3.7 GREENHOUSE GAS EMISSIONS AND CLIMATE CHANGE

This section describes the existing physical affected environment and regulatory framework related to climate change and greenhouse gas (GHG) emissions and discusses the potential effects of the EIS Alternatives related to GHG emissions and climate change.

3.7.1 Affected Environment

Greenhouse Effect, Global Warming, and Climate Change

Most of the energy that affects Earth’s climate comes from the sun. Some solar radiation is absorbed by Earth’s surface, and a smaller portion of this radiation is reflected by the atmosphere back toward space. As Earth absorbs high-frequency solar radiation, its surface gains heat and then re-radiates lower frequency infrared radiation back into the atmosphere. Most solar radiation passes through gases in the atmosphere classified as GHGs; however, infrared radiation is selectively absorbed by GHGs. GHGs in the atmosphere play a critical role in maintaining the balance between earth’s absorbed and radiated energy, earth’s radiation budget,2 by trapping some of the infrared radiation emitted from Earth’s surface that otherwise would have escaped to space (Figure 3.7-1). Specifically, GHGs affect the radiative forcing of the atmosphere,3 which in turn affects Earth’s average surface temperature. This phenomenon, the greenhouse effect, keeps the earth’s atmosphere near the surface warmer than it would be otherwise and allows successful habitation by humans and other forms of life.

The combustion of fossil fuels and deforestation release carbon that historically has been stored underground in sediments or in surface vegetation into the atmosphere, thus exchanging carbon from the geosphere and biosphere to the atmosphere within the carbon cycle. With the accelerated increase of fossil fuel combustion and deforestation since the industrial revolution of the 19th century, concentrations of GHGs have increased exponentially in the atmosphere. Such emissions of GHGs in excess of natural ambient concentrations contribute to the enhancement of the natural greenhouse effect. This enhanced greenhouse effect has contributed to global warming, an increased rate of warming of the earth’s average surface temperature. Specifically, increases in GHGs lead to increased absorption of infrared radiation by Earth’s atmosphere and warm the lower atmosphere further, thereby increasing temperatures and evaporation rates near the surface. Variations in natural phenomena such as volcanoes and solar activity produced most of the global temperature increase during preindustrial times; however, increasing atmospheric GHG concentrations resulting from human activity have been responsible for most of the observed global temperature increase.5

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1 Frequencies at which bodies emit radiation are proportional to temperature. Earth has a much lower temperature than the sun and emits lower frequency (longer wavelength) radiation, compared to the high-frequency (short wavelength) solar radiation emitted by the sun.

2 This includes all gains of incoming energy and all losses of outgoing energy; the planet is always striving to be in equilibrium.

3 This is the change in net irradiance at the tropopause after allowing for stratospheric temperatures to readjust to radiative equilibrium, but with surface and tropospheric temperatures and state held fixed at the unperturbed values.

4 This is the result of Earth having to work harder to maintain its radiation budget, because (under the condition of more GHGs in the atmosphere) Earth must force emission of additional infrared radiation out into the atmosphere.

5 These basic conclusions have been endorsed by more than 45 scientific societies and academies of science, including all of the national academies of science of the major industrialized countries. Since 2007, no scientific body of national or international standing has maintained a dissenting opinion.
Global warming affects global atmospheric circulations and temperatures, oceanic circulations and temperatures, wind and weather patterns, average sea level, ocean acidification, chemical reaction rates, precipitation rates, timing, and form, snowmelt timing and runoff flow, water supply, wildfire risks, and other phenomena in a manner commonly referred to as *climate change*.

**Intergovernmental Panel on Climate Change Temperature Prediction**

The Intergovernmental Panel on Climate Change (IPCC) was established by the World Meteorological Organization and United Nations Environment Programme to assess scientific, technical, and socioeconomic information relevant to the understanding of climate change, its potential impacts, and options for adaptation and mitigation. Warming of the climate system is now considered to be unequivocal (IPCC, 2007a) with global surface temperature increasing approximately 1.33 degrees Fahrenheit (°F) over the last 100 years. The IPCC predicts increases in global average temperature globally of between 2° and 11°F over the next 100 years (depending on scenario) (IPCC, 2007b).
Greenhouse Gases and Global Emission Sources

Prominent naturally occurring GHGs in Earth’s atmosphere are water vapor, carbon dioxide (CO₂), methane, nitrous oxide, and ozone. Anthropogenic (i.e., human-caused) emissions include additional release of these GHGs plus release of human-made, high-global-warming-potential gases (sulfur hexafluoride, perfluorocarbons [PFCs], hydrofluorocarbons [HFCs], and ozone-depleting substances) into Earth’s atmosphere. The GHGs listed by the IPCC (CO₂, methane, nitrous oxide, HFCs, PFCs, and sulfur hexafluoride) are discussed below, in order of abundance in the atmosphere. Water vapor, despite being the most abundant GHG, is not discussed below because natural concentrations and fluctuations far outweigh anthropogenic influences, making it impossible to predict. Ozone is not included because it does not directly affect radiative forcing. Ozone-depleting substances, which include chlorofluorocarbons, halons, carbon tetrachloride, methyl chloroform, and hydrochlorofluorocarbons, are not included because they have been primarily replaced by HFCs and PFCs.

GHGs have different potentials for contributing to global warming. For example, methane is 21 times as potent as carbon dioxide, while sulfur hexafluoride is 22,200 times more potent than carbon dioxide. To simplify reporting and analysis, methods have been set forth to describe emissions of GHGs in terms of a single gas. The most commonly accepted method to compare GHG emissions is the global warming potential (GWP) methodology defined in the IPCC reference documents (IPCC, 2001). The IPCC defines the GWP of various GHG emissions on a normalized scale that recasts all GHG emissions in terms of carbon dioxide equivalents (CO₂-e), which compares the gas in question to that of the same mass of CO₂ (CO₂ has a GWP of 1 by definition). As such, a high GWP represents high absorption of infrared radiation and a long atmospheric lifetime compared to CO₂. One must also select a time horizon to convert GHG emissions to equivalent CO₂ emissions to account for chemical reactivity and lifetime differences among various GHG species. The standard time horizon for climate change analysis is 100 years. Generally, GHG emissions are quantified in terms of metric tons (MT) of CO₂-e (MTCO₂-e) emitted per year.

The atmospheric residence time of a gas is equal to the total atmospheric abundance of the gas divided by its rate of removal (Seinfeld and Pandis, 2006). The atmospheric residence time of a gas is, in effect, a half-life measurement of the length of time a gas is expected to persist in the atmosphere when accounting for removal mechanisms such as chemical transformation and deposition.

Table 3.7-1 lists the GWP of each GHG, its lifetime, and abundance in the atmosphere in parts per trillion (ppT). Units commonly used to describe the concentration of GHGs in the atmosphere are parts per million (ppm), parts per billion (ppb), and ppT, referring to the number of molecules of the GHG in a sampling of 1 million, 1 billion, or 1 trillion molecules of air. Collectively, HFCs, PFCs, and sulfur hexafluoride are referred to as high-GWP gases. CO₂ is by far the largest component of worldwide CO₂-e emissions, followed by methane, nitrous oxide, and high-GWP gases, in order of decreasing contribution to CO₂-e.

The primary human processes that release GHGs include the burning of fossil fuels for transportation, heating, and electricity generation; agricultural practices that release methane, such as livestock grazing and crop residue decomposition; and industrial processes that release smaller amounts of high-GWP gases. Deforestation and land cover conversion have also been identified as contributing to global warming by reducing Earth’s capacity to remove CO₂ from the air and altering Earth’s albedo or surface reflectance, allowing more solar radiation to be absorbed. Specifically, CO₂ emissions associated with fossil fuel combustion are the primary contributors to
human-induced climate change. CO₂, methane, and nitrous oxide emissions associated with human activities are the next largest contributors to climate change. Table 3.7-2 lists the anthropogenic contribution of GHGs in terms of CO₂e for the year 2004.

Table 3.7-1: Lifetimes, Global Warming Potentials, and Abundances of Significant Greenhouse Gases

<table>
<thead>
<tr>
<th>Gas</th>
<th>Global Warming Potential (100 years)</th>
<th>Lifetime (years)</th>
<th>1998 Atmospheric Abundance (ppT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂</td>
<td>1</td>
<td>50–200</td>
<td>365,000,000</td>
</tr>
<tr>
<td>CH₄</td>
<td>21</td>
<td>9–15</td>
<td>1,745</td>
</tr>
<tr>
<td>N₂O</td>
<td>310</td>
<td>120</td>
<td>314</td>
</tr>
<tr>
<td>HFC-23</td>
<td>11,700</td>
<td>264</td>
<td>14</td>
</tr>
<tr>
<td>HFC-134a</td>
<td>1,300</td>
<td>14.6</td>
<td>7.5</td>
</tr>
<tr>
<td>HFC-152a</td>
<td>140</td>
<td>1.5</td>
<td>0.5</td>
</tr>
<tr>
<td>CF₄</td>
<td>6,500</td>
<td>50,000</td>
<td>80</td>
</tr>
<tr>
<td>C₂F₆</td>
<td>9,200</td>
<td>10,000</td>
<td>3</td>
</tr>
<tr>
<td>SF₆</td>
<td>23,900</td>
<td>3,200</td>
<td>4.2</td>
</tr>
</tbody>
</table>

Notes:
C₂F₆ = hexafluoroethane; CF₄ = tetrafluoromethane; CH₄ = methane; CO₂ = carbon dioxide; HFC = hydrofluorocarbon; N₂O = nitrous oxide; SF₆ = sulfur hexafluoride

Tetrafluoromethane and hexafluoroethane are perfluorocarbons.

1 ppT is a mixing ratio unit indicating the concentration of a pollutant in parts per trillion by volume.
Sources: IPCC, 2001

Table 3.7-2: Global Anthropogenic Greenhouse Gas Emissions in 2004 (CO₂ Equivalent)

<table>
<thead>
<tr>
<th>Gas</th>
<th>Source</th>
<th>GHG Emissions (Gt CO₂e/year)</th>
<th>CO₂ Equivalent Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂</td>
<td>Deforestation, decay of biomass, etc.</td>
<td>8.5</td>
<td>17.3</td>
</tr>
<tr>
<td>CO₂</td>
<td>Fossil fuel use</td>
<td>27.7</td>
<td>56.6</td>
</tr>
<tr>
<td>CO₂</td>
<td>Other</td>
<td>1.4</td>
<td>2.8</td>
</tr>
<tr>
<td>CH₄</td>
<td>Agriculture, natural gas combustion, coal mining, etc.</td>
<td>7.0</td>
<td>14.3</td>
</tr>
<tr>
<td>N₂O</td>
<td>Agriculture, industry, transportation, etc.</td>
<td>3.9</td>
<td>7.9</td>
</tr>
<tr>
<td>High GWP gases (includes HFCs, PFCs, and SF₆)</td>
<td>Consumer products, refrigerants, aluminum production, semiconductor manufacturing</td>
<td>0.5</td>
<td>1.1</td>
</tr>
<tr>
<td>All GHGs</td>
<td></td>
<td>49.0</td>
<td>100</td>
</tr>
</tbody>
</table>

Notes:
CH₄ = methane; CO₂ = carbon dioxide; CO₂e = carbon dioxide equivalent; GHG = greenhouse gas; Gt = gigatonnes; GWP = global warming potential; HFC = hydrofluorocarbon; N₂O = nitrous oxide; PFC = perfluorocarbon; SF₆ = sulfur hexafluoride
Sources: IPCC, 2007c
**Carbon Dioxide**

CO$_2$ is the most important anthropogenic GHG and accounts for more than 75 percent of all anthropogenic GHG emissions. Its long atmospheric lifetime (on the order of decades to centuries) ensures that atmospheric concentrations of CO$_2$ will remain elevated for decades after GHG mitigation efforts to reduce GHG concentrations are promulgated (IPCC, 2007c).

Increasing concentrations of CO$_2$ in the atmosphere are largely attributable to emissions from the burning of fossil fuels, gas flaring, cement production, and land use changes. Three-quarters of the current radiative forcing is likely caused by anthropogenic CO$_2$ emissions that result from fossil fuel burning (and to a very small extent, from cement production); approximately one-quarter of radiative forcing results from land-use changes (IPCC, 2007d).

Anthropogenic emissions of CO$_2$ have increased concentrations in the atmosphere most notably since the Industrial Revolution; the concentration of CO$_2$ has increased from approximately 280 to 379 ppm, an increase of more than 35 percent, in the last 250 years (IPCC, 2007d). IPCC estimates that the present atmospheric concentration of CO$_2$ has not been exceeded in the last 650,000 years and is likely to be the highest ambient concentration in the last 20 million years (IPCC, 2007b).

**Methane**

Methane, the main component of natural gas, is the second largest contributor to anthropogenic GHG emissions and has a GWP of 21 (IPCC, 2007b).

Anthropogenic emissions of methane are the result of growing rice, raising cattle, combusting natural gas, and mining coal. Atmospheric methane has increased from a preindustrial concentration of 715 ppb to 1,775 ppb in 2005 (IPCC, 2001). Although the reason is unclear, atmospheric concentrations of methane have not risen as quickly as anticipated (NOAA, 2008).

**Nitrous Oxide**

Nitrous oxide is a powerful GHG, with a GWP of 310 (IPCC, 2007b). Anthropogenic sources of nitrous oxide include agricultural processes, nylon production, fuel-fired power plants, nitric acid production, and vehicle emissions. Nitrous oxide also is used in rocket engines and racecars, and as an aerosol spray propellant. Agricultural processes that result in anthropogenic emissions of nitrous oxide are fertilizer use and microbial processes in soil and water.

Nitrous oxide concentrations in the atmosphere have increased from preindustrial levels of 270 ppb to 319 ppb in 2005, an 18 percent increase (IPCC, 2007b).

**Hydrofluorocarbons**

HFCs are human-made chemicals used in commercial, industrial, and consumer products and have high GWPs (EPA, 2010). HFCs generally are used as substitutes for ozone-depleting substances in automobile air conditioners and refrigerants. As seen in Table 3.7-1, the most abundant HFCs, in order from most abundant to least, are HFC-134a (35 ppT), HFC-23 (17.5 ppT), and HFC-152a (3.9 ppT).
Concentrations of HFCs have risen from zero to current levels (Table 3.7-2). Because these chemicals are human-made, they do not exist naturally in ambient conditions.

**Perfluorocarbons**

The most abundant PFCs are tetrafluoromethane (PFC-14) and hexafluoroethane (PFC-116). These human-made chemicals are emitted largely from aluminum production and semiconductor manufacturing processes. PFCs are extremely stable compounds that are destroyed only by very high-energy ultraviolet rays, which results in the very long lifetimes of these chemicals (EPA, 2010).

PFCs have large GWPs and have risen from zero to current levels (Table 3.7-2).

**Sulfur Hexafluoride**

Sulfur hexafluoride, another human-made chemical, is used as an electrical insulating fluid for power distribution equipment, in the magnesium industry, and in semiconductor manufacturing and also as a trace chemical for study of oceanic and atmospheric processes (EPA, 2010). In 1998, atmospheric concentrations of sulfur hexafluoride were 4.2 ppT and steadily increasing in the atmosphere.

Sulfur hexafluoride is the most powerful of all GHGs listed in IPCC studies, with a GWP of 23,900 (IPCC, 2007b).

**Global Climate Change Issue**

Climate change is a global problem because GHGs are global pollutants, unlike criteria air pollutants and hazardous air pollutants (also called toxic air contaminants), which are pollutants of regional and local concern. Pollutants with localized air quality effects have relatively short atmospheric lifetimes (approximately 1 day); by contrast, GHGs have long atmospheric lifetimes (several years to several thousand years). GHGs persist in the atmosphere for a long enough time to be dispersed around the globe.

Although the exact lifetime of any particular GHG molecule depends on multiple variables and cannot be pinpointed, more CO₂ is currently emitted into the atmosphere than is sequestered. Carbon dioxide sinks, or reservoirs, include vegetation and the ocean, which absorb CO₂ through photosynthesis and dissolution, respectively. These are two of the most common processes of CO₂ sequestration. Of the total annual human-caused CO₂ emissions, approximately 54 percent is sequestered through ocean uptake, Northern Hemisphere forest regrowth, and other terrestrial sinks within a year, whereas the remaining 46 percent of human-caused CO₂ emissions is stored in the atmosphere (Seinfeld and Pandis, 1998).

Similarly, effects of GHGs are borne globally, as opposed to the localized air quality effects of criteria air pollutants and hazardous air pollutants. The quantity of GHGs that it takes to ultimately result in climate change is not precisely known; the quantity is enormous, and no single project would be expected to measurably contribute to a noticeable incremental change in the global average temperature, or to global or local climates or microclimate.
Emissions of GHGs have the potential to adversely affect the environment because such emissions contribute, on a cumulative basis, to global climate change. A cumulative discussion and analysis of project impacts on global climate change is presented in this EIS because, although it is unlikely that a single project will contribute significantly to climate change, cumulative emissions from many projects affect global GHG concentrations and the climate system.

Global climate change has the potential to result in sea level rise (resulting in flooding of low-lying areas), to affect rainfall and snowfall (leading to changes in water supply), to affect temperatures and habitats (affecting biological resources and public health), and to result in many other adverse environmental consequences.

Although the international, national, State, and regional communities are beginning to address GHGs and the potential effects of climate change, it is expected that worldwide GHG emissions will continue to rise over the next decades.

**Climate and Topography**

Climate is the accumulation of daily and seasonal weather events over a long period of time, whereas weather is defined as the condition of the atmosphere at any particular time and place. For a detailed discussion of climate and topography, see Section 3.2, “Air Quality.”

**Existing Greenhouse Gas Emissions**

**U.S. Greenhouse Gas Inventory**

Total U.S. GHG emissions in 1990 were approximately 4 percent less than the 2012 total (EPA, 2014). Figure 3.7-2 presents 2012 U.S. GHG emissions by emissions sector.

Total emissions growth of 292.4 million metric tons of carbon dioxide equivalent (MMT CO₂e) per year between 1990 and 2012 (from 6,233.2 MMT CO₂e in 1990 to 6,525.6 MMT CO₂e in 2012) was largely the result of an increase in CO₂e emissions associated with the Energy sector (i.e., increase of 238.8 MMT CO₂e). Most other emissions sectors experienced an increase in GHG emissions during this time, except for the Waste sector, which decreased by approximately 25 percent from 1990 to 2012 (EPA, 2014).

**California Greenhouse Gas Inventory**

As the second largest emitter of GHGs in the U.S. and 12th to 16th largest GHG emitter in the world, California contributes a significant quantity of GHGs to the atmosphere (CEC, 2006). Emissions of CO₂ are byproducts of fossil-fuel combustion and are attributable in large part to human activities associated with transportation, industry/manufacturing, electricity and natural gas consumption, and agriculture (ARB, 2014). In California, the transportation sector is the largest emitter of GHGs, followed by electricity generation (ARB, 2014) (Figure 3.7-3).
San Francisco VA Medical Center

3.7 Greenhouse Gas Emissions and Climate Change

3.7-8 Long Range Development Plan

Final EIS

Source: EPA, 2014

Note: Emissions shown do not include carbon sinks such as change in land uses and forestry.

Figure 3.7-2: 2012 U.S. Greenhouse Gas Emissions by Gas

Year 2012
Total Gross Emissions: 6,525.8 MMT CO₂e

Energy 84.3%
Agriculture 8.1%
Industrial Processes 5.1%
Solvent and Other Product Use 0.1%
Land Use, Land use Change, Forestry 0.6%
Solid Waste 1.9%

Figure 3.7-3: 2012 California Greenhouse Gas Emissions by Sector

Year 2012
Total Gross Emissions: 458.7 MMT CO₂e

Transportation (36.5%)
Electric Power 20.7%
Commercial and Residential 9.2%
Industrial 19.4%
Recycling and Waste 1.9%
High GWP 4.0%
Agriculture 8.3%
Emissions of methane and nitrous oxide are generally much lower than those of CO$_2$ and are associated with anaerobic microbial activity resulting from agricultural practices, flooded soils, and landfills. The respective GWPs of these two compounds, methane and nitrous oxide, are approximately 23 and 296 times the GWP of CO$_2$.

**Bay Area Air Quality Management District Greenhouse Gas Inventory**

The Bay Area Air Quality Management District (BAAQMD) published a GHG inventory for the Bay Area, which provides an estimate of GHG emissions in the base year 2007 for all seven counties located in the jurisdiction of BAAQMD: Alameda, Contra Costa, Marin, San Francisco, San Mateo, Santa Clara, Napa, and the southern portions of Solano and Sonoma Counties (BAAQMD, 2010). This GHG inventory is based on the standards for criteria pollutant inventories and is intended to support BAAQMD’s climate protection activities.

Table 3.7-3 shows the 2007 GHG emissions from existing direct and indirect sources in the region (Bay Area) and the local area (San Francisco County, project location). The estimated GHG emissions are presented in CO$_2$e, which weights each GHG by its global warming potential. The GWPs used in the BAAQMD inventory are from the Second Assessment Report of the IPCC.

In 2007, San Francisco’s GHG emissions accounted for approximately 7.5 percent of the Bay Area’s total GHG emissions (BAAQMD, 2010). Transportation is the largest GHG emissions sector in the Bay Area and in San Francisco proper, followed by industrial/commercial, electricity generation and cogeneration, and residential fuel usage.

**Table 3.7-3: 2007 Estimated Bay Area and San Francisco Greenhouse Gas Emissions**

<table>
<thead>
<tr>
<th>Emissions Source</th>
<th>Emissions in Metric Tons of CO$_2$e per Year (2007)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bay Area</td>
</tr>
<tr>
<td>Transportation</td>
<td>34,870,000 (36.41%)</td>
</tr>
<tr>
<td>Industrial/Commercial</td>
<td>34,860,000 (36.40%)</td>
</tr>
<tr>
<td>Electricity/Cogeneration$^1$</td>
<td>15,200,000 (15.87%)</td>
</tr>
<tr>
<td>Residential Fuel Usage</td>
<td>6,820,000 (7.12%)</td>
</tr>
<tr>
<td>Off-Road Equipment</td>
<td>2,920,000 (3.05%)</td>
</tr>
<tr>
<td>Agricultural/Farming</td>
<td>1,110,000 (1.16%)</td>
</tr>
<tr>
<td><strong>Total Emissions</strong></td>
<td><strong>95,780,000 (100%)</strong></td>
</tr>
</tbody>
</table>

Note: 
CO$_2$e = carbon dioxide equivalent
$^1$ Includes imported electricity emissions of 7,100,000 metric tons of carbon dioxide equivalent.
Source: BAAQMD, 2010

**Existing SFVAMC Fort Miley Campus**

In the vicinity of the existing SFVAMC Fort Miley Campus, most GHG emissions are generated by vehicle use and residential uses. At the Campus, GHG emissions are generated by operation of hospital and research buildings and by employee and patient vehicles accessing the Campus.
Specifically, stationary-source emissions related to activities at the existing SFVAMC Fort Miley Campus currently total 23,615 metric tons of carbon dioxide equivalent (MTCO₂e) per year. However, with implementation of the Department of Veterans Affairs Strategic Sustainability Performance Plan (VA SSPP) and its related sustainability measures (VA, 2010), stationary-source emissions at the Campus currently total approximately 19,137 MTCO₂e per year (Table 3.7-4).

### Table 3.7-4: Existing SFVAMC Greenhouse Gas Emissions (Metric Tons of CO₂e per Year)

<table>
<thead>
<tr>
<th></th>
<th>Transportation Emissions</th>
<th>Stationary-Source Emissions</th>
<th>Total Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Area</td>
<td>Energy (Electricity and Natural Gas)</td>
<td>Water</td>
</tr>
<tr>
<td>Baseline (2012) without VA SSPP Applied</td>
<td>5,086</td>
<td>&lt;1</td>
<td>7,548</td>
</tr>
<tr>
<td>Baseline (2012) with VA SSPP Applied</td>
<td>5,086</td>
<td>&lt;1</td>
<td>5,314</td>
</tr>
</tbody>
</table>

Notes:
- CO₂e = carbon dioxide equivalent; VA SSPP = Department of Veterans Affairs Strategic Sustainability Performance Plan
- Source: Data compiled by AECOM in 2012 (see Appendix B)

Mobile-source emissions related to activities at the existing SFVAMC Fort Miley Campus currently total approximately 5,548 MTCO₂e per year.

Thus, GHG emissions related to Campus activities currently total 18,984 MTCO₂e per year. However, with implementation of the VA SSPP and its related sustainability measures, GHG emissions at the Campus total 16,750 MTCO₂e per year.

**Mission Bay Area**

In the Mission Bay area, GHG emissions are generated by vehicles and by industrial, commercial, and residential uses. However, because there are no existing SFVAMC uses in the Mission Bay area, no stationary-source or mobile-source emissions are generated by SFVAMC activities in this area.

**Climate Change Trends and Effects**

CO₂ accounts for more than 75 percent of all anthropogenic GHG emissions, the atmospheric residence time of CO₂ is decades to centuries, and the global atmospheric concentrations of CO₂ continue to increase and at a faster rate than ever previously recorded. Thus, the warming impacts of CO₂ will persist for hundreds of years after the implementation of mitigation efforts to reduce GHG concentrations. Substantially higher temperatures, more extreme wildfires, and rising sea levels are just some of the direct effects experienced in California (CNRA, 2009; CEC, 2012). As reported by the California Natural Resources Agency in 2009, despite annual variations in weather patterns, California has seen a trend of increased average temperatures, more extreme hot days, fewer cold nights, longer growing seasons, less winter snow, and earlier snowmelt and rainwater runoff. Statewide average temperatures increased by about 1.7°F from 1895 to 2011, and a larger proportion of total precipitation is

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6 The VA Downtown Clinic is located at the corner of Third and Harrison Streets. It is not considered part of SFVAMC.
falling as rain instead of snow (CEC, 2006). Sea levels rose by as much as 7 inches along the California coast over the last century, leading to increasing erosion and adding pressure to the State’s infrastructure, water supplies, and natural resources.

These observed trends in California’s climate are projected to continue in the future. Research indicates that California will experience overall hotter and drier conditions with a continued reduction in winter snow (with concurrent increases in winter rains), as well as increased average temperatures and accelerating sea level rise. In addition to these changes in average temperatures, sea level, and precipitation patterns, the frequency, intensity, and duration of extreme weather events such as heat waves, wildfires, droughts, and floods will change (CNRA, 2009). Following is a summary of climate change factors and predicted trends specific to the San Francisco Bay Area, using the latest information available as of 2014.

**Temperature/Heat**

The San Francisco Bay Area is expected to experience warming over the rest of the 21st century. Consistent with statewide projections, the annual average temperature in the Bay Area will likely increase by 2.7°F between 2000 and 2050, based on GHGs that have already been emitted into the atmosphere. By the end of the century, the increase in the Bay Area’s annual average temperature may range from approximately 3.5°F to 11°F relative to the average annual temperature simulated for the 1961–1990 baseline period used for the study, depending on the GHG emissions scenarios (CEC, 2009). The projected rate of warming, especially in the latter half of the 21st century, is considerably greater than warming rates derived from historical observed data.

Specific factors related to temperature/heat are summarized below.

- The annual average temperature in the Bay Area has been increasing over the last several decades.
- The Bay Area is expected to see an increase in average annual temperature of 2.7°F by 2050, and 3.5°F to 11°F by 2100. Projections show a greater warming trend during the summer season. The coastal parts of the Bay Area will experience the most moderate warming trends. Locally, San Francisco is expected to see an increase of approximately 2.2°F by 2050, and 3.3°F to 5.5°F by 2100 (Cal-Adapt, 2013).
- Extreme heat events are expected to increase in duration, frequency, and severity by 2050. Extreme freeze events are expected to decrease in frequency and severity by 2100, but occasional colder-than-historical events may occur by 2050 (Cal-Adapt, 2013).

**Precipitation/Rainfall/Extreme Events**

Recent studies of the effect of climate change on the long-term average precipitation for the state of California show some disagreement (CEC, 2009). Considerable variability exists across individual models, and examining the average changes can mask more extreme scenarios that project much wetter or drier conditions. California is expected to maintain a Mediterranean climate through the next century, with dry summers and wet winters that vary between seasons, years, and decades. Wetter winters and drier springs are also expected, but overall annual precipitation is not projected to change significantly. By mid-century, more precipitation is projected to occur in winter in the form of less frequent but larger events. By 2100, the majority of global climate models predict drying trends across the state (CNRA, 2009).
Specific factors related to precipitation/rainfall/extreme events are summarized below.

- Historical precipitation in the Bay Area has experienced no significant changes in rainfall depth or intensities over the past 30 years.

- The Bay Area will continue to experience a Mediterranean climate, with little change projected in annual precipitation by 2050, although a high degree of variability may persist.

- By 2100, an annual drying trend in annual precipitation is projected. The greatest decline is expected to occur during the spring months, while minimal change is expected during the winter months.

- Increases in drought duration and frequency coupled with higher temperatures, as experienced in 2012, 2013, and 2014, increase the likelihood of wildfires.

- California is expected to see increases in the magnitude of extreme events, including increased precipitation delivered from atmospheric river events, which would bring high levels of rainfall during short time periods—increasing the chance of flash floods. The Bay Area is also expected to see an increase in precipitation intensities, but possibly through less frequent events (CEC, 2009).

**Sea Level Rise**

This summary draws on the best available data for climate science and the potential effects of sea level rise in California as of August 2014. In March 2013, the Ocean Protection Council (OPC) adopted the 2012 National Research Council (NRC) report *Sea-level Rise for the Coasts of California, Oregon, and Washington: Past Present and Future* as the best available science on sea level rise for the state (NRC, 2012). The California Coastal Commission also supported the use of the NRC 2012 report as best available current science. The commission noted that the science of sea level rise is continually advancing, and that future research may enhance the scientific understanding of how the climate is changing, resulting in updating sea-level-rise projections (CCC, 2013.) The NRC report includes discussions of historic sea-level-rise observations, three projections of sea level rise for the coming century, and insight into the potential impacts of a rising sea on the California coast.

Additional resources provide information about sea level rise and impacts specific to California and the Bay Area. These include peer-reviewed academic articles, the California Coastal Commission’s *Draft Sea-Level Rise Policy Guidance* (public review draft released on October 14, 2013), and globally relevant information from the latest release of the IPCC Fifth Assessment Report, for which the summary for policymakers was released on September 27, 2013.

Records from satellite altimeters, tide gauges, and ocean temperature measurements infer a long-term increase in sea levels of the Pacific Coast. It is estimated that on average, the coast of California has experienced 8 inches (20 centimeters) of sea level rise over the past century, which is comparable to the global average (CCC, 2013).

The most recent climate science report, *Sea Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future*, has estimated that sea levels along the U.S. Pacific Coast would increase up to 66 inches by 2100 (NRC, 2012).
Specific factors related to precipitation/rainfall/extreme events are summarized below.

- Global sea level has risen 8 inches over the past century.\(^7\)
- Based on the latest IPCC report, the Fifth Assessment Report, global sea level is now expected to rise an additional 11–39 inches by 2100.

According to the latest NRC report, the Bay Area is expected to see 11 additional inches (range of 5–24 inches) of sea level rise by 2050, and approximately 36 inches (range of 17–66 inches) by 2100 (NRC, 2012). The likelihood of sea level rise to occur by certain time frames is described as follows (NRC, 2012):

- 12 inches of sea level rise is “most likely” by 2050.
- 24 inches of sea level rise by 2050 represents the upper uncertainty boundary.
- 36 inches of sea level rise is “most likely” by 2100.
- 48 inches of sea level rise by 2100 is within the upper 85 percent confidence interval.
- 66 inches of sea level rise by 2100 represents the upper uncertainty boundary.

See Figure 3.7-4 for a map of the worst-case scenario, a projected sea level rise of 66 inches in the Mission Bay portion of San Francisco. The water levels on the inundation map show an increase in future mean higher high water (MHHW)\(^8\) to 66 inches (sea level rise above existing MHHW) and areas that could be inundated permanently on a regular basis by tidal action. In contrast, temporary flooding can occur when an area is exposed to episodic, short-duration, extreme tide events of greater magnitude than normal tide levels. The inundation resulting from various combined sea level rise/storm surge\(^9\) scenarios are shown in Figure 3.7-4 and listed below the “permanent inundation” scenario. This inundation map for extreme tide and storm surge scenarios does not consider the duration of flooding, or the potential mechanism for draining the floodwaters from the inundated land once the extreme high-tide levels recede.

In addition, hydraulically disconnected low-lying areas are displayed in green in Figure 3.7-4. These areas do not have an effective overland flow path to allow water to reach the area, although they have topographic elevations below the inundated water surface. It is possible that the low-lying areas are connected through culverts, storm drains, or other hydraulic features that are not captured within the topographic digital elevation model.\(^10\) Therefore, there may be an existing or future flood risk within these areas.

\(^7\) For trends in mean sea level as captured at San Francisco’s tide gauge (NOAA 2013a).

\(^8\) MHHW is the average of the higher high-water height of each tidal day observed over the National Tidal Datum Epoch, a specific 19-year period adopted by the National Ocean Service as the official time segment over which tide observations are taken and reduced to obtain mean values (e.g., mean lower low water) for tidal datums. It is necessary for standardization because of periodic and apparent secular trends in sea level (NOAA, 2013b).

\(^9\) Storm surge is an abnormal rise of water generated by a storm, over and above the predicted astronomical tides. Storm surge should not be confused with storm tide, which is defined as the water level rise due to the combination of storm surge and the astronomical tide. This rise in water level can cause extreme flooding in coastal areas, particularly when storm surge coincides with normal high tide, resulting in storm tides reaching up to 20 feet or more in some cases. (NOAA, 2013c.)

\(^10\) The inundation map uses a 1-meter horizontal grid resolution digital elevation model based on the 2010/2011 California Coastal Mapping Program Light Detection and Ranging (i.e., LiDAR). The water level analysis leverages data from the Federal Emergency Management Agency’s California Coastal Mapping and Analysis Project. The inundation maps consider static sea level rise on top of MHHW, as well as a range of storm surge and wave hazard events ranging from the 1-year to the 100-year extreme tide. The methods and the associated digital data that were used to develop these inundation maps can be found in the Climate Stressors and Impacts: Bayside Sea Level Rise Mapping Technical Memorandum (SFPUC, 2014).
The sea level rise inundation mapping and supporting technical information were developed by AECOM for the San Francisco Public Utilities Commission (SFPUC) Wastewater Enterprise as part of its Sewer System Improvement Program. SFPUC provided the mapping to VA for use in this EIS. Low-lying areas depicted in green are hydraulically disconnected but have topographic elevations below the inundated water surface.

**Figure 3.7-4** Permanent Inundation Areas in the Mission Bay Area with Sea Level Rise of 66 Inches by the End of the 21st Century (or Earlier Temporary Inundation during Storm Surge Events)
All inundation maps are associated with caveats and uncertainties. Inundation maps and the underlying associated analyses are intended as planning-level tools to illustrate the potential for flooding under future sea-level-rise and storm-surge scenarios. Although this information is appropriate for conducting vulnerable and risk impact assessments, finer-grained information may be needed for detailed engineering design and implementation.

**Existing SFVAMC Fort Miley Campus**

The existing SFVAMC Fort Miley Campus sits at an elevation of 300–350 feet relative to mean sea level (msl).

**Mission Bay Area**

The Mission Bay area ranges in site elevation from 95 to 111 feet (this elevation references the San Francisco City Datum\(^{11}\) plus 100 feet), which is roughly equivalent to 6–22 feet above msl.

### 3.7.2 Regulatory Framework


**Massachusetts et al. v. Environmental Protection Agency (2007)**

Twelve U.S. states and cities, including California, in conjunction with several environmental organizations, sued in *Massachusetts et al. v. Environmental Protection Agency* to force the U.S. Environmental Protection Agency (EPA) to regulate GHGs as a pollutant pursuant to the Clean Air Act (CAA). On April 2, 2007, the U.S. Supreme Court held that EPA has the authority to regulate GHG emissions as a pollutant pursuant to the CAA. However, the court did not decide whether EPA is required to regulate GHG emissions at this time, or may exercise discretion to not regulate at this time.

Despite the Supreme Court ruling and the EPA proposal, there are no promulgated federal regulations to date limiting GHG emissions that are applicable to the SFVAMC LRDP.

**U.S. Environmental Protection Agency Finding of Endangerment (2007)**

On April 17, 2009, EPA issued a Proposed Endangerment and Cause or Contribute Finding for GHGs under the CAA. Through this Finding of Endangerment, the EPA Administrator proposed that current and projected concentrations of CO\(_2\), methane, nitrous oxide, HFCs, PFCs, and sulfur hexafluoride threaten the public health and welfare of current and future generations. Additionally, the Administrator proposed that combined emissions of CO\(_2\), methane, nitrous oxide, and HFCs from motor vehicles contribute to the atmospheric concentrations, and thus to the threat of climate change. Although the Endangerment Finding in itself does not place requirements on industry (including the SFVAMC LRDP), it is an important step in EPA’s process to develop regulation.

\(^{11}\) The San Francisco City Datum is a reference datum that has been used by San Francisco for surveying purposes since the early 1900s. To convert to the North American Vertical Datum of 1988 (approximately msl), add 11.37 feet to the City Datum.

In June 2008, EPA issued an Advance Notice of Proposed Rulemaking inviting comments on options and questions regarding regulation of GHGs under the CAA; however, EPA has not yet proposed or adopted regulations in response to the decision in Massachusetts et al. v. Environmental Protection Agency. Thus, there are no promulgated federal regulations to date limiting GHG emissions that are applicable to the SFVAMC LRDP.

U.S. Environmental Protection Agency Rule: Mandatory Reporting of GHGs (2009)

On September 22, 2009, the EPA Administrator signed a rule requiring mandatory reporting of emissions of GHGs from large sources in the United States. The rule was published in the Federal Register on October 30, 2009, and went into effect December 29, 2010. The rule applies to emissions of CO2, methane, nitrous oxide, HFCs, PFCs, sulfur hexafluoride, nitrogen trifluoride, hydrofluorinated ethers, and select other fluorinated compounds. Under the rule, suppliers of fossil fuels or industrial GHGs, manufacturers of vehicles and engines, and facilities that emit 25,000 MT or more per year of GHGs are required to report annual emissions to EPA. The first annual reports for the largest emitting facilities, covering calendar year 2010, were submitted to EPA in 2011.

For purposes of this EIS, facilities proposed under Alternative 1 would not be considered a large GHG emissions source. However, facilities operating under Alternative 2 would be considered a large source. Thus, if VA were to proceed with Alternative 2, it would be required to report annual GHG emissions to EPA.

Energy Independence and Security Act

The Energy Policy Act of 2005 created the Renewable Fuel Standard program. The Energy Independence and Security Act (EISA) of 2007 expanded this program by:

- expanding the Renewable Fuel Standard program to include diesel in addition to gasoline;
- increasing the volume of renewable fuel required to be blended into transportation fuel from 9 billion gallons in 2008 to 36 billion gallons by 2022;
- establishing new categories of renewable fuel, and setting separate volume requirements for each one; and
- requiring EPA to apply life-cycle GHG performance threshold standards to ensure that each category of renewable fuel emits fewer GHGs than the petroleum fuel it replaces.

This expanded Renewable Fuel Standard program lays the foundation for achieving significant reductions of GHG emissions from the use of renewable fuels, reducing the use of imported petroleum, and encouraging the development and expansion of the nation’s renewable-fuels sector.

For purposes of the SFVAMC LRDP, implementation of the EISA Renewable Fuel Standard program would take place in the form of compliance with the VA SSPP.
California Low Carbon Fuel Standard

The purpose of the California Low Carbon Fuel Standard (Title 17, California Code of Regulations, Sections 95480–95490) is to reduce GHG emissions by reducing the full fuel-cycle, carbon intensity of the transportation fuel pool used in California. The California Low Carbon Fuel Standard generally applies to any transportation fuel that is sold, supplied, or offered for sale in California, and to any person responsible for a transportation fuel in a calendar year. The Low Carbon Fuel Standard applies to the following types of transportation fuels:

- California reformulated gasoline
- California diesel fuel
- Fossil compressed natural gas (CNG) or fossil liquefied natural gas (LNG)
- Biogas CNG or biogas LNG
- Electricity
- Compressed or liquefied hydrogen
- A fuel blend containing hydrogen
- A fuel blend containing greater than 10 percent ethanol by volume
- A fuel blend containing biomass-based diesel
- Denatured fuel ethanol (also known as E100)
- Neat biomass-based diesel (also known as B100)
- Any other liquid or nonliquid fuel

The mobile-source GHG emissions associated with the SFVAMC LRDP were modeled by taking into account the Low Carbon Fuel Standard, which aims for a 10 percent reduction in life-cycle GHG emissions from increased use of renewable fuels in California by 2020.


The final combined EPA and National Highway Traffic Safety Administration (NHTSA) standards that make up the first phase of this national program apply to passenger cars, light-duty trucks, and medium-duty passenger vehicles, covering model years 2012–2016. They require these vehicles to meet an estimated combined average emissions level of 250 grams of CO₂ per mile, equivalent to 35.5 miles per gallon, if the automobile industry were to meet this CO₂ level solely through fuel economy improvements. Together, these standards will cut GHG emissions by an estimated 960 MMT and 1.8 billion barrels of oil over the lifetime of the vehicles sold under the program.

The State of California has received a waiver from EPA to have separate, stricter Corporate Average Fuel Economy standards. Thus, for purposes of the SFVAMC LRDP, EPA’s NHTSA GHG Emissions and Corporate Average Fuel Economy standards would be implemented through compliance with Assembly Bill (AB) 1493, described below.
**California Assembly Bill 1493 “Pavley”—Light Duty Vehicle Greenhouse Gas Emissions Standards**

On June 30, 2009, EPA granted California the authority to implement GHG emission reduction standards for new passenger cars, pickup trucks, and sport utility vehicles. With this waiver, it was expected that implementing California’s AB 1493 “Pavley” regulations would reduce GHG emissions from California passenger vehicles by approximately 22 percent in 2012 and 30 percent in 2016, all while improving fuel efficiency and reducing motorists’ costs.

The California Air Resources Board has adopted a new approach to passenger vehicles—cars and light trucks—by combining the control of smog-causing pollutants and GHG emissions into a single coordinated package of standards. The new approach also includes efforts to support and accelerate the numbers of plug-in hybrids and zero-emission vehicles in California.

The mobile-source GHG emissions associated with the SFVAMC LRDP were modeled by taking into account the Pavley GHG emissions standards, which require model year 2009–2016 passenger cars, light-duty trucks, and medium-duty passenger vehicles to reduce their GHG emissions from an average 0.45 percent reduction in 2009 to an average 29.7 percent reduction by 2016.

**Executive Order 13514, “Federal Leadership in Environmental, Energy, and Economic Performance”**

GHG management is required by Executive Order (EO) 13514. The terms of EO 13514 required each federal agency to do all of the following:

- Within 90 days, establish and report to the Chair of the Council on Environmental Quality (CEQ) and the Director of the Office of Management and Budget (OMB) a fiscal year (FY) 2020 percentage reduction target of agencywide scope 1 and scope 2 GHG emissions in absolute terms relative to a FY 2008 baseline.

- In establishing the target, consider reductions associated with the following actions:
  - Reducing the energy intensity of agency buildings
  - Increasing the agency’s use of renewable energy and on-site projects
  - Reducing the agency’s use of fossil fuels by:
    - using low-GHG-emitting and alternative-fuel vehicles,
    - optimizing vehicle numbers across agency fleets, and
    - reducing petroleum consumption in agency fleets of 20 or more 2 percent annually through FY 2020 relative to a FY 2005 baseline.

Where appropriate, this target excludes direct emissions from excluded vehicles and equipment as well as electric power produced and sold commercially to other parties in the course of regular business.

- Within 240 days, establish and report to the CEQ Chair and OMB Director an FY 2020 percentage reduction target for agencywide scope 3 GHG emissions in absolute terms relative to an FY 2008 baseline.
In establishing the target, consider reductions associated with:

- pursuing opportunities with vendors and contractors to address and incentivize GHG emission reductions;
- implementing strategies and accommodations for transit, travel, training, and conferences that actively reduce carbon emissions associated with commuting and travel by agency staff members;
- meeting GHG emissions reductions associated with other federal government sustainability goals; and
- implementing innovative policies and practices that address agency-specific scope 3 GHG emissions.

Within 15 months, establish and report to the CEQ Chair and OMB Director a comprehensive inventory of absolute GHG emissions across all three scopes for FY 2010. Comprehensive inventories must be submitted annually thereafter at the end of each January.

VA has completed the aforementioned EO 13514 requirements in the form of the VA SSPP. This VA SSPP Plan would be adhered to with implementation of the SFVAMC LRDP.

**Department of Veterans Affairs Strategic Sustainability Performance Plan**

The VA SSPP responds to Section 8 of EO 13514, which requires federal agencies to “develop, implement, and annually update an integrated Strategic Sustainability Performance Plan that will prioritize agency actions” for meeting sustainability goals identified in statutes, regulations, and executive orders. The VA SSPP identifies VA’s sustainability goals and defines VA’s policy and strategy for achieving these goals. It provides a means to review and evaluate VA’s performance and progress toward achieving the sustainability goals (VA, 2010).

VA is targeting a 29.6 percent reduction in Scope 1 (direct) and Scope 2 (indirect) GHG emissions by FY 2020 below the FY 2008 baseline. A 26.2 percent reduction in emissions is projected to come from meeting the FY 2015 alternative fuel use, petroleum reduction, energy intensity reduction, and on-site renewable electricity targets as set forth in the Energy Policy Act of 2005. VA plans to meet these targets through a combination of initiatives funded at the facility, regional, and department levels. Facility-level and regional strategies include energy conservation measures, retro-commissioning, installation of alternative fueling stations, and on-site generation of renewable electricity. Projects funded at the department level include additional alternative fueling stations as well as additional on-site generation of renewable electricity through technologies such as solar and renewably fueled combined heat and power.

VA’s current plan to achieve further reductions after FY 2015 is to leverage renewably fueled combined heat and power. Based on a preliminary inventory, 99 percent of VA Scope 1 and Scope 2 emissions come from Veterans Health Administration operations, and 90 percent of those emissions are from purchased electricity and on-site energy generation. In addition, the large thermal loads at VA medical centers make them good candidates for combined heat and power. VA has identified renewably fueled combined heat and power projects at VA medical centers that would produce an estimated 170,000 megawatt-hours per year. These projects are projected to provide the additional 3.4 percent reduction required to meet VA’s FY 2020 GHG goal.

VA has set an FY 2020 Scope 3 GHG emissions reduction target of 10 percent below the FY 2008 baseline. VA considers this target to be aggressive but achievable, despite its limited ability to control the sources of Scope 3 emissions. VA’s emissions from employee commuting are a particular challenge, given the current size of VA and its potential for growth to meet the demand for Veterans care and services. To meet its target, VA is relying...
on a combination of strategies and technology advances that include meeting existing targets (such as energy intensity and pollution prevention); improving fuel economy based on Corporate Average Fuel Economy standards; implementing innovative commuting strategies; and developing an action plan that will address noncommuting emissions, such as telework and alternate work schedules.

This VA SSPP would be adhered to with implementation of the SFVAMC LRDP. Specifically, direct and indirect (Scope 1 and 2) GHG emissions related to electricity and natural gas use under the SFVAMC LRDP take into account the 29.6 percent reduction through compliance with the VA SSPP. Mobile-source (Scope 3) GHG emissions related to individual vehicle commutes under the SFVAMC LRDP did not take into account the 10 percent reduction target, because SFVAMC does not have direct control over such sources of emissions.

### 3.7.3 Environmental Consequences

#### Significance Criteria

A NEPA evaluation must consider the context and intensity of the environmental effects that would be caused by, or result from, the EIS Alternatives.

CEQ’s national guidance suggests that federal agencies consider opportunities to reduce GHG emissions caused by proposed federal actions and adapt their actions to climate change impacts throughout the NEPA process and address these issues in their agency NEPA procedures. According to CEQ’s draft national guidance, there are two main considerations when addressing climate change in environmental documentation: (1) the GHG emissions effects of a proposed action and alternative actions and (2) the impacts of climate change on a proposed action or alternatives. Therefore, this analysis discloses both the proposed LRDP’s contribution to climate change and the effects that climate change may have on implementation of the LRDP Alternatives.

CEQ national guidance refers to a quantitative significance threshold of 25,000 MTCO₂e per year in GHG emissions for including a GHG analysis in a NEPA document. Therefore, absent established quantitative thresholds, an Alternative analyzed in this EIS is considered to result in an adverse impact related to GHG emissions if it would:

- make a considerable contribution to cumulative GHG emissions and global climate change. Annual GHG emissions totaling more than 25,000 MTCO₂e per year are considered a cumulatively considerable contribution to GHG emissions for the purposes of this EIS.

No quantitative climate change significance thresholds have been set for the effect of climate change on the region/project. However, absent guidance and established quantitative thresholds, an Alternative analyzed in this EIS is considered to result in an adverse impact if it would:

- result in development or ongoing operations in a region that is unprepared for environmental changes that would occur from climate change, and thus, would harm persons/property or degrade natural resources/ecosystems.
Assessment Methods

Greenhouse Gas Emissions

The magnitude of project emissions was quantified. Therefore, numerical GHG emissions associated with the proposed LRDP are included as part of the impact discussion.

California Emissions Estimator Model (CalEEMod) Version 2013.2.2 was used to estimate GHG emissions associated with construction of individual development projects and operational GHG emissions. CalEEMod is designed to model construction emissions for land use development projects based on building size, land use and type, and disturbed acreage and allows for the input of project-specific information. CalEEMod also calculates operational GHG emissions associated with a project at buildout, including those emissions resulting from transportation (trip generation), electricity use, natural gas use, solid waste generation, water and wastewater use, and other area sources (hearth and landscaping).

Construction-generated GHG emissions were modeled based on general information provided in Chapter 2.0, “Alternatives,” and default BAAQMD-recommended settings and parameters attributable to the proposed land use type and site location. CalEEMod estimates construction-related GHG emissions (i.e., CO₂e) resulting from off-road construction equipment, haul trucks, and construction worker commute trips.

Global Climate Change

The impacts of global climate change and scientific findings are summarized and discussed in terms of implications for the LRDP. Thus, this section includes an overview of the potential impacts of the EIS Alternatives in the context of global climate change, and the potential impact associated with the effect of an Alternative in the context of global climate change is determined in a qualitative manner. See Appendix G for the climate risk screening study prepared for the LRDP.

Alternative 1: SFVAMC Fort Miley Campus Buildout Alternative

Short-Term Projects

Construction

Under Alternative 1 short-term projects, construction emissions at the existing SFVAMC Fort Miley Campus would total 5,802 MTCO₂e. No VA sustainability measures are relevant to construction-related GHG emissions; thus, no sustainability measures were applied to determine total construction-related GHG emissions. However, these construction-related GHGs would be emitted only once and the emissions would be spread out over a time period of approximately 6 years. Thus, construction-related GHG emissions associated with Alternative 1 short-term projects would be substantially less than the 25,000 MTCO₂e per year threshold and would not make a considerable contribution to cumulative GHG emissions and global climate change. This impact would be minor.
**Operation**

Table 3.7-5 presents the GHG emissions related to operation of Alternative 1 short-term projects at the existing SFVAMC Fort Miley Campus. As shown, these operational GHG emissions would total 1,767 MTCO\(_2\)e per year. Of this total, mobile-source emissions would total 434 MTCO\(_2\)e per year and energy-source emissions would total 548 MTCO\(_2\)e per year. However, with implementation of the VA SSPP and its related sustainability measures, operational GHG emissions at the Campus under the Alternative 1 short-term projects would be reduced to 1,605 MTCO\(_2\)e per year (Table 3.7-5).

<table>
<thead>
<tr>
<th>Stationary-Source Emissions</th>
<th>Transportation Emissions</th>
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</thead>
<tbody>
<tr>
<td>Energy (Electricity and Natural Gas)</td>
<td>Area</td>
</tr>
<tr>
<td>Water</td>
<td>Solid Waste</td>
</tr>
<tr>
<td>Total Emissions</td>
<td></td>
</tr>
<tr>
<td>Short-Term Projects (2020) without VA SSPP Applied</td>
<td>434</td>
</tr>
<tr>
<td>Short-Term Projects (2020) with VA SSPP Applied</td>
<td>434</td>
</tr>
</tbody>
</table>

Notes:
- CO\(_2\)e = carbon dioxide equivalent; VA SSPP = Department of Veterans Affairs Strategic Sustainability Performance Plan
- Source: Data compiled by AECOM in 2014 (see Appendix B)

Because operations of Alternative 1 short-term projects would result in GHG emissions well below 25,000 MTCO\(_2\)e per year, implementing these projects would not make a considerable contribution to cumulative GHG emissions and global climate change. This impact would be minor.

**Impacts of Climate Change on Alternative 1 Short-Term Projects**

**Extreme Heat Events**

Extreme heat events related to climate change that could affect SFVAMC could occur. New buildings included in Alternative 1 short-term projects would be constructed to achieve a minimum Leadership in Energy and Environmental Design (LEED\(^\text{®}\)) Silver rating, and other sustainability measures would be implemented in accordance with the VA SSPP. Thus, future operational GHG emissions associated with these new buildings would be less than emissions associated with non-LEED\(^\text{®}\) buildings. However, without thermoregulated environments in patient-care buildings, sick, injured, and elderly Veterans could be vulnerable to extreme heat conditions. SFVAMC would likely require a high energy load while the rest of San Francisco would have similar energy demand, which could add stress to the overall system (i.e., lead to brownouts). Thus, under Alternative 1 short-term projects, the ongoing medical center operation designed for long-term use could still be unprepared for the results of climate change, and persons, property, and operations could be harmed. This would represent a potentially adverse effect.
However, SFVAMC keeps its fire sprinkler systems, heating, ventilation, and air conditioning (HVAC) systems, and geothermal cooling systems up to date. These systems undergo quarterly maintenance to ensure that they are sufficient to handle additional loads, including those related to potential extreme heat events. In addition, SFVAMC provides quarterly maintenance of its backup electricity and water supply systems to ensure the availability of air conditioning and water for its patients and employees during heat waves or other potential natural or human-caused disasters. Because SFVAMC’s existing sprinkler and HVAC systems would be kept up to date and backup electricity and water supplies would be maintained, this impact would be minor.

Wildfire Threat

The SFVAMC Fort Miley Campus is located at the wildland urban interface (ABAG, 2015) and surrounded on three sides by forested public land belonging to the National Park Service’s Golden Gate National Recreation Area (GGNRA), with an identified wildfire threat of “high” and “very high” (City, 2008). This existing wildfire threat could intensify if droughts and extreme temperature events were to increase in severity. Thus, under Alternative 1 short-term projects, the ongoing medical center operation designed for long-term use could be unprepared for the results of climate change, and persons, property, and operations could be harmed. This would represent a potentially adverse effect. However, with implementation of Mitigation Measure GHG-1, even in the short term (considering current drought conditions), attention would be paid to the potential wildfire risk near the SFVAMC Fort Miley Campus, thus reducing this impact to a minor level.

Mitigation Measure GHG-1: Maintain Foliage on Campus and Coordinate with Other Jurisdictions to Maintain Foliage Adjacent to Campus

SFVAMC will maintain its foliage on the SFVAMC Fort Miley Campus by conducting an annual foliage survey and then conducting appropriate pruning and/or removal actions. In addition, SFVAMC will coordinate with GGNRA and the City and County of San Francisco to ensure those agencies maintain foliage on their adjacent properties to minimize fuel load for potential wildfires that could affect the SFVAMC Fort Miley Campus.

Sea Level Rise

Based on the worst-case sea-level-rise predictions discussed above in Section 3.7.1, “Affected Environment,” sea level rise could cause flooding in some of the low-lying coastal areas of San Francisco. However, because the existing SFVAMC Fort Miley Campus is situated at a much higher elevation than the Pacific Ocean (approximately 300–350 feet above msl), no climate change–related sea-level-rise impacts would occur at the Campus under Alternative 1 short-term projects by mid-2020. Therefore, short-term development under Alternative 1 would not be unprepared for environmental changes that would occur from climate change, and thus, those changes would not result in harm to persons or property or degradation of natural resources or ecosystems. No impact would occur.
**Long-Term Projects**

**Construction**

**Greenhouse Gas Emissions**

Under the Alternative 1 long-term project, construction emissions at the existing SFVAMC Fort Miley Campus would total 1,198 MTCO$_2$e. No VA sustainability measures are relevant to construction-related GHG emissions; thus, no sustainability measures were applied to determine total construction-related GHG emissions. However, these construction-related GHGs would be emitted only once and emissions would be spread out over a time period of approximately 2 years. Thus, construction-related GHG emissions associated with the Alternative 1 long-term project would be substantially less than the 25,000 MTCO$_2$e per year threshold and would not make a considerable contribution to cumulative GHG emissions and global climate change. This impact would be minor.

**Operation**

**Greenhouse Gas Emissions**

Table 3.7-6 presents the GHG emissions related to operation of the Alternative 1 long-term project. Operational GHG emissions for the Alternative 1 long-term project would total 2,944 MTCO$_2$e per year. Of this total, mobile-source emissions would total 1,417 MTCO$_2$e per year and energy-source emissions would total 628 MTCO$_2$e per year. However, with implementation of the VA SSPP and its related sustainability measures, operational emissions at the Campus under the Alternative 1 long-term project would total 2,758 MTCO$_2$e per year (Table 3.7-6). This would result in a total net increase in GHG emissions under Alternative 1 short-term and long-term projects of 4,363 MTCO$_2$e.

Because operations of Alternative 1 short- and long-term projects would result in GHG emissions well below 25,000 MTCO$_2$e per year, implementing Alternative 1 projects would not make a considerable contribution to cumulative GHG emissions and global climate change. This impact would be minor.

<table>
<thead>
<tr>
<th>Table 3.7-6: Operational Greenhouse Gas Emissions of the Alternative 1 Long-Term Project (Metric Tons of CO$_2$e per Year)</th>
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<tbody>
<tr>
<td><strong>Transportation Emissions</strong></td>
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<tr>
<td><strong>Without VA SSPP Applied</strong></td>
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<td>Long-Term Project (2026)</td>
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Notes:
- CO$_2$e = carbon dioxide equivalent; VA SSPP = Department of Veterans Affairs Strategic Sustainability Performance Plan
- Source: Data compiled by AECOM in 2014 (see Appendix B)
Impacts of Climate Change on the Alternative 1 Long-Term Project

Climate change–related impacts on the Alternative 1 long-term project would be similar to those assessed for Alternative 1 short-term projects. These impacts would range in significance from minor with mitigation to no impact.

Alternative 2: SFVAMC Fort Miley Campus Buildout Alternative

Short-Term Projects

Construction

Greenhouse Gas Emissions

Under Alternative 2 short-term projects, construction emissions at the existing SFVAMC Fort Miley Campus would total 5,089 MTCO₂e, which is slightly less than construction emissions under Alternative 1 short-term projects. No VA sustainability measures are relevant to construction-related GHG emissions; thus, no sustainability measures were applied to determine total construction-related GHG emissions. However, these construction-related GHGs would be emitted only once and the emissions would be spread out over a time period of approximately 6 years. Thus, construction-related GHG emissions associated with Alternative 2 short-term projects would be substantially less than the 25,000 MTCO₂e per year threshold and would not make a considerable contribution to cumulative GHG emissions and global climate change. This impact would be minor.

Operation

Greenhouse Gas Emissions

Table 3.7-7 presents the GHG emissions related to operation of Alternative 2 short-term projects at the existing SFVAMC Fort Miley Campus. As shown, these operational GHG emissions would total 1,767 MTCO₂e per year, identical to the emissions associated with Alternative 1 short-term projects. Of this total, mobile-source emissions would total 434 MTCO₂e per year and energy-source emissions would total 548 MTCO₂e per year. However, with implementation of the VA SSPP and its related sustainability measures, operational GHG emissions at the Campus under the Alternative 2 short-term projects would be reduced to 1,605 MTCO₂e per year (Table 3.7-7). Because operations of Alternative 2 short-term projects would result in GHG emissions well below 25,000 MTCO₂e per year, implementing these projects would not make a considerable contribution to cumulative GHG emissions and global climate change. This impact would be minor.

Impacts of Climate Change on Alternative 2 Short-Term Projects

The climate change–related impacts on Alternative 2 short-term projects would be similar to those assessed for Alternative 1 short-term projects. These impacts would be minor.
Table 3.7-7: Operational Greenhouse Gas Emissions of Alternative 2 Short-Term Projects (Metric Tons of CO₂e per Year)

<table>
<thead>
<tr>
<th></th>
<th>Transportation Emissions</th>
<th>Stationary-Source Emissions</th>
<th>Total Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Energy (Electricity and Natural Gas)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Area</td>
<td>Water</td>
</tr>
<tr>
<td>Short-Term Projects (2020) without VA SSPP Applied</td>
<td>434</td>
<td>&lt;1</td>
<td>548</td>
</tr>
<tr>
<td>Short-Term Projects (2020) with VA SSPP Applied</td>
<td>434</td>
<td>&lt;1</td>
<td>386</td>
</tr>
</tbody>
</table>

Notes:
CO₂e = carbon dioxide equivalent; VA SSPP = Department of Veterans Affairs Strategic Sustainability Performance Plan
Source: Data compiled by AECOM in 2014 (see Appendix B)

Long-Term Projects

Construction

Greenhouse Gas Emissions

Under Alternative 2 long-term projects, construction emissions at the existing SFVAMC Fort Miley Campus would total 3,153 MTCO₂e. No VA sustainability measures are relevant to construction-related GHG emissions; thus, no sustainability measures were applied to determine total construction-related GHG emissions. However, these construction-related GHGs would be emitted only once and emissions would be spread out over a time period of approximately 5 years. Thus, construction-related GHG emissions associated with Alternative 2 long-term projects would be substantially less than the 25,000 MTCO₂e per year threshold and would not make a considerable contribution to cumulative GHG emissions and global climate change. This impact would be minor.

Operation

Greenhouse Gas Emissions

Table 3.7-8 presents the GHG emissions related to operation of Alternative 2 long-term projects. Operational GHG emissions for Alternative 2 long-term projects would total 2,944 MTCO₂e per year. Of this total, mobile-source emissions would total 1,417 MTCO₂e per year and energy-source emissions would total 628 MTCO₂e per year. However, with implementation of the VA SSPP and its related sustainability measures, operational emissions at the Campus under Alternative 2 long-term projects would total 2,758 MTCO₂e per year (Table 3.7-8). This would result in a total net increase in GHG emissions under Alternative 2 short- and long-term projects of 4,363 MTCO₂e.

Because operations of Alternative 2 short- and long-term projects would result in GHG emissions well below 25,000 MTCO₂e per year, implementing Alternative 2 projects would not make a considerable contribution to cumulative GHG emissions and global climate change. This impact would be minor.
Table 3.7-8: Operational Greenhouse Gas Emissions of Alternative 2 Long-Term Projects (Metric Tons of CO₂e per Year)

<table>
<thead>
<tr>
<th></th>
<th>Transportation Emissions</th>
<th>Stationary-Source Emissions</th>
<th>Total Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Energy</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Electricity and Water)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Area</td>
<td></td>
</tr>
<tr>
<td>Long-Term Projects (2027) without VA SSPP Applied</td>
<td>1,417</td>
<td>&lt;1</td>
<td>628</td>
</tr>
<tr>
<td>Long-Term Projects (2027) with VA SSPP Applied</td>
<td>1,417</td>
<td>&lt;1</td>
<td>442</td>
</tr>
</tbody>
</table>

Notes:
- CO₂e = carbon dioxide equivalent; VA SSPP = Department of Veterans Affairs Strategic Sustainability Performance Plan
- Source: Data compiled by AECOM in 2014 (see Appendix B)

Impacts of Climate Change on Alternative 2 Long-Term Projects

Climate change–related impacts on Alternative 2 long-term projects would be similar to those assessed for Alternative 1 short-term projects. These impacts would range in significance from minor to no impact.

Alternative 3: SFVAMC Fort Miley Campus plus Mission Bay Campus Alternative

Short-Term Projects

Alternative 3 short-term projects (during both construction and operation) would be the same as short-term projects for Alternative 1 (Table 2-1 and Figure 2-1). Therefore, the impacts of Alternative 3 short-term projects related to GHG emissions would be the same as the impacts of short-term projects for Alternative 1. These impacts would range in significance from no impact to minor.

Long-Term Projects

Alternative 3 long-term projects (during both construction and operation) located at the SFVAMC Fort Miley Campus would be the same as the Alternative 1 long-term project, except that the ambulatory care center would be located at the potential new SFVAMC Mission Bay Campus under Alternative 3 (Table 2-1 and Figure 2-1).

Construction

Under Alternative 3 long-term projects, construction emissions would total 1,109 MTCO₂e. It should be noted that under Alternative 3 long-term projects, the ambulatory care center would be constructed at the potential new SFVAMC Mission Bay Campus rather than at the existing SFVAMC Fort Miley Campus. Therefore, projected emissions at the existing SFVAMC Fort Miley Campus would be less under Alternative 3 than under Alternative 1. No VA sustainability measures are relevant to construction-related GHG emissions; thus, no sustainability measures were applied to determine total construction-related GHG emissions. However, these construction-related GHGs would be emitted only once and emissions would be spread out over a time period of approximately 3 years. Thus, construction-related GHG emissions associated with Alternative 3 long-term projects would be
substantially less than the 25,000 MTCO\textsubscript{2}e per year threshold and would not make a considerable contribution to cumulative GHG emissions and global climate change. This impact would be minor.

**Operation**

Table 3.7-9 presents the GHG emissions related to operation of Alternative 3 long-term projects at the potential new SFVAMC Mission Bay Campus. Operational GHG emissions during these projects would total 3,247 MTCO\textsubscript{2}e per year. Of this total, mobile-source emissions associated with the potential new Campus would total 878 MTCO\textsubscript{2}e per year and energy-source emissions would total 517 MTCO\textsubscript{2}e per year. However, with implementation of the VA SSPP and its related sustainability measures, energy-source emissions at the potential new Campus under Alternative 3 long-term projects would total 364 MTCO\textsubscript{2}e per year (Table 3.7-9). It should be noted that the difference in emissions at the existing SFVAMC Fort Miley Campus between Alternatives 1 and 3 is based on the difference in overall square footage that would occur under Alternative 3 versus Alternative 1.

**Table 3.7-9: Operational Greenhouse Gas Emissions of Alternative 3 Long-Term Projects**

<table>
<thead>
<tr>
<th></th>
<th>Transportation Emissions</th>
<th>Stationary-Source Emissions</th>
<th>Total Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Area</td>
<td>Energy (Electricity and Water)</td>
<td>Solid Waste</td>
</tr>
<tr>
<td>Long-Term Projects (2027) without VA SSPP Applied</td>
<td>878</td>
<td>517</td>
<td>132</td>
</tr>
<tr>
<td>Long-Term Projects (2027) with VA SSPP Applied</td>
<td>878</td>
<td>364</td>
<td>132</td>
</tr>
</tbody>
</table>

Notes:
CO\textsubscript{2}e = carbon dioxide equivalent; VA SSPP = Department of Veterans Affairs Strategic Sustainability Performance Plan
Source: Data compiled by AECOM in 2014 (see Appendix B)

Therefore, with implementation of the VA SSPP and its related sustainability measures under Alternative 3 long-term operational GHG emissions would total 3,094 MTCO\textsubscript{2}e per year. Taken into consideration with the projected emissions of Alternative 3 short-term projects, implementation of Alternative 3 would generate GHG emissions of 5,014 MTCO\textsubscript{2}e per year without the VA SSPP and 4,699 MTCO\textsubscript{2}e with the VA SSPP.

Because operations of Alternative 3 short- and long-term projects at the potential new SFVAMC Mission Bay Campus would result in GHG emissions below 25,000 MTCO\textsubscript{2}e per year, operation of Alternative 3 long-term projects would not make a considerable contribution to cumulative GHG emissions and global climate change. This impact would be minor.

**Impacts of Climate Change on Alternative 3 Long-Term Projects**

**Extreme Heat Events**

Climate change–related impacts on Alternative 3 long-term projects related to extreme heat events would be similar to those assessed for Alternative 1 short-term projects, with a minor impact.
Wildfire Threat

The potential SFVAMC Mission Bay Campus would not be located at a wildland urban interface or adjacent to forested land. Thus, no impact related to wildfire risk would occur.

Sea Level Rise

Based on the worst-case sea-level-rise predictions of 66 inches by 2099 as discussed above in Section 3.7.1, "Affected Environment,” sea level rise could cause flooding in the low-lying urbanized areas of San Francisco. Because a specific location for the potential new SFVAMC Mission Bay Campus has not been identified and the elevation of the site of the potential new Campus relative to San Francisco Bay is unknown, an adverse climate change–related sea level rise impact could occur at the potential new Campus by the year 2027. The potential new SFVAMC Mission Bay Campus could be located on fill on previous marshland at such a low elevation that it would be vulnerable to sea level rise, particularly in combination with a potential storm surge and/or extreme rainfall events by the middle and end of the century. Figure 3.7-4 shows a detailed worst-case sea-level-rise analysis map for the Mission Bay area through the end of the century. However, as part of construction of VA facilities at the potential new SFVAMC Mission Bay Campus, the ground elevation would be raised to a level that would avoid sea level rise–related inundation of VA structures and of the roadways and infrastructure that would serve the new facilities. In addition, VA facilities would be thoroughly assessed as a part of the design and approval process to satisfy building code and geotechnical requirements. Furthermore, a project-level environmental review would be conducted in the future when more specific project details are available. Thus, no climate change–related sea level rise impact would occur at the potential new SFVAMC Mission Bay Campus.

Alternative 4: No Action Alternative

Short-Term Projects

Construction

Greenhouse Gas Emissions

No short-term, construction-related GHG emissions impacts would occur under Alternative 4.

Operation

Greenhouse Gas Emissions

Under Alternative 4, there would be no LRDP-related operational GHG emissions above current conditions. Table 3.7-10 shows mid-2020 (i.e., future without project) conditions for GHG emissions. It should be noted that the decrease in total mobile-source GHG emissions shown with implementation of Alternative 4 is attributed to efficiencies in vehicle emissions rates that would occur by mid-2020. Furthermore, the decrease in energy-related emissions can be attributed to the implementation of the VA SSPP, and not part of Alternative 4. Therefore, no impact would occur.
### Table 3.7-10: Mid-2020 Operational Emissions without Project Greenhouse Gas Emissions (Metric Tons of CO₂e per year)

<table>
<thead>
<tr>
<th></th>
<th>Transportation Emissions</th>
<th>Stationary-Source Emissions</th>
<th>Total Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Area</td>
<td>Energy (Electricity and Natural Gas)</td>
</tr>
<tr>
<td>Baseline (mid-2020) without VA SSPP Applied</td>
<td>4,093</td>
<td>&lt;1</td>
<td>7,548</td>
</tr>
<tr>
<td>Baseline (mid-2020) with VA SSPP Applied</td>
<td>4,093</td>
<td>&lt;1</td>
<td>5,314</td>
</tr>
</tbody>
</table>

Notes:
CO₂e = carbon dioxide equivalent; VA SSPP = Department of Veterans Affairs Strategic Sustainability Performance Plan
Source: Data compiled by AECOM in 2014 (see Appendix B)

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**Short-Term Impacts of Climate Change under Alternative 4**

**Extreme Heat Events**

The short-term climate change–related impacts under Alternative 4 related to extreme heat events would be similar to those assessed for Alternative 1 short-term projects, with a minor impact.

**Wildfire Threat**

The SFVAMC Fort Miley Campus is located at the wildland urban interface (ABAG, 2015) and surrounded on three sides by forested public land belonging to the National Park Service’s GGNRA, with an identified wildfire threat of “high” and “very high” (City, 2008). This existing wildfire threat could intensify if droughts and extreme temperature events were to increase in severity. This would represent a potentially adverse effect.

**Sea Level Rise**

The short-term climate change–related impacts under Alternative 4 related to sea level rise would be similar to those assessed for Alternative 1 short-term projects, with no impact.

**Long-Term Projects**

**Construction**

No long-term, construction-related impacts related to GHG emissions would occur under Alternative 4.

**Operation**

Under Alternative 4, there would be no LRDP-related operational GHG emissions above current conditions. However, Table 3.7-11 shows 2027 (i.e., future without project) conditions for GHG emissions. As with short-term conditions identified above for Alternative 4, the decrease in total mobile-source GHG emissions shown with implementation of this alternative are attributed to efficiencies in vehicle emissions rates that would occur by
2027,\(^{12}\) and the decrease in energy-related emissions can be attributed to the implementation of the VA SSPP and not part of Alternative 4. Therefore, no impact would occur.

**Table 3.7-11: 2027 Future without Project Greenhouse Gas Emissions (Metric Tons of CO\(_2\)e per year)**

<table>
<thead>
<tr>
<th></th>
<th>Transportation Emissions</th>
<th>Stationary-Source Emissions</th>
<th>Total Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Emissions</td>
<td>Area</td>
<td>Energy (Electricity and Natural Gas)</td>
</tr>
<tr>
<td>Future Alt 4 (2027) without VA SSPP Applied</td>
<td>3,905</td>
<td>&lt;1</td>
<td>7,548</td>
</tr>
<tr>
<td>Future Alt 4 (2027) with VA SSPP Applied</td>
<td>3,905</td>
<td>&lt;1</td>
<td>5,314</td>
</tr>
</tbody>
</table>

Notes:
CO\(_2\)e = carbon dioxide equivalent; VA SSPP = *Department of Veterans Affairs Strategic Sustainability Performance Plan*
Source: Data compiled by AECOM in 2014 (see Appendix B)

**Long-Term Impacts of Climate Change under Alternative 4**

The climate change–related impacts under Alternative 4 would be similar to those assessed for the short term under Alternative 3. Impacts would range in significance from minor with mitigation to no impact.

**3.7.4 References**


\(^{12}\) This is in accordance with a new national fuel economy program that adopts uniform federal standards to regulate both fuel economy and greenhouse gas emissions, covers model year 2012 to model year 2016, and requires an average fuel economy standard of 35.5 miles per U.S. gallon in 2016 (specifically, 39 miles per gallon for cars and 30 miles per gallon for trucks). This is a jump from the current average for all vehicles of 25 miles per gallon.


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