 Cal. 4th 310).

On August 5, 2013, the California Supreme Court decided *Neighbors for Smart Rail v. Exposition Metro Line Construction Authority* (57 Cal. 4th 439). This latest decision has clarified that, under certain circumstances, a baseline may reflect future, rather than existing, conditions. The rule specifies that factual circumstances can justify an agency departing from that norm in the following circumstances when such reasons are supported by substantial evidence.

- When necessary to prevent misinforming or misleading the public and decision makers.
- When the use of future conditions in place of existing conditions is justified by unusual aspects of the project or surrounding conditions.

With respect to the Proposed Project, using existing conditions to evaluate GHG impacts would misrepresent and mislead the public and decision makers with respect to potential GHG impacts, for the following reasons: (1) changes in on-road emission factors, and (2) net project VMT reductions.

1. On-road vehicle emissions rates are anticipated to experience reductions in the future due to (a) continuing engine advancements, (b) more stringent air quality regulations, and (c) the retirement of older, more-polluting vehicles from the service population fleet. Quantifying emissions utilizing current vehicle emissions rates would not only represent a fictitious scenario but would also overestimate emissions reductions and potential air quality benefits achieved by the Proposed Project.
2. Using the relatively higher "existing conditions" emissions factors to quantify emissions reduction benefits associated with Proposed Project-related VMT reductions in the years 2030 and 2040 would overstate the Proposed Project's emissions reduction benefits.

These facts represent substantial evidence in support of using future conditions, rather than existing conditions, for the analysis to evaluate GHG impacts. Accordingly, for the purposes of this analysis, the CEQA assessment evaluates the Proposed Project and Atwater Station Alternative emissions under full operations (2030) and horizon (2040) year conditions, compared to the future No Project

Conditions. This approach reflects appropriate vehicle fleet characteristics and emission factors. Using future year conditions as the basis for the CEQA analysis avoids misinforming and misleading the public and decision makers with respect to GHG impacts, consistent with current CEQA case law.

Supplemental Thresholds

The following section summarizes relevant thresholds and presents substantial evidence regarding the basis upon which they were developed. This section also describes how the thresholds are used to determine whether construction and operation of the Proposed Project and the Atwater Station Alternative would result in a significant impact within the context of generating GHG emissions that conflict with adopted plans and policies.

GHG emissions and global climate change represent cumulative impacts of human activities and development projects locally, regionally, nationally, and worldwide. GHG emissions cumulatively contribute to the significant adverse environmental impacts of global climate change. No single project could generate enough GHG emissions to noticeably change the global average temperature; instead, the combination of GHG emissions from past, present, and future projects and activities have contributed and will contribute to global climate change and its associated environmental impacts.

The SJVAPCD's *Guide for Assessing and Mitigating Air Quality Impacts* does not identify a GHG emission threshold for construction-related emissions. There would be no construction activities in the BAAQMD.

Both air districts have adopted significance thresholds to evaluate operational emissions, but these are only applicable to land use development and stationary source projects. These thresholds were also established based on statewide emission reduction goals outlined in AB 32, and do not consider greater reductions that will be required to meet the long-term goals of SB 32 and California EO S-03-05 (if legislatively adopted).

The Proposed Project is a transportation project that does not fit into the land use development or stationary source project categories. Accordingly, there are no adopted quantitative GHG thresholds relevant to the Proposed Project. Therefore, direct and indirect GHG emissions from the improvements are discussed with respect to larger statewide GHG emission reduction goals, where a significant impact would occur if emissions would obstruct attainment of the targets outlined under AB 32, SB 32, or California EO S-03-05.

3.8.4.3 Impacts and Mitigation Measures

Impact GHG-1	Construction and operation of the Proposed Project could generate GHG emissions, either directly or indirectly, that would not have a significant impact on the environment.
Level of Impact	**Less than significant impact (beneficial)**

Impact Characterization and Significance Conclusion

Proposed Project

Construction of the Proposed Project has the potential to create GHG impacts through the use of heavy-duty construction equipment, construction worker vehicle trips, truck hauling trips, and

locomotive trips. GHG emissions generated by these sources were quantified using emission factors from CalEEMod, EMFAC2017, and other sources, as described in Section 3.8.4.1, *Methods for Analysis*. Table 3.8-4 summarizes estimated construction-related GHG emissions in the SJVAPCD in metric tons per year. The emissions modeling assumes implementation of Mitigation Measure AQ-2.1, which is required to reduce criteria pollutant emissions (refer to Section 3.3, *Air Quality*). Refer to Appendix J, *Air Quality, Greenhouse Gas, and Health Risk Assessment Supporting Documentation,* for detailed emissions calculations. As shown in Table 3.8-4, construction of the Proposed Project would generate a total of 2,761 metric tons CO_2e during the construction period. This amount of emissions (2,761 metric tons CO_2e) is equivalent to adding about 596 typical passenger vehicles for 1 year (U.S. Environmental Protection Agency 2018).

Table 3.8-4. Estimated Proposed Project and Atwater Station Alternative Construction Greenhouse Gas Emissions

	Metric Tons per Year			
Construction Year	**CO_2**	**CH_4**	**N_2O**	**CO_2e**
Proposed Project				
2023	1,039	< 1	< 1	1,058
2024	1,678	< 1	< 1	1,704
Total	2,717	< 1	< 1	2,761
Atwater Station Alternative				
2023	1,039	< 1	< 1	1,058
2024	1,678	< 1	< 1	1,704
Total	2,717	< 1	< 1	2,761

CO_2 = carbon dioxide.
CH_4 = methane.
N_2O = nitrous oxide.
$C0_2e$ = carbon dioxide equivalent.

Operation of the Proposed Project has the potential to create GHG impacts through increased ACE rail, shuttle, and station activity. However, the Proposed Project would improve existing passenger rail opportunities, which would remove single-occupancy vehicles from the transportation network. GHG emissions and reductions generated by these sources were quantified for the existing year (2019), full operations (2030), and horizon year (2040) conditions, to capture changes in regional emissions.

Tables 3.8-5 and 3.8-6 summarize operational emissions in BAAQMD and SJVAPCD, respectively. Table 3.8-7 summarizes total emissions within both air districts. The estimates reflect the difference between emissions generated by operation of the ACE locomotives plus the shuttles, and the reductions achieved by displaced VMT. Negative values represent a net reduction in emissions under the operating scenario. Refer to Appendix J for a detailed summary of emissions and reductions by source. Tables 3.8-5 through 3.8-7 also compare emissions to existing conditions and the No Project Conditions. There is currently no ACE locomotive or bus service as part of the existing conditions. The increase in operations emissions for the Proposed Project scenarios in 2030 and 2040 relative to the existing conditions is the result of the Proposed Project adding ACE locomotive service between Ceres and Merced where there is currently no service. The comparison to the No Project Conditions represents the net impact of Proposed Project operations relative to future years in the absence of Project implementation. With the No Project Conditions, ACE service between

Ceres and Merced would consist of electric bus service only. As noted in Section 3.8.4.1, *Methods for Analysis,* the No Project Conditions would result in reductions of VMT from the use of the bus bridge. Emissions reductions from those VMT reductions are not included in the No Project Conditions row in Tables 3.8-5 through 3.8-7 because the Proposed Project's VMT-related emissions are relative to the entire ACE system, including the bus bridge. In other words, for VMT accounting purposes the No Project Conditions are assumed to be zero. Thus, emissions from the No Project Conditions shown in Tables 3.3-5 through 3.3-7 only include emissions that are not accounted for elsewhere (i.e. charging of the electric buses, emissions from locomotive idling at the maintenance facility and end-of-line station). Additionally, as noted in Section 3.8.4.1, *Methods for Analysis*, the analysis presented here is conservative, because it assumes that locomotives, while Tier 4, will be fully diesel-powered and not hybrid-electric.

As reflected in Table 3.8-5, the existing conditions and No Project Conditions are assumed to have zero emissions in the BAAQMD, and thus there is no difference in the net project emissions whether compared to the existing conditions or No Project Conditions. Although there is currently ACE service in the BAAQMD, this analysis focuses on the changes associated with implementing ACE service between Ceres and Merced. Thus, under the existing conditions and the No Project Conditions, there would be no changes to the service or the ridership in the BAAQMD, and there would be no direct emissions sources in the BAAQMD.

Table 3.8-5. Estimated Greenhouse Gas Emissions in the Bay Area Air Quality Management District from Operation of the Proposed Project and the Atwater Station Alternative

Scenario[a]	CO_2	CH_4	N_2O	CO_2e
Existing (2019)	-	-	-	-
2030 No Project Conditions	-	-	-	-
2030 Proposed Project	-2,271	< 1	< 1	-2,279
2030 Atwater Station Alternative	-2,311	< 1	< 1	-2,318
2040 No Project Conditions	-	-	-	-
2040 Proposed Project	-1,844	< 1	< 1	-1,843
2040 Atwater Station Alternative	-1,872	< 1	< 1	-1,872
Comparison to Existing Conditions (2019)[b]				
2030 Proposed Project	-2,271	< 1	< 1	-2,279
2030 Atwater Station Alternative	-2,311	< 1	< 1	-2,318
2040 Proposed Project	-1,844	< 1	< 1	-1,843
2040 Atwater Station Alternative	-1,872	< 1	< 1	-1,872
Comparison to No Project Conditions				
2030 Proposed Project	-2,271	< 1	< 1	-2,279
2030 Atwater Station Alternative	-2,311	< 1	< 1	-2,318
2040 Proposed Project	-1,844	< 1	< 1	-1,843
2040 Atwater Station Alternative	-1,872	< 1	< 1	-1,872

CO_2 = carbon dioxide.
CH_4 = methane.
N_2O = nitrous oxide.
CO_2e = carbon dioxide equivalent.

a. The emissions estimates reflect the difference between emissions generated by operation of the ACE locomotives and shuttles and reductions achieved by displaced VMT, where negative values

represent a net reduction in emissions under the operating scenario. Refer to Appendix J, *Air Quality, Greenhouse Gas, and Health Risk Assessment Supporting Documentation,* for a detailed summary of emission and reductions by source.

b. Comparison provided for informational purposes only. Impact determination based on the net change in emissions relative to the No Project Conditions. Refer to Section 3.3.4.2, *Thresholds of Significance*, for additional information.

As shown in Table 3.8-6, in the SJVAPCD, there are emissions associated with the No Project Conditions but not the existing conditions. For the No Project Conditions, it is anticipated that ACE service will extend to Ceres with a bus bridge providing service further south to Merced. Thus, there are locomotive end-of-line layover idling emissions associated with the No Project Conditions that would occur at the Ceres Station. With the Proposed Project emissions, the locomotive layover idling emissions would occur at Merced Station (i.e. the new service terminus) instead of the Ceres Station. The quantity of GHG emissions would be approximately the same, however, whether the layover idling occurs at Ceres or Merced. The No Project Conditions would also result in emissions associated with the electric bus bridge service between Ceres and Merced. With the Proposed Project, these bus bridge emissions, resulting from charging of the electric buses, would be replaced by locomotive operational emissions, because the bus bridge would no longer be necessary once the locomotive service is extended to Merced. The layover idling emissions, bus bridge emissions, and other sources of emissions are shown as a sum for each scenario in Table 3.8-6. As shown in Tables 3.8-5 through 3.8-7, operation of the Proposed Project is anticipated to result in a net GHG reduction from changes in regional traffic and diverted private automobile trips to public transit (i.e. the ACE system). The Proposed Project operations would result in GHG reductions relative to both the existing conditions and No Project Conditions. Estimated annual GHG reductions under Proposed Project operations for 2030 and 2040 conditions would be 4,027 and 4,082 metric tons CO_2e, respectively, relative to the No Project Conditions. Net emission reductions on a per-vehicle-mile basis would decline as a function of time, because the vehicles that will be removed from the road will be progressively cleaner due to engine improvements and vehicle modernization. Despite the transition to cleaner vehicles, emissions reductions are larger for 2040 than in 2030 as shown in Table 3.8-7 due to the increase in anticipated ACE ridership between 2030 and 2040. The increased ridership would lead to increased VMT reductions, and thus the 2040 Proposed Project scenarios would result in more reductions than in 2030.

The analysis did not assume any additional ridership benefits beyond those directly induced by the Proposed Project. GHG benefits achieved through operation of the Proposed Project would offset the short-term construction emissions in about two and a half years based on expected 2025 reductions.[11] Emissions savings achieved thereafter would contribute to reductions in GHG emissions. This reduction would be an environmental benefit and would assist the state in meeting larger statewide GHG reduction goals outlined under AB 32, SB 32, EO S-03-05, and EO B-55-18. Therefore, this impact would be less than significant and beneficial.

[11] As noted above, train service between Ceres and Merced is expected to commence with one round trip per day in 2025 and increase to four trains by 2030. While not quantified, the GHG reductions in 2025 are likely to be approximately one quarter of those estimated for 2030 (based on the difference in train service). Presuming the 2025 GHG reductions are 25 percent of those in 2030, it would take approximately 2.5 years to offset the construction GHG emissions.

Table 3.8-6. Estimated Greenhouse Gas Emissions in the San Joaquin Valley Air Pollution Control District from Operation of the Proposed Project and the Atwater Station Alternative

Scenario[a]	CO_2	CH_4	N_2O	CO_2e
Existing (2019)	-	-	-	-
2030 No Project Conditions	5	< 1	< 1	31
2030 Proposed Project	-1,887	1	< 1	-1,717
2030 Atwater Station Alternative	-1,943	1	< 1	-1,776
2040 No Project Conditions	5	< 1	< 1	13
2040 Proposed Project	-2,302	1	< 1	-2,226
2040 Atwater Station Alternative	-2,356	1	< 1	-2,283
Comparison to Existing Conditions (2019)[b]				
2030 Proposed Project	-1,887	1	< 1	-1,717
2030 Atwater Station Alternative	-1,943	1	< 1	-1,776
2040 Proposed Project	-2,302	1	< 1	-2,226
2040 Atwater Station Alternative	-2,356	1	< 1	-2,283
Comparison to No Project Conditions				
2030 Proposed Project	-1,891	1	< 1	-1,748
2030 Atwater Station Alternative	-1,947	1	< 1	-1,807
2040 Proposed Project	-2,306	1	< 1	-2,239
2040 Atwater Station Alternative	-2,361	1	< 1	-2,297

CO_2 = carbon dioxide.
CH_4 = methane.
N_2O = nitrous oxide.
CO_2e = carbon dioxide equivalent.

a. The emissions estimates reflect the difference between emissions generated by operation of the ACE locomotives and shuttles and reductions achieved by displaced VMT, where negative values represent a net reduction in emissions under the operating scenario. Refer to Appendix J, *Air Quality, Greenhouse Gas, and Health Risk Assessment Supporting Documentation,* for a detailed summary of emission and reductions by source.

b. Comparison provided for informational purposes only. Impact determination based on the net change in emissions relative to the No Project Conditions. Refer to Section 3.3.4.2, *Thresholds of Significance*, for additional information.

Table 3.8-7. Total Estimated Greenhouse Gas Emissions from Operation of the Proposed Project and the Atwater Station Alternative

Scenario[a]	CO_2	CH_4	N_2O	CO_2e
Existing (2019)	-	-	-	-
2030 No Project Conditions	5	< 1	< 1	31
2030 Proposed Project	-4,158	1	< 1	-3,996
2030 Atwater Station Alternative	-4,253	1	< 1	-4,094
2040 No Project Conditions	5	< 1	< 1	13
2040 Proposed Project	-4,146	2	< 1	-4,069
2040 Atwater Station Alternative	-4,228	2	< 1	-4,155
Comparison to Existing Conditions (2019)[b]				
2030 Proposed Project	-4,158	1	< 1	-3,996
2030 Atwater Station Alternative	-4,253	1	< 1	-4,094
2040 Proposed Project	-4,146	2	< 1	-4,069
2040 Atwater Station Alternative	-4,228	2	< 1	-4,155
Comparison to No Project Conditions				
2030 Proposed Project	-4,163	1	< 1	-4,027
2030 Atwater Station Alternative	-4,258	1	< 1	-4,125
2040 Proposed Project	-4,150	2	< 1	-4,082
2040 Atwater Station Alternative	-4,233	2	< 1	-4,169

CO_2 = carbon dioxide.
CH_4 = methane.
N_2O = nitrous oxide.
$C0_2e$ = carbon dioxide equivalent.

a. The emissions estimates reflect the difference between emissions generated by operation of the ACE locomotives and shuttles and reductions achieved by displaced VMT, where negative values represent a net reduction in emissions under the operating scenario. Refer to Appendix J, *Air Quality, Greenhouse Gas, and Health Risk Assessment Supporting Documentation,* for a detailed summary of emission and reductions by source.

b. Comparison provided for informational purposes only. Impact determination based on the net change in emissions relative to the No Project Conditions. Refer to Section 3.3.4.2, *Thresholds of Significance*, for additional information.

Atwater Station Alternative

Like the Proposed Project, construction of the Atwater Station Alternative also has the potential to create GHG impacts through the use of heavy-duty construction equipment, construction worker vehicle trips, truck hauling trips, and locomotive trips. Table 3.8-4 summarizes estimated construction-related GHG emissions in the SJVAPCD in metric tons per year for the Atwater Station Alternative. Because of the identical methodologies, the Atwater Station Alternative would result in the same amount of emissions as the Proposed Project.

Like the Proposed Project, operation of the Atwater Station Alternative also has the potential to create GHG impacts through increased ACE rail, shuttle, and station activity. The Atwater Station Alternative would also improve existing passenger rail opportunities, which would remove single-occupancy vehicles from the transportation network. As with the Proposed Project, GHG emissions and reductions generated by these sources were quantified for the existing year (2019), full operations (2030), and horizon year (2040) conditions to capture changes in regional emissions

that would occur. The emissions associated with the Atwater Station Alternative are shown in Tables 3.8-5 through 3.8-7 and, when compared to the Proposed Project (i.e., implementation of the proposed Livingston Station), would result in slightly more GHG reductions. The Atwater Station Alternative would result in approximately 2.1 percent more GHG reductions in 2030 and approximately 2.4 percent more GHG reductions in 2040 than the proposed Livingston Station. The reason for the higher GHG reductions relative to the Proposed Project is higher ridership and thus higher displaced VMT for the Atwater Station Alternative.

For the Atwater Station Alternative, annual GHG reductions from operations for 2030 and 2040 conditions would be 4,125 and 4,169 metric tons CO_2e, respectively, relative to the No Project Conditions. As with the Proposed Project, net emission reductions on a per-vehicle-mile basis would decline as a function of time, because the vehicles that will be removed from the road will be progressively cleaner due to engine improvements and vehicle modernization; however, the increase in ridership between 2030 and 2040 would result in an increase in GHG reductions between those years. The offset time for the Atwater Station Alternative operations to "offset" the emissions from construction would be about two and a half years based on expected 2025 emissions. Emissions savings achieved thereafter would contribute to reductions in GHG emissions, which would be an environmental benefit and would assist the state in meeting larger statewide GHG reduction goals outlined under AB 32, SB 32, EO S-03-05, and EO B-55-18. Therefore, this impact would be less than significant and beneficial.

Impact GHG-2	The Proposed Project would not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs.
Level of Impact	**Less than significant impact (beneficial)**

Impact Characterization and Significance Conclusion

Proposed Project

California adopted AB 32 in 2006 and SB 32 in 2016, which codified the state's short-term (2020) and mid-term (2030) GHG reduction targets, respectively. Several jurisdictions in the study area have adopted or are currently preparing climate action plans to reduce community GHG emissions. The local metropolitan planning organizations (e.g., Metropolitan Transportation Commission [MTC]) have also developed transportation plans with policies and goals that are relevant to transportation and rail projects. Consistency with these documents is evaluated in this impact. This analysis also considers the long-range (2045, 2050) reduction targets outlined in EO S-3-05 and EO B-55-18.

AB 32 codifies the state's GHG reduction target for 2020, and SB 32 establishes the state's GHG reduction target for 2030. ARB adopted the 2008 *Scoping Plan* and 2014 *First Scoping Plan Update* as a framework for achieving AB 32. The 2008 *Scoping Plan* and 2014 *First Scoping Plan Update* outline a series of technologically feasible and cost-effective measures to reduce statewide GHG emissions. Some reductions would need to come in the form of changes pertaining to vehicle emissions and mileage standards. Some would come from changes pertaining to sources of electricity and increased energy efficiency at existing facilities. The remainder would need to come from state and local plans, policies, or regulations that will lower carbon emissions, such as those adopted by local government throughout the plan area. The 2017 *Scoping Plan Update* for achieving SB 32 extends and furthers much of the policies and programs included in the AB 32 *Scoping Plan*.

The Proposed Project would expand existing passenger rail opportunities and help accommodate increased ridership through improved system operations. The AB 32 *Scoping Plan* and local climate action plans include strategies to reduce single-occupancy vehicle usage and to increase alternative transportation. These benefits also would support implementation of MTC's *Metropolitan Transportation Plan/Sustainable Communities Strategy* (SCS), the Stanislaus Council of Government's RTP/SCS, and Merced County Council of Government's RTP/SCS all of which were adopted pursuant to SB 375.[12] The Proposed Project is also listed and/or mentioned in the California High-Speed Rail Authority's *Draft 2020 Business Plan* and the *2018 CA State Rail Plan* (California High-Speed Rail Authority 2020; California Department of Transportation 2018). In addition, the Proposed Project would support transit oriented development, which would help in the reduction of GHG emissions.

The emission reductions achieved through operation of the Proposed Project (see Table 3.8-7) would facilitate attainment of state and local GHG reduction goals and are consistent with the trajectory of statewide climate change planning, as represented by the EO S-03-05 long-term goal of reducing statewide emissions by 80 percent below 1990 levels by 2050 and the EO B-55-18 long-term goal of being carbon neutral by 2045. Therefore, this impact would be less than significant and beneficial.

Atwater Station Alternative

The Atwater Station Alternative would expand existing passenger rail opportunities and help accommodate increased ridership through improved system operations, consistent with the AB 32 *Scoping Plan* and regional SCSs and RTPs. The emission reductions achieved through operation of the Atwater Station Alternative (see Table 3.8-7) would facilitate attainment of state and local GHG reduction goals, and are consistent with the trajectory of statewide climate change planning, as represented by the EO S-03-05 long-term goal of reducing statewide emissions by 80 percent below 1990 levels by 2050 and the EO B-55-18 long-term goal of being carbon neutral by 2045. Therefore, this impact would be less than significant and beneficial.

As explained in impact GHG-1, The Atwater Station Alternative would result in slightly more GHG reductions, compared to the Proposed Project (i.e., implementation of the proposed Livingston Station). The reason for the higher GHG reductions relative to the Proposed Project is higher ridership and thus higher displaced VMT for the Atwater Station Alternative.

3.8.4.4 Overall Comparison of the Proposed Livingston Station and Atwater Station Alternative

Because the Atwater Station Alternative would have slightly higher ridership and associated VMT reductions than the proposed Livingston Station, the Atwater Station Alternative would have slightly greater benefits from GHG reductions compared to the proposed Livingston Station. As shown in Table 3.8-7, annual GHG reductions for the Atwater Station Alternative would be greater than the proposed Livingston Station by 98 and 87 metric tons CO_2e, relative to the No Project Conditions.

Overall, both the Atwater Station Alternative and the proposed Livingston Station would result in benefits from GHG reductions. However, overall, the Atwater Station Alternative would result in slightly greater benefits due to slightly greater GHG reductions.

[12] Although no components of the Proposed Project are located in San Joaquin County, the ACE system serves San Joaquin County and thus the benefits from implementing the Proposed Project would also affect this County. The Proposed Project would also support the applicable sustainable communities strategy, San Joaquin Council of Government's RTP/SCS.