Exposition Metro Line Construction Authority

Exposition Corridor Transit Project Phase 2

Final Environmental Impact Report

Technical Background Report

FINAL

Global Climate Change

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Prepared for:

Exposition Metro Line Construction Authority

By:

PBS&J

ERRATA

The Exposition Metro Line Construction Authority (Expo Authority) has determined that the bike path and Second Street Santa Monica Terminus are no longer under consideration as part of the Expo Phase 2 Light-Rail Transit project. This Technical Background Report was drafted prior to the final definition of the LRT Alternatives that was presented in the Draft Environmental Impact Report (DEIR). Accordingly, discussion of the bike path and Second Street Santa Monica Terminus still remain in this report but no longer apply and should be disregarded.

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1. INTRODUCTION

1.1 Overview

This section addresses the potential impacts of operation of the proposed Expo Phase 2 project on greenhouse gas emissions and the potential for emissions to cumulatively contribute to climate change, as required by the *California Global Warming Solutions Act of 2006* (AB 32).

1.2 Project Summary

The proposed Exposition Corridor Transit Project Phase 2 (referred to as either the Expo Phase 2 project or proposed project) would involve the implementation of new or upgraded corridor transit solutions within a western portion of Los Angeles County in the cities of Los Angeles, Culver City, and Santa Monica. Six alternatives are analyzed. The alternatives include the No-Build Alternative, Transportation Systems Management (TSM) Alternative, and four Light-Rail Transit (LRT) Alternatives. A brief description of these alternatives is provided below.

1.2.1 No-Build Alternative

The No-Build Alternative includes only Metro service features that currently exist or have been explicitly committed for project buildout in the year 2030. As such, the No-Build Alternative includes existing fixed guideway Metro Rail and Metro Liner bus rapid transit (BRT) systems currently under operation, the full implementation of the Metro Rapid Bus program, represented as twenty-eight routes across Los Angeles County, and planned peak-only rapid bus lanes along Wilshire Boulevard between Western Avenue and Bundy Drive. The rest of the bus network is based on June 2007 service patterns for Metro, Los Angeles Department of Transportation (LADOT), Culver City, and Santa Monica Big Blue Bus, as well as committed enhancements to those services anticipated by 2030. Based on direction from Metro, their bus fleet will be assumed to include a mix of articulated and higher-capacity 45-foot buses in 2030.

1.2.2 Transportation Systems Management (TSM) Alternative

The TSM Alternative seeks to address the corridor transit needs without major capital investments and includes the improvements outlined in the No-Build Alternative plus three additional components. These three components include (1) addition of a rapid bus route connecting downtown Culver City with downtown Santa Monica; (2) associated service improvements on selected north/south routes to feed stations along the new rapid bus route; and (3) service improvements on selected routes, connecting Westside communities to the Phase 1 Terminus.

1.2.3 Light-Rail Transit (LRT) Alternatives

LRT is defined as a metropolitan electric railway system characterized by its ability to operate single cars or short trains along exclusive rights-of-way at ground level, on aerial structures, in subways, or, occasionally, in streets, and to board and discharge passengers at track or car-

floor level. Light-rail vehicles are driven electrically with power drawn from an overhead electric line. LRT provides a cleaner, more energy-efficient form of transportation than automobiles and is quieter than conventional rail systems.

The LRT alignment would extend rail from the current Phase 1 terminus station at Venice/Robertson to a terminus station in Santa Monica at 4th Street and Colorado Avenue. The LRT Alternatives are as follows:

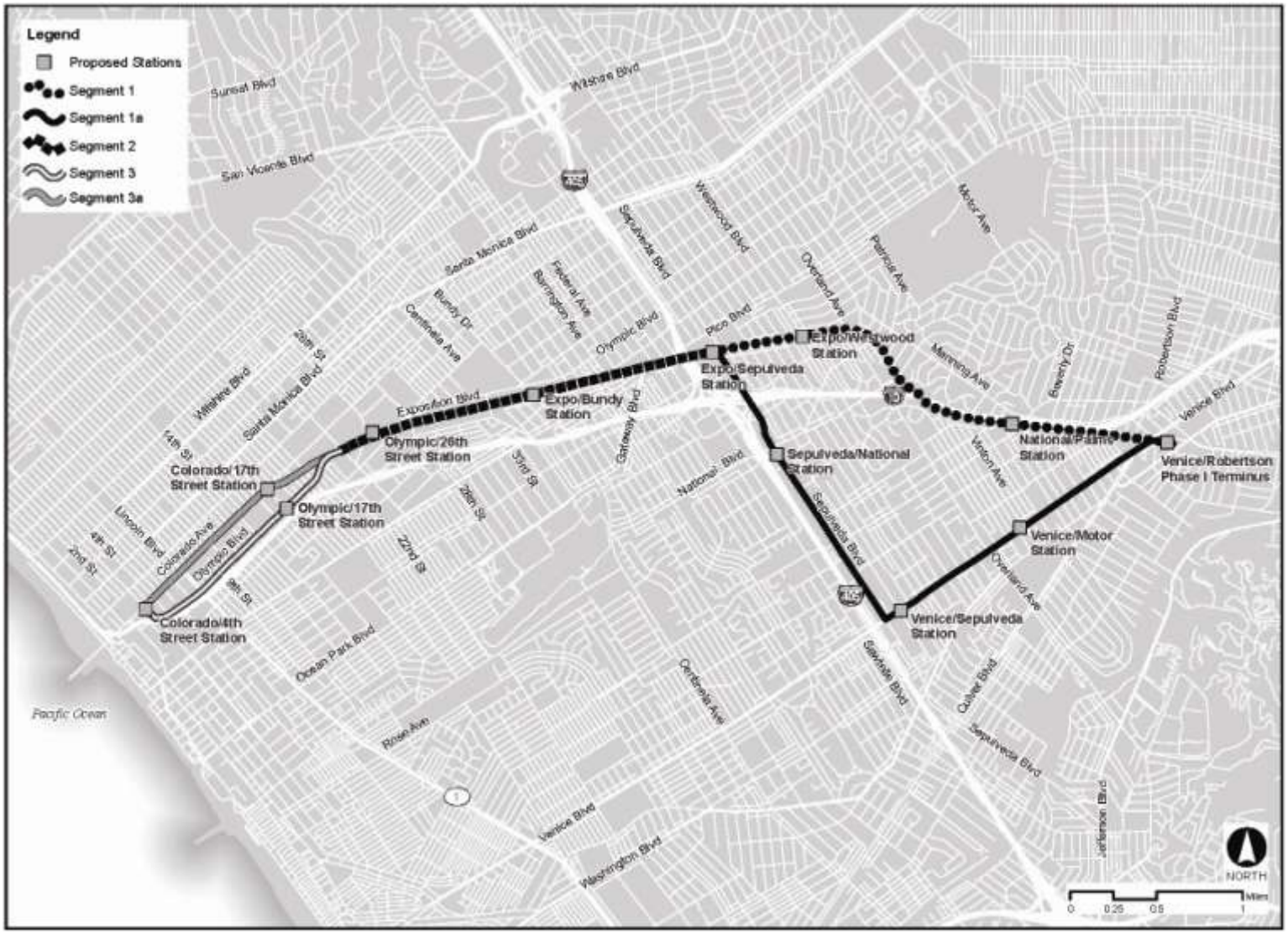
- LRT 1 (Expo ROW–Olympic Alternative) would utilize approximately 5 miles of the existing Expo ROW from the Expo Phase 1 terminus until reaching the intersection with Olympic Boulevard in Santa Monica. From that point, the alignment would follow Olympic Boulevard to the proposed terminus station.
- LRT 2 (Expo ROW–Colorado Alternative) would also utilize the existing Expo ROW from the Expo Phase 1 terminus until reaching the intersection with Olympic Boulevard in Santa Monica. From that point, the alignment would continue within the Expo ROW to west of 19th Street, then diverge from the Expo ROW and enter onto Colorado Avenue east of 17th Street and follow the center of Colorado Avenue to the proposed terminus.
- LRT 3 (Venice/Sepulveda–Olympic Alternative) would divert from the Expo ROW at the Expo Phase 1 terminus and follow Venice Boulevard and Sepulveda Boulevard until reaching the intersection with the Expo ROW. The alignment would then continue westward along the Expo ROW and Olympic Boulevard identical to the LRT 1 Expo ROW–Olympic Alternative.
- LRT 4 (Venice/Sepulveda–Colorado Alternative) would divert from the Expo ROW at the Expo Phase 1 terminus and follow Venice Boulevard and Sepulveda Boulevard until reaching the intersection with the Expo ROW. The alignment would then continue westward along the Expo ROW and Colorado Avenue identical to the LRT 2 Expo ROW–Colorado Alternative.

Geographic Segments

The proposed project traverses several jurisdictions, including the cities of Los Angeles, Culver City, and Santa Monica, and spans distinct communities within each jurisdiction. In order to account for these differences, the proposed project is described and examined at two different scales, from broad to specific—Westside of Los Angeles County and geographic segments with special consideration of proposed station areas—to identify potential impacts.

For purposes of this discussion, the LRT Alternatives have been divided into geographic segments for ease of analysis (Figure 1-1 [Project Location]). For the area between the Phase 1 terminus and the Exposition/Sepulveda intersection, there are two alternative alignments: Segment 1 (Expo ROW) and Segment 1a (Venice/Sepulveda). Segment 2 (Sepulveda to Cloverfield) is common to all LRT Alternatives. For the area between the Cloverfield/Olympic intersection and a terminus in Santa Monica, there are also two alternative alignments: Segment 3 (Olympic) and Segment 3a (Colorado). Thus, the segments are as follows:

- Segment 1: Follows the Expo ROW from the Expo Phase 1 terminus station in Culver City to the Expo ROW/Sepulveda Boulevard intersection, approximately 2.8 miles in length



Source: PBS&J, ESRI 2009

Figure 1-1 Project Location

- Segment 1a: Follows westerly in the median of Venice Boulevard from the Expo Phase 1 terminus station in Culver City to the Venice Boulevard/Sepulveda Boulevard intersection, then follows northerly in the center of Sepulveda Boulevard to the Expo ROW/Sepulveda Boulevard intersection, approximately 3.7 miles in length
- Segment 2: Follows the Expo ROW from the Expo ROW/Sepulveda Boulevard intersection to the Expo ROW/Olympic Boulevard intersection, approximately 2.3 miles in length
- Segment 3: Follows the median of Olympic Boulevard from the Expo ROW/Olympic Boulevard intersection to the Phase 2 terminus option at 4th Street and Colorado Avenue in Santa Monica, approximately 1.5 miles in length
- Segment 3a: Follows the Expo ROW from the Expo ROW/Olympic Boulevard intersection to west of 19th Street in Santa Monica. The alignment then diverges onto Colorado Avenue east of 17th Street and continues along the center of Colorado Avenue terminating between 4th Street and 5th Street, approximately 1.5 miles in length.

In response to comments received on the DEIR and after further analysis and coordination with various stakeholders, five design options have been added in the FEIR for the LRT Alternatives:

- Sepulveda Grade Separation Design Option
- Expo/Westwood Station No Parking Design Option
- Maintenance Facility Buffer Design Option
- Colorado Parking Retention Design Option
- Colorado/4th Parallel Platform and South Side Parking Design Option

Stations

Table 1-1 (Station Locations) provides a description of each station within the various segments, including the approximate location, the type of proposed station (i.e., at grade or aerial), and the amount of parking to be provided.

Table 1-1 Station Locations

Name	Location	LRT: EXPO ROW Alignment	LRT: Venice/ Sepulveda Alignment	Parking
Segment 1: Expo ROW				
National/Palms	Expo ROW just west of the aerial structure over National Boulevard/Palms Boulevard	On Embankment	N/A	0
Expo/Westwood	Within Expo ROW, ~~E~~east of Westwood Boulevard ~~on Exposition Boulevard~~	At grade	N/A	170
Segment 1a: Venice/Sepulveda				
Venice/Motor	Venice Boulevard, east of Motor Avenue	N/A	At grade	0

Table 1-1 Station Locations

Name	Location	LRT: EXPO ROW Alignment	LRT: Venice/ Sepulveda Alignment	Parking
Venice/Sepulveda	On Venice Boulevard, east of Sepulveda Boulevard	N/A	Aerial	0
Sepulveda/National	South of National Boulevard above the center of Sepulveda Boulevard	N/A	Aerial	250
Segment 2: Sepulveda to Cloverfield				
Expo/Sepulveda	West of Sepulveda Boulevard and Exposition Boulevard	At grade (aerial design option)	At grade (aerial design option)	~~270~~260
Expo/Bundy	Bundy Drive and Exposition Boulevard	Aerial	Aerial	250
Olympic/26th Street	East of 26th Street on Olympic	At grade	At grade	0
Segment 3: Olympic				
Olympic/17th Street	East and west side of 17th Street within the median of Olympic Boulevard	At grade	At grade	0
Colorado/4th	~~4th Street, east of Colorado Avenue~~On the existing commercial block bounded by 4th Street, 5th Street, and Colorado Avenue	Aerial	Aerial	~~250~~0
Segment 3a: Colorado				
Colorado/17th Street	Center of Colorado Avenue west of 17th Street	At grade	At grade	70
Colorado/4th	~~Center of Colorado Avenue between 2nd Street and 4th Street or o~~On the existing commercial block bounded by 4th Street, 5th Street, and Colorado Avenue	At grade	At grade	~~225~~0

SOURCE: DMJM Harris, 2008, updated 2009.

Maintenance Facilities

A Maintenance Facility is proposed to be constructed as a part of the Expo Phase 2 project. The Maintenance Facility site would be located on a parcel or parcels within the City of Santa Monica immediately south of the Expo ROW, north of Exposition Boulevard, and east of Stewart Street. The site is currently occupied by a surface parking lot and light-industrial facility. The maintenance facility is to be designed and built to meet the maintenance needs of the LRT vehicles required to operate Phase 2 through the year 2030. It could operate 24 hours a day in three shifts. The maintenance facility would consist of outdoor storage for ~~20 to 36~~approximately 43 to 45 LRT vehicles and associated storage track; trackway to connect to the main line and allow the movement of LRT vehicles from the main line track to and within the maintenance

facility area; main yard shop building with office and vehicle repair areas; vehicle wash facility; traction power substation; and parking for 65 ~~to 70~~ employees. The main yard shop structure would be approximately ~~300~~ 350 feet long and ~~166~~ 189 feet wide, two stories in height, and with a total area of approximately 125,000 square feet. The structure would be built of concrete block or corrugated metal or a combination thereof.

Since the release of the DEIR and in response to comments, the Expo Authority has worked with the City of Santa Monica, Metro, and the community to identify alternative layouts for the Maintenance Facility. As a result of these collaborative efforts, a Maintenance Facility Buffer Design Option has been developed for evaluation in the FEIR. This design option would occupy only a portion of the Verizon site, with an extension of the facility into the existing Santa Monica College parking lot to the west. Utilization of the adjacent parking lot on the west side of the Verizon site would create an approximate 100- to 110-foot buffer between the Maintenance Facility and the residential area on the south side of Exposition Boulevard. The Maintenance Facility Buffer Design Option would include much of the same facilities as the original Maintenance Facility concept.

2. AFFECTED ENVIRONMENT

2.1 Overview

The term “climate change” refers to long-term global and regional variations in wind patterns, storm intensity, precipitation, and temperature. It is widely accepted by the scientific community, and is recognized by the State of California, that (1) emissions of greenhouse gases and aerosols, and changes in land cover associated with development are accelerating global climate change and that (2) adverse environmental impacts will result from climate change in the future. This Technical Background Report discusses how potential adverse physical and environmental impacts associated with climate change could affect the proposed project and how the proposed project, by emitting greenhouse gases and altering existing land cover, could contribute to climate change.

Over time, the Earth’s climate has undergone significant change which can be traced and documented through fossil isotopes, ice core samples, and other measurement techniques. Recent climate change studies use the historical record to predict future climate variations and what level of fluctuation might be considered statistically “normal,” given historical trends. Temperature records from the last 150 years deviate from normal predictions in both rate and magnitude. Most climatologists predict an unprecedented warming period during the next century and beyond. This warming trend is increasingly attributed to human-generated greenhouse gas emissions resulting from the industrial processes, transportation, solid waste generation, and land use patterns of the twentieth and twenty-first centuries. According to the United Nations Intergovernmental Panel on Climate Change (IPCC), greenhouse gas emissions associated with human activities have grown since pre-industrial times. Greenhouse gas emissions have increased by 70 percent in the 34 years between 1970 and 2004 (IPCC 2007b).

The IPCC has constructed several emission trajectories of greenhouse gas emissions needed to stabilize global temperatures and minimize climate change impacts. The IPCC predicted that the range of global mean temperature change from 1990 to 2100, given six scenarios, could range from 1.1 degrees Celsius (°C) to 6.4°C. The IPCC projects an increase of global

greenhouse gas emissions by 25 to 90 percent between 2000 and 2030, depending on the reduction thresholds, mitigation, and alternative fuel development that are pursued around the world during this period. It should be noted that regardless of the analytical methodology used and the level of greenhouse gas reductions that are assumed, global average temperature and sea level are expected to rise under all scenarios modeled by the IPCC (IPCC 2007b).

2.2 Greenhouse Gases

Gases that trap heat in the atmosphere are called greenhouse gases, analogous to the way a greenhouse retains heat. Greenhouse gases act to transform the light of the sun into heat and to trap that heat in the lower atmosphere, in a manner similar to the glass walls of a greenhouse. Common greenhouse gases include water vapor, carbon dioxide, methane, nitrous oxides, chlorofluorocarbons, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, ozone, and aerosols. Without the natural heat trapping effect of greenhouse gases, the earth's surface would be about 34°C cooler (CAT 2006). However, it is believed that emissions from human activities, such as electricity production and vehicle use, have elevated the concentration of these gases in the atmosphere beyond the level of naturally occurring concentrations. Global atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased markedly since 1750 as a result of human activities introduced with the advent of the Industrial Age, and these concentrations now far exceed pre-industrial values as determined from ice core samples that contain trapped gases spanning many thousands of years.

Individual greenhouse gases have varying global warming potentials and atmospheric lifetimes (see Table 2-1 [Global Warming Potentials and Atmospheric Lifetimes of Select Greenhouse Gases]). The carbon dioxide equivalent is a consistent methodology for comparing greenhouse gas emissions since it normalizes various greenhouse gas emissions to a consistent metric. The reference gas for global warming potential is carbon dioxide, which has a global warming potential of one. By comparison, methane's global warming potential is 21, since methane has a greater global warming effect than carbon dioxide on a molecule-to-molecule basis. One teragram (Tg) (equal to one million metric tons) of carbon dioxide equivalent (Tg CO_2e) is the mass emissions of an individual greenhouse gas multiplied by its global warming potential.

The participation of water vapor as a GHG is poorly understood. It is unclear the extent to which water vapor acts as a GHG. The uncertainty is due to the fact that water vapor can also produce cloud cover, which reflects sunlight away from earth and can counteract its effect, if any, as a GHG. Also, water vapor tends to increase as the earth warms, so it is not well understood whether an increase in water vapor is contributing to climate change or rather a reaction to climate change. The main source of water vapor is evaporation from the oceans (approximately 85 percent). Other sources include evaporation from other water bodies, sublimation (change from solid to gas) from ice and snow, and transpiration from plant leaves.

Table 2-1 Global Warming Potentials and Atmospheric Lifetimes of Select Greenhouse Gases

Gas	Atmospheric Lifetime (years)	Global Warming Potential (100 year time horizon)
Carbon Dioxide	50–200	1
Methane	12±3	21
Nitrous Oxide	120	310
HFC-23	264	11,700
HFC-134a	14.6	1,300
HFC-152a	1.5	140
PFC: Tetrafluoromethane (CF_4)	50,000	6,500
PFC: Hexafluoroethane (C_2F_6)	10,000	9,200
Sulfur Hexafluoride (SF_6)	3,200	23,900

SOURCE: Environmental Protection Agency, 2006.

~~Of all greenhouse gases in the atmosphere, water vapor is the most abundant, important, and variable. It is not considered a pollutant. In the atmosphere, it maintains a climate necessary for life. The main source of water vapor is evaporation from the oceans (approximately 85 percent). Other sources include evaporation from other water bodies, sublimation (change from solid to gas) from ice and snow, and transpiration from plant leaves.~~

Carbon dioxide (CO_2) is an odorless, colorless gas, which has both natural and anthropogenic sources. Natural sources include the following: decomposition of dead organic matter; respiration of bacteria, plants, animals, and fungus; evaporation from oceans; and volcanic outgassing. Anthropogenic sources of carbon dioxide are from burning coal, oil, natural gas, and wood. CO_2 emissions in California are mainly associated with in-state fossil fuel combustion and with fossil fuel combustion in out-of-state power plants supplying electricity to California. Other activities that produce CO_2 emissions include mineral production, waste combustion, and land use changes that reduce vegetative cover.

Methane (CH_4) is a flammable gas and is the main component of natural gas. When one molecule of methane is burned in the presence of oxygen, one molecule of carbon dioxide and two molecules of water are released. There are no ill health effects from methane. A natural source of methane is from the anaerobic decay of organic matter. Geological deposits, known as natural gas fields, also contain methane, which is extracted for fuel. Other sources are from landfills, fermentation of manure, and cattle.

Nitrous oxide (N_2O), also known as “laughing gas,” is a colorless greenhouse gas. Higher concentrations can cause dizziness, euphoria, and sometimes slight hallucinations. Nitrous oxide is produced by microbial processes in soil and water, including those reactions that occur in fertilizer containing nitrogen. In addition to agricultural sources, some industrial processes (fossil fuel-fired power plants, nylon production, nitric acid production, and vehicle emissions) also contribute to its atmospheric load. It is used in rocket engines, racecars, and as an aerosol spray propellant.

Chlorofluorocarbons (CFCs) are gases formed synthetically by replacing all hydrogen atoms in methane or ethane with chlorine and/or fluorine atoms. CFCs are nontoxic, nonflammable, insoluble, and chemically unreactive in the troposphere (the level of air at the earth's surface). CFCs were first synthesized in 1928 for use as refrigerants, aerosol propellants, and cleaning solvents. Because they destroy stratospheric ozone, their production was stopped as required by the Montreal Protocol in 1987.

Hydrofluorocarbons (HFCs) are synthetic man-made chemicals that are used as a substitute for CFCs for automobile air conditioners and refrigerants.

Perfluorocarbons (PFCs) have stable molecular structures and do not break down though the chemical processes in the lower atmosphere. High-energy ultraviolet rays about 60 kilometers above the earth's surface are able to destroy the compounds. PFCs have very long lifetimes, between 10,000 and 50,000 years. Two common PFCs are tetrafluoromethane and hexafluoroethane. Concentrations of tetrafluoromethane in the atmosphere are over 70 parts per trillion (ppt). The two main sources of PFCs are primary aluminum production and semiconductor manufacture.

Sulfur hexafluoride (SF6) is an inorganic, odorless, colorless, nontoxic, nonflammable gas. It has the highest global warming potential of any gas evaluated, 23,900. Concentrations in the 1990s were about four ppt. Sulfur hexafluoride is used for insulation in electric power transmission and distribution equipment, in the magnesium industry, in semiconductor manufacturing, and as a tracer gas for leak detection.

Ozone is a greenhouse gas; however, unlike other greenhouse gas, ozone in the troposphere is relatively short-lived and, therefore, its effects are not globally important. It is difficult to make an accurate determination of the contribution of ozone precursors (nitrogen oxides and volatile organic compounds) to global climate change (Cal EPA 2004).

Aerosols are suspensions of particulate matter in a gas emitted into the air through burning biomass (plant material) and fossil fuels. Aerosols can warm the atmosphere by absorbing and emitting heat and can cool the atmosphere by reflecting light. Aerosols can also affect cloud formation. Sulfate aerosols are emitted when fuel-containing sulfur is burned. Black carbon (or soot) is emitted during bio mass burning or incomplete combustion of fossil fuels. Particulate matter regulation has been lowering aerosol concentrations in the United States; however, global concentrations are likely increasing.

Generally, greenhouse gases generated by electrical-powered light-rail vehicles and other transit sources (including those fueled by petroleum or natural gas) include carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), and hydrofluorocarbons (HFCs~~), sulfur hexafluoride (SF_6), and aerosols.~~). Other gases that contribute to the greenhouse effect include ozone,[1] chlorofluorocarbons (CFCs), ~~and~~ sulfur hexafluoride (SF_6), perfluorocarbons (PFCs) and aerosols, but these gases are generally associated with residential and/or industrial uses. Transportation infrastructure projects do not generate substantial levels of these gases. As HFCs are mainly associated with motor vehicle air conditioning units they are not considered in

[1] Ozone is a greenhouse gas; however, unlike other greenhouse gases, ozone in the troposphere, which is the lowest portion of the earth's atmosphere, is relatively short-lived. It is difficult to make an accurate determination of the contribution of ozone precursors (nitrogen oxides and volatile organic compounds) to global climate change (~~Cal EPA 2004~~Pavley 2002).

this analysis. The focus of this analysis is on transportation infrastructure generation of CO_2, CH_4, and N_2O.

2.3 Global, Federal, and State Greenhouse Gas Inventories

Worldwide anthropogenic emissions of greenhouse gases in 2006 were approximately 49,000 million metric tons of CO_2e, including ongoing emissions from industrial and agricultural sources and emissions from land use changes (i.e., deforestation, biomass decay) (IPCC, 2007). CO_2 emissions from fossil fuel use accounts for 56.6 percent of the total emissions. CH_4 emissions account for 14 percent and N_2O emissions for 8 percent of worldwide greenhouse gases (IPCC, 2007).

The US EPA publication, *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990—2006*, provides a comprehensive emissions inventory of the nation's primary anthropogenic sources of greenhouse gases. In 2006, total nationwide greenhouse gas emissions were 7,054 million metric tons of CO_2e (EPA, 2008). Overall, total US emissions have risen by about 15 percent from 1990 to 2006, while the gross domestic product increased by 59 percent over the same period. Emissions fell by 1 percent from 2005 to 2006. According to the EPA, the primary contributors to the decrease were increased fuel prices and warmer weather conditions, which resulted in a decreased consumption of fossil fuels.

The State of California is a substantial contributor of greenhouse gas emissions, as it is the second largest contributor in the U.S. and the 16th largest in the world. In 2004, the California Air Resources Board (CARB) conducted a detailed inventory of statewide sources. According to CARB, California generated 484 million metric tons of CO_2e in 2004. Greenhouse gas emissions in California are mainly associated with fossil fuel consumption in the transportation sector (38 percent) with the industrial sector as the second largest source (20 percent). Electricity production, agriculture, forestry, commercial, and residential activities comprise the balance of California's greenhouse gas emissions. Emissions of greenhouse gases were offset slightly in 2004 by the sequestration (intake) of carbon within forests, reducing the overall emissions by 4.7 million metric tons, resulting in net emissions of about 480 million metric tons of CO_2e (CARB, 2007).

2.3.1 Sources of Greenhouse Gases Associated with Transportation Sector

California's transportation sector is heavily dependent upon oil, with petroleum-based fuels currently supplying 96 percent of California's transportation energy needs (California Energy Commission [CEC] 2003). By percentage, the transportation sector (including highways, rail systems, airports, and ports) is the largest contributor to greenhouse gas emissions in California, and contributed 38 percent of California' greenhouse gas emissions between 2002 and 2004 (California Air Resources Board [California ARB] 2008).

Public transit is demonstrably more energy efficient than multiple automobile trips and has been shown to result in lower greenhouse gas emissions (Poudenx and Merida 2007). The California Attorney General's Office (AGO) suggests that land development projects should be required to create an interconnected transportation system that allows a shift in travel from private passenger vehicles to alternative modes, including public transit, ride sharing, bicycling and walking as a form of reducing and mitigating greenhouse gas emissions (AGO 2007). Generally, the Association of Environmental Professionals (AEP), California Air Pollution Control Officers

Association (CAPCOA), California Climate Action Team (CAT), United States Environmental Protection Agency (U.S. EPA), and other climate change policy makers consider the provision of public transit access that serves to reduce vehicle miles traveled (VMT) as mitigation for climate change impacts.

3. REGULATORY FRAMEWORK

3.1 Federal/International

3.1.1 Montreal Protocol

The Montreal Protocol was signed in 1987 and amended in 1990 and 1992. The Montreal Protocol governs compounds that deplete ozone in the stratosphere—chlorofluorocarbons (CFCs), halons, carbon tetrachloride, and methyl chloroform. The Protocol provided that these compounds were to be phased out by 2000 (2005 for methyl chloroform). In 1988, the United Nations and the World Meteorological Organization established the Intergovernmental Panel on Climate Change (IPCC) to assess “the scientific, technical and socioeconomic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts, and options for adaptation and mitigation” (Ontario 2007).

3.1.2 Kyoto Protocol

On March 21, 1994, the United States joined a number of countries around the world in signing the United Nations Framework Convention on Climate Change (UNFCCC). Under the Convention, governments: “gather and share information on greenhouse gas emissions, national policies, and best practices; launch national strategies for addressing greenhouse gas emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries; and cooperate in preparing for adaptation to the impacts of climate change” (IPCC 2004).

The treaty known as the Kyoto Protocol was created as a result of UNFCC efforts. Countries sign the treaty to demonstrate their commitment to reducing greenhouse gas emissions or to engage in emissions trading. More than 160 countries representing 55 percent of global emissions (not including the United States) are currently participating in the protocol. In 1998, former U.S. Vice President, Al Gore, symbolically signed the Protocol; however, in order for the Protocol to be formally ratified the U.S. Congress must adopt it, which has not occurred.

3.1.3 Climate Change Action Plan

In October 1993, President Clinton announced his "Climate Change Action Plan," with the goal of returning greenhouse gas emissions to 1990 levels by the year 2000. This was to be accomplished through fifty initiatives, relying on innovative voluntary partnerships between the private sector and government aimed at producing cost-effective reductions in greenhouse gas emissions. As of May 2008, thirty states, including California, have completed comprehensive Climate Action Plans that detail the steps that each state can take to reduce their contribution to climate change.

3.1.4 Clean Air Act

The United States Environmental Protection Agency (EPA) currently does not regulate GHG emissions from motor vehicles. *Massachusetts v. EPA* (Supreme Court Case 05-1120) was argued before the U.S. Supreme Court on November 29, 2006, in which it was petitioned that EPA regulate four GHG, including carbon dioxide, under §202(a)(1) of the *Clean Air Act*. A decision was rendered on April 2, 2007, in which the Court held that petitioners have standing to challenge the EPA and that the EPA has statutory authority to regulate emission of GHG from motor vehicles.

3.2 State

3.2.1 California Assembly Bill 32 (AB 32)

In 2006, the California State Legislature adopted AB 32, the *California Global Warming Solutions Act of 2006*. AB 32 focuses on reducing GHG in California. GHG as defined under AB 32 include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. AB 32 requires the California Air Resources Board (CARB), the State agency charged with regulating statewide air quality, to adopt rules and regulations that would achieve greenhouse gas emissions equivalent to statewide levels in 1990 by 2020. The law further requires that the CARB develop measures to achieve the maximum technologically feasible and cost effective reductions in GHGs from sources or categories of sources to achieve the statewide greenhouse gas emissions limit for 2020.

Under AB 32, CARB is required to establish a statewide greenhouse gas emissions cap for 2020 based on 1990 emissions. CARB estimates that California's annual emissions were equivalent to 427 million metric tons CO_2e in 1990 (CEC 2006b). CARB published its final report for Proposed Early Actions to Mitigate Climate Change in California, which describes recommendations for discrete early action measures to reduce GHG emissions in October 2007. The measures included are part of California's strategy for achieving GHG reductions under AB 32. Three new regulations are proposed to meet the definition of "discrete early action greenhouse gas reduction measures," which include the following: a low carbon fuel standard; reduction of HFC-134a emissions from non-professional servicing of motor vehicle air conditioning systems; and improved landfill methane capture. CARB estimates that by 2020, the reductions from those three measures will be approximately 13-26 million metric tons of carbon dioxide equivalent.

Under AB 32, CARB has the primary responsibility for reducing GHG emissions. However, the CAT Report contains strategies that can be undertaken by many other California agencies. In addition, CARB staff is working on several non-regulatory measures including guidance documents and protocols to encourage the public, local government and businesses to take positive steps to reduce GHG emissions. The AB 32 Scoping Plan does not recommend specific actions with respect to local or regional transit. However, the proposed project will help to achieve the overall California ARB Scoping Plan reductions by reducing the amount of overall vehicle miles traveled within the region.

3.2.2 Executive Order S-3-05

California Governor Arnold Schwarzenegger announced on June 1, 2005, through Executive Order S-3-05, the following GHG emission reduction targets: by 2010, reduce GHG emissions to 2000 levels; by 2020, reduce GHG emissions to 1990 levels; by 2050, reduce GHG emissions to 80 percent below 1990 levels. The California Climate Action Team's (CAT) Report to the Governor in 2006, contains recommendations and strategies to help ensure the targets in Executive Order S-3-05 are met.

3.2.3 Executive Order S-01-07

Governor Arnold Schwarzenegger enacted Executive Order S-01-07 on January 18, 2007. The order mandates that a statewide goal shall be established to reduce the carbon intensity of California's transportation fuels by at least 10 percent by 2020. The process for meeting the 2020 target includes coordination between the California Environmental Protection Agency, the University of California, the California Energy Commission to develop and propose, a draft compliance schedule to meet the 2020 Target by June 30, 2007. The order also requires that a Low Carbon Fuel Standard for transportation be established for California.

3.2.4 Senate Bill 97

The provisions of Senate Bill (SB) 97, which was enacted in August 2007 as part of the State Budget negotiations, directed the Office of Planning and Research (OPR) to propose *California Environmental Quality Act* (CEQA) Guidelines advising lead agencies on how to mitigate the impacts of greenhouse gas emissions. OPR ~~has been directed to promulgate such~~drafted a proposed set of guidelines ~~by July~~addressing greenhouse gas emissions and released them for informal public review and comment in December 2008. OPR made minor revisions to the guidelines based upon public comments and in April 2009~~, and~~ handed over the proposed guidelines to the Resources Agency for adoption. The Resources Agency is providing a formal public review process and has been directed to adopt such guidelines into law by January 2010~~. Draft guidelines were released in December 2008 and were used for the analysis in this section~~.

3.2.5 Senate Bill 1078

SB 1078 establishes a renewable portfolio standard (RPS) for electricity supply. The RPS requires that retail sellers of electricity, including investor-owned utilities and community choice aggregators, provide 20 percent of their supply from renewable sources by 2017. This target date was moved forward by SB 107 to require compliance by 2010. In addition, electricity providers subject to the RPS must increase their renewable share by at least 1 percent each year. As of July 2008, Southern California Edison has achieved 15.7 percent of its total electrical sales from renewable resources (California Public Utilities Commission [CPUC] 2008). The Los Angeles Department of Water and Power (LADWP) reported that in 2008, 10 percent of its electricity was generated from renewable sources.[2] The outcomes of this legislation will impact regional transportation powered by electricity.

[2] LADWP. *2008 Green Power Annual Report.*

3.2.6 Senate Bill 375

SB 375 was signed into law in September 2008, and requires the California ARB to develop regional greenhouse gas emission reduction targets to be achieved from the automobile and light truck sectors for 2020 and 2035. The eighteen metropolitan planning organizations (MPOs) in California will prepare a "sustainable communities strategy" (SCS), as part of their Regional Transportation Plans, to reduce the amount of VMT in their respective regions and demonstrate the ability for the region to attain the California ARB's targets. Starting in the year 2012, transit-oriented development that is consistent with the SCS would then be eligible for regional funding; and in order to incentivize smart growth, these funds would not be available for non-compliant projects.

Cities and counties, when pursuing developments that comply with the SCS that has been prepared for their region, would be incentivized to focus on constructing “transit priority projects” (TPPs) that are sufficiently dense and close to transit. If a TPP is consistent with a region’s SCS, and if it satisfies other necessary conditions (such as no interference with wetlands or the habitat of an endangered species), then a TPP may be approved with less rigorous environmental review than CEQA currently requires. In addition, Cities would get extra time—eight years instead of five—to update housing plans required by the state. The main goal underlying these amendments is to coordinate transportation and housing planning—in particular, to allocate housing in a way that is consistent with the growth blueprint that each MPO lays out in its Regional Transportation Plan (RTP)-SCS.

3.3 Regional

~~There are no regional statutes related to global climate change that would apply to the proposed project.~~

Metro Energy and Sustainability Policy

As a provider of public transportation, Metro is a large user of energy, both fossil fuels and electricity. The Metro Energy and Sustainability Policy, adopted in June 2007, examines ways that Metro could reduce energy consumption and consequently improve sustainability. Metro is in the process of completing numerous energy efficiency projects, such as lighting upgrades, escalator power controllers, HVAC replacements, and solar projects. The Metro Energy and Sustainability Policy codified an agency commitment to responsible energy management, renewable energy sources, energy efficiency, and general sustainability in Metro’s operations.

The immediate goals of the policy are to gain more control over Metro’s energy consumption and reduce costs by aggressively pursuing renewable energy sources and energy conservation projects, and to construct all new facilities using energy efficiency and conservation strategies.

3.4 Local

There are no local statutes related to global climate change that would apply to the proposed project.

4. ENVIRONMENTAL CONSEQUENCES

4.1 Analytic Method

Data used to prepare this section were taken from various sources, including the following professional white papers: *Mitigation Measures and Global Warming Resources* (AGO 2007); *Alternative Approaches to Analyzing Greenhouse Gas Emissions and Global Climate Change in CEQA Documents* (AEP 2007); *CEQA and Climate Change* (CAPCOA 2008); *Climate Action Team Proposed Early Actions to Mitigate Climate Change in California* (CAT 2007); and *Climate Change 2007: Fourth Assessment Report* (IPCC 2007). Significance criteria are derived from the CAPCOA report, while the description of predicted climate change impacts is drawn from the United Nations Intergovernmental Panel on Climate Change (IPCC) report and from U.S. EPA predictions. The discussion of emissions reductions strategies is drawn from the California AGO and CAT reports.

In June 2008, the OPR published a technical advisory with recommendations for the preparation of greenhouse gas analyses under CEQA. OPR recommends preparation of a quantitative emissions inventory for a proposed project, followed by a discussion of the significance of the project according to climate change thresholds defined by a local agency. The December 2008 Draft CEQA Guideline amendments, prepared pursuant to SB 97, are consistent with the technical advisory.

In January 2009, the Office of Planning and Research (OPR) released a preliminary draft of revisions to the CEQA Guidelines with regard to evaluating, measuring, and mitigating the potential greenhouse gas emissions of a project. These preliminary draft guidelines allow a lead agency to consider a number of factors in determining the significance of a project's potential greenhouse gas emissions including the extent to which the project would help or hinder attainment of emissions reduction goals set by Assembly Bill 32. The lead agency is allowed to either "use a model or methodology to quantify" the GHG emissions, or "rely on qualitative or other performance based standards" to estimate the significance of a project's potential GHG emissions. Further, the lead agency may consider thresholds of significance adopted by other public agencies.

This section uses data from Transportation/Traffic Technical Background Report for the Light-Rail Transit (LRT) Alternatives. The greenhouse gas emissions estimate for the No-Build Alternative was used as a baseline to compare with the TSM Alternative and the four LRT Alternatives to determine the reduction in passenger vehicle-related greenhouse gas emissions that would occur with implementation of the proposed project. In addition, the increased use of electricity from the implementation of the LRT alternatives were determined and included in comparison to the No-Build and TSM Alternatives. Emissions of CO_2 from buses and passenger vehicles were obtained from the URBEMIS 2007 model. Emissions of CH_4 and N_2O from busses and passenger vehicles were determined from vehicle miles traveled. CO_2, CH_4, and N_2O emissions were also determined for electrical generation with respect to the operation of the LRT lines, stations, and maintenance yard.

4.2 Environmental Criteria

Currently no State or regional regulatory agency has formally adopted or widely agreed upon thresholds of significance for greenhouse gas emissions. CEQA Guidelines §15064.7 states that "each public agency is encouraged to develop and publish thresholds of significance that the agency uses in the determination of the significance of environmental effects." This provides justification for lead agencies to determine their own climate change thresholds. The Association of Environmental Professionals (AEP) recommends that, "If a Lead Agency chooses to address GCC [Global Climate Change] in a [CEQA] document, it should be addressed in the context of a cumulative (versus project-specific) impact."

The FTA and the Expo Authority have identified the following CEQA criteria, taken, ~~or adapted,~~ from the preliminary draft revisions to Appendix G of the CEQA Guidelines ~~§15064.7~~, as appropriate for this project. The FTA does not have specific criteria for evaluating effects associated with energy resources under NEPA; therefore, the FTA and the Expo Authority have determined that an assessment based on CEQA criteria provides a reasonable means for determining environmental effects. The project would have significant impacts on energy resources, for the purposes of CEQA and NEPA, if the project would result in the following:

- ~~Contribute to a regional increase in greenhouse gas emissions~~
- Create GHG emissions that would directly or indirectly have a significant impact, based on any threshold of significance; or
- Conflict with any existing applicable agency plan, policy, or regulation adopted for the purpose of reducing greenhouse gas emissions.

In response to the first significance determination criteria, the California Air Pollution Control Officers Association (CAPCOA) prepared a white paper outlining programmatic approaches for determining the significance of greenhouse gas emissions. For the purposes of this analysis, the CAPCOA's "Non-Zero GHG Threshold" was chosen. Significance determination in this analysis also uses methods of analysis found in the South Coast Air Quality Management District (SCAQMD) "Draft Guidance Document—Interim CEQA Greenhouse Gas Significance Thresholds (October 2008)." Under this threshold and using the SCAQMD methodology, if a project with the inclusion of construction emissions amortized over thirty years, emits less than 10,000 metric tons per year of CO_2e ($MTCO_2e$) then the Project's incremental contribution of greenhouse gases is considered less than significant.

Based on the CAPCOA and SCAQMD methodology and guidance, the temporal changes of greenhouse gas emissions year to year on the ground are not important. What is important in the analysis of greenhouse gas emissions is the atmospheric lifetime of greenhouse gases in the upper atmosphere. Therefore, the analysis needs to depict the total annual average emissions generated by the Project. Specific to temporary construction emissions, in comparing these emissions to the Tier 3 brightline screening threshold proposed by SCAQMD, construction emissions need to be annualized over the economic life of the Project and added to the total operational emissions in order to predict the average annual emissions that can be expected to occur in the upper atmosphere. The SCAQMD methodology assumes the economic life of a Project is 30-years.

The mix of energy supplied to SCE and LADWP was assumed to remain as it is with no addition of renewable energy resources and there was no increase in energy efficiency taken into

account. These conservative assumptions were maintained for all alternatives. However, rules and regulations are being developed that will increase energy efficiency and renewable energy sources that would result in emissions reductions in each of the alternatives. Because the analysis was conservative and does not take into account future rules and regulations that may reduce emissions, the emissions shown in this analysis are considered a worst-case scenario.

4.3 Analysis

Criterion	**Would the project ~~contribute to a regional increase in greenhouse gas~~create greenhouse gas emissions that would directly or indirectly have a significant impact based on any threshold of significance?**

Impact GCC-1 **Implementation of the LRT 1 Alternative of the proposed project would contribute to the reductions in greenhouse gas emissions by increasing the efficiency of the regional transportation system ~~and therefore would have a *beneficial*~~to a point that completely offsets project generated emissions and therefore would have a *beneficial* effect. Implementation of the LRT 2, LRT 3, and LRT 4 Alternatives also increase the efficiency of the regional transportation system but not to a level that completely offsets the project generated emissions. The LRT 2, LRT 3, and LRT 4 Alternatives result in a net increase of less than 10,000 $MTCO_2e$, which would result in a *less-than-significant* effect.**

No-Build Alternative

Construction

There would be roadway and transit service improvements associated with the No-Build Alternative. However, the only improvement that would change the physical environment in the Expo Phase 2 ROW would be the I-405 Widening project. Greenhouse gas emissions would be released during construction of the No-Build Alternative from the operation of construction equipment, and from worker and construction supply vendor vehicles. Construction of the No-Build Alternative would consist of temporary activities that would not result in long-term greenhouse gas emissions. Therefore, ***no adverse effect*** would result.

Operation

Regional VMT, and corresponding mobile source emissions, are expected to increase by 2030 in response to increased population and economic activity (refer to Table 4-1 [Annual ~~Countywide Reductions in CO_2 Associated with Reduced Vehicle Single-Occupancy Miles Traveled~~$MTCO_2$ Emissions]). Under the No-Build Alternative, greenhouse gas emissions would increase as a result of the increased VMT. The minor improvements in bus service on existing routes that would be implemented under the No-Build Alternative would have a small but positive impact on future greenhouse gas emissions. However, the vast majority of other projects assumed in the Air Quality Management Plan (AQMP) would proceed. Therefore, ***no adverse ~~impact~~ effect*** would result.

Transportation Systems Management (TSM) Alternative

Construction

The TSM Alternative would include all of the improvements under the No-Build Alternative and new on-street bus services to directly serve the Expo Phase 2 community transit needs. Those additional improvements would include minor physical modifications such as upgraded bus stops and additional buses. Greenhouse gas emissions would be released during construction of the TSM Alternatives from the operation of construction equipment, and from worker and construction supply vendor vehicles. Construction of the TSM Alternatives would consist of temporary activities that would not result in long-term greenhouse gas emissions. Therefore, ***no adverse effect*** would result.

FEIR Design Options

The length and intensity of construction activities associated with implementation of the Sepulveda Grade Separation, Colorado Parking Retention, Colorado/4th Parallel Platform and South Side Parking, Maintenance Facility Buffer, or Expo/Westwood Station No Parking design options are anticipated to be consistent with those already contemplated as part of the LRT Alternatives. No change in the level of impacts is anticipated as a result of implementation of the proposed design options. As such, construction of the design options in conjunction with the other facilities proposed under the project would be below 10,000 $MTCO_2e$/year. Therefore, ***no adverse effect*** would result.

Operation

The TSM Alternative would increase Metro, local and Rapid Bus services along city streets. By providing expanded bus service, it is anticipated that the TSM Alternative would result in a slight decrease in countywide VMT (refer to Table 4-1 [Annual ~~Countywide Reductions in CO_2 Associated with Reduced Vehicle Single-Occupancy Miles Traveled~~$MTCO_2$ Emissions]). The TSM Alternative would result in a net decrease in regional emissions and would have a ***beneficial*** effect on regional greenhouse gas emissions with respect to the No-Build Alternative.

LRT Alternatives

Operation

The proposed project would consume electricity, water, and natural gas supplied by Southern California Edison (SCE) and Los Angeles Department of Water and Power. Electric consumption is attributed to the operation of the trains, stations, and maintenance facility yard. Consumption of natural gas is attributed only to the operation of the maintenance facility yard. Water consumption would be respective to irrigation and washing trains at the maintenance yard and is represented as emissions from the electricity needed to pump water to the facility and to treat the wastewater from the maintenance yard. Table 4-2 (Estimated Greenhouse Gas Emissions from LRT Operational Activities [Metric Tons per Year]) lists the estimated emissions from each of the LRT alternatives with respect to operational activities.

Implementation of the LRT Alternatives would result in increased transit ridership in Los Angeles County because of new connectivity. It is expected that over 10,000 new transit riders would choose to ride the LRT Alternatives in 2030. The LRT Alternatives would reduce annual VMT

Table 4-1 Annual MTCO$_2$e Emissions ~~Countywide Reductions in CO$_2$ Associated with Reduced Vehicle Single-Occupancy Miles Traveled~~

Measure	No-Build Alternative (~~b~~Baseline)	TSM Alternative	LRT 1: Expo ROW–Olympic Alternative	LRT 2: Expo ROW–Colorado Alternative	LRT 3: Venice/Sepulveda–Olympic Alternative	LRT 4: Venice/Sepulveda–Colorado Alternative
VMT, LA County	223,164,138	223,163,833	223,073,743	223,120,245	223,147,690	223,152,265
Miles of Track	0	0	6.6	6.6	7.5	7.5
Countywide Emissions (Annual—Metric Tons per ~~Y~~year)						
Total CO$_2$e Associated with VMT	~~40,496,032~~ 36,738,657	~~40,495,979~~ 36,738,609	~~40,479,626~~ 36,723,773	~~40,488,064~~ 36,731,429	~~40,493,055~~ 36,736,014	~~40,493,891~~ 36,736,715
Total CO$_2$e Associated with Track Usage	0	0	6,241	6,241	7,092	7,768
Total CO$_2$e Associated with Stations & Maintenance Facility Operations	0	0	722	723	727	729
30 year amortization of Construction impacts	0	0	609	609	609	609
Total CO$_2$e	36,738,657	36,738,609	36,731,346	36,739,003	36,744,442	36,745,822
Change from No-Build Alternative						
Net ~~CO$_2$ (Tons per Year)~~CO$_2$e	—	-~~53~~48	-~~16,406~~7,312	-~~7,968~~345	-~~2,977~~5,785	-~~2,141~~7,164
Percent Change	—	-0.00013	-0.~~04051~~01990	-0.~~01968~~00094	-0.0~~0~~1573~~3~~5	-0.~~00529~~01950
Change~~s~~ from TSM Alternative						
Net ~~CO$_2$ (Tons per Year)~~CO$_2$e	—	—	-~~16,353~~7,264	-~~7,915~~393	-~~2,924~~5,833	-~~2,088~~7,212
Percent Change	—	—	-0.~~04038~~01977	-0.~~01955~~00107	-0.~~00722~~01588	-0.0~~05~~1963

SOURCE: Data from URBEMIS2007; based on VMT in the *Transportation/Traffic Technical Background Report*~~.~~; PBS&J 2009

Table 4-2 Estimated Greenhouse Gas Emissions from LRT Operational Activities (Metric Tons per Year)

Measure	LRT 1: Expo ROW–Olympic Alternative	LRT 2: Expo ROW–Colorado Alternative	LRT 3: Venice/Sepulveda–Olympic Alternative	LRT 4: Venice/Sepulveda–Colorado Alternative
Emissions Associated with VMT ($MTCO_2e$)				
$MTCO_2$	36,722,499	36,730,154	36,734,682	36,735,440
$MTCH_4$	943	943	985	943
MTN_2O	332	332	347	332
Total CO_2e	36,723,773	36,731,429	36,736,014	36,736,715
Emissions Associated with Track Operations ($MTCO_2e$)				
$MTCO_2$	6,201	6,201	7,047	7,047
$MTCH_4$	3	3	4	4
MTN_2O	36	36	41	41
Total CO_2e	6,241	6,241	7,092	7,092
Emissions Associated with Station & Maintenance Yard Operations ($MTCO_2e$)				
$MTCO_2$	717	719	723	725
$MTCH_4$	1	1	1	1
MTN_2O	4	4	4	4
Total CO_2e	722	723	727	729
Total Operational CO_2e				
Metric Tons CO_2e	36,730,736	36,738,393	36,743,833	36,744,536

associated with single-occupancy automotive traffic as compared to both the No-Build and TSM Alternatives.

As shown in Table 4-1 (Annual CO_2e Emissions), the LRT 1 Alternatives will result in a reduction of Greenhouse Gas emissions of 7,312 tons per year as compared to the No-Build Alternative and a reduction of 7,264 tons per year as compared to the TSM Alternative. LRT 2, LRT 3, and LRT 4 Alternatives would result in a net increase of 345, 5,785, and 7,164.25 tons per year respectively over the No-Build Alternative and 393, 5,833 and 7,212 tons per year respectively over the TSM Alternative. Considering the CAPCOA Significance Threshold, a project is considered less than significant if greenhouse gas emissions show an incremental increase below 10,000 $MTCO_2e$/year.

The proposed project would consume electricity and natural gas supplied by SCE and LADWP. Electric consumption is attributed to the operation of the LRVs, stations, and maintenance facility. Consumption of natural gas is attributed only to the operation of the maintenance facility. Water consumption would be associated with irrigation and washing trains at the maintenance yard and is analyzed for greenhouse gas emissions from the electricity infrastructure needed to

pump water to the facility and to treat the wastewater from the maintenance yard. As shown in Table 3.5-1 (Annual $MTCO_2e$ Emissions), LRT 1 Alternative would result in a reduction of greenhouse gas emissions over the No-Build and TSM Alternatives. LRT 2, LRT 3, and LRT 4 Alternatives would result in an increase of less than 7,300 $MTCO_2e$ over the No-Build and TSM Alternatives. Based on the CAPCOA Significance Threshold, a project is considered less than significant if greenhouse gas emissions, including construction impacts amortized over 30 years, show an incremental increase below 10,000 $MTCO_2e$/year. As SCE and Los Angeles County Metropolitan Transportation Authority (LACMTA) move towards greater use of renewable resources such as solar, wind, and hydroelectric generation, the emissions from the consumption of electricity will continue to decrease thereby increasing the advantage of all of the LRT Alternatives. The LRT Alternatives would therefore have a ***beneficial*** effect on greenhouse gas emissions with respect to the LRT1 Alternative, and ***no adverse effect*** on greenhouse gas emissions with respect to the LRT 2, LRT 3, and LRT 4 Alternatives.

FEIR Design Options

Implementation of the Sepulveda Grade Separation, Colorado Parking Retention, Colorado/4th Parallel Platform and South Side Parking, Maintenance Facility Buffer, or Expo/Westwood Station No Parking design options would involve minor redesign of certain elements of the proposed alignment. However, the proposed design options would not be anticipated to affect the daily operations of the LRT Alternatives, nor increase/decrease traffic volumes. Thus, no change in the level of operational greenhouse gas emissions discussed above for the LRT Alternatives is anticipated. Impacts on greenhouse gas emissions would remain ***beneficial*** with LRT Alternative 1 and ***no adverse effect*** for LRT Alternatives 2, 3 and 4.

~~**LRT Alternatives**~~

~~**Operation**~~

~~The proposed project would use electrical power, presumably supplied by Southern California Edison and the Los Angeles Department of Water and Power. Although operation of the LRT Alternatives would indirectly increase greenhouse gas emissions through the generation of electricity required to operate the light-rail vehicles (LRVs), these emissions would not be substantial when considered in the context of the project's contributions to regional emission reductions.~~

~~Implementation of the LRT Alternatives would result in increased transit ridership in Los Angeles County because of new connectivity. The LRT Alternatives would reduce annual VMT associated with single-occupancy automotive traffic as compared to both the No-Build and the TSM Alternatives. A regional reduction in VMT would be expected to contribute to a corresponding regional reduction in greenhouse gas emissions producing anywhere from 2,141 to 16,406 tons of CO_2 less than the No-Build Alternative, and from 2,088 to 16,353 tons of CO_2 less than the TSM Alternative. In addition, implementation of the LRT Alternatives would result in improvements in intersection level of service (LOS), contributing to reductions in greenhouse gas emissions by increasing the efficiency of the regional transportation system (refer to Transportation/Traffic Technical Background Report). This would be considered a beneficial impact with regards to compliance with the emissions-reduction targets set forth in AB 32 and Executive Order S-3-05. The LRT Alternatives would therefore have a ***beneficial*** effect on greenhouse gas emissions.~~

Construction

Greenhouse gas emissions would be released during construction of the LRT Alternatives from the operation of construction equipment, and from worker and construction supply vendor vehicles. Demolition and site clearing, followed by construction of the guideway and stations would constitute the bulk of the construction process. Table 4-~~2~~3 (~~Estimated Greenhouse Gas~~ GHG Emissions from Construction Activities [Metric Tons per Year]) lists the estimated emissions that would occur during each year of each phase of construction activities.

The nature of the construction proposed is typical of standard construction activities for similar projects. Construction of the LRT Alternatives would consist of temporary activities that would not result in long-term greenhouse gas emissions. ~~The LRT Alternatives would~~Although there will be ~~bound to policies discussed in Air Quality Technical Background Report, such as anti-idling requirements for~~ emissions of greenhouse gases during the construction ~~vehicles, which would minimize greenhouse gas emissions~~period, they are not are not cumulatively considerable as they are temporary in nature, and are spread out over the multi-year construction period. Therefore, the LRT Alternatives are considered to have ***no adverse effect***.

Table 4-~~2~~3 ~~Estimated Greenhouse Gas~~GHG Emissions from Construction Activities (Metric Tons per Year)

Projected Year of Construction	Phases ~~u~~Under Construction	~~Tons~~ CO_2 ~~Produced~~	CH_4	N_2O	$MTCO_2e$
2010	Utility Relocation	1,~~819.18~~650	2	1	1,653
2011	Guideway ~~C~~construction, Station Construction, and Maintenance Facility Construction	~~5,251.55~~4,764	7	2	4,773
2012	Guideway Construction, Station Construction, Maintenance Facility Construction, System~~s~~ Installation, and Parking Structure Construction	~~7,649.16~~6,939	9	3	6,952
2013	Systems Installation, Parking Structure Construction, Station Area and ROW Improvements	~~5,395.72~~4,895	7	2	4,904
Total $MTCO_2e$ Project Construction Emissions					***18,282***

CEQA Determination

~~No~~**Less-Than-Significant Impact.** Greenhouse gas emissions would be released during construction of the No-Build Alternative~~,~~ and TSM Alternative~~, and the LRT Alternatives~~ from the operation of construction equipment, and from worker and construction supply vendor vehicles. Construction of the No-Build Alternative~~,~~ and TSM Alternative~~, and the LRT Alternatives~~ would consist of temporary activities that would not result in long-term greenhouse gas emissions. ~~The LRT Alternatives would be bound to policies discussed in Air Quality Technical Background Report, such as anti-idling requirements for construction vehicles, which~~

~~would minimize greenhouse gas emissions. Therefore, **no**~~ Therefore, ***a less-than-significant impact*** would occur.

~~**Less-Than-Significant Impact.**~~ The minor improvements in bus service on existing routes that would be implemented under the No-Build Alternative would have a small but positive impact on future greenhouse gas emissions. However, the vast majority of other projects assumed in the Air Quality Management Plan (AQMP) would proceed. Construction of the LRT Alternatives would consist of temporary activities that would not result in long-term greenhouse gas emissions. Therefore, the impact is ***less than significant***.

Implementation of all of the LRT Alternatives would result in increased transit ridership in Los Angeles County because of new connectivity. These Alternatives would reduce annual VMT associated with single-occupancy automotive traffic as compared to both the No-Build and the TSM Alternatives. Operation of the LRT 3 and LRT 4 Alternatives would result in greenhouse gas emissions that are less than a 1 percent increase from the No-Build and TSM Alternatives; in addition, the increase is less than 10,000 $MTCO_2e$. Therefore, impacts are ***less than significant***.

Beneficial Impact. The TSM Alternative would include all of the improvements under the No-Build Alternative and new on-street bus services to directly serve the Expo Phase ~~-~~ 2 community transit needs. Those additional improvements would include minor physical modifications such as upgraded bus stops and additional buses. The TSM Alternative would result in a net decrease in regional emissions and would have a ***beneficial*** impact on regional greenhouse gas emissions.

Implementation of the LRT ~~Alternatives~~ 1 Alternative would result in increased transit ridership in Los Angeles County because of new connectivity. ~~The LRT Alternatives~~This Alternative would reduce annual VMT associated with single-occupancy automotive traffic as compared to both the No-Build and the TSM Alternatives. Implementation of the proposed project would contribute to the reductions in overall greenhouse gas emissions ~~by increasing~~with respect to both the ~~efficiency of the regional transportation system~~ No-Build and TSM Alternatives and therefore would have a ***beneficial*** impact on regional greenhouse gas emissions.

Criterion — Would the project conflict with any existing applicable agency plan, policy, or regulation adopted for the purpose of reducing greenhouse gas emissions?

Impact GCC-2 — Implementation of the LRT Alternatives would not conflict with any existing applicable agency plan, policy, or regulation adopted for the purpose of reducing GHG emissions; therefore, the project would result in *no adverse* effect.

The Los Angeles County Metropolitan Transportation Authority has introduced a Sustainability Implementation Plan to "meet the needs of the present without compromising the ability of future generations to meet their own needs." In particular, the LACMTA is focused on the "continuous integration of decisions, infrastructure and services that optimize the transportation system to maximize efficiency, access, safety, and performance while minimizing energy use and consumption, air, water, and noise pollution and the generation of waste" (LACMTA 2008).

LACMTA has committed to a number of initiatives, programs, and projects that will further reduce the use of electricity and thereby further reduce greenhouse gas emissions. Although these initiatives and programs are not detailed enough to provide quantitative reductions, as they are implemented the emissions of greenhouse gases from electricity use will decrease and result in a greater beneficial effect for the LRT 1 Alternative, and with reductions in the emissions for the LRT 2, LRT 3, and LRT 4 Alternatives, the current estimate of a minor net increases in emissions for these alternatives may also become a net benefit. The following are some of the initiatives, programs, and projects to be undertaken by the LACMTA (LACMTA 2008):

- LACMTA and Countywide Greenhouse Gas Emissions Management which consists of developing and measuring the agency's GHG emissions footprint, monitoring, coordinating and providing input in to the various local, regional, and state and federal organizations developing Climate Change policy and regulations impacting planning and programming, construction and operating activities, and developing nationwide transit industry protocols for registering GHG emissions prior to participation in The Climate Registry;
- Develop Energy Sustainability Initiatives which include energy conservation initiatives; planning, feasibility studies, and installation of additional solar panels at various bus and rail divisions; and exploration of other renewable resources. Specifically the Metro Support Services Center Solar Energy and Infrastructure Upgrade project which will install an additional one megawatt of solar panels and energy efficiency upgrades to be completed by the end of 2009;
- Develop Sustainability Design Guidelines which will be used to incorporate and implement core sustainability elements into design and construction projects. Including the completion and implementation of Sustainability Design Criteria and tracking compliance with the Energy and Sustainability Policy, Construction Demolition Debris Recycling and Reuse Policy for all capital projects. This includes all future transportation corridor projects. Based on the Energy and Sustainability Policy, non-linear projects such as new buildings, shall be constructed to achieve the United States Green Building Council's Leadership in Energy and Environmental Design (LEED) Silver Rating, at a minimum;
- Development with key stakeholder partnerships of a Climate Change Action Plan that will identify climate change mitigation and adaptation goals and strategies to reduce GHG emissions and adapt the multi-modal transportation system investments to the effect of climate change;
- Development with stakeholder inputs as set of implementation tools such as Sustainable Mobility Corridors and Sustainable Mobility Transit Boulevards as strategies to optimize and prioritize regional transportation system investments; and
- Enhance energy portfolio by developing and exploring other sources or renewable energy.

In addition, the development of the LRT Alternatives support the Attorney General's suggestion that land development project create an interconnected transportation system and fosters the shift in travel from private passenger vehicles to alternative modes. By instituting any of the LRT Alternatives, the proposed project will assist in the reduction of vehicle miles traveled and therefore can in itself be considered a form of mitigation according to the USEPA, CAPCOA,

CAT, and other climate change policy makers. Therefore, ***no adverse effect*** is anticipated from the implementation of the LRT Alternatives.

No-Build Alternative

The LACMTA has authority over the improvements and operation of the No-Build Alternative, within their jurisdiction. As such, the No-Build Alternative would be subjected to the Sustainability Implementation Plan as unfolded by the LACMTA. The Sustainability Implementation Plan of the LACMTA furthers the reduction of greenhouse gas emissions and thereby complies with the Federal and State plans to reduce overall greenhouse gas emissions. Therefore, ***no adverse effect*** is anticipated from the implementation of the No-Build Alternative.

Transportation Systems Management (TSM) Alternative

The LACMTA has authority over the improvements and operation of the TSM Alternative, within their jurisdiction. As such, the TSM Alternative would be subjected to the Sustainability Implementation Plan as unfolded by the LACMTA. The Sustainability Implementation Plan of the LACMTA furthers the reduction of greenhouse gas emissions and thereby complies with the Federal and State plans to reduce overall greenhouse gas emissions. Therefore, ***no adverse effect*** is anticipated from the implementation of the TSM Alternative.

LRT Alternatives

The LACMTA has authority over the improvements and operation of all of the LRT Alternatives. These Alternatives would be subjected to the Sustainability Implementation Plan as unfolded by the LACMTA. The Sustainability Implementation Plan of the LACMTA furthers the reduction of greenhouse gas emissions and thereby complies with the Federal and State plans to reduce overall greenhouse gas emissions. Therefore, ***no adverse effect*** is anticipated from the implementation of the LRT Alternatives.

FEIR Design Options

Implementation of the Colorado Parking Retention, Sepulveda Grade Separation, Colorado/4th Parallel Platform and South Side Parking, Maintenance Facility Buffer, or Expo/Westwood Station No Parking design options would involve minor redesign of certain elements of the proposed alignment. However, the proposed design options would not be anticipated to affect the daily operations of the proposed alignment, nor increase/decrease traffic volumes. Thus, no change in the level of operational greenhouse gas emissions discussed above is anticipated. Impacts would result in ***no adverse effect*** relative to potential conflicts with plans, policies or regulations.

CEQA Determination

No Impact. The LACMTA's Sustainability Implementation Plan fosters the Federal and State regulations and plans with respect to reducing overall greenhouse gas emissions. Therefore, ***no impacts*** would occur.

4.4 Cumulative Impacts

~~Due to the~~Global climate change by its nature ~~of assessment of~~ is a cumulative impact. The amount of greenhouse gas emissions generated by this or any other single project on its own is not sufficient to create global climate change impacts. Rather, it is this project's incremental contribution to greenhouse gas emissions that when combined with all other anthropogenic sources of greenhouse gas emissions that create global climate change and the effects of global climate change, impacts can ~~currently~~ only be analyzed from a cumulative context. Therefore, the analysis provided above ~~includes the analysis of both the project and~~ is an assessment of cumulative impacts.

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