ATTACHMENT J
ESA GHG TECHNICAL REPORT (REPORT ONLY)

127 AND 141 NORTH MADISON AVENUE MIXED-USE PROJECT

Greenhouse Gas Emissions Technical Report

Prepared for
City of Pasadena
175 N Garfield Avenue
Pasadena, CA 91101

July 2019

ESA

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Acronyms and Abbreviations

AB 32	California Global Warming Solutions Act of 2006
Basin	South Coast Air Basin
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CalEEMod	California Emissions Estimator Model
CalEPA	California Environmental Protection Agency
CALGreen Code	California Green Building Standards Code
CAFE	Corporate Average Fuel Economy
CAP	Climate Action Plan
CAPCOA	California Air Pollution Control Officer's Association
CARB	California Air Resources Board
CBSC	California Building Standards Commission
CCAT	California Climate Action Team
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CEUS	Commercial End-Use Survey
CH_4	Methane
City	City of Pasadena
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalents
CPUC	California Public Utilities Commission
DPM	Diesel Particulate Matter
GHG	Greenhouse Gas
GWP	Global Warming Potential
HFCs	Hydrofluorocarbons
HVAC	Heating, Ventilating and Air Conditioning
IPCC	Intergovernmental Panel on Climate Change
LCFS	Low Carbon Fuel Standard
$MTCO_2e$	Metric ton of carbon dioxide equivalent
$MMTCO_2e$	Million metric tons of carbon dioxide equivalent
NAT	No-Action-Taken
N_2O	Nitrous Oxide
PFCs	Perfluorocarbons
RPS	Renewable Portfolio Standard
SF_6	Sulfur Hexafluoride

OPR	California Office of Planning and Research
USGBC	United States Green Building Code
VMT	Vehicle miles travelled
EMFAC	on-road vehicle emissions factor model
Hp	horsepower
LOS	Level of Service
MPO	Metropolitan Planning Organization
NAAQS	National Ambient Air Quality Standards
ppm	parts per million
RTIP	Regional Transportation Improvement Program
RTP/SCS	Regional Transportation Plan/Sustainable Communities Strategy
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SIP	State Implementation Plan
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency

EXECUTIVE SUMMARY

MBC Enterprises, LLC (the Applicant) proposes to develop the Madison Mixed-Use Project (Project), a mixed-use building containing 49 residential units, 4,210 square feet of commercial use, and 101 parking spaces in two levels of parking (one level at grade and one level subterranean), located at 127 and 141 North Madison Avenue in the City of Pasadena (City). The Project Site is an approximately 0.735-acre (32,000-square-foot [SF]) rectangular site (Project Site) located on the west side of North Madison Avenue, between East Walnut Street and Union Street. This Technical Report provides an estimate of the greenhouse gas (GHG) emissions from Project construction and operation, and the consistency of the Project with the City of Pasadena Climate Action Plan.

The Project would consist of a 72,000-SF, five-story, mixed-use building. Overall, the Project would consist of 49 residential units, two office spaces totaling 4,210 SF, 26,296 SF of open space, including a 1st Floor Central Courtyard and four Terraces, one on the 2nd, 3rd, 4th and 5th Floors. The Project would provide two levels of parking (one level at grade and one level subterranean) with 101 spaces and totaling 41,546 SF (with 20 spaces totaling 11,079 SF at grade, and 81 spaces totaling 30,467 SF subterranean). The Project includes demolition of the existing on-site building and features, excavation to accommodate the subterranean parking levels, and the construction of the new mixed-use building.

The Project would introduce short-term and temporary greenhouse gas (GHG) emissions from construction and long-term GHG emissions from operation. The following emissions sources associated with the Project have been evaluated:

- *Construction* – Activities associated with construction of the Project, such as combustion of fossil fuels for demolition, grading, building erection, paving, and painting, would result in temporary and incremental increases in GHG emissions.

- *Operation* – Operation of the Project would cause the emissions of GHGs from activities, such as heating, cooling, and electricity; lawn care and maintenance activities; the treatment and conveyance of water; and combustion of fossil fuels for transportation and power. However, the Project would implement Project Design Features that would be consistent with State- and City-recommended GHG reduction strategies and are predicted to lessen the emissions of GHGs.

This report summarizes the potential for the Project to generate GHG emissions and evaluates the Project's consistency with the City of Pasadena's Climate Action Plan (CAP). The findings of the analyses are as follows:

- The Project will be designed to meet the California Green Building Standards (CALGreen) Code, as adopted and amended by the City of Pasadena, through the incorporation of green building techniques and other sustainability features, including those within the City of Pasadena Green Building Code, where applicable, and GHG emissions associated with the Project would be consistent with the applicable portions of the City of Pasadena's qualified CAP as the Project would meet the applicable GHG per service population efficiency target. Thus, the Project's GHG emissions would be consistent with regulatory schemes intended to reduce GHG emissions.

- The Project would be consistent with local regulations for reducing GHG emissions in accordance with the City of Pasadena's qualified CAP. Therefore, the Project would be consistent with applicable plans, policies and regulations adopted for the purpose of reducing GHG emissions.

- Furthermore, the Project would implement green building measures that would reduce the Project's direct and indirect GHG emissions.

1.0
Introduction

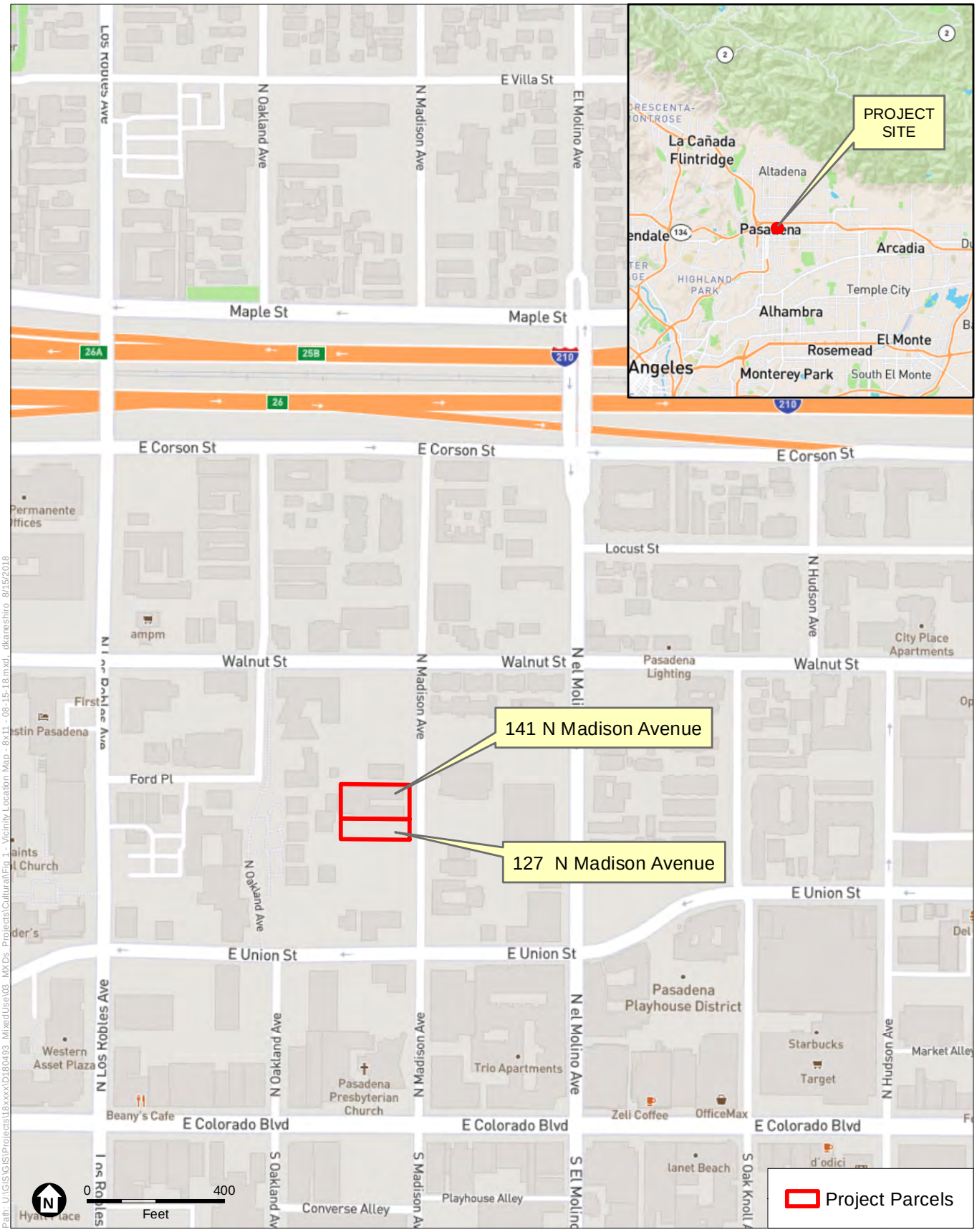
ESA has conducted a GHG emissions assessment to quantify the potential GHG emissions associated with construction activities, mobile sources, building energy demand, and other aspects of Project construction and operations that have the potential to generate GHG emissions. The objectives of this Greenhouse Gas Emissions Technical Report are to:

- Quantify the construction and operational GHG emissions associated with Project development;
- Evaluate the Project's consistency with the City of Pasadena's CAP; and
- Provide, if needed, GHG mitigation measures as required to meet applicable GHG emissions standards the City of Pasadena's CAP.

1.1 Existing Conditions

The Project Site is an approximately 0.735-acre (32,000-SF) rectangular-shaped site (Project Site) located on the west side of North Madison Avenue, south of East Walnut Street and north of Union Street. The Project Site is also located near public transportation options, including bus stops that are within walking distance of the Project Site and are located approximately 0.25 mile northwest of the Project Site at North Los Robles Avenue and East Walnut Street, approximately 0.16 mile south of the Project Site at North Madison Avenue and East Colorado Boulevard, approximately 0.25 mile west of the Project Site at North Los Robles Avenue and Union Street, and approximately 0.33 mile southwest of the Project Site at North Los Robles Avenue and East Colorado Boulevard. The Metro Gold Line Lake Station, which is also located within walking distance of the Project Site, is located approximately 0.6 mile northeast of the Project Site, and the Metro Gold Line Memorial Park Station is located approximately 0.7 mile west of the Project Site. The Project Site is shown in **Figure 1**, *Vicinity Location Map.* The Project Site abuts a mix of residential uses, commercial uses, medical uses and a seminary.

The Project Site is currently developed with a four-story office building totaling 27,579 SF and a 16,115-SF surface parking lot. **Figure 2**, *Aerial Photograph of Project Site and Vicinity*, shows the Project Site and surrounding land uses.



SOURCE: Open Street Map, 2018

127 and 141 N Madison Avenue Mixed-Use Project

Figure 1
Vicinity Location Map

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SOURCE: Open Street Map, 2018

127 and 141 N Madison Avenue Mixed-Use Project

Figure 2
Aerial Photograph of Project Site and Vicinity

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1.2 Project Description

The Project would consist of a 72,000-SF, five-story, 49-unit, mixed-use building, which includes two office spaces totaling 4,210 SF, 26,296 SF of open space, including a 1st Floor Central Courtyard and four Terraces, one on the 2nd, 3rd, 4th and 5th Floors. The Project would provide two levels of parking (one level at grade and one level subterranean) with 101 spaces and totaling 41,546 SF (with 20 spaces totaling 11,079 SF at grade, and 81 spaces totaling 30,467 SF subterranean). Project construction would include the demolition of current structures, grading to prepare the Site for new development, excavation to accommodate the subterranean parking and basement levels, and the construction and architectural coating of the mixed-use building.

The Project Site is located in the CD-3 (Central District Specific Plan, Walnut Housing sub-district) zoning district in the City of Pasadena and is currently developed with one four-story office building and surface parking lot. An Affordable Housing Concession Permit for floor area and building height is requested to achieve the density bonus. In addition, a vesting Tentative Tract Map for condominium purposes and Design Review approval are required.

1.3 Existing Greenhouse Gas Environment

1.3.1 Greenhouse Gases

Global climate change refers to changes in average climatic conditions on Earth as a whole, including changes in temperature, wind patterns, precipitation and storms. Historical records indicate that global climate changes have occurred in the past due to natural phenomena; however, current data increasingly indicate that the current global conditions differ from past climate changes in rate and magnitude. Global climate change attributable to anthropogenic (human) GHG emissions is currently one of the most important and widely debated scientific, economic, and political issues in the United States and the world. The extent to which increased concentrations of GHGs have caused or will cause climate change and the appropriate actions to limit and/or respond to climate change are the subject of significant and rapidly evolving regulatory efforts at the federal and state levels of government.

GHGs are compounds in the Earth's atmosphere, which play a critical role in determining temperature near the Earth's surface. More specifically, these gases allow high-frequency shortwave solar radiation to enter the Earth's atmosphere but retain some of the low frequency infrared energy, which is radiated back from the Earth towards space, resulting in a warming of the atmosphere. Not all GHGs possess the same ability to induce climate change; as a result, GHG contributions are commonly quantified in the units of equivalent mass of carbon dioxide (CO_2e). Mass emissions are calculated by converting pollutant specific emissions to CO_2e emissions by applying the proper global warming potential (GWP) value.[1] GWP is the measure

[1] GWPs and associated CO_2e values were developed by the Intergovernmental Panel on Climate Change (IPCC), and published in its Second Assessment Report (SAR) in, 1996. Historically, GHG emission inventories have been calculated using the GWPs from the IPCC's SAR. The IPCC updated the GWP values based on the latest science in its Fourth Assessment Report (AR4). The California Air Resources Board (CARB) has begun reporting GHG emission inventories for California using the GWP values from the IPCC AR4.

of the amount of energy one ton of a gas will absorb over a given period of time, relative to the emissions of one ton of carbon dioxide (CO_2). The larger the GWP, the more that a given gas warms the Earth compared to CO_2 over that time period. These GWP ratios are provided by the Intergovernmental Panel on Climate Change (IPCC) in its Fourth Assessment Report (AR4).[2] By applying the GWP ratios, project-related CO_2e emissions can be tabulated in metric tons per year. Typically, the GWP ratio corresponding to the warming potential of CO_2 over a 100-year period is used as a reference point for GHG emissions. The CO_2e values are calculated for construction years as well as existing and project build-out conditions in order to generate a net change in GHG emissions for construction and operation. Compounds that are regulated as GHGs are discussed below.

- **Carbon Dioxide (CO_2):** CO_2 is the most abundant anthropogenic GHG in the atmosphere and is primarily generated from fossil fuel combustion from stationary and mobile sources. CO_2 is the reference gas (GWP of 1) for determining the GWPs of other GHGs.

- **Methane (CH_4):** CH_4 is emitted from biogenic sources (i.e., resulting from the activity of living organisms), incomplete combustion in forest fires, anaerobic decomposition of organic matter in landfills, manure management, and leaks in natural gas pipelines. The GWP of CH_4 is 21 in the IPCC SAR and 25 in the IPCC AR4.

- **Nitrous Oxide (N_2O):** N_2O is produced by human-related sources, including agricultural soil management, animal manure management, sewage treatment, mobile and stationary combustion of fossil fuel, adipic acid production, and nitric acid production. The GWP of N_2O is 310 in the IPCC SAR and 298 in the IPCC AR4.

- **Hydrofluorocarbons (HFCs):** HFCs are fluorinated compounds consisting of hydrogen, carbon, and fluorine. They are typically used as refrigerants in both stationary refrigeration and mobile air conditioning systems. The GWPs of HFCs range from 140 for HFC-152a to 11,700 for HFC-23 in the IPCC SAR and 124 for HFC-152a to 14,800 for HFC-23 in the IPCC AR4.

- **Perfluorocarbons (PFCs):** PFCs are fluorinated compounds consisting of carbon and fluorine. They are primarily created as a byproduct of aluminum production and semiconductor manufacturing. The GWPs of PFCs range from 6,500 to 9,200 in the IPCC SAR and 7,390 to 17,700 in the IPCC AR4.

- **Sulfur Hexafluoride (SF_6):** SF_6 is a fluorinated compound consisting of sulfur and fluoride. It is a colorless, odorless, nontoxic, and nonflammable gas. It is most commonly used as an electrical insulator in high voltage equipment that transmits and distributes electricity. SF_6 has a GWP of 23,900 in the IPCC SAR and 22,800 in the IPCC AR4.

[2] Intergovernmental Panel on Climate Change, Fourth Assessment Report, The Physical Science Basis, Table 2.14, 2007. Available: https://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html. Accessed September 2018.

1.3.2 Existing Conditions

Greenhouse Gas Emissions Inventory

The California Air Resources Board (CARB) compiles GHG inventories for the State of California. Based on the 2016 GHG inventory data (i.e., the latest year for which data are available from CARB) prepared by CARB in 2018, California emitted 429.4 million metric tons of CO_2e ($MMTCO_2e$) including emissions resulting from imported electrical power.[3] Between 1990 and 2016, the population of California grew by approximately 9.5 million (from 29.8 to 39.3 million).[4] This represents an increase of approximately 32 percent from 1990 population levels. In addition, the California economy, measured as gross state product, grew from $773 billion in 1990 to $2.62 trillion in 2016, representing an increase of approximately 239 percent (over three times the 1990 gross state product).[5] Despite the population and economic growth, California's net GHG emissions have been reduced to below 1990 levels. According to CARB, the declining trend coupled with the state's GHG reduction programs (such as the Renewables Portfolio Standard, Low Carbon Fuel Standard, vehicle efficiency standards, and declining caps under the Cap and Trade Program) demonstrate that California is on track to meet the 2020 GHG reduction target codified in California Health and Safety Code (HSC), Division 25.5, also known as The Global Warming Solutions Act of 2006 (AB 32).[6] **Table 1**, *State of California Greenhouse Gas Emissions,* identifies and quantifies statewide anthropogenic GHG emissions and sinks (e.g., carbon sequestration due to forest growth) in 1990 and 2016. As shown in **Table 1**, the transportation sector is the largest contributor to statewide GHG emissions at approximately 39 percent in 2016.

1.3.3 Effects of Global Climate Change

The scientific community's understanding of the fundamental processes responsible for global climate change has improved over the past decade, and its predictive capabilities are advancing. However, there remain significant scientific uncertainties in, for example, predictions of local effects of climate change, occurrence, frequency, and magnitude of extreme weather events, effects of aerosols, changes in clouds, shifts in the intensity and distribution of precipitation, and changes in oceanic circulation. Due to the complexity of the Earth's climate system and inability to accurately model it, the uncertainty surrounding climate change may never be completely

3 California Air Resources Board, California Greenhouse Gas Inventory for 2000-2016– by Category as Defined in the 2008 Scoping Plan, https://www.arb.ca.gov/cc/inventory/data/tables/ghg_inventory_scopingplan_sum_2000-16.pdf. Accessed September 2018.

4 U.S. Census Bureau, Data Finders, http://www.census.gov/. 2009; California Department of Finance, E-5 Population and Housing Estimates for Cities, Counties and the State. State of California Department of Finance, American Community Survey, 2014, http://www.dof.ca.gov/Reports/Demographic_Reports/American_Community_Survey/documents/Web_ACS2016_Pop-Race.xlsx. Accessed September 2018.

5 California Department of Finance, Gross State Product, http://www.dof.ca.gov/Forecasting/Economics/Indicators/Gross_State_Product/. Accessed September 2018. Amounts are based on current dollars as of the date of the report (May 2018).

6 California Air Resources Board, Frequently Asked Questions for the 2016 Edition California Greenhouse Gas Emission Inventory, (2016), https://www.arb.ca.gov/cc/inventory/pubs/reports/2000_2014/ghg_inventory_faq_20160617.pdf. Accessed September 2018.

eliminated. Nonetheless, the IPCC's *Fifth Assessment Report, Summary for Policy Makers* states that, "it is *extremely likely* that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic increase in greenhouse gas concentrations and other anthropogenic forc[es [*sic*] together."[7] A report from the National Academy of Sciences concluded that 97 to 98 percent of the climate researchers most actively publishing in the field support the tenets of the IPCC in that climate change is very likely caused by human (i.e., anthropogenic) activity.[8]

TABLE 1
STATE OF CALIFORNIA GREENHOUSE GAS EMISSIONS

Category	Total 1990 Emissions using IPCC SAR ($MMTCO_2e$)	Percent of Total 1990 Emissions	Total 2016 Emissions using IPCC AR4 ($MMTCO_2e$)	Percent of Total 2016 Emissions
Transportation	150.7	35%	169.4	39%
Electric Power	110.6	26%	68.6	16%
Commercial	14.4	3%	15.2	4%
Residential	29.7	7%	24.2	6%
Industrial	103.0	24%	89.6	21%
Recycling and Waste [a]	–	–	8.8	2%
High GWP/Non-Specified [b]	1.3	<1%	19.8	5%
Agriculture/Forestry	23.6	6%	33.8	8%
Forestry Sinks	-6.7		-- [c]	--
Net Total (IPCC SAR)	**426.6**	**100%**	--	--
Net Total (IPCC AR4) [d]	**431**	**100%**	**429.4**	**100%**

[a] Included in other categories for the 1990 emissions inventory.

[b] High GWP gases include hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6). High GWP gases are not specifically called out in the 1990 emissions inventory.

[c] Revised methodology under development (not reported for 2016).

[d] CARB revised the State's 1990 level GHG emissions using GWPs from the IPCC AR4. Percent totals may not add up exactly due to rounding.

Sources: California Air Resources Board, Staff Report – California 1990 Greenhouse Gas Emissions Level and 2020 Emissions Limit, 2007; California Air Resources Board, California Greenhouse Gas Inventory for 2000-2016– by Category as Defined in the 2008 Scoping Plan, https://www.arb.ca.gov/cc/inventory/data/tables/ghg_inventory_scopingplan_sum_2000-16.pdf. Accessed September 2018.

According to CARB, the potential impacts in California due to global climate change may include: loss in snow pack; sea level rise; more extreme heat days per year; more high ozone days; more large forest fires; more drought years; increased erosion of California's coastlines and sea water intrusion into the Sacramento and San Joaquin Deltas and associated levee systems; and

7 Intergovernmental Panel on Climate Change, Fifth Assessment Report, Summary for Policy Makers, 2013. Available: http://ipcc.ch/report/ar5/syr/. Accessed September 2018.

8 Anderegg, William R. L., J.W. Prall, J. Harold, S.H., Schneider, Expert Credibility in Climate Change, Proceedings of the National Academy of Sciences of the United States of America, 2010; 107:12107-12109.

increased pest infestation.[9] Below is a summary of some of the potential effects that could be experienced in California as a result of global warming and climate change.

Air Quality and Wildfire

Higher temperatures, conducive to air pollution formation, could worsen air quality in California. Climate change may increase the concentration of ground-level ozone, but the magnitude of the effect and, therefore, its indirect effects, are uncertain. If higher temperatures are accompanied by drier conditions, the potential for large wildfires could increase, which, in turn, would exacerbate air quality. Additionally, severe heat accompanied by drier conditions and poor air quality could increase the number of heat-related deaths, illnesses, and asthma attacks throughout the state.[10] However, if higher temperatures are accompanied by wetter, rather than drier conditions, the rains would temporarily clear the air of particulate pollution and reduce the incidence of large wildfires, thus ameliorating the pollution associated with wildfires.

In 2009, the California Natural Resources Agency (CNRA) published the *California Climate Adaptation Strategy* as a response to the Governor's Executive Order S-13-2008.[11] The CNRA report lists specific recommendations for state and local agencies to best adapt to the anticipated risks posed by a changing climate. In accordance with the *California Climate Adaptation Strategy*, the CEC was directed to develop a website on climate change scenarios and impacts that would be beneficial for local decision makers.[12] The website, known as Cal-Adapt, became operational in 2011.[13] The information provided on the Cal-Adapt website represents a projection of potential future climate scenarios. The data are comprised of the average values (i.e., temperature, sea-level rise, snowpack) from a variety of scenarios and models and are meant to illustrate how the climate may change based on a variety of different potential social and economic factors. According to the Cal-Adapt website, the portion of the City in which the Project Site is located could result in an average increase in temperature of approximately 8 to 11 percent (about 5.9 to 8.7°F) by 2070–2099, compared to the 1961–1990 period.[14]

Water Supply

Uncertainty remains with respect to the overall impact of global climate change on future water supplies in California. Studies have found that, "Considerable uncertainty about precise impacts

9 California Environmental Protection Agency, Climate Action Team, Climate Action Team Report to Governor Schwarzenegger and the Legislature, 2006, http://climatechange.ca.gov/climate_action_team/reports/2006report/2006-04-03_FINAL_CAT_REPORT.PDF. Accessed September 2018.

10 California Environmental Protection Agency, *Preparing California for Extreme Heat: Guidance and Recommendations*, October 2013, https://toolkit.climate.gov/reports/preparing-california-extreme-heat-guidance-and-recommendations. September 2018.

11 California Natural Resources Agency, Climate Action Team, 2009 California Climate Adaptation Strategy: A Report to the Governor of the State of California in Response to Executive Order S-13-2008, 2009.

12 California Natural Resources Agency, Climate Action Team, 2009 California Climate Adaptation Strategy: A Report to the Governor of the State of California in Response to Executive Order S-13-2008, 2009.

13 The Cal-Adapt website address is: http://cal-adapt.org.

14 California Energy Commission. Cal-Adapt: Annual Averages, 2018, http://cal-adapt.org/tools/annual-averages/#climatevar=tasmax&scenario=rcp85&lat=34.15625&lng=-118.15625&boundary=locagrid&units=fahrenheit. Accessed September 2018.

of climate change on California hydrology and water resources will remain until we have more precise and consistent information about how precipitation patterns, timing, and intensity will change."[15] For example, some studies identify little change in total annual precipitation in projections for California while others show significantly more precipitation.[16] Warmer, wetter winters would increase the amount of runoff available for groundwater recharge; however, this additional runoff would occur at a time when some basins are either being recharged at their maximum capacity or are already full. Conversely, reductions in spring runoff and higher evapotranspiration because of higher temperatures could reduce the amount of water available for recharge.[17]

The California Department of Water Resources report on climate change and effects on the State Water Project (SWP), the Central Valley Project, and the Sacramento-San Joaquin Delta, concludes that "climate change will likely have a significant effect on California's future water resources…[and] future water demand." It also reports that "much uncertainty about future water demand [remains], especially [for] those aspects of future demand that will be directly affected by climate change and warming. While climate change is expected to continue through at least the end of this century, the magnitude and, in some cases, the nature of future changes is uncertain." It also reports that the relationship between climate change and its potential effect on water demand is not well understood, but "[i]t is unlikely that this level of uncertainty will diminish significantly in the foreseeable future." Still, changes in water supply are expected to occur, and many regional studies have shown that large changes in the reliability of water yields from reservoirs could result from only small changes in inflows.[18] In its *Fifth Assessment Report*, the IPCC states "Changes in the global water cycle in response to the warming over the 21st century will not be uniform. The contrast in precipitation between wet and dry regions and between wet and dry seasons will increase, although there may be regional exceptions."[19]

Hydrology and Sea Level Rise

As discussed above, climate changes could potentially affect: the amount of snowfall, rainfall and snow pack; the intensity and frequency of storms; flood hydrographs (flash floods, rain or snow events, coincidental high tide and high runoff events); sea level rise and coastal flooding; coastal erosion; and the potential for salt water intrusion. Sea level rise can be a product of global warming through two main processes: expansion of seawater as the oceans warm and melting of

15 Pacific Institute for Studies in Development, Environment and Security, Climate Change and California Water Resources: A Survey and Summary of the Literature, July 2003, http://www.pacinst.org/reports/climate_change_and_california_water_resources.pdf. Accessed September 2018.

16 Pacific Institute for Studies in Development, Environment and Security, Climate Change and California Water Resources: A Survey and Summary of the Literature, July 2003, http://www.pacinst.org/reports/climate_change_and_california_water_resources.pdf. Accessed September 2018.

17 CNRA, 2014. Safeguarding California: Reducing Climate Risk, an Update to the 2009 California Climate Adaptation Strategy, 2014.

18 California Department of Water Resources Climate Change Report, Progress on Incorporating Climate Change into Planning and Management of California's Water Resources, July 2006, http://baydeltaoffice.water.ca.gov/climatechange/DWRClimateChangeJuly06_update8-2-07.pdf. Accessed September 2018.

19 Intergovernmental Panel on Climate Change, Fifth Assessment Report, Summary for Policy Makers, 2013, page 20.

ice over land. A rise in sea levels could result in coastal flooding and erosion and could jeopardize California's water supply. Increased storm intensity and frequency could affect the ability of flood-control facilities, including levees, to handle storm events.

Agriculture

California has a $30 billion agricultural industry that produces half the country's fruits and vegetables. Higher CO_2 levels can stimulate plant production and increase plant water-use efficiency. However, if temperatures rise and drier conditions prevail, water demand could increase; crop-yield could be threatened by a less reliable water supply; and greater ozone pollution could render plants more susceptible to pest and disease outbreaks. In addition, temperature increases could change the time of year certain crops, such as wine grapes, bloom or ripen, and thus affect their quality.[20]

Ecosystems and Wildlife

Increases in global temperatures and the potential resulting changes in weather patterns could have ecological effects on a global and local scale. Increasing concentrations of GHGs are likely to accelerate the rate of climate change. Scientists expect that the average global surface temperature could rise by 2 to 11.5°F (1.1 to 6.4°C) by 2100, with significant regional variation.[21] Soil moisture is likely to decline in many regions, and intense rainstorms are likely to become more frequent. Sea level could rise as much as 2 feet along most of the United States coastline. Rising temperatures could have four major impacts on plants and animals: (1) timing of ecological events; (2) geographic range; (3) species' composition within communities; and (4) ecosystem processes such as carbon cycling and storage.[22]

1.4 Existing Site Emissions

The Project Site is currently developed with a four-story office building totaling 27,579 SF and a 16,115-SF surface parking lot. These existing uses would be demolished and removed to allow for development of the Project. GHG emissions are currently associated with vehicle trips to and from the existing Project Site, landscaping, on-site combustion of natural gas for heating, off-site combustion of fossil fuels for electricity, and off-site emissions from solid waste decomposition, water conveyance, and wastewater treatment. GHG emissions are estimated using the California Emissions Estimator Model (CalEEMod) (Version 2016.3.2), which is a statewide land use emissions computer model designed to provide a uniform platform for government agencies, land use planners, and environmental professionals to quantify potential GHG emissions from a variety of land use projects.

20 California Climate Change Center, Our Changing Climate: Assessing the Risks to California, 2006, http://meteora.ucsd.edu/cap/pdffiles/CA_climate_Scenarios.pdf. Accessed September 2018.

21 National Research Council, Advancing the Science of Climate Change, 2010, http://dels.nas.edu/resources/static-assets/materials-based-on-reports/reports-in-brief/Science-Report-Brief-final.pdf. Accessed September 2018.

22 Parmesan, C., and H. Galbraith, Observed Impacts of Global Climate Change in the U.S., Prepared for the Pew Center on Global Climate Change, December 2004, https://www.c2es.org/docUploads/final_ObsImpact.pdf. Accessed September 2018.

Existing operational GHG emissions for the Project Site are presented in **Table 2,** *Existing Project Site Annual Greenhouse Gas Emissions*. Details regarding the calculation of the existing Project Site emissions are provided in **Appendix A** of this Technical Report.

TABLE 2
EXISTING PROJECT SITE ANNUAL GREENHOUSE GAS EMISSIONS

	Project CO_2e (Metric Tons per Year) [a]
Emissions Sources	**Proposed Project**
Existing Operational	
On-Road Mobile Sources	220
Area	<1
Electricity	150
Natural Gas	18
Water Conveyance and Wastewater Treatment	44
Solid Waste	4
Total Existing Emissions	435

[a] Totals may not add up exactly due to rounding in the modeling calculations. Detailed emissions calculations are provided in **Appendix A** of this Technical Report.

[b] Project service population calculated by number of residential units multiplied by Average Household size for City of Pasadena provided by California Department of Finance and the employee density was calculated using office land use square footage and dividing by average employees per acre for retail uses derived by SCAG.

[c] GHG efficiency threshold is present in Appendix D - Climate Action Plan Consistency Checklist of the Pasadena CAP.

SOURCE: ESA, 2018; City of Pasadena, 2018; SCAG, 2001

2.0
Regulatory Setting

2.1 City of Pasadena Green Building Standards

In acknowledgment that land use and GHG emissions are interrelated, the City of Pasadena incorporated the CALGreen Code, with amendments in Chapter 14.04.500 et seq., in its Municipal Code. The City's ordinance requires applicable projects to comply with specified provisions to reduce energy consumption such as the use of low slope cool roofs and exceeding energy efficiency targets beyond regulatory requirements. The City's Municipal Code requires applicable projects to comply with specified provisions to reduce energy consumption. The ordinance added Section 307.1 to the CALGreen Standards Code, which states that buildings required to comply with Tier 1 requirements include mixed use and multi-family residential buildings four stories in height or more (Section 14.04.504). This would apply to the Project as it is a mixed-use building four stories in height or more.

2.2 City of Pasadena Climate Action Plan

The purpose of the Pasadena Climate Action Plan (CAP) is to analyze GHG emissions at a programmatic-level, outline a strategy to reduce and mitigate municipal and community-wide GHG emissions. In addition, the Pasadena CAP serves as a qualified GHG reduction plan and demonstrates Pasadena's commitment to achieving the state-wide emissions reduction targets as it is consistent with the California Environmental Quality Act (CEQA) Guidelines Section 15183.5. The timeframe for the Pasadena CAP extends from the date of adoption in 2018 through the year 2035, and includes Pasadena's overall GHG reduction strategy that consists of GHG emission reductions goals, strategies, and measures.[23] The Pasadena CAP establishes the following community-wide GHG emissions reduction goals:

- Reduce community-wide GHG emissions 27 percent below 2009 levels by 2020.
- Reduce community-wide GHG emissions 49 percent below 2009 levels by 2030.
- Reduce community-wide GHG emissions 59 percent below 2009 levels by 2035.
- Reduce community-wide GHG emissions 83 percent below 2009 levels by 2050.

The Pasadena CAP establishes the following GHG emission reduction strategies that are relevant to the proposed Project:

[23] City of Pasadena, Pasadena Climate Action Plan, March 5, 2018, https://ww5.cityofpasadena.net/planning/planning-division/community-planning/pasadena-climate-action-plan/. Accessed September 2018.

Strategy 1: Sustainable Mobility and Land Use: Create an interconnected transportation system and land use pattern that shifts travel from personal automobile to walking, biking, and public transit by improving pedestrian and bicycle infrastructure, enhancing carpooling and public transit services, supporting pedestrian and transit-oriented development, expanding the use of electric vehicles and related infrastructure, and improving the City's vehicle fleet.

Measure T-1 Walking and Bicycling.

T-1.1 Continue to expand Pasadena's bicycle and pedestrian network.

T-1.3 Continue to encourage bicycle and pedestrian travel.

Measure T-3 Transportation Demand Management.

T-3.1 Decrease annual commuter miles traveled by single-occupancy vehicles.

Measure T-4 Alternative Fuel Vehicles.

T-4.1 Expand the availability and use of alternative fuel vehicles and fueling infrastructure.

Measure T-5 Transit-Oriented Development.

T-5.1 Facilitate high-density, mixed-use, transit-oriented and infill development.

Measure T-7 Lawn and Garden Equipment.

T-7.1 Reduce GHG emissions from lawn and garden equipment.

Strategy 2: Energy Efficiency and Conservation: Minimize the City's energy consumption by creating high performance buildings, and transitioning to carbon neutral sources by enhancing energy performance requirements for new construction and energy efficiency retrofits for existing buildings, increasing use of carbon-neutral and renewable energy, and improving community energy management.

Measure E-1 Building Performance Standards for New Construction.

E-1.1 Increase energy efficiency requirements of new buildings to perform better than 2016 Title 24 Standards.

Strategy 3: Water Conservation: Promote water conservation and efficiency in both indoor and outdoor uses by increasing access to and use of recycled water and improving storm water infiltration.

Measure WC-1 Potable Water.

WC-1.1 Reduce potable water usage throughout Pasadena.

Strategy 4: Solid Waste Reduction: Minimize the City's waste by improving waste management and promoting reuse, recycling, and composting.

Measure WR-1 Solid Waste.

WR-1.1 Continue to reduce solid waste and landfill GHG emissions.

Measure WR-2 Reuse and Recycling.

WR-2.1 Establish a "Preferred Procurement Plan" for sustainable, strategic sourcing for all City departments and facilities.

WR-2.2 Create an internal program for all City departments to recirculate unwanted goods.

Measure WR-4 Waste Collection System.

WR-4.1 Reduce the GHG impacts of the waste collection system.

Strategy 5: Urban Greening: Maintain a healthy urban forest by preserving greenspace and increasing the number of trees in Pasadena.

Measure UG-1 Greenspace.

UG-1.1 Continue to preserve, enhance, and acquire additional greenspace throughout Pasadena to improve carbon sequestration, reduce the urban heat-island effect, and increase opportunities for active recreation.

Measure UG-2 Urban Forest.

UG-2.1 Continue to protect existing trees and plant new ones to improve and ensure viability of Pasadena's urban forest.

2.3 Appendix D - Climate Action Plan Consistency Checklist

The Pasadena CAP includes Appendix D - Climate Action Plan Consistency Checklist as a is tool for new development projects to demonstrate consistency with Pasadena's CAP, which is a qualified GHG emissions reduction plan in accordance with California Environmental Quality Act (CEQA) Guidelines Section 15183.5.[24] The Climate Action Plan Consistency Checklist was developed as part of the CAP implementation and monitoring process and will support the achievement of individual CAP measures, as well as Pasadena's overall GHG reduction goals.

The Climate Action Plan Consistency Checklist reflects Pasadena's goals and policies regarding sustainable development and aim to conserve and reduce the consumption of resources, such as energy and water, among others. CEQA Guidelines Section 15183.5 allows lead agencies to analyze the impacts associated with GHG emissions at a programmatic level in plan-level documents, such as CAPs, so that project-level environmental documents may tier from the programmatic review. Projects that meet the requirements of the Climate Action Plan Consistency Checklist will be deemed to be consistent with Pasadena's CAP and will be found to have a less-than-significant contribution to cumulative GHG (i.e., the project's incremental contribution to cumulative GHG effects is not cumulatively considerable), pursuant to CEQA Guidelines Sections 15064(h)(3), 15130(d), and 15183(b).

The Climate Action Plan Consistency Checklist is required for discretionary projects that are subject to CEQA. Projects that are exempt from CEQA are deemed to be consistent with Pasadena's CAP, and no further review is necessary, with the exception of the Class 32 "In-Fill Development Projects" categorical exemption (CEQA Guidelines Section 15332), for which Projects are required to demonstrate consistency with the CAP through the Climate Action Plan Consistency Checklist.

The Climate Action Plan Consistency Checklist presents three options in which projects can demonstrate consistency with Pasadena's CAP. Under Option A, projects can incorporate

[24] City of Pasadena, Pasadena Climate Action Plan: Appendix D - climate action plan consistency checklist, March 5, 2018, https://ww5.cityofpasadena.net/planning/wp-content/uploads/sites/56/2017/12/D-CAP-Consistency-Checklist.pdf. Accessed September 2018.

mandatory and selective sustainable development actions that will become conditions of the entitlement. Under Option B, projects can quantify the project's GHG emission levels and demonstrate that the project is below Pasadena's service person efficiency threshold. Under Option C, projects can quantify the project's GHG emission levels and demonstrate that the project would not result in a net increase in GHG emissions. Option B is utilized in this analysis and is further described below.

2.4 Climate Action Plan Consistency Checklist

Option B: GHG Efficiency - Demonstrate that the proposed project is consistent with Pasadena's per person GHG efficiency thresholds

Option B: the GHG Efficiency threshold assesses the GHG efficiency of a proposed project on a service person (residents plus full time employees) basis.[25] The City of Pasadena has developed per service person efficiency thresholds for the years 2020, 2025, 2030, and 2035 using the demographic projections developed for the CAP that are consistent with Pasadena's GHG emission goals included in the CAP and the State targets it is designed to achieve (Assembly Bill 32, Senate Bill 32, and progress towards Executive Order S-3-05).

To utilize Option B to demonstrate consistency with the CAP, proposed projects must be able to demonstrate a GHG efficiency which is less than or equal to the per service person efficiency threshold for the projects first operational year.

The Project is schedule to be completed in the second quarter of 2021, therefore this analysis will conservatively compare the GHG emission efficiency of the Project to the per service person efficiency threshold assuming first full buildout year of 2021. For projects with first operational year between 2021 to 2025, the GHG efficiency threshold is 4.56 $MTCO_2e$/Service Person in a year.[26]

[25] City of Pasadena, Pasadena Climate Action Plan: Appendix D - climate action plan consistency checklist, March 5, 2018, https://ww5.cityofpasadena.net/planning/wp-content/uploads/sites/56/2017/12/D-CAP-Consistency-Checklist.pdf. Accessed September 2018.

[26] City of Pasadena, Pasadena Climate Action Plan: Appendix D - climate action plan consistency checklist, March 5, 2018, https://ww5.cityofpasadena.net/planning/wp-content/uploads/sites/56/2017/12/D-CAP-Consistency-Checklist.pdf. Accessed September 2018.

3.0
Methodology

The quantification of GHG emissions that may result from the construction and long-term operations of the Project is conducted as described below.

3.1 Greenhouse Gas Emissions Estimates

The Climate Registry General Reporting Protocol provides procedures and guidelines for calculating and reporting GHG emissions from general and industry-specific activities.[27] Although the Climate Registry General Reporting Protocol does not establish numerical thresholds of significance, and there are no specific protocols available for land use development projects, such as the proposed Project, the General Reporting Protocol provides a framework for calculating and reporting GHG emissions from sources of GHG associated with the proposed Project, such as energy and transportation emissions. The GHG emissions provided in this report is consistent with the General Reporting Protocol framework. For the purposes of this report, total GHG emissions from the Project were quantified to provide information to decision makers and the public regarding the level of the Project's annual GHG emissions. The framework of the General Reporting Protocol recommends separating GHG emissions into three categories that reflect different aspects of ownership or control over emissions. They include the following

- Scope 1: Direct, on-site combustion of fossil fuels (e.g., natural gas, propane, gasoline, and diesel).
- Scope 2: Indirect, off-site emissions associated with purchased electricity or purchased steam.
- Scope 3: Indirect emissions associated with other emissions sources, such as third-party vehicles and embodied energy.[28]

CARB believes that consideration of so-called indirect emissions provides a more complete picture of the GHG footprint of a facility: "As facilities consider changes that would affect their emissions – addition of a cogeneration unit to boost overall efficiency even as it increases direct emissions, for example – the relative impact on total (direct plus indirect) emissions by the facility should be monitored. Annually reported indirect energy usage also aids the conservation awareness of the facility and provides information" to CARB to be considered for future strategies by the industrial sector. For these reasons, CARB has proposed requiring the

27 The Climate Registry. General Reporting Protocol Version 2.1, January 2016, https://www.theclimateregistry.org/tools-resources/reporting-protocols/general-reporting-protocol/. Accessed September 2018.

28 Embodied energy includes energy required for water pumping and treatment for end-uses. Third-party vehicles include vehicles used visitors of the Project Site.

calculation of direct and indirect GHG emissions as part of the HSC Division 25.5 reporting requirements. Additionally, the Office of Planning and Research directs lead agencies to "make a good-faith effort, based on available information, to calculate, model, or estimate… GHG emissions from a project, including the emissions associated with vehicular traffic, energy consumption, water usage and construction activities." Therefore, direct and indirect emissions have been calculated for the Project.

For purposes of this analysis, it is considered reasonable and consistent with criteria pollutant calculations to consider those GHG emissions resulting from Project-related incremental (net) increase in the use of on-road mobile vehicles, electricity, and natural gas compared to existing conditions. This includes Project construction activities, such as demolition, hauling, and construction worker trips. This analysis also considers indirect GHG emissions from water conveyance, wastewater generation, and solid waste handling. Since potential impacts resulting from GHG emissions are long-term rather than acute, GHG emissions are calculated on an annual basis.

The General Reporting Protocol provides a range of basic calculation methods. However, the calculation methods are typically designed for existing buildings or facilities and are not directly applicable to planning and development situations where the buildings or facilities do not yet exist. As a result, this section relies on calculation guidance from state and regional agencies with scientific expertise in quantifying GHG emissions, such as CARB and the South Coast Air Quality Management District (SCAQMD). GHG emissions are estimated using the California Emissions Estimator Model (CalEEMod), which is a statewide land use emissions computer model designed to provide a uniform platform for government agencies, land use planners, and environmental professionals to quantify potential criteria pollutant and GHG emissions from a variety of land use projects. CalEEMod was developed in collaboration with the air districts of California. Regional data (e.g., emission factors, trip lengths, meteorology, source inventory, etc.) have been provided by the various California air districts to account for local requirements and conditions. The model is considered to be an accurate and comprehensive tool for quantifying air pollutant and GHG emissions from land use projects throughout California.[29]

The California Air Pollution Control Officers Association (CAPCOA) has provided guidance on mitigating or reducing GHG emissions from land use development projects. In September 2010, CAPCOA released a guidance document titled *Quantifying Greenhouse Gas Mitigation Measures*, which provides GHG reduction values for recommended mitigation measures.[30] The CAPCOA guidance document was utilized in this analysis for quantifying reductions from physical and operational Project characteristics and Project Design Features in CalEEMod.

3.2 Construction Emissions

Emissions of GHGs during construction are forecasted by assuming a conservative estimate of construction activities (i.e., assuming all construction occurs at the earliest feasible date) and

29 See: http://www.aqmd.gov/caleemod/.

30 California Air Pollution Control Officers Association, Quantifying Greenhouse Gas Mitigation Measures, 2010.

applying the mobile source emissions factors. The emissions are estimated using the CalEEMod (Version 2016.3.2) software.

The input values used in this analysis were adjusted to be Project-specific based on construction equipment and schedule information from similar land use development projects in the City. Subphases of construction would include demolition of the existing on-site building and features, grading, excavation, drainage/utilities/trenching, foundations building construction, and architectural coatings. Emissions from these activities are estimated by construction phase. Construction haul and vendor truck emissions were evaluated using regional heavy-duty truck emission factors from EMFAC2014, as incorporated into CalEEMod. Truck trips and default trip length data were used to assess roadway emissions from truck exhaust.

The CO_2e emissions are calculated for the construction period and future Project build-out conditions in order to estimate the net change in GHG emissions for Project construction and operation. The SCAQMD recognizes that construction-related GHG emissions from projects "occur over a relatively short-term period of time" and that "they contribute a relatively small portion of the overall lifetime project GHG emissions."[31] The SCAQMD recommends that construction project GHG emissions should be "amortized over a 30-year project lifetime, so that GHG reduction measures will address construction GHG emissions as part of the operational GHG reduction strategies."[32] As such, GHG emissions from construction have been amortized over the 30-year lifetime of the Project (i.e., total construction GHG emissions were divided by 30 to determine an annual construction emissions estimate comparable to operational emissions).

A complete listing of the construction equipment by phase and construction phase duration assumptions used in this analysis is included within the CalEEMod printout sheets that are provided in **Appendix B** of this Technical Report.

3.3 Operational Emissions

Operational emissions are also estimated using the CalEEMod software and CARB's on-road vehicle emissions factor (EMFAC2014) model on-road emissions factor model, as incorporated into CalEEMod. CalEEMod was used to estimate GHG emissions from electricity, natural gas, solid waste, water and wastewater, and landscaping equipment. In 2014, Pasadena Water and Power provided approximately 29 percent of electricity via renewable sources but has indicated it would provide an increasing percentage from renewable sources that would exceed the Renewables Portfolio Standard with 40 percent by 2020.[33] An estimated emission factor of 774

31 South Coast Air Quality Management District, Draft Guidance Document – Interim CEQA Greenhouse Gas (GHG) Significance Threshold, 2008, page 3-9, http://www.aqmd.gov/docs/default-source/ceqa/handbook/greenhouse-gases-(ghg)-ceqa-significance-thresholds/ghgattachmente.pdf. Accessed January 2018.

32 South Coast Air Quality Management District, Draft Guidance Document – Interim CEQA Greenhouse Gas (GHG) Significance Threshold, 2008, page 3-9.

33 Pasadena Water and Power, 2015 Integrated Resource Plan Update (2015) 1.

lbs CO_2/MWh was calculated based on Pasadena Water and Power projections for providing 40 percent renewable electricity by 2020.[34, 35]

Operational GHG emissions are assessed based on the Project-related incremental increase in GHG emissions compared to baseline conditions. Under CEQA, the baseline environmental setting is established as the time that environmental assessment commences. Since the existing land use is currently developed, the trip generation forecasts provided in the Project Transportation Impact Analysis[36] include trip rates for the existing land uses to be removed on the existing Project Site. Thus, the net change in Project trips are based on the Project trips minus the existing trips generated at the Project Site. Similarly, the net change in the Project's energy, waste, and water GHG emissions are based on the Project's emissions minus the emissions from the existing land uses on the Project Site. Detailed operational GHG emissions calculations are provided in **Appendix C** of this Technical Report.

As previously discussed, CAPCOA has provided guidance on mitigating or reducing GHG emissions from land use development projects in its guidance document titled *Quantifying Greenhouse Gas Mitigation Measures*.[37] The CAPCOA guidance document was utilized in this analysis for quantifying reductions from physical and operational Project characteristics and Project Design Features in CalEEMod.

3.4 Project GHG Efficiency

The City of Pasadena Climate Action Plan Consistency Checklist states that total GHG emissions associated with the Project, which includes both construction and operations, should be divided by the Project's service population in order to determine the GHG efficiency of the Project using the following equation:

> Proposed Project's GHG Efficiency = Annual GHG Emissions ($MTCO_2e$) / Service Population (number of residents + full-time employees)

34 Pasadena Water and Power, 2012 Integrated Resource Plan Update (2012), https://ww5.cityofpasadena.net/water-and-power/wp-content/uploads/sites/54/2017/08/2012-IRP-Update.pdf. Accessed: July 2018.

35 Pasadena Water and Power, 2015 IRP Load Forecast (2015), https://ww5.cityofpasadena.net/water-and-power/wp-content/uploads/sites/54/2017/08/IRP-Load-Forecast-Summary.pdf. Accessed: March 2018.

36 City of Pasadena, Department of Transportation, Transportation Impact Analysis – Outside of CEQA Analysis, 127-141 North Madison Avenue, (2018).

37 California Air Pollution Control Officers Association, Quantifying Greenhouse Gas Mitigation Measures, 2010.

4.0
CAP Consistency Analysis

4.1 Greenhouse Gas Emissions

4.1.1 Construction Emissions

Construction of the proposed Project has the potential to generate GHG emissions through the use of heavy-duty construction equipment and through vehicle trips generated from haul trucks, delivery trucks, and construction workers traveling to and from the Project site. The Project was estimated to result in the export of approximately 13,500 cubic yards of soil during grading and excavation activities. Demolition activities would generate approximately 3,370 cubic yards of building and hardscape demolition debris. Construction emissions can vary from day to day, depending on the level of activity, the specific type of operation, and the prevailing weather conditions.

Construction of the Project was assumed to begin in early 2019. However, construction may commence at a later date than that analyzed in this GHG emissions analysis. If this occurs, construction emissions would be less than those analyzed herein because a more energy-efficient and cleaner burning construction equipment fleet mix would be expected in the future, pursuant to State regulations that require construction equipment fleet operators to phase-in less polluting heavy-duty equipment. As a result, should the Project commence construction at a later date, GHG emissions would be less than the emissions disclosed herein.

The emissions of GHGs associated with construction of the Project were calculated for each year of construction activity using CalEEMod. Results of the GHG emissions calculations are presented on **Table 3**, *Estimated Unmitigated Construction Greenhouse Gas Emissions*. It should be noted that the GHG emissions shown in **Table 3** are based on construction equipment operating continuously throughout the work day. In reality, construction equipment tends to operate periodically or cyclically throughout the work day. Therefore, the GHG emissions shown reflect a conservative estimate.

Due to the potential persistence of GHGs in the environment, GHG emissions are based on annual emissions, and, in accordance with SCAQMD methodology, construction-period GHG emissions are not assessed independent of operational-period GHG emissions, which are discussed in the next section.[38]

[38] South Coast Air Quality Management District, Greenhouse Gas CEQA Significance Threshold Stakeholder Working Group #12, http://www.aqmd.gov/ceqa/handbook/GHG/2009/july29mtg/ghgmtg12.pdf. September 2018.

TABLE 3
ESTIMATED UNMITIGATED CONSTRUCTION GREENHOUSE GAS EMISSIONS

Construction Year	CO_2e (Metric Tons) [a, b]
Year 1	350
Year 2	372
Year 3	163
Total	**885**
Amortized Emissions (30-years)	**30**

[a] Totals may not add up exactly due to rounding in the modeling calculations.

[b] CO_2e emissions are calculated using the global warming potential values from the Intergovernmental Panel on Climate Change Fourth Assessment Report: 25 for CH_4 and 298 for N_2O (Intergovernmental Panel on Climate Change, Fourth Assessment Report: The Physical Science Basis, Summary for Policy Makers, (2007))

SOURCE: ESA, 2018

4.1.2 Operational Emissions

GHG emissions associated with operation of the Project were calculated to disclose operational emissions from the Project and were estimated using the CalEEMod model. The Project would comply with the City of Pasadena Green Building Code as amended by the City and the Project must comply with the portions of City's Green Building Code applicable to low-rise residential development.

The Project would also minimize vehicle miles traveled (VMT) and associated mobile source GHG emissions. The Project represents an urban infill development since it would be undertaken on a currently developed property and would be located near existing off-site commercial, residential, and retail destinations and in proximity to existing public transit stops. Infill development results in reduced vehicle trips and VMT and reduced associated transportation-related emissions compared to a project without these characteristics. As discussed below under land use characteristic "Increased Transit Accessibility," because the Project consists of residential uses and the Project Site is a previously developed "infill" site located approximately 0.45 mile aerial distance (approximately 0.6 mile walking distance) from the Metro Gold Line Lake Station, the Project Site meets the criteria of the City as a Transit Priority Area (TPA).

The land use characteristics listed below are consistent with the CAPCOA guidance document and would reduce vehicle trips to and from the Project Site and vehicle trip distances and, as a result, would achieve a reduction in transportation-related air pollutant and GHG emissions.

- **Increased Density:** Increased density, measured in terms of persons, jobs, and/or dwelling units per unit area, reduces emissions associated with transportation as it reduces the distance people travel for work or services and provides a foundation for the implementation of other strategies such as enhanced transit services. This characteristic corresponds to CAPCOA guidance strategy LUT-1. According to CAPCOA, the reduction in VMT from this characteristic applies to urban and suburban settings for residential, retail, office, industrial,

and mixed-use projects. The Project is located in an urban infill[39] location and is mixed-use with residential and office uses; therefore, this characteristic applies to the Project. The Project would increase the Project Site density to approximately 67 dwelling units per acre and would provide approximately 27 jobs per acre.[40]

- **Increased Transit Accessibility:** Locating a project with high density near transit facilitates the use of transit by people traveling to or from a project site. This characteristic corresponds to CAPCOA guidance strategy LUT-5.[41] According to CAPCOA, the reduction in VMT from this characteristic applies to urban and suburban settings for residential, retail, office, industrial, and mixed-use projects. The Project is located in an urban infill location and is mixed-use with residential and office uses; therefore, this characteristic applies to the Project. According to the CAPCOA guidance, factors that contribute to VMT reductions under this characteristic include the distance to transit stations near the Project. The Project Site is located within a quarter-mile (walking distance) of public transportation, including the Metro bus 10, 40, 180/181, 256, 267, and 686/687 routes and Foothill Transit bus 187 and 690 routes. The Project Site is also approximately 0.6 mile (walking distance) southwest of the Metro Gold Line Lake Station approximately 0.7 mile (walking distance) east of the Metro Gold Line Memorial Park Station. The Project would also provide parking for bicycles on-site to encourage utilization of alternative modes of transportation. The increased transit accessibility would reduce vehicle trips and VMT versus the statewide and South Coast Air Basin average, encourage walking and non-automotive forms of transportation, and would result in corresponding reductions in transportation-related emissions.

- **Integrated Affordable and Below Market Rate Housing:** Below market rate housing provides greater opportunity for people to live closer to job centers and to accommodate more people in urban infill areas. This characteristic corresponds to CAPCOA guidance strategy LUT-6.[42] The Project would include 4 below market rate dwelling units (approximately 8 percent of the total number of dwelling units), which would result in an increase in a higher probability that a commuter would take transit or walk to work and a corresponding reduction in transportation-related emissions.

- **Improve Design of Development:** Improved street network characteristics within a neighborhood enhances walkability and connectivity. Characteristics include street accessibility usually measured in terms of number of intersections (e.g., 4-way intersections) per square mile. This characteristic corresponds to CAPCOA guidance strategy LUT-9.[43] According to CAPCOA, the reduction in VMT from this characteristic applies to urban and

39 California Air Pollution Control Officers Association, Quantifying Greenhouse Gas Mitigation Measures, p. 59-60, 2010. The project area meets the characteristics for an urban setting with respect to grid street pattern, minimal setbacks, constrained and paid parking, access to high quality rail service (i.e., Metro Gold Line), location relative to regional cores (5 miles or less), and a jobs/housing balance of 1.87 in 2013 and a projected 2.02 in 2020 (see City of Pasadena, General Plan Draft EIR, State Clearinghouse No. 2013091009, page 5.10-15, January 2015).

40 Los Angeles Unified School District, Level 1 – Developer Fee Justification Study for Los Angeles Unified School District, March 2017, https://achieve.lausd.net/cms/lib/CA01000043/Centricity/Domain/921/LAUSD%20Dev%20Fee%20Study%202018%20FINAL.pdf. Accessed September 2018. Based on 209 SF per employee for standard office uses.

41 California Air Pollution Control Officers Association, Quantifying Greenhouse Gas Mitigation Measures, p. 171-175, 2010.

42 California Air Pollution Control Officers Association, Quantifying Greenhouse Gas Mitigation Measures, p. 176-178, 2010.

43 California Air Pollution Control Officers Association, Quantifying Greenhouse Gas Mitigation Measures, p. 182-185, 2010.

suburban settings for residential, retail, office, industrial, and mixed-use projects. The Project is located in an urban infill location and is mixed-use with residential and office uses; therefore, this characteristic applies to the Project. The Project would be located in a street-accessible area with over 100 four-way intersections within a 1-mile radius of the Project Site, which exceeds the standard intersection density assumed in baseline VMT modeling. The increased intersection density would reduce vehicle trips and VMT versus the statewide and South Coast Air Basin average, encourage walking and non-automotive forms of transportation, and would result in corresponding reductions in transportation-related emissions.

- **Provide Pedestrian Network Improvements:** Providing pedestrian access that minimizes barriers and links a project site to existing or planned external streets encourages people to walk instead of drive. This characteristic corresponds to CAPCOA guidance strategy SDT-1.[44] According to CAPCOA, the reduction in VMT from this characteristic applies to urban and suburban settings for residential, retail, office, industrial, and mixed-use projects. The Project is located in an urban infill location and is mixed-use with residential and office uses; therefore, this characteristic applies to the Project. According to the CAPCOA guidance, factors that contribute to VMT reductions under this characteristic include pedestrian access connectivity within the Project and to/from off-site destinations. The walkability of existing facilities is based on the availability of pedestrian routes necessary to accomplish daily tasks without the use of an automobile. These attributes are quantified by WalkScore.com and assigned a score out of 100 points. With the various commercial businesses and recreational and entertainment facilities adjacent to the Project Site and proximity to public transit, the walkability of rating of the Project Site area is approximately 85 points;[45] this compares to the Citywide score of 66 points. The Project would provide common open space and walkways on its ground level that allow residents access North Madison Avenue from the east and north sides of the property. The Project would provide an internal pedestrian network for Project visitors and employees that links to the existing off-site pedestrian network, including existing off-site sidewalks and would, therefore, result in some reduction in VMT and associated transportation-related emissions.

Reductions in VMT were calculated for the above described land use characteristics. The Project's VMT would be reduced by approximately 31 percent compared to the Statewide and South Coast Air Basin default trip parameters in CalEEMod based on the calculation protocol from the CAPCOA guidance.

Maximum annual GHG emissions resulting from motor vehicles, energy (i.e., electricity, natural gas), water conveyance and wastewater treatment, and solid waste were calculated for the expected opening year (2021). The maximum opening year GHG emissions from operation of the Project are shown in **Table 4**, *Annual Greenhouse Gas Emissions*, and the Project's GHG efficiency in its opening year is 4.37 MT CO_2e/Service Person.

44 California Air Pollution Control Officers Association, Quantifying Greenhouse Gas Mitigation Measures, p. 186-189, 2010.

45 WalkScore.com (www.walkscore.com) rates the Project Site area (127 N Madison Avenue, Pasadena, CA) with a score of 85 of 100 possible points (scores accessed on September 5, 2018). Walk Score calculates the walkability of specific addresses by taking into account the ease of living in the neighborhood with a reduced reliance on automobile travel.

TABLE 4
ANNUAL GREENHOUSE GAS EMISSIONS

Emissions Sources	Project CO_2e (Metric Tons per Year) [a] Proposed Project
Proposed Project Operational	
On-Road Mobile Sources	370
Area	1
Electricity	146
Natural Gas	31
Water Conveyance and Wastewater Treatment	24
Solid Waste	4
Construction (Amortized)	30
Proposed Project Subtotal	**607**
Project Service Population [b]	139
Project GHG Service Population Efficiency (Metric Tons per Year per Service Person)	**4.37**
GHG Efficiency Threshold	**4.56**
Exceeds Performance Standard	**No**
Existing GHG Emissions	**435**
Net Project GHG Emissions	**172**

[a] Totals may not add up exactly due to rounding in the modeling calculations.

[b] Project service population calculated by number of residential units multiplied by Average Household size for City of Pasadena provided by California Department of Finance and the employee density was calculated using office land use square footage and dividing by the square footage per employee for standard office uses based on the LAUSD Developer Fee Justification Study (March 2017).

[c] GHG efficiency threshold is present in Appendix D - Climate Action Plan Consistency Checklist of the Pasadena CAP.

SOURCE: ESA, 2018; City of Pasadena, 2018; SCAG, 2001

4.2 Conclusion

In summary, the GHG emissions analysis provided above and the Project's consistency with applicable regulatory plans and policies to reduce GHG emissions demonstrate that the Project would substantially comply with or exceed the GHG reduction actions and strategies outlined in the City of Pasadena CAP and Green Building Code.

As discussed above, the Project would incorporate characteristics that would achieve reductions in VMT based on substantial evidence according to VMT reduction guidelines from CAPCOA's guidance document, *Quantifying Greenhouse Gas Mitigation Measures*, which provides emission

reduction calculation formulas for transportation characteristics and measures[46] that demonstrate that the Project would be sited in a location that is well served by multi-modal transportation choices. As such, the Project would be consistent with regional plans to reduce VMT and associated GHG emissions. As shown in **Table 4**, the Project would be consistent with the City of Pasadena's CAP as the Project's GHG efficiency would be below the applicable GHG efficiency threshold presented in Appendix D - Climate Action Plan Consistency Checklist.

46 California Air Pollution Control Officers Association, Quantifying Greenhouse Gas Mitigation Measures, 2010.