L. GREENHOUSE GAS EMISSIONS

1. Introduction

This section describes the setting and existing conditions for greenhouse gases (GHGs) as they relate to the BART to Livermore Extension Project; discusses the applicable federal, State of California (State), and local regulations; and assesses potential impacts from emissions of GHGs during construction and operation of the Proposed Project and Alternatives.

The study area for GHG impacts during construction includes all areas in which GHG emissions would occur due to construction of the Proposed Project or one of the Build Alternatives. This includes the collective footprint—the combined footprints of the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative—as well as the construction staging areas and roads in the vicinity of the construction sites on which vehicle trips (by workers and vendors, and for hauling) would occur. Additionally, the construction of the bus infrastructure improvements for the Enhanced Bus Alternative, as well as for the feeder buses for the Proposed Project and other Build Alternatives, which are anticipated to extend within existing street rights-of-way, are addressed programmatically in this analysis, as described in Chapter 2, Project Description.

The study area for GHG impacts during operation of the Proposed Project or one of the Build Alternatives includes all areas in which increases in or reduction of GHG emissions would occur due to project implementation. This includes (1) the area of transit operations, i.e., the proposed routes for the respective trains (BART, DMU, or EMU), and buses; (2) station and maintenance areas that would experience increases in emissions due to station and maintenance operations and offsetting reductions in emissions due to energy generation from solar voltaic panels at the Isabel Station; and (3) increases in or reduction of emissions from changes in passenger vehicle miles traveled (VMT), which are analyzed for the nine counties in the San Francisco Bay Area (Bay Area)—i.e., every county in which BART operates—as well as the adjacent San Joaquin County.

GHG emissions are inherently a cumulative concern. Although the geographic scope of cumulative impacts related to GHG emissions is global, this analysis focuses on the direct and indirect generation of, or reduction in, GHG emissions from the Proposed Project and Build Alternatives on both a statewide and regional level.

Comments pertaining to GHGs were received in response to the Notice of Preparation for this EIR or during the public scoping meeting held for the EIR. These comments focused on the following two issues: (1) the potential for additional traffic congestion to cause a net increase in GHGs despite the traffic reductions that would occur due to the Proposed Project and Alternatives; and (2) the amount of GHGs associated with new development occurring around the proposed Isabel BART Station (Isabel Station) versus development within already developed areas.

2. Existing Conditions

Constituent gases that trap heat in the atmosphere are called GHGs. Analogous to the way a greenhouse retains heat, GHGs allow sunlight to enter the atmosphere, but trap a portion of the outward-bound infrared radiation, which then warms the air. Both natural processes and human activities create GHGs. The accumulation of GHGs in the atmosphere regulates Earth's temperature; however, human activities such as fossil fuel-based electricity production and the use of motor vehicles have elevated GHG concentrations to the point of contributing to an increase in the atmospheric temperature of Earth (global warming) and to climate change. Climate change is a change in the average weather on earth that can be measured by wind patterns, storms, precipitation, and temperature, while global warming is a post-industrial age and ongoing trend of consistent rising global average temperatures that has been determined to be significantly influenced by human sources.

Although there is disagreement on the rate of global climate change and the extent of impacts attributable to human activities, there is widespread scientific consensus that a direct link exists between increased anthropogenic GHG emissions and long-term global temperature increases. If GHG emissions continue unabated, surface temperatures in California are expected to increase by 4.1–8.6 degrees Fahrenheit by the end of the century.[1] Some of the potential effects of global warming and climate change in California include loss of snow pack, sea level rise, greater risk of flooding, more extreme heat days per year, more high-ozone days, more large forest fires, and more drought years, all of which could contribute to changes in distribution of ecosystems throughout the state.[2]

The principal GHGs resulting from human activity that enter and accumulate in the atmosphere are carbon dioxide (CO_2), methane, nitrous oxide, and fluorinated gases such as sulfur hexafluoride, perfluorocarbons, and hydrofluorocarbons. In most cases, GHGs have both natural and anthropogenic (or human-based) sources. CO_2 is the most common reference gas regarding climate change. CO_2 enters the atmosphere through burning fossil fuels, solid waste, trees and wood products, and also as a result of certain chemical reactions (e.g., cement manufacturing). Methane is emitted during the production and

[1] California Climate Change Center, 2012. Our Changing Climate 2012, Vulnerability and Adaptation to the Increasing Risks from Climate Change in California. February 24. Available at: http://www.energy.ca.gov/2012publications/CEC-500-2012-007/CEC-500-2012-007.pdf, accessed October 25, 2016.

[2] California Energy Commission (CEC), 2006. Our Changing Climate Assessing the Risks to California: The 2006 Summary Report from the California Climate Change Center. July.

transport of coal, natural gas, and oil. Methane emissions also result from livestock and other agricultural practices and by the decay of organic waste in municipal waste landfills. Nitrous oxide is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste. Fluorinated gases are synthetic, powerful GHGs that are emitted from a variety of industrial processes.

The magnitude of impact on global warming differs among the GHGs depending on factors such as the length of time the gas remains in the atmosphere and the gas's unique ability to absorb energy. For example, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride have a greater global warming potential—i.e., they make a greater contribution to global warming on a per-mass basis—than does CO_2. To account for the global warming potential of GHGs, emissions are often quantified and reported in terms of carbon dioxide equivalents (CO_2e), with large sources reported in million metric tons (MMT) of CO_2e. Sulfur hexafluoride (commonly used in the utility industry as an insulating gas in circuit breakers and other electronic equipment) in particular, while composing a small fraction of total GHGs emitted annually throughout the world, is a potent GHG with 22,800 times the global warming potential of CO_2. Table 3.L-1 presents the global warming potential for CO_2, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride.

TABLE 3.L-1 GLOBAL WARMING POTENTIALS OF PRINCIPAL GREENHOUSE GASES

Greenhouse Gas	Global Warming Potential
Carbon dioxide	1
Methane	25
Nitrous oxide	298
Hydrofluorocarbons	124 – 14,800
Perfluorocarbons	7,390 – 17,700
Sulfur hexafluoride	22,800

Source: IPCC, 2007.

CO_2 has the greatest impact on global warming and climate change because it is emitted into the atmosphere in relatively large quantities. For example, the Bay Area Air Quality Management District (BAAQMD) estimates that, in 2011 in the Bay Area, CO_2 accounted for approximately 90.3 percent of the total emissions of the six gases listed above.[3]

[3] Bay Area Air Quality Management District (BAAQMD), 2015. Bay Area Emissions Inventory Summary Report: Greenhouse Gases, Base Year 2011. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/emission-inventory/by2011_ghgsummary.pdf, accessed October 25, 2016.

Climate change, by its nature, is a cumulative impact resulting from innumerable GHG sources around the world. Thus, global solutions are required to truly address the impacts of climate change. Globally, CO_2 concentrations, which ranged from 265 parts per million (ppm) to 280 ppm over the past 10,000 years, only began rising in the past 200 years to the current levels of 407 ppm (a 45 percent increase).[4] According to the World Resources Institute, in 2012, total worldwide GHG emissions were estimated at 42,790 MMT CO_2e. This estimate excludes GHG emissions associated with land use changes (i.e. such as the alteration of land from natural vegetation to other uses) and forestry (including deforestation, reforestation, and afforestation) because of the uncertainties associated with these particular emissions. The World Resources Institute reports that, in 2012, GHG emissions in the United States (U.S.) totaled 6,193 MMT CO_2e, while GHG emissions in California totaled 444 million metric tons of CO_2e.[5]

a. Regional Overview

According to the Fifth U.S. Climate Action Report, total GHG emissions in the U.S. increased 17 percent from 1990 through 2007, with fossil fuel combustion as the largest source of CO_2.[6] This trend is largely due to significant growth in emissions from transportation activities and electricity generation. The U.S. Climate Action Report forecasts that total CO_2 emissions will increase by 4 percent from 2010 to 2020, and by 18 percent from 2010 to 2050.

According to the California Air Resources Board (CARB), as of 2014, California's gross GHG emissions totaled 441.5 MMT CO_2e, and 84.3 percent of the emissions were in the form of CO_2.[7] The transportation sector is 37 percent of that total, and industrial sources make up another 24 percent. Electrical generation sources provide 12 percent from in-state sources and 8 percent from imports. The current GHG emissions inventory for the state (2016 edition) covers the period from 2000 to 2014. The emissions estimates are statewide, relying on state, regional, or national data sources, and on aggregated facility-specific emissions reports.

[4] National Oceanic and Atmospheric Administration (NOAA), 2017. Trends in Atmospheric Carbon Dioxide. Mauna Loa Observatory. Available at: http://www.esrl.noaa.gov/gmd/ccgg/trends/, accessed April 26, 2017.

[5] World Resources Institute, 2017. CAIT Climate Data Explorer. Available at: http://cait.wri.org/historical/, accessed April 17, 2017.

[6] United States Department of State, Office of Global Change, 2010. Fifth U.S Action Climate Report to the UN Framework Convention on Climate Change. Available at: https://2009-2017.state.gov/e/oes/rls/rpts/car5/index.htm, accessed April 26, 2017.

[7] California Air Resources Board (CARB), 2016. California Greenhouse Gas Emission Inventory – 2016 Edition. June 17. Available at: https://www.arb.ca.gov/cc/inventory/data/data.htm, accessed April 13, 2017.

b. Local Setting

In the Bay Area, GHG emissions are generated primarily from combustion of gasoline, diesel fuel, and natural gas used in mobile sources and by energy-generation activities. In particular, the BAAQMD has estimated that transportation, industrial/commercial activities, and power plants composed 39.7 percent, 35.7 percent, and 14.0 percent, respectively, of the total GHG emissions in the Bay Area (residential fuel usage, off-road equipment, and agriculture/farming constituted the remaining 11.6 percent). Of the total Bay Area GHG emissions, 15 percent originate in Alameda County.[8]

3. Regulatory Framework

This subsection describes the federal, State, and local environmental laws and policies relevant to GHG emissions.

a. Federal Clean Air Act

The federal Clean Air Act (CAA), enacted in 1970 and amended in 1977 and 1990, establishes the framework for federal air pollution control. The CAA does not identify GHGs as air pollutants subject to regulation. However, in April 2007, in Massachusetts v. U.S. Environmental Protection Agency, 549 U.S. 497 (2007), the U.S. Supreme Court held that CO_2 is an air pollutant as defined under the federal CAA, and that the U.S. Environmental Protection Agency (EPA) must follow the pertinent CAA criteria in determining whether to regulate emissions of CO_2 and other GHGs. In response to that decision, and as directed by the Supreme Court, in December 2009, the EPA issued an endangerment finding and cause or contribute findings under Section 202(a) of the CAA that GHGs from new motor vehicles contribute to air pollution and may endanger public health or welfare. The EPA found that the combined GHG emissions from new motor vehicles contribute to GHG pollution, which threatens public health and welfare. These findings became effective on January 14, 2010.

(1) Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards

The national program for GHG emissions and fuel economy standards for light-duty vehicles was developed jointly by the EPA and the National Highway Traffic Safety Administration. Phase 1 of the program covered passenger cars, light-duty trucks, and

[8] Bay Area Air Quality Management District (BAAQMD), 2015. Bay Area Emissions Inventory Summary Report: Greenhouse Gases, Base Year 2011. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/emission-inventory/by2011_ghgsummary.pdf, accessed October 25, 2016.

medium-duty passenger vehicles, in model years 2012 through 2016. Phase 2 of the program builds upon Phase 1, covering in model years 2017 through 2025. The final standards are projected to result in an average industry fleetwide level of 163 grams per mile of CO_2 in model year 2025, which is equivalent to 54.5 miles per gallon if achieved exclusively through fuel economy improvements. Light-duty vehicles are currently responsible for nearly 60 percent of U.S. transportation-related petroleum use and GHG emissions.

(2) Renewable Fuel Standard Program

The Renewable Fuel Standard program was created under the Energy Policy Act of 2005 and the Energy Independence and Security Act of 2007 to reduce GHG emissions and expand the nation's renewable fuels sector while reducing reliance on imported oil. The program requires a certain volume of renewable fuel to replace or reduce the quantity of petroleum-based transportation fuel, heating oil, or jet fuel.

b. State Regulations

Similar to the federal CAA, the California Clean Air Act of 1988 does not identify GHGs as pollutants subject to regulation. However, multiple State regulations and rules and several gubernatorial Executive Orders pertain to GHGs, which are presented below in chronological order.

(1) Assembly Bill 1493

California State Assembly Bill (AB) 1493, enacted in 2002, directs the CARB to develop and implement regulations that achieve the "maximum feasible reduction" of GHG emissions from passenger vehicles, light-duty trucks, and other noncommercial vehicles. Pursuant to AB 1493, in 2004, the CARB approved regulations limiting the amount of GHGs released from motor vehicles beginning with the 2009 model year. On March 6, 2008, the EPA published a Federal Register notice of its decision denying California's request for a CAA preemption waiver needed to allow the State to implement its motor vehicle GHG emissions standards. California sued the EPA, seeking reversal of that decision. On February 12, 2009, the EPA published a Federal Register notice proposing to approve the California waiver, and in March 2009, it held public hearings on the matter. On June 30, 2009, the EPA granted California's waiver request. On September 24, 2009, CARB adopted regulations that reduce GHG emissions in new passenger vehicles from 2009 through 2016. CARB, EPA, and the U.S. Department of Transportation's National Highway Traffic and Safety Administration have coordinated efforts to develop fuel economy and GHG standards for model 2017-2025 vehicles. The GHG standards are incorporated into the Low Emission Vehicle Regulations.

(2) Executive Order S-3-05

On June 1, 2005, Governor Schwarzenegger signed Executive Order S-3-05, which established the following GHG emissions reduction targets:

- By 2010, reduce GHG emissions to 2000 emissions levels
- By 2020, reduce GHG emissions to 1990 emissions levels
- By 2050, reduce GHG emissions to 80 percent below 1990 levels

A Climate Action Team was formed to implement GHG emissions reduction programs and report on progress made in meeting the emissions reduction targets. The Climate Action Team, which is led by the Secretary of the California Environmental Protection Agency, consists of representatives from several State agencies. A progress report on meeting the targets is issued every 2 years, starting with the report issued in March 2006. The most recent report was issued in 2010.[9]

(3) Assembly Bill 32

In 2006, the California Global Warming Solutions Act (AB 32) was signed into law by Governor Schwarzenegger. The law codified the State's goal of reducing statewide GHG emissions to 1990 levels by 2020. This reduction is being accomplished using several approaches, including a statewide cap on GHG emissions. AB 32 directs the CARB to develop GHG regulations and establish a mandatory reporting system to track and monitor global warming emissions.

Under AB 32, GHGs are defined as CO_2, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. The regulatory steps established in AB 32 require the CARB to adopt premature action measures to reduce GHGs; adopt mandatory reporting rules for significant sources of GHGs; and adopt a scoping plan indicating how emissions reductions will be achieved via regulations, market mechanisms, and other actions.

AB 32 required that the CARB complete a GHG emissions inventory showing California's 1990 GHG emissions. On December 6, 2007, the CARB approved this inventory, which showed 1990 emissions of 427 MMT CO_2e. The CARB estimated that, without any reduction measures (business-as-usual scenario), 2020 emissions levels would be 596 MMT CO_2. Based on these estimates, the CARB concluded that California's GHG emissions should be reduced by 173 MMT CO_2e (a 28 percent reduction) to meet the

[9] California Environmental Protection Agency (Cal/EPA), 2010. Climate Action Team Reports. December. Available at: http://www.energy.ca.gov/2010publications/CAT-1000-2010-005/CAT-1000-2010-005.PDF, accessed October 27, 2016.

427-MMT cap. In 2014, the original 1990 calculation was revised to 431 MMT CO_2e, using the updated Intergovernmental Panel on Climate Change's 2007 fourth assessment report on global warming potentials.[10]

To help achieve these reductions, the CARB evaluated over 100 possible measures. On October 25, 2007, the CARB approved nine discrete early action measures and 35 additional measures. These measures are expected to reduce GHGs by 42 MMT CO_2e by 2020, which is a reduction of about 25 percent of the reduction needed to meet the AB 32 target.[11]

AB 32 also required that the CARB adopt a Scoping Plan by January 1, 2009. That plan must show how emissions reductions will be achieved using regulations, voluntary actions, monetary and nonmonetary incentives, market mechanisms, and other actions. The CARB adopted the final Scoping Plan in November 2008. The Scoping Plan identifies CO_2e reductions of 2 MMT from land use and transportation scenarios that meet the recommended targets while addressing housing needs and other goals.

In August 2011, the Scoping Plan was re-approved by the CARB board, and included a Final Supplement to the Scoping Plan Functional Equivalent Document. This document included an updated business-as-usual estimate of 507 MMT CO_2e by 2020. Consequently, a 16 percent reduction below the estimated business-as-usual levels would be necessary to return to 1990 levels by 2020.

The First Update to the Climate Change Scoping Plan was approved by the CARB board on May 22, 2014. This update identifies opportunities to leverage existing and new funds to further drive GHG emissions reductions through strategic planning and targeted low-carbon investments. A second update to the Climate Change Scoping Plan is planned to be adopted in 2018.

(4) Senate Bill 97

California State Senate Bill (SB) 97, signed in August 2007, acknowledges that climate change is an important environmental issue that requires analysis under the CEQA. This bill required the Governor's Office of Planning and Research to prepare and develop guidelines for the feasible mitigation of GHG emissions. The California Natural Resources

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[10] California Air Resources Board (CARB), 2015. California 1990 Greenhouse Gas Emissions Level and 2020 Limit. May 6. Available at: http://www.arb.ca.gov/cc/inventory/1990level/1990level.htm, accessed October 27, 2016.

[11] California Air Resources Board (CARB), 2007. Expanded List of Early Action Measures to Reduce Greenhouse Gas Emissions in California Recommended for Board Consideration. Available at: https://www.arb.ca.gov/cc/ccea/meetings/ea_final_report.pdf, accessed January 26, 2017.

Agency adopted these amendments on December 30, 2009, and they took effect on March 18, 2010.

Revisions to the CEQA Guidelines specifically address the potential significance of GHG emissions (Section 15064.4). Section 15064.4 calls for a good-faith effort to describe, calculate or estimate GHG emissions. Section 15064.4 further states that the significance of any GHG impacts should consider the extent to which the project would increase or reduce GHG emissions; exceed a locally applicable threshold of significance; and comply with “regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of greenhouse gas emissions.” The CEQA Guidelines also state that a project may be found to have a less-than-significant impact on GHG emissions if it complies with an adopted plan that includes specific measures to sufficiently reduce GHG emissions (Section 15064(h)(3)). However, the CEQA Guidelines do not require or recommend a specific analytical methodology or provide quantitative criteria for determining the significance of GHG emissions.

(5) Senate Bill 375

On September 30, 2008, Governor Schwarzenegger signed SB 375. SB 375 melds regional transportation and local land use planning in an effort to achieve GHG emissions reductions from automobiles and light trucks by using transportation and land use planning to implement smart growth principles, thereby reducing vehicle trips and the resulting GHG emissions. Automobiles and light trucks contribute almost 30 percent of total GHG emissions in the Bay Area.[12] While substantial reductions to GHG emissions from automobiles and light trucks can be achieved through new vehicle technology and by the increased use of low-carbon fuel, the legislature determined that these reductions will not be enough to achieve the State’s AB 32 GHG emissions reduction goals, and that it will therefore be necessary to achieve additional significant GHG reductions from changed land use patterns and improved transportation.

SB 375 creates a new regional planning mechanism, the Sustainable Communities Strategy, which promotes high-density, transit-oriented development and creates incentives for specifically defined, high-density development projects. SB 375 requires multiple State and regional agencies to work cooperatively to establish regional GHG emissions reduction targets for 2020 and 2035. The CARB approved the final targets on

[12] Bay Area Air Quality Management District (BAAQMD), 2015. Bay Area Emissions Inventory Summary Report: Greenhouse Gases, Base Year 2011. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/emission-inventory/by2011_ghgsummary.pdf, accessed October 25, 2016.

February 15, 2011.[13] The primary means by which the GHG reduction targets are to be met is through adoption of a Sustainable Communities Strategy to be presented in the regional transportation plans of each of the 18 metropolitan planning organizations throughout California. Each Sustainable Communities Strategy must analyze the existing land use conditions; forecast expected population and employment growth; identify sufficient areas to accommodate the region's housing needs; and identify a transportation network to service the transportation needs of the region. Most importantly, it must "set forth a forecasted development pattern for the region, which, when integrated with the transportation network and other transportation measures and policies, will reduce GHG emissions from automobile and light trucks to achieve, if there is a feasible way to do so, the GHG emissions reduction targets approved by" the CARB.[14]

(6) Plan Bay Area

On July 18, 2013, the Association of Bay Area Governments and the Metropolitan Transportation Commission adopted Plan Bay Area, an integrated transportation and land use strategy through 2040, which serves as the nine-county Bay Area region's first long-range plan in compliance with the requirements of SB 375.[15] The Bay Area's target is a 7 percent per capita reduction in GHGs by 2020 and a 15 percent per capita reduction by 2035. Plan Bay Area is the region's first regional transportation plan subject to SB 375. Plan Bay Area identified a potential BART extension from the Dublin/Pleasanton BART Station (Dublin/Pleasanton Station) to Livermore as a Transportation Projects/Program in its Final Plan Bay Area Project List.[16]

Plan Bay Area will be superseded by Plan Bay Area 2040. A (final) draft of Plan Bay Area 2040 was published in July 2017.[17] The BART to Livermore extension is also listed as a Transportation Project in the project database for Plan Bay Area 2040.[18]

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[13] California Air Resources Board (CARB), 2011. Executive Order No. G-11-024, Relating to Adoption of Regional Greenhouse Gas Emission Reduction Targets for Automobiles and Light Trucks Pursuant to Senate Bill 375. Available at: http://www.arb.ca.gov/cc/sb375/executive_order_g11024.pdf, accessed October 25, 2016.

[14] California Government Code, Section 65080(b)(2).

[15] Association of Bay Area Governments (ABAG) and Metropolitan Transportation Commission (MTC), 2013. Plan Bay Area 2013. Available at: http://files.mtc.ca.gov/pdf/Plan_Bay_Area_FINAL/Plan_Bay_Area.pdf, accessed January 26, 2017.

[16] Ibid.

[17] Association of Bay Area Governments (ABAG) and Metropolitan Transportation Commission (MTC), 2017. Draft Plan Bay Area 2040 Released; Public Invited to Comment Online or at Open Houses. Available: http://www.planbayarea.org/news/news-story/draft-plan-bay-area-2040-released-public-invited-comment-online-or-open-houses, accessed April 13, 2017.

[18] Ibid.

(7) Senate Bills 1078, 107, X1-2, and 350 / Executive Order S-14-08

SB 1078 (Chapter 516, Statutes of 2002) requires retail sellers of electricity, including investor-owned utilities and community choice aggregators, to provide at least 20 percent of their supply from renewable sources by 2017. SB 107 (Chapter 464, Statutes of 2006) changed the target date to 2010. In November 2008, Governor Schwarzenegger signed Executive Order S-14-08, which expands the State's Renewables Energy Standard to include 33 percent renewable power in the retail seller's portfolios by 2020. In April 2011, Governor Jerry Brown signed SB X1-2, which created a legislative mandate codifying the 33-percent Renewables Portfolio Standard into law. In October 2015, Governor Jerry Brown signed SB 350, which requires retail sellers and publicly owned utilities to procure 50 percent of their electricity from eligible renewable energy sources by 2030.

Electricity service is provided within the Bay Area by Pacific Gas and Electric Company. Approximately 30 percent of the company's 2015 energy mix came from renewable energy sources that included wind, solar, biomass, small hydropower, and geothermal sources.[19]

(8) Executive Order B-16-2012

Executive Order B-16-2012 was issued in March 2012 and specifically focuses on reducing emissions from California's vehicle fleet. It directs that California achieve a 2050 target for GHG emissions reductions from the transportation sector equaling 80 percent less than 1990 levels. This would be accomplished by achieving benchmarks by 2020 and 2025 for advancements of zero-emissions vehicle infrastructure and technology advancement.

(9) Executive Order B-30-15 and Senate Bill 32

In April 2015, Governor Jerry Brown issued Executive Order B-30-15 to establish a GHG reduction target of 40 percent below 1990 levels by 2030. SB 32, which was passed in August 2016, codified the target. The CARB is moving forward with a second update to the Scoping Plan to reflect the 2030 target set in Executive Order B-30-15 and SB 32.[20]

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[19] Pacific Gas and Electric Company (PG&E), 2015. PG&E's 2015 Power Mix. Available at: https://www.pge.com/pge_global/common/pdfs/your-account/your-bill/understand-your-bill/bill-inserts/2016/11.16_PowerContent.pdf, accessed April 12, 2017.

[20] California Air Resources Board (CARB), 2017. AB 32 Scoping Plan. February 24. Available at: https://www.arb.ca.gov/cc/scopingplan/scopingplan.htm, accessed April 26, 2017.

(10) Assembly Bill 398

In July 2017, the California Legislature adopted AB 398, extending the AB 32 cap and trade program for GHG's to 2030. The Governor is expected to sign the bill.

(11) Other Mobile Source Reduction Requirements

Several other State provisions address the GHG emissions reduction targets set by the CARB for mobile sources, including trucks, passenger vehicles, trains, and ships. These measures include the following:

- Low Carbon Fuel Standard (Executive Order S-01-07)
- Advanced Clean Cars Program
- SmartWay Truck Efficiency Regulation
- AB 32 Cap-and-Trade Program as applicable to transportation fuel suppliers (17 California Code of Regulations, Sections 95800–96022)

c. Local Regulations

(1) Bay Area Air Quality Management District

For quantifying a project's GHG emissions, the BAAQMD recommends that all GHG emissions from a project be estimated, including a project's direct and indirect GHG emissions from operations. Emissions should be estimated in terms of CO_2e, a metric that accounts for the emissions of various GHGs based on their global warming potential. Expressing emissions in CO_2e considers the contributions of all GHG emissions to the greenhouse effect.

GHG emissions that would occur during construction should be quantified and disclosed, and an EIR should make a determination on the significance of these construction-generated GHG emissions impacts.

The BAAQMD's Clean Air Plan, adopted in September 2010, provides a comprehensive plan to improve Bay Area air quality and protect public health. The Clean Air Plan provides a control strategy to reduce ozone, particulate matter, air toxics, and GHGs. The 2017 Clean Air Plan was adopted by the BAAQMD Board on April 19, 2017. The 2017 Clean Air Plan includes a wide range of control measures, including improving fossil fuel combustion efficiency at oil refineries, power plants, and cement plants, reducing methane emissions from landfills and oil and gas production and distribution, advancing electrical vehicles, promoting clean fuels, supporting solar, and making new and existing buildings more energy efficient.

(2) BART's Wholesale Electricity Portfolio Policy

BART's Wholesale Electricity Portfolio Policy was adopted by the BART Board on April 27, 2017.[21] The goals of the policy are to support low and stable BART operating costs and maximum the use of low-carbon, zero-carbon, and renewable electricity. To maximize the use of this type of energy, BART would support state climate policies by prioritizing purchases from supply sources with very low or zero GHG emissions factors and support state renewable policies by prioritizing purchases from supplies that qualify as renewable under criteria set by state law. Performance measures include maintaining a long-term cost advantage compared to rates that BART would otherwise pay as a bundled utility customer, maintain per unit energy costs within BART's Short Range Transit Plan projections, and to achieve a portfolio that achieves the following:

- Has an average emissions factor no greater than 100 pounds of CO_2e per megawatt-hour during the period 2017 through 2024 (inclusive)
- Is from at least 50 percent eligible renewable sources and from at least 90 percent low- and zero-carbon sources by 2025
- Is 100 percent from zero-carbon sources by 2035
- Is 100 percent from eligible renewable sources by 2045

(3) BART's Sustainability Policy

BART updated its Sustainability Policy on April 27, 2017.[22] The goals of the Sustainability Policy are as follows:

1. Advance smart land use, livable neighborhoods, and sustainable access to transit
2. Choose sustainable materials, construction methods, and operations practices
3. Use energy, water, and other resources efficiently
4. Reduce harmful emissions and waste generation
5. Respond to risks from extreme weather, earthquakes, and other potential disruptions
6. Improve patron and employee health and experience

[21] San Francisco Bay Area Rapid Transit District (BART), 2017a. Wholesale Electricity Portfolio Policy. Available at: https://www.bart.gov/sites/default/files/docs/BART%20Wholesale%20Electricity%20Portfolio%20Policy%204.27.17.pdf, accessed June 15, 2017.

[22] San Francisco Bay Area Rapid Transit District (BART), 2017b. Sustainability Policy. Available at: https://www.bart.gov/sites/default/files/docs/BART%20Sustainability%20Policy%204.27.17.pdf, accessed June 15, 2017.

7. Serve as a leader in sustainability for transit agencies and the communities that BART serves by reducing BART's environmental footprint and encouraging other organizations and institutions to act similarly

BART plans to meet these goals by implementing the following GHG reduction and energy conservation methods: minimize ongoing maintenance and reduce waste; consider net embodied energy; incorporate efficient construction, deconstruction, and recycling practices; achieving 100 percent renewable energy; reducing energy use, water use, and consumption of other resources; designing new facilities to be resource efficient; powering non-electric facilities and vehicles with sources generating the lowest feasible greenhouse gas emissions and criteria air pollutants; reducing, reusing, and recycling materials; managing wastewater and stormwater comprehensively; and implementing programs for BART employees to decrease their environmental impact, among others.

4. Impacts and Mitigation Measures

This subsection lists the standards of significance used to assess impacts, discusses the methodology used in the analysis, describes the analysis scenarios, summarizes the impacts, and then provides an in-depth analysis of the impacts with mitigation measures identified as appropriate.

a. Standards of Significance

For the purposes of this EIR, impacts on GHG emissions are considered significant if the Proposed Project or one of the Alternatives would result in any of the following:

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

The State has not identified significance thresholds for GHG emissions from projects. The CARB released its draft interim CEQA threshold concepts for industrial, commercial, and residential projects for public comment in October 2008. However, the CARB has taken no further action on these draft concepts. Pursuant to SB 97 (2007), the Office of Planning and Research amended the State CEQA Guidelines regarding GHG analysis in 2010. These guidelines, however, do not identify specific numeric thresholds, but instead encourage each agency to develop and publish identifiable thresholds of significance supported by substantial evidence.

On June 2, 2010, the BAAQMD's Board of Directors unanimously adopted updated thresholds of significance for GHG emissions to assist in the review of projects under CEQA as part of a general revision of all of BAAQMD's thresholds of significance. The thresholds for evaluating health impacts were challenged in court and partially rejected, but the GHG thresholds are now in effect and are utilized in this EIR.

This analysis uses the significance thresholds for operational impacts published in the May 2017 BAAQMD CEQA Guidelines.[23] BAAQMD's approach to developing thresholds of significance for GHG emissions is to identify the emissions level for which a project would not be expected to substantially conflict with an applicable plan, policy, or regulation adopted to reduce GHG emissions. Although there is an inherent amount of uncertainty in deriving significance thresholds, the thresholds are based on BAAQMD's expertise, the best available data, and use conservative assumptions for the amount of emissions reductions from legislation. This approach is intended to attribute an appropriate share of GHG emissions reductions necessary for projects that are evaluated pursuant to CEQA to conform with applicable plans, policies, and regulation. If a project would generate operational GHG emissions above the threshold, the BAAQMD CEQA Guidelines consider the project to contribute substantially to a cumulative impact that is considered cumulatively significant.

The BAAQMD has adopted thresholds of significance for the operation of stationary sources and for projects other than stationary sources. The GHG threshold of significance for stationary sources is 10,000 metric tons (MT) of CO_2e per year. For projects other than stationary sources (such as the Proposed Project and Build Alternatives), a project is considered by BAAQMD to have a less-than-significant GHG impact if it (1) complies with a qualified GHG reduction strategy; (2) emits less than 1,100 MT CO_2e per year; or (3) emits less than 4.6 MT CO_2e per service population (residents plus employees) per year.

The BAAQMD has not adopted GHG thresholds of significance for construction. Instead, the BAAQMD recommends quantifying and disclosing GHG emissions that would occur during construction, and making a determination on the significance of the emissions impacts based on the achievement of reduction goals.[24] To compare the potential significance of construction GHG emissions, a two-tier approach is used in this EIR. First, if GHG emissions from construction would be less than the BAAQMD significance threshold for operational-related GHG emissions, GHGs emitted during construction are considered less than significant. However, if construction GHG emissions exceed BAAQMD's operational GHG significance threshold, a second step is used. For this second step, construction GHG emissions for the project are compared to the project's annual operational GHG emissions. If the increase in construction GHG emissions would be offset

[23] Bay Area Air Quality Management District (BAAQMD), 2017. California Environmental Quality Act Air Quality Guidelines. May. Available at: http://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en. accessed June 30, 2017.

[24] Ibid.

by a decrease in operational GHG emissions over the operational life of the project, then the project's construction GHG impacts are considered less than significant.

b. Impact Methodology

The methodology used to evaluate the significance of GHG emissions impacts is described below. The EMU Option would result in different energy requirements than the DMU Alternative, and is therefore discussed separately for each impact.

The Proposed Project and Build Alternatives would each have direct and indirect sources of GHG emissions. Direct GHG emissions changes (increases or decreases) would occur from sources that are included in the Proposed Project or a Build Alternative (i.e., emissions from DMU vehicles or bus vehicles, including feeder buses that are part of the Proposed Project, DMU Alternative, and Express Bus/BRT Alternative). Indirect GHG emissions changes would occur when GHG emissions are emitted by sources that are not themselves part of the Proposed Project or a Build Alternative (i.e., emissions from electricity used for train operations, reductions in emissions from passenger vehicles due to drivers and passengers switching to transit, or increases in emissions related to water and wastewater treatment).

GHG emissions estimates used in this analysis for the Proposed Project and Alternatives are based on data provided in Appendix H, Air Quality Technical Tables, and Appendix I.2, Energy and GHG Calculations.

As described in the Existing Conditions subsection above, units of CO_2e are commonly used to express emissions of GHGs and are used in the impacts discussion for ease of comparison between the Proposed Project and Build Alternatives. The assumptions and information used to estimate direct and indirect GHG emissions are described for construction and operations below.

(1) Construction

GHG emissions from construction include emissions from on-road vehicles and off-road equipment. On-road vehicle defaults from CalEEMod, version 2013.2.2, regarding trip lengths and project specific assumptions for vendor, hauling, and worker trip rates were used to calculate emissions. Worker trips were adjusted to account for carpool and public transportation rates. Diesel demand for on-road trucks is derived from EMFAC2014. Emissions of GHGs from off-road vehicles/equipment is calculated based on total horsepower-hours and EPA diesel fuel factors.[25]

[25] United States Environmental Protection Agency, 1996. AP-42, Fifth Edition, Volume 1, Chapter 3.4. Large Stationary Diesel and All Stationary Dual-fuel Engines. October.

(2) Operational Emissions

Under the Proposed Project and Build Alternatives, GHGs would be emitted during operation and maintenance of trains, stations, and associated infrastructure and support facilities. The sources of GHGs are described below for (1) transit operations, followed by (2) station and maintenance operations.

In addition, the Proposed Project and Build Alternatives would result in the reduction of GHG emissions from passenger vehicles due to decreased passenger VMT as more people take transit. Also, for the Proposed Project, DMU Alternative, and EMU Option, generation of renewable energy via a solar photovoltaic system at the proposed Isabel Station would help offset indirect GHG emissions that would otherwise be produced by electricity generation from off-site sources to meet project operational demand. These reductions are also described below.

(a) Transit Operations

Transit operations include BART trains, DMU vehicles, EMU vehicles, and bus operations as identified for the Proposed Project and Build Alternatives below.

- **BART Car Miles (Proposed Project, DMU Alternative, EMU Option, and Express Bus/BRT Alternative).** BART train use would result in indirect emissions of GHGs from off-site electricity generation due to the electricity used for train operations. BART traction power electricity demand is calculated from annual total BART car miles traveled and an electricity demand factor of 4.51 kilowatt-hours (kWh) per car mile, based on 2006 data.[26] However, the use of this electricity demand factor is conservative, as the current BART traction electricity demand factor is lower—4.30 kWh per car mile (as of 2015).[27] The annual total BART car miles traveled is the sum of the distance traveled for every BART car per year.

  The Proposed Project would result in additional BART car miles associated with the following: (1) the approximately 5.5-mile extension of BART service to the proposed Isabel Station; and (2) the increased BART car miles systemwide due to the increased ridership anticipated under the Proposed Project. On the other hand, the DMU Alternative, EMU Option, and Express Bus/BRT Alternative would only have increased BART car miles associated with increased systemwide ridership, due to the increased access to the BART system that these alternatives would provide. Under the Enhanced Bus Alternative, the number of BART car miles traveled for BART operations would be

[26] The electricity demand factor for BART cars is based on the 2006 BART systemwide traction power electricity divided by annual BART car miles.

[27] Dean, Donald, Environmental Coordinator, San Francisco Bay Area Rapid Transit District, 2017. Email communication with Urban Planning Partners, Inc. April 12.

equivalent to the number of BART car miles for the No Project Conditions; therefore, there would be no change in BART car miles.

- **DMU Vehicle Miles (DMU Alternative).** Operation of the DMU vehicles would result in direct GHG emissions associated with diesel fuel combustion, and to a lesser degree, indirect GHG emissions from off-site electricity generation associated with electricity use during train idling. DMU diesel demand is calculated from annual revenue DMU car miles. A two-car DMU train would consume approximately 9 kWh per mile traveled (running) and 0.88 kWh per idle minute, plus approximately 0.725 gallons of diesel per mile traveled.[28] The DMU energy use rates were adjusted to account for the project-specific assumption of four DMU cars per train, 11.4 miles traveled per round-trip, and 12 minutes of idling per round-trip. Based on these project-specific parameters, the DMU energy use rates are estimated to be 0.478 gallons of diesel per car mile and 2.5 kWh per idle minute. The DMU is expected to use electricity for idling energy needs; the idling electricity intensity factors for CO_2e are 97 pounds per megawatt-hour (see Appendix H).
- **EMU Vehicle Miles (EMU Option).** Operation of the EMU vehicles would result in indirect GHG emissions from off-site electricity generation, associated with the electricity use for train operations. EMU vehicle traction power electricity is calculated from annual revenue miles of EMU car miles and round trips. The EMU vehicle would have an electricity demand factor of approximately 8.6 kWh per mile traveled (running) and 0.88 kWh per idle minute (see Appendix H). The EMU energy use rates were modified to account for the project-specific assumptions of four EMU cars per train, 11.4 miles traveled per round-trip, and 12 minutes of idling per round-trip. Based on these project-specific parameters, the EMU energy use rates are estimated to be 4.3 kWh per car mile and 1.8 kWh per idle minute. EMU operations electricity intensity factors for CO_2e are 97 pounds per megawatt-hour.
- **Bus Miles (Proposed Project and Build Alternatives).** Bus use would result in direct GHG emissions, associated with diesel fuel combustion. Operational bus emissions are calculated based on total bus trips and vehicle miles for service to the proposed Isabel Station. The analysis assumed that each bus trip includes 5 minutes of idling. Diesel demand for buses is derived from EMFAC2014 daily fuel use in Alameda County for 2025 and 2040. The buses operated by the Livermore-Amador Valley Transit Authority (LAVTA) are hybrid-diesel models and consume 15 percent less fuel than standard

[28] LTK Engineering Services, 2008. eBART Phase I Project to Hillcrest Terminal: DMU and LRV Comparison. May 14.

diesel buses (per manufacturer specifications).[29, 30] Therefore, the diesel demand for buses was reduced by 15 percent to account for the hybrid-diesel bus models operated by LAVTA.

Table 3.L-2 presents the net change in miles and/or trips from transit operations listed above.

(b) Station and Maintenance Operations

Station and maintenance area operational GHG emissions include station electricity use, emergency generator testing and maintenance, water use, wastewater treatment, solid waste disposal, maintenance of BART vehicles and DMU/EMU vehicles, and other activities at the storage and maintenance facility, including use of maintenance trucks and forklifts and employee shuttle vans.

- **Proposed Isabel Station Electricity (Proposed Project, DMU Alternative, and EMU Option).** Electricity use at the proposed Isabel Station would result in indirect GHG emissions due to off-site electricity generation. Electricity consumption at the proposed Isabel Station was conservatively assumed to be similar to the electricity use at the Dublin/Pleasanton Station and station parking lot, an existing, comparable BART station.[31] This represents a conservative estimate of electricity use as the proposed Isabel Station and garage is anticipated to be more energy-efficient than the Dublin/Pleasanton Station due to the current building codes that require greater energy conservation (e.g., Title 24).[32]

[29] Peterson, Lee, 2017. Personal communication from Lee Peterson, Gillig, LLC with Aubrey Jones, Ramboll Environ. April 21.

[30] Approximately 90 percent of the buses in the model are assumed to be LAVTA buses under the Proposed Project and DMU Alternative and 100 percent are assumed to be LAVTA buses under the Express Bus/BRT Alternative and Enhanced Bus Alternative.

[31] Electricity use is based on a 3-year annual average (2012 to 2014) for the Dublin/Pleasanton Station.

[32] GHG emissions from electricity are conservatively calculated based on the gross electricity produced prior to electricity losses from the grid. Electricity transmission and distribution losses average about 5 percent of the electricity that is transmitted and distributed in the United States.

United States Energy Information Administration (USEIA), 2017. Frequently Asked Questions: How much electricity is lost in transmission and distribution in the United States? Available at: https://www.eia.gov/tools/faqs/faq.php?id=105&t=3, accessed June 15, 2017.

TABLE 3.L-2 NET CHANGE IN BART CAR MILES, DMU/EMU MILES, AND BUS MILES FOR 2025 AND 2040 PROJECT AND CUMULATIVE CONDITIONS

	BART Car Miles	DMU/EMU Miles	Bus Miles
2025			
Conventional BART Project	2,895,844	--	379,117
DMU Alternative (EMU Option is the same)	558,771	776,400	379,117
Express Bus/BRT Alternative	111,839	--	354,876
Enhanced Bus Alternative	--	--	235,016
2040			
Conventional BART Project	3,561,913	--	379,117
DMU Alternative (EMU Option is the same)	1,150,063	864,100	379,117
Express Bus/BRT Alternative	479,770	--	354,876
Enhanced Bus Alternative	--	--	235,016

Notes: -- = Not applicable or no change.
Change in BART car miles, DMU/EMU miles, and bus miles is the net change between the Proposed Project (or Alternative) and No Project Conditions for the specified year (2025 or 2040).
Source: Connetics Transportation Group, 2017.

- **Emergency Generators (Proposed Project, DMU Alternative, and EMU Option).** Combustion of diesel fuel for the emergency generators would result in direct GHG emissions. An approximately 2,500-kilowatt emergency generator would be located at the Isabel Station, and an approximately 500-kilowatt emergency generator would be located at the storage and maintenance facility. This analysis assumes that operation for routine maintenance and testing for the emergency generator at Isabel Station would not exceed 24 hours per year. For the emergency generator at the storage and maintenance facility, this analysis assumes that operation for routine maintenance and testing would not exceed 50 hours per year.
- **Water and Wastewater (Proposed Project and Build Alternatives).** Water use and wastewater generation would result in indirect GHG emissions from off-site electricity generation. Energy use related to water and wastewater consists of upstream electricity to supply, treat, and distribute water and downstream electricity to treat wastewater. Water use and wastewater generation would result from the stations (the Dublin/Pleasanton Station and the proposed Isabel Station), the storage and maintenance facility activities, and wayside facilities, as outlined in Section 3.P,

Utilities (see **Impact UTIL-5**).[33] For this analysis, water use and wastewater and solid waste generation are conservatively assumed to be the same in 2025 as 2040. GHG emissions from water use and wastewater generation are calculated consistent with CalEEMod, version 2013.2.2, for Alameda County.

- **Solid Waste (Proposed Project and Build Alternatives).** Solid waste disposal would be an indirect source of GHG emissions. Landfill emissions were conservatively estimated for the total disposed waste amount (i.e., even recyclable material was conservatively assumed to emit GHGs, although it would be recycled rather than sent to a landfill). Solid waste is assumed to be generated at the Dublin/Pleasanton Station and proposed Isabel Station and the storage and maintenance facility, as outlined in Section 3.P, Utilities (see **Impact UTIL-6**). Solid waste landfill GHG emissions are calculated consistent with CalEEMod, version 2013.2.2, for Alameda County.
- **Maintenance of BART cars and DMU/EMU vehicles (Proposed Project, DMU Alternative, EMU Option, and Express Bus/BRT Alternative).**[34] Electricity would be required for the maintenance of BART, DMU, and EMU vehicles, and the demand for electricity would result in indirect GHG emissions from off-site electricity generation. A maintenance factor of 7,060 British thermal units per car/vehicle mile was applied to the annual miles to determine total electricity usage for maintenance activities.[35] Maintenance of BART cars would occur at the storage and maintenance facility under the Proposed Project. For the other alternatives, maintenance of the BART cars associated with the increase in BART car miles traveled would occur at existing BART maintenance facilities.
- **Other Activities at the Storage and Maintenance Facility (Proposed Project, DMU Alternative, and EMU Option).** Activities associated with the storage and maintenance facility, specifically maintenance truck and forklift use, as well as shuttle vans for transporting BART employees to the proposed Isabel Station (under the Proposed Project only), would result in both direct and indirect GHG emissions (direct emissions from diesel fuel combustion and indirect emissions from off-site electricity generation

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[33] In addition to the water use described in Section 3.P, Utilities for water consumption in the study area, this analysis accounts for use of water outside the study area related to maintenance/cleaning of the additional BART cars required for the DMU Alternative and Express Bus/BRT Alternative that would be maintained at existing BART maintenance facilities, under these alternatives.

[34] Under the Enhanced Bus Alternative, the number of BART car miles traveled for BART operations are equivalent to the number of BART car miles for No Project Conditions (i.e., there would be no change in BART car miles).

[35] A British thermal unit is a traditional unit of heat. Maintenance factor from Table E-13, Caltrans Energy and Transportation Systems (1983).

California Department of Transportation (Caltrans), 1983. Energy and Transportation Systems. July. Available: http://www.dot.ca.gov/hq/env/air/documents/energytranssystems_ocr.pdf, accessed June 15, 2017.

for electricity use). Off-road maintenance trucks would also be used at the storage and maintenance facility. Project-specific assumptions for the trucks are as follows: approximately 8,030 annual VMT and 10 minutes of idling per day, per vehicle. Diesel demand for off-road trucks is derived from EMFAC2014 daily fuel use in Alameda County for 2025 and 2040. Two electric forklifts are assumed to be used at the storage and maintenance facility 365 days a year for 8 hours a day. Horsepower and load factors used are industrial averages and air quality model defaults from CalEEMod, respectively. In addition, one shuttle van will be used at the maintenance yard for the Proposed Project and is assumed to travel 20 miles per day and idle for 40 minutes per day.

(c) Emissions Reductions

Reductions in GHG emissions during operation would result from two activities. First, passenger VMT will be reduced due to the increased transit ridership from project implementation. Second, there will be a reduced demand for off-site electricity due to on-site electricity generation from a solar photovoltaic system at the proposed Isabel Station, as identified for the Proposed Project and Build Alternatives below. This will cause a reduction in GHG emissions for certain scenarios as a corresponding amount of GHG emissions from off-site electricity generation will no longer be occurring.

- **Reduced Passenger Vehicle VMT (Proposed Project and Build Alternatives).** Reductions in regional passenger VMT would occur as a result of the mode switch from passenger vehicles to transit thus causing reductions in GHG emissions, as shown in Table 3.L-3. Gasoline and diesel demand for passenger vehicles is derived from EMFAC2014 for daily fuel use in Alameda County for 2025 and 2040. A gallon-per-mile use factor was determined and applied to project specific VMT estimates. Electricity used in passenger vehicles was derived from the U.S. Department of Energy's 2016 Fuel Economy Guide.[36]
- **Solar Photovoltaic (Proposed Project, DMU Alternative, and EMU Option).** A solar photovoltaic system with a capacity of 1,000 kilowatts is assumed to be installed at the proposed Isabel Station. It is assumed to start operation in 2025, with a conservative 1 percent annual degradation in performance for every year thereafter. This system would provide on-site electricity to the Proposed Project, DMU Alternative, and EMU Option. This would reduce the demand for electricity generated at off-site power plants, and thus would reduce indirect GHG emissions from generating that electricity. Electricity generation was estimated using the National Renewable Energy

[36] Department of Energy (DOE), 2017. Model Year 2016 Fuel Economy Guide. April 25. Available at: https://www.fueleconomy.gov/feg/pdfs/guides/FEG2016.pdf, accessed April 26, 2017.

Laboratory's PVWatts Calculator.[37] Electricity generation is based on a roof-array using default assumptions and weather conditions typical of Livermore, California.

TABLE 3.L-3 NET CHANGE IN PASSENGER VEHICLE MILES TRAVELED

	Annual VMT		Average Daily VMT	
	2025	**2040**	**2025**	**2040**
Project Conditions				
Conventional BART Project	-38,250,574	-73,770,403	-128,000	-246,000
DMU Alternative (EMU Option is the same)	-28,578,215	-42,745,966	-95,000	-142,000
Express Bus/BRT Alternative	-13,357,023	-28,586,697	-45,000	-95,000
Enhanced Bus Alternative	-75,668	-2,722,388	-300	-9,000
Cumulative Conditions				
Conventional BART Project	-32,649,225	-82,390,212	-109,000	-275,000
DMU Alternative (EMU Option is the same)	-21,858,079	-49,924,896	-73,000	-166,000
Express Bus/BRT Alternative	-19,509,613	-34,691,838	-65,000	-116,000
Enhanced Bus Alternative	-8,705,948	-8,834,264	-29,000	-29,000

Notes: VMT = vehicle miles traveled
Change in annual VMT or average daily VMT is the difference between No Project Conditions and Project Conditions (or Cumulative Conditions). Negative values represent a decrease in VMT.
Source: Cambridge Systematics, 2017.

c. No Project Conditions

The 2025 No Project Conditions and 2040 No Project Conditions are described below. Under the 2025 and 2040 No Project Conditions, the Proposed Project and Build Alternatives would not be built. However, emissions of GHGs in the study area would result from new land use development and existing infrastructure. This would include the use of passenger vehicles and a continued increase in annual VMT in the study area and associated consumption of diesel fuel, gasoline, and electricity.

For 2025 and 2040, the project impacts are evaluated against No Project Conditions. Thus, the 2025 Proposed Project and Build Alternatives are evaluated against 2025 No Project Conditions and the 2040 Proposed Project and Build Alternatives are evaluated

[37] National Renewable Energy Laboratory (NREL), 2016. PVWatts Calculator. Available at: http://pvwatts.nrel.gov/, accessed November 7, 2016.

against 2040 No Project Conditions. See Section 3.B, Transportation, for additional details related to No Project Conditions.

(1) No Project 2025 Conditions

2025 No Project Conditions for GHGs and climate change assumes the growth-induced traffic volumes between the existing conditions and 2025 as determined in the transportation modeling.

(2) No Project 2040 Conditions

2040 No Project Conditions for GHGs and climate change assumes the growth-induced traffic volumes between the existing conditions and 2040 as determined in the transportation modeling.

d. Summary of Impacts

Table 3.L-4 summarizes the impacts of the Proposed Project and Alternatives described in the analysis below.

TABLE 3.L-4 SUMMARY OF GREENHOUSE GAS EMISSIONS IMPACTS

	Significance Determinations[a]				
Impacts	**No Project Alternative**	**Conventional BART Project**	**DMU Alternative (with EMU Option)**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Construction					
Project Analysis					
Impact GHG-1: Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, during construction	NI	LS	LS	LS	LS
Cumulative Analysis					
Impact GHG-2(CU): Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds during construction under Cumulative Conditions	NI	NI	NI	NI	LS

TABLE 3.L-4 SUMMARY OF GREENHOUSE GAS EMISSIONS IMPACTS

	Significance Determinations[a]				
Impacts	**No Project Alternative**	**Conventional BART Project**	**DMU Alternative (with EMU Option)**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Operational					
Project Analysis (2025 and 2040)					
Impact GHG-3: Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, or conflict with plans, policies, or regulations that reduce GHG emissions, under 2025 Project Conditions	NI	B	B	B	LSM
Impact GHG-4: Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, or conflict with plans, policies, or regulations that reduce GHG emissions, under 2040 Project Conditions	S	B	B	B	LS
Cumulative Analysis (2025 and 2040)					
Impact GHG-5(CU): Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, or conflict with plans, policies, or regulations that reduce GHG emissions, under 2025 Cumulative Conditions	NI	B	B	B	B
Impact GHG-6(CU): Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, or conflict with plans, policies, or regulations that reduce GHG emissions under 2040 Cumulative Conditions	S	B	B	B	B

Notes: BAAQMD = Bay Area Air Quality Management District; GHG = greenhouse gas.
NI=No impact; B=Beneficial impact; LS=Less-than-Significant impact, no mitigation required; LSM=Less-than-Significant impact with mitigation; S= Significant impact of No Project Alternative (mitigation is inapplicable).
[a] All significance determinations listed in the table assume incorporation of applicable mitigation measures.

e. Environmental Analysis

Impacts pertaining to project construction are described below, followed by operations-related impacts.

(1) Construction Impacts

Potential impacts related to project construction are described below, followed by cumulative construction impacts.

(a) Construction – Project Analysis

Impact GHG-1: Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, during construction.

(No Project Alternative: NI; Conventional BART Project: LS; DMU Alternative: LS; EMU Option: LS; Express Bus/BRT Alternative: LS; Enhanced Bus Alternative: LS)

No Project Alternative. Under the No Project Alternative, the BART to Livermore Extension Project would not be implemented and there would be no physical changes in the environment associated with construction of the Proposed Project or any of the Build Alternatives. However, planned and programmed transportation improvements for segments of Interstate Highway (I-) 580, local roadways and intersections, and core transit service improvements for BART, Altamont Corridor Express, and LAVTA would be constructed. In addition, population and employment increases throughout Alameda County would result in continued land use development, including both residential and commercial. Construction of these improvements and development projects could generate GHG emissions from construction. However, the effects of the other projects associated with the No Project Alternative have been or will be addressed in environmental documents prepared for those projects before they are implemented, and the No Project Alternative would not result in new impacts as a consequence of the BART Board of Directors' decision not to adopt a project. Therefore, the No Project Alternative is considered to have no impacts related to GHG emissions during construction. **(NI)**

Conventional BART Project and Build Alternatives. Table 3.L-5 presents the GHG emissions from construction of the Proposed Project and Build Alternatives. Emissions of GHG during construction are categorized by off-road and on-road vehicle sources. Off-road equipment anticipated to be needed for the construction of the Proposed Project and Build Alternatives include excavators, dozers, compactors, loaders, dump trucks, scrapers, graders, pavers, vibrator compactors, pile drivers, forklifts, cranes, air compressors, and generators. Details regarding the estimated off-road equipment and usage hours are listed in Table 2 in Appendix H of this EIR. On-road vehicles include vendors, truck hauling, and worker vehicles. Estimated VMT from on-road construction vehicles are presented in Table 4 in Appendix H of this EIR.

TABLE 3.L-5 GHG EMISSIONS FROM CONSTRUCTION OF PROPOSED PROJECT AND BUILD ALTERNATIVES

	CO_2e (MT)			
	Conventional BART Project	**DMU Alternative (or EMU Option)**	**Express Bus/ BRT Alternative**	**Enhanced Bus Alternative**
Sources				
Off-Road Vehicles/Equipment	5,337	2,867	706	92
On-Road Vehicles	5,682	6,591	2,118	189
Total Construction Emissions	**11,019**	**9,458**	**2,824**	**281**
Summary				
Average Annual Construction Emissions	**2,755**	**2,365**	664	281
BAAQMD Operational GHG Significance Threshold	1,100	1,100	1,100	1,100
Exceed BAAQMD Significance Threshold	**Yes**	**Yes**	No	No

Notes: CO_2e = carbon dioxide equivalent; MT = metric tons. **Bold**/gray values exceed thresholds. Construction activities are annualized as follows: Proposed Project, DMU Alternative, and EMU Option over approximately 4 years; Express Bus/BRT Alternative over approximately 4.25 years; and Enhanced Bus Alternative over approximately 2 months.

As described in the Standards of Significance subsection above, BAAQMD has not adopted GHG thresholds of significance for construction. Therefore, this analysis uses a two-tier approach as follows: (1) construction GHG emissions are compared to the BAAQMD significance threshold for operational-related GHG emissions, and if emissions are less than the threshold, there is no impact; and (2) if emissions exceed BAAQMD's operational significance threshold, construction GHG emissions are then compared to the project's annual operational GHG emissions. Construction GHG emissions that are offset by a decrease in operational GHG emissions within only a few years of operation, are considered less than significant.

Due to the type of off-road construction equipment, duration of construction activities, and total VMT by on-road vehicles during construction, the Proposed Project would emit the greatest amount of CO_2e during the construction phase compared to the other alternatives (approximately 11,019 MT CO_2e). Of that total, 5,337 MT CO_2e would be from off-road vehicles and 5,682 MT CO_2e would be from on-road vehicles. While construction and start-up of the Proposed Project would occur over approximately 5 years, the majority of the construction activities resulting in emissions would occur over approximately 4 years. Therefore, the average annual CO_2e emissions during construction would be approximately 2,755 MT CO_2e (total emissions conservatively averaged over the 4-year construction period).

Construction of the DMU Alternative would emit approximately 9,458 MT CO_2e. Construction for the EMU Option would have the same emissions; therefore, it is not described separately here. Construction of the DMU Alternative would result in total emissions of 2,867 MT CO_2e from off-road vehicles and 6,591 MT CO_2e from on-road vehicles. Similar to the Proposed Project, construction emissions are conservatively averaged over the approximately 4-year construction period. Therefore, average annual CO_2e emissions would be approximately 2,365 MT CO_2e per year.

The Express Bus/BRT Alternative would emit approximately 2,824 MT CO_2e during construction. For the Express Bus/BRT Alternative, 706 MT CO_2e would be released from off-road vehicles and 2,118 MT CO_2e from on-road vehicles. While construction and start-up of the Express Bus/BRT Alternative would occur over approximately 5 years, the majority of the construction activities resulting in emissions would occur over approximately 4.25 years. Therefore, the average annual CO_2e emissions for construction of the Express Bus/BRT Alternative (over 4.25 years) would be 664 MT CO_2e per year.

The Enhanced Bus Alternative would emit approximately 281 MT CO_2e during construction, with 92 MT CO_2e from off-road vehicles and 189 MT CO_2e from on-road vehicles. The Enhanced Bus Alternative would involve limited construction activities over approximately 2 months.

As shown in Table 3.L-5, construction-related GHG emissions from the Express Bus/BRT Alternative and Enhanced Bus Alternative would be less than the BAAQMD operational GHG significance threshold. However, construction-related GHG emissions from the Proposed Project, the DMU Alternative, and the EMU Option would be above the BAAQMD operational GHG significance threshold. Therefore, these emissions are compared to the net decrease in GHG emissions during operations to determine significance.

As shown in Table 3.L-6, GHG emissions from construction of the Proposed Project, the DMU Alternative, and the EMU Option, would be offset within a few years of operation of the Proposed Project, DMU Alternative, or EMU Option. Starting from the opening year (2025), GHG emissions from construction of the Proposed Project would be offset by the reduction in GHG emissions from operations in approximately 1.5 years (in 2026), GHG emissions from construction activities for the DMU Alternative would be offset in approximately 3.1 years (in 2028), GHG emissions from construction of the EMU Option would be offset in approximately 1.8 years (in 2026), and GHG emissions from construction of the Express Bus/BRT Alternative would be offset in approximately 1.7 years (in 2026). The duration to offset the GHG emissions is within only a few years of operation of the Proposed Project, DMU Alternative, the EMU Option, and Express Bus/BRT Alternative. Construction GHG emissions from the Enhanced Bus Alternative would not be offset during operations as there is no net reduction in operational GHG emissions from the Enhanced Bus Alternative in 2025 or in 2040; however, emissions from the Enhanced Bus Alterative are below the BAAQMD operational GHG significance threshold.

TABLE 3.L-6 TIME TO OFFSET CONSTRUCTION GHG EMISSIONS DUE TO OPERATIONAL EMISSION REDUCTIONS

	Conventional BART Project	DMU Alternative	EMU Option	Express Bus/BRT Alternative	Enhanced Bus Alternative
Total Construction Emissions (MT CO_2e)	11,019	9,458	9,458	2,824	281
Annual Operational Emissions starting in 2025 (MT CO_2e)	-7,115	-3,021	-5,254	-1,696	1,398
Time to Offset Construction Emissions (Years)	1.5	3.1	1.8	1.7	-- [a]

Notes: -- = not applicable; CO_2e = carbon dioxide equivalent; MT = metric tons.
Time to offset construction emissions is calculated by dividing the quantity of construction emissions by the absolute value of the reduction in operational emissions for the Proposed Project or alternative in 2025.
[a] Construction GHG emissions from the Enhanced Bus Alternative would not be offset from a reduction in operational emissions.

Therefore, because construction-related GHG emissions would either be below the BAAQMD operational GHG significance threshold (for the Express Bus/BRT Alternative and Enhanced Bus Alternative) and/or would be offset within a few years of operation due to reduced total operational GHG emissions (for the Proposed Project, DMU Alternative, EMU Option, and Express Bus/BRT Alternative), the GHG emissions associated with the construction of the Proposed Project and Build Alternatives would be considered less than significant. **(LS)**

Mitigation Measures. As described above, the Proposed Project and Alternatives would not result in significant construction impacts related to GHG emissions, and no mitigation measures are required.

(b) Construction – Cumulative Analysis

The geographic study area for the cumulative construction analysis is the same as the study area for the project analysis, described in the Introduction subsection above.

Consistent with CEQA requirements, this Draft EIR considers the direct impact of GHG emissions from the Proposed Project and Build Alternatives, together with the effects of past, present, and probable future projects that cause or contribute cumulatively to GHG emissions. For purposes of the GHG emissions analysis, as described in Section 3.A, Introduction to Environmental Analysis and Appendix E, these cumulative projects include the Isabel Neighborhood Plan (INP) and the Dublin/Pleasanton Station Parking Expansion project (for the Proposed Project and DMU Alternative), or the Dublin/Pleasanton Station Parking Expansion alone (for the Express Bus/BRT and Enhanced Bus Alternatives), in addition to the projections provided in Plan Bay Area.[38]

Impact GHG-2(CU): Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, during construction under Cumulative Conditions.

(No Project Alternative: NI; Conventional BART Project: NI; DMU Alternative: NI; EMU Option: NI; Express Bus/BRT Alternative: NI; Enhanced Bus Alternative: NI)

No Project Alternative. As described in **Impact GHG-1** above, the No Project Alternative would have no impacts related to GHG emissions during construction. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project and Build Alternatives. The effects of climate change and GHG emissions are generally considered at a global scale. Each of the cumulative projects would be required to undergo their own CEQA analysis and assess and disclose their GHG emissions from construction. Furthermore, while construction of the Proposed Project, DMU Alternative, EMU Option, and Express Bus/BRT Alternative would result in GHG emissions, as presented in Table 3.L-6, these emissions would be offset by the decrease in operational emissions over time, and would result in a net zero contribution to GHG emissions within approximately 3.1 years or less of commencement of project operation. Thus, over the life of the project, the Proposed Project, DMU Alternative, EMU Option, and Express Bus/BRT Alternative would result in a net decrease in GHG emissions and a net zero contribution to cumulative impacts related to GHG emissions during construction. **(NI)**

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[38] Association of Bay Area Governments (ABAG) and Metropolitan Transportation Commission (MTC), 2017. Draft Plan Bay Area 2040 Released; Public Invited to Comment Online or at Open Houses. Available: http://www.planbayarea.org/news/news-story/draft-plan-bay-area-2040-released-public-invited-comment-online-or-open-houses, accessed April 13, 2017.

Enhanced Bus Alternative. As described above, construction of the Enhanced Bus Alternative would result in emissions of 281 MT CO_2e. These emissions would not be offset by operation of the Enhanced Bus Alternative because the bus operations also would result in increased GHG emissions. However, emissions from the construction of the Enhanced Bus Alternative would be less than the BAAQMD operational significance threshold. According to BAAQMD's CEQA Guidelines, if annual emissions of operational-related GHG emissions do not exceed the operational threshold levels, the proposed project does not result in a cumulatively considerable contribution of GHG emissions. If that is the case for ongoing annual operational emissions over the lifetime of a project then short-term construction emissions below the same threshold can be similarly treated as less than cumulatively considerable. Therefore, the Enhanced Bus Alternative would not contribute to cumulative impacts related to GHG emissions during construction, and in combination with past, present, or probable future projects, would result in significant cumulative construction impacts related to GHG emissions. **(LS)**

Mitigation Measures. As described above, the Proposed Project and Build Alternatives, in combination with past, present, or probable future projects, would not result in significant cumulative construction impacts related to GHG emissions, and no mitigation measures are required.

(2) Operational Impacts

Potential impacts related to project operations are described below, followed by cumulative operations impacts.

(a) Operations – Project Analysis

Potential impacts related to project operations for opening year 2025 are described first, followed by impacts for the horizon year 2040.

Impact GHG-3: Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, or conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions, under 2025 Project Conditions.

(No Project Alternative: NI; Conventional BART Project: B; DMU Alternative: B; EMU Option: B; Express Bus/BRT Alternative: B; Enhanced Bus Alternative: LSM)

The change between 2025 No Project Conditions and the 2025 Project Conditions represents the net emissions increase or decrease attributed to the Proposed Project or an alternative. Table 3.L-7 shows the annual change in GHG emissions from the operation of the Proposed Project and Build Alternatives in 2025.

TABLE 3.L-7 CHANGE IN ANNUAL GHG EMISSIONS UNDER 2025 PROJECT CONDITIONS

	Metric Tons of CO_2e Per Year				
Emission Component	**Conventional BART Project**	**DMU Alternative**	**EMU Option**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Sources					
Transit Operations					
BART Operations[a]	576	111	111	22	--
DMU Operations	--	2,404	--	--	--
EMU Operations	--	--	171	--	--
Bus Operations	1,251	1,251	1,251	1,528	1,369
Station and Maintenance Operations					
Station Electricity	126	126	126	--	--
Emergency Generator	60	60	60	--	--
Water and Wastewater	9	7	7	3	1
Solid Waste	447	231	231	103	52
BART Car Maintenance	87	17	17	3	--
DMU/EMU Car Maintenance	--	23	23	--	--
Employee Shuttle Vans	5	--	--	--	--
Maintenance Trucks	5	5	5	--	--
Electric Forklifts	4	4	4	--	--
Subtotal Sources	*2,570*	*4,239*	*2,006*	*1,659*	*1,422*
Reductions					
Passenger Vehicles (Reduced VMT)	-9,616	-7,191	-7,191	-3,355	-24
Solar Photovoltaic Electricity Generation	-69	-69	-69	--	--
Subtotal Reductions	*-9,685*	*-7,260*	*-7,260*	*-3,355*	*-24*
Summary					
Total Emissions	**−7,115**	**−3,021**	**−5,254**	**−1,696**	**1,398**
BAAQMD Significance Threshold	**1,100**	**1,100**	**1,100**	**1,100**	**1,100**
Exceed Threshold?	**No**	**No**	**No**	**No**	**Yes**

Notes: CO_2e = carbon dioxide equivalent; VMT = vehicle miles traveled.
Emissions are shown as the change between 2025 No Project Conditions and 2025 Project Conditions. Positive values represent an increase in GHG emissions and negative values represent a decrease in GHG emissions.
[a] GHG emissions for BART Operations are from the additional BART cars needed to support the ridership for each alternative.

No Project Alternative. The 2025 No Project Alternative is the same as baseline conditions (i.e., 2025 No Project Conditions). Therefore, the 2025 No Project Alternative would have no impacts related to GHGs. **(NI)**

Conventional BART Project. In 2025, the Proposed Project would result in a net decrease of 7,115 MT CO_2e annually compared to 2025 No Project Conditions. While the Proposed Project would increase emissions by 2,570 MT CO_2e annually, this would be offset by a reduction in emissions of 9,685 MT CO_2e associated with the reduced passenger VMT associated with increased BART ridership and the energy produced by the solar photovoltaic cells installed at the Isabel Station. Therefore, overall GHG emissions would be reduced. Table 3.L-7 shows the GHG emissions from the operation of the Proposed Project in 2025. The emissions and emissions reductions are explained below.

Sources of GHG emissions for the Proposed Project include BART operations, bus operations, station electricity use, emergency generator testing and maintenance, water use, wastewater treatment, solid waste disposal, BART car maintenance, employee shuttle vans, maintenance truck use, and electric forklift use. Sources are described below in the order presented in Table 3.L-6. For additional information related to transit operations or passenger VMT, see Section 3.B, Transportation.

- **BART Car Miles.** Annually, net new BART car miles from operation of BART would increase by 2,895,844 miles in 2025 due to implementation of the Proposed Project. This increase in BART car miles occurs due to the increase in the number of cars and distance that BART cars travel with the extended line. GHG emissions due to electricity demand for operation of BART would increase by 576 MT CO_2e per year.
- **Bus Miles.** Annually, net new bus VMT would increase by 379,117 miles per year in 2025. Due to this increase, emissions of GHGs from bus operations would be 1,251 MT CO_2e annually.
- **Proposed Isabel Station Electricity.** Annual electricity use at Isabel Station would be 2,847,609 kWh annually, resulting in indirect emissions of 126 MT CO_2e annually.
- **Emergency Generators.** During testing and maintenance, the emergency generator at Isabel Station would emit approximately 42 MT CO_2e per year and the emergency generator at the Maintenance Station would emit approximately 18 MT CO_2e per year. Combined, the generators would emit 60 MT CO_2e per year.
- **Water, Wastewater and Solid Waste.** Water use and wastewater and solid waste generation would result from the stations (Dublin/Pleasanton Station and proposed Isabel Station), the storage and maintenance facility activities, and wayside facilities. Water consumption is expected to be 5,488,117 gallons per year and GHG emissions from water use and wastewater treatment would be 9 MT CO_2e per year in 2025

annually. Disposal of solid waste is expected to be 888 tons per year and indirect GHG emissions would be 447 MT CO_2e per year.

- **Maintenance of BART Cars.** Maintenance of BART cars would occur at the storage and maintenance facility under the Proposed Project and the amount of maintenance is based on the number of miles traveled. GHG emissions from the maintenance of BART cars would be 87 MT CO_2e annually in 2025.
- **Other Activities at the Storage and Maintenance Facility.** Other activities at the storage and maintenance facility would include the following: (1) employee shuttle vans that would use 401 gallons of diesel annually and emit 5 MT CO_2e per year; (2) maintenance trucks, which would use 442 gallons of diesel per year, emitting 5 MT CO_2e annually; and (3) energy use from electric forklifts, which would use 65,650 kWh per year, emitting 4 MT CO_2e annually.

In 2025, the Proposed Project would also result in a reduction in GHG emissions as described below.

- **Reduced Passenger Vehicle VMT.** The Proposed Project would reduce passenger VMT by approximately 38,250,574 miles annually, or 128,000 miles on an average weekday. The Proposed Project would result in the greatest reduction in VMT of all alternatives. Due to these reductions in passenger vehicle use, emissions of GHGs from passenger vehicles would be reduced by 9,616 MT CO_2e.
- **Solar Photovoltaic.** Solar photovoltaic electricity generation would offset the demand for off-site electricity at the Isabel Station and decrease indirect GHG emissions associated with generation of this off-site electricity by 69 MT CO_2e annually.

As described above, in 2025, the Proposed Project would reduce GHG emissions by approximately 7,115 MT CO_2e annually compared to 2025 No Project Conditions. The Proposed Project would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2025, the Proposed Project would result in a beneficial impact, and mitigation measures are not required. **(B)**

DMU Alternative. In 2025, the DMU Alternative would result in a net decrease of 3,021 MT CO_2e annually compared to 2025 No Project Conditions. While the DMU Alternative would increase emissions by 4,239 MT CO_2e annually, this would be offset by a reduction in emissions of 7,260 MT CO_2e associated with the reduced passenger VMT due to increased BART ridership and the production of energy by solar photovoltaic cells installed at the Isabel Station; therefore, the overall GHG emissions would be reduced. Table 3.L-7 shows the GHG emissions from the operation of the DMU Alternative in 2025. The emissions and emissions reductions are explained below.

Sources of GHG emissions would be generally similar to those described above for the Proposed Project, with the following differences: (1) emissions would result from operation of the DMU train; (2) emissions from DMU vehicle maintenance (in addition to BART car maintenance); and (3) an employee shuttle van would not be used at the storage and maintenance facility. Sources are described below in the order presented in Table 3.L-6.

- **BART Car Miles.** Annually, net new BART car miles from operation of BART would increase by 558,771 due to implementation of the DMU Alternative. BART car miles would increase to accommodate riders transferring from the DMU train to BART. In 2025, GHG emissions from the electricity demand for BART operations would be 111 MT CO_2e per year.
- **DMU Vehicle Miles.** Annually, net new DMU car miles in 2025 would be 776,400. These new DMU car miles would increase GHG emissions by 2,404 MT CO_2e in 2025.
- **Bus Miles.** GHGs from buses and net new bus miles traveled under the DMU Alternative are expected to be the same as for the Proposed Project in 2025 (1,251 MT CO_2e annually).
- **Proposed Isabel Station Electricity and Emergency Generators.** Annual emissions of GHGs from electricity use at the proposed Isabel Station and emergency generator testing and maintenance would be the same as described above for the Proposed Project in 2025 (126 MT CO_2e and 60 MT CO_2e annually, respectively).
- **Water, Wastewater and Solid Waste.** Water use and wastewater and solid waste generation would result from the stations (Dublin/Pleasanton Station and proposed Isabel Station), the storage and maintenance facility activities, and wayside facilities. Also, the additional BART cars required to serve the increased ridership would require washing, which would be done at BART's existing maintenance facilities. Water consumption is expected to be 3,636,758 gallons per year and GHG emissions from water use and wastewater treatment would be 7 MT CO_2e per year in 2025 annually. Disposal of solid waste is expected to be 378 tons per year and indirect GHG emissions from that disposal would be 231 MT CO_2e per year.
- **Maintenance of BART Cars and DMU Vehicles and Other Maintenance Activities.** Maintenance of BART cars would occur under the DMU Alternative due to the increase in BART ridership and car miles traveled. Maintenance would occur at existing BART maintenance facilities. GHG emissions from the maintenance of BART cars would be 17 MT CO_2e annually in 2025. Under the DMU Alternative, the DMU vehicles would be maintained at the storage and maintenance facility. Emissions of GHGs due to DMU car maintenance would be 23 MT CO_2e annually. Maintenance of DMU cars would also require the use of electric forklifts/maintenance trucks, as follows: (1) GHG emissions from the use of maintenance trucks would be 5 MT CO_2e annually, and (2) emissions from electric forklifts would be 4 MT CO_2e annually.

In 2025, the DMU Alternative would also result in a reduction in GHG emissions described below.

- **Reduced Passenger Vehicle VMT.** The DMU Alternative would reduce passenger VMT by approximately 28,578,215 miles in 2025 annually, or 95,000 miles on an average weekday. The DMU Alternative would result in the second-greatest reduction in VMT of all alternatives. Due to these reductions in passenger vehicle use, emissions of GHGs from passenger vehicles would be reduced by 7,191 MT CO_2e.
- **Solar Photovoltaic.** Similar to the Proposed Project, solar photovoltaic electricity generation would offset the electrical demand at Isabel Station and decrease indirect GHG emissions (from off-site electricity generation) in 2025 by 69 MT CO_2e.

As described above, in 2025, the DMU Alternative would reduce GHG emissions by approximately 3,021 MT CO_2e annually compared to 2025 No Project Conditions. The DMU Alternative would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2025, the DMU Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

EMU Option. In 2025, the EMU Option would result in a net decrease of 5,254 MT CO_2e annually compared to 2025 No Project Conditions, the second-largest decrease in GHG emissions out of the Proposed Project and Build Alternatives. While GHG emissions sources would increase by 2,006 MT CO_2e annually, this would be offset by a reduction of 7,260 MT CO_2e associated with the reduced passenger VMT due to increased BART ridership and the energy produced by solar photovoltaic cells installed at the Isabel Station. Therefore, overall GHG emissions would be reduced. Table 3.L-7 shows the GHG emissions from the operation of the EMU Option in 2025.

The sources of GHG emissions and the amount of GHG emissions are the same as described above for the DMU Alternative, except that the EMU Option includes indirect emissions from electricity generation for EMU vehicle operation rather than direct emissions from DMU vehicle operation.

- **EMU Vehicle Miles.** Annually, EMU vehicle miles would result in emissions of 171 MT CO_2e in 2025, compared to 2,404 MT CO_2e for DMU vehicle miles, therefore resulting in a reduction in GHG emissions compared to the DMU Alternative.
- **Maintenance of EMU Vehicles.** The EMU vehicles would be maintained at the storage and maintenance facility. Emissions of GHG due to EMU car maintenance would be 23 MT CO_2e annually, the same as under the DMU Alternative.

In 2025, the EMU Option would also result in a reduction in GHG emissions due to reduced passenger vehicle miles and solar photovoltaic electricity generation, as described above for the DMU Alternative.

As described above, in 2025, the EMU Option would reduce GHG emissions by approximately 5,254 MT CO_2e annually compared to 2025 No Project Conditions. The EMU Option would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2025, the EMU Option would result in a beneficial impact, and mitigation measures are not required. **(B)**

Express Bus/BRT Alternative. In 2025, the Express Bus/BRT Alternative would result in a net decrease of 1,696 MT CO_2e annually compared to 2025 No Project Conditions. While the Express Bus/BRT Alternative would increase emissions by 1,659 MT CO_2e annually in 2025, this would be offset by a reduction in emissions of 3,355 MT CO_2e associated with the reduced passenger VMT due to increased BART ridership; therefore, the overall GHG emissions would be reduced. Table 3.L-7 shows the GHG emissions from the operation of the Express Bus/BRT Alternative in 2025. The emissions and emissions reductions are explained below.

Sources of GHG emissions for the Express Bus/BRT Alternative include increased BART operations due to increases in ridership, bus operations, water use, wastewater treatment, solid waste disposal, and BART car maintenance. Sources are described below in the order presented in Table 3.L-6.

- **BART Car Miles.** Annually, net new BART car miles would increase by 111,839 miles due to an increase in the ridership as a result of transfers from buses to BART. In 2025, GHG emissions from operation of BART under the Express Bus/BRT Alternative would be 22 MT CO_2e per year.
- **Bus Miles.** Annual net new bus miles traveled under the Express Bus/BRT Alternative are expected to increase by 354,876 per year in 2025. GHG emissions from bus operation for the Express Bus/BRT Alternative in 2025 would be 1,528 MT CO_2e per year.
- **Water, Wastewater and Solid Waste.** Increased ridership at the Dublin/Pleasanton Station would result in increased water use and wastewater and solid waste generation under the Express Bus/BRT Alternative in 2025. Also, the additional BART cars required to serve the increased ridership, would require washing, which would be done at BART's existing maintenance facilities. Water use increase is expected to be 1,326,426 gallons per year and GHG emissions from water use and wastewater treatment would be 3 MT CO_2e in 2025 annually. Disposal of solid waste would be 165 tons per year and this disposal would emit 103 MT CO_2e annually.

- **Maintenance of BART Cars.** Maintenance of BART cars would be required due to increased BART ridership under the Express Bus/BRT Alternative. GHG emissions from the maintenance of BART cars would be 3 MT CO_2e annually in 2025, as a result of the number of BART car miles traveled under the Express Bus/BRT Alternative.

In 2025, the Express Bus/BRT Alternative would also result in a reduction in GHG emissions.

- **Reduced Passenger Vehicle VMT.** The Express Bus/BRT Alternative would reduce passenger VMT by approximately 13,357,023 miles in 2025 annually, or 45,000 miles on an average weekday. Due to these reductions in passenger vehicle use, emissions of GHGs from passenger vehicles would be reduced by 3,355 MT CO_2e in 2025.

As described above, in 2025, the Express Bus/BRT Alternative would reduce GHG emissions by approximately 1,696 MT CO_2e annually compared to 2025 No Project Conditions. The Express Bus/BRT Alternative would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2025, the Express Bus/BRT Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

Enhanced Bus Alternative. In 2025, the Enhanced Bus Alternative would result in a net increase of 1,398 MT CO_2e annually compared to 2025 No Project Conditions. The Enhanced Bus Alternative would increase emissions by 1,422 MT CO_2e annually, and would reduce emissions by 24 MT CO_2e annually associated with reduced passenger VMT due to increased BART ridership. The reduction in GHG emissions from the reduced passenger VMT would not be enough to fully offset the increase in GHGs from operations. Table 3.L-7 shows the GHG emissions from the operation of the Enhanced Bus Alternative in 2025. The emissions and emissions reductions are explained below.

Sources of GHG emissions for the Enhanced Bus Alternative include bus operations, water use, wastewater treatment, and solid waste disposal.

- **Bus Miles.** Annual bus miles traveled under the Enhanced Bus Alternative are expected to increase by 235,016 per year in 2025. GHG emissions from bus operation for the Enhanced Bus Alternative would be 1,369 MT CO_2e per year.
- **Water, Wastewater and Solid Waste.** Increased ridership at the Dublin/Pleasanton Station would result in increased water use and wastewater and solid waste generation under the Enhanced Bus Alternative. Water use is expected to be 688,715 gallons per year and GHG emissions due to water usage and wastewater treatment would be 1 MT CO_2e annually. Disposal of solid waste would be 103 tons per year and would emit 52 MT CO_2e annually.

In 2025, the Enhanced Bus Alternative would also result in a reduction in GHG emissions.

- **Reduced Passenger Vehicle VMT.** The Enhanced Bus Alternative would reduce passenger VMT in 2025 by approximately 75,668 miles annually, or 300 miles on an average weekday. Due to these reductions in passenger vehicle use, emissions of GHGs from passenger vehicles would be reduced by 24 MT CO_2e in 2025.

As described above, in 2025, the Enhanced Bus Alternative would increase GHG emissions by approximately 1,398 MT CO_2e annually compared to 2025 No Project Conditions, exceeding BAAQMD's significance threshold of 1,100 MT CO_2e by 299 MT CO_2e annually. Thus, the Enhanced Bus Alternative would conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. Therefore, in 2025, the Enhanced Bus Alternative would have significant impacts related to GHG emissions during operations.

This impact would be reduced to a less-than-significant level with implementation of **Mitigation Measure GHG-3**, which would require BART to purchase carbon offsets equivalent to the amount of GHG emissions that exceed BAAQMD's significance threshold. **(LSM)**

Mitigation Measures. As described above, in 2025, the Proposed Project, DMU Alternative, EMU Option, and Express Bus/BRT Alternative would not result in significant operational impacts related to GHG emissions, and no mitigation measures are required. However, the Enhanced Bus Alternative would result in a significant impact. This impact would be reduced to a less-than-significant level with implementation of **Mitigation Measure GHG-3**, which would require BART to purchase carbon offsets equivalent to the amount of GHG emissions that exceed BAAQMD's significance threshold. Various offset project registries provide these carbon offset credits for sale and the registries use approved compliance offset protocols to allow projects that have reduced their GHG emissions to make their reductions available for purchase to projects that emit GHGs to offset their GHG emissions.

Mitigation Measure GHG-3: Obtain Carbon Offsets For Bus Emissions (Enhanced Bus Alternative).

BART shall obtain offsets from a CARB-approved carbon offset project registry. Examples of approved carbon registries include the American Carbon Registry, the Climate Action Reserve, and the Verified Carbon Standard. BART shall obtain offsets in the amount of 300 MT CO_2e per year until 2040, or shall obtain offsets in a different amount that is sufficient to reduce GHG emissions from the Enhanced Bus Alternative to below BAAQMD's significance threshold of 1,100 MT CO_2e, as determined by a detailed GHG emissions analysis of the Enhanced Bus Alternative once it is in operation.

Impact GHG-4: Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, or conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions, under 2040 Project Conditions.

(No Project Alternative: S; Conventional BART Project: B; DMU Alternative: B; EMU Option: B; Express Bus/BRT Alternative: B; Enhanced Bus Alternative: LS)

The change between 2040 No Project Conditions and 2040 Project Conditions represents the net emissions increase or decrease attributed to the Proposed Project or an alternative. Table 3.L-8 shows the annual change in GHG emissions from the operation of the Proposed Project and Build Alternatives in 2040.

No Project Alternative. Under the 2040 No Project Alternative, the BART to Livermore Extension Project would not be implemented. The purpose of the No Project Alternative analysis under CEQA is to enable decision-makers and the public understand the consequences of not adopting a project. CEQA Guidelines 15126.6(e)(2) provides that the No Project Alternative must include "what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services." VMT and associated GHG emissions are reasonably expected to increase in 2040 under No Project conditions, consistent with projections-based continued regional land use development and planned and programmed transportation improvements.

Operation of the planned and programmed transportation improvements and continued land use development under the No Project Alternative could generate GHG emissions above BAAQMD significance thresholds. At the same time, if the BART Board of Directors selects the No Project Alternative, the reductions in GHG emissions due to the reduced passenger VMT anticipated under the Proposed Project, DMU Alternative, EMU Option, or Express Bus/BRT Alternative (associated with increased transit ridership) would not occur. The No Project Alternative is anticipated to result in significant impacts in 2040 related to GHG emissions, without the benefit of VMT reductions attributable to Proposed Project or Build Alternatives off-setting a portion of the VMT growth, as a consequence of BART Board of Directors' decision not to adopt a project. Therefore, the No Project Alternative is considered to have a significant impact related to the GHG emissions. **(S)**

TABLE 3.L-8 CHANGE IN ANNUAL GHG EMISSIONS UNDER 2040 PROJECT CONDITIONS

	Metric Tons of CO_2e Per Year				
Emission Component	**Conventional BART Project**	**DMU Alternative**	**EMU Option**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Sources					
Transit Operations					
BART Operations[a]	709	229	229	95	--
DMU Operations	--	2,675	--	--	--
EMU Operations	--	--	190	--	--
Bus Operations	1,103	1,103	1,103	1,347	1,207
Station and Maintenance Operations					
Station Electricity	126	126	126	--	--
Emergency Generator	60	60	60	--	--
Water and Wastewater	9	7	7	3	1
Solid Waste	447	231	231	103	52
BART Car Maintenance	107	35	35	14	--
DMU/EMU Car Maintenance	--	26	26	--	--
Employee Shuttle Vans	5	--	--	--	--
Maintenance Trucks	5	5	5	--	--
Electric Forklifts	4	4	4	--	--
Subtotal Sources	*2,575*	*4,501*	*2,016*	*1,562*	*1,260*
Reductions					
Passenger Vehicles (Reduced VMT)	-13,669	-7,922	-7,922	-5,302	-614
Solar Photovoltaic Electricity Generation	-59	-59	-59	--	--
Subtotal Reductions	*-13,728*	*-7,981*	*-7,981*	*-5,302*	*-614*
Summary					
Total Emissions	**−11,154**	**−3,482**	**−5,967**	**−3,739**	**646**
BAAQMD Significance Threshold	**1,100**	**1,100**	**1,100**	**1,100**	**1,100**
Exceed Threshold?	**No**	**No**	**No**	**No**	**No**

Notes: CO_2e = carbon dioxide equivalent; VMT = vehicle miles traveled.
Emissions are shown as the change between 2040 No Project Conditions and 2040 Project Conditions. Positive values represent an increase in GHG emissions and negative values represent a decrease in GHG emissions.
[a] GHG emissions for BART Operations are from the additional BART cars needed to support the ridership for each alternative.

Conventional BART Project. In 2040, the Proposed Project would result in a net decrease of 11,154 MT CO_2e annually compared to 2040 No Project Conditions. While sources of GHGs from the Proposed Project would increase by 2,575 MT CO_2e annually in 2040, this would be offset by a reduction of 13,728 MT CO_2e annually due to the reduced passenger VMT associated with increased BART ridership and the energy produced by solar photovoltaic cells installed for the proposed Isabel Station; therefore, the overall GHG emissions would be reduced. Table 3.L-8 shows the GHG emissions from the operation of the Proposed Project in 2040. The emissions and emissions reductions are explained below.

Sources of GHG emissions for the Proposed Project in 2040 would be the same as in 2025. However, overall GHG emissions would decrease in 2040 compared to 2025 due to cleaner electricity sources, a cleaner bus fleet, and increased BART ridership. Emissions of GHGs from station electricity use, emergency generators, water use and wastewater treatment, and solid waste would be the same for the Proposed Project in 2040 as in 2025. The differences in GHG emissions in 2040 compared to 2025 are described below in the order presented in Table 3.L-7.

- **BART Car Miles.** Annual net new BART car miles for BART operation would be 3,561,913, which is a slight increase in annual BART car miles compared to the Proposed Project in 2025 (2,895,844 net new annual BART car miles). The increase in net new annual BART car miles traveled in 2040 compared to 2025 would be offset some by cleaner electricity sources; however, overall GHG emissions would increase by 709 MT CO_2e per year. This is an increase of 133 MT CO_2e annually compared to the Proposed Project in 2025.
- **Bus Miles.** Net new annual bus VMT are expected to remain the same for the Proposed Project in 2025 and 2040; however, a cleaner and more fuel-efficient bus fleet coming into service over time would cause a decrease in GHG emissions in 2040. Bus operations would emit 1,103 MT CO_2e annually in 2040, which would be a decrease of 148 MT CO_2e compared to the Proposed Project in 2025.
- **Maintenance of BART Cars.** Under the Proposed Project, emissions of GHGs from BART car maintenance would be 107 MT CO_2e annually in 2040. Due to the increase in the number of BART car miles traveled, GHG emissions from the maintenance of BART cars would increase by 20 MT CO_2e annually in 2040 compared to 2025.

In 2040, the Proposed Project would also result in a reduction in GHG emissions.

- **Reduced Passenger Vehicle VMT.** Net new annual passenger VMT would be reduced even further for the Proposed Project in 2040 compared to 2025, due to increased transit ridership over time. The Proposed Project would result in the greatest reduction in VMT of all alternatives in 2040, approximately 73,770,403 VMT annually or

246,000 VMT on an average weekday. This would result in an annual reduction of GHG by 13,669 MT CO_2e compared to 2040 No Project Conditions, which is a reduction of 4,053 MT CO_2e compared to the Proposed Project in 2025.

- **Solar Photovoltaic.** Solar photovoltaic electricity generation would offset GHG emissions by 59 MT CO_2e. This reduction would be 10 MT CO_2e less than the Proposed Project in 2025 annually, due to the expected degradation of the solar panels and less efficient electrical generation capability.

As described above, in 2040, the Proposed Project would reduce GHG emissions by approximately 11,154 MT CO_2e annually compared to 2040 No Project Conditions. The Proposed Project would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2040, the Proposed Project would result in a beneficial impact, and mitigation measures are not required. **(B)**

DMU Alternative. In 2040, the DMU Alternative would result in a net decrease of 3,482 MT CO_2e annually compared to 2040 No Project Conditions. While sources of GHGs from the DMU Alternative would increase emissions by 4,501 MT CO_2e annually in 2040, this would be offset by a reduction in emissions of 7,981 MT CO_2e due to the reduced passenger VMT associated with increased attraction of new riders and the energy produced by solar photovoltaic cells installed at the Isabel Station; therefore, overall GHG emissions would be reduced. Table 3.L-8 shows the GHG emissions from the operation of the DMU Alternative in 2040. The emissions and emissions reductions are explained below.

Sources of GHG emissions for the DMU Alternative in 2040 would be the same as in 2025. However, similar to the Proposed Project, overall GHG emissions would decrease in 2040 compared to 2025 due to cleaner electricity sources, a cleaner bus fleet, and increased BART ridership. Emissions of GHGs from station electricity use, emergency generators, water use and wastewater treatment, and solid waste would be the same for the DMU Alternative in 2040 as in 2025. The differences in GHG emissions in 2040 compared to 2025 are described below in the order presented in Table 3.L-7.

- **BART Car Miles.** For the DMU Alternative in 2040, net new annual BART car miles for BART operation would be 1,150,063 miles compared to 2040 No Project Conditions—more than double the ridership for the DMU Alternative in 2025. This increase in net new annual BART car miles would increase GHG emissions to 229 MT CO_2e per year over 2040 No Project Conditions (an increase of 118 MT CO_2e per year over the DMU Alternative in 2025).
- **DMU Vehicle Miles.** Annually, net new DMU car miles in 2040 for the DMU Alternative would be 864,100 miles. This increase in net new annual DMU car miles would

increase GHG emissions by 2,675 MT CO_2e per year over 2040 No Project Conditions (an increase of 271 MT CO_2e per year over the DMU Alternative in 2025).

- **Bus Miles.** While net new annual VMT are expected to remain the same for the DMU Alternative between 2025 and 2040 (379,117 miles), the implementation over time of a cleaner and more fuel-efficient bus fleet would cause a decrease in GHG emissions in 2040. Bus operations would emit 1,103 MT CO_2e annually over 2040 No Project Conditions (a decrease of 148 MT CO_2e compared to the DMU Alternative in 2025).
- **Maintenance of BART Cars.** Emissions of GHG from BART car maintenance would be 35 MT CO_2e annually in 2040. Due to the increase in the number of BART car miles traveled, as described above, GHG emissions from the maintenance of BART cars would be 35 MT CO_2e annually in 2040 (an increase of 18 MT CO_2e annually above 2025). DMU car maintenance would also increase to 26 MT CO_2e annually (an increase of 3 MT CO_2e over the DMU Alternative in 2025).

In 2040, the DMU Alternative would also result in a reduction in GHG emissions.

- **Reduced Passenger Vehicle VMT.** In 2040, the DMU Alternative would reduce passenger VMT by approximately 42,745,966 miles annually, or 142,000 miles on an average weekday—the second-greatest reduction in VMT of all alternatives. Emissions of GHGs for the 2040 DMU Alternative would be reduced by 7,922 MT CO_2e annually compared to 2040 No Project Conditions (a reduction of 731 MT CO_2e compared to the DMU Alternative in 2025).
- **Solar Photovoltaic.** Solar photovoltaic electricity generation would be reduced by 59 MT CO_2e, the same amount as the Proposed Project in 2040. This reduction would be 10 MT CO_2e less than the DMU Alternative in 2025 annually, due to the expected degradation of the solar panels and less efficient electrical generation capability.

As described above, in 2040, the DMU Alternative would reduce GHG emissions by approximately 3,482 MT CO_2e annually compared to 2040 No Project Conditions. Therefore, in 2040, the DMU Alternative would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2040, the DMU Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

EMU Option. In 2040, the EMU Option would result in a net decrease of 5,967 MT CO_2e annually compared to 2040 No Project Conditions. While sources of GHGs from the EMU Option would increase emissions by 2,016 MT CO_2e annually in 2040, this would be offset by a reduction in emissions of 7,981 MT CO_2e associated with the reduced passenger VMT associated with increased BART ridership and the energy produced by solar photovoltaic cells installed for the Isabel Station; therefore, overall GHG emissions would be reduced.

Table 3.L-8 shows the GHG emissions from the operation of the EMU Option in 2040. The emissions and emissions reductions are explained below.

Sources of GHG emissions for the EMU Option in 2040 would be the same as in 2025. However, similar to the DMU Alterative in 2040, total GHG emissions would decrease in 2040 compared to 2025 due to cleaner electricity sources, a cleaner bus fleet, and increased BART ridership. See the discussion for the DMU Alternative above for changes from 2025 to 2040 for categories other than those outlined below. Differences from the DMU Alternative in 2040 are described below.

- **EMU Vehicle Miles.** Annually, net new EMU car miles in 2040 for the EMU Option would be the same as net new DMU car miles for the DMU Alternative in 2040. However, due to the different fuels used, the EMU Option would only increase GHG emissions by 190 MT CO_2e per year over 2040 No Project Conditions and 19 MT CO_2e per year over the EMU Option in 2025, a smaller increase compared to the DMU Alternative.
- **Maintenance of EMU Vehicles.** The EMU vehicles would be maintained at the storage and maintenance facility. Emissions of GHG due to EMU car maintenance would be 26 MT CO_2e annually, the same as for DMU car maintenance under the DMU Alternative.

In 2040, the EMU Option would also result in a reduction in GHG emissions due to reduced passenger vehicle miles and solar photovoltaic electricity generation, as described above for the DMU Alternative in 2040.

As described above, in 2040, the EMU Option would reduce GHG emissions by approximately 5,967 MT CO_2e annually compared to 2040 No Project Conditions. Therefore, in 2040, the EMU Option would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2040, the EMU Option would result in a beneficial impact, and mitigation measures are not required. **(B)**

Express Bus/BRT Alternative. In 2040, the Express Bus/BRT Alternative would result in a net decrease of 3,739 MT CO_2e annually compared to 2040 No Project Conditions. While sources of GHGs from the Express Bus/BRT Alternative would increase emissions by 1,562 MT CO_2e annually in 2040, this would be offset by a reduction in emissions of 5,302 MT CO_2e associated with reduced passenger VMT due to increased BART ridership, thus resulting in an overall net decrease in GHG emissions. Table 3.L-8 shows the GHG emissions from the operation of the Express Bus/BRT Alternative in 2040. The emissions and emissions reductions are explained below.

Sources of GHG emissions for the Express Bus/BRT Alternative in 2040 would be the same as in 2025. However, total GHG emissions would decrease in 2040 compared to 2025 due to cleaner electricity sources, a cleaner bus fleet, and increased BART ridership. GHG emissions from water use, wastewater treatment, and solid waste would remain the same as in 2025 under the Express Bus/BRT Alternative. The differences in GHG emissions in 2040 compared to 2025 are described below in the order presented in Table 3.L-7.

- **BART Car Miles.** For the Express Bus/BRT Alternative in 2040, net new annual BART car miles for BART operation would be 479,770 compared to 2040 No Project Conditions—more than four times the ridership for the Express Bus/BRT Alternative in 2025. This increase in net new annual BART car miles would increase GHG emissions by 95 MT CO_2e per year over 2040 No Project Conditions (an increase of 73 MT CO_2e per year over the Express Bus/BRT Alternative in 2025).
- **Bus Miles.** Net new annual VMT are expected to remain the same for 2025 and 2040 (354,876 miles); however, a cleaner and more fuel-efficient bus fleet being implemented over time would decrease GHG emissions in 2040. Bus operations for the Express Bus/BRT Alternative in 2040 would emit 1,347 MT CO_2e annually, a decrease of 181 MT CO_2e compared to the Express Bus/BRT Alternative in 2025.
- **Maintenance of BART Cars.** Emissions of GHG from BART car maintenance would be 14 MT CO_2e annually in 2040. Due to the increase in the number of BART car miles traveled in 2040 compared to 2025, GHG emissions from the maintenance of BART cars would increase by 11 MT CO_2e annually in 2040 under the Express Bus/BRT Alternative.

In 2040, the Express Bus/BRT Alternative would also result in a reduction in GHG emissions.

- **Reduced Passenger Vehicle VMT.** The Express Bus/BRT Alternative would reduce passenger VMT by approximately 28,586,697 miles annually, or 95,000 miles on an average weekday. In 2040, the Express Bus/BRT Alternative would reduce emissions of GHG from passenger vehicles by 5,302 MT CO_2e annually compared to 2040 No Project Conditions (a reduction of 1,947 MT CO_2e compared to the Express Bus/BRT Alternative in 2025).

As described above, in 2040, the Express Bus/BRT Alternative would reduce GHG emissions by approximately 3,739 MT CO_2e annually compared to 2040 No Project Conditions. Therefore, the Express Bus/BRT Alternative would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2040, the Express Bus/BRT Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

Enhanced Bus Alternative. In 2040, the Enhanced Bus Alternative would result in a net increase of 646 MT CO_2e annually compared to 2040 No Project Conditions. The Enhanced

Bus Alternative would increase GHGs by 1,260 MT CO_2e annually in 2040, and would reduce GHGs by 614 MT CO_2e annually associated with reduced passenger VMT due to increased BART ridership. The reduction in GHG emissions from the reduced passenger VMT would not be enough to fully offset the increase in GHGs from operations.
Table 3.L-8 shows the GHG emissions from the operation of the Enhanced Bus Alternative in 2040, which are explained below.

Sources of GHG emissions for the Enhanced Bus Alternative in 2040 would be the same as in 2025. GHG emissions from water use, wastewater treatment, and solid waste would remain the same as in 2025 under the Enhanced Bus Alternative. The differences in GHG emissions in 2040 compared to 2025 are described below in the order presented in Table 3.L-7.

- **Bus Miles.** Net new annual VMT are expected to remain the same between the 2025 and 2040 (235,016 miles); however, a cleaner and more fuel-efficient bus fleet would decrease GHG emissions in 2040. Bus operations for the Enhanced Bus Alternative in 2040 would emit 1,207 MT CO_2e annually (a decrease of 162 MT CO_2e compared to the Enhanced Bus Alternative in 2025).

In 2040, the Enhanced Bus Alternative would also result in a reduction in GHG emissions.

- **Reduced Passenger Vehicle VMT.** The Enhanced Bus Alternative would reduce passenger VMT by approximately 2,722,388 miles annually, or 9,000 miles per average weekday. Emissions of GHG from passenger vehicles would be reduced by 614 MT CO_2e annually compared to 2040 No Project Conditions (a reduction of 590 MT CO_2e compared to the Enhanced Bus Alternative in 2025).

As described above, in 2040, the Enhanced Bus Alternative would increase GHG emissions by approximately 646 MT CO_2e annually compared to 2040 No Project Conditions. However, the quantity of GHG emissions generated under the Enhanced Bus Alternative in 2040 would be less than BAAQMD's significance threshold (1,100 MT CO_2e annually). Therefore, in 2040, the Enhanced Bus Alternative would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2040, the Enhanced Bus Alternative would result in a less-than-significant impact, and mitigation measures are not required. **(LS)**

Mitigation Measures. As described above, in 2040, the Proposed Project and Build Alternatives would not result in significant operational impacts related to GHG emissions, and no mitigation measures are required. However, without the benefit of the Proposed Project, DMU Alternative, EMU Option, or Express Bus/BRT Alternative, the 2040 No Project Alternative would result in significant impacts related to GHG emissions.

(b) Operations – Cumulative Analysis

The geographic study area for the cumulative operations analysis is the same as the study area for the project analysis, described in the Introduction subsection above.

Impact GHG-5(CU): Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, or conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions, under 2025 Cumulative Conditions.

(No Project Alternative: NI; Conventional BART Project: B; DMU Alternative: B; EMU Option: B; Express Bus/BRT Alternative: B; Enhanced Bus Alternative: B)

The change between 2025 No Project Conditions and 2025 Cumulative Conditions represents the net emissions increase or decrease attributed to the Proposed Project or an alternative under Cumulative Conditions. Table 3.L-9 shows the annual change in GHG emissions from the operation of the Cumulative Conditions in 2025.

No Project Alternative. As described in **Impact GHG-3** above, the No Project Alternative would have no impacts associated with GHG emissions during operations under 2025 Project Conditions. Therefore, the No Project Alternative would not contribute to cumulative impacts. **(NI)**

Conventional BART Project. In 2025 under Cumulative Conditions, the Proposed Project would result in a net decrease of 5,731 MT CO_2e annually compared to 2025 No Project Conditions. While GHG emissions would increase by 2,570 MT CO_2e annually in 2025 under Cumulative Conditions, this would be offset by a reduction of 8,301 MT CO_2e, thus resulting in an overall net decrease in GHG emissions. Table 3.L-9 shows the GHG emissions under 2025 Cumulative Conditions.

All sources of GHG emissions and GHG emissions reductions would be the same under 2025 Cumulative Conditions as for the Proposed Project in 2025, except that GHG emissions associated with passenger VMT would change compared to the Proposed Project in 2025, as described below.

- **Reduced Passenger Vehicle VMT.** Annually, in 2025 under Cumulative Conditions, the Proposed Project would reduce passenger VMT by approximately 32,649,225 miles. Due to the reduction in passenger VMT, emissions of GHGs from passenger vehicles would be reduced by 8,232 MT CO_2e. This represents an increase in GHG emissions compared to the Proposed Project in 2025 (which would have a reduction of 9,616 MT CO_2e per year).

TABLE 3.L-9 CHANGE IN ANNUAL GHG EMISSIONS UNDER 2025 CUMULATIVE CONDITIONS

	Metric Tons of CO_2e Per Year				
Emission Component	**Conventional BART Project**	**DMU Alternative**	**EMU Option**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Sources					
Transit Operations					
BART Operations[a]	576	111	111	22	--
DMU Operations	--	2,404	--	--	--
EMU Operations	--	--	171	--	--
Bus Operations	1,251	1,251	1,251	1,528	1,369
Station and Maintenance Operations					
Station Electricity	126	126	126	--	--
Emergency Generator	60	60	60	--	--
Water and Wastewater	9	7	7	3	1
Solid Waste	447	231	231	103	52
Employee Shuttle Vans	5	--	--	--	--
BART Car Maintenance	87	17	17	3	--
DMU/EMU Car Maintenance	--	23	23	--	--
Maintenance Trucks	5	5	5	--	--
Electric Forklifts	4	4	4	--	--
Subtotal Sources	*2,570*	*4,239*	*2,006*	*1,659*	*1,422*
Reductions					
Passenger Vehicles (Reduced VMT)	-8,232	-5,521	-5,521	-4,901	-2,187
Solar Photovoltaic Electricity Generation	-69	-69	-69	--	--
Subtotal Reductions	*-8,301*	*-5,590*	*-5,590*	*-4,901*	*-2,187*
Summary					
Total Emissions	**−5,731**	**−1,351**	**−3,584**	**−3,242**	**−765**
BAAQMD Significance Threshold	**1,100**	**1,100**	**1,100**	**1,100**	**1,100**
Exceed Threshold?	**No**	**No**	**No**	**No**	**No**

Notes: CO_2e = carbon dioxide equivalent; VMT = vehicle miles traveled.
Emissions are shown as the change between the 2025 No Project Condition and 2025 Cumulative Conditions. Positive values represent an increase in GHG emissions and negative values represent a decrease in GHG emissions.
[a] GHG emissions for BART Operations are from the additional BART cars needed to support the ridership for each alternative.

As described above, in 2025 under Cumulative Conditions, the Proposed Project would reduce GHG emissions by approximately 5,731 MT CO_2e annually compared to 2025 No Project Conditions. The Proposed Project in 2025 under Cumulative Conditions would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2025 under Cumulative Conditions, the Proposed Project would result in a beneficial impact, and mitigation measures are not required. **(B)**

DMU Alternative. In 2025, under Cumulative Conditions, the DMU Alternative would result in a net decrease of 1,351 MT CO_2e annually compared to 2025 No Project Conditions. While GHGs would increase by 4,239 MT CO_2e, this would be offset by a reduction of 5,590 MT CO_2e, thus resulting in an overall net decrease in GHG emissions. Table 3.L-9 shows the GHG emissions under 2025 Cumulative Conditions.

All sources of GHG emissions and GHG reductions would be the same under 2025 Cumulative Conditions as for the DMU Alternative in 2025, except for GHG emissions associated with passenger VMT, as described below.

- **Reduced Passenger Vehicle VMT.** Annually, in 2025 under Cumulative Conditions, the DMU Alternative would reduce passenger VMT by approximately 21,858,079 miles. Due to the reduction in passenger VMT, emissions of GHGs from passenger vehicles would be reduced by 5,521 MT CO_2e. This represents an increase in GHG emissions compared to the DMU Alternative in 2025 (which would have a reduction of 7,191 MT CO_2e per year).

As described above, in 2025 under Cumulative Conditions, the DMU Alternative would reduce GHG emissions by approximately 1,351 MT CO_2e annually compared to 2025 No Project Conditions. In 2025 under Cumulative Conditions, the DMU Alternative would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2025 under Cumulative Conditions, the DMU Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

EMU Option. In 2025, under Cumulative Conditions, the EMU Option would result in a net decrease of 3,584 MT CO_2e annually compared to 2025 No Project Conditions. While GHG emissions would increase by 2,006 MT CO_2e, this would be offset by a reduction in GHG emissions of 5,590 MT CO_2e, resulting in an overall net decrease in GHG emissions. Table 3.L-8 shows the GHG emissions in MT CO_2e per year under 2025 Cumulative Conditions.

All sources of GHG emissions and GHG reductions would be the same under 2025 Cumulative Conditions as for the EMU Option in 2025, except for GHG emissions associated with passenger VMT. As described above for the DMU Alternative under Cumulative Conditions, passenger VMT reductions would be less for 2025 Cumulative Conditions than under 2025 Project Conditions.

As described above, in 2025 under Cumulative Conditions, the EMU Option would reduce GHG emissions by approximately 3,584 MT CO_2e annually compared to 2025 No Project Conditions. Under 2025 Cumulative Conditions, the EMU Option would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2025 under Cumulative Conditions, the EMU Option would result in a beneficial impact, and mitigation measures are not required. **(B)**

Express Bus/BRT Alternative. In 2025 under Cumulative Conditions, the Express Bus/BRT Alternative would result in a net decrease of 3,242 MT CO_2e annually compared to 2025 No Project Conditions. While GHGs would increase by 1,659 MT CO_2e, this would be offset by a reduction of 4,901 MT CO_2e, thus resulting in an overall net decrease in GHG emissions. Table 3.L-9 shows the GHG emissions under 2025 Cumulative Conditions.

All sources of GHG emissions and GHG reductions would be the same under 2025 Cumulative Conditions as for the Express Bus/BRT Alternative in 2025, except for GHG emissions associated with passenger VMT, as described below.

- **Reduced Passenger Vehicle VMT.** In 2025, under Cumulative Conditions, the Express Bus/BRT Alternative would reduce passenger VMT by approximately 19,509,613 miles. Due to the reduction in passenger vehicle VMT, emissions of GHGs from passenger vehicles would be reduced by 4,901 MT CO_2e. This represents a further reduction in GHG emissions compared to the Express Bus/BRT Alternative in 2025 (which would have a reduction of 3,355 MT CO_2e per year).

As described above, in 2025 under Cumulative Conditions, the Express Bus/BRT Alternative would reduce GHG emissions by approximately 3,242 MT CO_2e annually compared to 2025 No Project Conditions. Under 2025 Cumulative Conditions, the Express Bus/BRT Alternative would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2025 under Cumulative Conditions, the Express Bus/BRT Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

Enhanced Bus Alternative. In 2025 under Cumulative Conditions, the Enhanced Bus Alternative would result in a net decrease of 765 MT CO_2e annually compared to 2025 No Project Conditions. While GHGs would increase by 1,422 MT CO_2e, this would be offset from a reduction in emissions of 2,187 MT CO_2e, resulting in an overall decrease in GHG emissions. Table 3.L-9 shows the GHG emissions under 2025 Cumulative Conditions.

All sources of GHG emissions and GHG reductions would be the same under 2025 Cumulative Conditions as for the Enhanced Bus Alternative in 2025, except for GHG emissions associated with passenger VMT, as described below.

- **Reduced Passenger Vehicle VMT.** Annually, in 2025 under Cumulative Conditions, the Enhanced Bus Alternative would reduce passenger VMT by approximately 8,705,948 miles. Due to the reduction in passenger VMT, emissions of GHGs from passenger vehicles would be reduced by 2,187 MT CO_2e. This represents a further reduction in GHG emissions compared to the Enhanced Bus Alternative in 2025 (which would have a reduction of 24 MT CO_2e per year).

As described above, in 2025 under Cumulative Conditions, the Enhanced Bus Alternative would reduce GHG emissions by approximately 765 MT CO_2e annually compared to 2025 No Project Conditions. Under 2025 Cumulative Conditions, the Enhanced Bus Alternative would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2025 under Cumulative Conditions, the Enhanced Bus Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

Mitigation Measures. As described above, in 2025 under Cumulative Conditions, the Proposed Project and Alternatives would not result in significant operational impacts related to GHG emissions, and no mitigation measures are required.

Impact GHG-6(CU): Generate GHG emissions, either directly or indirectly, above BAAQMD significance thresholds, or conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions, under 2040 Cumulative Conditions.

(No Project Alternative: S; Conventional BART Project: B; DMU Alternative: B; EMU Option: B; Express Bus/BRT Alternative: B; Enhanced Bus Alternative: B)

The change between 2040 No Project Conditions and 2040 Cumulative Conditions represents the net emissions increase or decrease attributed to the Proposed Project or an alternative under Cumulative Conditions. Table 3.L-10 shows the annual change in GHG emissions from the operation of the Cumulative Conditions in 2040.

No Project Alternative. As described in **Impact GHG-4** above, the 2040 No Project Alternative would have significant impacts associated with GHG emissions during operations because the reductions in GHG emissions due to the reduced passenger VMT anticipated under the Proposed Project, DMU Alternative, EMU Option, or Express Bus/BRT Alternative (associated with increased transit ridership) would not occur. Under 2040 Cumulative Conditions, without the benefit of the Proposed Project or these alternatives, cumulative GHG emissions would be significant and the No Project Alternative would result in a cumulatively considerable contribution to impacts related to GHG emissions. **(S)**

Conventional BART Project. In 2040 under Cumulative Conditions, the Proposed Project would result in a net decrease of 12,760 MT CO_2e annually compared to 2040 No Project Conditions. While GHG emissions would increase by 2,575 MT CO_2e annually under the 2040 Cumulative with Proposed Project, this would be offset by a reduction of 15,334 MT CO_2e, resulting in an overall net decrease in GHG emissions. Table 3.L-10 shows the GHG emissions in MT CO_2e per year for the Proposed Project under 2040 Cumulative Conditions.

All sources of GHG emissions and GHG reductions would be the same under 2040 Cumulative Conditions as for the Proposed Project in 2025, except that GHG emissions associated with passenger VMT would change compared to the Proposed Project in 2040, as described below.

- **Reduced Passenger Vehicle VMT.** Annually, in 2040 under Cumulative Conditions, the Proposed Project would reduce passenger VMT by approximately 82,390,212. Due to the reduction in passenger VMT, emissions of GHGs from passenger vehicles would be reduced by 15,275 MT CO_2e. This represents a greater reduction in GHG emissions compared to the 2025 Proposed Project under Cumulative Conditions (which would have a reduction of 8,232 MT CO_2e per year).

As described above, in 2040 under Cumulative Conditions, the Proposed Project would reduce GHG emissions by approximately 12,760 MT CO_2e annually compared to 2040 No Project Conditions. In 2040 under Cumulative Conditions, the Proposed Project would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2040 under Cumulative Conditions, the Proposed Project would result in a beneficial impact, and mitigation measures are not required. **(B)**

DMU Alternative. In 2040, under Cumulative Conditions, the DMU Alternative would result in a net decrease of 4,814 MT CO_2e annually compared to 2040 No Project Conditions. While GHG emissions would increase by 4,501 MT CO_2e, this would be offset by a reduction in GHG emissions of 9,314 MT CO_2e, thus resulting in an overall net decrease in GHG emissions. Table 3.L-10 shows the GHG emissions under 2040 Cumulative Conditions.

TABLE 3.L-10 CHANGE IN ANNUAL GHG EMISSIONS UNDER 2040 CUMULATIVE CONDITIONS

	Metric Tons of CO_2e Per Year				
Emission Component	**Conventional BART Project**	**DMU Alternative**	**EMU Option**	**Express Bus/BRT Alternative**	**Enhanced Bus Alternative**
Sources					
Transit Operations					
BART Operations[a]	709	229	229	95	--
DMU Operations	--	2,675	--	--	--
EMU Operations	--	--	190	--	--
Bus Operations	1,103	1,103	1,103	1,347	1,207
Station and Maintenance Operations					
Station Electricity	126	126	126	--	--
Emergency Generator	60	60	60	--	--
Water and Wastewater	9	7	7	3	1
Solid Waste	447	231	231	103	52
BART Car Maintenance	107	35	35	14	--
DMU/EMU Car Maintenance	--	26	26	--	--
Employee Shuttle Vans	5	--	--	--	--
Maintenance Trucks	5	5	5	--	--
Electric Forklifts	4	4	4	--	--
Subtotal Sources	*2,575*	*4,501*	*2,016*	*1,562*	*1,260*
Reductions					
Passenger Vehicles (Reduced VMT)	-15,275	-9,255	-9,255	-6,425	-1,634
Solar Photovoltaic Electricity Generation	-59	-59	-59	--	--
Subtotal Reductions	*-15,334*	*-9,314*	*-9,314*	*-6,425*	*-1,634*
Summary					
Total Emissions	**−12,760**	**−4,814**	**−7,300**	**−4,862**	**−374**
BAAQMD Significance Threshold	**1,100**	**1,100**	**1,100**	**1,100**	**1,100**
Exceed Threshold?	**No**	**No**	**No**	**No**	**No**

Notes: CO_2e = carbon dioxide equivalent; VMT = vehicle miles traveled.
Emissions are shown as the change between 2040 No Project Conditions and 2040 Cumulative Conditions. Positive values represent an increase in GHG emissions and negative values represent a decrease in GHG emissions.
[a] GHG emissions for BART Operations are from the additional BART cars needed to support the ridership for each alternative.

All sources of GHG emissions and GHG reductions would be the same under 2040 Cumulative Conditions as for the DMU Alternative in 2025, except for GHG emissions associated with passenger VMT, as described below.

- **Reduced Passenger Vehicle VMT.** Annually, in 2040 under Cumulative Conditions, the DMU Alternative would reduce passenger VMT by approximately 49,924,896 miles. Due to the reduction in passenger VMT, emissions of GHGs from passenger vehicles would be reduced by 9,255 MT CO_2e. This represents a further reduction in GHG compared to the 2025 DMU Alternative under Cumulative Conditions (which would have a reduction of 5,521 MT CO_2e per year).

As described above, in 2040 under Cumulative Conditions, the DMU Alternative would reduce GHG emissions by approximately 4,814 MT CO_2e annually compared to 2040 No Project Conditions. Under 2040 Cumulative Conditions, the DMU Alternative would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2040 under Cumulative Conditions, the DMU Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

EMU Option. In 2040, under Cumulative Conditions, the EMU Option would result in a net decrease of 7,300 MT CO_2e annually compared to 2040 No Project Conditions. While GHG emissions would increase by 2,016 MT CO_2e, this would be offset by a reduction of 9,314 MT CO_2e, resulting in an overall net decrease in GHG emissions. Table 3.L-10 shows the GHG emissions in MT CO_2e per year under 2040 Cumulative Conditions.

All sources of GHG emissions and GHG reductions would be the same under 2040 Cumulative Conditions as for the EMU Option in 2040, except for GHG emissions associated with passenger VMT. As described above for the DMU Alternative under 2040 Cumulative Conditions, passenger VMT reductions would be less than under 2040 Project Conditions.

As described above, in 2040 under Cumulative Conditions, the EMU Option would reduce GHG emissions by approximately 7,300 MT CO_2e annually compared to 2040 No Project Conditions. Under 2040 Cumulative Conditions, the EMU Option would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2040 under Cumulative Conditions, the EMU Option would result in a beneficial impact, and mitigation measures are not required. **(B)**

Express Bus/BRT Alternative. In 2040 under Cumulative Conditions, the Express Bus/BRT Alternative would result in a net decrease of 4,862 MT CO_2e annually compared to 2040 No Project Conditions. While GHGs would increase by 1,562 MT CO_2e, this would be offset by a reduction in GHGs of 6,425 MT CO_2e, thus resulting in an overall net decrease in GHG emissions. Table 3.L-10 shows the GHG emissions under 2040 Cumulative Conditions.

All sources of GHG emissions and GHG reductions would be the same under 2040 Cumulative Conditions as for the Express Bus/BRT Alternative in 2040, except for GHG emissions associated with passenger VMT, as described below.

- **Reduced Passenger Vehicle VMT.** Annually, under 2040 Cumulative Conditions, the Express Bus/BRT Alternative would reduce passenger VMT by approximately 34,691,838 miles. Due to the reduction in passenger VMT, emissions of GHGs from passenger vehicles would be reduced by 6,425 MT CO_2e. This represents a further reduction in GHG emissions compared to the 2025 DMU Alternative under Cumulative Conditions (which would have a reduction of 4,901 MT CO_2e per year).

As described above, in 2040 under Cumulative Conditions, the Express Bus/BRT Alternative would reduce GHG emissions by approximately 4,862 MT CO_2e annually compared to 2040 No Project Conditions. Under 2040 Cumulative Conditions, the Express Bus/BRT Alternative would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2040 under Cumulative Conditions, the Express Bus/BRT Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

Enhanced Bus Alternative. In 2040 under Cumulative Conditions, the Enhanced Bus Alternative would result in a net decrease of 374 MT CO_2e annually compared to 2040 No Project Conditions. While GHG emissions would increase by 1,260 MT CO_2e, this would be offset by a reduction in GHG emissions of 1,634 MT CO_2e, resulting in an overall net decrease in GHG emissions. Table 3.L-10 shows the GHG emissions under 2040 Cumulative Conditions.

All sources of GHG emissions and GHG reductions would be the same under 2040 Cumulative Conditions as for the Enhanced Bus Alternative in 2025, except for GHG emissions associated with passenger VMT, as described below.

- **Reduced Passenger Vehicle VMT.** Annually, in 2040 under Cumulative Conditions, the Enhanced Bus Alternative would reduce passenger VMT by approximately 8,834,264 miles. Due to the reduction in passenger VMT, emissions of GHGs from passenger vehicles would be reduced by 1,634 MT CO_2e. This represents an increase in GHG emissions compared to the 2025 Enhanced Bus Alternative under Cumulative Conditions (which would have a reduction of 2,187 MT CO_2e per year).

As described above, in 2040 under Cumulative Conditions, the Enhanced Bus Alternative would reduce GHG emissions by approximately 374 MT CO_2e annually compared to 2040 No Project Conditions. Under 2040 Cumulative Conditions, the Enhanced Bus Alternative would not generate GHG emissions, either directly or indirectly, above the BAAQMD significance thresholds, and therefore would not conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing GHG emissions. In 2040 under Cumulative Conditions, the Enhanced Bus Alternative would result in a beneficial impact, and mitigation measures are not required. **(B)**

Mitigation Measures. As described above, in 2040 under Cumulative Conditions, the Proposed Project and Build Alternatives would not result in significant operational impacts related to GHG emissions, and no mitigation measures are required. However, in 2040 under Cumulative Conditions, without the benefit of the Proposed Project or the Build Alternatives, the No Project Alternative would result in significant impacts related to GHG emissions.